Porcelain Tower at Nankin.
THE HUNDRED WONDERS OF THE WORLD,
AND OF THE THREE KINGDOMS OF NATURE,
DESCRIBED ACCORDING TO THE BEST AND LATEST AUTHORITIES,
AND ILLUSTRATED WITH ONE HUNDRED ENGRAVINGS.

BY THE REV. C. C. CLARKE,
Author of the Wonders of the Heavens.

"The Ancients boasted of their Seven Wonders of the World; but this Work will prove that the Moderns may boast of their Hundred Wonders."

FIFTEENTH EDITION.
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THE Ancients boasted of their Seven Wonders of the World, but this work will prove that the Moderns may boast of their Hundred Wonders.

To embody these wonders, whether of nature, or of art, and to bring them into a comprehensive form, from the different stores in which they may be said to have been hitherto locked up, has been the aim of the editor of these pages. They are here drawn into light, and exhibited at a single view, presenting whatever is most striking in the creation, and whatever the genius and industry of man have been able to effect, in order to excite admiration at the sublimity of his conceptions, the depth of his scientific researches, and the grandeur of those structures, many of which have subsisted, almost unimpaired, for a long succession of ages, in testimony of his consummate skill, which could thus achieve monuments, at once so splendid, and of so imperishable a nature!

Those marvellous relations which the mischievous fancy of travellers has too often imposed on the credulity of the weak, as well as the fables founded in bigotry and priestcraft, which were received as truths
in the dark ages, have been sedulously shunned: where the subjects treated have incidentally led to them, they have, on the other hand, been as carefully exposed. But whatever has been confirmed by the concurrent testimony of enlightened writers, has been faithfully digested from their works. Whether on the subjects in which nature, in the different departments of her empire, and in the bestowal of her sublime gifts and attributes, displays herself in her most magnificent attire; or on those in which art has overstepped the ordinary bounds assigned to the faculties of man; the best authorities have been throughout consulted. The editor, therefore, flatters himself that, in compiling and assembling so many objects of wonder and delight, he has conferred a real benefit on the rising generation, and that his labours will not be disdained by those even, whose researches into the sublime wonders of nature and of art have engrossed the chief of their attention.
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THE WONDERS OF THE WORLD:
AND OF THE
THREE KINGDOMS OF NATURE.

THE MOUNTAINS OF THE ANDES,
IN SOUTH AMERICA.

"Mountains and all hills—praise the name of the Lord; for his name alone is excellent; his glory is above the earth and heaven."

Among the wonders, or uncommon phenomena of the world, may be classed stupendous Mountains; and of these the Andes, in South America, are the loftiest, the most extensive, and, therefore, the most wonderful. Descriptions of objects which are striking, because they are vast, often fail in exciting appropriate ideas; and however accurate or poetical may be the accounts of this class of Nature's Prodigies, no just notions of their vastness can be conveyed by any written or graphical representation. The magnitude of an object must be seen to be duly conceived, and mountain-wonders will be best felt by those who have visited Wales, Scotland, Switzerland, or the mountainous regions of America or Asia.

The stupendous mountains called by the Spaniards the Cordilleras, (from cord, or chain, pronounced by them Cor-dil-le-ras,) or Chains of the Andes, (An-des,) stretch north and south, near the western coast, from the Isthmus of Darien, through the whole of the continent of South America, to the Straits of Magellan. In the north there are three chains or separate ridges, but in advancing from Popayan towards the south, the three chains unite into
MOUNTAINS.

a single group, which is continued far beyond the equator. In the kingdom of Quito,* the more elevated summits of this group are ranged in two rows, which form a double crest to the Cordillera. The extent of the Andes Mountains is not less than four thousand three hundred miles.

Rocks rich in gems, and mountains big with mines,
That on the high equator ridgy ri-e,
Whence many a bursting stream auriferous plays.

Thomson.

In this country the operations of nature appear to have been carried on on a larger scale, and with a bolder hand, than elsewhere; and in consequence the whole is distinguished by a peculiar magnificence. Even the plain of Quito, which may be considered as the base of the Andes, is more elevated above the sea than the summits of many European mountains. In different places the Andes rise more than one-third above the famous Peak of Teneriffe, the highest land in the ancient hemisphere. Their cloud-enveloped summits, though exposed to the rays of the sun in the torrid zone, are covered with eternal snows, and below them the storm is seen to burst, and the exploring traveller hears the thunder roll, and sees the lightnings dart beneath his feet.

Throughout the whole of the range of these extensive mountains, as far as they have been explored, there is a certain boundary, above which the snow never melts, which boundary, in the torrid zone, has been ascertained to be 14,600 feet, or nearly three miles, above the level of the South Sea.

The ascent to the plain of Quito, on which stand Chimborazo, Cotopaxi, Pichineha, &c. is thus described by Don Juan de Ulloa:

"The ruggedness of the road from Taraguaga, leading up the mountain, is not easily described. The declivity is so great, in some parts, that the mules can scarcely keep their footing; and, in others, the acclivity is equally difficult. The trouble of sending people before to mend the road, the pain arising from the many falls and bruises,

* Pronounced Que-to, the t in all European languages being sounded as an e.
and the being constantly wet to the skin, might be supported; but these inconveniences are augmented by the sight of such frightful precipices, and deep abysses, as excite constant terror. The road, in some places, is so steep, and yet so narrow, that the mules are obliged to slide down, without making any use whatever of their feet. On one side of the rider, in this situation, rises an eminence of many hundred yards; and, on the other, is an abyss of equal depth; so that, if he should give the least check to his mule, and destroy the equilibrium, both must inevitably perish.

"Having travelled nine days in this manner, slowly winding along the sides of the mountains, we began to find the whole country covered with a hoar-frost; and a hut, in which we reposed, had ice in it. At length, after a perilous journey of fifteen days, we arrived upon a plain, at the extremity of which stands the city of Quito, the capital of one of the most charming regions in the world. Here, in the centre of the torrid zone, the heat is not only very tolerable, but, in some places, the cold is even painful. Here the inhabitants enjoy the temperature and advantages of perpetual spring; the fields being constantly covered with verdures, and enamelled with flowers of the most lively colours. However, although this beautiful region is more elevated than any other country in the world, and it employs so many days of painful journey in the ascent, it is itself overlooked by tremendous mountains; their sides being covered with snow, while their summits are flaming with volcanoes. These mountains seem piled one upon the other, and to rise with great boldness to an astonishing height. However, at a determined point above the surface of the sea, the congelation is found at the same height in all the mountains. Those parts which are not subject to a continual frost, have here and there growing upon them a species of rush, resembling the broom, but much softer and more flexible. Towards the extremity of the part where the rush grows, and the cold begins to increase, is found a vegetable with a round bulbous head. Higher still, the earth is bare of vegetation, and seems covered with eternal snow. The most remarkable of the Andes are the mountains of Chimborazo, Cotopaxi, and Pichincha."
CHIMBORAZO,
THE MOST LOFTY OF THE ANDES.

This is the most majestic of the Andes, and has a circular summit, 22,000 feet, or above four miles high. On the shores of the South Sea, after the long rains of winter, when the mistiness of the air has suddenly diminished, Chimborazo appears like a cloud in the horizon. It detaches itself from the neighbouring summits, and raises its lofty head over the whole chain of the Andes. Travellers who have approached the summits of Mont Blanc and Mont Rose, are alone capable of feeling the effect of such vast, majestic, and solemn scenery.

The bulk of Chimborazo is so enormous, that the part which the eye embraces at once, near the limit of the snows, is 22,968 feet, or four miles and a third in breadth. The extreme rarity of the strata of air, across which the summits of the Andes are seen, contributes greatly to the splendour of the snow, and the magical effect of its reflection. Under the tropics, at a height of 16,400 feet, upwards of three miles, the azure vault of the heavens appears of an indigo tint; while, in so pure and transparent an atmosphere, the outlines of the mountains detach themselves from the sky, and produce an effect at once sublime, awful, and profoundly impressive.

With the exception of the newly-discovered Asiatic mountains, Chimborazo is the highest known mountain in the world. Humboldt, Bonpland, and Montefari, were persevering enough to approach within 1600 feet of the summit of this mighty king of mountains. Being aided in their ascent by a train of volcanic rocks, destitute of snow, they thus attained the amazing height of nearly four miles above the level of the sea; and the former of these naturalists is persuaded that they might have reached the highest summit, had it not been for the intervention of a great crevice, or gap, which they were unable to cross. They were, therefore, obliged to descend, after experiencing great inconveniences, and many unpleasant sensations. For three or four days, even after their return into the plain, they were not free from sickness, and an uncomfortable feeling, owing, as they suppose, to the vast proportion of
Chimborazo.

Cotopaxi.
oxygen in the atmosphere above. Long before they reached the above surprising height, they had been abandoned by their guides, the Indians, who had taken alarm, and were fearful of their lives. So great was the fall of snow on their return, that they could scarcely recognize each other, and they all suffered dreadfully from the intenseness of the cold.

A great number of Spaniards formerly perished in crossing the vast and dangerous deserts which lie on the declivity of Chimborazo; being now, however, better acquainted with them, such misfortunes seldom occur, especially as very few take this route, unless there be a prospect of calm and serene weather.

COTOPAXI.

This mountain is the loftiest of those volcanoes of the Andes which, at recent epochs, have undergone eruptions. Notwithstanding it lies near the Equator, its summits are covered with perpetual snows. The absolute height of Cotopaxi is 18,876 feet, or three miles and a half, consequently it is 2,622 feet, or half a mile, higher than Vesuvius would be, were that mountain placed on the top of the Peak of Tenerife! Cotopaxi is the most mischievous of the volcanoes in the kingdom of Quito, and its explosions are the most frequent and disastrous. The masses of scoriae, and the pieces of rock, thrown out of this volcano, cover a surface of several square leagues, and would form, were they heaped together, a prodigious mountain. In 1738, the flames of Cotopaxi rose 3000 feet, or upwards of half a mile, above the brink of the crater. In 1744, the roarings of this volcano were heard at the distance of six hundred miles. On the 4th of April, 1768, the quantity of ashes ejected at the mouth of Cotopaxi was so great, that it was dark till three in the afternoon. The explosion which took place in 1803, was preceded by the sudden melting of the snows that covered the mountain. For twenty years before no smoke or vapour, that could be perceived, had issued from the crater; but in a single night the subterraneous fires became so active, that at sun-rise the external walls of the cone, heated to a very considerable temperature, appeared naked, and of the dark colour...
which is peculiar to vitrified scoriae. "At the port of Guayaquil," observes Humboldt, "fifty-two leagues distant in a straight line from the crater, we heard, day and night, the noise of this volcano, like continued discharges of a battery; and we distinguished these tremendous sounds even on the Pacific Ocean."

The form of Cotopaxi is the most beautiful and regular of the colossal summits of the high Andes. It is a perfect cone, which, covered with a perpetual layer of snow, shines with dazzling splendour at the setting of the sun, and detaches itself in the most picturesque manner from the azure vault above. This covering of snow conceals from the eye of the observer even the smallest inequalities of the soil; no point of rock, no stony mass, penetrating this coat of ice, or breaking the regularity of the figure of the cone.

**PICHINCHA.**

Though celebrated for its great height, Pichincha is 3,849 feet, or three-fourths of a mile, lower than the perpendicular elevation of Cotopaxi. It was formerly a volcano; but the mouth or crater on one of its sides is now covered with sand or calcined matter, so that at present neither smoke nor ashes issue from it.

When it was ascended by Don George Juan and Don Antonio de Ulloa, for the purpose of their astronomical observations, they found the cold on the top of this mountain extremely intense, the wind very violent, and the fog, or, in other words, the cloud, so thick, that objects at the distance of six or eight paces were scarcely discernible. On the air becoming clear, by the clouds descending nearer the earth, in such manner as to surround the mountain on all sides to a vast distance, these clouds afforded a lively representation of the sea, in which the top of the mountain seemed to stand, like an island in the centre.

With aspect mild, and elevated eye,
Behold him seated on a mount serene,
Above the fogs of sense, and passion’s storm;
All the black cares and tumults of this life,
Like harmless thuners, breaking at his feet,
Exite his pity, not impair his peace.    Young
Mountains.

When the clouds descended, the astronomers heard the dreadful noise of tempests, which discharged themselves from them on the adjacent country. They saw the lightning issue from the clouds, and heard the thunder roll far beneath them. While the lower parts were thus involved in tempests of thunder and rain, they enjoyed a delightful serenity, the wind abated, the sky cleared, and the enlivening rays of the sun moderated the severity of the cold. But when the clouds rose, their density rendered respiration difficult. Snow and hail fell continually, and the winds returned with such violence, that it was impossible to overcome the fear of being blown down the precipices, or of being buried by the accumulations of ice and snow, or by the enormous fragments of rocks which rolled around them. Every crevice in their hut was stopped, and, though the hut was small, was crowded with inhabitants, and several lamps were constantly burning, the cold was so great, that each individual was obliged to have a chafing-dish of coals, and several men were employed every morning in removing the snows which had fallen during the night. Their feet were swollen, and they became so tender and sensible, that walking was attended with extreme pain; their hands also were covered with chilblains, and their lips were so swollen and chapped, that every motion in speaking brought blood.

Mount Etna,
In the Island of Sicily.

Now under sulphurous Cumana's sea-bound coast,
And vast Sicilia, lies the shaggy breast
Of snowy Etna, nurse of endless frost,
The pillared prop of heaven, for ever pressed:
Forth from whose sulph'rous caverns issuing rise
Pure liquid fountains of tempestuous fire,
Which veil in ruddy mists the noon-day skies,
While wrapt in smoke the eddying flames aspire,
Or gleaming thro' the night with hideous roar,
Far o'er the redd'ning main huge rocky fragments pour

But he, Vulcanian monster, to the clouds
The fiercest, hottest inundations throws,
While, with the burden of incumbent woods,
And Etna's gloomy cliffs o'erwhelmed he glows.
The majestic Etna, which the ancients considered, not unreasonably, as one of the highest mountains in the world and on the summit of which they believed that Deucalion and Pyrrha sought refuge, to save themselves from the universal deluge, is situated on the plain of Catania, in Sicily.

Its elevation above the level of the sea has been estimated at 10,963 feet, upwards of two miles. On clear days it is distinctly seen from Valetta, the capital of Malta, a distance of 150 miles. It is incomparably the largest burning mountain in Europe. From its sides other mountains arise, which, in different ages, have been ejected in single masses from its enormous crater. The most extensive lavas of Vesuvius do not exceed seven miles in length, while those of Etna extend to fifteen, twenty, and some even to thirty miles. The crater of Etna is seldom less than a mile in circuit, and sometimes is two or three miles; but the circumference of the Vesuvian crater is never more than half a mile, even when widely distended, in its most destructive conflagrations. Lastly, the earthquakes occasioned by these adjacent volcanoes, their eruptions, their showers of ignited stones, and the destruction and desolation which they create, are severally proportionate to their respective dimensions.

A journey up Etna is considered as an enterprise of importance, as well from the difficulty of the route, as from the distance, it being thirty miles from Catania to the summit of the mountain. Its gigantic bulk, its sublime elevation, and the extensive, varied, and grand prospects which are presented from its summit, have, however, induced the curious in every age to ascend and examine it; and not a few have transmitted, through the press, the observations which they have made during their arduous journey. From its vast base it rises like a pyramid to the perpendicular height of two miles, by an acclivity nearly equal on all sides, forming with the horizon an angle of about fifteen degrees, which becomes greater on approaching
Distant View of Etna.

Etna by Moonlight.
the crater; but the inclination of the steepest part of the cone nowhere exceeds an angle of forty-five degrees. This prodigious volcano may be likened to a forge, which, in proportion to the violence of the fire, to the nature of the fossil matters on which it acts, and to the gases which urge and set it in motion, produces, destroys, and reproduces, a variety of forms.

The top of Etna being above the common region of vapours, the heavens, at this elevation, appear with an unusual splendour. Brydone and his company observed, as they ascended in the night, that the number of the stars seemed to be infinitely increased, and the light of each was brighter than usual. The whiteness of the milky way was like a pure flame which spread across the heavens; and, with the naked eye, they could observe clusters of stars which were invisible from below. They likewise noticed several of those meteors called falling stars, which appeared as much elevated here as when viewed from the plain beneath.

This single mountain contains an epitome of the different climates throughout the world, presenting at once all the seasons of the year, and all the varieties of produce. It is accordingly divided into three distinct zones or regions, which may be distinguished as the torrid, temperate, and frigid, but which are known by the names of the cultivated region, the woody or temperate region, and the frigid or desert region. The former of these extends through twelve miles of the ascent towards the summit, and is almost incredibly abundant in pastures and fruit-trees of every description. It is covered with towns, villages, and monasteries; and the number of inhabitants distributed over its surface is estimated at 120,000. In ascending to the woody or temperate region, the scene changes; it is a new climate, a new creation. Below, the heat is suffocating; but here, the air is mild and fresh. The turf is covered with aromatic plants; and the guls, which formerly ejected torrents of fire, are changed into woody valleys. Than this nothing can be more picturesque, the inequality of the soil displaying every moment some variety of scene: here, the ash and flowering thorns form domes of verdure; and there, the chesnut-trees grow to a most enormous size. The one called castagno de cento cavalli, according to Brydone and Glover, has a circum-
MOUNTAINS.

ference of 204 feet. Many of the oaks also are of a prodigious size. Mr. Swinburne measured one which had circumference of 28 feet. The last, or desert region, commences more than a mile above the level of the sea. The lower part is covered with snow in winter only; but on the upper half of this sterile district the snows constantly lie.

Sometimes the pencil, in cool airy halls,
Bade the gay bloom of vernal landscapes rise,
Or Autumn's varied shades imbrown the walls:
Now the black tempest strikes th' astonished eyes,
Now down the steep the flashing torrent flies;
The trembling sun now plays o'er ocean blue,
And now rude mountains frown amid the skies;
Whatever Lorraine light-touched with softening hue,
Or savage Rosa dashed, or learned Poussin drew.

Thomson

The upper part, which may properly be called the cone of Etna, is, in a right line, about a mile, or somewhat more, in ascent. It is described by Sir William Hamilton as a little mountain, about a quarter of a mile perpendicular, and very steep, situated in the middle of a gently-inclined plane, about nine miles in circumference. The cavity was, according to his perception, shaped like a funnel, diminishing until it terminated in a point, and having an outer circumference of two miles and a half round. Great changes have since taken place. Spallanzani also reached the edge of the crater, and found it to be an oval of about a mile and a half in circuit, having its edges in many places indented by projecting lavas or scoriæ. The bottom was nearly a horizontal plane, about two-thirds of a mile in circumference; hence issued a constant column of smoke, and hence, as well as from the sides, arose several streams of smoke, resembling thin clouds. Within the aperture a liquid ignited matter was clearly seen, constantly undulating, boiling, rising and falling, without spreading over the bottom. This was, no doubt, the melted lava which had issued from the bottom of the gulf. Neither of the above travellers, nor Brydone, dared to venture down the crater, which they found too hot; but M. D'Orville, more adventurous, by the means of ropes, which two or three men held at a distance, descended as far as possible. His
Great Crater of Etna.
view was, in a great measure, intercepted by the small flames and smoke; but in the centre he saw a mass of matter, which rose in the shape of a cone, to the height of about sixty feet.

On the vastness and beauty of the prospect, from the summit of Etna, all authors agree; and Spallanzani observes, that there is not, perhaps, any elevated region on the whole globe which offers at one view so fine an extent of sea and land. M. Honel was stationed there at sun-rise, when the horizon was clear, and without a single cloud. The coast of Calabria was, he says, undistinguishable from the adjoining sea; but in a short time a fiery radiance began to appear from behind those Italian hills which bounded the eastern part of the prospect. The fleecy clouds which generally appear early in the morning, were tinged with purple; the atmosphere became strongly illuminated, and, reflecting the rays of the sun, seemed to be filled with a bright refulgence of flame. Although the heavens were thus enlightened, the sea still retained its dark azure, and the fields and forests did not yet reflect the rays of the sun. The gradual rising of this luminary, however, soon diffused light over the hills which lie below the peak of Etna. This last stood like an island in the midst of the ocean, with luminous points multiplying every moment around, and spreading over a wider extent with the greatest rapidity. It was, said he, as if the world had been observed suddenly to spring from the night of non-existence.

Ere the rising sun
Shone o'er the deep, or 'mid the vault of night
The moon her silver lampsuspende:eere
The vales with springs were watered, or with groves
Of oak or pine the ancient hills were crowned;
Then the Great Spirit, whom his works adore,
Within his own deep essence viewed the forms,
The forms eternal of created things:
The radiant sun; the moon's nocturnal lamp;
The mountains and the streams: the ample stores
Of earth, of heaven, of Nature. From the first,
On that full scene his love divine he fixed,
His admiration. Till, in time complete,
What he admired and loved his vital power
Unfolded into being. Hence the breath
Of life informing each organic frame:
Hence the green earth, and wild resounding waves;
Hence light and shade, alternate; warmth and cold;
And bright autumnal skies, and vernal showers,
And all the fair variety of things.

The most sublime object, however, which the summit of Etna presents, is the immense mass of its own colossal body. Its upper region exhibits rough and craggy cliffs, rising perpendicularly, fearful to the view, and surrounded by an assemblage of fugitive clouds, to increase the wild variety of the scene. Amid the multitude of woods in the middle or temperate region, are numerous mountains, which, in any other situation, would appear of a gigantic size, but which, compared to Etna, are mere mole-hills. Lastly, the eye contemplates with admiration the lower region, the most extensive of the three, adorned with elegant villas and castles, verdant hills and flowery fields, and terminated by the extensive coast, where, to the south, stands the beautiful city of Catania, to which the waves of the neighbouring sea serve as a mirror.

Etna has been celebrated as a volcano from the remotest antiquity. Eruptions are recorded by Diodorus Siculus as having happened 500 years before the Trojan war, or 1693 years before the Christian era.

Ætna roars with dreadful ruins nigh,
Now hurls a bursting cloud of cinders high,
Involved in smoky whirlwinds to the sky;
With loud displosion to the starry frame,
Shoots fiery globes, and furious floods of flame:
Now from her bellowing cavern burst away.
Vast piles of melted rocks in open day.
Her shattered entrails wide the mountain throws,
And deep as hell her flaming centre glows.

In 1669, the torrent of burning lava inundated a space fourteen miles in length, and four in breadth, burying beneath it a part of Catania, till at length it precipitated itself into the sea. For several months before the lava broke out, the old mouth, or great crater of the summit, was observed to send forth much smoke and flame, and the top had fallen in, so that the mountain was much lowered.

Eighteen days before, the sky was very thick and dark,
with thunder, lightning, frequent concussions of the earth, and dreadful subterraneous bellowings. On the 11th of March, about sun-set, an immense gulf opened in the mountain, into which when stones were thrown, they could not be heard to strike the bottom. Ignited rocks, fifteen feet in length, were hurled to the distance of a mile; while others of a smaller size were carried three miles. During the night, the red-hot lava burst out of a vineyard twenty miles below the great crater, and ascended into the air to a considerable height. In its course it destroyed 5000 habitations, and filled up a lake several fathoms deep. It shortly after reached Catania, rose over the walls, whence it ran for a considerable length into the sea, forming a safe and beautiful harbour, which was, however, soon filled up by a similar torrent of inflamed matter. This is the stream, the hideous deformity of which, devoid of vegetation, still disfigures the south and western borders of Catania, and on which part of the noble modern city is built.

The showers of scoria and sand which, after a lapse of two days, followed this eruption, formed a mountain called Monte Rosso, having a base of about two miles, and a perpendicular height of 750 feet. On the 25th, the whole mountain, even to the most elevated peak, was agitated by a tremendous earthquake. The highest crater of Etna, which was one of the loftiest part of the mountain, then sunk into the volcanic gulf, and in the place which it had occupied, there now appeared nothing but a wide gulf, more than a mile in extent, from which issued enormous quantities of smoke, ashes, and stones.

In 1809, twelve new craters opened about half way down the mountain, and threw out rivers of burning lava, by which several estates were covered to the depth of thirty or forty feet; and during three or four successive nights a very large river of red hot lava was distinctly seen, in its whole extent, running down from the mountain.

In 1811, several mouths opened on the eastern side of the mountain; being nearly in the same line, and at equal distances, they presented to the view a striking spectacle, — torrents of burning matter, discharged with the greatest force from the interior of the volcano, illuminated the horizon to a great extent. An immense quantity of matter, which was driven to considerable distances, was dis-
charged from these apertures, the largest of which continued for several months to emit torrents of fire. Even at the time when it had the appearance of being choked, there suddenly issued from it clouds of ashes, which descended, in the form of rain, on the city of Catania and its environs, as well as on the fields situated at a very considerable distance. A roaring, resembling that of the sea in the midst of a tempest, was heard to proceed from the interior of the mountain; and this sound, accompanied from time to time by dreadful explosions, resembling thunder, re-echoed through the vallies and spread terror on every side.

MOUNT VESUVIUS,
NEAR NAPLES.

The fluid lake that works below,
Bitumen, sulphur, salt, and iron scum,
Heaves up its boiling tide. The lab'ring mount
Is torn with agonizing throes. At once,
Forth from its side disparted, blazing pours
A mighty river; burning in prone waves,
That glimmer thro' the night, to yonder plain
Divided there, a hundred torrent streams,
Each ploughing up its bed, roll dreadful on,
Resistless. Villages, and woods, and rocks,
Fall flat before their sweep. The region round,
Where myrtle walks and groves of golden fruit
Rose fair; where harvest waved in all its pride;
And where the vineyard spread its purple store,
Maturing into nectar; now despoiled
Of herb, leaf, fruit and flower, from end to end
Lies buried under fire, a glowing sea! Mallet.

This celebrated volcano, which has for so many ages attracted the attention of mankind, and the desolating eruptions of which have been so often and so fatally experienced, is distant, in an eastern direction, about seven miles from Naples. It rises, insulated, upon a vast and well-cultivated plain, presenting two summits on the same base, in which particular it resembles Mount Parnassus. One of these, La Somma, is generally agreed to have been the Vesuvius of Strabo and the ancients; the other, having the greatest elevation, is the mouth of the volcano, which almost constantly emits smoke. Its height above the
Cloud of Smoke issuing from Mount Vesuvius.
level of the sea, is 3,900 feet, and it may be ascended by three
different routes, which are all very steep and difficult, from
the conical form of the mountain, and the loose ashes
which slip from under the feet: still, from the base to the
summit the distance is not more than three Italian miles.
The circumference of the platform on the top, is 5,024
feet, or nearly a mile. Thence may be seen Portici,
Caprae, Ischia, Pausilippo, and the whole coast of the
gulf of Naples, bordered with orange trees: the prospect
is that of Paradise seen from the infernal regions.

On approaching the mountain, its aspect does not con-
voy any impression of terror, nor is it gloomy, being cul-
tivated for more than two-thirds of its height, and having
its brown top alone barren. There all verdure ceases;
yet, when it appears covered with clouds, which sometimes
encompass its middle only, this circumstance rather adds to
than detracts from the magnificence of the spectacle.
Upon the lavas which the volcano long ago ejected, and
which, like great furrows, extend into the plain, and to
the sea, are built houses, villages, and towns. Gardens,
vineyards, and cultivated fields, surround them; but a
sentiment of sorrow, blended with apprehensions about
the future, arises on the recollection that, beneath a soil so
fruitful and so smiling, lie edifices, gardens, and whole
towns swallowed up. Portici rests upon Herculaneum;
it environs upon Resina; and at a little distance is
Pompeii, in the streets of which, after more than seven-
teen centuries of non-existence, the astonished traveller
now walks. After a long interval of repose, in the first
year of the reign of Titus, (the seventy-ninth of the
Christian era,) the volcano suddenly broke out, ejecting
thick clouds of ashes and pumice-stones, beneath which
Herculaneum, Stabia, and Pompeii, were completely bu-
ried. This eruption was fatal to the elder Pliny, the his-
torian, who fell a victim to his humanity and love of
science. Even at this day, in speaking of Vesuvius, the
remembrance of his untimely death excites a melancholy
regret. All the coast to the east of the gulf of Naples
was, on the above occasion, ravaged and destroyed, pre-
senting nothing but a long succession of ejected matters
from Herculaneum to Stabia. The destruction did not,
however, extend to the western part, but stopped at
Naples, which suffered comparatively little.
Thirty-eight eruptions of Vesuvius are recorded in history up to the year 1806. That of 1779 has been described by Sir William Hamilton as among the most remarkable from its extraordinary and terrific appearance. During the whole of July the mountain was in a state of considerable fermentation, subterraneous explosions and rumbling noises being heard, and quantities of smoke thrown up with great violence, sometimes with red-hot stones, scoriae, and ashes. On the 5th of August the volcano was greatly agitated, a white sulphureous smoke, apparently four times the height and size of the volcano itself, issuing from the crater, at the same time that vast quantities of stones, &c. were thrown up to the supposed height of 2000 feet. The liquid lava, having cleared the rim of the crater, flowed down the sides of the mountain to the distance of four miles. The air was darkened by showers of reddish ashes, blended with long filaments of a vitrified matter resembling glass.

On the 7th, at midnight, a fountain of fire shot up from the crater to an incredible height, casting so bright a light that the smallest objects were clearly distinguishable at any place within six miles of the volcano. On the following evening, after a tremendous explosion, which broke the windows of the houses at Portici, another fountain of liquid fire rose to the surprising height of 10,000 feet, (nearly two miles,) while puffs of the blackest smoke accompanied the red-hot lava, interrupting its splendid brightness here and there by patches of the darkest hue. The lava was partly directed by the wind towards Ottiiano, on which so thick a shower of ashes, blended with vast pieces of scoriae, fell, that, had it been of longer continuance, that town would have shared the fate of Pompeii. It took fire in several places; and had there been much wind, the inhabitants would have been burned in their houses, it being impossible for them to stir out. To add to the horror of the scene, incessant volcanic lightning darted through the black cloud which surrounded them, while the sulphureous smell and heat would scarcely allow them to draw their breath. In this dreadful state they remained nearly half an hour. The remaining part of the lava, still red-hot and liquid, fell on the top of Vesuvius, and covered its whole cone, together with that of La Somma, and the valley
Vesuvius and Naples.

Vesuvius in Eruption.
between them, thus forming one complete body of fire, which could not be less than two miles and a half in breadth, and casting a heat to the distance of at least six miles around.

The eruption of 1794 is accurately described by the above writer; but has not an equal degree of interest with the one cited above. We subjoin a few particulars, among which is a circumstance well deserving notice, as it leads to an estimate of the degree of heat in volcanoes. Sir William says that, although the town of Torre del Greco was instantly surrounded with red-hot lava, the inhabitants saved themselves by coming out of the tops of their houses on the following day. It is evident, observes Mr. Kirwan, that if this lava had been hot enough to melt even the most fusible stones, these persons must have been suffocated.

This eruption happened on the 15th of June, at ten o'clock at night, and was announced by a shock of an earthquake, which was distinctly felt at Naples. At the same moment a fountain of bright fire, attended with a very black smoke and a loud report, was seen to issue, and rise to a considerable height, from about the middle of the cone of Vesuvius. It was hastily succeeded by other fountains, fifteen of which were counted, all in a direct line, tending, for the space of about a mile and a half downward, towards the towns of Resina and Torre del Greco. This fiery scene—this great operation of nature—was accompanied by the loudest thunder, the incessant reports of which, like those of a numerous heavy artillery, were attended by a continued hollow murmur, similar to that of the roaring of the ocean during a violent storm. Another blowing noise resembled that of the ascent of a large flight of rockets. The houses at Naples were for several hours in a constant tremour, the doors and windows shaking and rattling incessantly, and the bells ringing. At this awful moment the sky, from a bright full-moon and star-light, became obscured; the moon seemed eclipsed, and was soon lost in obscurity. The murmur of the prayers and lamentations of a numerous population, forming various processions, and parading the streets, added to the horrors of the scene.

On the following day a new mouth was opened on the
opposite side of the mountain, facing the town of Ottaiano; from this aperture a considerable stream of lava issued, and ran with great velocity through a wood, which it burnt; but stopped, after having run about three miles in a few hours, before it reached the vineyards and cultivated lands. The lava, which had flowed from several new mouths on the south-side of the mountain, reached the sea, into which it ran, after having overwhelmed, burnt, and destroyed the greater part of Torre del Greco, through the centre of which it took its course. This town contained about 18,000 inhabitants, all of whom escaped, with the exception of about fifteen, who, through age or infirmity, were overwhelmed in their houses by the lava. Its rapid progress was such, that the goods and effects were entirely abandoned.

It was ascertained some time after, that a considerable part of the crater had fallen in, so as to have given a great extension to the mouth of Vesuvius, which was conjectured to be nearly two miles in circumference. This sinking of the crater was chiefly on the west-side, opposite Naples, and, in all probability, occurred early in the morning of the 18th, when a violent shock of an earthquake was felt at Resina, and other places situated at the foot of the volcano. The clouds of smoke which issued from this now widely-extended mouth of Vesuvius, were of such a density as to appear to force their passage with the utmost difficulty. One cloud heaped itself on another, and, succeeding each other incessantly, they formed in a few hours such a gigantic and elevated column, of the darkest hue, over the mountain, as seemed to threaten Naples with immediate destruction, it having at one time been bent over the city, and appearing to be much too massive and ponderous to remain long suspended in the air.

From the above time until 1804 Vesuvius remained in a state of almost constant tranquillity. Symptoms of a fresh eruption had manifested themselves for several months, when at length, on the night of the 11th of August, a deep roaring was heard at the Hermitage of Salvador, and the places adjacent to the mountain, accompanied by shocks of an earthquake, which were sensibly felt at Resina. On the following morning, at noon, a thick black smoke rose from the mouth of the crater, which, dilating
prodigiously, covered the whole volcano. In the evening loud explosions were heard; and at Naples a column of fire was seen to rise from the aperture, carrying up stones in a state of complete ignition, which fell again into the crater. The noise by which these igneous explosions were accompanied resembled the roaring of the most dreadful tempest, and the whistling of the most furious winds; while the celerity with which the substances were ejected was such, that the first emission had not terminated when it was succeeded by a second. Small monticules were at this time formed of a fluid matter, resembling a vitreous paste of a red colour, which flowed from the mouth of the crater; and these became more considerable in proportion as the matter accumulated.

In this state the eruption continued for several days, the fire being equally intense, with frequent and dreadful noises. On the 28th, amid these fearful symptoms, another aperture, ejecting fire and stones, situated behind the crater, was seen from Naples. The burning mass of lava which escaped from the crater on the following day, was distinguished from Torre del Greco, having the appearance of a vitreous fluid, and advancing towards the base of the mountain between the south and south-west. It reached the base on the 30th, having flowed from the aperture, in less than twenty-four hours, a distance of 3,053 feet, while its mean breadth appeared to be about 350, but at the base 860 feet. In its course it divided into four branches, and finally reached a spot called the Guide's Retreat. Its entire progress to this point was more than a mile, so that, taking a mean proportion, this lava flowed at the rate of eighty-six feet an hour.

At the time of this eruption Kotzebue was at Naples. Vesuvius lay opposite to his window, and when it was dark he could clearly perceive in what manner the masses of fire rolled down the mountain. As long as any glimmering of light remained, that part of the mountain was to be seen, on the declivity of which the lava formed a straight but oblique line. As soon, however, as it was perfectly dark, and the mountain itself had vanished from the eye, it seemed as if a comet with a long tail stood in the sky. The spectacle was awful and grand!

He ascended the mountain on the morning succeeding
the opening of a new gulf, and approached the crater as nearly as prudence would allow. From its centre ascended the sulphureous yellow cone which the eruption of this year had formed: on the other side, a thick smoke perpetually arose from the abyss opened during the preceding night. The side of the crater opposite to him, which rose considerably higher than that on which he stood, afforded a singular aspect; for it was covered with little pillars of smoke, which burst forth from it, and had some resemblance to extinguished lights. The air over the crater was actually embodied, and was clearly to be seen in a tremulous motion. Below, it boiled and roared dreadfully, like the most violent hurricane; but occasionally a sudden deadly stillness ensued for some moments, after which the roaring recommenced with double vehemence, and the smoke burst forth in thicker and blacker clouds. It was, he observes, as if the spirit of the mountain had suddenly tried to stop the gulf, while the flames indignantly refused to endure the confinement.

It is remarkable, that the great eruption of 1805 happened on the 12th of August, within a day of that of the preceding year. Subterraneous noises had been previously heard, and a general apprehension of some violent commotion prevailing, the inhabitants of Torre del Greco and Annunziada had left their homes, through the apprehension of a shower of fire and ashes, similar to that which buried Pompeii. The stream of lava took the same course with that of 1794, described above, one of the arms following the direction of the great road, and rolling towards the sea. The stream soon divided again, and spreading itself with an increased celerity, swept away many houses and the finest plantations. The other branch, at first, took the direction of Portici, which was threatened; but turning, and joining the preceding one, formed a sort of islet of boiling lava in the middle, both ending in the sea, and composing a promontory of volcanic matters. In the space of twenty minutes the whole extent of ground which the lava occupied was on fire, offering a terrible yet singular spectacle, as the burning trees presented the aspect of white flames, in contrast with those of the volcanic matters, which were red. The lava swept along with it enormous masses of whatever occurred in its course, and, on its
Interior of the Crater of Vesuvius.

Crater of Etna.
reaching the sea, nothing was to be seen or heard for a great extent of shore, besides the boiling and hissing arising from the conflict of the water and fire.

It remains now to introduce a slight notice of the eruption of 1806, which, without any sensible indication, took place on the evening of the 31st of May, when a bright flame rose from the mountain to the height of about 600 feet, sinking and rising alternately, and affording so clear a light, that a letter might have been read at the distance of a league around the mountain. On the following morning, without any earthquake preceding, as had been customary, the volcano began to eject inflamed substances from three new mouths, pretty near to each other, and about 650 feet from the summit. The lava took the direction of Torre del Greco and Annunziata, approaching Portici, on the road leading from Naples to Pompeii. Throughout the whole of the second of June, a noise was heard, resembling that of two armies engaged, when the discharges of artillery and musketry are very brisk. The current of lava now resembled a wall of glass in a state of fusion, sparks and flashes issuing from it from time to time, with a powerful detonation. Vines, trees, houses,—whatever objects, in short, it encountered on its way, were instantly overthrown or destroyed. In one part, where it met with the resistance of a wall, it formed a cascade of fire. In a few days, Portici, Resina, and Torre del Greco, were covered with ashes thrown out by the volcano; and, on the ninth, the two former places were deluged with a thick black rain, consisting of a species of mud filled with sulphureous particles. On the 1st of July, the ancient crater had wholly disappeared, being filled with ashes and lava, and a new one was formed in the eastern part of the mountain, about 600 feet in depth, and having about the same width at the opening. Several persons, on the above day, descended about half way down this new mouth, and remained half an hour very near the flames, admiring the spectacle presented by the liquid lava, which bubbled up at the bottom of the crater, like the fused matter in a glass-house. This eruption continued until September, made great ravages, and was considered as one of the most terrible that had occurred in the memory of the inhabitants.
Still pressing on beyond Tornea's lake,
And Hecla flaming through a waste of snow,
And farthest Greenland, to the Pole itself,
Where, falling gradual, life at length goes out,
The Muse expands her solitary flight;
And hov'ring o'er the wide stupendous scene,
Beholds new scenes beneath another sky.
Throned in his palace of eternal ice,
Here Winter holds his un rejoicing court,
And through his airy hall the loud misrule
Of driving tempest is for ever heard;
Here the grim tyrant meditates his wrath;
Here arms his winds with all subduing frost,
Moulds his fierce hail, and treasures up his snows.

On proceeding along the southern coast of Iceland, and
at an inconsiderable distance from Skaalholt, this mountain,
with its three summits, presents itself to the view. Its
height is five thousand feet, or nearly a mile above the
level of the sea. It is not a promontory, but lies about
four miles inland. It is neither so elevated nor so pictu-
resque as several of the surrounding Icelandic mountains;
but has been more noticed than many other volcanoes of an
equal extent, partly through the frequency of its eruptions,
and partly from its situation, which exposes it to the view
of many ships sailing to Greenland and North America.
The surrounding territory has been so devastated by these
eruptions, that it has been deserted.

Vast regions dreary, bleak, and bare!
There on an icy mountain's height,
Seen only by the Moon's pale light,
Stern Winter rears his giant form,
His robe a mist, his life a storm:
His frown the shivering nations fly,
And, hid for half the year, in smoky caverns lie.

The natives asserted that it was impossible to ascend
the mountain, on account of the great number of danger-
ous bogs, which, according to them, are constantly emit-
ting sulphurous flames, and exhaling smoke; while the
more elevated summit in the centre is covered with boiling springs and large craters, which continually propel fire and smoke. To the south and west the environs present the most afflicting results of frequent eruptions, the finest part of the territory being covered by torrents of melted stone, sand, ashes, and other volcanic matter; notwithstanding which, between the sinuosities of the lava in different parts, some portion of meadows, walls, and broken hedges may be observed. The devastation is still greater on the north and east sides, which present dreadful traces of the ruin of the country and its habitations. Neither plants nor grass are to be met with to the extent of two leagues round the mountain, in consequence of the soil being covered with stones and lava; and in some parts, where the subterraneous fire has broken out a second time, or where the matter which was not entirely consumed has again become ignited, the fire has contributed to form small red and black hillocks and eminences, from scorie, pumice-stones, and ashes. The nearer the mountain the larger are these hillocks, and there are some of them, the summits of which form a circular hollow, whence the subterraneous fire ejects the matter. On approaching Hecla the ground becomes almost impassable, particularly near the higher branches of lava thrown from the volcano. Round the latter is a mountain of lava, consisting of large fused stones, from forty to seventy feet high, and in the form of a rampart or wall. These stones are detached, and chiefly covered with moss; while between them are very deep holes, so that the ascent on the western side requires great circumspection. The rocks are completely reduced to pumice, dispersed in thin horizontal layers, and fractured in every direction, from which some idea may be formed of the intensity of the fire that has acted on them.

There Winter, armed with terrors here unknown;
Sits absolute on his unshaken throne;
Rises up his stores amidst the frozen waste,
And bids the mountains he has built, stand fast;
Beckons the legions of his storms away
From happier scenes to make the land a prey;
Proclaims the soil a conquest he has won,
And scorns to share it with the distant sun.

Sir Joseph Banks, Dr. Solander, Dr. James Lind, of
Edinburgh, and Dr. Van Troil, a Swede, were the earliest adventurous travellers who ascended to the summit of Mount Hecla. This was in 1772; and the attempt was facilitated by a preceding eruption in 1766, which had greatly diminished the steepness and difficulty of the ascent. On their first landing, they found a tract of land sixty or seventy miles in extent, entirely ruined by lava, which appeared to have been in a state of complete liquefaction. To accomplish their undertaking, they had to travel from three hundred to three hundred and sixty miles over uninterrupted tracts of lava. In ascending, they were obliged to quit their horses at the first opening from which the fire had burst:—a spot, which they describe as presenting lofty glazed walls and high glazed cliffs, differing from any thing they had ever seen before. At another opening above, they fancied they discerned the effects of boiling water; and not far from thence, the mountain, with the exception of some bare spots, was covered with snow. This difference of aspect they soon perceived to be occasioned by the hot vapour ascending from the mountain. The higher they proceeded, the larger these spots became; and, about two hundred yards below the summit, a hole about a yard and a half in diameter, was observed, whence issued so hot a steam, that they could not measure the degree of heat with a thermometer. The cold now began to be very intense. Fahrenheit's thermometer, which at the foot of the mountain was at 54, fell to 24; while the wind became so violent, that they were sometimes obliged to lie down, from a dread of being blown into the most dreadful precipices. On the summit itself they experienced at one and the same time, a high degree of heat and cold for, in the air, Fahrenheit's thermometer constantly stood at 24, but when placed on the ground, it rose to 153.

Messrs. Olafsen and Povelsen, two naturalists, who
travels in Iceland were undertaken by order of his Majesty, after a fatiguing journey up several small slopes which occurred at intervals, and seven of which they had to pass, at length reached the summit of Mount Hecla at midnight. It was as light as at noon day, so that they had a view of an immense extent, but could perceive nothing but ice: neither fissures, streams of water, boiling springs, smoke, nor fire, were apparent. They surveyed the S
mountains in the eastern part, and in the distance saw the high and square mountain of Hærdabréid, an ancient volcano, which appeared like a large castle.

Sir G. S. Mackenzie, in his recent travels in Iceland, ascended Mount Hecla; and from his account we extract the following interesting particulars. In proceeding to the southern extremity of the mountain, he descended, by a dangerous path, into a valley, having a small lake in one corner, and the opposite extremity bounded by a perpendicular face of rock, resembling, in its broken and rugged appearance, a stream of lava. While advancing, the sun suddenly broke through the clouds, and the brilliant reflection of his beams, from different parts of this supposed lava, as if from a surface of glass, delighted our traveller by the instantaneous conviction that he had now attained one of the principal objects connected with the plan of his expedition to Iceland. He hastened to the spot, and all his wishes were fully accomplished in the examination of an object which greatly exceeded the expectations he had formed.

On ascending one of the abrupt pinnacles, which rose out of this extraordinary mass of rock, he beheld a region, the desolation of which can scarcely be paralleled. Fantastic groups of hills, craters, and lava, leading the eye to distant snow-crowned jockuls, (inferior mountains,) the mist rising from a water-fall; lakes, embosomed among bare bleak mountains; an awful profound silence; lowering clouds; marks all around of the furious action of the most destructive of elements; all combined to impress the soul with sensations of dread and wonder. The longer himself and his companions contemplated this scene, the more unable they were to turn their eyes from it; and a considerable time elapsed before they could bring themselves to attend to the business which had tempted them to enter so frightful a district of the country.

Having proceeded a considerable distance along the edge of a stream of lava, a narrow part of which they crossed, they gained the foot of the south-end of Mount Hecla. While, in ascending, they had to pass over rugged lava, they experienced no great difficulty in advancing; but when they reached the steepest part of the mountain, which was covered with loose slags, they sometimes lost at
one step, by the yielding of these, a space which had been gained by several.

Having passed a number of fissures, by leaping across some, and stepping along masses of slags which lay over others, they at length reached the summit of the first peak. The clouds now became so thick, that they began to despair of being able to proceed any further: it was, indeed, dangerous even to move; for the peak consists of a very narrow ridge of slags, not more than two feet broad, having a precipice on each side, several hundred feet in depth. One of these precipices forms the side of a vast hollow, which seems to have been one of the craters. At length the sky cleared a little, and enabled them to discover a ridge below, which seemed to connect the peak they had ascended with the middle or principal one. They lost no time in availing themselves of this opportunity, and, by balancing themselves like rope-dancers, succeeded in passing along a ridge of slags, so narrow, that there was scarcely room for their feet. After a short, but very steep ascent, they gained the highest part of this celebrated mountain.

Its earliest eruption is said to have happened in 1004, since which time upwards of twenty have occurred. That of 1693 was the most dreadful, and occasioned terrible devastations, the ashes having been thrown over the island in every direction, to the distance of more than one hundred miles. In 1728, a fire broke out among the surrounding lava; and also in that to the west of the volcano in 1754, which lasted for three days. There has not been any eruption of lava since 1766; but for some years after flames issued from the volcano.

THE GEYSERS.

Nor stops the restless fluid, mounting still,
Thou' oft amid th' irregulous vale of springs;
But to the mountain courted by the sand,
That leads it darkling on in faithful maze,
Far from the parent-main, it boils again
Fresh into day; and all the glittering hill
Is bright with spouting rills.
The crystal treasures of the liquid world,
Through the stirred sands a bubbling passage burst;
And welling out, around the middle steep,
Or from the bottoms of the bosomed hills,
In pure effusion flow.

THOMSON.

These celebrated fountains, or hot spouting water springs, being nearly connected with the operations of subterraneous fire, so visible in every part of Iceland, may be properly introduced after the description of Mount Hecla, given above.

They are seldom very near the volcanoes, but are dispersed over the whole country, and are even to be found on the summits of several of the ice mountains. The largest and most remarkable of these is situated in a large field, about sixteen miles to the north of Skalholt. At a great distance from it, on one side, are high mountains covered with ice, and on the other Hecla is seen rising above the clouds, while opposite to it is a ridge of rocks, at the foot of which water from time to time rushes forth. At the distance of a mile and a half a loud roaring noise is heard, like that of a torrent precipitated from stupendous rocks, each ejection being accompanied by violent subterraneous detonations. The depth of the opening from which the water rushes has not been ascertained, but some seconds elapse before a stone thrown in reaches the surface. The Danish traveller, Olafsen, asserts, that the water rises as high as sixty fathoms; while Van Troil estimates the highest jet at not more than sixty feet: the latter allows, however, that the jets may be more elevated, particularly in bad weather. The greatness of the explosive power is evinced by its not only preventing stones thrown in from sinking, but even forcing them up to a very great height, together with the water, and splitting the pebbles into a thousand pieces. The heat was found by Van Troil to be two hundred and twelve degrees of Fahrenheit, the boiling point. The edges of the pipe or basin are covered by a coarse stalactitic rind, and the water has been found to have a petrifying quality. The opening is perfectly circular, in diameter nineteen feet, and forms above, on the surface of the ground, a basin fifty-nine feet in diameter, the edge of which is nine feet above the orifice or hole.

In speaking of the Geysers, or hot spouting springs,
Horrobow observes, that if you fill a bottle at one of them, the water it contains will boil up two or three times, at the same time with the water in the well. The inhabitants boil their meat in it, by putting the meat in a vessel of cold water, which they place in the hot spring.

Sir G. S. Mackenzie, whose recent travels in Iceland we have already cited, visited the Geysers at a season favourable to his observations, the latter end of July. He found the cultivation of the surrounding territory much higher than might have been inferred from the idea generally entertained of the barren and unproductive state of Iceland. All the flat ground in that quarter of the island was swampy, but not so much so as to impede the progress of the party, who, having passed several hot springs to the eastward of Skalholt, and others rising among the low hills they had left to the right, in proceeding to the great Geyser, came to a farm-house, situated on a rising ground in the midst of the bogs. Here the people were busily employed in making hay, a scene which afforded a pleasing change from the dreary solitude they had quitted: the whole of this extensive district, which abounds in grass, would, if drained, our traveller observes, prove a very rich pasture country. Farther on they came to several cottages at the foot of the mountain, round which they turned, and came in sight of the hill, having the Geysers at one of its sides. This hill, in height not more than three hundred feet, is separated from the mountain, towards the west, by a narrow slip of flat boggy ground, connected with that which extends over the whole valley. Having crossed this bog, and a small river which ran through it, the party came to a farm-house at the east-end of the hill, and arrived at a spot where the most wonderful and awful effects of subterraneous heat are exhibited.

On the east-side of the hill there are several banks of clay, from some of which steam rises in different places; and in others there are cavities, in which water boils briskly. In a few of these cavities, the water, being mixed with clay, is thick, and varies in colour; but is chiefly red and grey. Below these banks there is a gentle and uniform slope, composed of matter which, at some distant period, has been deposited by springs which no longer exist. The strata or beds thus formed, seemed to have been broken
by the shocks of earthquakes, particularly near the great Geyser. Within a space not exceeding a quarter of a mile, numerous orifices are seen in the old incrustations, from which boiling water and steam issue, with different degrees of force. At the northern extremity is situated the great Geyser, sufficiently distinguishable from the others by every circumstance connected with it. On approaching this spot, it appeared that a mount had been formed of irregular, rough-looking depositions, upon the ancient regular strata, the origin of which had been similar. The slope of the latter has caused the mount to spread more on the east-side; and the recent depositions of the water may be traced till they coincide with them. The perpendicular height of the mount is about seven feet, measured from the highest part of the surface of the old depositions. From these the matter composing the mount may be readily distinguished, on the west-side, where a disruption has taken place. On the top of this mount is a basin, which was found to extend fifty-six feet in one direction, and forty-six in another.

At a quarter before three o'clock in the afternoon, when the party reached the spot, they found the basin full of hot water, a little of which was running over. Having satisfied their curiosity at that time, they proceeded to examine some other places, whence they saw water ascending. Above the great Geyser, at a short distance, they came to a large irregular opening, the beauties of which, the writer observes, it is hardly possible to describe. The water with which it was filled was as clear as crystal, and perfectly still, although nearly at the boiling point. Through it they saw white incrustations, forming a variety of figures and cavities, to a great depth, and carrying the eye into a vast and dark abyss, over which the crust supporting them formed a dome of an inconsiderable thickness; a circumstance which, though not of itself agreeable, contributed much to the effects of this awful scene.

Having pitched their tent at the distance of about one hundred yards from the Geyser, and so arranged matters as that a regular watch might be kept during the night, Sir G. S. MacKenzie took his station at eleven o'clock, and his companions lay down to sleep. About ten minutes before twelve he heard subterraneous discharges, and waked his
friends. The water in the basin was greatly agitated, and flowed over, but there was not any jet. The same occurred at half past two. At five minutes past four on Saturday morning, an alarm was given by one of the company. As our traveller lay next the door of the tent, he instantly drew aside the canvas, when, at a distance of little more than fifty yards, a most extraordinary and magnificent appearance presented itself. From a place they had not before noticed, they saw water thrown up, and steam issuing with a tremendous noise. There was little water; but the force with which the steam escaped, produced a white column of spray and vapour, at least sixty feet high. They enjoyed this astonishing and beautiful sight until seven o'clock, when it gradually disappeared.

The remaining part of the morning was occupied in examining the environs of the Geysers; and at every step they received some new gratification. Following the channel which had been formed by the water escaping from the great basin during the eruptions, they found several beautiful and delicate petrifications. The leaves of birch and willow were seen converted into white stone, and in the most perfect state of preservation, every minute fibre being entire. Grass and rushes were in the same state, and also masses of peat. Several of these rare and elegant specimens were brought safely to Great Britain. On the outside of the mount of the Geyser, the depositions, owing to the splashing of the water, are rough, and have been justly compared to the heads of cauliflowers. They are of a yellowish brown colour, and are arranged round the mount, somewhat like a circular flight of steps. The inside of the basin is comparatively smooth; and the matter forming it is more compact and dense than the exterior crust; when polished, it is not devoid of beauty, being of a grey colour, mottled with black and white spots and streaks. The white incrustation formed by the water of the beautiful cavity before described, had taken a very curious form at the water's edge, very much resembling the capital of a Gothic column.
THE SULPHUR MOUNTAIN.

This Icelandic mountain, distant about three miles from the village of Krisuvik, presents a phenomenon very different from the one above described, that of a cauldron of boiling mud. We extract the following particulars of this singular curiosity from the relation given by Sir G. Mackenzie in his Travels in Iceland.

At the foot of the mountain is a small bank, composed chiefly of white clay and sulphur, from every part of which steam issues. Having ascended this bank, a ridge presents itself, immediately beneath which is a deep hollow, whence a profusion of vapour arises, with a confused noise of boiling and splashing, accompanied by steam escaping from narrow crevices in the rock. This hollow being, as well as the whole side of the mountain opposite, covered with sulphur and clay, it was very hazardous to walk over a soft and steaming surface of such a description. The vapour concealing the party from each other occasioned much uneasiness; and there was some hazard of the crust of sulphur breaking, or of the clay sinking beneath their feet. They were thus several times in danger of being scalded, as, indeed, happened to one of the party, Mr. Bright, who accidentally plunged one of his legs into the hot clay. When the thermometer was immersed in it, to the depth of a few inches, it generally rose to within a few degrees of the boiling point. By stepping cautiously, and avoiding every little hole from which steam issued, they soon ascertained how far they might venture. Their good fortune, however, Sir George observes, ought not to tempt any person to examine this wonderful place, without being provided with two boards, with which every part of the banks may be traversed in perfect safety. At the bottom of the hollow, above described, they found the cauldron of mud, which boiled with the utmost vehemence. They approached within a few yards of it, the wind favouring them in viewing every part of this singular scene. The mud was in constant agitation, and often thrown up to the height of six or eight feet. Near this spot was an irregular space filled with water, boiling briskly. At the foot of the
hill, in a hollow formed by a bank of clay and sulphur, steam rushed with great force and noise from among the loose fragments of rock.

In ascending the mountain, our travellers met with a spring of cold water, which was little to be expected in such a place. At a greater elevation, they came to a ridge, composed entirely of sulphur and clay, joining two summits of the mountain. The smooth crust of sulphur was beautifully crystallized; and beneath it was a quantity of loose granular sulphur, which appeared to be collecting and crystallizing, as it was sublimed along with the steam. On removing the sulphureous crust, steam issued, and annoyed the party so much, that they could not examine this place to any depth.

Beneath the ridge, on the further side of this great bed of sulphur, an abundance of vapour escaped with a loud noise. Having crossed to the side of the mountain opposite, they walked to what is called the principal spring. This was a task of much apparent danger, as the side of the mountain, to the extent of about half a mile, was covered with loose clay, into which the feet of our travellers sunk at every step. In many places there was a thin crust, beneath which the clay was wet, and extremely hot. Good fortune attended them; and, without any serious inconvenience, they reached the object they had in view. A dense column of steam, mixed with a small portion of water, forced its way impetuously through a crevice in the rock, at the head of a narrow valley, or break in the mountain. The violence with which it rushed out was so great, that the noise, thus occasioned, might often be heard at the distance of several miles. During night, while the party lay in their tent at Krisuvik, they more than once listened to it with mingled awe and astonishment. Behind the column of vapour was a dark-coloured rock, which added to the sublimity of the effect.

"It is quite beyond my power," observes Sir George Mackenzie, "to offer such a description of this extraordinary place, as would convey adequate ideas of its wonders, or of its terrors. The sensations of a person, even of firm nerves, standing on a support which feebly sustains him, over an abyss where, literally, fire and brimstone are in dreadful and incessant action; having before his eyes tremendous
proofs of what is going on beneath him; enveloped in thick
vapours; his ears stunned with thundering noises; must be
experienced before they can be understood."

**MONT BLANC,**

**IN SWITZERLAND, WITH THE GLACIERS.**

When mid the lifeless summits proud
Of Alpine cliffs, where to the gelid sky
Snows piled on snows in wintry torpor lie,
The rays divine of vernal Phoebus play;
The awakened heaps, in streamlets from on high,
Roused into action, lively leap away,
Glad wafting through the vales, in their new being gay.

**Thomson.**

This mountain, so named on account of its white aspect,
belongs to the great central chain of the Alps. It is truly
gigantic, and is the most elevated mountain in Europe
rising no less than 15,872 feet, somewhat more than three
miles, above the level of the sea, and 14,624 feet above the
Lake of Geneva, in its vicinity. It is encompassed by those
wonderful collections of snow and ice, called "Glaciers,"
two of the principal of which, are called Mont Dolent and
Triolet. The highest part of Mont Blanc, named the
Dromedary, is in the shape of a compressed hemisphere.
From that point it sinks gradually, and presents a kind of
concave surface of snow, in the midst of which is a small
pyramid of ice. It then rises into a second hemisphere,
which is named the Middle Dome; and thence descends
into another concave surface; terminating in a point, which,
among other names bestowed on it by the Savoyards, is
styled "Dôme de Gouté," and may be regarded as the
inferior dome.

The first successful attempt to reach the summit of
Mont Blane was made in August 1786, by Doctor Paccard,
a physician of Chamouni. He was led to make the attempt
by a guide, named Balma, who, in searching for crystals,
had discovered the only practicable route by which so ar-
duous an undertaking could be accomplished. The ascent
occupied fifteen hours, and the descent five, under cir-
cumstances of the greatest difficulty, the sight of the Doc-
tor, and that of his guide, Balma, being so affected by the

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snow and wind, as to render them almost blind, at the same time that the face of each was excoriated, and the lips exceedingly swelled.

On the first of August of the following year, 1787, the celebrated and indefatigable naturalist, M. de Saussure, set out on his successful expedition, accompanied by a servant and eighteen guides, who carried a tent and mattresses, together with the necessary accommodations and various instruments of experimental philosophy. The first night they passed under the tent, on the summit of the mountain of La Côte, 4986 feet above "the Priory," a large village in the vale of Chamouni, the journey thither being exempt from trouble or danger, as the ascent is always over turf, or on the solid rock; but above this place it is wholly over ice or snows.

Early next morning they traversed the glacier of La Côte, to gain the foot of a small chain of rocks, inclosed in the snows of Mont Blanc. The glacier is both difficult and dangerous, being intersected by wide, deep, irregular chasms, which frequently can be passed only by three bridges of snow, which are suspended over the abyss. After reaching the ridge of rocks, the tract winds along a hollow, or valley, filled with snow, which extends north and south to the foot of the highest summit, and is divided at intervals by enormous crevices. These shew the snow to be disposed in horizontal beds, each of which answers to a year, and, notwithstanding the width of the fissures, the depth can in no part be measured. At four in the afternoon, the party reached the second of the three great platforms of snow they had to traverse, and here they encamped at the height of 9312 feet above the Priory, or 12,768 feet, nearly two miles and a half, above the level of the sea.

From the centre of this platform, enclosed between the farthest summit of Mont Blanc on the south, its high steps, or terraces, on the east, and the Dôme de Gouté on the west, nothing but snow appears. It is quite pure, of a dazzling whiteness, and on the high summits presents a singular contrast with the sky, which, in these elevated regions, is almost black. Here no living being is to be seen; no appearance of vegetation; it is the abode of cold and silence. "When," observes M. de Saussure, "I represent to myself Dr. Paccard and James Balma first
Mont Blanc.

Glaciers of Miage.
arriving, on the decline of day, in these deserts, without shelter, without assistance, and even without the certainty that men could live in the places which they proposed to reach, and still pursuing their career with unshaken intrepidity, it seems impossible to admire too much their strength of mind and their courage."

The company departed, at seven the next morning, to traverse the third and last platform, the slope of which is extremely steep, being in some places thirty-nine degrees. It terminates in precipices on all sides; and the surface of the snow was so hard, that those who went foremost were obliged to cut places for the feet with hatchets. The last slope of all presents no danger; but the air possesses so high a degree of rarity, that the strength is speedily exhausted, and on approaching the summit it was found necessary to stop at every fifteen or sixteen paces to take breath. At eleven they reached the top of the mountain, where they continued four hours and a half, during which time M. de Saussure enjoyed, with rapture and astonishment, a view the most extensive as well as the most rugged and sublime in nature, and made those observations which have rendered this expedition important to philosophy.

A light vapour, suspended in the lower regions of the air, concealed from the sight the lowest and most remote objects, such as the plains of France and Lombardy; but the whole surrounding assemblage of high summits appeared with the greatest distinctness.

M. de Saussure descended with his party, and the next morning reached Chamouni, without the smallest accident. As they had taken the precaution to wear veils of crape, their faces were not exoriated, nor their sight debilitated. The cold was not found to be so extremely piercing as it was described by Dr. Paccard. By experiments made with the hygrometer on the summit of the mountain, the air was found to contain a sixth portion only of the humidity of that of Geneva; and to this dryness of the air M. de Saussure imputes the burning thirst which he and his companions experienced. The balls of the electrometer diverged three lines only, and the electricity was positive. It required half an hour to make water boil, while at Geneva fifteen or sixteen minutes sufficed, and twelve or thirteen at the sea side. Not any of the party discovered
the smallest difference in the taste or smell of bread, wine, meat, fruits, or liquors, as some travellers have pretended is the case at great heights; but sounds were of course much weakened, from the want of objects of reflection. Of all the organs, that of respiration was the most affected, the pulse of one of the guides beating ninety-eight times in a minute, that of the servant one hundred and twelve, and that of M. de Saussure one hundred and one; while at Chamouni the pulsations respectively were forty-nine, sixty, and seventy-two. A few days afterwards, Mr. Beaufoy, an English gentleman, succeeded in a similar attempt, although it was attended with greater difficulty, arising from enlargements in the chasms in the ice.

THE GLACIERS, OR ICE MASSES.

The three great Glaciers, or Ice mountains, which descend from the flanks of Mont Blanc, add their ice to that of the Miage, and present a majestic spectacle, amid the astonishing succession of icy summits, of deep valleys, and of wide chasms, which have become channels for the innumerable torrents and cataracts with which these mountains abound. The view which the Glacier of Talayre affords from its centre, looking towards the north, is as extraordinary as beautiful. It rises gradually to the base of a semicircular girdle, formed of peaks of granite of a great height, and terminating in sharp summits, extremely varied in their forms; while the intervals between these peaks are filled up by ice, which falls into this mass, and this mass of ice is crowned by masses of snow, rising in festoons between the black and vertical tables of granite, the steepness of which does not allow them to remain. A ridge of shattered wrecks divides this glacier lengthwise, and forms its most elevated part, being 8538 feet, upwards of a mile and a half, above the level of the sea. This prospect has nothing in common with what is seen in other parts of the world. The immense masses of ice, surrounded and surmounted by pyramidal rocks, still more enormous in magnitude; the contrast between the whiteness of the snows and the obscure colours of the stones, moistened by the water which trickles down their sides; the purity of the air; the dazzling light of the sun, which gives to these
objects extraordinary brilliancy, the majestic and awful silence which reigns in these vast solitudes—a silence which is only interrupted at intervals by the noise of some great mass of granite, or of ice, tumbling from the top of the mountain; and the nakedness of these elevated rocks themselves, on which neither animals, shrubs, nor verdure, are to be seen, combined with the recollection of the fertile country and rich vegetation which the adjacent vallies at so small a distance present; tend to produce a mixed impression of admiration and terror, which tempts the spectator to believe, that he has been suddenly transported into a world forgotten by the great Author of Nature.

The glacier of Triolet is covered with the wrecks of another ice-mountain, which fell some years ago, and buried many huts, flocks, and shepherds beneath its ruins.

VIEW FROM THE BUET.

Before we take our leave of Mont Blanc and of the Alps, the peculiarly brilliant view from the summit of the Buêt ought to be noticed. Never, says M. Bourrit, did prospect appear so vast. Towards the west the Rhone is seen, winding for a space of thirty-six leagues through the rich plains of the Valais; the parts of the river which the mountains cover with their shade seeming like threads of silver, and those which the sun illumines like threads of gold. Beyond the river and its rich plains, the view extends to the highest mountains of Switzerland, St. Gothard, and the Grisons, all covered with ice; while, on the east, the heights sink suddenly, from some of the loftiest elevations on the globe, to level plains washed by the sea. Geneva seems like a spot at one end of the lake, and the lake itself, like a sinuous band, dividing the fields which it waters. Beyond it are discovered the vast plains of Franche Comté and Burgundy, the mountains of which diminish by almost imperceptible gradations. Here the eye has neither power nor extent of sight to embrace the whole of the objects presented to its view. Amid the fearful aspect of the precipices which descend on every side, what a contrast between the country decorated with all that is smiling and gay, and the sublime spectacle of the Alps, their gloomy and aspiring summits, and, above all, the prodigious height
of Mont Blanc, that enormous colossus of snow and ice, which parts the clouds, and pierces to the very heavens! Below this mountain, which bids defiance to time, and whose eternal ice disregards the dissolving power of the sun, a band of pyramidal rocks appears, the intervals between them being so many vallies of ice, the immensity of which appals the imagination. Their deep chasms may be distinguished, and the noise of the frequent avalanches (falls of immense masses of snow,) presents to the mind the gloomy ideas of horror, devastation, and ruin. Farther on, other summits of ice prolong this majestic picture. Among these are the high mountains of the St. Bernard, and those which border on the Boromean islands.

Perhaps there is not in our hemisphere a theatre more instructive, or more adapted for reflection, than the summit of this mountain. Where beside can be seen such variety and contrast of forms; such results of the efforts of time; such effects of all the climates, and of all the seasons? At one glance may be embraced frosts equally intense with those of Lapland, and the rich and delightful frontiers of Italy; eternal ice, and waving harvests; all the chilling horrors of winter, and the luxuriant vegetation of summer; eighty leagues of fertile plains, covered with towns, with vineyards, with fields and herds, and, adjoining to these, a depth of twenty thousand feet of everlasting ice.

MONTSERRAT.

Here, 'midst the changeful scenery, ever new,
Fancy a thousand wondrous forms descries,
More wildly great than ever pencil drew;
Rocks, torrents, gulfs, and shapes of giant size,
And glittering cliffs on cliffs, and fiery ramparts rise.

Beattie.

This Spanish mountain, which has been so long celebrated on account of the singularity of its shape, but chiefly for its convent and its numerous hermitages, is nine leagues north-west of Barcelona, in the province of Catalonia. It is in height only 3300 feet above the level of the sea, but it commands an enchanting prospect of the fine plain of Barcelona, extending to the sea, as well as of the islands of Majorca and Minorca, distant 150 miles.
Towards Barcelona this mountain presents a bold and rugged front; but on the west, towards Vacarisas, it is almost perpendicular, notwithstanding which, a carriage-road winds round to the convent, which is placed in a sheltered recess among the rocks, at about half the height of the mountain. The Llobregat roars at the bottom; and the rock presents perpendicular walls from the edge of the water: but above the convent, the mountain divides into two crowns or cones, which form the most prominent features; while smaller pinnacles, blanched and bare, and split into pillars, pipes, and other singular shapes, give a most picturesque effect. Here are seen fourteen or fifteen hermitages, which are scattered over different points of the mountain, some of them on the very pinnacles of the cones, to which they seem to grow, while others are placed in cavities hewn out of the loftiest pyramids. The highest accessible part of the mountain is above the hermitage of St. Maddelena, the descent from which is between two cones, by a flight of steps, called Jacob's Ladder, leading into a valley, which runs along the summit of the mountain. The cones are here in the most grotesque shapes, the southern one being named "the Organ," from its resemblance to a number of pipes.

At the extremity of this valley, which is a perfect shrubbery, and on an eminence, stands the hermitage of St. Jerome, the highest and most remote of all; and near it is the loftiest station of the whole mountain, on which is a little chapel, dedicated to the Virgin. From this elevated pinnacle the prospect is vast and splendid.

Although the elements have wreaked all their fury on these shattered peaks, yet nature has not been sparing in her gifts; the spaces between the rocks being filled up with close woods, while numerous evergreens, and other plants, serve to adorn the various chasms, rendering them valuable depositories of the vegetable kingdom. Few, indeed, are the evergreens of Europe which may not be found here; and when the mountain was visited by Mr. Swinburne, the apothecary of the convent had a list of four hundred and thirty-seven species of plants, and forty of trees, which shoot up spontaneously, and grace this hoary and venerable pile. There being two springs only on the mountain, there is a scarcity of water, which is chiefly
collected in cisterns; an inconvenience, however, which is in a great measure counterbalanced by the absence of wolves, bears, and other wild beasts.

Captain Carlton, an Englishman, who visited Montserrat some years ago, ascended to the loftiest hermitage, that of St. Jerome, by the means of spiral steps hewn out in the rock, on account of the steep acclivity. This, he observes, however, which in a great measure counterbalanced by the absence of wolves, bears, and other wild beasts.

The Convent is situated on the eastern side of the mountain, which seems to have been split by vast torrents of water, or by a violent convulsion of nature; in this way a platform has been formed in the cleft, sufficiently ample for the purpose of its construction. It is one of the forty-five religious houses of the Spanish congregation of the order of St. Benedict. The monks are bound to supply food and lodging for three days to all pilgrims who come up to pay their homage to the Virgin; beside which, they entertain the hermits on Sundays. The latter, who make a vow never to quit the mountain, take their stations by seniority, the junior hermit being placed at the greatest distance from the convent, and descending progressively as the vacancies happen. They are not altogether idle, taking pains to rival each other in making basket-works and other fanciful productions, which they display with great ability to their visitors. They assemble every morning to hear mass and perform divine service, in the parish church of St. Cecilia, which lies considerably above the convent; and twice a week they confess and communicate. They wear their beards long, and are clad in brown.

The church of St. Cecilia is a gloomy edifice, the gilding
of which is much sullied by the smoke of eighty-five silver lamps, of various forms and sizes, suspended round the cornice of the sanctuary. For the supply of these with oil, funds have been bequeathed by devotees. The choir is decorated with wood carvings, curiously wrought, representing the most prominent passages in the life of Christ.

THE PEAK OF TENERIFFE.

The Island of Teneriffe has received its present name from the inhabitants of the adjacent island Palma, in whose language *tener* signifies snow, and *ife*, a hill. In extent, wealth, and fertility, it exceeds all the other Canary islands. It continues to rise on all sides from the sea, until it terminates in the celebrated Peak, which is, however, situated rather in the southern part than in the centre of the island. The ascent on the north is more gradual than at the other parts, there being a space along the shore about three leagues in breadth, bounded on the sides by high mountains, or rather cliffs; but more inland it rises like a hanging garden all the way, without any considerable interruption of hills or vallies. The form of this island is triangular, extending itself into three capes, the nearest of which is about eighty leagues from the coast of Africa. In the middle it is divided by a ridge of mountains, which have been compared to the roof of a church, the Peak forming the spire or steeple in the centre.

The elevation of the Peak of Teneriffe, according to the most accurate measurement, made by Cordier, is 12,165 feet, nearly two miles and one-third, above the level of the sea. In the ascent, the first eminence is called Monte Verde, or the green mountain, from the high fern with which it is covered, and presents a level plain of considerable extent. Beyond this, is the Mountain of Pines, which are said to have formerly grown there in great abundance; but its steep sides are now become craggy and barren, and its whole appearance very different from that of the eminence described above. After passing this summit, the traveller reaches a plain, on which the natives have bestowed the name of Mouton de Trigo, and upon which the Peak in reality stands. It is a mountainous platform, rising more
than seven thousand feet, nearly a mile and a half, above
the level of the sea; and here the currents of lava, hitherto
concealed by the vegetation, begin to appear in all their
aridity and confusion, a few lowly shrubs and creeping
plants alone diversifying the surface of a desert, the most
arid and rugged that can be imagined.

A small sandy platform of pumice stones, bordered by
two enormous currents of vitreous lava, and blocks of the
same nature, ranged in a semicircle, forms what is called
the Station of the English, on account of the Peak having
been so often visited by British travellers. This platform is
9786 feet, upwards of a mile and three quarters, above the
level of the sea; and beyond it the acclivity is very steep,
great masses of scoriae, extremely rough and sharp, covering
the currents of lava. Towards the summit, nothing but pumice stone is to be seen. In fact, the Peak can only
be ascended on the east and south-east sides. As it is
impossible to get round the crater, the traveller’s progress is
arrested at the spot at which he reaches it. Here the two
orders of volcanic substances are to be seen, the modern
lavae being thrown up amid the ruins of ejection of much
more ancient, the immense masses of which constitute the
platform on which the Peak is placed. The shattered sides
present a series of thick beds, almost all plunging towards
the sea, composed alternately of ashes, volcanic sand,
pumice stones, lavas, either compact or porous, and scoriae.
An incalculable number of currents, comparatively recent,
which have descended from the Peak, or have issued from
its flanks, form irregular furrows, which run along the more
ancient masses, and lose themselves in the sea to the west
and north. Among these currents more than eighty craters
are scattered, and augment with their ruins the confusion
which prevails throughout.

The crater can alone be reached by descending down
three chasms. Its sides are absolutely precipitous within,
and are most elevated towards the north. Its form is elliptical; its circumference about one thousand two hundred
feet; and its depth, according to Cordier, one hundred and
ten feet. Humboldt, however, estimates it at not more
than from forty to sixty feet. The sides are, agreeably to
the former of these observers, formed of an earth of snowy
whiteness, resulting from the decomposition of the blackest
and hardest vitreous porphyritic lava. All the rest is solid, and the lowest part occupied by blocks, which have fallen down from the sides. These solid parts are covered with shining crystals of sulphur, of a rhomboidal and octaedral figure, some of which are nearly an inch high, and are, perhaps, the finest specimens of native volcanic sulphur yet known. Vapours issue in abundance from among these blocks, and from an infinity of fissures which preserve a very intense heat. These vapours consist solely of sulphur and water, perfectly insipid. Beside the encrustations of sulphur, opal, in thin plates, is formed with great celerity. Humboldt regards the Peak of Teneriffe as an enormous basaltic mountain, resting upon a dense secondary calcareous stone.

Various travellers have asserted, that the cold is intensely keen on the summit of the Peak; that respiration is difficult; and that, particularly, spirituous liquors lose all their strength; which latter circumstance they ascribe to the spirit being more or less exposed to the sulphurous fumes exhaled from the crater. Cordier, and several other accurate observers, declare, however, that neither the smell nor the strength of liquids appeared, at this elevation, to be in the least degree impaired; and that volatile alkali, ether, and spirit of wine, possessed their usual pungency. They add, that the cold is very supportable; and that neither the aqueous sulphurous vapours, nor the rarity of the air, render breathing difficult.

We extract the following interesting particulars from Humboldt’s account of his visit to Teneriffe.

"Towards three in the morning, by the sombreous light of a few fir torches, we began our expedition for the summit of the Piton. We scaled the volcano on the north-east, where the declivities are extremely steep; and came, after two hours’ toil, to a small plain, which, on account of its isolated situation, bears the name of Alta Vista. It is the station also of the Neveros—those natives, whose occupation it is to collect ice and snow, which they sell in the neighbouring towns. Their nules, better practised in climbing mountains than those hired by travellers, reach Alta Vista, and the Neveros are obliged to transport the snow to this place on their backs. Above this point the Malpays begins; a term by which is designated here, as
well as in Mexico, Peru, and every other country subject to volcanoes, a ground destitute of vegetable mould, and covered with fragments of lavas.

"We observed, during the twilight, a phenomenon which is not unusual on high mountains, but which the position of the volcano we were scaling, rendered very striking. A layer of white and fleshy clouds concealed from us the sight of the ocean, and the lower region of the island. This layer did not appear above one thousand six hundred yards high; the clouds were so uniformly spread, and kept so perfect a level, that they were the appearance of a vast plain covered with snow. The colossal pyramid of the Peak, the volcanic summits of Lanzerota, of Fortaventura, and the isle of Palma, were like rocks amidst this vast sea of vapours, and their black tints were in fine contrast with the whiteness of the clouds."

By an astronomical observation, made at the above elevation at sun-rise, it was ascertained that the true horizon, that is, a part of the sea, was distant one hundred and thirty miles. Our traveller proceeds thus:

"We had yet to scale the steepest part of the mountain, the Piton, which forms the summit. The slope of this small cone, covered with volcanic ashes, and fragments of pumice stone, is so steep, that it would have been almost impossible to reach the top, had we not ascended by an old current of lava, the wrecks of which have resisted the ravages of time. These wrecks form a wall of scoriaceous rocks, which stretches itself into the midst of the loose ashes. We ascended the Piton by grasping these half decomposed scoriae, the sharp edges of which remained often in our hands. We employed nearly half an hour to scale a hill, the perpendicular height of which does not exceed five hundred feet.

"When we gained the summit of the Piton, we were surprised to find scarcely room enough to seat ourselves conveniently. The west wind blew with such violence that we could scarcely stand. It was eight in the morning, and we were frozen with the cold, though the thermometer kept a little above the freezing point.

"The wall, which surrounds the crater like a parapet, is so high, that it would be impossible to reach the Caldera, if on the eastern side there were not a breach, which seems
to have been the effect of a flowing of very old lava. We descended through this breach towards the bottom of the tunnel, the figure of which is elliptical. The greatest breadth of the mouth appeared to us to be three hundred feet, the smallest two hundred feet.

"We descended to the bottom of the crater on a train of broken lava, from the eastern breach of the enclosure. The heat was perceptible only in a few crevices, which gave vent to aqueous vapours, with a peculiar buzzing noise. Some of these funnels or crevices are on the outside of the enclosure, on the external brink of the parapet that surrounds the crater. We plunged the thermometer into them, and saw it rise rapidly to sixty-eight and seventy-five degrees.

"We prolonged in vain our stay on the summit of the Peak, to wait the moment when we might enjoy the view of the whole of the Archipelago of the Fortunate Islands. We discovered Palma, Gomera, and the Great Canary, at our feet. The mountains of Lanzarota, free from vapours at sun-rise, were soon enveloped in thick clouds. On a supposition only of an ordinary refraction, the eye takes in, in calm weather, from the summit of the volcano, a surface of the globe of five thousand seven hundred square leagues, equal to a fourth of the surface of Spain.

"Notwithstanding the heat we felt in our feet on the edge of the crater, the cone of ashes remains covered with snow during several months in the winter. It is probable, that under the cap of snow considerable hollows are found, like those we find under the glaciers of Switzerland, the temperature of which is constantly less elevated than that of the soil on which they repose. The cold and violent wind which blew from the time of sun-rise, engaged us to seek shelter at the foot of the Piton. Our hands and faces were frozen, while our boots were burnt by the soil on which we walked. We descended in the space of a few minutes the Sugar-Loaf, which we had scaled with so much toil; and this rapidity was in part involuntary, for we often rolled down on the ashes. It was with regret that we quitted this solitary place, this domain where nature towers in all her majesty."

To the above we subjoin the following extract from the account published in the first volume of the Transactions of the Geological Society, by the Hon. Mr. Bennet.
At the distance of thirty-four leagues from the island, Mr. Bennet had a very distinct view of the Peak, rising like a cone from the bed of the ocean. The rocks and strata of Teneriffe, he observes, are wholly volcanic, the long chain of mountains, which may be termed the central chain, traversing the island from the foot of the second region of the Peak, and sloping down on the eastern, western, and northern sides, to the sea. Towards the south or more properly the S. S. W. the mountains are nearly perpendicular, and though broken into ridges, and occasionally separated by deep ravines, that are cut transversely as well as longitudinally, there are none of those plains, nor that gradual declination of strata, which the south-eastern and north-western sides of the island exhibit.

Mr. Bennet ascended the Peak in the month of September, 1810. We give the abridged details of this expedition in his own words.

The road to the city of Orotava, is a gradual and easy slope for three or four miles, through a highly cultivated country. Leaving the town, after a steep ascent of about an hour, through a deep ravine, we quitted the cultivated part, and entered into forests of chestnuts, the trees of which are of a large size. The form of this forest is oblong; the soil is deep, and formed of decomposed lava, small ash, and pumice. I examined several channels in the strata, or ravines worn by the rains, and there was no appearance of any other rock. Leaving this forest, the track passes over a series of green hills, which we traversed in about two hours, and at last halted to water our mules at a spot where there is a small spring of bad and brackish water issuing from a lava rock. The ravine is of considerable depth. The range of green hills extends a mile or two further, the soil shallowing by degrees, until at length the trees and shrubs gradually dwindling in size, the Spanish broom alone covers the ground. Leaving behind us this range of green hills, the track, still ascending, leads for several hours across a steep and difficult mass of lava rocks, broken here and there into strange and fantastic forms, worked into deep ravines, and scantily covered in places by a thin layer of yellow pumice. As we proceeded on our road, the hills on our left gradually rose in height till the summits were lost in those of the central chain; while, on our right,
we were rapidly gaining an elevation above the lower range of the Peak. We met with several small conical hills, or mouths of extinct volcanoes, the decomposed lava on the edges of the craters having a strong red ochreous tint. At length, an immense undulated plain spreads itself like a fan, on all sides, nearly as far as the eye can reach. This plain is bounded on the west south-west, and south south-west, by the regions of the Peak; and on the east and north-east, by a range of steep perpendicular precipices and mountains, many leagues in circumference, called by the Spaniards Las Faldas. On this plain, or desert, for we had long left all show of vegetation, except a few stunted plants of Spanish broom, a sensible change was felt in the atmosphere: the wind was keen and sharp, and the climate like that of England in the months of Autumn. All here was sad, silent, and solitary. We saw at a distance the fertile plains on the coast, lying as it were under our feet, and affording a cheerful contrast to the scenes of desolation with which we were surrounded; we were already seven or eight thousand feet above the level of the sea, and had reached the bottom of the second region of the Peak.

Having reached the end of the plain, we found ourselves at the bottom of a steep hill, at the foot of which is a mass or current of lava. After a laborious, not to say hazardous, ascent of about an hour, the pumice and ash giving way, and the mules sinking knee deep at each step, we arrived at about five in the afternoon at the other extremity of the stream of lava, which, descending from the summit of the second region of the peak, divides at the foot of the cone into two branches, the one running to the north-east, and the other to the north-west. It was here we were to pass the night; so, lighting a fire made of dry branches of the Spanish broom, and stretching part of a sail over a portion of the rock, we ate our dinner and laid ourselves down to sleep. I however passed the best part of the night by the fire, the weather being piercingly cold. As I stood by the fire, the view all around me was wild and terrific, the moon rose about ten at night, and, though in her third quarter, gave sufficient light to shew the waste and wilderness by which we were surrounded. The Peak and the upper regions which we had yet to ascend, towered awfully above our heads, while, below, the mountains that had appeared of
such a height in the morning, and had cost us a day's labour to climb, lay stretched as plains at our feet; from the uncommon rarity of the atmosphere, the whole vault of heaven appeared studded with innumerable stars, while the valleys of Orotava were hidden from our view by a thin veil of light fleecy clouds, that floated far beneath the elevated spot we had chosen for our resting-place; the solemn stillness of the night was only interrupted by the crackling of the fire round which we stood, and by the whistling of the wind, which, coming in hollow gusts from the mountain, resembled the roar of distant cannon.

Between two and three in the morning we resumed, on foot, our ascent of the mountain, the lower part of which we had climbed on horseback the preceding evening; the ascent, however, became much more rapid and difficult, our feet sinking deep in the ashes at every step. From the uncommon sharpness of the acclivity, we were obliged to stop often to take breath; after several halts, we at last reached the head of the pumice hill. After resting some short time here, we began to climb the stream of lava, stepping from mass to mass. The ascent is steep, painful, and hazardous; in some places the stream of lava is heaped up in dykes or embankments; and we were often obliged to clamber over them as one ascends a steep wall.

We halted several times during the ascent, and at last reached a spot called La Cueva, one of the numerous caves that are found on the sides of the mountain; this is the largest of them, and is filled with snow and the most delicious water, which was just at the point of congelation. The descent into it is difficult, it being thirty or forty feet deep. One of our party let himself down by a rope; he could not see the extent of the cave, but the guides declared it to be three hundred feet in length, and to contain thirty or forty feet of water in depth. The roof and sides are composed of a fine stalactic lava, similar to that found on Vesuvius, and it is of the same nature as that which flowed on the surface. We rested here about half an hour, during which we had an opportunity of observing the rising of the sun, and that singular and rapid change of night into day, the consequence of an almost entire absence of twilight. As we ascended the north-east side of the mountain, this view was strikingly beautiful: at
first there appeared a bright streak of red on the horizon, which gradually spread itself, lighting up the heavens by degrees, and growing brighter and brighter, till at last the sun burst forth from the bed of the ocean, gilding, as it rose, the mountains of Teneriffe, and those of the great Canary; in a short time the whole country to the eastward lay spread out as a map. The great Canary was easily to be distinguished; and its rugged and mountainous character, similar to that of the other islands, became visible to the naked eye. The cold at this time was intense, the wind keen and strong, and the thermometer sunk to 32 degrees. After a short though rapid ascent, we reached the summit of the second stage of the mountain, passing over a small plain of white pumice, on which were spread masses of lava, and at length arrived at the foot of the cone. This division of the mountain forms what is generally termed the Peak of Teneriffe: it represents the present crater of Vesuvius, with this difference, however, that, while the surface of that mountain is composed of a black cinder or ash, the supericies of this appears to be a deposit of pumice of a white colour, of scoria and lava, with here and there considerable masses that were probably thrown out when the volcano was in action. Numerous small cavities on the side of the mountain emitted vapour with considerable heat. Here begins the only fatiguing part of the ascent; the steepness of the cone is excessive; at each step our feet sunk into the ash, and large masses of pumice and lava rolled down from above; we were all bruised, and our feet and legs were cut, but none materially hurt: at last we surmounted all difficulties, and seated ourselves on the highest ridge of the mountain. This uppermost region does not appear to contain in supericies more than an acre and a half, and is itself a small crater, the walls of which are the different points on which we sat, and are plainly visible from below. Within, the lava is in the most rapid state of decomposition. The surface is hot to the feet, and the guides said it was dangerous to remain long in one spot; as it was, some of us sunk to our knees in the hot deposit of sulphur; upon striking the ground with the feet, the sound is hollow, similar to what is produced by the same impulsion on the craters of Vesuvius, and Solfaterra. I estimate the depth of the crater to be, from the highest
ridge to the bottom, about two hundred feet, forming an easy and gradual descent.

The view from the summit is stupendous: we could plainly discover the whole form of the island, and we made out distinctly three or four of the islands, which, collectively, are called the Canaries; we could not, however, see Lancerotte or Fuerteventura, though we were told other travellers had distinguished them all.

From this spot, the central chain of mountains that run from south-west to north-east, is easily to be distinguished. These, with the succession of fertile and woody valleys, commencing from San Ursula, and ending at Las Horeas, with the long line of precipitous lava rocks that lay on the right of our ascent, and which traverse that part of the island running from east to west, from their point of departure at the Canales to where they end in an abrupt headland on the coast, with their forests, and villages, and vineyards, the port with the shipping in the roads, the towns of Orotava with their spires glittering as the morning sun burst upon them, afford a cheerful contrast to the streams of lava, the mounds of ash and pumice, and the sulphurated rock on which we had taken our seat. The sensation of extreme height was in fact one of the most extraordinary I ever felt; and though I did not find a pain in my chest, arising from the rarity of the atmosphere, near so acute as on the mountains of Switzerland, there was a keenness in the air, independent of the cold, that created no small uneasiness in the lungs. The respiration became short and quick, and repeated halts were found necessary. The idea also of extreme height was to me more determinate and precise than on the mountains of Switzerland; and though the immediate objects of vision were not so numerous, yet as the ascent is more rapid, the declivity sharper, and there is here no mountain like Monte Blanc towering above you, the 12,000 feet above the level of the sea appeared considerably more than a similar elevation above the lake of Geneva. We remained at the summit about three quarters of an hour, our ascent having cost us a labour of four hours, as we left the Estancia ten minutes before three, and reached the top of the peak before seven. Our thermometer, which was graduated in the scale of Fahrenheit, was, during our ascent, as follows
at Orotava, at eight in the morning, 74°; at six in the evening, at La Estancia, 50°; at one, in the following morning, 42°; at La Cueva, at half past four, 32°; at the bottom of the cone, 36°; at the top of the peak, one hour and a half after sun-rise, 33°. The descent down the cone is difficult from its extreme rapidity, and from the fall of large stones, which loosen themselves from the beds of pumice. Having at last scrambled to the bottom, we pursued our march down the other course of the lava, that is to say, down its westerly side, having ascended its eastern. The ravines and rents in this stream of lava are deep and formidable; the descent into them is always painful and troublesome, often dangerous: in some places we let ourselves down from rock to rock. I can form no opinion why there should be these strange irregularities in the surface of this lava; in places it resembles what sailors term the trough of the sea, and I can compare it to nothing but as if the sea in a storm had by some force become on a sudden stationary, the waves retaining their swell. As we again approached La Cueva, we came to a singular steep valley, the depth of which, from its two sides, cannot be less than one hundred to one hundred and fifty feet the lava lying in broken ridges one upon the other similar to the masses of granite rock that time and decay have tumbled down from the top of the Alps; and, except from the scoria, or what Milton calls "the Fiery Surge, they in no degree bear the marks of having rolled as a stream of liquid matter.

We descended the pumice hill with great rapidity almost at a run, and arrived at La Estancia in little more than two hours. We then mounted our mules, and following the track by which we had ascended the preceding day, we reached, about four o'clock, the country-house of our hospitable friend Mr. Barry.

The first eruption of which there is any distinct account, occurred on the 24th of December, 1704, when twenty-nine shocks of an earthquake were distinctly felt. On the 31st a great light was observed on Manja, towards the white mountains. Here the earth opened, and two volcanoes were formed, which threw up such heaps of stones as to raise two considerable mountains: the combustible matter, which still continued to be thrown up, kindled above fifty
fires in the vicinity. The whole country for three leagues round was in flames, which were increased by another volcano opening by at least thirty different vents within the circumference of half a mile. On the 2nd of February following, another volcano broke out in the town of Guaymar, swallowing up a large church.

A subsequent eruption in 1706 filled up the port of Guarachico. The lava, in its descent, ran five leagues and six hours; and on this lava houses are now built where ships formerly rode at anchor. Neither of these eruptions were from the crater on the summit of the peak, for this has not ejected lava for centuries, and it now issues from the flanks only. The last eruption was on the 9th of June 1798, and was very terrible. Three new mouths opened at the height of 8,130 feet, upwards of a mile and a half above the level of the sea, upon the inclined slope of the base of the Peak towards the S. W. Above this, at the height of 10,240 feet, nearly two miles, M. Cordier found a vast crater nearly four miles and a half in circumference which he ascertained to be very ancient. Its sides are extremely steep, and it still presents the most frightful picture of the violence of subterranean fire. The Peak rises from the sides of this monstrous aperture. To the S. W. is the mountain of Cahorra, which is said to have become a volcano in 1797. The other mountains of Teneriffe, which tradition reports to have been formerly volcanoes, are Monte Roxo, or the red mountain; several mountains, called Malpasses, lying to the eastward; and one, in a southerly direction, named Rejada. Throughout the whole of the distance between Monte Roxo and the bay of Adexe, according to Mr. Glass, the shore is about 2500 feet, nearly half a mile, in height, and perpendicular as a wall. The southern coast has a much superior elevation, the chain of mountains by which it is bounded being, agreeably to Mr. Vincent, 8,320 feet, more than a mile and a half, above the level of the sea.

THE SOUFFRIERE MOUNTAIN,
IN THE ISLAND OF ST. VINCENT.

This volcanic mountain, the dreadful eruption of which we are about to describe, is the most elevated and ma...
northerly of the lofty chain running through the West-India island of St. Vincent. From the extraordinary frequency and violence of the earthquakes, which, in 1811, are calculated to have exceeded two hundred, some great movement or eruption was looked for. In the interim the mountain indicated much disquietude; but the apprehension was not so immediate as to restrain curiosity, or to prevent repeated visits to the crater, which had latterly been more numerous than ever. Even on the 26th of April, 1812, the day preceding the eruption, several gentlemen ascended and remained there for some time. Nothing unusual was then remarked, nor any external difference observed, except rather a stronger emission of smoke from the interstices of the conical hill, at the bottom of the crater. To those who have not visited this romantic and wonderful spot, a slight description of it, as it lately stood, is previously necessary.

About 2000 feet from the level of the sea, on the south side of the mountain, and at rather more than two-thirds of its height, opens a circular chasm, somewhat exceeding half a mile in diameter, and between 400 and 500 feet in depth. Exactly in the centre of this capacious bowl, rose a conical hill about 260 or 300 feet in height, and about 200 in diameter, richly covered and variegated with shrubs, brushwood, and vines, above half way up, and the remainder covered over with virgin sulphur to the top. From the fissures of the cone and interstices of the rocks, a thin white smoke was constantly emitted, occasionally tinged with a slight bluish flame. The precipitous sides of this magnificent amphitheatre were fringed with various evergreens and aromatic shrubs, flowers, and many alpine plants. On the north and south sides of the base of the cone were two pieces of water, one perfectly pure and tasteless, the other strongly impregnated with sulphur and alum. This lonely and beautiful spot was rendered more enchanting by the singularly melodious notes of a bird, an inhabitant of these upper solitudes, and altogether unknown to the other parts of the island—hence principally called or supposed to be invisible, though it certainly has been seen, and is a species of blackbird.

A century had now elapsed since the last convulsion of the mountain, or since any other elements had disturbed the serenity of this wilderness, beside those which are common
to the tropical tempest. It apparently slumbered in pre-
meval solitude and tranquility, and, from the luxurian
t vegetation and growth of the forest, which covered its side
from the base nearly to the summit, seemed to discounte-
nance the fact, and falsify the records of the ancient vol-
cano. Such was the majestic, peaceful Souffriere, on Apr.
the 27th; but our imaginary safety was soon to be confound-
ed by the sudden danger of devastation. Just as the plan-
tation bells rang at noon on that day, an abrupt and dread-
ful crash from the mountain, with a severe concussion of the
earth, and tremulous noise in the air, alarmed all around it.
The resurrection of this fiery furnace was proclaimed in
moment by a vast column of thick, black, ropy smoke-
like that of an immense glass-house, bursting forth at once
and mounting to the sky; showering down sand, with gritty
calcined particles of earth and ashes mixed, on all below.
This, driven before the wind towards Wallibou and Mor-
Ronde, darkened the air like a cataract of rain, and covered
the ridges, woods, and cane-pieces with light grey-coloured
ashes, resembling snow when slightly covered by dust.
As the eruption increased, this continual shower expanded,
destroying every appearance of vegetation. At night a very
considerable degree of ignition was observed on the lips of
the crater; but it is not asserted that there was as yet any
visible ascension of flame. The same awful scene presented
itself on the following day; the fall of ashes and calcined
pebbles still increasing, and the compact, pitchy column
from the crater rising perpendicularly to an immense height
with a noise at intervals like the muttering of distant thun-
der.

On Wednesday, the 29th, all these menacing symp-
toms of horror and combustion still gathered more thick and
terrific for miles around the dismal and half-observed moun-
tain. The prodigious column shot up with quicker motion
dilating as it rose like a balloon. The sun appeared in total
eclipse, and shed a meridian twilight over us, that aggravated
the wintry gloom of the scene, now completely powdered
over with falling particles. It was evident that the crisis was
yet to come—that the burning fluid was struggling for a
vent, and labouring to throw off the superincumbent strata
and obstructions, which suppressed its torrent. At night
it was manifest that it had greatly disengaged itself from it
burthen, by the appearance of fire flashing above the mouth of the crater.

On the memorable 30th of April, the reflection of the rising sun on this majestic body of curling vapour was sublime beyond imagination:—any comparison of the Glaciers, or of the Andes, can but feebly convey an idea of the fleecy whiteness and brilliancy of this awful column of intermingled and wreathed smoke and clouds. It afterwards assumed a more sulphureous cast, like what are called thunderclouds, and in the course of the day had a ferruginous and sanguine appearance, with a much livelier action in the ascent, and a more extensive dilatation, as if almost freed from every obstruction. In the afternoon, the noise was incessant, and resembled the approach of thunder still nearer and nearer, with a vibration that affected the feelings and hearing: as yet there was no convulsive motion, or sensible earthquake. The Charaibs settled at Morne Ronde, at the foot of the Souffriere, abandoned their houses, with their live stock, and every thing they possessed, and fled precipitately towards town. The negroes became confused, forsook their work, looked up to the mountain, and, as it shook, trembled, with the dread of what they could neither understand nor describe—the birds fell to the ground, overpowered with showers of ashes, unable to keep themselves on the wing—the cattle were starving for want of food, as not a blade of grass or a leaf was now to be found—the sea was much discoloured, but not uncommonly agitated; and it is remarkable, that throughout the whole of this violent disturbance of the earth, it continued quite passive, and did not at any time sympathise with the agitation of the land. About four o'clock in the afternoon, the noise became more alarming, and just before sun-set the clouds reflected a bright copper colour, suffused with fire. Scarcely had the day closed, when the flames burst at length pyramidically from the crater, through the mass of smoke; the rolling of the thunder became more awful and deafening; electric flashes quickly succeeded, attended with loud claps; and now, indeed, the tumult began. Those only who have witnessed such a sight, can form any idea of the magnificence and variety of the lightning and electric flashes; some forked and zig-zag, playing across the perpendicular column from the crater—
others shooting upwards from the mouth like rockets of the most dazzling lustre—others like shells, with their trailing fuses, flying in different parabolas, with the most vivid oscillations from the dark sanguine column, which seemed inflexible, and immovable by the wind. Shortly after seven in the afternoon, the mighty caldron was to simmer, and the ebullition of lava to break out on the N. W. side. This, immediately after boiling over the crater, and flowing a short way, was opposed by theacrity of a higher point of land, over which it was impelled by the immense tide of liquified fire that drove it on, forming the figure V in grand illumination. Sometimes, when the ebullition slackened, or was insufficient to urge it on the obstructing hill, it recoiled like a refluent bilow from the rock, and then again rushed forward, impelled by fresh supplies, and surmounting every obstacle, current of fire and electric flashes tending it. About half past one, the following morning another stream of lava was seen descending to the eastward towards Rabacca. The thundering noise of the mountain and the vibration of sound that had been so formidable hitherto, now mingled in the sudden monotonous roar of the rolling lava, became so terrible, that dismay was turned into despair. At this time the first earthquake was felt; this was followed by showers of cinders, which with the hissing noise of hail, during two hours.

At three o'clock, a rolling on the roofs of the houses indicated a fall of stones, which soon thickened, and at length descended in a rain of intermingled fire, which threatened at once the fate of Pompeii, or Herculaneum. The crackling coruscations from the crater at this period exceeded that which had yet passed. The eyes were struck with momentary blindness, and the ears stunned with a confusion of sounds. People sought shelter in the cellars, under rocks.
or any where—for every place was nearly the same; and the miserable negroes, flying from their huts, were knocked down, or wounded, and many killed in the open air. Several houses were set on fire. The estates situated in the immediate vicinity seemed doomed to destruction. Had the stones which fell been heavy in proportion to their size, not a living creature could have escaped death: these, having undergone a thorough fusion, were divested of their natural gravity, and fell almost as light as pumice, though in some places as large as a man's head. This dreadful rain of stones and fire lasted upwards of an hour, and was again succeeded by cinders from three till six o'clock in the morning. Earthquake followed earthquake, almost momentarily; or rather the whole of this part of the island was in a state of continued oscillation; not agitated by shocks, vertical or horizontal; but undulated like water shaken in a bowl.

The break of day, if such it could be called, was truly terrific. Utter darkness prevailed till eight o'clock, and the birth of May dawned like the day of judgment: a chaotic gloom enveloped the mountain, and an impenetrable haze hung over the sea, with black sluggish clouds of a sulphureous cast. The whole island was covered with cinders, scoriae, and broken masses of volcanic matter. It was not until the afternoon, that the muttering noise of the mountains sunk gradually into a solemn yet suspicious silence. Such are the particulars of this sublime and tremendous scene, from its commencement to its catastrophic.

THE PEAK OF DERBYSHIRE.

This Peak consists of a chain of high mountains in the County of Derby, and has been long celebrated, as well on account of its mineral productions, and natural curiosities in general, as of what are called its Seven Wonders. Six of these are natural, namely, Poole's Hole, Elden Hole, the Peak Cavern, or the Devil's Hole, Mam-tor, St. Ann's Well, and the Ebbing and Flowing Well. Having described these, we shall add a recent discovery, that of the Crystallized Cavern, which possesses an equal interest.

Poole's Hole lying about a mile to the westward of
Buxton, is a vast cavern formed by nature in the limestone rock, and was, according to tradition, the residence of an out-law, named Poole. The entrance is low and contracted, and the passage narrow; but this widening, at length, leads to a lofty and spacious cavern, from the roof of which stalactites or transparent crystals, formed by the constant dropping of water laden with calcareous matter, hang in spiral masses. Other portions of these petrifactions drop and attach themselves to the floor, rising in cones, and becoming what are termed stalagmites.

One of the dropping stalactites, of an immense size, called the fitch of bacon, occurs about the middle of the cavern, which here becomes very narrow, but soon spreads to a greater width, and continues large and lofty until the visitor reaches another surprisingly large mass of stalactite, to which the name of Mary Queen of Scots' Pillar is given, from the tradition of that unfortunate queen having passed a visit to the cavern, and proceeded thus far into its recesses. As this pillar cannot be passed without some difficulty, few persons venture beyond it; nor does it seem desirable as, by proceeding thus far, a very competent idea of the cavern may be formed. The path hitherto is along the sides and at some height from the bottom of the cavern; but to visit and examine the interior extremity, it becomes necessary to descend a few yards by very slippery and ill-formed steps. The path at the bottom is tolerably even and level for about sixty feet, when an almost perpendicular ascent commences, which leads to the extremity of the fissure through the eye of St. Anthony's needle; a narrow strait beyond which the steepness of the way is only to be surmounted by clambering over irregular masses of rock.

The cavern terminates at nearly three hundred feet beyond the Queen of Scots' pillar. Towards the end is an aperture through a projecting rock, behind which a candle is generally placed, when any person has reached the extremity when seen at that distance, it appears like a dim star. The visitor returns along the bottom of the cavern, beneath a considerable portion of the road by which he entered; and by thus changing the path, has an opportunity better to ascertain the height and width of the cavern, in every part, and to view other accumulated petrifactions, some of which are of a prodigious size, and of an extraordinary form.
one part of this passage is a fine spring of transparent water; and a small stream, which becomes more considerable in rainy seasons, runs through the whole length of the cavern. Its sound, in passing through this spacious and lofty concavity, which resembles the interior of a Gothic cathedral, has a fine effect. To the right, in a small cavern called Poole's chamber, is a curious echo.

The various masses of stalactical matter which are every where met with in this natural excavation, and which reflect innumerable rays from the lights carried by the guides, are distinguished by the names of the objects they are fancied most to resemble. Thus we have Poole's saddle, his turtle, and his woolsack; the lion, the lady's toilet, the pillion, the bee-hive, &c. It should be noticed, however, that the forms are constantly varied by the percolation of the water through the roof and sides of the rock. The subterraneous passage is nearly half a mile in length.

ELDEN HOLE.

Elden Hole is situated on the side of a gentle hill about a mile to the north-west of the village of Peak Forest. It is a deep chasm in the ground, surrounded by a wall of un cemented stones, to prevent accidents. This fissure or cleft in the rock has been the subject of many exaggerated descriptions and superstitious reports, having been represented not only as unfathomable, but as teeming, at a certain depth, with so impure an air, that it could not be respired without immediate destruction. Mr. Lloyd, however, who descended into it about fifty years ago, has proved the absurdity of these relations, in a paper, of which the following is a brief abstract, published in the Philosophical Transactions.

For the first sixty feet, he observes, he descended somewhat obliquely, the passage then becoming difficult from projecting crags. At the further depth of thirty feet, the inclination of his rope varied at least eighteen feet from the perpendicular. The breadth of the chink was here about nine feet, and the length eighteen; the sides being irregular moss-grown, and wet. Within forty-two feet of the bottom, the rock opened on the east, and he swung till he reached the floor of a cave, one hundred and eighty-six feet only from the mouth, the light from which was suffi-
ciently strong to permit the reading of any book. The interior of the chasm he describes as consisting of two parts, which communicate with each other by a small arched passage, the one resembling an oven, the other the dome of a glass-house. On the south side of the latter, was a small opening, about twelve feet in length, and four in height lined throughout with a kind of sparkling stalactite, of a fine deep yellow colour, with petrifying drops hanging from the roof. Tracing the entrance he found a noble column, above ninety feet high, of the same kind of incrustation. As he proceeded to the north, he came to a large stone which was covered with the same substance; and beneath it he found a hole six feet in depth, uniformly lined with it. From the edge of this hole sprung up a rocky ascent, sloping, like a buttress, against the side of the cavern, and consisting of vast, solid, round masses of the same substance and colour. Having climbed this ascent to the height of about sixty feet he obtained some fine pieces of stalactite, which hung from the craggy sides of the cavern. Descending with some difficulty and danger, he proceeded in the same direction, and soon came to another pile of incrustations of a brown colour, above which he found a small cavern, opening into the side of the vault, which he now entered. Here he saw vast masses of stalactite, hanging like icicles from every part of the roof; several of these were four and five feet long, and as thick as a man's body. The sides of the largest cavern were chiefly lined with incrustations of three kinds; the first of which was a deep yellow stalactite; the second, a thin coating which resembled a pale stone-colour varnish, and reflected the light of the candle with great splendour; and the third, a rough efflorescence, the shoot of which resembled a rose flower.

The authors of a recent publication thus state the result of their observations and inquiries relative to Elden Holc. They describe the mouth of this chasm as opening horizontally, in a direction from north to south; its shape being nearly that of an irregular ellipsis, about ninety feet in length, and twenty-seven in breadth at the widest part. The northern end is fringed with small trees; and moss and underwood grow out of the crevices on each side, to the depth of forty or fifty feet. As the fissure recedes from the surface, it gradually contracts; and at the depth of
about seventy feet inclines considerably to the west, so as to prevent its course from being further traced. Notwithstanding the obstacles of the bushes and projecting masses of stone, it was sounded, and its depth found not to exceed two hundred and two feet—an estimate which corresponds with the assertion of three miners, who had descended in search of the bodies of individuals who were missing, and were supposed to have been robbed, murdered, and thrown into this frightful abyss.

**PEAK CAVERN.**

**Peak Cavern**, also called the Devil's Hole, is one of those magnificent, sublime, and extraordinary productions of nature, which constantly excite the wonder and admiration of their beholders. It has accordingly been considered as one of the principal wonders of Derbyshire, and has been celebrated by several poets. It lies in the vicinity of Castleton, and is approached by a path at the side of a clear rivulet, leading to the fissure, or separation of the rock, at the extremity of which the cavern is situated. It would be difficult to imagine a scene more august than that which presents itself to the visitor at its entrance; on each side, the huge grey rocks rise almost perpendicularly, to the height of nearly three hundred feet, or about seven times the height of a modern house, and, meeting each other at right or cross angles, form a deep and gloomy recess. In front, it is overhung by a vast canopy of rock, assuming the appearance of a depressed arch, and extending, in width, one hundred and twenty feet; in height, forty-two; and in receding depth, about ninety. After penetrating about ninety feet into the cavern, the roof becomes lower, and a gentle descent leads, by a detached rock, to the interior entrance of this tremendous hollow. Here the light of day, having gradually diminished, wholly disappears; and the visitor is provided with a torch to illumine his further progress.

The passage now becoming extremely confined, he is obliged to proceed, in a stooping posture, about twenty yards, when he reaches a spacious opening, named the Bell-house, and is thence led to a small lake, called the First Water, about forty feet in length, but not more than two or three feet in depth. Over this he is conveyed in a boat to the in-
THE PEAK OF DERBYSHIRE.

terior of the cavern, beneath a massive vault of rock, which in some parts descends to within eighteen or twenty inches of the water. "We stood some time," says M. de St. Fend, "on the brink of this lake; and the light of our dismal torches which emitted a black smoke, reflecting our pale image from its bottom, we almost conceived that we saw a troop of spectres starting from an abyss to welcome us. The illusion was extremely striking."

On landing, the visitor enters a spacious vacuity, 220 feet in length, 200 feet in breadth, and in some parts 120 feet in height, opening into the bosom of the rock; but from the want of light, neither the distant sides, nor the roof of this abyss, can be seen. In a passage at the inner extremity of this vast cave, the stream which flows through the whole length of the cavern, spreads into what is called the Second Water, and near its termination is a projecting pile of rocks, known by the appellation of Roger's House, from the incessant fall of water in large drops through the crevices of the roofs. Beyond this, opens another tremendous hollow, called the Chancel, where the rocks are much broken, and the sides covered with stalactical or petrified incrustations. Here the visitor is surprised by a vocal concert which bursts in discordant tones from the upper regions of the chasm. "Still, observes a modern tourist, "this being unexpected, issuing from a quarter where no object can be seen, in a place where all is still as death, is calculated to impress the imagination with solemn ideas, and can seldom be heard without that mingled emotion of awe and pleasure, astonishment and delight, which is one of the most interesting feelings of the mind." At the conclusion of the strain the choristers, who consist of eight or ten women and children, are seen ranged in the hollow of the rock, about fifty feet above the floor.

The path now leads to a place whimsically called the Devil's Cellar and Half-way House, and thence, by three natural and regular arches, to a vast concavity, which, from its uniform bell-like appearance, is called Great Tom or Lincoln. When illuminated by a strong light, this concavity has a very pleasing effect; the symmetrical disposition of the rocks, the stream flowing beneath, and the spirals in the roof, forming a very interesting picture. From this
point the vault gradually descends, the passage contracts, and at length does not leave more than sufficient room for the current of the stream, which continues to flow through a subterraneous channel of several miles in extent, as is proved by the small stones brought into it, after great rains, from the distant mines of the Peak Forest.

The entire length of this wonderful cavern is 2250 feet, nearly half a mile; and its depth, from the surface of the Peak mountain, about 620 feet. A curious effect is produced by the explosion of a small quantity of gunpowder, wedged into the rock in the interior of the cavern; for the sound appears to roll along the roof and sides, like a tremendous and continued peal of thunder. The effect of the light, on returning from these dark recesses, is particularly impressive; and the gradual illumination of the rocks, which become brighter as the entrance is approached, is said to exhibit one of the most interesting scenes that ever employed the pencil of an artist, or fixed the admiration of a spectator.

**Mam Tor.**

**Mam Tor,** or the *Shivering Mountain,* is a huge precipice facing the east or south-east, chiefly composed of a peculiar kind of slate, which, although very hard before it is exposed to the air, very easily crumbles to dust on such exposure. Hence it is perpetually wasted by the action of the rain and snow; while the harder and larger masses of stone, being thus loosened and disengaged, necessarily fall from their positions, and this with a rushing noise which is occasionally so loud as to be heard at Castleton, a distance of two miles. The valley beneath is overwhelmed with their fragments to the extent of half a mile. In many parts of the precipice, they produce, before their descent, a cavernous appearance, and even a romantic overhanging scenery, highly dangerous to be approached. It is affirmed by the most intelligent of the neighbouring inhabitants, that this mountain chiefly wastes during violent storms of snow and rain; and Mr. Martin, who published an account of Mam Tor, in the *Philosophical Transactions* for 1729, affirms that the decay is not constantly the same. He not only surveyed it closely, but ascended the steepest part of the
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precipice, without tracing any other shivering in the moun-
tain, beside that which was occasioned by the treading
his feet in the loose crumbled earth.

THE EBBING AND FLOWING WELL.

In the vicinity of Chapel-en-le-Frith is a steep hill, ris-
to the height of more than a hundred feet, immediately
beneath which this natural phenomenon lies. It is of an
irregular form, but nearly approaching to a square, from
two or three feet in depth, and about twenty feet in width.

Its ebbings and flowings are irregular, and depend
on the quantity of rain which falls in the different ses-
sions of the year; when it begins to rise, the current can
only be perceived by the slow movement of the blades of
grass, or other light bodies floating on the surface; notwith-
standing which, before the expiration of a minute, the
water issues, with a gurgling noise, in considerable quan-
tities, from several small apertures on the south and west
sides. The interval of time between the ebbing and flow-
ing is not always alike: consequently the proportion of
water it discharges at different periods, also varies. In a
space of five minutes flowing, the water occasionally rises
the height of six inches; and, after remaining a few secon-
dary, the well assumes its former quiescent state.

The cause of the intermittent flowing of this well may
be satisfactorily explained, on the principle of the action of
the syphon, and on the supposition of a natural one com-
municating with a cavity in the hill, where the water may
be supposed to accumulate:—but for the phenomenon of
its ebbing, no satisfactorily reason has been assigned. The
opinion of a second syphon, as ingeniously advanced by
modern Tourist, which begins to act when the water rises
is inconsistent with the appearance of the well, and there-
fore cannot be just.

ST. ANNE'S WELL.

This Well, the usual resort of the company who frequent
Buxton to drink the waters, has been classed among the
wonders of the Peak, on account of this singularity—the
within five feet of the hot spring by which it is supplied.
a cold one arises. This is not, however, the only well of the kind, since hot and cold springs rise near each other in many parts of England, and in other countries. The water is conveyed to the well, which is an elegant classical building, in the Grecian style, from the original spring, by a narrow passage, so close and well contrived as to prevent it from losing any considerable portion of its heat, and is received in a white marble bason. It is not so warm as the Bath water, its temperature being about 80 degrees of Fahrenheit.

THE CRYSTALLIZED CAVERN.

The CRYSTALLIZED CAVERN, the new wonder of the Derbyshire Peak, has been recently discovered in the vicinity of the village of Bradwell. We extract the following particulars of this singular and beautiful natural excavation from Hutchinson's late Tour in the High Peak.

The entrance is rather terrific than grand; and the descent for about thirty paces very abrupt. The visitor has then to pass along an inclined way for nearly a quarter of a mile, the opening being so low that it is impossible to proceed, in particular parts, in an erect posture. The different crystallizations which now attract his attention on every side, soon make him forget the irksomeness of the road, and banish every idea of fatigue. New objects of curiosity crowd one on the other: in a place called the Music Chamber, the petrifications take the semblance of the pipes of an organ; while in other parts, these stalactites are formed into elegant small colonnades, with as exact a symmetry as if they had been chiselled by the most skilful artist. Candles judiciously disposed within them, give an idea of the imaginary palaces of fairies, or of sylphs and genii, who have chosen this for their magnificent abode.

Still he has seen nothing comparable to what he is now to expect; for, at the distance of about a hundred paces further, by a rugged descent, he enters what is called the Grotto of Paradise. This heavenly spot, for it cannot be compared to any thing terrestrial, is, of itself, a beautiful crystallized cavern, about twelve feet high, and in length twenty feet, pointed at the top, similar to a gothic arch, with a countless number of large stalactites hanging from the
roof. Candles placed among them give some idea of being lighted up with elegant glass chandeliers; while the sides are entirely incrusted, and brilliant in the extreme. The floor is chequered with black and white spar. It altogether, Mr. Hutchinson observes, the most novel and elegant appearance of any cavern he ever beheld. The glittering apartment would be left by the visitor with a certain degree of regret, did he not expect to see it again on his return.

Still continuing a route similar to the one he has passed in the course of which his attention is occasionally arrested by the curiosities of the place, and by the gentle droppings of the water, which scarcely break the solemn silence of the scene, he at length reaches the Grotto of Calypso, at the extremity of the cavern, upwards of 2000 feet from the entrance. To see this grotto to advantage, he has to ascend about six feet, into a recess. There, the beautiful appearances of the different crystallizations, some of them of azure cast, and the echoes reverberating from side to side, make him fancy that he has reached the secluded retreat of some mythological deity.

Returning by the same path for a considerable distance another cavern, which branches in a south-western direction from the one already explored, presents itself. The recesses here are still more difficult of access, but the stalactites are certainly most beautiful. Many of them, more than a yard in length, are pendent from the roof, and the greater part do not exceed the dimension of the smallest room. The top and sides of this cavern are remarkably smooth, particularly at the part called the Amphitheatre. In general the stonework is of a very dark colour, to which the transparent appearances before mentioned, with each a drop of water hanging at its extremity, form a fine contrast.

**SPEEDWELL LEVEL.**

In the Speedwell Level, or Navigation Mine, in the vicinity of Castleton, art has been combined with subterraneous wonders of nature. Being provided with lights, the guide leads the visitor beneath an arched viaduct by a flight of 100 steps, to the sough or level, where a lamp is ready for his reception, and which is put in motion...
pushing against pegs driven into the wall for that purpose. After proceeding about one third of a mile through various caverns, the level bursts into a tremendous gulf, the roof and bottom of which are invisible, but across which the navigation has been carried, by throwing a strong arch over a part of the fissure where the rocks are least separated. Here, leaving the boat, and ascending a stage erected above the level, the attention of the visitor is directed to the dark recess of the abyss beneath his feet; and firm indeed must be his resolution, if he can contemplate the scene unmoved, and without an involuntary shudder. To the depth of ninety feet all is vacancy and gloom; but beyond that commences a pool of stygian waters, not unsaptly named the bottomless pit, the prodigious range of which may in some measure be conceived, by the circumstance of its having swallowed up more than 40,000 tons of rubbish, made in blasting the rock, without any apparent diminution either of its depth or extent. The guides assert that the former has not been ascertained; but there is reason to believe that its actual depth in standing water is about 320 feet. There cannot, however, be a doubt but that this abyss has communications with others still more deeply situated in the bowels of the mountain, and into which the precipitated rubbish has found a passage. The superfluous water of the level falls through a water-gate into this profound caldron, with a noise like a rushing torrent.

This fissure is calculated to be about 800 feet beneath the surface of the mountain; and so great is its reach upward, that rockets of sufficient strength to ascend 450 feet, have been fired without rendering the roof visible. The effect of a Bengal light discharged in this stupendous cavity is extremely magnificent and interesting.

THE HIGH TOR.

This is one of the many sublime objects presented by Matlock Dale, the beauties of which will be cursorily described, in proportion as these objects pass under our review.

In approaching the bath, which is nearly a mile to the south-west of the village of Matlock, a specimen of the
scenery by which this charming vale is distinguished, sends itself. The entrance is through a rock, which been blasted for the purpose of opening a convenient sage;—and here a scene which blends the constituent principles of the picturesque, the beautiful, and the sublime opens suddenly on the view. Through the middle of narrow plain flows the Derwent, overhung by a profusion of luxuriant beeches and other drooping trees. Toward the east are gently rising grounds; and on the west huge mural banks of the vale stretch along, the white of the rock of which they are composed occasionally playing itself through the woody clothing of their sides and summits. This magnificent scenery is singularly contrasted by the manufactories and lodging-houses at the bottom of the vale.

To see this magic spot to the greatest advantage, it should be entered at its northern extremity, its beauties then succeeding each other in a proper gradation, and their grandeur and effect being rendered more impressive. The chief attention is now attracted to the High Tor, a grand and stupendous rock, which appears like a vast abrupt wall of limestone, and rises almost perpendicularly from the river to the height of upwards of 350 feet. The lower part of this majestic feature is shaded by yew-trees, elms, limes, and underwood of various foliage; but the upper part, fifty or sixty yards, presents a rugged front of one block of perpendicular rock. From its summit the vale is seen in all its grandeur, diversified by woods of various height and species. The windings of the Derwent, the great coloured rocks, and the white fronts of the houses, encrusted amidst groves of trees which sprout from every crevice of the precipices, give variety and animation to scene of wonderful beauty.

CHEE TOR.

In a romantic and deep hollow, near the little village of Wormhill, the river Wye flows beneath this stupendous mass of rock, which rises perpendicularly more than 300 feet above its level. The channel of the river, which meanders at the base, is confined between huge rocks of limestone, having such a general correspondence of size
tion and form, as to render it probable that they were once united. In some parts they are partially covered with brushwood, nut-trees, and mountain-ash; while in others, they are totally naked, precipitous, and impending. The chasm runs in a direction so nearly circular, that the sublime CHEE Tor, and its dependant masses of rock, are almost insulated by the river which rolls at their feet. Its length, as far as it possesses any considerable beauty, is between five and six hundred yards; a distance which presents several picturesque and interesting views, the general effect of the fine scenery being enhanced by the plantations on the neighbouring heights, and by a spring which flows into the river near the bottom of a deep descent. From a particular station in this romantic spot, the four vallies of Wye Dale, Chee Dale, Flag Dale, and Water Dale, may be together with the Tor and river.

MASSON HILL.

Where as proud Masson rises rude and bleak,
And with mis-shapen turrets crests the peak,
Old Matlock gapes, with marble jaws beneath,
And o'er scar'd Derwent bends his slinty teeth;
Deep in wide caves, below the dangerous soil,
Impetuous streams in spiral columns rise,
Through rifted rocks, impatient for the skies;
Oh, o'er bright seas of bubbling lavas blow,
As heave and toss the billowy fires below;
Condens'd on high, in wandering rills they glide,
From Masson's dome, and burst his sparry side;
Round his grey towers, and down his fringed walls,
From cliff to cliff the liquid treasure falls;
In beds of stalactite, bright ores among,
O'er corals, shells, and crystals, winds along;
Crusts the green mosses, and the tangled wood,
And sparkling plunges to its parent flood.

DARWIN'S LOVES OF THE PLANTS.

This very high eminence is directly opposite to the High Tor, but rises with a less steep ascent. Its summit is named the Heights of Abraham, from its resemblance to the heights of that name near Quebec, rendered so memorable by the enterprise of the gallant Wolfe in 1759. It overlooks the country to a vast extent, so as to command a view
of almost the whole length of the valley. Its considerable elevation above the surrounding objects greatly changes their general size and appearance. Even the High Tor seems considerably diminished in grandeur and sublimity; but this effect is partly compensated by the extent of the prospect and the variety of objects it comprehends. The height of this eminence is about 750 feet, the path to its summit having been carried, in a winding direction, through a grove. At the one half of its ascent is an alcove, from which an extensive view of a great part of Matlock Dale may be seen, through a fine avenue formed for that purpose.

THE CUMBERLAND CAVERN.

To the west and north-west of the village of Matlock are three apertures in the rock, respectively named the Cumberland, Smedley, and Rutland Caverns. The former of these is well deserving of a short notice.

The entrance is partly artificial, to afford a greater facility to the visitor, who has to descend fifty-four steps. The cavern now opens on him in solitary grandeur. Huge masses of stone are piled on each other with a tremendous kind of carelessness, evidently produced by some violent concussion, though at an unknown period. He is conducted to a long and wide passage, the roof of which has all the regularity of a finished ceiling, and is bespangled by spars of various descriptions. From above, from beneath, and from the sides, the rays of the lights are reflected in every direction. In an adjacent compartment rocks are heaped on rocks in terrible array, and assume a threatening aspect. Next is an apartment decorated with what, in the language of the country, is called the snow fossil—a petrifaction which, both in figure and colour, resembles snow, as it is drifted by the winter storm into the cavities of a rock. Near the extremity of the cavern are to be seen fishes petrified and fixed in the several strata which form the surrounding recess. One of these has its back jutting out of the side of the earth, as if it had been petrified in the act of swimming. In another branch of the cavern a web has been found of a considerable depth.
After having proceeded about a mile in Dove Dale, the romantic and sublime beauties of which will be hereafter noticed, by a route constantly diversified by new fantastic forms, and uncouth combinations of rock, the visitor is led to a mass of mural rock, bearing the above name, and perforated by nature into a grand arch, nearly approaching to the shape of the sharply-pointed gothic style of architecture, about forty-five feet in height, and in width twenty. Having passed through this arch, a steep ascent leads to a natural cavern, called Reynard's Hall, forty-five feet in length, fifteen in breadth, and in height thirty. From the mouth of this cavern the scenery is singular, beautiful, and impressive. The face of the rock, which contains the arch, rises immediately in front, and would effectually prevent the eye from ranging beyond its mighty barrier, did not its centre open into the above-mentioned arch, through which is seen a small part of the opposite side of the Dale, consisting of a mass of gloomy wood, from the shade of which a huge detached rock, solitary, cragged, and pointed, starts out to a great height, and forms an object truly sublime. This rock, which has received the name of Dove Dale Church, is pleasingly contrasted by the little pastoral river Dove, and by its verdant turf y banks. A narrow opening at the extremity of the cavern is supposed to lead to other similar cavities in the rock; and on the left is a cavern, about forty feet in length, in breadth fourteen, and in height twenty-six, called Reynard's Kitchen, from the interior of which a pleasing view is presented of the upper part of the dale, its river, and rocks.

After passing Reynard's Hole, already described, the rocks rise more abruptly on either side, and appear in shapes more wild and irregular, but diversified and softened by shrubs.

Dove Dale is nearly three miles in length; but from the sinuosity of its course, and its projecting precipices, the views are limited. Throughout the whole of this majestic feature of country, the river Dove flows, in the halcyon days of summer, with soft murmurs, innocently and transparently over its pebbly bed; but swells into rage during the
winter months. Little tufts of shrubs and underwood form islands in miniature within its bed, which enlarge and swell the other objects. The scenery of this Dale is distinguished from almost every other in the United Kingdoms, by the rugged, dissimilar, and frequently grotesque and fanciful appearance of the rocks. To employ the words of a late tourist, "It is, perhaps, on the whole, one of the most pleasing sceneries of the kind any where to be met with. It has something peculiarly characteristic. Its detached perpendicular rocks stamp it with an image entirely its own, and for that reason it affords the greater pleasure. For it is in scenery as in life. We are most struck with the peculiarity of an original character, provided there be nothing offensive in it."

**THOR'S HOUSE.**

Where Haumps and Manifold, their cliffs among,
Each in his flinty channel winds along,
With lucid lines the dusky moor divides,
Hurry ing to internix their sister tides,
Where still their silver-bosom'd nymphs abhor
The blood-smear'd mansion of gigantic Thor—
First fires volcanic in the marble womb
Of cloud-wrapp'd Whetton rais'd the massy dome
Rocks rear'd on rocks, in huge disjointed piles,
Form the tall turrets, and the lengthen'd aisles;
Broad pond'rous piers sustain the roof, and wide
Branch the vast rainbow ribs from side to side.
While from above descends, in milky streams,
One scanty pencil of illusive beams,
Suspended crags, and gaping gulfs illumes,
And gilds the horrors of the deepen'd glooms,
—Here oft the Naiads, as they chance to stray
Near the dread Fane, on Thor's returning day,
Saw from red altars streams of guiltless blood,
Stain their green reed-beds, and pollute their flood;
Heard dying babes in wicker prisons wail,
And shrieks of matrons thrill the affrighted gale;
While from dark caves infernal echoes mock,
And fiends triumphant shout from ev'ry rock!

**DARWIN**

This spacious cavern is situated about two miles above Dove Dale, near the village of Whetton; and tradition says that the Druids here offered human sacrifices, inclosed in wicker idols, to Thor, the principal deity of the Saxons.
and Danes, in the ages of their idolatrous worship. Beneath is an extensive and romantic common, where the rivers Hamps and Manifold sink into the earth, and rise again in Islam gardens. These rivers merit a brief description. A wooden bridge has been thrown over an abyss in the rock, out of which the river Manifold bursts with surprising force, after having pursued a subterraneous course of five miles, from the point where it had engulfed itself in the earth, called Weston Hill. At the further distance of twenty yards a similar phenomenon occurs; for here another fissure in the rock presents itself, whence the river Hamps throws its waters into day. This river disappears at Leek-Water Houses, a place between Leek and Ashbourne; thus pursuing a subterraneous course of seven miles, before it again emerges into light. On their emersion, the temperature of the two rivers differs two degrees and a half, the Hamps being the coldest.

THE LOVERS’ LEAP.

The environs of Buxton abound in romantic sites, among the most striking of which is the Dale named the Lovers’ Leap, on account of a vast precipice which forms one side of a narrow chasm, and from the summit of which a love-lorn female is said to have precipitated herself into the rocky gulf below. Each side of this beautiful dell is bounded by elevated rocks, the proximity of which is such, that for a considerable space there is scarcely room for the passage of the bubbling current of the Wye. Several of these rocks are perpendicular, and bare of vegetation; while others are covered with ivy, yew, and ash-wood, with a craggy steep occasionally starting through the verdure. A circular road, extending in circumference about three miles, passes in view of the most romantic part of this dale, and forms a very agreeable walk or ride from Buxton. At the southern extremity the scenery assumes a milder character, the hollow taking the name of Mill Dale, from a mill which is turned by the stream. In conjunction with a rude bridge, a mountainous path, and other rural objects, this forms a very picturesque view. Another fine scene is presented by a lofty rock, called Swallow Tor, which soars over a mass of wood, the river at its base foaming and roaring over broken masses of
THE PEAK OF DERBYSHIRE.

THE MOORS.

Derbyshire is everywhere fruitful in natural curiosities; among the most striking of which may be reckoned the Moors of Hope Parish, inasmuch as they afford an extraordinary instance of the preservation of human bodies interred in them. In the year 1674 a grazier and his female servant, in crossing these Moors on their way to Ireland, were lost in the snow, with which they were covered from January to May, when, on their being found, the bodies were so offensive that the Coroner ordered them to be buried on the spot. After a lapse of twenty-nine years on the ground being opened, they were in no way changed; the colour of the skin being fair and natural, and the flesh as soft as that of persons newly dead. For twenty succeeding years they were occasionally exposed as a spectacle, but carefully covered after being viewed. They lay at the depth of about three feet, in a moist soil, or moss. The Minister of Hope Parish was present in 1716, forty-two years after the accident, at a particular inspection of the bodies. On the stockings being drawn off, the man's legs, which had not been uncovered before, were quite fair: the flesh, when pressed by the finger, pitted a little; and the joints played freely, without the least stiffness. Such part of the clothing as the avidity of the country people possess so great a curiosity, had spared, were firm and good; and a piece of new serge, worn by the woman, not appear to have undergone any sensible change.

OTHER ENGLISH CURIOSITIES

Having thus brought to a conclusion our details relative to the wonders of the Peak, and the various and interesting natural curiosities there to be found, we subjoin a brief notice of several others, which have, in our Island, attracted the notice of travellers.

Among the extraordinary caverns to be found in the mountains of the north of England, may be reckoned Yordas Cave, in the vale of Kingsdale, in Yorkshire, which contains a subterraneous cascade. Whethercot Cave, m
far from Ingleton, is divided by an arch of limestone, passing under which is seen a large cascade falling from a height of more than sixty-feet. The length of this Cave is about one hundred and eighty-feet, and the breadth ninety.

There are also in various parts of England many remarkable springs, of which some are impregnated either with salt, as that of Droitwich, in Worcestershire; or sulphur, as the famous well of Wigan, in Lancashire, or bituminous matter, as that at Pitchford, in Shropshire. Others have a petrifying quality; as that near Lutterworth, in Leicestershire, and a dropping well in the West Riding of Yorkshire. And, finally, some ebb and flow, as that of the Peak described above, and Laywell near Torbay, whose waters rise and fall several times in an hour. To these we may add that remarkable fountain near Richard's Castle, in Herefordshire, commonly called Bone Well, which is generally full of small bones, like those of frogs or fishes, though often cleared out. At a cliff near Wigan, in Lancashire, is the famous burning well; the water is cold, neither has it any smell; yet so strong a vapour of sulphur issues out with the stream, that upon applying a light to it, the top of the water is covered with a flame, like that of burning spirits, which lasts several hours, and emits such a heat that meat may be boiled over it.

**BRITISH MOUNTAINS.**

The British Isles present many mountains of a bold and imposing character: when contrasted, however, with those which have been already described, they must be considered as comparatively diminutive.

**BEN NEVIS.**

The loftiest of these mountains is Ben Nevis, in Scotland, its elevation above the level of the sea being 4280 feet, somewhat more than four-fifths of a mile. It terminates in a point, and elevates its rugged front far above all the neighbouring mountains. It is of easy ascent; and at the perpendicular height of 1500 feet, the vale beneath presents a very...
agreeable prospect, the vista being beautified by a diversity of bushes, shrubs, and birch woods, beside many little verdant spots. The sea and the shore are also seen.

At the summit, the view extends at once across the Island, eastwards towards the German sea, and westward to the Atlantic Ocean. Nature here appears on a majestic scale, and the vastness of the prospect engages the whole attention, at the same time that the objects in view are of no common dimensions. Just over the opening of the sound, at the south-west corner of Mull, Colonsay rises out of the sea, like a shade of midst, at the distance of more than ninety miles. Shuna and Lismore appear like small spots of rich verdure, and, though nearly thirty miles distant, seem quite under the spectator. The low parts of Jura cannot be discerned, nor any part of Islay; far less the coast of Ireland, as has been asserted. Such is, however, the wide extent of view, that it extends 170 miles from the horizon of the sea at the Murray Firth, on the N. E., to the Island of Colonsay, on the S. W.

On the N. E. side of Ben Nevis is an almost perpendicular precipice, certainly not less than 1400 feet in depth: probably more, as it appears to exceed the third part of the entire height of the mountain. A stranger is astonished at the sight of this dreadful rock, which has a quantity of snow lodged in its bosom throughout the whole year. The sound of a stone thrown over the cliff to the bottom, cannot be heard when it falls, so that it is impossible to ascertain in that way the height of the precipice.

SNOWDON.

This is the loftiest of the Welch mountains, its elevation above the level of the sea being 3720 feet, nearly three quarters of a mile. It is accessible on one side only, its flanks being in every other quarter precipitous. Its aspect soon convinces the spectator that he is not to look to the Alps alone, or to the rocky regions of Altai, bordering on Siberia, for romantic scenes of wildness, confusion, and disorder. Snowdon presents them in all their rude and native majesty.

In the ascent, a narrow path, not more than nine feet in width, leads along the margin of a frightful precipice of
BRITISH MOUNTAINS.

nearly 1500 feet in extent, so perpendicular that it cannot be approached without terror; while to the north of the summit nearest to the one the most elevated, a semi-amphitheatre of precipitous rocks, also of a great height, is seen; and, behind this summit, another semicircle of equal depth and extent. The loftiest summit here appears to descend in the form of a sharp ridge, and beneath it another point appears, which, on account of its colour, is called the Black Rock. From the upper part of the valley one of these summits presents a grand, vertical, and very elevated point.

The bottom of each of the amphitheatres of rocks, thirteen in number, is occupied by a small lake of a circular form, and very deep. The one known by the name of Llyn Glass is remarkable for its green hue, derived from its being impregnated with copper, several mines of which line its borders. Than this mountain nothing in the Alps can be more arid and desert, those regions alone excepted which are too lofty to admit of vegetation. Here there is not a tree; not even a shrub: small patches of verdure, which sheep can scarcely reach, are alone to be seen. Its summit, or highest peak, is a flat of about eighteen feet only in circumference. Thence may be seen a part of Ireland, a part of Scotland, Cumberland, Lancashire, Cheshire, all North Wales, the Isle of Man, and the Irish and British seas, with innumerable lakes; while the whole island of Anglesea is displayed so distinctly, that its flat and uncultivated plains, bounded by the rich Parys mountain in the vicinity of Holyhead, may be described as on a map.

CADER IDRIS.

To the south of Dolgellau, Cader Idris towers above the subject mountains, which seem to retire, to allow its base more room to stand, and to afford to their sovereign a better display. It stands on a broad rocky base, with a gradual ascent to its brow, when the peaks elevate themselves in a manner at once abrupt, picturesque, and distinct. The point emphatically named Cadair appears to the eye below to be a little superior in height to the saddle; but the third point, or apex, which has a name expressive of its sterility, is neither equal in height, nor in beauty, to the
other two. On its loftiest peak a stone pillar has lately been erected, for the purpose of a trigonometrical survey.

Cader Idris is the commencement of a chain of primitive mountains, and is computed to be 2850 feet above the green of Dolgelly, and 3550 feet, nearly three-fourths of a mile, above the level of the sea. A recent traveller has attempted to demonstrate that at some remote period it was a volcano of immense magnitude.

The tract to the south of Cader Idris, as far as Talyllyn and Malwydd, is peculiarly grand. High and rugged mountains of every possible form close in on all sides, while huge masses of rock hang over, or lie scattered in misshapen fragments by the side of the road. To add to the effect of this scene, the river Dilli forms one continued cataract for five or six miles, overflowing with the innumerable tributary torrents which precipitate themselves from the highest summits of the surrounding rocks; while, to crown the whole, the shaggy head of Cader Idris towers, the majestic centinel of the group.

Penman Mawr.

The county of Caernarvon, in which this mountain is situated, claims precedence over every other in Wales, for the loftiness of its mountains, and the multitude of the eminences which, in a curved and indented chain, occupy nearly the whole of its extent.

In proceeding from Conway to Bangor, by a route at once picturesque and romantic, and amid a scenery which varies at every step, Penman-mawr discloses to the traveller its bulky head. It protrudes itself into the sea, and exhibits a fine contrast to the fertility which it interrupts, by a rude view of grey weather-beaten stones and precipices. The passage over this mountain was formerly terrific; but the road has been latterly widened, and secured, near the verge of the precipice, by a strong wall about five feet in height. It forms the most sublime terrace in the British Isles, winding round the mountain on the edge of the abrupt cliff; while the vast impending rocks above, roaring of the waves at a great distance below, and the frequent howling of the wind, all unite to fill the mind with solemnity and awe.
SKIDDAW.

This English mountain, which has an elevation of 3530 feet, nearly three fourths of a mile, above the level of the sea, is situated in Cumberland. It is more remarkable on account of the scenery over which it presides, and which exceeds in beauty whatever the imagination can paint, than for those bold projections and that rugged majesty which might be expected, but which will be here sought in vain. Except at such a distance as smooths the embossed work of all these rich fabrics, and where its double summit makes it a distinguished object to mark and characterize a scene, it may be considered as a tame and inanimate object.

WHARNSIDE.

In the map of Yorkshire, by Jeffries, the height of this mountain is greatly exaggerated, its elevation above the sea not being more than 2500 feet, nearly half a mile. As it is situated in the midst of a vast amphitheatre of hills, the prospect it affords is diversified with pleasing objects. On its summit are four or five small lakes, two of which are about nine hundred feet in length, and nearly the same in breadth. A thin seam of coal also occurs near the top, and another is said to correspond with it on the summit of the lofty Colm-hill, on the opposite side of Dent-dale. Numerous caves and other natural curiosities abound here, as well as on Pennigent, about six miles to the eastward of Ingleborough. These latter mountains do not possess any particular interest.

STROMBOLI.

This is the principal of the cluster of small Islands, lying to the north of Sicily, named the Lipari Isles, the whole of which contain volcanoes. At a distance its form appears to be that of an exact cone, but on a closer examination it is found to be a mountain having two summits of different heights, the sides of which have been torn and
shattered by craters. The most elevated summit, inclining to the S. W., is, agreeably to Spallanzani, about a mile in height.

In this volcanic mountain the effects of a constantly active fire are everywhere visible, heaping up, destroying, changing, and overturning every instant what itself has produced, and incessantly varying in its operations. At the distance of one hundred miles the flames it emits are visible, whence it has been aptly denominated the light-house of that part of the Mediterranean sea.

From the more elevated summit, all the inner part of the burning crater, and the mode of its eruption, may be seen. It is placed about half way up, on the N. W. side of the mountain, and has a diameter not exceeding 250 feet. Burning stones are thrown up at regular intervals of seven or eight minutes, ascending in somewhat diverging rays. While a portion of them roll down towards the sea, the greater part fall back into the crater; and these being again cast out by a subsequent eruption, are thus tossed about until they are broken and reduced to ashes. The volcano, however, constantly supplies others, and seems inexhaustible in this species of productions. Spallanzani affirms that, in the more violent eruptions, the ejected matter rises to the height of half a mile, or even higher, many of the ignited stones being thrown above the highest summit of the mountain.

The erupted stones, which appear black in the day-time, have at night a deep red colour, and sparkle like fire-works. Each explosion is accompanied by flames or smoke, the latter resembling clouds, in the lower part black, in the upper white and shining, and separating into globular and irregular forms. In particularly high winds from the S. or S. E., the smoke spreads over every part of the island. Spallanzani observed this volcano on a particular night, when the latter of these winds blew with great violence. The clear sky exhibited the appearance of a beautiful aurora borealis over that part of the mountain on which the volcano is situated, and which from time to time became more red and brilliant, in proportion as the ignited stones were thrown to a greater height. The violence of the convulsions depends on that of the wind.

The present crater has burned for more than a century.
without any apparent change having taken place in its situation. The side from which the showers of ignited matter fall into the sea, is almost perpendicular, about half a mile broad at the bottom, and a mile in length, terminating above in a point. In rolling down, the lava raises the fine sand like a cloud of dust. While this was observed by Spallanzani, the volcano suddenly made an eruption. Numerous pieces of lava, of a dark red colour, and enveloped in smoke, were ejected from the top of the precipice, and thrown high into the air. A part of them fell on the declivity, and rolled down, the smaller preceded by the greater; and, after a few bounds, dashed into the sea, giving out a sharp hissing sound. The more minute fragments, from their lightness, and the hinderance of the sand, rolled slowly down, and, striking against each other, produced nearly the same sound as hail-stones falling on a roof. In a few minutes another explosion followed, without any sensible noise; and two minutes after, a third eruption took place, with a much louder explosion than the first, and a far more copious ejection of lava. The eruptions, which were almost innumerable during the time Spallanzani remained there, all exhibited the same appearances.

On the night following the one above described, the volcano raged with still greater violence, and rapidly hurled to a great height thousands of red-hot stones, forming diverging rays in the air. Those which rolled down the precipice produced a hail of streaming fire, which illuminated the steep descent. Independently of these ignited stones, there was, in the air which hovered over the volcano, a vivid light, which was not extinguished when that was at rest. It was not properly flame, but real light reverberated by the atmosphere, impregnated by extraneous particles, and more especially by the ascending smoke. Besides varying in intensity, it appeared constantly in motion, ascending, descending, dilating, and contracting, but always remaining perpendicular over the mouth of the volcano, which showed that it was occasioned by the conflagration within the crater. The detonations in the greater eruptions resembled the roaring of distant thunder; but, in the more moderate ones, the explosions of a mine. In the smallest they were scarcely audible. Each was some seconds later than the ejection.
Near the mouth of the volcano is a small cavern, a projection above which secures it from the entrance of the ignited stones. From this cavern Spallanzani was enabled to look down into the very bowels of the volcano. He describes the edges of the crater as of a circular form, and not more than 340 feet in circumference, the internal sides contracting as they descend, and assuming the shape of a truncated inverted cone. The crater itself, to a certain height, is filled with a liquid red-hot matter, resembling melted brass. This is the fluid lava, which appears to be agitated by two distinct motions, the one intestine, whirling and tumultuous, and the other that by which it is impelled upward. This liquid matter is raised, sometimes with more, and sometimes with less rapidity, within the crater, and when it has reached within twenty-five or thirty feet of the upper edge, a sound is heard not unlike a short clap of thunder, while at the same moment a portion of the lava, separated into a thousand pieces, is thrown up with indescribable swiftness, accompanied by a copious eruption of smoke, ashes, and sand. A few moments before the report, the superficials of the lava is inflated and covered with large bubbles, some of which are several feet in diameter; on the bursting of these the detonation and fiery shower take place. After the explosion, the lava within the crater sinks, but soon rises again as before, and new bubbles appear, which again burst and produce new explosions. When the lava sinks, it gives little or no sound; but when it rises, and particularly when it begins to be inflated with bubbles, it is accompanied by a noise similar, in proportion to the difference of magnitude, to that of liquor boiling vehemently in a cauldron.

LIPARI.

This island, which has given name to the whole cluster, is deserving of notice on account of its celebrated stoves. They are the only vestiges of subterraneous conflagration now remaining, and lie to the west of the city, on the summit of a mountain of considerable elevation, called Monte della Stufa; the Mountain of Stoves. They consist of five excavations, in the form of grottoes; but two of them have been abandoned on account of the great
heat, an exposure to which might cause suffocation. Even the stones are so hot that they cannot be touched; but still the heat varies, and experiences all the vicissitudes of volcanoes. The ground is not penetrated with hot vapours issuing from several apertures, as has been asserted: Spalanzani, however, found one from which a thin stream of smoke issued from time to time, with a strong sulphureous smell indicating the remains of the conflagration existing beneath.

It is impossible to fix the exact epoch at which the fires of Lipari were extinguished, or rather the period at which the eruptions ceased, for the existence of the former may be deduced from the hot springs and stoves. Dolomieu thinks that the last eruptions are as old as the sixth century of the Christian era, and conjectures that they may have ceased since the fires found a new vent in Vulcano, since he does not entertain any doubt but that the two islands have a subterraneous communication. Of this the inhabitants of Lipari are so well convinced, that they are in the greatest agitation when Vulcano does not smoke, and when its passages are obstructed. They fear shocks and violent eruptions, suspecting even that the fires may again break out in their own island. It is certainly a fact that the earthquakes, which are very frequent, generally cease when the eruptions of Vulcano commence.

**Vulcano.**

This, which is the last of the Lipari isles, bears in every part the stamp of fire. It was the superstitious belief of the ancient inhabitants that Vulcan had here established his forges, there being constant fires during the night, and a thick smoke throughout the day. It consists of a mountain in the form of a truncated cone, which is, however, merely a case opening and exposing to view a second cone within, more exact than the other, and in which the mouth of the volcano is placed. The latter is thus enveloped on three sides by the ancient cone, and is only open on that side which is immediately washed by the sea.

The base of the interior cone is separated from the steep sides of the ancient crater by a circular valley, which terminates on one side at the junction of the two mountains,
VULCANO.

and on the other sinks into the sea. In this valley light pumice-stones are blended with fragments of black vitreous lava, and buried in ashes perfectly white. The blow of a hammer on these stones produces a loud hollow sound, which re-echoes in the neighbouring caverns, and proves that the surface is nothing more than the arch of a vault covering an immense abyss. The sound varies according to the thickness of the crust, which must have considerable solidity to support the weight of the new mountain. This, according to Dolomieu, is higher and steeper than the cone which contains the crater of Etna, and its access still more difficult; its perpendicular height, however, is not more than 2640 feet, half a mile. He represents the crater of Vulcano as the most magnificent he ever saw; and Spallanzani observes that, with the exception of that of Etna, he does not know of any more capacious and majestic. It exceeds a mile in circuit, has an oval mouth, and its greatest diameter is from the S.E. to the W., while its depth is not more than a quarter of a mile. The bottom is flat, and from many places streams of smoke exhale, emitting a strong sulphureous vapour. This vast cavity is very regular, and as its entire contents are displayed to the eye, presents one of the grandest and most imposing spectacles in nature. On large stones being rolled down, the mountain re-echoes; and on their reaching the bottom, they appear to sink in a fluid. Indeed, with the aid of a glass, two small lakes, supposed to be filled with melted sulphur, have been discovered. The declivity of the interior walls is so great, that, even when there is not any danger from fire, the descent is next to impossible. After considerable difficulty, however, this was accomplished by Spallanzani on the S.E. side, the only one accessible. He found the bottom to be somewhat more than one third of a mile in circumference, and of an oval form. The subterraneous noise was here much louder than on the summit, sounding like an impetuous river foaming beneath, or, rather, like a conflict of agitated waves meeting and clashing furiously together. The ground was likewise in some places perforated with apertures, from which hissing sounds issued, resembling those produced by the bellows of a furnace. It shrieked when pressed by the feet; and a large piece of lava, let fall five or six feet, produced a subterraneous echoing sound, which continued some time, and was loudest in the
centre. These circumstances, combined with its burning heat, and the strong stench of sulphur it emits, prove that the fires of the volcano are still active.

Its eruptions have been most considerable during the earthquakes which have desolated Sicily and a great part of Italy. In the month of March, 1786, after subterraneous thunders and roarings, which were heard over all the Islands, to the great terror of the inhabitants, and were accompanied by frequent concussions, the crater threw out a prodigious quantity of sand, mixed with immense volumes of smoke and fire. This eruption continued fifteen days, and so great was the quantity of sand ejected, that the circumjacent places were entirely covered with it to a considerable height. The lava did not flow at the time, at least over the edges of the crater; and, indeed, such a current has not happened during the memory of any living person.

THE HIMALAYA MOUNTAINS,
BETWEEN INDIA AND THIBET.

The great Himalayan snowy range, says Mr. Fraser, is only the highly elevated crest of the mountainous tract that divides the plains of Hindostan from those of Thibet, or Lesser Tartary. Far as they predominate over, and precipitously as they rear themselves above the rest, all the hills that appear in distant ranges, when viewed from the plains, are indeed only the roots and branches of this great stem; and, however difficult to trace, the connexion can always be detected between each inferior mountain and some particular member of its great origin.

The horizontal depth of this mountainous tract, on that side which overlooks Hindostan, is no doubt various; but, from the difficulty of the country, a traveller performs a journey of many days before he reaches the foot of the immediate snowy cliffs. The best observations and survey do not authorise the allowance of more than an average depth of about sixty miles from the plains to the commencement of these, in that part of the country that form the subject of this narrative. The breadth of the snowy zone itself in all probability varies still more;
huge masses advance in some places into the lower districts, and in others the crest recedes in long ravines, that are the beds of torrents, while behind they are closed by a succession of the loftier cliffs. Every account we receive of a passage through them, (and this is no doubt found most commonly where the belt is narrowest,) gives a detail of many days' journey through deserts of snow and rocks; and it is to be inferred, that on the north-east side they advance to, and retreat from the low ground in an equally irregular manner. Indeed, some accounts would induce the belief, that long ranges, crowned with snow-clad peaks, project in various places from the great spine, and include habitable and milder districts; for, in all the routes of which we have accounts, that proceed in various directions towards the Trans-Himalayan countries, hills covered with snow are occasionally mentioned as occurring, even after the great deserts are passed, and the grazing country entered. The breadth, then, of this crest of snow-clad rock itself cannot fairly be estimated at less than from seventy to eighty miles.

The great snowy belt, although its loftiest crest is broken into numberless cliffs and ravines, nevertheless presents a barrier perfectly impracticable, except in those places where hollows that become the beds of rivers have in some degree intersected it, and facilitated approach to its more remote recesses; and courageous and attentive perseverance has here and there, discovered a dangerous and difficult path, by which a possibility exists of penetrating across the range. Few rivers hold their course wholly through it: indeed, in the upper part in the Sutlej alone has been traced beyond this rocky barrier; and there is a path along its stream, from different parts of which roads diverge, that lead in various directions through the mountains. No reasonable doubt can now exist of the very long and extraordinary course which this river takes.

Captain Webb of the Bengal establishment, was lately employed on a survey of the province of Kurnoon. On the 21st day of June, his camp was 11,680 feet above Calcutta. The surface was covered with very rich vegetation as high as the knee: very extensive beds of strawberries in full flower; and plenty of currant-bushes in blossom all around, in a clear spot of rich black mould
soil, surrounded by a noble forest of pine, oak, and rhododendron. On the 22d of June he reached the top of Pilgoomia-Churkreas, (or ascent,) 12,642 feet above Calcutta. He was prevented from distinguishing very distant objects by a dense fog around him; but there was not the smallest patch of snow near him, and the surface a flat black mould through which the rock peeped, was covered with strawberry plants (not yet in flower), butter-cups, dandelion, and a profusion of other flowers. The shoulders of the hill above him, about 450 feet more elevated, were covered with the same to the top; and about 500 feet below was a forest of pine, rhododendron, and birch. There was some snow seen below in deep hollows, but it dissolves in the course of the season.

These facts led Captain Webb to infer, that the inferior limit of perpetual congelation on the Himala mountains is beyond 13,500 feet, at least, above the level of Calcutta: and that the level of the table land of Tartary, immediately bordering on the Himala, is very far elevated beyond 8000 feet, the height at which it has been estimated. journey, I may not be able either to make all the deductions which they will afford, or to shun any errors that they may involve, they will still, I think, yield some ground of inference to estimate the height to which I ascended; and consequently, give some approximation to the heights of the surrounding peaks.

On the night of the 16th July we slept at Bheemkendar, near the source of the Coonoos and Bheem streams. There is no wood near this place, even in the very bottom of the valley, and we had left even the stunted birch at a considerable distance below; but there was a profusion of flowers, ferns, thistles, &c., and luxuriant pasture. Captain Webb’s limit of wood is at least as high as 12,000 to 12,300 feet. I would, therefore, presume the site of Bheemkendar to be considerably above that level; say 13,000 to 13,300 feet above the level of Calcutta. From thence we ascended at first rather gradually, and then very rapidly, till we left all luxuriant vegetation, and entered the region of striped and scattered and partially melting snow, (for nearly two miles of the perambulator.) From calculating the distance passed, and adverting to the elevation we had attained, I would presume
that this was at least 1500 feet above Bheemkcudar, or from 14,500 to 15,000 feet above Calcutta.

We proceeded onwards, ascending very rapidly, while vegetation decreased gradually to a mere green moss, with here and there a few snow-flowers starting through it; snow fast increasing, till at length we entered on what I presume was the perennial and unmelting snow, entirely beyond the line of vegetation, where the rock was bare even of lichens: and in this we ascended, as I think, about 800 feet; for, though Bamsooroo Ghat may not be so far above this line, we continued ascending, even after crossing that point, and I would incline to estimate this utmost extent of ascent at 2000 feet more, or nearly 17,000 feet above the level of Calcutta.

Whilst proposing to consider the point of 16,000 to 16,500 feet as that of inferior congelation, I must observe, that there was no feeling of frost in the air, and the snow was moist, though hard, chiefly through the influence of a thick mist, which, in fact, amounted to a very small drizzling rain, which fell around: all which would seem to indicate, that the true line of congelation had not there been attained; but we were surrounded by snow which evidently never melted. To a great depth below it extended all over the hills, very little broken, while on the valleys from whence the Coonoor and Bheera streams issue, at full 2000 feet below, it lay covering them and the surrounding mountains, in an unbroken mass, many hundred feet thick. Thus, though it may seem contradictory, the line of perpetual congelation, in fact, seems fixable at even below the point I have ventured to indicate; and, I presume, might on these grounds, be placed somewhere between 15 and 16,000 feet above the level of Calcutta.

The result of all the considerations that arise out of the foregoing remarks is a belief, that the loftiest peaks of the Himalaya range will be found to fall considerably short of the height attributed to them by Mr. Colebrooke; and that their loftiest peaks do not more than range from 18,000 to 22 or 23,000 feet above the level of the sea.

Having reached the top of an ascent, we looked, says Mr. Fraser, down upon a very deep and dark glen, called Palia Gadh, which is the outlet to the waters of one of the most terrific and gloomy valleys I have ever seen.
But it would not be easy to convey by any description a just idea of the peculiarly rugged and gloomy wildness of this glen: it looks like the ruins of nature, and appears, as it is said to be, completely impracticable and impenetrable. Little is to be seen except dark rock: wood only fringes the lower parts and the waters' edge: perhaps the spots and streaks of snow, contrasting with the general blackness of the scene, heighten the appearance of desolation. No living thing is seen; no motion but that of the waters; no sound but their roar. Such a spot is suited to engender superstition, and here it is accordingly found in full growth. Many wild traditions are preserved, and many extravagant stories related of it.

The glen above described is by far the most gloomy savage scene we have yet met with. I regret that the weather did not permit a sketch of it to be attempted. Beyond this we could see nothing in the course of the river but rocky banks. The opposite side is particularly precipitous; yet along its face a road is carried, which is frequented as much as this, and leads to the villages still further up. By the time we had reached the village, the clouds which had lowered around and sunk down on the hills, began to burst with loud thunder and heavy rain. The noise was fearfully reverberated among the hills; and during the night more than once the sound was heard of fragments from the brows of the mountains, crashing down to the depths below with a terrific din. Our quarters were good. I slept in a temple, neat, clean, and secure from the weather.


Gungotree, the source of the Jumna, the most sacred branch of the Ganges, ought to hold and does bear the first rank among its holy places. Here, says Mr. Fraser, all is mythological if not holy ground. Here Mahadeo sits enthroned in clouds and mist amid rocks that defy the approach of living thing, and snows that make desolation more awful. Gods, goddesses, and saints here continually adore him at mysterious distance, and you traverse their familiar haunts. But, although Gungotree be the most sacred, it is not the most frequented shrine,
access to it being far more difficult than to Buddrinath; and consequently to this latter, pilgrims flock in crowds, appalled at the remoteness and danger of the former place of worship. This may pretty fully account for the superior riches and splendour of Buddrinath. Here are temples of considerable extent, priests and officials in abundance, who preserve an imposing exterior, and an appearance venerable from power and comparative magnificence, and consequently procure rich and ample offerings to keep up their comfortable dignity.

The temple of Bhadri-Nath, is situated on the west bank of the Alacknunda, in a valley four miles long, and one mile in its greatest breadth. The east bank rises considerably higher than the west bank, and is on a level with the top of the temple. The position of the sanctuary is considered equi-distant from two lofty mountains, which are designated by the names of the Nar and the Narayena Purvatas. The former is to the east, the latter to the west, and completely covered with snow from the summit to the base.

The temple of Bhadri-nath has more beneficed lands attached to it than any sacred Hindu establishment in this part of India. It is said to possess 700 villages in different parts of Gurwhal and Kumaoon: many of these have been conferred by the government; others have been given in pledge for loans; and some few, purchased by individuals, have been presented as religious offerings.

The annual ceremony of carrying the images of their gods to wash in the sacred stream of the Jumna is (it appears) one of much solemnity among the inhabitants of the neighbourhood; and the concourse of people here assembled has been busily engaged, and continues to be fully occupied in doing honour to it. They dance to the sound of strange music, and intoxicate themselves with a sort of vile spirit, brewed here from grain and particular roots, sometimes, it is said, sharpened by pepper. The dance is most grotesque and savage: a multitude of men taking hands, sometimes in a circle, sometimes in line, beating time with their feet, bend with one accord first nearly to the earth with their faces, then backwards and then sidewise, with various wild contortions. These and their uncouth dress of black and gray blankets, give
peculiar air of brutal ferocity to the assemblage. The men dance all day, and in the evening they are joined by the women, who mix indiscriminately with them, and keep up dancing and intoxication till the night is far advanced. They continue this frantic kind of worship for several days; and, in truth, it is much in unison with their general manners and habits—savage and inconsistent. At a place so sacred, the residence of so many holy Brahmins, and the resort of so many pious pilgrims, we might expect to find a strict attention to the forms of religion, and a scrupulous observance of the privations and austerities enjoined by it. So far, however, is this from the truth, that much is met with, shocking even to those Hindoos who are least bigotted.

There were several points to be arranged before we could set off for Gungotree, the source of the Jumna. I did not deem it proper to go unarmed; but agreed that only five men should be accoutred to attend us, and that I should myself carry my gun. But all these weapons of war were to be put aside before we got within sight of the holy spot, and deposited in a cave near it, under a guard. I also pledged myself that no use should be made of these instruments, nor any life sacrificed for the purpose of food, either by myself, or by any of my people, after leaving the village, until we returned: moreover, that I would not even carry meat of any sort, dead or alive, along with me, but eat only rice and bread. As to the putting off my shoes, they did not even propose it to me, and it could not have been done; but I volunteered to put them off, when entering into the precincts of the temple and holier places, which pleased them greatly. All the Hindoos, including the Ghoorkhas, went from the village barefoot.

Just at the end of the bridge there is an overhanging rock, under which worship is performed to Bhurum, and a black stone partly painted red, is the image of the god; and here prayers and worship alone were not performed, but every one was obliged to bathe and eat bread baked by the Brahmins, as preparatory to the great and effeminate ablutions at the holier Gungotree. This occupied a considerable time, as the party was numerous: in the meantime I took a very imperfect sketch of the scene, after
which I bathed myself at the proper place (which is the junction of the two streams), while the Brahmin prayed over me. Among the ceremonies performed, he made me hold a tuft of grass while he prayed, which at the conclusion he directed me to throw into the eddy occasioned by the meeting of the two waters.

By an unpleasant path we reached a step, or level spot on the first stage of the mountain, where, in a thick grove of fir trees, is placed a small temple to Bhayram a plain white building, built by order of Umur Sing Thappa, who gave a sum of money to repair the road, and erect places of worship here, and at Gungotree. Having paid our respects to Byramjee, we proceeded along the side of the hill on the right bank (north) of the river, gradually ascending by a path equally difficult and dangerous as the first part of our ascent, but more fearful, as the precipice to the river, which rolls below us, increases in height, and exceedingly toilsome from the nature of the ground over which it passes, and which consists wholly of sharp fragments from the cliffs above, with fallen trunks and broken branches of trees.

The path increases in difficulty from the very irregular nature of the ground, as well as the steepness of the hill face across which it leads, ascending and descending as the small, though deep, watercourses furrow the mountain side, in loose soil, formed of the small fragments fallen from above, and which slip down, threatening to carry the traveller to the gulph below. The shapeless blocks of rock now more completely obstructed the way, and for hundreds of yards, at times, the passenger must clamber over these masses, heaped as they are one upon another, in monstrous confusion, and so uncertain and unsteady that, huge though they are, they shake and move even under the burthen of a man's weight. So painful indeed is this track, that it might be conceived as meant to serve as a penance to the unfortunate pilgrims with bare feet, thus to prepare and render them worthy for the special and conclusive act of piety they have in view, as the object of their journey to these extreme wilds.

The spot which bears the name of Gungotree is concealed by the roughness of the ground, and the masses of fallen rock, so as not to be seen till the traveller comes close upon it.
The temple is situated precisely on the sacred stone on which Bhagirutte used to worship Mahadeo, and is a small building of a square shape for about twelve feet high, and rounding in, in the usual form of pagodas, to the top. It is quite plain, painted white, with red mouldings, and surmounted with the usual melon-shaped ornaments of these buildings. From the eastern face of the square, which is turned nearly to the sacred source, there is a small projection covered with a stone roof, in which is the entrance facing the cast, and just opposite this there is a small pagoda-shaped temple to Bhyramjee. The whole is surrounded by a wall built of unhewn stone and lime, and the space this contains is paved with flat stones. In this space too there is a comfortable but small house for the residence of the Brahmins who come to officiate. Without the inclosure there are two or three sheds constructed of wood, called diurum sallahs, built for the accommodation of pilgrims who resort here: and there are many caves around formed by overhanging stones, which yield a shelter to those who cannot find accommodation in the sheds.

The scene in which this holy place is situated is worthy of the mysterious sanctity attributed to it, and the reverence with which it is regarded. We have not here the confined gloominess of Bhyram Gatee: the actual dread which cannot but be inspired by the precipices and torrents, and perils of the place, here gives way to a sensation of awe, imposing, but not embarrassing, that might be compared to the dark and dangerous pass to the centre of the ruins of a former world; for, most truly, there is little here that recalls the recollection of that which we seem to have quitted. The bare and peaked cliffs which shoot to the skies, yield not in ruggedness or elevation to any we have seen; their ruins lie in wild chaotic masses at their feet, and scantier wood imperfectly relieves their nakedness; even the dark pine more rarely roots itself in the deep chasms which time has worn. Thus on all sides is the prospect closed, except in front to the eastward; where, from behind a mass of bare spires, four huge, lofty, snowy peaks arise; these are the peaks of Roodroo-Himala. There could be no finer finishing, no grander close to such a scene, as is visible in the engraving.
We approach it through a labyrinth of enormous shapeless masses of granite, which during ages have fallen from the cliffs above that frowned over the very temple, and in all probability will some day themselves descend in ruins and crush it. Around the inclosure, and among these masses, for some distance up the mountain, a few fine old pine trees throw a dark shade, and form a magnificent fore-ground; while the river runs impetuously in its shingly bed, and the stifled but fearful sound of the stones which it rolls along with it, crushing together, mixes with the roar of its waters.

It is easy to write of rocks and wilds, of torrents and precipices; it is easy to tell of the awe such scenes inspire: this style and these descriptions are common and hackneyed. But it is not so simple, to many surely not very possible, to convey an adequate idea of the stern and rugged majesty of some scenes; to paint their lonely desertness, or describe the undefinable sensation of reverence and dread that steals over the mind while contemplating the deathlike ghastly calm that is shed over them; and when at such a moment we remember our homes, our friends, our firesides, and all social intercourse with our fellows, and feel our present solitude, and far distance from all these dear ties, how vain is it to strive at description! Surely such a scene is Gunngotree. Nor is it, independent of the nature of the surrounding scenery, a spot which lightly calls forth powerful feelings. We were now in the centre of the stupendous Himalaya, the loftiest and perhaps most rugged range of mountains in the world. We were at the acknowledged source of that noble river, equally an object of veneration and a source of fertility, plenty, and opulence to Hindostan; and we had now reached the holiest shrine of Hindoo worship which these holy hills contain. These are surely striking considerations, combining with the solemn grandeur of the place, to move the feelings strongly.

The fortuitous circumstance of being the first European that ever penetrated to this spot was no matter of boast, for no great danger had been braved, no extraordinary fatigues undergone: the road is now open to any other who chooses to attempt it, but it was a matter of satisfaction to myself. The first object of inquiry that naturally
Source of the Jumna, near Gungotree.
occurs to the traveller, after casting a glance over the general landscape, is the source of the river. Here, as at Jumnotree, you are told that no mortal has gone, or can go further towards its extreme origin than this spot; and the difficulty is indeed very apparent. I made a trial to gain a point about two furlongs beyond the temple, both for the purpose of observing the course of the river, and of seeing Gungotree in another point of view. But having with considerable difficulty made my way over the unsteady fragments for some hundred yards, at the risk of being precipitated into the stream, I was forced to turn back.

The source is not more than five miles horizontal distance from the temple, and in a direction south-east, 85° nearly; and beyond this place it is in all probability chiefly supplied by the melting of the great bosom of snow which terminates the valley, and which lies between the peaks of the great mountain above mentioned.

This mountain, which is considered to be the loftiest and greatest of the snowy range in this quarter, and probably yields to none in the whole Himalaya, obtains the name of Roodroo Himala, and is held to be the throne or residence of Mahadeo himself. It is also indiscriminately called Pauch Purbut, from its five peaks; and Soomeroo Purbot, which is not to be confounded with the mountain so called near Bunderbouch; and sometimes the general appellation of Kylas is given, which literally signifies any snowy hill, but is applied to this mountain by way of pre-eminence. It has five principal peaks, called Roodroo Himala, Burrumpoorce, Bissenpooree, Oodgurre Kanta, and Soorga Rounee. These form a sort of semi-circular hollow of very considerable extent, filled with eternal snow, from the gradual dissolution of the lower parts of which the principal part of the stream is generated: probably there may be smaller hollows beyond the point to the right above Gungotree, which also supply a portion.

Within the temple there are three images: one, that of Kali; and the elevated stone shelf on which they were placed was wet and soiled with the offerings made: there was a peculiar smell, but I know not whence it proceeded. The place, as usual, was lighted by a small lamp: no
daylight had admittance. Just below the temple, on the river side, grew three poplar-trees, and a few small larches: above there are the remains of a fine old silver fir tree, which overshadows some of the caves and sheds. The whole people also bathed, and contributed something to the priesthood; and it was a matter of serious importance, as well as of great joy to every one, that we had thus happily reached a place of such supereminent sanctity: such, indeed, that the act of bathing here is supposed to cleanse from every sin heretofore committed, and the difficulty of which is so great, that few, except professional devotees, ever attempt reaching the holy place.

It is customary that those who have lost their father and mother, or either of these, shall be shaved at this spot; and it was curious to observe the whimsical changes produced by the operation, which numbers underwent. It appears also, that one chief ordinance was the going frequently round the holy temple; and we particularly observed that those who were noted as the greatest requests were most forward in this pious exercise: one man, in particular, who had been a notorious thief, was unwearied in his perseverance.

Well, indeed, do they say, that Seeva has formed these recesses which he inhabits, inaccessible to all but those whom true devotion leads to his shrine. That man must have been indeed strongly impelled by devotion, ambition, or curiosity, who first explored the way to Gungotree. It were unavailing to enquire, and perhaps of little use, if known, to which of these motives we owe the enterprise: but patience, perseverance, and courage, must have been strongly united with it to lead him safely and successfully through those awful cliffs, that would bar the way to most men. Another omen of favour pointed out was, the increase of the river after bathing, as at Jumnotree; and it is singular enough, that during the time we remained here, I remarked several increases and decreases of the water, without any obvious causes; but these may fairly be referred to the effects of sudden changes of temperature occurring frequently among the hills, and acting on the body of snow that feeds the river.
ASIATIC MOUNTAINS.

Among the Asiatic burning mountains, a brief account of which we introduce after the above interesting notice of the grand Himalaya chain, those of Japan are both remarkable and numerous. On the summit of a mountain in the province of Figo, is a large cavern, formerly the mouth of a volcano, but the flame of which has ceased, probably for want of combustible matter. In the same province, near a religious structure called the Temple of the Jealous God of Aso, a perpetual flame issues from the top of a mountain. In the province of Tsickusen is another burning mountain, where was formerly a coal-pit, which having been set on fire by the carelessness of the workmen, has been burning ever since. Sometimes a black smoke, accompanied by a very disagreeable stench, is observed to issue from the summit of a famous mountain called Fesi, in the province of Seruga. This mountain is said to be nearly as high as the Peak of Teneriffe, but in shape and beauty is supposed not to have an equal. Its top is covered with perpetual snow. Belonging to the Japanese cluster, and not far from Firanda, is a small rocky Island, which has been burning and trembling for many centuries; and in another small Island, opposite to Santzuma, is a volcano which has been burning at different intervals for many ages.

Captain Gore, when leaving Japan, passed by great quantities of pumice-stone, several pieces of which were taken up, and found to weigh from one ounce to three pounds. It was conjectured that these stones had been thrown into the sea by eruptions at various times, as many of them were covered by barnacles (small shells), and others were quite bare.

VOLCANIC MOUNTAINS OF KAMTSCHATKA.

There are three burning mountains in Kamtschatka, which for many years have thrown out a considerable smoke, but do not often burst into flame. One of these is situated in the vicinity of Awatska; and another, named the volcano of Tolbatchiek, on a neck of land between the river Kamtschatka, and the Tolbatchiek. In the beginning of the year 1739 the flames issued with such vio-
88 VOLCANIC MOUNTAINS OF KAMTSCHATKA.

dence from its crater, as to reduce to ashes the forests on the
neighbouring mountains. This was succeeded by a cloud of
smoke, which overspread and darkened the whole coun-
try, until it was dissipated by a shower of cinders, which
covered the ground to the distance of thirty miles. The
third volcano is on the top of the particular mountain of
Kamtschatka, which is described as by far the highest in
the peninsula. It rises, from two rows of hills, somewhat
in the form of a sugar-loaf, to a very great height.
usually throws out ashes twice or thrice a year, some
times in such quantities, that for three hundred vers, over
hundred and sixty-five English miles, the earth is covered
with them. In the year 1737, at the latter end of Septem-
ber, a conflagration, which lasted for a week, was so vir-
lent and terrific, that the mountain appeared, to those who
were fishing at sea, like one red-hot rock; and the flames
which burst through several openings, with a dreadful
noise, resembled rivers of fire. From the inside of the
mountain were heard thunderings, crackings, and blasts
like those of the strongest bellows, shaking all the neigh-
bouring territory. During the night it was most terrible,
but at length the conflagration ended by the mountain
casting forth a prodigious quantity of cinders and ashes,
among which were porous stones, and glass of various
colours. When Captain Clarke sailed out of the harbo-
ors of St. Peter and St. Paul, in June, 1776, to the northward,
an eruption of the first of these volcanoes was observed.
A rumbling noise, resembling distant hollow thunder, was
heard before day-light; and when the day broke,
decks and sides of the ships were covered with a fine dust
resembling emery, nearly an inch thick, the air at
the same time being charged with this substance to such
degree, that towards the mountain, which is situated to
north of the harbour, the surrounding objects were not
distinguished. About twelve o'clock, and during the
afternoon, the explosions became louder, and were
followed by showers of cinders, which were in general about
the size of peas, though many were picked up on the
deck larger than a hazel-nut. Along with the cinders
several small stones which had not undergone any change
from the action of fire.
Volcanic Mountain of Albay.

The following details of the dreadful eruption of the Volcano of Albay, in the island of Luzon, one of the Philippines, on the 1st February, 1814, are from an eye witness of the dreadful scenes it presented.

During thirteen years the volcano of Albay had preserved a profound silence. It was no longer viewed with that distrust and horror with which volcanoes usually inspire those who inhabit the vicinity. Its extensive and spacious brow had been converted into highly-cultivated and beautiful gardens. On the first day of January last, no person reflected, in the slightest degree, upon the damages and losses which so bad a neighbour had once occasioned. Previously to the former eruptions there had been heard certain subterraneous sounds, which were presages of them. But upon the present occasion we remarked nothing, except that on the last day of January we perceived some slight shocks. In the night the shocks increased. At two in the morning one was felt more violent than those hitherto experienced. It was repeated at four, and from that time they were almost continual until the eruption commenced.

The day broke, and I scarcely ever remarked in Camarines a more serene and pleasant morning. I observed, however, that the ridges nearest to the volcano were covered with mist, which I supposed to be the smoke of some house that might have been on fire in the night. But at eight o'clock the volcano began suddenly to emit a thick column of stones, sand, and ashes, which, with the greatest velocity, was elevated into the highest regions of the atmosphere. At this sight we were filled with the utmost dread, especially when we observed that in an instant the brow of the volcano was quite covered. We had never seen a similar eruption, but were convinced that a river of fire was flowing towards us, and was about to consume us. The first thing which was done in my village was to secure the holy sacrament from profanation! we then betook ourselves to flight. The swiftness with which the dreadful tide rolled towards us, did not give us time either for reflection or consultation. The frightful noise
of the volcano caused great terror even in the stoutest hearts. We all ran, filled with dismay and consternation, endeavouring to reach the highest and most distant place to preserve ourselves from so imminent a danger. The horizon began to darken, and our anxieties redoubled. The noise of the volcano continually increased, the darkness augmented, and we continued our flight. But, notwithstanding our swiftness, we were overtaken by a heavy shower of huge stones, by the violence of which many unfortunate persons were in a moment killed. This cruel circumstance obliged us to make a pause in our career, and to shelter ourselves under the houses; but the flames and burnt stones which fell from above, in a short time reduced them to ashes.

The sky was now completely overcast, and we remained enveloped and immersed in a thick and palpable darkness. From that moment reflection was at an end. The mothers abandoned her children, the husband his wife, and the children forgot their parents.

In the houses we had no longer any shelter. It was necessary to abandon, or perish with, them; yet, to go out to be covered, was to expose one's self to a danger not less imminent, because many of the stones were of an enormous size, and they fell as thick as drops of rain. It was necessary to defend ourselves as well as we could. Some covered themselves with hides, others with tables and chairs, and others with boards and tea-trays. Many took refuge in the trunks of trees, others among the canes and hedges, and some protected themselves in a cave, when the brow of a mountain protected them.

About ten o'clock the heavy stones ceased to fall, and the rain of thick sand succeeded. At half past one the noise of the volcano began to diminish, and the horizon to clear a little; and at two it became quite tranquil; and we began to perceive the dreadful ravages which the darkness had hitherto concealed from us. The ground was covered with dead bodies, part of whom had been killed by stones, and the others consumed by the fire. Two hundred perished in the church of Budiao, and thirty-five in a single house in that village. The joy the living felt at having served themselves, was in many converted into the extremity of sorrow at finding themselves deprived of their relations and friends. Fathers found their children
husbands their wives, and wives their husbands, in the village of Budiao, where there were very few who had not lost some of their nearest connexions. In other places we found many persons extended upon the ground, wounded or bruised in a thousand ways. Some with their legs broken, some without arms, some with their sculls fractured, and others covered with wounds. Many died immediately, others on the following days, and the rest were abandoned to the most melancholy fate, without physicians, without medicines, and in want even of necessary food.

Five populous towns were entirely destroyed by the eruption; more than twelve hundred of the inhabitants perished amidst the ruins; and the twenty thousand who survived the awful catastrophe, were stripped of their possesssions and reduced to beggary.

The subsequent appearance of the volcanic mountain was most melancholy and terrific. Its side, formerly so well cultivated, and which afforded a prospect the most picturesque, is now become a barren sand. The stones, sand, and ashes, which cover it, in some places exceed the depth of ten and twelve yards; and on the ground where lately stood the village of Budiao, there are spots, in which the cocoa-trees are almost covered. In the ruined villages, and through the whole extent of the eruption, the ground remains buried in the sand to the depth of half a yard, and scarcely a single tree is left alive. The crater of the volcano has lowered more than one hundred and twenty feet; and the south side discovers a spacious and horrid mouth, which is frightful to the view. Three new ones have opened at a considerable distance from the principal crater, through which also smoke and ashes are incessantly emitted. In short, the most beautiful villages of Camarines, and the principal part of that fine province, are deeply covered with barren sand.

ISLANDS WHICH HAVE RISEN FROM THE SEA.

Beside the convulsions of nature displayed in volcanoes, the most remarkable particulars of which we have given in our history of mountains, other operations are carried on below the fathomless depths of the sea, the nature of which
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can only be conjectured by the effects produced. Nor is more astonishing that inflammable substances should be found beneath the bottom of the sea, than at similar depths on land, and that there also the impetuous force of fire should cause the imprisoned air and elastic gasses to expand and, by its mighty force, should drive the earth at the bottom of the sea above its surface. These marine volcanos are perhaps more frequent, though they do not so often come within the reach of human observation, than on land; and stupendous must be the operations carried on when matter is thrown up to an extent which the ingenuity of man does not enable him to reach by fathoming.

Many instances have occurred, as well in ancient as modern times, of islands having been formed in the midst of the sea; and their sudden appearance has constantly been preceded by violent agitations of the surrounding waters, accompanied by dreadful noises, and, in some instances, by fiery eruptions from the newly-formed islands which are composed of various substances, frequently intermixed with a considerable quantity of volcanic lava. Such islands remain for ages barren, but in a long course of time become abundantly fruitful. It is a matter of curious inquiry, whether springs are found on such newly-created spots, when the convulsions which gave them birth have subsided; but on this point it would seem that we are not possessed of any certain information, as it does not appear that they have been visited by any naturalist with the express view of recording their properties.

Among the writers of antiquity who have transmitted accounts of islands which have thus started up to the view of the astonished spectator, Seneca asserts that, in his time, the island of Therasea, in the Egean sea, was seen to rise in this manner, by several mariners who were sailing near the point of its ascent. Pliny's relation is still more extraordinary; for he says that, in the Mediterranean, thirteen islands emerged at once from the sea, the cause of which he ascribes rather to the retiring of the waters, than to any subterraneous operation of nature: but he speaks at the same time of the island of Hiera, in the vicinity of Therasea, as having been formed by subterraneous explosions, and enumerates several others said to have been derived from a similar origin, on one of which, he says,
abundance of fishes were found, of which however all who ate perished soon after.

It is to the Grecian Archipelago and the Azores that we are to look for the grandest and most surprising instances of this phenomenon. We will select an example from each of these groups of islands, beginning with the former.

Before we enter, however, on the somewhat minute details we shall have to bring forward, on this very curious and interesting subject, it may not be improper to observe, that the island of Acroteri, of great celebrity in ancient history, appears to have its surface composed of pumice stone, encrusted by a surface of fertile earth; and that it is represented by the ancients as having risen, during a violent earthquake, from the sea. Four neighbouring islands are described as having had a similar origin, notwithstanding the sea is in that part of the Archipelago of such a depth as to be unfathomable by any sounding line. These arose at different times: the first long before the commencement of the Christian era; the second in the first century; the third in the eighth; and the fourth in 1573.

To proceed to a phenomenon of a similar nature, belonging to the same cluster of islands, which being of a more recent date, we are enabled to enter into all its particulars. They are such as cannot fail to interest and surprise.

On the 22d of May, 1707, a severe earthquake was felt at Stanchio, an island of the Archipelago; and on the ensuing morning a party of seamen, discovering not far off what they believed to be a wreck, rapidly rowed towards it; but finding rocks and earth instead of the remains of a ship, hastened back, and spread the news of what they had seen in Santorini, another of these islands. However great the apprehensions of the inhabitants were at the first sight, their surprise soon abated, and in a few days, seeing no appearance of fire or smoke, some of them ventured to land on the new island. Their curiosity led them from rock to rock, where they found a kind of white stone, which yielded to the knife like bread, and nearly resembled that substance in colour and consistence. They also found many oysters sticking to the rocks; but while they were employed in collecting them, the island moved and shook under their feet, on which they ran with precipitation to
their boats. Amid these motions and tremblings the island increased, not only in height, but in length and breadth still, occasionally, while it was raised and extended on one side, it sunk and diminished on the other. The person to whom we are indebted for this narrative, observed
a rock to rise out of the sea, forty or fifty paces from an island, which, having been thus visible for four days, sunk and appeared no more: several others appeared and disapeared alternately, till at length they remained fixed so unmoved. In the mean time the colour of the surrounding sea was changed: at first it was of a light green, then a dish, and afterwards of a pale yellow, accompanied by a noisome stench, which spread itself over a part of Island of Santorini.

On the 16th of July smoke first appeared, not inde on the island, but issuing from a ridge of black stone which suddenly rose about sixty paces from it, where the depth of the sea was unfathomable. Thus there were separte islands, one called the White, and the other Black Island, from the different appearances they exhibited. This thick smoke was of a whitish colour, like of a lime-kiln, and was carried by the wind to Santorini where it penetrated the houses of the inhabitants.

In the night between the 19th and 20th of July, than began to issue with the smoke, to the great terror of inhabitants of Santorini, especially of those occup the castle of Scaro, who were distant about a mile and half only from the burning island, which now increased very fast, large rocks daily springing up, which sometimes added to its length, and sometimes to its breadth. smoke also increased, and, there not being any wa ascended so high as to be seen at Candia, and other tain islands. During the night, it resembled a column five, fifteen, or twenty feet in height; and the sea was covered with a scurf or froth, in some places reddish, in others yellowish, from which proceeded such a steam that the inhabitants throughout the whole island of Sanini burnt perfumes in their houses, and made fires in streets, to prevent infection. This, indeed, did not above a day or two; for a strong gale of wind dispersed froth, but drove the smoke on the vineyards of Santorini by which the grapes were, in one night, parched up.
ISLANDS WHICH HAVE RISEN FROM THE SEA.

destroyed. This smoke also caused violent head-ach attended with retchings.

On the 31st of July the sea smoked and bubbled in two different places near the island, where the water formed a perfect circle, and looked like oil when beginning to simmer. This continued above a month, during which time many fishes were found dead on the shore of Santorini. On the following night a dull hollow noise was heard, like the distant report of several cannon, which was instantly followed by flames of fire, shooting up to a great height in the air, where they suddenly disappeared. The next day the same hollow sound was several times heard, and succeeded by a blackish smoke, which, notwithstanding a fresh gale blew at the time, rose up to a prodigious height, in the form of a column, and would probably in the night have appeared as if on fire.

On the 7th of August a different noise was heard, resembling that of large stones thrown, at very short intervals, into a deep well. This noise, having lasted for some days, was succeeded by another much louder, so nearly resembling thunder, as scarcely to be distinguished from three or four real claps, which were heard at the same time.

On the 21st the fire and smoke were very considerably diminished; but the next morning they broke out with still greater fury than before. The smoke was red, and very thick, the heat at the same time being so intense, that all around the island the sea smoked and bubbled surprisingly. At night, by the means of a telescope, sixty small openings or funnels, all emitting a very bright flame, were discovered on the highest part of the island, conjointly resembling a large furnace; and, on the other side of the great volcano there appeared to be as many.

On the morning of the 23d, the island was much higher than on the preceding day, and its breadth increased by a chain of rocks which had sprung up in the night nearly fifty feet above the water. The sea was also again covered with reddish froth, which always appeared when the island seemed to have received any considerable additions, and occasioned an intolerable stench, until it was dispersed by the wind and the motion of the waves.

On the 5th of September, the fire opened another vent
at the extremity of the Black Island, from which it issued for several days. During that time little was discharged from the large furnaces; but from this new passage the astonished spectator beheld the fire dart up three several times to a vast height, resembling so many prodigious sky-rockets of a glowing lively red. The following night the sub-aqueous fire made a terrible noise, and immediately after a thousand sheaves of fire darted into the air, where breaking and dispersing, they fell like a shower of stars on the island, which appeared in a blaze, presenting to the amazed spectator at once a most dreadful and beautiful illumination. To these natural fire-works, succeeded a kind of meteor, which for some time hung over the castle of Scaro, and which, having a resemblance to a flaming sword, served to increase the consternation of the inhabitants of Santorini.

On the 9th of September, the White and Black Islands united; after which the western end of the island grew daily in bulk. There were now four openings only which emitted flames: these issued forth with great impetuosity, sometimes attended with a noise like that of a large organ-pipe, and sometimes like the howling of wild beasts.

On the 12th the subterraneous noise was much augmented, having never been so frequent or so dreadful as on that and the following day. The bursts of this subterraneous thunder, like a general discharge of the artillery of an army, were repeated ten or twelve times within twenty-four hours, and, immediately after each clap, the large furnace threw up huge red-hot stones, which fell into the sea at a great distance. These claps were always followed by a thick smoke, which spread clouds of ashes over the sea and the neighbouring islands.

On the 18th of September an earthquake was felt at Santorini. It did but little damage, although it considerably enlarged the burning island, and in several places gave vent to the fire and smoke. The claps were also more terrible than ever; and, in the midst of a thick smoke, which appeared like a mountain, large pieces of rock, which afterwards fell on the island, or into the sea, were thrown up with as much noise and force as balls from the mouth of a cannon. One of the small neighbouring islands was covered with these fiery stones, which being
thickly crustd over with sulphur, gave a bright light, and continued burning until that was consumed.

On the 21st a dreadful clap of subterraneous thunder was followed by very powerful lightnings, and at the same instant the new island was so violently shaken, that part of the great furnace fell down, and huge burning rocks were thrown to the distance of two miles and upwards. This seemed to be the last effort of the volcano, and appeared to have exhausted the combustible matter, as all was quiet for several days after; but on the 25th, the fire broke out again with still greater fury, and among the claps one was so terrible, that the churches of Santorini were soon filled with crowds of people, expecting every moment to be their last; and the castle and town of Scaro suffered such a shock, that the doors and windows of the houses flew open. The volcano continued to rage during the remaining part of the year; and in the month of January, 1708, the large furnace, without one day's intermission, threw out stones and flames, at least once or twice, but generally five or six times a day.

On the 10th of February, in the morning, a pretty strong earthquake was felt at Santorini, which the inhabitants considered as a prelude to greater commotions in the burning island; nor were they deceived, for soon after the fire and smoke issued in prodigious quantities. The thunder-like claps were redoubled, and all was horror and confusion: rocks of an amazing size were raised up to a great height above the water; and the sea raged and boiled to such a degree as to occasion great consternation. The subterraneous bellowings were heard without intermission, and sometimes in less than a quarter of an hour there were six or seven eruptions from the large furnace. The noise of the repeated claps, the quantity of huge stones whichlew about on every side, the houses at Santorini tottering to their very foundations, and the fire, which now appeared in open day, surpassed all that had hitherto happened, and formed a scene terrific and astonishing beyond description. The 15th of April was rendered memorable by the number and violence of the bellowings and eruptions, by one of which nearly a hundred stones were thrown at the same instant into the air, and fell again into the sea at about two miles distant. From that day until the 22nd of
ISLANDS WHICH HAVE RISEN FROM THE SEA.

May, which may be considered as the anniversary of the birth of the new island, things continued much in the same state, but afterwards the fire and smoke subsided by degrees, and the subterraneous thunders became less terrible.

On the 15th of July 1709, the Bishop of Santorini, accompanied by several friars, hired a boat to take a new view of the island. They made directly toward it on the side where the sea did not bubble, but where it smoked very much. Being within the range of this vapour, they felt a close suffocating heat, and found the water very hot on which they directed their course toward a part of the island at the farthest distance from the large furnace. The fires, which still continued to burn, and the boiling of the sea, obliged them to make a great circuit, notwithstanding which they felt the air about them very hot and sultry. Having encompassed the island, and surveyed it carefully from an adjacent one, they judged it to be two hundred feet above the sea, about a mile broad, and five miles in circumference; but, not being thoroughly satisfied, they resolved to make an attempt at landing, and accordingly rowed toward that part of the island where they perceived neither fire nor smoke. When, however, they had proceeded within the distance of a hundred yards, the great furnace discharged itself with its usual fury, and the wind blew upon them so dense a smoke, and so heavy a shower of ashes, that they were obliged to abandon their design.

Having retired somewhat further, they let down the sounding lead, with a line ninety-five fathoms in length, but it was too short to reach the bottom. On their return to Santorini, they observed that the heat of the water melted the greater part of the pitch employed in caulking their boat, which had now become very leaky.

From that time until the 15th of August, the fire, smoke, and noises continued, but not in so great a degree and it appears that for several years after the island was increased, but that the fire and subterraneous noises were much abated. The most recent account we have been enabled to collect, is that of a late traveller who, in 1819, passed this island at some distance. It appeared to him like a stupendous mass of rock, but was not inhabited cultivated. It had then long ceased to burn.
We have stated that similar eruptions of islands have occurred in the group of the Azores. Thus, in December 1720, a violent earthquake was felt on the island of Tercera. On the following morning a new island, which had sprung up in the night, made its appearance, and ejected a huge column of smoke. The pilot of a ship, who attempted to approach it, sounded on one of these newly-formed islands, with a line of sixty fathoms, but could not find a bottom. On the opposite side, the sea was deeply tinged with various colours, white, blue, and green; and was very shallow. This island was larger on its first appearance, than at some distance of time afterwards; it at length sunk beneath the level of the sea, and is now no longer visible.

"What can be more surprising," observes the author of the preceding account, "than to see fire, not only force its way out of the bowels of the earth, but likewise make for itself a passage through the waters of the sea! What can be more extraordinary, or foreign to our common notions of things, than to observe the bottom of the sea rise up into a mountain above its surface, and become so firm an island as to be able to resist the violence of the greatest storms! I know that subterraneous fires, when pent up in a narrow passage, are able to elevate a mass of earth as large as an island; but that this should be done in so regular and precise a manner, that the water of the sea should not be able to penetrate and extinguish those fires; and that, after they should have exhausted themselves, the mass of earth should not fall down, or sink again with its own weight, but still remain in a manner suspended over the great arch below---this seems to me more surprising than any of the facts which have been related of Mount Etna, Vesuvius, or any other volcano."

In the first part of the Transactions of the Royal Society for the year 1812, Captain Tillard, of the British Navy, has published his very interesting narrative of a similar phenomenon, which occurred in the same sea near the Azores. We give this narrative in his own words.

Approaching the island of St. Michael's on Sunday the 22d of June, 1811, in his Majesty's sloop Sabrina, under my command, we occasionally observed, rising in the horizon, two or three columns of smoke, such as would have
been occasioned by an action between two ships, to which cause we universally attributed its origin. This opinion was, however, in a very short time changed, from the smoke increasing and ascending in much larger bodies than could possibly have been produced by such an event; and, having heard an account, prior to our sailing from Lisbon, that in the preceding January or February a volcano had burst out within the sea near St. Michael's, we immediately concluded that the smoke we saw proceeded from that cause, and, on our anchoring the next morning in the road of Ponta de Gada, we found this conjecture correct as to the cause, but not as to the time; the eruption of January having totally subsided, and the present one having only burst forth two days prior to our approach, and about three miles distant from the one before alluded to.

Desirous of examining as minutely as possible a conflagration so extraordinary between two such powerful elements I set off from the city of Ponta del Gada on the morning of the 14th, in company with Mr. Read, the Consul General of the Azores, and two other gentlemen. After riding about twenty miles across the N. W. end of the island of St. Michael's, we came to the edge of a cliff, whence the volcano burst suddenly upon our view in the most terrific and awful grandeur. It was only a short mile from the base of the cliff, which was nearly perpendicular, and formed the margin of the sea; this cliff being, as nearly as I could judge, from three to four hundred feet high. To give you an adequate idea of the scene by description, is beyond my powers; but, for your satisfaction, I shall attempt it.

Imagine an immense body of smoke rising from the sea, the surface of which was marked by the silvery rippling of the waves, occasioned by the light and steady breezes incident to those climates in summer. In a quiescent state, it had the appearance of a circular cloud revolving on the water like an horizontal wheel, in various and irregular involutions, expanding itself gradually on the lee side, when suddenly a column of the blackest cinders, ashes, and stones would shoot up in the form of a spire, at an angle of from ten to twenty degrees from a perpendicular line, the angle of inclination being universally to windward; this was rapidly succeeded by a second, third, and fourth shower,
acquiring greater velocity, and overtopping the other till they had attained an altitude as much above the level of our eye, as the sea was below it.

As the impetus with which the columns were severally propelled diminished, and their ascending motion had nearly ceased, they broke into various branches resembling a group of pines; these again forming themselves into festoons of white feathery smoke, in the most fanciful manner imaginable, intermixed with the finest particles of falling ashes, which at one time assumed the appearance of innumerable plumes of black and white ostrich feathers surmounting each other; at another, that of the light wavy branches of a weeping willow.

During these bursts, the most vivid flashes of lightning continually issued from the densest part of the volcano; and the cloud of smoke, now ascending to an altitude much above the highest point to which the ashes were projected, rolled off in large masses of fleecy clouds, gradually expanding themselves before the wind in a direction nearly horizontal, and drawing up to them a quantity of waterspouts, which formed a most beautiful and striking addition to the general appearance of the scene.

That part of the sea where the volcano was situated, was upwards of thirty fathoms deep, and at the time of our viewing it the volcano was only four days old. Soon after our arrival on the cliff, a peasant observed he could discern a peak above the water: we looked, but could not see it: however, in less than half an hour it was plainly visible, and before we quitted the place, which was about three hours from the time of our arrival, a complete crater was formed above the water, not less than twenty feet high on the side where the greatest quantity of ashes fell; the diameter of the crater being apparently about four or five hundred feet.

The great eruptions were generally attended with a noise like the continued firing of cannon and musquetry intermixed, as also with slight shocks of earthquakes; several of which having been felt by my companions, but none by myself, I had become half sceptical, and thought their opinion arose merely from the force of imagination; but, while we were sitting within five or six yards of the edge of the cliff, partaking of a slight repast which had been brought with us, and were all busily engaged, one of the
most magnificent bursts took place which we had yet witnessed, accompanied by a very severe shock of an earthquake. The instantaneously and involuntary movement each was to spring upon his feet; and I said, "This is of no doubt." The words had scarcely passed my lips before we observed a large portion of the face of the cliff about fifty yards on our left, falling, which it did with a violent crash. So soon as our first consternation had little subsided, we removed about ten or a dozen yards farther from the edge of the cliff, and finished our dinner.

On the succeeding day, June 15th, having the Captain and some other friends on board, I weighed, and proceeded with the ship towards the volcano, with the intention of witnessing a night view; but in this expectation we were greatly disappointed, from the wind freshening, and the weather becoming thick and hazy, and also from thecano itself being clearly more quiescent than it was the preceding day. It seldom emitted any lightning, but occasionally as much flame as may be seen to issue from the top of a glass-house or foundry chimney. On passing direct under the great cloud of smoke, about three or four miles distant from the volcano, the decks of the ship were covered with fine black ashes, which fell intermixed with rain. We returned the next morning, and late on the evening of the same day I took my leave of St. Michael's to complete my cruise.

On opening the volcano clear of the N. W. part of the island, after dark on the 15th, we witnessed one of the eruptions that, had the ship been near enough, would have been awfully grand. It appeared one continued bolt of lightning; but its distance from the ship, upwards of two miles, prevented our seeing it with effect. Returning towards St. Michael's, on the 4th of July, I was ordered by the state of the wind, to pass with the ship very close to the island, which was now completely formed by thecano, being nearly the height of Matlock High Top, eighty yards above the sea. At this time it was perfectly tranquil; which circumstance determined me to land, explore it more narrowly. I left the ship in one of the boats, accompanied by some of the officers, and, proceeding, we perceived that it was still smoking in parts, and, upon our reaching the island, found the
the beach very high. Rowing round to the lee side, with
some little difficulty, by the aid of an oar, as a pole, I
jumped on shore, and was followed by the other officers.
We found a narrow beach of black ashes, from which the
side of the island rose in general too steep to admit of our
ascending; and where we could have clambered up, the mass
of matter was much too hot to allow our proceeding more
than a few yards in the ascent.
The declivity below the surface of the sea was equally
steep, having seven fathoms water at scarcely the boat's
length from the shore, and at the distance of twenty or
thirty yards we sounded twenty-five fathoms. From
walking round it in about twelve minutes, I should judge
that it was something less than a mile in circumference;
but the most extraordinary part was the crater, the mouth
of which, on the side facing St. Michael's, was nearly level
with the sea. It was filled with water, at that time boil-
ing, and was emptying itself into the sea by a small stream
about six yards over, and by which I should suppose it was
continually filled again at high water. This stream, close
to the edge of the sea, was so hot, as only to admit the
finger to be dipped suddenly in, and taken out again imme-
diately.

It appeared evident, by the formation of this part of
the island, that the sea had, during the eruptions, broken
into the crater in two places, as the east side of the small
stream was bounded by a precipice; a cliff between
twenty and thirty feet high, forming a peninsula of about
the same dimension in width, and from fifty to sixty feet
long, connected with the other part of the island by a nar-
row ridge of cinders and lava, as an isthmus, of from forty
to fifty feet in length, from which the crater rose in the
form of an amphitheatre.

This cliff, at two or three miles distance from the
island, had the appearance of a work of art resembling
a small fort or block-house. The top of this we were de-
termined, if possible, to attain; but the difficulty we had
to encounter in doing so was considerable; the only way
to attempt it was up the side of the isthmus, which was so
steep, that the only mode by which we could effect it, was
by fixing the end of an oar at the base, with the assistance of
which we forced ourselves up in nearly a backward direc-

Having reached the summit of the isthmus, we found another difficulty; for it was impossible to walk upon it, as the descent on the other side was immediate, and as steep as the one we had ascended: but, by throwing our legs across it, as would be done on the ridge of a house, and moving ourselves forward by our hands, we at length reached that part of it where it gradually widened itself, and formed the summit of the cliff, which we found to have a perfectly flat surface, of the dimensions before stated. Judging this to be the most conspicuous situation, we here planted the Union, and left a bottle sealed up, containing a short account of the origin of the island, and of our having landed upon it, and naming it Sabrina Island.

Within the crater I found the complete skeleton of a guard-fish, the bones of which, being perfectly burnt, fell to pieces upon attempting to take them up; and, by the account of the inhabitants on the coast of St. Michael's, great numbers of fish had been destroyed during the early part of the eruption, as large quantities, probably suffocated or poisoned, were occasionally found drifted into the small inlets or bays. The island, like other volcanic productions, is composed principally of porous substances, generally burnt to complete cinders, with occasional masses of a stone, which I should suppose to be a mixture of iron and limestone.

Sabrina Island has gradually disappeared, since the month of October, 1811, leaving an extensive shoal. Smoke was discovered still issuing out of the sea in the month of February, 1812, near the spot where this wonderful phenomenon appeared.

**SUBTERRANEAN WONDERS.**

**THE GREAT KENTUCKY CAVERN.**

Give me, ye powers, the wondrous scenes to show,
Conceal'd in darkness, in the depths below.

For the very interesting account of this stupendous cavern, which is unparalleled in the history of subterraneous wonders, we are indebted to Dr. Nahum Ward, who published it in the *Monthly Magazine* of October 1816. It is situated in Warren County, and in a territory not mysterious, but broken, differing in this respect from all the
other caverns hitherto known. The Doctor, provided with guides, two large lamps, a compass, and refreshments, descended a pit forty feet in depth, and one hundred and twenty in circumference, having a spring of fine water at the bottom, and conducting to the entrance of the cavern. The opening, which is to the north, is from forty to fifty feet high, and about thirty in width. It narrows shortly after, but again expands to a width of thirty or forty feet, and a height of twenty, continuing these dimensions for about a mile, to the first hoppers,* where a manufactory of salt-petre has recently been established. Thence to the second of these hoppers, two miles from the entrance, it is forty-feet in width, and sixty in height. Throughout nearly the whole of this distance handsome walls have been made by the manufacturers, of the loose limestone. The road is hard, and as smooth as a flag pavement. In every passage which the Doctor traversed, the sides of the cavern were perpendicular, and the arches, which have bid defiance even to earthquakes, are regular. In 1802, when the heavy shocks of earthquakes came on which were so severely felt in this part of Kentucky, the workmen stationed at the second hoppers, heard, about five minutes before each shock, a heavy rumbling noise issue from the cave, like a strong wind. When that ceased, the rocks cracked, and the whole appeared to be going in a moment to final destruction. However, no one was injured, although large portions of rock fell in several parts of the cavern.

In advancing into the cavern, the avenue leads from the second hoppers, west, one mile; and thence, south-west, to the chief area or city, which is six miles from the entrance. This avenue, throughout its whole extent from the above station to the cross-roads, or chief area, is from sixty to one hundred feet in height, of a similar width, and nearly on a level, the floor or bottom being covered with loose limestone, and salt-petre earth. "When," observes the Doctor, "I reached this immense area (called "the chief city) which contains upwards of eight acres, without a single pillar to support the arch, which is "entire over the whole, I was struck dumb with astonishment.--Nothing can be more sublime and grand than

* A hopper is an inverted cone, into which corn is put at a mill before it runs between the stones.
"this place, of which but a faint idea can be conveyed; covered with one solid arch at least one hundred feet high, and to all appearance entire."

Having entered the area, the Doctor perceived five large avenues leading from it, from sixty to one hundred feet in width, and about forty in height. The stone walls arched, and were from forty to eighty feet perpendicular in height before the commencement of the arch.

In exploring these avenues, the precaution was taken to cut arrows, pointing to the mouth of the cave, on stones beneath the feet, to prevent any difficulty in the return. The first which was traversed, took a southern direction for more than two miles; when a second was taken, which led first east, and then north, for more than two miles further. These windings at length brought the party, by another avenue, to the chief city after having traversed different avenues for more than five miles. Having repose for a few minutes on a bed of limestone near the centre of this gloomy area, refreshed themselves and trimmed their lamps, departed a second time, through an avenue almost parallel with the one leading from the chief city to the mouth of the cavern, and, having proceeded upward two miles, came to the second city. This is covered by a single arch, nearly two hundred feet high in the centre, and is very similar to the chief city, except in the number of its avenues which are two only. They crossed it on a very considerable rise in the centre, and descended through an avenue which bore to the east, to the distance of a mile, when they came to a third area, or city, about a hundred feet square, and fifty in height, which had a delightful stream of water issuing from the side of a wall about thirty feet high, and which fell on a bright surface of stone, and was afterwards entirely lost to view.

Having passed a few yards beyond this beautiful source of water, so as to reach the end of the avenue, they returned about one hundred yards, and passing over a considerable mass of stone, entered another, but smaller avenue to the right, which carried them south, through a third, of uncommonly black hue, somewhat more than a mile, they ascended a very steep hill about sixty yards, conducted them to within the walls of the fourth city.
is not inferior to the **second**, having an arch which covers at least six acres. In this last avenue, the extremity of which cannot be less than four miles from the chief city, and ten from the mouth of the cavern, are upwards of twenty large piles of salt-petre earth on the one side, and broken lime-stone heaped up on the other, evidently the work of human hands.

From the course of his needle, the Doctor expected that this avenue would have led circuitously to the chief city; but was much disappointed when he reached the extremity, at a few hundred yards distance from the fourth city. In retracing his steps, not having paid a due attention to mark the entrances of the different avenues, he was greatly bewildered, and once completely lost himself for nearly fifteen or twenty minutes. Thus, faint and wearied, he did not reach the chief area till ten at night; but was still determined to explore the cavern so long as his light should last. Having entered the fifth and last avenue from the chief area, and proceeded south-east about nine hundred yards, he came to the fifth area, the arch of which covers upwards of four acres of level ground, strewed with lime-stones, and having fire-beds of an uncommon size, surrounded with brands of cane, interspersed. Another avenue on the opposite side, led to one of still greater capacity, the walls or sides of which were more perfect than any that had been noticed, running almost due south for nearly a mile and a half, and being very level and straight, with an elegant arch. While the Doctor was employed, at the extremity of this avenue, in sketching a plan of the cave, one of his guides, who had strayed to a distance, called on him to follow. Leaving the other guide, he was led to a vertical passage, which opened into a chamber at least 1800 feet in circumference, and the centre of the arch of which was 150 feet in height.

It was past midnight when he entered this chamber of eternal darkness; and when he reflected on the different avenues through which he had passed, since he had penetrated the cave at eight in the morning, and now found himself buried several miles in the dark recesses of this awful cavern—the grave, perhaps, of thousands of human beings—he felt a shivering horror. The avenue, or passage, which led from it was as large as any he had entered; and it is un-
certain how far he might have travelled had his lights not failed him. All those who have any knowledge of this eave, he observes, conjecture that Green River, a stream navigable several hundred miles, passes over three of its branches.

After a lapse of nearly an hour, he descended by what is called the "passage of the chimney," and joined the other guide. Thence returning to the chief area or city, where the lamps were trimmed for the last time, he entered the spacious avenue which led to the second hoppers. Here he met with various curiosities, such as spars, petrifications, &c.; and these he brought away, together with a mummy which was found at the second hoppers. He reached the mouth of the cave about three in the morning, nearly exhausted with nineteen hours of constant fatigue. He nearly fainted on leaving it, and on inhaling the rapid air of the atmosphere, after having so long breathed the pure air occasioned by the nitre of the cave. His pulse beat stronger when within, but not so quick as when on the surface.

Here the Doctor observes that he has hardly described half the cave, not having named the avenues between its mouth and the second hoppers. This part of his narrative is of equal interest with what has been already given. He states that there is a passage in the main avenue, upwards of nine hundred feet from the entrance, like that of a transom door. By sliding aside a large flat stone, you can descend sixteen or eighteen feet in a very narrow defile, where the passage comes on a level, and winds about in such a manner, as to pass under the main passage without having any communication with it, at length opening into the main cave by two large passages just beyond the second hopper. This is called the "glauber-salt room," from salts of that kind being found there. Next come the sick-room, the bat-room, and the flint-room, together with a winding avenue, which, branching off at the second hoppers, runs west and south-west for more than two miles. It is called the "haunted chamber," from the echo within; its arched ceiling is very beautifully incrusted with lime-stone spar; and in many places the columns of spar are truly elegant, extending from the ceiling to the floor. Near the centre of this arch is a dome, apparently fifty feet high, hung in rich draperies festooned in the most fanciful manner, for six or eight feet
GROTTO OF ANTIPAROS.

The grotto of Antiparos, or Antipakos, is situated in the Cyclades, in the Aegean Sea, or Grecian Archipelago. It is a small island, about sixteen miles in circumference, and lies two miles to the west of the celebrated Paros, from which circumstance it derives its name, anti in the Greek language signifying opposite to. Its singular and most interesting grotto, though so inferior in size to the cavern in Kentucky, has

from the hangings, and in colours the most rich and brilliant. By the reflection of one or two lights, the columns of spar and the stalactites have a very romantic appearance. Of this spar a large cellar, called "Wilkins' armed chair," has been formed in the centre of the avenue, and encircled with many smaller ones. The columns of spar, fluted and studded with knobs of spar and stalactites; the drapery of various colours superbly festooned, and hung in the most graceful manner; these are shown with the greatest brilliancy by the reflection of the lamps.

In the vicinity of the "haunted chamber" the sound of a cataract was heard; and at the extremity of the avenue was a reservoir of water, very clear and grateful to the taste, apparently having neither inlet nor outlet. Here the air, as in many other parts of the cave, was pure and delightful. Not far from the reservoir, an avenue presented itself, within which were several columns of the most brilliant spar, sixty or seventy feet in height, and almost perpendicular, standing in basins of water; which, as well as the columns, the Doctor observes, surpass, in splendour and beauty, every similar work of art he had ever seen.

Returning by a beautiful pool of water, the Doctor came to the second hoppers, where he had found the mummy before alluded to. It had been removed from another cave, for preservation, and was presented to him by his friend Mr. Wilkins, together with the apparel, jewels, music, &c. with which it was accompanied. It has since been placed in the Washington museum, the proprietor of which thinks it probable that this mummy is as ancient as the immense mounds of the western country, which have so much astonished the world.
attracted the attention of an infinite number of travellers. The entrance to this superb grotto is on the side of a rock and is a large arch, formed of craggy stones, overhung with brambles and creeping plants, which bestow on it a gloominess at once awful and agreeable. Having proceeded about thirty paces within it, the traveller enters a low narrow alley, surrounded on every side by stones, which, by the light of torches, glitter like diamonds; the whole being covered and lined throughout with small crystals, which give, by their different reflections, a variety of colours. At the end of this alley or passage, having a rope tied round his waist, he is led to the brink of an awful precipice, and thence lowered into a deep abyss, the gloom pervading which makes him regret the "alley of diamonds" he has just quitted. He has not as yet, however, reached the grotto, but is led forward about forty paces, beneath a roof of rugged rocks, amid a scene of terrible darkness, and a vast depth from the surface of the earth, to the brink of another precipice, much deeper and more awful than the former.

Having descended this precipice, which is not accomplished without considerable difficulty, the traveller enters a passage, the grandeur and beauty of which can be imperfectly described. It is one hundred and twenty feet in length, about nine feet high, and in width seven, with a bottom of a fine green glossy marble. The walls and arched roof are as smooth and polished as if they had been wrought by art, and are composed of a fine glittering and white granite, supported at intervals by columns of deep blood-red shining porphyry, which, by the reflection of the lights, presents an appearance inconceivably grand. At the extremity of this passage is a sloping wall, forming a single mass of purple marble, studded with spring rock crystal, which, from the glow of the purple behind appear like a continued range of amethysts.

Another slanting passage, filled with petrifications, representing the figures of snakes and other animals, and running towards its extremity two pillars of beautiful yellow marble, which seem to support the roof, leads to the last precipice, which is descended by the means of a ladder. The traveller, who has descended to the depth of nearly two thousand five hundred feet beneath the surface, now enters
the magnificent grotto, to procure a sight of which he has endured so much fatigue. It is in width three hundred and sixty feet; in length three hundred and forty; and in most places one hundred and eighty in height. By the aid of torchlight, he finds himself beneath an immense and finely-vaulted arch, overspread with icicles of white shining marble, many of them ten feet in length, and of a proportionate thickness. Among these are suspended a thousand festoons or leaves and flowers, of the same substance, but so glittering as to dazzle the sight. The sides are planted with petrifications, also of white marble, representing trees; these rise in rows one above the other, and often enclose the points of the icicles. From them also hang festoons, tied as it were one to another, in great abundance; and in some places rivers of marble seem to wind through them. In short, these petrifications, the result of the dripping of water for a long series of ages, nicely resemble trees and brooks turned to marble. The floor is paved with crystals of different colours, such as red, blue, green, and yellow, projecting from it, and rendering it rugged and uneven. These are again interspersed with icicles of white marble, which have apparently fallen from the roof, and are there fixed. To these the guides fasten their torches; and the glare of splendour and beauty which results from such an illumination, may be better conceived than described.

To the above lively description we subjoin an extract from the one given by Dr. Clarke, a learned traveller, who visited this celebrated grotto in 1802.

"The mode of descent is by ropes, which, on the different declivities, are either held by the guides, or are joined to a cable which is fastened at the entrance around a stalactite pillar. In this manner, we were conducted, first down one declivity, and then down another, until we entered the spacious chambers of this truly enchanted grotto. The roof, the floor, the sides of a whole series of magnificent caverns, were entirely invested with a dazzling incrustation as white as snow. Columns, some of which were five-and-twenty feet in length, pended in fine icicle forms above our heads: fortunately some of them are so far above the reach of the numerous travellers, who, during many ages, have visited this place, that no one has been able to injure or to remove them. Others extended from
the roof to the floor, with diameters equal to that of the mast of a first-rate ship of the line. The incrustations of the floor, caused by falling drops from the stalactites above had grown up into dendritic and vegetable forms, which first suggested to Tournefort the strange notion of his having here discovered the vegetation of stones. Vegetation itself has been considered as a species of crystallization; and as the process of crystallization is so surprisingly manifested by several phænomena in this grotto, some analogy may perhaps be allowed to exist between the plant and the stone; but it cannot be said, that a principle of life existing in the former has been imparted to the latter. The last chamber into which we descended surprised us more by the grandeur of its exhibition than any other. Probably there are many other chambers below this, yet unexplored, for no attempt has been made to penetrate farther: and, if this be true, the new caverns, when opened, would appear in perfect splendour, unsullied, in any part of them, by the smoke of torches, or by the hands of intruders."

CAVERNS IN GERMANY AND HUNGARY.

CONTAINING FOSSIL BONES.

Among the most remarkable of these caverns are those of Gaylenreuth, on the confines of Bayreuth. The opening to these, which is about seven feet and a half high, is at the foot of a rock of lime-stone of considerable magnitude and in its eastern side. Immediately beyond the opening is a magnificent grotto, of about three hundred feet in circumference, which has been naturally divided by the form of the roof into four caves. The first is about twenty-five feet long and wide, and varies in height from nine to eighteen feet, the roof being formed into irregular arches. Beyond this is the second cave, about twenty-eight feet long, and of nearly the same width and height with the former.

A low and very rugged passage, the roof of which is formed of projecting pieces of rocks, leads to the third grotto, the opening into which is a hole three feet high.
Caverns in Germany and Hungary.

And four feet wide. This grotto is more regular in its form, and is about thirty feet in diameter, and nearly round; its height is from five to six feet. It is very richly and fantastically adorned by the varying forms of its stalactite hangings. The floor is also covered with a wet and slippery glazing, in which several teeth and jaws appear to have been fixed.

From this grotto commences the descent to the inferior caverns. Within only about five or six feet an opening in the floor is seen, which is partly vaulted over by a projecting piece of rock. The descent is about twenty feet. This cavern is about thirty feet in height, about fifteen feet in width, and nearly circular; the sides, roof, and floor, displaying the remains of animals. The rock itself is thickly beset with teeth and bones, and the floor is covered with a loose earth, the evident result of animal decomposition, and in which numerous bones are imbedded.

A gradual descent leads to another grotto, which, with its passage, is forty feet in length, and twenty feet in height. Its sides and top are beautifully adorned with stalactites. Nearly twenty feet further is a frightful gulf, the opening of which is about fifteen feet in diameter; and, upon descending about twenty feet, another grotto, about the same diameter with the former, but forty feet in height, is seen. Here the bones are dispersed about; and the floor, which is formed of animal earth, has great numbers of them imbedded in it. The bones which are here found, seem to be of different animals; but in this, as well as in the former caverns, perfect and unbroken bones are very seldom found. Sometimes a tooth is seen projecting from the solid rock, through the stalactite covering, showing that many of these wonderful remains may here be concealed. A specimen of this kind has been preserved, and is rendered particularly interesting, by the first molar tooth of the lower jaw, with its enamel quite perfect, rising through the stalactitic mass which invests the bone. In this cavern the stalactites begin to be of a larger size, and of a more columnar form.

Passing on through a narrow opening in the rock, a small cave, seven feet long, and five feet high, is discovered: another narrow opening leads to another small cave; from which a sloping descent leads to a cave twenty-five feet in
height, and about half as much in its diameter, in which a truncated columnar stalactite, eight feet in circumference.

A narrow and most difficult passage, twenty feet in length, leads from this cavern to another, five-and-twenty feet in height, which is everywhere beset with teeth, bones, and stalactitic projections. This cavern is suddenly contracted, so as to form a vestibule of six feet wide, or long, and nine high, terminating in an opening close to the floor, only three feet wide and two high, through which it is necessary to writhe, with the body on the ground. This leads into a small cave, eight feet high and wide, which is the passage into a grotto, twenty feet in height, eight feet high, and about three-and-forty feet long and wide. Here the prodigious quantity of animal earth, vast number of teeth, jaws, and other bones, and the heavy grouping of the stalactites, produce so dismal an appearance, as to become a perfect model of a temple to a god of the dead. Here hundreds of cart-loads of bones remains might be removed, pockets might be filled with fossil teeth, and animal earth was found to reach to the utmost depth to which the workmen dug. A piece of stalactite, being here broken down, was found to contain pieces of bones within it, the remnants of which were imbedded in the rock.

From this principal cave is a very narrow passage, terminating in the last cave, which is about six feet in width, fifteen in height, and the same in length. In this cave were no animal remains, and the floor was the naked rock.

Thus far only could these natural sepulchres be traced, but there is every reason to suppose, that these animal remains were disposed through a greater part of the rock.

Whence this immense quantity of the remains of carnivorous animals could have been collected, is a question which naturally arises; but the difficulty of answering appears to be almost insurmountable.
THE GROTTO DEL CANE.

This name has been given to a small cavern between Naples and Pozzuoli, on this account, that if a dog be brought into it, and his nose held to the ground, a difficulty of respiration instantly ensues, and he loses all sensation, and even life, if he be not speedily removed into purer air. There are other grottoes endowed with the same deleterious quality, especially in volcanic countries; and the pestiferous vapours they exhale are quickly fatal both to animals and man, though they do not offer to the eye the slightest indication of their presence. These vapours are, however, for the greater part temporary; while that of the Grotta del Cane is perpetual, and seems to have produced its deadly effects even in the time of Pliny. A man standing erect within does not suffer from it, the mephitic vapour rising to a small height only from the ground. It may, therefore, be entered without danger.

The smoke of a torch extinguished in this vapour, or gas, sinks downward, assumes a whitish colour, and passes out at the bottom of the door. The reason of this is, that the fumes which proceed from the torch mix more readily with the gas than with the atmospheric air. It has been supposed, that the mischievous effects of the vapour were the result of the air being deprived of its elasticity; but it has been clearly demonstrated by M. Adolphus Murray, that they are solely to be attributed to the existence of carbonic acid gas.

The person who is the keeper, or guide, at the grotto, and who shows to strangers the experiment of the dog for a gratuity, takes the animal, when he is half dead and panting, into the open air, and then proceeds to throw him into the neighbouring lake of Agnano, thus insinuating that this short immersion in the water is necessary to his complete restoration. This, however, is a mere trick, to render the experiment more specious, and to obtain a handsome present from the credulous, the atmospheric air alone sufficing for that purpose.

The celebrated naturalist, the Abbé Spalanzani, projected a regular series of experiments on the mephitic
vapour of this grotto, from a persuasion that they would tend to throw a new light on physiology and natural philosophy. Being, however, prevented from undertaking the task by his duties as a professor, his friend, the Abbé Breislak, who resided near the spot, engaged in the task; and the following is an abstract of his learned memoir on the subject.

It is well known, the Abbé observes, that the mephitic vapour occupies the floor of a small grotto near the lake Agnano, a place highly interesting to naturalists from the phenomena its environs present, and the hills within which it is included. This grotto is situated on the south-east side of the lake, at a little distance from it. Its length is about twelve feet, and its breadth from four to five. It appears to have been originally a small excavation, made for the purpose of obtaining puzzolana, an earth which, being applied in mortar, becomes a powerful cement. In the sides of the grotto, among the earthy volcanic matters, are found pieces of lava, of the same kind with those which are met with scattered near the lake.

The Abbé is persuaded that, if new excavations were to be made in the vicinity of the grotto, at a level with its floor, or a little lower, the same mephitic vapour would be found; and thinks it would be curious to ascertain the limits of its extent. It would also be advantageous to the physical observations, if the grotto were to be somewhat enlarged, and its floor reduced to a level horizontal plane, by sinking it two or three feet, and surrounding it by a low wall, with steps at the entrance. In its present state it is extremely inconvenient for experiments, and the inclination of the ground towards the door causes a great part of the vapour, from the effect of its specific gravity, to make its way out close to the ground.

When the narrow limits of this place are considered, and the small quantity of the vapour which has rendered it so celebrated, there cannot be any doubt but that it has undergone considerable changes; since it does not appear probable that Pliny refers to the present confined vapour only, when, in enumerating many places from which deadly air exhaled, he mentions the territory of Pozzuoli. The internal fermentations by which it is caused are certainly much diminished in the vicinity of the lake Agnano.
The water near its banks is no longer seen to bubble up, from the disengagement of a gas, as it appears, from accounts not of very remote antiquity, to have done. The borders of the lake were attentively examined by the Abbé, when its waters were at the highest, and after heavy rains; but he could never discover a single bubble of air. A number of aquatic insects which sport on the surface, may at first sight occasion some deception; but a slight observation soon detects the error. If, therefore, we do not suppose those authors who have described the ebullition of the water near the banks of the lake Agnano to have been deceived, it must at least be confessed, that this phenomenon has now ceased. The quantity of the sulphureous vapours which rise in the contiguous stoves, called the stoves of St. Germano, must likewise be greatly diminished from what it anciently was: for, adjoining to the present stoves, we still find the remains of a spacious ancient fabric, with tubes of terra cotta inserted in the walls, which, by their direction, show for what purpose they were intended. It appears certain, that this was a building in which, by the means of pipes properly disposed, the vapours of the place were introduced into different rooms, for the use of patients. To these ruins, however, the vapours no longer extend; so that, if this edifice had remained entire, it could not have been employed for the purpose for which it was intended. The veins of pyrites which produced the more ancient conflagrations of the Phlegrean fields, between Naples and Cuma, and which, in some places, are entirely consumed, approach their total extinction. To proceed to the experiments within the grotto.

The object of the first was to determine the height of the mephitic vapour at the centre of the grotto, that is, at the intersection of the line of its greatest length with that of its greatest breadth. This height varies according to the different dispositions and temperatures of the atmosphere, the diversity of winds, and the accidental variations which take place in the internal fermentations by which the vapour is produced. It may, however, be estimated, at a mean, at nearly nine English inches.

The second set of experiments regarded the degree of heat on entering into the mephitis: it was slightly sensible.
in the feet and lower part of the legs; notwithstanding which, on taking out of the vapour several substances which had remained in it for a long time, such as stone-leaves, the eareases of animals, &c., the Abbé found that these were of the same temperature with the atmospheric air. Feeling in his body a slight degree of heat, which he could not perceive in the substances removed from the mephitic vapour, he was led by comparison to conclude that the temperature of the latter was the same with the atmospheric air, agreeably to the principles of Dr. Crawford. He was, however, mistaken; for, in subsequent experiments, he found a very distinct degree of heat was now provided with a thermometer, his former one having been broken, and, having suspended it at the ap- ture of the grotto, three feet above the surface of the vapour, found the mercury to stand at from sixty-two to sixty-four degrees of Fahrenheit; but, on placing the body on the ground, so as to immerse it in the vapour, the mercury rose to eighty, and even eighty-two degrees. The substances taken out of the mephitic did not exhibit this diversity of temperature, was, he thinks, owing to quantity of humidity with which they are always soaked, and which produces on their surface a constant evaporation. He was the more particular in repeating these experiments because the naturalists who had, before him, made similar ones in the Grotta del Cane, had not observed the vapour to produce any effect on the mercury in the thermomenter.

Thirdly. He repeated for his own satisfaction, the usual experiments made by naturalists, with the tincture of camphor, lime-water, the crystallizations of alkalis, the absorption of water, and the acidulous taste communicated to which prove, beyond all doubt, the existence of fixed or carbonic acid gas, in the vapour of the grotto. He cerned that it is not formed of fixed air alone, as may have been conjectured; but that the relative quantities the different gases which compose its mephitic air, are:—In one hundred parts, there are ten of vital or oxygenous gas; forty of fixed air, or carbonic gas; and fifty of phlogisticated air, or azotic gas.

Fourthly. The phenomena of magnetism and electric were investigated by the Abbé in this grotto. With respect
to the former, there was not any new appearance; the magnetic needle, being placed on the ground, and consequently immersed in the mephitis, rested in the direction of its meridian; and, at the approach of a magnetized bar, exhibited the usual effects of attraction and repulsion, in proportion as either pole was presented. As to the latter, electricity, it was impossible to make the experiments within the mephitis, not because this kind of air is a conductor of the electric fluid, as has been imagined, but because the humidity by which it is constantly accompanied, disperses the electric matter; and this, not being collected in a conductor, cannot be rendered sensible. He attempted several times to fire inflammable gas, with electric sparks, in the mephitic vapour, by means of the conductor of the electrophorus; but, notwithstanding his utmost endeavours to animate the electricity, he could never obtain a single spark, the non-conductor becoming a conductor the moment it entered into the mephitis, on account of the humidity which adhered to its surface.

Fifthly. His latest experiments were directed to the theory of the combustion of bodies. He first endeavoured to ascertain whether those spontaneous inflammations which result from the mixture of concentrated acids with essential oils, could be obtained within the grotto. He placed on the ground a small vessel, in such a situation that the mephitis rose six inches above its edges, employing oil of turpentine, and the vitriolic and nitrous acids: the same inflammation, accompanied by a lively flame, followed, as would have taken place in the open atmospheric air. The dense smoke which always accompanies these inflammations, being attracted by the humidity of the mephitis, presented its undulations to the eye, and formed a very pleasing object. As he had put a considerable quantity of acid in the vessel, he repeatedly poured in a little of the oil, and the flame appeared in the mouth of the vessel fifteen times successively. The oxygenous principle contained in the acids, and with which the nitrous acid principally abounds, undoubtedly contributed to the production and duration of this flame, though enveloped in an atmosphere inimical to inflammation.

The Abbé had, in the district of Latera, observed that in a mephitis of hydrogenous sulphurated or hepatic gas,
a slow combustion of phosphorus took place, with the same resplendence as in the atmospheric air. On the present occasion, his first experiment, in the mephitis of Agnano, was made with common phosphoric matches, five of which he broke, holding them to the ground, and consequently immersed in the mephitis. They produced a short and transient flame, which became extinguished the moment it was communicated to the wick of a candle.

His second experiment was as follows:—He placed on the ground, within the grotto, a long table, in such a manner as that one extremity was without the mephitis, while the other, and four-fifths of its length, were immersed in it. Along this table he laid a train of gunpowder, beginning from the end without the mephitis; and, at the other end, which was immersed in it to the depth of seven inches, he placed, adjoining to the gunpowder, a cylinder of phosphorus, eight lines in length. The gunpowder, without the mephitis, being fired, the combustion was soon communicated to the other extremity of the train, and to the phosphorus, which took fire with decrepitation, burned rapidly with a bright flame, slightly coloured with yellow and green, and left on the wood a black mark, as of charcoal. The combustion lasted nearly two minutes, when the whole phosphoric matter was consumed.

In succeeding experiments not any alteration was perceptible in the flame, or manner of burning, of the light phosphorus, either at the moment of its entrance into the mephitis, or during its continuance in it. When suddenly withdrawn, it ignited gunpowder equally well. Hence the Abbé deduces, that the mephitic gas of the Grot del Cane, however it may be utterly unfit for the respiration of animals, and for the inflammation of combustible substances, readily allows that of phosphorus which not only burns in it, but emits, as usual, luminous sparks.
THE GREAT CAVERN OF GUACHARO, IN SOUTH AMERICA.*

In a country where the people love what is marvellous, a cavern that gives birth to a river, and is inhabited by thousands of nocturnal birds, the fat of which is employed in the Missions to dress food, is an everlasting object of conversation and discussion. Scarcely has a stranger arrived at Carzana, when he is told of the stone of Araya for the eyes; of the labourer of Arenas who suckled his child; and of the CAVERN OF GUACHARO, which is said to be several leagues in length; till he is tired of hearing of them.

The Cueva del Guacharo is pierced in the vertical profile of a rock. The entrance is toward the south, and forms a vault eighty feet broad, and seventy-two feet high. The rock, that surmounts the grotto, is covered with trees of gigantic height. The mammee-tree, and the genipa with large and shining leaves, raise their branches vertically toward the sky; while those of the courbaril and the erythrina form, as they extend themselves, a thick vault of verdure. Plants of the family of bethos with succulent stems, oxalises, and orchideae of a singular structure, rise in the driest clefts of the rocks; while creeping plants, waving in the winds, are interwoven in festoons before the opening of the cavern. We distinguished in these festoons a bignonia of a violet-blue, the purple dolichos, and for the first time that magnificent clandra, the orange flower of which has a fleshy tube more than four inches long. The entrances of grottoes, like the view of cascades, derive their principal charm from the situation, more or less majestic, in which they are placed, and which in some sort determines the character of the landscape. What a contrast between the Cueva of Caripe, and those caverns of the North crowned with rocks and gloomy larch-trees!

But this luxury of vegetation embellishes not only the outside of the vault, it appears even in the vestibule of the grotto. We saw with astonishment plantain-leaved heliconias eighteen feet high, the praga palm-tree, and beautiful, arums, follow the banks of the river even to

* Abridged from the Personal Narrative of Humboldt, vol. iii.
those subterranean places. The vegetation continues in the cave of Caripe, as in those deep crevices of the Andes, half excluded from the light of day; and does not disappear, till, advancing in the interior, we reach thirty or forty paces from the entrance. We measured the way by means of a cord: and we went on about four hundred and thirty feet, without being obliged to light our torches.

Day-light penetrates into this region, because the grotto forms but one single channel, which keeps the same direction from south-east to north-west. Where the light begins to fail, we heard from afar the hoarse sounds of the nocturnal birds, sounds which the natives think belong exclusively to those subterraneous places.

The guacharo is of the size of our fowls, has the mouth of the goatsuckers and procnias, and the port of those vultures, the crooked beak of which is surrounded with stiff silk hairs. It forms a new genus, very different from the goatsucker by the force of its voice, by the considerate strength of its beak, containing a double tooth, by its feet without the membranes that unite the anterior phalanxes of the claws. In its manners it has analogies both with the goatsuckers and the alpine crow. The plumage of the guacharo is of a dark bluish-grey, mixed with small streaks and specks of black. It is difficult to form an idea of the horrible noise occasioned by thousands of these birds in the dark part of the cavern, and which can only be compared to the croaking of our crows, which in the pine forests of the north, live in society, and construct their nests upon trees the tops of which touch each other. The shrill and piercing cries of the guacharos strike upon the vaults of the rocks, and are repeated by the echo in the depth of the cavern. The Indians shewed us the nests of these birds, by fixing torches at the end of a long pole. These nests were fifty or sixty feet high above our heads, in holes in the shape of tunnels, with which the roof of the grotto is pierced like a sieve. The noise increased as we advanced, and the birds were affrighted by the light of the torches of our compatriots. When this noise ceased around us, we heard at a distance the plaintive cries of the birds roosting in other ramifications of the cavern. It seemed as if these bands answered each other alternately.
The Indians enter into the Cueva del Guacharo once a-year, near midsummer, armed with poles, by means of which they destroy the greater part of the nests. At this season several thousands of birds are killed; and the old ones, to defend their brood, hover around the heads of the savage Indians, uttering terrible cries, which would appal any heart but that of man in an untutored state.

We followed, as we continued our progress through the cavern, the banks of the small river which issued from it, and is from twenty-eight to thirty feet wide. We walked on the banks, as far as the hills formed of calcareous crustations permitted us. When the torrent winds among very high masses of stalactites, we were often obliged to descend into its bed, which is only two feet in depth. We learnt, with surprise, that this subterraneous rivulet is the origin of the river Caripe, which, at a few leagues distance, after having joined the small river of Santa Maria, is navigable for canoes. It enters into the river Aro under the name of Canno de Terezen. We found on the banks of the subterraneous rivulet a great quantity of palm-tree wood, the remains of trunks, on which the Indians climb to reach the nests hanging to the roofs of the cavern. The rings, formed by the vestiges of the old footstalks of the leaves, furnish as it were the footsteps of a ladder perpendicularly placed.

The Grotto of Caripe preserves the same direction, the same breadth, and its primitive height of sixty or seventy feet, to the distance of 1458 feet, accurately measured. I have never seen a cavern in either continent, of so uniform and regular a construction. We had great difficulty in persuading the Indians to pass beyond the outer part of the grotto, the only part which they annually visit to collect the fat. The whole authority of los padres was necessary, to induce them to advance as far as the spot where the soil rises abruptly at an inclination of sixty degrees, and where the torrent forms a small subterraneous cascade.* The natives connect mystic ideas with this cave, inhabited by nocturnal birds; they believe, that the

* We find this phenomenon of a subterranean cascade, but on much larger scale, in England, at Yordas Cave, near Kingsdale, in Yorkshire.
souls of their ancestors sojourn in the deep recesses of the cavern. "Man," say they, "should avoid places which are enlightened neither by the Sun nor by the Moon. To go and join the guacharoes, is to rejoin their father; is to die. The magicians and the poisoners perform the nocturnal tricks at the entrance of the cavern, to conjure the chief of the evil spirits.

At the point where the river forms the subterranean cascade, a hill covered with vegetation, which is opposite the opening of the grotto, presents itself in a very picturesque manner. It appears at the extremity of a straight passage, 240 toises in length. The stalactites, which descend from the vault, and which resemble columns suspended in the air, display themselves on a back-ground of verdure. The opening of the cavern appeared singularly contracted, when we saw it about the middle of the day, illumined by the vivid light reflected at once from the sky, the plants, and the rocks. The distant light of the day formed somewhat of magical contrast with the darkness that surrounded us in those vast caverns. Climbed, not without some difficulty, the small hill, where the subterraneous rivulet descends. We saw that the grotto was perceptibly contracted, retaining only forty feet in height; and that it continued stretching to the north-east, without deviating from its primitive direction which is parallel to that of the great valley of Caripe.

The missionaries, with all their authority, could not prevail on the Indians to penetrate farther into the cavern. As the vault grew lower, the cries of the guacharoes became more shrill. We were obliged to yield to the pusillanimity of our guides, and trace back our steps. We followed the course of the torrent to go out of the cavern. Before our eyes were dazzled with the light of day, we saw, without the grotto, the water of the river sparkling amid the foliage of the trees that concealed it. It was like a picture placed in the distance, and to which the mouth of the cavern served as a frame. Having at length reached the entrance, and seated ourselves on the bank of the rivulet, we rested after our fatigues. We were glad to be beyond the hoarse cries of the birds, and to leave a place where darkness does not offer even the charm of silence and tranquillity.
GRAND STAFFA CAVERN;

OR, FINGAL'S CAVE.

By far the best description of this very extraordinary feature of the most wonderful island of the Hebrides, the whole of which constitutes as singular and romantic a spot as is anywhere to be found, has been given by Sir Joseph Banks, from whose more detailed account we extract the following particulars.

Staffa, about seven miles N. N. E. of Jona, and equi-distant westward from the shores of Mull, about one mile in length, and half a mile in breadth, is noted for the basaltic pillars which support the major part of the island, and for the magnificent spectacle afforded by the Cave of Fingal, one of the most splendid works of nature.

Notwithstanding the contiguity of this island to Mull and Jona, and the numerous vessels which navigate these seas, this wonderful island was unknown to the world in general, and even to most of the neighbouring islanders, until near the close of the last century, when Sir Joseph, then on his voyage to Iceland, in consequence of information received in the Sound of Jona from some gentlemen of Mull, was induced to sail thither. It is, indeed, slightly mentioned by Buchanan; but assuredly was not equally dead to fame at the time the Norwegians had sway in these parts; for from them it derives its name of Staffa.

The basaltic pillars stand in natural colonnades, mostly above fifty feet high, in the south-western part, upon a firm basis of solid unshapen rock; above these, the stratum, which reaches to the soil of the island, varies in thickness, in proportion to the distribution of the surface into hill and valley. The pillars are of three, four, and more sides; but the number of those with five and six exceeds that of the others; one of seven sides, measured by Sir Joseph, was four feet five inches in diameter.

On the west side of Staffa is a small bay, the spot where boats usually land. In this neighbourhood occurs the first
group of pillars; they are small, and, instead of being placed upright, are recumbent on their sides, and form a segment of a circle. Further on is a small cave, above which pillars again are seen, of somewhat larger dimensions, which incline in all directions; in one place in particular, a small mass of them much resembles the ribs of a ship. Beyond the cave is the first continued range of pillars, larger than the former, and opposite to them is a small island called Bhuachaille, (pronounced Boo sha-lay) or the Herdsman's Isle, separated from the main by a channel, not many fathoms wide. The whole of this islet is composed of pillars without any strata above them; these are small, but by much the neatest formed of any in the quarter.

The first division of this islet, for at high water it is divided into two parts, makes a kind of cone, the pillars converging together towards the centre. On the other side, the pillars are in general recumbent; and in the front next the main, the beautiful manner in which they are joined is visible from their even extremities; all these have their transverse sections exact, and their surfaces smooth, but with the larger pillars the reverse is the case, and they are cracked in all directions.

The main island opposite the Boo-sha-lay, and towards the north-west, is entirely supported by ranges of pillars, pretty erect, which, although not apparently from their not being uncovered to the base, are of large diameter; at their feet is an irregular pavement, the upper sides of such as have been broken off. This tends as far under the water as the eye can reach.

In proceeding along the shore, the superb career of Fingal appears, for such is the denomination given it by the Highlanders, to whom it is known. It is supported by ranges of columns, and is roofed by the fragments of the roof a yellow stalactitic matter has extended, which precisely defines the different angles; and, the colour, tends to augment the elegance of its appearance. What adds to the grandeur of the scene, the cave is lighted from without, in such a manner, that the farthest extremity is plainly distinguished; while the within, being constantly in motion, owing to the flux and
Fingal’s Cave.

Bending Pillars at Staffa
It is perfectly dry and wholesome, and entirely exempt from the damp vapours to which natural caverns are generally subject. The following are its dimensions:

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<tr>
<th>Dimension</th>
<th>Feet</th>
<th>Inch</th>
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<tr>
<td>Length of the cave from the rock without from the pitch of the arch</td>
<td>371</td>
<td>6</td>
</tr>
<tr>
<td>Breadth of ditto at the mouth at the farther end</td>
<td>53</td>
<td>7</td>
</tr>
<tr>
<td>Height of the arch at the mouth at the end</td>
<td>117</td>
<td>6</td>
</tr>
<tr>
<td>Height of an outside pillar one at the north-west corner</td>
<td>39</td>
<td>6</td>
</tr>
<tr>
<td>Depth of water at the mouth at the extremity</td>
<td>18</td>
<td>0</td>
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The cave runs to the rock in the direction by compass N.N.E.

The mind can hardly form an idea more magnificent than such a space.—And, indeed, speaking of the general aspect of Staffa, Sir Joseph is led by his enthusiasm to make the following reflections:—"Compared to this, what are the cathedrals or the palaces built by men! mere models or playthings, imitations as diminutive as his works will always be when compared to those of nature. Where is now the boast of the architect! regularity, the only part in which he fancied himself to exceed his mistress, Nature, is here found in her possession, and here it has been left undescribed for ages. Is not this the school where the art was originally studied? And what has been added to this by the whole Grecian school? a capital to ornament the column of nature, of which they could execute a model only; and for that very capital they were obliged to a bush of Acanthus. How amply does nature repay those who study her wonderful works."

Such were his feelings, and in this way did he moralize, when, proceeding along shore, and treading, as it were, on another Giant's Causeway, he arrived at the mouth of the cave.

To the north-west are found the highest range of pillars. Here they are bare to their base, and the stratum beneath is visible, as it rises several feet above the water. The surface of it is rough, with frequent large pieces of stone.
Sticking in it, as if half immersed. The base, when broken, appears to be composed of many heterogeneous parts, and much resembles lava. Many of the floating stones are of a similar substance with the pillars, a coarse basaltic, less beautiful than that of the Giant's Causeway: the colour is a dirty brown. The whole of this stratum dips gradually to the south-east.

The thickness of the stratum of lava-like matter below the pillars, the height of the pillars, and the thickness of the superincumbent stratum at three different places westward of the mouth of the cave, beginning with the corner pillar of the cave, are described as under by Sir Joseph Banks.

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<tbody>
<tr>
<td>Height of pillars</td>
<td>54</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>Stratum above</td>
<td>61</td>
<td>0</td>
<td>51</td>
</tr>
</tbody>
</table>

The stratum above the columns is uniformly the same, consisting of numberless small pillars, bending and inclining in all directions, sometimes so irregularly, that the stones can only be said to have an inclination to assume a columnar form; in others more regularly; but never breaking into, or disturbing the stratum of large pillars, whose tops keep everywhere an uniform line. On the opposite side of the island is a cavern, called Ouatar scarf, or the Cormorant's Cave; here the stratum under the pillars is lifted up very high, and the pillars are considerably less than at the north-west side. Beyond, a bay cuts deep into the island, rendering it not more than a quarter of a mile across. On the sides of this bay, especially beyond a little valley, which almost divides the island, are two stages of small pillars, with a stratum between exactly resembling that above, formed of innumerable little pillars shaken out of their places, and leaning in all directions. Beyond this, the pillars totally cease. The rock is of a dark-brown stone, without regularity, from the bay along the south-east end of the island; which, a disposition to columnar formation is again manifested, extending from the west side, but in an irregular manner, to the bending pillars first described.
OTHER GROTTOES AND CAVERNS.

There are few countries which have not to boast of a variety of natural excavations; and these have, from their extent, structure, and the curious phenomena they exhibit, in the formation of petrifications, &c. been at all times objects of popular attention. Among those particularly deserving of notice are the following:

The volcanic country bordering on Rome is peculiarly diversified by natural cavities of great extent and coolness, on which last account it is related by Seneca, that the Romans were accustomed to erect seats in their vicinity, to enjoy their refreshing chillness in the summer season. He gives a particular account of two such grottoes belonging to the villa of Valatia; and it was in a place of this kind that Tiberius was nearly destroyed while at supper. Its roof suddenly gave way, and buried several of his attendants in its ruins; which so alarmed the others, that they fled and abandoned the emperor, with the exception of Sejanus, who, stooping on his hands and knees, and covering the body of Tiberius with his own, received all the stones which fell at that part from the roof, insomuch that, although he himself sustained considerable injury, the emperor escaped unhurt.

The grottoes of the Cevennes Mountains, in Lower Languedoc, are both numerous and extensive. The principal one is not to be explored without much precaution, and without a safe guide. The entrance, which is low and narrow, leads to a spacious amphitheatre, the petrifications hanging from the roof of which have a most splendid effect by the light of torches. Hence the visitor has to descend to several chambers, one of which is named the Chamber of the Winds; another, of Echo; another, of the Cascade; another, again, of the Statue, &c.; on account of their exhibiting these different phenomena. In the grotto of Valori, at a small distance, the different natural curiosities which are to be found at every step, may be viewed at leisure, and without apprehension, as the visitor never loses sight of the light at the entrance, and is, therefore, not under any dread of returning in safety. Here he is gratified by a view of the most singular petri-
factions, representing flowers, fruits, bee-hives, and, short, a variety of objects, in many of which the balance is nearly as accurate as if they had been sculptured.

In a wood, about five leagues from Besançon, in the province of France, called Franche Comté, an opening formed by two masses of rock, leads to a cavern more than nine hundred feet beneath the level of the country. It is in width sixty feet, and eighty feet high, at the entrance, and exhibits within side an oval cavity of one hundred and thirty-five feet in breadth, and one hundred sixty-eight in length. To the right of the entrance is a deep and narrow opening, bordered with festoons which, distilling in successive drops on the bottom of the cavern, form a mass of about thirty feet in diameter. Similar one, but somewhat smaller, produced by the water which drips in less abundance from the imperceptible fissures in the roof, is seen on the left. The ground of the cavern is perfectly smooth, and covered with ice eighteen inches thick; but the top, on the outside, is a dry stony soil, covered with trees, and on a level with the rest of the wood. The cold within this cavern is so great that, however warm the external atmosphere may be the time it is visited, it is impossible to remain in it for continuance.

These natural ice-houses are not unfrequent in France and Italy, and supply this agreeable luxury at a very cheap rate. Thus, in the same province, in the vicinity of Vesoul, is a cavern which, in the hot season when it is eagerly sought, produce more ice in one day than can be carried away in eight. It measures thirty-five feet in length and in width sixty. The large masses of ice which depend from the roof, have a very pleasing effect. When mists are observed in this cavern, they are regarded by the neighbouring peasantry as infallible prognostics of rain and it is worthy of observation, that although the water of the interior is always frozen in the summer, it becomes liquid in the winter season.

A grotto near Douse, also in Franche Comté, forms a similar ice-house, and is remarkable on account of various forms of its congelations, which represent a series of columns, sustaining a curious vault, which appear to be carved with figures of men, animals, trees, &c.
The caverns of Gibraltar are numerous, and several of them of a great extent. The one more particularly deserving attention is called St. Michael's Cave, situated on the southern part of the mountain. Its entrance is one thousand feet above the level of the sea, and is formed by a rapid slope of earth, which has fallen in at various periods, and which leads to a spacious hall, incrusted with spar, and apparently supported in the centre by a large stalactical pillar. To this succeeds a long series of caves, of difficult access. The passages leading from the one to the other are over precipices, which cannot be passed without the aid of ropes and scaling ladders. Several of these caves are three hundred feet beneath the upper one; but at this depth the smoke of the torches carried by the guides becomes so disagreeable, that the visitor is obliged reluctantly to give up the pursuit, and leave other caves unexplored. In these cavernous recesses, the process and formation of the stalactites is to be traced, from the flimsy quill-like cone suspended from the roof, to the robust trunk of a pillar, three feet in diameter, which rises from the floor, and seems intended by nature to support the roof from which it originated.

The variety of forms which this matter takes in its different situations and directions, renders this subterraneous scenery strikingly grotesque, and in some places beautifully picturesque. The stalactites of these caves, when near the surface of the mountain, are of a brownish yellow colour; but, in descending towards the lower caves, they lose the darkness of their colour, which is by degrees shaded off to a pale yellow. Fragments are broken off, and, when wrought into different forms, and polished, are beautifully streaked and marbled.

About seven English miles from Adlersberg, in Carniola, is a remarkable cavern, named St. Magdalen's Cave. The road being covered with stones and bushes, is very painful; but the great fatigue it occasions is overbalanced by the satisfaction of seeing so extraordinary a cavern. The visitor first descends into a hole, where the earth appears to have fallen in for ten paces, when he reaches the entrance, which resembles a fissure caused by an earthquake, in a huge rock. The torches are here lighted, the cave being extremely dark. This wonderful natural exca-
Subterraneous Wonders.

The vast number of pillars by which it is ornamented give it a superb appearance, and are extremely beautiful: they are as white as snow, and have a superb transparent lustre. The bottom is of the same material insomuch that the visitor may fancy he is walking beneath the ruins of some stately palace, amid noble pillars and columns, partly mutilated, and partly entire. Sprung icicles are everywhere seen suspended from the roofs of some places resembling wax tapers, which, from their diant whiteness, appear extremely beautiful. All the convenience here arises from the inequality of the surface which may make the spectator stumble while he is contemplating the beauties above and around him.

In the neighbourhood of the village of Szeltze, Upper Hungary, there is a very singular excavation. The adjacent country is hilly, and abounds with woods, the being cold and penetrating. The entrance into this cavern, fronting the south, is upwards of one hundred feet in height, and forty-eight in breadth, consequently sufficiently wide to receive the south wind, which here generally blows with great violence; but the subterraneous passages, which consist entirely of solid rock, winding round, stretch so farther to the south. As far as they have been explored, their height has been found to be three hundred feet, and their breadth about one hundred and fifty. The most inexplicable singularity, however, is, that in the midst of winter the air in this cavern is warm; and when the sun without is scarcely supportable, the cold within is not only very piercing, but so intense, that the roof covered with icicles of the size of a large cask, which spreading into ramifications, form very grotesque figures. When the snow melts in spring, the inside of the cavern where its surface is exposed to the south sun, emits pellucid water, which congeals instantly as it drops, thus forms the above icicles: even the water which from them on the sandy ground, freezes in an instant. Is observed, that the greater the heat is without, the more intense is the cold within; so that, in the dog-days, part of this cavern is covered with ice. In autumn, when the nights become cold, the ice begins to dissolve, much that, when the winter sets in, it is no longer
seen: the cavern then is perfectly dry, and has a mild warmth. It is, therefore, not surprising that swarms of flies, knats, bats, owls, and even great numbers of foxes and hares, resort thither, as to their winter retreat, and remain there until the return of spring.

THE YANAR,

OR PERPETUAL FIRE.

Captain Beaufort, of the Royal Navy, F. R. S. among the interesting details of his late survey of Karamania, or the South coast of Asia Minor, describes this curious phenomenon; and from his account the following particulars are extracted, as supplementary to the ample details of volcanoes already given.

Having perceived during the night a small but steady light among the hills, this was represented by the inhabitants as a yanar, or volcanic light; and on the following morning curiosity led him to visit the spot. In the inner corner of a ruined building he came to a wall, so undermined as to leave an aperture of about three feet in diameter, and shaped like the mouth of an oven. From this aperture the flame issued, giving out an intense heat, but without producing any smoke on the wall; and although several small lumps of caked soot were detached from the neck of the opening, the walls were scarcely discoloured. Trees, brushwood, and weeds, grew close around this little crater; a small stream trickled down the hill in its vicinity; and the ground did not appear to feel the effect of its heat at more than a few yards distance. Not any volcanic productions were to be perceived near to it; but at a short distance, lower down on the side of the hill, was another hole or aperture, which had apparently been at some remote period the vent of a similar flame. It was asserted, however, by the guide, that, in the memory of the present race of inhabitants, there had been but one such volcanic opening, and that its size and appearance had been constantly the same. He added, that it was never accompanied by earthquakes or noises; and that it did not eject either stones, smoke, or noxious vapours; but that its brilliant and perpetual flame could not be quenched by any quan-
quantity of water. At this flame, he observed, the shepherds were in the habit of cooking their food.

This phenomenon appears to Captain Beaufort to have existed for many ages, and he is persuaded that it is the spot to which Pliny alludes in the following passage:—

"Mount Chimæra, near Phaselis, emits an unceasing flame, which burns day and night." Within a short distance is the great mountain of Takhtalu, the naked summit of which rises, in an insulated peak, 7800 feet above the level of the sea. In the month of August a few streaks of snow were still discernible on the peak; but many of the distant mountains of the interior were completely white for nearly a fourth down their sides. It may hence be inferred, that the elevation of this part of Mount Taurus is not less than 10,000 feet, which is equal to that of Mount Etna.

Such a striking feature as this stupendous mountain, in a country inhabited by an illiterate and credulous people, cannot fail to have been the subject of numerous tales and traditions." Accordingly, the Captain was informed by the peasants, that there is a perpetual flow of the purest water from the very apex; and that, notwithstanding the snow which was still lingering in the chasms, roses blew there all the year round. He was assured by the Agha of Delikח, that every autumn a midnight groan is heard to issue from the summit of the mountain, louder than the report of any cannon, but unaccompanied by fire or smoke. He professed his ignorance of the cause; but on being pressed for his opinion, gravely replied, that he believed it was an annual summons to the elect, to make the best of their way to Paradise. However amusing this theory may have been, it may possibly be true that such explosions take place. The mountain artillery described by Captains Lewis and Clarke, in their travels in North America, and similar phenomena which are said to have occurred in South America, seem to lend some probability to the account. The natives have also a tradition, that, when Moses fled from Egypt, he took up his abode near this mountain, which was therefore named Moossa-Dagby, or the mountain of Moses. Between this story, and the Yanar, as it has been described above, may there not have been some fanciful connection? The site of this volcanic opening, at an inconsiderable distance from the mountain; and the
name issuing from the thicket which surrounds it, may have led to some confused association with the burning-bush, on Mount Horeb, recorded in Exodus.

HERCULANEUM.

This city was, together with Pompeii and Stabia, involved in the common ruin occasioned by the dreadful eruption of Vesuvius, in the reign of Titus, already described. It was situated on a point of land stretching into the Gulf of Naples, about two miles distant from that city, near where the modern towns of Portici and Resini, and the Royal Palace, by which they are separated, now stand. The neck of land on which it was built, and which has since disappeared, formed a small harbour. Hence the appellation of Herculis Porticum, the small haven of Hercules, sometimes given to Herculaneum, and thence, in all probability, the modern name of Portici. The latter being situated immediately above some of the excavations of Herculaneum, the just fear of endangering its safety, by undermining it, is given as a principal reason why so little progress has been made in the Herculanean researches.

The discovery of Herculaneum is thus explained. At an inconsiderable distance from the Royal Palace of Portici, and close to the sea side, Prince Elbeuf, in the beginning of the last century, inhabited an elegant villa. To obtain a supply of water, a well was dug, in the year 1730, through the deep crust of lava on which the mansion itself had been reared. The labourers, after having completely pierced through the lava, which was of a considerable depth, came to a stratum of dry mud. This event precisely agrees with the tradition relative to Herculaneum, that it was in the first instance overwhelmed by a stratum of hot mud, which was immediately followed by a wide stream of lava. Whether this mud was thrown up from Vesuvius, or formed by torrents of rain, does not appear to have been decided. Within the stratum the workmen found three female statues, which were sent to Vienna.

It was not until some years after that the researches at Herculaneum were seriously and systematically pursued. By continuing Elbeuf's well, the excavators at once came to the theatre, and from that spot carried on their further sub
The condition of Herculaneum was at that time much more interesting, and more worthy the notice of the traveller, than it is at present. The object of its excavation having unfortunately been confined to the discovery of statues, paintings, and other curiosities, and not carried on with a view to lay open the city, and thus to ascertain the features of its buildings and streets, most of the latter were again filled up with rubbish as soon as they were divested of every thing moveable. The marble even was torn from the walls of the temples. Herculaneum must therefore be said to have been overwhelmed a second time by its modern discoverers; and the appearance it previously presented, can now only be ascertained from the accounts of those who saw it in a more perfect state. Agreeably to them, it must at that time have afforded a very interesting spectacle.

The theatre was one of the most perfect specimens of ancient architecture. It had, from the floor upwards, eighteen rows of seats, and above these, three other rows, which, being covered with a portico, seem to have been intended for the female part of the audience, to screen them from the rays of the sun. It was capable of containing between three and four thousand persons. Nearly the whole of its surface was, as well as the arched walks which led to the seats, cased with marble. The area, or pit, was floored with thick squares of giallo antico, a beautiful marble of a yellowish hue. On the top stood a group of four bronze horses, drawing a car, with a charioteer, all of exquisite workmanship. The pedestal of white marble is still to be seen in its place; but the group itself had been crushed and broken in pieces by the immense weight of lava which fell on it. The fragments having been collected, might easily have been brought together again, but having been carelessly thrown into a corner, a part of them were stolen, and another portion fused, and converted into busts of their Neapolitan Majesties. At length, it was resolved to make the best use of what remained, that is, to convert the four horses into one, by taking a fore leg of one of them, a hinder leg of another, the head of a third, and, where the breach was irretrievable, to cast a new piece. To this contrivance the bronze horse in the court yard of the Museum of Portici owes its existence; and
Considering its patchwork origin, still conveys a high idea of the skill of the ancient artist.

In the forum, which was contiguous to the theatre, beside a number of inscriptions, columns, &c. two beautiful equestrian statues of the Balbi family were found. These are of white marble, and are deposited in the hall of the left wing of the Palace at Portici.

Adjoining to the forum stood the temple of Hercules, an elegant rotunda, the interior of which was decorated with a variety of paintings, such as Theseus returning from his Cretan adventure with the Minotaur; the birth of Telephus; Chiron the centaur instructing Achilles, &c. These were carefully separated from the walls, and are deposited in the museum.

The most important discovery, however, was that of a villa, at a small distance from the forum; not only on account of the peculiarity of its plan, but because the greater number of the works of art were dug out of its precinct; and more especially because it contained a library consisting of more than fifteen hundred volumes, which are likewise safely deposited in the museum, and which, were they legible, would form a great classic treasure. These will be considered under the head of Papyri.

The villa is conjectured to have belonged to one of the Balbi family. Although elegant, it was small, and consisted of a ground-floor only, like those of Pompeii. Beside a number of small closets round an interior hall, it contained a bathing-room, curiously fitted up with marble and water-tiles, and a chapel of a diminutive size, without any window or aperture for day-light, the walls of which were filled with serpents, and within which a bronze tripod, bespattered with cinders and ashes, was found standing on the floor.

The apartment which contained the library was fitted up with wooden presses around the walls, about six feet in height; a double row of presses stood insulated in the middle of the room, so as to admit a free passage on every side. The wood of which the presses had been made, was burned to a cinder, and gave way at the first touch; but the volumes, composed of a much more perishable substance, the Egyptian or Syracusan papyrus, were, although completely carbonized through the effect of the heat, still so far pre-
served as to admit of their removal to a similar set of modern presses, provided, however, with glass doors, in the museum.

In the middle of the garden belonging to this villa, was a basin nearly of the size and form of the one in the Greek Park, having its edges faced with stone, and the two narrow ends rounded off in a semicircular form. This piece of water was surrounded by beds or *parterres* of various shapes and the garden was on every side enclosed by a covered walk, supported by columns. Of these columns there were sixty-four, ten for each of the shorter, and twenty-two for each of the longer sides of the quadrangle: they were made of brick, neatly stuccoed over, exactly similar to those in the Pompeian barracks. Each pillar supported one end of a wooden beam, the other extremity of which rested on the garden wall, thus forming an arbour, in all probability planted with vines, around the whole garden. Under this covered walk several semicircular recesses, which appear to have served as bathing-places, were built. The spaces between the pillars were decorated with marble busts and bronze statues, alternately arranged.

This garden was surrounded by a narrow ditch; and another covered walk, of a considerable length, led to a circular balcony, or platform, the ascent to which was by four steps, but which overhung the sea about fifteen feet. The floor of the balcony consisted of the very beautiful tessellated pavement, which now serves as the floor of one of the rooms of the Portici museum. From this charming spot the prospect over the whole Bay of Naples, including the mountains of Sorrento, the Island of Capri, and Mount Posilipo, must have been delightful.

**Pompeii.**

A great and rich town, which, after lying eighteen centuries in a deep grave, is again shone on by the sun, stands amidst other cities, as much a stranger as any of its former inhabitants would be among his descendants of the present day—such a town has not its equal in the world.

The distance from Naples to Pompeii is little more than
Near the Torre dell' Annunziata, to the left, and amid hills planted with vineyards, the town itself, which, throwing off its shroud of ashes, came forth from its grave, breaks on the view. The buildings are without roofs, which are supposed to have been destroyed by an enemy in an unguarded state, or torn off by a hurricane. The tracks of the wheels which anciently rolled over the pavement are still visible. An elevated path runs by the side of the houses, for foot-passengers; and, to enable them in rainy weather to pass more commodiously to the opposite side, large flat stones, three of which take up the width of the road, were laid at a distance from each other. As the carriages, in order to avoid these stones, were obliged to use the intermediate spaces, the tracks of the wheels are there most visible. The whole of the pavement is in good condition: it consists merely of considerable pieces of lava, which, however, are not cut, as at the present, into squares, and may have been on that account the more durable.

The part which was first cleared, is supposed to have been the main street of Pompeii; but this is much to be doubted, as the houses on both sides, with the exception of a few, were evidently the habitations of common citizens, and were small, and provided with booths. The street itself likewise is narrow: two carriages only could go abreast; and it is very uncertain whether it ran through the whole of the town; for, from the spot where the moderns discontinued digging, to that where they recommenced, and where the same street is supposed to have been again found, a wide tract is covered with vineyards, which may very well occupy the place of the most splendid streets and markets, still concealed underneath.

Among the objects which attract a particular attention, is a booth in which liquors were sold, and the marble table within which bears the marks of the cups left by the drinkers. Next to this is a house, the threshold of which is inlaid with a salutation of black stone, as a token of hospitality. On entering the habitations, the visitor is struck by the strangeness of their construction. The middle of the house forms a square, something like the cross passages of a cloister, often surrounded by pillars: it is cleanly, and paved with party-coloured mosaic, which has an agreeable
effect. In the middle is a cooling well; and on each side a little chamber, about ten or twelve feet square, but left and painted with a fine red or yellow. The floor is a mosaic; and the door is made generally to serve as a window, there being but one apartment which receives light through a thick blue glass. Many of these rooms are supposed to have been bed-chambers, because there is an elevated broad step, on which the bed may have stood and because some of the pictures appear most appropriate to a sleeping-room. Others are supposed to have dressing-rooms, on this account, that on the walls is described, decorated by the Graces, added to which little flasks and boxes of various descriptions have been found in them. The larger of these apartments serve for dining-rooms, and in some are to be met with suitable accommodations for cold and hot baths.

The manner in which a whole room was heated, is particularly curious. Against the usual wall a second wall was erected, standing at a little distance from the first. This purpose large square tiles were taken, having, like other tiles, a sort of hook, so that they kept the first wall as well as were off from them; a hollow space was thus left around, from the top to the bottom, into which pipes were introduced, that carried the warmth into the chamber, as it were rendered the whole of the place one stove. The ancients were also attentive to avoid the vapour or smoke from their lamps. In some houses there is a niche made in the wall for the lamp, with a little chimney in the form of a funnel, through which the smoke ascended. Opposite to the house-door the largest room is placed: it is proper a sort of hall, for it has only three walls, being quite open in the fore part. The side rooms have no connection with each other, but are divided off like the cells of monks, the door of each leading to a fountain.

Most of the houses consist of one such square, surrounded by rooms. In a few, some decayed steps seem to have led to an upper story, which is no longer in existence. Some habitations, however, probably belonging to the richer and more fashionable, are far more spacious. In these, a first court is often connected with a second, and even with a third, by passages: in other respects their arrangements are pretty similar to those above described.
Many garlands of flowers and vine-branches, and many handsome pictures, are still to be seen on the walls. The guides were formerly permitted to sprinkle these pictures with fresh water, in the presence of travellers, and thus revive their former splendour for a moment; but this is now strictly forbidden; and, indeed, not without reason, since the frequent watering might at length totally rot away the wall.

One of the houses belonged to a statuary, whose workshop is still full of the vestiges of his art. Another appears to have been inhabited by a surgeon, whose profession is equally evident from the instruments discovered in his chamber. A large country-house near the gate undoubtedly belonged to a very wealthy man, and would, in fact, still invite inhabitants within its walls. It is very extensive, stands against a hill, and has many stories. Its finely-decorated rooms are unusually spacious; and it has airy terraces, from which you look down into a pretty garden, that has been now again planted with flowers. In the middle of this garden is a large fish-pond, and near that an ascent from which, on two sides, six pillars descend. The hinder pillars are the highest, the middle somewhat lower, and the front the lowest: they appear, therefore, rather to have propped a sloping roof, than to have been destined for an arbour. A covered passage, resting on pillars, incloses the garden on three sides; it was painted, and probably served in rainy weather as an agreeable walk. Beneath is a fine arched cellar, which receives air and light by several openings from without; consequently its atmosphere is so pure, that in the hottest part of summer it is always refreshing. A number of amphorae, or large wine-vessels, are to be seen here, still leaning against the wall, as the butler left them when he fetched up the last goblet of wine for his master. Had the inhabitants of Pompeii preserved these vessels with stoppers, wine might still have been found in them; but as it was, the stream of ashes rushing in, of course forced out the wine. More than twenty human skeletons of fugitives, who thought to save themselves here under ground, but suffered a tenfold more cruel death than those who were in the open air, were found within this
The destiny of the Pompeians must have been dreadful. It was not a stream of fire which encompassed their abodes; they could then have sought refuge in flight. Neither did an earthquake swallow them up; sudden suffocation would then have spared them the pangs of a lingering death. A rain of ashes buried them alive by degrees. We will read the delineation of Pliny:—"A darkness suddenly overspread the country; not like the darkness of a moonless night; but like that of a closed room, in which the light is on a sudden extinguished. Women screamed; children moaned, men cried. Here, children were anxiously calling their parents; and there, parents were seeking their children, or husbands their wives; all recognizing each other only by their cries. The former lamented their own fate, and the latter that of those dearest to them. Many wished for death, from the fear of dying. Many called on the gods for assistance: others despaired of the existence of the gods, and thought this the last eternal night of the world. Actual dangers were magnified by unreal horrors. The earth continued to shake, and men, half distracted, to reel about, exaggerating their own fears, and those of others, by terrifying predictions."

Such is the frightful but true picture which Pliny gives us of the horrors of those who were, however, far from the extremity of their misery. But what must have been the feelings of the Pompeians, when the roaring of the mountain, and the quaking of the earth, awaked them from their first sleep? They also attempted to escape the wrath of the gods; and, seizing the most valuable thing they could lay their hands upon in the darkness and confusion, to seek their safety in flight. In this street, and at the front of the house marked with the friendly salutation of its threshold, seven skeletons were found: the first carried a lamp, and the rest had still between the bones of their fingers something that they wished to save. On a window-sill they were overtaken by the storm which descended from heaven, and buried in the grave thus made for them. Before the above-mentioned country-house was still a skeleton, standing with a dish in his hand; and, as he wore on his finger one of those rings which were allowed to be worn by Roman knights only, he is supposed to have been the master of the house, who had just opened
back-garden gate with the intent of flying, when the shower overwhelmed him. Several skeletons were found in the very posture in which they had breathed their last, without having been forced by the agonies of death to drop the things they had in their hands. This leads to a conjecture, that the thick mass of ashes must have come down all at once, in such immense quantities as instantly to cover them. It cannot otherwise be imagined how the fugitives could all have been fixed, as it were by a charm, in their position; and in this manner their destiny was the less dreadful, seeing that death suddenly converted them into motionless statues, and thus was stripped of all the horrors with which the fears of the sufferers had clothed him in imagination. But what then must have been the pitiable condition of those who had taken refuge in the buildings and cellars? Buried in the thickest darkness, they were secluded from every thing but lingering torment; and who can paint to himself without shuddering, a slow dissolution approaching, amid all the agonies of body and of mind? The soul recoils from the contemplation of such images.

To proceed now to the public edifices. The temple of Isis is still standing, with its Doric pillars, and its walls painted with emblems of the service of the deity, such as the hippopotamus, cocoa-blossom, ibis, &c. The sacred vessels, lamps, and tables of Isis are still to be seen. From a little chapel within, a poisonous vapour is said to have formerly arisen, which the heathen priests may have used for every species of deception. This vapour is said to have increased after the violent eruption of Vesuvius; but has not latterly given out the slightest smell.

A small Grecian temple, of which only two pillars remain, had been probably already destroyed by an earthquake which, in the reign of Titus, preceded the dreadful irruption of the Volcano.—On the opposite side of this temple there is still an edifice named the quarter of the soldiers, because all sorts of arms, pictures of soldiers, and a skeleton in chains, were found there. By others it has been considered as the forum of Pompeii.

Two theatres, the smaller one particularly, are in an excellent state of preservation. The structure of this one is such as was usually adopted by the ancients, and is well deserving of modern imitation, as it affords the spectators
commodious seats, a free view of the stage, and facility of hearing. Although sufficiently large to contain two thousand persons, the plebeians, standing in a broad gallery at the top, were quite as able to see all that was passing on the stage as the magistrate in his marble balcony. In this gallery the arrangements for spreading the sail-cloth over the spectators are still visible.—The stage itself is very broad, as it has no side walls; and appears less deep than it really is. A wall runs across it, and cuts off just as much room as is necessary for the accommodation of the performers. But this wall has three very broad doors; the middle one is distinguished by its height, and the space behind it is still deeper than in front. If these doors, as may be conjectured, always stood open, the stage was in fact large, and afforded besides the advantage of being able to display a double scenery: if, for example, the scene in front was that of a street, there might have been behind a free prospect into the open field.

The cemetery lies before the gate of the high road. The tomb of the priestess Mammea is very remarkable: it was erected, according to the epitaph, by virtue of a decree of the Decemvirs. In the midst of little boxes of stone, in square piles, and on a sort of altar, the family urns were placed in niches; and without these piles the broken masks are still to be seen. In front of the cemetery, by the road side, is a beautiful seat, forming a semicircle, which will contain twenty or thirty persons. It was probably overshadowed by trees eighteen hundred years ago; under which the women of Pompeii sat in the cool evenings, while their children played before them, and viewed the crowds which were passing through the gate.

To the above particulars from the pen of the elegant and lively Kotzebue, the following details, given by a late very accurate traveller, are subjoined.

The entrance into Pompeii is by a quadrangular court nearly of the size of the railed part of our Leicester Square. This court is surrounded on every side by a colonnade which supports the roof of a gallery; and the latter leads to several small apartments, not unlike the cells of a prison. The columns are of brick, stuccoed over, and painted of a deep red: they are in height from ten to twelve feet; are placed at about a like distance from each other; and are of the
High Street of Pompeii.

Temple of Isis, Pompeii.
Fornelli. 141

Doric order, fluted two thirds from the top, and well proportioned. After a variety of conjectures relative to the purpose to which this building was applied, it has been ascertained that it was either a barrack for soldiers, (various pieces of armour having been found in some of the cells) or the Praetorium of the Governor, where a body of military must have been stationed. Adjacent to it stood the theatres, the forum, and one or two temples, all connected by very neat and well-paved courts.

The smaller of the theatres is to the right, and is called the covered theatre, because it was so constructed, that, by the means of canvas awnings, the spectators were defended from the sun and rain. A door through the wall leads to the different galleries, and to the open space in the centre, resembling the pit of a modern theatre. The interior is beautifully neat; and, with the exception of the spoliating of the marble slabs, removed to the Palace at Portici, with which the whole of the inside, not excepting the seats, had been covered, in excellent preservation. On each side are the seats for the magistrates; the orchestra, as in modern theatres, is in front of the stage; and the latter, with its brick wings, is very shallow. This theatre was calculated to contain about two thousand spectators.

From its level a staircase leads to an eminence on which several public buildings are situated. The most conspicuous of these is a small temple said to have been dedicated to Isis, and having a secret passage, perforated in two places, whence the priests are supposed to have delivered to the deluded multitude the oracles of that deity.

Within a paved court is an altar, of a round shape, on the one side, and on the other side a well. A cistern, with four apertures, was placed at a small distance, to facilitate the procuring of water. In this court, sacrifices and other holy rites are conjectured to have taken place, various utensils for sacrifice, such as lamps, tripods, &c. having been found, when the place was first excavated. One of the tripods is of most admirable workmanship. On each of the three legs, a beautiful sphinx, with an unusual head-dress, is placed, probably in allusion to the hidden meanings of the oracles which were delivered in the above-mentioned temple. The hoop in which the basin for the coals was banked, is elegantly decorated with rams' heads, connected
by garlands of flowers; and within the basin, which is filled with baked earth, the very cinders left from the last sacrifice (nearly two thousand years ago,) are seen as fresh as if they had been the remains of yesterday's fire!

From the above court, you enter another somewhat larger, with a stone pulpit in the centre, and stone seats near the walls. This spot, therefore, was either the auditory of the philosopher, or the place where the public orators pleaded in presence of the people. Every thing here is in the highest order and preservation.

The great amphitheatre proudly rears its walls over every other edifice on the same elevated spot. It is a stupendous structure, and has twenty-four rows of seats, the circumference of the lowest of which is about 750 feet. It is estimated to have contained about 30,000 spectators. The upper walls are much injured, having partially projected above ground long before the discovery of Pompeii.

A corn-field leads to the excavated upper end of the street, which consists of a narrow road for carts, with pavements on each side. The middle is paved with blocks of marble, and the ruts of the wheels proclaim antiquity, even at the time of its being overwhelmed. The foot-paths are elevated about a foot and a half from the level of the carriage-road. The houses on each side, whether shops or private buildings, have not any claim to external elegance: they consist of a ground-floor only, and, with the exception of the door, have not any opening towards the street. The windows of the private houses look into an inner square court, and are in general very high. Each house, which probably served as a drawing-room, is low and diminutive. In point of decoration they are simple and, in many instances, elegant: the floors generally consist of figured pavements, either in larger stones of various colours, regularly cut and symmetrically disposed, or formed of a beautiful mosaic, with a fanciful border, an animal or figure in the centre. The geometrical lines of figures in the design of the borders, have an endless variety of the most pleasing shapes, to display the fancy and imagination of the artists. Their tesselated pavements alone must convince us that the ancients were well skilled in geometry. The ground is usually white, and the
THE MUSEUM AT PORTICI.

The walls of the apartments are equally, if not still more deserving attention. They are painted, either in compartments, exhibiting some mythological or historical event, or simply coloured over with a light ground, adorned with a border, and perhaps an elegant little vignette, in the centre, or at equal distances. But few of the historical paintings now exist in Pompeii; for wherever a wall was found to contain a tolerable picture, it was removed and deposited in the museum at Portici. To effect this, the greatest care and ingenuity were required, so as to peel off, by the means of sawing pieces of wall, twenty and more square feet in extent, without destroying the picture. This, however, was not a modern invention; for, among the excavated remains of Stabiae, the workmen came to an apartment containing paintings which had been separated by the ancients themselves from a wall, with the obvious intent of their being introduced in another place. This was, however, prevented by the ruin of the city; and the paintings, therefore, were found leaning against the wall of the apartment.

Another excavated portion of Pompeii is likewise part of a street, and, being perfectly in a line with the one already described, is conjectured to be a continuation, or rather the extremity of the latter; in which case, Pompeii must have been a city of considerable importance, and its main street nearly a mile in length. The houses here, as in the other instance, are distributed into shops and private dwellings, some of the latter of which are distinguished by the remains of former internal elegance, such as tesselated pavements, painted walls, &c; most of them have likewise an interior court, surrounded by apartments.

THE MUSEUM AT PORTICI.

The best statues, busts, vases, and, in short, whatever was supposed, from its materials or construction, to have a superior value, were packed in fifty-two chests, and conveyed to Palermo, at the time the court sought refuge in that city, on the French penetrating into the Neapolitan
territory. What still remains, however, in the Museum has a high intrinsic value; since who can behold, with the strongest emotions of admiration, the relics of the most transitory things, which, for nearly eighteen hundred years, have braved the ravages of time? Here are seen bread, corn, dough which was about to be placed in the oven, soap which had been used for washing, figs, even egg-shells perfectly white, and in as good a state as the cook had broken them an hour before. Here a kitchen presents itself provided with every thing requisite: bread and pots stand on the hearth; stew-pans hang on the wall; skimmers and tongs are placed in the corner; and a mortar rests on the shaft of a pillar. Weights, hammer, scythes, and other utensils of husbandry, are here blended with helms and arms. Sacrificing bowls and knives, a number of well-shaped glasses; large and small bottles; lamps; vases; decorations for furniture; a piece of cloth; nets; and even shoe-soles; all sorts of ornaments, — necklaces, rings, and ear-rings; a wooden chess-board, reduced, indeed, to a cinder: all these things are more or less injured by the fire; but still are distinguishable at first sight.

Every apartment of the museum is laid with the most charming antique floors, which are partly mosaic, partly marble, from Herculanenum. Statues, vases, busts, chandeliers, altars, tables of marble, bronze, are all in as good a state as if they had just come from the hands of the artist. The coins which have been collected are very numerous, and fill several cases. Dallions of marble, containing on each side a bas-relief, are suspended by fine chains from the ceiling of one of the apartments, and are within the reach of the hand, so as to be conveniently turned and examined.

Most of the pictures found at Herculanenum, Pompeii, and Stabiae, and now deposited in the museum, have been sawed from the walls of the edifices they adorned. The unique relics of ancient art form an extensive gallery of genuine antique pictures, the only one in the world. They may, on that account alone, be considered as an incomparable treasure. They are placed in a range of apartments on the ground-floor, and are suspended against the wall in plain frames. Their size varies from a foot square.
whole-length groups, nearly as large as life. Beside the injury they have sustained by having been exposed to the heat of burning cinders, they have been impaired by the modern varnish which was intended to protect them: it would, therefore, not be right to subject their colouring to the rigid rules of art; but the grouping of the Minotaur, of the Telephus, of the sitting Orestes, and of the Bacchus and Ariadne, is admirable. In their paintings, as well as in their sculptures, the ancients were influenced by that love of simplicity which distinguishes their works from those of the moderns, and the result is, that in them the chief merits of composition are combined,—unity of subject, and unity of interest. When, again, it is considered, that the paintings collected in the museum at Portici were taken from provincial towns, "it must be inferred, that those which were admired in the chief seats of art corresponded in excellence with the Laocoon and the Apollo. Such was the judgment of the ancients themselves, and their taste is not to be disputed.

The museum at Portici excels all others in ancient bronze,—a substance which, although dearer, more difficult to be wrought, more inviting to the rude grasp of avarice, and less beautiful than marble, forms the greater proportion of the statues. The larger of them had been originally composed of pieces connected by dove-tail joints; and these promiscuous fragments have been recompiled into new figures, as in the instance of the single horse made from four, in the centre of the court-yard of the museum. Those fragments which had escaped fusion, were rent, inflated, or bruised, by the burning lava. In addition to these misfortunes, they have been made up unhappily; for the eye of an artist can sometimes detect two styles of art, evidently different, the large and the exquisite, soldered together in the same statue. The figures most admired are, the drunken Faun, the sleeping Faun; the sitting Mercury; the Amazon adjusting her robe; and an Augustus and a Claudius, both of heroic size.

The most remarkable objects in the museum at Portici, are the manuscripts, found in two chambers of a house at Herculaneum. Although they have been so frequently described, they must be seen, to furnish a correct idea of them. Before they are devolved, they resemble sticks of
charcoal, or cudgels reduced to the state of a cinder, and petrified. They are black and chesnut-brown; and are unfortunately so decayed, that under each of them, as they are in glass cases, a quantity of dust and detached fragments may be perceived. Their characters are legible in a certain light only, by a gloss and relief which distinguish the faint or rather black paint, from the tinder. Cut, crumbled on the edge, and caked by the sap remaining, the leaves of the papyrus, they require in the operator great sagacity to meet the variety of the injuries they have received; since, in gluing rashly the more delicate parts, one might reach the heart of a volume, while working at the outside. At first, it appeared almost impracticable ever to decipher a syllable of them; but to the industry and talent of man nothing is impossible, and his curiosity impels him to the most ingenious inventions.

As the preservation of the subterraneous cities of Herculaneum and Pompeii was owing to a natural cause, that of a dreadful eruption of Vesuvius in the seventy-ninth year of the Christian era, the details relative to these cities, and the interesting results to which their discovery has led, have been introduced among the class of natural wonders now under consideration.

**EARTHQUAKES.**

"He looketh on the earth, and it trembleth: he toucheth the hills, and they smoke."

Towers, temples, palaces,
Flung from their deep foundations, roof on roof
Crushed horrible, and pile on pile o'erturned;
Fall total.

The globe around earth's hollow surface shakes,
And is the ceiling of her sleeping sons.
O'er devastation we blind revels keep;
Whose buried towns support the dancer's heel.

That fires to a very great extent, and produced by various causes, exist at different depths beneath the surface of the earth, must be evident to those who have attentively perused what has been given under the head of Volcanoes.
and recent experiments have shown, that, where the substances in which such fires occur, lie at a considerable depth, and are surmounted by a very deep and heavy superincumbent pressure, more especially when they contain large portions of elastic gases, the effects of such fires will be much greater, and more diversified, than where these circumstances are absent.

Among the most powerful and extraordinary of these effects earthquakes are to be reckoned. They are unquestionably the most dreadful of the phenomena of nature, and are not confined to those countries which, from the influence of climate, their vicinity to volcanic mountains, or any other similar cause, have been considered as more particularly subject to them, their effects having oft been felt in the British isles, although not in so extensive and calamitous a degree. Their shocks, and the eruptions of volcanoes, have been considered as modifications of the effects of one common cause; and where the agitation produced by an earthquake extends farther than there is reason to suspect a subterraneous commotion, it is probably propagated through the earth nearly in the same manner as a noise is conveyed through the air. The different hypotheses which have been imagined on this subject may be reduced to the following:

Some naturalists have ascribed earthquakes to water, others to fire, and others, again, to air; each of these powerful agents being supposed to operate in the bowels of the earth, which they assert to abound every where with huge subterraneous caverns, veins, and canals, some filled with water, others with gaseous exhalations, and others replete with various substances, such as nitre, sulphur, bitumen, and vitriol. Each of these opinions has its advocates, who have written copiously on the subject.

In a paper published in the Philosophical Transactions, Dr. Lister ascribes earthquakes, as well as thunder and lightning, to the inflammable breath of the pyrites, a substance, he supposes, in a world, as Pliny had observed before him, he supposed it to be nothing more than subterraneous fire, which continually raises the water from the abyss, or great reservoir, in the centre of the earth, for the supply...
of dew, rain, springs, and rivers, being diverted from its ordinary course by some accidental obstruction in the part through which it used to ascend to the surface, becomes by such means, preternaturally assembled, in a greater quantity than usual, in one place, and thus causes a fermentation and intumescence of the water of the abyss, throwing it into greater commotions, and at the same time making the like effort on the earth, which, being expanded through the surface of the abyss, occasions an earthquake. Mitchell supposes these phenomena to be occasioned by subterraneous fires, which, if a large quantity of water let loose on them suddenly, may produce a vapour, quantity and elastic force of which may sufficiently perform the purpose. Again, M. Amontons, a member of the French Academy of Sciences, endeavours to prove, on the principle of the experiments made on the weight and spring of the air, a moderate degree of heat may be sufficient to cause the élément into a state capable of causing earthquakes.

Modern electrical discoveries have thrown much light on this subject. Dr. Stukely strenuously denies that earthquakes are to be ascribed to subterranean winds, fires, or vapours; and thinks that there is not any evidence of the cavernous structure of the earth, which such an hypothesis requires. Subterraneous vapours, he thinks, are altogether inadequate to the effects produced by earthquakes, particularly in cases where the shock is of considerable extent: for a subterraneous power, capable of moving the surface of earth only thirty miles in diameter, must be lodged at least fifteen or twenty miles below the surface, and move an inverted cone of solid earth, whose base is thirty miles in diameter, and axis fifteen or twenty miles, which he thinks absolutely impossible. How much more inconceivable is it, then, that any such power could have produced the earthquake of 1755, which was felt in various parts of Europe and Africa, and in the Atlantic ocean, or that which in Asia Minor, in the seventeenth year of the Christian era, destroyed thirteen great cities in one night, and shook a mass of earth three hundred miles in diameter. To effect this, the moving power, supposing it to have been internal fire or vapour, must have been lodged two hundred miles beneath the surface of the earth! sides, in earthquakes, the effect is instantaneous; whereas
the operation of elastic vapour, and its discharge, must be gradual, and require a long space of time; and if these be owing to explosions, they must alter the surface of the country where they happen, destroy the fountains and springs, and change the course of its rivers,—results which are contradicted by history and observation.

To these and other considerations the Doctor adds, that the strokes which ships receive during an earthquake, must be occasioned by something which can communicate motion with much greater velocity than any heaving of the earth under the sea, caused by the elasticity of generated vapours, which would merely produce a gradual swell, and not such an impulsion of the water as resembles a violent blow on the bottom of a ship, or its striking on a rock. Hence he deems the common hypothesis insufficient, and adduces several reasons to show that earthquakes are in reality electric shocks. To confirm this opinion, he notices, among other phenomena, either preceding or attending earthquakes, that the weather is usually dry and warm for some time before they happen, and that the surface of the ground is thus previously prepared for that kind of electrical vibration in which they consist; while, at the same time, in several places where they have occurred, the internal parts, at a small depth beneath the surface, were moist and boggy. Hence he infers, that they reach very little beneath the surface. That the southern regions are more subject to earthquakes than the northern, he thinks is owing to the greater warmth and dryness of the earth and air, which are qualities so necessary to electricity. It may here be noticed, that, before the earthquakes of London, in 1749, all vegetation was remarkably forward; and it is well known, that electricity quickens vegetation. The frequent and singular appearances of boreal and austral aurora, and the variety of electrical state of the atmosphere; and the Doctor apprehends that, in this state of the earth and air, nothing more necessary to produce these phenomena, than the appurtenances of a non-electric cloud, and the discharge of its trifled state. In the same way as the discharge from an excited tube occasions a commotion in the human body.
so the shock produced by the discharge between the clouds and many miles in compass of solid earth, must be an earthquake, and the snap from the contact the noise attending it.

The theory of M. de St. Lazare differs from the above hypothesis, as to the electrical cause. It ascribes the production of earthquakes to the interruption of the equilibrium between the electrical matter diffused in the atmosphere, and that which belongs to the mass of our globe, and pervades its bowels. If the electrical fluid should be superabundant, as may happen from a variety of causes, its current, by the laws of motion peculiar to fluids, carried towards those places where it is in a similar quantity; and thus it will sometimes pass from the interior parts of the globe into the atmosphere. This happens if the equilibrium be re-established without difficulty; the current merely produces the effect of what M. de St. Lazare calls ascending thunder; but if this re-establishment be opposed by considerable and multiplied obstacles, the consequence is then an earthquake, the violence and extent of which are in exact proportion to the degree of interruption of the equilibrium, the depth of the electric matter, and the obstacles which are to be surmounted.

The electric furnace be sufficiently large and deep to give rise to the formation of a conduit or issue, the production of a volcano will follow, its successive eruptions being according to him, nothing more in reality than electric repulsions of the substances contained in the bowels of the earth. From this reasoning he endeavours to deduce the practicability of forming a counter-earthquake, and counter-volcano, by means of certain electrical conductors which he describes, so as to prevent these convulsions in the bowels of the earth.

The opinion of Signior Beccaria is nearly similar to that from his hypothesis and that of Dr. Stukeley, the celebrated Priestley has endeavoured to form one still more general and more feasible. He supposes the electric fluid to be in some mode or other accumulated on one part of the face of the earth, and, on account of the dryness of the season, not to diffuse itself readily: it may thus, as Beccaria conjectures, force its way into the higher regions of the air, forming clouds out of the vapours which then
Earthquakes.

The atmosphere, and may occasion a sudden shower, which may further promote its progress. The whole surface being thus unloaded, will, like any other conducting substance, receive a concussion, either on parting with, or on receiving, any quantity of the electric fluid. The rushing noise will likewise sweep over the whole extent of the country; and, on this supposition also, the fluid, in its discharge from the surface of the earth, will naturally follow the course of the rivers, and will take the advantage of any eminences to facilitate its ascent into the higher regions of the air.

Such are the arguments in favour of the electrical hypothesis; but, since it has been supported with so much ability, by an ingenious writer, Whitehurst, in his Inquiry into the original State and Formation of the Earth, contends, that subterraneous fire, and the steam generated from it, are the true and real causes of earthquakes. When, he observes, it is considered that the expansive force of steam is to that of gunpowder as twenty-eight to one, it may be conceded that this expansive force, and the elasticity of steam, are in every way capable of producing the stupendous effects attributed to these phenomena.

Among the most striking phenomena of earthquakes, which present a fearful assemblage of the combined effects of air, earth, fire, and water, in a state of unrestrained contention, may be noticed the following: Before the percussion a rumbling sound is heard, proceeding either from the air, or from fire, or, perhaps, from both in conjunction, forcing their way through the chasms of the earth, and endeavouring to liberate themselves: this, as has been seen, likewise happens in volcanic eruptions. Secondly, a violent agitation or heaving of the sea, sometimes preceding, and sometimes following the shock: this is also a volcanic effect. Thirdly, a spouting up of the waters to a great height—a phenomena which is common to earthquakes and volcanoes, and which cannot be readily accounted for. Fourthly, a rocking of the earth, and, occasionally, what may be termed a perpendicular rebounding: this diversity has been supposed by some naturalists to arise chiefly from the situation of the place, relatively to the subterraneous fire, which, when immediately beneath, causes the earth to rise, and, when at a distance, to rock.
Fifthly, earthquakes are sometimes observed to travel onward, so as to be felt in different countries at different hours of the same day. This may be accounted for by the violent shock given to the earth at one place, and communicated progressively by an undulatory motion, successively affecting different regions as it passes along, in the same way as the blow given by a stone thrown into a lake, is not perceived at the shore until some time after the first concussion. Sixthly, the shock is sometimes instantaneous, like the explosion of gunpowder, and sometimes tremulous, lasting for several minutes. The nearer to the observer the place where the shock is first given, the more instantaneous and simple it appears; while, at a greater distance, the earth seems to redouble the first blow, with sort of vibratory continuation. Lastly, as the waters have in general so great a share in the production of earthquakes, it is not surprising that they should generally follow the breaches made by the force of fire, and appear in the great chasms opened by the earth.

The most remarkable earthquakes of ancient times are described by Pliny in his Natural History. Among the most extensive and destructive of these was the one already noticed, by which thirteen cities in Asia Minor were swallowed up in one night. Another which succeeded, shook the greater part of Italy. But the most extraordinary one, described by him, happened during the consulate of Lucius Marcius and Sextus Julius, in the Roman province of Mutina. He relates, that two mountains felt so tremendous a shock, that they seemed to approach and retire with a most dreadful noise. They at the same time, and in the middle of the day, cast forth fire and smoke, to the dismay of the astonished spectator. By this shock several towns were destroyed, and all the animals and their vicinity killed. During the reign of Trajan, the city of Antioch was, together with a great part of the adjacent country, destroyed by an earthquake; and about three hundred years after, during the reign of Justinian, it was again destroyed, with the loss of forty thousand of its inhabitants. Lastly, after an interval of sixty years.
an earthquake which happened at Rhodes, upwards of two hundred years before the Christian era, threw down the famous Colossus, together with the arsenal, and a great part of the walls of the city. In the year 1182, the greater part of the cities of Syria, and of the kingdom of Jerusalem, were destroyed by a similar catastrophe; and in 1594, the Italian writers describe an earthquake at Puteoli, which occasioned the sea to retire two hundred yards from its former bed.

Earthquake in Calabria.

The dreadful earthquake which happened in Calabria in 1688, is described by Father Kircher, who was at that time on his way to Sicily, to visit Mount Etna. In approaching the Gulf of Charybdis, it appeared to whirl round in such a manner as to form a vast hollow, verging to a point in the centre. On looking towards Etna, it was seen to emit large volumes of smoke, of a mountainous size, which entirely covered the whole island, and obscured from his view the very shores. This, together with the dreadful noise, and the sulphureous stench, which was strongly perceptible, filled him with apprehensions that a still more dreadful calamity was impending. The sea was agitated, covered with bubbles, and had altogether a very unusual appearance. The Father’s surprise was still increased by the serenity of the weather, there not being a breath of air, nor a cloud, which might be supposed to put all nature thus in motion. He therefore warned his companions that an earthquake was approaching, and landed with all possible diligence at Tropæa, in Calabria.

He had scarcely reached the Jesuits’ College, when his ears were stunned with a horrid sound, resembling that of an infinite number of chariots driven fiercely forward, the wheels rattling, and the thongs cracking. The tract on which he stood seemed to vibrate, as if he had been in the scale of a balance which still continued to waver. The motion soon becoming more violent, he was thrown prostrate on the ground. The universal ruin around him now redoubled his amazement: the crash of falling houses...
the tottering of towers, and the groans of the dying, contributed to excite emotions of terror and despair. Danger threatened him wherever he should flee; but, having remained unhurt amid the general concussion, he resolved to venture for safety, and reached the shore, almost terrified. He fled out of his reason. Here he found his companions whose terrors were still greater than his own.

He landed on the following day at Rochetta, where the earth still continued to be violently agitated. He had, however, scarcely reached the inn at which he intended to lodge, when he was once more obliged to return to the boat: in about half an hour the greater part of the town, including the inn, was overwhelmed, and the inhabitants buried beneath its ruins.

Not finding any safety on land, and exposed, by the smallness of the boat, to a very hazardous passage by sea, he at length landed at Lopizium, a castle midway between Tropæa and Euphæmia, the city to which he was bound. Here, wherever he turned his eyes, nothing but scenes of ruin and horror appeared: towns and castles were leveled to the ground; while Stromboli, although sixty miles distant, was seen to vomit flames in an unusual manner, and with a noise which he could distinctly hear. From remoter objects his attention was soon diverted to contiguous danger: the rumbling sound of an approaching earthquake, with which he was by this time well acquainted, alarmed him for the consequences. Every instant it grew louder as if approaching; and the spot on which he stood shone so dreadfully, that, being unable to stand, himself and his companions caught hold of the shrubs which grew nearest to them, and in that manner supported themselves.

This violent paroxysm having ceased, he now thought of prosecuting his voyage to Euphæmia, which lay within a short distance. Turning his eyes towards that city, he could merely perceive a terrific dark cloud, which seemed to rest on the place. He was the more surprised at this, as the weather was remarkably serene. Waiting, therefore, until this cloud had passed away, he turned to look for the city; but, alas! it was totally sunk, and in its place a dismal and putrid lake was to be seen. All was a melancholy solitude—a scene of hideous desolation. Was the fate of the city of Euphæmia; and such was the
Earthquake in Calabria.

Earthquake at Lisbon.
devastating effects of this earthquake, that along the whole coast of that part of Italy, for the space of two hundred miles, the remains of ruined towns and villages were every where to be seen, and the inhabitants, without dwellings, dispersed over the fields. Father Kircher at length ter-
mimated his distressful voyage, by reaching Naples, after having escaped a variety of perils both by sea and land.

THE GREAT EARTHQUAKE OF 1755.

This very remarkable and destructive earthquake extended over a tract of at least four millions of square miles. It appears to have originated beneath the Atlantic Ocean, the waves of which received almost as violent a concussion as the land. Its effects were even extended to the waters, in many places where the shocks were not perceptible. It pervaded the greater portions of the continents of Europe, Africa, and America; but its extreme violence was exer-
cised on the south-western parts of the former.

Lisbon, the Portuguese capital, had already suffered greatly from an earthquake in 1531; and, since the cala-
mity about to be described, has had three such visitations, in 1761, 1765, and 1772, which were not, however, attended by equally disastrous consequences. In the pre-
ent instance, it had been remarked that, since the com-
cencement of the year 1750, less rain had fallen than had been known in the memory of the oldest of the inha-
itants, unless during the spring preceding the calamitous event. The summer had been unusually cool; and the weather fine and clear for the last forty days. At length, on the first of November, about forty minutes past nine in the morning, a most violent shock of an earthquake was felt; its duration did not exceed six seconds; but so powerful was the concussion, that it overthrew every church and convent in the city, together with the Royal Palace, and the magnificent Opera House adjoining to it; in short, not any building of consequence escaped. About one-fourth of the dwelling-houses were thrown down; and, at a moderate computation, thirty thousand individuals perished. The sight of the dead bodies, and the shrieks of those who were half buried in the ruins, were terrible beyond description; and so great was the consternation,
that the most resolute person durst not stay a moment to
extricate the friend he loved most affectionately, by the
removal of the stones beneath the weight of which he was
crushed. Self-preservation alone was consulted; and the
most probable security was sought, by getting into open
places, and into the middle of the streets. Those who
were in the upper stories of the houses, were in general
more fortunate than those who attempted to escape by the
doors, many of the latter being buried beneath the ruins
with the greater part of the foot passengers. Those who
were in carriages escaped the best, although the drivers and
cattle suffered severely. The number, however, of those
who perished in the streets, and in the houses, was great
inferior to that of those who were buried beneath the ruins
of the churches; for, as it was a day of solemn festival,
these were crowded for the celebration of the mass.
were more numerous than the churches of London and
Westminster taken collectively; and the lofty steeples
most instances fell with the roof, insomuch that they
escaped.

The first shock, as has been noticed, was extremely
short, but was quickly succeeded by two others; and the
whole, generally described as a single shock, lasted from
five to seven minutes. About two hours after, fires broke
out in three different parts of the city; and this new calam-
ity prevented the digging out of the immense riches con-
cealed beneath the ruins. From a perfect calm, a fierce
gale immediately after sprang up, and occasioned the con-
tinued rage with such fury, that in the space of three days
the city was nearly reduced to ashes. Every element seemed
to conspire towards its destruction; for, soon after the
second shock, which happened near high water, the tide rose in
an instant forty feet, and at the castle of Belem, which de-
sfends the entrance of the harbour, fifty feet higher than
had ever been known. Had it not subsided as suddenly as
the whole city would have been submerged. A large har-
bour quay sunk to an unfathomable depth, with several hun-
dreds of persons, not one of the bodies of whom was
afterwards found. Before the sea thus came rolling in on
a mountain, the bar was seen dry from the shore.

The terrors of the surviving inhabitants were great and
multiplied. Amid the general confusion, and
I. scarcity of hands, the dead bodies could not be buried, and it was dreaded that a pestilence would ensue; but from this apprehension they were relieved by the fire, by which these bodies were for the greater part consumed. The fears of a famine were more substantial; since, during the three days succeeding the earthquake, an ounce of bread was literally worth a pound of gold. Several of the corn-magazines having been, however, fortunately saved from the fire, a scanty supply of bread was afterwards procured: Next came the dread of the pillage and murder of those who had saved any of their effects; and this happened in several instances, until examples were made of the delinquents.

The great shock was succeeded about noon by another, when the walls of several houses which were still standing, were seen to open, from the top to the bottom, more than a fourth of a yard, and afterwards to close again so exactly as not to leave any signs of injury. Between the first and the eighth of November twenty-two shocks were reckoned.

A boat on the river, about a mile distant from Lisbon, was heard by the passengers to make a noise as if it had run aground, although then in deep water: they at the same time saw the houses falling on both sides of the river, in front of which, on the Lisbon side, the greater part of a convent fell, burying many of its inmates beneath the ruins, while others were precipitated into the river. The water was covered with dust, blown by a strong northerly wind; and the sun entirely obscured. On landing, they were driven by the overflowing of the waters to the high grounds, whence they perceived the sea, at a mile's distance, rushing in like a torrent, although against wind and tide. The bed of the Tagus was in many places raised to its surface; while ships were driven from their anchors, and jostled together with such violence, that their crews did not know whether they were afloat or aground. The master of a ship, who had great difficulty in reaching the port of Lisbon, reported that, being fifty leagues at sea, the shock was there so violent as to damage the deck of the vessel. He fancied he had mistaken his reckoning.

The following observations, relative to this fatal earth-
quake, were made at Cares, about twenty miles from Lisbon, and within two miles of the sea. On the last day of October, the weather was clear, and remarkably warm for the season. About four o'clock in the afternoon a breeze arose, proceeding from the sea, and covering the valley which was very unusual at that season of the year. The wind shifted soon after to the east, and the fog returned to the sea, collecting itself, and becoming exceedingly thick. As the fog retired, the sea rose with a prodigious

On the first of November, the day broke with a serene sky, the wind continuing at east; but about nine o'clock, the sun began to be obscured; and about half an hour after, a rumbling noise was heard, resembling that of...
THE GREAT EARTHQUAKE OF 1755.

Resembling thunder, or the rattling of coaches at a distance, was heard, and almost at the same instant the earth began to quake. In the space of two minutes, the river rose and fell five or six feet, and continued to do so for four hours. At the commencement it ran with so much violence as to break a ship's hawser. In some parts the river opened, and seemed to discharge vast quantities of air. The agitation of the sea was so great, about a league beyond the bar, that air was supposed to have been discharged there also.

During the first shock, which was very terrible, the houses in the city were rocked, as if in a convulsion, and every thing within shook and rattled to such a degree, that the affrighted inhabitants ran into the streets, where the earth was evidently seen to heave up. At six o'clock in the evening another violent shock was felt. The only damage done was the overturning of a few pedestals from the tops of the churches, and the splitting of the walls of the decayed houses.

Sant Ubes, a sea-port town about twenty miles south of Lisbon, was entirely swallowed up by the repeated shocks, and by the vast surf of the sea. Huge pieces of rock were detached at the same time from the promontory at the west end of the town, which consists of a chain of mountains containing fine jasper of different colours.

At Cadiz, a sea-port of Spain, according to the report of Don Antonio d'Ulloa, the earthquake commenced at three minutes after nine in the morning of the first of November, and continued five minutes, the weather being at the time remarkably fine. It was, he observes, not inferior in violence to that which swallowed up Lima and Callao, in Peru, towards the end of October, 1746, and was nearly of twice the duration, the latter having been felt for three minutes only. That every thing here was not destroyed, appears to have been owing to the great solidity of the buildings. The water of the cisterns, under ground, was washed backward and forward, and was covered with a great froth. The inhabitants, who had quitted the houses and churches, seeking safety in the open air, had scarcely recovered from their first terror, when they were plunged into a new alarm. At ten minutes after eleven o'clock, a wave was seen coming from the sea,
at the distance of eight miles, and at least sixty feet higher than usual. It dashed against the west part of the city, which is very rocky. Although its force was much broken by these rocks, it at length reached the walls, and beat in the breast-work, which was sixty feet above the ordinary level of the water, removing pieces of the fabric, of the weight of eight or ten tons, to the distance of forty or fifty yards. At half past eleven came a second wave, and this was followed by four others of equal magnitude. Others, but smaller, and gradually lessening, continued in uncertain intervals until the evening. A considerable part of the rampart was thrown down, and carried by the current above fifty paces. Several persons perished on the causeway leading to the Isle of Lesu. The accounts brought to Cadiz reported that Seville had been much damaged, and that a similar fate had attended St. Lucar and Cheres. Colonel was said to have been destroyed, and, indeed, with the exception of the provinces of Catalonia, Aragon, and Valencia, the effects of this earthquake were felt throughout Spain.

At Madrid the shock was very sensibly felt soon after ten in the morning, and lasted five or six minutes. First the inhabitants fancied they were seized with a swooning in the head; and, afterwards, that the houses were falling. In the churches the sensations were the same, and the terror so great, that the people trod each other under foot in getting out. Those who were within the towers were still more affrighted, fancying every instant, while the shock lasted, that they were falling to the ground. It was not sensible to those who were in carriages, and very little so to foot passengers.

At Gibraltar it was felt about the same time as at Madrid, and began with a tremulous motion of the earth, which lasted about half a minute. A violent shock succeeded; and this again was followed by a second tremulous motion, of the duration of five or six seconds. Another shock, not so violent as the first, subsided gradually; and the whole lasted about two minutes. Several of the guns on the batteries were seen to rise, and others to sink, while the earth had an undulating motion. The greater part of the garrison and inhabitants were seized with giddiness and sickness: several fell prostrate; others were stupified.
and many who were walking or riding, became sick, without being sensible of any motion of the earth. Every fifteen minutes the sea rose six feet; and then fell so low, that the boats and small vessels near the shore were left aground, as were also numbers of small fish. The flux and reflux lasted till next morning, having decreased gradually from two in the afternoon.

In Africa this earthquake was felt almost as severely as it had been in Europe. A great part of the city of Algiers was destroyed. At Arzilla, a town belonging to the kingdom of Fez, about ten in the morning, the sea suddenly rose with such impetuosity, that it lifted up a vessel in the bay, and impelled it with such force on the land, that it was shattered in pieces; and a boat was found two musket-shots within land from the sea. At Fez and Mequinez, great numbers of houses fell down, and a multitude of people were buried beneath the ruins. At Morocco, similar accidents occurred; and at Salle also, much damage was done. At Tangier the earthquake began at ten in the morning, and lasted ten or twelve minutes. At Tetuan it commenced at the same time, but was of less duration; three of the shocks were so extremely violent, that it was feared the whole city would be destroyed.

In the city of Funchal, in the Island of Madeira, a shock of this earthquake was felt at thirty-eight minutes past nine in the morning. It was preceded by a rumbling noise in the air, like that of empty carriages passing hastily over a stone pavement. The observer felt the floor beneath him immediately to be agitated by a tremulous motion, vibrating very quickly. The shock continued more than a minute; during which space the vibrations, although continual, were twice very sensibly weakened and increased in force. The increase after the first remission of the shock was the most intense. During the whole of its continuance it was accompanied by a noise in the air; and this lasted some seconds after the motion of the earth had ceased, dying away like a peal of distant thunder rolling through the air. At three quarters past eleven, the sea, which was quite calm, suddenly retired several paces; when, rising with a great swell, and without any noise, it as suddenly advanced, overflowed the shore, and entered
the city. It rose fifteen feet perpendicular above high water mark, although the tide, which there flows seven feet, was at half-ebb. The water immediately receded and after having fluctuated four or five times between high and low water mark, it subsided, and the sea remained calm as before. In the northern part of the island inundation was more violent, the sea there retiring above hundred paces at first, and, suddenly returning, overflowed the shore, forcing open doors, breaking down the walls of several magazines and storehouses, and leaving great quantities of fish ashore, and in the streets of the village Machico. All this was, the effect of one rising of the sea, for it never afterwards flowed high enough to reach the high-water mark. It continued, however, to fluctuate here much longer before it subsided than at Funchal; and in some places farther to the westward, it was hardly, if at all, perceptible.

These were the phenomena with which this remarkable earthquake was attended in those places where it was most violent. The effects of it, however, reached to an immense distance; and were perceived chiefly by the agitations of the waters, or some slight motion of the earth. Its unknown boundaries to the south are unknown; the barbarity of the African nations rendering it impossible to procure intelligence from them, except where the effects were dreadful. On the north, however, we are assured, that it reached as far as Norway and Sweden. In the former kingdom, the waters of several rivers and lakes were violently agitated. In the latter, shocks were felt in several provinces, and all the rivers and lakes were strongly agitated, especially in Dalecarlia. The river Dala suddenly overflowed its banks, and as suddenly retired. At the same time, a lake at the distance of a league from it, and which it had no manner of communication, bubbled with great violence. At Fahlun, a town in Dalecarlia, several strong shocks were felt.

In many places of Germany the effects of this earthquake were very perceptible; but in Holland, the agitations were still more remarkable. At Alphen on the Rhine between Leyden and Woerden, in the afternoon of the first of November, the waters were agitated to such a violent degree, that buoys were broken from their
large vessels snapped their cables, smaller ones were thrown out of the water upon the land, and others lying on land were set afloat. At AmsterdAm, about eleven in the forenoon, the air being perfectly calm, the waters were suddenly agitated in their canals, so that several boats broke loose; chandeliers were observed to vibrate in the churches; but no motion of the earth, or concussion of any building, was observed. At Haarlem, in the forenoon, for nearly four minutes, not only the water in the rivers, canals, &c. but also all kinds of fluids in smaller quantities, as in coolers, tubs, backs, &c. were surprisingly agitated, and dashed over the sides, though no motion was perceptible in the vessels themselves. In these small quantities also the fluid apparently ascended prior to its turbulent motion; and in many places, even the rivers and canals rose one foot perpendicular.

The agitation of the waters was also perceived in various parts of Great Britain and Ireland. At Barlborough, in Derbyshire, between eleven and twelve in the forenoon, in a boat-house on the west side of a large body of water, called Pibley Dam, supposed to cover at least thirty acres of land, was heard a surprising and terrible noise; a large swell of water came in a current from the south, and rose two feet on the sloped dam-head at the north end of the water. It then subsided; but returned again immediately, though with less violence. The water was thus agitated for three quarters of an hour; but the current grew every time weaker and weaker, till at last it entirely ceased.

At Busbridge, in Surrey, at half an hour after ten in the morning, the weather being remarkably still; without the least wind, in a canal nearly seven hundred feet long, and fifty-eight in breadth, with a small spring constantly running through it, a very unusual noise was heard at the east end, and the water there observed to be in great agitation. It raised itself in a heap or ridge in the middle; and this heap extended lengthwise about thirty yards, rising between two and three feet above the usual level. After this, the ridge heeled or vibrated towards the north side of the canal, with great force, and flowed above eight feet over the grass walk on that side. On its return back into the canal, it again ridged in the middle, and then heeled with yet greater force to the south side, and flowed over its
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grass walk. During this latter motion, the bottom on the north side was left dry for several feet. This appearance lasted for about a quarter of an hour, after which the walk became smooth and quiet as before. During the latter time, the sand at the bottom was thrown up and mixed with the water; and there was a continual noise like that of water turning a mill. At Cobham, in Surrey, Dursley, in Suffolk, Earsy Court, in Berkshire, Eaton Bridge, Kent, and many other places, the waters were variously agitated.

At Eyam-Bridge, in Derbyshire Peak, the overseers of the lead-mines, sitting in his writing-room, about eleven o'clock, felt a sudden shock, which very sensibly raised him up in his chair, and caused several pieces of plaster to drop from the sides of the room. The roof was so violently shaken, that he imagined the engine-shaft had been falling in. Upon this he immediately ran to see what the matter, but found everything in perfect safety.

This time two miners were employed in carting, or drawing along the drifts of the mines, the ore and other materials to be raised up at the shafts. The drift in which they were working was about a hundred and twenty yards deep, and the space from one end to the other fifty yards or upwards. The miner at the end of the drift had just loaded his cart, and was drawing it along; but he was suddenly surprised by a shock, which so terrified him, that he immediately quitted his employment, and ran to the west end of the drift to his partner, who was no less terrified than himself. They durst not attempt to climb the shaft, lest that should be running in upon them: but while they were consulting what means they should take for their safety, they were surprised by a second shock, more violent than the first; which frighted them so much, that they both ran precipitately to the other end of the drift. They then went down to another miner, who worked about twelve yards below them. He told them that the violence of the second shock had been so great, that it caused the rocks to grind upon one another; but his account was interrupted by a third shock, which, after an interval of four or five minutes, was succeeded by a fourth, and, about the same space of time after, by a fifth; none of which were so violent as the second. They heard, and
every shock, a loud rumbling in the bowels of the earth, which continued about half a minute, gradually decreasing, or seeming to remove to a greater distance.

At Shirburn Castle, Oxfordshire, a little after ten in the morning, a very strange motion was observed in the water of a moat which encompasses the building. There was a pretty thick fog, not a breath of air, and the surface of the water all over the moat as smooth as a looking-glass, except at one corner, where it flowed into the shore, and retired again successively, in a surprising manner. How it began to move is uncertain, as it was not then observed. The flux and reflux, when seen, were quite regular. Every flood began gently, its velocity increasing by degrees, until at length it rushed in with great impetuosity, till it had attained its full height. Having remained for a little time stationary, it then retired, ebbing gently at first, but afterwards sinking away with great swiftness. At every flux the whole body of water seemed to be violently thrown against the bank; but neither during the time of the flux, nor that of the reflux, did there appear even the least wrinkle of a wave on the other parts of the moat. Lord Parker, who had observed this motion, being desirous to know whether it was universal over the moat, sent a person to the other corner of it, at the same time that he himself stood about twenty-five yards from him to examine whether the water moved there or not. He could not perceive any motion there; but another person, who went to the north-east corner of the moat, diagonally opposite to his lordship, found it as considerable there as where he was. His lordship imagining, that in all probability the water at the corner diagonally opposite to where he was would sink as that by him rose, ordered the person to signify, by calling out, when the water by him began to rise; and when to rise. This he did; but to his lordship's great surprise, immediately after the water began to rise at his own end, he heard the voice calling that it began to rise with him also; and in the same manner he heard that it was sinking at his end, soon after he perceived it to sink by himself. A pond just below was agitated in a similar manner; but the risings and sinkings happened at different times from those at the pond where Lord Parker stood.

At White Rock, in Glamorganshire, about two hours
THE GREAT EARTHQUAKE OF 1755.

The ebb of tide, and near three quarters after six in the evening, a vast quantity of water rushed up with a prodigious noise, floated two large vessels, the least of them two hundred tons, broke their moorings, drove across the river, and had like to have overset them. The whole rise and fall of this extraordinary body of water did not last above ten minutes, nor was it felt in any other part of the river, so that it seemed to have gushed out of the earth at that place.

Similar instances occurred at Loch Lomond and Loch Ness, in Scotland. At Kinsale, in Ireland, and all along the coast to the westward, many similar phenomena were observed.

Shocks were also perceived in several parts of France, as at Bayonne, Bordeaux, and Lyons; and continuations of the waters were observed at Angoulesme, Belleville, Havre de Grace, &c., but not attended with the remarkable circumstances above-mentioned.

These are the most striking phenomena with which the earthquake of November 1, 1755, was attended on the surface of the earth. Those which happened below ground cannot be known but by the changes observed in springs, &c., which were in many places very remarkable.

At Tangier, all the fountains were dried up, so that there was no water to be had till night. A very remarkable change was observed in the medicinal waters of Toplis, village in Bohemia, famous for its baths. These waters were discovered in the year 762; from which time the principal spring had constantly thrown out hot water in the same quantity, and of the same quality. On the morning of the earthquake, between eleven and twelve, in the forenoon, this principal spring cast forth such a quantity of water, that in the space of half an hour all the baths were over. About half an hour before this great increase of the water, the spring flowed turbid and muddy; then, having stopped entirely for a minute, it broke forth again with prodigious violence, driving before it a considerable quantity of reddish ochre. After this, it became clear; but flowed as pure as before. It still continued to do so, as the water was in greater quantity, and hotter, than before the earthquake. At Angoulesme, in France, a subterraneous noise, like thunder, was heard; and presently after
the earth opened, and discharged a torrent of water, mixed with red sand. Most of the springs in the neighbourhood sank in such a manner, that for some time they were thought to be quite dry. In Britain, no considerable alteration was observed in the earth, except that, near the lead-mine above-mentioned, in Derbyshire, a cleft was observed about a foot deep, six inches wide, and one hundred and fifty yards in length.

At sea the shocks of this earthquake were felt most violently. Off St. Lucar, the Captain of the Nancy frigate felt his ship so violently shaken, that he thought she had struck the ground; but, on heaving the lead, found she was in a great depth of water. Captain Clark, from Denia, in north latitude thirty-six degrees twenty-four minutes, between nine and ten in the morning, had his ship shaken and strained as if she had struck upon a rock, so that the seams of the deck opened, and the compass was overturned in the binacle. The Master of a vessel bound to the American islands, being in north latitude twenty-five degrees, west longitude forty degrees, and writing in his cabin, heard a violent noise, as he imagined, in the steerage; and while he was asking what the matter was, the ship was put into a strange agitation, and seemed as if she had been suddenly jerked up, and suspended by a rope fastened to the mast-head. He immediately started up with great terror and astonishment; and looking out at the cabin- window, saw land, as he took it to be, at the distance of about a mile. Coming upon the deck, the land was no more to be seen, but he perceived a violent current cross the ship's way to the leeward. In about a minute, this current returned with great impetuosity; and at a league's distance, he saw three craggy-pointed rocks throwing up waters of various colours, resembling fire. This phenomenon, in about two minutes, ended in a black cloud, which ascended very heavily. After it had risen above the horizon, no rocks were to be seen; though the cloud, still ascending, was long visible, the weather being extremely clear. Between nine and ten in the morning, another ship, forty leagues west of St. Vincent, was so strongly agitated, that the anchors, which were lashed, bounced up, and the men were thrown a-foot and a half perpendicularly up from the deck. Immediately after this,
the ship sunk in the water as low as the main-chains. 
Head showed a great depth of water, and the line tinged of a yellow colour, and smelt of sulphur.

shock lasted about ten minutes; but they felt smaller ones for the space of twenty-four hours.

EARTHQUAKES IN SICILY, AND IN THE CALABRIAS.

These Earthquakes began on the 5th of February, and continued until the latter end of the May following, doing infinite damage, and exhibiting at Messina, in parts of Sicily nearest to the Continent, and in the Calabrias, a variety of phenomena. The part of the labrian provinces most affected by this heavy calamity, between the thirty-eighth and thirty-ninth degrees of latitude, being the extreme point of the Continent; and the greatest force of the earthquakes was exerted at the base of the particular mountains of the Apennines, namely, Monte Deio, Monte Sacro, and Monte Caulone, extending westward to the Tyrrhenian sea. The towns, villages, farm-houses, nearest to these mountains, whether situated on the hills, or in the plains, were totally ruined by the shock, which happened about noon; and there the destruction of lives was the greatest. The towns still more distant were, however, greatly damaged by the subsequent shocks, particularly those of the 7th, 26th, and 28th of February, and that of the 1st of March. The earth was in a constant tremour, and its motions were various, being either vertical, or whirling round, horizontal, or oscillating, that is, by pulsations or beatings, from the bottom upwards. This variety increased the apprehensions of the unfortunate inhabitants, who momentarily expected that the earth would open beneath their feet, and swallow them up. Rains had been continual and violent, often accompanied by lightning, and furious gusts of wind. There were numerous openings and cracks in the earth; and several hills had been lowered, while others were quite level. In the places where the chasms were so deep, that many roads were rendered impassable. Huge mountains were severed, and portions of them driven into the valleys, which were thus filled up.
The course of several rivers was changed; and many springs of water appeared in places which had before been perfectly dry.

From the city of Amantea, situated on the coast of the Tyrrhenian Sea, in Lower Calabria, proceeding along the western coast to Cape Spartevento, in Upper Calabria, and thence along the eastern coast to Cape Alice, a part of Lower Calabria, on the Ionian Sea, the towns and villages, amounting to nearly four hundred, whether on the coast or inland, were either totally destroyed, or suffered greatly. At Casal Nuovo, the Princess Gerace, and upwards of four thousand of the inhabitants, lost their lives. At Baguara, the number of dead amounted to upwards of three thousand; and Radicimia and Palmi experienced a similar loss. The total amount of the mortality occasioned by these earthquakes, in Sicily and the two Calabrias, was, according to the official returns, thirty-two thousand three hundred and sixty-seven; but Sir William Hamilton thought it still greater, and carries his estimate to forty thousand, including foreigners.

On the first shock of the earthquake, on the 5th of February, the inhabitants of Scylla escaped from their houses, built on the rock, and, following the example of their prince, took shelter on the sea-shore. By this shock the sea had been raised and agitated so violently, that much damage had been done on the point of the Faro of Messina; but here it acted with still greater violence, for, during the night, an immense wave, which was falsely represented to have been boiling hot, and to have scoured many persons on its rising to a great height, flowed furiously three miles inland, and swept off in its return two thousand four hundred and seventy-three of the inhabitants, with the prince at their head, who were either at that time on the strand, or in boats near the shore.

The shocks felt since the commencement of these formidable earthquakes, amounted to several hundreds; and among the most violent may be reckoned the one which happened on the 25th of March. It affected most of the Lower part of Upper Calabria, and the inferior part of Lower Calabria, being equally tremendous with the first. Indeed these shocks were the only ones sensibly felt in the capital, Naples. With relation to the former, two singular
phenomena are recorded: at the distance of about three miles from the ruined city of Oppido, in Upper Calabria, was a hill, having a sandy and clayey soil, nearly four hundred feet in height, and nearly nine hundred feet in circumference at its basis. This hill is said to have been carried to the distance of about four miles from the spot where it stood, into a plain called Campo di Bassano. The same time, the hill on which the city of Oppido stood and which extended about three miles, divided into two parts: being situated between two rivers, its ruins filled the valley, and stopped their course, forming two large lakes, which augmented daily.

The accounts from Sicily were of a most alarming nature. The greatest part of the fine city of Messina was destroyed by the shock of the 5th of February, and what remained was greatly injured by the subsequent shock. The quay in the port had sunk considerably, and was in some places more than a foot beneath the water. The superb building, called the Palazzata, which gave the port a more magnificent appearance than any other in Europe, could boast, was entirely thrown down; and the hazard greatly damaged. The citadel suffered little; but the cathedral was destroyed, and the tower at the point of entrance of the harbour much damaged. The wave which had done so much mischief at Scylla, had passed over the point of land at the Faro, and swept away twenty persons. The accounts from Melazzo, Patti, Terra Santa Lucia, Castro Reale, and from the island of Lipari, were very distressing; but the damages done there by these earthquakes not so considerable as at Messina.

Sir William Hamilton, from the limited boundaries of these earthquakes, was persuaded that they were caused by some great operation of nature, of a volcanic kind. To ascertain this, he began his tour by visiting the parts of the coasts of the two Calabrias which had suffered most from this severe visitation. He everywhere saw towns and houses, the inhabitants of which were in shock, many of them built on such insalubrious spots, that an epidemic had ensued. These unfortunate people gave that every shock they had felt, seemed to come with a rumbling noise from the westward, beginning usually with the horizontal motion, and ending with the vertical
AND IN THE TWO CALABRIAS.

whirling motion, which last had ruined most of the build-
ings. It had also been generally observed, that, before a
shock, the clouds seemed to be fixed and motionless; and
that, after a heavy shower of rain, a shock quickly fol-
lowed. By the violence of some of the shocks, many
persons had been thrown down; and several of the pea-
sants described the motion of the earth as so violent, that
the tops of the largest trees almost touched the ground
from side to side. During a shock, the oxen and horses,
they said, kept their legs wide asunder, to prevent being
thrown down, and gave evident signs of being sensible of
the approach of each shock. Being thus warned, the neigh-
ring of a horse, the braying of an ass, or the cackling of a
goose, drove them from their temporary huts.

From Monteleone, Sir William descended into the plain,
and passed many towns and villages in a ruined state: the
city of Mileto, lying in a bottom, was totally destroyed,
without a house standing. Among the many examples
afforded by these earthquakes, of animals being able to
live a long time without food, was that of two hogs, which
had remained buried under a heap of ruins at Soriano for
forty-two days, and were dug out alive. He had frequent
opportunities to observe, that the habitations situated on
high grounds, having a soil of a gritty sand-stone, somewhat
like granite, but without its consistence, suffered less than
those in the plain, the soil of which is a sandy clay.
The latter were universally levelled with the ground.
During the first shock, he was told that a fountain or
water, mixed with sand, had been forced to a considerable
height: prior to this phenomenon, the river was dry, but
soon returned and overflowed its banks. The other rivers
in the plain underwent the like vicissitudes; to account for
which, Sir William supposes the first impulsion of the
earthquake to have come from the bottom upwards; and
that such was the fact, the inhabitants attested. The sur-
face of the plain having suddenly risen, the rivers, which
are not deep, would naturally disappear; and the plain
seeking with violence its former level, the rivers would
necessarily return and overflow, at the same time that the
sudden depression of the boggy grounds would as natu-
ally force out the water which lay hidden beneath the

1 2
It had been stated, in the reports made to Government, that two tenements, named Macini and Vaticano, had, by the effect of the earthquake, changed their situation. This fact Sir William agrees, and he accounts for it in the following manner:—They were situated in a valley surrounded by high grounds, and the surface of the earth, which had been removed, had probably been long undermined by the little rivulets which flow from the mountains and were in full view on the bare spot the tenements had deserted. He conjectures besides, that, the earthquake having opened some depositions of rain-water in the clayey hills which surround the valley, the water, mixing with the loose soil, and taking its course suddenly through the undermined surface, had lifted it up, together with large olive and mulberry trees, and a thatched cottage floating the entire piece of ground, with all its vegetation about a mile down the valley, where he saw it, with much of the trees erect. These two tenements occupied a space of ground about a mile in length, and half a mile in breadth. There were in the vicinity several deep cracks in the earth, not one of which was then more than a foot and a half in breadth; but Sir William was credibly assured, that during the earthquake, one had opened wide, and had swallowed up an ox, and nearly a hundred goats. In the valley he saw hollows, in the form of inverted cones, from which water and sand had been ejected violently at the time of the earthquakes, similar to those which had been pointed out to him at Rosarno. As well at the latter place, as in every ruined town he visited, an interesting remark was made to him, namely, that the male dead were generally found under the ruins, in the attitude of struggling against the danger; but that the attitude of the females was usually with the hands clasped over the head, or giving themselves up to despair, unless they had children near them: in this case they were always found clasping them in their arms, or in some attitude which indicated their anxious care to protect them. How striking an instance of maternal tenderness!

Sir William travelled four days in the plain, in the midst of indescribable misery. Such was the force of the shock, on the 5th of February, that the inhabitants of the towns were buried in an instant beneath the ruins of the
Of the population of the town of Polistene, which was badlysituated between two rivers, subject to overflow their banks, two thousand one hundred individuals perished, out of six thousand. It was built near a ravine of great depth; and, by the violent motion of the earth, two huge portions of the ground on which a considerable part of the town, consisting of several hundreds of houses, stood, were detached into the ravine, and nearly across it, to the distance of about half a mile from their original position. What was most extraordinary, many of the inhabitants of these houses, who had taken this singular leap in them, were dug out alive, and several unhurt. Terra Nuova lost three-fourths of a population of sixteen hundred inhabitants; and near to this town, and to the ravine, many acres of land, covered with trees and cornfields, had been detached and thrown into the latter, often without having been overturned, insomuch that the trees and crops were growing as well as if they had been planted there. Other such pieces of ground were lying in the bottom, in an inclined situation, and others, again, were quite overturned. Two immense portions of land, having been detached opposite to each other, filled the valley, and stopped the course of the river, the waters of which formed a great lake.

Having walked over the ruins of Oppido, Sir William descended into the ravine, which he carefully examined. Here he saw the wonderful force of the earthquake, which had produced exactly the same effects as in the ravine of Terra Nuova, but on a scale infinitely greater. The enormous masses of the plain, detached from each side of the ravine, lay in confused heaps, forming real mountains; and, having stopped the course of two rivers, great lakes were formed. He occasionally met with a detached piece of the surface of the plain, many acres in extent, with the large oaks and olive-trees, having lupins and corn beneath, growing as well, and in as good order at the bottom of the ravine, as their companions, from whom they had been separated, did in the plain, at least five hundred feet higher, and at the distance of about three-quarters of a mile, represented vineyards, which had taken a similar journey, in the same order in the bottom. In another part of the ravine was a mountain, composed of a clayey soil
which was probably a portion of the plain, detached by an earthquake at some former period; it was in height about two hundred and fifty feet, and about four hundred feet in diameter at its basis. It was well attested, Sir William observes, that this mountain travelled down the nearly four miles, having been put in motion by the first shock. The abundance of rain which fell at that time, the great weight of the newly-detached pieces of the plain, which were heaped up at its back; the nature of its soil, and particularly its situation on a declivity; in his opinion, satisfactorily account for this phenomenon. The Prince of Cariati showed him two girls, one of the age of about sixteen years, who had remained eleven days without food under the ruins of a house in Oppido; and the other, eleven years of age, who had been under the same circumstances six days, but in a very confined and distressing posture.

Sir William describes the port of Messina, and the town, in their half-ruined state, when viewed by moonlight, as strikingly picturesque. On landing, he was assured by several fishermen, that, during the earthquake of the 5th of February, at night, the sand near the sea was hot, and that in many parts they saw fire issue from the earth. This had been often repeated to him in the Calabrian plain; and the idea he entertained was, that the exhalations which issued during the violent commotions of the earth, were full of electric fire, just as the smoke of volcanoes is constantly observed to be during violent eruptions; for he did not, during any part of his tour, perceive an indication of volcanic matter having issued from the fissures of the earth. He was, therefore, convinced that the whole damage had been done by exhalations and vapours only. In this city, where they had had so long and experience of earthquakes, he was told, that all animals and birds are, in a greater or less degree, more sensible of an approaching shock of an earthquake than any human being; but that geese, above all, were the soonest and the most alarmed at the approach of a shock: if in the water, they quit it immediately, and they cannot be driven into it for some time after.

The force of the earthquakes, although very violent in Messina, and at Reggio on the opposite side of the strait...
was not to be compared to that which was felt in the
plain. In the former city the mortality did not exceed
seven hundred, of a population of thirty thousand. A
curious circumstance happened there also, to prove that
animals can sustain life for a long time without food. Two
mules belonging to the Duke of Belviso remained under a
heap of ruins, the one twenty-two, and the other twenty-
three days: for some days after they refused their food,
but drank plentifully, and finally recovered. There were
numberless instances of dogs remaining many days in the
same situation; and a hen, belonging to the British Vice-
consul, having been closely shut up beneath the ruins of
his house, was taken out on the twenty-second day, and
recovered, although, at first it showed but little signs of
life: like the mules, it did not eat for some days, but
drank freely. From these instances, and from those above
related, of the girls at Oppido, and the hogs at Soriano, as
well as from several others of the same kind, it may be
concluded, that long fasting is always attended with great
thirst, and a total loss of appetite.

A circumstance worth recording, and which was ob-
served throughout the whole coast of the part of the Cala-
brian provinces which had been most affected by the earth-
quakes, was, that a description of small fishes, named
seriellii, resembling what in England are called white-bait,
but larger, and which usually lie at the bottom of the sea,
buried in the sand, were, from the commencement of these
earthquakes, and for a considerable time after, taken near
the surface, and in such abundance as to become the com-
mon food of the poorer sort of people; whereas, before
these events, they were rare, and reckoned among the
greatest delicacies. Fishes in general having been taken,
wherever the effects of the shocks had reached, in much
greater abundance, and with greater facility, than before,
Sir William conjectures, either that the bottom of the sea
may have been heated by the volcanic fire beneath it, or
that the continual tremor of the earth had driven the fishes
out of their strongholds, in the same way as an angler,
when he wants a bait, obliges the worms to come out of a
turf on the river-side, by trampling on it with his feet,
which motion never fails of its effect.

The Commandant of the Citadel of Messina assured
him, that on the fatal 5th of February, and the following days, the sea, at the distance of about a quarter of a mile from that fortress, rose and boiled in a most extraordinary manner, and with a horrid and alarming while the water in the other parts of the Faro was perfectly calm. This appeared to him to point out exhalations or eruptions from cracks at the bottom of the sea which were probably made during the violence of the earthquakes; and to these phenomena he ascribes a volcanic origin. He thus attempts to explain the nature of the formidable wave which was represented as boiling in and which, as has been already noticed, was so fatal to the inhabitants of Scylla.

Sir William concludes by remarking, that the last earthquakes here described, appear to have been caused by the same kind of matter as that which gave birth to the Æolian or Lipari islands. He conjectures that an eruption may have been made at the bottom of the sea, most probably between Stromboli and Upper Calabria; for in that quarter, it was on all hands agreed, the subterranean noises seemed to proceed. He adds, that the foundation of a new island, or volcano, may have been laid, although it may be ages, which to nature are but moments, before shall be completed, and appear above the surface of the sea. Nature is ever active; but her acts are in general carried on so very slowly, as scarcely to be perceptible to the mortal view, or recorded in the very short space of what we call history, let it be ever so ancient. It is probable, also, he observes, that the whole of the destruction he has described, may have simply proceeded from the exhalations of confined vapours, generated by the fermentation of such minerals as produce volcanoes, which would escape where they met with the least resistance, and would consequently affect the plain in a greater degree than the high and more solid grounds by which it is surrounded.

Count Francesco Ippolito, in speaking of the last great shock of the 28th of March, as it affected the Calabrian territory, is persuaded that it arose from an internal fire in the bowels of the earth, as it took place precisely in the mountains which cross the neck of the peninsula, formed by the two rivers, the Lameto and the Corace, the stream of which flows into the Gulf of St. Euphemia, and the
Earthquakes in Sicily, &c.

All the phenomena it displayed, made this evident. Like the other shocks, it came in a south-west direction: the earth at first undulated, then shook, and finally rocked to-and-fro to such a degree, that it was scarcely possible to stand. It was preceded by a terrible groan from beneath the ground; and this groan, which was of the same duration with the shock, terminated with a loud noise, like that of the explosion of a mine. These thunderings accompanied not only the shock of that night, and of the succeeding day, but likewise all the others which were afterwards felt; at the same time that the earth was continually shaken, at first every five minutes, and subsequently each quarter of an hour. During the night, flames were seen to issue from the ground in the neighbourhood of Reggio, towards the sea, to which the explosion extended, insomuch that many of the peasants ran away through fear. These flames issued precisely from a spot where some days before an extraordinary heat had been perceived. After this great shock there appeared in the air, in a slanting direction, and towards the east, a whitish flame, resembling electric fire: it was seen for the space of two hours.

Several hills were either divided or laid level; and within the surface of the earth apertures were made, from which a great quantity of water, proceeding either from subterraneous concentrations, or from the rivers adjacent to the ground thus broken up, spouted for several hours. From one of these openings, in the territory of Borgia, and about a mile from the sea, there issued a large quantity of salt water, which for several days imitated the motions of the sea. Warm water likewise issued from the apertures made in the plains of Maida. In all the sandy parts where the explosion took place, there were observed, from distance to distance, apertures in the form of an inverted cone, emitting water, and which seemed to prove the escape of a flake of electric fire.

Amid the various phenomena which either preceded or followed this particular shock, the following are well deserving of notice. The water of a well at Maida, which was of an excellent quality, was affected, just before the shock, with so disgusting a sulphureous flavour, that it could not even be smelt to. On the other hand, at Catania:
zar0, the water of a well, which before could not be used on account of its possessing a strong smell of calcination, became potable. For a long time before the earthquake, the sea was considerably agitated, so as to terrify the fishermen, at the same time that there was not a breath of wind. On the side of Italy, the volcanoes had not emitted any eruptions for a considerable time before; but in the same way as, during the first great shock, Etna was in flames, so Stromboli emitted fire during this last.

EARTHQUAKES IN PERU, &c.

South America has been at all times very subject to earthquakes; and it is remarkable, that the city of Lima, the capital of Peru, situated in about twelve degrees south latitude, although scarcely ever visited by tempest and equally unacquainted with rain as with thunder and lightning, has been singularly exposed to their fury. The shocks indeed, happen so frequently there, that the inhabitants are under continual apprehensions of being, from their suddenness and violence, buried beneath the ruins of their houses. Still they have their presages, one of the principal of which is a rumbling noise in the bowels of the earth, heard about a minute before the shocks are felt, and seeming to pervade all the subterraneous adjacent parts. This is followed by the dismal howlings of the dogs, who seem to give notice of the approaching danger; while the beams of burden, in their passage through the streets, stop all sudden, as it were by a natural instinct, and seek the attitude which may best secure them from falling. On these portents, the terrified inhabitants flee from their houses into the streets, forming large assemblies, in the midst of which the cries of children are blended with the lamentations of the females, whose agonizing prayers to the saints increase the common fear and confusion. In a word, the entire city exhibits a dreadful scene of consternation and horror.

Since the establishment of the Spaniards in Peru, the first earthquake in this capital happened in 1582; but the damage it did was much less considerable than that of some of those which succeeded. Six years after Lima was again visited by an earthquake, the results of which were
so dreadful, that it is still solemnly commemorated every year. In 1609, a third convulsion threw down many houses; and on the 27th of November, 1630, so much damage was done by an earthquake, that, in acknowledgement of the city not having been entirely demolished, a festival is also on that day annually celebrated. On the 3d of November, 1654, the most stately edifices in Lima, and a great number of houses, were destroyed by a similar event; but the inhabitants having had timely presages, withdrew themselves from their houses, insomuch that few perished. In 1678, another dreadful concussion took place.

Among the most tremendous earthquakes with which the Peruvian capital has been visited, may be reckoned that which happened on the 28th of October, 1687. The first shock was at four in the morning, when several of the finest public buildings and houses were destroyed, with the loss of many lives. This was, however, merely a prelude to what followed; for, two hours after, a second shock was felt, with such impetuous concussions, that all was laid in ruins, and every description of property lost. During this second shock the sea retired considerably, and then returned in mountainous waves, entirely overwhelming Callao, the sea-port of Lima, distant five miles, as well as the adjacent country, together with the wretched inhabitants. From that time six other earthquakes were felt at Lima, prior to that of 1746, which likewise happened on the 29th of October, at half past ten at night. The early concussions were so violent, that in the space of somewhat more than three minutes, the greater part, if not all, the buildings in the city were destroyed, burying under their ruins such of the inhabitants as had not made sufficient haste into the streets and squares, the only places of safety. At length the horrible effects of the first shock ceased; but the tranquillity was of short duration, the concussions swiftly succeeding each other. The fort of Callao was dilapidated; but what this building suffered from the earthquake, was inconsiderable when compared with the dreadful catastrophe which followed. The sea, as is usual on such occasions, receding to a considerable distance, returned in mountainous waves, foaming with the violence of the agitation, and suddenly buried Callao and the neigh-
bouring country in its flood. This, however, was entirely effected by the first swell of the waves; for sea, retiring still farther, returned with greater impetuosity and covered not only the buildings, but also the lofty walls of the fortress; so that what had even escaped the inundation, was totally overwhelmed by these succeeding mountainous waves. Of twenty-three ships, and vessels of light burden, then in the harbour, nineteen were sunk and the four others, among which was a frigate, named San Firmin, were carried by the force of the waves a considerable distance up the country. This terrible inundation extended, as well as the earthquake, to other parts of the coast, and several towns underwent the fate of Lima. The number of persons who perished in that catastrophe extended, as well as the earthquake, to other parts of the coast, and several towns underwent the fate of Lima. The number of persons who perished in that disaster, within two days after the earthquake commenced, an estimate of the bodies found, amounted to thirteen hundred, beside the wounded and maimed, many of whom survived their tortures but a short time.

The earthquake of Jamaica, in 1692, was one of the most dreadful history has had to record. In the space of two minutes it destroyed the town of Port Royal, and swept the houses in a gulf forty fathoms deep. It was attended with a hollow rumbling noise, like that of thunder. In less than a minute, the greater part of the houses on one side of the streets, were, with their inhabitants, sunk beneath the water, while those on the other side were thrown into heaps, the sandy soil on which they were built rising like the waves of the sea, and suddenly overthrew them on its subsidence. The water of the wells was charged with a most vehement agitation; and the sea was equally turbulent, bursting its mounds, and deluging whatever came in its way. The fissures in the earth were some places so great, that one of the streets appeared more than twice its original breadth. In many places earth opened and closed again; and this agitation continued for a considerable time. Several hundreds of the openings were to be seen at the same moment; in some of them the wretched inhabitants were swallowed up; in others, the earth suddenly closing, caught them by the middle, and thus crushed them to death. Other openings still more dreadful, swallowed up entire streets; while others, again, spouted up cataracts of water, drowning
those whom the earthquake had spared. The whole was attended with a most noisome stench. The thundering of the distant falling mountains; the sky overcast with a dusky gloom; and the crash of the falling buildings; gave unspeakable horror to the scene. This dreadful calamity having ceased, the whole island exhibited a scene of desolation. Few of the houses which had not been swallowed up were left standing; and whatever grew on the plantations shared in the universal ruin. These cultivated spots were now converted into large pools of water, which, when dried up by the sun, left so many plains of barren sand. The greater part of the rivers had, during the earthquake, been choked by the falling in of the detached masses of mountains; and it was not until some time after that they made themselves new channels. The mountains seem to have been more particularly exposed to the force of the first tremendous shock; and it was conjectured, that the principal seat of the concussion was among them. Such of the inhabitants as were saved, sought shelter on board the ships in the harbour, and remained there above two months, the shocks continuing during that interval with more or less violence every day.

EARTHQUAKE IN VENEZUELA.

On the 26th of March, 1812, between four and five, p.m. Venezuela was visited by one of those tremendous earthquakes, which from time to time ruin whole provinces. During a minute and fifteen seconds the earth was convulsed in every direction, and nearly twenty thousand persons fell victims. The towns of Caraccas, La Guayra, Mayquetia, Merida, and Sanfelipe, were totally destroyed. Barquisimeto, Valencia, La Vittoria, and others, suffered considerably. This catastrophe happened on Holy Thursday, a day when every Christian church peculiarly commemorates the sufferings of our blessed Redeemer, and at the very hour when the people were crowding into the churches to attend the processions which are usual in Roman Catholic Countries, and to see the representation of our Saviour led to the cross. Troops are placed on such occasions at the entrance of the churches, to follow the
procession; and many churches, and the principal barracks at Caraccas, being thrown down, there was a considerable number of soldiers killed, and many thousand persons crushed under their ruins. The arms and animating destines for the defence of the country were buried in a similar manner; and what was worse, an unconquerable enemy to the independence of Venezuela seemed to raise its head from among the ruins—that religious prejudice which the earthquake inspired.

In an era less remarkable, a mere convulsion of nature would have had no influence on a new government; but notwithstanding the prosperity Venezuela then enjoyed, the seeds of discontent had fallen on one class of the community. The principles which formed the basis of the new constitution were democratical, and it had been necessary to deprive the clergy of some of their privileges, which of course created enmity in their minds to the present government. Immediately after the earthquake, the priests proclaimed, that the Almighty condemned the revolution they denounced his wrath on all who favoured it; and the counter-revolution, attended by great bloodshed, was the unhappy consequence.

CONNEXION OF EARTHQUAKES WITH VOLCANOES.

ISLAND OF JAVA.

The connexion of earthquakes with volcanoes has been already noticed; and a remarkable instance of an occurrence of this nature is recorded in Raffles' History of Java. Papandayang was formerly one of the largest volcanoes that island; but in the month of August, 1772, of greatest part of it was, after a short but severe combustion, swallowed up by a dreadful convulsion of the earth. The event was preceded by an uncommonly luminous cloudburst, by which the mountain was completely enveloped, and which so terrified the inhabitants dwelling at the foot, and on its declivities, that they betook themselves to flight. Before they could all save themselves, however, the mountain began to give way, and the greater part of it actually
ISLAND OF JAVA.

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fell in and disappeared in the earth. At the same time, a
horrifying noise was heard, resembling the discharge of
the heaviest cannon; while the immense quantities of vol-
canic substances which were thrown out, and spread in
every direction, propagated the effects of the explosion
through the space of many miles.

It was estimated that an extent of ground, belonging to
the mountain itself, and to its immediate environs, fifteen
miles in length, and six in breadth, was by this commotion
swallowed up in the bowels of the earth. Six weeks after
the catastrophe, persons who were sent to examine the
condition of the surrounding territory, reported, that it was
impossible to approach the mountain, on account of the
heat of the substances which covered its circumference,
and which were piled on each other to the height of three
feet. It has been reported, that forty villages, partly swal-
lowed up by the opening of the earth, and partly covered
by the substances ejected, were destroyed on this melan-
choly occasion, with the loss of nearly three thousand
lives. A proportionate number of cattle was destroyed;
and the greater part of the plantations of cotton, indigo,
and coffee, in the adjacent districts, buried beneath the
volcanic matter. The effects of this explosion were long
apparent on the remains of the volcanic mountain.

The very interesting work of Governor Raffles contains
several curious and novel details relative to volcanic phe-
nomena, a sketch of which is here introduced, on account
of their intimate connexion with the subterraneous opera-
tions of nature, in the production of earthquakes. It may
be considered as supplementary to the detailed account of
volcanoes given at the commencement of this work.

There are in Java thirty-eight large mountains, which,
although they differ from each other in external figure,
agree in the general attribute of volcanoes, by their hav-
ing a broad base, which gradually verges towards the
summit, in the form of a cone. One of these is named
Tanjukan-Pralhu, on account of its resembling, at a dis-
tance, a boat turned upside down; and forms a vast trun-
cated cone. Its base extends to a considerable distance,
and it is not only one of the largest mountains in the
island, but a most interesting volcano. Although it has
not for many ages had any violent eruption, as is evident
from the progress of vegetation, and from the depth of black mould which covers its sides, its interior has continued in a state of uninterrupted activity. Its crater is large, and has, in general, the shape of a funnel, but with its sides very irregular: the brim, or margin, which bounds it at the top, has also different degrees of elevation, rising and descending along the whole course of its circumference. This may be estimated at a mile and a half; and the perpendicular depth on the south-side, where it is the steepest, is at least two hundred and fifty feet: towards the west it rises considerably higher. The bottom of the crater has a diameter of nine hundred feet, but is not regular in its form, which depends on the meeting of the sides below.

Near the centre it contains an irregular oval lake; a collection of water, the greatest diameter of which is nearly three hundred feet. The water being white, exhibits the appearance of a lake of milk, boiling with perpetual discharge of large bubbles, occasioned by development of fixed air. Towards its eastern extremity are the remaining outlets of the subterraneous fires, consisting of several apertures, from which an uninterrupted discharge of sulphureous vapours takes place. These vapours rush out with incredible force, with violent subterraneous noises, resembling the boiling of an immense caldron in the bowels of the mountain. When at the bottom, the force of the impression made on the spectator this grand and terrific scene, is increased by the recollection of the dangers he had to encounter in the design while the extent of the crater, and the remains of former explosions, afford an indescribable enjoyment, fill his mind with the most awful satisfaction.

The explosions of mud, called by the natives biédéga, a great curiosity. This volcanic phenomenon is in centre of a limestone district, and is first discovered approaching it from a distance, by a large volume of smoke, which rises and disappears at intervals of a few seconds, and resembles the vapours arising from a violent surf. A dull noise, like that of thunder, is at the same time heard; and, on a nearer approach, when the view is no longer impeded by the smoke, a large hemispherical mass is observed, consisting of black earth, mixed with water, about sixteen feet in diameter, rising up to
thirty feet in a perfectly regular manner, and, as it were, pushed up by a force beneath. This mass suddenly explodes with a dull noise, and scatters, in every direction, a volume of black mud. After an interval of a few seconds, the hemispherical body of earth mud again rises and explodes. In the same manner this volcanic ebullition goes on without interruption, throwing up a globular body of mud, and dispersing it with violence through the neighbouring plain. The spot where the ebullition occurs is nearly circular, and perfectly level, and is entirely covered with the earthy particles, impregnated with salt water, which are thrown up from below. The circumference may be estimated at about half a mile. In order to conduct the salt water to the circumference, small passages, or gutters, are made in the loose muddy earth, which lead it to the borders, where it is collected in bowls, or salt wells, dug in the ground, for the purpose of evaporation. The mud recently thrown up, possesses a degree of heat greater than that of the surrounding atmosphere, and emits a strong, pungent, and sulphureous smell.

This volcanic phenomenon is situated near the centre of the large plain which interrupts the series of the more considerable volcanoes, and owes its origin to the general cause of the numerous volcanic eruptions which occur in the island of Java.

The tremendous violence with which nature marks the operations of volcanoes in these regions, will be best exemplified by the following details of the extraordinary and wide-spreading phenomena which accompanied the eruption of the Tomboro mountain, in the island of Sumbawa, one of the Javanese cluster. This eruption, which happened in April, 1815, was sensibly felt over the whole of the Molucca islands, over Java, and over a considerable portion of Celebes, Sumatra, and Borneo, to a circumference of a thousand statute miles from its centre, by tremulous motions and loud explosions; while, within the range of its more immediate activity, embracing a space of three hundred miles around it, it produced the most astonishing effects, and excited the most alarming apprehensions. On Java, at the distance of three hundred miles, it seemed to be awfully present. The sky was overcast at noon-day with a cloud of ashes; the sun was
enveloped in an atmosphere, the "palpable" density of which it was unable to penetrate; showers of ashes covered the houses, the streets, and the fields, to the depth of several inches; and, amid this darkness, explosions were heard at intervals, like the report of artillery, or the noise of distant thunder. Every one conceived, that the effects experienced might be caused by eruptions of some of the numerous volcanoes on the island; but no one could have conjectured, that the shower of ashes which darkened the air, and covered the ground of the eastern districts of Java, could have proceeded from a mountain, Sumbawa, at the distance of several hundred miles.

The first explosions were heard at Java, on the evening of the 5th of April, and continued until the following day, when the sun became obscured, and appeared enveloped in a fog. The weather was sultry; the atmosphere close; and the pressure of the latter, added to the general stillness, seemed to forebode an earthquake. It lasted for several days, the explosions continuing, but with so much violence as at first. On the evening of the 10th, the eruptions, however, were more loud and frequent; ashes fell in abundance; the sun was newly ascended; and in several parts of the island a tremor of the earth was felt. On the following day the explosions were so tremendous as to shake the houses perceptibly in the more eastern districts.

In the Island of Sumbawa itself, there was a great loss of lives, and the surviving inhabitants were reduced to extreme misery. It appears from the account of the editor, who was a spectator of the eruption, that on the afternoon of the 10th of April, three distinct columns of flame, apparently within the verge of the crater of the Tengger mountain, burst forth, and, after ascending separately to a very great height, united their tops in the air. The summit of the mountain now appeared like a body of liquid extending itself in every direction. Stones and ashes precipitated; and a whirlwind ensued, which blew the greater part of the houses in an adjoining village into the air up by the roots the largest trees, and carried them the air, together with men, horses, cattle, and whatever came within its influence. The sea rose nearly twelve feet higher than usual,—a phenomenon commonly attendant
earthquakes,—overwhelming the plantations of rice, and sweeping away houses, with whatever came within its reach. It is calculated that twelve thousand individuals perished. The trees and herbage of every description, along the whole of the north and west sides of the peninsula, were completely destroyed, with the exception of a high point of land near the spot where the village of Tomboro stood.

The extreme misery to which the inhabitants of the western part of the island were reduced, was dreadful to behold. The roads were strewed with dead bodies; the villages were almost entirely deserted, and the houses fallen down. The peasants wandered in all directions in search of food; and the famine became so severe, that one of the daughters of the Rajah died of hunger.

To judge of the violence of the eruption, it will suffice to state, that the cloud of ashes which had been carried with so much celerity as to produce utter darkness, extended, in the direction of the Island of Celebes, two hundred and seventeen nautical miles from the seat of the volcano; and, in a direct line towards Java, upwards of three hundred geographical miles.

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**Basaltic and Rocky Wonders.**

**The Giant's Causeway.**

This vast collection of basaltic pillars is in the vicinity of Ballinamory, in the county of Antrim, Ireland. The principal, or grand causeway, (there being several less considerable and scattered fragments of a similar nature,) consists of an irregular arrangement of many hundred thousands of columns, formed of a black rock, nearly as hard as marble. The greater part of them are of a pentagonal figure, but so closely and compactly situated on their sides, anything can be introduced between them. These columns are of an unequal height and breadth: several of the most elevated, visible above the surface of the strand, and at the foot of the impending angular precipice, are of the height of about twenty feet, which they do not exceed, at least not any of the principal arrangement.
How deeply they are fixed in the strand, has never been ascertained.

This grand arrangement extends nearly two hundred yards, as it is visible at low water; but how far beyond, uncertain: from its declining appearance, however, at high water, it is probable that it does not reach beneath the water to a distance equal to that which is seen above. The breadth of the principal causeway, which runs out in a continued range of columns, is in general from twenty to thirty feet: in some parts it may, for a short distance, be nearly forty. From this account are excluded the broken and scattered pieces of the same kind of construction, which are detached from the sides of the grand causeway as they do not appear to have ever been contiguous to the principal arrangement, although they have been frequently comprehended in the width, which has led to such and dissimilar representations of this causeway, in the different accounts that have been given. Its highest part, the narrowest, at the very spot of the impending cliffs, whence the whole projects; and there, for about the space in length, its width is not more than from twelve to fifteen feet. The columns of this narrow part incline in a perpendicular a little to the westward, and form a gradual ascent on their tops, by the unequal height of their sides; and in this way a gradual ascent is made at the foot of the cliff, from the head of one column to the next above, to the head of the great causeway, which, at the distance of about eighteen feet from the cliff, obtains a perpendicular position, and lowering from its general height, widens between twenty and thirty feet, being for nearly a hundred feet always above the water. The tops of the columns being, throughout this length, nearly of an equal height, from a grand and singular parade, which may be walked on, somewhat inclining to the water's edge from the high-water mark, as it is perpetually washed by the beating surges, on every return of the tide, the form lowers considerably, becoming more and more even, so as not to be walked on but with the greatest caution. At the distance of a hundred and fifty yards from the cliff, it turns a little to the east, for the space of twenty or thirty yards, and then sinks into the sea. The figure of the columns is, with few exceptions, pentagonal, or comp
of five sides; and the spectator must look very narrowly to find any of a different construction, having three, or six sides. What is very extraordinary, and particularly curious, is, that there are not two columns in ten thousand to be found, which either have their sides equal among themselves, or display a like figure.

The composition of these columns, or pillars, is not less deserving the attention of the curious observer. They are not of one solid stone in an upright position, but composed of several short lengths, nicely joined, not with flat surfaces, but articulated into each other like a ball and socket of fish, the one end at the joint having a cavity, into which the convex end of the opposite is exactly fitted. This is not visible unless on disjoining the two stones. The depth of the concavity or convexity is generally about three or four inches. It is still farther remarkable, that the concavity and correspondent concavity of the joint, are not conformable to the external angular figure of the column, but exactly round, and as large as the size or diameter of the column will admit; consequently, as the angles of these columns are in general very unequal, the circular edges of the joints are seldom coincident with more than two or three sides of the pentagonal, and are, from the edge of the circular part of the joint to the exterior sides and angles, quite plain. It ought likewise to be noticed as a singular curiosity, that the articulations of these joints are sufficiently inverted, in some of them the concavity being upwards, in others the reverse. This occasions that variety and mixture of concavities and convexities on the tops of the columns, which is observable throughout the platform of this causeway, without any discoverable design or regularity with respect to the number of either.

The length of these particular stones, from joint to joint, is various: they are in general from eighteen inches to two feet long; and, for the greater part, longer towards the bottom of the columns than nearer the top, the articulation of the joints being there somewhat deeper. The size, or diameter, likewise of the columns is as different as their length and figure: in general they are from fifteen to twenty inches in diameter. Throughout the whole of this combination there are not any traces of uniformity or de-
sign, except in the form of the joint, which is inward by an articulation of the convex into the concave of a piece next above or below it; nor are there traces finishing in any part, whether in the height, length, or breadth. If there be particular instances in which columns above water have a smooth top, others near the base of an equal height, are more or less convex or concave, which shows them to have been joined to pieces that have been washed away, or by other means taken off. It is not be doubted but that those parts which are considered above water have gradually become more and more so at the same time that the remaining surfaces of the columns must necessarily have been worn smoother, by the concretion of the air, and by the friction in walking over them than where the sea, at every tide, beats on the causeway continually removing some of the upper stones, and exposing fresh joints. As all the exterior columns have two or three sides exposed to view, preserve diameters from top to bottom, it may be inferred, that such is also the case with the interior columns, the parts which alone are visible.

Notwithstanding the general dissimilitude of the columns, relatively to their figure and diameter, they are arranged and combined at all the points, that a knot scarcely be introduced between them, either at the sides or angles. It is most interesting to examine the close cuture and nice insertion of the infinite variety of forms exhibited on the surface of this grand parade. From the great dissimilarity of the figures of the columns, the spectator would be led to believe the causeway a work of human art, were it not, on the other hand, inconceivable that the genius or invention of man should construct columns combine such an infinite number of columns, which shall have a general apparent likeness, and still be so universally dissimilar in their figure, as that, on the minutest examination, not two in ten or twenty thousand should be found having their angles and sides equal among themselves, those of one column to those of another. As there is infinite variety in the configuration of the several parts are there not any traces of regularity or design in the outlines of this curious phenomenon: including the bases or detached pieces of a similar structure, they are extrem
scattered and confused. Whatever may have been their original state, they do not at present appear to have any connection with the grand or principal causeway, as to any supposable design or use in its first construction; and as little design can be inferred from the figure or position of the several constituent parts.

The cliffs, at a great, distance from the causeway, exhibit in many parts similar columns. At the depth of ten or twelve feet from the summit of the cape of Benore the rock begins to assume a columnar tendency, and forms a range of massy pillars of basalt, which stand perpendicular to the horizon, presenting in the sharp face of the promontory, the appearance of a magnificent gallery or colonade, upwards of sixty feet in height. This colonade is supported on a solid base of coarse, black, irregular rock, nearly sixty feet thick, abounding in blebs and air-holes; but, though comparatively irregular, it evidently affects a peculiar figure, tending in many places to run into regular forms, resembling the shooting of salts and many other substances during a hasty crystallization. Beneath this great bed of stone, stands a second range of pillars from forty to fifty feet high, more exactly defined, and emulating in the neatness of its columns, those of the Giant's Causeway. This lower range is upborne by a layer of red ochre stone, which serves as a relief to shew it to greater advantage. The two admirable natural galleries, with the interjacent mass of irregular rock, form a perpendicular height of one hundred and seventy feet, from the base of which the promontory, covered with rock and grass, slopes down to the sea a considerable space, so as to give an additional height of two hundred feet, making in all nearly four hundred feet of perpendicular elevation, and presenting a mass, which for beauty and variety of colouring, for elegance and novelty of arrangement, and for the extraordinary magnitude of its objects, cannot, perhaps, be rivalled by any thing at present known.

The promontory of Fairhead raises its lofty summit more than four hundred feet above the level of the sea, and forms the eastern termination of Ballycastle bay. It presents a vast compact mass of rude columnar stones, the forms of which are extremely gross, many being a hundred and fifty feet in length. At the base of these
gigantic columns lies a wild waste of natural ruins of
enormous size, which, in the course of successive ages
have been tumbled down from their foundations by storms
or some more powerful operations of nature. These
massive bodies have occasionally withstood the shock of the
fall, and often lie in groups, and clumps of pillars,
seeming artificial ruins, and forming a very novel
striking landscape.

Many of these pillars lie to the east, in the very bottom
of the bay, at the distance of about one-third of a mile
from the causeway. There the earth has evidently fell
away from them upon the strand, and exhibits a very con-
scuous arrangement of pentagonal columns, in a perpen-
dicular position, apparently supporting a cliff of different
earth, clay, rock, &c. to the height of a hundred and
a half feet. Some of these columns are from thirty to forty
high, from the top of the sloping bank beneath them
and being longer in the middle of the arrangement,
shortening on either of the sides, have obtained the ap-
plication of organs, from a rude likeness in this particular
the exterior or frontal tubes of that instrument. As the
are few broken pieces on the strand, near this assem-
blage of columns, it is probable that the outside range, as it
appears, is in reality the original exterior line towards
the sea; but how far these columns extend internally into
the bowels of the incumbent cliff is unknown. The sub-
stance, indeed, of that part of the cliff which projects
to a point, between the two bays on the east and west
of the causeway, seems composed of similar materials;
besides the many pieces which are seen on the sides of
the cliff, as it winds to the bottom of the bays, particularly
the eastern side, there is, at the very point of the cliff
just above the narrow and highest part of the causeway,
long collection of them, the heads or summits of which
just appearing without the sloping bank, make it evident
that they lie in a sloping position, and about half-way
tween the perpendicular and the horizontal. The heads
of these columns are likewise of mixed surfaces, convex
and concave; and they evidently appear to have been removed
from their original upright position, to the inclining
oblique one they have now assumed, by the sinking
falling of the cliff.
BASALTIC COLUMNS.

In the country surrounding Padua, in the State of Venice, there are several basaltic columns, similar to those of the Giant's Causeway, although less magnificent in appearance. About seven miles, in a southern direction, from that city, is a hill named Monte Rosso, or the Red Mount, which presents a natural range of prismatic columns, of different shapes and sizes, placed in a direction nearly perpendicular to the horizon, and parallel to each other, nearly resembling that part of the Giant's Causeway, called "The Organs."

At an inconsiderable distance is another basaltine hill, called Il monte del Diavolo, or the Devil's Hill, along the sides of which the prismatic columns are arranged in an oblique position. This causeway extends along the side of the vale beneath, nearly with the same arrangement of the columns as is displayed on the hill. Although the columns of both these hills are of the simple, or unjointed kind, still they differ very remarkably from each other in many respects, but principally in their forms, and in the texture and quality of their parts. Those of the Monte del Diavolo commonly approach a circular form, as nearly as their angles will allow; which is also observable in the columns of the Giant's Causeway, and of most other basaltic groups. On the contrary, those of Monte Rosso assume an oblong or oval figure. The columns of the former measure one with the other, nearly a foot in diameter, varying but little in their size; while those of the latter present a great variety in their dimensions; the diameter of some of them being nearly a foot, and that of others scarcely three inches: their common width may be estimated at six or eight inches. They differ, therefore, very considerably in size from those of the Giant's Causeway, some of which measure two feet in width. The length of the columns of the Monte del Diavolo cannot be ascertained, as they present their summits only to the view; their remaining parts are deeply buried in the hill, and in some places entirely covered. Those of Monte Rosso, as far as they are visible, measure from six to eight or ten feet in height—an incon-
siderable size when compared with the height of those of the Giant's Causeway. The columns of the Venetian group display, however, all the varieties of prismatic forms; some are observable in those of the latter, and other similar groups. They are usually of five, six, or seven sides; but the \( \text{agonal form seems chiefly to prevail.} \)

The texture and quality of these columns are not different than their forms. Those of the Monte del Volo present a smooth surface, and, when broken, a solid and uniform texture; in which characters they respond with the columns of the Giant's Causeway to those of most other basaltic groups. But the columns of Monte Rosso are in these respects very different, being not only a very rough, and sometimes knotty, surface, but displaying likewise, when broken, a variegated and unequal texture of parts. They are commonly speckled, more or less distinctly, and resemble an inferior sort of granite, of which Monte Rosso is itself in part and which serves as a base to the range of columns. It is, in general, not quite so hard as the Sierra and Oriental granites, and is sometimes even friable. A species of granite abounds in France, where large tracts of it are to be seen in the adjoining provinces of Auvergne, Vivarez, and Lionnois. But it is still more common in Italy, seeing that, besides Monte Rosso, the bulk of the Euganean hills, of which that is a part, principally consist of it; and these hills occupy a considerable tract of the plains of Lombardy. It is also common in the Roman and Tuscan States; and of this substance the mountain range to Viterbo, on the road to Rome, is entirely composed. The columns of Monte Rosso appear, therefore, different character from any hitherto described by mineralogists, who mention those only of an uniform texture. But the great singularity here is, that in a mass of granite, and composed nearly of the same substance. An instance of this kind, relative to other causeway, is not recorded; and this circumstance seems to render that of Monte Rosso, in one respect, at least, more curious and singular than the celebrated Causeway is known to be, from the regular articulation.
BASALTIC COLUMNS.

It is certain, that the basaltic group of Monte Rosso is not only highly curious in itself, but interesting on account of the great light it throws on the origin of granites in general.

It is likewise remarkable, that the columns, in the two groups of Monte Rosso and Monte del Diavolo, preserve respectively the same position, nearly parallel to each other; which is not usually the case in basaltic groups. For, although the principal aggregate of which the Giant's Causeway is formed, stands in a direction perpendicular to the horizon, still other small detached groups of columns also appear on the eminence above, assuming by their position different degrees of obliquity. Among the numerous basaltic hills of Auvergne and Velay in France—phenomena which seem to abound in those provinces more than in any other part of Europe, and, perhaps, of the known globe—nothing is more common than to see the columns of the same group lying in all possible directions, as irregularly almost as the prisms in a mass of common crystal. Nor is this variety of position so observable in single columns as in whole masses or ranges of them, which often present themselves on the same hill, disposed in different strata or stages, as it were, one above the other, many of them assuming very different, and even opposite directions. The columns of the Monte del Diavolo are built in a kind of volcanic sand, by which, in many parts of the hill, they are entirely covered: it is probable, however, that they repose beneath on a base of basaltic rock of a similar nature. Nothing is more common, in the provinces of France, above mentioned, than to see insulated basaltic hills almost exclusively composed of different layers of columns, which present themselves in stages, one above the other, often without any other stratum between them, resembling in some measure, if the comparison can be allowed, a huge pile or stack of cleft wood. Although the columnar crystallization of Monte Rosso is the only one yet known or described, in a mass of granite, still other groups of columns have elsewhere been met with, which are equally of a heterogeneous substance or texture, however they may otherwise differ from those of Monte Rosso, as well as from the common basalts.
Natural Bridges.

Natural Bridges of Icononzo.

Amid the majestic and varied scenery of the Cordilleras of South America, that of their valleys most forcibly struck the imagination of European travellers. Their enormous height is not discoverable but at a considerable distance, and while the spectator is on one of those plains which extend from the sea-coasts to the foot of the central chain. The flats, or table lands, which surround the snow-capped summits of the mountains, are themselves, for the greater part, of an elevation of from seven to nine thousand feet, nearly a mile and three quarters, above the level of the sea. This circumstance diminishes, to a certain degree, the impression of greatness produced by the colossal masses of Chimborazo, Cotopaxi, and Antisana, when seen from the flats of Riobamba, or from those of Quito. It is, however, with the valleys as with the mountains: deeper and narrower than those of the Alps and the Pyrenees, the valleys of the Cordilleras present situations still more stupendous than these, and more adapted to fill the soul with admiration and with terror. Fissures and chasms present themselves, having their bottoms and sides ornamented with vigorous vegetation, and of such a depth, that Vesuvius and the Puy-de-Dôme might be placed within several miles of them, and not show their summits above the edge of the surrounding mountains. In passing along the back of Andes, from Pasto to Villa d'Ilbarra, and in descending Loxa towards the banks of the river of the Amazon, the traveler reaches the celebrated fissures of Chota and Cutaco, the former of which is nearly a mile, and the latter upwards of three-quarters of a mile, in perpendicular depth. To give a more complete idea of the grandeur of these geological phenomena, it should be observed, that the bottoms of these fissures are by one-fourth only elevated above the level of the sea, than the passages St. Gothard and Mount Cenis.

The valley of Icononzo, or of Pandi, is less remarkable
Natural Bridges of IcononzO.

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for its dimensions, than for the extraordinary form of its rocks, which appear as if shaped by the hand of man. 

Their naked and barren summits form the most picturesque contrasts with the tufts of trees and herbaceous vegetables which cover the edges of the fissure. The little torrent which has worked itself a passage through the valley of IcononzO, bears the name of Rio de la Summa Paz. It descends from the eastern chain of the Andes, which, with the kingdom of New Granada, separates the basin of the river of Madelema from the vast plains of the Meta, Guaviare, and Orinoco. This torrent, confined within a bed almost inaccessible, could not have been crossed without many difficulties, had not Nature herself formed two natural bridges, which are justly regarded in the country as among the objects most worthy of the attention of travellers. These natural bridges are on the route from Santa-Fé de Bogota to Papayan and Quito.

IcononzO is the name of an ancient village of Muyscas Indians, situated on the south side of the valley, and of which scarcely any vestige now remains, except a few scattered huts. The nearest inhabited place to this remarkable spot is the little village of Pandi, or Mercadillo, distant about a mile. The road from Santa-Fé to Fusagasuga, and thence to Pandi, is one of the most difficult and least beaten to be met with in the Cordilleras. None but those who passionately love the beauties of Nature, would fail to prefer the usual road which leads from the summit of Bogota to the banks of the Madelema, to the perilous descent from the Paramo de San-Fortunato, and the mountains of Fusagasuga, toward the Natural Bridges of IcononzO.

The deep chasm through which the torrent of Summa Precipitates itself, occupies the centre of the valley of IcononzO. Near the first natural bridge, it maintains, for a length of nearly four-fifths of a mile, a direction from east to west. The river forms two fine cascades, the one at the spot where it enters the chasm on the west of Doa, and the other at that where it leaves it, in descending resembles Molgar. It is possible that this chasm, which may have been the result of an earthquake, and that, at its formation, the compact bed of quartz, com-
posing the superior stratum of rock, had resisted the force which tore asunder these mountains. The uninterrupted continuation of this quartzose bed would thus form a bridge, which affords a passage from one part of the valley to the other. This surprising natural arch is forty-eight feet in length, forty in width, and eight feet in thickness at the centre. By experiments carefully made on the fallen bodies, its height above the level of the water of the torrent, has been ascertained to be about three hundred twenty feet. The depth of the torrent, at the mean height of the water, may be estimated at twenty feet. The Indians of the valley of Icononzo, for the security of the traveller, have formed a fence of reeds, which extends to leading to this first natural bridge.

At the distance of sixty feet below is another, to which the traveller is conducted by a path descending along the edge of the chasm. Three enormous masses of rock have fallen into such positions as enable them reciprocally to support each other. The one in the centre forms the keystone of the vault,—an accident which may have conveyed to the natives of this spot an idea of arched masonry, which was unknown to the people of the new world, as well as to the ancient inhabitants of Egypt. It is uncertain whether these portions of rock have been projected from a distance, or are merely the fragments of an arch which has been destroyed on the spot, but which was originally similar to the upper natural bridge. This last supposition is rendered probable by an analogous accident, observed in the Coliseum at Rome, where there are seen, half fallen, several stones which were arrested in their descent, because in falling they happened to form an arch.

In the midst of this second natural bridge is an aperture about twenty-five feet in every direction, through which the eye reaches the bottom of the abyss. The torrent appears to run into a dark cavern, whence a monotonous sound proceeds, formed by the cries of an infinity of nocturnal birds which inhabit the chasm, and which at sight may be taken for those bats of a monstrous size, so well known in the equinoctial regions. They can only be perceived by the help of lighted brands, thrown into the chasm to illuminate its sides; and thousands of them may thus be distinguished, skimming along the surface of the
Rock Bridge in Virginia.

Their plumage is uniformly of a brown grey color; and M. Humboldt, from whose account these particulars are extracted, was assured by the Indians, that these hitherto undescribed birds are of the size of a chicken, with the eyes of an owl, and a curved beak. On account of the depth of the valley, it was impossible to obtain a near view of them.

The elevation of the bridges of Icononzo—these surprising productions of nature—above the level of the ocean, is two thousand seven hundred feet, somewhat more than half a mile. In concluding his description of them, M. Humboldt notices several other natural bridges, among which is that of Cedar-creek, in Virginia. It is an arch of limestone, having an aperture of ninety feet, and an elevation of two hundred and twenty feet above the level of the water of the creek. He considers this, as well as the bridge of earth, called Rumichaca, which is on the declivity of the porphyritic mountains of Chumban, in the South American province of Los Pastos; together with the bridge of Madre de Dios, named Dantcu, near Tontonico, in Mexico; and the perforated rock near Granda, in the province of Alentejo, in Portugal, as geological phenomena, which have some resemblance to the natural bridges of Icononzo; but he doubts whether, in any other part of the world, there has yet been discovered an accidental arrangement so extraordinary as that of three masses of rock, which, reciprocally sustaining each other, form a natural arch.

This Natural Bridge is described by Mr. Jefferson, late President of the United States, as one of the most sublime of the productions of nature. It is on the ascent of a hill, which seems to have been cloven through its length by some great convulsion. It is in height two hundred and thirteen feet, about fifty feet in breadth at the bottom, and at the superior part about ninety feet. The passage over it is about sixty feet in width, and the thickness of the mass at the summit of the arch about forty feet. A portion of this thickness is constituted by a coat of earth, which affords growth to many large trees. The residue,
with the hill on both sides, is solid rock of lime-stone; The arch approaches the semi-elliptical form; but the larger axis of the ellipsis, which would be the eord of the arch, is many times longer than its transverse. Although the sides of this bridge are provided in some parts with a parapet of fixed rocks, yet few persons have sufficicnt resolution to walk to them, and look over into the abyss. The passenger involuntarily falls on his hands, creeps to the parapet, and peeps over it. Looking down from the height, for the space of a minute, occasions a violent heart-ache. If the view from above be so exquisitely painfut, that not long to be borne, that from beneath is delightful in the extreme. It is impossible for the emotions arising from the sublime to be felt in a greater degree than at this spot. The rapture of the spectator cannot be described, when he surveys an arch at once so beautiful, so elevated, and so light, springing up, as it were, to heaven! This grand natural bridge is in the county of Bessely, to which it has given name, and affords a passage over a valley, which cannot be crossed elsewhere for a considerable distance.

**PRECIPICES AND PROMONTORIES.**

**BESSELY GAUT.**

The precipitous pathways which frequently occur in the Indian Appennines, a chain of mountains extending along the Western or Malabar Coasts of the Peninsula, are called GAUTS; and of these abrupt and perpendicular precipices, Bessely Gaut is considered as the most romantic. It is admirably described in the travels of Lord Valentia, from which the following particulars are extracted.

On entering the defiles of the chain of mountains which the table-land of Mysore is separated from the country of Canara and Malabar, the scenery becomes extremely wild and romantic. Having reached Perias Chuttoor, situated on the summit of this celebrated Gaunt, his lordship began his descent at three in the morning, on a road formed with great labour out of a bed of hard rock, over which the torrents of the preceding winter have.
run with such force, as to wash away all the softer parts, and in several places to leave single rocks, of four or five feet diameter, standing in the centre of the road, and not more than two feet asunder. He alighted from his palanquin to admire the sublimity of the scene, and entered a forest of the largest Oriental trees, several of which were one hundred feet in the stem before a single branch extended itself, notwithstanding which, the descent was so steep, that he was frequently on a level with their tops, at so small a distance as to be able to distinguish them, by the gleam of the numerous torches by which his party was accompanied, but which were insufficient to enlighten the impenetrable canopy of foliage which for miles concealed the face of heaven, or the deep gloom of the abyss into which he appeared to descend. In the day-time the scene could not have been half so awful or magnificent. The descent was impeded by numerous droves of oxen which were ascending the Gait.

At break of day an opening, in a winding part of the road, displayed the lofty mountain the party had descended, covered with forests nearly to its summit. They passed several rivulets, which at one spot had united, and formed a small stream. The surrounding vegetation was richly variegated; and the branches of the loftiest trees covered by plants of the parasitical tribe. The inhabitants of a small village, in the centre of this immense forest, were employed in thrashing their grain in a truly patriarchal manner; on a floor of hard earth the grain was trodden out by men, which, agreeably to the Mosaical law, were unmuz-

THE CAPE OF THE WINDS.

The fortress of Mankoop, in the Crimea, is of a very extraordinary magnitude, and may be described as being literally stationed in the clouds. It covers the summit of a semicircular insulated mountain, which, from its frightful aspect, its altitude, and craggy perpendicular sides, independently of every other consideration than as a surprising work of nature, fills the mind with wonder on entering the defiles. In this singular situation, where there are not any visible means of ascent towards the height, and still less
of conveying the necessary materials for the completion of so astonishing a work, the Genoese constructed this citadel, perhaps without a parallel in Europe, the result of their wealth, address, and enterprise. Being at a remote distance from the coast, it is natural to conjecture that it was employed to curb the hostile spirit of the natives towards their maritime colonial possessions. The latest possessors of the fortress were Jews, in the cemetery of whose colony the traveller meets with ruined tombs of marble and stones lying beneath the trees he has to pass in his ascent. The whole of the passage up the mountain is steep and difficult; nor is it rendered more practicable by the ancients’ labours of its original possessors, whose dilapidated works occur almost at every step. On reaching the summit, cavens and gloomy galleries, perforated in the rock, present on every side their dark mouths. On the more elevated part of this extraordinary eminence, is a beautiful plain, covered with fine turf: it is partly fenced in by a mouldering wall of the fortress, but otherwise open to the surrounding precipices. From this spot the adjacent mountains, valleys, hills, woods, and villages, may be discerned. “While,” observes the traveller, “these details are supplied, with dismay and caution crept on our hands and knees to look over the brink of these fearful heights, a half-clad Tartar, wild as the wind of the north, mounted, without a saddle, and without other bridle except the twisted stem of a wild vine, on his colt equally unsubdued, galloped to the very edge of the precipice, where, as his horse stood prancing on the borders of eternity, he amused himself with pointing to us the different places in the vast district which the eye commanded. We entered one of the excavated chambers—a small square apartment, which led to another in our right-hand; and, on our left, a narrow passage conducted us to an open balcony, with a parapet in place formed of the rock, on the very face of one of the principal precipices, whence the depth below might be contemplated with less danger. The vultures which hovered over the valleys did not appear larger than swallows; and the waters of the hills, covered by tufted woods, with the villages scattered amid the rocks and defiles, appeared at so immense a depth, that the blood chilled at the view.
THE CAPE OF THE WINDS.

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length, being conducted to the north-eastern point of the
crescent, that being the shape of the summit on which
the fortress of Mankoop was built, and descending a few
stone steps, neatly hewn out in the rock, we entered by a
square door the cavern, called by the Tartars the CAPE
of the WINDS. It has been chiselled, like the rest, out
of the solid stone; but is open on four sides. From the
amazing prospect here commanded of all the surrounding
country, it probably served as a post of military observa-
tion. The apertures, or windows, are large arched chasms
in the rock: through these, a most extensive range of
scenery over the distant mountains and rolling clouds forms
a sublime spectacle. There is nothing in any part of
Europe to surpass the tremendous grandeur of the place.
Beneath the cavern is another chamber leading to the
several cells on its different sides: these have all been cut
out of the same rock."

The party, in descending, pursued a different route,
which, if they had taken in their ascent, would, our tra-
veller observes, have afforded them a view of the sublimest
scenery imaginable. They now passed beneath an old
arched gate-way of the citadel, once its principal entrance.
This road flanks the northern side of the mountain; and
the fall into the valley is so bold and profound, that a single
false step would precipitate both horse and rider. By
alighting, the danger is avoided; and the terror of the
descent compensated by the noblest scenery the eye ever
believed. It was dark before they reached the bottom;
and they had some difficulty to regain the principal road
which leads through the defile, owing principally to the
trees which project over all the lanes in the vicinity of
Tartar villages, and so effectually obstruct the passage of
persons on horseback, that they were in continual danger
of being thrown. The defile itself is not without danger
in certain seasons of the year, immense masses of lime-
stones detaching themselves from the rocks above, and
carrying all before them in their descent. Several of these
masses, detached from the northern precipices, had crossed
the river at the bottom, and, by the prodigious velocity
acquired in their descent, had actually rolled nearly half-
way up the opposite side.
This Cape forms the most northerly point of the Continent of Europe, and may be regarded as one of the sublimest wonders of nature. It is situated within the arctic circle, in seventy-one degrees ten minutes north latitude. It has been accurately described by a late voyager, from whose account the following particulars are extracted.

In approaching the Cape, a little before midnight, the rocks at first appeared to be nearly of an equal height, until they terminated in a perpendicular peak; but, on a nearer view, those within were found to be much higher than those of the extreme peak, or point. Their general appearance was highly picturesque. The sea, breasting against this immovable rampart, which had withstood the fury from the remotest ages, bellowed, and formed a thick border of white froth. This spectacle, equally beautiful and terrific, was illumined by the midnight sun; and the shade which covered the western side of the rocks rendered their aspect still more tremendous. The height of these rocks could not be ascertained; but here everything was on so grand a scale, that a point of comparison could not be afforded by any ordinary known objects.

On landing, the party discovered a grotto, formed of rocks, the surface of which had been washed smooth by the waves, and having within a spring of fresh water. The only accessible spot in the vicinity was a hill, some hundred paces in circumference, surrounded by enormous crags. From the summit of this hill, turning towards the sea, they perceived to the right a prodigious mountain, attached to the Cape, and rearing its sterile mass to the skies. To the left, a neck of land, covered with less elevated rocks, against which the surges dashed with violence, closed the bay, and admitted but a limited view of the ocean. One might see as far as possible into the interior, our navigators climbed almost to the summit of the mountain, wherein a most singular landscape presented itself to the view. A lake in the foreground had an elevation of at least nine feet above the level of the sea; and on the top of an adjacent, but less lofty mountain, was another lake.
North Cape at Midnight.

Ice Islands and Continent of Ice, in the North Polar Circle.
At midnight the sun still remained several degrees above the horizon, and continued to ascend higher and higher till noon, when, having again descended, it passed the north, without dipping below the horizon. This phenomenon, which is as extraordinary to the inhabitants of the torrid and temperate zones, as snow is to the inhabitants of the arctic zone, could not be viewed without a particular interest. Two months of continued day-light, during which space the sun never sets, seem to place the traveller in a new state of existence; while the effect on the inhabitants of these regions is singular. During the time the sun is perpetually above the horizon, they rise at ten in the morning, dine at five or six in the evening, and go to bed at one. But, during the winter season, when, from the beginning of December until the end of January, the sun never rises, they sleep above half of the twenty-four hours, and employ the other half in sitting over the fire, all business being at an end, and a constant darkness prevailing.

The cause of this phenomenon, as it affects the northern and southern regions of the earth, may be readily understood. The sun always illuminates half the earth at once, and shines on every side ninety degrees from the place where he is vertical. When he is vertical over the equator, or equidistant from both poles, he shines as far as each pole; and this happens in spring and autumn. But, as he declines to the north in summer, he shines beyond the north pole, and all the countries near that pole turn round in perpetual sunshine: he, at the same time, leaves the north pole an equal number of degrees, and those parts turn round in darkness. The effect is contrary at each pole in our winter, the sun then declining southward or the equator.

About three miles from the North Cape lies Masō, the northernmost port of Norwegian Lapland. It is formed of a very fine bay, in which ships may winter with the greatest security.
The mountain of San Antonia, on the route from Guayaquil to Quito, is described by Ulloa as presenting a set of the most fearful precipices. In crossing this mountain, the declivity was in some parts so great, that the mules could not have kept their footing, had not the paths been filled with holes, upwards of two feet in depth, in which the mules placed their fore and hinder feet, occasioning dragging their bellies, and the legs of the rider, along the ground. Without these holes, which serve as steps, the precipices would not be practicable. Should the hand happen, however, to place his foot between two of the holes, or to falter in the slightest degree, the rider would fall, and perish inevitably. To lessen the difficulties and dangers of these craggy paths, the Indians, who go before the travellers, dig small trenches across.

The descent from the heights was a task of serious danger. Owing to the excessive steepness, the water washed away the greater part of the holes; while, on one side were steep eminences, and on the other, frightful abysses. The mules were themselves sensible of the caution requisite in descending; for, on reaching the top of an eminence, they stopped, and having placed their fore feet close together, as in a posture of stopping themselves, they also placed their hinder feet together a little forwards, as if going to lie down. In this attitude having, as it were, taken a survey of the road, they went down with the swiftness of a meteor. All the rider had to do, was to keep himself fast in his saddle, without checking his beast; as the least motion would have been sufficient to destroy its equilibrium, and both would inevitably perished. The address of the creatures is truly wonderful, for, in this rapid motion, when they seem to have lost all government of themselves, they follow exactly the different windings of the road, as if they had previously reconnoitered, and settled in their minds the route they were to follow, and taken every precaution to their safety, amid so many irregularities. The safety of the rider depended entirely on their experience and address.
but, long as they had been accustomed to travel these roads, they still felt a degree of horror on reaching the top of a steep declivity. Without being checked by their rider, they stopped; and if he inadvertently endeavoured to spur them on, they were immovable until they had placed themselves in a secure posture. They seemed truly to be actuated by reason; for they not only viewed the road attentively, but trembled and snorted at the danger—emotions which inspired the party with the most dreadful apprehensions. The Indians went before, and, placing themselves along the sides of the mountain, where they held by the roots of trees, animated the beasts with shouts, until they at once started down the declivity.

There were some parts where the declivities were not on the side of precipices; but the road was so narrow and hollow, and the sides nearly perpendicular, that the danger was almost equal. The track being extremely narrow, with scarcely a sufficient width of road to admit the mule with its rider, if the former had fallen, the latter would necessarily have been crushed, and, for want of room to disengage himself, would have been mutilated in his limbs, if he had escaped with life. It was truly wonderful to consider with what exactness these animals, after having overcome the first emotions of their fear, and when they were going to slide down the declivity, stretched out their fore-legs, to the end that they might preserve their equilibrium. The gentle inclination they made with the body, at a proper distance, in following the several windings of the road, was also a mark of surprising sagacity; and, lastly, their address in stopping themselves at the end of the impetuous career, was truly deserving of observation. Greater prudence and conduct could not have been exhibited by man!

Precipice of the Table Mountain,

South Carolina.

The Table Mountain, situated in Pendleton District, in South Carolina, presents an awful precipice of nine hundred feet. Few persons who have once cast a glimpse into the almost boundless abyss beneath, can again exercise sufficient fortitude to approach the margin of the chasm.
Almost every one, on looking over, involuntarily falls to the ground, senseless, perveless, and helpless; and would inevitably be precipitated, and dashed to atoms, not for measures of caution and security, that have always been deemed indispensable to a safe indulgence of curiosity of the visitor or spectator. Every one, on proceeding to the spot, whence it is usual to gaze over the wonderful deep, has, in his imagination, a limit or boundary graduated by a reference to distances with which his eye has been familiar. But in a moment, eternity, as it were, is presented to his astounded senses; and he is instantly overwhelmed: his whole system is no longer subject to his volition or his reason, and he falls like a mass of lead obedient only to the common laws of mere matter. But then revives, and, in wild delirium, surveys a scene which for a while, he is unable to define by description or imagination.

GEOLOGICAL CHANGES OF THE EARTH

There are more things in heaven and earth
Than are dreamt of in our philosophy.

Shakespeare

The variety of fossil substances, many of them marine productions, which are found in mountains remote from the sea, are undeniable proofs that the earth's surface has undergone considerable changes, some of which indicate an alteration of climate not easily to be explained. The remains of animals inhabiting hot countries, and the marine productions of hot climates, which are frequently found in high northern latitudes, lead to a suspicion that the earth's axis was at a very remote period differently inclined to what it is at present. The tropics now extend twenty-three degrees and a half on each side the equator; but if they were extended to forty-five degrees, then the arctic circle and the tropics would coincide, and thence would arise inconceivable variations in the productions and phenomena of the earth. All this would form an amusing speculation to a person possessed of a terrestrial globe, who might wind a thread round it to represent the tropics at forty-five de
grees of elevation.
By the gradual operation of the sea, and of rivers, the face of the globe has, in the course of ages, undergone particular changes. The former has encroached in large rivers, running through low countries, have often been variously modified, by a deposition and transfer of the matter washed down from the land. At Havre, the sea undermines the steep coast; while it retreats at Dunkirk, where the shore is flat. In Holland the Zuyder Zee was probably formed, in the middle ages, by continual intrusions of the sea, where only the small lake Flevo had before existed. The mouths of the Rhine have been considerably altered, as well in their dimensions as in their directions. The mud, as it is deposited by large rivers, generally causes a delta, or a triangular piece of land, to grow out into the sea. Thus the mouth of the Mississippi is said to have advanced above fifty miles since the discovery of America. The island called Sandy Hook, at the entrance of the river of New York, was, about forty years ago, a peninsula attached to the high land. The sea, within the space of forty years, has retired more than a mile from Rosetta, in Egypt; and the mouths of the Arno, and of the Rhone, consist in a great measure of new land.

The Javanese have a tradition, that in former times the islands of Sumatra, Java, Bali, and Sumbawa, were united, and afterwards separated into nine different parts. They add, that when three thousand rainy seasons shall have passed away, they will be united. In the Mediterranean, geological phenomena evince, that the island of Malta, and that of Gozo, its dependency; now separated by a wide channel, and the intermediate small island of Comino, formed, together with the latter, a single island. By the encroachments of the sea, and the subsidence of some parts of the land, the islands of Scilly, the aboriginal inhabitants of which carried on a considerable trade in tin with the Phenicians, Greeks, and Romans, are now little more than barren rocks, with small patches of earth interspersed in the hollows. Strabo describes the Phenicians as having been so jealous of their lucrative traffic with these islands, that they ran a vessel purposely on shore, and took the lives of the crew, rather than have it made
known to the Romans. The land, within which these mines were worked, must now be sunk, and buried beneath the sea. On the shifting of the sands between islands, walls and ruins are frequently seen; the difference of level, since these walls, or fences, were made, to prevent the encroachments of the sea, being estimated at sixteen feet. There is little doubt but that there have been a subsidence of the land, followed by a subsequent inundation. This, indeed, seems to be confirmed by tradition, there being a strong persuasion in the western part of Cornwall, that there formerly existed a large causeway between the Land's-end and the islands of Scilly, now many fathoms under water. Although there are not positive evidences of such an ancient connexion between the main land and these islands, still it is extremely probable, that the cause of the inundation which destroyed the greater part of them, may have reached the Cornish shore, there being several proofs of a subsidence of the land Mount's Bay. The principal anchoring place, which is called a lake, is now a haven, or open harbour; and mount, from its Cornish name, signifying the grey rock, a wood, must have formerly stood in a wood, but is at full tide half a mile in the sea.

Examples of a similar kind, relative to every known country, might be multiplied. One of the most considerable inundations to be met with in history, is that which happened in the reign of Henry I. and which overflowed the estates of Earl Goodwin, forming the banks called Goodwin Sands. In the year 1546, a similar inundation of the sea destroyed a hundred thousand persons in the territory of Dort, in the United Provinces; and a still greater number round Dollart. In Friesland and Zealand, than three hundred villages were overwhelmed; and their remains are still visible, on a clear day, at the bottom of the water. The Baltic Sea has, by slow degrees, covered a large part of Pomerania; and, among others, overwhelmed the famous port of Vintia. The Norwegian Sea has formed several little islands from the main land, still daily advances on the continent. The German Sea has advanced on the shores of Holland, near Catt, to a degree, that the ruins of an ancient citadel of the Romans, formerly built on that coast, are now under water.
The country surrounding the Isle of Ely was, in the time of Bede, about a thousand years ago, one of the most delightful and highly cultivated spots in Great Britain: it was overwhelmed, and remained for several centuries under water, until at length, the sea, by a caprice similar to the one which had prompted its invasions, abandoned the earth, but without the latter being able to recover its primitive state, that of one of the most fertile valleys in the world.

On the other hand, the sea has, in many instances, deserted the land; and by the deposition of its sediment in some places, and the accumulation of its sands in others, has also formed new lands. In this manner the Isle of Oxney, near Romney Marsh, was produced. In France, the town of Aigues Mortes, which was a sea-port in the time of St. Louis, is now removed more than four miles from the sea. Psalmody, also in that kingdom, was an island in the year 815, and is now upwards of six miles within the land. In Italy, a considerable portion of land has been gained at the mouth of the river Arno; and Ravenna, which once stood by the sea-side, is now considerably removed from it. Every part of Holland seems to be a conquest from the sea, and to have been rescued, in a manner, from its bosom. The industry of man, however, in the formation of dykes, is here to be brought into account; for the surface of the earth, in that country, is for the greater part below the surface of the sea.

Three-fifths of the surface of the globe are covered by the sea, the average depth of which has been estimated at from five to ten miles. Demonstrative proofs exist in Great Britain, and in various parts of the world, that great changes have taken place in the relative positions of the present continents with the ocean, which, in former ages, rolled its waves over the summits of our present elevated mountains. To illustrate this subject, and before these proofs are entered on, in the consideration of the geological phenomena, named "extraneous fossils," it will be proper to introduce the pleasing and truly philosophical view of the successive changes the earth has undergone, contained in Sir Richard Phillips's Morning's Walk to Kew. In passing near the banks of the Thames, Sir Richard was led, in two several places, to introduce
the following observations and reflections on this high and curious and interesting subject. They apply the principles in a way to which they may be applied to any river, and indicate how much we are daily surrounded by the wonders of creation, the process of which, as Sir Richard observes, is _never ceasing_. In passing over the alluvial banks of Barnes Common, he introduces the following paragraphs, p. 197.—

"On this Common, nature still appears to be in a pre-}
meval and unfinished state. The entire flat from the background to the Thames, is evidently a mere fresh-water formation, of comparatively modern date, created out of the rocky ruins which the rains, in a series of ages, have washed from the high grounds, and further augmented by the decay of local vegetation. The adjacent high lands being elevated above the action of the fresh water, have no doubt marine formations, created by the flowing of the sea during the four thousand years when the earth was last in a perihelion during our summer months; which was between twelve and seven thousand years since. The flat, or fresh-water formation, on which I was walking, still only approaches its completion; and the desiccated soil has yet fully defined the boundaries of the river. At springs tides, particularly when the line of the moon's apsides coincides with the syzygies, or when the ascending node of the vernal equinox, or after heavy rains, the river overflows its banks, and indicates its originally exten- scite under ordinary circumstances.

"The state of transition also appears in marshes, bay- and ponds, which, but for the interference of man, many ages ago, have been filled up with decayed basis and the remains of undisturbed vegetation. Rivers and streams become agents of the _never-ceasing creation_, and means of giving greater equality to the face of the land. The sea, as it retired, either abruptly from some situation or gradually from others, left dry land, consisting of downs and swelling hills, disposed in all the variety which would be consequential on a succession of floods and ebbs for several thousand years. These downs, acted upon by rain were mechanically, or in solution, carried off by the water to the lowest levels, the elevations being thereby depressed and the valleys proportionally raised. The low lands of
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When of course the channels through which the rains returned to the sea, and the successive deposits on their sides, hardened by the wind and sun, have, in five or six thousand years, created such tracts of alluvial soil, as those which now present themselves in contiguity with most rivers. The soil, thus assembled and compounded, is similar in its nature to the rocks and hills whence it was washed; but, having been so pulverized, and so divided by solution, it forms the finest medium for the secretion of all vegetable principles, and hence the banks of rivers are the favourite residences of man. Should the channel constantly narrow itself more and more, till it becomes choked in its course, or at its outlet, then, for a time, lakes would be formed, which, in like manner, would narrow themselves and disappear. New channels would then be formed, or the rain would so diffuse itself over the surface, that the fall and the evaporation would balance each other.

"Such are the unceasing works of creation, constantly taking place on this exterior surface of the earth; where, though less evident to the senses and experience of man, matter apparently inert is in as progressive a state of change, from the operation of unceasing and immutable causes, as in the visible generations of the animal and vegetable kingdoms. Thus water, wind, and heat, the energies of which never cease to be exerted, are constantly producing new combinations, changes, and creations; which, if they accord with the harmony of the whole, are fit and "good;" but, if discordant, are speedily re-organized or extinguished by contrary and oppressing powers. In a word, whatever is, is fit; and whatever is not fit, is not, or soon ceases to be!

"Such seems to be the governing principle of Nature—the key of all her mysteries—the primary law of creation! All things are the proximate effects of a balance of immeasurable powers—those powers are results of a primary Cause, while that cause is inscrutable and incomprehensible to creatures possessing but a relative being, who live only in Time and Space, and who feel and act merely by the impulse of limited senses and powers."

Again, in page 354, Sir Richard introduces the following opposite remarks on this very interesting subject:
As I approached a sequestered mansion-house, and some other buildings, which together bear the name of Bates' Stables, I crossed a corner of the meadow towards an angle formed by a rude inlet of the Thames, which was running smoothly towards the sea, at the pace of four miles an hour. The tide unites here with the ordinary current, and, running a few miles above this place, exhibits twice a day the finely-reduced edge of that physical balance-wheel, or oscillating fluid-pendulum, which creates the earth's centrifugal power, and varies the centre of its forces. In viewing the beautiful process of Nature, presented by a majestic river, we cease to wonder that priest-craft has often succeeded in teaching nations to consider rivers as of divine origin, and as proximate living emblems of Omnipotence. Ignorance, whose constant error it is to look only to the last term of every series of causes, and to term higher, and Atheism on all who dare to explore several terms, (though every series implies a first term, which would easily be persuaded by a crafty priesthood to consider a beneficent river as a tangible branch of the Godhead. But we now know that the waters which flow down a river are but a portion of the rains and snows which, having fallen near its source, are returning to the ocean, there to rise again and re-perform the same circle of vapours, clouds, rains, and rivers. What a process of fertilization, and how still more luxuriant would have been this vicinity, if man had not levelled the trees, and carried away the crops of vegetation. What a place of shelter would thus have been afforded to tribes of amphibia, whose accumulated remains often surprise geologists, though necessarily consequent on the fall of crops of vegetation on each other, upon undisturbed banks of rivers. Happily, in Britain, coal-pits, or mineralized forests, have supplied the place of our living woods; or man, regardless of the fitness of the parts to the perfection of every natural result, might have thwarted the course of Nature by cutting down the timber, which, acting on the electricity of the clouds, affects their density, and causes them to fall in fertilizing showers. Such has been the fate of all the countries famous in antiquity. Persia, Syria, Arabia, parts of Turkey, and...
Barbary coast, have been rendered arid deserts by this inad-
vertency. The clouds from the Western Ocean would
long since have passed over England without disturbance
from the conducting powers of leaves of trees, or blades
of grass, if our coal-works had not saved our natural con-
ductors; while this Thames, the agent of so much abun-
dance and so much wealth, might, in that case, have be-
come a shallow brook, like the once equally famed Jordan,
Granicus, or Hyssus.

I now descended towards a rude space near the Thames,
which appeared to be in the state in which the occasional
overflowings and gradual retrocession of the river had left
it. It was one of those wastes which the lord of the
manor had not yet enabled some industrious cultivator to
dispose; and in large tracts of which Great Britain still
exhibits the surface of the earth in the pristine state in
which it was left by the secondary causes that have given it
form. The Thames, doubtless, in a remote age, covered
the entire site; but it is the tendency of rivers to narrow
themselves, by promoting prolific vegetable creations on
their consequently increasing and encroaching banks,
though the various degrees of fall produce every variety of
currents, and, consequently, every variety of banks, in
their devious course. In due time, the course of the river
becomes choked where a flat succeeds a rapid, and the
detained waters then form lakes in the interior. These
like-wise generate encroaching banks, which finally
fill up their basins, when new rivers are formed on higher
levels. These, in their turn, become interrupted, and re-
productions of the former circle of causes produce one class
of those elevations of land above the level of the sea,
which have so much puzzled geologists. The only con-
venient raise itself, is the absence of salt-water, consequent on
which is an accumulation of vegetable and animal

The Thames has not latterly been allowed to produce its
natural effects, because for two thousand years the banks
have been inhabited by man, who, unable to appreciate
the general laws by which the phenomena of the earth are
produced, has sedulously kept open the course of the river,
and prevented the formation of interior lakes. The Can-
pian Sea, and all similar inland seas and lakes, the most part, formed from the choking up of rivers which once constituted their outlets. If the course of nature be not interrupted by the misdirected industry of man, the gradual desiccation of all such collections of water will, in due time, produce land of higher level than their sites. In like manner, the great lakes of North America, if the St. Lawrence be not sedulously kept open will, in the course of ages, be filled up by the gradual encroachment of their banks, and the raising of the bottoms with strata of vegetable and animal remains. New rivers would then flow over these increased elevations, and the ultimate effect would be to raise the level of the Continent of North America several hundred feet above its present level. Even the very place on which stand was, according to Webster, once a vast lake extending from the Nore to near Reading, but now filled up with vegetable and animal remains; and the illustrious Cuvier has discovered a similar basin round the site of Paris. These once were Caspian basins, created by the choking and final disappearance of some mighty rivers—they have been filled up by gradual encroachments, and now the Thames and the Seine flow over them;—but left to themselves, will, in their turn, generate new lakes or basins—and the successive recurrence of a similar series of causes will continue to produce similar effects, till interrupted by superior causes.

"This situation was so sequestered, and therefore so favourable to contemplation, that I could not avoid indulging myself. What, then, are those superior causes, claimed, which will interrupt this series of natural evolutions to which man is indebted for the innumerable variations of hill and dale, and for the elysium of beauty and peace in which he finds himself? Alas! facts prove, however, that all things are transitory, and that change of condition is the constant and necessary result of that motion which is the chief instrument of eternal causation, but while it is generating new ones. In the motions of the earth as a planet, doubtless are to be discovered the superior causes which convert seas into continents, and continen

ents into seas. These sublime changes are occasioned
EXTRANEOUS FOSSILS.

The progress of the perihelion point of the earth's orbit through the ecliptic, which passes from extreme northern to extreme southern declination, and vice versa, every ten thousand four hundred and fifty years; and the maxima of the central forces in the perihelion occasion the waters to accumulate alternately upon either hemisphere. During ten thousand four hundred and fifty years, the sea is therefore gradually retiring and encroaching in both hemispheres:—hence all the varieties of marine appearances and accumulations of marine remains in particular situations; and hence the succession of layers or strata, one upon another, of marine and earthy remains. It is evident, from observation of those strata, that the periodical changes have occurred at least three times; or, in other words, it appears that the site on which I now stand has been three times covered by the ocean, and three times has afforded an asylum for vegetables and animals! How sublime—how interesting—how affecting is such a contemplation! How transitory, therefore, must be the local arrangements of man, and how puerile the study of the science miscalled Antiquities! How foolish the pride which vaunts itself on splendid buildings and costly mausoleums! How vain the ostentation of large estates, of extensive boundaries, and of great empires!—All—all will, in due time, be swept away and defaced by the unsparing ocean; and, if recorded in the frail memorials of human science, will be spoken of like the lost Atalantis, and remembered only as a Philosophical dream!"—Phillips's Walk to Kew.

EXTRANEOUS FOSSILS.

The fossil remains of animals not now in existence, enshrouded and preserved in solid rocks, present us with durable monuments of the great changes which our planet has undergone in former ages. We are led to a period when the waters of the ocean have covered the summits of our highest mountains, and are irresistibly compelled to adopt one of two conclusions, either that the sea has received, and sunk beneath its former level; or that some power, operating from beneath, has lifted up the islands and continents, with all their hills and mountains, from the watery abyss to their present elevation above its surface. The calcareous, or limestone, mountains in Derbyshire,
and at Craven, in Yorkshire, having an elevation of about two thousand feet above the present level of the sea, contain, in a greater or less abundance, and throughout their whole extent, fossil remains of zoophites, shell-fish and marine animals. Not any remains of vegetables have been found in the calcareous mountains of England; in the thick beds of shale and grit-stone lying upon them are found various vegetable impressions, and above these regular beds of coal, with strata, containing shells of fresh-water muscles. In the earthy limestone of the upper strata are sometimes found fossil flat-fish, with the impres-
sion of the scales and bones quite distinct. The moun-
tains of the Pyrenees are covered in the highest parts
Mont Perdu, with calcareous rocks, containing impres-
sions of marine animals; and, even where the impressions
not visible in the limestone, it yields a fetid cadaverous
odour, when dissolved in acids, owing, in all probability
to the animal matters it contains. Mont Perdu rises ten thousand five hundred feet, nearly two
above the level of the sea, is the highest situation in any marine remains have been found in Europe.
Andes they have been observed by Humboldt at the base
of fourteen thousand feet, more than two miles and a half.
Lastly, in southern countries, in and under beds of chalk, the bones of the elephant, and of the
rhinoceros, are frequently found.

These bones, as they have been brought from differ-
ent parts of the world, have been examined with the utmost
attention by the sagacious naturalist, Cuvier. He has observed characteristic variations of structure, which prove
that they belong to animals not now existing on our globe,
or have many of the various zoophites and shell-fish
found in calcareous rocks, been discovered in our present
seas. From these very curious facts he makes the follow-
ing deductions.

"These bones are buried, almost everywhere, in similar beds: they are often blended with some other animals resembling those of the present day. The beds are generally loose, either sandy or marly; and always ne-
bouling, more or less, to the surface. It is then probable
that these bones have been enveloped by the last, or one of the last, catastrophes of this globe. In a gro

218 GEOLOGICAL CHANGES OF THE EARTH.
number of places they are accompanied by the accumulated remains of marine animals; but in some places, which are less numerous, there are none of these remains: sometimes the sand or marl, which covers them, contains only fresh-water shells. No well-authenticated account proves that they have been covered by regular beds of stone, filled with sea-shells; and, consequently, that the sea has remained on them undisturbed, for a long period.

The catastrophe which covered them was, therefore, a great, but transient, inundation of the sea. This inundation did not rise above the high mountains; for we find no analogous deposits covering the bones, nor are the bones themselves there met with, not even in the high valleys, unless in some of the warmer parts of America. These bones are neither rolled nor joined in a skeleton, but scattered, and in part fractured. They have not, then, been brought from afar by inundation, but found by it in places where it has covered them, as might be expected, if the animals to which they belonged had dwelt in these places, and had there successively died. Before this catastrophe, these animals lived, therefore, in the climates in which we now dig up their bones: it was this catastrophe which destroyed them there; and, as we no longer find them, it is evident that it has annihilated those species. The northern parts of the globe, therefore, nourished formerly species belonging to the genus elephant, hippopotamus, rhiinus, and tapir, as well as to mastodon, genera of which the four first have no longer any species existing, except in the torrid zone; and of the last, none in any part."

That every part of the dry land was once covered by the ocean, is a fact on which all geologists agree; and the discovery, noticed above, of the fossil remains of many genera of quadrupeds, once existing, but which have now disappeared from the earth, leads to another fact, not less interesting, and which is at the same time coincident with the oldest records or traditions of the human race, namely, that at the period when these great changes took place, man was not an inhabitant of the planet. These fossil remains, now about to be particularized, are among the most surprising of nature's phenomena, and irresistibly lead to awful speculations respecting the past and future condition of the terrestrial globe.
FOSSIL CROCODILES.

These fossils were collected in the neighbourhood of Honfleur, on the coast of France, and were found in a bed of hard limestone, of a bluish grey colour, which becomes nearly black when wet, and which is found along the shore on both sides of the mouth of the Seine, being in some places covered by the sea, and in others, above low level, even at high water.

Remains of crocodiles have also been found in other parts of France; as, at Angers and Mans. Some of these remains seem to show, that at least one of the fossil species above noticed is also found in other parts of France besides Honfleur.

The remains of crocodiles have been also found in different parts of England; but particularly on the coast of Dorsetshire, and of Yorkshire, near Whitby; in the neighbourhood of Bath; and near Newark, in Nottinghamshire.

Somersetshire, particularly in the neighbourhood of Bath, the cliffs on the Dorsetshire, or Southern, coast, and on the Yorkshire, or Northern, coast, are the places in the island in which the remains of the animals of this tribe have been chiefly found. The matrix in which they are found is in general similar to that which has been already mentioned as containing the fossils of Honfleur—a bluish limestone, becoming almost black when wetted.

The description exactly agrees with the limestone of Chale mouth, Lime, &c. in Dorsetshire, on the opposite coast of that of France, on which Honfleur is situated. At Whitley and Scarborough, where these fossils are also found, the stone is indeed somewhat darker than in the former place, but no difference is observable which can be regarded as offering any forcible opposition to the probability of the original identity of this stratum, which is observed on the northern coast of France, on the opposite southern England coast, and at the opposite northern extremity of the island.

Some of these remains are also found in quarries of common coarse grey and whitish limestone. Instances of this kind of matrix, for these remains, are observable in quarries between Bath and Bristol.
The Rev. Mr. Hawker, of Woodchester, in Gloucestershire, possesses, perhaps, one of the handsomest specimens of the remains of the crocodile discovered in this island. It was found by him in the neighbourhood of Bath, and contains great part of the head and of the trunk of the animal.

The large animal, whose fossil remains are found in the quarries of Maestricht, has been deservedly a frequent object of admiration; and the beautiful appearance which its remains possess, in consequence of their excellent state of preservation, in a matrix which admits of their fair display, has occasioned every specimen of this fossil to be highly valued. The lower jaw of this animal, with some other specimens, which were presented by Dr. Peter Camper to the Royal Society, and which are now in the British Museum, are among the most splendid and interesting fossils in existence.

In 1770, the workmen, having discovered part of an enormous head of an animal imbedded in the solid stone, in one of the subterraneous passages of the mountain, gave information to M. Hoffman, who, with the most zealous assiduity, laboured until he had disengaged this astonishing fossil from its matrix. But when this was done, the fruits of his labours were wrested from him by an ecclesiastic, who claimed it as being proprietor of the land over the spot on which it was found. Hoffman defended his right in a court of justice; but the influence of the Chapter was employed against him, and he was doomed not only to the loss of this inestimable fossil, but to the payment of heavy law expenses. But in time, justice, M. Paujas says, though tardy, at last arrived—the troops of the French Republic secured this treasure, which was conveyed to the National Museum.

The length of the cervical, dorsal, and lumbar vertebrae, appears to have been about nine feet five inches, and that of the vertebrae of the tail about ten feet; adding to which the length of the head, which may be reckoned, considering the length of the intermaxillary bones, at least at four feet, we may safely conclude the whole length of the
skeleton of the animal to have approached very nearly a twenty-four feet.

The head is a sixth of the whole length of the animal, a proportion approaching very near to that of the crocodile, but differing much from that of the monitor, the head of which animal forms hardly a twelfth part of the whole length.

The tail must have been very strong, and its width, at its extremity, must have rendered it a most powerful organ, and have enabled the animal to have opposed the most vigorous agitations of its hinder parts, as has been well remarked by M. Adrien Cuvier. From this circumstance, and from the other remains which accompany those of this animal, there can be no doubt of its having been an inhabitant of the ocean.

Taking all these circumstances into consideration, Cuvier concludes, and certainly on fair, if not indisputable grounds, that this animal must have formed an intermediate genus between those animals of the lizard tribe, which have an extensive and forked tongue, which include the monitors and the common lizards, and those which have a short tongue, and the palate armed with teeth, which comprise the iguanas, marbrés, and anolis. Of this genus, he thinks, could only have been allied to the crocodile by the general characters of the lizards.

FOSSIL REMAINS OF RUMINANTIA.

Among the fossils of the British Empire, none are more calculated to excite astonishment than the enormous size of the horns which have been dug up in different parts of Ireland. Their dimensions, Dr. Molyneux informs us, follow:

<table>
<thead>
<tr>
<th>Description</th>
<th>Feet.</th>
</tr>
</thead>
<tbody>
<tr>
<td>From the extreme tip of each horn</td>
<td>10</td>
</tr>
<tr>
<td>From the tip of the right horn to its root</td>
<td>10</td>
</tr>
<tr>
<td>From the tip of one of the inner branches to the tip of the opposite branch</td>
<td>3</td>
</tr>
<tr>
<td>The length of one of the palms, within the branches</td>
<td>2</td>
</tr>
<tr>
<td>The breadth of the same palm, within the branches</td>
<td>1 1/2</td>
</tr>
<tr>
<td>The length of the right brow antler</td>
<td>1 2/3</td>
</tr>
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</table>
A similar pair, found ten feet under ground, in the county of Clare, was presented to Charles II. and placed in the horn-gallery, Hampton-court; but was afterwards removed into the guard-room of the same palace.

At Ballyward, near Ballyshannon; at Turvy, eight miles from Dublin; and at Portumery, near the river Shannon, in the county of Galway; similar horns have been found. In the common-hall of the Bishop of Arnhagh's house, in Dublin, was a forehead, with two amazingly large beams of a pair of this kind of horns, which, from the magnitude of the beams, must have much exceeded in size those of which the dimensions are given above. Dr. Molyneux states, that in the last twenty years, thirty pair of these horns had been dug up by accident in this country; the observations, also, of several other persons, prove the great frequency with which these remains have been found in Ireland.

Various opinions have been entertained respecting this animal and its existing prototype. This, however, does not appear to have been yet discovered; and these remains may, therefore, be regarded as having belonged to an animal now extinct.

Fossil Remains of Elephants.

Numerous remains of elephants have been found in Italy; and, although a very considerable number of elephants were brought from Africa into that country, yet the vast extent through which these remains have been found, and the great probability that the Italians, particularly the Romans, would have known sufficient of the value of ivory, to have prevented them from committing the tusks to the earth, lead to the belief, that by far the greater number of these remains which have been dug up, have been deposited here, not by the hands of man, but by the changes which, at least, the surface of this globe has undergone, at very remote periods. The circumstances, indeed, under which many of these have been found, afford indubitable proof of this fact.

In France, where it well known that living elephants have been much less frequent, at least in times of which we have any record, than either in Italy or in Greece, their
fossil remains have been found in a great number of places and in situations which prove their deposition at a very remote period. The whole valley through which the Rhine passes, yields fragments of this animal, and perhaps more numerously on the side of Germany than on that of France. Not only in its course, but in the alluvia of its several streams which empty themselves into it, are the fossil remains also found. Thus Holland abounds with them, and even the most elevated parts of the Batavian Republic are not exempt from them.

Germany and Swisserland appear particularly to abound in these wonderful relics. The greater number found in these parts, is, perhaps, as is observed by M. Cuvier, attributable to their greater abundance, but to the number of well-informed men, capable of making the necessary researches, and of reporting the interesting facts they discover.

As in the banks of the Rhine, so in those of the Danube, these fossils abound. In the valley of Atmsaul, a grand deposit of these remains. The bones which have been found at Krembs, in Sweden; at Baden, near Vienna; in Moravia; in different parts of Hungary and of Transylvania; at the foot of the Hartz; in Hesse at Hildesheim; all appear to be referable to this animal. So also are those which are found on the Elbe, the Oder and the Vistula. Different parts of the British Empire are not less productive of these remains.

In London, Brentford, Harwich, Norwich, Gloucestershire, Staffordshire, Warwickshire, Salisbury, the Isle of Shepey, and, indeed, in several other parts of Great Britain, different remains of these animals have been found.

When we add to those places which have been already enumerated, Scandinavia, Ostrobothnia, Norway, Iceland, Russia, Siberia, Tunis, America, Huehuetoca, near Mexico, and Ibarra, in the province of Quito, near Peru; we will appear that there is hardly a part in the known world whose subterrestrial productions are known to us, in which these animal remains have not been discovered.

M. Cuvier is satisfied, from the actual comparison of several skulls of the East-Indian and African elephants, that different specific characters exist in them respectively.

In the Indian elephant, the top of the skull is raised in
South American Mammoth
kind of double pyramid; but, in the African it is nearly rounded. In the Indian the forehead is concave, and in the African it is rather convex. Several other differences exist, not necessary to be here particularised, which seem to be fully sufficient to mark a difference of species.

A cursory view is sufficient to enable us to determine that the ordinary fossil teeth of elephants are not of the African species, and it may be further said, that the greater number of these teeth bear a close resemblance to the East-Indian species, showing, on their masticating surface, bands of an equal thickness through their whole length, and rudely eremulated. So great, indeed, is the resemblance, that Pallas, and most other writers, have considered the fossil elephant as being of the same species with the Asiatic.

M. Cuvier, anxious to discover the degree of accordance of the fossil elephant’s skeleton with that of the living species, compared the fossil skull, found in Siberia by Messerschmidt, with those of the African and Asiatic elephants. The result of his comparison was, that in the fossil species the alveoli of the tusks are much longer; the zygomatic arch is of a different figure; the postorbital aperture of the frontal bone is longer, more pointed, and more crooked; and the tubercle of the os lachrymalis is considerably larger, and more projecting. To these peculiarities of the fossil skull, M. Cuvier thinks, may be added the parallelism of the molares.

Comparing together the bones of the Asiatic and of the African elephant, he was able to discover some differences between them, as well as between those and some of the fossil bones which he possessed. These latter he found, in general, approached nearest to those of the Asiatic elephant. He concludes with supposing that the fossil remains are of a species differing more widely from the Asiatic elephant than the horse does from the ass, and therefore does not think it impossible but that it might have existed in a climate that would have destroyed the elephant of India.

It may, therefore, be assumed as certain, from the observations of M. Cuvier, that at least one species of elephants has existed, of which none are now known living; and, should the difference of structure which has been pointed out, in some of the fossil teeth, be admitted as sufficient,
to designate a difference of species, it may be then said that there exist the fossil remains of, at least, two species of elephants, which were different from those with which we are acquainted.

From the preceding observations it appears, then, that the fossil elephantine remains, notwithstanding their resemblance in some respects to the bones of the Asiatic elephant, have belonged to one or more species, different from those which are now known. This circumstance agrees with the facts of the fossil remains of the tapires and rhinoceroses, which appear to have differed materially from the living animals of the same genera. The remains of elephants obtained from Essex, Middlesex, Kent, and other parts of England, confirm the observation of Cuvier, that these remains are generally found in the looser and most superficial parts of the earth, and most frequently in the alluvia which fill the bottoms of the vallies, or which border the beds of rivers. They are generally found mingled with the other bones of quadrupeds of known genera, such as those of the rhinoceros, ox, horse, &c. and consequently, also, with the remains of marine animals.

**FOSSIL REMAINS OF THE MASTODON.**

We now come to the examination of one of the most extraordinary animals known, either in a recent or a fossil state, and which, whether we contemplate its original mode of existence, or the period at which it lived, cannot but fill our minds with astonishment.

The first traces of this animal are sketched in a letter from Dr. Mather, of Boston, to Dr. Woodward, in 1775, and are transcribed from a work in manuscript, entitled *Biblia Americana*. In this work, teeth and bones of prodigious size, supposed to be human, are said to have been found in Albany, in New England. About the year 1790, numerous similar bones were found in Kentucky, on the Ohio, and dispersed among the European virtuosi.

Many bones of this animal were found, in 1799, in the State of New York, in a large plain, bounded on every side by immense mountains, in the vicinity of Newburgh, situated on the Hudson, or North River. These remains are also found on the side of the three great chains
Fossil Remains of the Rhinoceros.

Mountains, the Aligamys, the North Mountains, and the Blue Mountains; in the anterior parts of Pennsylvania and Carolina; and in New Jersey, a few miles from Philadelphia.

From a careful attention to every circumstance, M. Cuvier conceives we have a right to conclude, that this great mastodon, or animal of the Ohio, did not surpass the elephant in height, but was a little longer in proportion; its limbs rather thicker; and its belly smaller. It seems to have very much resembled the elephant in its barks, and, indeed, in the whole of its osteology; and it also appears to have had a trunk. But, notwithstanding its resemblance to the elephant, in so many particulars, the form and structure of the grinders are sufficiently different from those of the elephant, to demand its being placed in a distinct genus. From the later discoveries respecting this animal, M. Cuvier is also inclined to suppose that its food must have been similar to that of the hippopotamus and the boar, but preferring the roots and fleshy parts of vegetables; in the search of which species of food it would, of course, be led to such soft and marshy spots as it appears to have inhabited. It does not, however, appear to have been at all formed for swimming, or for living much in the waters, like the hippopotamus, but rather seems to have been entirely a terrestrial animal.

Fossil Remains of the Rhinoceros.

There appear to be three living species of rhinoceros:

1. That of India, a unicorn, with a rugose coat, and with incisors, separated, by a space, from the grinders. 2. That of the Cape, a bicorn, the skin without rugae, and having twenty-eight grinders, and no incisors. 3. That of Sumatra, a bicorn, the skin but slightly rugose, thus far resembling that of the Cape, but having incisive teeth, like that of India.

The fossil remains of the rhinoceros have been generally found in the same countries where the remains of elephants have been found; but they do not appear to have so generally excited attention; and, perhaps, but few of those who discovered them were able to determine to what animal they belonged. Thus a tooth of this animal is described
by Grew merely as the tooth of a terrestrial animal; and the remains of this animal, found in the neighbourhood of Canterbury, were supposed to have belonged to the hippopotamus.

In Hartzberg, in the principality of Grubenhausen, Quedlimburg, Darmstadt, the borders of the Rhein, Mentz, Strasbourg, the neighbourhood of Cologne, Westphalia, numerous parts of France, and in several parts of Great Britain, the remains of the rhinoceros have been found. In Siberia these remains have been met with in considerable quantities. Pallas, whose researches have been particularly directed to this part of the world, makes the astonishing discovery of a complete rhinoceros, covered by its skin, and buried in the sand on the borders of the river Wiluji.

**Fossil Remains of the Siberian Mammoth**

It has been demonstrated by Cuvier, that this animal was of a different species from the mastodon, or American mammoth. Its bones have been found in the alluvial soil near London, Northampton, Gloucester, Harwich, Norwich, in Salisbury plain, and in other places in England; they also occur in the north of Ireland; and in Sweden, Iceland, Russia, Poland, Germany, France, Holland, and Hungary, the bones and teeth have been met with in abundance. Its teeth and bones have also been found in North and South America, and abundantly in Asiatic Russia. Pallas says, that from the Don to the Tchuskoiness, there is scarcely a river that does not afford the remains of the mammoth, and that they are frequently imbedded in the alluvial soil, containing marine productions. The skeleton is seldom complete; but the following interesting narrative will show that, in one instance, the animal was found in an entire state.

In the year 1799, a Tungusian fisherman observed a strange shapeless mass projecting from an ice-bank, near the mouth of a river in the north of Siberia, the nature of which he did not understand, and which was so high above the bank as to be beyond his reach. He next year observed the same object, which was then rather more disengaged from among the ice; but was still unable to come
receive what it was. Towards the end of the following
summer, 1801, he could distinctly see that it was the frozen
carcass of an enormous animal, the entire flank of which,
and one of its tusks, had become disengaged from the
ice. In consequence of the ice beginning to melt earlier,
and to a greater degree than usual, in 1803, the fifth year
of this discovery, the enormous carcase became entirely
disengaged, and fell down from the ice-crag on a sand-
bank forming part of the coast of the Arctic Ocean. In
the month of March of that year, the Tungusian carried
away the two tusks, which he sold for fifty rubles, about
fifteen pounds sterling.

Two years afterwards this animal still remained on the
sand-bank where it had fallen from the ice; but its body
was then greatly mutilated. The peasants had taken away
considerable quantities of its flesh to feed their dogs; and
the wild animals, particularly the white bears, had also
feasted on the carcase; yet the skeleton remained quite
entire, except that one of the fore legs was gone. The en-
tire spine, the pelvis, one shoulder-blade, and three legs,
were still held together by their ligaments, and by some
remains of the skin; and the other shoulder-blade was
found at a short distance. The head remained, covered by
the dried skin, and the pupil of the eyes was still distin-
guishable. The brain also remained within the skull, but
a good deal shrunk and dried up; and one of the ears was
in excellent preservation, still retaining a tuft of strong
bristly hair. The upper lip was a good deal eaten away,
and the under lip was entirely gone, so that the teeth were
distinctly seen. The animal was a male, and had a long
nuane on its neck.

The skin was extremely thick and heavy, and as much
of it remained as required the exertions of ten men to
carry away, which they did with considerable difficulty.
More than thirty pounds weight of the hair and bristles of
this animal were gathered from the wet sand-bank, having
been trampled into the mud by the white bears, while
devouring the carcase. The hair was of three distinct
kinds; one consisting of stiff black bristles, a foot or more
in length; another of thinner bristles, or coarse flexible
hair, of a reddish-brown colour; and the third of a coarse
reddish-brown wool, which grew among the roots of the
GEOLOGICAL CHANGES OF THE EARTH.

These afford an undeniable proof that this animal had belonged to a race of elephants inhabiting a cold region, with which we are now unacquainted, and by means fitted to dwell in the torrid zone. It is also evident that this enormous animal must have been frozen up in the ice at the moment of its death.

FOSSIL SHELLS.

At whatever elevations these shells may have been found and however remote from the parts of the globe now occupied by water, it is certain that they were once generated in the sea, by which they were deposited. The chain of primitive mountains in Siberia is flanked on each side by a chain of hills inclosing marine shells. On a comparison of the forms, contexture, and composition, of these shells, as they have been found imbedded in rocks, no slightest difference can be detected between several varieties of them and those which still inhabit the sea. At Touraine, in France, a hundred miles from the coast, and about nine feet beneath the surface, a bed of fossil shells has been found, nine leagues in length, and about twenty feet in thickness. Such beds are known to exist in every part of Europe; and in South America, agreeably to Ulloa, they are very frequent.

Great Britain abounds in these fossil productions. In the cliffs of the Isle of Sheppey, bordering on the Thames, several varieties of the crab, and lobsters nearly whole, have been found in a petrified state. Within the islands in the vicinity of Reading, in Berkshire, an abundance of oyster-shells have been found, many of them entire, and having both their valves united. At Broughby, in Lincolnshire, there are two quarries abounding in fresh-water shells, which are found in a blue stone, supposed to have been formerly clay, and to have been gradually indurated. A bed of shells, twelve feet thick, and lying in a greenish sand, has been found about a mile from Reculver in Kent. At Harwich, at the entrance of the river, a sandy cliff, fifty feet in height, contains shells, of which there are no less than twenty-eight varieties. On digging a moorish pasture, in Northamptonshire, many snails and river shells were found; and these were the more about
In the year 1708, a breach made by the Thames, at an extraordinary high tide, inundated the marshes of Dagenham and Havering, in Essex. Such was the impetuous rush of the water, that a large passage or channel was torn up, three hundred feet in width, and in some parts twenty feet in depth. In this way, a great number of trees, which had been buried there many ages before, were exposed to view. With one exception, that of a large oak, having the greatest part of its bark, and some of its heads and roots in a perfect state, these trees bore a greater resemblance to alder than to any other description of wood. They were black and hard, and their fibres extremely tough. Not any doubt was entertained of their having grown on the spot where they now lay; and they were so numerous, that in many places they afforded steps to the passengers. They were imbedded in a black oozy soil, on the surface of which they lay prostrate, with a covering of grey mould.

In passing along the channel torn up by the water, vast numbers of the stumps of these subterraneous trees, remaining in the posture in which they grew, were to be seen, some with their roots running down, and others branching and spreading about in the earth, as is observed in growing trees. That they were the ruins, not of the doluge, but of a later age, has been inferred from the existence of a bed of shells, which lies across the highway, on the descent near Stifford Bridge, leading to South Ockendon. At a perpendicular depth of twenty feet beneath this bed of shells, and at the distance of nearly two hundred feet, in the bottom of the valley, runs a brook which empties itself into the Thames at Purfleet. This brook is known to ebb and flow with the Thames; and,
consequently, if the bed of shells, as has been conjectured, was deposited in that place by an inundation of the Thames, it must have been such as to have drowned a proportion of the surrounding country, and have over-topped the trees near the river, in West Horrock, Dagenham, and the other marshes, overturning them in its progress. In support of this hypothesis, it should be remarked that the bed of earth in which the trees grew, was entirely and undisturbed, and consisted of a spongy, light, organic soil, filled with the roots of reeds, of a specific gravity much less than that of the stratum above it.

The levels of Hatfield Chase were, in the reign of Charles I., the largest chase of red deer in England. They contained about one hundred and eighty thousand acres of land, about one half of which was yearly inundated; and being sold to one Vermuiden, a Dutchman, he contrived at a great labour and expense, to dischase, drain, and reduce these lands to arable and pasture grounds, not subject to be overflowed. In every part of the soil, in the bottom of the river Ouse even, and in that of the adventitious soil of all marsh land, together with the skirts of the Lincolnshire Woods, vast multitudes of the trunks of trees of different sizes are found. The roots are fixed in the soil, in their natural position, as thick as the could have grown; and near to them lie the trunks. Many of these trees appear to have been burned, and others have been chopped and squared; and this in such place and at such depths, as could never have been opened, since the destruction of the forest, until the time of the drainage. That this was the work of the Romans, who were destroyers of all the woods and forests which are found underground in the bottoms of moors and bogs, is evidenced by the coins and utensils, belonging to that nation, which have been collected, as well in these levels as in other parts of Great Britain where these subterraneous forests have been discovered.

**MOORS, MOSSES, AND BOGS.**

It having been reported in Lincolnshire, that a large extent of islets of moor, situated along its coast, and visible only at the lowest ebbs of the tide, was chiefly composed of
 decayed trees, Dr. de Serra, accompanied by Sir Joseph Banks, proceeded, in the month of September, 1796, to examine their nature and extent. They landed on one of the largest of these islets, when the ebbs were at the lowest, and found its exposed surface to be about ninety feet in length, and seventy-five in width. They were enabled to ascertain, that these islets consist almost entirely of roots, trunks, branches, and leaves of trees and shrubs, intermixed with leaves of aquatic plants. The remains of many of the trees were still standing on their roots; but the trunks of the greater part of them lay scattered on the ground, in every direction. The bark of the trees and roots appeared in general as fresh as when they were growing; in that of the birches particularly, many of which were found, even the thin silvery membranes of the outer skin were discernible. The timber of all kinds, on the contrary, was decomposed and soft, in the greater part of the trees; but in some was firm, especially about the knots. Sound pieces of timber had been often found by the country people.

In general, the trunks, branches, and roots of the decayed trees were considerably flattened,—a phenomenon which has been observed in the surtirbrand, or fossil wood of Iceland, and also in that found near the lake of Thun, in Switzerland. The soil was chiefly composed of rotten leaves; and, on being thrown into water, many of these were taken out in a perfect state.

These islets extend about twelve miles in length, and one in breadth, opposite the shore of Sutton, at which place, on digging a well, a moor of the same nature was found under ground, at the depth of sixteen feet, and, consequently, very nearly on the same level with that which constitutes the islets. On a boring being made, in the fields belonging to the Royal Society, in the parish of Mablethorpe, to ascertain the course of the subterraneous stream of decayed vegetables, a similar moor was found. The appearance of these decayed vegetables was found exactly to agree with that of the moor which is thrown up in Blankney fen, and in other parts of the east fen of Lincolnshire, in making the embankments; barks, like those of the birch-tree, being there also abundantly found. This moor has been traced as far as Peterborough, sixty
miles south of Sutton. On the north side, the moor
islets extend as far as Grimsby, on the south of the mouth
of the Humber: and it is a remarkable circumstance, in
the large tracts of low lands which lie on the south
banks of that river, a little above its mouth, there is
subterraneous stratum of decayed trees and shrubs, exactly
resembling those observed at Sutton. At Axholme side
similar stratum extends over a tract of ten miles in length
by five in breadth. The roots there also stand in the place
where they grew; while the trunks lie prostrate, amid the
roots of aquatic plants and reeds.

Little doubt can be entertained of the moor islets
Sutton being a part of this extensive subterraneous stratum
which, by some inroad of the sea, has been there stripped
of its covering of soil. The identity of the levels; that of
the species of trees; the roots of these affixed, in both
the soil where they grew; and, above all, the flattened
shape of the trunks, branches, and roots, found in
islets, which can only be accounted for by the heavy pres-
sure of a super-induced stratum, are sufficient reasons
in this opinion. Such a wide-spread assemblage of vegeta-
ruins, lying almost in the same level, and that level gen-
rally under the common mark of low water, naturally
gives rise to reflections on the epoch of this destruction
and the agency by which it was effected.

The original catastrophic which buried this immense
forest must have been of very ancient date; but it is truly
suspected, that the inroad of the sea which uncovered the
decayed trees of the islets of Sutton, is comparatively
recent. The state of the leaves, and of the timber,
also the tradition of the country people, concur to strengthen
this suspicion. Leaves and other delicate parts of plant
though they may be long preserved in a subterraneous
situation, cannot remain uninjured, when exposed to the seis-
mites of the waves, and of the air. The inhabitants of Sutton
believe that their parish church once stood on the site
where the islets now are, and was submerged by the
inroads of the sea; that, at very low water, their ances-
tors could even discern its ruins; and that their pretci-
church was built to supply the place of that which was
washed away. So many concomitant, though weak, evi-
timonies, render their report to a certain degree deserv-
of credit, and lead to a supposition, that some of the stormy
manifestations of the North Sea, which in these last centuries
have washed away such large tracts of land on its shores,
may have carried away a soil resting on clay, and have
finally uncovered the trees of these moory islets.
Bogs and Mosses are little more than lakes filled up with
vegetable matter, usually of aquatic origin. They are to be
found not only in Ireland and Scotland, but also in every
northern country, more especially when thinly peopled. It
should be remarked, that Ireland abounds in springs, which
are mostly dry in summer; and that grass and weeds grow
abundantly about these spots. In the winter these springs
swell and run, softening and loosening all the earth about
them. Now, that sword or surfacc of the earth which
consists of the roots of grass, being lifted up, and made
fuzzy or spongy by the water in the winter, is dried in the
spring, and does not fall together, but withers in a tuft.
The new grass which springs through it is again lifted
during the following winter; and thus the spring is still
more and more stopped, and the sword grows thicker and
thicker, till at length it makes what is called a quaking
bog. In proportion as it rises and becomes drier, and as
the grass roots and other vegetables become more putrid,
together with the mud and slime of the water, it acquires
a blackness, and becomes what is called a turf bog. When
the vegetables rot, it is considered that the saline particles
are in general carried away by the water, in which they
are dissolved; but that the oily or sulphureous particles
remain and float on the water; it is thus that the turf
acquires its inflammability. The highest mountains of
Ireland are, as well as the plains, covered with bogs, be-
cause they abound in springs, which, on account of a
defective population, are not cleared: they are thus over-

In that country mosses also abound; and the particular
kind which grows in bogs, is remarkable on this account,
that a congeries of its threads, before it is decayed, consti-
tuates the substance of the light spongy turf, which thus
becomes so tough as not to yield to the spade. This curious
substance, in the North of Ireland, is called old wives’ tow,
is still unlike flax. The turf hardens by degrees, but
turf employed as fuel.
The production of the quaking bogs is as follows: When a stream or spring runs through a flat, it becomes filled with weeds in summer, and trees fall across and obstruct it up. During the winter season the water stagnates and more every year, until the whole flat is covered with a coarse kind of grass, peculiar to these bogs, springing up in tufts, the roots of which are consolidated, and which, in a few years, grow to the height of several feet. In the winter the grass rots, and falls with its seed on the mud, thus adding to their growth the ensuing spring. The flags and grass are sometimes interwoven on the surface of the water, and gradually becoming thicker, cover the supercicies. On this covering herbs grow; and by the interweaving of their roots, it is rendered so strong as to bear a man. Some of these bogs sink, where a man stands, to a considerable depth, and rise before and behind, and underneath, the water is clear. Even these in time come red bogs; but may easily be converted into meadow land, by clearing a trench for the passage of the water.

Sir Hans Sloane, in his account of the bogs of Ireland published in the Philosophical Transactions, notices a curious fact, namely, that when the turf-diggers, after having dug out the earth proper to make turf or peat, reached the bottom, so as to come to the clayey or other soil, by digging off the water, they met with the roots of fir-trees with their stumps standing upright, and their branches spread out on every side horizontally. This was evident to the place of the growth of these trees, the branches of which roots are in some parts matted, as is seen in the roots of trees closely planted. Large pieces of wood have been found, not only in clay-pits, but likewise in granite or stone-pits, in the blocks of stone raised out of strata or layers. The black spongy mould employed in peat smells strongly of bitumen, or petroleum, a small proportion of the oil of which is yielded by distillation. In several parts of Ireland a singular phenomenon has been observed: on horses trampling with their feet on a soft ground, a sudden appearance of light ensued. In the mould, which agreed in colour, lightness, &c., with peat-earth, being examined with a microscope, was found to proceed from an abundance of small worms which lay in it.
The Commissioners appointed by Parliament to inquire into the nature and extent of the bogs of Ireland, and the practicability of draining them, represent them as occupying thousands of acres—indeed, many square miles. Their nature and constituent parts are described by them as consisting of an accumulation of vegetable matter, settling in successive generations on itself, and occasioned by the want of ventilation to a stagnant pool, which first furnished the elements of life and increase of the plants covering its surface. The progress of the accumulation may be best conceived by imagining a basin, or concave reservoir, of a certain extent and depth, formed of clay, limestone, gravel, or still more obdurate materials, through which the water, scantily but constantly supplied, cannot obtain an issue. Undisturbed in this water, a surface of bog moss grows, decays, and putrefies. To this a second generation succeeds; and this is followed by others, until, at length, the bulk rises considerably above the level of its bed, forming hillocks of various heights, shapes, and dimensions. The surface of a bog is not level like a lake, but undulating; and it terminates somewhat abruptly, and almost perpendicularly. The average height of the great bogs, above the level of high water mark in Dublin harbour, is about two hundred and fifty feet. Many acres of these bogs have been reclaimed; and the practicability of draining and cultivating the greater proportion of them has been pointed out in the reports of the Commissioners.

Perthshire, in North Britain, abounds in mosses, the contents of which are computed to exceed nine thousand acres. The greatest height of the moss, above the clay on which it lies, is fourteen feet and a half. Its surface, when viewed at a distance, seems wholly covered with heath; but when closely examined, is found to be composed of small tufts of heath, intermixed with a variety of mossy plants. Here also are found innumerable trunks of trees, growing along close to their roots, the latter being still fixed in the clay, as in their natural state.

The intrusion of Solway Moss has greatly attracted the public attention; for, although the cause of it is obvious, still the alteration it produced on the surface of the earth, was more considerable than any known in Great Britain, as resulting from a natural cause, since the destruc-
GEOLOGICAL CHANGES OF THE EARTH.

It happened in the year 1771, after severe rains which had in many places produced great inundations of the rivers. The following is a concise description of the spot where this event happened.

Along the side of the river Esk is a vale, about a mile in breadth, bounded on the south-east by the river, and the north-west by a steep bank, about thirty feet in height above the level of the vale. From the top of the hill the ground rises on an easy ascent for about a quarter of a mile, where it is terminated by the moss, which extends about two miles north and south, and about a mile and a half east and west, being bounded on the north-west by the river Sark. It is probable that the solid ground, in the same direction under the moss, before its irruption, had a considerable space; for the moss, at the place where the irruption happened, was inclined towards the slope of the ground. From the edge of the moss there was a great hollow, called by the country people the gap, and said to be thirty yards deep where it entered the vale: down this hollow ran a small rill of water, which was often dry in summer, not having any other supply but what filtered in the moss.

The irruption happened, at the head of this gap, on the night of the 16th of November, between the hours of nine and eleven, when all the neighbouring rivers and brooks were prodigiously swollen by the rains. A large body of water was forced, partly by the great fall of rain, partly by the springs beneath, into a small beck or beck which runs within a few yards of its border to the south-east. By the united pressure of the water behind it, the moss was forced, partly by the great fall of rain, partly by the springs beneath, into a small beck or beck which runs within a few yards of its border to the south-east. By the united pressure of the water behind it, down a narrow glen between two banks about thirteen feet high, into a wide and spacious plain, over which it spread with great rapidity. The moss continued for some time to send off considerable quantities of its substance, which, being borne along by the torrent from the back of the first great body, kept it for many days in perpetual motion, and drove it still farther on. The first night, at least four hundred acres of fine arable land were covered with moss from three to twelve feet in depth. Several houses were destroyed,
CORAL REEFS AND ISLANDS.

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When the waters subsided, the moss also ceased to flow; but two of it, and carried away some pieces of mossy matter to the place where it burst. They then joined the beck, already mentioned, which, with this addition, resumed its former channel, and, with a little assistance from the people of the neighbourhood, made its way to the Esk, through the midst of that body of moss which obstructed its course. Thus, in a great measure drained, the new works fell several feet, when the fair weather came on at the end of November, and settled in a firmer and more solid body on the lands it had overrun. By this inundation about eight hundred acres of arable ground were overrun before the moss stopped, and the habitations of twenty-seven families destroyed.

Tradition has preserved the memory of a similar inundation in another part of North Britain. At Monteith in Lancashire, which greatly alarmed the neighbourhood, and was regarded as a miracle. The moss was observed to rise to a surprising height, and soon after to sink as much beneath the level, moving slowly towards the south.

CORAL REEFS AND ISLANDS.

Coral belongs to the class of those surprising productions of nature, which are named zoophites, or plants, on account of their filling up an intermediate tract between the animal and vegetable kingdoms; and of them this curious substance will be distinctly considered. In the mean time, the production of coral reefs and islands presents one of those geological changes, by which the earth's surface has been modified, and has received a new accession from the sea.

The common foundation of the clusters of islands dis-covered by modern navigators in the Pacific ocean, as well as those belonging to New South Wales, is evidently of coral structure, immense reefs of which shoot out in all directions. There is every reason to believe that the agency of subterraneous volcanoes, do not bear any pro-
portion to those which are perpetually forming, by slow, silent but persevering efforts of the sea worms by which coral is produced. Banks of coral are found at all depths and at all distances from the shore, entirely unconnected with the land, and detached from each other. By a slow progression, they grow up towards the surface; while the winds, heaping up the coral from deeper water, accelerate the formation of these banks into shallow islands. They become gradually shallower; and when once the sea meets with resistance, the coral is thrown up by the force of the waves breaking against the bank. These coral banks have been seen in all stages—some in deep water—others with a few rocks peeping above the surface, just formed into islands without the least appearance of vegetation; and, lastly, others covered with soil and weeds.

The loose corals, rolled inward by the billows in pieces, ground, and, the reflux being unable to carry them away, become a bar to the coagulated sand with which they are always intermixed. This sand, being raised, is lodged at top; and when its accumulated mass is elevated by violent storms, and no longer within reach of common waves, it becomes a resting-place for birds whom the search of prey draws thither. Their droppings, feathers, &c. augment the soil, and prepare it for the reception of accidental roots, branches, and seeds, cast by the waves, or brought thither by birds. Thus islands are formed: the leaves and rotten branches, intermixed with the sand, produce in time a light black mould, in which trees and shrubs vegetate and thrive. Cocoa nuts, vines, continue long in the sea without losing their vegetable powers, having been thrown on such islands, where trees which are particularly adapted to all soils, sandy, rich, or rocky.

The violence of the waves, within the tropics, generally be directed to two points, according to the soons. Hence the islands formed from coral banks be long and narrow, and lie nearly in a meridional direction. Even supposing the banks to be round, as they seldom are when large, the sea, meeting most resistance in the middle, must heave up the matter in greater quantities towards the extremities: and, by the same rule,
Coral Reefs and Islands.

will generally be open, or at least lowest. They will also commonly have soundings there, as the remains of the banks, not accumulated, will be under water. Where the coral banks are not exposed to the common monsoon, they will alter their direction, and become either round, extended in the parallel, or of irregular forms, according to accidental circumstances.

Captain Flinders, in his voyage to Terra Australis, gives a lively and interesting description of a coral reef on the southern coast of New South Wales. On this reef be landed, and the water being very clear round the edges, a new creation, as it were, but imitative of the old, was presented to the view. Wheat sheaves, mushrooms, stags' horns, cabbage leaves, and a variety of other forms, were glowing under water with vivid tints of every shade becoming, purple, brown, and white; equalling in grandeur the most favourite portiere of the curious florist. These were different species of coral and fungus, growing, as it were, out of the solid rock, and each had its peculiar form and shade of colouring: but, whilst contemplating the richness of the scene, the destruction with which it was pregnant could not be forgotten.

Different corals in a dead state, concreted into a solid mass of a dull-white colour, composed the stone of the reef. The negro heads were lumps which stood higher than the rest; and being generally dry, were blackened by the weather; but even in these the forms of the different corals and some shells were distinguishable. The sea broke, were the lightest parts; within these were holes containing live corals, sponges, sea-eggs, and cucumbers; and many enormous cockles were scattered upon different parts of the reef. At low-water, these cockles seem most commonly to lie half open; but the shells then spouts up in a stream, three or four feet high, it is from this noise and the spouting of the water that they are discovered, for, in other respects, they are scarcely to be distinguished from the coral rock.

The description of a coral island which he afterwards visited on the same coast, is truly philosophical, and
throws great light on these surprising productions of nature.

"This little island, or rather the surrounding reef, which is three or four miles long, affords shelter from the south-east winds. It is scarcely more than a mile in circumference, but appears to be increasing both in elevation and extent. At no very distant period of time, it is one of those banks produced by the washing up of sand and broken coral, of which most reefs afford instances, and those of Torres' Strait a great many. These banks are in different stages of progress; some, like these new become islands, but not yet habitable; some are high-water mark, but destitute of vegetation; whilst others are overflowed with every returning tide.

"It seems to me, that, when the animalcules which the corals at the bottom of the ocean, cease to live, structures adhere to each other, by virtue either of glutinous remains within, or of some property in the sea water and the interstices being gradually filled up with sand and broken pieces of coral washed by the sea, which adhere, a mass of rock is at length formed. Future generations of these animalcules erect their habitations upon rising bank, and die in their turn, to increase principally to elevate, this monument of their works and labours. The care taken to work perpendicularly in early stages, would mark a surprising instinct in diminutive creatures. Their wall of coral, for most situations where the winds are constant, being arrived at the surface, affords a shelter, to leeward of which infant colonies may be safely sent forth, and to this instinctive foresight it seems to be owing, that this ward side of a reef exposed to the open sea, is generally if not always, the highest part, and rises almost perpendiclar, sometimes from the depth of 200, and many more fathoms. To be constantly covered with wave seems necessary to the existence of the animalcules, they do not work, except in holes upon the reef, below low-water mark; but the coral sand and other remnants thrown up by the sea adhere to the rock, and form a solid mass with it, as high as the common reach. That elevation surpassed, the future remains being rarely covered, lose their adhesive property.
INHOSPITABLE DESERTS.

The chief Asiatic deserts are in Persia and Arabia, the former of which countries contains three of considerable extent and celebrity. The first of these commences on the east of the Tigris, in latitude thirty-three, is pervaded by the river Ahwas, and extends to the north of Shuster. The second reaches from the vicinity of Korn very nearly a hundred English miles, and, from north to south, or a hundred and fifty. In the latter direction it is a great desert of Kerman, which, alone, extends nearly a tract of three hundred and fifty miles. The two together, therefore, be considered as forming one common extent, and stretch, north-west and south-east, over a large area of about seven hundred miles, thus intersecting this
wide empire into two nearly equal portions. This vast extent is impregnated with nitre and other salts, which taint the neighbouring lakes and rivers, and has, on this account, been denominated the Great Saline Desert.

ARABIAN DESERTS.

The sandy deserts of Arabia form one of the most striking objects of that country. From the hills of Omiss which appear to be a continuation of those on the other side of the Persian gulf, as far as Mecca, the greater part of Negad is one prodigious desert, interrupted, toward the frontiers of Hejaz and Yemen, or Arabia Felix, by Kirgê, containing the district of Sursa, and several oases, or fertile spots. The north-west part of Negad presents almost a continued desert, and is considered a prolongation of the one above-mentioned.

The Beled El Haram, or Holy Land of Islam, which Mecca is the capital, is comprehended between Red Sea, and an irregular line which, commencing Arabog, about sixty miles to the north of Djedda, forms a bend from the north-east to the south-east, in passing Yelemlem, two days' journey to the north-east of Mecca. It thence continues to Karua, nearly seventy miles to the east of the same place, and twenty-four miles to the west of Taif which is without the limit of the Holy Land; after which turning to the south-west, it passes by Drataerk, and terminates at Mehherma upon the coast, at the port name Almara Ibrahim, about ninety miles to the south-east of Djedda.

It therefore appears that the Holy Land is about one hundred and seventy miles in length, from the north to the south-east, and eighty-four miles in breadth, in the north-east to the south-west—which space is comprehended in that part of Arabia, known by the name of El Hedjaz, or the Land of Pilgrimage, and includes the cities of Medina and Taif. It has not any rivers, and the only water to be found, is that of some inconsiderable springs, which are not numerous, and the brackish water obtained from the deep wells. Thus it is a desert. It is at Mecca and Medina alone that have been wrought to preserve the rain water; on this account, a garden is very rarely to be seen throughout.
AFRICAN DESERTS.

The vast territory. The plains are composed either of sand, or bad earth, entirely abandoned; and, as the inhabitants do not, in any part of the country, sow any description of grain, they are supplied with flour, &c. from Upper Egypt, Yemen, and India.

AFRICAN DESERTS.

The most striking feature of Africa consists of the immense deserts which pervade its surface, and which are supposed to comprise the one half of its whole extent. The chief of these is, by way of eminence, called Sahara, or the Desert. It stretches from the shores of the Atlantic, with few interruptions, to the confines of Egypt, a space of more than forty-five degrees, or 2700 geographical miles, by a breadth of twelve degrees, or 720 geographical miles. It is one prodigious expanse of red sand, and sandstone rock, of the granulations of which the red sand consists. It is, in truth, an empire of sand which seems to defy every exertion of human power or industry, although it is interspersed with various islands, and fertile and cultivated spots of different sizes, of which Fessan is the chief of that which have been hitherto explored.

Nearly in the centre of this sandy ocean, and nearly mid-way between the Mediterranean Sea and the coast of Guinea, rise the walls of Tornbuetoo, the capital of the very interesting empire of Bernabar—a city which constitutes the great mart for the commerce of all the interior of Africa. To maintain this commerce is the laborious work of the akkabaars, or caravans, which cross this enormous desert from almost every part of the African coast. The mode in which it is traversed is highly curious, accompanied by the Arabs who let them out to the merchants for the transport of their goods. During their route, they are often exposed to the attacks of the roving Arabs of Sahara, who generally commit their depredations on the approach to the confines of the desert. In this tire- some journey, the caravans do not proceed to the place of their destination, in a direct line across the trackless desert, but turn occasionally eastward or westward, according to the situation of certain fertile, inhabited, and cultivated spots, called oases, interspersed in various parts
of the Sahara, like islands in the ocean. These watering-places to the men, as well as to feed, rest, and replenish the hardy and patient camel. At these cultivated spots, the caravan sojourns about ten days, and then proceeds on its journey, until it again reaches another spot of the same description. In the intermediate journeys, the hot winds, denominated shams, or storms, are often so violent, as if not entirely to exhale the water carried in skins by the camels for use of the passengers and drivers. On these occasions, affirmed by the Arabs, that five hundred dollars have been frequently given for a draught of water, and that not less than twenty dollars are commonly paid, when a partial or total exhaustion has occurred. These scorching winds will be particularly described, in treating of atmospheric phenomena.

In 1805, a caravan proceeding from Tombuctoo to Tafilet, was disappointed in not finding water at one of the usual watering-places, when, horrible to relate, the number of the persons belonging to it, two thousand in all, beside one thousand eight hundred camels, perished from thirst! Accidents of this nature, account for the quantities of human and other bones which are heaped together in various parts of the desert.

The following is the general route of the caravan crossing the desert. Having left the city of Fez, the capital of Morocco, they proceed at the rate of fifteen miles and a half an hour, and travel seven days. In the space of eighteen days they reach Akka, where they remain a month, as this is the place of rendezvous at which they are formed into one grand associated caravan. In proceeding from Akka to Taoudeny, sixteen days are employed; and here again, the caravan sojourns fifteen days to refresh the camels. It then departs, reaching in seven days; and, after another stay of five days, proceeds to Arawan, a watering-place, situated like distance. After having sojourned there fifteen days, it sets out, and reaches Tombuctoo on the sixth day, having performed a journey of fifty-four days of travelling, and seventy-five of repose, making, altogether, from Fez to Tombuctoo, one hundred and twenty days, or four lunar months and nine days.
Another caravan sets out from Wedimoon and Sok Assa, traversing the desert between the black mountains of Cape Bajador and Gualata: it touches at Tagassa and El Garbie, or West Tagassa, where having staid to collect salt, it proceeds to Tombuctoo. The time occupied by this caravan is five or six months, as it proceeds as far as Gibbel-djebel, or the white mountains, near Cape Blanco, through the deserts of Mograffia and Woled Abusebah, to a place named Agadeen, where it sojourns twenty days.

The caravans which cross the desert, may be compared to fleets of merchant vessels under convoy, the stata, or convoy of the desert consisting of a certain number of caravans. Thus, in crossing the territory of Woled Abusebah, it is accompanied by Sebayhees, or people of that country, who, on reaching the confines of the territory of Woled Deleim, deliver their charge to the protection of the chiefs of that country. These, again, conduct it to the confines of the territory of the Mograffia Arabs, under whose care it at length reaches Tombuctoo.

Any assault on the caravan during this journey, is considered as an insult to the whole tribe to which the convoy belongs; and for such an outrage they never fail to take ample revenge.

Besides these grand caravans, others cross the desert on an emergency, without a convoy, or guard. This is, however, a perilous expedition—as they are too often plundered near the northern confines of the desert, by two notorious tribes, named Dikua and Emjot. In the year 1798, a caravan consisting of two thousand camels, laden with the produce of the Souhan territory, dispersed with seven hundred slaves, was plundered and conducted in the following manner. The tribe being assembled, the horses are picketed at the entrance of the likely to pass. These scouts being mounted on the heire, intelligence, and the whole tribe mount their horses, taking ambush near an oasis, or watering-place, they issue thence
on the arrival of the caravan, which they plunder with merciless leave of the unfortunate merchants entirely destitute.

The food, dress, and accommodations of the people who compose the caravans, are simple and natural. Prohibited by their religion the use of wine and intoxicating liquors, and exhort by its principles to perseverance in all things, they are commonly satisfied with a few nourishing dates, and a draught of water, that will sustain them for weeks successively without any other food. At times, when they undertake a journey of a few hours across the desert, a little barley meal, mixed with of what constitutes their only nourishment. In following an abstemious mode of life, they never complain, but content themselves with the hope of reaching their native country singing occasionally during the journey, whenever they approach a habitation, or when the camels are fatigued. Their songs are usually sung in trio; and those of the camel-drivers who have musical voices, join in the choral. These songs have a surprising effect in renovating the countenance, while the symphony and time maintained by the string instruments surpass what any one would conceive who has not heard them. The day's journey is terminated early in the afternoon, when the tents are pitched, prayers said, and supper prepared by sunset. The guests now arrange themselves in a circle, and, the sober meal being terminated, converse till they are overcome by sleep. At daybreak next morning, they again proceed on their journey.

**PIGLRIMAGE ACROSS THE DESERTS.**

The following very lively description of a pilgrimage across the desert is given by Ali Bey, in his travels in Pach- rcco, Tripoli, &c. It is an animated picture which portrays in the strongest colours the perils and sufferings encountered in these enterprises.

"We continued marching on in great haste, for fear of being overtaken by the four hundred Arabs whom we wished to avoid. For this reason we never kept the common road, but passed through the middle of the desert, marching through stony places, over easy hills. The try is entirely without water; not a tree is to be seen to a rock which can offer a shelter or a shade. A transparent atmosphere, an intense sun, darting its beams upon the..."
heads, a ground almost white, and commonly of a cone-
care form, like a burning glass; slight breezes, scorching
like a flame. Such is a faithful picture of this district,
through which we were passing.

Every man we meet in this desert is looked upon as
an enemy. Having discovered about noon a man in arms,
on horseback, who kept at a certain distance, my thirteen
beduins united the moment they perceived him, darted like
an arrow to overtake him, uttering loud cries, which they
interrupted by expressions of contempt and derision; as,
'What are you seeking, my brother?' 'Where are you
going, my son?' As they made these exclamations they
kept playing with their guns over their heads. The disco-
overed beduin profited of his advantage, and fled into
the mountains, where it was impossible to follow him.
We met no one else.

We had now neither eaten nor drank since the prece-
ding day; our horses and other beasts were equally des-
travelling rapidly. Shortly after noon we had not a drop of
water remaining, and the men, as well as the poor animals,
were worn out with fatigue. The mules, stumbling every
moment, required assistance to lift them up again, and to sup-
ported the little strength we had left.

At two o'clock in the afternoon a man dropped down
dead, and as if dead, from great fatigue and thirst. I stopt
wet which was left in one of the leathern budgets, was
poor man's mouth, but without any effect. I now felt
becoming very weak, I determined to mount on horseback,
poor fellow behind. From this moment, others
possibility of giving them any assistance; they were
only of saving himself. Several mules with their burdens
abandoned to their unhappy destiny, as every one thought
left behind, and I found on my way two of my
phants on the ground, without knowing what was become
at the mules which had been carrying them, the drivers
having forsaken them as well as the care of my effects and
of my instruments.

I looked upon this loss with the greatest indifference,
as if they had not belonged to me, and pushed on.
my horse began now to tremble under me, and yet he was
the strongest of the whole caravan. We proceeded in silent
despair. When I endeavoured to encourage any one
of the party to increase his pace, he answered me by looking
steadily at me, and by putting his forefinger to his mouth
to indicate the great thirst by which he was affected.
I was reproaching our conducting officers for their inaction,
which had occasioned this want of water, they accused themselves by alleging the mutiny of the conductors;
and besides, added they, "Do we not suffer like the rest?"
Our fate was the more shocking, as every one was sensible of the impossibility of supporting the fatigue of the place where we were to meet with water again. At about four in the evening, I had my turn and fell down
with thirst and fatigue.

Extended without consciousness on the ground, in the
middle of the desert, left only with four or five men
of whom had dropped at the same moment and all without any means of assisting me, because I knew not where to find water, and, if they had known it, had not strength to fetch it, I should have perished
with them on the spot, if Providence, by a kind
miracle, had not preserved us.

Half an hour had already elapsed since I had fallen
senseless to the ground, (as I have since been told,) when
at some distance, a considerable caravan, of more than one
thousand souls, was seen advancing. It was under the
reception of a marebout or saint called Sidi Alaou;
sent by the Sultan to Tlemsen or Tremecen. Seeing us
in this distressed situation, he ordered some skins of water
to be thrown over us. After I had received several of these
over my face and hands, I recovered my senses, opened my
eyes, and looked around me, without being able to
discern any body. At last, however, I distinguished seven or eight sheriffs and fakeers, who gave me the
assistance, and shewed me much kindness. I endeavored to speak to them, but an invincible knot in
Pilgrimage across the deserts.

Our throat seemed to hinder me; I could only make myself understood by signs, and by pointing to my mouth with my finger.

They continued pouring water over my face, arms, and hands, and at last I was able to swallow small mouthfuls. This enabled me to ask, 'Who are you?' When they heard me speak, they expressed their joy, and answered me, 'Fear nothing; far from being robbers, we are your friends,' and every one mentioned his name. I began by degrees to recollect their faces, but was not able to remember their names. They poured again over me a still greater quantity of water, gave me some to drink, filled some of my leather bags, and left me in haste, as every minute spent in this place was precious to them, and could not be repaired.

This attack of thirst is perceived all of a sudden by an extreme aridity of the skin; the eyes appear to be bloody, the tongue and mouth both inside and outside are covered with a crust of the thickness of a crown piece; this crust is of a dark yellow colour, of an insipid taste, and of a consistence like the soft wax from a beehive. A faintness or languor takes away the power to move; a kind of knot in the throat and diaphragm, attended with great pain, interrupts respiration. Some wandering tears escape from the eyes, and at last the sufferer drops down to the earth, and in a few moments loses all consciousness. These are the symptoms which I remarked in my unfortunate fellow travellers, and which I experienced myself.

I got with difficulty on my horse again, and we proceeded on our journey. My Beduins and my faithful Salem were gone in different directions to find out some water, and two hours afterwards they returned one after another, carrying along with them some good or bad water, as they had been able to find it; every one presented to me part of what he had brought; I was obliged to taste it, and I drank twenty times, but as soon as I swallowed it my mouth became as dry as before; at last I was not able either to spit or to speak.

The greatest part of the soil of the desert consists of pure clay, except some small traces of a calcareous nature. The whole surface is covered with a bed of chalky calcareous stone of a whitish colour, smooth, round, and loose,
and of the size of the fist; they are almost all of the same dimension, and their surface is carious like pieces of old mortar; I look upon this to be a true volcanic production. This bed is extended with such perfect regularity, that the whole desert is covered with it; a circumstance which makes pacing over it very fatiguing to the traveller.

Not any animal is to be seen in this desert, neither quadrupeds, birds, reptiles, nor insects, nor any plant whatever; and the traveller who is obliged to pass through it is surrounded by the silence of death. It was not till late in the evening that we began to distinguish some small plants, burnt with the sun, and a tree of a thorny nature without blossom or fruit."

SANDS OF THE DESERT.

Now o'er their head the whizzing whirlwinds breathe;
And the live desert pants, and leaves beneath;
Tinged by the crimson sun, vast columns arise
Of eddying sands, and war amid the skies,
In red arcades the billowy plain surround,
And stalking turrets dance upon the ground.

In the pathless desert, high mounds of sand, shifting with every change of wind, surround the traveller on every side, and conceal from his view all other objects. The wind is of a surprising rapidity, and the sand so extremely fine, that it forms on the ground waves which resemble those of the sea. These waves rise up so fast, that in a very few hours a hill of from twenty to thirty feet high is transported from one place to another. The shifting of these hills, however, does not take place on a sudden, as is generally believed, and is not by any means capable of surprising and burying a caravan while on the march. The mode in which the transposition of the hills takes place is not difficult of explanation. The wind sweeping the sand from the surface continually, and that with an astonishing rapidity, the ground lowers every moment; but the quantity of sand in the air increasing quickly by successive waves, cannot support itself there, but falls in heaps, and forms a new hill; leaving the place it before occupied level, and with the appearance of having been swept.
It is necessary to guard the eyes and mouth against the quantity of sand which is always flying about in the air; and the traveller has to seek the right direction, to avoid being lost in the windings made in the middle of the hills of sand which bound the sight, and which shift from one spot to another so often, as not to leave any thing to be seen beside the sky and sand, without any mark by which the position can be known. Even the deepest footstep in the sand of either man or horse disappears the moment the foot is raised.

The immensity, the swiftness, and the everlasting motion of these waves disturb the sight both of men and beasts, so that they are almost continually marching as if in the dark. The camel gives here a proof of his great superiority; his long neck, perpendicularly erected, removes his head from the ground, and from the thick part of the waves; his eyes are well defended by thick eye-lids, largely provided with hair, and which he keeps half shut; the construction of his feet, broad and cushion-like, prevents his treading deep into the sand; his long legs enable him to pass the same space with only half the number of steps of any other animal, and therefore with less fatigue. These advantages give him a solid and easy gait, on a ground where all other animals walk with slow, short, and uncertain steps, and in a tottering manner. Hence the camel, intended by nature for these journeys, affords a new motive of praise to the Creator, who in his wisdom has given the camel to the African, as he has bestowed the rein-deer on the Laplander.

Lieutenant Pottinger, in his travels in Beloochistan, a province of India, gives the following interesting account of these curious phenomena. He had to pass over a desert of red sand, the particles of which were so light, that when taken in the hand they were scarcely more than palpable, the whole being thrown by the winds into an irregular mass of waves, principally running east and west, and varying in height from ten to twenty feet. The greater part of them rose perpendicularly on the opposite side to that from which the prevailing north-west wind blew, and might readily have been fancied, at a distance, to resemble a new brick wall. The side facing the wind sloped off with a gradual declivity towards the base of the next windward
wave, again ascending in a straight line, in the same extraordinary manner as above described, so as to form a path or path between them. Our traveller kept as much as these paths as the direction he had to take would allow, but it was not without great difficulty and fatigue that the camels were urged over the waves, when it was requisite to do so, and more particularly when they had to climb up the lee-ward or perpendicular face of them, in attempting which they were often defeated. On the oblique shelving side they ascended pretty well, their travelling saving them from sinking deeper than did the travellers themselves; and the instant they found the top of a wave giving way from their weight, they most expertly dropped on their knees, and in that posture gently down with the sand, which was luckily so unconnected that the leading camel usually caused a sufficient break for the others to follow on foot. The night was spent under shelter of one of these sand waves, the surrounding atmosphere being uncommonly hot and close.

On the following day, in crossing a desert of the same description, the like impediments occurred; but these were trifling compared with the distress suffered, not only by our traveller and his people, but also by the camels, from the floating particles of sand—a phenomenon for which he confesses himself at a loss to account. When he first observed it, in the morning, the desert appeared to the distance of half a mile or less, an elevated and flat surface from six to twelve inches higher than the summits of the sand waves. This vapour appeared to recede as he advanced, and once or twice completely encircled his path, limiting the horizon to a very confined space, and conveying a most gloomy and unnatural sensation to the beholders, who were at the same moment imperceptibly covered with innumerable atoms of small sand, getting into the eyes, mouth and nostrils, caused irritation, attended by an extreme thirst, which was increased in no small degree by the intense heat of the sun. This annoyance is supposed by the natives to originate in the solar beams causing the dust of the desert, as they phatically call it, to rise and float through the air—a phenomenon which appears to be in a great measure correct, this effect ocean being only visible during the hottest part of the day.
The following simple theory of these moving sands is sub-
mitted by the author. When the violent whirlwinds which
prevail in the desert, terminate in gusts of wind, they
tusly expand over several square miles of surface, raging
with irresistible force, and bearing upwards an immense body
of sand, which descends as the current of air that gave it
action dies away, thus creating the extraordinary appearance
in question. If it should be asked what prevents the sand from
rest apparently on the waves, the answer is, that all the
greater particles do settle, but that the more minute ones
become rarified to such a degree by the heat produced by
the burning sand on the red soil, that they remain as it
were in an undecided and undulating state, until the returning
temperature restores their specific gravity, when, by an
undeviating law of nature, they sink to the earth. This in
some measure coincides with the opinion of the native
tribes; but, conformably to their notion, it is evident
that the floating sands would be apparent at all periods of
excessive solar influence, which not being the case, it be-
comes necessary to find a primary cause for the phenome-
on. To remove any suspicion of his having been de-
duced in the reality of this floating vapour of sand, he
or watery illusion so frequent in deserts, called by the
french mirage, in opposite quarters at the same moment,
each of them being to his sight perfectly distinct. While
the former had a cloudy and dim aspect, the latter was lu-
ferous, and could only be mistaken for water. To corro-
date what he has here advanced, he states that he was
wards joined by a fakier from Kaboul, who informed
him that he had witnessed the moving sands, in passing
through the desert from Seistan, to a much greater degree
spoke of having been forced to sit down, in consequence
of the density of the cloud in which he was enveloped.
Our traveller next proceeds to a curious description of
the pillars or columns of sand formed in the deserts. He
experienced a violent tornado, or gust of wind, which
swept on so suddenly, that, if he had not been apprized
of its strength by the guide, it might have been disas-trous
to his party, in whom it would have been an act of teme-
WIDEN AND INHOSPITABLE DESERTS.

It is said that the order to have endeavoured to sit on the camels during an impetuous fury. Before it began, the sky was clear, and only warnings it afforded, were the oppressive sultriness of the air, and a vast number of whirlwinds springing on all sides. These whirlwinds, he observes, might perhaps be more correctly expressed by some other names; as the wind issued from them, he adopts the term, are vast columns of sand, which begin by a trifling agitation, with a revolving motion on the surface of the desert, and gradually ascend and expand, until they are lost to the view. In this manner they move about every breath of wind, and are observed, thirty or forty of them at the same time, of different dimensions, from one to twenty yards in diameter. Those seen a water-spout at sea, may exactly conceive the sand formed of sand on shore. The moment the guide saw the whirlwinds disperse, which they did as if by magic and a cloud of dust approaching, he advised the party to dismount, which they had hardly time to do, and lock themselves snugly behind the camels, when a storm burst upon them with a furious blast of wind, the rain falling in huge drops, and the air being so completely darkened that they were unable to discern any object at the distance of even five yards.

The following is Bruce's account of this singular phenomenon, which he represents as one of the most magnificent spectacles imaginable, and by which himself and his companions were at once surprised and terrified. Having reached the vast expanse of desert which lies to the west and northwest of Chendi, they saw a number of prodigious pillars of sand at different distances, at times moving with great celerity, and at others stalking on with a majestic slowness. At intervals the party thought they should be overwhelmed by these sand pillars; and small quantities of sand actually more than once reach them. Again, they were to retreat so as to be almost out of sight, their summits reaching to the very clouds. There the tops often separated from the bodies; and these, once disjointed, dispersed in the air, and did not appear more. They were sometimes broken near the middle, as if struck with a large cannon shot. About noon they began to advance with caution.
SANDS OF THE DESERTS.

4"Sti upon the party, the wind being very strong at north. Eleven of them ranged alongside, at an interval the greatest diameter of the largest of them appeared to Mr. Bruce to be about ten feet. They retired with a wind at south-east, leaving an impression on our traveller's mind, to which he could give no name, though assuredly one of its ingredients was fear, blended with a considerable portion of wonder and surprise. It was in vain to think of fleeing: the swiftest horse, or fastest-sailing ship, would not have been of any use in rescuing him from his danger. The full persuasion of this riveted him as it were to the spot where he stood, and he allowed the camels to gain on him so much, that it was with difficulty he could overtake them.

On a subsequent occasion, an assemblage of these moving pillars of sand, more numerous, but less in size than the former, approached Mr. Bruce's party soon after sun-rise, and appeared like a thick wood. They almost darkened the sun, the rays of which, shining through them for nearly an hour, gave them an appearance of pillars of fire. The people became desperate, some saying it was the day of judgment—and others, that the world was on fire.

Dr. Clarke, in his more recent travels in Egypt, thus describes this phenomenon.

One of those immense columns of sand, mentioned by Bruce, came rapidly towards us, turning upon its base as upon a pivot: it crossed the Nile so near us, that the whirlwind by which it was carried placed our vessel upon its beam-ends, bearing its large sail quite into the water, and nearly upsetting the boat. As we were engaged in righting the vessel, the column disappeared. It is probable that those columns do not fall suddenly upon any particular spot, so as to be capable of overwhelming an army or a caravan; but that, as the sand, thus driven, is gradually accumulated, it becomes gradually dispersed, and the column, diminishing in its progress, at length disappears. A great quantity of sand is no doubt precipitated as the effect which gathers upon a smaller scale, it does not seem likely that the whole body of the sand is at once abandoned.
MINES, METALS, AND GEMS.

Through dark retreats pursue the winding ore,
Search nature's depths, and view her boundless store;
The secret cause in tuneful numbers sing,
How metals first were framed, and whence they spring;
Whether the active sun, with chymic flames,
Through porous earth transmits his genial beams;
With heat impregnating the womb of night,
The offspring shines with his paternal light:—
Or whether, urged by subterraneous flames,
The earth ferments, and flows in liquid streams;
Purged from their dross, the nobler parts refine,
Receive new forms, and with fresh beauty shine:—
Or whether by creation first they sprung;
When yet unpoised the world's great fabric hung:
Metals the basis of the earth were made,
The bars on which its fixed foundation's laid—
All second causes they disdain to own,
And from th' Almighty's fiat sprung alone.

Those excavations in which metals, minerals, and precious stones are dug, are called mines, and receive, from the substances they yield, various denominations. The richest and most celebrated gold and silver mines are those of Mexico and Peru, in South America. Iron mines are more abundant in Europe than elsewhere. Copper mines are chiefly found in England, Sweden, and Denmark; and lead and tin mines in England: the latter, more particularly in the county of Cornwall. Quicksilver mines abound principally in Hungary, Spain, Friuli, in the Venetian republic, and Peru; diamond mines, in the East Indies, and in the Brazils; and salt mines in Poland.

To explain the structure of mines, it should be observed that the internal parts of the earth, as far as they have been investigated, do not consist of one uniform substance, but of various strata, or beds, of substances, different in their appearances, specific gravities, and chemical qualities, from one another. Neither are these strata similar to each other, either in their nature or appearance, in different countries: insomuch that, even in the short extent of half a mile, the strata will be found quite different from what they are in another place.
The high value attached to diamonds does not depend so much on their beauty and hardness, as on their great scarcity, and the labour and expense necessary in procuring them. Hitherto they have been observed in the torrid zone alone; and Brazil is the only part of the Americas in which they have been found. The historical account of their discovery in that country is as follows. Near the capital of the territory of Serro do Frio flows the river Milho Verde, where it was the custom to dig for gold, or rather to extract it from the alluvial soil. The miners, during their search for gold, found several diamonds, which their
were induced to lay aside in consequence of their particular shape and great beauty, although they were ignored of their intrinsic value.

The diamond works on the river Jigitonhonha are described by Mr. Mawe as the most important in the Bega lian territory. The river, in depth from three to nine feet, is intersected by a canal, beneath the head of which it stopped by an embankment of several thousand bove sand, its deeper parts being laid dry by chain-pumps. mud is now washed away, and the cascalhoa, or that contains the diamonds, dug up, and removed to a convenient place for washing. The process is as follows:

A shed, consisting of upright posts, which support a thatched roof, is erected in the form of a parallelogram, length about ninety feet, and in width forty-five. The middle of its area a current of water is conveyed through a canal covered with strong planks, on which the earth is laid to the thickness of two or three feet. On the other side of the area is a flooring of planks, from twelve to fifteen feet in length, imbedded in clay, extending the whole length of the shed, and having a gentle slope to the canal. This flooring is divided into about twenty compartments, or troughs, each about three feet wide, means of planks placed on their edge; and the upper of these troughs communicate with the canal, being formed that water is admitted into them between these planks about an inch separate from each other. Through this opening the current falls about six inches into the trough and may be directed to any part of it, or stopped at pleasure, by means of a small quantity of clay. Along the lower ends of the troughs a small channel is dug, to carry off the water.

On the heap of earth, at equal distances, three or four chairs are placed for the overseers, who are no sooner seen than the negroes enter the troughs, each provided with rake of a peculiar form, and having a short handle, which he rakes into the trough from fifty to eighty pounds weight of the earth. The water being then allowed to pass in by degrees, the earth is spread abroad, and currently raked up to the head of the trough, so as to be kept in constant motion. This operation is continued for a quarter of an hour, when the water begins to run clear.
and, the earthy particles having been washed away, the gravel-like matter is raked up to the end of the trough. As length the current flowing quite clear, the largest stones are thrown out, and afterwards those of an inferior size. The whole is then examined with great care for diamonds. When a negro finds one, he immediately stands upright, and claps his hands: he then extends them, holding them between the fore finger and the thumb. An overseer receives it from him, and deposits it in a bowl, suspended from the centre of the structure, and half filled with water. In this vessel all the diamonds found in the course of the day are deposited, and at the close of the work are taken out and delivered to the principal overseer, who, after they have been weighed, registers the particulars in a book kept for that purpose.

When a negro is so fortunate as to find a diamond of the weight of seventeen carats and a half, the following ceremony takes place: he is crowned with a wreath of flowers, and carried in procession to the administrator, who gives him his freedom by paying his owner for it. He also receives a present of new clothes, and is permitted to work on his own account. For smaller stones proportionate premiums are given; while many precautions are taken to prevent the negroes from stealing the diamonds, with which these precious gems should be concealed in the corners of the troughs. When a negro is suspected of swallowing means taken to bring the gem to light.

In the EAST INDIES, the KINGDOM OF GOLCONDA, extending two hundred and sixty miles along the bay or sea, and having a breadth of two hundred miles from east to west, abounds in DIAMOND MINES. They are scattered in the vicinity of the rocky hills and mountains, and intersect the country, and in the whole of which points are supposed to be contained. In several of these mines they are found scattered in the earth, within two or three furlongs of the surface, and in others are met with in a natural substance in the body of the rocks, forty or fifty feet deep. The labourers having dug five or six feet into the rock, soften the stone by fire, and proceed till they find the vein, which often runs two or three furlongs under
the rock. The earth being brought out, and carefully searched, affords stones of various shapes, and of a greyish water. This earth is of a yellowish, and sometimes of a reddish colour, frequently adhering to the diamond with a strong a crust that the separation becomes difficult.

To find the diamonds, the workmen form a cistern of kind of clay, with a small vent on one side, a little above the bottom; in this vent they place a plug, and then throw into the cistern the earth they have dug, pour in water, and dissolve it. They then break the clods, and stir the earth in the cistern, allowing the lighter part to be carried off in the form of mud, when the vent-hole is opened, and let out the water. They thus continue washing until what remains in the cistern is pretty clean; and then, in the middle of the day, when the sun shines bright, carefully look over all the sand, at which practice they are so expert that the smallest stone cannot escape them. The brightness of the sun being reflected by the diamonds, aids them in their research, which would be foiled if a cloud were to intervene.

The specific gravity of the diamond is so great, that in the proportion of seven to one, it is the hardest of all precious stones, and can only be cut and ground by itself and its own substance. To bring it to the perfection by which its price is so great augmented, the lapidary begins by rubbing several of the stones against each other, while rough, having first got them to the ends of two wooden blocks, thick enough to be held in the hand. The powder thus rubbed off on the stones, and received in a small box for the purpose, serves to grind and polish them.

The greatest known diamond was found in Brazil, and belongs to the King of Portugal. It weighs 1699 carats, and, although uncut, is estimated by Romé de l'Isle at an enormous sum of two hundred and twenty-four millions of sterling, which gives an estimate of nearly eighteen per cent. of sterling for each carat, the multiplicand of the square root of its whole weight being taken. The one next in magnitude and value is that purchased in 1772 by the late Emperor of Russia; it weighs seven hundred and seventy-nine carats, and has been estimated at nearly five millions sterling. It ought, however, to be observed, that these estimates are founded on the magnitude and brilliancy of the gems.
GOLD AND SILVER MINES.

The mines of La Plata, so denominated on account of the abundance of silver it contains, are chiefly situated in the provinces which were strictly considered as Peru before the new partition of territory in 1778; Charcas, Tucuman, and even Buenos Ayres, being then considered as dependencies of Peru. With the exception of Spain, the upper part of the Viceroyalty of La Plata contains, and contains innumerable mines both of that metal and of gold. All its northern provinces teem with mineral wealth; and those of Laricaja and Carabaya are distinguished by the production of the latter, and still nobler in its virgin state.

The mountain of Potosi alone produces weekly about two thousand marks of silver, that is, from thirty to forty thousand dollars—a surprising produce, when it is considered that it has been wrought since 1545, at which time it was accidentally discovered by an Indian. At the commencement it was still more abundant, and the metal quite pure and permanent mine. The silver is often found in earth. Six thousand Indians are employed every eighteen months, from the provinces of the Viceroyalty, to work this mine. The expedition is called a small daily stipend, (equal to about eighteen dollars English) until the period of their labour is completed. They are thus condemned to a forced service, which is regarded as less than slavery, so long as it lasts; and which the Indians endeavor to justify by the plea that labourers...
MINES, METALS, AND GEMS.

could not otherwise be procured. The mita, according to them, has been rendered indispensable, to observe that it is conducted with all possible humanity, which those may believe who have never heard of the servilities they have exercised, it may be said habitually, on wretched Indians, since the conquest.

Lumps of pure gold and silver, called papas, from their resemblance to the potato, are often found in the sands. poor likewise occupy themselves in lavaderos, or in washing the sands of the rivers and rivulets, in order to find particles of the precious metals.

To compensate for the mines which are rendered useless by the irruption of water, or other accidents, rich new ones are daily discovered. They are all found in chains of mountains, commonly in dry and barren spots, and sometimes in the sides of the quebradas, or ascending precipitous breaks in the ridges. However certain a rule may be in the Viceroyalty of Buenos Ayres, it is contradicted in that of Lima, where, at three leagues distance from the Pacific Ocean, not far from Tagna, in the province of Africa, there was discovered not many years since the famous mine of Huantajaya, in a sandy plain at a distance from the mountains, of such exuberant wealth that the pure metal was cut out with a chisel. From this mine a large specimen of virgin silver is preserved in the cabinet of natural history at Madrid. It attracted considerable population, although neither water nor the common conveniencies for labour could be found on the spot; nor was there any pasturage for the cattle.

In the mint of Potosi about six millions of dollars annually coined; and the mines of the viceroyalty of Plata, taken collectively, are reckoned to yield about sixteen millions. The new viceroyalty of Buenos Ayres contains thirty gold mines, twenty-seven silver mines, and fifteen of other metals.

The mines of Mexico, or New Spain, have been celebrated for their riches than those of La Plata, notwithstanding which they are remarkable for the poverty of mineral they contain. A quintal, or one hundred of silver ore, affords, at a medium, more than three or four ounces of pure silver, about one third what is yielded by the same quantity of mineral in Saxony.
GOLD AND SILVER MINES. 263

is not, therefore, owing to the richness of the ore, but to its
abundance, and the facility of working it, that the mines
of New Spain are so much superior to those of Europe.
The fact of the small number of persons employed in
working them, is not less contrary to the commonly re-
garded opinion on this subject. The mines of Guanaxuato,
undoubtedly richer than those of Potosi ever were, afforded
from 1796 to 1803, nearly forty millions of dollars in gold
and silver, or very nearly five millions of dollars annually,
being somewhat less than one fourth of the whole quantity
of gold and silver from New Spain; notwithstanding
which, these mines, productive as they were, did not
employ more than five thousand workmen of every de-
scription. In Mexico, the labour of the mines is perfectly
meritorious, and better paid than any other kind of industry, a
miner earning from five to five dollars and a half weekly,
while the wages of the common labourer do not exceed a
dollar and a half. The *tenateros*, or persons who carry the
ore on their backs, from the spot where it is dug out of the
mine to that where it is collected in heaps, receive a sum
nearly five English shillings for a day's work of six hours.
Neither slaves, criminals, nor forced labourers, are employed
in the Mexican mines.

In consequence of the clumsy, imperfect, and expensive
methods of clearing them from water, several of the richest
of these mines have been overflowed and abandoned; in the want of method in the arrangement of the
mines, and the absence of lateral communications, add
to the uncertainty, and greatly increase the expense of
working them. Labour is not, as in the working of the
European mines, abridged, nor the transport of materials
bored. When new works are undertaken, a due con-
cern is not bestowed on the preliminary arrangements;
and they are always conducted on too large and expensive

More than three-fourths of the silver obtained from
America is extricated from the ore by the means of quick-

ence. The quantity consumed annually in New Spain
is about sixteen thousand quintals; and, in the whole
of America, about twenty-five thousand quintals are an-
tually expended, the cost of which, in the colonies, has
been estimated at one-fourth of a million sterling.

The greater part of this quicksilver has been lately furnished by the mine of Almaden in Spain, and that of Istria in Niola, the celebrated quicksilver mine of Huancavelica. Peru having greatly fallen off in its produce, since the sixteenth century, when it was highly flourishing, prosperity of the silver mines, both in Mexico and Peru, therefore greatly depends on the supplies of quicksilver from Spain, Germany, and Italy; for such is the abundance of the ore in those kingdoms, that the only limit to the quantity of silver obtained there, is the want of cinnabar for amalgamation.

In taking a general view of the riches of the provinces of America, Mr. Humboldt, who has supplied these details, remarks that, in Peru, silver ore exists in great abundance as in Mexico, the mines of Lauria, being capable of yielding as great a produce as those of Guanaxuato; but that the art of mining, and the manner of separating the silver from its ore, are still more active than in New Spain. Notwithstanding this important system, the total amount of the precious metals furnished by America, is estimated at upwards of five millions and a half sterling—the gold being in proportion to the silver as one to forty-six. From 1492 to 1500, the quantity of gold and silver extracted from the mines has been equal in value to 5,700,700,000 dures, of which immense sum, the portion brought into Europe, including the booty made by the conquerors of America, is estimated at 5,445,000,000, giving an average of sixteen million and a half of dollars yearly. The annual importation being divided into six periods, appears to have been constantly augmenting, and in the following progressive ratio.

From 1792 to 1800, it did not exceed five million dollars. From 1500 to 1545, it amounted to three millions. From 1645 to 1600, to eleven millions. From 1700 to 1700, to sixteen millions. From 1700 to 1803, to the prodigious sum of thirty-five millions.

The first period was that of exchange with the port of mere rapine. The second was distinguished by conquest and plunder of Mexico, Peru, and
Gold and silver mines.

Granada, and by the opening of the first mines. The third began with the discovery of the rich mines of Potosi; and in the course of it the conquest of Chili was completed, and various mines opened in New Spain. At the commencement of the fourth period, the mines of Potosi began to be exhausted; but those of Lauricocha were discovered, and the produce of New Spain rose from two millions to five millions of dollars annually. The fifth period began with the discovery of gold in Brazil; and the sixth is distinguished by the prodigious increase of the mines of New Spain, while those of every other part of America, with the exception of the Brazils, have been constantly improving.

The gold mines of Brazil are very productive. Those called general are distant about seventy-five leagues from Rio Janeiro, which is the staple and principal outlet of the riches of the Brazilian territory. They yield to the king, generally, for his right of fifths, at least one hundred and twelve arrobas [weighing twenty-five pounds each] of gold. Their yearly produce may, therefore, be estimated at upwards of eight hundred thousand pounds sterling; and most of the more distant mines at about one third the same.

The gold drawn from them cannot be carried to Rio Janeiro, without being first brought to the smelting houses established in each district, where the right of the crown is received. What belongs to private persons is remitted in bars, with their weight, number, and an impression of the royal arms. The gold is then assayed, and its standard printed on each bar. When these bars are carried to the mint, their value is paid to the possessor in coin, commonly in half-doubloons, each worth eight Spanish dollars. On each of these half-doubloons the king gains a half, by the alloy and right of coinage. The mint of Rio Janeiro is one of the most beautiful in existence, and finished with every convenience for working with the greatest celerity. As the gold arrives from the mines at the same time that the fleets arrive from Portugal, it is necessary to accelerate the operations of the mint, and coinage proceeds with surprising quickness.

In Africa, the kingdom of Mozambique abounds in gold which is washed down by the rivers, and forms a
chief part of the commerce of the country. The kingdoms of Monomotapa and Sofala likewise furnish considerable quantities of gold; and the Portuguese who reside in the latter territory, report that it yields annually millions of metigals, equal to somewhat more than million sterling. The merchants export from Mechivan other parts, about the same quantity of gold. The soldiers are paid in gold dust, in the state in which it is collected; and this is so pure, and of so fine a yellow, as to be exceeded, when wrought, by any other gold besides that of Japan. Gold is likewise found on the island of Madagascar. The gold coast is so denominated from the abundance of gold found among the sands: it is not, however, so productive as has been generally supposed, owing to the intense heats, which, in a great measure, prevent the natives from prosecuting their researches.

In Asia, the island of Japan is most productive gold, which is found in several of its provinces, and in by far the greater proportion, melted from its ore is likewise procured by washing the sands, and a small quantity is likewise found in the ore of copper. The emperor claims a supreme jurisdiction, not only over gold mines, but over all the mines of the empire, which are not allowed to be worked without a licence from him. Two thirds of their produce belong to him, and the third is left to the governor of the province in which the mines are situated. But the richest gold ore, and that which yields the finest gold, is dug in one of the provinces of the island of Niphon, a dependency of Japan, where the gold mines have been highly productive lately, that they have much fallen off. In the Japanese province of Tsekungo, a rich gold mine, filled with water, was no longer worked: as it was, however, so situated, that, by cutting the rock, and making an opening beneath the mine, the water could be drawn off, this was attempted. At the moment of commencing the operation, so violent a storm of thunder and lightning arose, that the workmen were obliged to shelter elsewhere; and these superstitious people, imagine that the tutelar god and protector of the spot, unwilling to have the bowels of the earth thus rifled, had raised the storm to make them sensible of his great displeasure at
GOLD AND SILVER MINES.

undertaking, desisted from all further attempts, through the fear of incurring his displeasure.

TIBET, a mountainous country of India, contains a great abundance of gold, which is traced in the rivers flowing from that territory into the Ganges. In Hindostan there are not any mines of gold; but in the Irrnada district gold is collected in the river which passes Nelambur in the Meengery Talui, a Nair having the exclusive privilege of this collection, for which he pays a small annual tribute. Silver is in general rare throughout the oriental regions, and there is not any indication of this metal in India; but in Japan there are several silver mines, more particularly in the northern provinces, and the metal extracted from them is very pure and fine.

Turning to Europe, DALMATIA is said in ancient times to have produced an abundance of gold. Pliny reports that in the reign of the emperor Nero, fifty pounds of this precious metal were daily taken from the mines of that province; and that it was found on the surface of the ground. It is added that Vibius, who was sent by Augustus to subdue the Dalmatians, obliged that hardy and warlike people to work in the mines, and to separate the gold from the silver, in small, thin leaves, resembling moss.

ROSSINA, in SCALONIA, contains many mineral mountains, and has rich mines of gold and silver. The district in which the latter are found is named Srebrarniza, being derived from the word Srebr, which signifies silver in all Sclavonian dialects. Their produce resembles the silver of Potosi, and is found, combined with pure ore, in small, thin leaves, resembling moss.

The kingdom of NORWAY formerly produced gold; but the expense of working the mines, and procuring the ore, being greater than the profit, these have been deserted. There are, however, silver mines, which are extremely valuable, and give employment to several thousand persons. The principal of these is at Konigsberg, discovered in 1623, when the town was immediately built, and peopled with German miners. In 1751, twelve veins, and twelve shafts, and twelve veins, were wrought in this town, and gave employment to three thousand five hundred artificers, and labourers.

The silver ore is not, as was at first imagined, confined to
the mountain between Konigsberg and the river Jer, but extends its veins for several miles throughout the
adjacent districts, in consequence of which new mines
have been undertaken in several places, and prosperously con-

A mine named "Old God’s blessing," has sometimes, in the space
of a week, yielded several hundred pounds weight of
barytes. The astonishing depth of this mine, which is more
than a hundred and eighty fathoms perpendicular, fills
the mind of the beholder with amazement; and the con-

ference at the bottom forms a clear space of several hun-
dreds of fathoms. Here the sight of thirty or forty piles,
burning on all sides in this gloomy cavern, and continu-

led to soften the stone in the prosecution of the labor,
seems, according to the notions commonly entertained,
an apt image of hell; and the swarms of miners, covered
with soot, and bustling about in habits according to
several employments, may well pass for so many infer-

ior spirits; more especially when, at a given signal when
the mine is to be sprung in this or that direction, they ex-
clam: "Berg-livet, berg-livet!" Take care of your
lives.

The gold mines of Cremnitz lie forty miles south
the Carpathian hills; and twenty miles farther to the south
are the silver mines of Shemnitz. These are
mining towns; and the former is the principal, its
ores being found in what is styled metallic rock. Its oles
also produce a certain proportion of silver.
beside enriched by a mineral peculiar to itself, or one
least, which has not hitherto been discovered elsewher,
ecessarily, the opal—a gem preferred to all others by
oriental nations. The opal mines are situated at Ozemen,
where they are found in a hill consisting of decem-
porphyry, a few fathoms beneath the surface.
produce is of various qualities, from the opales-
or semi-opal, to the utmost refulgence of the lively em,
by which this noble gem is distinguished.

Transylvania and the Bannat contain numerous
valuable mines, consisting chiefly of grey gold ore, and
gold ore. The finest gold is found at Olapian, not
from Zalathna, intermixed with gravel and sand,
QUICKSILVER MINES.

The mountains of Spain were, according to ancient writers, very rich in gold and silver; and accordingly Gibbon calls that kingdom "the Peru and Mexico of the old world." He adds that "the discovery of the rich western continent by the Phenicians, and the oppression of the simple natives, who were compelled to labour in their own mines for the benefit of strangers, form an exact type of the more recent history of Spanish America." The Phenicians were simply acquainted with the sea-coasts of Spain; but avarice as well as ambition carried the arms of Rome and Carthage into the heart of the country, and almost every part of the soil was found pregnant with gold, silver, and copper. A mine near Carthagena is said to have yielded daily twenty-five thousand drachms of silver, or three hundred thousand pounds sterling a year. The provinces of Asturia, Galicia, and Lusitania, yielded twenty thousand pounds weight of gold annually: the precious metals from America, than to seek them at home.

Portugal is in many parts mountainous, and these mountains contain, beside others, rich ores of silver; but the Portuguese, like the Spaniards, being supplied with metals from their transatlantic possessions, and particularly with an abundance of gold and silver from Brazil, do not work the mines in their own country. Gems of all kinds, as turquoises and hyacinths, are also found in the above mountains, together with a beautifully variegated marble, and many curious fossils.

The quicksilver mines of Idria are the most interesting of these, and demand a particular description, as they have been celebrated in natural history, poetry, and romance. The ban of Idria is a district immediately subject to the Chamber of Inner Austria, and lies westward of Carniola. The town, which is small, is seated in a deep valley, amid high mountains, on the river of the same name; and at the bottom of so steep a descent, that its approach is a task of great difficulty, and sometimes of danger.

The mines were discovered in 1497, before which time
only, and other artificers in wood, with which the territory abounds. One evening, a cooper having placed a new tub under a dropping spring, to try if it would hold water, on returning next morning, found it so heavy that he could scarcely move it. He at first was led by his superstition to suspect that the tub was bewitched; but perceiving a length a shining fluid at the bottom, with the nature of which he was unacquainted, he collected it, and proceeded to an apothecary at Laubach, who, being an artful man, dismissed him with a small recompense, requesting that he would not fail to bring him further supplies.

The subterraneous passages of the great mine are so extensive, that it would require several hours to pass through them. The greatest perpendicular depth, computing from the entrance of the shaft, is 840 feet; but as these passages advance horizontally under a high mountain, the depth would be much greater if the measure were taken from the surface. One mode of descending the shaft is by a bucket, but as the entrance is narrow, the bucket is liable to strike against the sides, or to be stopped by some obstacle, so that it may be readily overturned. A second mode of descending is safer, by the means of a great number of ladders, placed obliquely, in a kind of zig-zag: as the ladders, however, are wet and narrow, a person must be very cautious to keep his steps to prevent his falling. In the course of the descent, there are several resting places, which are extremel welome to the wearied traveller. In some parts of the subterraneous passages the heat is so intense, as to occasion a profuse sweat; and in several of the shafts the air was formerly so confined, that several miners were suffocated by an igneous vapour, or gaseous exhalation called the fire-damp. This has been prevented by the use of the main shaft deeper. Near to it is a large wheel, or an hydraulic machine, by which the mine is cleared of waste.

To these pernicious and deadly caverns criminals are occasionally banished by the Austrian government; and has sometimes happened that this punishment has been allotted to persons of considerable rank and family. An incident of this nature, in the person of Count Albert, laid the foundation of Mr. Sargent's elegant dramatic poem entitled "THE MINE."

The Count having fought a duel with an Austrian gen-
iron mines.

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Iron mines.

Native iron, the existence of which was formerly questioned, has been found in several places: it is, however, far from being common, and occurs in several mines.

A mass of this description of iron was discovered in the district of Santiago del Estero, in South America, by a party of Indians, in the midst of a wide extended plain, projected about a foot above the ground, nearly the whole of its upper surface being visible; and the news of having been found in a country where there are not any mountains, nor even the smallest stone, within the circumference of a hundred leagues, was considered as truly surprising.

Although the journey was attended with great danger, on account of the want of water, and abundance of wild beasts in these deserts, several individuals, in the hope of gain, undertook to visit this mass; and, having accomplished their journey, sent a specimen of the metal to Lima and Madrid, where it was found to be very pure.

As it was reported that this mass was the extremity of
were selected on account of their peculiar beauty, they were spotted and studded, as it were, with gold; one of them
A fibrous kind of native iron has been found at Eibenstock in Saxony, and also in Siberia, where one particular mass weighed 1600 pounds. It resembled forged iron in its composition, and was malleable when cold, but brittle when red hot. In Senegal, where it is most common, it is of a cubical form, and is employed by the natives in the manufacture of different kinds of vessels.

Iron, although one of the imperfect metals, is susceptible of a very high polish, and more capable than any other metal of having its hardness increased or diminished by certain chemical processes. It is often manufactured in such a way as to be one hundred and fifty times, and, as will now be seen, even above six hundred and thirty times, more valuable than gold. On weighing several common watch-pendulum springs, such as are sold, for ordinary work, by the London artists, at half a crown, ten of them were found to weigh but one single grain. Hence one pound avoirdupois, equal to seven thousand grains, contains ten times that number of these springs, which amount, at half a crown each, to 8750 pounds sterling. Reckoning the troy ounce of gold at four pounds sterling, and the pound, equal to 5760 grains, at 48 pounds sterling, the value of an avoirdupois pound of gold is 58.33, or 58l. 6s. 7d. The above amount of the value of the watch springs weighing an avoirdupois pound, being divided by that sum, will give a ratio of somewhat more than 150 to 1. But the pendulum-springs of the best kind of watches sell at half a guinea each; and at this price the abovementioned value is increased in the ratio of four and one fifth to one; which gives an amount of 36,750l. sterling. This sum, being divided by the value of the avoirdupois pound of gold, gives a quotient of more than 630 to 1.

It is the valuable property of iron, after it is reduced into the state of steel, that, although it is sufficiently soft when hot, or when gradually cooled, to be formed without difficulty into various tools and utensils, still it may be afterwards rendered more or less hard, even to an extreme degree, by simply plunging it, when red hot, into cold water. This is called tempering, the hardness produced being greater in proportion as the steel is hotter, and the
water colder. Hence arises the superiority of this metal for making mechanic instruments or tools, by which all other metals, and even itself, are filed, drilled, and cut. The various degrees of hardness given to iron, depend on the quantity of ignition it possesses at the moment of being tempered, which is manifested by the succession of colours exhibited on the surface of the metal, in the progress of its receiving the increasing heat. These are, the yellowish white, yellow, gold-colour, purple, violet, and deep blue;—after the exhibition of which the complete ignition takes place. These colours proceed from a kind of scorification on the surface of the heated metal.

The largest iron works in England are carried on in Colebrook Dale, in Shropshire. This spot, which is situated between two towering and variegated hills, covered with wood, possesses peculiar advantages, the ore being obtained from the adjacent hills, the coals from the valley, and abundance of limestone from the quarries in the vicinity. The romantic scenery which nature here exhibits, and the works which are carrying on, seem to realize the ancient table of the Cyclops. "The noise of the forges, &c." Mr. Young observes, "with all their vast mass, chinery, the flames bursting from the furnaces, with the burning of coal, and the smoke of the lime-kilns, altogether horridly sublime." To complete the peculiarities of this spot, a bridge, entirely constructed of iron, is here thrown over the Severn. In one place it has parted and a chasm is formed; but such is its firm basis, that the fissure has neither injured its strength nor utility.

The great superiority of Swedish iron over that of other countries, for the manufacture of steel, is well known, and is ascribed to the great purity of the ore from which the iron is smelted. Hitherto the British steel makers had not been able to employ British iron in their processes, having been found too brittle to bear cementation; but attempts are now making by some very spirited steel makers at Sheffield; and from the products already obtained, great hopes are entertained of ultimate success. One of the most remarkable of the Swedish mines, if the name can with propriety be applied to it, is Tabern, a mountain of considerable size, composed entirely of pure iron ore, and occurring in a large tract of sand over which it seems to
have been deposited. This mountain has been wrought for nearly three centuries, notwithstanding which its size is scarcely diminished.

But the richest iron mine of Sweden is that of Danmora, in the province of Upland. It is in depth eighty fathoms; occupies a considerable extent of territory; and its ore is conveyed to the surface of the earth, through several or openings made for that purpose, by means of casks fixed to large cables, which are put in motion by horses. The workmen, standing on the edges of these casks, and having their arms clasped round the cable, descend and ascend with the utmost composure. The water is drawn from the bottom by a wheel sixty-six feet in diameter, and is afterwards conveyed along an aqueduct nearly a mile and half in length. At certain distances from Danmora, several furnaces, with large and populous villages exclusively inhabited by the miners.

In Wraxall's tour through the north of Europe, the mine of Danmora is described as yielding the finest iron ore in Europe, its produce being exported to every country, and constituting one of the most important sources of national wealth and royal revenues. The ore is not dug, as is usual in other mines, but is blown up by the force of gunpowder—an operation which is performed every day at noon, and is one of the most awful and tremendous that can possibly be conceived. "We arrived," observes the tourist, "at the mouth of the great mine, which is nearly half an English mile in circumference, in time to be present at it. Soon after twelve the first explosion took place, and could not be so aptly compared to any thing as to subterraneous thunder, or rather volleys of artillery discharged under ground. The stones were thrown up, by the violence of the gunpowder, to a vast height above the surface of the ground, and the concussion was so great as to shake the surrounding earth or rock on every side.

As soon as the explosions had ceased, I determined to descend into the mine, to effect which I had to seat myself in a large deep bucket, capable of containing three persons, and fastened by chains to a rope. When I found myself thus suspended between heaven and earth by a rope, and looked down into the dark and
MINES, METALS, AND GEMS.

Deep abyss beneath me, to which I could see no termination, I shuddered with apprehension, and
repented my curiosity. This was, however, a
momentary sensation, and before I had descended
hundred feet, I looked round on the scene with very
tolerable composure. It was nearly nine minutes before
I reached the bottom; and when I set my foot on the
earth, the view of the mine was awful and sublime.

Whether, as I surveyed it, terror or pleasure formed the predominant feeling, is hard to say. The light of the day was very faintly admittance into these subterraneous caverns; in many places it was absolutely lost, and flambeaux were kindled in its stead.

Beams of wood were laid across some parts, from side of the rock to the other; and on these the miners employed in boring holes for the admission of gunpowder, with the most perfect unconcern, although the least dizziness, or even a failure in preserving the equilibrium, must have made them lose their seat, have dashed them against the rugged surface of the rock beneath. The fragments torn up by the explosion, previously to my descent, lay in vast heaps on all sides, and the whole scene was calculated to inspire a generous admiration.

I remained three quarters of an hour in these frightful and gloomy caverns, which find employment for less than one thousand three hundred workmen, traversed every part of them which was accessible, conducted by my guides. The weather above was warm, but here the ice covered the whole surface of the ground, and I found myself surrounded with colds of the most rigorous winter, amid darkness and caves of iron. In one of these, which ran a coterelable way beneath the rock, were eight wretched beings warming themselves round a charcoal fire, eating the little scanty subsistence arising from their miserable occupation. They rose with surprise at seeing so unexpected a guest among them, and I was not little pleased to dry my feet, which were wet with cold,
ing on the melted ice, at their fire.

Having gratified my curiosity with a view of these subterraneous apartments, I made the signal for bear-
COPPER, TIN, AND LEAD MINES.

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SO little terror while re-ascending, convinced, after five or six repetitions, I should have been perfectly indifferent to the undertaking. So strong is the effect of custom on the human mind, and so contemptible does danger or horror become, when familiarized by continual trials!"

Throughout the whole extent of Sweden, the iron mines at present wrought, employ upwards of twenty-five thousand persons, and yield annually upwards of fifty-seven thousand tons of metal. It has been calculated that the furnace and forges, which give to the iron the degree of perfection requisite before it can be used, consume annually two millions four hundred thousand loads of charcoal.

MINES OF COPPER, TIN, LEAD, &C.
The purest copper obtained in Europe is the produce of the mines of the Swedish province of Dalecarlia. The following is a brief description of the principal of these antiquity and gloomy caverns, all of which boast a high antiquity.

The traveller's curiosity is first attracted by the hydraulic machines which are destined to convey the water to the present quarters, and the power of which is such, that one of the wheels has a diameter of not less than forty-four feet. Another wheel, of proportionate magnitude, employed to raise the ore from the mine to the surface of the earth, and is admirably constructed. Regular circles are placed on each side, and round these the chain rises, forming a larger or smaller circumference, in proportion to the necessary circle to be made, so as to counterbalance the weight, and consequently the increased motion of the bucket. Externally, a vast chasm of a tremendous depth presents itself to the view. This being the part of the mine which was first opened, either through the ignorance or neglect of those who had then the management of the works, the ex- terior has since taken a most chaotic scene of precipitated courses, and a gaping gulf resembling the mouth of a vol- can. Great care has been since taken that no such dis- order should again occur. Plans and sections are drawn of the galleries, &c; and, where the prosecution of the
works, in the same direction, might be dangerous, orders are issued for the miners to stop, and an iron crown fixed on the spot, as a prohibition to proceed further. The workmen then explore in a different direction, while every subterraneous excavation is nicely watched.

The traveller passes into the great chasm by a range of wooden steps, which cross, in a variety of directions, rough masses of fallen rocks, of gravel, and of the ancient machinery. Ere he reaches the entrance of the cavern, he has to descend thirty toises; and this being accomplished, proceeds horizontally to a considerable distance within. He now loses the pure air of day, and gradually breaks through an oppressive vapour, which rolls towards him, in volumes from the mouths of a hundred caves leading into the main passage. He now feels as if he were inhaling the atmosphere of Tartarus. The Swedish iron mines which have been described above, are mere purgatories compared with this Satanic dwelling. The descent is performed entirely by steps laid in the winding rock; and, in following the subterraneous declivity, the traveller reaches the tremendous depths of these truly Stygian dominions. The pestilential vapours which environ him with increasing clouds, and the style of the entrance, remind him of Virgil's description of the descent of Aeneas to the infernal regions. Here are to be seen the same caverned passages in the rocky, rough descent, the steaming sulphur, and the deadly stench of Avernus. The wretched inhabitants of this gloomy cavern appear to him like so many spectres, as poetic fiction has described them; and he is induced, by the length of the way, joined to the excessive heat and suffocating quality, to fancy that he will be made to feel dearly for his curiosity. In one part the steam is so excessively hot as to scorch at the distance of twelve years ago the same time that the sulphurous smell is intolerable. Near this spot a volcanic fire broke out some years ago, a consequence of which, strong walls were constructed as barriers to its power, and several contiguous passages which, had it spread, would have proved dangerous to the mine, closed up. The visitor has now to traverse many long and winding galleries, as well as large vaulted caverns, where the workmen are dispersed on all sides, employed in heaving the
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of the rock, and preparing other parts for explo-

sion. Others wheel the brazen ore toward the black abyss

where the suspended buckets hang ready to draw it upward.

From the effect of such violent exercise, combined with

the heat, they are obliged to work almost naked. Their

enoples, occupations, and primitive appearance, scantily

lighted by the trembling rays of torches, form a curious and

interesting scene.

The depth of the mine being at least twelve hundred

feet, a full hour is required to reach the bottom. The

mass of copper lies in the form of an inverted cone. Five

hundred men are employed daily: but females are not ad-

mitted, on account of the deleterious quality of the

vapours.

This mine was anciently a state prison, in which crimi-
nal, slaves, and prisoners of war toiled out their wretched

course of existence. Near the bottom is a rocky saloon furnished

with benches. It is called the HALL OF THE SENATE, on

account of its having been the resting place of several

Swedish Kings, who came, attended by the senators, to

examine the works, and here took refreshments. It was

in this mine that the immortal GUSTAVUS VASA, disguised

as a peasant, laboured for his bread, in the course of a long

concealment, after having been robbed by the peasant who

showed him as a guide.

In the year 1751, a very rich copper mine was wrought

in the county of WICKLOW, IRELAND. From this mine

ran a stream of blue-coloured water, of so deleterious a

nature as to destroy all the fish in the river Arklow, into

which it flowed. One of the workmen, having left an

en shovel in this stream, found it some days after en-

tered with copper. This led one of the proprietors of

the mine to institute a set of experiments, from which he

concluded that the blue water contained an acid holding

both copper and iron in solution; that iron had a stronger affinity for the

copper than copper; and that the consequence of this affinity

was the precipitation of the copper, and the solution of

the iron, when pieces of that metal were thrown into the

blue water. These ideas induced the miners to dig several

bore for the reception of this water, and to put bars of iron

and copper in them. The result was, that they obtained an abun-
dance of copper, much purer and more valuable than which they procured from the ore itself by smelting.

On the island of Anglesea, near Dulas bay, on the north coast, is Parys Mountain, which contains the most considerable quantity of copper ore perhaps ever known. The external aspect of the hill is extremely rude, and it is surrounded by enormous rocks of coarse white quartz. The ore is lodged in a basin, or hollow, and on one side a small lake, over the waters of which over those of Avernus, fatal to the feathered tribe, are never known to pass. The effect of the mineral operations has been, that the whole of this tract has assumed a most savage appearance. Suffocating fumes of the burning heaps of copper arise in all parts, and extend their baneful influence for miles around. That the ore was worked in a very remote period, appears by vestiges of the ancient operations, which were carried on by trenching and by heating the rocks intensely, when water was sud- denly poured on them, so as to cause them to crack and scale. In the year 1769, after a long search, which was so little profitable that it was on the eve of being abandoned, a large body of copper ore was found; and has ever since been worked to great advantage, still promising a vast supply. The water lodged in the bottom of the bed of ore, being strongly impregnated with the metal upwards of fifty ounces of silver are generally contained. These works have added greatly to the population of the country, since they find employment for about fifteen hundred persons, who, with their families, are supposed to amount to eight thousand souls, all of which deriving subsistence from the mines.

The copper mines of Cornwall are very numerous,

expended in blasting the rock. Nature has here been profuse in bestowing her mineral favours; for, above the copper ore, and not more than two feet beneath, is a bed of yellowish greasy clay, from three to four feet in thickness, containing lead ore, from a ton of which metal upwards of fifty ounces of silver are generally contained. These works have added greatly to the population of the country, since they find employment for about fifteen hundred persons, who, with their families, are supposed to amount to eight thousand souls, all of which deriving subsistence from the mines.

The copper mines of Cornwall are very numerous,
and several of them large and rich in ore. It is remarkable that in various parts of this county the earth has produced such an exuberance of this metal, as to afford it in large massy lumps of malleable copper, several pieces of which are shown in very curious vegetable forms. The particular ore named mundic, found in the tin mines, was for many ages considered of no other use but to nourish that metal while in the mine. In the reign of Queen Elizabeth, a laudable curiosity tempted several private individuals to examine into its nature; but the design miscarried, and the mundic was thrown, as useless, into the old pits in which the rubbish was collected. However, about a century ago, this purpose was effected by degrees; and the copper extracted from the ore now produces, on an average, upwards of one hundred and fifty thousand pounds annually, equalling in goodness the best Swedish copper, while the ore itself yields a proportionate quantity of lapis calaminaris for the making of brass.

At Ecton Hill, near the river Dove, in Derbyshire, a valuable copper mine was discovered some years ago, and has since been worked to great advantage. In its position, situation, and inclination, it differs from any mine discovered in Europe, Asia, Africa, or America; the wonderful mass of copper ore not running in regular veins or courses, but sinking perpendicularly down, widening and swelling out at the bottom in the form of a bell. The works are four hundred and fifty feet beneath the river, it being the deepest mine in Great Britain. On the opposite side of Ecton hill is a valuable lead mine, the veins of which approach very nearly to the copper mine.

Copper is converted into brass by the agency of Calamine, an oxide of zinc. It occurs frequently in beds, and in some places exists in great abundance. The Mendip mines in Somersetshire, were once celebrated for their richness of calamine, which are now in a great measure exhausted. It is dug out of the earth, and, being broken into small pieces, is exposed to the action of a current of water, which washes away the light earthy matter, and leaves the calamine. The whole is then thrown into deep wooden vessels filled with water, and agitated for a considerable time. The galena sinks to the bottom, the calamine is deposited in the centre, and the earthy matter lies
on the surface. The calamine, thus separated from its
impurities, is ground to powder, and becomes fit for use.

Hungary abounds in valuable ores and minerals, and is
most celebrated for its vast copper works, at a town called
Herrengrund, built on the summit of a mountain, and
exclusively inhabited by miners. Here the process, noticed
above, of apparently converting iron into copper, is pursued
with great success; several hundreds weight of iron being
thus transmuted every year. The vitriol with which the
blue water is strongly impregnated, cannot be strictly said
to convert the iron into copper, but insinuates into it the
copper particles with which it is saturated; and this secur-
ing transmutation requires a fortnight or three weeks only:
but if the iron be suffered to lie too long in this vitriolic
solution, it becomes at length reduced to powder.

In Japan, copper is the most common of all the metals,
and is considered as the finest and most malleable of any
where to be found. Much of this copper is not only of
the purest quality, but is blended with a considerable pro-
tion of gold, which the Japanese separate and retain.
The whole is brought to Saccin, one of the five principal
cities of Japan; and it is there purifled, and cast into
small cylinders, about a span and a half in length, and a
finger's breadth in thickness. Brass is there very scarce,
and much dearer than copper, the calamine employed in
making it being imported from Tonquin in flat cakes, and
sold at a very high price.

Cornwall has been, in all ages, famous for its numer-
ous mines of tin, which are in general very large, and
drich in ore. The tin-works are of different kinds, de-
pendent on the various forms in which the metal appears.
In many places its ore so nearly resembles common
sand that it can only be distinguished from it by its superior
weight. In other parts, the ore is a compound of tin and
earth, concreted into a substance almost as hard as stone,
of a blueish or greyish colour, and to which the min-
impregnated with copper, frequently gives a yellowish cast.
This ore is always found in a continued stratum, which
the miners call load; and this, for the greater part, is
found running through the solid substance of the harder
rocks, beginning in small veins near the surface, perhaps
not above half an inch or an inch wide, and increasing
they proceed, into large dimensions, branching out into several ramifications, and bending downward in a direction which is, generally, nearly east and west. These loads, or veins, are sometimes white, very wide, and so thick, that large lumps of the ore are frequently drawn up of more than twenty pounds weight. The loads of tin-ore are not always contiguous, but sometimes break off so entirely, that they seem to terminate; but the sagacious miner knows by experience, that, by digging at a small distance on one side, he shall meet with a separated part of the load, apparently tallying with the other end, as nicely as if it had been broken off by some sudden shock of the earth.

The miners of Cornwall follow the load, or vein, in all its rich and meandering curves through the bowels of the earth. The waters are sometimes drained from the works, by subterranean passages, formed from the body of the mountain to the level country. These passages are called adits, and are occasionally the labour of many years; when effected, they save the constant expense of water-works and fire-engines. From the surface of earth the workmen sink a passage to the mine, which they call a shaft, and place over it a large winch, or, in places of greater magnitude, a wheel and axle, by which they draw up large quantities of ore at a time, in which great numbers of poor people are employed in breaking to pieces, and fitting the ore for the stamping.

A third form in which tin appears is that of crystals; this metal will, under proper circumstances, readily metallicize. Hence, in many parts of the mineral rocks, are found the most perfectly transparent and beautiful crystals of pure tin. Beside these crystals, in many of the cavernous parts of the rocks, are found those transparent crystals, called Cornish diamonds, they being exceptionally brilliant when well polished. Their form is that of a five-inch pointed on the top, and they are sometimes

COPPER, TIN, AND LEAD MINES.

Among the most remarkable lead mines, may be cited those of Upper Louisiana, in North America, which for many years been highly productive. That called
Burton’s mine is so extensive, that the mineral is calculated to cover two thousand acres of land. It is of two kinds, the gravel and fossil. The gravel mineral is found immediately under the soil, intermixed with gravel, in pieces of solid mineral weighing from one to fifty pounds. Beneath the gravel is a sand rock, which being broken, crumbles to a fine sand, and contains mineral nearly of the same quality as that of the gravel. But the mineral of the first quality is found in a bed of red clay, under the sand rock, in pieces of from ten to five hundred pounds weight, as the outside of which is a spar, or fossil, of a bright glittering appearance, resembling spangles of gold and silver, as solid as the mineral itself, and of a greater specific gravity, being taken off, the mineral is solid, unconnected with any other substance, of a broad grain, and what mineralogists call potters’ ore.

In other mines, in the vicinity of the above, the lead is found in regular veins, from two to four feet in thickness, containing about fifty ounces of silver in a ton; but at the depth of twenty-five feet the operations are impeded by water. The whole of this mineral tract is very rich and extensive.

In Great Britain there are numerous lead mines among which may be cited that of Arkingdale, in Yorkshire, and those with which Shropshire abounds. In the south of Lanerksire, and in the vicinity of Waulock-lead in Scotland, are two celebrated lead mines, which yield annually above two thousand tons of metal. The Silver nah-vein Lead-hills, has been worked for many years and has been productive of great wealth. The above are considered as the richest lead mines of Europe.

Several of the Irish lead mines have yielded a considerable proportion of silver; and mention is made of one, in the county of Antrim, which afforded, in thirty pounds of lead, a pound of that metal. Another, less productive in silver, was found at Ballysadare, near the harbour of Sligo in Connaught; and a third in the county of Tipperary, thirty miles from Limerick. The ores of this last were of two kinds, most usually of a reddish colour, resembling a glistering; the other, which was the richest in silver, resembed a blue marl. The works were destroyed in the Irish insurrections in the reign of Charles I. The mine, however, is still wrought on account of the lead it contains.
COAL MINES.

The following is the enumeration of the different substances in which metals are found. In granitic mountains, lead, iron, zinc, bismuth, cobalt; and in gneifs, or phaneritic granite, silver, copper, lead, tin, and zinc. In hornblende slate, copper ore; and under argillate, or common slate, silver, copper, lead, and zinc. In steatite, or soapstone, copper, lead, and zinc appear; and even in strata of coal, native silver, galena, and manganese, have been discovered.

COAL MINES.

COALS are scattered, with a more or less sparing hand, over every continent, and almost over every kingdom of the globe; but there is not any country where coal mines are so rich and so frequent as in Great Britain, the opulence of which has been principally ascribed to this valuable mineral. It is, in truth, the very soul of her manufactures, and consequently of her commerce, every manufacturing town being established in the midst of a coal country. Of this instances are afforded by Bristol, Birmingham, Wolverhampton, Sheffield, Newcastle, and Glasgow.

The coals of Whitehaven and Wigan are esteemed the most beautiful, that they are suspected by some to have constituted the gagates, or jet, which the ancients ascribed to Somersetshire, the Mendip coal-mines are distinguished by their productiveness: they occur as indeed in every other part, in the low country, and are not to be found in the hills. The beds of coal are horizontal, but sloping, dipping to the south-east at the rate of about twenty-two inches per fathom. Hence they speedily sink so deep that it would not be possible to reach them, were it not that they are intersected at intervals by perpendicular dykes or veins, of a different kind of mineral, on the other side of which these beds are found considerably raised up. They are seven in number, lying at regular distances beneath each other, and separated by beds of a different kind of substance, the deepest being more than two hundred feet beneath the surface of the earth.

The town of Newcastle, in Northumberland, has been
celebrated during several centuries for its very extensive trade in coals. It was first made a borough by William the Conqueror, and the earliest charter for digging coals granted to the inhabitants, was in the reign of Henry III in 1239; but in 1306, the use of coal for fuel was prohibited in London, by Royal proclamation, chiefly because it injured the sale of wood, with which the environs of the Capital were then overspread. This interdict did, however, continue long in force; and coals may be considered as having been exported at Newcastle more than four centuries. It has been estimated that there are twenty-four considerable collieries lying at different distances from the river, from five to eighteen miles; and the they produced, or an average of six years, up to close of 1776, an annual consumption of three hundred and eighty thousand chaldrons, Newcastle measure, (equal to seven hundred and seventeen thousand, six hundred and fifteen chaldrons, London measure) of which thirty thousand chaldrons were exported to foreign parts. The boats employed in the colliery are keels, and are described as strong, clumsy, and each carrying about twenty tons; and of these four hundred and fifty are kept constantly employed. In the year 1776 an estimate was made of the shipping employed in the Newcastle coal trade; and from this estimate it appears, were three thousand, five hundred, and eighty-five ships, during that year engaged in the coasting trade, and hundred and sixty-three in the trade to foreign ports, the joint tonnage amounting to seven hundred and thirty thousand, two hundred and fourteen tons.

It is a common opinion among geologists, that pit coal of vegetable origin, and that it has been brought to present state by the means of some chemical process, at this time understood. However extravagant this opinion may at first sight appear, it is supported by the existence of vast depositions of matter, half way, as it were, between perfect wood and perfect pit coal; which, while obviously betrays its vegetable nature, has in some respects so near an approximation to pit coal, as to be, in the most remarkable of these depositions exists in Devon thire, about thirteen miles south-west of Exeter, and is well.
The beds of this coal are seventy feet in thickness, and interspersed by beds of clay. On the north side they are lowest and heaviest, and have the closest resemblance to coal, while the upper ones strongly resemble wood, and are considered as such by those who dig them. They become, and become extremely friable when dry, burn with a flame similar to that of wood, and assuming the appearance of wood which has been rendered soft by some known cause, and, while in that state, has been crushed by the weight of the incumbent earth. This is the case not only with the Bovey coal, but also with all the kind of wood coal which have been hitherto examined in different parts of Europe.

The coal mines of Whitehaven may be considered as the most extraordinary in the known world. They are excellest which have, in their structure, a considerable resemblance to the gypsum quarries of Paris, and are of such magnitude and extent, that in one of them alone, a sum exceeding half a million sterling, was, in the course of a single passage, hewn in the rock, leading to the lowest part of coal. The greater part of this descent is through various galleries, which continually intersect other galleries, the coal being cut away, with the exception of large pillars, of which, where the mine runs to a considerable depth, the height, and about thirty-six feet square at the base. Such is the strength there required to support the ponderous roof. The mines are sunk to the depth of one hundred and fifty fathoms, and are extended under the sea to places where there is, above them, sufficient depth of water for large burden. These are the deepest coal mines that have hitherto been wrought; and perhaps the miners have not in any other part of the globe penetrated to so great a depth beneath the surface of the sea, the very deep...
mines in Hungary, Peru, and elsewhere, being situated in mountainous countries, where the surface of the earth is elevated to a great height above the level of the ocean.

In these mines there are three strata of coal, which lie at a considerable distance one above the other, and are not always communicating by pits; but the vein is not always continuous in the same regularly-inclined plane, the miners frequently meeting with hard rock, by which their further progress is interrupted. At such places there seem to have been breaks in the earth, from the surface downward, one portion appearing to have sunk down, while the adjoining part has preserved its ancient situation. In some of these places the earth has sunk ten, twenty fathoms, and even more; while in others the depression has been less than one fathom. These breaks the miners call dykes; and when they reach one of them, their first care is to discover whether the strata in the adjoining part are higher or lower than in the part where they had been working; or, according to their own phrase, whether the coal be cast down or cast up. In the former case they sink a pit; but it be cast up to a considerable height, they are frequently obliged, with great labour and expense, to carry forward a level, or long gallery, through the rock, until they again reach the stratum of coal.

Coal, the chief mineral of Scotland, has been worked for a succession of ages. Pope Pius II., in his description of Europe, written about 1450, mentions that he beheld with wonder black stones given as alms to the poor of Scotland. This mineral may, however, be traced to the twelfth century; and a very early account of the Scottish coal mines, explains, with great precision, the manner of working the coal, not neglecting to mention the subterranean walls of whin which intersect the strata, particularly a remarkable one, visible from the river Tweed where it forms a cataract, and passes by Prestonpans to the shore of Fife. The Lothians and Fifeshire particularly abound with this useful mineral, which also extends into Ayrshire; and near Irwin is found a curious variety of ribbon coal. A singular coal, in veins of mineral rock, has been found at Castle Leod, in the east of Ross-shire, in Europe, exists in a barren tract of country in Labrador.

In North America, coal has been discovered in
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This coal, as first observed by a boy in pursuit of cray fish. This remarkable mineral also abounds towards the Mississippi and Ohio, that of Pittsburgh being of a superior quality; it is chiefly worked in Virginia, where the beds are extensive. One of these beds, about twenty-four in thickness, was found to repose on granite, and is as a great singularity. In the territory south of the mountains, what is called stone coal is found in the Cumberland river Juniata, in the vicinity of the Apalachian moun-

The bed is horizontal, on which account it is

right with considerable advantage, and the mineral is

beds of ten feet in thickness. Notwithstanding these

places at particular points of the extensive territory of the

United States, coals are imported from Great Britain in

considerable quantities. In the space of one year,

coming from the first of October, 1801, the importation

amounted to not less than 18,473 chaldrons.

The process of mining is a combination of boring and

sinking. Shafts are sunk, levels are driven, and drains

are carried off, by the help of picks or pick-axes, wedges,

hammers, the rocks being also sometimes loosened by

using gunpowder. In searching for coal, a shaft is

bored, by striking it continually with an iron borer

boring in an edge of steel, which is in the mean time

partly round; and, at proper intervals, a scoop is

boring, is sometimes made for more than a hundred

feet, to draw up the loose fragments. In this manner

machinery. Should it happen to break, the piece is

by a rod furnished with a hollow cone, as an extin-

guisher, which is driven down on it. The borer is some-

times furnished with knives, which are made to act on

pleasure, and to scrape off a portion of the surround-

ing substance, which is collected in a proper receptacle.

One who have the direction of deep and extensive coal

mines are obliged, with great art and care, to keep them

oiled with perpetual currents of fresh air, which afford

a constant supply of that vital fluid, and expel
from the mines damps and other noxious exhalations, together with such other burnt and foul air, as is becomes deleterious and unfit for respiration. In the deserted mines which are not thus ventilated with currents of fresh large quantities of these damps are frequently collected and, in such works, they often remain for a long time without doing any mischief. But when, by some accident they are set on fire, they then produce dreadful explosions and, bursting out of the pits with great impetuosity, the fiery eruptions from burning mountains, force with them ponderous bodies to a great height in the air.

Various instances have occurred in which the coal has been set on fire by the fulminating damp, and has continued burning for several months, until large streams of water were conducted into the mine, so as to inundate parts where the conflagration existed. By such fires some collieries have been entirely destroyed, in the vicinity of Newcastle, and in other parts of England, as well as Fifeshire in Scotland. In some of these places the fire has continued to burn for ages. To prevent, therefore, as much as possible, the collieries from being filled with these pernicious damps, it has been found necessary carefully to search for the crevices in the coal whence they issue at those places, to confine them within a narrow space, conducting them through long pipes into the open air, where, being set on fire, they consume in perpetual flames as they continually arise out of the earth.

The late Mr. Spelling, engineer of the Whitehaven mines, having observed that the fulminating damp only be kindled by flame, and that it was not liable to be set on fire by red-hot iron, nor by the sparks produced by the collision of flint and steel, invented a machine called a steel-mill, in which a wheel of that metal is turned with a very rapid motion, and, by the application of great plenty of sparks are emitted, which afford the only such a light as enables them to carry on their work in places, where the flame of a candle, or of a lamp, as has already happened in various instances, the violent explosions. In that dreadful catastrophe of explosion of the Felling Colliery, the particulars of which will be hereafter detailed, it will be seen that mills of description were employed, in searching for the remains...
FELLING COLLIERY.

The sad victims of the disaster; but this event happened before the invention of Sir Humphrey Davy's safety lamp, which, while it affords a more certain light, holds out every security to the miner against accidents through which, without such a resource, might still be superadded to those already recorded, as arising from the flame of a candle or lamp.

A greater number of mines have, however, been ruined by inundations than by fires; and here that noble invention of the fire-engine displays its beneficial effects. It appears, from nice calculations, that it would require about 550 steam, or a power equal to that of 110 horses, to work the pumps of one of the largest fire engines, having a cylinder of seventy inches diameter, now in use, and thrice that number of men to keep an engine of that size constantly at work. It also appears that as much water may be raised by such an engine, as can be drawn, within the same space of time, by 2520 men with rollers and buckets, after the manner now daily practised in many mines; or as much as can be borne on the shoulders of twice that number of men, as is said to be done in several of the mines of Peru.

The great is the power of the elastic steam of the boiling water in those engines, and of the outward atmosphere, which, by their alternate actions, give force and motion to the beam, and, through it, to the pump rods which elevate water through tubes, and discharge it from the mine!

There are four fire engines belonging to the Whitehaven colliery, which, when all at work, discharge from it about 18,200 gallons of water every minute, at thirteen strokes; and, at the same rate, 1,768,320 gallons, upwards of 7000 every twenty four hours. By these engines nearly the above-mentioned quantity of water might be discharged from mines which are not above sixty or seventy fathoms deep, which depth is rarely exceeded in the New-castle collieries, or in any other English collieries, with the exception of the above.

Coal pits have sometimes taken fire by accident, and been continued to burn for a considerable length of time. About the year 1648, a coal mine at Benwell, a village near Newcastle-upon-Tyne, was accidentally kindled by a spark: at first, the fire was so feeble, that the reward of a crown, which was asked by a person who offered to
extinguish it, was refused. It gradually increased, however, and had continued burning for thirty years, when an account was drawn up and published in the Philosophical Transactions; it was not finally extinguished until all the fuel was consumed. Examples of a similar kind have happened in Scotland and in Germany.

FELLING COLLIERY.

But of all the recorded accidents relative to coal mines that of Felling Colliery, near Sunderland, a concise narrative of which here follows, was the most disastrous.

Felling is a manor about a mile and a half east of Greathead. It contains several strata of coal, the uppermost of which were extensively wrought in the beginning of the last century. The stratum called the High-main, was worked in 1779, and continued to be wrought till the 19th January, 1811, when it was entirely excavated. The present colliery is in the seam called the Low-main. It commenced in October, 1810, and was at full work in May, 1812. The mine was considered by the workmen as a model of perfection in the purity of its air, and orderly arrangement. Its inclined plane was saving the daily expense of about 13 horses—the concern wore the features of the greatest possible prosperity, and no accident, except a trifling emission of fire-damp slightly burning two or three workmen, had occurred. Two shifts or sets of men were continually employed, except on Sundays. Twenty-five acres of coal had been excavated. The first shift entered the mine at four o'clock A.M. and were relieved at their works by the next at 11 o'clock in the morning. The establishment it employed under-ground, consisted of about 128 persons, who, in the fortnight from the 11th to the 25th of May, 1812, wrought 624 scores of coal, equal to 1300 Newcastle chaldrons, or 2455 London chaldrons.

About half past eleven o'clock on the morning of the 25th of May, 1812, the neighbouring villages were alarmed by a tremendous explosion in this colliery. The subterraneous fire broke forth with two heavy discharges from the Lowe-main, which were almost instantaneously followed by one from the High-main. A slight trembling as from an earthquake was felt for about half a mile around the workings; and the noise of the explosion, though dull, was heard to burst...
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. and much, resembled an unsteady fire

The immense quantities of dust and small coal accompanied each blast, and rose high into the air, in the form of an inverted cone. The heaviest part of the ejected matter, such as corves, pieces of wood, and small coal, fell near the explosion, but the dust, borne away by a strong west wind, fell as a continued shower from the pit to the distance of a mile and a half. As soon as the explosion was heard, the wives and children of the workmen ran to the pit; the scene was pressing beyond the power of description.

One hundred and twenty-eight persons in the mine at the time of the explosion, only thirty-two were brought to light, twenty-nine survived the fatal combustion, the rest were destroyed. Nor from the time of the explosion of the 8th of July, could any person descend. But after many unsuccessful attempts to explore the burning mine, it was re-closed, to prevent the atmospheric air from entering it. Before this being done, no attempt was afterwards made to explore it, till the morning of the last-mentioned day; from that time to the 19th of September, the heart-rending task of mothers and widows examining the putrid bodies of their sons and husbands, for marks by which to identify them, was almost daily renewed; but very few of them were known by any personal mark,—they were too much consumed and scorched to retain any of their features. Their shoes, tobacco-boxes, shoes, and the like, were, therefore, the only indexes by which they could be recognised.

At the crane twenty-one bodies lay in ghastly confusion: some like mannikins, scorched as dry as if they were baked. One wanted its head, another an arm. The scene was truly frightful. The power of fire was visible from them all; but its effects were extremely variable: while some were almost torn to pieces, there were others which appeared as if they had sunk down overpowercd by deep sleep.

The ventilation condensed on Saturday the 19th of Sept-

At six o'clock in the morning the pit was clarified by candle-light, which had not been used in it for a space of one hundred and seventeen days; and at eleven o'clock in the morning the tube-furnace was lighted. From

...
MISCELLANEOUS SUBJECTS.

this time the colliery has been regularly at work; but the ninety-second body has never yet been found. All these persons, except four, who were buried in single graves, were interred in Heworth Chapel-yard, in a trench, side by side, two coffins deep, with a partition of brick, and then between every four coffins.

MISCELLANEOUS SUBJECTS CONNECTED WITH MINERALOGY.

CLIFTON HOT-WELL.

The warm spring, or fountain, called the Hot-well, in the parish of Clifton, is said to be so copious as to discharge sixty gallons of water in a minute. It rises forcibly from an aperture in the solid rock, at about twenty-six feet below the high-water mark, and ten feet above low-water. Over the immediate influx from the rock, the water is much warmer than when it is pumped up for drinking; and it also feels and tastes warmer in winter than in summer, and in cold days heats the glass into which it falls from the cove. In 1695, this celebrated spring, after having fallen into neglect, was recovered, and the Hotwell-house erected, proper foundations being made for the pumps, by which the water is raised to the height of thirty feet: pipes are conveyed through which the waste water runs into the river; and these pipes are valves, which open to let out the water, but shut when the tide is coming in.

With respect to the qualities of this mineral water, it is natural to suppose that, in its subterraneous passage through the rocks, over different strata, and among such variety of mineral and other substances, it must be impregnated with their several virtues. In the common spring water of the neighbouring rock-house, on a trial being made, the mercury in Fahrenheit's thermometer stood at fifty degrees, while that of the Hotwell, taken immediately from the pump, raised it to seventy-six degrees; and as the body of a person in health seldom exceeds the ninety-sixth de- gree, it follows, that the Bristol water possesses somewhat more than three-fourths of the human heat.

Below the Hotwell-house rises a magnificent range of
CLIFTON HOTWELL.

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rocks, which are not more remarkable for their height, than for their being equally so on both sides the river, the
area in some places answering on each side for about a
side and a half in a serpentine course. These constitute
one of the greatest natural curiosities in England. The rock
beyond the Hotwell, and on the same side, is named St.
Hocart’s, a chapel dedicated to that saint having been
formerly built on its summit. It is in height three hundred
and, and has a very majestic appearance. It supplies the
naturalist with many curious fossils; the botanist with a va-
ety of scarce plants; the antiquary with the remains of
Roman camp; and the less curious enquirer with a view
of a most dreadful and surprising precipice.

The rocks, in general, when broken up, are of a dusky
and, brown, or chocolate colour marble, very hard and close
mixed, and which, on being struck with a hammer, emits
strong sulphurous smell. It will bear a polish equal to
foreign marble; and, when sawed into slabs and po-
blished, appears beautifully variegated with veins of white,
blush grey, or yellow. It is often employed for chimney-
 purposes; but is principally used for making lime, for which
there is not any stone in England so well calculated, al-
though there any lime so strong, fine, and white, which ex-
ception.

Here, and in the vicinity, labourers are daily employed
in blowing up the rocks with gunpowder, by which process
the fragments are frequently thrown down, and repeatedly
the precipice with a dreadful crash, which, com-
posed with the loud report of the explosion, re-echoed
noise, resembling thunder, for which it is frequently
heard by strangers. It is the opinion of the greater
ment of those who have viewed these rocks, that they were
more united, and were separated by some terrible convulsion
A bridge of one arch, from rock to rock, over
Ahon, has long been in contemplation; but if the
lining up of these rocks should still be persisted in, the
will be rendered impracticable. This is the more to
regret, because stone of the same quality is to be pro-
Dorham-down, or lower down the river.

In the fissures and cavities of these rocks are found these
fine crystals called Bristol stones, or diamonds, some of which are so hard as to cut glass, and are exceedingly clear, colourless, and brilliant. When set in rings, in the natural state, these have appeared of as high a polish as lustre as if they had been wrought by the most skilful lapidary.

Bristol is surrounded by coal-pits, those of Gloucestershire being at Kingswood, and those of Somerset at Bath, minster, Ashton, Nailsea, and Brislington. But the more copious supply is from Kingswood, where there are a great number of pits and colliers' houses, which last are so frequent, that Kingswood, viewed from the neighbourly hills, has the appearance of being one vast rural suburb of Bristol.

DIAMONDS AND PRECIOUS STONES.

In addition to the information relative to Diamond Mines at p. 259, et seq. of this work, the reader will not fail to be gratified by some curious particulars relative to the and the other more precious gems, drawn from the valuable treatise of Mr. Mawe, on this interesting subject.

In the history of the human race, there are few things which at first sight appear so remarkable, as the productions of civilized countries, has been attached to the diamond. That a house with a large estate, the means of living, not only at ease but in splendour, should be set in competition with and even be deemed inadequate to the purchase of a transparent crystallized stone, not half the size of a hen's egg, seems almost a kind of insanity. It would, indeed, deserve this name, if the purchaser were to part with any consciousness of possessing a diamond of nearly the quarters of an ounce weight, a country gentleman would pay ninety thousand pounds in ready money, and an amount of four thousand pounds besides, he would, very servingly, incur some risk of a statute of lunacy; yet only the above sum was given, but a patent of nobility for the bargain, by the Empress Catharine of Russia, for the famous diamond of Nadir Shah. In this case, however, although the seller acquired much, the purchaser did not undergo any personal privation; and, in reality, endured
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The costliness and high estimation of diamonds, they are not put in competition with the substantial comforts and conveniences of life. Among ornaments and curiosities, they, however, unquestionably occupy, and have occupied, the highest rank. Even fashion, proverbially capricious as she is, has remained steady in this, one of her costliest attachments, during, probably, three or four thousand years. There must be, therefore, in the nature of things, some adequate reason for this universal consent, which becomes a curious object of enquiry.

The utility of the diamond, great as it is in some respects, enters for little or nothing into the calculation of its price; at least all that portion of its value which constitutes the difference between the cost of an entire diamond and an equal weight of diamond powder, must be attributed to other causes.

The beauty of this gem, depending on its unrivalled state, is, no doubt, the circumstance which originally brought it into notice, and still continues to uphold it in the public estimation; and certainly, notwithstanding the smallness of its bulk, there is not any substance, natural or artificial, which can sustain any comparison with it in this respect. The vivid and various refractions of the pure, the refreshing tints of the emerald, the singular and beautiful light which streams from the six-rayed star of the various colours, combined with high lustre, which distinguish the ruby, the sapphire, and the topaz, are lost to a near inspection, are almost entirely lost to a distant beholder; whereas the diamond, without any essential colour of its own, imbibes the purest ray, and then reflects it, either with undiminished intensity, too white and too vivid to be sustained for more than an instant by the most insensible eye, or decomposed by refraction into those prismatic colours which paint the rainbow, and the morning and evening clouds, combined with a brilliancy which yields, and hardly yields, to that of the meridian sun. Other gems, inserted into rings and bracelets, are best seen by the wearer; and, if they attract the notice of the bystanders, divide their attention, and withdraw those regards which ought to be concentrated on one person, to the merely accessory ornaments. The dia-
MISCELLANEOUS SUBJECTS.

Mond, on the contrary, whether blazing on the crown of state, or diffusing its starry radiance from the breast, of merit, or "in courts and feasts and high solemnities, wreathing itself with the hair, illustrating the shape and colour of the neck, and entering ambitiously into contrast with the lively lustre of those eyes that "rain influence on all beholders, blends harmoniously with the general effect, and proclaims to the most distant ring of the surrounding crowd, the person of the monarch, of the knight or of the beauty.

Another circumstance tending to enhance the value of the diamond is, that although small stones are sufficiently abundant to be within the reach of moderate expenditure and therefore afford, to all those who are in easy circum- stances, an opportunity to acquire a taste for diamonds, yet those of a larger size are, and ever have been, rather rare, and of those which are celebrated for their size and beauty, the whole number, at least in Europe, scarcely amounts to half a dozen, all of them being in possession of sovereign princes. Hence, the acquisition even of a moderately large diamond, is what mere money cannot always command, and many are the favours, both political and of other kinds, for which a diamond of a large size, or of uncommon beauty, may be offered as a compensation, where its commer- cial price, in money, neither can be tendered, nor would be received. In many circumstances also, it is a matter of no small importance for a person to have a considerable part of his property in the most portable form possible; and in this respect what is there that can be compared to diamonds, which possess the portability, without the risk, of bills of exchange? It may further be remarked, in favour of the species of property, that it is but little liable to fluctuations, and has gone on pretty regularly increasing in value, since much that the price of stones of good quality is consider- ably higher than it was some years ago.

THE ART OF CUTTING AND POLISHING DIAMONDS has a twofold object: first, to divide the natural surface of the stone in a symmetrical manner, by means of highly-polished polygonal planes, and thus to bring out, to the best advantage, the wonderful refulgence of this beautiful gem; and, secondly, by cutting out such flaws as may happen to be not
DIAMONDS AND PRECIOUS STONES.

The surface, to remove those blemishes which materially detract from its beauty, and consequently from its value.

The removal of flaws is a matter of great importance, owing to the form in which the diamond is cut, and its high degree of refrangibility, the smallest fault is magnified, and becomes obtrusively visible in every face. For this reason also, it is by no means an easy matter, at all times, to ascertain whether a flaw is, or is not, superficial; and a person with a correct and well-practised eye, may often purchase to great advantage stones which appear to be flawed quite through, but are, in fact, only superficially blemished.

The most esteemed, and, at the same time, nearest colour of the ORIENTAL RUBY, is pure earmine, or blood red of considerable intensity, forming, when well polished, a blaze of the most exquisite and unrivalled tint. It is, however, more or less pale, and mixed with blue in various proportions, hence it occurs rose-red and reddish-white, crimson, peach-blossom-red, and lilae-blue, the latter variety being termed ORIENTAL AMETHYST. It is a native of Pegu, and said to be found in the sand of certain streams near the town of Sirian, the capital of that country: it also occurs, with sapphire, in the sands of the rivers of Ceylon. A ruby perfect both in colour and transparency, is much less common than a good diamond, and when of the weight of three or four carats, is even more valuable than that gem. The kings of Pegu, and the monarchs of Ava and Siam, monopolise the finest rubies, in the same way as the Sovereigns of the world is in possession of the first of these Kings: its value has passed into a proverb, and its worth, when compared with gold, is inestimable. The Subah of the Deccan, in possession of a prodigiously fine one, a full inch in diameter. The princes of Europe cannot boast of any of a greater magnitude.

The ORIENTAL SAPPHIRE ranks next in value to the ruby: when perfect, its colour is a clear and bright Prussian blue, united to a high degree of transparency. The asterias, or aster-stone, is a remarkable variety of this beautiful gem: its semi-transparent, with a reddish purple tinge.
that of a natural road under the mountain of Norway, situated in a territory which abounds with mineral productions. This natural curiosity is so well exhibited in the plate, as not to need a particular description.

**SALT MINES.**

*Hence with diffusive salt old ocean steeps*

*His emerald shallows, and his sapphire deeps.*

*Oft in wide lakes, around their warmer brim,*

*In hollow pyramids the crystals swim;*

*Or, fused by earth-born fires, in cubic blocks*

*Shoot their wide forms, and harden into rocks.*

**CULINARY salt,** or, as it is termed in chemistry, marine, soda, exists abundantly in a native state, both in a form, and dissolved in water. It occurs, in solutions, only throughout the wide range of the ocean, but in various springs, rivers, and lakes; and is known, in its solid form, as a peculiar mineral, under the names of rock-salt, forsterite, salt, and salt-gem. Its beds are mostly beneath the surface of the ground, but sometimes rise into hills of considerable elevation. At Cordova, in Spain, a hill between four and five hundred feet in height, is entirely composed of this mineral. But the most celebrated salt mines are those of Wieliczka in Galicia, commonly called the salt mines of Cracow, those of Tyrol, of Poland, of Guadix in Spain, and of Cheshire in England. In the province of Labor, in Hindostan, is a hill of rock-salt, equal in magnitude with that near Cordova. The mines of Iletski, in Russia, yield vast quantities of this substance. It is so plentiful in the desert of Caramania, and the sandy, dry, that it is there used as a material for building, forms the surface of a large part of the northern deserts of Lybia; and is found in great abundance in the mounds of Peru. It has a pure saline taste, without any mixture of bitterness; and crystallizes in cubes when obtained by slow evaporation from its solution. In Germany the mines of this kind are numerous: one of the largest is that of Hallein, near Salzburg, in which the salt is removed from subterraneous caverns of a considerable extent, exhibits almost every diversity of colour, as yellow, blue, and white; in consequence of which it is described in water, to be liberated from its impurities,
The salt mines of Cracow, and Cheshire, merit a particular description.

SALT MINES OF CRACOW.

Thus, cavern’d round, in Cracow’s mighty mines,
With crystal walls a gorgeous city shines;
Scoop’d in the briny rock long streets extend
Their hoary course, and glittering domes ascend.
Down their bright steeps, emerging into day,
Impetuous fountains burst their headlong way,
O’er milk-white vales in ivory channels spread,
And wondering seek their subterraneous bed.

Form’d in pellucid salt, with chisell’d née,
The pale lamp glittering through the sculptur’d ice.
With wild reverted eyes fair Lotia stands,
And spreads to heaven, in vain, her glassy hands:
Cold dews condense upon her pearl’d breast,
And the big tear rolls lead down her vest.

Far gleaming o’er the town, transparent vanes
Bear their white towers, and wave their golden vanes;

And the bright vault resounds with mingled blaze.

Darwin.

These celebrated excavations are about five miles distant from the city of Cracow, in a small town named Wielicza, which is entirely undermined, the cavities reaching to a considerable extent beyond its limits. The length of the deepest mine, from east to west, is six thousand feet; its breadth, from north to south, two thousand; and its greatest depth eight hundred: but the veins of salt are not pursued to this extent, the depth and length of them, east to west, being yet unknown, and their breadth not a single spring has been discovered throughout the extent of the mine.

In descending to the bottom, the visitor is surprised to see a kind of subterraneous commonwealth, consisting of families, who have their peculiar laws and polity. Employed to draw the salt to the mouths of the mine, where it is taken up by engines. These horses, when of the sun; and many of the people seem buried alive in the strange abyss, having been born there, and never re-crystalized.
tuulties of breathing the fresh air in the fields, and enjoyed the surrounding prospects. The subterraneous passages, galleries, are very spacious, and in many of them crucifixes are hewn out of the rock-salt. In these passages crucifixes are set up, together with the images of saints, before which a light is kept constantly burning. The places where the salt is hewn out, and the empty cavities whence it has been removed, are called chambers, in several of which where the water has stagnated, the bottoms and sides are covered with very thick incrustations of thousands of small crystals, lying one on the other, and many of these weighing half a pound and upwards. When candles are placed before them, the numerous rays of light reflected by these crystals emit a surprising lustre.

In several parts of the mine huge columns of salt are left standing, to support the rock; and these are very fancifully ornamented. But the most curious object in the inhabited part, or subterraneous town, is a statue, which is considered by the immured inhabitants as the actual transmutation of Lot's wife into a pillar of salt; and in proportion as this statue appears either dry or moist, the state of the weather above ground is inferred. The windings in this mine are so numerous and intricate that the workmen have frequently lost their way; and several, whose lights have been extinguished, have perished. The number of miners to whom it gives employment, is computed at between four and five hundred, but the whole amount of the men employed in it is about seven hundred.

The salt lies near the surface, in large shapeless masses, out of which blocks of sixty, eighty, or a hundred square, may be hewn; but at a considerable depth found in smaller lumps. About six hundred thousand quintals of salt are annually dug out of the mines of the cow. The worst and cheapest is called green salt, for its greenish colour, occasioned by an heterogeneous mixture of a greyish mineral, or clay, and entirely consists of crystals of different dimensions. A finer sort is dug in large blocks; and the third kind is the sal geminis, crystal salt, which is found in small pieces interspersed in the rock, and, when detached from it, breaks into chips of rectangular prisms. This is usually sold unpurified.
The colour of the salt stone is a dark grey mixed with yellow.

**SALT MINES AND SALT SPRINGS OF CHESHIRE.**

The Cheshire rock-salt, with very few exceptions, has hitherto been ascertained to exist only in the vallies borned on the river Weaver and its tributary streams; in some places manifesting its presence by springs impregnated with salt, and in others being known by mines actually carried down into the substance of the salt strata between the source of the Weaver and Nantwich, many springs make their appearance; and occur again at several places, in proceeding down the stream. At Moulton, a mine has been sunk into the body of rock-salt, and a similar mine is wrought near Middlewich. At Northwich, brine springs are very abundant; and there also many mines have been sunk for the purpose of working out the salt. In that vicinity a body of rock salt has been met with in searching for coal.

The brines in this district are formed by the penetration of spring or rain waters to the upper surface of the rock salt, in passing over which they acquire such a degree of strength, that one hundred parts have yielded twenty-seven of pure salt, thus nearly approaching to the perfect saturation of brine. Their strength is therefore much greater than that of the salt springs met with in Hungary, Germany, and France. The brine having been pumped out of the pits, or first conveyed into large reservoirs, and afterwards drawn, as it is needed, into pans made of wrought iron. Here the salt is applied in a degree determined by the nature of the salt to be manufactured, and various additions are made to the brine, with a view either to assist the crystallization of the salt, or to promote the separation of the earthy particles, which exist in a very small proportion. The importance of the manufacture of Cheshire salt will be readily obvious from the statement, that, besides the which exceeds 16,000 tons, the average of the quantity sent yearly to Liverpool for exportation, has not been less than 140,000 tons.

The mine of rock-salt first worked was discovered by accident at Marbury, near Northwich, about a century and
a half ago; and this bed had been wrought for more than a century, when, in the same neighbourhood, a second inferior stratum was fallen in with, separated from the former by a bed of indurated clay. This lower stratum was ascertained to possess a very great degree of purity and freedom from earthy admixture; on which account and from the local advantages of Northwich for exporting the fossil salt is worked in the vicinity of that place all the same. It occurs in two great strata or beds, lying nearly horizontally, and separated, the superincumbent from the subjacent stratum, by several layers of indurated clay, or argiloceous stone. These intervening beds possess in conjunction a very uniform thickness of from thirty to thirty-five feet, and are irregularly penetrated by veins of fossil sand. There is every reason to believe that the beds of rock salt at Northwich, are perfectly distinct from any others in the salt district, and form what are termed by mineralogists *incumbent bodies or masses of mineral.*

These enormous masses stretch a mile and a half in their longitudinal direction from north-east to south-west, and their transverse extent, as measured by a line at right angles from the former, does not exceed 4,200 feet, and what more than three quarters of a mile. Without exception, the brine which is met with is of a very weak inferior quality, and at a short distance disappears altogether. The thickness of the upper bed varies from sixty to eighty feet; and a general estimate made from its level, shows that its upper surface, which is ninety feet beneath the earth, is at least thirty-six feet beneath the low-water mark of the sea at Liverpool—a fact not unimportant in determining the nature of the formation of this mineral. The thickness of the lower bed has not hitherto been ascertained; but the workings are usually begun at a depth of from sixty to seventy-five feet, and are carried down for the space of fifteen or eighteen feet, through a formation the purest portion of the bed. In one of the recent shafts a level of forty-two feet has been reached in the lower, without passing through the body of rock salt. There is thus an ascertained thickness of this bed of one hundred and twenty feet, and without any direct evidence that it may not extend to a considerably greater depth.

Although two distinct beds only of fossil salt have been
SALT MINES OF CHESHIRE.

At Lawton, near the source of the river Wheelock, three distinct beds have been found, separated by strata of indurated clay: one at the depth of 120 feet, four feet in thickness; a second, thirty feet lower, twelve feet in thickness; and a third, forty-five feet farther down, which was sunk into seventy-two feet, without passing through its substance. The intervening clay, the structure of which is very peculiar, is called the shaggy metal, and the fresh water which passes through its pores has the expressive appellation of ROARING Meg. This epithet will not appear too strong, when it is mentioned that in a place in which the section of strata was taken, and where the shaggy metal was found at the depth of about eighty feet, the quantity of water ascertained to issue from its pores in one minute, was not less than three hundred and sixty gallons; a circumstance greatly enhancing the difficulties of passing a shaft down to the body of rock-

In many of these beds of argillaceous stone, a portion of salt, sufficiently strong to affect the taste, is found to exist; and this saltiness increases, as might be expected, in proportion as the body of rock-salt is approached: in the strata or layers immediately above the rock, which in the mines are perfectly uniform in their appearance and structure, it is particularly remarkable, notwithstanding there are not, in these strata, any veins of rock-salt connected with the great mass below. On the contrary, the saltiness in every instance, without presenting any of those inequalities which would arise from a mutual penetration of the strata. Not any marine exuviae, or organic remains, are found in the strata above the rock-salt; and with almost universal occurrence of gypsum, in connexion with beds of fossil salt, is a fact still more deserving of observation, because it appears, not only in these mines, but also in the salt mines of Hungary, Poland, and Transylvania, on which account Werner, in his geognostic system, assigns to the rock-salt and fleetz gypsum a con-

The fossil salt extracted from the Northwich mines is of
different degrees of purity, and more or less olended with earthy and metallic substances. The purer portion of the lower bed yields a rock-salt, which, being principally exported to the Baltic, obtains the name of Prussian rock-salt. The extent of the cavity formed by the workings varies in different mines, the average depth being about sixteen feet. In some of the pits, where pillars from eighteen to twenty-four feet square form the supports of the mine, the appearance of the cavity is singularly striking, and the brilliancy of the effect is greatly increased when the near scene is illuminated by candles fixed to the side of the rock. The scene thus formed almost appears to realize the most brilliant palaces of the eastern poets. Some of the pits are worked in aisles or streets, but the choice here is wholly arbitrary.

Among the methods employed in working out the rock-salt, the operation of blasting is applied to the separation of large masses from the body of the rock, and these are afterwards broken down by the mechanical implement in common use. The present number of mines is eleven or twelve, from which there are raised, on an annual average, fifty or sixty thousand tons of rock-salt. The greater part of this quantity is exported to Ireland and the Baltic, the remainder being employed in the Cheshire district, in the manufacture of white salt by solution and subsequent evaporation.

The general situation occupied by the rock-salt in Cheshire is very similar to that of the Transylvanian and Polish mines, the beds of this mineral being disposed in small plains, bounded by hills of considerable height, forming a kind of basin or hollow, from which there is usually only a narrow egress for the waters. The situation of the Austrian salt mines near Saltzburg is, however, very different. The mineral there appears to be disposed in beds of great thickness, which occur near the summit of limestone hills, at a great elevation above the adjacent country. This is a singular fact; and if the hypothesis is allowed that rock-salt is formed from the waters of the sea, it is necessary to suppose the occurrence on this spot of the most vast and surprising changes!

The theory of the formation of rock-salt presents some difficulties, at the same time that little doubt can exist of the general fact, that the beds of this mineral have been
SALT MINES OF CHESHIRE.

The formation by deposition from the waters of the sea. Such an opinion acquires much probability from the situation in which these beds usually occur; occupying the vallies and lower parts of the plains which are so surrounded by hills of secondary formation, as to leave only a narrow egress for the waters collected on their surface. The structure of the plain which constitutes the salt district of Cheshire, regarded in its general character, leads strongly to the conclusion that the waters of the sea must, at some former period, have occupied the lower parts at least of the basin thus formed, which at that time had a level lower by two hundred and fifty or three hundred feet than the one now existing. To account for the great depositions of salt in the lower parts of this basin, it is necessary to suppose that some barrier must have been afterwards interposed to prevent the free communication of the waters of the sea with those thus collected; and the general course of the streams, disposition of the beds of rock-salt, and the contractions in the valley of the Weaver, which appear below Northwich, at Anderton and Frodsham, point out with some distinctness the place where these obstructions may properly have occurred.

The principal objection to this theory undoubtedly is the non-existence of marine exuviae, either in the rock-salt, or in the adjacent strata of clay; a fact very difficult to account with the idea of a deposition from the waters of the sea. Other objections, though perhaps of less moment, arise from the appearance of the earthy salts in smaller proportion in the rock-salt than in sea water; from the partial deposition of the beds; and from the difficulty of explaining the formation of certain figured appearances which occur in the substance of the rock. These circumstances, however, by no means authorize the rejection of the general idea which has been given of the origin of this mineral, strengthened as it is by the situation of the proofs of marine deposition are still stronger than those presented in the Cheshire district.
PHENOMENA OF THE OCEAN.

They that go down to the sea in ships, that do business in great waters; these see the works of the Lord, and his wonders in the deep.—Psalms.

With wonder mark the moving wilderness of waves.
From pole to pole through boundless space diffused,
Magnificently dreadful! where, at large,
Leviathan, with each inferior name
Of sea-born kinds, ten thousand thousand tribes,
Find endless range for pasture and for sport.
Adoring own
The Hand Almighty, who in channelled bed
Immeasurable sunk, and poured abroad,
Fenced with eternal mounds, the fluid sphere;
With every wind to waft large commerce on,
Join pole to pole, consociate severed worlds,
And link in bonds of intercourse and love
Earth’s universal family.

That huge mass of waters impregnated with salt, which encompasses all parts of the globe, and by the present navigated distant regions, is denominated the Ocean, and has three great divisions assigned to it. First: That vast expanse of water, which lies to the westward of the northern and southern continents of America, and by which those continents are divided from Asia. On account of the uniform and separate gales which sweep its surface within the tropics, it is named “the Pacific Ocean;” and has again been divided into the Northern and Southern Pacific, the equal, being considered as the boundary of each, and the Southern Ocean,” or South Sea, being, consequently, that part of the general assemblage of waters which lies in the direction from about the fortieth degree of latitude towards the south pole. Its general width is estimated about ten thousand miles. Secondly: The “Atlantic Ocean,” which divides Europe and Africa from the two American continents, and has a general width of about three thousand miles; while the waters which occupy the polar regions are named “The Northern sea.” And

Lastly: “The Indian Ocean,” which extends from the
PHENOMENA OF THE OCEAN.

The ocean, 311

Among the chief of those less expansive sheets of water, properly called seas, may be mentioned the Baltic, the Mediterranean Sea, and the Black and Red Seas. The Caspian Sea, being entirely encompassed by land, might, with more propriety, have been styled a lake; but as its water possesses the quality of saltiness, it is ranked among the seas. It is, notwithstanding, certain that Lake Superior, North America, has a still greater circumference, existing around its shores at least fourteen hundred miles, while the extent of the Caspian Sea does not exceed twelve.

Of the origin of this division into different seas, and seas of different depths, little is known; but it is highly probable that many of the larger excavations and partitions met with, have existed, without much change as to their extent, from the creation. Others have undoubtedly been the result of that conflict which is perpetually taking place between the elements of land and water, and which, for the greater part, given rise to islands, isthmuses, peninsulas; while subterraneous volcanoes, and those surprising and indefatigable exertions of corals, madrepores, tubifores, and other restless and multitudinous plates, have laid, and are daily laying the foundation of islands and continents in the middle of the widest and deepest seas.

The quantity of water in the ocean not only remains constantly the same; but, notwithstanding its most violent incessant motion, continues stable within certain limits. However, is what cannot be inferred from observations, for, although in the almost infinite variety of disturbances to which the ocean is liable, from the action of ordinary causes, it may appear to return to its former state of equilibrium, still it may be apprehended that some exceedingly inconsiderable at its origin, may augment continu- and elevate it above the highest mountains. It is, therefore, interesting to investigate the conditions which are necessary for the absolute stability of the ocean. This has been effected by the celebrated Laplace, who has de-
stable, if its density be less than the mean density of the earth, which is known to be the case. He has likewise determined, by means of his refined analysis; that the stability would cease to exist, if the mean density of the sea were to exceed that of the earth; so that the stability of the equilibrium of the ocean, and the excess of density of the terrestrial globe above that of the water which cover it, are reciprocally connected with each other, and indicate infinite wisdom and contrivance in such an adjustment.

SALTNESS OF THE SEA.

Of the various phenomena of the sea, that of its saltness one of the most obvious. No questions concerning the natural history of our globe have been discussed with more attention, or decided with less satisfaction, than that concerning its primary cause, which had perplexed the philosophers before the time of Aristotle, and surpassed the great genius of that profound enquirer into natural causes. Father Kircher, after having consulted not less than thirty-three authors on this subject, could not but remarking, that the fluctuations of the ocean itself is scarcely more various, than the opinions concerning its origin of its saline impregnation.

This question does not seem capable of an illustration from experiment; at least, not any experiment hitherto made for that purpose: it is, therefore, not surprising that it remains nearly as problematical in the present age, as it has been in any of the preceding ages. Observations been made three or four centuries ago to ascertain the then saltness of the sea, at any particular place, we might now, by making similar observations at the same place, in the same season, be able to know, whether the saltness, at that particular place, was an increasing, or a decreasing, or an increasing quantity. This kind and degree of knowledge would have served as a clue to direct us to a full investigation of the matter in general. It is to be regretted, however, that observations of this nature have not, until very lately, been made with any degree of precision.

One of the principal opinions maintained on this subject by modern philosophers, and more particularly by Doctor Halley, is, that since river water, in
Part Qf of the globe, is impregnated, in a greater or less degree, by sea-salt, the sea must have gradually acquired its present quantity of salt from the long-continued influx of rivers. The water which is carried into the sea by these dispersed over the atmosphere by winds, soon descends in rain or vapour upon the surface of the earth, whence it pours into the bosom of the ocean the fresh trite of salt it has collected in its inland progress. Thus salt conveyed into the sea not being a volatile substance, performing an incessant circulation, must be a perpetually increasing quantity; and sufficient time, it is concluded, has elapsed, since the creation, for the sea to acquire from this source its present quantity of salt.

This opinion has been successfully combated; and it is believed that fresh water rivers can, in the course of many thousands of years, have produced saltness in the sea. If this were the case, every sea, or great body of water, which receives rivers, must have been salt, and have possessed a degree of saltness in proportion to the quantity of water which these rivers discharge. But so far is this from being the case, every sea, or great body of water, which contains salt water but fresh. It may indeed be objected, that the quantity of salt which rivers carry along with them, and deposit in the sea, must depend on the nature of the soil through which they flow, which may in some places not contain any salt; and that this is the reason why the great lakes in America, and the Palus Mæotis are not salt. But to this opinion, which is merely hypothetical, there are insurmountable objections. It is a curious fact, that the saltiness of the sea is greatest under the line, and diminishes gradually towards the poles; but it cannot therefore be assumed that the earth contains more salt in the tropical regions than in the temperate zones, and in these again than in the frigid zones. On the hand, if it be allowed that the sea receives its saltness from the rivers, it must be equally salt, or nearly so, in part of the earth; since, according to a simple and known principle in chemistry, when any substance is thrown into water with the assistance of agitation, at every part of the water it is introduced, it will be evenly diffused through the whole liquid. Now, though
it were true that a greater quantity of salt should have been introduced into the sea under the line, than towards the poles, from the constant agitation occasioned by the wind and tide, the salt must have soon pervaded the whole mass of water. Neither is this greater proportion of saltiness owing to a superior degree of heat, since it is an established principle in chemistry, that cold water and salt water dissolve nearly the same proportion of salt.

The saltiness of the sea has also been ascribed to the HUDation of subterraneous mines of salt, which is supposed to abound in the bottom of the sea, and along its shores, this hypothesis cannot be supported. If the sea were constantly dissolving salt, it would soon become saturated for it cannot be said that it is deprived of any portion of its salt by evaporation, since rain water is fresh. If the sea were to become saturated, neither fishes nor vegetable could live in it. It may hence be inferred that the saltness of the sea cannot be accounted for by secondary causes and that it has been salt since the beginning of time.

Indeed, impossible to suppose that the waters of the sea were at any time fresh, since the formation of fishes and sea-plants; for, as these will not live in water saturated with salt, neither will they live in water which is fresh. It may hence be concluded that the saltness of the sea with some few exceptions, perhaps, arising from mineral rock-salt dispersed near its shores, been nearly the same all ages. This hypothesis, which is the simplest, and involved in the fewest difficulties, best explains the various phenomena dependent on the saltness of the sea.

Although this saline property may be one of the causes by which the waters of the sea are preserved from mortality, still it cannot be considered as the principal one. The ocean has, like rivers, its currents, by which its contents are circulated round the globe; and these may be to be the great agents which keep it sweet and wholesome. A very enlightened navigator, Sir John Hawkins, speaks a calm in which the sea, having continued for some time without motion, assumed a very formidable aspect. "It not," he observes, "for the moving of the sea, by the force of winds, tides, and currents, it would continue the world. The experiment of this I saw in the year 1592, lying with a fleet about the islands of Azores, almost
CONGELATION OF SEA WATER.

Although the assertion that salt water never freezes has been contradicted by repeated experience, it is still certain that it requires a much greater degree of cold to produce its congelations than fresh water. It is, therefore, one of the greatest blessings which we derive from this element, that when we find all the stores of nature locked up to us on the land, the sea is, with a few exceptions, ever open to our necessities. It is well known that at particular seasons, the mouth of the river St. Lawrence, the entrance into the Baltic Sea, &c. are so much frozen over as to be impassable by ships; while the vast mountains and fields of ice in the polar regions have, for ages past, been insurmountable obstructions to the daring researches of modern navigators. These exceptions, however, will appear of comparatively trifling importance to navigation, when the number of ports which are, in almost every region, open at all seasons of the year, are considered; and this facility of intercourse would certainly not have been afforded, if sea water had admitted of as easy a congelation as that of water not impregnated with salt.

On the origin of ice in the frozen seas different opinions have been entertained. The authority of Captain Cook and Lord Mulgrave has been cited by Bishop Watson, to show that good fresh water may be procured from ice found in those seas; but he observes that, notwithstanding the
testimonies of these very able navigators, it may still be doubted whether the ice from which the water was obtained, had been formed in the sea, and, consequently, whether sea water itself would, when frozen, yield fresh water. He thinks it probable that the ice had either been formed at the mouths of large fresh water rivers, and had thence, by tides or torrents, been drifted into the sea, or that it had been broken by its own weight, from the immense cliffs of ice and frozen snow, which, in countries where there are few rivers, are found in high latitudes to project a great way into the sea. An early navigator, Fotherbye, in the relation of his voyage toward the South Pole, in 1614, considers snow to be the original cause of the ice found at sea, he himself having observed it to be an inch thick on the surface; and Captain Cook, from his own observations in the South Sea, was disposed to think that the vast floats of ice he met with in the spring, were formed from the congelation of snow. It is certain that the snow which falls upon the surface of the sea, being in a solid state, and, bulk for bulk, lighter than sea water, will not readily combine with it, but may, by a due degree of cold in the atmosphere, be speedily converted into a layer of ice. The upper layer of this first surface of being elevated above the surface of the sea, will receive the fresh water which falls from the atmosphere in the form of snow, sleet, rain, or dew, by the successive congelation of which the largest fields of ice may at length be formed. It is a matter of little consequence to a navigator, where the ice which supplies him with fresh water is produced. Leaving, therefore, these hypotheses relative to the formation of ice in the Frozen Seas, it should be observed that the question, whether congealed sea water will, when thawed, yield fresh water, has been satisfactorily decided by experiments made with every suitable attention. A quantity of sea water having been taken up off the North Foreland, was exposed to a freezing atmosphere, and afforded an ice perfectly free from any taste of salt; and it has likewise been found, that not only sea water, but water containing double the proportion of salt commonly found in our sea water, and more than is contained in the river water of any climate, may be frozen by the cold prevailing in our atmosphere.
This name is bestowed by seamen on the huge solid masses of ice which float on the seas near or within the Polar circles. Many of these fluctuating islands are met with on the coasts of Spitzbergen, to the great danger of the vessels employed in the Greenland fishery. In the midst of these tremendous masses, navigators have been arrested and frozen to death. In this manner the brave Sir Hugh Willoughby perished with all his crew in 1553; and in the year 1773, Lord Mulgrave, after every effort which the most accomplished seaman could make, to reach the termination of his voyage, was caught in the ice, and nearly experienced the same unhappy fate. The scene he describes, destitute of the horrors attendant on the eventful expectation of change, was most beautiful and picturesque. Two large ships becalmed in a vast basin, surrounded on all sides by ice islands of various forms; the weather clear; the sun guiding the circumambient ice, which was low, smooth, even, and covered with snow, except where pools of water, on a portion of the surface, shot forth new icy crystals; and the smooth surface of the comparatively small space of sea in which they were hemmed. Such is the picture drawn by our navigator, amid the perils by which he was surrounded. After fruitless attempts to force their way through the fields of ice, the limits of these became at length so contracted, that the ships were immovably fixed. The smooth extent of surface was soon lost: the pressure of the pieces of ice, by the violence of the swell, caused them to pack; and fragment rose upon fragment, until they were in many places higher than the main-yard. The movements of the ships were tremendous and involuntary, in conjunction with the surrounding ice, actuated by the currents. The water having shoaled to fourteen fathoms, great apprehensions were entertained, as the grounding of the ice, or of the ships, would have been equally fatal: the force of the ice might have crushed them to atoms, or have lifted them out of the water, and have overset them; or, again, have left them suspended on the summits of the pieces of ice at a tremendous height, exposed to the fury of the winds, or to the risk of being dashed to pieces by the failure of their
frozen dock. 'An attempt was made to cut a passage through the ice; but after a perseverance truly worthy of Britons, it proved ineffectual. The commander, who was at all times master of himself, directed the boats to be made ready to be hauled over the ice, till they should reach the gable water, proposing in them to make the voyage to England; but after they had thus been drawn over the ice for three progressive days, a wind having sprung up, the ice separated sufficiently to yield to the pressure of the ships in full sail. After having laboured against the resisting field of ice, they at length reached the harbour of Smeeringlehen at the west end of Spitzbergen.

The vast islands of floating ice which abound in the high southern latitudes, are a proof that they are visited by a much severer degree of cold than equal latitudes towards the north pole. Captain Cook, in his second voyage, fell in with one of these islands in latitude 50° 40' south. It was about fifty feet high, and half a mile in circuit, being flat on the top, while its sides, against which the sea broke exceedingly high, rose in a perpendicular direction. In the afternoon of the same day, the 10th of December, 1773, he fell in with another large cubical mass of ice, about two thousand feet in length, two hundred feet in breadth, and in height two hundred feet. Mr. Foster, the naturalist of the voyage, remarks that, according to the experiments of Boyle and Mariot, the volume of ice is to that of sea water nearly as 10 to 9: consequently by the known rules of hydrostatics, the volume of ice, which rises above the surface of the water, is to that which sinks below it as 1 to 9. Supposing, therefore, this mass of ice to have been of a regular figure, its depth under water must have been 1800 feet, and its whole height 2000 feet; estimating its length, as above, at 2000 feet, and its breadth at 400 feet, the entire mass must have contained 1600 millions of cubic feet of ice.

Two days after, several other ice-islands were seen of them nearly two miles in circuit, and 600 feet high; yet such was the force of the waves, that the sea broke quite over them. They exhibited for a few moments the very pleasing to the eye; but a sense of danger struck against the mind with horror: for had the ship struck against the weather side of one of these islands, when the sea was high, she must in an instant have been dashed to pieces.
ICE ISLANDS.

route to the southward was afterwards impeded by an immense field of low ice, the termination of which could not be seen, either to the east, west, or south. In different parts of this field were islands, or hills of ice, like those which had before been found floating in the sea.

At length these ice-islands became as familiar to those on board as the clouds and the sea. Whenever a strong reflection of white was seen on the skirts of the sky, near the horizon, then ice was sure to be encountered; notwithstanding which, that substance itself was not entirely white, but often tinged, especially near the surface of the sea, with a most beautiful sapphirine, or rather berryline blue, evidently reflected from the water. This blue colour sometimes appeared twenty or thirty feet above the surface, and was probably produced by particles of sea water which had been dashed against the mass in tempestuous weather, and had penetrated into its interstices. In the evening, the sun setting just behind one of these masses, tinged its edges with gold, and reflected on the entire mass a beautiful suffusion of purple. In the larger masses were frequently observed shades or casts of white, lying above each other in strata, sometimes of six inches, and at other times of a foot in height. This appearance seemed to confirm the opinion entertained relative to the increase and accumulation of such huge masses of ice, by heavy falls of snow at different intervals: for snow being of various kinds, small-grained, large-grained, in light feathery locks, &c.; the various degrees of its compactness may account for the different colours of the strata.

In his third attempt to proceed southward, in January, 1774, Captain Cook was led, by the mildest sun-shine which was, perhaps, ever experienced in the frigid zone, to entertain hopes of penetrating as far toward the south pole as other navigators had done toward the north pole; but on the 26th of that month, at four in the morning, before them, bearing from east to west. A bed of fragments floated around this field, which was raised several feet above the surface of the water. While in this situation, rays of light reflected from the ice, to a considerable height. Ninety-seven ice-islands were distinctly seen within the
field, beside those on the outside; many of them very large, and looking like a ridge of mountains, rising above the other until they were lost in the clouds. The most elevated and most rugged of these ice-islands were surrounded by peaks, and were from two to three hundred feet in height, with perpendicular cliffs or sides astonishing to behold. The largest of them terminated in a peak not unlike the cupola of St. Paul's.

The outer, or northern edge, of this immense field of ice, was composed of loose or broken ice closely packed together, so that it was not possible to find any entrance. Such mountains of ice, Captain Cook was persuaded, were never seen in the Greenland seas, so that not any comparison could be drawn; and it was the opinion of most of the persons on board, that this ice extended quite to the pole, to which they were then within less than nineteen degrees of, or, perhaps, joined to some land to which it had beenfixed from the earliest time. Our navigator was of opinion that it is to the south of this parallel that all the ice is formed which is found scattered up and down to the northward, and afterward broken off by gales of wind, or other causes, and brought forward by the currents which are always found to set in that direction in high latitudes. "Should there he observes, "be land to the south behind this ice, it can afford no better retreat for birds, or any other animal than the ice itself, with which it must be wholly covered. I, who was ambitious, not only to go farther than any one had been before, but as far as it was possible for man to go, was not sorry at meeting with this interruption as it in some measure relieved us, or at least shortened the dangers and hardships inseparable from the navigation of the southern polar regions."

The approximation of several fields of ice of different magnitudes produces a very singular phenomenon. The smaller of these masses are forced out of the water, and thrown on the larger ones, until at length an aggregate is formed of a tremendous height. These accumulated dies of ice float in the sea like so many rugged mountains, and are continually increased in height by the spray of the sea, and the melting of the snow which falls on them. While their growth is thus augmented, the smaller fields, of a less elevation, are the meadows of
The collision of great fields of ice, in high latitudes, is often attended by a noise, which, for a time, takes away the sense of hearing any thing beside; and that of the smaller fields with a grinding of unspeakable horror. The water which dashes against the mountainous ice, freezes into an infinite variety of forms, and presents to the admiring view of the voyager ideal towns, streets, churches, steeples, and almost every form which imagination can picture to itself.

**ICEBERGS.**

Analogous to the ice-fields described above, are those large bodies of ice, named *Icebergs*, which fill the vallies between the high mountains in northern latitudes. Among the most remarkable are those of the east coast of Spitzbergen. They are seven in number, and lie at considerable distances from each other, extending through tracts unknown, in a region totally inaccessible in the internal parts. The most distant of them exhibits over the sea a front three hundred feet in height, emulating the colour of the emerald; contracts of melted snow fall down in various parts; and black spiral mountains, streaked with white, bound the sides, rising crag above crag, as far as the eye can reach in the back-ground. At times immense fragments break off, and precipitate themselves into the water with a most alarming dashing. A portion of this vivid green substance was seen by Lord Mulgrave, in the voyage above referred to, to fall into the sea; and, notwithstanding it grounded in twenty-four fathoms water, it spired above the surface sixty feet. Similar icebergs are frequent in all the arctic regions; and to their lapse is owing the solid mountainous ice which infests those seas.

The frost sports wonderfully with these icebergs, and gives them majestic, as well as other most singular forms. Misses have been seen to assume the shape of a gothic church, with arched windows and doors, and all the rich drapery of that style of architecture, composed of what the writer of an Arabian tale would scarcely have ventured to introduce among the marvellous suggestions of his fancy—crystals of the richest sapphirine blue. Tables with one or
more feet; and often immense flat-roofed temples, like those of Luxor on the bank of the Nile, supported by transparent columns of cerulean hue, float by the astonished spectator. These icebergs are the creation of ages, and acquire annually additional height by falls of snow or rain which latter often freezes instantly, and more than repairs the loss occasioned by the influence of the sun's heat.

LUMINOUS POINTS IN THE SEA.

Among the phenomena which have long exercised the sagacity of philosophers, that of the luminous appearance of the surface of the sea, during the obscurity of the night, is highly curious. A variety of experiments were made by a French naturalist at Cayenne, at different seasons, to ascertain its true cause; and to him it appeared that these luminous points were produced by motion and friction alone, as he could not, with the help of the best glasses, perceive any insects floating in the water. But would seem, from the experiments and observations of many learned men, that this phenomenon is produced by various causes, both jointly and separately. It has been proved by one set of experiments, that the putrefactive animal substances produces light and scintillation in the water.

A little white fish placed in sea-water rendered it luminous in the space of twenty-eight hours. On another hypothesis it is certain that there is in the sea a prodigious quantity of shining insects or animalculae, which contribute to this phenomenon. A French astronomer, M. Dangelet, who returned from Terra Australis in 1774, brought with him several kinds of worms which shine in water, set in motion; and M. Rigaud affirms, that the surface of the sea, from Brest to the Antilles, contains an immense quantity of little, round, shining polypi, of about a quarter of a line in diameter. Other learned men, who acknowledge the existence of these luminous phenomena, cannot, however, be persuaded to consider them as the cause of all that light and scintillation which appear on the surface of the ocean. They imagine that some substance of a phosphoric nature, arising from putrefaction, admitted as one of the causes of this phenomenon, other naturalists it has been ascribed to the oily and greasy substances with which the sea is impregnated;
of which a kind of fish, resembling the tunny, is cited, as being provided with an oil which shines with considerable lustre.

The Abbé Nollet was convinced, by a series of experiments, that this phenomenon is caused by small animals, either by their luminous aspect, or by some liquor or effluvium which they emit. He did not, however, exclude other causes; and among these, the spawn or fry of fishes, deserving of attention. M. Dangelot, in sailing into the bay of Antongil, in the island of Madagascar, observed a prodigious quantity of fry, which covered the surface of the sea for the extent of more than a mile, and which he, at first, on account of its colour, mistook for a bank of sand. This immense accumulation of spawn or fry exhaled a disagreeable odour; and it should be remarked that the sea bad, for some days before, appeared with uncommon splendour. The same accurate observer, perceiving the sea remarkably luminous in the road of the Cape of Good Hope, during a perfect calm, remarked that the oars of the canoes produced a whitish and pearly kind of lustre: when he took in his hand the water, which contained phosphorus, he discerned in it, for some minutes, globules of light as large as the heads of pins. On pressing these globules, they appeared to his touch like a soft and thin pulp; and some days after the sea was covered with entire banks of small fishes, in innumerables multitudes.

From all these facts it may be deduced, that various causes contribute to the light and scintillation of the sea; and that the light which the Cayenne naturalist attributed to agitation and friction, differs from that which is extended far and near, seeming to cover the whole surface of the ocean, and producing a very beautiful and striking appearance, particularly in the torrid zone, and in the summer season.

TIDES AND CURRENTS.

Alternate tides in sacred order run.

Among the most wonderful phenomena of nature may be reckoned the tides of the sea. They were but little understood by the ancients, although Pliny, Ptolemy, and Macrobius were of opinion that they were influenced by the sun and moon. The former expressly says, that the
cause of the ebb and flow is in the sun, which attracts the waters of the ocean; and he adds, that the waters rise in proportion to the proximity of the moon to the earth.

The phenomena of the tides have been ascribed to the principle of innate gravitation; but Sir Richard Phillips, in his Theory of the System of the Universe, refers them to that general law of motion which he considers as the primary and proximate cause of all phenomena, operating in a descending series, from the rotation of the sun round the fulcrum of the solar system, to the fall of an apple on the earth. This motion being transferred through all nature from its source, serves as the efficient cause of every species of vitality, of every organic arrangement, and of all those accidents of body heretofore ascribed to attraction.

The waters of the ocean are observed to flow and rise twice a day, in which motion, or flux, which in the same direction lasts nearly six hours, the sea gradually swells and, entering the mouths of rivers, drives back the river waters towards their head. After a continued flux of six hours, it seems to repose for a quarter of an hour; and then begins to ebb, or retire back, for six hours more; at which time, by the subsidence of the waters, the river resume their usual course. After a quarter of an hour, the sea again flows and rises as before.

According to the theory of Newton, these phenomena were supposed to be produced by an imaginary power called attraction. The moon was supposed to attract the waters by the hoc-us-pocus of an occult power inherent in all matter; just as the earth was supposed to attract the moon, the moon the earth, and the planets one another. This might be very good philosophy as long as names were admitted as efficient causes; but the more inquisitive spirit of modern philosophy asks how any attraction, or operative force of the nature of attraction, can exist between bodies necessarily separated, according to the same theory, by a vacuum in space, and prevented from failing together by the further necessary hypothesis of a projecting force. Besides, in the phenomena of the tides, it was unfortunate for this gravitating theory, that the tides rise on the opposite sides of the earth at the same time.

The entire theory of all occult attraction and repulsion is, however, visionary and fabulous, and must yield, before...
The light of reason, to the new theory, which ascribes all phenomena of motion to superior motions, or to the transfer of the motions of greater bodies to smaller ones. Thus, all motions which we witness on the earth, as the motion of the waters and atmosphere, the fall of bodies, the principle of weight or centripetal force, the motions of animals, &c. &c. are ascribed by Sir Richard Phillips, to the combined motions of the earth around its axis in every twenty-four hours, and around the sun in every year.

It is easy to conceive, that even if there were no Moon, the moving waters of the two great oceans, the Atlantic and Pacific, would necessarily oscillate, or vibrate, between the continents, which bound them from north to south, by the combined force of the two-fold motions of the earth. They would be intercepted in their rotation by the continents on the eastern sides, which it is well known are worn away by their action; and a re-action would take place on the western sides of the same continents. But as the motions of the moon, in its lunar orbit, coincide with those of the tides in their terrestrial orbit, there is evidently a connection in the cause of both motions, or rather, the causes of both appear to be identically the same; and the effects are, therefore, simultaneous.

This common cause, Sir Richard Phillips asserts, is to be found in the motions of the earth, which operate alike on the waters of the earth, and on the moon according to their respective quantities of matter, and to the square of their distances from the centre.

The connection between the earth and its waters is palpable, but that between the earth and the moon is, he asserts, maintained by means of the gaseous, or fluid medium, which fills all space, and transfers the motions of the sun, from the sun to the planets, and their secondaries, and from the planets to their several secondaries. The gaseous medium filling universal space, is, he says, in this respect, and in universal nature, as efficient in transferring motion from masses to masses in proportion to their quantity of matter and to their distance, as the continuous fixed matter of a rod, or lever of wood or metal.

The causes and phenomena of the tides, according to the new system of Phillips, may be described in the following paragraphs;
1. The tides are simple and palpable phenomena of motion, and all motion is caused by other motion.

2. If the earth were a true homogeneous sphere, covered equally with water, and moved or turned by forces acting equally on the ends of its equatorial axis, then all its parts would move simultaneously with equal momentum, and there could be no tides. But if any inequalities in the density of its masses, or any variation in the direction of the forces caused the centre of gyration to become different from the mathematical centre, then the moveable waters, in their capability of accommodating themselves to the centre of gyration, would constantly change their position in relation to the fixed masses.

3. The earth and moon move round a common centre of fulcrum, the arms or distances being in the inverse duplicate ratio of their quantities of matter and the mundane fluids, in respecting this centre of motion, rise towards the fulcrum, which is always in the line joining the centres of the earth and moon; and hence the phenomena of the tides, governed in successive rotations by the time in which the common fulcrum, passes the meridian.

4. The tides therefore are caused by the revolution of the earth round the fulcrum, or centre of the moment of the earth and moon, and as the moveable waters in restoring the equilibrium, accumulate opposite the fulcrum, they have the appearance of being attracted, as it is called, by the moon.

5. The double tide in every twenty-four hours caused by the departure of the fulcrum from the sea or the continents which separate the two great oceans from each other, when, as no force retains the elevated waters, they relapse or swing back, and produce a second tide.

6. The variable heights of the tides, as appear connected with the age of the moon, are caused by the variable distance of the body of the earth from the lunar and mundane centre of motion.

On account of the shallowness of some seas, and the narrowness of the straits in others, there arises a great diversity in the phenomena, only to be accounted for by an exact knowledge of the place. For instance, in the English channel, and the German ocean, the tide...
Tides and Currents.

Tides and currents.

The shallowness and narrowness of many parts of the world give rise also to a peculiarity in the tides of some parts of the world: for, in many places, in our own seas in particular, the greatest swell of the tide is not while the moon is at its meridian height, and directly over the place, but some time after it has declined thence. The sea, in this case, being obstructed, pursues the moon with what speed it can, but does not arrive with all its waters until the moon has ceased to operate. Lastly, from this shallowness of the sea, and from its being obstructed by banks and straits, it happens that the Mediterranean, the Baltic, and the Black Sea, have not any sensible tides, but rise or depress them in a considerable degree.

Among the phenomena of the tides, one of the most remarkable is the bore, peculiar to several rivers: it is ascribable to the waters, which were before expansive, being suddenly pent up, and confined within a narrow space. The flowing of the tide in the Perret, in Somersetshire, and the Seine, in France. It is also one of the peculiarities of the Severn, the most rapid river in England.

One of the greatest known tides is that of the Bristol Channel, which sometimes flows upwards of forty feet. The tides are also remarkably high on the coasts of Malay, in the straits of Sunda, in the Red Sea, at the mouth of the river Indus the water rises thirty feet.

The remarkable tides, however, are those at Batsha, in the kingdom of Tonquin, in 20° 50′ north latitude. In that place the sea ebbs and flows once only in twenty-four hours, and in all other places there are two tides within that time. What is still more extraordinary, twice in each month, when the moon is near the equinoctial, there is not any water being for some time quite stagnant. These, and other anomalies of the tides there, Sir Isaac Newton,
with peculiar sagacity, ascertained to arise from the confluence of two tides, one from the South Sea, and the other from the Indian Ocean. Of each of these two tides there came successively two every day; two at one time greater, two at another which are less. The time between the arrival of the two greater was considered by him as flood tide; that between the two less, as ebb. In short, these simple facts in his possession, that great mathematician solved every appearance, and so established his theory as to silence every opposer.

Besides the common and periodical tides, a variety of local currents are met with in different seas, on different parts of the ocean, and for the greater part at an considerable distance from land. They have been ascribed to particular winds; but their origin is not easily trace, as they have been occasionally found beneath the surface of the water, running in a contrary direction to the stratum above, and cannot, therefore, have been owing to winds or monsoons. These particular currents have been ascribed to the immense masses of polar ice, which produce a greater degree of cold in the under than in the upper stratum of waters; and it has been suspected that these an under current of cold water flowing perpetually from the poles towards the equator, even where the water surface flows towards the poles. The great inferiority of temperature which is frequently found in deep and superior soundings of the same space of water is thus accounted for.

The most extraordinary current is that of the gulf of Florida, usually called the gulf-stream, which runs along the coast of North America to the northward and eastward, and flows with an uninterrupted rapidity. It is ascribed to the Trade winds, which, blowing from the eastern parts into the great Mexican gulf, cause there an accumulation above the common level of the sea. The water, therefore, constantly runs out by the channel where it finds least resistance, that is, through the gulf of Florida, with such force as to continue a distinct stream to a very great distance. A proof of its having thus originated is, that the water of the gulf-stream has been found to have retained a great portion of the heat it had acquired in the torrid zone.

A very singular upper current often prevails to the northward of Scilly, and is highly dangerous to ships which approach the British Channel. Currents of this description
**PRINCIPAL RIVERS.**

Tell by what paths, what subterraneous ways,
Back to the fountain's head the sea conveys
The refleunt rivers, and the land repays?
Tell what superior, what controlling cause,
Makes waters, in contempt of nature's laws,
Climb up, and gain th' aspiring mountain height,
Swift and forgetful of their native weight?

What happy works, what engines underground,
What instruments of curious art are found,
Which must with everlasting labour play,
Back to their springs the rivers to convey,
And keep their correspondence with the sea?

BLACKMORE.

*Further longest on the country though which it flows,*
winding course becomes a delightful ornament, and renders
the most beautiful landscape still more exquisitely enchan-
ing. At its fountain head it is nothing more than a sub-
vein of water, oozing from a hill on a bed of sand or clay
on which account it has been supposed to originate in water
brought from the sea by subterraneous ducts, and having
lost their saltness by percolation in their passage through the
earth. If this be conceded, it is not so easy to explain
what power the water rises above the level of the sea to
summits of mountains, where springs generally abound it being contrary to the laws of hydrostatics that a spring
should rise in a tube above the level of its surface. Dr.
Halley has on this subject ventured an hypothesis which
has been most generally received. He attributes the supply
of springs to vapoors raised by the action of the sun, as well as by the agitation of the winds, from seas, lakes, &c.
He made several experiments to show that vapour is a rea-
cient fund to supply all our springs, rivers, &c. To find a quantity of water which the Mediterranean receives allows the most considerable rivers which run into it, as the Iber, Rhone, Tyber, Po, Danube, Neister, Thanes, Tanais, and Nile, cach to furnish ten times as much water as the Thames, including in this estimate the
which flows into that sea from the small rivulets. The
Thames is found by calculation to evacuate two hundred and three millions of tons of water daily. The above
rivers, will, therefore, evacuate little more than a million and three millions of tons in a day; and this scarcely exceeds a sixth of what he had, by preceding experiments, doomed
to be raised in that time in the form of vapour. He thus discovered a source abundantly sufficient for the supply
of fountains.

To explain this theory on the principles of evaporation the
Doctor considers that if an atom of water were expanded into a bubble, so as to be ten times as large as when it was in its condensed
water, that atom would become specifically lighter than the
air, and would, therefore, rise so long as the water first separated it from the surface of the
should continue to distend it in the same degree; and, consequently, that vapours may be raised from the sea in this
manner, till they arrive at a certain height in the stratus
phere, in which they find air of equal specific gravity

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PRINCIPAL RIVERS

Here they will float, till, being condensed by condensation, they become specifically heavier than the air, and fall in dew; or, being driven by the winds against the foot of mountains, many of which far exceed the usual height to which vapours would of themselves ascend, are expelled by the stream of air to mount up with it to summits. Being there condensed into water, they precipitate, and, oozing down by the crannies of stones, enter in part the crevices of the hills. But these being once filled, all the overplus of water which breaking out by the sides of the hills, forms single springs. being, by gaining the plain ground, having grown rapid, become a river; and many of these uniting, such prodigious streams of water as the Wolga, the Rhine, and the Rhone.

Thus, one part of the vapours which are blown on the earth is returned, by the rivers, to the sea whence it came, while another part falls into the sea before it can reach the land; which is the reason why the rivers do not return so much into the Mediterranean as is raised by vapour. A part falls on the low ground, and furnishes the pabulum or nutriment of plants. But the circulation does not even here; for it is again exhaled into vapour by the action of the sun, and returned to the great world of waters whence it first arose.

As to this theory, beautiful as it appears, it has been objected that it does not account for the origin of hot and salt springs, and that many springs, among which is a remarkable one at Bembridge, in Essex, are not only perpetual, but yield the quantity of water, whatever proportion of rain or plenitude may be afforded. Amid these uncertainties, the declaration of the apostle Paul may be aptly cited: 'O depth of the riches both of the wisdom and knowledge of God! How unsearchable are his judgments, and his ways past finding out!'

AMERICAN RIVERS.

Nor less thy world, Columbus, drinks refresh'd
The lavish moisture of the melting year.
Wide o'er his isles, the branching Oronoque
Rolls a brown deluge; and the native drives
To dwell aloft on life-sufficing trees,
At once his dome, his robe, his food, and arms.
Swell'd by a thousand streams, impetuous hurl'd
From all the roaring Andes, huge descends
The mighty Orellana. Scarcely the muse
Dares stretch her wing o'er the enormous mass
Of rushing water; scarce she dares attempt
The sea-like Plata—to whose dread expanse,
Continuous depth, and wondrous length of course.
Our floods are rills. With unabated force,
In silent dignity they sweep along,
And traverse realms unknown, and blooming wilds,
And fruitful deserts, worlds of solitude,
Where the sun shines, and seasons teem in vain;
Unseen and menjoy'd.

THOMPSON

RIVER OF THE AMAZONS.

This prince of rivers, as it is emphatically styled by him,
is likewise called the Maranon, and was first navigated
Francisco Orellana, shortly after the discovery of Peru,
which account it has occasionally received the name
Orellana. As it is the largest of all known rivers, so is
its source among the Andes mountains, which, with
exception of a portion of the great Himalaya chain of
mountains, recently discovered, have the greatest elevation.
It forms the northern boundary of Brazil, taking rise
at an inconsiderable distance from the Pacific Ocean,
flowing in an eastern course more than twelve hundred
leagues, in which progress it receives upwards of nine
considerable rivers. In some parts it divides into some
branches, encompassing a multitude of islands, and
length discharges itself into the Atlantic Ocean, under
the equatorial line, by a channel one hundred and
fifty miles in breadth.

As, among the great number of roots by which peren-
ual life is conveyed to a stately tree, it is difficult, from
length of some, and the magnitude of others, to delin-
RIVER OF THE AMAZONS.

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Perplexity occurred in discovering the spring of this river. All the provinces of Peru may be said to have each other in scending forth supplies for its increase; and these, together with the many torrents which precipitate themselves from the cordilleras, or chains of the sea of what at first scarcely deserved the name of a river. The sources by which this river is increased are so numerous that every one which issues from the eastern cordilleras, beginning with the government of Popayan, where the river Caqueta, or Upura, originates, to the province of Huanico, within thirty leagues of Lima, the capital, may shortly be reckoned among the number. For, be it observed, all the streams which run westward from this immense chain of mountains, widening as they advance from their source by the conflux of others, form those mighty rivers which afterwards unite in that of the Amazons; although some traverse a larger distance from their source, still, others which rise nearer, by receiving in their course a greater number of brooks, and by consequently discharging a proportionate quantity of water, be considered as having an equal claim to be called principal source. The authors of the Peruvian Mercury, in their profound enquiries on this subject have been given work entitled "The present state of Peru," regard, however, the Ucayali as its real trunk, observing, among cogent reasons, that it does not yield to this river in quantity of its waters; but, on the contrary, presents at the confluence with a greater breadth, and with a greater quantity which obliges it to change its course. This will best explained in treating of the Apurimac, the name longed on the Ucayali at its origin.

The Maranon, or river of the Amazons; issues from the Maranon, or river of the Amazons, near the city of Huanico, in the jurisdiction of Tarapaca, in eleven degrees of south latitude, hence it takes a southern course almost to the twelfth degrees, through the country belonging to that jurisdiction, and, forming insensibly a circuit, flows eastward through the country of Juaxa. After being precipitated from the eastern side of the cordillera, or chain, of the Maranon, it proceeds northward; and, leaving the jurisdictions
of Mayabamba and Chacha-poyas, continues its course
the city of Jaen, in the latitude of five degrees, twenty-
minutes. Thence, by a second circuit, it flows towards
east in a continued direction, till at length it falls into
ocean, where its mouth is of such an enormous breadth
that it reaches from the equinoctial to beyond the
fourth degree of north latitude. Its distance from the
Lauricocha to Jaen, including its windings, is about
three hundred leagues; and that city being thirty degrees
distant west of its mouth, gives a further extent of six hundred
leagues, which may, including the several circuits and wind-
ings, be moderately computed at one thousand. Thus, the
ends of the course of this transcendant river, from Lauricocha
its influx into the ocean, is at least twelve hundred leagues.

THE APURIMAC.

This river has its source in the wild heaths of Conda
in the province of Tinta, in sixteen degrees of south latitude. It
flows impetuously to the east towards the Cordillera of
Vilcanota, to the distance of three leagues, when, shifting its course to the west, it divides that
province from the province of Chambibilcas. It now enters the provinces of Aimaraes and Cotabambas, and directs a
rapid course to the north-west, leaving to the east the province of Cusco. In passing through that
province, it declines to the north-east, by which direction it forms, fifteen degrees, its primitive source, an arc that receives so many branches from either side, as to prevent it from being longer than
Determined its career to the north, two leagues beyond the bridge of Apurimac, it forces its passage through the lofty territory of the Andes, running between mountains of
incredible elevation, by which it is supplied with
waters. In thirteen degrees, ten minutes, the whole
Cocharcas, or Pampas, which descends from the mountain of Huancavelica, flows into it to the west. The Apurimac
continues its course, collecting the waters poured from the mountains of Guanca; and is joined to the east
in twelve degrees, fifteen minutes, by the river Quillanentico or Vilcamayo. In twelve degrees, six minutes, it is joined to the west by the river of Jauxa, named by the Indians yana
taro; when, taking a bend to the north-east, in six
degrees, eighteen minutes, the Perene incorporates it.
The Oronoko.

This latter river, originating within its mass of waters. This latter river, originating within dreams from the Cordillera of Bombon, and from Pasco.

From the confluence of the Perene to that of the Pachitea, very capacious rivers empty themselves into the Apurimac of the two which are of particular note, the one that flows into it on the eastern side, in ten degrees, forty-five minutes, the Paucartambo; and the other, which disembogues three leagues below, with such an impetuosity as to propel it against the mountains, and to cause it to change its direction to the north-west, is the Beni. The former of these rivers is the celebrated Amarumayu, by which the Loa Yupanqui entered, in undertaking the conquest of the tribes of Moxas Indians—an enterprise which was afterward meditated by Alvarez Maldonado. It originates on the heights of Cusco, and enters with a quantity of water greater by the one half than that which the Apurimac contained before its confluence. After this junction, the latter acquires the name of Apo-paru, or Gran-Paro; and before, is augmented, in eight degrees, twenty-six minutes, the waters of the Pachitea. It now becomes the formidable rival of the river of the Amazons, and receives the name of UcaYali, by which it is henceforward distinguished. Taking a declination, in its progress, from the north to the north-east, at the western bank, at which it arrives the Pachitea, the following rivers pay it tribute:—Aguaitia; the Manoa, or Cuxhiabatay; the Sarayacu; the Tapichiy Cano Pocati, which communicates with the river of the Amazons in front of the town of San Regis, five degrees. A bay which occupies an extent of territory for three leagues, having been formed, it divides into three branches; and finally falls in with the river of the Amazons, in four degrees, forty-five minutes, causing it to change its impetuous course.

The Oronoko.

This celebrated river lies in the jurisdiction of Popayan, and falls into the sea by sixteen mouths. It communicates with the river of the Amazons by the Negro, one of the formidable branches (the eastern) of the river Caqueta, in its western branch, named Yupura, disembogues itself into
the river of the Amazons like another Nile, through seven or eight mouths, and these at such a distance from each other, that the intermediate space between the first and the last is not less than a hundred leagues. M. de la Croyère, in the narrative of his voyage, confirms the opinion of the Negro being one of the communications between the Oroonoko and the river of the Amazons, and corroborates his assertion by the following anecdote, related by a Jesuit, who published a map of these rivers. In the year 1525, a flying camp of Portuguese, posted on the bank of this river Negro, having embarked on it, proceeded until they found themselves near the Spanish missions of Oroonoko, and, meeting with the superior of these missions, returned with him to the flying camp they had quitted, without going one step by land. Here then is a communication of water between the Spanish and Portuguese possessions in South America, placed at so vast a distance, which demonstrates the magnitude and extent of these mighty rivers.

The Oroonoko, although it fails in comparison with several other rivers of the new world, far surpasses all the largest rivers of our hemisphere. It rolls toward the ocean such a vast body of water, and rushes into it with so impetuous force, that when it meets the tide, which that coast rises to an uncommon height, their collision occasioned a swell and agitation of the waters no less surprising than formidable. When Columbus, in his third voyage, having taken a more southern course than he had pursued in the former ones, reached the island of Trinidad, a swell occasioned by the waters of this river pouring into the ocean was so great, that his ships were exposed to extreme danger. After having, however, long combated the lements and tremendous waves with dubious success, he conducted his squadron safely through a narrow strait which separates that island from the continent. This strait he has named "Bocca del Drago," the Dragon's Mouth. Justly concluding that such a vast body of water must flow through a country of immense extent, and that he was now arrive that continent it had long been the object of his wishes to discover, he stood to the west, along the coast of these provinces, now known by the names of Paria and Leana.
This vast river, like those already described, runs among the stupendous mountains on the western side of South America. During its course, which is said to exceed eight hundred leagues, it receives upwards of fifty rivers, and at length discharges itself into the Atlantic ocean by a very extensive mouth, its northern coast being in thirty degrees, and its southern in thirty-six degrees, twenty minutes, of south latitude. It was discovered, in 1515, by Don Díaz de Solís, a very skilful Spanish navigator, who had been sent to open a communication with the Moluccas, or Spice Islands, lying to the west. Having entered a river which he called Rio Janiero, and which he named in honor of his discovery, was cut off, with several of his crew, by the natives. Being thus disheartened, the survivors returned to Europe, without having made any further attempt to explore the territory.

P. Catanéo, a Modenese jesuit, who landed at Buenos-Aires in 1749, expresses his astonishment at viewing this body of water. “When,” he observes, “I resided in Europe, and read in books of history or geography that the mouth of the Rio de la Plata was a hundred and fifty miles in breadth, I considered it as an exaggeration, because in this hemisphere we have not any example of such vast rivers. When I approached its mouth, I had the most vehement desire to ascertain the truth with my own eyes; and I have found the matter to be exactly as it was represented. This I deduce particularly from one circumstance. When we took our departure from Monte-Video, a fort situated more than a hundred miles from the mouth of the river, and where its breadth is considerably diminished, we sailed an entire day before we discovered the land on the opposite bank of the river; and when we were ‘in the middle of the channel, we
could not discern land on either side, and saw nothing but the sky and water, as if we had been in some great ocean. Indeed, we should have taken it to be the sea, if the freshness of its water, which was turbid like that of the Po, had not satisfied us that it was a river.

At Buenos Ayres, another hundred miles up the river, and where it is still much narrower, it is not only impossible to discern the opposite coast, which is, indeed, very flat, but one cannot perceive the houses, or the top of the steeples, in the Portuguese settlement at Colonia on the other side of the river.

It has been asserted that most of the rivers of Peru and Chili have scarcely any motion by night, while on the appearance of the morning sun, they resume their rapidity. This would appear to proceed from the melting snows, which, being melted by the powerful heats, increase the stream, and continue to drive on the current, while the sun is engaged in dissolving them. Thus are formed these wonderful masses of water!

In concluding this account of the rivers of South America, the prodigious multitudes and varieties of the fishes which they abound, ought not to be passed over unnoticed.

In the river of the Amazons, agreeably to the testimony of the Jesuit Acugna, they are so abundant, that, with any art, they may be readily taken with the hands.

"An infinite variety of other fishes, turtles abound in such numbers as words cannot be found to express. Not but that such as read my account will accuse me of exaggeration: but I can affirm, that it would be difficult to count them, as to count the sands on the banks of that river. Their multitudes may be estimated by the surprising consumption of them; for all nations contiguous to the river, and even many distant nations at a distance, flock thither at the breeding season, not only to find sustenance during that time, but carry great numbers both of the turtles, their eggs, &c.

THE MISSISSIPPI.

Proceeding to North America, this vast river claims principal attention. It runs chiefly from North to South, receiving in its course many large rivers, scarcely inferior to the Rhine or the Danube, navigable almost from its source.
THE MISSISSIPPI.

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The Mississippi is supposed to take its rise from three or four springs which unite at about forty-six degrees of north latitude, and ninety-eight of west longitude. It has been as high as forty-five degrees North, about one hundred and fifty miles above the Falls of St. Anthony. Its course extends above two thousand miles, comprising continual flexions. In a south-east direction, it proceeds until it reaches about thirty-eight degrees of north latitude; and then takes a course almost due south, till it arrives at St. Florida, where it again runs to the south east. On its westward, near the Falls of St. Anthony, it receives the river St. Pierre, or St. Peter; and, in the same direction, in about forty-one degrees of north latitude, the Illinois; receiving from the eastward the Fox river, and the Missouri, below forty degrees. A little lower, the noble river runs into it from the westward, the Ohio joining it to the eastward. At thirty-three degrees the White River and the Paniassas first join, and then pour their united streams into this grand receptacle of waters, which discharges itself into the sea by many openings.

The ascent is still more difficult northward from its mouth. Proceeding northward from its mouth, the country on each side the river is a level spot, covered with forests, which so entirely intercept the winds as to make a dead calm constantly to prevail, insomuch that, in some places only. When these forests cease, the remainder of

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the navigation is obstructed by strong currents, so that but seldom advance farther than five or six leagues in the course of a day and night. This river bounds Louisiana to its eastward; and at its mouth is the Isle of Orleans, a very beautiful and fertile spot. The city of New Orleans, its capital, owed its rise to the delusions which were practiced on the French nation by the celebrated projector La Salle. The immense wealth which was supposed to be contained in the mines of St. Barbe, in Louisiana, caused a company to be formed in France; and the national phrensy, which was long prevalent, led vast numbers to embark, for the purpose of settling on the banks of the Mississippi. Landed in West Florida, the greater part perished through want; and the survivors were removed to this island, where the city of New Orleans was built for their accommodation.

**THE OHIO.**

This river rises in several branches, some of which have their source in the vicinity of Lake Erie, and others within a few miles of Lake Ontario. It is also denominated "Fair river," and is styled by Mr. Jefferson, late President of Congress, "the most beautiful river on earth." For it is joined by the Monongahela, it is named the Alleghany, the former rising from the west side of the Alleghanian mountains, in a great number of small streams, unite, and, together with the Alleghany, form this river, forty degrees, thirty-five minutes north latitude. RECEIVED now the name of the Ohio, its general course afterwards inclines to the south-west, and takes a remarkably winding, serpentine form. At Fort Pitt, where the junction is made, it is little more than a mile in width, but becomes thirty wider before it joins the Mississippi, in latitude thirty-four degrees, eight minutes, north, receiving several streams in its course thither. Between the lakes and this junction, the country, for several hundred miles, is delightfully variegated scenery, and a rich soil.

This river is not, any more than the Mississippi, navigable by tides, the copious efflux causing the waters constantly to proceed with rapidity toward the mouth, so that ships cannot, without great difficulty, navigate upward. Commercial benefits which these rivers yield are great.
THE SAINT LAURENCE.

The source of this great Canadian river has never been traced, although it is known to have communication, by the lakes, with the interior of the country, to a vast extent. After a north-eastern course of many hundred miles, it discharges its waters into a large gulf, extending from forty-five degrees, thirty minutes, to fifty-one degrees of north latitude; the islands of Newfoundland and Cape Breton lying between it and the great Atlantic ocean. It is navigable for large ships as high as Quebec, four hundred miles from its mouth; but higher up, the navigation is impeded by rocks and shoals. The difficulties and dangers attendant on it were greatly exaggerated by the French, while in possession of Canada; but since the latter has become a British colony, the utmost attention has been paid to form accurate charts of this river, and to design, the immortal Cook was for some time employed, before he became a circumnavigator; and the abilities he displayed, laid the foundation of his future fame.

The other North American rivers, however inferior to those already described, and to those of South America, are still on the grand scale by which the face of that continent is so pre-eminently distinguished. On the eastern
side, are the fine rivers Hudson, Delaware, Potomac, Susquehanna, Connecticut, and others of extensive length, and great depth. Those which flow westward, and discharge themselves into the ocean, are but imperfectly known: the Oregon, likewise called the Columbia, or River of the West, is supposed to be the largest, and, so far as it has been traced, been found to be of such a breadth and depth, and so rapidly as to lead to a conjecture that it takes its rise in the central part of the American continent.

The Delaware, the largest river in the state of Pennsylvania, rises in the country of the five nations, and flows into the sea at Delaware bay. It is navigable a hundred and fifty miles, when falls occur. The settlements on this river extend a hundred and fifty miles from the city of Philadelphia, which is seated westward, on its bank, and to the eastward on the Schuylkill, which the Delaware joins a few miles below Philadelphia. The Susquehanna rises in the same state, at the distance of ninety miles from the Appalachian mountains, and runs first south-west, and then south-east, nearly parallel to the Delaware, till it discharges itself into Chesapeake bay, Maryland. This river is likewise navigable to a very great distance in the interior of the country, and, if possible, exceeds the other in the pleasantness and fertility of the soil on its banks. The Schuylkill, already mentioned, runs parallel to the other two rivers, and is navigable at least a hundred miles in the interior. These rivers, with the numerous bays and creeks in Delaware bay, which is capable of containing the largest fleets, render this port wine admirably suited for carrying on a foreign trade.

On the side of Virginia, James River, York River, the Rappahannock, and the Potomac, flow into the bay of Chesapeake, which is enriched throughout its extent by a vast number of fine navigable rivers. The bay is one of the finest and largest in the known world, for it enters the country nearly three hundred miles from the south to the north, having the eastern side of Maryland and a part of Virginia, on the same peninsula, to separate it from the Atlantic ocean. Its breadth for a considerable distance is nearly eighteen miles, and seven miles narrowest.
The above rivers are not only navigable to a very considerable extent, but have so many creeks, and receive a number of smaller navigable rivers, as to render the communication to all parts of the country inconceivably easy. The Potowmac is navigable for nearly two hundred miles, being nine miles in breadth, at its mouth, and not less than seven for a very considerable distance. The other three are navigable upwards of eighty miles; and in their windings approach so near to each other, that the distance between them in some parts is not more than five miles, and in others does not exceed ten.

The Connecticut rises in the State of New Hampshire, forty-five degrees of latitude, and pursues a remarkably straight course to the south, discharging its waters into the opposite Long Island. About one hundred and forty miles from its source, are the rapids, or falls, occasioned by the water being enclosed by two rocks within a space of about thirty feet, and falling into a broad basin beneath. Over these rocks a bridge has been thrown with such an elevation as to be inaccessible to the highest

Hudson’s, or the North River, rises within about twenty miles of Lake George, and, running to the south, discharges itself at Sandy Hook, the entrance of the river of New York. It is navigable for vessels of a moderate burden as high as Albany, a distance of one hundred and

ASIATIC RIVERS.

THE GANGES.

Born in magnitude and extent the Ganges is a most noble and majestic river. It rises in the kingdom of Thibet; and runs first south-eastward by the cities of Bokanor, Micapor, Halabes, Benaires, and Patna, to Rajah Mahal, where it divides into two branches. The eastern having been divided by Dakka, the capital of Bengal, enters the gulf of that name about Chatigan. The western, descending Cadzum-bazar and Hughly, falls into the gulf below Pipeli. Many of the Jews and
ancient Christians believed this river to be the Pison, one of the four mentioned in Scripture as the boundaries of the terrestrial paradise.

The length of the Ganges exceeds fourteen hundred miles. The Burrampooter, its proudest auxiliary, is nearly of the same length; and the opinion generally entertained, that the sources of these mighty rivers are not far distant from each other. Each of them runs, however, near a thousand miles, before they unite and constitute one common stream, falling into the bay of Bengal by seven mouths. Ganga is, in the Hindostan language, a general term for a river; but it is particularly applied to this one account of its unrivalled magnificence. The Hindoos have a superstitious veneration for all the great rivers which fertilize their country; but the waters of the Ganges to them peculiarly sacred. In its impetuous course it passes a passage through Mount Himmeleh, and again appears amidst impending rocks, which resembling, on an immense scale, the head of a cow, an animal equally esteemed by the Hindoos, as was the apis, or sacred ox, among the Egyptians, their religious awe for the Ganges is increased that account, enhanced. Not any river in the world possesses greater benefits to the countries through which it passes for, by annually overflowing its banks like the Nile, it waters and manures the country to an extent of a hundred miles in breadth. The Hindoos having deified this river, make it an act of their religion to perform a pilgrimage into it, supposing its waters to purify from defilement such a bathe in them. On its slimy shore they bury their dead and also remove those who are at the point of death to its banks, or to those of some one of the creeks which run into it.

On certain festivals, a conourse of upwards of a hundred thousand persons assemble to bathe in the Ganges, the banks of which are a great number of superb immensely rich pagodas. But what principally distinguishes this river, besides its greatness and rapidity, is the gold it brings down in its sands, and throws on the banks; and the precious stones and pearls it produces, only in itself, but in the Gulf of Bengal, into which it discharges its waters, and which abounds with them. The Chun or Jemma, the Guderasu, the Persilis, Lakul, and
THE INDUS.

This river is by the natives called Sinde or Sindet, and in the Sanscrit language Seendho. It is likewise denominated Nilab, or the blue river. Its source has not been accurately traced; but it is generally supposed to originate in the mountains of Mus Tag, running from east to west, and forming a chain to the south of Little Bucharia. Having flowed for an extent of upwards of a thousand miles, it forms a Delta in the province of Sinde, and enters the Indian Sea by numerous mouths.

The tributary streams of the Indus chiefly join it in the northern part of its course, where they form the Panja, or county of five rivers. From the west, the Kamet, with its auxiliary streams, and the Comul, flow into it; from the east, the Bahut, or Hydaspes; the Chnnab, or Heesinas; the Kanvee, or Hydraotes; and the Setlege, or Hesudrus. The whole of this part of Hindostan is at present but little known: much is, however, expected from the indefatigable researches of the members of the Asiatic Society. It is even uncertain whether the Caggan, a considerable and distant river to the east, joins the Indus, or falls into the gulf of Cutch.

Mr. Elphinstone, in his account of the kingdom of Caubul, introduces the following interesting account of the Indus:

"We were anxious and happy as we approached the river, and were not a little gratified when at last we found ourselves upon its banks. The Indus, besides its great name, and the interest it excites as the boundary of India, rendered a noble object by its own extent, and by the lofty hills which form the back-ground of the view. We were, however, a little disappointed in its appearance, owing to an island, which divided it, and impaired the banks of its stream. There were other islands and sand- banks in the river; but near the side where we stood, on the banks of the river, we met a native, to whose conversation, and that of the guide, we listened with great
interest and curiosity. The plains on the opposite side we found were inhabited by Beloches, and the mountains by the Sheeraunees, a fierce and turbulent tribe. On the other side of the range were tribes and places, of which we had never heard the names; while those we had learned from our maps, were equally new to our informants. As we could learn was, that beyond the hills was something wild, strange, and new, which we might hope one day to explore.

"From Oodoo da Kote, near which we first saw the Indus to the ferry of Kahecree, where we crossed it, is about seventy-five miles. It is a narrow tract, contested between the river and the desert. If, in hunting, we were led many miles to the west of the road, we got into thickets of the river, and troublesome quicksands, among which of tamarisk or of reeds; and, if we went as far to the right, the appearance of sand, and even in some places of sand hills, admonished us of the neighbourhood of the desert. Many parts, however, were cultivated with great pains and method, and produced good crops of wheat, barley, turnips, and cotton. The fields were always enclosed, either with hedges of dry thorn, with hurdles, supported by stakes, or with fences, made of stiff mats of reed, supported by strong posts, twelve or fifteen feet high. We were often told they were meant to take refuge in during the inundations when the country for ten or twelve coss (twenty or twenty-four miles,) from the banks was under water."

Beside the above majestic rivers, those principally serving of notice in the Asiatic territory are the following.

The Euphrates, which has two sources: one of them is about seventy miles from the shores of the Black Sea, and, taking a circuitous course of five hundred leagues, first to the south-west, and then to the south-east, discharges itself into the Persian gulf. About a hundred miles to the north-west of Bassora it is joined by the Tigris, which, rising in its vicinity, proceeds in a nearly straight course through Armenia Major, or Armenia, until it forms its junction. On this river the ancient city of Ninevah is supposed to have stood. The Kistna, a stream peculiarly sacred, rises at Bikaner.
THE KIAN-KU.

not far to the south of Poonah, and is equally celebrated for the fertility it diffuses, and for the rich diamond mines near which it flows, particularly those of Visiapour and Golconda. The CAVERY passes by Seringapatam, the capital of Mysore, forming an immensely wide Delta, or triangle, and entering the sea after a course of about three hundred miles.

In the enormous extent of the Chinese Empire there are two rivers which are rendered particularly interesting by their great length and majestic breadth. These are the Hoang-ho, or Yellow River, and the Kian-ku.

THE HOANG-HO.

The sources of this river are two lakes, situated in the chain of the Tartarian mountains, known by the name of Khotonor. They lie in about the thirty-fifth degree of north latitude, and in the nineteenth of longitude, to the westward of Pekin, and in ninety-seven degrees east of Greenwich. This prodigious river is extremely winding, and deviates in its course, pursuing a north-east direction, after running due east, it suddenly bends south to a latitude nearly parallel to its source, and pursues an easterly direction till it is lost in the Yellow Sea. Its course may be estimated at about one thousand eight hundred British miles, or, according to the embassy of Lord Macartney, about seventeen hundred and fifty. At the distance of the imperial canal, its breadth is little more than a mile, with a depth of a few feet only; but its velocity is equal to seven or eight miles an hour.

THE KIAN-KU.

This river rises in the vicinity of the sources of the Hoang-ho, and winds nearly as far to the south as the latter does to the north. After washing the walls of Nankin, it enters the sea about a hundred miles to the south of the Hoang-ho. Through its long progress, the Kian-ku is known by various names. Its course is nearly equal to that of the other river, these two being considered as nearly, if not altogether the longest on the face of the globe. They
AFRICAN RIVERS.

certainly equal, if they do not exceed, the famous river of the Amazons in South America: the majestic course of the Ganges does not exceed half their length. In the narrative of Lord Macartney's embassy, the extent of the Kian-ku is estimated at about two thousand two hundred miles; and it is there observed that these two great Chinese rivers, taking their source from the same mountains, and passing almost close to each other in a particular spot, when they separate to the distance of fifteen degrees of latitude, or about one thousand and fifty British miles, finally discharge themselves into the same sea, comprehending a tract of land of about a thousand miles in length, which they greatly contribute to fertilize.

AFRICAN RIVERS.

THE NILE.

This celebrated river is likewise called Abanchi, signifying in the Abyssinian tongue "the father of rivers," and is named by the Africans Neel Shem, the Egyptian river. It divides Egypt into two parts; and its extent, from its source, is supposed to exceed two thousand miles. It arises from amidst the mountains of the Moon, in Upper Ethiopia, and flows into the Mediterranean sea by seven channels, two only of which are at present navigable. The ancients were entirely ignorant of the source of this river, although many endeavours were made by them to explore it; but it is now well known to lie in about the twelfth degree of north latitude. It enters the lake of Dambia, in Abyssinia, crossing one of its extremities with such extreme rapidity, that its waters may be distinguished through a progress of six leagues within this lake. Here its magnificence commences: after a further progress of about fifteen miles, it rushes precipitately from the summit of a high rock, forming one of the most beautiful streams of a fall known. It now again collects its scattered streams among the rocks, which seem to be disjointed in that part.
THE NILE.

They are so close to each other, that a bridge of beams was once laid over them to afford a passage to an army; and Sultan Segued built over them a bridge of one arch, to construct which he procured stones from India.

The greater part of Lower Egypt is contained in a triangular island, formed by the Mediterranean Sea, and the two great branches of the Nile—which, dividing itself one or six miles below Old Cairo, flows on the one side to the north-east, falling into the sea at Damietta; while the other branch runs to the north-west, and enters the sea at Rosetta. What is called the Delta, resembling the Greek letter of that name, and constituting a triangle, is thus formed.

The water of the Nile is thick and muddy, more particularly when the river is swollen by the heavy rains which constantly fall within the tropics in the beginning of the summer-season, and which are doubtless the principal cause of its overflowing the low lands of Egypt. A similar phenomenon in the Ganges has been noticed above; and it is the same with all the rivers which have either their rise or course within the tropics; they annually break their bounds, and overflow the lands for many miles on each side, before they reach the sea. They likewise leave a prolific mud, which, like that of the Nile, fertilizes the land; beside which, the north winds prevailing about the latter end of May, drive in the waters from the sea, and keep back those of the river, in such a manner as considerably to assist the swell.

The Egyptians, and the Copts more especially, are persuaded that the Nile always begins to rise on the same day of the year; as, indeed, it generally commences on the 16th or 19th of June. Its rise was observed for three successive years by Dr. Pococke, who found it to ascend during the first five days from five to ten inches; and it then continued rising till it had attained the height of nine feet, when the canal of Cairo was cut. It then rose from three to five inches only in the day; for, having spread itself over the land, and entered the canal, although more water might have descended than before, its rise was less considerable. The other canals were now laid open at stated times, and those which water the lower grounds the last, those canals are carried along the highest parts of the coun-
try, to the end that the water may be conveyed to the
valleys.

The Nile has one peculiar characteristic. Other rivers
being supplied by rivulets, the ground is lowest at
banks; but as not any water flows into the Nile in its
course through Egypt, and as it is necessary that this
river should overflow the land, the country is generally
a distance from, than near to it; and, in most parts, the
land has a gradual descent from the river to the foot of the
hills; which terminate the sandy plains most benefited by
the irrigation.

Among other remarkable appearances, the celebrated
Bruce notices a very singular one attendant on the
mentioned river. In Abyssinia, the early part of the morn-
ing is constantly clear in that season, with a fine sunshine.
About nine, a small cloud, not above four feet in appar-
ent breadth, appears in the east, whirling violently round on
an axis; but, having approached nearly to the zenith,
first abates its motion, and then loses its form, extends
itself greatly, and seeming to call up vapours from all
opposite quarters. The clouds thus formed having attained
nearly the same height, rush against each other with great
violence, and remind the spectator of Elisha foretelling his
appearance on Mount Carmel. The air being impelled before
the heaviest mass, or swiftest mover, makes an impression
its form on the collection of clouds opposite; and the con-
tinuance it has taken possession of the space made to need it,
the most violent thunder possible to be conceived follows
instantly, attended by rain. After some hours the sky
clears, with a wind at north; and it is always disagreeably
cold when the thermometer is below sixty-three degrees.

Doctor Clarke, in his travels, draws the following
elegant picture of this most interesting river.

"Here we were unexpectedly greeted with an astonish-
ing view of the Nile, the Delta, and the numerous
in the neighbourhood of Rosetta. The scene is beyond
description. The sudden contrast it offers, opposed to the
desert we had traversed, the display of riches and the
dance poured forth by the fertility of this African par-
with all the local circumstances of reflection excited by an
extensive prospect of the Nile, and of the plains of the
make it one of the most interesting sights in the world."
The beautiful boats peculiar to the Nile, with their large wide-spreading sails, were passing up and down the river. Having some time contemplating the delightful picture. Afterwards, descending on foot, close by the superb mosque of Abu-mandir, we continued our walk along the banks of the Nile, through gardens richer than imagination can portray, beneath the shade of enormous overhanging arches of sycamore and fig-trees, amidst bowers of roses, and through groves of date, citron, lime, and banana trees.

Next to the Nile, this is the most remarkable river in Africa. It takes its rise from the Western declivity of the mountains of Govina, or Caiphas, in fourteen degrees of west latitude, and nearly on the meridian of Greenwich. From the eastern declivity of these mountains the Niger takes its rise, and may, therefore, be comprehended in this description. The Africans navigate both these rivers; and, where the cataracts occur in the former, carry their goods by land. A trade is carried on by small vessels as high as the first cataract of the Senegal, two hundred and eighty miles from its mouth, at which it is extremely rapid, owing to an immense body of water being confined within a small breadth of half a league. There is also at the entrance a bar, which renders the passage very difficult and dangerous, especially in the rainy season, when the prodigious swell of the river, and the south-west winds, being opposed to its rapid course, raise waves of so prodigious a height at the bar, that their clashing resembles the shock of mountains, and they are said to be so furious as occasionally to dash in pieces the stoutest ships. Having crossed the bar, a smooth and gently-gliding river is entered, four hundred miles.

The Senegal has been supposed to be a continuation of the Niger; but it is now thought that the latter discharges its rapid stream into a lake not more than sixty miles distant from another lake of great depth, called Maberia, whence
issues one of the sources of the Senegal. These two latter rivers are intersected by a ridge of very high mountains.

These two rivers have, like the Nile, their inundations which overspread the whole of the flat country of Nijer. They begin and cease much about the same time as the latter overflows; but the salutary effects experienced in Egypt are not to be found here; for, instead of health, plenty, diseases, famine, and death, follow in their train. The soil thrown up by the Senegal, becomes, through indolence of the savage wanderers who occupy its banks, useless to any agricultural purpose; and the country, left unttiled, produces from its luxuriance great abundance of rank and noxious herbage, furnishing a convenient repository for venomous insects and reptiles, as well as beasts of prey. When the waters of these rivers retire from their channels, the humidity and heat which prevail spread a pestilential taint; while the carcases of vast numbers of animals, swept away by the inundation, become putrid and spread around a loathsome and baneful stench. The vegetation itself is charged with destruction; among the plants which grow on the banks of the Senegal, some diffuse an insufferable and deleterious odour.

THE GAMBA.

This river lies to the south of the Senegal, and flows nearly the same direction. It has a very extensive, vast, and rapid course, and discharges itself into the Atlantic thirteein degrees of north latitude.

EUROPEAN RIVERS.

THE VOLGA.

In surveying the grand and beneficial assemblage of rivers dispersed over the countries of Europe, the Volga presents itself as the most extensive in its course, being above ten thousand miles in length. Having passed through the territories of Russia, it enters Asia in 48 degrees 30 minutes north latitude, discharging its waters into the Caspian Sea by various channels, below Astrakan, and producing many islands at the place where it disembogues.
The principal source of this great river issues from lake
Demen, in the government of Novogorod, in about 59
degrees of north latitude: another considerable source is
derived from a small lake to the south-east, in the govern-
ment of Twer. These two streams unite at the capital of
that name, near which the Volga first becomes navigable.
Not only this river, but the Duna, the Nieper, and, indeed,
all the principal rivers of European Russia, take their rise
at the vast forest of Volkonski, which extends on the side
of Smolensko almost to the gates of Moscow.
The banks of the Volga are in general fertile and well
wooded, the greater part of the Russian oaks growing in
the countries it waters. It is navigable for large ships;
and toward the end of the spring is so swollen by the
melting of the ice and snow, as to cause great inun-
dations. This season is carefully watched by navigators, as
they have at that time not only the opportunity of a safe
passage over the shallows, but over several flat islands
which lie at a considerable depth under water. This
river receives several tributary streams, particularly the
Ocea and Cama, and abounds with that species of whale
called beluga, from ten to eighteen feet in length.

THE DON.

This river, the Tanais of the ancients, has its source in
the Iwano Ossero, or St. John's lake, near Tula. It runs
first from north to south, and, after its confluence with the
Soma, directs its course from east to west, whence, taking
several windings, it again runs from north to south, dividing
its length into three channels, and falling into the sea of
Asph. In its course it approaches so near the Volga, that
in one part, in forty-nine degrees of latitude, the distance
does not exceed eighty miles. This led Peter the Great to
form a design of uniting these two rivers by the means of
a canal, and some progress was made in this enterprise, the
completion of which was, however, abandoned on his
death.

THE NIEPER.

This river, the ancient Borysthenes, issues from a morass
in the forest of Voleonski, one hundred and twenty miles
distant from Smolensko, and makes several windings through
Lithuania, Little Russia, the country of the Zaporozi-Gid, sacks, and a tract inhabited by the Nagaian. After forming a lake thirty-four miles in length, and many places from two to six in breadth, it discharges into the Black Sea. Within the space of thirty-five miles the Nieper, the banks of which are elevated, has more than thirteen falls. At Kiow a floating bridge, a thousand six hundred and thirty-eight paces (upwards a mile and a half) in length, has been thrown over. This bridge is removed towards the end of September, and then a passage down the river to the immense masses of floating ice; and is again put together in the spring. This river a great number of mills have been erected at boats.

THE NEVA.

This river likewise belongs to the vast empire of Russia, and issues from the lake Lagoda, flowing with a course until it discharges itself into the gulf of Finland. A great part of the city of St. Petersburgh is built on islands formed by its branches, and by those of the river Fontanca and Moica. It has but one bridge, which is constructed with large flat-bottomed boats, which are thrown across the river in the spring, and removed in the autumn at the setting in of the frost. In this way a safe and convenient passage is formed between the Arsenal and St. Ostrow, or Bazils' island. The communication between the other islands is by boats and barks; but bridges are built over the Moica and Fontanca, and likewise over the canals, which are as numerous as at Amsterdam. Petersburgh is much exposed to inundations; in September 1777, one rose to a very great height, and did prodigious damage.

THE DWINA.

This is a very considerable river, the name of which implies double, it being formed by the confluence of Sukona and the Yug. It divides itself into two branches or channels, near Archangel, whence it runs into the White Sea.
The next considerable river of Europe, in which quarter it rises and terminates, is the Danube, the ancient Ister. It has its source in Suabia, within a few miles of the borders of Switzerland, in latitude forty-eight degrees north, and nine degrees of east longitude, whence the Rhine also issues, but takes a north-west course, while that of the Danube is eastward. It intersects Bavaria, Austria, and Hungary, inclining to the south at Vác, a town in the older kingdom. It divides the banov of Târnave from Servia, and Wallachia from Bulgaria, discharging itself, after a course of nearly fourteen hundred miles, by several channels, into the Euxine or Black Sea, with such violence, that its waters are distinguishable for several miles from those of the sea into which they are precipitated. It is said to receive sixty navigable rivers in its progress, and an equal number of smaller streams. From Buda, in the course of Hungary, to Belgrade, on the northern confines of Servia, its depth and breadth are so considerable, that at the wars between the Christians and Turks, these powers had fleets on it, and several naval engagements took place. Further down it is rendered unnavigable by its many catacombs, so that all commerce with the Black Sea, by means of this great river, is rendered impracticable.

The Rhine.

Of all the countries of Europe, Switzerland is the one in which the greatest number of rivers take their rise. Of these the principal is the Rhine, which has its sources in the Grison territory; and by these the distinctions of Upper Rhine, Middle Rhine, and Lower Rhine, are determined. The Upper Rhine issues from a small lake on a mountain called the Oberalp. The Middle Rhine joins the Upper Rhine, after a course of about eighteen miles. The Lower Rhine, rises at a distance of about nine miles, in a mountain, called by the Italians Monte del Uccelo, or Bird's Hill.

At a small distance from the lake of Constance, through which the Rhine flows, a bridge has been thrown over
it at Schaffhausen, which is much admired on account of the beauty and singularity of its architectural details. The rapidity of the river having carried away several stone bridges, this one, constructed of wood, and of a single arch, has been so well contrived, as to be perfectly secure. Near this bridge is a fine water-fall.

Having flowed westward to Basle, it proceeds in a direction due north, along the eastern border of Alsace, till it receives the Maine, a little below Frankfort; and proceeding thence north-westward, enters the Netherlands. Its course exceeds seven hundred miles; and on its banks the cities of Mentz, Coblenz, Cologne, Dusseldorf, Wesel, and Cleves, are situated. It intersects the circles of the Upper and Lower Rhine. In its course through Alsace it frequently causes dreadful devastation, not only in winter, but in the summer, when the snow melts on the Alps. Its inundations, in devastating the fields, cover them with sand; and the violence of the torrents, which are very frequent, occasionally changes the situation of the islands placed within its bed.

One of the singularities of the Rhine is, that particles of gold are found in the sand which the torrents fall, wash from the Alps, and bring into it. Hence it is below Basle that the sand contains this precious metal, which, in autumn and winter, when the river is at its lowest, is drawn out with the sand, and extracted by repeated washings. Its particles are seldom so large as a grain of millet seed; but the gold is very fine and beautiful. It is so scarce, however, that the city of Strasburg, which has the privilege of collecting it for the extent of precisely four miles, scarcely collects five ounces in a year. The river also contains many crystals, and particularly pebbles which take a beautiful polish; these are well known under the name of Rhine pebbles.

At Utrecht the Rhine divides into two branches, called the Old and New Rhine, both of which cross the sands below Leyden, and the other, assuming the name of the Lech, falls into the Maine. Thus does a grand and important river, after so long a course, terminate obscurely, without pouring its aggregated waters into the common receptacle, the ocean!
THE RHONE.

This fine river rises in the glacier of Furea, near the canton of Uri, in Switzerland, but in the north-east border of the Valais. It first precipitates itself with great noise from amid several rocks, and, in flowing into the vale beneath, has the appearance of a single cataract, with several cascades. It is afterwards joined by the Mayanwang stream, issuing from the Grimsel mountain, and then directs its course from east to west, until, after taking a winding course to the north, it discharges itself with great impetuosity into the lake of Geneva. All the streams and smaller rivers of the Valais, rising from the mountains, flow into it.

The waters of the Rhone rush into the lake with such velocity, that for the distance of half a league they continue mixed with those of the latter; but there is not afterwards any visible distinction, as has been affirmed. At its banks on either side, the city of Geneva is built, being divided into three unequal parts, having a communication by four bridges. Onward it forms the boundary between Savoy and Savoy. It then takes a western direction, and, crossing the province of Burgundy from that of Dauphiné, flows to Lyons, from which city it proceeds due southward, forming the eastern boundary of Languedoc, which it meets from Provence at Avignon. It discharges its waters into the Mediterranean by several mouths, a little below Arles.

THE VISTULA.

This river is likewise called the Weisel, and in Polish the Wisła. It rises in the Carpathian mountains, on the confines of Silesia and Upper Hungary; and, taking a north-western course through Little Poland, a part of Masovia, of Great Poland, and of Prussia, falls by three mouths into the Baltic, below Danzig. Warsaw, the capital of Little Poland, and Thorn, which once boasted a very considerable timber, are situated on its banks. Great quantities of grain and timber, the growth of Poland, are sent down this river to Danzig, and thence exported to foreign countries.
THE ELBE.

Not far from the source of the above river, and in the principality of Jauer, in Silesia, the Elbe rises at the GIANTS' MOUNTAIN. It divides Dresden, the capital of Saxony, into the old and new towns, between which there is a communication by a stone bridge, three thousand four hundred feet, (nearly three-fourths of a mile) in length, and in breadth eighty-five feet, provided with eighteen arches. Meissen, ten miles north-west of Dresden, is likewise situated on this river, over which is a bridge, supported by stone piers, but having a wooden superstructure: the bridge is considered as a master-piece of art, the middle arch of which is three hundred and seventy-five feet in width; but kept together by a single wooden peg. The Elbe is the boundary of Brandenburgh toward the east, and receives the Havel. It is the principal river in Lower Saxony. At Hamburgh it becomes of such a breadth as to receive large ships. It discharges its waters into the German Ocean by the fortress of Glukstadt.

THE LOIRE.

Of the principal rivers which have their sources in FRANCE, the Loire is the most considerable, being still longer than the Rhone. It rises in the Cevennes mountains, in Lower Languedoc, and takes a course north and north-west, passing by the city of Orleans. It thence pursues a south and south-west course, by Tours and Angers, discharging itself into the bay of Biscay, forty miles below Nantes. Its entire course, comprehending its windings, is computed at five hundred miles; and in its progress it receives the Allier, Cher, Indre, Creuse, Sienne, and Maine. It communicates with the Seine by the canals of Britany, and Orleans. In November, 1790, it overflowed its banks, and laid a very large extent of country under water.

THE GARONNE.

This river rises at the foot of the Pyrenees, in the districts of Cominges, and becomes navigable on the course of Languedoc, being joined by many rivers in its course; it passes Toulouse and Bordeaux, below which it receives no
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Dordogne, a river nearly of equal magnitude with itself. These united streams now take the name of the Girondiz, become very broad, and empty themselves into the Bay of Biscay. By the means of this river, and a noble canal which will hereafter be described, a junction has been formed between the Mediterranean sea and the Atlantic.

THE SEINE.

This river rises near Dijon, in Burgundy, and, taking a north-west course, forms three islands on which the capital of France is situated. One of these, called l'Isle du Palais, communicates with the other parts of the city by seven bridges of stone, the principal of which is the Pont-Neuf, provided with twelve arches, and having a breadth, including the parapets, of seventy-two feet. The Seine, in its passage through Normandy, flows by Rouen, and falls into the British Channel near Havre.

RIVERS OF SPAIN.

This kingdom abounds with rivers, the number of which, comprehending the smaller streams, is said to amount to one hundred and fifty. The principal of these are, the Silo, which rises in Galicia; the Douro, which has its source in Old Castile, in a part of the mountains of Beza; and the Tago, rising in a mountain of New Castile, through which province it passes, the city of Beira being situated on its banks, and being encompassed by the river in the form of a horse shoe. It bounds the Portuguese province of Beira to the south, passes through the mouth of this river the Portuguese capital, Lisbon, unobstructed.

Indeed, all the great rivers which flow through Portugal, have their source in Spain. Thus the Guadiana issues from New Castile, deriving its source from an assemblage of several lofty mountains, concealing itself for nearly forty miles, and then suddenly re-appearing in a fenny soil, anon hiding itself again amidst reeds and rocks, which secretly gave occasion to the mistaken idea of its losing itself under ground. This river separates the Spanish pro-
province of Andalusia from the Portuguese province
of Algarva.

The Guadalquivir, or Great River, by the ancient
name of Bætis, and Tartessus, rises in Andalusia, where
several small streams, issuing from Mount Segura, unite
a lake from which this river flows. From Cordoba
and Seville, it is navigable by small craft only; but from
deveral city to its mouth it receives ships of burthen, altho
it is dangerous on account of its many sand-banks.

The Ebro rises in the mountains of Santillane, in Old
Castile, from two springs, and receives upwards of thirty
streams in its course, becoming navigable near Tudela.
Navigation is, however, dangerous, on account of the rocks
and shoals with which it abounds. It at length discharges
itself into the Mediterranean, forming at its mouth the
small island of Alfas.

In the province of Andalusia, the river Tanos,
Azeche, presents a singular phenomenon. Not only are
its waters of so bad a quality as not to be potable, but
is asserted that they are noxious even to plants and to the
roots of trees. It is consequently not the abode of fishes
or of any of those reptiles which breed in the aqueous
element.

ITALIAN RIVERS.

Among the principal rivers of Italy, the following are
most worthy to be cited. The Po, which rises in the
Viso, in Piedmont, one of the highest of the Alps, dis-
charges itself into the Adriatic by seven mouths. It passes
through Monseratt, the Milanese, and Mantua, and waters
the borders of the Parmesan territory, and a portion of the
Milanese. It frequently overflows its banks, and causes
great devastations.—The Adige has its source in the high
Alps, and waters the cities of Trent and Verona: it is the
only large river in Lombardy, and does not unite with the
Po, but, like that river, flows into the Adriatic.—The Arno
flows from the Apennine mountains, and issues
the Tuscan sea near Pisa.—The Tiber, which issues
the Apennine mountains, at an inconsiderable distance
from Rome, empties itself also into the sea of Tuscan.
Tects' waters are generally so foul and muddy at Rome, that
are not watered at its stream; but after reposing a few days
THE THAMES.

They become clear, and fit to drink. The bed of this river being raised by the ruins of many edifices which have fallen into it, and its mouth much choked up, it frequently overflows its banks, more particularly during the prevalence of a strong south wind.

BRITISH RIVERS.

The principal rivers of England are the Thames, the Severn, the Trent, and the Humber.

THE THAMES.

Thames, the most lov'd of all the Ocean's sons
By his old sire, to his embraces runs;
Hasting to pay his tribute to the sea,
Like mortal life to meet eternity.
Nor are his blessings to his banks confin'd,
But free and common as the sea or wind;
Where he, to boast or to disperse his stores,
Full of the tribute of his grateful shores,
Visits the world, and in his flying towers
Brings home to us, and makes both Indies ours;
So that to us no thing, no place is strange,
While his fair bosom is the world's exchange.
O could I flow like thee, and make thy stream
My great example, as it is my theme!
Though deep, yet clear; though gentle, yet not dally;
Strong without rage, without overflowing full.

DENHAM.

This fine river, if considered respectively to its course and navigability, is not to be equalled by any one in the known world. It rises from a small spring somewhat to the south-west of Cirencester, in Gloucestershire; and, taking an easterly course, becomes navigable at Lechlade for vessels of forty tons. It there receives the river Colne, at a distance of about one hundred and thirty-eight miles from Oxford. From Lechlade it continues its course north-easterly, where it receives the Charwell; after which it again flows north-west to Abingdon, and thence to Dorchester, off which it receives the Thame, and continuing its course north-east, flows by the borders of Berkshire, Bucking-

hamsire, Surrey, Middlesex, Essex, and Kent. In this progressive progress it passes along a multitude of towns and
EUROPEAN RIVERS.

fine picturesque villages; and, having visited London and Westminster, proceeds by Deptford, Greenwich, Woolwich, and Gravesend, to the sea.

To represent the beauties with which the banks of this noble river are embellished, between Windsor and London would require the pencil of a Claude, or the pen of the sublimest of poets: besides numerous villages, they are adorned with magnificent seats and gardens, belonging to the nobility and gentry. The tide flows as high as windsor, in Surrey—a distance which, following the winders course of the river, may be computed at seventy miles from the sea. At London the depth of water is sufficient for navigation of large ships, which renders it the greatest for trade in the commercial world. Its water is justly teemed exceedingly wholesome, and fit for use in the longest voyages, during which it ferments, and becomes fresh and clear. The Thames, likewise, abounds with a great variety of fishes.

THE SEVERN.

This river springs from a small lake on the mountain Plynlimmon, in Montgomeryshire, and is the principal beauty of that part of Wales, in which it receives so many small streams, that it becomes navigable near the town of Montgomery. It passes through the centre of Shropshire, the towns of Shrewsbury and Bridgenorth being situated on its banks; and thence directs its course from north to south, through Worcestershire, taking the city of Warter, and the town of Tewkesbury, in its route. Entering Gloucestershire, it runs by the city of Gloucester, and discharges itself into a large bay, called the Bristol channel, from the commercial city in its course. About fifteen miles from its mouth, a navigable canal has been constructed, which conveys the waters of the river to within about two miles of Cirencester; are then carried by a tunnel, or archway, fifteen feet height above the surface of the water, through a hill, an extent of two miles and three furlongs, for the purpose of communicating with the Thames at Lechlade. The Severn is distinguished by the abundance of eels which frequent it, and by the lamprey, a fish almost peculiar to this river.
THE TRENT.

This river rises among the moor-lands in the north-west part of Staffordshire, and having received the tribute of several rivulets and streams, runs to the eastward. It becomes navigable at Burton-upon-Trent, where it leaves that shire, and, flowing through Derbyshire, Nottinghamshire, and Lincolnshire, discharges itself into that great receptacle of the northern rivers, the Humber, after a course of nearly two hundred miles. It enters Nottinghamshire at the south-west point, and being there joined by the Erwash, passes to the eastward till it reaches Newark, where it forms an island; when, turning to the north, after a tract of about fourteen miles, it constitutes the boundary of that shire on the side of Lincolnshire.

The Trent is joined a little below Burton by the beautiful river Dove, which, rising at the most northern point of Staffordshire, forms the boundary between it and Derbyshire, and joins the Trent a little below Burton. Another river, the Sow, rises a few miles to the west of Newark-under-Line, and falls into the Trent on the south-east. A canal has been formed from Chesterfield, in Derbyshire, which, passing through the northern part of Nottinghamshire, communicates with the Trent at a little distance below Gainsborough. In its course a subterraneous tunnel has been cut through Norwood hill, upwards of a mile and a half in extent, and so straight, that the termination at one end may be seen at the other. The arch is twelve feet high, nine feet three inches in width, and in the deepest part one hundred and eight feet beneath the surface of the earth. By the numerous canals formed in the north of England, a communication is now opened between the Trent and the Mersey, or quite across the kingdom, from east to west.

THE HUMBER.

The rivers which fall into the Humber are the Ouse, or Lincolnshire Ouse, and those by which the Ouse itself is enriched, as the Dun, or Don, the Derwent, the Calder, the Aire, the Wharfe, the Nidd, the Yore, and the Swale. The Ouse rises in the west-north-west side of Yorkshire,
and chiefly runs to the south-east. The Dun, or Don, rises in the hills near the south-west extremity of Yorkshire, where it is called the Sheaf, and running to the south-west until it reaches Sheffield, turns to the north-east, and flows into the Ouse. The Calder has its source in the borders of Lancashire, and entering the south-west side of Yorkshire runs eastward, and joins the river Aire. The Aire springs from the foot of a high hill, called Pennigent, and with a slow course, chiefly to the eastward, discharges itself into the Ouse. The Wharfe or Wharfe, rises among the hills in the west of Yorkshire, and flows with a swift impetuous current, chiefly to the south-east, till it falls into the Ouse. The Swale rises among the north-west hills of Yorkshire, and, running to the south-east, joins the North Yorkshire, about four miles below Boroughbridge. The Derwent, which divides the North and East Ridings, rises in the north-east part of Yorkshire, near the sea-coast, between Whibley and Scarborough, and first running to the south, winds to the west, and again to the south, falling at length into the Ouse. The river Hull has its source in the north-west whence it runs chiefly to the southward, passing near Beverley, and falls into the Humber. Into each of these rivers a great number of rivulets discharge themselves.

The Humber is formed at the confluence of the Ouse and may rather be considered as a narrow bay than a river, being throughout its short course of an extreme width. Its whole extent to Spurnhead, a narrow peninsula which terminates Yorkshire to the south-east, does not exceed thirty-six miles. By one of the rivers which flow into Yorkshire partakes, however, of the advantages derived from the great modern improvement, canals: A communication has been made between the western and eastern coasts, across Lancashire and Yorkshire, by a canal which proceeds from the river Mersey, at Liverpool, to the Ouse at Selby, sixteen miles above its junction with the Hull. It crosses the county of York, from Holme-bridge, seven miles north-west of Skipton, to the Ouse, passing by Bradford and has two subordinate branches, one leading to Wakefield, and another to the vicinity of Wakefield, to facilitate communication between that place and Halifax.
THE SHANNON.

THE FORTH.

This river, the most considerable in Scotland, has its origin from a lake under Ben Lomond, in the western angle of Stirlingshire, and runs Eastward to Stirling, near which place it unites with the Teith, and forms Lake Katherine. From Stirling it flows west by south, and mixes with the German Ocean by a wide estuary, called the Firth of Forth. From its origin to Berwick, at the mouth of the Firth, its course, exclusive of windings, is seventy-five miles. It is navigable as far as Stirling for vessels of eighty tons burthen. A winding stream, skirted by woods, by fertile and well-cultivated plains, and occasional ancient ruins; its waters, at times spreading themselves from a small breadth, to the increase of a lake; and the Lennox and Oichill hills rising from its northern bank, afford many pleasing and delightful prospects. A canal now joins this river to the Clyde.

THE TAY.

This river, springing from Benmore, on the western borders of Perthshire, runs north-east to a lake of the same name, one of the most beautiful in Scotland, at the extremity of which, being joined by the Lyon, it continues the same course to Logierait, where it receives the waters discharged by cast between Great and Little Dunkeld, and bends toward, curving again to Cargil: near Cargil it receives the Isla from Forfar, and turns southward to Perth, turning the river Earn from a lake of a similar name westward. It emptied itself, by an estuary called the Firth of Tay, into the German Ocean. This river is navigable for sixty a hundred miles above Perth: the length of its course is thirty-five hundred miles.

THE SHANNON.

Among the many navigable rivers of Ireland, the noble Shannon asserts its preeminence. If the extent of its extent, the richness and fertility of the fine country it bathes, as great subserviency to commerce, and the excellent bay at its mouth, be considered, it may fairly rank among the most eminent rivers of Europe. It has its origin in Lough
or Lake Nean, eleven miles east-south-east of Sligo, the chief town of the county of that name, in the province of Connaught; whence, passing under Ballyntrane bridge, after a south-south-east course of five miles, it falls into Lough Allen. To Carrick, traversing this lake latitudinally, its course, eight miles, is nearly south. There it receives a stream which brings it from the right the superfluity of the waters of Lough Gara, and Lough Key; and after a winding course in a south-east direction, it flows into Lough Bofin, eleven miles from Carrick. From the south-eastern extremity of the lake it takes a south-west direction, its current now much broader, to Lough Ree, which it joins at Langsborough, and leaves at Athlone, seventeen miles south-east of its entrance into the lake. Thence bending to the west it receives the Suck from the right at nearly seventeen miles south-south-west of Athlone; five miles beyond this point the Brosna, from the left at Banagher, south-south-west of Raghery. From Banagher it makes a long course towards the west, and fourteen miles south-west of that place joins Lough Derg, south-west of that place joins Lough Derg, south-west of that place joins Lough Derg, and leaves at Limerick, eleven miles distant, whence its direction is turned by south to the sea. Between Limerick and the Clare, it receives several small rivers from the county of the Maig, with others of inferior size, from the county of Limerick, on the left; and at its mouth the county of Kerry. The mouth of this beautiful river is free from bar, and forms a capacious bay, eleven miles long, and from six to eight in breadth, exempt from every species of danger, and from any strong current; but, unfortunately, exposed to western gales: some few sunken rocks, and between Achnish Isle and Limerick, require a pilot's skill to avoid. This river is navigable from its mouth to Limerick for vessels of large burthen, and from Limerick for vessels of draught as far as Ballyntrane-bridge, at the extremity of Lough Allen, a hundred and eighty miles from the city of Kerry Head. From Limerick, to avoid the rocks and shallows at the bend, a canal is cut seven miles in length, the Grand Canal from Dublin, joining this river at Banagher, a communication is formed between the Shannon and the Irish sea.
LAKES.

AMERICAN LAKES.

The northern parts of this division of the globe are distinguished by their numerous and immense lakes, the five principal of which lie either wholly, or chiefly, in the two Canadian provinces: these are the Lakes Superior, Huron, Ontario, Erie, and Michigan. These vast assemblages of fresh water, which are neither put in motion, nor alternately raised and sunk, by tides, are supposed to contribute very considerably to the greater degree of cold felt in the northern parts of America, than in the same parallels of latitude in Europe. They are situated within about seven degrees of latitude, and fourteen of longitude, or from 41° 35' to 49° north, and from 75° 27' to 92° west.

LAKE SUPERIOR.

This great North American Lake is justly entitled to the distinguished name it bears, not only because it is the largest expanse of fresh water in the known world, surpassing in magnitude the Asiatic salt-water lake improperly denominated "the Caspian sea," but because it has a much greater elevation than the other lakes of that country, the level of its waters being several hundred feet higher than the river St. Lawrence. Its circumference is estimated at about fifteen hundred miles; but it has been observed by an intelligent navigator, Carver, that "if it were coasted round, and the utmost extent of each of the bays taken, it would exceed sixteen hundred!" He coasted nearly twelve hundred miles on the north and eastern shores. "When it was calm," he observes, "and the sun shone bright, I could sit in my canoe, where the depth was upward of six fathoms, and could plainly see huge piles of stones at the bottom. The water at this time was pure and transparent as the air, and my canoe seemed as if it hung suspended in that element. It was impossible to look attentively, through this limpid medium, at the rocks beneath, for even a few minutes, without feeling the head swim,
and the eyes no longer able to view the dazzling scene. This occurred in the month of July; and, although the surface of the water, from the heat of the atmosphere was warm, still on letting down a cup to the depth of about a fathom, the water drawn thence was so excessively cold, that it had nearly the same effect as ice, when taken into the mouth.

Lake Superior is said to receive nearly forty rivers and streams of water: the two principal rivers are the Algoncon, from the north, and the Michipicoten, from the west. By the means of the latter a communication is established with the lakes Bourbon, Winnipeg, and du Bois; and in this river the source of the St. Lawrence is said to have been traced. A small river on the west before it enters the lake, has a perpendicular fall from the top of a mountain, of more than six hundred feet, through a very narrow channel. In this lake, which has one passage only, St. Mary's strait, for the discharge of great waters, there are many islands, two of which are of great extent. The largest of them, Isle Royal, is nearly a hundred miles from east to west, and about forty miles from north to south. Michipau Isle is likewise of consider able extent; and at the entrance of West Bay is a cluster of small islands, called "The twelve Apostles." On the south side of the lake is a peninsula, which spreads into the lake sixty miles.

LAKE HURON.

This lake is next in magnitude to the one described above, being about a thousand miles in circumference. Its shape is nearly triangular; and on its north side is nearly an hundred miles in extent from east to west, and about eight from north to south: it is called by the Indians Manataulin, which signifies the abode of spirits. At the west point of the lake are the straits of Michilimackinac, which unite with lake Michigan; and about fifty miles to the north-east of these straits are those of St. Mary, of which lake Huron communicates with lake Superior. They are about forty miles in length, and have falls, which are not, however, perpendicular, like those of Niagara, but the waters of which pass along a sloping bottom, and are on that account named THE RAPIDS. These are about this
L A K E O N T A R I O.

The southern extremity of lake Huron runs into a strait, which soon after runs into a small lake called St. Claire, from which itself into another strait named Detroit. The latter discharges into lake Erie, the distance between which and lake Huron is eighty miles. Lake Erie extends about three hundred miles from west to north-east, and in its widest part is about seventy miles in breadth from north to south. Its navigation is more dangerous than that of the other lakes, on account of many high lands on its borders projecting into the waters, so that, when sudden storms arise, canoes and boats are frequently lost, there not being any place to afford shelter or retreat. Several islands near its western extremity are so infested by venomous snakes, that it is highly dangerous to land on them. It discharges its waters, at the north-east extremity, into lake Niagara.

Lake Michigan, to the west of lake Huron, is long and narrow, extending nearly two hundred miles from north-west to south-east, and having a breadth of forty miles from north to south. Between these two lakes a peninsula is formed, which runs to a point at the north-west; and on the same side is a strait about forty miles wide, called the Grand Traverse, within which are several islands inhabited by Indians. This strait leads to a long and narrow bay, called Green Bay, into which flows the Fox River, rising near the Mississippi, and having its banks inhabited by a powerful tribe of Indians.

Lake Ontario is the smallest of the five great Canadian lakes. Its form is nearly oval, its greatest length being six hundred miles. Near to the south-east part it receives the waters of the Oswego river, and on the north-east discharges itself into the river Catarca, communicating with the river St. Laurence.

To the eastward of these great lakes, are lakes George and Champlain. The most northern lake visited by the traders, is lake Bourbon, extending to $51^\circ$ north latitude; and to the south of this is lake Winnipesaukee, communicating with the former by a strait. From this lake a river
In the southern part of the American continent, Lake Mayacaybo is the only one deserving a particular notice. It communicates with the gulf of Venezuela, by a strait on the western coast of which the city of Mayacaybo is situated. This lake is eighty leagues in circumference, and contributes equally to the beauty and convenience of the province of Venezuela, with which it is encompassed. The gulf of this lake, which terminates in the Caribbean sea, extends about a hundred and ten miles from south to north.

**ASIATIC LAKES.**

**LAKE ASPHALTITES.**

This Lake is more usually known by the name of the Dead Sea. It lies in Palestine, and is about fifty miles in length, and twelve or thirteen in breadth. It is surrounded by lofty mountains, and receives the river Jordan. It covers the ground on which stood the cities of Sodom and Gomorrah, buried, according to Strabo's report, by an earthquake, accompanied by frequent eruptions of fire, or, according to the scriptural expression, by a rain of sulphur. This lake is rendered remarkable by the great quantity of the bituminous and inflammable substance called Asphaltos, floating on its surface. This substance, having been thrown up from its bottom in a melted state, by the agency of subterraneous heat, and having become solid by the coldness of the water, is collected on the margin of the lake.

Doctor Clarke, in his recent travels, has removed the superstitious prejudices so long entertained relative to the Dead Sea, of which he gives the following animating description.

"The Dead Sea below, upon our left, appeared so near to us, that we thought we could ride thither in a very short space of time. Still nearer stood a mountain upon its western shore, resembling, in its form, the cone of Vesuvius, and having also a crater upon its top, which was plainly discernible. The distance, however, is much greater than it appears to be; the magnitude of the objects beheld in this fine prospect, causing them to appear less remote than
LAKE ASPHALTITES.

The atmosphere was remarkably clear and serene; but we saw none of those clouds of smoke, which, by some writers, are said to exhale from the surface of Lake Asphaltites, nor from any neighbouring mountain. Everything about it was, in the highest degree, grand and awful. Its desolate, although majestic, features, are well suited to the tales related concerning it by the inhabitants of the country, who all speak of it with terror, seeming to shrink from the narrative of its deceitful allurements and deadly influence. 'Beautiful fruit,' say they, 'grows upon its shores, which is no sooner touched, than it becomes dust and bitter ashes.' In addition to its physical horrors, the region around is said to be more perilous, owing to the ferocious tribes wandering upon the shores of the lake, than any other part of the Holy Land. A passion for the marvellous has thus affixed, for ages, false characteristics to the sublimest associations of natural scenery in the whole world; for, although it be now known that the waters of this lake, instead of proving destructive of animal life, swarm with myriads of fishes; that, instead of falling victims to its exhalations, certain birds make it their peculiar resort; that shells abound upon its shores; that the pretended 'fruit, containing ashes,' is as natural and as admirable a production of nature, as the rest of the vegetable kingdom; that bodies sink or float in it, according to the proportion of their gravity to the gravity of the water; that its vapours are not more insalubrious than those of any other lake; that innumerable Arabs people the neighbouring district; notwithstanding all these facts are now well established, even the latest authors by whom it is mentioned, and one among the number, from whose writings some of these truths have been derived, continue to fill their descriptions with imaginary horrors and ideal phantoms, which, though less substantial than the 'black perpendicular rocks,' around it, 'cast their lengthened shadows over the waters of the Dead Sea.' The ancients, as it is acquainted with it than are the moderns; and, it may be added, the time is near at hand, when it will be more philosophically examined. The present age is not that in which countries so situated, can long continue unexplored. The thirst of knowledge, and the love of travel, have at-
tained to such a pitch, that every portion of the globe would be ransacked for their gratification."

THE CASPIAN SEA.

This large body of water, improperly called a sea, as it neither ebbs nor flows, nor has any visible connexion with the ocean, is the greatest lake in the eastern hemisphere. It is bounded on the north by the country of the Calm, Tartars, on the east by Bucharia and a part of Persia, on the south by another part of Persia, and on the west by Persia and Circassia. Its length, from north to south, is about four hundred miles, and its greatest breadth, from east to west, three hundred. Within the last fifty years the water has risen so considerably, that it has made great inroads on the Russian side, both to the east and west of the Volga, and has rendered the adjacent country extremely marshy.

AFRICAN LAKES.

The only Lake deserving of notice in this arid and sandy quarter of the globe, is that of Dambia, in Upper Ethiopia. In describing the Nile, it has already been mentioned that it is considered as the source of that interesting river. This lake contains twenty-one islands, several of which are very fertile, more particularly the largest, called Tzana, the name likewise bestowed by the natives on the lake itself. Its greatest extent, in a north-east and south-west direction, is about ninety miles, and its breadth thirty-six.

EUROPEAN LAKES.

These Lakes, although much inferior in size to several of those above described, merit a brief description on account of the phenomena they occasionally present.

Lake Lagoda, in the western part of the Russian empire, lies between the gulf of Finland and Lake Oneiza, and is one hundred and fifty miles in length, and ninety in breadth. It is the largest lake in Europe; but is so full of quick sands, which are constantly moved from place to place by the frequent storms to which it is subject, that very dangerous shelves are formed along its course. This led Peter the Great to cause a canal, nearly seventy English miles in length, seventy feet in breadth, and about eleven feet in
LAKE OF CONSTANCE.

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The completion of this great work, which has twenty-five sluices, or locks, and into which several rivers flow, was a labour of fourteen years. To keep it in repair is the constant employment of a regiment of soldiers, who for that purpose are stationed on different parts of its banks. Lake Onega is situated between the lake and the White Sea, and communicates with the former by the river Swir. It is one hundred and twenty miles in length, and in breadth between fifty and sixty. Notwithstanding its waters are fresh, it is frequented by

The other principal Lakes of the north of Europe are the following. Lake Peipus, in Livonia, nearly seventy miles in length, and forty in breadth, runs into the gulf of Finland, by the river Narva, and is celebrated for the abundance of fishes with which it swarms.—In Sweden Proper, which is divided between Upland, Sudermanland, and Westmanland. The principal Lake is Lake Maler, seventy-two miles in length, and is said to contain not less than twelve hundred and ninety islands. It communicates with the sea by the mouths of the north and south branches, which enter it near Stockholm, and its banks are for the most part beautifully diversified.—Lake Wetter is one of the twenty-three lakes to be found in Gothland. It is ninety miles in length, fifteen in breadth, and has but one outlet, by the river Motala, through which it receives upwards of forty small streams. This lake lies a hundred feet higher than either the Baltic or the Sound, and is deep and clear, but very boisterous in the winter season. On its banks are found agates, corals, and other valuable stones.

Lake of Constance is one of the great boundaries which separate Switzerland from Germany. Its broadest part stretches into Switzerland; while towards Germany it divides itself into two arms, one called the Zellersee, Lake of Zell, and the other the Bodmen, or Lake Zeilengen. In the former is the island of Reicheneck, three miles in length, and one in breadth, abounding in fine vineyards, and all kinds of fruit; and in the latter, a small island of Meinau. From Bregentz to Zell this

is likewise distinguished by two appellations, the part
from the former of these places to Constance being called the Upper Lake, and that from Constance to Lower Lake.

The Lake of Geneva resembles the sea, both in colour of its water, the storms which are raised on it, the ravages it makes on its banks. It receives different names from the coasts it washes, and has in summer sometimes like the flowing and ebbing of the tide, occasioned by melting of the snows, which fall more copiously into a noon than at other times of the day. It is shaped like a half-moon, its convex side looking towards Switzerland, having on that side a length of forty-eight miles, towards Savoy its length does not exceed thirty-six of such a depth as to be navigable for larger vessels than commonly seen in rivers. Near Villeneuve, the River discharges itself into it with such rapidity, that for the distance of half a league, the river water, which is very clear, continues unmixed with that of the lake, which is particularly clear.

Lago Maggiore, in the Duchy of Milan, is a most extraordinary lake, sixty miles in length, and six in general breadth, with a depth of eight fathoms in the extreme. It is surrounded on every side with hills covered with yards; and along its banks are rows of fine trees, walks arched with vine branches. This enchanting prospect is heightened by several large natural cascades from the mountains. At the part where it widens into a bay, appear the two celebrated islands named Bella, and Isola Madre, which have been compared to two pyramids of confectionary, adorned with green beasts and flowers. At one extremity of the garden of which Bella, are ten terraces, the perpendicular height of which, taken collectively, is more than two hundred feet above the level of the water of the lake. These terraces descend proportionally in their circuit as they rise toward the hill, where an oblong area, paved with fine stones, surrounded with a balustrade, affords a most delightful prospect. Isola Madre has seven terraces, which are broken by sloping, and at a considerable distance from each other, on which account it appears to be lower than Isola Bella, although the terraces have been planned of an equal height. Nature was, perhaps, never so successfully aided by
decorations of art, as in the disposition of the gardens and ornaments with which these islands, so beautiful in themselves, are embellished.

BRITISH LAKES.

Although these Lakes are far inferior in size to those described above, they are not without their sublimities, and present phenomena which deservedly class them among the wonders of nature.

The most interesting of these is ULSWATER, a lake of Cumbrieland, ten miles north of Ambleside, and four miles south-west of Penrith. It is nine miles in length, nearly a mile in breadth. On this lake much amusement arises from the discharge of guns, or small cannon, in different stations. The report is reverberated from rock, promontory, cavern, and hill, with every variety of sound; now dying away on the ear, and again returning as the echo of thunder. It is thus re-echoed seven times in rapid succession. The lake, viewed from an ascent, flows majestically in its calmness, clear and smooth as a blue mirror, winding shores and low points of land, covered with green inclosures. The water is almost every where bordered with cultivated lands, gently sloping upward from the lake to a quarter of a mile in breadth, till they reach the west of the mountains, which rise, rudely and awfully, on either hand, displaying their broken summits. Directly opposite, at a distance of somewhat more than three miles, Place-Fell, one of the loftiest of these mountains, forces its bold broad breast into the middle of the lake, and then bending to the right. From a southern direction it flows due west, but is soon interrupted by the root of Hevellyn, a lofty and very rugged hill; when, once more spreading its waters, it turns to the south-east, and is lost among the deep recesses of the hills.

WINANDER MERE, the longest and most beautiful lake in England, said to be so called by the Saxons on account of their nests, in the western part of Westmoreland, 375 miles from north to south, but its breadth does not any
where exceed a mile. It is in some parts of a vast depth; and its bottom is one continued rock, with which it is in a manner paved.

The Lake of Derwent Water, three miles in length, and half a mile in width, lies in the beautiful vale of Keswick. Out of this lake rise five islands, which covered either with turf or trees, add greatly to the beauty of its most picturesque appearance. Still more to the north-west, the river Derwent, after running for a small space in a narrow channel, spreads itself into a long, narrow lake, called Bassenthwaite, at the terminus of which is a remarkable water-fall named Lowdons.

Loch Lomond is the most beautiful of the lakes of Scotland; it is thirty miles in length, and its greatest breadth ten miles. Its greatest depth, which is between Firkin point and Ben Lomond, is a hundred and twenty fathoms. The first view of this charming scene from an elevated spot named Tarbat, presents an extensive serpentine winding amid lofty hills, which, towards the north, are barren, black, and rocky, darkening with their shade that contracted part of the water. On the west side, the mountains, the summits of which are lofty, naked, and craggy, are clothed beneath with wood of oak quite to the water's edge. Toward the east, the mountains are equally high, but their summits form a more even ridge, parallel to the lake, except where Ben Lomond like Saul amidst his companions, overtops the rest. And lastly, the eastern boundary is formed of a part of the Grampian hills.

The first scene which presents itself to the view of an admiring spectator, is separated from one totally different by two headlands covered with trees, the most remote of which is Firkin point. On passing this cape an expanse bursts at once on the view, varied with all the softer beauties of nature. Immediately beneath is a flat stretch with wood and corn: beyond, the headlands stretch into the water, and consist of gentle risings; many of their surfaces covered with wood, while others are almost with trees loosely scattered over a fine verdure, or the purple bloom of the heath. Numbers of islands dispersed over the lake; some of the same elevated as the little capes, and wooded in the same manner;
Lough-lean lake. 377

Peep above the surface, and are tufted with trees; between.

The other remarkable lochs, or lakes, of Scotland, are Loch-Tay, Loch-Ness, and Loch-Leven, whence arise
which flows the river Jern. Of these the one most deserving a concise description is Loch-Ness, which is twenty-
miles in length, and in most parts two in breadth.

The lake has been sounded in many parts, with upwards
five hundred fathoms of line, without any bottom
been found. Its banks are mountainous, and
covered with wood. That its waters never freeze, is as-
to the many great springs which flow into it. It
emerges itself into the river of the same name, six miles
in length, which likewise never freezes, but has a condensed
formation during the frost. Near to this lake is the

mountain Meal-fuor-youny, of a round shape, on
summit of which is a lake of fresh water, about thirty
fathoms in length, and six in breadth, without any course or
stream running to or from it. Although of so inconsider-

able extent, it is unfathomable.

Ireland abounds more in Lakes than perhaps any other
country of the same extent, more especially in the pro-
of Ulster and Connaught. They are usually classed
under two denominations: fresh-water lakes, which have
access of tide, or mixture with the sea; and salt lakes,
which the tide flows, and which may more properly
be called inlets of the sea.

The most extraordinary fresh-water lake is Lough-lean,

otherwise called the lake of Killarney, in the county

of Kerry. It possesses singular beauties, and is divided
three parts. The northern, or lower lake, is six miles
length, and from three to four in breadth. On the
north falls into the lake with a roaring noise which strikes
a timid spectator with awe. The view of this sheet of
water is uncommonly fine, appearing as if it were de-

tending from an arch of wood, which overhangs it above

to so numerous in this part as in the Upper Lake;
there is one of uncommon beauty, called Innisfallen,
nearly opposite to O'Sullivan's cascade. It contains eight-hundred
acres; and the coast is formed into a variety of bays by
promontories, skirted and crowned with arbutus, heather,
and other shrubs and trees. The promontory of Mucruce,
which divides the Upper from the Lower Lake, is a piece of
land of enchantment; and a road is carried through the
centre of this promontory, which unfolds all the internal
beauties of the place. Among the distant mountains
the one named Turk, presents itself as an object of
noticence; and the summit of Mangerton, more lofty
though less interesting, soars above the whole.

The passage to the upper lake is round the extreme
of Mucruce, which confines it on one side, and the
proaching mountains on the other. Here is a celebrated
rock, called the Eagle's nest, which produces wonderful
echoes: the report of a single cannon is answered by a
succession of peals resembling the loudest thunder, and
seems to travel along the surrounding scenery, and
away amid the distant mountains. The upper lake is
six miles in length, and from two to three in breadth,
and is almost surrounded by mountains, from which descend
a number of beautiful cascades. The islands in this lake
are numerous, and afford an amazing variety of picturesque
views.

The centre lake, which communicates with the upper
lake, is small in comparison with the other two, and can
boast of equal variety; but its shores are, in many places,
indented with beautiful bays, surrounded by the dark green
of trees. The eastern boundary is formed by the descent
of Mangerton, down the steep side of which cascade, visible for four hundred and fifty feet.

The lake of water is supplied by a circular lake near the
foot of the mountain, called the Devil's Punch-Bowl, on account of its immense depth, and the continual
flow of water, is considered as one of the greatest com-
in Killarney.

Lough-Neagh is somewhat of a square in form,
indented on every side, and is the largest lake in
Ireland, being twenty miles long from the north-west to
the south-east, nearly fifteen from the north-east to
the west, and ten or twelve at a medium breadth. This
lake communicates its benefits to five counties, Armagh,
FALLS OF NIAGARA.

Antrim, and Down; the latter of which
descends six considerable rivers, four of smaller note, and
everal brooks; notwithstanding which, it has but one
roller for the discharge of this great flux of waters. Among
peculiarities, it has that of petrifying vegetable sub-

ough-erne is divided into two branches, the Upper
and Lower, which are thus formed by the water being con-
ted into the compass of a considerable river for several
; after which, having spread, it forms the lower lake.
both its branches, it takes its source through the whole
length of the county of Fermanagh, from the south-east
Point to the north-west, nearly dividing it into two equal
which are pike of a prodigious size.

CATARACTS AND CASCADES.

The river Niagara, in Upper Canada, takes its rise in the
eastern extremity of Lake Erie, and, after flowing for twelve
miles, empties itself into Lake Ontario. Its breadth is
hundred feet, and its depth very considerable; but its
urrent is so exceedingly strong and irregular, and its channel
so frequently interspersed with rocks, that it is navigable for
small boats only. Proceeding lower, the stream widens,
ough strong, is smooth and regular. At fort Chippewa,
ever, situated one league above the cataracts, the scene is
changed, and the river so violently agitated, that a boat
ould be inevitably dashed in pieces, were it permitted to
Fort Niagara, situated on its bank. So impetuously do
waves break among the rocks, that the mere sight of
them, from the adjacent shore, is sufficient to strike terror
the spectator. As it approaches the falls, the stream
makes along, with redoubled fury, until it reaches the edge
of the stupendous precipice, when it tumbles suddenly to the
bottom, without meeting with any obstruction in its descent.

FALLS OF NIAGARA.
the line of cataracts winds obliquely across, instead of extending, in the shortest direction, from the one bank to the other. It ought to be observed, that the water does not precipitate itself down the vast abyss in one entire fall, but, being separated by islands, forms three distinct collateral falls.

One of these is called the Great, or Horse-shoe Fall, from the similarity of its form to that of a horse-shoe. It is situated on the north-west extremity of the river, and is most deserving of the attention of the spectator. Its grandeur is evidently superior to that of the adjacent cataracts, although its height may be considerably less. The extent of this fall can be ascertained by the eye only; it is impossible precisely to describe its limits; but its circumference is generally computed at one thousand and eight hundred feet, somewhat more than one-third of a mile. Beyond the intervening island, the width of which may be equal to a thousand and fifty feet, is the second fall, about fifteen feet wide; and at the distance of ninety feet, occupied by the second island, is situated Fort Scloper Fall, so called from its proximity to that fort. The dimensions of the cataract may be reckoned equal to those of the large island, so that the entire extent of the precipice, including the intermediate islands, is four thousand and five hundred feet; a computation which certainly does not exceed the truth. The quantity of water precipitated from the falls is prodigious; and, agreeably to a late estimate, amounts to six hundred and seventy thousand, two hundred and fifty tons in a minute.

From the eminence entitled "the Table Rock," the spectator has a fine prospect of the terrific Rapids, the falls, and of the surrounding shores, embellished with lofty woods. He there sees to advantage the adjacent Horse-shoe Fall, and the dread abyss, into which he may look perpendicularly from the edge of the rock, if his courage be equal to his curiosity. The immensity of the various objects which here present themselves to the eye infallibly overthrows a stranger with astonishment; several minutes must elapse before he can possibly consider himself sufficiently to form any just conception of the vast and magnificent scene before him, which requires that its component parts should be separately examined.
which affords so truly surprising an exhibition, that persons who have resided in its vicinity for several years, and who have been constantly habituated to its sublimity, ingeniously acknowledge, at their last visit, that they were never able before to discover its peculiar grandeur.

From a cliff nearly opposite to one extremity of Fort Schloper Cataraft, the falls are seen in a very interesting point of view: the scenery there, it is true, is less magnificent, but is infinitely more beautiful than from any other station.

for several miles beneath the precipice the river is bounded, on either side, by steep and lofty cliffs, composed of earth and rocks, which in most parts are perpendicular. The descent to the bottom of the falls is here accomplished by two ladders, formed of long pine trees, with notches on their sides, on which the traveller rests his feet, and passes amid a variety of huge misshapen rocks and pendent trees which seem to threaten him with instantaneous destruction. The breadth of the river in this part is about two furlongs; and towards the right, on the opposite side, Fort Schloper Fall appears in a very advantageous point of view. About the one half of the Horse-shoe fall is concealed by the projecting cliff, but its partial prospect is extremely fine. The bottom of the former of these falls is covered with a beautiful white foam, which ascends from the neck in thick volumes, but does not rise into the air like a cloud of smoke, as is the case with that of the latter fall, though its spray is so considerable, as to descend like a shower of rain, near the second ladder, on the opposite side of the river. On its brink, and along the strand, to the Great Fall, are to be constantly seen shattered trees and masses of animals, which have been carried away by the extreme violence of the current.

The colour of the water of the cataracts, as it descends perpendicularly on the rocks, is occasionally a dark green, and sometimes a foaming brilliant white, displaying a thousand elegant variations, according to the state of the atmosphere, the height of the sun, or the force of the wind, and the rapid descent of the stream, continue about
CATARACTS AND CASCADES.

eight miles farther; and the river is not sufficiently calm to admit of navigation, till it reaches Queen's-town, on the west side of the straits of Niagara, and nine miles distant from the falls.

To attempt an adequate description of them would be a fruitless task. Their wondrous reality puts to flight the most sublime ideas of anticipating fancy, and overpowers the soul of an intelligent spectator, with such enthusiastic feelings, as can never be rightly conceived, unless by those who have, on some occasion, contemplated a similar scene.

FALLS OF THE MONTMORENCY.

The Montmorency empties itself, at the distance of about eight miles north east of Quebec, into the great river St. Laurence, to the coast of which it gradually descends from the elevated mountain on which it has its source. At a station called La Motte, situated on the northerm extremity of a sloping ground, its waters diffuse themselves into shallow currents, interrupted by rocks which romantic them into foam, and accompanied by murmuring sounds which enliven the solitude and solemn stillness prevailing throughout the surrounding forests and desolate bays.

Farther down, its channel is bounded by precipitous rocks, its breadth becoming extremely contracted, and the rapidity of its current proportionably augmented. At a place called 'the natural steps' there are several beautiful cascades of ten or twelve feet. These steps, which are extremely regular, have been gradually formed by the accession of waters the river receives in its progress, after breaking up of winter, by the melting of the snows. From the middle of April to the end of May, its waters roll with increasing height and rapidity. Being impelled in their course, they insinuate between the strata of the horizontal rock, vast fragments which are detached by the rushing violence of the swelling torrent.

On the eastern side, the bank, which is almost perpendicular and fifty feet in height, is surmounted by lofty trees. The south-west bank rises beyond the steps, and terminates in a precipice. On the opposite side, the bank is regular, and of a singular shape, resembling the ruin of an ancient wall. The trees by which the banks are enclosed, extend...
Falls of Niagara.

Falls of Montmorenci.
FALLS OF MONTMORENCY.

The effect produced by the foaming currents, and the masses of stone, form a scene wild and picturesque. The stream now taking a southern direction, is accompanied in its velocity, and forms a grand cascade intercepted by huge rocks. A quarter of a mile lower down a greater effect is produced. After exhibiting an agreeable velocity through its course, the river is precipitated, in an almost perpendicular direction, over a rock two hundred and fifty feet in height. Wherewer it touches the rock it propels with uninterrupted gravitation, it forms numerous flakes, like wool or cotton, which are gradually interrupted in the descent, until they are received into the profound abyss beneath.

The effect from the summit of the cliff is awfully grand, truly sublime. The prodigious depth of the descent of waters of this surprising fall; the brightness and volatility of their course; the swiftness of their movement through the air; and the loud and hollow noise emitted on the basin, swelling with incessant agitation from the height of the dashing waters, forcibly combine to attract attention, and to impress the mind of the spectator with sentiments of grandeur and elevation. The clouds of vapour, which assume the prismatic colours, contribute to enliven the scene. They fly off from the fall in form of a revolving sphere, emitting with velocity numerous flakes of spray, which spread in receding, until they are intercepted by the neighbouring banks, or dissolve in the atmosphere.

The breadth of the fall is one hundred feet; and the basin, which is bounded by steep cliffs, forms an angle of fifty-five degrees. When viewed from the beech, the exact is seen, with resplendent beauty, to flow down the precipice, the summit of which is crowned with forests. The diffusion of the stream, to the breadth of five hundred feet, and the various small cascades produced by the inequalities of its rocky bed, on its way to St. Lawrence, display a very singular and pleasing
THE TUCOCA FALL.

This fall, in Franklin County, Georgia, is as yet scarcely known to the best informed of our geographers, and is one of the most beautiful that can be received. It is much higher than the great fall of Niagara and the water is charmingly propelled over a perpendicular rock. When the stream is full, it passes down the rock in one expansive sheet magnificent to behold.

FALLS OF THE MISSOURI.

The most prominent features of this great American river, which is fed by so many streams, having their sources in a great variety of soils and climates, are its wonderful rapids, and cascades, the following connected view of which is abstracted from the very accurate draught survey made by Captain Clarke.

This river is nine hundred feet wide at the point where it receives the waters of Medicine river, which is four thousand four hundred and twelve feet, somewhat more than a mile, to a small rapid on the north side, from which it gradually widens to four thousand two hundred feet at the distance of nine thousand and forty-two feet (less a mile and three-fourths) reaches the head of the river narrowing as it approaches them. Here the hills on the north, which had withdrawn from the bank, closely border the river, which, for the space of a mile, makes its way over the rocks with a descent of thirty feet: in this case the current is contracted to sixteen hundred and forty and, after throwing itself over a small pitch of five feet, a beautiful cascade of twenty-six feet five inches; this not, however, fall immediately perpendicular, being helped by a part of the rock, which projects at about one-fourth of the distance. After descending this fall, and passing Cotton-wood island, on which the eagle has fixed its nest, the river goes on for eight thousand seven hundred seventy-eight feet (more than a mile and a half) over the little falls, the estimated descent of which is thirteen feet six inches, till it is joined by a large fountain boiling underneath the rocks near the edge of the river.
FALLS OF THE MISSOURI.

Which it falls with a cascade of eight feet. It is of the most perfect clearness, and rather of a bluish cast; and even after falling into the Missouri it preserves its colour for half a mile. From this fountain the river descends with increased rapidity for the distance of three thousand five hundred and thirty-one feet, during which the estimated descent is five feet: from this, for a distance of two thousand and two hundred and twenty-seven feet, the river descends fourteen feet seven inches, including a perpendicular fall of six feet seven inches. The river has now become pressed into a space of one thousand four hundred and nineteen feet, and here forms a grand cataract, by falling over a plain rock, the whole distance across the river to the depth of forty-seven feet eight inches: after uncovering itself, the Missouri then proceeds with an estimated descent of three feet, till at the distance of sixteen hundred and eighty-three feet it again is precipitated down crooked falls of nineteen feet perpendicular; below which, for the distance of sixteen thousand and five hundred level plain for the space of two thousand nine hundred and thirty-seven feet (more than half a mile,) with a computed descent of three feet, making a bend towards north. Thence it descends, during seven thousand feet, about eighteen feet and a half; when it makes a perpendicular fall of two feet, which in approaching which it descends thirteen feet, within a distance of about six hundred feet, and gathering length from its confined channel, which is only eight hundred and forty feet wide, rushes over the fall to the depth of eighty-seven feet and three quarters of an inch. It dashes among the rocks, and losing itself in foam, it compressed immediately into a bed of two hundred and eighty-nine feet in width; it continues for five thousand one hundred and ten feet to the entrance of a run or deep slop, where there is a fall of three feet, which, joined to the descent of the river during that course, makes the descent three thousand nine hundred and sixty feet is only four
feet; from this, passing a run or deep ravine, the descent for one thousand six hundred feet is thirteen feet; three thousand nine hundred and sixty feet, is a sudden descent of eighteen feet; thence two thousand six hundred and forty feet further, is a descent of six feet; which, to the mouth of Portage creek, a distance of four thousand six hundred and twenty feet, the descent ten feet. From this survey and estimate it results that the river experiences a descent of three hundred and fifty feet in the course of two and three quarter miles, from commencement of the rapids, to the mouth of Portage creek, exclusive of almost impassable rapids which extend for a mile below its entrance.

WATER-FALL OF SOUTH AFRICA.

The great chain of mountains which runs from northsouth through the colony of the Cape of Good Hope, divides into two branches, one of which stretches south, and the other due south. At the extremity of the east branch is "the water-fall mountain," in one of the sides of which a large stream of water falls from the height above, and presents, in the winter season, when swelled by the rains, a glorious spectacle. To view this advantage, the traveller has to climb to a considerable height over the steep and broken rocks which separate the sides of the mountain, and, on reaching the top, the other side. Its height is estimated at between thirty and ninety feet, and its breadth at between thirty arches. Adequate terms cannot be found to describe the sublimity of this scene, after abundant rains, when it displays its full beauty. In the vale beneath, the water is collected in a vast and deep basin, excavated in the stone; and on the side of the stream is a grotto, which runs within the rock to the depth of between thirty and forty feet, and with an arched entrance to this grotto is close to the falling water, when the stream is full. The rocks about it are thickly overgrown with shrubs, which are then sprinkled by the running water. The European travellers who proceed from Cape Town to the interior of Southern Africa, seldom fail to make the grimage to this enchanting spot.
CATARACTS OF THE NILE.

This celebrated river, through its long and fertile range of about two thousand British miles, in winding through desert and precipitous countries, exhibits very considerable cataracts, ten or twelve of which, having a descent of more than twenty feet, occur, before it reaches the level of Egypt. The one which, by way of eminence, is named the Cataract of the Nile, was visited by Mr. Bruce, from whose relation the following particulars are extracted.

At the distance of half a mile beneath the cataract, the river is confined between two rocks, over which a long bridge of a single arch has been thrown, and runs in a deep trough, with great roaring, and an impetuous velocity. On ascending, the cataract presents itself amid trees of beautiful trees, and exhibits a most magnificent stupendous sight, such as, Mr. Bruce observes, ages ded to the greatest length of human life, could not efface eradicate from his memory. It struck him with a kind of every sublunary concern. At the time of his visit, river had been considerably increased by rains, and in one sheet of water, above half an English mile in breadth, and to the depth of at least forty feet, with a sound and noise which were truly terrific, and which, for a while, covered him, and made him giddy. A thick fume, caused by the spray of the stream both above and below, marking stream, although the waters were not seen. The river, though much swollen, preserved its natural clearness, fall, partly swollen, preserved its natural clearness, and partly in a deep pool, or basin, in the solid, and partly in twenty different eddies to the very crest of the precipice. In falling, a portion of the stream forward to run back with great fury on the rock, as well emissions, which chafed against each other.

CATARACT OF THE MENDER.

The cataract which constitutes the source of this river, commanded of the ancients, is thus beautifully described.
CATARACTS AND CASCADES. by Doctor Clarke. "Our ascent, as we drew near to the
source of the river, became steep and rocky. The
summits towered above us, in the greatest style of Alps,
grandeur; the torrent, in its rugged bed below, all
while foaming on our left. Presently we entered
one of the sublimest natural amphitheatres the eye beheld; and here the guides desired us to alight. Huge
towers of water noise of waters silenced every other sound. Huge rocks rose perpendicularly, to an immense height
whose sides and fissures, to the very clouds, concealed
their tops, were covered with pines. These green
eyes of nature, in the greatest style of Alps,
every possible direction, among a variety of every
trees; and enormous plane-trees waved their
branches above the torrent. As we approached its
mouth, we beheld several cascades, all of foam
impetuously from cataracts in the naked magnificence
of a perpendicular rock. It is said the same magnificence
cataract continues during all seasons of the year,
unaffected by the casualties of rain or melting snow.
Having reached the cataract, we found, in their front, a beautiful natural basin
or eight feet in depth, serving as a reservoir. If
water during the first moments of its emission
so clear, that the minutest object might be discerned in the bottom. The copious overflowing of this reservoir
causes the appearance, to a spectator below, of distinct
cascades, falling to the depth of about forty feet,
there is only one source. Behind are the chasms which issues. We entered one of these, and
into a cavern. Here the water appeared, rushing
with great force, beneath the rock, towards the basin outside. The whole of the rock about the source
covered with moss; close to the basin grew
plane trees; above were oaks and pines; and all below
a naked and fearful precipice.

The bold and precipitous country of the Alps offers a
variety of waterfalls and perpendicular torrents which
are well deserving of notice; more particularly those in
vicinity of Mount Rosa, a part of the northern border
of Piedmont. The river Oreo, fed by numerous springs
from Mount St. Gothard, Mount Cenis, and the
branches of the Apennines, forms at Cerisola a river...
CASCADE OF THE ANIO.

Cascade estimated at four hundred fathoms, or two thousand four hundred feet; while the torrent Evanston, descending from another part of Mount Rosa, exhibits a fall of more than two hundred fathoms, rolling down pebbles of quartz, veined with the gold which is occasionally found in the mountains of Challand. The Cascata del Marmore, or Marble Cascade, so denominated from the mountain down which the Velcino falls being almost wholly of marble, lies about three miles from Terni. In proceeding towards it, the traveller is struck with terror on viewing the precipices, which are of a romantic height; and is sufficiently rewarded, when, on reaching the summit of the mountain, he regards the stupendous cataract, formed by the river as it rushes from the mountain. Having reached the declivity of its channel, the waters descend with a rapid course for a short space, and then fall from a perpendicular height of three hundred feet, breaking against lateral rocks, which cause vapours to ascend much higher than the summit of the cataract, by which the neighboring valley receives a perpetual fall of rain. After this ascent, the waters rush into the cavities of the rocks, and then bursting through several openings, at length reach the bed of the river.

The grand cascade of the Anio, near Tivoli, flows down the edge of a steep rock; and at its foot, the water, in a succession of ages, has hollowed grottoes of various shapes and sizes, so beautifully picturesque as to baffle all description. Of these, the grotto of Neptune is the most illustrated. Near to it are three smaller cascades, which murmur through the ruins of the villa Mecænas, down the woody steep which forms the opposite bank of the river, and present the painter with one of the most picturesque views imaginable, the foreground varying beautifully at every step he takes.

In Savoy, the Arvo flows many miles between high, steep, and inaccessible rocks, which appear to have purposely been left to give its waters a free passage. The roaring echoes and continual sounds occasioned by its passage, the trampling of the horses and mules, the halting of passengers, &c. — are, in these places, reverberated in a noise so deep and wild, as to strike with terror the
traveller who is unaccustomed to them; and the firing of a gun or pistol, is there more terrible than the loudest clap of thunder. A steep precipice, with monstrous impos- mous rocks, which seem ready to fall, joined to the roaring of the river, add largely to the general sublimity. Cataracts of this river are more or less loud and terrible in proportion as the waters are more or less swallowed up by the melting snows, with which the tops of the mountains are covered. One in particular, called the Nun of Aragon, falls from a prodigiously high rock with great violence: its descent is said to exceed eleven hundred feet.

In Dalmatia, the river Cettina forms a magnificent cascade, called by the inhabitants Velica Gubavica, distinguish it from a less fall a little below. The waves precipitate themselves from a height of above one hundred and fifty feet, forming a deep majestic sound, which by the echo resounding between the steep and naked banks. Many broken fragments of rocks, which impede the course of the river after its fall, break the waves, so as to render them still more lofty and sonorous. By the violence of the repercussion, their froth flies off in small white particles, and is raised in successive clouds, which are scattered, by the agitation of the air, over the valley. When these clouds ascend directly upward, the inhabitants call the noxious south-east wind called the sirocco.

The fall of the Staub-Bach, in the valley of Lauterbrunnen, estimated at nine hundred feet of perpendicular height and about a league from Schaffhausen, at the village of Laufen, in Switzerland, is a tremendous cataract of the Rhine, where that river precipitates itself from a rock so high as to be seventy feet in height, and not less than four hundred and fifty feet in breadth.

In Sweden, near Gottenburgh, the river Gotha, falling down from a prodigiously high precipice into a deep ravine with a dreadful noise, and with such marvellous force, that trees designed for the masts of ships, which are carried down the river, are usually turned upside down in the water and shattered in pieces. They frequently sink so fast in the water, as to disappear for a quarter of an hour, half an hour, and sometimes for three quarters of an hour. The fall, which the torrent precipitates them, is of a depth not less
FALL OF THE TEEES.

...having been sounded with a line of several fathoms, without the bottom being reached.

In addition to the stupendous North American cataracts already described, may be noticed the one formed by the river Passaic, which discharges itself into the sea at the western extremity of the State of New Jersey. About forty miles from the mouth of this river, where it has a depth of about a hundred and twenty feet, and runs with a very swift current, it reaches a deep chasm, or cleft, which becomes its channel, and falls about seventy feet perpendicular to the entire sheet. One end of the cliff is closed up, and water rushes out at the other with incredible rapidity, at an acute angle to its former direction, and is received into a large basin. It thence takes a winding course through the cleft and spreads again into a very considerable channel. The cleft is from four to twelve feet in breadth, and is supposed to have been produced by an earthquake. When this cataract was visited by a late British traveller, the spray spread two beautiful rainbows, primary and secondary, which greatly assisted in producing as fine a scene as the imagination can conceive. It was heightened by another fall of less magnificence, about ninety feet above.

In England, among the cataracts which merit a brief mention, may be cited the one in Devonshire, near the spot where the Tamar receives the small river Lidd. The water falls above a hundred feet; it proceeds from a mill at some distance, and after a course on a descent of nearly one hundred feet from the level of the mill, reaches the brink of the precipice, whence it falls in a most beautiful and picturesque manner, and, striking on a part of the cliff, rises from it in a wider cataract to the bottom, where it falls again with great violence, it makes a deep and foaming basin in the ground. This fine sheet of water causes the surrounding air at the bottom to be so impregnated with the finest particles, that those who approach it find themselves as if in a mist. In Cumberland there are several cataracts; but these are exceeded in beauty by a remarkable fall of the
which is a bridge suspended by chains, seldom passed under by the adventurous miners.—Asgarth force, in Yorkshire, likewise a very interesting fall.

In Scotland, the Fall of Fyers, near Loch-Ness, is a vast cataract, in a darksome glen of a stupendous depth. The water rushes beneath, through a narrow gap between two rocks, and thence precipitating itself more than 100 feet lower into the bottom of the chasm, the foam, the great cloud of smoke, rises and fills the air. The sides of this glen are stupendous precipices, blended with trees overhanging the water, through which, after a short space, the waters discharge themselves into the lake. About a mile to the south of this fall, is another which passes through a narrow chasm, whose sides it has undermined a considerable distance. Over the gap is a true Alice bridge, formed of the trunks of trees covered with snow from the middle of which is an awful view of the water roaring beneath. In Perthshire, the river Keith presents a very considerable cataract, the noise produced by which is so violent as to stun those who approach it.—The western coast of Ross-shire is, however, peculiarly distinguished by these natural wonders, among which may be cited the grand cataract of the river Kirkag, and the cascade of Glanno which latter being situated amid the constant obscurity of woody hills, is truly sublime.

In Ireland, the noble river Shannon has a prodigious cataract, which, at about fifty miles from its mouth, prevents it from being longer navigable for vessels of a large burthen.

**SPRINGS AND WELLS.**

**SAINT WINIFRED'S WELL.**

Holywell, in Flintshire, is famous for Saint Winifred's Well, one of the finest springs in the world. On account of the sanctity in which it was holden, it gave name to the town. This well pours out, each minute, twenty-one tons of water, which, running in the middle of the town, is made use of by every house as it passes the side of a hill, is made use of by every house as it passes after which it turns several mills, and is employed in various
St. Winifred's Well.

Dropping Well at Knaresborough.
SAINT WINIFRED’S WELL.

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manufactures, which greatly increase the population of the place, and its neighbourhood. Over the spring, where a handsome bath has been erected, is a neat chapel, supported by pillars, and on the windows are painted the chief events of Winifred’s, or, as it was anciently written, Wenefrede’s

About the well grows moss, which the ignorant and superstitious devotees most stupidly imagine to be St. Winifred’s hair. This saint is reported to have been a pagan martyr, who lived in the seventh century, and, as the legend says, was ravished and beheaded in this place by a pagan tyrant; the spring having miraculously risen from her blood. Hence this bath was much frequented by Popish pilgrims, out of devotion, as well as by those who came to divine in it for medieval purposes. Mr. Pennant says, the custom of visiting this well in pilgrimage, and offering up devotions there, is not yet entirely laid aside: in the summer a few are still to be seen in the water, in deep devotion, up to their chins for hours, sending up their prayers, or performing a number of evolutions round the polygonal well.”

It might have been supposed that the present enlightened age would have been secure against a repetition of impossibilities of this kind; but Doctor Milner, a Catholic Bishop, of Wolverhampton, has taken much pains to persuade the world that an ignorant proselyte, of the name of Winefrid, was there cured of various chronic diseases so late as the year 1804, by a miracle. Sir Richard Phillips, having, in the Monthly Magazine, referred this pretended miracle to the known effects of strong faith on ignorant minds, in the proposed means of cure, has been attacked by the clerical clergy for his incredulity; but, in number of words.

We have no doubt whatever that Winefrid White was cured by her journey to Holywell, and by bathing in the wonderful natural spring at that place; but we are not antagonists enough to believe that her cure was effected by antagonist properties of the water to the cause of her irremissible impiousness, nor impious enough to sport with eternal infi n dence as to assert that a capricious suspension of the powers of Nature took place for this purpose. On the con-
known to every medical practitioner, and proved hundreds of recorded instances; that is to say, by her high pitch by her religion, and by the assurances of those to whom she was accustomed to defer. We think, nevertheless, that the publication of this 'Case of Winefrid White' strongly of religious empiricism, and is exactly analogous the 'cases of cure' which we every day see advertised on all the newspapers. We refrain from treating the subject theologically, yet it appears to us that Matthew, chap. verse 24, proves that 'signs and wonders' are not only evidence of divine interposition, but may be used even 'false prophets, so as to deceive the very elect.'

continuance of miraculous powers will be found, we suspect to depend on other circumstances than the date of the The they disappear wherever the printing-press begins to freely used, and, by its agency, fixes all the circumstances that attend them, and they still continue to flourish when the history of the circumstances depends for any period traditional evidence. Miracles are, therefore, performed abundance, even in our days, among the Negroes, Hottentots, the Caffres, the Tartars, the South Islanders, and the Indians of the two Americas. The we believe on record are to be found in the Indes. M. Elphinstone's published Embassy to Caubul in 1818, he states that the sick were carried after him many miles journey; and, at page 28, he says, 'some thought could raise the dead; and there was a story current, that had made and animated a wooden ram at Moolkan, we had sold him as a ram; and that it was not till the purchaser began to eat him, that the material of which it was made was discovered.'—We forbear,' says Sir Richard "to press the subject further."

**DROPPING WELL AT KNARESBOROUGH.**

This dropping well, or petrifying spring, rises at the nose of a limestone rock, at an inconsiderable distance from the bank of the river Nidd. The spring, after running sixty feet, divides, and spreads itself over the top of the rock, whence it trickles very fast, from thirty or forty places, into a channel hallowed for the purpose.
WIGAN WELL.

drop producing a musical kind of tinkling, probably owing to the concavity of the rock, which, bending in a circular projection, from the bottom to the top, occasions its brow to overhang about fifteen feet. This rock, which is about thirty feet in height, forty-eight in length, and from thirty to fifty in breadth, started, in the year 1704, from the common bank, and left a chasm, from five to nine feet wide, over which the water passes by an aqueduct formed for the purpose. It is clothed with evergreens and other shrubs, which add greatly to the beauty of this very inter-

esting scene.

The water is said to abound with fine particles of ainous earth, which it deposits, but when in a languid motion only, and leaves its incrustations on the leaves, through the cavities of the rock. This spring is estimated to send forth twenty gallons of water in a minute. Here are to be seen pieces of moss, birds' nests, with their eggs, and a variety of other objects, some of them very curious, which have been incrusted or petrified by the water.

About a mile from Wigan, in Lancashire, is a spring, the water of which burns like oil. On applying a lighted candle to the surface, a large flame is suddenly produced, and burns vigorously. A dishful of water having been taken up at the part whence the flame issues, and a lighted candle held to it, the flame goes out; notwithstanding which the water in this part boils and rises up like water the hand. What is still more extraordinary, on making a small dam, and preventing the flowing of fresh water to the dry earth at the same point where the water before burned, the flames take fire, and burn with a resplendent flame ascending a foot and a half than the surface of the earth. It is not discoloured, like sulphureous bodies, neither has it any manifest air. The latter unquestionably consist of in-

WIGAN WELL.
SPRINGS AND WELLS.

served that the whole of the country about Wigan, compass of several miles, is underlaid with coal. phenomenon may therefore be referred to the same case, which occasioned the dreadful explosion of Bell's Colliery; but in the present case, this destructive was instead of being pent up in the bowels of the earth, in companies the water in its passage to the surface.

BROSELEY SPRING.

This celebrated boiling spring, or well, at Broseley, Shropshire, was discovered in the month of June, 1711. It was first announced by a terrible noise in the night, there having been a remarkable thunder-storm. Several persons who resided in the vicinity having been awakened in their beds by this loud and rumbling noise, arose, and proceeding to a bog under a small hill, about two hundred yards from the river Severn, perceived a surprising current of motion and shaking of the earth, and a little boiling up of water through the grass. They took a spade, and dug up a portion of the earth, the water immediately flew up to a great height, and was set on fire by a candle which was presented to it. To prevent the spring from being destroyed, an iron cistern has been placed over it, provided with a cover, and a hole in the centre, through which the water may be viewed. If a lighted candle, or any burning substance, be presented to this aperture, the water instantly takes fire, and burns like spirit of wine, continuing to do so as long as the air is kept from it; but on removing the cover of the cistern, it quickly goes out. The apparent boiling and ascent of the water of this spring, are still more obviously the result of hydrogen gas, or inflammable air, than in the preceding instance of Wigan well.

HOT SPRINGS OF ST. MICHAEL.

In the eastern part of this island, or one of the Azores, is a round deep valley surrounded by high mountains, in which are many hot springs; but the most remarkable is that called Caldeira, situated in the eastern part of the valley, on a small eminence by the side of a river, on which is a basin about thirty feet in diameter, where the water continually boils with prodigious fury. A few yards distant from it is
a cavern in the side of a bank, in which the water boils in a
terrible manner, throwing out a thick, muddy, unctuous
water, several yards from its mouth, with a hideous noise.
In the middle of the river are several places where the
water boils with so intense a heat, that a person cannot
dip his finger into it without being scalded. On its banks
are several apertures, out of which the steam rises to a
considerable height, and is so hot that it cannot be approach-
ed by the hand. In other parts, the spectator would be
led to suppose that the bellows of a hundred forges are
blowing in concert; while sulphureous streams issue out
in thousands of places. The bushes even, near these spots,
are covered with pure brimstone, condensed from the
steam which issues from the ground. In the small caverns
in which the steam issues, many of the inhabitants prepare
their food.

HOT SPRINGS OF THE TROAS.

Troy, a country of Phrygia, in Asia Minor, of
which Troy was the capital, abounds with hot springs;
and is particularly interesting one of which is thus described by
the late Dr. Clarke. It is situated near a place called Bonar-
ley, signifying literally "The head of the springs;"
and gushes perpendicularly out of the earth, rising from
the bottom of a marble and granite reservoir, and throwing
up a much water as the famous fountain of Holywell in
Northshire. Its surface seems vehemently boiling; and,
with the cold weather, the condensed vapour above it, causes
an appearance of a cloud of smoke over the well.
When the thermometer stood at 46° in the open air, it rose,
and when it was plunged in the water, to 62°.
In consequence of the warmth of this spring, fishes were
often sported in the reservoir. In every part of the district
through which the Mender flows, from Ida to the Helles-
ontion, are many of these springs, of different degrees of
temperature.

The Geysers have already been described, in treating
Mount Hecla, and its surprising volcano. In following
the details of the phenomena of this nature given above,
we may not be improper to premise that heat,
boiling water, and vapours of various kinds, exist in prodigious
quantities beneath the surface of the earth; and frequently as has been seen in the phenomena of volcanoes and earthquakes, burst forth from enormous openings, with tremendous destruction. It often happens, however, that the openings are small and porous, and that the vapours ascending through them, are simply combined with water. Hence that almost infinite variety in the characters of the springs, fountains, and lakes, the waters of which are combined with extraneous substances. In some cases elastic gases, or vapours, ascend from specific levity and are destitute of all taste and odour; insomuch that springs are found which bubble without boiling, or bearing heat or any other foreign quality. In other cases they are strongly impregnated with heat; and are then either tepid or boiling, according to the proportion of extraneous caloric they contain. Occasionally, whether hot or cold, they are blended with metallic, sulphurous, saline, or other substances, and hence assume the name of mineral waters; while, if the substance thus dissolved be combustible, as naphtha, bitumen, or turpentine, the fountain will often inflame and burn on the application of a lighted torch.

The water of the noted boiling spring at Peroul near Montpelier, is observed to heave and boil up furiously in small bubbles, which manifestly proceed from a vapour breaking out of the earth, and rushing through the water, so as to throw it up with noise, and in little bubbles; for on digging in the vicinity of the spring, and pouring fresh water on the dry newly dug, the same boiling is immediately observed. A similar bubbling of the water is likewise found at Peroul on the sea shore. In several dry places near the spring, are small venti-ducts, passages, or crevices, through which steam issues; and at the mouths of these passages, light bodies, such as feathers, pieces of straw, leaves, etc., being placed, are soon blown away. This vapour, on application of a lighted candle or torch, does not generally take fire, as is the case with that of the boiling springs at Wigan; so that there are two different sorts of steam occasion these boilings, at the same time that the fountains is medicinal, or even warm.

Other boiling waters, of a very different
HOT SPRING AT BATH.

process, like those of the hot springs of St. Michael, a sufficient degree of heat to boil eggs, and to serve for other culinary purposes. Among these may be instanced those of the Solfatara, near Naples; those on the summit of Mount Zebio, in the Modenese territory; and those which constitute the source of the imperial bath at Aix la Chapelle. In Japan, a hot spring is said to burst forth which constantly maintains the boiling point, and the water does not flow regularly, but during an interval of two days each day; and the force and violence of the vapours then so great, that large stones are ejected, and raised to the height of ten or twelve feet, with a noise like that of an explosion of a piece of artillery.

from the phenomena which have been adduced, it appears that the exhalations constantly escaping from the subterraneous magazines in which they are prepared, greatly in their qualities and effects. Some are cold and dry, resembling air or wind, as those near Peroul, in the cavities of mountains, especially those of Æolus, other hills of Italy; as well as in particular mines. Some are inflammable, and of a bituminous nature, not positively warm, as those of Wigan well. Others are very hot, sulphureous, and saline, more especially of the natural stoves, sweating vaults, grottoes, baths, volcanoes near Naples, Baiae, Cuma, and Puzzuoli, also in some of the subterraneous works at Rome. Others, again, are of an arsenical, or other noxious quality, as those of the Grotta del Cane. Now, these streams meeting with, and running through water, occasion in it a great variety of phenomena and

It is observed by Doctor Thomson, in his history of the Royal Society, that the HOT SPRING AT BATH has continued at a temperature higher than that of the air for a period not less than two thousand years, although it is so far from any volcano, that, without a very violent and probable extension of the agency of volcanic fires, it cannot be ascribed to them. There are various decompositions of mineral bodies, which generate considerable heat by its decomposition.
The evolution of azotic gas is a proof that the heat of these waters is owing to a particular decomposition which takes place within the bowels of the earth. The greatest heat of these waters, is 116° of Fahrenheit's scale; and that of the mineral waters of Carlsbad, in Bohemia, ascends to 165°.

**Reciprocating fountains, or springs,** may be cited among the most curious phenomena of nature. Irregularity of flow is not uncommon in boiling springs; but there are other springs which evince a periodical flow and reflux almost as regular as the tides of the ocean. Changes, it will be seen, frequently occur several times in a day, or even in an hour. They are ascribed to various causes, either subterraneous, or superficial; but, in general, there are other springs which evince a periodical flow and reflux almost as regular as the tides of the ocean. In such changes, it will be seen, frequently occur several times in a day, or even in an hour. They are ascribed to various causes, either subterraneous, or superficial; but, in general, there are other springs which evince a periodical flow and reflux almost as regular as the tides of the ocean. In such cases the flux and reflux of the upper head of water must, necessarily, depend on the state of that beneath, and the causes which alternately augment and diminish the latter, must produce a similar effect on the former.

**Paderborn spring,** in Westphalia, disappears twice in twenty-four hours, returning constantly, after a lapse of six hours, with a great noise, and so forcibly as to cause the liquid to shoot up three mills at a short distance from its source. The inhabitants call it the bottlerborn, that is, the boisterous spring. The Lay-well spring, near Torbay, is about six feet in length, five in breadth, and nearly six inches deep. The flux and reflux, which are very visible, are performed in two minutes; when the spring remains at its lowest, for the space of about three minutes. In this way the ebb and flow continue twenty times within the hour. As soon as the water begins to rise, many bubbles ascend more forcibly from the bottom; but on its falling, the bubbling ceases.—**Giggleswick spring,** in the West Riding of Yorkshire, lies at the foot of a hill of limestone rising out of Giggleswick Scar. Its reciprocations are irregular with respect to duration and magnitude, the interval of time between any two succeeding flows being sometimes greater, and at other times less, insomuch that a standard of comparison cannot be formed.
PITCH LAKE OF TRINIDAD.

Near point La Braye, Tar Point, the name assigned to it on account of its characteristic feature, in the Island of Trinidad, is a Lake which at the first view appears to be an expanse of still water, but which, on a nearer approach, is found to be an extensive plain of mineral ground, with frequent crevices and chasms filled with water. When being visited in the autumal season, the singularity of the scene was so great, that it required some time for spectators to recover themselves from their surprise, in order to examine it minutely. The surface of the lake is of an ash colour, and not polished or smooth, so as to bear any weight. It was not adhesive, although it received in part the impression of the foot, and could be trodden without tremulous motion, several head of cattle browsing on its surface is much more yielding, and in a state approaching fluidity, as is evidenced by pieces of wood and other substances, recently thrown in, having been found entangled in it. Even large branches of trees, which were not placed above the level, had, in some way, become entangled in the bituminous matter. The interstices, or holes, are very numerous, ramifying and joining in every
direction; and being filled with water in the wet season, present the only obstacle to walking over the surface. These cavities are in general deep in proportion to their width, and many of them unfathomable: the water they contain is uncontaminated by the pitch, and is the avenue of a variety of fishes. The arrangement of the channels is very singular, the sides invariably shelving from the surface, so as nearly to meet at the bottom, and then bulging out towards each other with a considerable degree of convexity. Several of them have been known to close entirely, without leaving any mark or seam.

The pitch lake of Trinidad contains many islets covered with grass and shrubs, which are the haunts of birds, the most exquisite plumage. Its precise extent cannot any more than its depth, be readily ascertained, the channel between it and the neighbouring soil not being well defined; but its main body may be estimated at three miles in circumference. It is bounded on the north and west by the sea, on the south by a rocky eminence, and on the east by the usual argillaceous soil of the country.

MUD LAKE OF JAVA.

The following details relative to the volcanic spreading of boiling mud in Java are extracted from the Peculier Gazette.

Having received an extraordinary account of a natural phenomenon in the plains of Grobogna, fifty pails north of Solo; a party set off from Solo the 25th Sept. 1814 to examine it.—On approaching the dass or village of Kuhoo, they saw between two tops of trees in a plain, an appearance like the surf breaking over rocks with a strong spray falling leeward. Alighting, they went to the 'Bluddugs,' or Javanese call them. They are situated in the village of Kuhoo, and by Europeans are called by that name. They found them, says the narrator, to be an elevated plain of which about two miles in circumference, in the centre of which immense bodies of soft mud were thrown up to the height of ten to fifteen feet, in the form of large bubbles, which bursting, emitted great volumes of dense white vapour. These large bubbles, of which there were two, sometimes throwing up and bursting seven or eight times in a minute, at times they threw up two or three tons of mud.
perty got to leeward of the smoke, and found it to stink like the washings of a gun barrel.—As the bubbles burst, they threw the mud out from the centre, with a pretty loud report, occasioned by the falling of the mud on that which surrounded it, and of which the plain is composed. It was difficult and dangerous to approach the large bubbles, as the mud was all a quagmire, except where the surface of the plain had become hardened by the sun;—upon this, we approached cautiously to within fifty yards of one of the largest bubbles, or mud-pudding, as it might properly be called, for it was of the consistency of custard-pudding, and about a hundred yards in diameter:—here and there, where the foot accidentally rested on a spot not sufficiently hardened to bear, it sunk—to the no small distress of the walker.

We also got close to a small bubble, (the plain was full of them, of different sizes,) and observed it attentively for some time. It appeared to heave and swell, and, when the aerial air had raised it to some height, it burst, and the mud fell down in concentric circles; in which state it remained quiet until a sufficient quantity of air again formed a bubble, to raise and burst another bubble, and this continued at intervals of from about half a minute to two minutes.

From various other parts of the pudding round the large bubbles, there were occasionally small quantities of sand accompanied by smoke:—this was in parts where the mud at all the places we came near was cold.

The water which drains from the mud is collected by Javanese, and, being exposed in the hollows of split boos to the rays of the sun, deposits crystals of salt. The salt thus made is reserved exclusively for the use of the emperor of Solo; in dry weather it yields thirty dudgis of cattles each, every month, but, in wet or cloudy weather, less.

Next morning we rode two and a half paals to a place called Ram am, to view a salt lake, a mud hillock, various boiling pools.

The lake was about half a mile in circumference, of a grey-looking water, hoiling up all over in gurgling eddies
but more particularly in the centre, which appeared to be a strong spring. The water was quite cold, and bitter, salt, and sour, and had an offensive smell.

About thirty yards from the lake stood the mud-hill which was about fifteen feet high from the level of the earth. The diameter of its base was about twenty yards, and its top about eight feet—and in form an enormous cone. The top is open, and the interior keeps constantly boiling and heaving up like the bluddugs. The hillock is entirely formed of mud which has flowed out of the lake. Every rise of the mud was accompanied by a rumbling noise from the bottom of the hillock, which was distinctly heard for some seconds before the bubble burst;—the outside of the hillock was quite firm. We stood on the edge of the opening and sounded it, and found it to be eleven feet deep. The mud was more liquid than at the bluddugs; no smoke was emitted either from the lake, hillock, or pools.

"Close to the foot of the hillock was a small pool of the same water as the lake, which appeared exactly like a pool of water boiling violently;—it was shallow, except in the centre, into which we thrust a stick twelve feet long and found no bottom. The hole not being perpendicular, we could not sound it without a line.

"About 200 yards from the lake were two very beautiful pools or springs, eight and twelve feet in diameter; they were like the small pool, but boiled more violently, and stunk excessively. We could not sound them to find the bottom, for the same reason which prevented our sounding the small pool.

"We heard the boiling thirty yards before we entered the pools, resembling the noise of a waterfall. These pools did not overflow—of course the bubbling was occasioned by the rising of air alone. The water of the bluddugs and the lake is used medicinally by the Javanese."
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From look to look, contagious through the crowd,
The panic runs, and into wondrous shapes
The appearance throws: armies in meet array,
Throughed with aerial spears and steeds of fire;
Till the long lines of full-extended war
In bleeding sight commiXt, the sanguine flood
Rolls a broad slaughter o'er the plains of heaven.
As thus they scan the visionary scene,
On all sides swells the superstitions din,
Incontinent; and busy frenzy talks
Of blood and battle; cities overturned,
And late at night in swallowing earthquake sunk,
Or hideous wrapt in fierce ascending flame;
Of sorrow famine, inundation, storm;
Of pestilence, and every great distress;
Empires subverted, when ruling fate has struck
Th'unalterable hour: ev'n nature's self
Deemed to totter on the brink of time.
Not so the man of philosophic eye,
And inspect sage; the waving brightness he
Curious surveys, inquisitive to know
The causes, and materials, yet unixed,
Of this appearance beautiful and new.

Thomson.

The nature of these splendid phenomena of the heavens
cannot be so well elucidated as by an extract from the
regions of M. M. Humboldt and Bonpland to the equinoc-
tial regions of the New Continent. The sublime wonders
described by the former of these travellers were witnessed
by them at Cumana, a city of South America, and capital
of the province of that name.

The night of the 11th of November, 1799, was cool
and extremely beautiful. Toward the morning, from half
past two, the most extraordinary luminous meteors were
seen towards the east. M. Bonpland, who had risen to
enjoy the freshness of the air in the gallery, perceived
at first, Thousands of bolides, (fire-balls,) and falling stars,
which passed each other during four hours. Their direction
was very regular, from north to south. They filled a space
in the sky extending from the true east 30° toward the
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north and south. In an amplitude of 60° the meteors were seen to rise above the horizon at east-north-east, and at others to describe arcs more or less extended, falling toward south, after having followed the direction of the meridian. Some of them attained a height of 40°, and all exceeded 25° or 30°. There was very little wind in the low regions of the atmosphere, and this blew from the east. No trace of clouds was to be seen. M. Bonpland relates, from the beginning of the phenomenon, there was not space in the firmament equal in extent to three diameters of the moon, which was not filled at every instant of bolides and falling stars. The first were fewer in number, but as they were seen of different sizes, it was impossible to fix the limit between these two classes of phenomena. All these meteors left luminous traces from five to thirty degrees in length, as often happens in the equinoctial regions. The phosphorescence of these traces, or luminous bands, lasted seven or eight seconds. Many of the bolides had a very distinct nucleus, as large as the brilliant Jupiter, from which darted sparks of vivid light. The bolides seemed to burst as by explosion; but the largest, from 1° to 1° 15' in diameter, disappeared without any tillation, leaving behind them phosphorescent bands whose exceeding in breadth fifteen or twenty minutes, or parts of a degree. The light of these meteors was white and not reddish, which must be attributed, no doubt, to the absence of vapours, and the extreme transparency of the air. For the same reason, under the tropics, the stars of the first magnitude have, at their rising, a light evident whiter than in Europe.

Almost all the inhabitants of Cumana were witnesses of this phenomenon, and did not behold these bolides with indifference; the oldest among them remembered the great earthquakes of 1766 were preceded by similar phenomena. The fishermen in the suburbs asserted, the fire-work had begun at one o'clock; and that, as they returned from fishing in the Gulf, they received very small falling stars toward the east. They affirmed at the same time, that igneous meteors were very rare on those coasts after two in the morning.

The phenomenon ceased by degrees after four o'clock, and the bolides and falling stars became less frequent.
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we still distinguished some toward the north-east, by a whitish light, and the rapidity of their movement, nearer on an hour after sun-rise. This circumstance will prove extraordinary, when I state that in full day-light, 1789, the interior of the houses in the town of Popayan was brightly illuminated by an aerolite of immense magni-

tude. It passed over the town when the sun was shining clearly, about nine o'clock. M. Bonpland and myself, during our second reconnaissance at Cunana, after having observed on the 26th of September, 1800, the immersion of the first satellite of Jupit-
er, succeeded in seeing the planet distinctly with the naked eye, eighteen minutes after the disc of the sun had appeared in the horizon. There was a very slight vapour in the east, Jupiter appeared on an azure sky. These facts prove the extreme purity and transparency of the atmosphere under the equatorial zone. The mass of diffused light is so much diminished that the vapours are more perfectly dissolved. The same cause that weakens the diffusion of the solar light, diminishes the extinction of that which emanates either from the bolides, Jupiter, or the moon, seen on the second day of its conjunction.

The researches of M. Chladni having singularly fixed the position of the scientific world upon the bolides and falling stars, I did not neglect, during the course of our journey from Caracas to the Rio de Oro, to inquire every where, whether the meteors of the 12th of November had been perceived. In a savage country, where the greater number of the inhabitants sleep in the air, so extraordinary a phenomenon could not fail to be remarked, except when concealed by clouds. At Fernando de Apura, a village situate amid the savan-

noirs of the province of Varinas; and the Franciscan monks of the Rio Negro; had seen numberless bolides and bolides illuminate the vault of heaven. The star, four leagues distance. All these observers com-

plained from three till six in the morning. Some of the bolides had marked the day upon their ritual; others had celebrated it by the nearest festivals of the church. Unfor-
fortunately, none of them could recollect the meteors, or their apparent height. From the positions of the mountains and thick forests which surrounded the missions of the cataracts and the little village of Maravitas, I presume that the bolides were still visible at 20° above the horizon. On my arrival at the southern extremity of Spanish Guiana, at the little fort of San Carlos, I found a party of Portuguese, who had gone up the Rio Negro from the Mission of St. Joseph of the Maravitas, who assured me, that in that part of Brazil, the phenomenon had been perceived, at least as far as San Gabriel das Cachoeiras, consequently as far as the equator itself.

"I was powerfully struck at the immense height which these bolides must have attained, to have been visible in the same time at Cumana, and on the frontiers of Brazil, in a line of two hundred and thirty leagues in length. But what was my astonishment, when at my return to Europe, I learnt, that the same phenomenon had been perceived on an extent of the globe of 64° of latitude, 91° of longitude; at the equator, in South America, Labrador, and in Germany! I found accidentally during my passage from Philadelphia to Bordeaux, in the minutes of the Pennsylvanian Society, the corresponding observations of Mr. Ellicott (lat 30° 42'); and, upon my return from Naples to Berlin, I read the account of the Missionaries among the Eskimoes, in the library of Géttingen. Several philosophers had already discussed this period the coincidence of the observations in the north with those at Cumana, which M. Bonpland and I had published in 1800.

"The following is a succinct enumeration of the observations:

1st, the fiery meteors were seen in the east, and the south-east, to 40° of elevation, from 2 h. to 6 h. at Cumana (lat. 10° 27' 52", long. 66° 30'); at Porto Cabello (lat. 6° 52", long. 67° 5'); and on the frontiers of Brazil, near the equator, in the longitude of 70° west of the meridian of Paris. 2d, In French Guiana (lat. 4° 56', long. 54° 35'), the northern part of the sky was seen all of half an hour. Innumerable falling stars traversed the heavens during an hour and a half, and diffused so vivid a light, that those meteors might be compared to the blazing sheaves shot out from a fire-boat.

3d, Mr. Ellicott, astronomer to the United States,
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delivered his trigonometric operations for the rectification of the limits on the Ohio, being, on the 12th of November, 31° 50', saw, in all parts of the sky, 'as many meteors as leadenly, moving in all directions; some appeared to fall peculiarly, and it was expected every minute that they would drop into the vessel.' The same phenomenon was perceived upon the American continent as far as the latitude of 30° 42'. 4th, In Labrador, at Nain (lat. 56° 55'), and Offenthal (lat. 61° 5'), and at New Herrenhut (lat. 64° 14', long. 58° 4'); the Eskimos were frightened at the enormous magnitude of bolides which fell during twilight toward all points of the firmament, some of them being a foot broad.

In Germany, M. Zeissing, vicar of Itterstadt near Weimar (lat. 50° 59', long. 9° 1 east), perceived, on the 10th of November, between the hours of six and seven in the morning, when it was half after two at Cumana, some very stars, which shed a very white light. Soon after, around the south and south-west, luminous rays appeared with four to six feet long; they were reddish, and resembled a luminous track of a sky-rocket. During the morning light, between the hours of seven and eight, the southern part of the sky was seen, from time to time, strongly illuminated by white lightning, which ran in serpentine lines along the horizon. At night the cold increased, and at least 411 leagues. Near Weimar, the appearance like sky-rockets was seen in the north-east; at Cumana, in the east, and in the south-east.

We may therefore conclude, that numberless bolides must have fallen into the sea, between Africa and South-America, to the west of the Cape-Verde Islands, since the direction of the bolides was not the same at Niterói and at Cumana, why were they not perceived in that latter place towards the north, as at Cayenne? I am disposed to think, that the Chayma Indians of Cumana did
missionaries in Labrador; but, at the same time, it cannot
be doubted, and this fact appears to me very remarkable
that in the New World, between the meridians of 40° and
82°, between the equator and 64° north, at the same time
an immense number of bolides and falling stars were per
ceived; and that those meteors had everywhere the same
brilliance, throughout a space of 921,000 square leagues.

"The scientific men who have lately made such rigorous
researches on falling stars and their parallaxes, consider thes
as meteors belonging to the farthest limits of our atmosphe
phere, between the region of the Aurora Borealis and the
of the lightest clouds. Some have been seen, which were
not more than 14,000 toises, or about five leagues of ele
vation. The highest do not appear to exceed thirty leagues. Th
are often more than a hundred feet in diameter; and the
swiftness is such, that they dart, in a few seconds, over
space of two leagues. Some of these have been measured
the direction of which was almost perpendicularly upward,
or forming an angle of 50° with the vertical line.

extremely remarkable circumstance has led to the conclusion
that falling stars are not aërolites, which, after having
hovered about a long time in space, take fire on entering
accidently into our atmosphere, and fall toward the earth.

"Whatever may be the origin of these luminous revolu
tions, it is difficult to conceive any instantaneous inflamma
taking place in a region, where there is less air than in
vacuum of our air-pumps; and where (at 25,000 toises the
mercury in the barometer would not rise to 0.012 line). We have ascertained the uniform mixture of atmosphe
pheric air to 0.003 nearly, only to an elevation of 100
foises: consequently, not beyond the last stratum of atmosphe
Clouds. It might be admitted, that, in the first revolution
of the globe, gaseous substances, which yet remain unknown
to us, may have risen toward that region, through which
the falling stars pass: but accurate experiments, made on
mixtures of gases which have not the same specific grip,
prove, that we cannot admit a superior stratum of atmosphe
atmosphere entirely different from the inferior one. Gaseous
substances mix and penetrate each other with at least motion; and a uniformity of their mixture would ad
the effects of a repulsive action unexampled in the
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Instances which we can subject to our observations. Rather, if we admit the existence of a particular aerial fluid
in the inaccessible regions of luminous meteors, falling stars,
and the Aurora Borealis, how can we conceive why
the whole stratum of those fluids does not at once take fire,
for that the gaseous emanations, like the clouds, occupy only
limited spaces? How can we suppose an electrical explosion
without some vapours collected together, capable of con-
taining unequal charges of electricity, in air, the mean
temperature of which is, perhaps, 25° below the freezing
point of the centigrade thermometer, and the rarefaction of
which is so considerable, that the compression of the
electrical shock could scarcely disengage any heat? These
difficulties would, in great part, be removed, if the direction
of the motion of falling stars allowed us to consider them as
coalescing with a solid nucleus, as cosmic phenomena (belonging
to the limits of our atmosphere) and not as
météoriques phenomena (belonging to our planet only).

Supposing that the meteors of Cumana were only at
the mean height at which falling stars in general move, the
meteoric showers were seen above the horizon in places more
than 310 leagues distant from each other. Now, what an
extraordinary disposition to incandescence must have reigned
the 12th of November, in the higher regions of the
atmosphere, to have furnished, during four hours, myriads
of meteors and falling stars, visible at the equator, in Green-
land and in Germany.

Mr. Benzenberg judiciously observes, that the same
cause which renders the phenomenon more frequent, has
duly an influence on the largeness of the meteors, and the
intensity of their light. In Europe, the nights when there
are the greatest number of falling stars, are those in which
the bright ones are mixed with very small ones. The
unusual brilliancy of the phenomenon augments the interest
it excites. There are months, in which M. Brandes
reckoned in our temperate zone, only sixty or eighty
falling stars in one night; and in other months their number
risen to two thousand. Whenever one is observed,
which has the diameter of Sirius or of Jupiter, we are sure
of being so brilliant a meteor succeeded by a great number
of smaller meteors. If the falling stars be very frequent

T 2
will continue during several weeks. It would seem that in the higher regions of the atmosphere, near that extreme limit where the centrifugal force is balanced by gravitation, there exists, at regular periods, a particular disposition of the production of bolides, falling stars, and the Aurora Borealis. Does the periodicalness of this great phenomenon depend upon the state of the atmosphere? or upon some thing which this atmosphere receives from without, when the earth advances in the ecliptic? Of all this we are as ignorant as men were in the days of Anaxagoras.

"With respect to the falling stars themselves, it appears to me, from my own experience, that they are not frequent in the equinoctial regions than in the tropical zone; more frequent over the continents, and near certain coasts, than in the middle of the ocean. Do the radiations of the surface of the globe, and the electric charge of the lower regions of the atmosphere, which varies according to the nature of the soil, and the positions of the continents and seas, exert their influence as far as those heights, eternal winter reigns? The total absence even of the small clouds, at certain seasons, or above some barren places destitute of vegetation, seems to prove, that this influence can be felt at least as far as five or six thousand miles.

A phenomenon analogous to that of the 12th of November was observed thirty years before, on the table-land of the Andes, in a country studded with volcanoes. At the city of Quito, there was seen, in one part of the sky, above a volcano of Gayambo, so great a number of falling stars, that the mountain was thought to be in flames. This sight lasted more than an hour. The people assembled in the plain of Xico, where a magnificent view presents us of the highest summits of the Cordilleras. A procession of grey already on the point of setting out from the convent of Francis, when it was perceived, that the blaze on the sky was caused by fiery meteors, which ran along the skies in all directions, at the altitude of twelve or thirteen degrees.

The bolides, or fire-balls, and falling stars, so striking an example of which is given above, are of all sizes; from a small shooting star of the fifth magnitude, to a considerable cylinder of two or three miles in diameter. They differ in consistency as much as in dimensions, and in colour, much as in either. Occasionally, they are a subtle, faint
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and pellucid vapour; and sometimes a compact ball, or globe, as though the materials of which they are formed, were more condensed and concentrated. Not unfrequently they have been found to consist of both, and consequently to assume a comet-like appearance, with a nucleus of compact substance in the centre, or towards the centre, and a long, thin, pellucid, or luminous main, or tail, sweeping to each side. They are sometimes of a pale white light; others, of a deep igneous crimson; and, occasionally, condensant and vibratory. The rarer meteors appear frequently to vanish on a sudden, as though abruptly dissolved extinguished in the atmospheric medium, their flight being accompanied by a hissing sound, and their disappearance by an explosion. The most compact of them, or the nuclei of those which are rarer, have often descended to the surface of the earth, and with a force sufficient to bury them many feet under the soil; generally exhibiting marks of imperfect fusion and considerable heat. The substance of these cases, for the greater part metallic; but the constituent proportions, in the same constituent proportions, in the bowels of the earth.

Under this form the projected masses are denomi-

nated aerolites, or meteoric stones.

It may not be uninteresting to preface a succinct account of the most surprising of these meteors, by a brief notice of the hypotheses which have been imagined concerning them; however justly the learned Humboldt may have concluded, in the words of the extract given above, that "as ignorant on this subject as men were in the days of Anaxagoras." Sir J. Pringle contended, with other philosophers, that they are revolving bodies, or a kind of terrestrial planets. Doctor Halley conjectured them to consist of combustible vapours, accumulated and formed concrete bodies on the outskirts, or extreme regions of atmosphere, and to be suddenly set on fire by some unknown cause; an opinion which, with little difference, has ever since entertained by Sir W. Hamilton and Doctor King. M. Blagdon regarded them altogether as electrical pheno-

mena. M. Lézam believed them to consist of volcanic materials, expelled into the atmosphere in the course of explosions of violence. M. Chladni supposed them to be form-
of the earth, and other planets, which have never incor-
ported with them, and are found loose in the vast ocean of
space, being there combined and inflamed by causes un-
known to us. Lastly, the most favourite hypothesis is
that the whole, or, at least, the more compact division of
these meteors, are made up of materials thrown from im-
mense volcanoes in the moon. This hypothesis, which
was started by M. Olbers, in 1795, has been since very
plausibly supported by the celebrated Laplace, but does not
apply to the smaller and less substantial meteors, namely
shooting stars. Hence these philosophers derive the latter
phenomena from some other cause, as electricity, or terres-
trial exhalations; and observe, in support of the distinction,
they find it necessary to make, that shooting stars must be
of a different nature from fire-balls, since they sometimes
appear to ascend as well as to fall. This observation has
been especially dwelt on by MM. Chladni and Benzenburg,
both of them favourably noticed, as accurate observers of
Humboldt.

On the 21st of March, 1676, two hours after sunset, an
extraordinary meteor was seen to pass over Italy. In
Bononia, its greatest altitude in the south-south-east
38°; and at Sienna, 58° towards the north-north-east.
its course, which was from east-north-east to west-south-
west, it passed over the Adriatic sea, as if coming from
Dalmatia. It crossed all Italy, being nearly vertical
Rimini and Savigniano, on the one side, and to Leghorn
the other: its perpendicular altitude was at least thirty-five
miles. At all the places near its course it was heard to emit
missing noise as it passed, like that of artificial fire-works.
passing over Leghorn, it gave a very loud report, like that of
a cannon; immediately after which another sort of sound
was heard, like the rattling of a deeply-loaded waggons
passing over the stones, which continued for several seconds.
The professor of mathematics at Bononia calculated the ap-
parent velocity of this surprising meteor at not less than
hundred and sixty miles in a minute of time, which is
above ten times as swift as the diurnal rotation of the earth
under the equinoctial, and not many times less than the
with which the annual motion of the earth about the sun
performed. It therefore appeared larger than the moon in
diameter, and above half as large again in the ratio of
METEORS.

with the given distance of the eye, made its real diameter above half a mile, and the larger one in proportion. It is, therefore, not surprising, that so great a passing with such an amazing velocity through the atmosphere, it may be in its upper regions, should produce so loud a hissing noise as to be heard at such a distance. It finally went off to sea towards Corsica.

Two luminous meteors of great magnitude were observed near Leipsic within the space of six years. On the 22d of January, 1830, about three in the morning, the first of these was seen, to the great terror of the spectators, descending from the north, and leaving behind it a long white streak where it had passed. As the same phenomenon was witnessed again the north-north-east at Haarburg, and also at Hamburgh, Leipsic, and Stralsund, all of which places are about a hundred and fifty English miles from Leipsic, it was concluded that this meteor was exceedingly high above the earth, and the second meteor was still more terrific. On the 9th of February, 1836, at half past one in the morning, a fire-ball with a tail was observed in 82 degrees of Aquarius, and 4 degrees of Pisces, with a diameter nearly equal to half the moon's diameter. At first, its light was so great that the spectators could see to read by it; after which it gradually disappeared. This phenomenon was observed at the same time at several other places, more especially at Schlaitza, a town distant from Dantzic forty English miles towards the south, where it was observed in 6 degrees of Pisces, and 42 degrees of Aquarius, being about 60 above the southern horizon. At this time it was estimated to be distant not more than sixty English miles, and to be about twenty-four miles perpendicularly above the horizon, so that it was at least thirty miles high in the air.

A very extraordinary meteor, which the common people called a flaming sword, was first seen at Leeds, in Yorkshire, on the 18th of May, 1710, at a quarter after ten at night. Its direction was from south to north: it was broad at one end, and small at the other; and was described by the spectators as resembling a trumpet, moving with the broad end foremost. The light was so sudden and bright, that they were startled at seeing their own shadows, when they thought sun nor moon shone upon them. This meteor was, in course, seen, not only in Yorkshire and Lancashire,
but also in the counties of Nottingham and Derby, notwithstanding which, each of those who observed it, although at many miles distant from each other, fancied it fell within a few yards of him. In disappearing, it presented bright sparklings at the small end.

A blazing meteor was, on the 19th of March, 1718, seen in every part of England. In the metropolis, about a quarter after eight at night, a sudden powerful light was perceived in the west, far exceeding that of the moon, which then shone very bright. The long stream it gave out appeared to be branched about the middle; and the meteor, in its course, turned pear-fashioned, or tapering upwards. At the lower end it came at length to be larger and spherical, although not so large as the full moon. Its colour was whitish, with an eye of blue of a most vivid dazzling lustre, which seemed in brightness very nearly to resemble, not to surpass, that of the body of the sun in a clear day. This brightness obliged the spectator to turn his eyes several times from it, as well when it was a stream, as when it was pear-fashioned and a globe. It seemed to move, half a minute or less, about the length of twenty degrees, and to disappear about as much above the horizon, where it had passed, it left behind a track of a cloudy or fiery reddish yellow colour, such as red-hot iron or glowing coal have: this continued more than a minute, seemed to interrupt, and kept its place without falling. This track was interrupted, or had a chasm towards its upper end, at about two thirds of its length. Not any explosion was heard; but the place where the globe of light had been, continued for some time after it was extinct, of the same reddish yellow colour, with the stream, and at first sparks seemed to issue from it such as proceed from red hot iron beat out on an anvil.

It was agreed by all the spectators in the capital, that the splendour of this meteor was little inferior to that of the sun. Within doors the candles did not give out any light and in the streets, not only all the stars disappeared, but the moon, then nine days old, and high near the meridian, the sky being very clear, was so far effaced as scarcely to be seen: it did not even cast a shade, where the beams of the meteor were intercepted by the houses; so that, for a few seconds of time, there was in every respect a resemblance of perfect day.
The perpendicular height of this surprising meteor was estimated at 64 geometrical miles; and it was computed to have run about 300 of these miles in a minute. It was seen, not only in every part of Great Britain and Ireland, but likewise in Holland, in the hither parts of Germany, in France, and in Spain, nearly at the same instant of time. The accounts from Devonshire, Cornwall, and the neighbouring counties, were unanimous in describing the wonderful noise which followed its explosion. It resembled the report of a large cannon, or rather of a broadside, at some distance, which was soon followed by a rattling noise, as if many small-arms had been promisuously discharged. This tremendous sound was attended by an uncommon tremour of the air; and every where in those counties, not only the windows and doors of the houses were sensibly shaken, but, according to several of the reports, even the houses themselves, beyond the usual effect of cannon, however near.

On the 11th of December, 1741, at seven minutes past one in the afternoon, a globe of fire, somewhat larger than the horizontal full moon, and as bright as the moon appears at any time while the sun is above the horizon, was seen at Steatham, in Surry, in a south-south-east direction, moving towards the east with a continued equable motion, and leaving behind it a narrow streak of light, whiter than the globe itself, throughout its whole course. Towards the end it appeared less than at the beginning of its motion; and in three or four seconds suddenly vanished. Its apparent velocity was nearly equal to half the medium velocity of the ordinary meteors called falling or shooting stars; and in elevation, throughout the whole of its course, about twenty degrees above the horizon.

On the 18th of August, 1783, an uncommon meteor was seen in several parts of Great Britain, as well as on the continent of Europe, rising in the north-north-east, nearly of a globular form, and passing through an elliptical, and gradually assumed a tail as it ascended. At a certain part of its course it underwent a remarkable change, which might be compared to bursting, and which, might to be observed, has been since frequently noticed in the passage of the aërolites, or meteoric stones, particular
longer proceeded as an entire mass, but was apparently divided into a great number, or cluster of balls, some larger than the others, and all carrying a tail, or leaving a train behind. Under this form, it continued its course with a nearly equable motion, dropping, or casting off sparks, and yielding a prodigious light, which illumined all objects to a surprising degree; until, having passed the east, and veering considerably to the southward, it gradually distended, and was at length lost to the sight. The time of its appearance was 9h. 10min. P. M. mean time of the meridian of London, and it continued visible about half a minute.

This beautiful meteor having been seen in Shetland, in the northern parts of Scotland, ascending from the north and rising like the planet Mars, little doubt was entertained of its course having commenced beyond the farthest extremity of this island, somewhere over the northern parts of Denmark. Having proceeded over Essex, and the Straits of Dover, it probably entered the continent not far from Calais and Ostend, it was thought to be vertical. Still holding on its course to the southward, it was seen at Brussels, at Paris, and at Nuits in Burgundy; insomuch that there was sufficient proof of its having traversed thirteen or fourteen degrees of latitude, describing a track of at least one thousand miles over the surface of the earth—a length of course far exceeding the extent of what had been then ascertained of any similar phenomenon.

During the passage of this meteor over Brussels, the moon appeared quite red, but soon recovered its natural light. The results of several observations give it an elevation of more than fifty miles above the surface of the earth, in a region where the air is at least thirty thousand times rarer than here below. Notwithstanding this great elevation, the fact of a report having been heard some time after it disappeared, rests on the testimony of too many witnesses to be controverted. It was compared to the falling of a heavy body in a room above stairs, or to the discharge of one or more large cannon at a distance: this report was loudest in Lincolnshire, and the adjacent counties, and was in the eastern parts of Kent.

Supposing the transverse diameter of this meteor to have subtended an angle of 30 minutes when it passed over the zenith, and that it was fifty miles high, it must have been
METEORS.

I — a mile across. The tail sometimes appeared ten or twelve times longer than the body; but most of this was train, and the real elongation behind seems seldom to have exceeded twice or thrice its transverse diameter; it consequently was between one and two miles in length. Now, if the cubical contents be considered, for it appeared equally round and full in all directions, such an enormous mass must afford just matter of astonishment, when the extreme velocity with which it moved is considered. This velocity, agreeably to the observations of Sir W. Herschel and several other astronomers, could not have been less than 20 miles in a second, exceeding that of sound above ninety times, and approaching toward that of the earth in her annual orbit. At such a rate, it must have passed over the whole island of Great Britain in less than half a minute, and would, in the space of less than seven minutes, have traversed the whole diameter of the earth!

On the 4th of October of the above year, 1783, two meteors were seen in England. The first, at three in the morning, on account of the early hour, was witnessed by but few spectators, who represented it as rising from the north to a small altitude, and then becoming stationary with a vibratory motion, and an illumination like day-light: it vanished in a few moments, leaving a train behind. This out of tremulous appearance has been noticed in other eaeors, as well as their continuing stationary for some time, either before they begin to shoot, or after their course ended. The second of these meteors appeared at forty-three minutes past six in the evening, and was much smaller, and also of much shorter duration, than the one seen in August. It was first observed to the north, like a stream of fire, similar to that of the common shooting stars, but large; and having proceeded some distance under this form, suddenly burst out into that intensely bright blueish light, peculiar to such meteors, which may be most aptly compared to the blue lights of India, or to some of the brightest electrical sparks. The illumination was very great; on that part of its course where it had been so bright, a dusky red streak or train was left, which remained invisible about a minute, and was thought by some gradually to change its form. Except this train, the meteor had not any tail, but was nearly of a round body, or, perhaps, some-
what elliptical. After moving not less than ten degrees in this bright state, it became suddenly extinct, without any appearance of bursting or explosion.

AÉROLITES.

These phenomena, otherwise entitled meteoric stones, have been ascertained, by recent observations, to be connected with the bolides, or fire-balls, described above. Scoriaceous masses have frequently been either actually seen to fall at the time of the disappearance of the latter, or have been found soon after on the surface of the earth. Most of the stones which have fallen from the atmosphere have been preceded by the appearance of luminous bodies, or meteors. These meteors burst with an explosion, and then the shower of stones falls to the earth. Sometimes the stones continue luminous till they sink into the earth; but most commonly their luminousness disappears at the time of their explosion. These meteors move in a direction nearly horizontal, and seem to approach the earth before they explode.

The stony bodies, when found immediately after their descent, are always hot. They commonly bury themselves some depth under ground. Their size differs, from fragments of a very inconsiderable weight, to masses of several tons. They usually approach the sphericall form, and are always covered with a black crust; in many cases they smell strongly of sulphur. The black crust consists chiefly of oxide of iron; and from several accurate analyses of these stones, the following important inferences have been drawn: that not any other bodies have as yet been discovered on our globe which contain the same ingredients; and that they have made us acquainted with a species of pyrites not formerly known, nor any where else to be found.

The ancients were not unacquainted with these meteoric stones, a shower of which is reported by Livy to have fallen at Rome under the Consulate of Tullus Hostilius, and another under that of C. Martius and M. Torquatus. Pliny relates that a shower of iron (for thus he designates these stones) fell in Lucania, a year before the defeat of Crassus, and likewise speaks of a very large stone which fell near
AEROLITES.

In the chronicle of Count Marcellin, there is an account of three immensely large stones having fallen in Thrace, in the year 452 before the Christian era. To proceed to more modern, and well-authenticated instances of the fall of ærolites.

On the 7th of November, 1492, a little before noon, a dreadful thunder-clap was heard at Ensisheim, in Alsace, instantly after which a child saw a huge stone fall on a field newly sown with wheat. On searching, it was found to have penetrated the earth about three feet, and weighed 1200lbs., making its size equal to a cube of thirteen inches side. All the contemporary writers agree in the reality of this phenomenon, observing that, if such a stone had before existed in a ploughed land, it must have been known to the proprietor.

The celebrated astronomer Gassendi relates an instance of an ærolitic descent of which he was himself an eye-witness. On the 27th of November, 1627, the sky being clear, he saw a burning stone fall on Mont Vaisir, in the south-east extremity of France, near Nice. While in the air, it seemed about four feet in diameter; was inclosed in a luminous sphere of colours like a rainbow; and in its fall produced a sound like the discharge of cannon. It weighed 59lbs. very hard, of a dull metallic colour, and had a specific gravity considerably greater than that of marble.

In the year 1672, two stones fell near Verona, in Italy, one weighing 300, the other 200lbs. This phenomenon was witnessed in the evening, by three or four hundred spectators. The stones fell, with a violent explosion, in a flying direction, and in calm weather. They appeared to rise and ploughed up the ground.

Paul Lucas, the traveller, relates that when he was at Panticapaeum, a town of Greece, near the gulf of Salonica, a stone weighing 72lbs. fell in the vicinity. It was observed to come from the northward, with a loud hissing sound, and seemed to be enveloped in a small cloud, which preceded when the stone fell. It looked like iron dross, and smelt of sulphur.

In September 1753, several stones fell in the province of Thessaly, to the west of Geneva: one in particular fell at Pont-de-Vesle, and another at Liponas, places three miles distant from each other. The sky was clear,
and the weather warm. A loud noise, and a hissing sound were heard at those two places, and for several miles round, on the fall of these stones, which exactly resembled each other, were of a darkish dull colour, very ponderous, and manifesting on their surface that they had suffered a violent degree of heat. The largest weighed about 200 lbs. and penetrated about six inches into the ploughed ground, a circumstance which renders it highly improbable that they could have existed there before the explosion. This phenomenon has been described by the astronomer Delétinne, whose strict enquiries on the spot enabled him to testify the truth of the circumstances he relates.

In the year 1768, three stones were presented to the French Academy of Sciences, which had fallen in different parts of France; one at Lucé, in the Maine; another at Aire, in Artois; and the third in Cotentin. They were externally of the same identical appearance; and on one of them a particular report was drawn up by Messrs. Fougeraux, Cadet, and Lavoisier. This report states that on the 18th of September, 1768, between four and five in the afternoon, there was seen, near the above village of Lucé, a cloud in which a short explosion took place, followed by a hissing noise, but without any flame. The same sound was heard by several persons about ten miles from Lucé; and, on looking up, they perceived an opaque body, which describe a curve in the air, and fall on a piece of green turf near the high road. They immediately ran to the spot, where they found a kind of stone about 7½ lbs. buried in the earth, extremely hot, and weighing about

In the particular instance now to be cited, very distinct traces were left to show the progress of aérolites through the air. During the explosion of a meteor near Bordeaux, on 20th of August, 1789, a stone in diameter about five inches, fell through the roof of a cottage, and killed a young man and some cattle. Part of this stone is now in the Greville Museum, and part in the Museum of Bordeaux.

On the 24th of July, 1790, between nine and ten at night, a shower of stones fell near Agen, in Guienne, near the south-west angle of France. First a luminous ball of fire was seen, traversing the atmosphere with great rapidity, leaving behind it a train of light which lasted about

ATMOSPHERICAL PHENOMENA.
AEROLITES.

soon after this a loud explosion was heard, and stones were seen to fly off in all directions. This was soon followed by the fall of stones, over a considerable extent of ground, and at various distances from each other. The stones were all alike in appearance, but of many different weights; some falling with a hissing noise, others entered the ground; but the smaller ones remained on the surface. The only damage done by this shower of stones was, that they broke the tiles of several houses, in losing which they had not the sound of hard and compact substances, but of a matter in a soft half-melted state. As fell on straws adhered to them, and could not be easily separated; — a manifest proof that they were in a state of fusion.

On the 18th of December, 1795, several persons, near the house of Captain Topham, in Yorkshire, heard a loud noise in the air, followed by a hissing sound, and soon after felt a rush, as if a heavy body had fallen to the ground at a little distance from them. In reality, one of them saw a huge fragment fall to the earth, at the distance of eight or nine yards from the place where he stood. When he first observed it, it was seven or eight yards above the ground; and in its fall it drew up the mould on every side, burying itself twenty inches in the earth. This stone, on being dug up, was found to weigh 56 lbs.

On the 17th of March, 1796, a body, burning with an intense light, passed over the vicinity of Ville Franche, on the Saone, near Lyons, accompanied by a hissing sound, leaving behind a luminous track. This phenomenon exploded with a great noise, about twelve hundred feet from the ground, and one of the splinters, still luminous, having been observed to fall in a neighbouring vineyard, was traced. The body was about a foot in diameter, and had penetrated twenty inches into the ground.

On the 4th of July, 1803, a ball of fire struck a public house at East Norton, in Oxfordshire. The chimney was blown down, the roof partly torn off, the windows shattered to atoms, and the dairy, &c. converted into a heap of rubbish. It was of considerable magnitude, and, on coming into contact with the house, exploded with great noise, and gave a very oppressive sulphureous smell. Several fragments of
stones were found on the spot, having a surface of a dark colour, and varnished as if in a state of fusion, with numerous globules of a whitish metal, combining sulphur and nickel. The indentures on these surfaces render it probable that the ball was soft when it descended; and it was obviously in a state of fusion, as the grass, &c. were burnt where the fragments fell. The motion of this fire-ball, while in the air, was very rapid, and apparently parallel to the horizon.

The latest remarkable fall of aërolites in Europe, of which there is a distinct account, was in the vicinity of Laigle in Normandy, early in the afternoon of the 26th of April 1812. A fiery globe of a very brilliant splendour, which moved in the air with great rapidity, was followed in a few seconds by a violent explosion, which lasted five or six minutes, and was heard to the extent of more than thirty leagues in every direction. Three or four reports, like those of a cannon, were followed by a discharge resembling a shower of musketry, after which a dreadful rumbling was heard like the beating of a drum. The air was calm, and the sky serene, with the exception of a few clouds, such as are frequently observed. The noise proceeded from a dense cloud of a rectangular form, the largest side being in the direction from east to west. It appeared motionless all the time the phenomenon lasted; but the vapour of which it was composed was projected momentarily from the different sides by the effect of the successive explosions. This cloud was about half a league to the north-north-east of the town of Laigle, and was at so great an elevation, that the inhabitants of two hamlets, a league distant from each other, saw it at the same time over their heads. In the whole country over which this cloud hovered, a hissing noise, like the sound of a stone discharged from a sling, was heard; and a multitude of meteoric stones were seen to fall at the same time.

The district in which they fell forms an elliptical area of about two leagues and a half in length, and nearly one in breadth; the greatest dimension being in a direction from south-east to north-west, forming a declination of about 22°. This direction, which the meteor must have followed is exactly that of the magnetic meridian; which is a remarkable result. The number of these stones was reckoned to
They subsequently acquired the degree of hardness common to these stones.

While, in Europe, these phenomena thus strongly confirmed the long-exploded idea of the vulgar, that many of the luminous meteors observed in the atmosphere, are masses of ignited matter, an account of one of precisely the same description was received from the East Indies. On the 19th of December, 1798, at eight in the evening, a large fire-ball, or luminous meteor, was seen at Benares, and at several places in its vicinity. It was attended by a loud rumbling noise; and, about the same time, the inhabitants of Krakhat, fourteen miles from Benares, saw the light, heard what resembled a loud thunder-clap, and, immediately after, the noise of heavy bodies falling around them. Next morning mould in the fields was found to have been turned up at many spots; and unusual stones of various sizes, but of the same substances, were picked out of the moist soil, generally from a depth of six inches. One stone fell through the roof of a hut, and buried itself in the earthen roof.

From these multiplied evidences it is proved that, in various parts of the world, luminous meteors have been moving through the air with surprising rapidity, in a direction more or less oblique, accompanied with a noise, commonly like the whizzing of cannon balls, followed by explosion, and the fall of hard, stony, or semi-metallic substances in a heated state. The constant whizzing sound; the fact of stones being found, similar to each other, but unlike all others in the vicinity, at the spots towards which the luminous body, or its fragments had been seen to move; the scattering or ploughing up of the soil at those spots, in proportion to the size of the stones; the concussion on the neighbouring ground at the same time; and, especially, the impinging of the stones on bodies somewhat above the earth, or lying loose on its surface, are circumstances perfectly well authenticated in these reports; proving that such meteors are usually inflamed hard masses, descending rapidly through the air to the earth.
AURORA BOREALIS, AND AURORA AUSTRALIS.

These splendid meteors are generally considered as the result of a combination of the two powers of magnetism and electricity. When the light, or aurora, appears chiefly in the north part of the heavens, it is called the aurora borealis, or northern lights; and when chiefly in the south part, the aurora australis, or southern lights. Where the coruscation is more than ordinary bright and streaming, which, however, seldom occurs in the north, it is denominated lumen boreale; and when these streams have assumed a decided curvature, like that of the rainbow, they are distinguished by the name luminous arches.

The aurora is chiefly visible in the winter season, and in cold weather. It is usually of a reddish colour, declining to yellow, and sends out frequent coruscations of pale light, which seem to rise from the horizon in a pimidal, undulating form, shooting with great velocity up to the zenith. This meteor never appears near the equator, but of late years has frequently been seen toward the south pole.

The aurora borealis has appeared at some periods more frequently than at others. This phenomenon was so rare in England, or so little regarded, that its appearance was not recorded in our annals between a remarkable one observed on the 14th of November, 1554, and a very brilliant one on the 6th of March, 1716, and the two succeeding nights, but which was much strongest on the last night. Hence it may be inferred, that the state of either the air or earth, or perhaps of both, is not at all times fitted for its production.

The extent of these appearances is surprisingly great. The very brilliant one referred to above was visible from the west of Ireland to the confines of Russia, and east of Poland, extending over, at the least, thirty degrees of longitude, and, from about the fiftieth degree of latitude, over almost all the northern part of Europe, every place, it exhibited, at the same time, the same wonderful features. The elevation of these lights is equally surprizing: an aurora borealis which appeared on the 16th
December, 1737, was ascertained, by a mean of thirty
computations, to have an average height from the earth of
375 leagues, equal to 464 English miles.
Captain Cook, in his first voyage round the world, ob-
erved that these coruscations are frequently visible in
southern latitudes. On the 16th of September, 1770, he
witnessed an appearance of this kind about ten at night,
consisting of a dull, reddish light, and extending about
twenty degrees above the horizon. Its extent was very
different at different times, but it was never less than eight
points of the compass. Rays of light, of a brighter
shade, passed through and without it; and these rays
continued, without diminution of its brightness, till twelve o'clock, when
observers retired. The ship was at this time within the

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observers retired. The ship was at this time within the

LUMEN BOREALE.

On the 17th of February, 1773, during his second
voyage, Captain Cook speaks of a beautiful phenomenon
which was observed in the heavens. " It consisted of
long columns of a clear white light, shooting up from
the horizon to the eastward, almost to the zenith, and
spreading gradually over the whole southern parts of
the sky. These columns even sometimes bent sideways
at their upper extremity; and, although in most respects
similar to the northern lights (the aurora borealis of
our hemisphere) yet differed from them in being always
of a whitish colour; whereas ours assume various tints,
especially those of a fiery and purple hue. The stars
were sometimes hidden by, and sometimes faintly to
be seen through the substance of these southern lights,
aurora australis. The sky was generally clear when
they appeared, and the air sharp and cold, the mercury
in the thermometer standing at the freezing point; the
ship being then in 58 degrees south." On six different

LUMEN BOREALE, OR STREAMING LIGHTS.

On the 8th of October, 1726, uncommon streams of light
were exhibited in every part of the heavens, about eight
o'clock in the evening. They were seen throughout Europe, and in the southern parts of America. They were mostly pointed, and of different lengths, assuming the appearance of flaming spires or pyramids; some were truncated, and reached but half way; while others had their points reaching up to the zenith, or near it. Where they formed a sort of canopy, or thin cloud, sometimes red, sometimes brownish, sometimes blazing as if on fire, and sometimes emitting streams all around it. This canopy was manifestly formed by the matter carried up by the streaming on all parts of the horizon. It sometimes seemed to ascend with a force, as if impelled by the petus of some explosive agent below; and this force, ascent of the streaming matter gave a motion to the canopy, and sometimes a gyration, like that of a whirlwind. This was manifestly caused by the streams striking the outer part of the canopy; but if they struck the canopy in the centre, all was then confusion. The vapours between the spires, or pyramids, were of a blood-red colour and gave those parts of the atmosphere the appearance of blazing lances, and bloody-coloured pillars. There was also a strange commotion among the streams, as if some large cloud or other body was moving behind and disturbing them. In the northern and southern parts the streams were perpendicular to the horizon; but in the intermediate points they seemed to decline more or less in one way or the other; or rather to incline towards the meridian. Several persons declared that, in the time of the streaming, they heard a hissing, and in some places a cracking noise, like what is reported to be often heard in earthquakes.

At Naples, on the 16th of December, 1757, early in the evening, a light was observed in the north, as if the air was on fire, and flashing. Its intenseness gradually increasing, about seven o'clock it spread to the westward. Its greatest height was about 65 degrees. Its extremity, followed the course of the westerly wind; so that for a few hours, spread considerably wider, yet without ever reaching the zenith. About eight o'clock, a very regular arch, of parabolic figure, was seen to rise gently, to two degrees of rectangular elevation, and to twenty degrees of horizontal amplitude. At ten the intenseness of the colour.
At Padua, on the appearance of this extraordinary meteor, the air was calm, and the barometer remarkably high. Five in the afternoon a blackish zone, with its upper limb of a sky-colour, appeared near the horizon; and above this zone was another, very luminous, resembling the sun pretty far advanced. The highest zone was of a fiery colour. A little after six o'clock, the upper parts of these zones emitted an abundance of red streamings, or their vivid colour being occasionally intermixed with white and darkish spots. In a few seconds after, there issued from the west, a red and very bright column, which extended to the third part of the heavens, and which, a little after, became curved like a rainbow. At half past six, almost instantaneously, the bright zone, from eight degrees west to fifty degrees east, became more vivid, rose higher; and above this appeared a new large one, red fiery colour, with several successive streamings streaming upward, and exceeding sixty degrees of altitude; the western part having assumed the form of a thin cloud. At Bononia, this surprising meteor spread to such an extent as to occupy about one hundred and forty degrees of heavens. Its light was so vivid that houses could be distinguished, at eight in the evening, at a very considerable distance; and these were so reddened, that many persons supposed there was a fire in the neighbourhood. At that time the aurora formed itself into a concave arch towards the horizon; and in half an hour, at its eastern limit, a break of light, between a white and a yellow colour, went to terminate in the pyramid. At the upper part, a considerable tract of the heavens was enlightened by very vivid red light, which was interrupted by several streamings or columns of a bright yellowish light. These streamings shot up vertically, and parallel to each other, a narrow cloud seeming to serve them as a basis. Under this cloud there issued forth two tails of a whitish light,
hanging downward on a basis of a weak red, and seemed to kindle and dart the light downward. A white streak which passed across these two tails, and extended from one end of the phenomenon to the other, in a position almost parallel to the above-mentioned cloud, gave a spark to the whole. This surprising meteor disappeared a little after nine o’clock; but an abundance of falling stars were afterwards seen in the south.

Similar observations were made at Rome; but in Great Britain, where this phenomenon was likewise seen, different appearances were displayed. At Edinburgh, six in the evening, the sky appeared to be in flames. A arch of red light reached from the west, over the earth to the east, its northern border being tinged with a colour approaching to blue. This aurora did not form in the north, as usually happens, and after form an arch there, rise toward the zenith; neither did light shiver, and spread itself, by sudden jerks, over the hemisphere as is common; but gradually and gently along the face of the heavens, till it had covered the whole hemisphere: this alarmed the vulgar, and was indeed strange sight. At Rosehill, in Sussex, it appeared a strong and very steady light, nearly of the colour of ochre. It did not dart or flash, but kept a steady course against the wind, which blew fresh from the south-east. It began in the north-north-west, in form of a point light, at a quarter past six in the evening; in about 16 minutes a fourth part of it divided from the rest, never joined again. In ten minutes more it described an arch, but did not join at top; and at seven o’clock formed a bow, disappearing soon after. It was light and reddest at the horizon, and gave as much light as a moon.

LUMINOUS ARCHES.

In the month of March, 1774, a very beautiful luminous arch was seen at Buxton. It was white, inclining to yellow, and its breadth in the crown was apparently equal to that of the rainbow. As it approached the horizon, each of the arch became gradually broader. It was stationary, and free from any sensible coruscations. It formed from north-east to south-west; and its crown of
IGNES FATUI; OR MOCK FIRES.

The grandest spectacle of this kind which appears to have been seen in Great Britain, was observed at Leeds, in Yorkshire, on the 12th of April, 1783, between the hours of nine and ten at night. A broad arch of a bright pale yellow, and having an apparent breadth of about fifteen degrees, arose in the heavens, and passed considerably south of the zenith. Such was its varied density, that it appeared to consist of small columns of light, having a visible motion. After about ten minutes innumerable electric sparkings shot out at right angles from its northern edge, elongating themselves more and more till they had nearly reached the northern horizon. As they descended, their extremities were tipped with an elegant crimson, such produced by the electric spark in an exhausted tube. After some time this beautiful northern light ceased to extend horizontally about the fourth of a circle, its greatest portion, which darted from this arch towards the earth, as well as the cloud-like and more stationary aurora, became so dense as to hide the stars from view. The arch was eleven days old, and shone brightly during this night.

A similar phenomenon was observed at Leeds on the 26th of the same month. From a mass, or broad column of light in the west, issued three luminous arches, each of which bore a different angle with the horizon. They had not been viewed many minutes when they were rendered invisible by a general blaze of aurora borealis, which possessed the space just before occupied by these arches.

IGNES FATUI, OR MOCK-FIRES.

Those meteors, denominated by the vulgar Will-with-a-lantern, and Jack-with-a-lantern; and, at sea, or on the

Mariners' lights, or St. Helmo's fires, are now considered as real exhalations from the earth, produced by

vapour, or some other attenuated substance, emanating from vegetable, animal, or mineral materials, and com-

bined with the matter of light or heat, or both. Instead
of being dense or solid, they are uniformly rare and subtile, and, instead of originating in the loftiest regions of the atmosphere, or beyond its range, are generated for the greater part in low marshy plains or valleys. To the fearsome and superstitious they are a source of as much terror as are the nobler and sublimier meteors which have just been enumerated; and it is probable that they have occasioned the greatest part of the damage and extensive damage, when in a state of actual combustion; and that they have still more frequently seduced timid and benighted travellers and endangered bogs and quagmires.

In Italy, in the Bolognese territory, they are frequent, in the morass grounds, that they are to be seen every night, some of them affording as much light as a kindled torch, and others not being larger than the head of a candle, but all of them so luminous as to shed a light on the surrounding objects. They are constantly in motion, but this motion is various and uncertain. They sometimes rise, and at other times sink, occasionally disappearing, sudden, and appearing again in an instant in some other place. They usually hover about six feet from the ground, differing both in figure and size, and spreading and contracting themselves alternately. Sometimes they appear to appearance into two parts, soon after uniting into one body; and at intervals float like waves, letting fall portions of ignited matter, like sparks from a fire. They are more frequently observed in winter than in summer, and cast the strongest light in rainy and moist weather. They are most friendly to the banks of brooks and rivers and to morasses; but are likewise seen on elevated grounds where they are, however, of a comparatively diminutive size.

In the month of March, 1728, a traveller being on a mountainous road, about ten miles south of Bologna, perceived, as he approached the river Riverade, better, eight and nine in the evening, a light shining very brightly on some stones which lay on the banks. It was elevated about two feet above them; its figure describing a parallelogram, more than a foot in length, and about two inches high, its longest side lying parallel to the horizon. Its light was so strong that he could distinguish by it very plainly a part of a neighbouring hedge, and water in the river. On a near approach it changed into
ill b, IGNES FATLI; OR MOCK FIRES. 433

A bright red to a yellowish colour; and on drawing still nearer became pale; but when the observer reached the spot, it vanished. On his stepping back, he not only saw it again, but found that the farther he receded, the stronger and more luminous it became. This light was afterwards seen several times, both in Spring and Autumn, precisely at the same spot, and preserving the same shape.

On the 12th of December, 1776, several very remarkable ignes fatui were observed on the road to Bromsgrove, five miles from Birmingham, a little before daylight. A great many of these lights were playing in an adjacent field, in different directions; from some of which there suddenly sprang up bright branches of light, something resembling the explosion of a rocket, filled with many brilliant stars, if, in the case of the latter, the discharge was supposed to be upward, or vertical, instead of taking the usual direction. The hedge, and the trees on each side, were strongly illuminated. This appearance continued a few seconds only, when the ignes fatui played as before. The spectator was not sufficiently near to observe whether the apparent explosions were attended with any effect.

In the month of December, 1693, between the 24th and 30th, a fiery exhalation, without doubt generated in the same way with the meteors described above, set fire to several ricks of hay, and two barns filled with corn and hay, at the village of Hartech, in Pembrokeshire. It had not only fired the hay, but poisoned the grass, for the extent of a mile, so as to induce a distemper among the cattle. It was a weak blue flame, easily extinguished, and did not in the least burn any of the men who interposed to save the hay, although they ventured, even close to it, but sometimes into it. All the damage caused happened constantly in the night.

Belonging to this class of meteors is the DRACO VOLANS, a very exhalation, frequent in marshy and cold countries. It is most common in summer; and, although principally

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appearance is that of an oblong, sometimes roundish, body, with a long tail. It is entirely harmless, frequently sticking to the hands and clothes of the spectators, doing them the least injury.

SPECTRE OF THE BROKEN.

This is one of those curious and interesting atmospheric phenomena, or deceptions, which proceed from one common cause, an irregularity in the tenuity of the atmospheric fluid. This fluid is commonly of an homogeneous, equable tenuity, and consequently suffers the rays of the sun to penetrate it without any obstruction or change; but it is at times irregular, and composed of parts or bodies of denser medium than its general texture and constitution. Under these circumstances, the fluent ray, if it do not pass the denser medium in a direct or perpendicular line, will be either reflected, or refracted, or both; and an object surveyed through it, will assume a new, and, unfrequently, a grotesque or highly magnified appearance.

The Spectre of the Broken is an aerial figure which is sometimes seen among the Hartz mountains in Hanover. This phenomenon has been witnessed by various travellers, and, among them, by M. Haue, from whose relations the following particulars are extracted. "Having ascended the Broken (mountain) for the thirtieth time, I was length so fortunate as to have the pleasure of seeing a phenomenon. The sun rose about four o'clock, and atmosphere being quite serene towards the east, its could pass without any obstruction over the Heurichalm mountain. In the south-west, however, towards the town Achtermannshöhe, a brisk west wind carried thin transparent vapours. About a quarter past four I knocked round, to see whether the atmosphere would permit to have a free prospect to the south-west, when I served, at a very great distance towards the Achtermannshöhe, a human figure of a monstrous size! A gust of wind having almost carried away my arm, clapped my hand to it; and in moving my arm towards my head, the colossal figure did the same.

"The pleasure which I felt at this discovery can hardly be described; for I had already walked many a time
up in the hope of seeing this shadowy image, without being ably to gratify my curiosity. I immediately made another movement, by bending my body, and the colossal figure before me repeated it. I was desirous of doing the same thing once more, but my colossus had vanished. I remained in the same position, waiting to see whether it would return; and in a few minutes it again made its appearance on the Achtermannshöhe. I then called the landlord of the neighbouring inn, and having both taken the position which I had taken alone, we looked towards the Achtermannshöhe, but did not perceive any thing. We had not, however, stood long, when two such colossal figures were formed over the above eminence, which repeated their compliments by nodding their bodies as we did, after which they vanished. We retained our position, kept our eyes fixed on the spot, and in a little time the two figures again stood before us, and were joined by a third.” [that of a traveller then came up and joined the party.] “Every movement made by us, these figures imitated; but with this difference, that the phenomenon was sometimes weak and faint, sometimes strong and well defined.”

Clarke’s “Survey of the Lakes,” a phenomenon similar to that of the Spectre of the Broken, is recorded to have been observed in the years 1743, and 1744, on Souter Fell, a mountain in Cumberland. It excited much confusion and alarm at the time, and exposed to great ridicule those who asserted they had witnessed it. It is, however, too well attested not to deserve a short notice here, and may be referred to the same causes by which the above images on the Broken mountain were produced. The mountain is as follows.

Souter Fell is a mountain about half a mile in height, situated on the north and west sides by precipitous rocks, somewhat more open on the east, and easier of access. At Walton Hall, within half a mile of this mountain, on a winter’s evening, in the year 1743, a farmer and his servant, sitting at the door, saw the figure of a man with a horse pursuing some horses along Souter Fell side, a place so steep that a horse could scarcely travel on it. They appeared to run at an amazing pace, till they got out of sight at the lower end of the Fell. On the following morning
the farmer and his servant ascended the steep side of the mountain, in full expectation that they should find the man lying dead, being persuaded that the swiftness with which he ran must have killed him; and imagined also that they should pick up some of the shoes which they thought the horses must have lost, in galloping at so furious a pace. They were, however, disappointed, as not the least vestige of either man or horses appeared, not so much as the marks of a horse's hoof on the turf.

On the 23d of June of the following year, 1744, about half past seven in the evening, the same servant, then residing at Blakehills, at an equal distance from the mounta

tain, being in a field in front of the farm-house, saw a troop of horsemen riding on Souter-Fell side, in pretty close ranks, and at a brisk pace. Having observed them some time, he called out his young master, who, before the spot was pointed out to him, discovered the six troopers; and this phenomenon was shortly after witnessed by the whole of the family. The visionary horsemens appeared to come from the lowest part of Souter-Fell, were visible at a place called Knott: they then moved regular troops along the side of the Fell, till they came opposite to Blakehills, when they went over the mountain. They thus described a kind of curvilinear path, and the first, as well as their last appearance, was bounded by the foot of the mountain. Their pace was that of a rapid swift walk; and they were seen for upwards of two hours in darkness intervened. Several troops were in succession, and frequently the last, or last but one, of a troop, would quit his position, gallop to the front, then observe the same pace with the others. The sudden change was visible to all the spectators; and the sight of this phenomenon was not confined to Blakehills, but was witnessed by the inhabitants of the cottages within a mile of the spot.

It was attested before a magistrate by the two above-named individuals in the month of July, 1785. Twenty-two persons are said in the attestation to have witnessed the march of these aerial travellers.

It should be remarked that these appearances were ob

served on the eve of the rebellion, when troops of men might be privately exercising; and as the powers of the Spectre of the Broken demonstrate that
sections of human beings are sometimes pictured in the
clouds, it seems highly probable, on a consideration of all
the circumstances of this latter phenomenon on Soutter
hil, that certain thin vapours must have hovered round
the summit of the mountain when the appearances were
observed. It is also probable that these vapours may have
been impressed with the shadowy forms which seemed to
imitate humanity," by a particular operation of the sun's
rays, united with some singular, but unknown, refractive
combinations then taking place in the atmosphere.

THE MIRAGE.

This very curious phenomenon, which was remarked
by M. Monge, one of the French savants belonging to the
Institute of Cairo, in the hot and sandy desert between
Alexandria and that city, is described by him as resulting
from an inverted image of the cerulean sky intermixed with
the ground scenery, the neighbouring villages appearing to
be surrounded with the most beautiful sheeting of water,
and to exist, like islands, in its liquid expanse, tantalizing
the eye by an unfaithful representation of what the thirsty
traveller earnestly desires.

Doctor Clarke, in his interesting travels, introduces the
following animated description of this phenomenon. "Here
[the village of Utko] we procured asses for our party,
setting out for Rosetta, began to re-cross the desert, ap-
ting like an ocean of sand, but flatter and firmer as to
surface, than before. The Arabs, uttering their harsh
Arabic language, ran chattering by the side of our asses;
and some of them calling out 'Roschid!' we perceived
the immense lake or sea, that covered all the intervening
space between us and the city. Not having in my own
sight, at the time, any doubt as to the certainty of its being
a lake, and seeing the tall minarets and buildings of Rosetta,
all its groves of dates and sycamores, as perfectly
delineated by it as by a mirror, insomuch that even the
detail of the architecture, and of the trees, might
have been thence delineated, I applied to the Arabs to be
informed in what manner we were to pass the water. Our in-
tricacy, although a Greek, and therefore likely to have been
informed of such a phenomenon, was as fully convinced as any of us that we were drawing near to the water's edge, and became indignant, when the Arabs maintained, that within an hour we should reach Rosetta, by crossing the sands in the direct line we then pursued, and that there was no water. 'What,' said he, giving way to his impatience, 'do you suppose me an idiot, to be persuaded contrary to the evidence of my senses?' The Arabs, smiling, soon pacified him, and completely astonished the whole party, by desiring us to look back at the desert we had already passed, where we beheld a precisely similar appearance. It was, in fact, the mirage, a prodigy to which every one of us were then strangers, although it afterwards became more familiar. Yet upon no future occasion did we ever behold this extraordinary illusion so marvellously displayed. The view of it afforded us ideas of the horrible despondency to which travellers must sometimes be exposed, who, traversing the interminable desert, destitute of water, and perishing with thirst, have sometimes this deceitful prospect before their eyes."

This appearance is often seen, when the sun shines upon the extensive flat sand on the shores of the Bristol channel in Somersetshire, and probably on the sea-shore in other parts of England; the cause is, we believe, the evaporation of water.

**Fata Morgana.**

As when a shepherd of the hebrid isles
Placed far amid the melancholy main,
(Whether it be lone fancy him beguiles,
Or that aerial beings sometimes deign
To stand, embodied, to our senses plain)
Sees on the naked hill, or valley low,
The whilst in ocean Phoebus dips his main,
A vast assembly moving to and fro;
Then all at once in air dissolves the wondrous show.

Thomson.

These optical appearances of figures in the sea and sky in the Faro of Messina, are the great delight of the populace, who, whenever the vision is displayed, run about the streets shouting for joy, and calling on every
FATA MORGANA.

To produce this pleasing deception, many circumstances must concur which are not known to exist in any other situation. The spectator must stand with his back to the east, in some elevated place behind the city, that he may command a view of the whole bay, beyond which the mountains of Messina rise like a wall, and darken the back-ground of the picture. The winds must be hushed, the surface quite smoothed, the tide at its height, and the waters pressed up by currents of great elevation in the middle of the channel. All these events coinciding, as soon as the sun surmounts the western hills behind Reggio, (on the Calabrian coast, opposite and rises high enough to form an angle of forty-five degrees on the water before the city, every object, existing moving at Reggio, will be repeated a thousand-fold in a marine looking-glass, which, by its tremulous motion, as it were, cut into facets. Each image will pass rapidly in succession, as the day advances, and the stream moves down the wave on which it appeared. Thus the eye. Sometimes the air is at that time so impregnated vapours, and undisturbed by winds, as to reflect objects in a kind of aerial screen, rising about thirty feet above the level of the sea. In cloudy, heavy weather, are drawn on the surface of the water, bordered with prismatic colours.

There have been some attempts to describe this phenomenon accurately. Father Angelucci as been the first to describe this phenomenon accurately. His relation is as follows. "On the 15th of August, 1643, the Sicilian shore swelled up, and became, for twelve miles in length, like a chain of dark mountains; while the waters near our Calabrian coast grew quite smooth, streaming against the aforesaid ridge. On this glass was reflected, in chiaroscuro, a string of several thou- sands of pilasters, all equal in altitude, distance, and degree of light and shade. In a moment they lost half their height, and bent into arcades, like Roman aqueducts. A long cornice was next formed on the top, and above it long cornice was next formed on the top, and above it
soon split into towers, which were shortly after lost in colonnades, then in windows, and at last ended in pikes. This was the Fata Morgana, which, for twenty-six years, I had thought a mere fable.

ATMOSPHERICAL REFRACTION.

A surprising instance of atmospheric refraction occurred at Hastings on the 26th of July, 1798. W. Latham, F. R. S. sitting in his dining room, situated on the parade, close to the sea shore, and nearly fronting the south, five in the afternoon, had his attention suddenly drawn by a great number of people running down to the side. On enquiring the reason, he was informed that the coast of France was plainly to be distinguished with the naked eye. On going down to the shore, he was surprised to find that, even without the assistance of a telescope, he could very plainly see the cliffs on the opposite coast, which, at the nearest part, are between forty and fifty miles distant, and are not to be discerned, from that situation, by the aid of the best glasses. They appeared to be only a few miles off, and seemed to extend for some leagues along the coast. Pursuing his walk along the shore to the eastward, close to the water's edge, and conversing on the subject with the sailors and fishermen, they soon not, at first, be persuaded of the reality of the appearance of the cliffs, but soon became so thoroughly convinced, by gradually appearing more elevated, and approaching nearer as it were, that they pointed out, and named to him the different places they had been accustomed to visit, such as the Bay, the Old Head or Man, the Windmill, &c., or Boulogne; together with St. Vaillery, and other places on the coast of Picardy. This they afterwards confirmed when they viewed them, thus refracted, through their telescopes, observing that the above places appeared as near as if they had been sailing, at a small distance, into the harbours.

From the eastern cliff, which is of a very considerable height, a most beautiful scene presented itself to Mr. Latham's view, for there he could at once see Dungeness, Dover Cliffs, and the French coast, all along from
Boulogne, &c. to St. Vallery; and, as some of the fisher
men affirmed, as far to the westward even as Dieppe,
by the telescope, the French fishing boats were plainly to
be seen at anchor, and the different colours of the land on
the heights, with the buildings, were perfectly discernible.
This curious phenomenon continued in the highest splendour
half past eight o'clock, notwithstanding a black cloud
for some time totally obscured the face of the sun, and
then vanished gradually. So remarkable an instance of
atmospherical refraction had not been before witnessed by
the oldest inhabitant of Hastings. It was likewise observed
at Winchelsea, and other places along the coast. The day
was remarkably hot, without a breath of wind stirring.

PARHELIA, OR MOCK SUNS.

On the 5th of February, 1674, near Marienberg in Prussia;
the sky being every where serene, the sun, which was still
some degrees above the horizon, was seen to lance out
very long and reddish rays, forty or fifty degrees towards
the zenith, notwithstanding it shone with great lustre.
Beneath this planet, towards the horizon, there hung a
somewhat dilute small cloud, at the inferior part of which
there appeared a mock sun, of the same apparent size with
true sun, and of a somewhat red colour. Soon after,
the true sun descending gradually to the horizon, towards
this cloud, the spurious sun beneath it grew clearer and
cleaner, insomuch that the reddish colour in this apparent
second disc vanished, and put on the genuine solar light, in
portion as it was approximated by the genuine disc of
sun. The latter, at length, passed into the lower coun-
trey, and thus remained alone. This phenomenon
was considered the more extraordinary, as it was perpendi-
cular under the sun, instead of being at its side, as parhelia
usually are; not to mention the colour, so different from
that which is usual in mock suns, nor the great length of
spiral light than parhelia use to exhibit. This ap-
pearance was soon followed by an exceedingly intense frost,
which lasted till the 25th of March, the whole bay being
soon up from the town of Dantzic to Hela in the Baltic

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On the 28th of August, 1698, about eight o'clock in the morning, there was seen, at Stibury, in Suffolk, the appearance of three suns, which were then extremely bright. Beneath a dark, watery cloud, in the east, and nearly at its centre, the true sun shone with such strong beams, that the spectators could not look at it; and on each side of the reflections. Much of the firmament was elsewhere of an azure colour. The circles were not coloured like a rainbow, but white; and there was also, at the same time, a considerable distance from the other phenomena, the form of a half moon, but apparently of double the size, with the horns turned upward. This appearance was within a fiery red colour, imitating that of the rainbow. These phenomena faded gradually, after having continued about two hours.

Two mock suns, an arc of a rainbow inverted, and a halo, were seen at Lyndon, in the county of Rutland, on the 22d of October, 1721, at eleven in the morning. There had been an aurora borealis the preceding night, with a wind at west-south-west. The two parhelia, or mock suns, were bright and distinct, and in the usual places, namely, in the two intersections of a strong and large portion of a halo, with an imaginary circle parallel to the horizon, passing through the true sun. Each parhelion had its halo a white colour, and in direct opposition to the true sun, that towards the east being 20 degrees or 25 degrees long, and that towards the west 10° or 12°, both narrowing at the remote ends. The mock suns were evidently seen towards the sun, but pale or whitish at the opposite side as was the halo also. Still higher in the heavens, was an inverted rainbow, about the middle of the distance between the top of the halo and the vertex. This arc was as distinct in its colours as the common rainbow, and of the same breadth. The red colour was on the convex, and the blue on the concave of the arc, which seemed to be about 90° in length, its centre being in or near the vertex. On the top of the halo was a kind of inverted bright arc. This phenomenon was seen on the 21st day, and, again, on the 26th. On the 11th of the preceding month, September, a very splendid and remarkable aurora borealis, presenting truly unaccountable motions and
CONCENTRIC RAINBOWS.

This very rare phenomenon was witnessed at Glapwell Hall, in Derbyshire, on the 25th of December, 1710, about eight in the evening, with a remarkable and very unusual display of colours. The moon had passed her full about twenty-four hours, and the evening had been rainy; but the clouds were dispersed, and the moon then shone perfectly clear. This iris lunaris had all the colours of the solar iris, exceedingly beautiful and distinct, only faint in comparison with those which are seen in the day; as must necessarily have been the case, both from the different beams by which it was occasioned, and the disposition of the medium. What most surprised the observer was the largeness of the arc, which was not so much less than that of the sun, as the different dimensions of their bodies, and their respective distances from the earth, seemed to require; but the entireness and beauty of its colours furnished a charming spectacle.

CONCENTRIC RAINBOWS.

This extraordinary phenomenon, which is seen at sun-rise on the Cordilleras of the Andes, in South America, was witnessed by Ulloa and his companions in the wildness of Pambamarca, and is thus described by him. At day-break the whole of the mountain was enveloped in dense clouds, which at sun-rise were dissipated, leaving behind them vapours of so extreme a tenuity, as not to be distinguishable to the sight. At the side opposite to that where the sun rose on the mountain, and at the distance of about sixty yards from the spot where we were standing, the image of each of us was seen represented, as if in a mirror, three concentric rainbows, the last, or most exterior colours of one of which touched the first of the following one, being centered on the head. Without the whole of them, and at an inconsiderable distance, was seen a fourth arc purely white. They were all perpendicular to the horizon; and in proportion any one of us moved from one side to the other, he
was accompanied by the phenomenon, which preserved
the same order and disposition. What was, however,
most remarkable, was this, that although six or seven
persons were thus standing close together, each of us
saw the phenomenon as it regarded himself, but did not
perceive it in the others. This, adds Bouguer, is a kind
of apotheosis, in which each of the spectators, seeing
his head adorned with a glory formed of three or four
concentric crowns of a very vivid colour, each of them
presenting varieties similar to those of the first rainbow.
tranquilly enjoys the sensible pleasure of reflecting that
the brilliant garland he cannot discover in the others, is
destined for himself alone."

A similar phenomenon is described by Mr. Hagarth
F. R. S. as having been seen by him on the 13th of Feb-
Iuary, 1780. His relation is as follows. "In ascending
at Rhealt, the mountain which forms the eastern bound-
dary of the vale of Clwyd (in Denbighshire) I observed
a rare and curious phenomenon. In the road above me,
I was struck with the peculiar appearance of a very
white shining cloud, which lay remarkably close to the
ground. The sun was near setting, but shone extremely
bright: I walked up to the cloud, and my shadow was
projected into it, its superior part being surrounded, a
some distance, by a circle of various colours, whose
centre appeared to be near the situation of the eye, and
whose circumference extended to the shoulders. This
circle was complete, except what the shadow of my
body intercepted. It exhibited the most vivid colours
the red being outermost, all of them appearing in the
same order and proportion as they are presented to the
view by the rainbow. It resembled very exactly what
in pictures is termed a GLORY, surrounding the head,
of saints: not indeed that it exhibited the luminous dis-
dance which is painted close to the head, but an area
of concentric colours placed separately and distinctly from
it. As I walked forward, this glory approached or re-
tired, just as the inequality of the ground shortened or
lengthened my shadow. The cloud being sometimes in a
small valley below me, sometimes on the same level
or on higher ground, the variation of the shadow and
the glory became extremely striking and singular.
THUNDER AND LIGHTNING.

The thunder of his power who can understand?

Joe.

Loud thunder, livid flames, and Stygian night,
Compounded horrors, all the deep affright.

Blackmore.

To conceive justly of the nature of thunder and lightning, we have only to view the effects of a common electrical machine, and its apparatus, in an apartment. These experiments mimic the great, wonderful, and terrific phenomena of nature. The stream, or spark, from the machine to the hand, represents the shaft of lightning from the clouds to the earth; and the snapping noise of the diminutive spark corresponds with the explosion produced by the shaft of lightning which we call thunder. In what manner the clouds become electrified, and, in short, what is the nature of electricity itself, our present range of experiments is little to determine, that a century will perhaps elapse before a philosophical precision can be attained. At present we only know for certain that the electrical power displays itself merely on the surfaces of bodies; and whether it is a by points, he apprehended that lightning was likewise possess the same quality; although the effects of the latter would in that case surpass those of the former in an astonishing degree. Flashes of lightning, he observed, are generally seen crooked and waving in the air; and the electric spark drawn from an irregular
body, or through a space in which the best conductors are disposed in an irregular manner, always exhibits the same appearance.

Lightning strikes the highest and most pointed objects in its way, in preference to others, as high hills, trees, spire masts, &c.; and all pointed conductors receive and throw off the electric fluid more readily than those which are terminated by flat surfaces. Lightning is observed to take the best and readiest conductor; and this is also the case with electricity, in the discharge of the Leyden phial, whence Doctor Franklin inferred that, in a thunder-storm, it would be safer for a person to have his clothes wet than dry. Lightning burns, dissolves metals, rends some particular bodies, such as the roots and branches of trees; strikes persons with blindness, destroys animal life, deprives magnets of their virtue, and reverses their poles; and these are the well known properties of electricity.

Lightning not only gives polarity to the magnetic needle out to all bodies which have any portion of iron in them, a brick, &c.; and, by observing which way the poles of these bodies lie, the direction in which the stroke has passed may be known with the utmost certainty.

In order to demonstrate, by actual experiment, the identity of the electric fluid with the matter of lightning, Doctor Franklin contrived to bring lightning from the heavens by means of an electrical kite, which he used as the approach of a thunder storm; and, with the electricity thus obtained, charged phials, kindled spirits, and performed all other electrical experiments, as they are usually exhibited by an excited globe or tube. This happened in 1752, a month after the French electricians, pursuing the method which he had proposed, had verified the same theory; but without any knowledge on his part of what they had done. On the following year, he further discovered that the air, sometimes electrified positively, and sometimes negatively, and that, in the course of one thunder storm, the electric change from positive to negative electricity several times. He was not long in perceiving that this important discovery was capable of being applied to practical use; and proposed a method, which he soon accomplished, of securing buildings from being damaged by lightning, by means of conductors, the use of which is now universally known.
From a number of judicious experiments made by him, Dr. Beccaria concludes that the clouds serve as conductors to convey the electric fluid from those parts of the earth which are overloaded with it, to those where it is exhausted. The same cause by which a cloud is first filled, from vapours dispersed in the atmosphere, draws to those which are already formed, and still continues to form new ones, till the whole collected mass extends so far to reach a part of the earth where there is a deficiency of the electric fluid, and where the electric matter will disperse itself on the earth. A channel of communication thus produced, a fresh supply of electric matter is conveyed from the overloaded part, which continues to be preyed by the medium of the clouds, till the equilibrium of the fluid is restored between the two places of the earth. Further observes that as the wind constantly blows from a place where the thunder cloud proceeds, the sudden degeneration of such a prodigious quantity of vapours must produce the air, and repel it on all sides. Indeed, many observations of the descent of lightning confirm his theory of the mode of its ascent; for it often throws before it the forms of conducting bodies, and distributes them along the passing medium through which it must force its passage; on this principle the longest flashes of lightning seem to be produced, by its forcing in its way part of the vapours in air. One of the chief reasons why the report of these flashes is so much protracted, is the vast length of the current made by the passage of the electric matter; for through the air collapses the moment after it has passed; the vibration, on which the sound depends, commences at the same moment, still, when the flash is directed towards a person who hears the report, the vibrations excited at the one end of the track will reach his ear much sooner than from the remote end, and the sound will, without any repercussion, continue till all the vibrations have successively reached him. The rattling noise of the thunder, which makes it seem as if it passed through arches, or were broken, is probably owing to the sound being reflected among clouds hanging over one another, and the attenuated air passing irregularly between them.

Among other precautions pointed out by Doctor Franklin, he recommends to those who happen to be in the fields, at
the time of a thunder storm, to place themselves within a few yards of a tree, but not quite near it. Signor Bеча
however, cautions persons not to depend on a higher, or in all cases, a better conductor than their own body; as according to his repeated observations, the lightning by some means descends in one undivided track, but bodies of various kinds conduct their share of it at the same time, in proportion to their quantity and conducting power. The late Earl Stanhope, in his principles of Electricity, observes that damage may be done by lightning, not only by the main stroke and lateral explosion, but likewise by what he calls the Return ing Stroke; that is, by the sudden violent return of that part of the natural share of electricity of any conducting body, or any combination of conducting bodies, which had been gradually expelled from such bodies or bodies respectively, by the superinduced elastic electrical pressure of a thunder-cloud's electrical atmospheres.

Among the awful phenomena of nature, none have excited more terror than thunder and lightning. It is recorded of several of the profligate Roman emperors, who had succored themselves to be deified, that when they heard the thunder, they tremblingly concealed themselves,acknowledging a divine power greater than their own—a Spirit thundering in the heavens!

REMARKABLE THUNDER STORMS.

A few instances in which the effects of these storms have been particularly characterised, will be both interesting and instructive.

That fermented liquors are apt to be soured and spoiled by thunder, is a fact well known; but that dried substances should be so acted on, is a still more remarkable pheno-
menon, and not so easy of explanation. It happened, how-
ever, some years ago, that in the immense granaries of Dantzic, the repositories of the corn, of Polish growth, intended for exportation, the wheat and rye, which before dry and sweet, were, by the effect of a violent thunder-storm in the night, rendered clammy and stinking, so much that it required several weeks to sweeten them and render them fit for shipping.

The effects of a thunder-storm on a house and its furni-
ture, at New Forge, Ireland, on the 9th of August
1707, were very singular. It was observed that the day was throughout close, hot, and sultry, with scarcely any mizzling rain, which lasted about an hour. As the darkened after sun-set, several faint flashes of light were seen, and thunder claps heard, as at a distance; but between ten and eleven o'clock they became, in their approach, very violent and terrible, progressively increasing their intensity, and coming on with more frequency, until towards midnight. A flash of lightning, and clap of thunder, louder and more dreadful than all the rest, came simultaneously, and shook and inflamed the whole house. The mistress being sensible at that instant of a strong sulphurous smell in her chamber, and feeling a thick gross dust on her hands and face as she lay in bed, concluded that her house to have been thrown down by the thunder, and set on fire by the lightning. The family being called up, candles lighted, both the bed-chamber, and the kitchen, and in it, were found to be filled with smoke and dust. A smoking-glass in the chamber had been broken with such violence, that not a piece of it was to be found of the size of half a crown: several of the pieces were stuck in the chamber door, which was of oak, as well as on the other piece of the room. The edges and corners of some of the piece of broken glass were tinged of a light flame colour, if they had been heated by the fire.

On the following morning it was found that the cornice of the chimney next the bed-chamber had been struck off, a breach twenty inches in breadth, made in the wall. As if left by the smoke of a candle, which pointed toward to another part of the wall, where a similar breach was made. Within the chamber, the boards on the back of a large hair trunk, filled with linen, were forced in: thirds of the linen were pierced or cut through, the appearing of a quadrangular figure. Several pieces of clothing and wearing apparel, which lay on the trunk, were burnt about the room, not in any way singed or scorched, the breach was made, was singed. In the kitchen, a cat was found dead, with its legs extended as in a moving pos-
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ture, without any other sign of being hurt, except that
the fur was singed a little about the rump.

In the parish of SAMFORD-COURTNEY, near Oakhampton,
in Devon, on the 7th of October, 1811, about three in the
afternoon, a sudden darkness came on. Several persons,
being in the church-porch, a great fire ball fell among them
and threw them down in various directions, but without
one being hurt. The ringers in the belfry declared that they
never knew the bells go so heavy, and were obliged to
ringing. Looking down from the belfry into the church,
they perceived four fire balls, which suddenly burst, and
the church was filled with fire and smoke. One of the con-
gregation received a blow in the neck, which caused him
to bleed both at nose and mouth. He observed the fire
smoke to ascend to the tower, where a large beam, on which
one of the bells was hung, was broken, and the gudgeon
breaking, the bell fell to the floor. One of the pilasters
of the tower, next the town, was carried away, and several
of the stones were found near a barn door, at a considera-
distance from the church.

On the 15th of December, 1754, a vast body of light-
ing fell on the great hulk at Plymouth. It burst out a
or two to the westward of the hulk, and rushed towards
it with incredible velocity. A portion of the
(a part of the apparatus which serves to hoist in and fix the
masts of the men of war) was cut out, of a diameter
at least eighteen inches, and about fifteen feet in length,
this particular piece was in three or four places girt with
iron hoops, about two inches broad, and half an inch thick,
which were completely cut in two by the lightning, as
was immediately succeeded by a dreadful hand and instrument.
The lightning done by the nicest hand and instrument.
and that by a most violent shower of hail, the hail-stones
being as large as nutmegs, and for the greater part of the
same size and shape.

Among the many fatal accidents by lightning which have
befallen ships, the following is a remarkable instance. In the
year 1746, a Dutch ship lay in the road of Batavia
was preparing to depart for Bengal. The after-
calm, and towards evening the sails were loosed, to take
advantage of the wind which then constantly blows from
the land. A black cloud gathered over the hills, and was
THUNDER AND LIGHTNING.

Light by the wind towards the ship, which it had no
time reached, than a clap of thunder burst from it, and
lightning set fire to the main-top-sail: this being very
burned with great fury; and thus the rigging and mast
set on fire. An attempt was immediately made to cut
the mast, but this was prevented by the falling of the
rigging from the head of the mast. By degrees the
communicated to the other masts, and obliged the crew
toert the ship, the hull of which afterwards took fire,
burning down to the powder magazine, the upper part
down into the air, and the lower part sunk at the place
where the ship was at anchor.

In crossing the Atlantic, in the month of November, 1749,
crew of an English ship observed a large ball of blue
dolling on the water. It came down on them so fast,
before they could raise the main tack, they observed
ball to rise almost perpendicularly, and within a few
of the main chains: it went off with an explosion as
hundreds of cannon had been fired off simultaneously, and
behind it a great smell of brimstone. The main-top-
was shattered into a thousand pieces, and spikes driven
of the main-mast which stuck in the main-deck. Five
men were knocked down, and one of them greatly
by the explosion. The fire ball was of the apparent
of a large millstone, and came from the north-east
the ingenious and indefatigable Professor Richman
his life on the 6th of August, 1753, as he was observing,
M. Sokolow, engraver to the Royal Academy of
Petersburgh, the effects of electricity on his gnomon,
ning a thunder-storm. It was ascertained that the light-
was more particularly directed into the professor's
strument, by the means of his electrical apparatus, for
Sokolow distinctly saw a globe of blue fire, as large as
chanced hand, jump from the rod of the right gnomon,
wards the forehead of Professor Richman, who at that
tment was about a foot distant from the rod, observing the
ical index. The globe of fire which struck the
ator, was attended with a report as loud as that of a
The nearest metal wire was broken in pieces, and
ments thrown on M. Sokolow's clothes, on which
marks of their dimensions were left. Half of the
vessel was broken off, and the metallic filings it con-
tained thrown about the room. Hence it is plain that the force of the lightning was collected on the right rod, which touched the filings of metal in the glass vessel. On examining the effects of the lightning in the Professor’s chamber, the door-case was found split half through, the door torn off, and thrown into the chamber. Lightning therefore seems to have continued its course along the chain conducted under the ceiling of the apartment.

In a Latin treatise, published by M. Lomonosow, member of the Royal Academy of Sciences of St. Petersburg, several curious particulars are mentioned relative to the melancholy catastrophe. At the time of his death, Professor Richman had in his left coat-pocket seventy coins, called rubles, which were not in the least altered by the accident which befell him. His clock, which stood in the corner of the next room, between an open window and the door, was stopped; and the ashes from the hearth thrown about the apartment. Many persons without doors declared that they actually saw the lightning shoot from the clasp of the Professor’s apparatus at the top of his house. The author, in speaking of the phenomena of electricity, observes that he once saw, during a storm of thunder and lightning, brushes of electrical fire, with a hissing noise, communi- between the iron rod of his apparatus and the side of a window, and that these were three feet in length, and a foot in breadth.

HAIL STORMS.

On the 17th of July, 1666, a violent storm of hail fell on the coasts of Norfolk and Suffolk. At North Yarmouth, the hail-stones were comparatively small; but at Southbridge one was taken up which measured a foot in circumference; at Seckford Hall, one which measured eight inches; and at Melton, one measuring eight inches. At Friston Hall, one of these hail-stones being put on a balance, weighed two ounces and a half. At Aldborough, it was affirmed that several of them were as large as middle eggs. A carter had his head broken by a piece of stiff felt hat: in some places it bled, and in others it burst: and it arose: the horses were so pelted that they hurried away.
HAIL STORMS.

On the 25th of May, 1686, the city of Lille, in Flanders, was visited by a tremendous hail storm. The hail-stones fell from a quarter of a pound to a pound weight, and even more. One among the rest was observed to burn in the centre a dark brown matter, and being thrown on the fire, gave a very loud report. Others, were trans

ted, and melted instantly before the fire. This storm spread over the city and citadel, leaving not a whole glass window on the windward side. The trees were bent, and some beaten down, and partridges and hares killed in abundance.

In 1697, a horrid black cloud, attended with frequent thunders and thunder, coming with a south-west wind of Carnarvonshire, and passing near Snowdon, was precursor of a most tremendous hail storm. In the north of Denbighshire bordering on the sea, all the windows of the city and citadel, leaving not a whole glass of it in the windward side. The trees were bent, and some beaten down, and partridges and hares killed in abundance.

In the north part of Lancashire, in a right line from Ormskirk to Blackburn, on the borders of Yorkshire. The breadth of this cloud was about two miles, within which compass incredible damage, killing all descriptions of fowl and small creatures, and scarcely leaving a whole pane of glass where it passed. What was worse, it ploughed up the earth, and cut off the blade of the green corn, so as utterly to destroy it, the hail-stones driving themselves in the ground. These hail-stones, some of which weighed five ounces, were of different forms, some others semi-spherical; some smooth, others embossed with small swellings, like the foot of a drinking glass, the ice being very transparent and hard; but a snowy kernel was usual in the midst of most of them, if not of all. The force with which they fell showed that they descended from a great height.

It was thought that they descended from a great height.

There was thought that the vapour which disposed the aqueous thus to congeal, should have continued undispersed for so long a tract as upwards of sixty miles, and should,
during this extensive passage, have occasioned an extraordinary coagulation and congelation of the watery drops as to increase the hail-stones to so vast a bulk in so short a space as that of their fall.

On the 4th of May, 1767, at Hitchin, in Hertfordshire, after a violent thunder-storm, a black cloud suddenly rose in the south-west, about two o'clock in the afternoon, the wind then blowing strongly in the east, and was instantly followed by a shower of hail, several of the hailstones which fell measuring from seven or eight to thirty or fourteen inches in diameter. The extremity of the storm fell near Offley, where a young man was killed and one of his eyes beaten out of his head, his body being in every part covered with bruises. Another person, driven to Offley, escaped with his life, but was much bruised. At a nobleman's seat in the vicinity, seven thousand square feet of glass were broken, and great damage was done to the neighbouring houses. The large hail-stones fell in immense quantities, that they tore up the ground, split many large oaks and other trees, cutting down intensive fields of rye, and destroying several hundred acres of wheat, barley, &c. Their figures were various, some being oval, others round, others pointed, and others

HU RRI C A N E S.

The ruin and desolation accompanying a hurricane can scarcely be described. Like fire, its resistless force consumes every thing in its track. It is generally preceded by an awful stillness of the elements, and a closeness of mistiness in the atmosphere, which make the sun red, and the stars of more than an ordinary magnitude. A dreadful reverse succeeding, the sky is sudde'nly overcast and wild; the sea rises at once from a profound calm; the mountains; the wind rages and roars like the noise of cannon; the rain descends in a deluge; a dismal obscurity envelops the earth with darkness; and the superior restlessness of these occasions, often does, and always seems to render while terror and consternation distract all nature: birds are carried from the woods into the ocean; and those which remain, element is the sea, fly for refuge on land.
Hurricanes.

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Animals in the fields assemble together, and are almost suffocated by the impetuosity of the wind, in searching for shelter, which, when found, serves them only for destruction. The roofs of houses are carried to vast distances from their walls, which are beaten to the ground, burying their inmates beneath them. Large branches shivered off, and driven through the air in every direction, with immense velocity. Every tree and bush that withstands the shock, is stripped of its boughs and foliage. Plants and grass are laid flat to the earth. The devastation is surveyed with accumulated horror: the harbour is covered with wrecks of boats and vessels; the shore has not a vestige of its former state remaining. Winds of rubbish and rafters in one place; heaps of earth and trunks of trees in another; deep gullies from remnants of water; and the dead and dying bodies of men, women, and children, half buried, and scattered about, are streets but a few hours before were, present to the terrible survivors a shocking conclusion of a spectacle to shatter, by famine, and, when accompanied by an earthquake, by mortal diseases.

Such is the true and terrific picture of a hurricane in the West Indies, as drawn by Doctor Mosely, in his treatise on tropical diseases!

On the Indian coast hurricanes are both frequent and disastrous. On the 2d of October, 1746, the French squadron, commanded by Le Bourdonnaire, being at anchor in Madras Bay, a hurricane came on which in a few hours destroyed the whole of the fleet, together with twenty other vessels belonging to different nations. One of the French ships foundered in an instant, and only six of the crew were saved. On the 30th of December, 1760, during the siege of Pondicherry, a tremendous hurricane drove on shore, and dashed, three British ships belonging to the besieging squadron; the crews were saved. On the 20th of October following year, 1761, the British fleet, then lying in Madras Roads, had to encounter a violent hurricane. The fleet of war put to sea, and were thus providentially saved; and all the vessels which still lay at anchor were lost, and nearly a soul on board saved. On the 29th of October,
1766, another hurricane was, on the coast of Coromandel, fatal to the Chatham Indiaman, which neglected to put to sea.

In the West Indies, the late tremendous hurricane of the 21st of October, 1817, was particularly severe at the Island of St. Lucie. All the vessels in the port were entirely swept away. The Government-house was blown down, and all within it: the walls, comprising the Governor, his lady and child, the staff, secretaries, servants, &c. amounting to about three hundred persons, buried in its ruins: not one survived the dreadful accident; and, still more horrid to relate, the barracks in which the officers and soldiers were demolished, and all within them (about two hundred persons) lost. All the estates on the island were reduced to a heap of ashes. At Dominica, nearly the whole of the town was inundated, with immense destruction of property.

In Great Britain, a dreadful hurricane, commonly called the great storm, set in at ten at night, on the 26th of November, 1703, and raged violently until seven the next morning. It extended its ravages to every part of the kingdom, and the capital, upwards of two thousand stacks of chimneys were blown down. The lead on the tops of several churches was rolled up like skins of parchment. Many houses were levelled with the ground, and, by the fall of the roofs, persons were killed, and more than 200 wounded. The ships in the Thames broke from their moorings: four hundred wherries were lost, and many barges sunk, with a great loss of lives. At sea the destruction was still greater: two ships of war, with upwards of eighteen hundred men on board, were totally lost, together with many merchantmen. 

THE MONSOONS.

The setting in of the Monsoon, or tropical sea wind, in the East Indies, is thus described by Forbes in his Oriental Memoirs. The scene was at Baroche, where the British army was encamped. “The shades of evening approached as we reached the ground, and just as the encampment was completed, the atmosphere grew suddenly oppressive, and an usual stillness presaged the immediate setting in of the monsoon. The whole appearance of nature resembled those solemn preludes to earthquakes and hurricanes in the West Indies, from which the
We are allowed very little time for conjecture; in a few minutes the heavy clouds passed over us.

I had witnessed seventeen monsoons in India, but this exceeded them all in its awful appearance and dreadfulness. Encamped in a low situation, on the borders of a large lake, formed to collect the surrounding water, we found ourselves in a few hours in a liquid plain. The tent-pins were拔 down, and left the army exposed to the contending elements. It requires the most vivid imagination to conceive the situation of an hundred and human beings of every description, with more than two hundred thousand elephants, camels, horses, oxen, suddenly overwhelmed by this dreadful storm, surrounded by thick darkness, which prevented our distinguishing a single object, except such as the vivid glare of the lights displayed in horrible forms. No language can describe the wreck of a large encampment thus instantaneously destroyed, and covered with water; amid the wailing shrieks of their expiring children, unable to afford an instant relief. During this dreadful night more than two thousand persons and three thousand cattle perished, and the following dawn exhibited a shocking spectacle."

The south-west monsoon generally sets in very early in the parts of India. "At Anjengo," observes the above writer, "it commences with great severity, and presents an overwhelming spectacle; the inclement weather continues, with little or less violence, from May to October: during that period of tempestuous ocean rolls from a black horizon, riding under heavy summits, until they approach the land, and break upon the beach; every ninth wave observed to be generally more tremendous than the rest, and threaten to overwhelm the settlement. The noise of thunder and lightning, so frequent in the rainy season, is truly awful. During the tedious monsoon I passed at Anjengo, I often stood upon the trembling sand-bank, waiting for the failure of the deluge."
to contemplate the solemn scene, and derive a comfort from that sublime and omnipotent decree. "Hitherto shalt thou come, but no further; and here shall thy proud waves be stayed!"

WHIRLWINDS AND WATERSPOUTS.

— the dreadful spout

Which shipmen do the hurricane call
Constring'd in mass by the almighty sun.

SHAKESPEARE (Troilus and Cressida)

In number 302 of the Monthly Magazine, Sir Richard Phillips, in describing a water-spout observed by him, pointed out the connexion between those phenomena, and offered a very philosophical explanation of the formation of the latter.

"It happened to him," he observes, "on the 27th of June 1817, about seven in the evening, to witness the formation, operation, and extinction of what is called a water-spout. His attention was drawn to a sudden hurricane which nearly tore up the shrubs and vegetables in the western gardens, and filled the air with leaves and small collection of the recently-cut grass. Very dark clouds had collected over the adjoining country, and some stormy rain, accompanied by several strokes of lightning, followed this hurricane of wind. The violence lasted a few minutes, and the writer being drawn to an eastern balcony, it was evident that a whirlwind agitated the variety of substances which had been raised into the air. The storm proceeded from west to east, that is, from Hampstead over Kentish Town towards Holloway. In about five minutes, in the direction of the latter place, a magnificent projection was visible from the clouds, like what is represented by Fig. 1 on the plate. It descended two-thirds of the distance from the clouds towards the earth, and evidently consisted of parts of clouds descending in a vortex, violently agitated like smoke from the chimney of a furnace recently supplied with fuel. It then shortened, and appeared to be drawn up towards the stratum of clouds, and presently it assumed the appearance represented by Fig. 2.

It finally drew itself into the cloud; but a small column or projecting thread, of varying size and length, continued for ten minutes. At the time, and for half an hour after
Flight of Meteoric Stones.
WHIRLWINDS AND WATERSPOUTS.

A storm of rain was visibly falling from the mass of connected with it, the extent being exactly defined breadth of Holloway, Highgate, and Hornsey. But two hours after, on walking from Kentish-Town Holloway, it was found that one of the heaviest of rain remembered by the inhabitants had fallen and the foot of Highgate-hill; and some persons having the projecting cloud, an absolute belief existed that a waterspout had burst at the crossing of the new and old On proceeding towards London, various accounts being with the superstition or pre-conceived notions of eye-standers, were given; but, in the farm-yard at the mile stone, it appeared that some hay-makers were carrying hay from a waggon which stood between two ricks, that the same whirlwind which passed over Kentish town, had passed over the loaded waggon with an impetus meant to carry it above twenty yards from its station, to put the men upon it, and on the rick, in fear of their Passing the road, it carried with it a stream of and, nearly unroofing a shed on the other side, filled to a great height with fragments of hay, leaves boughs of trees, which resembled a vast flight of birds closely of the writer beheld the descending cloud, or spout, pass over, and they saw its train, which, at the they took to be a flight of birds. They afterwards being the descending cloud draw itself upward, and they, and witnesses, describe it as a vast mass of smoke working in agitation; to them it was nearly vertical in a northern direction; and to persons a quarter of a mile north, it was vertical in a southern direction; and all agree that it itself up without rain, and was followed near the earth train of light bodies. It appeared also, on various tes- beginning with a sort of knob in the cloud, and then bending lower, and curling and twisting about, till it turned, and gradually drew itself into the cloud.”

The inferences which Sir Richard draws from what he saw afterward, are as follow: “That the phenomenon called waterspout is a mere collection of clouds, of the same as the mass whence they are drawn. That the descent mechanical effect of a whirlwind, which creating a high degree of rarefaction, extending between x 2
the clouds and the earth, the clouds descend in it by their
gravity, or by the pressure of the surrounding clouds or
air.
That the convolutions of the descending mass, and the se-
sible whirlwind felt at the earth, as well as the appear-
ance of the commencement, increase, and decrease, of the mass,
all demonstrate the whirl of the air to be the mecha-
ism of the cause.—That the same vortex, whirl, or eddy, of the
which occasions the clouds to descend, occasions the same
bodies on the earth to ascend.—That, if in this case the
lower surface had been water, the same mechanical proc-
cess would have raised a body of foam, vapour, and water
wards the clouds.—That, as soon as the vortex or whirl
haunts or dissipates itself, the phenomena terminate by
falling to the lower surface of the light bodies or water, and
the ascent of the cloud.—That when water constitu-
ates the light body of the lower surface, it is probable that
aqueous vapour of the cloud, by coalescing with it, oc-
casion the clouds to condense, and fall at that point
through a syphon.—That if the descending cloud be
a church steeple, it is probable it may be condensed by
electrical concussion, and fall at that spot—disch.
whatever has been taken up from the lower surface
producing the strange phenomena of showers of rain,
fish, &c.—And, lastly, it appears certain, that the action
of the air on the mass of clouds, pressing towards the mass
of the vortex as to a funnel (which, in this case, it ex-
represented,) occasioned such a condensation as to occur
the simultaneous fall of rain to a prodigy.”

In the month of July, 1800, a water-spout was seen
rapidly to approach a ship navigating between the
Islands. It had the appearance of a viscous fluid, taper-
in its descent, and proceeding from the cloud above
sea. It moved at the rate of about two miles an hour,
a loud sound of rain, passing the stern of the ship;
wetting the after part of the mainsail. It was then
cluded that water-spouts are not continuous columns
water, as has been confirmed by subsequent observa-

In November, 1801, about twenty miles from Trieste
the Adriatic sea, a water-spout was seen eight miles
southward: round its lower extremity was a mass,
feet high, nearly of the form of an Ionian capital,
WHIRLWINDS AND WATERSPOUTS.

In some distance from this spout, the sea began to be agitated, and a mist rose to the height of about four feet: the spout, resting obliquely on its crown, was impeding, and met the ascending mist about twenty feet above the sea, the last ten yards of the distance being descried with great rapidity. A cloud of a light colour appeared to ascend in this cloud like quicksilver in a glass beaker. The first spout then snapped at about one third of its height, the inferior part subsiding gradually, and the spout curling upward.

Several other projections from the cloud, appeared with corresponding agitations of the water below, but not always spouts vertically under them: seven spouts in all were noticed; and two other projections re-absorbed. Some of the spouts were not only oblique, but curved, the ascending part moving most rapidly in those which were vertical. They lasted from three to five minutes, and their dissipation was attended by any fall of rain. For some days before the weather had been very rainy, with a S. E. wind; but any rain had fallen on the day of observation.*

The corresponding phenomena of whirlwinds have been generally productive of much mischief, as the following narratives will show. On the 30th of October, 1669, six in the evening, the wind being then westwardly, a remarkable whirlwind, scarcely of the breadth of sixty yards, and which spent itself in about seven minutes, arose suddenly, in Northamptonshire. Its first assault was on a maid, whose pail and hat were taken from off her head, and the former carried many scores of yards from her, and lay undiscovered for some days. It next stormed a yard, where it blew a waggon body off the axle-tree, breaking in pieces the latter, and the wheels, three of which, thus shattered, were blown over a wall. Another branch, which did not, like the former, lie across the road of the wind, was driven with great speed against the side of the farm house. A branch of an ash-tree, so that two stout men could scarcely lift it, was blown by the blast representing the two figures of a water-spout, passage of a cluster of aerolites, or meteoric stones, through the air, is likewise described; and to that subject the reader's attention is directed in viewing the plate.
over a house without damaging it, although torn from a mile
100 yards distant. A slate was carried nearly 200 yards and forced against a window, the iron bar of which it broke. Several houses were stripped; and in one instance, this powerful gust, or stream of air, forced open a door, breaking the latch; whence it passed through the entry, and, forcing open the dairy door, overturned the milk pans, and blew out three panes of glass. It next ascended to the chambers, and blew out nine other panes. Lastly, it blew a gate-post fixed two feet and a half in the ground, out of the earth, and carried it many yards into the fields.

On the 30th of October, 1731, at one in the morning, a very sudden and terrific whirlwind, having a breadth of two hundred yards, was experienced at Cerne-Abbas in Dorsetshire. From the south-west side of the town it passed to the north-east, crossing the centre, and unroofed the houses in its progress. It rooted up trees, broke on the houses in its progress. It rooted up trees, broke on
in the middle, at least a foot square, and carried up tops a considerable distance. A sign-post, five feet four, was broken off six feet in the pole, and carried across a street forty feet in breadth, over a house opposite. The pinnacles and battlements of one side of the church-tower were thrown down, and the leads and timber of the next aisle broken in by their fall. A short time before the air was remarkably calm. It was estimated that this sudden and terrible gust did not last more than two minutes.

About the middle of August, 1741, at ten in the morning, several peasants being on a heath near Holkham in Norfolk, perceived, about a quarter of a mile from where the wind like a whirlwind approach them gradually, in a straight line from east to west. It passed through the field where they were ploughing, and tore up the stubble and grass to the ploughed ground, for two miles in length, to the breadth of thirty yards. In reaching an enclosure at the top of a rising ground, it appeared like a great flash or bolt of fire, emitting smoke, and accompanied by a noise amounting to that of carts passing over a stony ground. Both before and after the wind passed, there was a strong smell of sulphur; and the noise was heard long after the smoke had been perceived. This fiery whirlwind moved so rapidly forward, that it was nearly ten minutes in proceeding from the enclosure to a farm house in the vicinity, where it did much mischief.
SOUNDS AND ECHOES.

Sound is propagated successively from the sounding body to the places which are nearest to it, then to those more distant, &c. Every observer knows that when a gun is fired at a considerable distance from him, he perceives the flash and a certain time before he hears the report; and the same thing is true with respect to the stroke of a hammer, or of a hatchet, the fall of a stone, or, in short, any visible action which produces a sound or sounds. In general, sound travels through the air at the rate of 1142 feet in a second, or about thirteen miles in a minute. This is the case with all kinds of sounds, the softest whisper flying as fast as the loudest thunder. Sound, like light, after it has been reflected from several places, may be collected into one point as a focus, where it will be more audible than in any other part; and on this principle WHISPERING GALLERIES are constructed.

The particulars relative to the celebrated whispering gallery in the Dome of St. Paul's Church, London, will be comprehended in the description of that noble edifice.

An echo is the reflection of sound striking against a surface adapted to the purpose, as the side of a house, a brick wall, hill, &c. and returning back again to the ear, at distinct intervals of time. If a person stand about sixty-five or seventy feet from such a surface, and perpendicular to it, and speak, the sound will strike against the wall, and be reflected back, so that, he will hear it as it goes to the wall, and again on its return. If a bell situated in the same way be struck, and an observer stand between the bell and the reflecting surface, he will hear the sound going to the wall, and also on its return. Lastly, if the sound strike the wall obliquely, it will go off obliquely, so that a person who stands in a direct line between the bell and the wall will not hear the echo.

According to the greater or less distance from the speaker, a reflecting object will return the echo of several, or of fewer syllables; for all the syllables must be uttered before the echo of the first syllable reaches the ear, to prevent the confusion which would otherwise ensue. In a moderate way of speaking, about three and a half syllables are
pronounced in one second, or seven syllables in two seconds: therefore, when an echo repeats seven syllables, the reflecting object is 1142 feet distant; for sound travels at the rate of 1142 feet per second, and the distance from the speaker to the reflecting object, and again from the latter to the former, is twice 1142 feet. When the echo returns fourteen syllables, the reflecting object must be 2084 feet distant, and so on.

The most remarkable Echo recorded, is at the palace of a nobleman, within two miles of Milan, in Italy. The building is of some length in front, and has two wings jetting forward; so that it wants only one side of an oblong figure. About one hundred paces before the mansion, a small brook glides gently; and over this brook is a bridge forming a communication between the mansion and the garden. A pistol having been fired at this spot, fifty-six reiterations of the report were heard. The first twenty were distinct; but in proportion as the sound died away and was answered at a greater distance, the repetitions were so doubled that they could scarcely be counted, the principal sound appearing to be saluted in its passage by reports on either side at the same time. A pistol of a larger caliber having been afterwards discharged, and consequently with a louder report, sixty distinct reiterations were counted.

From this example it follows, that the farther the reflecting surface is, the greater number of syllables the echo will repeat; but that the sound will be enfeebled nearly in the same proportion, until at length the syllables cannot be distinctly heard. On the other hand, when the reflecting object is too near, the repetition of the sound reaches the ear, whilst the perception of the original sound still continues, in which case an indistinct resounding is heard, as may be observed in empty rooms, passages, &c. In such places, several reflections from the walls to the hearer, as also from one wall to the other, and then to the hearer, clash with each other, and increase the indistinction.
MISCELLANEOUS WONDERs OF NATURE.

THE GREAT SERPENT, CALLED THE BOA CONstrictor.

Ye too, in other climes who harmless rove
In gilded scales, the guardians of the grove,
In horrid Afric's pestiferous air
Acquire new natures from the burning glare;
Ride thro' the blaze of noon on sable wing,
Quick on th' affrighted herds with fury spring,
And gathering all your folds in wreathings dire,
Bid the huge ox beneath your crush expire:
Th' enormous elephant by force can slay,
And need no poison to secure your prey.

Among serpents, the genus Boa is distinguished by its vast,
and, indeed, almost unlimited size, as well as by its pro-
digious strength, which enables it to destroy cattle, deer,
and other serpents by the beauty of its colours,
and the peculiar disposition of its variegations. The entire
ground colour of this animal, in the younger specimens,
is a yellowish grey, and sometimes a bright yellow, on
which is disposed, along the whole length of the back,
series of large, chain-like, reddish brown, and sometimes
perfectly red variegations, leaving large open spaces of the
ground colour at regular intervals. The largest, or prin-
cipal marks, composing the above chain-like pattern, are
of uncertain forms, and more or less numerous in
different parts. The ground colour itself is also scattered
by many small specks of the same colour with the
variegations. The exterior edges of all the larger spots and
markings are commonly blackish, or of a much deeper
than the middle part, and the ground colour imme-

cently accompanying the outward edges of the spots is, on
the contrary, lighter than on the other parts, or even whitish,
constituting a general richness of pattern, of which
nothing but an actual view of a highly-coloured specimen of the animal itself can convey a complete idea. In large specimens, the yellow tinge is often lost in an uniform ground cast, and the red tinge of the variegations sinks into a dark chestnut: in some instances the general regularity of the pattern, as above described, is disturbed by a kind of confluent appearance. The head is invariably marked above by a large longitudinal dark band, and by a narrower lateral band passing across the eyes towards the neck.

It was, in all probability, an enormous specimen of this very serpent which once threw a whole Roman army into dismay. The fact is recorded by Valerius Maximus, who quotes it from one of the lost books of Livy, where it was detailed at a greater length. He relates that near the river Bagrada, in Africa, a snake was seen of so enormous a magnitude as to prevent the army of Attilus Regulus from using the river; and which, after having snatched several soldiers with its enormous mouth, and others by striking and squeezing them with its tail, was at length destroyed by assailing it with force of military engines and showers of stones, which, with the spires of the spires of Carthage destroyed, withstood the attack of their spears and darts, regarded by the whole army as a more formidable enemy than even Carthage itself. The whole adjacent region was tainted with the pestilential effluvia proceeding from the remains, as were the waters with its blood, so as to obligate the Roman army to shift its station. The skin of this monster, measuring in length one hundred and twenty feet, was sent to Rome as a trophy, and was there suspended in a temple, where it remained till the time of the Numidian war.

In the narrative of Mr. McLeod, surgeon of the Asia frigate, which conveyed the late embassy to China, it was wrecked in the Straits of Gaspar, is an account of the boa constrictor having been embarked on board the vessel which brought home the officers and crew of the shipwrecked frigate. The details are of great interest; but the mode in which this prodigy of nature was supplied with its food, during the passage, supplied with its food, causes him to shudder. Well may Sir Richard Phillips have remarked in the supplementary number of the Monthly Magazine [No. 307, p. 646,] that the parties guilty of the atrocity Scroll back to the top
BOA CONSTRICTOR.

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 boa constrictor was a native of Borneo, and had been sent to Batavia, where he was embarked. "He was brought on board shut up in a wooden crib or cage, the bars of which were sufficiently close to prevent his escape; and it had a sliding door, for the purpose of admitting the articles on which he was to subsist, the dimensions of the crib were about four feet high, and about five feet square, a space sufficiently large to allow him to coil himself round with ease. The live stock for his use during the passage, consisting of six goats of the ordinary size, were sent with him on board, five being considered as a fair allowance for as many months. At an early period of the voyage we had an exhibition of his talent in the way of eating, which was publicly performed on the quarter-deck, upon which he was brought. The sliding-door being opened, one of the goats was thrust in, and the door of the cage shut. The poor goat, as if instantly aware of the horrors of its perilous situation, immediately began to utter the most piercing and distressing cries, butting instinctively, at the same time, with its head towards the serpent, in self-defence.

The snake, which at first appeared scarcely to notice the poor animal, soon began to stir a little, and, turning its head in the direction of the goat, it at length fixed a deadly and malignant eye on the trembling victim, whose agony and terror seemed to increase; for, previous to the snake seizing its prey, it shook in every limb, but still continuing its unavailing show of attack, by butting at the serpent, who now became sufficiently animated to prepare for the banquet. The first operation was that of darting his forked tongue, and at the same time rearing a little head; then suddenly seizing the goat by the fore leg with his mouth, and throwing him down, he was encircled in an instant in his horrid folds. So quick, indeed, and instantaneous was the act, that it was impossible for the eye to follow the rapid convolution of his elongated body. It was not a regular screw-like turn that was formed, but resembling rather a knot, one part of the body overlaying the other, as if to add weight to the muscular pressure, the snake effectually to crush his object. During this time he
continued to grasp with his mouth, though it appeared an unnecessary precaution, that part of the animal which he had first seized. The poor goat, in the mean time, continued its feeble and half-stifled cries for some minutes, but they soon became more and more faint, and at last it expired. The snake, however, retained it for a considerable time in its grasp, after it was apparently motionless. He then began slowly and cautiously to unfold himself till the goat fell dead from his monstrous embrace, when he began to prepare himself for the feast. Placing his mouth in front of the head of the dead animal, he commenced by lubricating with his saliva that part of the goat; and then taking its muzzle into his mouth, which had, and indeed always has, the appearance of a raw lacerated wound, he sucked it in, as far as the horns would allow. The protuberances opposed some little difficulty, not so much from their extent as from their points; however, they disappeared in a very short time, that is to say, externally, but their progress was still to be traced very distinctly on the outside, threatening every moment to protrude through the skin. The victim had now descended as far as the shoulders; and it was an astonishing sight to observe the extraordinary action of the snake's muscles when stretched to such an unnatural extent—an extent which must have utterly destroyed all muscular power in any animal that was like itself, endowed with very peculiar faculties of expansion and action at the same time. When his head and neck had no other appearance than that of a serpent's stuffed almost to bursting, still the workings of the muscles were evident; and his power of suction, as it is erroneously called, unabated; it was, in fact, the effect of a contracted muscular power, assisted by two rows of strong hooked teeth. With all this he must be so formed as to be able to suspend, for a time, his respiration, for it is impossible to conceive that the process of breathing could be carried on while the mouth and throat were so completely stuffed and expanded by the body of the goat, and the lungs themselves (admitting the trachea to be ever so hard) compressed, as they must have been, by its passage downwards.

"The whole operation of completely gorging the goat occupied about two hours and twenty minutes: at the end of which time the tumefaction was confined to the middle
Part of the body, or stomach, the superior parts, which had been so much distended, having resumed their natural dimensions. He now coiled himself up again, and laid in his usual torpid state for about three weeks or a month, when, his last meal appearing to be completely digested and dissolved, he was presented with another goat, which he devoured with equal facility. It would appear almost all he swallows is converted into nutrition, for a small quantity of calcareous matter (and that, perhaps, in a tenth part of the bones of the animal) with occasional scales;—and this may account for these animals being able to remain so long without a supply of food. He had more facility in killing a fowl than a larger animal, the former was too small for his grasp.

As we approached the Cape of Good Hope, this animal began to droop, as was then supposed, from the increasing coldness of the weather, (which may probably have had its influence,) and he refused to kill some fowls which were offered to him. Between the Cape and St. Helena he was found dead in his cage; and, on dissection, the coats of his stomach were discovered to be excoriated and perforated by worms. Nothing remained of the goat except one of his horns, every other part being dissolved.”

THE SEA SERPENT.

The existence of this Marine prodigy on the coast of North America, has been placed beyond a doubt by the multiplied evidences procured by the Linnaean Society of New England, published at Boston. Their enquiries were founded on the rumours currently spread, on various authorities, that in the month of August, 1817, an animal of a very singular appearance had been repeatedly seen in the harbour of Gloucester, Ann, about thirty miles from Boston. It was said to resemble a serpent in its general form and motions, to be of immense size, and to move with wonderful rapidity; to swim on the surface of the water in calm and bright weather and to seem jointed, or like a number of buoys or following each other in a line. The following is a

abstract of the evidences taken on oath in support of these rumours. The depositions were made before Lonson, Esq., a magistrate of Gloucester, by whose own
Mr. Nash saw the serpent at the distance of about two hundred and fifty yards. It was so long, that the two extremities were not visible at one view, with a telescope. He therefore judged it to be seventy, or, perhaps, a hundred feet in length. He perceived eight distinct portions, or bunches, apparently caused by the vertical motion of the animal, which he conjectures to be straight. In this vertical motion all the testimonies agree, as well as in the apparent bunches. The track made in the water was visible for half a mile, and the progress of the animal, when on its surface, a mile in four minutes; but when immersed, by the motion of the water, which could be often traced, he appeared to move a mile in two minutes, or in three minutes at the most. His body was of the size of a half barrel, apparently rough, and of a very dark colour, in which latter particular all the accounts coincide.

A ship-master, and two of his men, being in a boat, approached this monstrous animal to within the short distance of thirty feet. They describe it as being of the serpent form, its head resembling that of a land snake, and very large, of the size of a ten gallon keg. It darted out its tongue, the extremity of which resembled a fisherman's harpoon, to the extent of two feet, raising it perpendicularly and again letting it fall. Over each of the eyes, which were very bright, was a bunch. Its body was apparently about two feet and a half in circumference. Its motion was at the rate of twelve or fourteen miles in an hour, much swifter than that of a whale, or any other fish, and vertical but steady.

Another ship-master attests that he saw the serpent three times, twenty or thirty persons being present, at the distance of about 150 yards. Its apparent length was 80 or 90 feet, and its size that of a half barrel. It had joints, from head to tail; its head, which was raised two feet above the water, resembling that of a rattlesnake, and of the size of a horse's head. Its mouth was open about ten inches. Its body was of a dark chocolate colour, and rough and scaly. In turning short and quick, the first part of the curve it made resembled the link of a chain; but when the head came parallel with the tail, they appeared near together.
The sea serpent.

When on the surface of the water, its motion was slow, the animal at times playing about in circles, and at others moving directly forward. In disappearing, it apparently sunk called up to witness a strange appearance the cove next his house. By the aid of his glass, he was in a moment that it was some aquatic animal, with a form, motion, and appearance of which he had been unacquainted. It moved, at the distance of a quarter of a mile from the shore, with great rapidity towards north, being then apparently about thirty feet in length; again making towards the cove, it displayed a much greater length, not less in the deponent's opinion, than a hundred feet. It approached him, in a southerly direction, rapidly, until it came in a line with him, when it stopped, and lay entirely still on the surface of the water.
I had then," observes the deponent, "a good view of the animal through my glass, at the distance of a quarter of a mile. His appearance in this situation was like a string of buoys. I saw perhaps thirty or forty of these protruberances or bunches, which were about the size of a barrel. The head, which tapered off to the size of a horse's head, appeared to be about six or eight feet long, and where it was connected with the body was a little larger than the latter. I could not discern any mouth; but what I supposed to be his under jaw had a white stripe extending the whole length of the head, just above the water. While he lay in this situation he appeared to be about a hundred or a hundred and twenty feet long. The body appeared to be of an uniform size. I saw no part of the animal which I supposed to be a tail and thought, therefore, that he did not discover to me the whole length. His colour was a deep brown or black. I could not discover any eyes, mane, gills, or breathing holes. I did not see any fins or legs. The animal did not utter any sound, and did not appear to notice anything, remained still and motionless for five minutes or more. The wind was light, with a clear sky, and the water quite smooth. He then moved to the southward, but not with so rapid a motion as before. The next morning at eight o'clock, it being quite calm I again saw the animal about a mile to the northward of my house, down the beach. He did not display so great a length as the night before, perhaps not more than twenty or thirty feet. He often disappeared and was gone five or ten minutes under water. He was diving or fishing for his food. He remained nearly in the same situation, and thus employed, for nearly two hours. I then saw him moving off, in a northern direction towards the light-house. I could not determine whether his motion was up and down, or to the right and left; but the quickest motion was very rapid; I should suppose at the rate of fifteen or twenty miles an hour. Mackarel, herrings, and other bait fish, abound in the cove where the animal was seen. This deposition is considered as impartial and unbiased, it agreeing uniformly with the deponent's first declaration in 1815. When made, he had not perused the testimony procured at Cape Ann; and having been engaged from his youth in foreign voyages, and frequently seen whales, and almost every species of fish, his testimony must be allowed to have great weight.
In corroboration of the existence of the Sea Serpent on the coasts of North America, the testimony of the Rev. Mr. Cummings, a clergyman employed in the Missions of the district of Maine, is adduced by the Society. His relation, made in the month of June, 1809, was taken down in writing by a friend. It states that in Penobscot bay, a Sea Serpent, supposed to be about sixty feet in length, and of the size of a sloop's mast, had been occasionally seen within the last thirty years. Mr. Cummings being with a party, in a boat twenty-three feet in length, the animal approached within fifteen rods, and was judged to be about three feet out of the water. He held his head, which resembled that of a common snake, flattened, and about the size of a pail, colour out of the water. About the head and neck the clear was a bluish green; but the tint of the body could not be determined, on account of the rippling of the water. A British, Mr. Cummings observed, saw him in their ex- pediton to Bagaduce, and estimated his length at 300 feet, which he thought an exaggeration. He added that this animal had been frequently seen by the inhabitants of Fox Long Islands, Mount Desert, &c.

In the communication to the Society from which the above extract is made, there are two other testimonies, that of a man Lillis, who observed that he had seen off the coast, in 1809, a very singular fish, about forty feet in length, which appeared more like an ordinary serpent than a fish, being his head erect, without a mane;—and that of a tenant of one of the islands in the bay of Penobscot, who asserted that he had often seen a marine monster of this description, which was as large as a sloop's boom, and about or seventy feet long. He asserted that about the year 1807, as a schooner was lying at the mouth of the river, in the bay, one of these enormous creatures leaped over it between the masts; the men ran into the hold for fright, and the weight of the serpent sunk the vessel, which was of ten tons burden, 'one streak,' or plank.

Extracts are given by the Society from the Natural History of Norway, by Pontoppidan, Bishop of Bergen, to show how much his account of the Sea Serpent on the Norwegian coast agrees with the above depositions and statements. The following passage will suffice to evince with the difference, however, that the Norwegian
Serpent is represented as much longer, and of a proportionate bulk. "Though one cannot," says the Bishop, an opportunity of taking the exact dimensions of the creature, yet all who have seen it are unanimous in affirming, as far as they can judge at a distance, that it appears to be the length of a cable, i.e. one hundred fathoms or six hundred English feet; that it lies on the surface of the water, when it is very calm, in many folds; and that there are, in a line with the head, some small parts of it back to be seen above the surface of the water, when it moves or bends. These at a distance appear like so many casks or hogsheads floating in a line, with a considerable distance between them. Mr. Tuchsen, of Heroe, is one of the many correspondents I have, who informs me that he has observed the difference between the body and the tail of this creature, as to thickness. It appears at a point, but that the body, which looks to be as big as row hogsheads, grows remarkably small at once where the head begins. The head in all the kinds has a high and broad forehead, but in some a pointed snout, though in others it is flat, like that of a cow or horse, with large nostrils, and several stiff hairs standing out on each side, like whiskers. The accounts add, that the eyes of this creature are very large, of a blue colour, and looked like a couple of bright pewter plates. The whole animal is of a deep brown colour, but speckled and variegated with lighter streaks or spots, which shine like tortoise shell. Some say it sheds its skin like the land snake. The wind is very destructive to this creature, that it is never seen on the surface of the water but in the greatest calm; and the least gust of wind drives it immediately to the bottom. It shoots through the water like an arrow from the bow, seeking constantly the coldest places. I have been informed by some of our seafaring men that a cable would not be long enough to measure the length of some of them, when they are observed on the surface of the water in an entire line. They say those round lumps or folds sometimes one after another as far as a man can see."

The report of the Committee of the Linnaean Society adds: "We have seen and heard sundry other statements of various authority, relating to similar animals, said to have
THE SEA SERPENT.

been seen at sea by different persons; but do not insert them in our report, because we consider the foregoing testimony sufficient to place the existence of the animal beyond a doubt; and because they do not appear so minute and so well authenticated as the preceding documents."

About four weeks after the depositions, the substance of which has been given above, had been received, a young serpent of a remarkable appearance was brought from Gloucester to Boston, and exhibited as the progeny of the Great Sea Serpent. It had been killed in a meadow situated on the eastern shore of Cape Ann, within 150 paces of high water mark, by a planter, who, with a pitchfork, confined the animal against some loose rocks. He exhibited the most violent rage, biting himself twice, holding on, and shaking (to use the planter's expression) as one dog shakes rather in fighting. His tail seemed likewise a weapon of defence; for he struck the end of it against the handle of the fork several times. His progressive movement was vertical, very slow, and was produced, first by contracting, and then by extending the body. When contracted, the animal was more than a foot and a half in length; and the protuberances on his back were then at least three times as large when he was extended.

The Committee of the Linnaean Society having inspected the external and internal structure of this animal, which they name the Scoliophis Atlanticus, or flexuous serpent of the Atlantic, proceed to remark that it has a remarkable form and external characters of a serpent, but is distinguishably distinguished from all others of that class by a number of protuberances along the back, apparently formed by evolutions of the spine. These protuberances are forty in number, and their size is proportioned to that of the body, in the places where they are respectively situated. Thus the body can be bent with facility upward and downward, a circumstance not common to other serpents. The whole length of the animal is 2 feet 11½ inches.

After a minute anatomical description of the Scoliophis Atlanticus (the young serpent) the Committee discuss the question whether it is to be so identified with the Great Serpent, as to be considered of the same species. The appearance, they remark, at nearly the same time and place, two creatures agreeing with each other in certain impor-
MISCELLANEOUS WONDERS OF NATURE.

tant and conspicuous particulars, disagreeing in the most re-
markable of these particulars with other animals of their
class, and between whom no difference, but that of size,
has been discovered, must naturally lead to a conjecture that
they are of the same species. The appearances noticed in
the depositions, relative to the great serpent, bating a few
exceptions, agree with, and are accounted for, by a structure
like that of the Scoliophis. The protuberances seen above
the water might have been produced in two ways: by
bunches on the back projecting out of the water; or by
vertical undulations of the body when in motion.

supposition that both these appearances have been presented
at different times, is the most satisfactory mode of account-
ing for the variety of testimony with regard to the number,
size, and distance of these protuberances. The other facts
stated in relation to the form and general arrangement of
colours in the large serpent, apply sufficiently well to the
Scoliophis. The shape of the head and proportion of
eye—the protuberance on the side of the head, just above
the eye—the form of the mouth—the distance from the
head to the commencement of the protuberances—the brown
colour of the body, and the whitish colour of the under part
of the head and neck—the disappearance of bunches from
what was supposed to be the navel towards the tail—the
tapering of the body toward the tail—its roundness; and great
flexibility, are all points of the closest resemblance.

These coincidences cannot be the effect of design, since all the de-
positions from Gloucester, relative to the Great Serpent,
were in the hands of the Committee before the Scoliophis
was discovered.

The prong or spear seen near the head of the former,
when in motion, was probably the tongue. The shape
of a harpoon, ascribed to that organ, was doubtless an
optical illusion, occasioned by its rapid vibration; and the
it is well known, is not the first instance of such a decep-
tion. The structure of the Scoliophis is besides well suited
to a residence in the water, being capable of various and
complicated motions. It bends horizontally, as did the
Great Serpent, in the act of turning; it bends vertically,
that animal is supposed to do in the act of swimming; and it
might assume any compound and intermediate motion, which
would be most effectual in propelling it through the water.
Supposing, therefore, the species of the two serpents to be the same, it is not improbable that the one is the progeny of the other. The Cubibrï without fangs, the tribe most nearly resembling the Scolioïphis, are said by naturalists to be generally, if not always, oviparous; to deposit their eggs in the sand in the spring, or in the end of summer; and to abandon them. These eggs are hatched by the heat of the sun often in less than a month. It should be remarked that the large serpents described in the accounts and depositions, were seen near the shore, and, with one exception, in the month of August only.

In reply to the three principal objections which may be made against the specific identity of the two animals; and, their disproportionate size. This is not apparently greater than is found between the young and full grown individuals of some other animals, among which may be cited the Boa Constrictor. Secondly, that the one was seen only in the water, and the other on land. This objection is lessened when it is recollected that the eggs of amphibious animals are deposited on land. The large serpent may have visited the shore in the night, or at other times. That it was an amphibious animal, dependent on respiration, rendered probable by its general structure; and by its frequenting the surface of the water, often with its head out of water, in a place over which the sea breaks in stormy weather. Supposing it a young animal, it might have resorted in the place where it was hatched, or it might occasionally have resorted to the shore from the water. It would not be expected to venture far from the shore, until increased size should afford it some security from becoming prey to larger animals of the ocean. Lastly, the committee observe, as these two species are not any evidences of immaturity were observed in the Scolioïphis might be considered as the source of a third objection, if it were not well known that, as the animals generally abandon their eggs, the young are perfect in all their parts, and capable of providing for their own subsistence, immediately on their being hatched.

On the whole, the Committee observe, as these two serpents agree in so many conspicuous, important, and peculiar characters, and as no material difference has been yet clearly pointed out, excepting that of size, the Society will
probably feel justified in considering them individuals of the same species, and entitled to the same name, until a more close examination of the Great Serpent shall have disclosed some difference of structure, important enough to constitute a specific distinction.

A postscript contains a communication from Long Island, stating that, on the 5th of October, 1817, the Sea Serpent had been seen in the Sound. At the distance of half a mile from the shore, a long, rough, dark-looking body was observed, making a rapid progress towards New York, against a brisk breeze, and a strong ebb tide. The observers were soon convinced that it was a living animal. His head did not at first appear more elevated above the water than the ridges or humps on his back; but when he was afterwards seen, nearly in the middle of the Sound, his body, owing to the increased velocity with which he moved, became more depressed, and his head greatly elevated. He was distinctly seen for about ten minutes, during which short space it was estimated that his progress was not less than six or seven miles. His back, 40 or 50 feet of which appeared above the surface of the water, was irregular, uneven, and deeply indented. The general description of the animal, in this statement, agrees with that already given; but it is said that the extreme rapidity with which he moved, created a swell not unlike that of a boat towed rapidly at the stern of a vessel.

THE RATTLESNAKE.

The genus crotalus, or rattlesnake, affords the most signal examples of the powerfully destructive poison with which some of the serpent tribe are furnished; instances having frequently occurred in which the bite of these snakes has, in the space of a few minutes even, proved fatal to man.

It was not until the discovery of the western hemisphere that naturalists beheld with amazement a reptile of the most fatal nature, furnished, agreeably to their conception, as by a peculiar institution of Providence, with an instrument capable, in general, of warning mankind of their danger too near an approach. This is, however, treated by Mende as a vulgar error; and he very sensibly observes, that "all the parts of animals are made either for the preserva-

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THE RATTLE SNAKE.

This snake is chiefly on squirrels and birds, which a reptile can never bring within its reach. The way is this. The snake creeps down the foot of a tree, and by shaking his rattle, awakens the creatures which are lodged in it. They are so frightened of their enemy, who fixes his lively piercing eyes on one or other of them, that they have not the power to fly away, but leap about from bough to bough, till they are tired, and at last falling to the ground, are snapped into the mouth. This, by the people of the country, called the "hissing of squirrels and birds." This opinion of Doctor [insert name, possibly Barton] is supported by Doctor Barton of Philadelphia, who, in a memoir on the supposed fascinating power of the rattle, imagines the whole to be, nothing more than the hissing of old birds in defence of their young, and which themselves occasionally caught by the rattle snake, in consequence of too near an approach.

This species is in general from three to five feet in length; one is described by Catesby, as measuring eight feet. The traveller observes, that "it is the most inactive of all snakes, and has the slowest motion, never being the aggressor, except in what it preys upon; for, unless it is disturbed, it will not bite." It is of a yellowish-brown colour, marked throughout its whole length with several transverse and what irregular fasciae of deep brown. From the head some distance down the neck run two or three longitudinal stripes of the same colour. The head is large, flat, and bordered with small scales; the rest of the upper parts with moderately large oval ones, all strongly furnished with a prominent line down the middle: the under parts are of a dingy yellowish-brown colour, marked with numerous dusky variegations and freckles. At the extremity of the tail is situated a rattle, consisting of several hard, dry, horny processes, which on the least disturbance or irritation, is elevated and in such a manner as to cause a strong and brisk sound.

The rattlesnake is a viviparous animal, and is said to preserve the same extraordinary mode of preserving its life, as is ascribed to the viper in Europe, by receiving them into its mouth and swallowing them. M. de Beauvois, in the relation of his travels
declares that he was himself an eye-witness of this
Happening, in his walk, to disturb a large rattlesnake, the
creature immediately coiled itself up, opened its jaws, and
instantly five small ones, which were lying near it, rushed
into its mouth. He retired, and watched the snake, and in
a quarter of an hour saw her again discharge them. He next
approached a second time, when the young retired into
mouth with greater celerity than before, and the snake im-
mediately moved off among the grass, and escaped.

THE COBRA DE CAPELLO.

The following interesting account of this very curious snake
native of India, is extracted from Forbes's Oriental
Metem-

"The Cobra de Capello, or hooded-snake (coluber capello),
called by the Indians the maag, or nagao, is a large and
beautiful serpent; but one of the most venomous of all the
coluber class; its bite generally proves mortal in less than
an hour. It is called the hooded-snake, from having a hood
near the head, which it contracts or enlarges at pleasure; the centre of this hood is marked in black and white
like a pair of spectacles, whence it is also named the spec-
tacle snake.

Of this genus are the dancing-snakes, which are carried
in baskets throughout Hindostan, and procure a mainte-
ance for a set of people, who play a few simple notes on a
flute, with which the snakes seem much delighted, and keep
time by a graceful motion of the head, erecting about
their length from the ground, and following the music with
gentle curves, like the undulating lines of a swan's neck.
It is a well-attested fact, that when a house is infested with
these snakes, and some other of the coluber genus, larger serpents of the boa tribe, the musicians are sent for
who, by playing on a flagelet, find out their hiding-places
and charm them to destruction; for no sooner do they begin
to hear the music, than they come softly from their retreats
and are easily taken. I imagine these musical snakes were
known in Palestine, from the Psalmist comparing the ungodly
to the deaf adder, which stoppeth his ears, and refused to
hear the voice of the charmer, charm he never so wisely.

"When the music ceases the snakes appear motionless.

..."
but if not immediately covered up in the basket, the spectacles are liable to fatal accidents. Among my drawings is that of a Cobra de Capello, which danced for an hour on the table while I painted it; during which I frequently handled it to observe the beauty of the spots, and especially the spectacles on the hood, not doubting but that its venomous fangs had been previously extracted. But the next morning, my upper servant, who was a zealous Mussulman, came to me in great haste, and desired I would instantly retire, and praise the Almighty for my good fortune; not understanding his meaning, I told him that I had already performed my devotions, and had not so many stated prayers as the followers of his prophet. Mahomed then informed me that while purchasing some fruit in the bazar, he observed the man who had been with me on the preceding evening, entertaining the country people with his dancing snakes; they, according to their usual custom, sat on the ground around him; when, either from the music stopping suddenly, or from some other cause irritating the vicious spirit which I had so often handled, it darted at the throat of a young woman, and inflicted a wound of which she died about half an hour. Mahomed once more repeated his praise for praise and thanksgiving to Alla, and recorded me to his calendar as a lucky man.

THE CERASTES, OR HORNED SNAKE.

This curious species is a native of many parts of Africa, and frequent in Egypt, Syria, and Arabia. It is about 3 feet in length, and is distinguished by a pair of horns, curved processes, situated above the eyes, and pointing forwards; these horns have not any thing analogous in their nature to the horns of quadrupeds, and are by no means to be considered in the light of offensive or defensive organs: they increase, however, the natural antipathy so generally felt against the serpent tribe, and give the animal a more than ordinary appearance of malignity. Its bite is much to be dreaded, since, exclusively of the general danger attending accidentally on this reptile, and thus irritating it aware, it possesses a propensity to spring suddenly to a considerable distance, and assail without provocation those happen to approach it. "When," Mr. Bruce observes, he inclines to surprise any one, the Cerastes creeps with his
side towards the person, and his head averted, till, judging
his distance, he turns round, springs upon him, and fastens on
the part next to him.”

On the subject of the incantation of serpents, this celebrated
traveller remarks as follows: “There is not any doubt of
its reality; the scriptures are full of it; and those who have
been in Egypt have seen as many different instances as they
chose. Some have suspected that it was a trick, and that
the animals so handled had been first trained, and then dis-
armed of the power of hurting; and, fond of the discovery,
have rested themselves upon it, without experiment, in the
face of all antiquity. But I will not hesitate to say, that
I have seen at Cairo (and this may be seen daily, without
trouble or expense) a man who came from above the outer
combs, where the pits of the mummy birds are kept, who
has taken a Cerastes with his naked hand, from a number
others lying at the bottom of a tub, has put it upon his head, covered it with the common red cap he wears then
taken it out, put it on his breast, and tied it about its neck
like a necklace; after which it has been applied to a man
and bit it, which has died in a few minutes; and, to com-
plete the experiment, the man has taken it by the neck, and,
beginning at the tail, has eaten it, as one would do a carac
or a stock of celery, without any seeming repugnance.

“However lively the snake may have been before
when he is seized by any of these barbarians, he seems as
if taken with sickness and feebleness, frequently shut
his eyes, and never turns his mouth towards the arm of the
person who holds him. On their being questioned how they
are exempted from its attack, the gravest and most ren-
spectable among the Egyptians reply that they were both
so; while the lower sort talk of enchantments by words and
by writing. They all pretend to prepare any remedy for
remedies, that is, by decoctions of herbs and roots. Be that
as it may, the records of history attest, that where any
people have been screened by a secret of some kind. This
it was with the Psylli and Maronides of old.”

“Tame at whose spell the charm’d Cerastes lay.”
GREAT VIPER OF MARTINIQUE.

This formidable reptile is peculiar to the islands of Martinique, St. Lucie, and Bequia, and has never been traced to the American continent. On account of its triangular head resembling that of a spear, it has been named by the French naturalists *Trigonocephalus*; when full grown it is nearly eight feet in length, and its bite is highly dangerous. Its agility is, as well as its mode of darting, very remarkable: it rolls the body in four circles, one upon the will of the animal, so as to throw the whole mass forward five or six feet. After the manner of the crested or hooded snake, it can raise itself vertically on its tail, and with the height of a man; at the same time that, by the aid of large scales, laid over each other, with which the body is covered, this serpent, like the adder, can climb the trees, and creep among the branches, in order to reach the birds' nests, whose young he devours, and in which he is often been found coiled up.

FASCINATING POWER OF SNAKES.

REMARKABLE instance of the fascinating power of snakes is given in Lichtenstein's travels in Southern Africa. In rambling in the fields near Cape Town, he saw, at the brink of a ditch, a large snake in pursuit of a field mouse. The animal was just at its hole, when it seemed in a motion to stop, as if unable to proceed, and, without being stayed by the snake, to be palsied with terror. The snake raised its head over him, had opened its mouth, and seemed to fix its eyes steadfastly upon him. Both remained awhile; but as soon as the mouse made a motion, as it alighted, the head of the snake instantly followed the movement, as if to stop his way. This sport lasted four or five minutes, till the author's approach put an end to it: the snake then snapped up his prey hastily, and glided away into a neighbouring bush. "As I had," he observes, "I heard a great deal of this magic power in the snake over smaller animals, it was very interesting to me to see a specimen of it. I think it may be made a question, however, whether the poisonous breath of the reptile
"might not really have had the effect of paralysing the
"limbs of the mouse, rather than that its inability to move
"proceeded either from the fixed eye of the snake, or the
"apprehension of inevitable death. It is remarkable, and
"very certain, that serpents will sport with their prey,
"cats do, before they kill it."

This author notices several peculiarities of the snakes of
South Africa. A very rare description of serpent is there
called the Spruiting Snake. It is from three to four feet
long, of a black colour, and has the singular property, as
the colonists assert, that, when it is attacked, it sprouts out
its venom, and knows how to give it such a direction as to
hit the eyes of the person making the attack. This is fol-
lowed by violent pain, and by so great an inflammation
that it frequently occasions the entire loss of the sight.—The
Pop-Adder, one of the most poisonous species, is distin-
guishable by a disproportionate thickness, and by a belly
handsomely spotted with black and white spots on a brown
ish ground. It has this peculiarity, that, when it is raged,
it swells out its neck to a very great size. One which was caught, measured in length about an ell and a
half, and was about six inches round in its greatest cir-
cumference.—One of the species, called the Tree Snake, was
caught while in the act of climbing up the wall of a farm-
house, to take the swallows which had their nests under its
roof. This snake is extremely adroit at climbing, and is
therefore, a terrible enemy to small birds. Its bite is ex-
tremely venomous, and is considered as mortal. The one
here noticed, measured six feet in length, with a black back
and greyish belly. In the belly were found six half-digested
young swallows.—The Lemon Snake measures about six
feet in length, and has a skin of a fine lemon-colour, regu-
larly spotted with black.

THE ELEPHANT.

How instinct varies in the grovilling swine!
Compar'd, half-reasoning elephant, with thine!
'Twixt that, and reason, what a nice barrier!
For ever separate, yet for ever near!

The largest elephants are from ten to eleven feet in height;
some are said to exceed it; but the average is eight or nine
feet. They are fifty or sixty years before they arrive at their

THE ELEPHANT.

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full growth; and their natural life is about one hundred and twenty years. Their price increases with their merit during a course of education. Some, for their extraordinary qualities, become in a manner invaluable; when these are purchased, no compensation induces a wealthy owner to part with them.

The skin of the elephant is generally a dark grey, sometimes almost black; the face frequently painted with a variety of colours; and the abundance and splendour of his trappings add much to his consequence. In India the Mogul princes allow five men and a boy to take care of each elephant; the chief of them, called the mahawut, rides upon his neck to guide him; another sits upon the rump, and assists in battle; the rest supply him with food and water and perform the necessary services. Elephants bred to war, and well disciplined, will stand firm against a volley of musquetry, and never give way unless severely wounded. One of these animals has been seen with upwards of thirty bullets in the fleshy parts of his body, perfectly recovered from his wounds. All are not equally docile, and when enraged elephant retreats from battle, nothing can withstand his fury: the driver having no longer a command and foes are involved in undistinguished ruin.

The elephants in the army of Antiochus were provoked to fight by shewing them the blood of grapes and mulberries. The history of the Maccabees informs us, that to every elephant they appointed a thousand men, armed with coats of mail, and five hundred horsemen of the best; these were ready at every occasion; wherever the beast went, and whithersoever he went, they went also; and upon the elephants were strong towers of wood, filled with armed men, besides the Indian that ruled them."

Elephants in peace and war know their duty, and are more obedient to the word of command than many rational beings. It is said they can travel, on an emergency, two hundred miles in forty-eight hours; but will hold out for a month, at the rate of forty or fifty miles a day, with cheerfulness and alacrity. "I performed," observes Forbes in his Oriental Memoirs, "many long journeys upon an elephant: nothing could exceed the sagacity, docility, and prospect, he remained immovable until my sketch was
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finished; if I wished for ripe mangoes growing out of the common reach, he selected the most fruitful branch, and breaking it off with his trunk, offered it to the driver for the company in the houdah, accepting of any part given to himself with a respectful salam, by raising his trunk three times above his head, in the manner of the oriental obeisance, and as often did he express his thanks by a murmuring noise. When a bough obstructed the houdah, he twisted his trunk around it, and, though of considerable magnitude, broke it off with ease, and often gathered a leafy branch, either to keep off the flies, or as a fan to agitate the air around him, by waving it with his trunk; he generally paid a visit at the tent-door during breakfast to procure sugar-candy or fruit, and be cheered by the encomiums and caresses he deservedly met with: no stranger could be more innocently playful, nor fonder of those who noticed him, than this docile animal, who on particular occasions appeared conscious of his exaltation above the brute creation."

However surprising may be the docility of this noble animal, when tamed, its sagacity, in a savage state even is a subject of still greater wonder, as is evidenced by the following narrative extracted from Lichtenstein's travels in Southern Africa. Two individuals, named Müller and Prince, being engaged, in the Caffire territory, where these animals abound, in an elephant hunt, discovered the footsteps of a very large elephant, and soon espied the animal himself on the declivity of a naked and widely outstretched hill. It is a rule, when an elephant is thus found, to endeavour to get above him on the hill, to the end that, in case of necessity, the hunter may flee to the summit, whether the animal, on account of the unwieldiness of its body, cannot follow him fast. This precaution was neglected by Prince, who shot too soon, while they were yet at no great distance, and the elephant on higher ground than himself and his companion. The wounded animal rushed towards them, while they endeavoured to push their horses and gain the brow of the hill. Being able, on favourable ground, to run as fast as a horse, he soon came up with them, and struck with his tusk at Müller's thigh, the nearest of the two fugitives. Müller now considered his fate as inevitable, as he endeavoured in vain to see
almost exhausted horse into a gallop, and saw the animal, after giving a violent snort, raise his powerful trunk above his head. It was not, however, on himself, but on his companion, that the stroke fell; and in an instant he saw him snatched from his horse, and thrown up into the air. Scarcely in his senses, he continued his flight, and only in some degree recovered himself by finding Prince's horse running by his side without a rider: then looking back, he saw his unfortunate friend on the ground, and the elephant stamping upon him with the utmost fury. He was now convinced, not without the greatest astonishment, that the sagacious animal had distinguished which of the two was who wounded him, and wreaked his whole vengeance upon him alone. Müller, on this, went in search of the rest of the party, that they might collect the mangled remains of their companion, and bury them; but they were put to flight by the elephant rushing again from a neighbouring thicket, to vent his wrath once more upon the corpse, already so dreadfully mangled. While he was engaged in doing this, however, he was attacked by the dis- tressed hunters, and sacrificed to the manes of his unfortunate victim.

The contrivances for taking elephants are various; but the most curious are those employed by the natives of Bengal, where the finest race of these animals is found. They sometimes surround the woods in bands, and drive out lighted torches, amid the clamour of trumpets, the discharge of fire-arms, and noises of every description, the elephants which inhabit them, till they are at length trapped into a particular spot surrounded with palisades, as to prevent all escape. At other times a kind of decoy, a female elephant, is sent out in order to induce some of the males to pursue her, who are by that means secured.

When a wild elephant is taken, it still remains to reduce it to a quiet state, and to tame it, in order to its being made useful; this is effected by throwing ropes round the legs of the body, which are well secured; and two tame elephants, properly instructed, are placed on each side. The captive elephant finds himself gradually so fatigued by his ineffectual struggles, and so much soothed by the caresses occasionally given him by the trunks of the tame elephants, by the food from time to time presented to him, and the water with which he
is refreshed by its being poured over him, that in the space of a few days, unless more than usually untractable in his nature, he becomes completely tame, and is placed with the rest of the domesticated troop. Sometimes, in order more effectually to subdue them, the elephants are deprived of sleep for a considerable time.

The anecdotes recording the sagacity, and also the amiable qualities of the elephant, are numerous. Of these the following are selected as highly interesting. In Delhi, an elephant passing along the streets, put his trunk into a tailor's shop, where several persons were at work; the beast passed on; but at the next dirty puddle fired his trunk with water, returned to the shop, and spurring it among those who had offended him, spoiled their work.—In Adsmear, an elephant who often passed through bazar, or market, as he went by a certain herb-woman always received from her a mouthful of greens: at length he was seized with one of his periodical fits of rage, broke his fetters, and, running through the market, put the crowd to flight, and, among others, this woman, who, in her haste, forgot a little child she had brought with her. The animal recollecting the spot where his benefactress was wont to sit, took up the infant gently on his trunk, and placed it in safety on a stall before a neighbouring house.—At the same place, another elephant, in his madness, killed his cornc, or governor: the wife, witnessing the misfortune, took her two children, and flung them before the elephant, saying: "now you have destroyed their father, you may as well put an end to their lives and mine." It instantly stopped, relented, took the eldest of the governor and never afterwards would permit any other to mount him.—A painter was desirous of drawing the elephant kept in the menagerie at Versailles, in an uncommon posture. He placed the animal in this posture, threw fruit into his mouth, but as the lad frequently deceived him, and made an offence only of throwing the fruit, he grew angry; and, as if he had known that the painter's intention of drawing him was the cause of the affront thus offered, instead of averting
himself on the lad, he turned his resentment on the master, and taking up a quantity of water in his trunk, threw it on the paper on which the painter was drawing, and spoiled it.

THE ORANG OUTANG.

This singular animal, likewise called the satyr, great ape, man of the woods, which has, on account of its near approximation to the human species, so strongly excited the attention of naturalists, is a native of the warmer parts of Africa and India, where it resides principally in woods, on the fruits of which it feeds, like the other species of the human race. Such of these animals as have been imported to Europe have rarely exceeded the height of two or three feet, and have therefore been supposed to be young; those grown being said to be at least six feet in height.

The general colour of the orang outang is a dusky brown: the face is bare; the ears, hands, and feet nearly similar to the human; and the whole appearance such as to exhibit the most striking approach to the human figure. The tendency, however, is only a general one, and the structure of the hands and feet, when examined with an anatomical precision, seems to prove that the animal was principally designed by nature for the quadrupedal mode of walking, not for an upright posture, which is only occasionally assumed, and which, in those exhibited to the public, is, perhaps, rather owing to instruction than truly natural.

Habit, indeed, makes it one of the distinctive characters of the real or proper apes, of which the orang-outang is the least, to walk erect on two legs only; and it must be granted these animals support an upright posture much more easily and readily than most other quadrupeds, and may probably be often seen in this attitude even in a state of leisure.

The manners of the orang-outang, when in captivity, are mild and docile, and may be taught to perform, with success in some of the larger baboons and monkies, a variety of actions in domestic life. Thus it has been seen to sit at table, and, in its manner of feeding and general behaviour, to imitate the company in which it was placed; to pour out tea, and drink it without awkwardness
or restraint; to prepare its bed with exactness, and compose itself to sleep in a proper manner. Such are the actions recorded of one which was exhibited in London, in the year 1738.

The orang-outang described by Buffon was mild, affectionate, and good-natured. His air was melancholy, his gait grave, his movements measured, his dispositions gentle, and very different from those of other apes. He had neither the impatience of the Barbary ape, the maliciousness of the baboon, nor the extravagance of the monkey tribe. It may be alleged, observes this writer, that he had had the benefit of instruction; but the other apes I shall compare with him were educated in the same manner. Signs and words alone were sufficient to make our orang-outang act, but the baboon required a cudgel, and the other apes a whip; for none of them would obey without blows. I have seen this animal present his hand to conduct the person who came to visit him, and walk as gravely along with them as if he had formed a part of the company. I have seen him sit down at table, unfold his napkin, wipe his lips, eat soup or a fork to carry the victuals to his mouth, pour liquor into a glass, and make it touch that of the person who drank along with him. When invited to take tea, he brought a cup and a saucer, placed them on the table, put the sugar, poured out the tea, and allowed it to cool before he drank it. All these actions he performed without any instigation than the signs or verbal orders of his master, often of his own accord. Far from doing an injury to one, he even approached company with circumspection, and presented himself as if he wished to be caressed.

Doctor Tyson, who, about the close of the seventeenth century, gave a very exact description of a young orang-outang, then exhibited in the metropolis, observes that many of its actions, it seemed to display a very high degree of sagacity, and was the most gentle and affectionate creature imaginable. Those whom it had known on shipboard embraced with the greatest tenderness, opening their bosoms and clapping its hands around them; and although these monkeys had been embarked, still it was observed during the passage to England, it would never associate with them, and, as if nothing akin to them, would carefully avoid their company.
But however acible and gentle the orang-outang may be, when taken young, and instructed, it is said to be possessed of great ferocity in its native state, and is considered as a dangerous animal, capable of readily overpowering the strongest man. Its swiftness is equal to its strength, and for this reason it is but rarely to be obtained in its full-grown state, the young alone being taken.

The orang-outang now exhibiting at Exeter Change, is a native of Borneo, and is remarkable, not only on account of its extreme rarity, but as possessing, in many respects, a strong resemblance to man. What is technically denominated the cranium, is perfectly human in its appearance; the shape of the upper part of the head, the forehead, the eyes (which are dark and full), the eye-lashes, and, indeed, every thing relating to the eyes and ears, differing in no respect from man. The hair of his head, however, is merely the same which covers his body generally. The nose is very flat,—the distance between it and the mouth considerable; the chin, and, in fact, the whole of the lower jaw, is very large, and his teeth, twenty-six in number, are strong. The lower part of his face is what may be termed an ugly, or caricature, likeness of the human countenance. The position of the scapulae, or shoulder blades, the general form of the shoulders and breasts, as well as the figure of the arms, the elbow-joint especially, and the hands, strongly continue the resemblance. The metacarpal, or that part of the hand immediately above the fingers, is somewhat elongated; and, by the thumb being thrown a little higher up, nature seems to have adapted the hand to his mode of life, and given him the power of grasping more effectually the branches of trees. The fingers, both of the hands and feet, have nails exactly like those of the human race, with the exception of the thumb of the foot, which is without a nail.

He is corpulent about the abdomen, or, to employ the common phrase, rather pot-bellied, looking like one of those figures of Bacchus often seen riding on casks: but whether this is his natural appearance when wild, or acquired since his introduction into new society, and by indulging in a high style of living, it is difficult to determine.

His thighs and legs are short and bandy, the ankle and heel like the human; but the fore-part of the foot is com-
posed or toes, as long and as pliable as his fingers, with a thumb a little situated before the inner ankle; this configuration enabling him to hold equally fast with his feet as with his hands. When he stands erect, he is about three feet high, and he can walk, when led, like a child; but his natural locomotion, when on a plane surface, is supporting himself along at every step, by placing the knuckles of his hands upon the ground.

His natural food appears to be all kinds of fruits and nuts; but when he was embarked on board the Caesar, the vessel which brought him to England, Mr. McLeod observes in his narrative, already cited, he ate biscuit, or any other sort of bread, and sometimes animal food. He drank grog, and even spirits, if given to him; and has been known repeatedly to help himself in this way: he was also taught to sip his tea or coffee; and, since his arrival in England, has discovered a taste for a pot of porter. His usual conduct while on board was not mischievous, and chattering like that of monkeys in general; but he had rather a grave and sedate character, and was much inclined to be social, and on good terms with everybody. He made no difficulty, however, or inclined to sleep, in supplying himself with any jacket he found hanging about, or in stealing a pillow from a hammock, in order to lie more soft and comfortably.

Sometimes, when teased by shewing him something to eat, he would display, in a very strong manner, the human passions, following the person whining and crying, throwing himself off on his back, and rolling about apparently in a great rage, attempting to bite those near him, and frequently lowering himself by a rope over the ship's side, as if pretending to drown himself; but when he came near the water's edge, he always reconsidered the matter, and came on board again. He would often rifle and examine the pockets of his friends in quest of nuts and biscuits, which they sometimes carried for him. He had a great antipathy to the smaller tribe of monkeys, and would throw them overboard if he could; but in his general habits and dispositions there was much docility and good nature, and when not annoyed, he was extremely inoffensive.
THE BEAVER.

Of all quadrupeds the Beaver possesses the greatest degree of natural or instinctive sagacity in constructing its dwelling; preparing, in concert with others of its own species, a kind of arched caverns or domes, supported by a foundation of strong pillars, and lined or plastered internally in a surprising degree of neatness and accuracy.

The American, or, as they are called, the associated civilized beavers, unite in society in the months of June and July, arriving in numbers from all parts, and soon forming a troop of two or three hundred. If the waters above their establishment are flat, and do not rise above their ordinary level, as in lakes, they dispense with a bank or dam; but in rivers or brooks, where the waters rise and fall, they construct a bank, and by this artifice form a pond, or piece of water, which remains always at the base height. The bank traverses the river, from one side to the other, like a sluice, and is often from eighty to a hundred feet long, by ten or twelve broad at the base. This pile, for animals of so small a size, appears to be enormous, and supposes an incredible labour: but the necessity with which the work is constructed is still more astonishing than its magnitude. The part of the river where they erect this bank is generally shallow. If they find on its margin a large tree which can be made to fall into the water, they begin with cutting it down, to form the principal part of their work. This tree is often thicker than the body of a man; but by gnawing at its foot with their cutting teeth, they accomplish their purpose in a very short time, always contriving that the tree should fall across the river. They next cut the branches from the trunk, make it lie level. These operations are performed by the whole community: while some are employed in gnawing the foot of the tree, others traverse the banks of the river, cut down smaller trees, which they dress and cut to a certain length, to make stakes of them, and first drag them to land to the margin of the river, and then by water to the place where the building is carrying on. These piles they sink down, and interweave the branches with the larger
While some are labouring in this manner, others bring earth, which they plash with their fore-feet, transport in such quantities, that they fill with it all the intervals between the piles. These piles consist of several rows of stakes, of equal height, all placed opposite to each other, and extend from one bank of the river to the other. The stakes facing the under part of the river are placed perpendicularly; but the rest of the work slopes upwards to sustain the pressure of the fluid, so that the bank, which is ten or twelve feet wide at the base, is reduced to two or three at the top.

The first great structure is made with a view to render their small habitations more commodious. These cabins, or houses, are built on piles near the margin of the pond, and have two openings, the one for going on the land, and the other to enable the beavers to throw themselves into water. The form of these edifices is either oval or round, and their dimensions vary from four or five to eight or ten feet diameter. Some of them consist of three or four stories, and their walls are about two feet thick, raised perpendicularly on planks, or plain stakes, which serve both as foundations and floors. They are built with amazing solidity, neatly plastered both without and within, impregnable to rain, and capable of resisting the most insidious winds. The partitions are covered with a kind of stucco as nicely plastered as if it had been executed by the hand of man. In the application of this mortar their tails serve as trowels, and their feet for plastering. They employ different materials, as wood, stone, and a kind of earth, which is not subject to dissolution in water.

These most interesting animals labour in a sitting posture and, besides the convenience of this situation, enjoy the pleasure of gnawing perpetually the wood and bark of trees, substances most agreeable to their taste; for they prefer fresh bark and tender wood to the greater part of their ordinary aliment. Of these provisions they lay up ample stores to support them during the winter; but they are not fond of dry wood, and make occasional excursions during the winter season for fresh provisions in the forests. They establish their magazines in the water, or near their habitations, and each cabin has its own, proportioned to the number of its inhabitants, who have all a common right to

494 MISCELLANEOUS WONDERS OF NATURE.
THE CHAMELEON.

No numbers can the varying robe express,
While each new day presents a different dress.

Few animals have been more celebrated by naturalists than the CHAMELEON, which is said to possess the power of changing its colour at pleasure, and of assimilating it to that of any particular object or situation. This, however, is received with certain limitations, the change of colour takes varying in degree, according to the circumstances of health, temperature of weather, and other causes. It is a native of Africa and India, and has likewise been seen in the eastern parts of Europe. It is harmless in its nature, and supports itself by feeding on insects, for which purpose the structure of the tongue is admirably adapted. It consists of
a long missile body, furnished with a dilated, and somewhat
tubular tip, by means of which the animal seizes insects
with great ease, darting out its tongue in the manner of a
wood-pecker, and retracting it instantaneously with the
prey on its tip. It can also support a long abstinence, and
hence arose the popular idea of the chameleon being nourished
by air alone.

A very interesting account of the chameleon is given by
Forbes in his Oriental Memoirs. This great curiosity, remarks, is so common in India, that it is found in every
thicket. He describes with great accuracy, and in the
following terms, one which he kept for several weeks.

"The Chameleon of the Concan, including the tail, is
about nine inches long; the body only half that length;
varying in circumference, as it is more or less inflated; the
head, like that of a fish, is immovably fixed to the shoulders,
but every inconvenience is removed by the structure of the
eyes, which, like spheres rolling on an invisible axis, are
placed in deep cavities, projecting from the head: through
a small perforation in the exterior convexity appears a bright
pupil, surrounded by a yellow iris, which, by the singular
formation and motion of the eye, enables the animal to see
what passes before, behind, or on either side; and it can
give one eye all these motions, while the other remains per-
fectedly still: a hard rising protects these delicate organs.

another extends from the forehead to the nostrils: the mouth
is large, and furnished with teeth, with a tongue half the
length of the body, and hollow like an elephant’s trunk;
it darts nimbly at flies and other insects, which it seems to
prefer to the aerial food generally supposed to be its essence.
The legs are longer than usual in the lacertæ genera,
on the fore-feet are three toes nearest the body, and two
without; the hinder exactly the reverse; with these claws
it clings fast to the branches, to which it sometimes twines itself by the tail, and remains suspended: the skin
granulated like shagreen, except a range of hard excres-
cences, or denticulations, on the ridge of the back, which
are always of the same colour as the body; whereas a row
of similar projections beneath continue perfectly white.

notwithstanding any metamorphosis of the animal.

"The general colour of the chameleon, so long in my
possession, was a pleasant green, spotted with pale blue:
THE BOTTLE-NESTED SPARROW.

The bottle-nested sparrow, 

is remarkable for its brilliant plumage, and uncommon sagacity. These birds are found in most parts of Hindostan; in shape they resemble the sparrow, as also in the brown feathers of the back and wings; the head and breast are of a bright yellow, and in the rays of a tropical sun have a splendid appearance, when flying; by thousands in the same grove they make a chirping noise, but have no song; they associate in large communities and cover extensive clumps of bananaras, acacias, and date, trees, with their nests. These are formed in a very ingenious manner, by long grass woven together in the shape of a bottle, with the neck hanging downwards, and suspended by the other end to the extremity of a flexible branch, the more effectually to secure the birds of prey and young brood from serpents, monkeys, squirrels, 

The nests contain several apartments, appropriated to different purposes: in one the hen performs the office of incubation; another, consisting of a little 

The Hindoos are fond of these birds, for their docility and sagacity: when young, they teach them to fetch and carry; and at the female during her maternal duties. The Hindoos are 

From this it changed to a bright yellow, dark olive, and a dull green; but never appeared to such advantage as when inflated, or a dog approached it; the body was then considerably inflated, and the skin clouded like tortoise-shell, shades of yellow, orange, green, and black. A black object always caused an almost instantaneous transformation; the room appropriated for its accommodation was startled by a board painted black; this the chameleon carefully avoided; but if he accidentally drew near it, or we produced a black hat in his way, he was reduced to a hideous skeleton, and from the most lively tints became black as jet; removing the cause, the effect as suddenly ceased; the bottle hue was again succeeded by a brilliant colouring, and the body was again inflated.

THE BOTTLE-NESTED SPARROW.
ment, from the forehead of their favourite, and bring it to their expecting master.

THE HUMMING BIRD.

There are not less than sixty-five species of this very curious bird, all of them remarkable for the beauty of the colour.

Of these the minimus, fly-bird, or least humming-bird, the most diminutive of the feathered tribe, may be cited as among the most interesting of the minute wonders of nature. It is exceeded, both in weight and dimensions, by several species of bees. Its total length is one inch and a quarter; and, when killed, it does not weigh more than about twenty grains. The bill is straight and black, three lines and a half in length; the upper parts of the body are of a greenish brown, in some lights appearing reddish; the under parts are greyish white; the wings are violet brown; the tail of a bluish black, with a gloss of polished metal; but the outer feathers, except one on each side, are grey from the middle to the tip, and the outer one wholly grey; the legs and claws are brown. The female is still less than the male.

These birds, which are natives of the Brazils, of various parts of South America, and of the adjacent islands, subsist on the nectar or sweet juice of flowers, frequenting those most which have a long tube. They never settle on the flower during the act of extracting the juice, but flutter continually like bees, moving their wings very briskly, and making a humming noise, whence they have received their name. They are not shy; but when very nearly approached they fly off like an arrow from a bow. They often meet and fight for the right to a flower, and this all on the wing. In this state they often enter an apartment, the windows of which are open, fight a little, and go out again. When they come to a flower which is juiceless, or on the point of withering, they pluck it off as it were in anger, by which means the ground is often strewed with flowers. If they are against each other, they have, besides the humming, a chirping note resembling that of a sparrow. They do not feed either on insects or fruits; but have been kept alive in cages for several weeks, by feeding them with sugared water.

The humming-bird builds most frequently in the middle
EDIBLE BIRDS' NESTS.

Among the interesting subjects which still remain open for research, are the habits and constitution of the Hirundo Renzenta, the small swallow which forms the edible birds, annually exported in large quantities from Java and the eastern islands for the Chinese market. These birds, Governor Raffles observes, in his history of Java, not only breed among the cliffs and caverns of the south coast of the island, but inhabit the fissures and caverns of several of the mountains and hills in the interior of the country. Every observation which has been made in Java, it has been inferred that the mucilaginous substance of which the nests are formed, is not, as has been generally supposed, obtained from the ocean. The birds, it is true, generally inhabit the caverns in the vicinity of the sea, as agreeing with their habits, and affording them the most convenient retreats to which to attach their nests; but several caverns are found inland, at a distance of forty or fifty miles.
from the sea, containing nests similar to those on the shore. From many of their retreats along the southern coast, they have been observed to take their flight in an inland direction towards the pools, lakes, and extensive marshes, covered with stagnant water, as affording them abundance of their food, which consists of flies, mosquitoes, gnats, and small insects of every description. The sea, which washes the foot of the cliffs, where they most abound, is almost always in a state of the most violent agitation, and affords none of those substances which have been supposed to constitute the food of the esculent swallow. Another species of swallow, in the island of Java, forms a nest, in which grass, moss, &c., are merely agglutinated by a substance exactly similar to that of which exclusively the edible nests consist. This substance, from whatever part of those regions the nests derived, is essentially uniform, differing only in the color according to the relative age of the nests. It exhibits none of those diversities which might be expected, if, like the mud employed by the martin, and the materials commonly used in nest-making, it were collected casually, and applied to the rocks. Were it to consist of the substances usually supposed, it would be putrescent and diversified.

THE MIGRATION OF BIRDS.

Yea, the stork in the heavens knoweth her appointed times; and the turtle, and the crane, and the swallow observe the time of their coming.

Jeremiah.

Who bids the stork, Columbus like, explore Heavens not his own, and worlds unknown before? Who calls the council, states the certain day? Who forms the phalanx, and who points the way? Poës.

The migration of birds, which is common to the quail, the stork, the crane, the fieldfare, the woodcock, the cuckoo, the martin, the swallow, and various others, is justly considered as one of the most wonderful instincts of nature. Two circumstances, Doctor Derham observes, are remarkable in this migration: the first, that these un instructed creatures should know the proper times for their passage when to come, and when to go, some departing while others
THE MIGRATION OF BIRDS.

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secondly, that they should know which way to steer their course, and whither to go.

Birds of passage are all peculiarly accommodated, by the structure of their parts, for long flights; and it is remarked in their migrations, they observe a wonderful order and regularity: they fly in troops, and steer their course, without the aid of a compass, to vast unknown regions. The flight of wild geese, in a wedge-like figure, has often been observed; and it has been noticed that the three foremost, who are the nest tired, retreat behind, and are relieved by others, who again succeed by the rest in order. At the approach of winter, the wild ducks and cranes of the north fly in quest of more favourable climates. They all assemble, at a certain day, like swallows and quails, decamping at the same time. Their flight is highly curious: they generally range themselves in a long column, like an I: or in two lines united at point, like a V reversed. It is observed by Shaw, in the travels, that storks, about a fortnight before they pass from one country to another, constantly resort together from the circumjacent parts, to a certain plain, and there form themselves daily into what, in the popular phrase, is called a dou vanne, determine the exact time of their departure, and the places of their future abode.

Swallows have often been observed, in innumerable flocks, in churches, rocks, and trees, previously to their departure from Great Britain; and their return, in apparently equal numbers, has been witnessed in a variety of instances. In Sweden, the starling, finding, after the middle of summer, her worms are less plentiful, goes annually into Scania, Germany, and Denmark. The female chaffinches, every winter, about Michaelmas, go in flocks to Holland; but as the males stay in Sweden, the females come back in the spring, except such as do not choose to breed any longer. In the same manner, the female Carolina yellow-hammer, in the month of September, while the rice on which she feeds is laid up in the granaries, goes towards the south, and returns in the spring to seek her mate. The aquatic birds of the north are forced by necessity to fly toward the south every autumn before the water is frozen. Thus the lakes of Poland and Lithuania are filled with swans and geese in the autumnal season, at which time they go in great flocks, along many rivers, as far as the Euxine Sea. In the
beginning of spring, however, as soon as the heat of the sun molests them, they return back, and again frequent the borders of the springs and lakes, where the females deposit their eggs; for there, and especially in Lapland, a vast abun-
dance of gnats—insects which live in the water before they get their wings—afford them an excellent nourish-
ment. By these migrations, birds become useful to many countries, and are distributed over almost every part of the globe.

THE TERMITES, OR WHITE ANTS.

Of these very surprising insects naturalists describe four species, the largest of which is the Termes bellicosus, or belligerent termite. The nests of these insects are large handsome pyramids, ten or twelve feet and up-ward above the surface of the earth, and as many below The second species is named the fatal termite, the head of which are likewise of a pyramidal form, but neither lofty nor extensive as the former. Its ravages, however, are more fatal, and its punctures more painful and dangerous. The biting termite forms the third species, and constructs its nest in the form of a cylindrical turret, four feet high, and one in diameter. The turret is covered with a conical roof, which projects some inches over, and beyond the building, doubtless to prevent it from being injured by the rain. The destroying termite constitutes the fourth species, and constructs spherical nests round the branch of a tree, which passes entirely through them.

The Termes bellicosus, according to Mr. Smeaton, whose account has appeared in the Philosophical Trans-
actions, constructs works which surpass those of the bee-
asps, beavers, and other animals, as much at least as those of the most polished European nations exceed those of the least cultivated savages. Even with regard to man, greatest works, the boasted pyramids, fall comparatively far short, even in size alone, of the structures raised by these insects. The labourers among them employed in this service are not a quarter of an inch in length; but the structures which they erect, rise, as has already been ob-
served, to the height of ten or twelve feet and upward above the surface of the earth. Supposing the height of a man to be six feet, this author calculates, that the buildings
THE TERMITES, OR WHITE ANTS.

These insects may be considered, relatively to their size, as that of a man, as being raised to nearly five times the height of the greatest of the Egyptian pyramids; that is, corresponding with considerably more than half a mile, may be added, that, with respect to the interior construction, and the various members and dispositions of the parts of the buildings, they appear greatly to exceed that, any other work of human construction.

The most striking parts of these structures are, the royal apartments, the nurseries, magazines of provisions, arched centers and galleries, with their various communications; ranges of the gothic-shaped arches, projected, and not so high, but which diminish rapidly, like the arches of perspectives; the various roads, sloping staircases, and bridges, consisting of one vast arch, and constructed to lessen the distance between the several parts of the building, which would otherwise communicate only by winding passages. In the plate, a section is given of one of these rising mounds or ant hills; and likewise the section of pyramid surmounted by its conical roof. In some parts of Senegal, the number, magnitude, and closeness of these structures, make them appear like the villages of the

The economy of these industrious insects is equally curtailed with the plan and arrangement of the interior of their buildings. There are three distinct ranks or orders among them, constituting a well-regulated community. These

first, the labourers, or working insects; next, the soldiers, or fighting order, who abstain from all labou, are about twice as long as the former, and equal in size to about fifteen of them; and, lastly, the winged, perfect insects, which may be styled the nobility or gentry of the state; for they neither labour nor fight, being scarcely capable even of self-defence. These alone are capable of being elected kings or queens; and it has been so ordained nature, that they emigrate within a few weeks after they are elevated to this state, and either establish new kingdoms, perish in the space of one or two days.

The first order, the working insects, are most numerous, being in the proportion of one hundred to one of the soldiers. In this state they are about a quarter of an inch
long, and twenty-five of them weigh about a grain, that they are not so large as some of the ants of Europe.

The second order, or soldiers, have a very different form from the labourers, and have been by some authors supposed to be the males, and the former the neuters; but they are, in reality, the same insects as the foregoing, only they have undergone a change of form, and approached a degree nearer to the perfect state.

The second order, or soldiers, have a very different form from the labourers and soldiers; beside which, it now furnished with four fine, large, brownish, transparent wings, with which it is, at the time of emigration, to make its way in search of a new settlement. The difference is indeed, so great, that these perfect insects have not, more recently, been supposed to belong to the same community with the others, and are not to be discovered in the state until just before the commencement of the rainy season, when they undergo the last change, which is preparatory to the formation of new colonies. They are equal in bulk to two soldiers and about thirty labourers; and, with the aid of their wings, roam about for a few hours, when their wings fall off, and they become the prey of innumerable birds, reptiles, and insects. Hence it happens that searching a pair of many millions of this unhappy race, find a pair of safety, to fulfil the first law of nature, and lay the foundation of a new community. In this state many fall into the neighbouring waters, and are eaten with avidity by the Africans, who roast them in the manner of coffee, and find them delicate, nourishing, and wholesome.

The few fortunate pairs who survive this annual massacre and destruction, being casually found by some of the labourers, who are constantly running about on the surface of the ground, are elected kings and queens of new species. Those who are not so elected and preserved, certainly perish, and most probably in the course of the following day. By these industrious creatures the king and queen elect are immediately protected from their enemies, by inclosing them in a chamber of clay, where the propagation of the species soon commences. Then voluntary subjects then busy themselves in constructing wooden nurseries, or apartments entirely composed of wooden
After impregnation, a very extraordinary change begins to take place in her person, or rather in her abdomen only. It gradually increases in bulk, and at length becomes of such an enormous size as to exceed the bulk of the rest of her body 200 or 2000 times. She becomes 1000 times heavier than her consort, and exceeds 20,000 or 30,000 times the bulk of the labourers. In this state 80,000 eggs (for they have been counted) are protruded in twenty-four hours. They are instantly taken from her body by the attendants, sufficient number of whom are constantly in waiting in royal chambers, and adjacent galleries, and carried to nurseries, which are sometimes four or five feet distant along a straight line. Here, after they are hatched, the young are attended and provided with every thing necessary, until they are able to shift for themselves, and take their share of the labours of the community.

Many curious and striking particulars are related of the devastations committed by this powerful community, which construct roads, or rather covered ways, diverging in all directions from the nest, and leading to every object of plunder within their reach. Though the mischiefs they commit are great, such is the economy of nature, that they are probably counterbalanced by the good produced by them, in quickly removing dead trees and other substances, which would otherwise, by a tedious decay, serve only to encumber the surface of the earth. Such is their alacrity and dispatch in their office, that the total destruction of deserted towns is accomplished in two or three years, and their space filled with thick wood, not the least vestige of a house remaining.
At Bombay, Mr. Forbes observes in his memoirs, they are so numerous and destructive that it is difficult to guard against their depredations; in a few hours they will demolish a large chest of books, papers, silk, or clothes. Performing them with a thousand holes: the inhabitants dare not leave a box on the floor without placing it on glass bottles, which if kept free from dust, they cannot ascend: this is tribulation when compared with the serious mischief they sometimes occasion, by penetrating the beams of a house, or destroying the timbers in a ship.

These destructive animals advance by myriads to their work, under an arched incrustation of fine sand, tempered with a moisture from their body, which renders the covering way as hard as burnt clay, and effectually conceals them in their insidious employment.

Mr. Forbes, on his departure from his residence at Anjengo, to pass a few weeks at a country residence, locked up a room containing books, drawings, and a few valuables; as he took the key with him, the servant could not enter to clean the furniture: the walls of the room were white-washed, and adorned with prints and drawings: English frames and glasses: returning home in the evening, and taking a cursory view of his cottage by candle-light, he found every thing apparently in the same order as he left it out on a nearer inspection the next morning, he observed a number of advanced works, in various directions, of his pictures; the glasses appeared to be uncommonly dirty, and the frames covered with dust: on attempting to wipe it off, he was astonished to find the glasses fixed to the walls not suspended in frames as he left them, but completely surrounded by an incrustation cemented by the white sand which had actually eaten up the deal frames and back-boards, and the greater part of the paper, and left the glasses fastened by the incrustation, or covered-way, which they had made during their depredation. From the flat Dutch bottoms, on which the drawers and boxes were placed, not having been wiped during his absence, the ants had ascended the handle by means of the dust, eaten through the bottom: and had made some progress in perforating the book; and he, who had actually eaten up the deal frames and back-boards, and the greater part of the paper, and left the glasses fixed to the walls not suspended in frames as he left them, but completely surrounded by an incrustation cemented by the white sand which had actually eaten up the deal frames and back-boards, and the greater part of the paper, and left the glasses fastened by the incrustation, or covered-way, which they had made during their depredation.
The termites or white ants. On making a breach in any part of this structure, with a hoe or pick-axe, a soldier immediately appears, and walks about the breach, as if to see whether the enemy is gone, or to examine whence the rest proceeds. In a short time he is followed by two or three others, and soon afterwards by a numerous body, who rush out as fast as the breach will permit them, their numbers increasing as long as any one continues to batter the building. During this time they are in the most violent bustle of agitation; some being employed in beating with their heads upon the building, so as to make a noise which may be heard at three or four feet distance. On ceasing to disturb them, the soldiers retire, and are succeeded by the labourers, who hasten in various directions towards the breach, each with a burden of mortar in his mouth ready prepared. Though there are millions of them, they never embarrass each other; and a wall gradually arises to fill the chasm. A soldier attends every 600 or 1000 of the labourers, seemingly as a director of the works; for he constantly makes the above-mentioned noise, which is instantly answered by a loud hiss from all the labourers in the dome: and at every such signal, they evidently increase their pace, and work as fast again. The work being completed, a renewal of the attack commonly produces the same effects. The soldiers again rush in, and then retreat, and are followed by the labourers loaded with mortar, and as active and as diligent as before. Mr. Smeathman observes, may be obtained as curiosity excites, or time permits; and it will easily be found that the one order never attempts to beat out the other to work, let the emergency be ever so great. The obstinacy of the soldiers is remarkable: they are as often to drive away the negroes, who are without weapons, and make white people bleed plentifully through their D. 

Such is the strength of the buildings erected by these puny bees, that when they have been raised to little more than half their height, it is the constant practice of the African
wild bulls to stand as sentinels upon them, while the rest of
the herd are ruminating below. When at their full height
of ten or twelve feet, they are used by the Europeans as look-
out stations whence they can see over the grass, which in
Africa is on an average of the height of thirteen feet. Four
or five persons may stand on the top of one of these build-
ings to look out for a vessel the approach of which is
expected.

THE BEE.

Their delicious task the fervent bees,
In swarming millions tend: around, athwart,
Through the soft air, the busy nations fly,
Cling to the bud, and with inserted tube,
Suck its pure essence, its ethereal soul;
And oft, with bolder wing, they soaring dare
The purple heath, or where the wild thyme grows,
And yellow load them with the luscious spoil.

The wisdom of the bees, the perfection and harmony of
their government, their persevering industry, and their
wonderful economy, have been celebrated by the natural
historians of every age. Indeed, the skill and dexterity
displayed by the honey bees, in the construction of their
combs, or nests, are truly wonderful. These are composed
of cells regularly applied to each other's sides, and united
of an hexagonal or six-sided figure. In a bee-hive, every
part is arranged with such symmetry, and so finely finished,
that, if limited to the same materials, the most expert work-
man would find himself unqualified to construct a similar
habitation, or rather a similar city.

In the formation of their combs, bees seem to have
solved a problem which would perplex geometers; not a
little; namely, a quantity of wax being given, to make an
equal and similar cells of a determined capacity, and dispo-sed
in such a manner as to occupy in the hive the
least possible space. Every part of this problem is com-
pletely executed by the bees. By applying hexagonal cells
to each other's sides, not any void spaces are left behind
them; and, although the same end might be accomplished
by other figures, yet they would necessarily require a greater
quantity of wax. Hexagonal cells are, besides, better fitted to receive the cylindrical bodies of these insects. A comb being made to consist of two rows of cells applied to each other's ends, this arrangement both saves room in the hive, and gives a double entry into the cells of which the comb is composed. As a further saving of wax, and for the prevention of void spaces, the bases of the cells in one row of a comb serve for bases to the opposite row. In a word, the more minutely the construction of these cells is examined, the more is the admiration of the observer excited. Their walls are so extremely thin, that the mouths of the bees would, on entering and passing out continually, be in danger of suffering; to prevent which, a kind of ring, three or four times thicker than the walls, is formed round the margin of each cell.

The mode in which bees operate, when constructing their cells, is not easily to be traced, even with the help of glass hives. They are so eager to afford mutual assistance, and for this purpose so many of them crowd together, and are perpetually succeeding each other, that their individual operations can seldom be distinctly observed. It has, however, been fully ascertained that, in modelling and polishing the wax, they do not employ any other instruments besides their two teeth. With a little patience and attention, cells may be perceived just begun; and the celerity with which a bee moves its teeth against a small proportion of one of these wax, they do not employ any other instruments besides

The little animal, by repeated strokes on each side, smooths this portion, renders it compact, and reduces it to a proper thinness of consistence. While some of the hive are lengthening their hexagonal cells, others are laying the foundations of new ones. When one puts its head a little way into a cell, it may easily be observed to scrape the walls with the points of its teeth, in order to detach such useless and irregular fragments as may have been left in the work. Of these fragments it forms a ball about the size of a pin's head, comes out of the cell, carries the wax to another part of the work where it is wanted. It no sooner leaves the cell, than it is succeeded by another bee, which performs the same office; and in this manner the work is carried on till the cell is completely finished.

The cells are designed for different purposes, some being
employed for the accumulation and preservation of honey, while in others the female deposits her eggs, from which worms are hatched, to remain in the cells until their transformation into winged insects. The drones or males are larger than the common or working bees; and the queen or mother of the hive, is much larger than either. A cell destined for the lodging of a male or female worm must therefore be considerably larger than the cell of the smaller working bees. Those destined for the reception of the working bees are far more numerous than those in which the males are lodged. The honey-cells are always made deeper and more capacious than the others. When the honey collected is so abundant that the receptacles cannot contain the bees lengthen, and consequently deepen the honey-cells.

Bees, when placed in an empty hive, display the highest sagacity, as well in their mode of working, as in the disposition and division of their labour. They immediately begin to lay the foundations of their combs, a task which they execute with surprising quickness and alacrity. Shortly after having begun to construct one comb, they divide themselves into two or three companies, each of which, in a different part of the hive, is occupied with the same labours. By the division of the task, a greater number of bees find employment at the same time, and, consequently, the common work is sooner finished. The combs are generally arranged in a direction parallel to each other, an interval, or street, being always left between them, that the bees may have a free passage, and an easy communication with the different combs in the hive. These streets are wide enough to allow two bees to pass each other; and there are, besides, several round cross passages, always covered, to shorten their journeys when working.

By the means of their hinder thighs, bees carry into the hive great quantities of the farina or dust of flowers, which after having been thus industriously collected, becomes their food, and is, by an animal process, converted into wax. This digestive process, which is necessary for the formation of that substance, is carried on in the stomach, and perhaps in the intestines of bees. Reasonably speaking, to whom the merit of this discovery is due, likewise it is certained that all the cells in a hive are not destined for the reception of honey, and for depositing the eggs of the
THE BEE.

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some of them are employed as receptacles for the farina of flowers, which is the great basis and raw material of all their curious operations. When a bee comes to the hive with its thighs filled with farina, it is often met by the entrance by some of its companions, who first take off the load, and then devour the provisions so kindly brought to them. But when the members of the community are no longer oppressed by hunger, the carriers of the farina deposit their loads in cells prepared for that purpose.

To these cells the bees resort, when the weather is so bad that they cannot venture into the fields to seek a fresh supply of food. The farina being digested, and converted into wax, the bees possess the faculty of bringing from the stomach to the mouth, employing the tongue, which is placed beneath the two teeth, or fangs, in suppling the materials for the construction of their waxen cells. When at work, this member is in perpetual and rapid motion; being at times more or less concave, and nearly covered with a moist paste or wax. By its different movements the bee continues to supply fresh wax to the walls of its cell, till they have acquired a sufficient height. The moist paste or wax is no sooner dry, than it assumes all appearances of common wax.

Bees not only require much warmth, but are also extremely solicitous to prevent other insects from an entrance to their hives. To accomplish both these purposes, when they take possession of a new hive, they carefully examine every part of it, and, if they discover any small holes or chinks, paste them firmly with a resinous substance composed from various trees, as poplars, birches, and willows, differing entirely from wax, more durable, and more capable resisting the vicissitudes of weather. A bee having procured a sufficient quantity of this purely natural production, fills the cavities of its two hinder thighs, repairs to the places where two of its companions are in readiness to draw off the glue, and apply it to fill up such chinks, holes, or other deficiencies, as they find in their habitation. This is, however, the only use to which bees apply the glue. They are extremely solicitous to remove such insects, or foreign bodies, as chance to introduce themselves into the hive. When so light as not to exceed their powers, they
first kill the insect with their stings, and then drag it out with their teeth. But it sometimes happens that a small creeps into the hive; in which case it is no sooner perceived than it is attacked on all sides, and stung to death. The bees being unable to carry out a burden of such a weight to prevent so large a body from diffusing a disagreeable odour through the hive, instantly cover every part of it with glue through which not any effluxia can escape. When a small with a shell finds an entrance, the bees have less trouble since it naturally retires within its shell, on receiving the first wound from a sting. In this case, the bees, instead of gluing it all over, satisfy themselves with passing the glue round the margin of the shell, which renders the animal immovable fixed.

Bees being prevented by the weather, not only during the winter, but on many summer days, from going abroad in quest of provisions, collect and amass, in cells destined for that purpose, large quantities of honey, which they extract, by means of their proboscis or trunk, from the nectariferous glands of flowers. After collecting a few small drops, the animal, with its proboscis, conveys them to its mouth, and swallows them. From the gullet, the honey passes into the first stomach, which is more or less swollen in proportion to the quantity of honey it contains. When filled, the bee returns to the hive, and discharges it in a cell the honey it has collected. It occasionally happens, however, that it is accosted on its way by a hungry companion. How the latter communicates its necessity to the other, remains to be discovered; but the fact is certain that when two bees, thus circumstanced, meet, the one which is laden extends its trunk, opens its mouth, and like ruminating animals, forces up the honey into the cavity. The hungry bee knows how to take advantage of this hospitable invitation, and, with the point of its trunk, sucks the honey from the other's mouth. In the same way, the loaded bee, on reaching the hive, offers its honey to those who are at work, as if to save them the necessity of quitting their labour to proceed in quest of food. In bad weather, the bees feed on the honey laid up in open cells; but never touch these reservoirs when their companions are enabled to supply them with fresh honey from the fields. But the mouths of those cells which are destined to preserve
The honey for winter’s use, are carefully covered with a lid of thin plate of wax.

The honey bees not only labour in common with astonishing assiduity and art, but their whole attention and affections seem to centre in the person of the Queen of the hive. She is the basis of their association, and of all their operations. When she dies by any accident, disorder ensues throughout the community; all labour ceases; there is an end to the construction of new cells, as well as to the collection of either honey or wax. In this state of anarchy the bees remain, until a new queen or female is obtained, to effect which they have the power of selecting one or two grubs of workers, and converting them to queens. This they accomplish by greatly enlarging the cells of the selected larvae, by supplying them more commonly with food, and that of a more pungent kind than is given to the common larvae.

The government or society of bees is therefore more of a chimerical than of a republican nature. All the members of the state seem to respect and to be directed by a single female. This fact affords a strong instance of the force and effect of nature. The female is the mother of the whole, however numerous; and without her the species could not be continued. Nature has therefore endowed the rest of the hive with a wonderful affection to their common parent. For the reception of her eggs nature impels them to construct cells, and to lay up stores of provisions for winter subsistence. These operations proceed from pure instinctive impulses, it is true, but every instinct necessarily posess a degree of intellect, a principle to be acted upon, otherwise not any impulse could be felt, nor could either action or mark of intelligence possibly be produced.

On the subject of swarms, the following are the conclusions drawn by M. Huber, who has paid particular attention to the economy and habits of bees. First: a swarm is always led off by a single queen, either the sovereign of a parent hive, or one recently brought into existence. If, at the return of spring, a well-peopled hive, under the government of a fertile queen, be examined, it will be seen to lay a prodigious number of male eggs in the course of the month of May, and the workers will then that moment for constructing several royal cells.
Secondly: when the larvae hatched from the eggs, laid by the queen in the royal cells, are ready for a transformation into nymphs, this queen leaves the hive, conducting a swarm along with her; and the first swarm that leaves the hive is uniformly conducted by the old queen. Lastly: after the old queen has conducted the first swarm from the hive, the remaining bees take particular care of the royal cells, and prevent the young queens successively hatched, from leaving them, unless at an interval of several days between each.

TRANSFORMATION OF INSECTS.

Nature's smallest products please the eye,
While greater births pass unregarded by,
Her monsters seem a violence to sight:
They're form'd for terror, insects to delight.
Thus, when she nicely frames a piece of art,
Fine are her strokes, and small in every part.
No labour can she boast more wonderful
Than to inform an atom with a soul;
To animate her little beauteous fly,
And clothe it in her gaudiest drapery.

All winged insects, without exception, and many of those which are destitute of wings, have to pass through several changes before they arrive at the perfection of their natures. The appearance, the structure, and the organs of a caterpillar, a chrysalis, and a fly, are so different, that to a person unacquainted with their transformations, an identical animal would be considered as three distinct species. Without the aid of experience, who could believe that a butterfly, adorned with four beautiful wings, furnished with six legs, a long spiral proboscis, instead of a mouth, and with six pairs of appendages, proceeded from a disgusting caterpillar, provided with horns and teeth, and fourteen feet? Without experience, who could imagine that a long, white, smooth, soft worm, which under the earth, should be transformed into a black crustaceous beetle, having wings covered with hard cases?

Besides their final metamorphosis into flies, caterpillars undergo several intermediate changes. All caterpillars pass or change their skins more or less frequently according to the
TRANSFORMATION OF INSECTS.

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The silkworm, previous to its chrysalis state, casts its skin four times. The first skin is cast on the 10th, 11th, or 12th day, according to the nature of the season; the second in five or six days after; the third in five or six days more; and the fourth and last in six or seven days after the third. This changing of skin is not only common to all caterpillars, but to every insect whatever. Not one of them arrives at perfection without casting its skin at least once or twice. The skin, after it is cast, preserves so entirely the figure of the caterpillar in its head, teeth, legs, colour, hair, etc., that it is often mistaken for the animal itself. A day or two before this change happens, caterpillars take no food; they lose their former activity, attach themselves to a particular place, and bend their bodies in various directions, till, last, they escape from the old skin, and leave it behind them. The intestinal canal of caterpillars is composed of two principal tubes, the one inserted into the other: the external tube is compact and fleshy; but the internal one is thin and transparent. Some days before caterpillars change into the chrysalis state, they void, along with their excrement, the inner tube which lined their stomach and intestines. When about to pass into the chrysalis state, which is a state of inbecility, they select the most proper places and modes of concealing themselves from their enemies. Some, as the silkworm and many others, spin silken webs or cords round their bodies, which completely disguise the animal form. Others leave the plants upon which they formerly fed, and hide themselves in little cells which they make in the earth. The rat-tailed worm abandons the water upon the approach of its metamorphosis, retires under the earth, where it is changed into a chrysalis, and, after a certain time, bursts from its seemingly inanimate condition, and appears in the form of a winged insect. Thus the same animals pass the first and longest period of their existence in the water, another under the earth, and the third and last in the air. Some caterpillars, when about to change into a chrysalis, cover their bodies with a mixture of earth and of silk, and conceal themselves in the loose soil. Others incrust themselves with a silky or glutinous matter, which they push out from their mouths, without spinning it into threads. Others retire into the holes of walls or decayed trees, Others suspend themselves to the twigs of trees, or to other
Some attach themselves to walls, with their heads undermost. Some fix themselves by a gluten, and spin a rope round their middle to prevent them from falling. Those which feed upon trees attach themselves to the branches, instead of the leaves, which are less durable, and subject to a greater variety of accidents. The colours of the caterpillars give no idea of those of the future flies.

The metamorphosis of insects has been regarded as a sudden operation, because they often burst their shell or silky covering quickly, and immediately appear furnished with wings. But, by more attentive observation, it has been discovered, that the transformation of caterpillars is a gradual process from the moment the animals are hatched till they arrive at a state of perfection. Why, it may be asked, do caterpillars so frequently cast their skins? The new skin, and other organs, were lodged under the old ones, as in many tubes or cases, and the animal retires from these cases because they have become too strait. The reality of these encasements has been demonstrated by a simple experiment. When about to molt or cast its skin, if the foremost legs of a caterpillar are cut off, the animal comes out of the old skin deprived of these legs. From this fact, Renanum conjectured, that the chrysalis might be thus encased, and concealed under the last skin of the caterpillar. He discovered that the chrysalis, or rather the butterfly itself, was inclosed in the body of the caterpillar. The proboscis, the antennae, the limbs, and the wings of the fly, are so nicely folded up that they occupy a small space only under the first two rings of the caterpillar. In the first six limbs of the caterpillar are encased the six limbs of the butterfly. Even the eggs of the butterfly have been discovered in the caterpillar long before its transformation.

From these facts it appears, that the transformation of insects is only the throwing off external and temporary coverings, and not an alteration of the original forms. Caterpillars may be considered as analogous to the fetuses of men and of quadrupeds. They live and receive nourishment in envelopes till they acquire such a degree of perfection as enables them to support the situation to which they are ultimately destined by Nature.
ZOOPHITES, OR PLANT-ANIMALS.

These wonderful productions are so denominated on account of their existing in the shape of plants. They are very numerous, and the greater part of them have so great a resemblance to vegetables, that they have generally been considered as such, although the horny and stony appearance of several of the tribe declares them, at first view, to be of a widely different nature from the generality of plants. In others, however, the softness of their substance, and the renounced mode of their growth, would lead any one not acquainted with their real nature, to suppose them vegetables. 

The hard, horny, or stony zoophites are in general known by the name of corals; and of these several distinctions are adopted, either from the structure and appearance of the animal or hard part, or from the affinity which the softer, or animal part, bears to some other genus among soft-bodied animals, or mollusca. The zoophites may be therefore said to unite the animal and vegetable kingdoms, so as to fill up the intermediate space.

Belonging to the class of zoophitic-worms, the fresh-water species are infinitely curious. These animals may be found in small streams, and in stagnant waters, adhering to the stems of aquatic plants, or to the under surfaces of the leaves, and other objects. If a polype be cut in two parts, the superior part will produce a new tail, and the inferior part a new head and arms; and this, in warm weather, in the space of a very few days. If cut into three pieces, the middle portion will produce both the head and tail; and, if three polypes may be cut in all directions, and will still resemble the deficient organs. The natural mode of propagation in this animal, is by shoots or offsets, in the manner of a tree; one or more branches or shoots proceed from the central stem, dropping off when complete; and it often happens that these young branches produce others before they themselves drop off from the parent; so that a polype may be found with several of its descendants still adhering to the stem, thus constituting a real genealogical tree. The type likewise, during the autumnal season, deposits eggs, which evolve themselves afterwards into distinct animals;
and thus possesses two modes of multiplication. It seems paradoxical that a polype should be able to swallow a worm three or four times as large as itself, which is frequently observed to happen; but it must be considered that the body of the animal is extremely extensile, and that it possesses, in an extraordinary degree, the power of stretching itself according to the size of the substance it has to swallow. It seizes its prey with great cangerness, but swallows it slowly, in the same manner as a snake swallows any small quadruped. The arms of a polype, when microscopically examined, are found to be furnished with a vast number of small organs, apparently acting like so many suckers, by the means of which the animal can hold a worm, even though but slightly in contact with one of its arms; but when on the point of swallowing its prey, it then makes use of all its arms at once, in order to absorb it the more readily.

Corals, on being gathered perfectly fresh, and placed in sea water, appear to put forth small flowers from all the minute cavities, or hollow points, on the surface. These supposed flowers (for such an idea has been entertained by supposed flowers (for such an idea has been entertained by the name of corallines, or sea mosses, are so many ramified sea-polypes, covered with a kind of strong, horny case, to defend them from the injuries to which they would be liable in the boisterous element destined for their abode. The harder, or stony corals are equally of an animal nature; the entire coral continuing to grow as an animal, and to form by secretion, the strong or horny exterior, which may at once be considered as its bone, and the habituation in which it has constantly to dwell. A coral of this kind is, therefore, a large compound zoophite, springing up from the rock in which it seems to have taken root, and shooting out into branches like a vegetable production.

Sponges afford another curious instance of zoophitic life. There are forty-nine species of this zoophite, each of which is characterised in the Linnean system as a flexible, torpid, of various forms, composed of articulate fibres, or masses of small spines interwoven together.
and clothed with a gelannous flesh, full of small mouths on its surface, by which it absorbs and rejects water. The existence of the animal inhabitant within its cell has been satisfactorily ascertained by the observations and experiments of Ellis on the spongia tormentosa. He remarked its contraction when exposed to pain or injury, as well as the expiration and inspiration of water through its tubes. He established the position that sponge is an animal, and that the ends or openings of the branched tubes are the mouths by which it receives its nourishment, and discharges its excrementitious matter. This position chemistry has abundantly supported, by proving the ammoniacal property of the cellular substance of sponge.

THE BANIAN TREE.

PROCEEDING to the vegetable kingdom, the BANIAN, or BANIAN TREE, the ficus indica of Linneus, claims a particular attention. It is considered as one of the most curious and beautiful of nature's productions in the genial climate of Persia. Each tree is in itself a grove, and some of them, contrary to most other animal and vegetable productions, seem to be exempted from decay: for every branch of the main body throws out its own roots, at first in small tender fibres, several yards from the ground, which continually grow thicker; until, by a gradual descent, they reach its surface; where, striking in, they increase to a large trunk, and become a parent tree, throwing out new branches to the top. These in time suspend their roots, and, deriving nourishment from the earth, swell into trunks, shoot forth other branches; thus continuing in a state of progression so long as the first parent of them all supplies sustenance.

A banian tree, with many trunks, forms the most beautiful groves, vistas, and cool recesses, that can be imagined. The leaves are large, soft, and of a lively green; the fruit, a small fig, when ripe of a bright scarlet; affording sustenance to monkeys, squirrels, peacocks, and birds of various kinds, which dwell among the branches.

The Hindoos are peculiarly fond of this tree: they con-
MISCELLANEOUS WONDERS OF NATURE.

Consider its long duration, its out-stretching arms, and overshadowing beneficence, as emblems of the Deity, and almost pay it divine honours. The Brahmins, who thus "find a fane in every sacred grove," spend much of their time in religious solitude under the shade of the banian-tree; they plant it near the dewals, or Hindoo temples, improperly called pagodas; and in those villages where there is not any structure for public worship, they place an image under one of these trees, and there perform a morning and evening sacrifice.

These are the trees under which a sect of naked philosophers, called Gymnosophists, assembled in Arrian’s days; and this historian of ancient Greece, it is observed by Forbes, in his Oriental Memoirs, affords a true picture of the modern Hindoos. "In winter the Gymnosophists enjoy the benefits of the sun’s rays in the open air; and in summer, when the heat becomes excessive, they pass their time in cool and moist places, under large trees; which, according to the accounts of Nearchus, cover a circumference of five acres, and extend their branches so far, that ten thousand men may easily find shelter under them."

On the banks of the Narbudda, in the province of Guzzerat, is a banian tree, supposed by some persons to be the one described by Nearchus, and certainly not inferior to it. It is distinguished by the name of the Cubbeer Burr, which was given to it in honour of a famous saint. High floods have, at various times, swept away a considerable part of this extraordinary tree; but what still remains is nearly two thousand feet in circumference, measured round the principal stems; the over-hanging branches, not yet struck down, cover a much larger space; and under it grow a number of custard-apple, and other fruit trees. The large trunks of this single tree amount to three hundred and fifty, and the smaller ones exceed three thousand; each of these is constantly sending forth branches and boughs from its roots, to form other trunks, and become the parents of a future progeny.

The Cubbeer Burr is famed throughout Hindostan, not only on account of its great extent, but also of its passing beauty. The Indian armies generally encamp around it; and, at stated seasons, solemn jatarras, or Hindoo festivals, to which thousands of votaries repair from every
THE WEDDED BANIAN TREE.

Among the varieties of the Banyan, or Burr trees, is the
ficus religiosa, which is not uncommon in Guz-
and causes a singular variety of vegetation. It may
considered as belonging to the order of creepers, and
springs round different trees, particularly the palmyra,
The latter, growing through the centre of a
Banyan tree, looks extremely grand. The pipal frequently
from old walls, and runs along them, so as to cause
regular phenomenon of vegetation. In the province of
one of these trees was seen by an English traveller,
inside of a large brick well, the whole circumference
the internal space of which it lined, and thus actually
a tree turned inside out. A banian tree thus in-
uncommon: but the general usefulness and beauty
this variety, especially in overshadowing the public wells
village markets, can only be known by those who live

THE COCOA-NUT TREE.

in all the gifts which Providence has bestowed on the
natural world, the cocoa-nut tree is the one most deserving
notice. The blessings which are conveyed to man, by
ingle production of nature, are incalculable. It grows
in a stately column, from thirty to fifty feet in height, crowned by a verdant capital of waving branches, covered with long spiral leaves; under this foliage, bunches of blossoms, clusters of green fruit, and others arrived at maturity, appear in mingled beauty. The trunk, though porous, furnishes beams and rafters for the habitations; and the leaves, when platted together, make an excellent thatch as well as common umbrellas, coarse mats for the floor, and brooms; while their finest fibres are woven into very beautiful mats for the rich. The covering of the young is extremely curious, resembling a piece of thick cloth, in a conical form, close and firm as if it came from the loom; it expands after the fruit has burst through its inclosure; then appears of a coarser texture. The nuts contain delicious milk, and a kernel sweet as the almond; when dried, affords abundance of oil; and when that is expressed, the remains feed cattle and poultry, and make good manure. The shell of the nut furnishes cups, ladles, and other domestic utensils, while the husk which encloses it is of the utmost importance: it is manufactured into rope and cordage of every kind, from the smallest twine to the largest cables, which are far more durable than those of hemp.

In the Nicobar islands, the natives build their vessels, make the sails and cordage, supply them with provisions and necessaries, and provide a cargo of arrack, vinegar, jaggree or coarse sugar, cocoa-nuts, coir, cordage, black paint, and several inferior articles, for foreign merchants, entirely from this tree.

Many of the trees are not permitted to bear fruit; but the embryo bud, from which the blossoms and nuts while spring, is tied up to prevent its expansion; and a small incision being then made at the end, a cool pleasant liquor called Tarce, or Toddy, the palm-wine of the poets, oozes out in gentle drops.

**THE UPAS, OR POISON TREE.**

Although a serious refutation of the gross impostures practised on the people of Europe, by the romancers Foersch on the subject of the Upas, or celebrated poisoners of Java, may at this time be in a great measure superfluous, as the world has long ceased to be the dupe of his story, and as regular series of experiments have been instituted...
THE UPAS, OR POISON TREE.

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Both in England and in France, to ascertain the nature and
danger of the poison; yet an authentic account of this
poison, as drawn out by Dr. Horsfield, and published in
the seventh volume of the Batavian Transactions, cannot fail
to be interesting. Almost every one has heard of its fabulous
history, which, from its extravagant nature, its susceptibility
to poetical ornament, its alliance with the cruelties of a
depopulated government, and the sparkling genius of Darwin,
whose purpose it answered to adopt and personify it as a
despotic spirit (in his Loves of the Plants), has obtained
most equal currency with the wonders of the "Lernian
poison," or any other of the classic fictions of antiquity.

Although, the Doctor observes, the account published by
Horsfield, so far as relates to the situation of the poison-
ous tree, its effects on the surrounding country, and to the
description said to have been made of the upas on criminals
in different parts of the island, has, as well as the description
of the poisonous substance itself, and its mode of collection,
been demonstrated to be an extravagant forgery; — the
existence of a tree on Java, from the sap of which a poison
prepared, equal in fatality, when thrown into the circula-
tion, to the strongest animal poisons hitherto known, is a
fact which it is his object to establish and illustrate. The
place which produces this poison is the anchar, and grows in
the eastern extremity of the island. The work of Rhum-
phius contains a long account of the upas, under the denomi-
ation of arbor toxicaria. The tree does not grow on
Makasarn, and his description was made from the informa-
tion he obtained from Makasar. His figure was drawn
on a branch of what is called the male-tree, sent to him
from the same place, and establishes the identity of the
true anchar of Makasar, and the other Eastern Islands, with
the anchar of Java. The simple sap of the arbor toxicaria,
(according to Rhumphius) is harmless, and requires the
addition of several substances, of the affinity of ginger, to
render it active and mortal. In so far it agrees with the
anchor, which, in its simple state, is supposed to be inert,
before being employed as a poison, is subjected to a
peculiar preparation. Besides the true poison-tree, the
Island produces a shrub, which, as far as observations
hitherto been made, is peculiar to the same, and, by
a different mode of preparation, furnishes a poison far ex-
ceeding the upas in violence. Its name is chetik; but the
genus to which it belongs has not yet been discovered or
described.

The anchar is one of the largest trees in the forests of
Java. The stem is cylindrical, perpendicular, and rises com-
pletely naked to the height of sixty, seventy, or eighty feet.
It is covered with a whitish bark, slightly bursting in hori-
gitudinal furrows. Near the ground this bark is, in old
trees, more than half an inch thick, and, upon being
wounded, yields plentifully the milky juice from which the
celebrated poison is prepared. A puncture or incision
being made into the tree, the juice or sap appears outside,
out, of a yellowish colour (somewhat frothy) from other
paler, or nearly white, from young ones; exposed to the air,
its surface becomes brown. The consistence very much
resembles milk; but it is more thick and viscid. This sap
contained in the true bark (or cortex), which, when
punctured, yields a considerable quantity, so that in a short
time a cup-full may be collected from a large tree. The
inner bark (or liber) is of a close fibrous texture, like that
of the morus papyrifera, and, when separated from the outer
bark, and cleansed from the adhering particles, resembles a
course piece of linen. It has been worked into ropes, which
are very strong; and the poorer class of people employ the
inner bark of the younger trees, which is more easily pre-
pared, for the purpose of making a coarse stuff which they
wear in working in the fields. But it requires much
bruising, washing, and a long immersion, before it is
used; and, when it appears completely purified, persons
wearing this dress, being exposed to rain, are affected with
an intolerable itching, which renders their flimsy covering
insupportable. It appears from the account of the manner
in which the poison is prepared, that the deleterious quality
exists in the gum, a small portion of which produces, when exposed to wet, this irritating effect; and it
is singular that this property of the prepared bark is known
to the Javans in all places where the tree grows, while the
preparation of a poison from its juice, which produces a mortal
effect when introduced into the body by pointed weapons,
is an exclusive art of the inhabitants of the eastern extremity
of the island
WONDERS OF ART.

PYRAMIDS OF EGYPT

The largest of these stupendous monuments, equally famous for the enormity of their size, and their remote antiquity, are those of Djiiza, so called from a village of that name on the bank of the Nile, distant from them about eleven miles. The three which most attract the attention of travellers stand near one another on the west side of the river, almost opposite to Grand Cairo, and not far from the site of the ancient Memphis. When viewed from a distance, rising above the horizon, they display the fine transparent form they derive from the rarefied air by which they are surrounded. M. Savary having approached to within three degrees of them, in the night time, while the full moon shone bright upon them, describes them as appearing to him, under this particular aspect, like two points of rock surrounded by the clouds. On a nearer approach, their shape and angular forms disguise their real height, and cause it to the eye; independently of which, as whatever is great or small by comparison, and as these objects of stone eclipse in magnitude every surrounding subject, at the same time that they are inferior to a mountain, which alone the imagination can successfully compare with them, a degree of surprise is excited on finding the first impression produced by a distant view so much diminished on drawing near to them. On attempting, however, to measure any one of these gigantic works of art by some determinate scale, it resumes its immensity to the mind; since, on drawing near to the opening, the persons who stand beneath it appear so small that they can scarcely be taken for men.

The base of the great pyramid of Cheops, or Cheospes, named after a king of Egypt, is estimated by Denon at seven hundred and twenty feet, and its height at four hundred and forty-eight feet, calculating the base by the mean proportion of the length of the stones, and the height by the sum of that of each of the steps or stages. Its con-
structure required so many years, and employed such a multitude of labourers, that the expenditure for garlic and
onions alone, for their consumption, is said to have amount-
ed to one thousand and sixty talents, upwards of one fourth
of a million sterling. Its interior is thus accurately described
by the above traveller.

"The entrance of the first gallery is concealed by the general outer covering which invests the whole of the pyramid. It is, however, probable, that the attention of the earlier searchers was by some particular appearance directed to this spot. This gallery goes towards the centre of the edifice, in a direction sloping downward to the base, it is sixty paces in length; and at the further end are two large blocks of granite, an obstacle which caused some uncertainty in the digging. A horizontal passage has been made for some distance into the mass of stone; but the undertaking was afterwards abandoned.

"Returning to the extremity of the first gallery, and working upward by the side of the two granite blocks, you come to the beginning of the first sloping stair-case, which proceeds in an oblique direction upward for a hundred and twenty feet. You mount the steep and narrow gallery, helping your steps by notches cut in the ground and by resting your hands against the sides. At the end of this gallery, which is formed of a calcareous stone com-
mented with mortar, you find a landing place about fifteen feet square, within which, to the right of the entrance, is a perpendicular opening called the well. This appears from its irregularity, to have been the result of a failure in an attempt at a search, and has a diameter of about two feet by eighteen inches. There were no means of descending this perpendicular direction could not be very considerable. but by throwing down a stone, it was ascertained that a level with the landing is a horizontal gallery, a hundred and seventy feet in length, running directly towards the centre of the pyramid; and at the extremity of this gallery is a small room, called the Queen's chamber. This room is an oblong square of eighteen feet two inches, by fifteen feet by eight inches; but the height is uncertain, the floor having been tarred up by the avidity of the searchers. One of the side walls has also been worked into, and the rubbish left on the spot. The roof, which is formed of a fine calc-
Pyramids of Dijza.

Entrance to the principal Pyramid of Dijza.
GYPTIAN PYRAMIDS.

Pyramids, very nearly brought together, has the form of an angle nearly equilateral: but contains neither ornament, hieroglyphic, nor the smallest trace of a sarcophagus. Whether it was intended to contain a body, is uncertain; but, in this case, the pyramid must have been built with a view of containing two bodies, and would not therefore have been closed at once. If the second tomb was really that of the queen, the two blocks of granite at the end of the gallery, must have been finally reserved to close all interior chambers of the pyramid.

Returning again from the queen’s chamber to the landing-place, you ascend a few feet, and immediately find yourself at the bottom of a large and magnificent stair-case, rather inclined plane, one hundred and eighty feet in length, taking a direction upward, and still bearing towards the centre of the edifice. It is six feet six inches in breadth, which are to be included two parapets, each nineteen inches in diameter, and pierced every three feet six inches, oblong holes twenty-two inches by three. The sarcophagus must have ascended this passage, and the series of obstructions must have been intended to receive a machine of some description, to assist in raising so heavy a mass as the sarcophagus up so steep an ascent.

The side walls of this ascending gallery rise perpendicularly for twelve feet, and then form a sloping roof of excessively high pitch, not by a regular angle, but by successive projections, each of them six feet in height, rising above the other, and approaching nearer to the corresponding projection on the opposite side, till the ascent is entirely shut in. The height of this singularly-constructed vault may be estimated at sixty feet from the part of the floor immediately beneath. The ascent of the stair-case is facilitated by pretty regular but modern footings cut in the floor; and at the top is a small platform, in which is thick block of granite, resembling an immense chest, embedded in the solid building, and hollowed out so as to receive the alternate projections and retirings, into which are let projections of the same material, with corresponding grooves, intended for ever to conceal and protect the entrance to the principal chamber which is behind this part of the edifice, and not less to have broken
an opening through; so that the zeal of superstition here been opposed to the eagerness of avarice, and the latter has prevailed. After mining through thirteen feet of solid granite, a door three feet three inches square, been discovered, which is the entrance to the principal chamber. This is a long square, sixteen feet by thirty-two and eighteen in height. The door is in the angle facing gallery, corresponding to the door of the queen's chamber below. When it is said that the tomb is a single piece of granite, half polished, and without cement, all that rigid simplicity in the midst of the utmost magnificence human power, will have been described. The only broken part is an attempt at a search at one of the angles, small holes nearly round and breast high. Such is the interior of this immense edifice, in which the work hand of man appears to rival the gigantic forms of nature.

To the above account by the accurate Denon, we subjoin the following pleasing one by the celebrated Doctor Clarke.

The impression made by these monuments, when viewed at a distance, can never, he observes, be obliterated from mind.

"By reflecting the sun's rays, they appeared as white as snow, and of such surprising magnitude, that nothing had previously conceived in our imagination had prepared us for the spectacle we beheld. The sight instantly convinced us that no power of description, no delineation can convey ideas adequate to the effect produced in viewing these stupendous monuments. The formality of their structure is lost in their prodigious magnitude: the mind, elevated by wonder, feels at once the force of an axiom, which, however disputed, experience confirms,—that in vastness whatsoever be its nature, there dwells sublimity!

"Having arrived at the bottom of a sandy slope, leading up to the principal pyramid, a band of Bedouin Arabs who had assembled to receive us upon our landing, were much amused by the eagerness excited in our whole party to prove who should first set his foot upon the summit of this artificial mountain. As we drew near its base, the effect of its prodigious magnitude, and the amazement caused by viewing the enormous masses used in its construction, affected every one of us; but it was an impression
Egypl*n Pyramids.

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tear, rather than of pleasure. In the observations of trave-
ellers who had recently preceded us, we had heard the
Pyramids described as huge objects which gave no satisfac-
tion to the spectator, on account of their barbarous shape,
and formal appearance: yet to us it appeared hardly possible,
that persons susceptible of any feeling of sublimity could
behold them unmoved. With what amazement did we
survey the vast surface that was presented to us, when we
reached at this stupendous monument, which seemed to
touch the clouds! Here and there appeared some Arab
guides upon the immense masses above us, like so many
companies, waiting to shew the way up to the summit. Now
and then we thought we heard voices, and listened; but
was the wind, in powerful gusts, sweeping the immense
rages of stone. Already some of our party had begun
ascent, and were pausing at the tremendous depth
which they saw below. One of our military companions,
after having surmounted the most difficult part of the un-
taking, became giddy in consequence of looking down
from the elevation he had attained; and being compelled to
abandon the project, he hired an Arab to assist him in
descending his descent. The rest of us, more accustomed to
business of climbing heights, with many a halt for re-
fection, and many an exclamation of wonder, pursued
way towards the summit. The mode of ascent has
been frequently described; and yet, from the questions
which are often proposed to travellers, it does not appear
to be generally understood. The reader may imagine him-
to be upon a staircase, every step of which, to a man
middle stature, is nearly breast high; and the breadth
of each step is equal to its height; consequently, the foot-
steps are secure; and although a retrospect, in going up, be
sometimes fearful to persons unaccustomed to look down
from any considerable elevation, yet there is little danger
of falling. In some places, indeed, where the stones are
reared, caution may be required; and an Arab guide
is always necessary, to avoid a total interruption; but, upon
the whole, the means of ascent are such that almost every
one may accomplish it. Our progress was impeded by
other causes. We carried with us a few instruments; such
as a boat-compass, a thermometer, a telescope, &c.;
we could not be trusted in the hands of Arabs, and they

A a
were liable to be broken every instant. At length we reached the topmost tier, to the great delight and satisfaction of all the party. Here we found a platform, thirty-two feet square; consisting of nine large stones, each of which might weigh about a ton; although they are much inferior in size to some of the stones used in the construction of this pyramid.

"The view from the summit of the pyramid amply fulfilled our expectations; nor do the accounts which have been given of it, as it appears at this season of the year (in the month of August), exaggerate the novelty and grandeur of the sight. All the region towards Cairo and the Delta resembled a sea, covered with innumerable islands. Forests of palm-trees were seen standing in the water; the inundation spreading over the land where they stood, so as to give them an appearance of growing in the flood. To the north, as far as the eye could reach, nothing could be discerned, but a watery surface thus diversified by plantations and by villages. To the south we saw the pyramids of Saccara; and, upon the east of these, smaller monuments of the same kind, nearer to the Nile. An appearance of ruins might indeed be traced the whole way had they been once connected, so as to constitute one vast cemetery. Beyond the pyramids of Saccara we could perceive the distant mountains of the Said; and upon an eminence near the Libyan side of the Nile appeared a monastery of considerable size. Towards the west and south-west, the eye ranged over the great Libyan Desert, extending to the most verge of the horizon, without a single object to interrupt the dreary horror of the landscape, except dark floating spots, caused by the shadows of passing clouds upon the sand.

"The stones of the platform upon the top, as well as most of the others used in constructing the decreasing ranges from the base upwards, are of soft limestone. These employed in the construction of the pyramids, are of the same nature as the calcareous rock on which they stand, and which was apparently cut away to form them. Herodotus says, however, that they were brought from the Arabian side of the Nile.

"The French attempted to open the smallest of the three
principa1 Pyramids; and having effected a very considerable
change in one of its sides, have left this mark behind them,
in an everlasting testimony of their curiosity and zeal. The
marching of our army in Egypt put a stop to their labour.

had it not been for this circumstance, the interior of that
mysterious monument would probably be now submitted to
the inquiry which has long been an object among literary
men.

Having collected our party upon a sort of platform before
entrance of the passage leading to the interior, and
after a number of tapers, we all descended into the dark
depth of the larger pyramid. The impression made upon
every one of us, in viewing the entrance, was this: that no
men whatever could thus have opened a passage, by
covering precisely the part of the pyramid where the en-
trance was concealed, unless they had been previously
acquainted with its situation; and for these reasons: First,
because its position is almost in the centre of one of its planes,
leaves of being at the base. Secondly, that not a trace
of those dilapidations which must have been the
fruit of any search for a passage to the interior; such as now
annihilate the labours of the French upon the smaller
pyramid, which they attempted to open. The persons who
took the work, actually opened the pyramid in the only
to over all its vast surface, where, from the appearance of
stones inclined to each other above the mouth of the
passage, any admission to the interior seems to have been
really intended. So marvellously concealed as this was,
we to credit the legendary story of an Arabian writer,

Regarding of the Wonders of Egypt, attributed the

musting of this pyramid to Almamon, a Caliph of Babylon,

nine hundred and fifty years since?

Proceeding down this passage, which may be compared to a
fera mass of granite; this seems to have been placed
Gpose to choke up the passage; but a way has been
round it, by which we were enabled to ascend into a
channel, sloping, in a contrary direction, towards the
bottom of the first. Having ascended along this channel, to
a distance of one hundred and ten feet, we came to a
crannial passage, leading to a chamber with an angular
in the interior of the pyramid. In this passage we
found, upon our right hand, the mysterious well, which has been so often mentioned. Pliny makes the depth of it equal to one hundred and twenty-nine feet; but Greaves, by sounding it with a line, found the plummet rest at the depth of twenty feet.

"We threw down some stones, and observed that they rested at about the depth which Greaves has mentioned; but being at length provided with a stone nearly as large as the mouth of the well, and about fifty pounds in weight, we let this fall, listening attentively to the result from the spot where the other stones rested: we were agreeably surprised by hearing, after a length of time which must have equalled some seconds, a loud and distinct report, seeming to emanate from a spacious subterraneous apartment, accompanied by a splashing noise, as if the stone had been broken into pieces and had fallen into a reservoir of water at an amazing depth. Thus does experience always tend to confirm the accounts given by the Ancients; for this exactly answers to the description given by Pliny of this well.

"After once more regaining the passage whence the ducts diverge, we examined the chamber at the end of it, mentioned by all who have described the interior of this building. Its roof is angular; that is to say, it is formed by the inclination of large masses of stone leaning towards each other, like the appearance presented by those masses which are above the entrance to the pyramid. Then quitting this passage altogether, we climbed the slippery and difficult ascent which leads to what is called the principal chamber. The workmanship, from its perfection, and its proportions, is truly astonishing. All about the whole as he proceeds, is full of majesty, and mystery, and present we entered that 'glorious room,' as it is called by Greaves, where, 'as within some consecrated oratory, Art may seem to have contended with Nature. It stands 'in the very heart and centre of the pyramid, equidistant from all its sides, and almost in the middle between the basis and the top. The floor, the sides, the roof of it, are all made of vast and exquisite tablets of Thebaick marble.' So nicely are these masses fitted to each other upon the sides of the chamber, that, having no common blade of a knife within the joints. This has been often related below.
There are only six ranges of stone from the floor to the roof, which is twenty feet high; and the length of the chamber is about twelve yards. It is also about six yards wide. The roof or ceiling consists only of nine pieces, of stupendous size and length, traversing the room from side to side, and lying, like enormous beams, across the top."

Mr. Salt, the traveller, having paid a recent visit to the principal pyramid, in company with a British officer, it has been ascertained that the short descending passage at its entrance, which afterwards ascends to the two chambers, is continued in a straight line through the base of the pyramid to the rock on which it stands. This new passage, after turning what was formerly called the well, is continued outward in an horizontal line, and terminates in a well, 10 feet in depth, exactly beneath the apex of the pyramid, and the depth of 100 feet beneath its base. Mr. Salt's companion has likewise discovered an apartment immediately above the king's chamber, exactly of the same size, and of the same fine workmanship, but only four feet in height.

The base of the pyramid of Cepheus, the next in magnitude, of the pyramids of Djiza, to that of Cheops, is estimated at 655 feet, and its height at 398. The pyramid of Miseninus has a base of 280 feet, and an elevation of 162.

The pyramids of Saccara, which are numerous, are interesting on account of the peculiarities of their structure. The largest of them is of an irregular form, the line of the terminating angle being sloped like a buttress reversed. Another, of a middling size, is composed of stages rising one above the other. The smaller ones are greatly decayed; but the whole occupy an extent of two leagues.

This multitude of pyramids scattered over the district of Bacearn, Denon observes, prove that this territory was the Necropolis (city of the dead) to the south of Memphis, and that the village opposite to this, in which the pyramids of Djiza are situated, was another Necropolis, which formed the northern extremity of Memphis. The extent of that ancient city may thus be measured.
THE SPHYNX.

At an inconsiderable distance from the great Egyptian pyramids, and by an almost imperceptible descent, the traveller arrives at the Sphynx, the enormous bulk of which instantly attracts his attention. It is cut out of the solid rock, and is said to have been the sepulchre of Amen. The height of this figure is twenty-seven feet; and the beginning of the breast thirty-three feet in width. The nose has been shamefully mutilated. "Although," Denon remarks, "the proportions are colossal, the outline is plain and graceful; the expression is mild, gracious, and treble; the character is African; but the mouth, the lips which are thick, has a softness and delicacy of execution truly admirable; it seems real life and flesh. Art must have been at a high pitch when this monument was executed; for, if the head is deficient in what is called that is the straight and bold lines which give expression to the figures under which the Greeks have designated their deities, yet sufficient justice has been rendered to the simplicity and character of nature displayed in this figure.

EGYPTIAN TEMPLES AND MONUMENTS.

The ruins of the Temple of Hermopolis, or the great city of Mercury, afford a precise idea of the immense range and high perfection the arts had attained in Egypt. These stones have preserved their original destination, without having been altered or deformed by the works of modern times, and have remained untouched for four thousand years! They are of freestone, of the fineness and have neither cement, nor mode of union, besides the perfect fitting of the respective parts. The colossal proportions of this edifice evince the power the Egyptians possessed to raise enormous masses. The diameter of the columns which are placed at equal intermediate distances, is eight feet 10 inches; and the space between the two middle columns within which the gate was included, 12 feet. Not only 120 feet for the portico: its height is 60 feet. The spring of an arch remains to throw light on the dimensions of the whole extent of the temple, or of the nave.
Remarkable form of one of the Pyramids of Saccara.

Stonehenge.
EGYPTIAN Temples AND MONUMENTS. 543

Architecture is still richer than the doric order of the Greeks. The shafts of the pillars represent fasciae, or bundles; and the pedestal, the stem of the lotus. Under the roof between the two middle columns, are winged globes; and the roofs are ornamented with a wreath of painted stars, of an aurora colour on a blue ground.

The temple of Apollinopolis Magna is described by Dionysius as surpassing in extent, majesty, magnificence, and preservation, whatever he had seen in Egypt, or elsewhere. This building is a long suite of pyramidal gates, of which are three orders of hieroglyphic figures increasing in gigantic dimensions, insomuch that the last have a proportion of twenty-five feet. The inner court is decorated at two gates, through which is the passage to the stairs. Leading to the platform of the mounds. Behind the inner court are several apartments, and the sanctuary of the temple. A wall of circumvalation is decorated both within without with innumerable hieroglyphics, executed in a finished and laborious style. This magnificent temple appears to have been dedicated to the evil genius, the figure of a monster. The entire temple, and all the paintings within, are descriptive of Isis standing herself against the attacks of that monster.

The ruins of Thebes, which Homer characterized by the single expression of the city with hidden gates, are of so immense an extent as to contain the spectator that fame has not magnified its size; for, the diameter of Egypt not being sufficient to contain it, its monuments rest on two chains of contiguous mountains, and its tombs occupy the vallies towards the west, far on the desert. A large temple on the eastern side is more two leagues and a half distant from Medinet-Abu, the most western temple is situated. The modern

Karnac is built on a small part of the site of a
single temple, which requires half a mile to walk round.
The remains of this temple are thus described by Denon.

"Of the hundred columns of the portico alone, the
smallest are seven feet and a half in diameter, and the largest
twelve. The space occupied by the circumvallation of the
temple contains lakes and mountains. In short, to be enabled
to form a competent idea of so much magnificence, the
reader ought to fancy what is before him to be a dream, as
he who views the objects themselves rubs his eyes to know
whether he is awake. The avenue leading from Karnac to
Luxor, a space nearly half a league in extent, contains a
constant succession of sphynxes and other chimneypiece
figures to the right and left, together with fragments of
stone walls, of small columns, and of statues."

The village of Luxor is also built on the side of the ruins
of a temple, not so large as that of Karnac, but in a better
state of preservation, the masses not having as yet been
through time, and by the pressure of their own weight.
The most colossal parts consist of fourteen columns of
nearly eleven feet in diameter, and of two statues in granite,
at the outer gate, buried up to the middle of the arms, and
having in front of them the two largest and best preserved
obelisks known. The French, when in Egypt, deemed it
their means insufficient, not to hew out, but merely to
transport these two monuments, which are not more than
fragment of one of the numerous edifices of the astonishing
city of Thebes. They are of rose-colour granite, are still
seventy feet above the ground, and to judge by the depth to
which the figures seem to be covered, about thirty feet more
may be reckoned to be concealed from the eye, making in
all one hundred feet for their height. Their perfect; and the hieroglyphics with which they are covered
being cut deep, and in relief at the bottom, the hand of a master, and a beautiful finish.
which could touch such hard materials must have been of
the labour, surpass all conception!

In speaking of the gate of the temple, which is now to
come that of the village of Luxor, Denon remarks as
follows. "Nothing can be more grand, and at the same time
EGYPTIAN TEMPLES AND MONUMENTS. 543

more simple, than the small number of objects of which this
entrance is composed. No city whatever makes so proud a
display at its approach as this wretched village, the popula-
tion of which consists of two or three thousand souls, who
have taken up their abode on the roofs and beneath the
galleries of this temple, which has, nevertheless, the air
of being in a manner uninhabited.

The Tombs of the Kings of Thebes are grottoes con-
stituted of a regular double gallery supported by pillars, behind
which is a row of chambers, often double. In proportion as
the height of these grottoes increases, they become more
handsomely decorated; and the spectator is soon convinced, by the
majesty both of the paintings and sculptures, and of the
subjects they represent, that he is among the tombs of great men or heroes. Those which appear to have be-
gotten to the ancient kings, are only distinguished from the
others by the magnificence of the sarcophagi, and the myster-
ious solitude of their situation; the others immediately
overlooking the great buildings in the city. The sculpture
is incomparably more laboured and higher finished than that
of the temples, and displays a high perfection of the
The lines of the hieroglyphics have been cut with a
rudeness of touch, and a precision, of which marbles offer
few examples; and the figures have a particular elegance
correctness of contour. Small subjects taken from
nature are introduced; and in these the groups of persons are
seen in perspective; and cut in deep relief, in simple and
natural attitudes. Several of these subjects bear but little
resemblance to the spot in which they are immured; for bas-
reliefs, representing games, such as rope-dancing, and a
horse dressed with all the traits of genuine nature and

The plan of these excavations is singular; and many are so
complicated, that they might be mistaken for
temples, or subterranean mansions. After passing the
apartments described above, long and gloomy gal-
lerys present themselves, winding backwards and for-
ward in numerous angles, and seeming to occupy a great
ground. They are melancholy, repulsive, and
entirely without any decoration; but open from time to time into
chambers covered with hieroglyphics, and branch out
into narrow paths, leading to deep perpendicular pits. At the bottom of these pits are other adorned chambers; and lower still a new series of perpendicular pits and horizontal chambers, until at length, ascending a long flight of steps, the visitor reaches an open place on a level with the chambers he first entered.

The ancient Latopolis, now called Esneh, presents among its remains, the portico of a temple which is considered as one of the most perfect monuments of ancient architecture. It is very well preserved, and possesses a great richness of sculpture. It is composed of eighteen noble and elegant columns, with broad capitals; and the hieroglyphics in relief with which it is covered with inside and without have been executed with great care. They contain, among other subjects, a zodiac, and large figures of men with crocodiles' heads. The capitals, though all different, have a very fine effect; and, as a proof that the Egyptians did not borrow from other nations, it may be remarked, that all the ornaments of which these capitals are composed, have been taken from the productions of their own country, such as the lotus, the palm-tree, the vine, the rush, &c.

Cryptæ, or Catacombs of Alexandria.

In the construction of these primeval sepulchres a prodigious labour has been bestowed. They are situated about half a league along the shore, to the westward of the modern city of Alexandria. Their intricacy is such that the guides will not enter them without being provided with a clue of thread to secure their retreat. Doctor Clarke has been very particular in his description of these subterraneous abodes of the dead, and from his interesting narrative the following particulars are extracted.

"The original entrance to them is now closed, and is eminently concealed from observation. The only place by which admittance to the interior is practicable, is a small aperture made through the soft and sandy rock, barely large enough to admit a person upon his hands and knees. Here it is not unusual to encounter jackals, escaping from the interior, when alarmed by any person approaching; and from this account the guides recommend the practice of discharging a gun, or pistol, to prevent any sally of this kind. Having this aperture with lighted tapers, we arrived, by a gradual
Catacombs of Alexandria.

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descent, in a square chamber, almost filled with earth: to the right and left of this are smaller apartments, chiselled in the rock; each of these contains on either side of it, except that of the entrance, a Soros for the reception of a mummy; but, owing to the accumulation of sand in all or them, this part of the Catacombs cannot be examined without great difficulty. Leaving the first chamber, we found a second of still larger dimensions, having four Cryptæ with Sorois, two on either side, and a fifth at its extremity towards the south-east. From hence, penetrating towards the west, we passed through another forced aperture, which conducted us into a square chamber, without any receptacles for dead bodies; thence, pursuing a south-western course, we persevered in effecting a passage, over heaps of sand, till one chamber to another, admiring every where the same extraordinary effects of labour and ingenuity, until we found ourselves bewildered with so many passages, that our clue of thread became of more importance than we at first believed it would prove to be. At last we reached the lastly antichamber of the principal sepulchre, which had every appearance of being intended for a regal repository. It was of a circular form, surmounted by a beautiful dome, drawn out of the rock, with exquisite perfection, and the greatest simplicity of workmanship. In a few of the chambers we observed pilasters, resembling, in their style of architecture, the Doric, with architraves, as in some of the most ancient sepulchres near Jerusalem; but they were all integral parts of the solid rock. The dome covering the circular chamber was without ornament; the entrance to it being from the north-west. Opposite to this entrance was a handsome square Crypt with three Sorois; and to the right and left were other Cryptæ, similarly surrounded with places for the dead. Hereabouts we observed the remarkable symbol, sculptured in relief, of an orb with extending wings, evidently intended to represent the subterraneous Sun, or Sol Inferus, as mentioned by Macrobius. We endeavoured to penetrate further towards the south-west and south, and found another complete wing of the vast fabric extended in those directions, but the labour of the research was excessive.

The cryptæ upon the south-west side corresponded with those which we have described towards the north-east. In
the middle, between the two, a long range of chambers extended from the central and circular shrine towards the north-west; and in this direction appears to have been the principal and original entrance. Proceeding towards it we came to a large room in the middle of the fabric, between the supposed Serapeum and the main outlet, or portal, towards the sea. Here the workmanship was very elaborate; and to the right and left were chambers, with receptacles ranged parallel to each other. Farther on, in the same direction, is a passage with galleries and spacious apartments on either side; probably the chambers for embalming the dead, or those belonging to the priests, who constantly officiated in the Serapeum. In the front is a kind of vestibule, or porch: but it is exceedingly difficult to ascertain precisely the nature of the excavation towards the main entrance, from the manner in which it is now choked with earth and rubbish. If this part were laid open, it is possible that something further would be known as to the design of the undertaking; and, at all events, one of the most curious of the antiquities of Egypt would then be exposed to the investigation it merits. Having passed about six hours in exploring, to the best of our ability, these gloomy mansions, we regained, by means of our clue, the aperture by which we had entered, and quitted them for ever."

**RUINS OF PALMYRA.**

This noble city of ancient Syria, likewise called Tadmor, is of uncertain date and origin, but is thought by many to have been the Tadmor in the wilderness, built by Solomon. Its splendid ruins consist of temples, palaces, and porticoes of Grecian architecture, scattered over an extent of several miles. The most remarkable of them is the Temple of the Sun, the ruins of which are spread over a square of 220 yards. It was encompassed with a stately wall, built of large square stones, and adorned with pilasters within and without, the number of 62 on each side. Within the court are the remains of two rows of very noble marble pillars 37 feet high, with their capitals of most exquisite workmanship. Of these 58 only remain entire; but there must have been many more, for they appear to have surrounded the whole court, and to have supported a double piazza. The walks on the side of the piazza opposite to the front of the edifice.
View of Palmyra.

St. Peter's of Rome.
RUINS OF PALMYRA.

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Ruins of Palmyra.

been to have been the most spacious and beautiful. At the end of this line are two niches for statues, with their pedestals, borders, supporters, and canopies, carved with the greatest elegance. The space within the inclosure appears to have been an open court, in the centre of which stood the temple, encompassed with another row of pillars of a different order, and much taller, being 50 feet in height. Of these 16 only remain. The whole space contained within these pillars is 50 yards in length, and nearly 28 in breadth. The temple, which points north and south, is 33 yards in length, and 13 or 14 in breadth. At its centre, on the west side, is a most magnificent entry, on the remains of which clusters of grapes are carved in the most bold and quarterly imitation of nature that can be conceived. Over the door is displayed a pair of wings extending its whole breadth; but the body to which they belonged is totally destroyed, so that it cannot certainly be known, whether it was that of an eagle or of a cherub, several representations both being visible on other fragments of the building. The north extremity is adorned with the most curious fretwork and bas-reliief; and in the centre is a dome or cupola, about 10 feet in diameter, which appears to have been either torn out of the rock, or moulded of some composition which by time has become equally hard. North of this there is an obelisk, consisting of seven large stones, besides a capital, and the wreathed work about it. It probably supported a statue, which the Turks, in their zeal against idolatry, have destroyed. At the distance of a quarter of a mile from this pillar, to the east and west, are two others, besides the fragment of a third, so as to lead to the supposition that there was originally a continued row.

About 100 paces from the middle obelisk, straight forward, is a magnificent entry to a piazza, 40 feet in breadth, and more than half a mile in length, inclosed with two rows of marble pillars 26 feet high, and 8 or 9 feet in compass. Of these there still remain 129; and by a moderate computation, there could not have been originally less than 300. The upper end of this piazza was shut in by a row of pillars, standing somewhat closer than those on each side. A little to the left are the ruins of a stately building, which appears to have been a banqueting house: it is built of better marble, and is finished with still greater elegance than the
piazza. The pillars by which it was supported were of entire stone, so strong that one of them which has fallen down has not received the slightest injury. It measures 23 feet in length; and in compass 8 feet 9 inches. At the west side of the piazza are several apertures for gates into the court of the palace, each of them ornamented with five porphyry pillars, not standing in a line with those of the wall, but placed by couples in the front of the gate facing the palace, two on each side. Two of these only remain entire, and one only standing in its place. They are 30 feet in length, and nine in circumference. On the east side of the piazza stand a great number of marble pillars, some perfect, but the greater part mutilated. In one place 11 of them are ranged in a square, the space they inclose being paved with broad flat stones, but without any remains of a roof. At a little distance are the remains of a small temple, also without a roof, and having its walls much defaced. Before the entry, which faces the south, is a piazza supported by six pillars, two on each side of the door and one at each end. The pedestals of those in front have been filled with inscriptions, both in the Greek and Palmyrene languages, which are become totally illegible. Among these ruins are many sepulchres, ranged on each side of a hollow way, towards the north part of the city, and extending more than a mile. They are square towers, four or five stories high, alike in form, but differing in magnitude and splendour. The outside is of common stone; but the floors and partitions of each story are of marble. A walk crosses the centre of this range of buildings, and the space on each side is subdivided by thick walls, into six partitions, the spaces between which is wide enough to receive the largest corpses. In these nitches six or seven are piled on one another.

RUINS OF BALBEC.

These magnificent ruins are described by Mr. Bruce as even surpassing what he had seen at Palmyra. He was particularly struck by the splendid vestiges of the great temple supposed to have been dedicated to the sun. The Temple of Balbec, or Tower of Lebanon, is described by Father Leander, of the order of bare-footed Carmelites, in his interesting travels, as a surprising monument of antiquity, built
According to the tradition of the natives, by Solomon. His relation is as follows.

Balbec is distant from Damascus, towards the north, about fifty miles, and on the southern side is watered by springs and rivulets, brought thither, no doubt, to fill the basins by which it was to have been surrounded for defence, which were not completed. It is situated on the lofty summit of a hill, in approaching which the façade of the castle is seen, having two towers at its angles, between which is a great portico, resembling the mouth of a vast cave, and provided with very strong walls. That on the right hand, by which the portico is attached to the tower, from the west to the east, is composed of four stones only, the fifth, which was left incomplete, being deficient. The length of these stones is not less than sixty-two feet, and breadth and height thirteen. They are so artfully brought together, without any cement, that they appear to form only one solid block. The remainder of the wall to the base is of hewn stones, well cemented with quick lime, the smallest of which are 6 feet in length, and 4 feet 6 inches in height: there are many which are upwards of 15 feet in length, but the height of all of them is the same.

Having entered the cavern by the grand portico, the traveller proceeds in obscurity to the distance of eighteen paces, when he at length perceives a ray of light proceeding from the aperture of the door which conducts to the centre. Each of the sides, and within this grand portico, is a flight of stone steps which leads to the subterraneous prisons. Their aspect is horrid, and they are dangerous, inasmuch as they are wont to be frequented by banditties of robbers, who plunder, kill, and bury such wretched travellers as are inadvertently led by their curiosity to penetrate, and risk the extent, without being well escorted. Following the road of the cavern, to the extent of fifty paces, an ample figure of a spherical figure presents itself, surrounded by ionic columns of granite, some of them of a single piece, others formed of two pieces, the whole of them of so great a dimension, that two men can with difficulty girt them. They are of the Ionic order of architecture, and are placed on bases of the same stone, at such distances from one another that a coach and six might commodiously turn between them. They support a flat tower or roof, which
projects a cornice wrought with figures of matchless workmanship: these rise above the capitals with so nice an union, that the eye, however perfect it may be, cannot distinguish the part in which they are joined. At the present time the greater part of this colonnade is destroyed, the western part alone remaining perfect and upright. This fabric has an elevation of 500 feet, and is 400 feet in length. In its exterior, and behind, it is flanked by two other towers similar to those of the first façade, the whole projecting from the wall, which within is provided with loop holes to keep off the enemy, in case of necessity, by the means of stones, fire, &c. It also surrounds the colonnade, more particularly in the part which looks towards the east. At the left flank rises a temple, which tradition says was the hall of audience of Solomon, in height at least 80 feet, and long and large in proportion. Its stones are all sculptured with bass-reliefs, similar to those which ornament Trajan's column at Rome, representing many triumphs and naval engagements. Several of these bass-reliefs have been defaced by the Saracens, who are the decided enemies of these sculptures. Without this grand hall is an avenue of the same size and breadth, where the traveller admires a large portal constructed with three stones only, attached to which in the middle part, serving as an architrave, is seen, in a garland of laurel interwoven with flowers, a large eagle admirably sculptured in bas-relief. At the sides of the portal are placed two columns, in one of which, although formed of a single stone, is a winding staircase by which very narrow. There is in the vicinity another temple, of an octagonal shape, with a portico of superb architecture, and having three windows on the side opposite to the former.

On a large stone are inscribed these words in Latin: Divisi Moses, on which Father Leander confesses he knows not what interpretation to bestow. Thrice he returned to visit this splendid vestige of antiquity; and on the last of these occasions, being well escorted, he proceeded to the distance of about a mile, to the foot of the construction of Damascus, whence the stones employed in its remains were brought. He measured the stone which remained there, and which has been already noticed as having been intended for the fifth in the construction of the wall; it had
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The ruins are to be regarded as the most interesting monuments of man, as well on account of their paramount antiquity, as of all the associations connected with them. They have been visited and described by Mr. Rich, resident on the East India Company at Bagdad; and the result of his researches is given by the Rev. Mr. Maurice, Author of An Antiquities; and Assistant Librarian to the British Museum, in his elaborate work entitled "Observations connected with Astronomy and Ancient History, sacred and profane, on the Ruins of Babylon."

Babylon was situated in a plain of vast extent, and bounded by the noble river Euphrates. Over this river was a bridge of massy masonry, strongly compacted with and lead, by which the two sides of the city were connected; and the embankments on each side, to restrain its course, were lofty, and formed of the same durable materials as the walls of the city. The city itself is represented by Herodotus to have been a perfect square, enclosed by a circumference four hundred and eighty furlongs, stated to have abounded in houses three or four stories high, and to have, been regularly divided into streets, parallel to each other, with transverse avenues longitudinally opening to the river. It was surrounded with a large and deep trench, the earth dug out of which was formed square bricks and baked in a furnace. With these bricks, together with heated bitumen, intermixed with sand, to bind the viscid mass, the sides of the trenches were paved; and of the same solid materials the walls of the vast...
dimensions above described were formed. At certain regular distances on them, watch towers were erected; and below they were divided and adorned with a hundred gates of brass.

In the centre of each of the grand divisions of the wall a stupendous public fabric was erected. In one (the eastern side) stood the temple of Belus; and in the other, (or western division) in a large and strongly fortified inclosure, the royal palace, intended, doubtless, for defence as well as for ornament. The temple of Belus was a square pile, on each side of the extent of two furlongs. The tower erected in the centre was a furlong in breadth, and as much in height, of the latter of which (taking the furlong at only 500 feet) is enormous, being higher, by 20 feet, than the great pyramids of Memphis, whose altitude was taken by Greaves. On this tower, as a base, seven other lofty towers were erected in regular succession; and the whole was crowned, according to Diodorus, with a brazen statue of the good Belus, 50 feet high! The palace, intended also as a citadel, was erected on an area a mile and a half square, and was surrounded with three vast circular walls, which, as we are informed by Diodorus Siculus, were ornamented with sculptured animals resembling life, richly painted in their natural colours on the bricks of which they were composed, and afterwards burnt in. This may be mentioned as nearly the earliest specimen of enamelling on bricks. Indeed, it was scarcely possible for a nation, who were so well practised in the burning of bricks even to the vitreous hardness, to have been ignorant of this fine art, and that they could also engrave upon them, is evident (were such evidence wanting) from the characters of that day sculptured upon those that have been dug up and brought to Europe, two of which are preserved in the British Museum. On the far-famed hanging gardens, and the subterraneous vault or tunnel constructed by Senenramis, or Nitocris, or the founder of Babylon, whoever he was, there is no necessity to dilate, as every trace of them except what the idle fancy of travellers has supplied must long since have disappeared; but such, in its general outline, was the mighty Babylon!

Mr. Rich, whose residence at the court of Bagdad, and the powerful protection of the Pacha, afforded him every
Ruins of Babylon.

The Birs Nimroud.

The Kasr.

The Mujelibe.
Feasibility for comprehensive investigation, describes the whole
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of the country between Bagdad and Hella, a distance of 48 miles,
though it is evident, from the number of canals by
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which it is traversed, and the immense ruins that cover its
surface, that it must formerly have been both well peopled
and cultivated. About two miles above Hella, the more
prominent ruins commence, among which, at intervals, are
discovered, in considerable quantities, burnt and unburnt
bricks and bitumen; two vast mounds in particular attract
attention from their size, and these are situated on the
western bank of the Euphrates. There are scarcely any re-
 mains of ruins visible, immediately opposite on the western
bank, but there are some of a stupendous magnitude on that
side, about six miles to the south-west of Hella.

The first grand mass of ruins—described by Mr. Rich,
extends one thousand one hundred yards in length, and eight
hundred in its greatest breadth, its figure nearly resembling
that of a quadrant; its height is irregular; but the most
elevated part may be about fifty or sixty feet above the level
of the plain, and it has been dug into for the purpose of pro-
ducing bricks. On the north is a valley of five hundred and fifty
yards in length, the area of which is covered with tussocks
of rank grass, and crossed by a line of ruins of very little
elevation. To this succeeds the second grand heap of ruins,
the shape of which is nearly a square, of seven hundred
yards length and breadth, and having its S. W. angle con-
ected with the N. W. angle of the mounds of Amran, by
ridge of considerable height, and nearly one hundred yards
breadth. This is certainly the most interesting part of the
ruins of Babylon; every vestige discoverable in it declares it
have been composed of buildings far superior to all the
rest which have left traces in the eastern quarter: the bricks
and storehouse of them, and that the greatest supplies have
been and are now constantly drawn from it, they appear still
the abundant. But the operation of extracting the bricks
caused great confusion, and contributed much to increase
the difficulty of decyphering the original design of this
ruin; as, in search of them, the workmen pierce into it in
every direction, hollowing out deep ravines and pits, and
throwing up the rubbish in heaps on the surface. In some
places they have bored into the solid mass, forming winding caverns and subterraneous passages, which, from their being left without adequate support, frequently bury the workmen in the rubbish. In all these excavations, walls of burnt brick, laid in lime mortar of a very good quality are seen; and, in addition to the substances generally strewn on the surfaces of all these mounds, we here find fragments of alabaster vessels, fine earthenware, marble, and great quantities of varnished tiles, the glazing and colouring of which are surprisingly fresh. In a hollow near the southern part Mr. Rich found a sepulchral urn of earthen, which had been broken in digging, and near it lay some human bones, which pulverized with the touch.

Not more than two hundred yards from the northern extremity of the above mound is a ravine hollowed out by those who dig for bricks, in length nearly a hundred yards, and thirty feet wide, by forty or fifty deep. On one side of it a few yards of wall remain standing, the face of which is very clean and perfect, and which appears to have been the front of some building. The opposite side is so confused a mass of rubbish, that it should seem the ravine had been worked through a solid building. Under the foundations at the southern end an opening is made, which discovers a subterraneous passage seven feet in height, and winding to the south, floored and walled with large brick, laid in brick, and covered over with pieces of sand-stone, a yard thick, and several yards long, on which the whole pressure is so great as to have given a considerable degree of obliquity to the side walls of the passage. The superstructure is cemented with bitumen, other parts of the ravine with mortar, and the bricks have all writing on them. The northern end of the ravine appears to have been crossed by an extremely thick wall of yellowish brick, cemented with a brilliant white mortar, which has been broken through in some places and broken out; and a little to the north is sculptured a lion of coloured granite, and of rude workmanship; in the mouth is a circular aperture, into which a man may introduce his fist.

The next considerable mass to that of Amman is the Kas, or Palace, as it is called by the natives, and it is thus described by Mr. Rich.

"It is a very remarkable ruin, which, being uncovered..."
RUIKS or BABYLOi.

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detached from the rubbish, is visible from a considerable distance, but so surprisingly fresh in its appearance as to lead me to believe that it was only after a minute inspection I was satisfied of its being in reality a Babylonian remain. It consists of several walls and piers, (which face the cardinal points,) eight in thickness, in some places ornamented with niches and in others, strengthened by pilasters and buttresses, built of fine burnt brick, (still perfectly clean and sharp,) laid in some cement, of such tenacity, that those whose business it is to have given up working, on account of the extreme difficulty of extracting them whole. The tops of these walls have been broken, and may have been much higher. On the outside, they have in some places been cleared nearly to the foundations; but the internal spaces, formed by them, are filled with rubbish, in some parts almost to their summit. One part of the wall has been split into three parts, and overthrown, as if by an earthquake; some detached walls of the same kind, standing at different distances, show what remains to have been only a small part of the original structure; indeed, it appears that the passage in the ravine, together with the wall which crosses its upper end, were connected with it. There are some hollows underneath, in which several persons have lost their lives; so that no one will now venture into them, and their entrances have become choked up with rubbish. Near this ruin is a heap of rubbish, the sides of which are curiously streaked by the alternation of its materials, the chief part of which, it is probable, was unburnt brick, of which I found a small quantity in the neighbourhood; but no reeds were discoverable in the interstices.

A mile to the north of the Kasr, or full five miles distant from Hella, and 950 yards from the river bank, is the last ruin of this series, which has been described by Pietro della Valle, who determines it to have been the Tower of Babel, an opinion adopted by Rennel. The natives call it Mukallibe, or, according to the vulgar Arab pronunciation of these parts, Mujelibe, meaning overturned; they sometimes also apply this term to the mounds of the Kasr. It is of an oblong shape, irregular in its height and the measurement of its sides, which face the cardinal points; the northern side being 200 yards in length, the southern 219, the eastern 182, and the western 136; the elevation of the
south-east, or highest angle, 141 feet. The western face, which is the least elevated, is the most interesting, on account of the appearance of building it presents. Near the summit of it appears a low wall, with interruptions, built of unburnt bricks, mixed up with chopped straw or reeds, and cemented with clay-mortar of great thickness, having between every layer a layer of reeds: and on the north-side are also some vestiges of a similar construction. The south-west angle is crowned by something like a turret, or lantern; the other angles are in a less perfect state; but may originally have been ornamented in a similar manner. The western face is lowest and easiest of ascent, the northern the most difficult. All are worn into furrows by the weather, and in some places, where several channels of rain have united together, these furrows are of great depth, and penetrate a considerable way into the mound. The summit is covered with heaps of rubbish, in digging into some of which, layers of broken burnt brick, cemented with mortar, are discovered, and whole bricks, with inscriptions on them, are here and there found; the whole is covered with innumerable fragments of pottery, brick, bitumen, pebbles, vitrified brick, or scoria, and even shells, bits of glass, and mother of pearl."

Mr. Rich having now finished his observations on the ruins of the east bank of the Euphrates, enters upon the examination of what, on the opposite west bank, have been by some travellers supposed, (and their suppositions have been adopted by Major Rennel,) to be the remains of this great city. Those, however, which Mr. Rich describes, are of the most trifling kind, scarcely exceeding one hundred yards in extent, and wholly consisting of two or three insignificant mounds of earth, overgrown with rank grass. The country too being marshy, he doubts the possibility of there having been any buildings of considerable magnitude at that spot, and, much less, buildings of the dimensions of those described by the classical writers of antiquity. He then opens to our view a new and almost unexplored remain of ancient grandeur, in the following passage:

"But, although there are not any ruins in the immediate vicinity of the river, by far the most stupendous and prising mass of all the remains of Babylon is situated in the
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L’ab, the Arabs Birs Nimroud, by the Jews, Nebuchadnezzar’s Prison. It is a mound of an oblong figure, the circumference of which is seven hundred and sixty-two yards. At the eastern side it is cloven by a deep furrow, not more than fifty or sixty feet high; but at the southern it rises in a conical figure to the elevation of one hundred and ninety-eight feet; and on its summit is a solid mass of brick, thirty-seven feet high by twenty-eight in breadth, diminishing in thickness to the top, which is broken irregular, and rent by a large fissure extending through half of its height. It is perforated by small square holes, disposed in rhomboids. The fine burnt bricks of which it was built have inscriptions on them; and so admirable is the workmanship, which appears to be lime-mortar, that, though the bricks are so close together that it is difficult to discern what difference is between them, it is nearly impossible to extract any one of the bricks whole. The other parts of the summit of the mound are occupied by immense fragments of brick-work, in a solid vitrified masses, as if they had undergone the action of the fiercest fire, or been blown up with gunpowder, the layers of the bricks being perfectly discernible, and a curious fact, and one for which I am utterly incapable of accounting.

Round the Birs are traces of ruins to a considerable extent. To the north is the canal which supplies Mesjid with water, which was dug at the expense of the Awaub Shujahed Doubah, and called after his country, Doubah. We are informed that, from the summit of the mound, in a clear morning, the gilt dome of Mesjid Ali may be seen.

BABYLONIAN BRICKS.

The most ancient method of writing was on stone or brick, which, as the earliest example on record, if allowable to be cited, may be adduced that of the two pillars of Seth, one of brick and the other of stone, said by Josephus to have been erected before the deluge, and to have contained the history of antediluvian arts and sciences. However dis-
Deity, and delivered to Moses on Mount Sinai, can admit of no doubt, no more than can the hieroglyphic characters of the most ancient periods, engraved on the marbles of Egypt at present so abundant in the collections of Europe. They remain to this day, and will be, for centuries to come, lasting proof of the high advance in the engraving art as well as in chemical science, of a nation, who, at that early period, could fabricate instruments to cut them so deep and indelibly on the almost impenetrable granite.

In countries destitute of stone, like Chaldaea, an artificial substance, clay, intermixed with reeds, and indurated by fire, was made use of for that purpose. Of this substance formed into square masses, covered with mystic characters the walls and palaces of Babylon were, for the most part, constructed; and it has been seen in the accounts of vellers who have visited these ruins, examined the bricks, and observed those reeds intermingled with their substance, how durable, through a vast succession of ages, these bricks, with their inscribed characters, have remained. The real meaning, or that of the Persepolitan arrow-headed obelistical characters, and the still more complicated hieroglyphics of Egypt, however partially deciphered by the bours of the learned, will, perhaps, never be fathomed in their full extent, by the utmost ingenuity of man.

Of the bitumen with which these Babylonian bricks were cemented together, and which was plentifully produced in the neighbourhood of Babylon, it may be proper in this place to remark, that it binds stronger than mortar, and in time becomes harder than the brick itself. It was also impervious to water, as to the early descendants of Noah it was well known, for both the outside and the inside of the ark was incrusted with it. Gen. vi. 14. It may be proper to add here, that the bitumen, to deprive it of its brittleness, and render it capable of being applied to the brick, must be boiled with a certain proportion of oil, and that it retains its tenacity longest in a humid situation. Mr. Rich informs us, that it is, "at present, principally used for caulking boats, coating cisterns, baths, and other places which usually come in contact with water. The fragments of it scattered over the ruins of Babylon are black, shining, and brightly somewhat resembling pit-coal in substance and appearance. It will not be forgotten, that the custom, above alluded to..."
Ruins of Persepolis.

I'll Vr?'''S straw or reeds in Persepolis. 501

leaked in the sun, in them closer, and to make them more firm.

In Exodus v. 7, where Pharaoh commands the taskmasters of the oppressed Israelites not to give them straw to make bricks, in order to multiply their vexations, and increase their toil.

Speaking of the Babylonian bricks, and their variety, in respect to size, colour, and hardness, Mr. Rich informs us, that "the general size of the kiln-burnt brick is thirteen inches square, by three thick: there are some of half these dimensions, and a few of different shapes for particular purposes, such as rounding corners, &c. They are of several different colours; white, approaching more or less to yellowish cast, like our Stourbridge, or fire-brick, which is the finest sort; red, like our ordinary brick, which is the nearest sort; and some which have a blackish cast, and are hard. The sun-dried brick is considerably larger than that baked in the kiln, and in general looks like a thick bloody slop of earth, in which are seen small broken reeds, chopped straw, used for the obvious purpose of binding them in like manner the flat roofs of the houses of Bagdad are covered with a composition of earth and mortar, hedged up with chopped straw." At the Birs Nemroud, Rich found some fire-burnt bricks, which appeared to have the same materials in their composition. The best burned bricks he met with are those which compose the so-called Akerkout. In the kasr, or palace, our author found, in general; finer specimens of art; for, in addition to the substances generally strewn on the surfaces of all the mounds, he saw fragments of alabaster vessels, fine china-ware, marble, and great quantities of varnished ware, the glazing and colouring of which are surprisingly fresh. The process from making pottery to moulding figures in clay was not difficult; but the designs in brass, and the shaping of the figures, must have required much greater skill and labour.

Ruins of Persepolis.
The most striking feature, on a first approach to these ruined ruins, is the staircase and its surrounding walls. 

B b
Two grand flights, which face each other, lead to the principal platform. To the right is an immense wall of the finest masonry, and of the most massive stones; to the left, are other walls, equally well built, but not so imposing. On arriving at the summit of the staircase, the first objects which present themselves directly facing the platform are four vast portals and two columns. Two portals first, then the columns, and then two portals again. On the front of each are represented, in basso-relievo, figures of animals, which, for want of a better name, may be called sphinxes. The two sphinxes on the first portals face outwardly, i. e. towards the plain and the front of the building. The two others, on the second portals, face inwardly, i. e. towards the mountain. From the first, (to the right, on a straight line,) at the distance of fifty-four paces, is a staircase of thirty steps, the sides of which are ornamented with bas-reliefs, originally in three rows, but now partly reduced by the accumulation of earth beneath, and by mutilations above. This staircase leads to the principal compartment of the whole ruins, which may be called a small plain, thickly studded with columns, sixteen of which are now visible. Having crossed this plain, on an eminence are numerous stupendous remains of frames, both of windows and doors, formed by blocks of marble of sizes most magnificent. These frames are ranged in a square, and indicate an apartment the most royal that can be conceived. On each side of the frames are sculptured figures, and the marble still retains a polish which, in its original state, must have vied with the finest mirrors. On each corner of this room are pedestals, of an elevation much more considerable than the surrounding frames; one is formed of a single block of marble. The front of this apartment seems to have been on that exposure, and the base of that side is richly sculptured and ornamented. This front opens upon a square platform, on which no building appears to have been raised. But on the side opposite to the room just mentioned, there is the same appearance of a corresponding apartment, and though nothing but the bases of some small columns, and the square of its floor, attest it to have been such. The interval between these two rooms, (on those angles which are the furthest distant from the grand front of the building.)
RUINS OF PERSEPOLIS.

...filled up by the base of a sculpture, similar to the bases of the two rooms, excepting that the centre of it is occupied by a small flight of steps. Behind, and contiguous to these ruins, are the remains of another square room, surrounded on all sides by frames of doors and windows. On the floor are the bases of columns: from the order in which they appear to have stood, they formed six rows, each of which, leads into the lesser and enclosed plain below. Towards the plain are also three smaller rooms, or rather one room and the bases of two closets. Every thing on this part of the building indicates rooms of rest or retirement.

In the rear of the whole of these remains, are the beds of aqueducts, which are cut into the solid rock. They occur in every part of the building, and are probably, therefore, as extensive in their course, as they are magnificent in their construction. The great aqueduct is to be discovered among a confused heap of stones, not far behind the building described above, on that quarter of the palace, and next adjoining to a ruined staircase. Its bed in some places is cut ten feet into the rock. This bed leads east and west; to the eastward its descent is rapid, about twenty-five feet; it there narrows; but again enlarges, so that a man of common height may stand upright in it. It terminates in an abrupt rock.

Proceeding from this towards the mountains, situated in rear of the great hall of columns, stand the remains of a magnificent room. Here are still left walls, frames, and pieces, the sides of which are thickly ornamented with reliefs of a variety of compositions. This hall is a peragonal, and before to the southward of that is another, on the mountain’s surface, which, from the fragments about it, have supported a sphynx. In a recess of the mountain, towards the north, in a separate collection, is a fragment of a column, which, from the fragments about it, the manner on the mountain’s surface between both,
and just on that point where the ascent from the plain commences, is a reservoir of water.

Those, observes Mr. Morier, in the account of his Embassy to Persia, constitute the sum of the principal objects among the ruins of Persepolis.

ROYAL. PALACE OF ISPAHAN.

The palaces of the King are inclosed in a fort of lofty walls, which is estimated to have a circumference of three miles. The palace of the Chehel Sitoon, or "forty pillars," is situated in the middle of an immense square, which is intersected by various canals, and planted in different directions by the beautiful ehenar tree. In front is an extensive square basin of water, from the farthest extremity of which the palace is beautiful beyond either the power of language or the correctness of pencil to delineate. The first saloon is open towards the garden, and is supported by eighteen pillars, all inlaid with mirrors, and, the glass being in a much greater proportion than the wood, appears at a distance to be formed of glass only. Each pillar has a marble base, which is carved into the figures of four lions placed in such attitudes, that the shaft seems to rest on their four united backs. The walls, which form its termination behind, are also covered with mirrors placed in such a variety of symmetrical positions, that the mass of the structure appears to be of glass, and when new must have glittered with most magnificent splendour. The ceiling is painted in gold flowers, which are still fresh and brilliant. Large curtains are suspended on the outside, which are occasionally lowered to lessen the heat of the sun.

THE TEMPLE OF MECCA.

This magnificent temple, to which pilgrims resort from every quarter of the globe where the religion of Islamism is practised, is known by Mussulmen under the name of El Haram, or the temple of excellence. It is situated nearly in the middle of the city, which is built in a valley, having a considerable slope from the north to the south. It is composed of the House of God, Beit Allah, or as it is called also, La Kaaba; of the Well of Zemzem; of the Cobba, or Place of Abraham, Makka.
Ibrahim; of the places of the four orthodox rites, Makam Htanefi, Makam Shaffi, Makam Maleki, and Makam Htanbeli; of two Cobbas, or Chapels, El Cobbatain; of an arch, called Babes-selem (in the same style as a triumphal arch), near the place of Abraham; of El Monbar or the Tribune for the Priest; of the wooden staircase, Daureh, which leads to the saloon of the house of God; of an immense court, surrounded by a triple row of arches; of two smaller courts, surrounded with elegant piazzas; of nineteen doors; and of seven towers, or minarets, five of which were to the edifice, and the other two are placed between the neighbouring houses, out of the inclosure.

La Kaaba, Beit Allah, or the House of God, is a quadrilateral tower, the sides and angles of which are unequal, so that its plan forms a true trapezium. The size of the edifice, and the black cloth which covers it, make this irregularity disappear, and give to it the figure of a perfect square.

The black stone, Hhajera el Assouad, or heavenly Stone, which all true Mussulmen believe to have been brought either by the Angel Gabriel, is raised forty-two inches above the surface, and is bordered all round with a large plate of silver, about a foot broad. The part of the stone that is not covered by the silver at the angle is almost a semi-circle, six inches in height, by eight inches six lines diameter at its base.

El Bir Zemzem, or the well of Zemzem, is situated fifty-one feet distant to the E., 10° N. of the black stone. It is about seven feet eight inches in diameter, and fifty-six feet deep to the surface of the water. The brim is of fine white marble, five feet high. Tradition records that this well was miraculously opened by the angel of the Lord for Agár, when she was nearly perishing from thirst in the desert with her son Ismael, after having been sent from Abraham's house.

The Kaaba, and the stones of Ismael, are situated nearly in the centre of the temple, and occupy the middle of an oval or irregular elliptical surface, which forms a zone of thirty-nine feet wide round the edifice, upon which the pillars make their tours round the Kaaba. It is paved with fine marble, and is situated upon the lowest plane of the temple.
HOLY LAND.

BETHLEHEM.

Bethlehem is situated at the distance of six miles from Jerusalem, in a fine country, blest with a salubrious air, and abundant fertility. The water is conveyed in a low aqueduct which formerly passed to Jerusalem. The Fons Signavit is a charming spring, yielding a constant supply of water to three large cisterns, one of which is still in good preservation. At a small distance from these, a beautiful rivulet called the Deliciæ Solomonis laves the herbage of the valley, and fertilizes several fine gardens, while the circumjacent soil is richly clothed with an elegant assemblage of fig-trees, vines, and olives.

Bethlehem received its name, which signifies the House of Bread, from Abraham; and it was surnamed Ephrata, the Fruitful, after Caleb's wife, to distinguish it from another Bethlehem, in the tribe of Zebulon. It belonged to the tribe of Judah, and also went by the name of the Court of David, that monarch having there been born, and tended sheep in his childhood. Abijan, the seventh judge of Israel, Elimelech, Obad, Jesse, and Boaz, were, like David, natives of Bethlehem, and here must be placed the scene of the admirable eclogue of Ruth. St. Matthias the apostle, also received life in the village of Bethlehem.

The convent is connected with the church by a court inclosed with lofty walls. This court leads by a small side-door into the church. The edifice is certainly of high antiquity, and, though often destroyed and as often repaired, it still retains marks of its Grecian origin. On the pavement at the foot of the altar you observe a marble star, which corresponds, as tradition asserts, with the point of the heavens where the miraculous star that conducted the three kings became stationary. The Greeks occupy the choir or the Magi, as well as the two other naves formed by the transom of the cross. These last are empty, and without altars. Two spiral staircases, each composed of fifteen steps, open on the sides of the outer church, and conduct to the
NAZARETH.

The village of Nazareth is situated in a long valley, surrounded by lofty hills, between which a road leads to the

subterraneous church situated beneath this choir. At the farther extremity of the crypt, on the east side, is the spot where tradition reports the Virgin to have brought forth the Redeemer of mankind. This spot is marked by a white marble, incrusted with jasper, and surrounded by a circle of silver, having rays resembling those with which the sun is represented. Around it are inscribed these words:

HIC DE VIRGINE MARIA
JESUS CHRISTUS NATUS EST.

At the distance of seven paces towards the south, after you have passed the foot of one of the staircases leading to the upper church, you find the Manger. You go down to it by two steps, for it is not upon a level with the rest of the crypt. It is a low recess, hewn out of the rock. A block of white marble, raised about a foot above the floor, and hollowed in the form of a manger, indicates the spot where our Saviour was laid upon straw.

Two paces farther, opposite to the manger, stands an altar, which occupies the place where Mary sat when she presented the Child of Sorrow to the adoration of the Magi.

Nothing can be more pleasing, or better calculated to excite sentiments of devotion, than this subterraneous church. It is adorned with pictures of the Italian and Spanish schools. These pictures represent the mysteries of the place, the Virgin and Child, after Raphael, the Annunciation, the Adoration of the Wise Men, the Coming of the Shepherds, and all those miracles of mingled grandeur and innocence. The usual ornaments of the manger are of blue satin embroidered with silver. Incense is continually smoking before the cradle of the Saviour.

The Grotto of the Nativity leads to the subterraneous chapel, where tradition places the sepulchre of the Innocents: "Herod sent forth and slew all the children that were in Bethlehem, and in all the coasts thereof, from two years old and under. Then was fulfilled that which was spoken by Jeremiah the prophet, saying: In Rama was there a voice heard," &c.

NAZARETH.
neighbouring plain of Esdraelon, and to Jerusalem. The convent is situated in the lower part of the village; and the church belonging to it, a very handsome edifice, is erected over the grotto, or cave, in which, tradition says, the Virgin Mary took up her residence.

The other objects of veneration in Nazareth are, 1. The Workshop of Joseph, which is near the convent, and was formerly included within its walls; this is now a small chapel, perfectly modern, and lately whitewashed. 2. The Synagogue, where Christ is said to have read the Scriptures to the Jews, at present a church. And 3. A Precipice without the town, where, they say, the Messiah leaped down, to escape the rage of the Jews, after the offence his speech in the synagogue had occasioned. Here they show the impression of his hand, made as he sprang from the rock.

THE HOLY SEPULCHRE AT JERUSALEM.

The church of the Holy Sepulchre is very irregular, owing to the nature and situation of the places which it was designed to comprehend. It is nearly in the form of a cross, being one hundred and twenty paces in length, exclusive of the descent to the discovery of the Holy Cross, and seventy in breadth. It has three domes, of which that covering the Holy Sepulchre serves for the nave of the church, is thirty feet in diameter, and is covered at top like the Rondanella at Rome. There is not any cupola, the roof being supported by large rafters, brought from Mount Lebanon.

On entering the church, you come to the Stone of Unction, on which the body of our Lord was anointed with myrrh and aloes, before it was laid in the sepulchre. Some say, that it is of the same rock as Mount Calvary; and others assert, that it was brought to this place by Joseph and Nicodemus, secret disciples of Jesus Christ, who performed this pious office, and that it is of a greenish colour. Be that as it may, on account of the indiscretion of certain pilgrims, who broke off pieces, it was found necessary to cover it with white marble, and to surround it with an iron railing, lest people should walk over it. This stone is eight feet, wanting three inches, in length, and two feet, wanting one inch, in breadth; and above it, eight lamps are kept continually burning.
Grotto of Nazareth.

Holy Sepulchre at Jerusalem.
The Holy Sepulchre is thirty paces from this stone, exactly in the centre of the great dome; it resembles a small sheet, hewn out of the solid rock. The entrance, which faces the east, is only four feet high, and two feet and a quarter broad. The interior of the sepulchre is nearly square. It is six feet, wanting an inch, in length, and six feet, wanting two inches, in breadth, and from the floor to the roof, eight feet one inch. There is a solid block of the same stone, which was left in excavating the other part: this is two feet four inches and a half high, and occupies half of the sepulchre, for it is six feet, wanting one inch, in length, and two feet and five-sixths wide. On this table the body of our Lord was laid, with the head towards the west, and the feet to the east; but, on account of the superstitious devotion of the Orientals, who imagine that, if they leave their hair upon this stone, God will never forsake them, and also, because the pilgrims broke off pieces, it has received a covering of white marble, on which mass is now celebrated. Forty-four lamps are constantly burning in this sacred place, and three holes have been made in the roof for the emission of the smoke. The exterior of the sepulchre is also faced with slabs of marble, and adorned with several columns, having a dome above.

The Holy Sepulchre is composed of three churches; the first of the Holy Sepulchre, properly so called; that of Calvary; and the church of the Discovery of the Holy Cross. The first is built in the valley at the foot of Calvary, on the spot where tradition reports that the body of Christ was deposited. This church is in the form of a cross, the chape of the Holy Sepulchre constituting, in fact, the nave of the church. It is circular, like the Pantheon at Rome, and is covered only by a dome, beneath which is the sepulchre. Six marble columns adorn the circumference of this rood; they are connected by seventeen arches, and support an upper gallery, likewise composed of sixteen columns and seventeen arches, of smaller dimensions than those of the lower range. Niches corresponding with the arches appear above the frieze of the second gallery, and the dome springs from the arch of these niches.

The origin of the church of the Holy Sepulchre is of high antiquity. The author of the Epitome of the Holy Wars asserts, that forty-six years after the destruction of...
Jerusalem by Vespasian and Titus, the Christians obtained permission of Adrian to build, or rather to rebuild, a church over the tomb of their God, and to enclose, in the new city, the other places venerated by the Christians. This church, he adds, was enlarged and repaired by Helena, the mother of Constantine.

THE MOUNT OF OLIVES.

The following descriptions of the spots in the Holy Land, which excite a more particular interest, are extracted from Dr. Clarke’s very valuable Travels in Europe, Asia, and Africa.

"As we advanced, our journey led through an open campaign country, until, upon our right, the guides showed us the Mount, where it is believed that Christ preached to his disciples that memorable sermon, concentrating the soul and substance of every Christian virtue. We left our route to visit this elevated spot; and, having attained the highest point of it, a view was presented, which, for its grandeur, independently of the interest excited by the different objects contained in it, has no parallel in the Holy Land.

"From this situation we perceived that the plain, over which we had been so long riding, was itself very elevated. Far beneath appeared other plains, one lower than the other, and extending to the surface of the Sea of Tiberias or Sea of Galilee. This immense lake, almost equal to the grandeur of its appearance, to that of Geneva, spreads its waters over all the lower territory, extending from the north-east towards the south-west, and then bearing east of us. Its eastern shores present a sublime scene of mountains, extending towards the north and south, and seeming to close it in at either extremity, both towards where the Jordan enters, and the Aulon, or Campus-magnus, through which it flows to the Dead Sea. The cultivated plains reaching to its borders, which we beheld at an amazing depth below our view, resembled, by the various hues their different produce exhibited, the motley pattern of a vast carpet. To the north appeared snowy summits, towering, beyond a series of intervening mountains, with unspeakable greatness. We considered them as the summits of Libanus; but the Arabs belonging to our caravan called the principal eminence Jebel el Sieh, saying it was
near Damascus; probably, therefore, a part of the chain of Libanus. This summit was so lofty, that the snow entirely covered the upper part of it; not lying in patches, as I have seen it, during summer, upon the tops of very elevated mountains, (for instance, upon that of Ben Nevis, in Scotland,) but investing all the higher part with that perfect white and smooth velvet-like appearance which snow only exhibits when it was very deep; a striking spectacle in such a climate, where the beholder, seeking protection from a burning sun, almost considers the firmament to be on fire."

OTHER REVERED SITES.

"As we rode towards the Sea of Tiberias, the guides pointed to a sloping spot from the heights upon our right, whence we had descended, as the place where the miracle was accomplished by which our Saviour fed the multitude: it is therefore called The Multiplication of Bread; as the Mount above, where the Sermon was preached to his Disciples, is called The Mountain of Beatitudes, from the expressions used in the beginning of that discourse. The lake now continued in view upon our left. The wind rendered its surface rough, and called to mind the situation of our Saviour's Disciples, when, in one of the small vessels which traverse these waters, they were tossed in a storm, and saw Jesus, in the fourth watch of the night, walking to them upon the waves. Often as this subject has been painted, combining a number of circumstances adapted for the representation of sublimity, no artist has been aware of the uncommon grandeur of the scenery, memorable on account of the transaction. The Lake of Gennesareth is surrounded by objects well calculated to heighten the solemn impression made by such a picture; and, independent of the local feelings likely to be excited in its contemplation, affords one of the most striking prospects in the Holy Land.

"Along the borders of this lake may still be seen the remains of those ancient tombs, hewn by the earliest inhabitants of Galilee, in the rocks which face the water. Similar works were before noticed among the Ruins of Telmes-tert. They were deserted in the time of our Saviour, and had become the resort of wretched men, afflicted by diseases, and made outcasts of society; for, in the account of the
cure performed by our Saviour upon a mania in the country of the Gadarenes, these tombs are particularly alluded to and their existence to this day, (although they have been neither noticed by priests nor pilgrims, and have escaped the ravages of the Empress Helena, who would, undoubt-edly, have shaped them into churches,) offers strong internal evidence of the accuracy of the Evangelist who has recorded the transaction: "There met him out of the tombs a man with an unclean spirit, who had his dwelling among the tombs."

NAPOLOSE, OR SICHEM.

"There is nothing in the Holy Land finer than the view of this city from the surrounding heights. As the traveller descends towards it from the hills, it appears luxuriously embosomed in the most delightful and fragrant bowers, half concealed by rich gardens, and by stately trees collected into groves, all around the bold and beautiful valley in which it stands. The traveller, directing his footsteps to-wards its ancient sepulchres, as everlasting as the rocks wherein they are hewn, is permitted, upon the authority of sacred and indelible record, to contemplate the spot where the remains of Joseph, of Eleazar, and of Joshua, were severally deposited.

"In the time of Alexander the Great, Sichem was con-sidered as the capital of Samaria. Its inhabitants were called Samaritans, not merely as people of Samaria, but a sect at variance with the other Jews. They consisted prin-cipally of deserters from Judea. The principal object of veneration among them is Jacob's Well, over which a church was formerly erected. This is situated at a small distance from the town, in the road to Jerusalem, and has been visited by pilgrims of all ages; but particularly since the Christian æra, as the place where our Saviour revealed himself to the woman of Samaria.

MOSQUE OF OMAR.

Doctor Clarke, on viewing this Mosque, observes, that "the sight was so grand, that he did not hesitate in pronouncing it the most magnificent piece of architecture in the Turkish empire; and, considered externally, far super-ior to the mosque of Saint Sophia in Constantinople. By
the sides of the spacious area in which it stands, are certain
vaulted remains; these plainly denote the masonry of the
ancients; and evidence may be adduced to prove, that they
belonged to the foundations of Solomon's temple. He ob-
served also that reticulated stucco, which is commonly
considered as an evidence of Roman work. Phocas be-
lieved the whole space surrounding this building to be the
ancient area of the temple; and Golius, in his note upon
the Astronomy of Alferganes, says, the whofoundation of the original edifice remained. As to the
mosque itself, there is no building at Jerusalem that can be
compared with it, either in beauty or riches. The lofty
Saracen pomp so nobly displayed in the style of the
building; its numerous arcades; its capacious dome, with
all the stately decorations of the place; its extensive area,
covered and variegated with the choicest marbles; the extreme
beauty observed in every avenue towards it; and, lastly,
the sumptuous costume observable in the dresses of all the
Eastern devotees, passing to and from the sanctuary, make it
altogether one of the finest sights the Mahometans have to

**MOSQUE OF ST. SOPHIA AT CONSTANTINOPLE.**

The dome of this celebrated structure is one hundred and
thirteen feet in diameter, and is built on arches, sustained by
fourteen pillars of marble. The pavement and staircase are also
covered with marble. There are two rows of galleries, supported by
pillars of party-colour marble, and the entire roof is of fine
mosaic work. In this mosque is the superb tomb of the
Emperor Constantine, for which the Turks have the highest
veneration.

Besides the above, two other mosques attract the particular
notice of travellers who visit the Turkish capital. That of
the Valide-Sultan, founded by the mother of Mahomed
IV., is the largest, and is built entirely of marble. Its pro-
portions are stupendous; and it boasts the finest symmetry. —
the mosque of Sultan Solyman is an exact square, with four
towers in the angles: in the centre is a noble cupola,
supported by beautiful marble pillars. Two smaller ones at
the extremities are supported in the same manner. The
pavement and gallery surrounding the mosque are of marble;
and under the great cupola is a fountain, adorned with such
finely-coloured pillars, that they can scarcely be esteemed as natural marble. On one side is the pulpit, of white marble; and on the other the little gallery for the Grand Signior. A fine staircase leads to it; and it is built up with gilt lattices. At the upper end is a kind of altar, on which the name of God is inscribed: and before it stand two candlesticks, six feet in height, with wax candles in proportion. The pavement is spread with fine carpets, and the mosque illuminated by a vast number of lamps. The court leading to it is very spacious, with galleries of marble, supported by green columns, and covered by 28 leaden cupolas on the sides, with a fine fountain in the centre.

The mosque of Sultan Selim I. at Adrianople is another surprising monument of Turkish architecture. It is situated in the centre and most elevated part of the city, so as to make a very noble display. The first court has four gates, and the innermost three; both being surrounded by cloisters, with marble pillars of the Ionic order, finely polished, and of very lively colours: the entire pavement is of white marble, and the roof of the cloisters is divided into several cupolas or domes, surmounted with gilt balls. In the midst of each court are fine fountains of white marble; and, before the grand entrance, is a portico, with green marble pillars, provided with five gates. The body of the mosque is one prodigious dome, adorned with lofty towers, whence the imams, or priests, call the people to prayers. The ascent to these towers is very artfully contrived: there is but one door, which leads to three different staircases, going to three different stories of the tower, in such a manner, that three priests may ascend and descend, by a spiral progress, without meeting each other.

The walls of the interior are inlaid with porcelain, ornamented with small flowers and other natural objects, in very lively colours. In the centre hangs a vast lamp of gilt silver, besides which there are at least two thousand smaller ones. The whole, when lighted, have a very splendid effect.

RUINS OF CARTHAGE.

The remains of the grandeur and magnificence of Carthage, the rival of Rome, and one of the most commercial cities in the ancient world, are not so striking as might be expected;
and at a little distance, can scarcely be distinguished from the ground on which they lie. The vestiges of triumphal arches, of superb specimens of Grecian architecture, of columns of porphyry or granite, or of curious entablatures, are no longer discernible; all are vanished; and thus it will be in future ages with the most renowned cities now on earth!

To discover these ruins requires some method. Leaving Tunis, the traveller rides along the shore in an east-north-east direction, and reaches, in about half an hour, the salt-pits which extend toward the west, as far as a fragment of wall, very near to the Great Reservoirs. Passing between these salt-pits and the sea, jetties are seen running out to a considerable distance under water. The sea and the jetties are on his right; on his left he perceives a great quantity of ruins, upon eminences of unequal height; and below these ruins a basin of a circular form, and of considerable depth, which formerly communicated with the sea by means of a canal, traces of which are still to be seen. This basin appears to have been the Cothon, or inner port of Carthage. The remains of the immense works discernible in the sea, in this case, indicate the site of the outer mole. Some piles of the cann said to have been constructed by Scipio, for the purpose of blocking up the port, may still be distinguished. A second inner canal is conjectured to have been the exit made by the Carthaginians, when they opened a new passage for their fleet.

The greater part of Carthage was built on three hills. On a spot which overlooks the eastern shore is the area of a spacious room, with several smaller ones adjoining; some of them have tessellated pavements; and in all are found broken pieces of columns of fine marble and porphyry. They are conjectured to have been summer apartments beneath one of the palaces, such as the intense heat of the climate must have required.

In rowing along the shore, the common sewers are still visible, and but little impaired by time. With the exception of these, the cisterns have suffered the least. Besides such as belong to private houses, there are two sets for the public use of the Tunisians: the largest of these was the grand reservoir, and received the water of the aqueduct. It lay near the western wall of the city, and consisted of upwards of twenty contiguous cisterns, each about one
hundred feet in length, and thirty in breadth. They form a series of vaults, communicating with each other, and are bordered throughout their whole length by a corridor. The smaller reservoir has a greater elevation, and lies near the Cothon or inner port. The ruins of the noble aqueduct which conveyed the water into the larger cisterns, may be traced as far as Zawan and Zungar, at least fifty miles distant. This must have been a truly magnificent, and at the same time, a very expensive work. That part of it which extends along the peninsula was beautifully faced with stone. At Aduana, a village to the north of Tunis, are several entire arches 70 feet high, and supported by piers 16 feet square. The water-channel is vaulted over, and plastered with a strong cement. A person of an ordinary height may walk upright in it; and at intervals are apertures, left open, as well for the admission of fresh air, as for the convenience of cleansing it. The water-mark is nearly three feet high; but it is impossible to determine the quantity daily conveyed to Carthage by this channel, without knowing the angle of descent which, in its present imperfect state, cannot be ascertained.

Temples were erected at Zawan and Zungar, over the fountains by which this aqueduct was supplied. That at Zungar appears to have been of the Corinthian order, and terminates very beautifully in a dome with three niches, probably intended for the statues of the divinities of the spring.

**THE PLAIN OF TROY.**

According to Homer's description of the Trojan territory, it combined certain prominent and remarkable features, not likely to be affected by any lapse of time. Of this natural was the Hellespont; the Island of Tenedos; the Plain itself; the river by whose inundations it was occasionally over-flowed; and the mountain whence that river issued. The following is an abstract of Dr. Clarke's accurate account of the vestiges of high antiquity contained in this truly classic spot.

"We entered an immense plain, in which some Turks were engaged hunting wild-boars. Peasants were also employed in ploughing a deep and rich soil of vegetable earth. Proceeding towards the east, and round the bay distinctly pointed out by Strabo, as the harbour in which the Grecian fleet was stationed, we arrived at the Sepulchre of
Ajax, upon the ancient Rhætean Promontory. The view
there afforded of the Hellespont and the Plain of Troy is one
of the finest the country affords.

From the Aianteum we passed over a heathy country
to Halil Elly, a village near the Thymbrius, in whose
vicinity we had been instructed to seek the remains of a
temple once sacred to the Thymbrean Apollo. The ruins
we found were rather the remains of ten temples than of
ten. The earth to a very considerable extent was covered
by subverted and broken columns of marble, granite, and of
every order in architecture. Doric, Ionic, and Corinthian
capitals, lay dispersed in all directions, and some of these
were of great beauty. We observed a bas-relief representing
a person on horseback pursued by a winged figure: also a
beautiful representation, sculptured after the same manner, of
chariotes in her car drawn by two scaly serpents.

At the town or village of Tchiblack, we noticed very
considerable remains of ancient sculpture, but in such a
state of disorder and ruin, that no precise description of
them can be given. The most remarkable are upon the
side of a hill called Beyan Mezaley, near the town, in the
neighborhood of a beautiful grove of oak trees, towards the
village of Callisvat. Here the ruins of a Doric temple of white
marble lay heaped in the most striking manner, mixed with
broken stelæ, cippi, sarcophagi, cornices and capitals of very
handsome size, entablatures, and pillars. All of these have
sacrifice to some peculiar sanctity by which this hill was
frequently characterized.

We proceeded hence towards the plain; and no sooner
reached it, than a tumulus of very remarkable size and
magnitude drew our attention, for a short time, from the main
object of our pursuit. This tumulus, of a high conical form
of a very regular structure, stands altogether insulated. Of
great antiquity no doubt can be entertained by persons
accustomed to view the everlasting sepulchres of the ancients.
The southern side of its base is a long natural mound of
conglomerate ; this, beginning to rise close to the artificial
tumulus, extends toward the village of Callisvat, in a direction
merely from north to south across the middle of the plain.

Of such height that an army encamped on the eastern
edge of it, would be concealed from all observation of persons
sailing upon the coast, by the mouth of the Mender.
If the Poems of Homer, with reference to the Plain of Troy, have similarly associated an artificial tumulus and a natural mound, a conclusion seems warranted, that these are the objects to which he alludes. This appears to be the case in the account he has given of the Tomb of Theseus and the Mound of the Plain.

"From this tomb we descended into the plain, when our guides brought us to the western side of it, near its southern termination, to notice a tumulus, less considerable than the last described, about three hundred paces from the mound, almost concealed from observation by being continually overflowed, upon whose top two small oak trees were then growing.

"We now came to an elevated spot of ground, surrounded on all sides by a level plain, watered by the Culifat Osmack, and which there is every reason to believe the Simoisian. Here we found, not only the traces, but also the remains of an ancient citadel. Turks were then employed raising enormous blocks of marble, from foundations surrounding the place; possibly the identical walls constructed by Lysimachus, who fenced New Ilium with a wall. All the territory within these foundations was covered by broken pottery, whose fragments were parts of these ancient vases now held in such high estimation. Many Greek medals had been discovered in consequence of the recent excavations made there by the Turks. As these medals, bearing indisputable legends to designate the people by whom they were fabricated, have also, in the instance of their discovery, a peculiar connexion with ruins here, they may be considered as indicating, with tolerable certainty, the situation of the city to which they belonged. These ruins evidently appear to be the remains of New Ilium; whether we regard the testimony afforded by their situation, as accordant with the text of Strabo, or the discovery there made of medals of the city.

The conclusions relative to Troas, drawn by this learned writer, are as follows:—"That the river Scamander of Homer, Strabo, and Pliny. The annis maius vigabilis of Pliny flows into the Archipelago, to the south of Sigeum. That the Aiantum, or Tomb of Aias, still remains, answering the description given of its situation by ancient authors, and thereby determining also the exact po-
ATHENS.

This celebrated city by sea, presents a spectacle, which was viewed by Dr. Clarke and his companions with great transports of joy. It was no sooner discovered, than its lofty edifices, catching the sun's rays, rendered the buildings in the Acropolis visible at the distance of fifteen miles.

The reflected light gave them a white appearance. The Parthenon appeared first, above a long chain of hills; presently we saw the top of Mount Aegaeus, to the left of the temple; the whole being backed by a lofty mountainous ridge, which we supposed to be Parnes.

As we drew near to the walls, we beheld the vast Acropolis Citadel, crowned with temples that ori-
ginated in the veneration once paid to the memory of the illustrious dead, surrounded by objects telling the same theme of sepulchral grandeur, and now monuments of departed greatness, gradually mouldering in all the solemnity of ruin. So paramount is this funereal character in the approach to Athens from the Piræus, that, as we passed the hill of the Museum, which was, in fact, an ancient cemetery of the Athenians, we might have imagined ourselves to be among the tombs of Telmessus, from the number of the sepulchres hewn in the rock, and from the antiquity of the workmanship, evidently not of later date than any thing of the kind in Asia Minor. In other respects the city exhibits nearly the appearance so briefly described by Strabo eighteen centuries before our coming; and, perhaps, it wears a more magnificent aspect, owing to the splendid remains of Hadrian’s Temple of Olympian Jove, which did not exist when Athens was visited by the Disciple of Xenarchus. The prodigious columns belonging to this temple appeared full in view between the Citadel and the bed of the Ilissus: high upon our left rose the Acropolis, in the most imposing grandeur: an advanced part of the rock upon the western side of it is the Hill of the Areopagus, where St. Paul preached to the Athenians, and where their most solemn tribunal was held. Beyond all, appeared the beautiful Plain of Athens, bounded by Mount Hymettus. We rode towards the craggy rock of the Citadel, passing some tiers of circular arches at the foot of it; these are the remains of the Odeum of Herodes Atticus, built in memory of his wife Regilla. Then, continuing to skirt the base of the Acropolis, winding rather towards the north, we saw also, upon our left, scooped in the solid rock, the circular sweep on which the Athenians were wont to assemble to hear the plays of Æschylus, and where the Theatre of Bacchus was afterwards constructed.

“We proceeded toward the east, to ascend Mount Anchæmus, and to enjoy in one panoramic survey the glorious prospect presented from its summit, of all the antiquities and natural beauties in the Athenian Plain.” We ascended to the commanding eminence of the Mount, occupied by a Temple of Anchæsmian Jupiter. The Pagan Shrine has, as usual, been succeeded by a small
Parthenon at Athens.

Temple of Jupiter.
TEMPLES OF ELEPHANTA.

Christian Sanctuary: it is dedicated to St. George. Of the view from this rock, even Wheler could not write without emotion. 'Here,' said he, 'a Democritus might sit and sigh at the pomp and vanities of the world, whose glories soon vanish; or an Heraclitus weep over its manifold misfortunes, telling sad stories of the various changes and events of Fate.' The prospect embraces every object, excepting only those upon the south-west side of the Castle. The situation of the observer is north-east of the City; and the reader may suppose him to be looking, in a contrary direction, towards the Acropolis, which is in the centre this fine picture; thence, regarding the whole circuit of the Citadel, from its north-western side, toward the south east, the different parts of it occur in the following or- although to a spectator they all appear to be com-

"The lofty rocks of the Acropolis, crowned with its majestic temples, the Parthenon, Erectheum, &c. con-
tinue the central object. In the foreground is displayed the whole of the modern City of Athens, with its gardens, mosques, and walls, spreading into the plain beneath the Citadel. On the right, or north-west wing, is the Temple of Theseus; and on the left, or south-west wing, the Temple of Jupiter Olympius. Proceeding from west to the south and east, the view beyond the Citadel plays the Areopagus, the Pnyx, Ilissus, the site of the Temple of Ceres in Agræ, the Fountain of Hellinæ, the Stadium Panthenaïaum, the site of the Lyceum, &c. In a parallel circuit, with a more extended radius, are seen the hills and defile of Daphne, or Ta Sagra, the Piræus, Munychia and Phalerum, Lamis, Ægina, the more distant Isles, and Hymettus. A similar circuit, but still more extended, embraces Parnes, the Mountains beyond Elusis and Megara, the Acro-

TEMPLES OF ELEPHANTA.

The Island of Elephanta, distant about two leagues from Bombay, has a circumference of about three miles, and consists of two rocky mountains, covered with trees and
Wonders of Art.

brushwood. Near the landing-place is the figure of an elephant, as large as life, shaped out of a rock, and supposed to have given its name to the island. Having ascended the mountain by a narrow path, the visitor reaches the excavation which has so long excited the attention of the curious and afforded such ample scope for the discussion of antiquarians. With the strongest emotions of surprise and admiration, he beholds four rows of massive columns cut out of the solid rock, uniform in their order, and placed at regular distances, so as to form three magnificent avenues from the principal entrance to the grand idol which terminates the middle vista; the general effect being heightened by the blueness of the light, or rather gloom, peculiar to the situation. The central image is composed of three colossal heads, reaching nearly from the floor to the roof, of height of fifteen feet. It represents the triad deity in the Hindoo mythology, Brahma, Vishnoo, and Seeva, in the characters of the creator, preserver, and destroyer. The middle face displays regular features; and a mild and serene character; the towering head-dress is much ornamented, as are those on each side, which appear in profile, lofty, and richly adorned with jewels. The countenance of Vishnoo has the same mild aspect as that of Brahma; but the visage of Seeva is very different,—severity and revenge, characteristic of his destroying attribute, are strongly depicted; one of the hands embraces a large COBRA DE CAPELLO; while the others contain fruit, flowers, and blessings for mankind, among which the lotos and pomegranate are readily distinguishable. The former of these, the lotos, so often introduced into the Hindoo mythology, forms a principal object in the sculpture and paintings of their temples; is the ornament of their sacred lakes, and the most conspicuous beauty in their flowery sacrifices.

On either side of the Elephanta triad is a gigantic figure leaning on a dwarf, an object frequently introduced in these excavations. The giants guard the triple deity, and separate it from a large recess filled with a variety of figures, male and female, in different attitudes; they are in tolerable proportion, but do not express any particular character of countenance: one conspicuous female, like the Amazon, is single breasted; the rest, whether intended for goddesses or mortals, are generally adorned, like the mo-
Hindoo women, with bracelets and rings for the anterior; the men have bracelets only. The intervening space between these figures is occupied by small aerial beings, holding about them in infinite variety. The larger images in these groups are in alto-relievo; and most of the smaller in basso-relievo, brought sufficiently forward from the rock to produce a good effect.

The sides of the temple are adorned with similar compositions, placed at regular distances, and terminating the avenues formed by the colonnades, so that only one group can be seen at a time, except on a near approach; the regularity of proportion of the whole are remarkably striking. The figures are in general in graceful attitudes; but those of perculean stature do not indicate any extraordinary muscular strength. Among many thousands of them, few countenances express any particular passion, or mark decided character; they have generally a sleepy aspect, bear a greater resemblance to the tame sculpture of Egypt than to the animated works of the Grecian chisel.

From the right and left avenues of the principal temple passages to smaller excavations on each side: that on the right is much decayed, and very little of the sculpture remains entire. A pool of water penetrates from it into a cavern far under the rock; but whether natural or artificial, has not been decided. A small corresponding temple on the left side, contains two baths, one of them not finished; the front is open, and the roof supported by pillars of a different order from those in the large temple; the sides are adorned with sculpture, and the roof cornice painted in mosaic patterns; some of the colours are still bright. The opposite bath, of the same proportion, is less ornamented; and, between them is a room derived from the rock, containing a colossal representation of Lingam, or symbol of Seeva. Several small caves branch out from the grand excavations.

An anecdote is related by Mr. Forbes, in his Oriental memoirs, relative to these sculptured monuments. He accompanied an eminent English Artist on his first visit to Elephanta. "After the glare of a tropical sun, during the walk from the landing place, it was some time before the shade accommodated itself to the gloom of these subterraneous chambers, sufficiently to discriminate objects in
that sombre light. We remained for several minutes without speaking, or looking particularly at each other; at length, when more familiarized to the cavern, my companion still remaining silent, I expressed some fear of having been too warm in my description, and that, like most other objects, the reality fell short of the anticipated pleasure. He soon relieved my anxiety by declaring, that, however highly he had raised his imagination, he was so absorbed in astonishment and delight, on entering this stupendous scene, as to forget where he was. He had seen the most striking objects of art in Italy and Greece; but never anything which filled his mind with such extraordinary sensations. So enraptured was this artist with the spot, that, after staying until a late hour, he quitted it most reluctantly.

The caves of the Isle of Elephanta cannot be sufficiently admired, when the immensity of such an undertaking, the number of artificers employed, and the extraordinary genius of its projector, are considered, in a country until lately accounted rude and barbarous by the now enlightened nations of Europe. Had this work been raised from a foundation, like other structures, it would have excited the admiration of the curious; but when the reflection is made, that it is hewn inch by inch in the hard and solid rock, how great must the astonishment be at the conception and completion of the enterprise!

TEMPLES OF SALSETTE.

High over-head, sublime,
The mighty gate-way's storied roof was spread,
Dwarfsing the puny piles of younger time.
With the deeds of days of yore
The ample roof was sculptur'd o'er,
And many a god-like form there met the eye,
And many an emblem dark of mystery.
Such was the city, whose superb abodes
Seem'd scooped by giants for the immortal gods.
Now all is silence dread,
Silence profound and dead,
The everlasting stillness of the deep!

The excavations of the Island of Salsette, also to Bombay, are hewn in the central mountains. The temple is excavated at some distance from the summit of a steep mountain, in a commanding situation. This stupendous
TEMPLES OF SALSETTE.

The temple at Salsette is upwards of ninety feet long, thirty-eight wide, and thirty-eight feet high, hewn out of the solid rock, and divided into three aisles by regular colonnades, similar to the ancient basilica, a pile of building twice as long as it was wide, and one of the extremities of which terminated in a hemicircle, two rows of columns forming a spacious space in the centre, and leaving a narrow walk between the columns and the wall. In these basilica the Roman emperors of the east frequently administered justice. This magnificent excavation at Salsette appears to be on the same plan, although, doubtless, intended for a place of worship: towards the termination of the temple, fronting the entrance, is a circular pile of solid rock, nineteen feet high, forty-eight in circumference, most probably a representation of the ingam, the symbol already alluded to in the description of the Temples of Elephanta. In this temple there are not any images, nor any kind of sculpture, except on the capitals of the pillars, which are in general executed in a very masterly style, and are little impaired by time. Several have been left in an unfinished state; and the summit of others is something like a bell, between elephants, horses, lions, and animals of different kinds.

The lofty pillars and concave roof of the principal temple at Salsette present a much grander appearance than the best excavation at the Elephanta, although that is much higher in statues and bas-reliefs. The portico at Salsette, of the same height and breadth as the temple, is richly decorated; on each side, a large niche contains a colossal statue, and facing the entrance are small single statues, with groups in various attitudes, all of them in perfect preservation. The outer front of the portico, and the area before it, corresponding in grandeur with the interior, are now injured by time, and the mouldering sculpture mingled with a variety of rock-plants. On the square which at the entrance are long inscriptions, the characters are obsolete, and which modern ingenuity has not yet succeeded in deciphering.

Further up the mountain, a flight of steps, hewn in the rock, and continued to the summit, leads, by various intricate paths, to smaller excavations, most of which consist of rooms, a portico and benches, cut in the rock. To
each is annexed a cistern of about three cubic feet, also hewn in the rock, for the preservation of rain-water. Some of these excavations are larger and better finished than others; and a few, although inferior in size and decoration, in their general effect resemble the principal temple.

The whole appearance of this excavated mountain indicates it to have had a city hewn in its rocky sides, capable of containing many thousand inhabitants. The larger temple was, doubtless, their principal place of worship and the smaller, on the same plan, inferior ones. The rest were appropriated as dwellings for the inhabitants, differing in size and accommodation according to their respective ranks in society; or, as is still more probable, these habitations were the abode of religious brahmins, and of their pupils, when India was the nursery of art and science, and the nations of Europe were involved in ignorance and barbarism.

MAUSOLEUM OF HYDER ALLY.

This splendid monument of oriental grandeur is situated at the western extremity of the great garden of Seringapatam, a city of Hindostan, and capital of the Mysore territory. It is surrounded by a grove of beautiful cypress trees, and was erected by Tippoo Saib in honour of the deceased sovereign, his father. Beneath tombs of black marble, elevated about eighteen inches from the ground, lie the remains of Hyder Ally, his consort, and Tippoo Saib. They are covered with rich cloths, and have canopies over them. The whole of this sumptuous edifice is, with its dome, supported by brilliantly-polished black marble columns. It is surrounded by a magnificent area, within which the fakirs have cells allotted to them; and on an elevated platform are the tombs of several faithful servants. The mosque annexed to it is flanked by two towers. The Moulaahs stationed there are, through the liberality of the British government, still allowed two thousand pagodas per annum to read the Koran; and three pagodas are daily disbursed in charity at the mausoleum.
THE TAJ MAHAL.

This grand mausoleum, which stands due north and south, on the southern bank of the river Jumna, was built by command of the Emperor Shah Jehan for the interment of his favourite sultana Montaz mehl, or Montazal Zumani, the "Pre-eminent in the seraglio, or Paragon of the age;" and at his death his remains were also here deposited, by order of his son Aurungzebe.

This building, in point of design and execution, is one of the most extensive, elegant, commodious, and perfect works ever undertaken and finished by one man. To this celebrated architect the Emperor Shah Jehan gave the title of Zerereer dust, or Jewel-handed, to distinguish him from all other artists.

It is built entirely of pure white marble, on an immense square platform of the same material, having a lofty minaret of equal beauty at every corner. On each side, and behind the imperial mausoleum, is a suit of elegant apartments, also of white marble, highly decorated with coloured stones.

The tombs and other principal parts of this vast fabric are clad with wreaths of flowers and foliage in their natural colors, entirely composed of cornelians, onyxes, verd-antique, sapphires, lazuli, and every variety of agates, so admirably finished as to have rather the appearance of an ivory model with jewels.

It was commenced in the fifth year of the reign of the Emperor Shah Jehan, and the whole completed in sixteen years, four months, and twenty-one days. It cost ninety-eight millions eight hundred and fifteen thousand rupees, equal to one million two hundred and twenty-five thousand pounds sterling: although the price of labour then was, and still continues to be, very reasonable in India.

GREAT WALL OF CHINA.

This stupendous wall, which extends across the northern boundary of the Chinese Empire, is deservedly ranked among the grandest labours of art. It is conducted over the summits of high mountains, several of which have an elevation of not less than 5225 feet, (nearly a mile) across deep vallies and over wide rivers, by means of arches: in
many parts it is doubled or trebled, to command important
passes; and at the distance of nearly every hundred yards is a
tower or massive bastion. Its extent is computed at 1500
miles; but in some parts, where less danger is apprehended,
it is not equally strong or complete, and towards the N. W.
consists merely of a strong rampart of earth. Near Koopakoo
it is twenty-five feet in height, and at the top about fifteen
feet thick: some of the towers, which are square, are forty-
eight feet high, and about forty feet in width. The stone
employed in the foundations, angles, &c. is a strong grey
granite; but the materials for the greater part consists
of bluish bricks, and the mortar is remarkably pure and
white.

The æra of the construction of this great barrier, which
has been and will continue to be the wonder and admiration of
ages, is considered by Sir George Staunton as having been
absolutely ascertained; and he asserts that it has existed for
two thousand years. In this assertion he appears to have
followed Du Halde, who informs us that “this prodigious work was constructed two hundred and fifteen years before
the birth of Christ, by order of the first Emperor of the
family of Tsin, to protect three large provinces from the
raiment of the Tartars.” However, in the History of
China, contained in his first volume, he ascribes the
erection to the second Emperor of the dynasty of Tsin,
named Chi Hoang Ti; and the date immediately preceding
the narrative of this construction is the year 137 before the
birth of Christ. Hence suspicions may arise, not only con-
cerning the epoch when this work was undertaken, but also
relatively to the purity and precision of the Chinese annals
in general. Mr. Bell, who resided some time in China, and
whose travels are deservedly esteemed for the accuracy of
their information, assures us that this wall was built some
where about the year 1160, by one of the Emperors, to pre-
vent the frequent incursions of the Monguls, whose numerous
cavalry used to ravage the provinces, and effect their escape
before an army could be assembled to oppose them. Renau-
dot observes that this wall is not mentioned by any
oriental geographer whose writings boast a higher antiquity
than three hundred years; and it is surprising that it should
have escaped Marco Paulo, who, admitting that he entered
China by a different route, can hardly be supposed, during
Great Wall of China.

Natural Road under the Mountain of Filisfeld.
his long residence in the north of China, and in the country of the Monguls, to have remained ignorant of so stupendous a work. Amid these difficulties, it may be reasonably conjectured, that similar modes of defence had been adopted in different ages; and that the ancient rude barrier, having fallen into decay, was replaced, perhaps after the invasion of Zingis, by the present erection, which, even from its state of preservation, can scarcely aspire to a very remote antiquity.

**Porcelain Tower at Nankin.**

This elegant and commodious building, a very correct idea of which may be formed from the cut, may be regarded as a fine specimen of oriental pagodas. The tower is about two hundred feet in height, and derives its name from its having a chain or porcelain coating. The Portuguese were the first to bestow on these superb edifices the title of pagodas, and to attribute them to devotional purposes. There can be little doubt, however, that in many instances they have been rather erected as public memorials or ornaments, like the columns of the Greeks and Romans.

Mr. Ellis, in his Journal of the late Embassy to China, relates that, in the company of three gentlemen of the Embassy, he succeeded in passing completely through the uninhabited part of the city of Nankin, and in reaching the gateway visible from the Lion Hill. The object of the party was to have penetrated through the streets to the Porcelain Tower, apparently distant two miles. To this, however, the soldiers who accompanied them, and who, from their willingness in allowing them to proceed thus far, were entitled to consideration, made so many objections, that they were forced to desist, and to content themselves with proceeding to a temple on a neighbouring hill, from which they had a very complete view of the city. From this station the Porcelain Tower presented itself as a most magnificent object.

**The Shoemadoo at Pegu.**

The object in Pegu that most attracts and most merits notice, says Mr. Symes in his Embassy to Ava, is the noble edifice of Shoemadoo, or the Golden Supreme. This extraordinary pile of buildings is erected on a
double terrace, one raised upon another. The lower and
greater terrace is about ten feet above the natural level
of the ground, forming an exact parallelogram: the upper
and lesser terrace is similar in shape, and rises about
twenty feet above the lower terrace or thirty above the
level of the country. I judged a side of the lower terrace
to be 1391 feet; of the upper 684. The walls that sus-
tained the sides of the terrace, both upper and lower, are
in a ruinous state; they were formerly covered with
plaster, wrought into various figures; the area of the
lower is strewed with the fragments of small decayed
buildings, but the upper is kept free from filth, and is in
tolerable good order. There is reason to conclude that
this building and the fortress are coeval, as the earth of
which the terraces are composed appears to have been
taken from the ditch; there being no other excavation
in the city, or in its neighbourhood, that could have af-
forded a tenth part of the quantity.

The terraces are ascended by flights of stone steps,
which are now broken and neglected. On each side are
dwellings of the Rhahaans, raised on timbers four or five
feet from the ground; these houses consist only of a
large hall; the wooden pillars that support them are
turned with neatness; the roofs are covered with tiles,
and the sides are made of boards; and there are a
number of bare benches in every house, on which the
Rhahaans sleep; but we saw no other furniture.

'Shoemadoo' is a pyramidal building, composed of
brick and mortar, without excavation or aperture of any
sort; octagonal at the base, and spiral at top; each side
of the base measures 162 feet; this immense breadth di-
minishes abruptly, and a similar building has not unaptly
been compared in shape to a large speaking trumpet.

Six feet from the ground there is a wide projection
that surrounds the base, on the plane of which are fifty-
seven small spires of equal size, and equidistant; one of
them measured twenty-seven feet in height, and forty in
circumference at the bottom. On a higher ledge there
is another row, consisting of fifty-three spires of similar
shape and measurement.

A great variety of mouldings encircle the building;
and ornaments somewhat resembling the fleur-de-lys.
Temple of Shoemadoo in Pagu.

Sarcophagus, or Tomb, of Alexander the Great, in the British Museum, described Page 628.
surround the lower part of the spire; circular mouldings likewise girt it to a considerable height, above which there are ornaments in stucco not unlike the leaves of a Corinthian capital; and the whole is crowned by a Tee, or umbrella, of open iron-work, from which rises a rod with a gilded pennant.

The tee or umbrella is to be seen on every sacred building that is of a spiral form; the raising and consecration of this last and indispensable appendage, is an act of high religious solemnity, and a season of festivity and relaxation. The present king bestowed the tee that covers Shoemadoo. It was made at the capital; and many of the principal nobility came down from Ummereapoora to be present at the ceremony of its elevation.

The circumference of the tee is fifty-six feet; it rests on an iron axis fixed in the building; and is farther secured by large chains strongly rivetted to the spire. Round the lower rim of the tee are appended a number of bells, which agitated by the wind, make a continual jingling.

The tee is gilt, and it is said to be the intention of the king to gild the whole of the spire. All the lesser pagodas are ornamented with proportionable umbrellas of similar workmanship, which are likewise encircled by small bells.

The extreme height of the edifice, from the level of the country, is 361 feet, and above the interior, terrace, 331 feet.

On the south-east angle of the upper terrace there are two handsome saloons, or kioums, lately erected, the roofs composed of different stages, supported by pillars; we judged the length of each to be about 60 feet, and the breadth 30: the ceiling of one is already embellished with gold leaf, and the pillars are lackered; the decoration of the other is not yet completed. They are made entirely of wood; the carving on the outside is laborious and minute: we saw several unfinished figures of animals and men in grotesque attitudes, which were designed as ornaments for different parts of the building. Some images of Gaudma, the supreme object of Birman adoration, lay scattered around.

At each angle of the interior and higher terrace there
is a temple 67 feet high, resembling, in miniature, the great temple temple: in front of that, in the south-west corner, are four gigantic representations, in masonry, of Pallo, or the evil genius, half beast, half human, seated on their hams, each with a large club on the right shoulder. The Pundit who accompanied me, said that they resembled the Rakuss of the Hindoos. These are guardians of the temple.

Nearly in the centre of the east face of the area are two human figures in stucco, beneath a gilded umbrella; one, standing, represents a man with a book before him and a pen in his hand; he is called Thaisiamce, the recorder of mortal merits and mortal misdeeds; the other, a female figure kneeling, is Mahasumdera, the protectress of the universe, so long as the universe is doomed to last; but when the time of general dissolution arrives, by her hand the world is to be overwhelmed and everlastingly destroyed.

A small brick building near the north-east angle contains an upright marble slab, four feet high, and three feet wide: there is a long legible inscription on it. I was told it was an account of the donations of pilgrims of only a recent date.

Along the whole extent of the north face of the upper terrace, there is a wooden shed for the convenience of devotees who come from a distant part of the country. On the north side of the temple are three large bells of good workmanship, suspended high the ground, between pillars; several deers' horns lie strewed around; those who come to pay their devotions first take up one of the horns, and strike the bell three times, giving an alternate stroke to the ground: this act, I was told, is to announce to the spirit of Gaudma the approach of a supplicant. There are several low benches near the foot of the temple, on which the person who comes to pray, places his offering, commonly consisting of boiled rice, a plate of sweetmeats, or cocoa-nut fried in oil; when it is given the devotee cares not what becomes of it; the crows and wild dogs often devour it in presence of the donor, who never attempts to disturb the animals. I saw several plates of victuals disposed of in this manner, and understood it to be the case with all that was brought.
There are many small temples on the areas of both terraces, which are neglected, and suffered to fall into decay. Numberless images of Gaudma lie indiscriminately scattered. A pious Birman who purchases an idol, first procures the ceremony of consecration to be performed by the Rhaaans; he then takes his purchase to whatever sacred building is most convenient, and there places it within the shelter of a kioum, or on the open ground before the temple; nor does he ever again seem to have any anxiety about its preservation, but leaves the divinity to shift for itself. Some of those idols are made of marble that is found in the neighbourhood of the capital of the Birman dominions, and admits of a very fine polish; many are formed of wood, and gilded, and a few are of silver; the latter, however, are not usually exposed and neglected like the others. Silver and gold is rarely used, except in the composition of household gods.

On both the terraces are a number of white cylindrical flags, raised on bamboo poles; these flags are peculiar to the Rhaaans, and are considered as emblematic of purity, and of their sacred function. On the top of the staff there is a henza, or goose, the symbol both of the Birman and Pegu nations.

The Colossal Figure of Jupiter Pluvius, or Statue of Father Appenine, at Pratolino, in Italy.

Statues above the ordinary size, were named by the ancients, Colossi, from a Greek word which signifies Members. That at Rhodes was the most famous, executed by Carelus, a pupil of Lysippus. There were several at Rome; the most considerable was that of Vespasian in the amphitheatre, that bore the name of Coliscaust. Claudius caused a colossal statue of himself to be raised on a rock exposed to the sea waves, in front of the Portus Ostium. Nero had his person and figure painted ion a linen cloth, 120 feet in height. In the Court of the Capi and in the Place Farnesi, &c. are colossi, either entire or mutilated.

The space in which stands this enormous statue, is planted round, on all sides, with lofty fir and beech trees, the trunks of which are hid by a wood of laurel, wherein niches have been, cut for statues. The middle
part is a green lawn, and at a little distance, is a semi-
circular basin of water, behind which rises the colossal
statue of Father Apennine.

Encased, as it were, in the groves, it can only be
surveyed in front, and from a point of view marked
by the artist, in the adjoining engraving.

Elevated on a base to appearance irregular, and of its-
self lofty, at which the astonished spectator arrives through
two balustrades that run round the basin, this Colossus,
at first, looks like a pyramidal rock, on which the hand
of man might have executed some project analogous to
what the statuary Stasicrates had conceived respecting
Mount Athos,* and which Alexander nobly rejected.
But soon he recognises the genius of a pupil and worthy
rival of Michelangelo.

It was, in fact, John of Bologna, who, by an inspira-
tion derived from the ancients, has executed their been
ideal of Jupiter Pluvius. This name seems more suit-
able to the figure than that of Father Apennine, which
has been assigned to it. The style, in point of magni-
tude, is of the largest, and the character of the head
is in perfect conformity to the subject. His brows and
front brave the tempest, and seem the region of the
hoar frost; his locks descend in icicles on his broad
shoulders, and the flakes of his immense beard resemble
stalactites; his limbs seem covered with rime, but with
no alteration in their contour, or in the form of the
muscles.

To add to the extraordinary effect, about the head
is a kind of crown, formed of little jetteaux, that drop
on the shoulders and trickle down the figure, shedding
a sort of supernatural lustre, when irradiated by the sun.

It would be difficult to imagine a composition more
picturesque and perfect in all its proportions. The figure

* Stasicrates proposed to Alexander, to transform Mount Athos
into a most durable statue, and one that would be most prominent
to a world of beholders. His left hand to contain a city, peopled
with 10,000 inhabitants, and from the right a great river to flow, its
waters descending to the sea. The proposition of this gigantesque
monument was rejected by Alexander, exclaiming, 'The passage of
Mount Caucasus, the Tanais, and the Caspian, which I have forced,
shall be my monuments.'
Colossal Statue of the Appenine Jupiter.
harmonizes with the surrounding objects, but its real
magnitude is best shewn by comparison with the groups
promenading about the water, and which, in comparison,
at a certain distance, resemble pigmies. A nearer ap-
proach exhibits a truly striking proportion of the limbs.

A number of apartments have been fabricated in the
interior, and within the head is a beautiful belvidere,
wherein the eye-balls serve for windows. The extremi-
ties are of stone; the trunk is of bricks overlaid with a
mortar or cement that has contracted the hardness of
marble, and which, when fresh, it was easy to model in
due forms.

It is related in the life of John of Bologna, that several
of his pupils, unaccustomed to work with hand, while
engaged in this work, forgot the correct standard of di-

gensions, both as to the eye and hand, and that Father
Apennine and his enormous muscles made them spoil a
number of statues.

The greatest difficulty in the workmanship was to in-
press on the mass, the character of monumental durability.
The artist has succeeded in uniting the rules of the statu-
ary with those of construction, in combining the beauty
of the one with the solidity of the other. All the parts
refer to a common centre of gravity, and the members
are arranged so as to serve for a scaffolding to the body,
without impairing its dignity or magnitude.

The colossal statues of the ancients may have suggested
the idea of this configuration, or, as before hinted, the
artist may have aimed to represent the Jupiter Pluvius.
However, it seems probable that Poussin, in his painting
of the Plains of Sicily, has, from this, formed his Poly-

phemus, seated on the summit of a lofty rock. From the
beauty of its proportions, and skill in the execution, all
artists who have to work on colossal figures, ought to
cherish the preservation of this, as an imposing object,
that cannot be too profoundly studied.

**THE HANGING TOWER OF PISA, IN TUSCANY.**

This celebrated tower, likewise called CAMPANILE, on
account of its having been erected for the purpose of con-

taining bells, stands in a square close to the cathedral of
Pisa. It is built entirely of white marble, and is a beautiful
cylinder of eight stories, each adorned with a round of columns, rising one above another. It inclines so far on one side from the perpendicular, that in dropping a plummet from the top, which is 183 feet in height, it falls 10 feet from the base. Much pains have been taken by connoisseurs to prove that this was done purposely by the architect; but it is evident that the inclination has proceeded from another cause, namely, from an accidental subsidence of the foundation on that side. The pillars are there considerably sunk; and this is also the case with the very threshold of ambition, meant to shew how far he could with safety deviate from the perpendicular, and thus display a novel specimen of his art, he would have shortened the pilasters on that side, so as to exhibit them entire, without the appearance of sinking.

THE COLISEUM AT ROME.

On approaching the majestic ruins of this vast amphitheatre, the most stupendous work of the kind antiquity can boast, a sweet and gently-moving astonishment is the first sensation which seizes the beholder; and soon afterwards the grand spectacle swims before him like a cloud. To give an adequate idea of this sublime building, is a task to which the pen is unequal: it must be seen to be duly appreciated. It is upwards of 1600 feet in circumference, and of such an elevation that it has been justly observed by a writer, Ammianus, "the human eye scarcely measures its height." Nearly the one half of the external circuit still remains, consisting of four tiers of arcades, adorned with columns of four orders, the Doric, Ionian, Corinthian, and Composite. Its extent may, as well as its elevation, be estimated by the number of spectators it contained, amounting, according to some accounts, to eighty thousand, and agreeably to others, to one hundred thousand.

Thirty thousand captive Jews are said to have been engaged by Vespasian, whose name it occasionally bears, in the construction of this vast edifice; and they have not discredited their forefathers, the builders of Solomon's temple, by the performance. It was not finished, however, until the reign of his son Titus, who, on the first day of its being opened introduced into the arena not less than 5000, or
Coliseum at Rome.
ROMAN AMPHITHEATRE AT NISMES.

According to Dio Cassius, 9000 wild beasts, between whom, and the primitive Christians held captive by the Romans, combats were fought. At the conclusion of this cruel spectacle the whole place was put under water, and two fleets, named the Corcyrian and the Corinthian, represented a naval engagement. To render the vapour from such a multitude of persons less noxious, sweet-scented water, and frequently wine mixed with saffron, was showered down from a grated work above, on the heads of the spectators.

The Roman Emperors who succeeded Titus were careful of the preservation of this superb monument: even the voluptuous Heliogabulus caused it to be repaired after a great fire. The rude Goths, who sacked the city of Rome, were contented with despoiling it of its internal ornaments, but respected the structure itself. The Christians, however, through an excess of zeal, have not been satisfied with allowing it gradually to decay. Pope Paul II. had as much of it levelled as was necessary to furnish materials for building the palace of St. Mark, and his pernicious example was followed by Cardinal Riario, in the construction of what is now called the chancery. Lastly, a portion of it was employed by Pope Paul III. in the erection of the Palace of the; scene. Notwithstanding all these dilapidations, there still exists enough of it to inspire the spectator with awe. Immense masses appear fastened to and upon one another: without any mortar or cement; and these alone, from their structure, are calculated for a duration of many thousands of years. Occasionally, where the destroyers have not effectually attained their object, the half-loosened masses appear to be held in the air, by some invisible power; for the wide interstices among them leave no other support than their joints, which seem every moment as if about to yield unavoidably to the superior force of gravitation. "They will fall;" "they must fall;" "they are falling;" is, and has been the language of all beholders during the vast periods through which this stupendous edifice has thus hung together in the air.

ROMAN AMPHITHEATRE AT NISMES.

Nismes, anciently called Nemausus, in the province of Lower Languedoc, was a very flourishing colony of Romans.
established by Augustus Cesar, after the battle of Actium. Among its splendid monuments of antiquity, the Amphitheatre, being infinitely better preserved than those of Rome and Verona, is the finest monument of the kind now extant. It was built in the reign of Antoninus Pius, who contributed a large sum of money towards its erection. It is of an oval figure, 1080 feet in circumference, sufficiently capacious to contain twenty thousand spectators. The architecture is of the Tuscan order, sixty feet high, composed of two open galleries, built one over another, consisting each of sixty arcades. The entrance into the arena was by four great gates, with porticoes; and the seats, of which there were thirty, rising one above another, consisted of great blocks of stone, many of which still remain. Over the north gate appear two bulls, in alto relievo, extremely well executed emblems which, according to the usage of the Romans, signified that the amphitheatre was erected at the expense of the people. In other parts are heads, busts, and other sculptures in bas-relief.

This magnificent structure stands in the lower part of the city, and strikes the spectator with awe and veneration. The external architecture is almost entire in its whole circuit. It was fortified as a citadel by the Visigoths, in the beginning of the sixth century; they raised within it a castle, two towers of which are still extant; and surrounded it with a broad and deep moat, which was filled up in the thirteenth century. In all the subsequent wars to which the city of Nismes was exposed, it served as the last refuge of the citizens, and sustained a great number of successive attacks; so that its fine preservation is almost miraculous.

**TRAJAN'S PILLAR.**

This historical column was erected at Rome by the Emperor Trajan to commemorate his victories over the Dacians, and is considered as the master-piece of the splendid monuments of art elevated by that Emperor in the Roman capital. Its celebrity is chiefly owing to the beautifullly-wrought bas-reliefs, containing about two thousand figures, with which it is ornamented. It stands in the middle of a square, to form which a hill, one hundred and forty feet in height, was elevated; and was intended, as appears by the inscription on the base, both as a tomb for the Emperor, and to display the
MAISON CARREE AT NISMES.

height of the hill, which had thus, with incredible labour, been reduced to a plane surface. It was erected in the year 114 of the Christian era; and the Emperor Constantine, two centuries and a half afterwards, regarded it as the most magnificent structure by which Rome was even at that time embellished.

This pillar is built of white marble, its base, consisting of twelve stones of an enormous size, being raised on a socle, or foot, of eight steps: within is a staircase illuminated by 44 windows. Its height, equalllng that of the hill which had been levelled, to give place to the large square called the forum Romanum, is 140 feet, being 35 feet less elevated than the Antonine column. The latter, the sculptured ornaments of which are not equally esteemed, is decorated with bas-reliefs representing the victories of Marcus Aurelius over the Marcomanni. A spiral staircase of nearly 200 steps leads to the summit of this column.

MAISON CARREE, AT NISMES.

In the Amphitheatre of Nismes strikes the spectator with an idea of greatness and sublimity, the Maison Carrée enchants him with the most exquisite beauties of architecture and sculpture. This fine structure, as is evidenced by the inscription discovered on its front, was built by the inhabitants of Nismes, in honour of Caius Cesar, and Lucius Cesar, twin children of Augustus, by his daughter Julia, the wife of Agrippa. It stands upon a pediment 6 feet high, is 62 feet long, 35 broad, and 37 in height, without reckoning the pediment. The body of it is adorned with 20 columns engaged in the wall; and the peristyle, which is open, with 20 detached pillars that support the entablature. They are all of the Corinthian order, fluted and embellished with capitals of the most exquisite sculpture: the frize and cornice are much admired, and the foliage is esteemed inimitable. The proportions of the building are so happily blended, as to give it an air of majesty and grandeur, which the most indifferent spectator cannot behold without emotion. To enjoy these beauties, it is not necessary to be a connoisseur in architecture: they are indeed so exquisite that they may be visited daily with a fresh appetite for years together. What renders them still more interesting is, that they are
entire, and very little affected, either by the ravages of time, or the havoc of war. Cardinal Alberoni declared this elegant structure to be a jewel which deserved a cover of gold to preserve it from external injuries. An Italian painter, perceiving a small part of the roof repaired by modern French masonry, tore his hair, and exclaimed in a rage, "Zounds! what do I see? Harlequin's hat on the head of Augustus!"

In its general architectural effect, as well as in all its details of sculpture and ornament, the Maison Carrée of Nismes is ravishingly beautiful, and cannot be paralleled by any structure of ancient or modern times. That which most excites the astonishment of the admiring spectator is to see it standing entire, like the effect of enchantment, after such a succession of ages, subjected, as several of them were, to the ravages of the barbarians who overrun the most interesting parts of Europe!

THE PONT DU GARD.

This celebrated Roman monument is distant about three leagues from the city of Nismes. Instead of finding it in a ruinous condition, as he might reasonably have expected, the traveller, on approaching it, is agreeably disappointed when he perceives that it looks as fresh as a modern bridge of a few years standing. The climate is either so pure and dry, or the free-stone with which it is built so hard, that the very angles of the stones remain as acute as if they had been recently cut. A few of them have, indeed, dropped out of the arches; but the whole is admirably preserved, and presents the eye with a piece of architecture, so unaffectedly elegant, so simple, and, at the same time, so majestic, that it defies the most phlegmatic spectator to view it without admiration. It was raised, in the Augustan age, by the Roman Colony of Nismes, to convey a stream of water between two mountains, for the use of that city. It stands over the river Gardon, a beautiful pastoral stream, brawling among rocks which form a number of pretty natural cascades, and overshadowed on each side by trees and shrubs, which add greatly to the rural beauties of the scene.

This elegant structure consists of three bridges, or tiers of arches, one above another; the first of six, the second of eleven, and the third of thirty-six arches.
Pont du Gard, near Nismes, in Languedoc.

Aqueduct of the Peat Forest Canal.
comprehending the aqueduct on the top, is 174 feet 3 inches, and the length, between the two mountains, which it unites, is 723 feet. The order of the architecture is Tuscan; but its symmetry is inconceivable. By scooping the bases of the pilasters of the second tier of arches, a passage was made for foot travellers; but although the ancients far excelled the moderns in point of beauty and magnificence, they certainly fell short of them in point of convenience. The inhabitants of Avignon have, in this particular, improved the Roman work by a new bridge by apposition, constructed on the same plan with that of the lower tier of arches, of which indeed it seems to be a part, affording a broad and commodious passage over the river, to horses and carriages. The aqueduct for the continuance of which this superb work was raised, conveyed a stream of pure water from the fountain of Eure, near the city of Uzès, and extended nearly six leagues in length.

To enable the reader to form a comparative judgment of ancient and modern aqueducts, a delineation of the one at the Peat Forest Canal, stretching from the great Canal which extends from Manchester towards Wakefield, is introduced in the plate, beneath that of the Pont du Gard.

ST. PETER'S OF ROME.

The piazza of this masterpiece of architecture is altogether sublime. The double colonnade on each side, extending in a semi-circular sweep; the stupendous Egyptian obelisk; the two fountains; the portico; and the admirable façade of the church; form such an assemblage of magnificent objects, as cannot fail to impress the mind with awe and admiration. The church appears in the back-ground, and on each side is a row of quadruple arches, resting on two hundred and eighty-four pillars, and eighty-eight pilasters; the arches support one hundred and ninety-two statues, twelve feet in height. The two noble fountains throw a mass of water to the height of nine feet, from which it falls in a very picturesque manner, and adds greatly to the beauty of the scene. In the centre is the fine obelisk.

At the first entrance into St. Peter's, the effect is not so striking as might be expected: it enlarges itself, however, insensibly on all sides, and mends on the eye every moment.
The proportions are so accurately observed, that each of the parts are seen to an equal advantage, without distinguishing itself above the rest. It appears neither extremely high, nor long, nor broad, because a just equality is preserved throughout. Although every object in this church is admirable, the most astonishing part of it is the cupola. On ascending to it, the spectator is surprised to find, that the dome which he sees in the church, is not the same with the one he had examined without doors, the latter being a kind of case to the other, and the stairs by which he ascends into the ball, lying between the two. Had there been the outward dome only, it would not have been seen to advantage by those who are within the church; or had there been the inward one only, it would scarcely have been seen by those who are without; and had both been one solid dome of so great a thickness, the pillars would have been too weak to have supported it.

It is not easy to conceive a more glorious architectural display than the one which presents itself to the spectator who stands beneath the dome. If he looks upward, he is astonished at the spacious hollow of the cupola, and has a vault on every side of him, which makes one of the most beautiful vistas the eye can possibly have to penetrate. To convey an idea of its magnitude, it will suffice to say, that the height of the body of the church, from the ground to the upper part of its ceiling, is four hundred and thirty-two feet, and that sixteen persons may place themselves, without inconvenience, in the globular top over the dome, which is annually lighted, on the 29th of June, by four thousand lamps and two thousand fire-pots, presenting a most delightful spectacle.

The vestibule of St. Peter's is grand and beautiful. Over the second entrance is a fine mosaic from Giotto, executed in the year 1303; and at the corners, to the right and left, are the equestrian statues of Constantine and Charlemagne. Of the five doors leading to the church itself, one, called the holy door, is generally shut up by brick-work, and is only opened at the time of the Jubilee. The middle gate is of bronze, with bas-reliefs.

Of the one hundred and thirty statues with which this church is adorned, that of St. Peter is the most conspicuous: it is said to have been re-cast from a bronze statue of Jupiter.
St. Peter's at Rome.

St. Peter's at Rome, St. Paul's at London, and the Mosque of St. Sophia at Constantinople; engraved in their exact relative dimensions.
Capitolinus. One hundred and twelve lamps are constantly burning around the tomb of this Saint; and the high altar close to it, on which the Pope alone reads mass, is overshadowed by a ceiling, which exceeds in loftiness that of any palace of Rome. The splendid sacristy was built by Urban VI. But by far the greatest ornaments of the interior are the excellent works in mosaic, all copied from the most celebrated pictures, which are thus guarded from oblivion.

The great and truly awful dome of St. Peter's is only two feet less in diameter than that of the Pantheon, being one hundred and thirty-seven feet; but it exceeds the latter in height by twenty feet, being one hundred and fifty-nine feet, besides the lantern, the basis pedestal of the top, the globular top itself, and the cross above it, which, collectively, measure one hundred and twenty feet. The roof of the church is ascended by easy steps; and here the visitor seems to have entered a small town, for he suddenly finds himself among a number of houses, which either serve as repositories of implements and materials for repairing the church, or are inhabited by the workmen. The dome, at the foot of which he now arrives, appears to be a parish-church of this town; and the inferior domes seem as if intended only for ornaments to fill up the vacancies. Add to this, that he cannot see the streets of Rome, in account of the surrounding high gallery, and its colossal statues; and the singularity of such a scene may be easily conceived. It is besides said, that a market is occasionally held here for the aerial inhabitants.

Although the adventurous stranger is now on the roof, he has still a great height to ascend before he reaches the summit of the dome. Previously to his engaging in this enterprise, he is conducted to the inside gallery of the dome. From this spot the people within the body of the church appear like children. The higher he goes, the more uncomfortable he finds himself, on account of the oblique walls over the narrow staircase; and he is often compelled to lean with his whole body quite to one side. Several marble plates are affixed in these walls, containing the names of the distinguished personages who have had the courage to ascend to the dome, and even to climb up to the lantern, and the top. The Emperor Joseph II. is twice mentioned; and Paul I. as Grand Duke. In some parts,
where the stairs are too steep, more commodious steps of wood have been placed: by these the lantern can be reached with greater facility; and the view which there waits the visitor, may be imagined without the aid of description; it is an immense panorama, bounded by the sea.

EDDYSTONE LIGHT-... USE.

The Eddystone Rocks, on which this celebrated Lighthouse is built, are situated nearly south-south-west from the middle of Plymouth-sound, being distant from the port of Plymouth nearly fourteen miles, and from the Promontory called Ramhead, about ten miles. They are almost in the line, but somewhat within it, which joins the Start and the Lizard Points; and as they lie nearly in the direction of vessels coasting up and down the Channel, they were necessarily, before the establishment of a light-house, very dangerous, and often fatal to ships under such circumstances.

Their situation, likewise, relatively to the Bay of Biscay and the Atlantic Ocean, is such, that they lie open to the swells of both from all the south-western points of the compass, which swells are generally allowed by mariners to be very great and heavy in those seas, and particularly in the Bay of Biscay. It is to be observed, that the soundings of the sea from the south-west towards the Eddystone, are from eighty fathoms to forty, and that in every part, until the rocks are approached, the sea has a depth of at least thirty fathoms; insomuch that all the heavy seas from the south-west reach them uncontrolled, and break on them with the utmost fury.

The force and height of these seas are increased, by the circumstance of the rocks stretching across the channel, in a direction north and south, to the length of above one hundred fathoms, and by their lying in a sloping manner toward the south-west quarter. This striving of the rocks, as it is technically called, does not cease at low-water, but still goes on progressively; so that, at fifty fathoms westward, there are twelve fathoms of water; neither does it terminate at the distance of a mile. From this configuration it happens, that the seas are swollen to such a degree in storms and heavy gales of wind, as to break on the rocks with the utmost violence.
It is not surprising, therefore, that the dangers to which navigators were exposed by the Eddystone rocks should have made a great commercial nation desirous to have a light-house erected on them. The wonder is that any one should have had sufficient resolution to undertake its construction. Such a man was, however, found in the person of Mr. Henry Winstanley, of Littleburgh, in Essex, who, being furnished with the necessary powers to carry the design into execution, entered on his undertaking in 1696, and completed it in four years. So certain was he of the stability of his structure, that he declared it to be his wish to be in it " during the greatest storm which ever blew under the face of the heavens." In this wish he was but too amply gratified; for while he was there with his workmen and light-keepers, that dreadful storm began, which raged most violently on the night of the 26th of November, 1703; and of all the accounts of the kind which history has furnished us, not any one has exceeded this in Great Britain, nor has been more injurious or extensive in its devastations. On the following morning, when the storm was so much abated, that an enquiry could be made, whether the lighthouse had suffered from it, not any thing appeared standing, with the exception of some of the large irons by which the work was fixed on the rock; nor were any of the people, nor any of the materials of the building, ever found afterwards.

In 1709, another light-house was built of wood, on a very different construction, by Mr. John Rudyard, then a silk-mercer on Ludgate-hill. This very ingenious structure, after having braved the elements for forty-six years, was burned to the ground in 1755. On the destruction of this light-house, that excellent mechanic and engineer, Mr. Smeaton, was selected as the fittest person to build another. He found some difficulty in persuading the proprietors, that a stone building, properly constructed, would be in every respect preferable to one of wood; but having at length convinced them, he turned his thoughts to the shape which would be most suitable to a building so critically situated. Reflecting on the structure of the former buildings, it seemed to him a material improvement to procure, if possible, an enlargement of the base, without increasing the size of the waist, or that part of the building placed between the
top of the rock and the top of the solid work. Hence he thought a greater degree of strength and stiffness would be gained, accompanied with less resistance to the acting power. On this occasion, the natural figure of the waist or bole, of a large spreading oak, occurred to our sagacious engineer.

With these very enlightened views, as to the proper form of the superstructure, Mr. Smeaton began the work on the 2d of April, 1757, and completed it on the 4th of August, 1759. The rock, which slopes towards the south-west, is cut into horizontal steps, into which are dovetailed, and united by a strong cement, Portland-stone and granite. The whole, to the height of thirty-five feet from the foundation, is a solid body of stones, engrafted into each other, and united by every means of additional strength that could be devised. The building has four rooms, one over the other, and at the top a gallery and lantern. The stone floors are flat above, but concave beneath, and are kept from pressing against the sides of the building by a chain let into the walls. It is nearly eighty feet in height, and since its completion has been assaulted by the fury of the elements, without suffering the smallest injury.

To trace the progress of so vast an undertaking, and to show with what skill and judgment this unparalleled engineer overcame the greatest difficulties, would far exceed the limits of this work.

BELL ROCK LIGHT-HOUSE.

The Bell Rock, or Inch Cape, is situated on the north-east coast of Great Britain, twelve miles south-west from the town of Arbroath, in Fifeshire, and thirty miles north-east from St. Abb's Head, in the county of Berwick. It lies in the direct trace of the Firth of Tay, and of a great proportion of the shipping of the Firth of Forth, embracing a very extensive local trade. This estuary is besides the principal inlet on the northern coast of Britain, in which the shipping of the German Ocean and North Sea take refuge when overtaken by easterly storms. At neap-tides, or at the quadratures of the moon, the Bell Rock is scarcely uncovered at low-water; but in spring-tides, when the ebbs are greatest, that part of the rock which is exposed to view at
low-water, measures about four hundred and twenty-seven feet in length, by two hundred and thirty in breadth; and in this low state of the tides, its average perpendicular height above the surface of the sea is about four feet. Beyond the space included in these measurements, at very low tides, a reef extends about a thousand feet, in a south-west direction, from the higher part of the rock just described; on this reef the light-house is erected.

In the erection of a light-house on the Bell Rock, independently of its distance from the main land, a serious difficulty presented itself, arising from the greater depth of water at which it was necessary to carry on the operations, than in the case of the Eddystone light-house, described above, or of any other building of the same kind, ancient or modern, which had been hitherto undertaken. Its description is as follows:

The Bell Rock Light-house, which has, not improperly, been termed the Scottish Pharos, is a circular building, the foundation-stone of which is nearly on a level with the surface of the sea at low-water of ordinary spring tides; and, consequently, at high-water of these tides the building is immersed to the height of about fifteen feet. The first two, or lowest courses of the masonry, are imbedded, or sunk into the rock, and the stones of all the courses are curiously dovetailed and joined with each other, forming one connected mass from the centre to the circumference. The successive courses of the work are also attached to each other by joggles of stone; and, to prevent the stones from being lifted up by the force of the sea, while the work was in progress, each stone of the solid part of the building had two holes bored through it, entering six inches into the course immediately below, into which oaken tree nails, two inches in diameter, were driven, after Mr. Smeaton's plan at the Eddystone Light-house. The cement used at the Bell Rock, like that at the latter, was a mixture of puzzolan, earth, lime, and sand, in equal parts, by measure.

The stones employed in this surprising structure weigh from two tons to half a ton each. The ground course measures forty-two feet in diameter, and the building diminishes as it rises to the top, where the parapet wall of the light-room has a diameter of thirteen feet only. It is solid from the ground course to the height of thirty feet,
where the entry door is placed, the ascent to which is by a kind of rope-ladder with wooden steps, hung out at ebb-tide, and taken into the building again when the water covers the rock; but strangers to this sort of climbing are taken up in a kind of chair, by a small moveable crane projected from the door, from which a narrow passage leads to a stone staircase thirteen feet in height. Here the walls are seven feet thick; but they gradually diminish from the top of the staircase to the parapet wall of the light-room, where they measure one foot only in thickness. The upper part of the building is divided into six apartments for the use of the light-house keepers, and for containing light-house stores. The lower, or first of these floors, contains the water-tanks, fuel, and other bulky articles; the second, the oil-cisterns, glass, and other light-room stores; the third is occupied as a kitchen; the fourth is the bedroom; the fifth, the library, or stranger's room; and the upper apartment forms the light-room. The floors of the several apartments are of stone, and the communication from the one to the other is effected by wooden ladders, except in the case of the light-room, where every article being fire-proof, the steps are made of iron. In each of the three lower apartments are two windows; but the upper rooms have four windows each. The casements of the windows are double, and are glazed with plate-glass, having besides an outer storm-shutter, or dead-light, of timber, to defend the glass from the waves and spray of the sea. The parapet wall of the light-room is six feet in height, and has a door leading out to the balcony, or walk, formed by the cornice round the upper part of the building, which is surrounded by a cast-iron rail, curiously wrought like net-work. This rail reposes on batts of brass, and has a massive coping, or top-rail, of the same metal.

The light-room was, with the whole of its apparatus, framed and prepared at Edinburgh. It is of an octagonal figure, measuring twelve feet across, and fifteen feet in height, formed with cast-iron sashes, or window-frames, glazed with large plates of polished glass, measuring about two feet six inches, by two feet three, and the fourth of an inch in thickness. It is covered with a dome roof of copper, terminating in a large gilt ball, with a vent-hole in the top.
The light is very powerful, and is readily seen at the distance of seven leagues, when the atmosphere is clear. It is from oil, with Argand burners, placed in the focus of silver-plated reflectors, measuring two feet over the lips, the silver surface being hollowed, or wrought to the parabolic curve. To the end that this splendid light may be the more easily distinguished from all the other lights on the coast, the reflectors are ranged on a frame with four faces, or sides, which, by a train of machinery, is made to revolve on a perpendicular axis once in six minutes. Between the observer and the reflectors, on two opposite sides of the revolving frame, shades of red glass are interposed in such a manner, that, during each entire revolution of the reflectors, two appearances, distinctly differing from each other, are produced: one is the common bright light familiar to all; but on the other, or shaded sides, the rays are tinged of a red colour. These red and bright lights, in the course of each revolution, alternate with intervals of darkness, which, in a very beautiful and simple manner, characterize this light.

As a farther warning to the manner in foggy weather, two large bells, each weighing about twelve hundred, are tolled day and night by the same machinery which moves the lights. As these bells, in moderate weather, may be heard considerably beyond the limits of the rock, vessels, by this expedient, get a warning to put about, and are thereby prevented from running on the rock in thick and hazy weather, a disaster to which ships might otherwise be liable, notwithstanding the erection of the light-house.

The establishment consists of a principal light-keeper, with three assistants, two of whom are constantly at the light-house, while the third is stationed at a tower erected at Arbroath, where he corresponds by signals with the light-keepers at the rock.

This stupendous undertaking is highly creditable to Mr. Stevenson, the engineer, and does honour to the age in which it has been produced. The lights were exhibited, for the first time, on the 1st of February, 1811.

STONEHENGE.

This celebrated monument of antiquity stands in the middle of a flat area near the summit of a hill, six miles distant
from Salisbury. It is inclosed by a double circular bank and ditch, nearly thirty feet broad, after crossing which an ascent of thirty yards leads to the work. The whole fabric was originally composed of two circles and two ovals. The outer circle is about 108 feet in diameter, consisting, when entire, of sixty stones, thirty uprights, and thirty impostos, of which there now remain twenty-four uprights only, seventeen standing, and seven down, three feet and a half asunder, and eight impostos. Eleven uprights have their five impostos on them by the grand entrance: these stones are from thirteen to twenty feet high. The smaller circle is some what more than eight feet from the inside of the outer one, and consisted of forty smaller stones, the highest measuring about six feet, nineteen only of which now remain, and only eleven standing. The walk between these two circles is 300 feet in circumference. The adytum, or cell, is an oval formed of ten stones, from sixteen to twenty-two feet high, in pairs, and with impostos above thirty feet high, rising in height as they go round, and each pair separate, and not connected as the outer pair: the highest eight feet. Within these are nineteen other smaller single stones, of which six only are standing. At the upper end of the adytum is the altar, a large slab of blue coarse marble, twenty inches thick; sixteen feet long, and four broad: it is pressed down by the weight of the vast stones which have fallen upon it. The whole number of stones, uprights and impostos, comprehending the altar, is 140. The stones, which have been by some considered as artificial, were most probably brought from those called the grey weathers on Marlborough Downs, distant fifteen or sixteen miles; and if tried with a tool appear of the same hardness, grain, and colour, generally reddish. The heads of oxen, deer, and other beasts, have been found in digging in and about Stonehenge: and in the circumjacent barrows human bones. From the plain to this structure there are three entrances, the most considerable of which is from the north-east; and at each of them were raised, on the outside of the trench, two huge stones, with two smaller parallel ones within.

Geoffroy of Monmouth, in his history of the Britons, written in the reign of King Stephen, represents this monument as having been erected at the command of Aurelius Ambrosius, the last British king, in memory of 460 Britons
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who were murdered by Hengist the Saxon. Polydore Virgil says that it was erected by the Britons as the sepulchral monument of Aurelius Ambrosius; and other writers consider it to have been that of the famous British queen Boadicea. Inigo Jones is of opinion that it was a Roman temple; and this conclusion he draws from a stone sixteen feet in length, and four in breadth, placed in an exact position to the eastward, altar-fashion. By Charlton it is ascribed to the Danes, who were two years master of Wiltshire; a tin tablet, on which were some unknown characters, having been dug up in the vicinity, in the reign of Henry VIII. This tablet, which is lost, might have given some information respecting its founders. Its common name, Stonehenge, is Saxon, and signifies a "stone gallows," to which these stones, having transverse-imposts, bear some resemblance. It is also called in Welch choir gour, or the giants' dance.

Mr. Grose, the antiquary, is of opinion that Doctor Stukeley has completely proved this structure to have been a British temple, in which the Druids officiated. He supposes it to have been the metropolitan temple of Great Britain, and translates the words choir gour, "the great choir or temple." It was customary with the Druids to place one large stone on another for a religious memorial; and these they often placed so equably, that even a breath of wind would sometimes make them vibrate. Of such stones one remains at this day in the pile of Stonehenge. The ancients distinguished stones erected with a religious view, by the name of ambrosie petrae, amber stones, the word amber implying whatever is solar and divine. According to Bryant, Stonehenge is composed of these amber stones; and hence the next town is denominated Ambresbury.

ROCKING STONES.

The rocking stone, or Logan, is a stone of a prodigious size, so nicely poised, that it rocks or shakes with the smallest force. Several of the consecrated stones mentioned above, were rocking stones; and there was a wonderful monument of this kind near Penzance in Cornwall, which still retains the name of main-amber, or the sacred stones with these stones the ancients were not unacquainted.
Pliny relates that at Harpasa, a town of Asia, there was a rock of such a wonderful nature, that, if touched with the finger, it would shake, but could not be moved from its place with the whole force of the body. Ptolemy Hespiration mentions a stone of this description near the Ocean, which was agitated when struck by the stalk of the plant asphodel, or day-lily, but could not be removed by a great exertion of force. Another is cited by Apollonius Rhodius, supposed to have been raised in the time of the Argonauts, in the island Tenos, as the monument of the two-winged sons of Boreas slain by Hercules; and there are others in China, and in other countries.

Many rocking stones are to be found in different parts of Great Britain; some natural, and others artificial, or placed in their position by human art. That the latter are monuments erected by the Druids cannot be doubted; but tradition has not handed down the precise purpose for which they were intended. In the parish of St. Leven, Cornwall, there is a promontory called Castle Treryn. On the western side of the middle group, near the top, lies a very large stone, so evenly poised, that a hand may move it from one side to the other; yet so fixed on its base, that not any lever, or other mechanical force, can remove it from its present situation. It is called the Logan-stone, and is at such a height from the ground as to render it incredible that it was raised to its present position by art. There are, however, other rocking stones, so shaped and situated, that there cannot be any doubt of their having been erected by human strength. Of this kind the great quoit, or Karn-le Hau, in the parish of Tywidneck, in Wales, is considered. It is 30 feet in circumference, and four feet thick at a medium, and stands on a single pedestal. In the Island of St. Agues, Scilly, is a remarkable stone of the same kind. The under rock is 10 feet high, 47 feet round the middle, and touches the ground with not more than half its base. The upper rock rests on one point only, and is so nicely balanced, that two or three men with a pole can move it. It is 8½ feet high, and 47 inches in diameter at a medium, but wider at the brim and 3 feet in depth. From the globular shape of this upper stone, it is highly probable that it was rounded by human art, and perhaps even placed on its pedestal by human
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strength. In Sithney parish, near Helston, in Cornwall, stood the famous logan, or rocking stone, commonly called Men Amber, that is, Men an Bar, or the top stone. It was 11 feet by 6, and 4 high, and so nicely poised on another stone, that a little child could move it. It was much visited by travellers; but Shrubsole, the Governor of Pendennis Castle, under Cromwell, caused it to be undermined, by the dint of much labour, to the great grief of the country. There are some marks of the tool on it; and it seems probable, by its triangular shape, that it was dedicated to Mercury.

ST. PAUL'S CATHEDRAL.

The chief ecclesiastical ornament of London is the Cathedral Church of St. Paul, which stands in the centre of the metropolis, on an eminence rising from the valley of the Fleet. The body of the church is in the form of a cross over the space where the lines of that figure intersect each other, rises a stately dome, from the top of which springs a lantern adorned with Corinthian columns, and surrounded at its base by a balcony; on the lantern rests a gilded ball, and on that a cross (gilt also) crowning the ornaments of the spire. The length of the church, including the portico, is 510 feet; the breadth 282; the height to the top of the cross 404; the exterior diameter of the dome 145; and the entire circumference of the building 2,292 feet. A dwarf stone wall, supporting a balustrade of cast iron, surrounds the church, and separates a large area, which is properly the church-yard, from a spacious carriage and foot-way on the south side, and a foot pavement on the north.

The dimensions of this cathedral are great; but the grandeur of the design, and the beauty and elegance of its proportions, more justly rank it among the noblest edifices of the modern world. It is adorned with three porticos: one at the principal entrance, facing the west, and running parallel with the opening of Ludgate Street; and the other two facing the north and south, at the extremities of the cross aisle, and corresponding in their architecture. The western portico combines as much grace and magnificence as any specimen of the kind in the world. It consists of twelve lofty Corinthian columns below, and eight composite above,
supporting a grand pediment; the whole resting on an elevated base, the ascent to which is by a flight of twenty-two square steps of black marble, running the entire length of the portico. The portico at the northern entrance consists of a dome, supported by six Corinthian columns, with an ascent of twelve circular steps, of black marble. The southern portico is similar, except that the ascent consists of twenty-five steps, the ground on that side being lower.

The great dome is ornamented with thirty-two columns below, and a range of pilasters above. At the eastern extremity of the church, is a circular projection, forming a recess within for the communion table. The walls are wrought in rustic, and strengthened and ornamented by two rows of coupled pilasters, one above the other, the lower being Corinthian, and the other composite. The northern and southern sides have an air of uncommon elegance. The corners of the western front are crowned with turrets of an airy and light form.

To relieve the heavy style of the interior, statues and monuments have been erected to the memory of great men. The statues are plain full-length figures, standing on marble pedestals, with appropriate inscriptions, in honour of Doctor Samuel Johnson, the benevolent Howard, and Sir William Jones, of Asiatic celebrity. Several of the monuments would disgrace the most barbarous age, and ought to be removed. The tomb of the great Nelson is beneath the pavement immediately under the dome.

The two turrets on the right and left of the west front are each two hundred and eight feet in height. In one on the southern side is the great clock, the bell of which, weighing 11,474 pounds, and 10 feet in diameter, may be heard in the most distant part of London, when the wind blows towards that quarter. The entire pavement, up to the altar, is of marble, chiefly consisting of square slabs, alternately black and white, and is very justly admired. The floor round the communion table is of the same kind of marble, mingled with porphyry. The communion table has no other beauty; for, though it is ornamented with four fluted pilasters, which are very noble in their form, they are merely painted and veined with gold, in imitation of lapis lazuli. Eight Corinthian columns of blue and white marble, of exquisite
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Mosque of St. Sophia, Constantinople.
beauty, support the organ gallery. The stalls in the choir are beautifully carved, and the other ornaments are of equal workmanship.

This Cathedral was built at the national expense, and cost 736,752l. The iron balustrade on the wall surrounding the space that is properly the church-yard, which, with its seven iron gates, weigh 200 tons, cost 11,202l. 0s. 6d. This immense edifice was reared in 35 years, the first stone being laid on the 21st of June, 1675, and the building completed in 1710, exclusive of some of the decorations, which were not finished till 1723. The highest stone of the lantern was laid on by Mr. Christopher Wren, son of the architect, in 1710. It was built by one architect, Sir Christopher Wren, by one mason, Mr. Strong; and while one prelate, Dr. Henry Compton, filled the see of London.

The dimensions of St. Paul's, from cast to west, within the walls, are 510 feet; from north to south, within the doors of the porticoes, 282; the breadth of the west entrance, 100; the circuit, 2292; its height within, from the centre of the floor to the cross, 340 feet. The circumference of the dome is 430 feet; the diameter of the ball, 6; from the ball to the top of the cross, 30; and the diameter of the columns of the porticoes, 4 feet. The height to the top of the west pediment, under the figure of St. Paul, is 120 feet; and that of the tower of the west front, 287.

From the bottom of the whispering gallery are 280 steps; including those to the golden gallery, 534, and to the ball, in all, 616 steps.—The weight of the ball is 5600 pounds.—The weight of the cross is 3360.—The extent of the ground whereon this Cathedral stands, is two acres and a half.

The length of the hour figures 2 feet 2 inches, and the circumference of the dial is 57 feet.

The Whispering Gallery is a very great curiosity.—It is 40 yards in circumference. A stone seat runs round the gallery along the foot of the wall. On the side directly opposite the door by which the visitor enters, several yards of the seat are covered with matting, on which the visitor being seated, the man who shews the gallery whispers, with mouth close to the wall, near the door, at the distance of 140 feet from the visitor, who hears his words in a loud voice, seemingly at his ear. The mere shutting of the door
produces a sound to those on the opposite seat like violent claps of thunder. The effect is not so perfect if the visitor sits down half way between the door and the matted seat, and still less so if he stands near the man who speaks, but on the other side of the door.

The marble pavement of the church is extremely beautiful, seen from this gallery. The paintings on the inner side of the dome, by Sir James Thornhill, are viewed with most advantage here. The ascent to the Ball is attended with some difficulty, and is encountered by few, yet both the Ball and passage to it well deserve the labour. The diameter of the interior of the Ball is six feet two inches, and twelve persons may sit within it.

The prospect from every part of the ascent to the top of St. Paul's, wherever an opening presents itself, is extremely curious. The effect is most complete from the gallery surrounding the foot of the lantern. The metropolis, from that spot, has a mimic appearance, like the objects in a fantoccino. The streets, the pavements, the carriages, and foot-passengers, have all the appearance of fairy ground and fairy objects. The spectator, contemplating the bustle of the diminutive throng below, is moved a little out of the sphere of his usual sympathy with them; and, as if they were emmets, asks himself involuntarily "about what are these little, inconsequential animals engaged?"

The form of the metropolis, and the adjacent country, is most perfectly seen from the gallery at the foot of the lantern, on a bright summer day. The ascent to this gallery is by 534 steps, of which 260, nearest the bottom, are extremely easy; those above difficult, and in some parts dark and unpleasant. In the ascent to this gallery may be seen the brick cone that supports the lantern, with its ball and cross; the outer dome being turned on the outside of the cone, and the inner dome turned on the inside. The entire contrivance to produce the effect within the church, and on the outside, intended by the architect, is extremely fine, even marvellous. From the pavement of the church, the interior appears one uninterrupted dome to the upper extremity; but it consists, in fact, of two parts, the lower and principal dome having a large circular aperture at its top, through which is seen a small dome, that appears part of the great and lower dome.
This interesting edifice derives its name from Westminster Abbey from its situation in the western part of the metropolis, and its original destination as the church of a monastery. The present church was built by Henry III, and his successors, with the exception of the two towers at the western entrance, which are the work of Sir Christopher Wren. The length of the church is 360 feet; the breadth of the nave 72 feet; and the cross aisle 195 feet. The roof of the nave and of the cross aisle is supported by two rows of arches, one above the other, each of the pillars of which is a union of one ponderous round pillar, and four of similar form, but extremely slender. These aisles being extremely lofty, and one of the small pillars continued throughout, from the base to the roof, produce an effect uncommonly grand and awful. The choir is one of the most beautiful in Europe. It is divided from the western part of the great aisle by a pair of noble iron gates, and terminates at the east by an elegant altar of white marble. The altar is enclosed with a very fine balustrade, and in the centre of its floor is a large square of curious mosaic work, of porphyry, and other stones of various colours. In this choir, near the altar, is performed the ceremony of crowning the kings and queens of England.

At the southern extremity of the cross aisle are erected monuments to the memory of several of our eminent poets. This interesting spot is called Poet's Corner; and never could place be named with more propriety; for here are to be found the names of Chaucer, Spencer, Shakespeare, Ben Jonson, Milton, Dryden, Butler, Thomson, Gay, Goldsmith, Addison, Johnson, &c.—Here also, as if this spot was dedicated to genius of the highest rank, are the tombs of Handel, Chambers, and Garrick.

The curiosities of Westminster Abbey consist chiefly of its highly-interesting chapels, at the eastern end of the church, with their tombs. Immediately behind the altar stands a chapel dedicated to Edward the Confessor, upon an elevated floor, to which there is a flight of steps on the
northern side. The shrine of the Confessor, which stands in the centre, was erected by Henry III. and was curiously ornamented with mosaic work of coloured stones, which have been picked away in every part within reach. Within the shrine is a chest, containing the ashes of the Confessor. The frieze representing his history from his birth to his death, put up in the time of Henry III. is highly curious, and deserves the study and attention of every lover of antiquity. The tomb of Henry III. is in this chapel; it has been extremely splendid, but is now mutilated. The table on which lies the king's effigy in brass is supported by four twisted pillars, enamelled with gilt. This tomb, which is a fine specimen of its kind, is almost entire on the side next the area. It likewise contains the tombs of Edward I. and his Queen Eleanor; of Edward III. and Queen Philippa; of Richard II. and his Queen; of Margaret, daughter of King Edward IV.; of King Henry V.; and of Elizabeth, daughter of King Henry VII.

The grand monument of Henry V. is inclosed by an iron gate. The great arch over the tomb is full of ribs and pannels, and the headless figure of Henry still remains; the head was of solid silver, but stolen during the civil wars. There was a chantry directly over the tomb, which had an altar-piece of fine carved work. The armour of Henry once hung round this chantry; his helmet yet remains on the bar, and the very saddle which he rode at the battle of Agincourt, stripped of every thing which composed it, except the wood and iron, hangs on the right.

Contiguous to the eastern extremity of the church, and opening into it, stands the famous chapel of Henry VII. dedicated to the Virgin Mary, one of the finest and most highly-finished pieces of Gothic architecture in the world. On its site formerly stood a chapel, dedicated to the Virgin Mary, and also a tavern, distinguished by the sign of the White Rose. Henry, resolving to erect a superb mausoleum for himself and his family, pulled down the old chapel and tavern; and on the 11th of February, 1503, the first stone of the present edifice was laid by Abbot Islip, at the command of the King. It cost 14,000l., a prodigious sum for that period, (equal to 280,000l. of our money;) and still more so, considering the parsimonious temper of the King. The labour merely of working the materials will, at a
The exterior of this chapel is remarkable for the richness and variety of its form, occasioned chiefly by fourteen towers, in an elegant proportion to the body of the edifice, and projecting in different angles from the outermost wall. It has lately been repaired and renewed with exquisite taste, and at great cost. The inside is approached by the area behind the chapels of Edward the Confessor and Henry V.

The floor is elevated above that of the area, and the ascent is by a flight of marble steps. The entrance is ornamented with a beautiful Gothic portico of stone, within which are three large gates of gilt brass, of most curious open workmanship, every panel being adorned with a rose and a portcullis alternately.

The chapel consists of the nave and two small aisles. The centre is 99 feet in length, 66 in breadth, and 54 in height, and terminates at the east in a curve, having five deep recesses of the same form. The entrance to these recesses being by open arches, they add greatly to the relief and beauty of the building. It is probable they were originally so many smaller chapels, destined to various uses. The side aisles are in a just proportion to the centre; with which they communicate by four arches, turned on Gothic pillars. Each of them is relieved by four recesses, a window running the whole height of each recess, and being most minute and curious in its divisions. The upper part of the nave has its four windows on each side, and ten at the eastern extremity, five above and five below. The entire roof of the chapel, including the side aisles, and the curve at the end, is of wrought stone, in the Gothic style, and of most exquisite beauty.

An altar tomb, erected by Henry, at the cost of 10,000l. to receive his last remains, stands in the centre of the chapel. It is of basaltic stone, ornamented with gilt brass, and is surrounded with a magnificent railing of the same. This monument is by Pietro Torregiano, a Florentine sculptor, and possesses uncommon merit. Six devices in bas-relief, and four statues, all of gilt brass, adorn the tomb.

It is impossible to conceive Gothic beauty of a higher degree than the whole of the interior of Henry the Seventh's
Chapel; and it is with regret that the antiquary sees the stalls of the knights reared against the pillars and arches of the nave, forming screens that separate the smaller aisles from the body of the chapel, and diminish the airiness, and interrupt the harmony of the plan.

The prospect from the top of one of the western towers, the ascent to which consists of 283 steps, is infinitely more beautiful, though less extensive, than that from St. Paul's. The many fine situations and open sites at the west end of the town, and its environs, occasion the difference. The Banqueting House at Whitehall, St. James's Park, with the Parade and Horse Guards, Carlton House, the Gardens of the Queen's Palace, the Green Park, the western end of Piccadilly, and Hyde Park, with its river, lie at once under the eye, and compose a most grand and delightful scene. The bridges of Westminster, Waterloo, and Blackfriars, with the broad expanse of water between them, the Adelphi and Somerset House on its banks, St. Paul's stupendous pile, and the light Gothic steeple of St. Dunstan's in the East, are alike embraced with one glance, and happily contrast with the former prospect. From this tower the exterior form of St. Paul's, when the sun falls upon it, is distinctly seen: and here its exquisite beauty will be more fully comprehended than in any part of the city, for a sufficient area to take in the entire outline is not there to be found.

THE TOWER OF LONDON.

The Tower of London was anciently a palace inhabited by various sovereigns of England, till the reign of Queen Elizabeth. Its extent within the wall is twelve acres and five roods. The exterior circuit of the ditch, which entirely surrounds it, is 3156 feet. The ditch, on the side of Tower-hill, is broad and deep; on the side next to the river it is narrower. A broad and handsome wharf, or gravel terrace, runs along the banks of the river, parallel with the Tower, from which it is divided by the ditch.

Within the walls of the Tower are several streets, and a variety of buildings. The principal buildings are the Church, the White Tower, the Ordnance Office, the Record Office, the Jewel Office, the Horse Armory,
Grand Store House, the Small Armory, the Houses belonging to the Officers of the Tower, Barracks for the Garrison, and two Suttling Houses, commonly used by the soldiers of the Garrison.

The White Tower is a large square building, situated in the centre of the fortress. On the top are four watch-towers, one of which, at present, is used as an observatory. It consists within of three lofty stories, beneath which are large commodious vaults. In the first story are two grand rooms, one of which is a small armory for the sea-service, and contains various sorts of arms, curiously laid up, which would serve upwards of ten thousand seamen. In the other rooms, in closets and presses, are abundance of war-like tools and instruments of death. In the upper stories are arms and armourers' tools. The models of all new-invented engines of destruction, which have been presented to government, are preserved in this tower. On the top is a large cistern filled from the Thames by a water-engine, to supply the garrison with water.

The grand Store House, which stands north of the White Tower, is a plain building of brick and stone, 345 feet long, and 60 feet broad. The Jewel Office is a little to the east of the grand Store House. It is a dark and strong stone room. The Horse Armory is a brick building, eastward of the White Tower. The Record Office is in the Wakefield Tower, opposite the platform. The rolls from the time of King John to the beginning of the reign of Richard III. are kept here in fifty-six wainscot presses. They contain the ancient tenures of land in England, the original laws and statutes, the rights of England to the domination of the British seas, the forms of submission of the Scottish Kings, and a variety of other records, &c.

The principal entrance to the Tower is on the west. It consists of two gates on the outside of the ditch; a stone bridge built over the ditch, and a gate within the ditch. On the right-hand, at the west entrance, the lions and other wild beasts and birds are kept in a yard. The dens are very commodious, and are about twelve feet in their whole height, being divided into an upper and lower apartment. In the former the animals live, and are shown in the daytime; and in the latter they sleep at night. They are in general very healthy; and it is remarkable, that those which
have been welched in the Tower are more fierce than such as have been taken wild. The dens are inclosed in front by iron gratings; the greater part of them have been recently rebuilt, and every precaution taken to prevent accidents.

The Spanish Armory contains the trophies of the famous victory of Queen Elizabeth over the Spanish Armada. Among these the most remarkable are the thumb-screws, intended to be used to extort confession from the English where their money was hidden. In the same room are other curiosities; among which is the axe with which the unfortunate Anne Bullen was belted, to gratify the capricious passions of her husband, Henry VIII. A representation of Queen Elizabeth in armour, standing by a cream-coloured horse, attended by a page, is also shown in this room. Her Majesty is dressed in the armour she wore at the time she addressed her brave army, in the camp of Tilbury, 1588, with a white silk petticoat, ornamented with pearls and spangles.

The Small Armory is one of the finest rooms of its kind in Europe. It is 345 feet in length, and in general it contains complete stands of arms for no less than 100,000 men. They are disposed in a variety of figures, in a very elegant manner. A piece of ordnance from Egypt has been lately added, sixteen feet long, and seven inches and a half bore. There are several other curiosities, among which are arms taken at various periods from rebels; the highland broad-sword deserves particular notice. In many respects this room may be considered as one of the wonders of the modern world.

The Volunteer Armory is in the White Tower, and contains arms, piled in beautiful order, for 30,000 men, with pikes, swords, &c. in immense numbers, arranged in stars and other devices. At the entrance of this room stands a fine figure of Charles Brandon, Duke of Suffolk, in bright armour, and having the very lacer he used in his life-time, which is eighteen feet long.—The Sea Armory is also in this Tower, and, contains arms for nearly 50,000 sailors and marines. In this room are two elegant pieces of brass cannon, presented by the City of London to the Earl of Leicester, and various similar curiosities.

Part of the Royal Train of Artillery is kept on the ground-floor, under the small armory. The room is
380 feet long, 50 feet wide, and 24 in height. The artillery is ranged on each side, a passage 10 feet in breadth being left in the centre. In this room are 20 pillars that support the small armory above, which are hung round with implements of war, and trophies taken from the enemy. There are many peculiarly fine pieces of cannon to be seen here: one (of brass) is said to have cost 200l. in ornamenting. It was made for Prince Henry, eldest son of James I. Others are extremely curious for their antiquity. Among them is one of the first invented cannon. It is formed of bars of iron hammered together, and bound with iron-hoops. It has no carriage, but was moved by six rings, conveniently placed for that purpose.

The Horse Armory is a noble room, crowded with curiosities. The armour of John of Gaunt, Duke of Lancaster, and son of Edward III. is seven feet in height. The sword and lance are of a proportionable size. A complete suit of armour, rough from the hammer, made for Henry VIII. when eighteen years old, is six feet high. The kings of England on horseback, are shewn in armour from the Conqueror to George II.

The Jewel Office contains, 1. The imperial crown, with which the kings of England are crowned. It is of gold, enriched with diamonds, rubies, emeralds, sapphires, and pearls; within is a cap of purple velvet, lined with white taffety, and turned up with three rows of ermine. This is never used but at coronations, and of course has never been produced since the year 1761.—2. The golden globe. This is put into the king’s right-hand before he is crowned; and when he is crowned, he bears it in his left-hand, having the sceptre in his right.—3. The golden sceptre, and its cross, upon a large amethyst, decorated with table diamonds.—4. The ancient sceptre, covered with jewels and Gothic enamel work, and surmounted with an onyx dove. This sceptre is believed to be far the most ancient in the collection, and probably is a part of the original regalia. It was found by the present keeper in 1814, exactly at the time of the general peace. It is estimated at a very high value.—5. St. Edward’s staff. It is four feet seven inches and a half long, and three inches and three quarters round, made of beaten gold. It is borne before the king in the coronation procession.—6. The gold salt-seller of state.
WONDERS OF ART.

In make it is the model of the square White Tower, and is of excellent workmanship. At the coronation it is placed on the king's table.—7. The sword of Mercy. It has no point.—8. A grand silver font, used for christenings of the royal family.—9. The crown of state, which is worn by the king at his meeting of the parliament, and other state occasions. It is of extreme splendour and value, being covered with large-sized precious stones, and on the top of its cross is a pearl which Charles I. pledged to the Dutch Republic for eighteen thousand pounds. Under the cross is an emerald diamond of a pale green colour, seven inches and a half in circumference, and valued at one hundred thousand pounds; and in the front is a rock ruby, unpolished, in its purely natural state, three inches long, and the value of which cannot be estimated.—10. The golden eagle, with which the king is anointed, and the golden spur.—11. The diadem, worn by the Queens Anne and Mary.—And, 12. The crown of Queen Mary, the cross of King William, and several other valuable jewels.

In this Office are all the crown jewels worn by the princes and princesses at coronations, and abundance of curious old plate. Independently of several of the jewels, which are inestimable, the value of the precious stones and plate contained in this office, is not less than two millions sterling.

The Chapel, situated at the north-end of the parade, is not otherwise attractive than as it contains a few ancient tombs and monuments.

THE BANK OF ENGLAND.

The building thus entitled is an immense and very extensive stone edifice, situated a little to the north-west of Cornhill: The front is composed of a centre, eighty feet in length, of the Ionic order, on a rustic base; and of two wings, ornamented with a colonnade. The back of the building in Lothbury, is a high and heavy wall of stone, with a gateway for carriages into the bullion court.

On the east-side of the principal entrance from Threadneedle-street, is a passage leading to a spacious apartment, called THE ROTUNDA, in which business in the public funds is transacted; and, branching out of this apartment, are various offices appropriated to the management of each
particular stock. In each of these, under the several letters of the alphabet, are arranged the books, in which the amount of every individual's interest in such a fund is registered. The hall for the issue and exchange of bank-notes is a noble room, seventy-nine feet by forty, and contains a very fine marble statue of King William III., the founder of the bank, an admired piece of sculpture.

The Bank of England covers an extent of several acres, and is completely insulated. Its exterior is not unsuitable to the nature of the establishment, as it conveys the idea of strength and security; but having been erected at different periods, and according to different plans, by several architects, it wants uniformity of design and proportion. In the interior, a variety of alterations and improvements have been made to accommodate the vast increase of business, and of the paper-money and discounting systems. This has required considerable enlargements of the offices in every department, and has led, in the space of twenty-five years, to the necessary increase of the clerks from two hundred to eleven hundred. The capital, or Bank Stock, of this grand national establishment, has also been considerably and progressively augmented: at its incorporation, in 1694, this capital did not exceed 1,200,000l. but has since risen to 14,608,500l. The direction is vested in a governor, deputy-governor, and twenty-four directors, elected annually at a general court of proprietors. Thirteen of the directors, with the governor, form a court for the management of the business of the institution.

GENERAL POST-OFFICE.

This collection of buildings, important as its concerns are to the nation, does not claim any praise in an architectural point of view. It stands behind Lombard-street, from which, on the south-side, is a passage leading to it, under an arched gateway: It was erected in 1660; but great additions have been made to it from time to time, though the whole is disjointed and inconvenient. A plan has, however, been adopted for erecting a building worthy of this great establishment, on the site now called St. Martin's-le-Grand, and to improve the access to it by pulling down the cast-ends of Newgate-street and Paternoster-row. It is now proceeding rapidly.
The Post-office system is one of the most perfect regulations of finance and convenience existing under any government. It has gradually been brought to its present perfection, being at first in the hands of individuals, and replete with abuses. In its present form it not only supplies the government with a great revenue, but accomplishes that by means highly beneficial to the persons contributing.

The Post-office is the most important spot on the surface of the globe. It receives information from all countries; it distributes instructions to the antipodes; it connects together more numerous and distant interests of men than any similar establishment. It is, in the highest degree hitherto realized, the seat of terrestrial perception and volition,—the brain of the whole earth!

The mode of carrying letters by the general-post was greatly improved a few years since, by a most admirable plan, invented by Mr. Palmer. Previously to its adoption, letters were conveyed by carts, without protection from robbery, and subject to delays. At present they are carried, according to Mr. Palmer’s plan, by coaches, distinguished by the name of mail-coaches, provided with a well-armed guard, and forwarded at the rate of eight miles an hour, including stoppages. Government contracts with coach-keepers merely for carrying the mail, the coach-owner making a profitable business besides, of carrying passengers and parcels. It is not easy to imagine a combination of different interests to one purpose, more complete than this. The wretched situation, however, of the horses, on account of the length of the stages which they are frequently driven, is a disgrace to the character of the British nation, and requires the interference of the legislature. No stage should exceed twelve miles in length. The rapidity of this mode of conveyance is unequalled in any country.

THE MONUMENT.

About two hundred yards north of London-bridge is situated one of the finest pillars in the world, erected by Sir Christopher Wren, in memory of the great fire, which, in 1666, broke out at a house on this spot, and destroyed the metropolis from the Tower to Temple Bar. It is a fluted column of the Doric order; its total height is 202 feet;
the diameter at the base is 15 feet; the height of the column 120 feet; and the cone at the top, with its urn, 42 feet. The height of the massy pedestal is 40 feet. Within the column is a flight of 345 steps; and from the iron balcony at the top is a most fascinating prospect of the metropolis and the adjacent country. It is impossible not to lament the obscure situation of this beautiful monument, which, in a proper place, would form one of the most striking objects of the kind that architecture is capable of producing.

The inscription had better be erased, for no rational being can entertain the notion, that the Catholics, or any religious sect, could wilfully have perpetrated so horrible a deed as this pillar was intended to impute to them, nor can so much credit be given to human foresight, as for it to be concluded that a fire, which broke out in a single house, could, upon this, rather than upon other occasions, have extended its ravages in so extraordinary a manner.

**THE LOUVRE.**

This splendid palace, which was planned in the reign of Francis I. at the commencement of the sixteenth century, is a quadrangular edifice, having a court in the centre, and forming a square of 65 French toises, or 416 English feet. The front was built in the reign of Louis XIV. and is one of the most beautiful monuments of his reign. A spacious gallery, 227 toises, or 1450 English feet, in length, connects this palace with that of the Tuileries. Here was displayed, under the title of the MUSEE NAPOLEON, that inestimable collection of paintings, one thousand and thirty in number, consisting of the chefs-d'œuvres of the great masters of antiquity, and constituting a treasury of human art and genius, far surpassing every other similar institution. The anti-room leading to the gallery contained several exquisite paintings, the fruits of the triumphs of Bonaparte, or which had been presented to him by the sovereigns who had cultivated his alliance. This apartment was styled by the Parisians the NOSEGAY OF BONAPARTE: its most costly pictures were from the gallery of the Grand Duke of Tuscany; and to these were added a selection from those procured at Venice, Naples, Turin, and Bologna.
It would be impossible adequately to describe the first impressions made on the spectator on his entrance into the gallery, where such a galaxy of genius and art was offered to his contemplation. It was lined by the finest productions of the French, Flemish, and Italian schools, and divided by a curious double painting upon slate, placed on a pedestal in the middle of the room, representing the front and back views of the same figures.

From the Museum the visitor descended into the salle des antiques, containing the finest treasures of Grecian and Roman statuary. His notice was instantly attracted by the belvidere apollo, a statue surpassing, in the opinion of connoisseurs, all the others in the collection. This matchless statue is thus described by Sir John Carr, in his work entitled The Stranger in France. "All the divinity of a god beams through this unrivalled perfection of form. It is impossible to impart the impressions which it inspires: the riveted beholder is ready to exclaim with Adam, when he first discerns the approach of Raphael:

"—Behold what glorious shape
Comes this way moving: seems another morn
Risen on mid-noon; some great behest from heaven."

"The imagination cannot form such an union of grace and strength. One of its many transcendant beauties consists in its aerial appearance and exquisite expression of motion."

The Medicean Venus, from the Palace Pitti, at Florence also formed a part of this magnificent collection of statues. The classic Addison, in speaking of this statue, which he saw at Florence, observes, that it appeared to him much less than life, in consequence of its being in the company of others of a larger size; but that it is, notwithstanding, as large as the ordinary size of woman, as he concluded from the measure of the wrist; since, in a figure of such nice proportions, from the size of any one part it is easy to guess at that of the others. The fine polish of the marble, communicating to the touch a sensation of fleshy softness, the delicacy of the shape, air, and posture, and the correctness of design, in this celebrated statue, are not to be expressed.

The Paris Museum, and salle des antiques, al-
though deprived, at the termination of the contest with France, of so many chefs-d'œuvres of art, still contain others which render them highly interesting. The finest productions of Le Brun, several of them on an immense scale, still remain; as do likewise the matchless marine paintings by Vernet; the truly sublime works of Poussin, consisting of the chief of his masterpieces; together with many choice paintings by Rubens, Wouervermans, De Witte, &c. Many of the statues remaining in the Hall of Antiquities are likewise admirable specimens of sculpture.

In the gallery of the Louvre a very curious collection of models, representing the fortresses of France and other countries, was once exhibited; but was removed to the end that the paintings might be seen with greater effect. These models, executed in the reign of Louis XIV. and amounting to upwards of one hundred and eighty, were wrought with the greatest accuracy, and so naturally, as to represent the several cities which they describe, with their streets, houses, squares, and churches, together with the works, moats, bridges, and rivers, not neglecting the adjacent territory, as consisting of plains, mountains, corn-lands, meadows, gardens, woods, &c. Several of these models were so contrived as to be taken in pieces, to the end that the curious observer might be better enabled to perceive their admirable construction.

THE BRITISH MUSEUM

This grand national collection of antiquities, books, and natural curiosities, is placed in the noble house formerly belonging to the Duke of Montagu, in Great Russell-street, Bloomsbury. It is a stately edifice, in the French style of the reign of Louis XIV. and on the plan of the Thuilleries. The celebrated French architect, Peter Paget, was sent over from Paris, by Ralph, first Duke of Montagu, expressly to construct this splendid mansion, which is, perhaps, better calculated for its present purpose than for a private residence.

The British Museum was established by act of parliament, in 1753, in consequence of the will of Sir Hans Sloane, who left his museum to the nation, which he declared in his testament, cost him upwards of fifty thousand pounds, on condition that parliament should pay twenty
thousand pounds to his executors, and purchase a house sufficiently commodious for it. The parliament acted with great liberality on this occasion; several other valuable collections were united to this of Sir Hans Sloane, and the whole establishment completed for the sum of eighty-five thousand pounds, which was raised by way of lottery. Parliament afterwards added, at various times, to the Sloanean Museum, the Cottonian Library; that of Major Edwards; the Harleian Collection of Manuscripts; Sir William Hamilton’s invaluable Collection of Greek Vases; the Townleian Collection of Antique Marbles; the Manuscripts of the late Marquis of Lansdown; and, lastly, the celebrated Elgin Marbles, which comprise what are considered as the finest specimens of ancient sculpture.

The whole of the important library of printed books and manuscripts which had been gradually collected by the Kings of England from Henry VIII. to William III. was presented to the Museum by George II.; and George III. bestowed on it a numerous collection of valuable pamphlets, which had been published in the interval between 1660 and 1760. His Majesty likewise contributed the two finest mummies in Europe; the sum of 1,123l. arising from lottery prizes, which had belonged to his royal predecessor; and, in 1772, a complete set of the Journals of the Lords and Commons. To these contributions His Majesty has since added a collection of natural and artificial curiosities, sent to him, in 1796, by Mr. Menzies, from the North-West coast of America, and several single books of great value and utility.

The trustees have lately added Greenwood's collection of stuffed birds; Hatchet’s minerals; Hallhed’s oriental manuscripts; Tyssen’s collection of Saxon coins; Dr. Bentley’s classics; and the Greville collection of minerals. To these may be added numerous donations from several of the Sovereigns of Europe, as well as from learned bodies, and private individuals.

On entering the gate of the Museum, a spacious quadrangle presents itself, with an Ionic colonnade on the south side, and, on the north, the main building, which measures 216 feet in length, and 57 in height, to the top of the cornice. Several additional buildings have lately been added for the above collections.
The ground-floor consists of twelve rooms, and contains the library of printed books. The decorations of the staircase have lately been restored, and are worthy of admiration. The ceiling, which represents Phaeton petitioning Apollo for permission to drive his chariot, was painted by Charles de la Fosse, who was reckoned one of the best colourists of the French school, and who painted the cupola of the dome of the Invalids at Paris. The landscape and decorations are by James Rousseau, an artist justly admired for his skill in perspective.

The first room on the upper story contains modern works of art from all parts of the world, arranged in cases. In the one in the centre are several beautiful miniatures, among which are those of Sir Thomas More, King Charles I, and Oliver Cromwell, the latter having his watch placed by its side. Two curious portraits of King William III, and Queen Mary, are carved on two walnut-shells. In the presses are arranged, in geographical order, some fine specimens of China, and a variety of implements of war from different quarters of the globe. Here is to be seen the rich collection of curiosities from the South Pacific Ocean, brought by Captain Cooke. In the left corner is the mourning dress of an Otaheitean lady, in which taste and barbarity are singularly blended; and opposite, are the rich cloaks and helmets of feathers from the Sandwich Islands. Among these is one, which, in elegance of form, vies even with the Grecian helmets. In another case are the cava bowls, and above them battoons, and other weapons of war. The next object of attention are the idols of the different islands, presenting, in their hideous rudeness, a singular contrast with many of the works of art, formed by the same people; near these are the drums and other instruments of music, and a breast-plate from the Friendly Islands. The ceiling of this room, or vestibule, represents the fall of Phaeton.

The second room consists of similar objects. The third is devoted to the Lansdowne collection of manuscripts, which have been handsomely bound and lettered. In the fourth are the Sloanean and Birchean collections of manuscripts. The fifth contains part of the Harleian library of manuscripts: and the sixth the first part of the same, and additions made since the establishment of the Museum.
The seventh is appropriated to the Royal and Cottonian library of manuscripts. On a table, in a glazed frame, is the original of the Magna Charta, belonging to the Cottonian library. Against the press, No. 21, of the Cottonian collection, is the original of the Articles preparatory to the signing of the Great Charter, perfect, with the seal.

The magnificent saloon is filled with the Greville collection of minerals, the finest in the world, admirably arranged, and luminously coloured. The dome of this saloon merits notice. It was painted by La Fosse, and has been described as the apotheosis of Iris, or birth of Minerva. In the middle of the window stands a table, composed of a variety of lavas from Mount Vesuvius presented by the Earl of Exeter.

The eighth room contains a department of natural history, part of which is the valuable donation of Mr. Cracherode, disposed in two tables, nearly in the Linnaean order; and a much more extensive series, arranged according to the Wernerian system. The principal productions are very valuable, consisting of minerals from Derbyshire, Siberia, the South Seas, volcanic and rock stones from Germany. One very curious specimen of natural history is pointed out in the fifth division of the Cracherodean collection, an egg-shaped piece of calcereony, containing water, (enhydros,) which may be seen by gently shaking the vase. Here also, in a glass-case, is the famous fossil skeleton from Guadaloupe, which has been the object of much interesting controversy among eminent naturalists in the Monthly Magazine. The ninth is appropriated to petrifactions and shells. In the first division of the cases in the middle of the room is a valuable univalve shell, of the species called the paper nautilus, or argonaut shells, remarkable for the slightness of its fabric, and the elegance of its shape. It is inhabited by an animal not unlike a cuttle-fish, which, by extending a pair of membranes, adhering to the top of its longest arms, has the power of sailing on the surface of the sea. Under the tables are deposited, in this and the next room, a great number of volumes and parcels, containing collections of dried plants; which, from the fragile nature of their contents, are shewn only on particular leave. The tenth room is entirely filled with vegetable productions, zoophytes, sponges, &c. The contents of the eleventh
Room are birds, and arranged, as far as convenience would admit, according to the Linnean system. Among the curious specimens of ornithology is a humming-bird, scarcely larger than a bee; and another beautiful little creature, called the harlequin humming-bird, from the variety of its colours. In this room there is a curious picture, executed many years ago in Holland, of that extremely rare and curious bird, the dodo, belonging to the tribe gallinæ. In the middle are preserved the nests of several birds, among the most curious of which are several hanging nests, chiefly formed by birds of the oriole tribe; nests of a substance resembling isinglass, which the Chinese make into a rich soup; scarce feathers, &c. In the second table are deposited a variety of eggs and nests: among the former may be noticed the eggs of the ostrich, the cassowary, the crocodile, &c. In the cases between the windows are several of the rarer quadrupeds; among these the most curious are, two ourang-outangs, in a young state, a long-tailed macauci, ermine, &c.; in cases under the tables are an armadillo, or porcupine, several young sloths, and a fine specimen of the two-toed ant-eater. The twelfth room contains a general and extensive arrangement of fishes, serpents, lizards, frogs, &c.

The Townley Marbles and Egyptian Antiquities are deposited in a very elegant suite of rooms built purposely for them. The first room is devoted to a collection of bas-reliefs, in terra cotta, pronounced the finest in Europe. The second is a beautiful circular room, whence you have a fine view of the whole suite of apartments, bounded at the end by an exquisitely-wrought discobolon, or ancient quoit-player. This room is devoted to Greek and Roman sculptures, among which may be pointed out a fine candelabrum, with several beautiful busts and statues. The third and fourth rooms are also filled with Greek and Roman sculptures: in the latter are several fine bas-reliefs. The fifth contains a collection of Roman sepulchral monuments, and a beautiful mosaic pavement, recently discovered in digging the foundations for the new building at the Bank of England. The sixth exhibits a miscellaneous collection of one hundred grand pieces of Roman and Greek sculpture. The seventh is devoted to Roman antiquities; and the eighth, on the left, to Egyptian antiquities, among which are the tow
mummies before mentioned, with their coffins; a manuscript, or papyrus, taken from a mummy, &c. Among the Egyptian sculptures in the ninth room, is the celebrated sarcophagus, commonly called the tomb of Alexander the Great, an engraving and dissertation on which appeared in the Monthly Magazine for February, 1809. The tenth contains Greek and Roman sculptures of singular beauty.

Thence returning, and proceeding up stairs, the visitor is conducted to the eleventh room, containing ancient and modern coins and medals, arranged in geographical order, those of each country being kept separate. It is not shown unless by the permission of the trustees, or of the principal librarian. Not more than two persons are admitted at one time, without the presence of the principal librarian, or of some other officer. The twelfth room contains the collection of the late Sir William Hamilton, which has been removed from the saloon. It principally consists of penates, or household goods, bronze vessels, utensils, &c. specimens of ancient glass, necklaces, bullæ, fragments of reliefs, and ancient armour, tripods, knives, patent lamps, seals, weights, sculpture in ivory, bracelets, bits, spurs, ancient paintings from Herculaneum, Babylonish bricks, and his unrivalled collection of Greek vases, the greater part of which were found in the sepulchres of Magna Grecia. The forms of the vases are much varied, and are equally simple and beautiful. In the thirteenth is deposited the extensive and valuable collection of prints and drawings, the most important part of which was bequeathed by the Rev. William Cracherode. The contents of this room can be seen only by a few persons at a time, by particular permission.

THE LINWOOD GALLERY, LEICESTER-SQUARE.

In viewing the beautiful specimens of female ingenuity displayed in this gallery, the mind naturally reverts to the best days of the Gobelin tapestry; and it is not paying any compliment to Miss Linwood to say, that, as works of art, for truth and fidelity of colouring, expression, and outline, they need not shun a comparison with the finest of the French performances. Considering them in another point of view, as productions of the needle, they are the most wonderful performances on record, and have opened a new
and beautiful road for the amusement of our females of every rank. Too much praise cannot, therefore, be bestowed on this lady for her invention of a new style of picturing “A Michael’s grandeur and a Raphael’s grace.”

The exhibition consists of about seventy exquisite copies, in needle-work, of the finest pictures of the English and Foreign schools, possessing all the correct drawing, just colouring, light and shade, of the original pictures from which they are taken, and to which, in point of effect, they are in no degree inferior. On entering the door from Leicester-square, the visitor is shown into the principal room, a fine gallery of excellent proportions, hung with scarlet broadcloth, gold bullion tassels, and Greek borders. On one side of this room the pictures are hung, and have a guard in front to keep the company at the requisite distance, and for preserving them. In the piers and windows are sofas and settees, to match the hangings of the room, for the accommodation of the visitors; and at the upper-end a splendid seat and canopy of satin and silver. Turning to the left, through the door near the canopy, a long and obscure passage prepares the mind, and leads to the cell of a prison, on looking into which is seen the beautiful Lady Jane Gray, visited by the abbot and keeper of the tower, the night before her execution. The scenic deception of the whole is most beautiful. A little farther on is a cottage, the casement of which opens, and the hatch of the door is closed; on looking in at either, is seen a fine and exquisitely-finished copy of Gainsborough’s cottage children, standing by the fire, with chimney-piece and cottage furniture complete. Near to this is Gainsborough’s woodman, exhibited in the same scenic manner; and a little farther is a den with lions. Returning back into the gallery on the window side, the visitor finds a tasteful room, which is properly devoted to a single picture, Christ blessing the sacramental bread and wine, after Carlo Dolci; and this is, without doubt, the most valuable copy of that fine original in existence, independently of its value being increased as the work of Miss Linwood.

BULLOCK’S MUSEUM, PICCADILLY.

This collection may be reckoned one of the most complete of its kind, and contains upwards of ten thousand
different objects, including quadrupeds, birds, reptiles, insects, ancient arms, works of art, &c. arranged in scientific order.

The South Sea Curiosities were principally brought to England by Captain Cook, and consist of superb feathers, cloaks, helmets, hats of feathers, ornaments, breast-plates, war-clubs, idols, fish-hooks, fly-flaps, caps, &c. To these are added, from other sources, war-clubs, paddles, bows, rackets, adzes and axes of hard black stone, knives, dresses, &c. Among the North and South American Curiosities are maucasions, or shoes; a quiver, with poisoned arrows; and a tube for discharging them; belts; pouches; a great variety of bows and arrows; snow-shoes; the calumet, pipe of peace; a wampum belt; a specimen of cloth, made of the asbestos, &c. brought from Canada, Hudson's Bay, and other parts of those territories. The class of African Curiosities contains musical instruments; sceptres; pouches; shoes; fans; bows; poisoned arrows; lances; daggers, &c. with hammocks; gourds; an African harp; a pair of bellows; and other curious objects.

The department of Works of Art, contains, among other objects of great value and beauty, a fine equestrian model of Edward the Black Prince, in armour; models in coloured wax; busts in rice paste; medals of an ancient armory, of a Chinese pagoda, and of men of war, in coloured straw; sculptures in ivory; pictures, in coloured sand, in wood, &c.

The department of Natural History contains several thousand species, and excels any in Great Britain, either for the rarity and number of the specimens, or the beautiful and novel manner in which they are displayed. Among the quadrupeds are all the interesting specimens, from the huge elephant and the rhinoceros to the most minute species. The giraffe, or camelopardalis, seventeen feet three inches high, is the finest in Europe. Among the birds, are beautiful specimens of the bird of Paradise; that magnificent bird the grand hoopoe; humming birds; a black swan; an undescribed water-bird, of the duck tribe, &c. &c. all beautifully stuffed. Among the amphibious animals is the great boa, thirty-two feet in length; the American and African iguana serpents; rattlesnakes; spectacle snakes; a fine specimen of the geometrical tortoise, &c. The Ichthyological, Entomological, and Mineralogical departments are
equally rich; as is likewise that of the marine productions. The miscellaneous articles are numerous, and skillfully selected.

The Armory of the Museum is fitted up in an appropriate and elegant manner, representing the interior of the hall of one of the castles of our ancient nobility: the armour and various instruments of war are displayed in trophies, or on figures, placed under gothic canopies.

Neither pains nor expense have been spared by Mr. Bullock to enrich his museum. The travelling carriage of Bonaparte,—the economy of space in which is like that of the cells of a bee-hive,—was purchased by him of Lord Bathurst for three thousand guineas. It was estimated that, up to the month of June, 1817, either at the museum, or in several great towns of the empire, where it has been exhibited, not less than four hundred thousand persons had entered this very interesting vehicle. To this he has added a curious and costly assemblage of imperial relics from the palaces of Napoleon the Great: two splendid mosaic pavements, recently found on the floors of the baths of Nero; two specimens of the transcendant skill of Canova, displayed in the figures of Hebe and Terpsichore, so admirably sculptured, that they seem to move and breathe, &c. &c.

DOCTOR HERSHEYEL'S GRAND TELESCOPE.

To lead to a clearer comprehension of the principle on which the telescopes of Dr. Herschel are constructed, it is necessary to advert to those of Newton and Gregory. The former of these consists of a tube, towards the end of which a concave mirror is placed. The converging rays, before they reach the focus, are made to fall on a plane mirror placed at an angle of forty-five degrees, and thrown upward to the focus of a convex lens, fixed in the upper side of the telescope, through which the eye looks down on the object. The latter consists of a tube, on which a concave mirror, having a hole in its centre, is placed. Any parallel rays from an object falling on this mirror, will, after reflection, form an inverted image at its focus. This image, however, is intercepted by a smaller mirror, which reflects it back to an eye-glass in the hole of the large mirror, through which the observer views the object.

In the telescopes made by Dr. Herschel, the object is
reflected by a mirror, as in the Gregorian telescope; and the rays are intercepted by a lens at a proper distance, so that the observer has his back to the object, and looks through the lens at the mirror. The magnifying power is the same as in the Newtonian telescope; but there not being any second reflector, the brightness of the object viewed in the Herschel telescope is greater than that in the Newtonian telescope.

The tube of Doctor Herschel's grand telescope is 39 feet 4 inches in length, and 4 feet 10 inches in diameter; every part being made of iron. The concave polished surface of the great mirror is 4 feet in diameter, its thickness 3 1/2 inches, and its weight upwards of 2000lbs.

This noble instrument was, in all its parts, constructed under the sole direction Doctor Herschel: it was begun in the year 1785, and completed August 28th 1789, on which day was discovered the sixth satellite of Saturn. It magnifies six thousand times.

Illustration of the cut. A B C is a ray of light, reflected by the great speculum B to the eye-glass. C D is a chair for the observer. E, a moveable gallery for spectators. F G, a smooth base for the frame to turn on. H and I, pulleys to move the instrument. K are rooms for assistants.

**The English Telegraph.**

Between London and Portsmouth there are twelve stations; and thirty-one between London and Plymouth, of which eight are part of the Portsmouth line till they separate in the New Forest. Another chain, extending from London to Yarmouth, contains nineteen stations; and another from London to Deal, ten stations; making in the whole system sixty-four telegraphs. The distances average about eight miles, yet some of them extend to twelve or fourteen; and the lines are often increased by circuits, for want of commanding heights. In the Yarmouth line particularly, the chain makes a considerable detour to the northward.

After about twenty years' experience, they calculate on about two hundred days on which signals can be transmitted throughout the day; about sixty others on which they can pass only part of the day, or at particular stations; and about one hundred days in which few of the stations are
The English Telegraph.

Air Balloon.

Exact Simile of a Roll of the Papyrus, from Heracleum.
Visible to the others. The powers of the stations in this respect are exceedingly various. The station on Putney Heath, communicating with Chelsea, is generally rendered useless during easterly winds by the smoke of London, which fills the valley of the Thames between this spot and Chelsea hospital; or, more commonly between the shorter distance of the Admiralty and Chelsea. Dead flats are found to be universally unfavourable; and generally stations are useless nearly in the proportion of the miles of dead flat looked over. On the contrary, stations between hill and hill, looking across a valley, or series of valleys, are mostly clear; and water surfaces are found to produce fewer obscure days than land in any situation. The period least favourable of the same day is an hour or two before and after the sun's passage of the meridian, particularly on dead levels, where the play of the sun's rays on the rising exhalations renders distant vision exceedingly obscure. The tranquillity of the morning and evening are ascertained to be the most favourable hours for observation.

A message from London to Portsmouth, is usually transmitted in about fifteen minutes; but, by an experiment tried for the purpose, a single signal has been transmitted to Plymouth and back again in three minutes, which, by the Telegraph route, is at least five hundred miles. In this instance, however, notice had been given to make ready, and every captain was at his post to receive and return the signals. The progress was at the rate of one hundred and seventy miles in a minute, or three miles per second, or three seconds at each station; a rapidity truly wonderful! The English telegraph consists of a large frame, in which are placed and worked six shutters, marked in the plate a, b, c, d, e, f, by means of ropes pulled in the manner of bell ropes. The number of signals produced by it is sixty-three—by which are represented the ten digits, the letters of the alphabet, many generic words, and all the numbers which can be expressed by sixty-three variations of the digits. The signals are sufficiently various to express any three or four words in twice as many changes of the shutters.

The observers at these telegraphs are not expected to keep their eye constantly at the glass, but look only every five minutes for the signal to make ready. The telescopes are Dolland's Achromatics, which possess no recommenda-
tion but their enlarged field, and their freedom from prismatic colours in that field; points of no consequence in looking through a fixed glass at a fixed and circumscribed object. The field of the Galilean telescope is quite large enough, and having, instead of the six contained in Dollond's achromatics, but two lenses, one of which is a thin concave, it exhibits the object with greater brightness, and therefore ought to have been preferred for this purpose. It seems strange also, that, to ease the operator, it has never been contrived to exhibit the fixed spectrum on the principle of a portable camera, so that, without wearying the eye, the changes of the distant telegraph might have been exhibited on a plane surface, and seen with both eyes like the leaf of a book.

THE AIR BALLOON.

Among the many discoveries of modern philosophy this is one of the most splendid: hitherto, however, it has not been attended by corresponding utility, owing to the difficulty of steering the machine. The most promising attempts to overcome this difficulty were made by Zambecari, an Italian whose aerial excursions are curiously detailed by Kotzebue, in his travels, and whose principles were truly scientific; but still this great desideratum remains to be attained.

The discovery of hydrogen gas, which is 15 times lighter than atmospheric air, suggested the plan of filling with this gaseous substance a silken balloon, and of its ascent in air with an aeronaut appended to it, provided the whole should not exceed the weight of an equal bulk of atmospheric air. The process of filling the balloon is accomplished by mixing five parts of water with one of sulphuric acid, and pouring the mixture on iron filings: the light gas, by the decomposition of the water, will rise into the balloon; and the balloon, being 12 times lighter than the atmospheric air, will rise through it. Thus have two, three, and even four persons, been at one time carried through the atmosphere.

More than fifty aerial voyages, in different parts of Europe, have been made by Blanchard; nearly as many by Gaunetinj and thirty by Mr. Sadler.
Dr. Herschel's Grand Telescope:

Steam Boat navigating the Clyde.

New York and Albany Steam Boat.
THE STEAM ENGINE.

This engine consists of a large cylinder or barrel, in which is fitted a solid piston like that of the forcing pump. Steam is thus supplied from a large boiler, which in forcing up the piston, instantly opens a valve, through which cold water rushes, on the principle of the common pump. Other steam is then introduced, which forces it down again, and drives the water out of the pipe with immense force. The steam then raises the piston again, and again makes it fall, by which alternate motion the grandest operations are performed. The action of the piston moves up and down a large beam; and this beam communicates to other machinery the power of 100 or 200 horses!

The power of some of the steam engines constructed by Messrs. Boulton and Watt, is thus described, as taken by actual experiment. An engine, having a cylinder of 31 inches in diameter, and making 17 double strokes per minute, performs the work of 40 horses, working night and day, (for which three relays, or 120 horses, must be kept,) and burns 11,000 pounds of Staffordshire coal per day. A cylinder of 19 inches, making 25 strokes of 4 feet each per minute, performs the work of 12 horses, constantly labouring, and burns 3,700 pounds of coals per day. These engines will raise more than 20,000 cubic feet of water, 24 feet high for every hundred weight of good pit coal consumed by them.

The principle of Watts's improved engine, represented in the cut, is the same as the above, but the economy is still greater. The steam which is below the piston escapes into the condenser A, by the cock B, which is opened by the rod C, and at the same time the steam is admitted by the cock D into the upper part of the cylinder: when the piston has descended, the cocks E and F act in a similar manner in letting out the steam from above, and admitting it below the piston. The jet is supplied by the water of the cistern G, which is pumped up at H, from a reservoir; it is drawn out, together with the air which is extricated from it, by the air pump I, which throws it into the cistern K, whence the pump L raises it to the cistern M, and it enters...
the boiler through a valve which opens whenever the float W descends below its proper place. The pipes O and P serve also to ascertain the quantity of water in the boiler. The piston rod is confined to a motion nearly rectilinear, by the frame Q. The fly-wheel R is turned by the sun and planet wheel S T, and the strap U turns the centrifugal regulator W, which governs the supply of steam by the valve or stop cock X.

STEAM BOATS.

The description of the Clyde steam boat, represented in the plate, is as follows. Its extreme length is 75 feet, its breadth 14, and the height of the cabins 6½ feet. She is built very flat, and draws from 2 feet 9 inches to 3 feet water. The best, or after-cabin, is 20 feet long, and is entered from the stern: between the after-cabin and the engine a space of 15 feet is allotted for goods. The engine is a 12 horse power, and occupies 15 feet: the fore-cabin is 16 feet long, and is entered from the side. The paddles, 16 in number, form two wheels of 9 feet diameter, and 4 feet broad, made of hammered iron: they dip into the water from 1 foot 3 to 1 foot 6 inches. Along the outer edge of these wheels a platform and rail are formed quite round the vessel, projecting over the sides, and supported by timbers reaching down to the vessel's side. This steam boat runs at the rate of 4 or 4½ miles per hour in calm weather; but against a considerable breeze 3 miles only. It can accommodate 250 passengers, and is wrought by five men. The engine consumes 12 cwt. of coals per day. The funnel of the boiler is 25 feet high; and carries a square sail 22 feet in breadth.

To convey a precise idea of the utility of steam boats, and to quiet the apprehensions entertained relative to their safety, the following details, by Sir Richard Phillips, have appeared in the Monthly Magazine.

The groundless alarms relative to a supposed increase of danger from travelling by Steam-packets, led the editor of the Monthly Magazine, within the current month (July, 1817) to make a voyage in one of them from London to Margate. This vessel left her moorings, at the Tower of London, about half past eight in the morning, at the time the tide was running strong up the river, and when no other vessel could make progress, except in the direction of the
tides. The steam-packet proceeded, however, against the
stream, in a gallant style, at the rate of six or seven miles
an hour; and a band of music, playing lively airs on the
deck, combined, with the steadiness of the motion, to ren-
der the effect delightful. An examination of the steam-
engine, and of her rate of working, proved that no possi-
Bility of danger exists. It appeared that the boiler had been
proved at twenty-five pounds to the square inch; but that
the valve was held down by a weight of only four pounds,
and that the mercurial gauge did not indicate an employ-
ment of actual pressure of above two pounds and a half per
square inch. Hence it follows, that, although the engine
was capable of sustaining a pressure of at least twenty-five
pounds, only four pounds, or less than a sixth, was the
whole force which the valve would permit to be exerted;
and that, in point of fact, a pressure of only two pounds
and a half to the square inch, or only one-tenth of the
proven power of the boiler, was employed. There is,
therefore, less danger in passing some hours in contact with
such a machine, than there is in sitting near a boiling tea-
kettle, tea-urn, or saucepan, under circumstances in which
they are often used. Opposite Greenwich a fine com-
mentary was afforded of the value of steam as a navigating
power, in preference to winds and tides, a Margate sailing-
packet passing towards London, which had been a day and
two nights on its passage, a period of time which it ap-
pears is not uncommon. In short, with uninterrupted
pleasure, and in an hour sooner than the captain had named
at starting, the vessel was carried along-side Margate-pier,
having employed nine hours in performing a voyage of
ninety miles. In this case it appeared, that a pressure of
two pounds to the square inch produced about forty rota-
tions per minute of the acting water-wheels; and, as these
were ten feet in diameter, the motion of the impelling
floats, or wheel-paddles, would be at the rate of fifteen
miles an hour; and proved sufficient to carry the vessel,
with or against the stream, at an average of ten miles an
hour. The consumption of coals during the voyage was
less than a chaldron; but it was described as amounting
frequently to a chaldron and a half. On the whole, nothing
could be more demonstrative of the worth and security of
this mode of navigation; and there can be little doubt but,
in a few years, vessels of every size, and for every extent of voyage, will be provided with their steam-engine, which will be more used, and more depended upon, than winds or tides. The chances of accidents are lower than those under most other circumstances in which men are placed in travelling. By land, horses kill their thousands per annum, open chaises their hundreds, and stage-coaches their scores; and, by water, the uncertainty of winds has destroyed thousands, by prolonging the voyage, and increasing the exposure to bad weather; but in a steam-packet, navigated by an engine, whose proven powers necessarily exceed what can be exerted during its use, or in general by such engines as those used on the Thames or Clyde, no accident can possibly happen—unless, by a miracle, it were to happen, that a force of four pounds should overcome a resistance of twenty-four pounds.

The principle of this wonderful boat appears to have been suggested to the inventor, Mr. Greathead, by the following simple fact: that if a spheroid be divided into quarters, each quarter is elliptical, and nearly resembles the half of a wooden bowl, having a curvature with projecting ends; and that this quarter being thrown into the sea, or agitated water, cannot be upset, or be made to lie with the bottom upwards.

The length of the boat is thirty feet, and the breadth ten feet; the depth from the top of the gunwale to the lower part of the keel is three feet three inches; from the gunwale to the platform (within) two feet four inches; from the top of the stems (both ends being similar) to the horizontal line of the bottom of the keel five feet nine inches. The keel is a plank of three inches thick, of a proportionate breadth in midships, narrowing gradually towards the ends to the breadth of the stems at the bottom, and forming a great convexity downwards. The ends of the bottom section form that fine kind of entrance observable in the lower part of the bow of the fishing-boat called a coble, much used in the north. From this part to the top of the stem it is more elliptical, forming a considerable projection. The sides from the floorheads to the top of the gunwale launch...
of each side in proportion to above half the breadth of the floor. The breadth is continued far forwards towards the ends, leaving a sufficient length of straight side at the top. The sheer is regular along the straight side, and more elevated towards the ends; the gunwale fixed to the outside is three inches thick, and cased with layers of cork to the depth of sixteen inches downwards. The cork on the outside is secured with thin plates or slips of copper, and the boat is fastened with copper nails. The thwarts, or scats, are five in number, double banked, consequently the boat may be rowed with ten oars. The boat is steered with an oar at each end, and the steering-oar is one-third longer than the rowing-oar. The platform, placed at the bottom within the boat, is horizontal, the length of the midships, and elevated at the ends for the convenience of the steersman, to give him a greater power with the oar. The internal part of the boat next the sides is cased with cork, the whole quantity of which affixed to the life-boat is nearly seven hundred weight. The cork contributes much to the buoyancy of the boat, and is a good defence in going along-side a vessel; but its principal use is in keeping the boat in an erect position in the sea; or, rather, for giving her a very lively and quick disposition to recover from any sudden cant or lurch, which she may receive from the stroke of a heavy wave.

The ends being similar, the boat can be rowed either way; and this peculiarity of form alleviates her in rising over the waves. The curvature of the keel and bottom facilitates her movement in turning, and contributes to the ease of the steerage, as a single stroke of the steering-oar has an immediate effect, the boat moving, as it were, upon a centre. The fine entrance below is of use in dividing the waves when rowing against them; and, combined with the convexity of the bottom, and the elliptical form of the stem, admits her to rise with wonderful buoyancy in a high sea, and to launch forward with rapidity, without shipping any water, when a common boat would be in danger of being filled. The internal shallowness of the boat from the gunwale down to the platform, the convexity of the form, and the bulk of cork within, leave a very diminished space for the water to occupy; so that the life-boat, when filled with water, contains a considerable less quantity than the
common boat, and is in no danger either of sinking or over-turning, whatever be the violence of the winds or waves.

The first of these boats went off on the 30th of January, 1790, and it has so well answered every expectation in the most tremendous seas, that, during the last twenty-five years, between four and five hundred lives have been saved at the entrance of the Tyne alone, which otherwise must have been lost, and in no instance has it ever failed. Of course, every ship and every port ought to be provided with its life-boat.

FIRST-RATE MAN OF WAR.

Of all the arts and professions which are calculated to attract a particular notice, no one appears more astonishing and marvellous than that of navigation, in the state in which it at present exists. This cannot be made more evident, than by taking a retrospective view of the small craft to which navigation owes its origin, and comparing them to a MAJESTIC FIRST-RATE MAN OF WAR, containing one thousand men, with their provisions, drink, furniture, apparel, and other necessaries, for many months, besides one hundred pieces of heavy ordnance, and bearing all this heavy apparatus safely to the most distant shores. A man in health consumes, in the space of twenty-four hours, about eight pounds of victuals and drink: consequently eight thousand pounds of provisions are daily requisite in such a ship. Let her be supposed, then, to be fitted out for three months, and it will be found, that she must be laden with 720,000 pounds of provisions. A large forty-two pounder, if made of brass, weighs about 6,100; and about 5,500, if of iron; and, in general, there are twenty-eight or thirty of these on the lower gun-deck, on board a ship of 100 guns; the weight of these, exclusive of that of their carriages, amounts to 183,000 pounds. On the middle gun-deck are thirty twenty-four-pounders, each weighing about 5,100 pounds, and, therefore, collectively, 153,000 pounds; and the weight of the twenty-six or twenty-eight twelve-pounders on the upper gun-deck, amounts to about 75,400 pounds; that of the fourteen six-pounders on the quarter-deck, forecastle, and poop, to about 26,000 pounds; and besides these, there are, in the round-tops, even three-
pounders and swivels. If to this be added, that the complete charge of a forty-two-pounder weighs about sixty-four pounds; and that at least 100 charges are required for each gun, this will be found to amount nearly to the same weight as the guns themselves. In addition also to this, the reflection must be made, that every ship must have, to provide against exigencies, at least another set of sails, cables, cordage, and tackling, which, taken together, amount to a considerable weight: the stores, likewise, consisting of planks, pitch, and tow; the chests belonging to the officers and seamen; the surgeon’s stores; and various other articles requisite on a long voyage; with the small arms, bayonets, swords, and pistols, make no inconsiderable load. To this must be finally added, the weight of the crew; so that one of these first-rates carries, at the least, 2,162 tons burden, or 4,324,000 pounds; and, at the same time, is steered and governed with as much ease as the smallest boat.

**PRINTING ENGINE.**

A new printing press, or printing engine, has recently excited the attention of the typographical world. It is wrought by the power of steam, and, with the aid of three boys, perfects nearly a thousand sheets per hour. A common press, worked by two men, takes off but two hundred and fifty impressions on one side, and requires eight hours to perfect a thousand sheets. Hence, three boys in one hour are enabled, by this new application of the power of steam, to perform the labour of two men for eight hours. Such are the present capabilities of this engine; but, as there is no limit to its required powers, and the size of the form is no obstacle to its perfect performance, it is proposed to take impressions on double-demy, in which case three boys will, in one hour, perform the labour of thirty-two men. This engine is now at work at the printing-office of Bensley and Sons, near Fleet-street, and another on a similar, but less perfect, construction, has for some time past been employed on a Morning Newspaper. In its general analogy, this press is not unlike the rolling-press of copper-plate printers. The forms being fixed on the carriage, are drawn under a cylinder, on which the sheet being laid, and the ink distributed by an arrangement
of rollers, the impression is taken on one side. The sheet is then conveyed off by bands to a second cylinder, around which it is carried on the second form, and the reiteration is produced in perfect register, without the aid of points. All the manual labour is performed by a boy, who lays the sheet of paper on the first cylinder, by one who takes it off from the second cylinder, and by a third, who lays the sheets even on the bank. As a further instance of economy in the materials, we may mention, that the waste steam from the copper is carried in tubes round the entire suite of offices, with a view to warm them.

GRAND GALVANIC BATTERY.

To comprehend more precisely the astonishing powers of this battery, prepared by Sir Humphrey Davy for the laboratory of the Royal Institution, it is necessary to premise, that the conductors of the galvanic fluid are divided into perfect and imperfect, the former consisting of metallic substances and charcoal, and the latter of water and oxidated fluids, as the acids and all the substances which contain these fluids. The simplest galvanic combinations must consist of three different conductors, not wholly of one class. When two of the three bodies are of the first class, the combination is said to be of the first order; when otherwise, it is said to be of the second. In simple galvanic circles it is indispensably requisite that the conductors of one class shall have some chemical action on those of the other; for example: if a piece of zinc be laid on a piece of copper, and on the copper a piece of card or flannel, moistened with a solution of salt-water, a circle of the first class is formed; and if three other pieces be then laid on these in the same order, and repeated several times, the whole will form a pile, or battery, of the first order. When the three bodies which form a galvanic circle of the first order are laid on each other, the upper and the under ones not touching, these two extremes are in opposite electric states. The galvanic effects may be increased to any degree, by a repetition of the same simple galvanic combination; and these repeated combinations are called galvanic piles or batteries, which may be constructed of various forms.

THE GRAND GALVANIC BATTERY, the most powerful.
THE BLOW-PIPE.

Combination existing, consists of two hundred separate troughs of Porcelain, connected together in regular order, each being composed of ten double plates, arranged in cells, and containing in each plate 32 square inches; so that the whole number of double plates is 2000, and the whole surface 128,000 square inches. This battery, when the cells are filled with sixty parts of water, mixed with one part of nitric acid, and one part of sulphuric acid, affords a series of brilliant and impressive effects. When pieces of charcoal, about an inch in length, and one-sixth of an inch in diameter, are brought near each other (within the thirty-sixth or fortieth part of an inch) a bright spark is produced, and more than half the volume of the charcoal becomes ignited to whiteness; and, by withdrawing the points from each other, a constant discharge takes place through the heated air, in a space equal at least to four inches, producing a most brilliant ascending arch of light, broad, and conical in form in the middle. When any substance is introduced into this arch, it instantly becomes ignited; platina melts as readily in it as wax in the flame of a common candle; quartz, the sapphire, magnesia, lime, all enter into fusion: fragments of diamond, and points of charcoal and plumago, rapidly disappear, and seem to evaporate in it. Such are the decomposing powers of electricity, that not even insoluble compounds are capable of resisting their energy: for glass, sulphate of baryta, fluor spar, &c. when moistened and placed in contact with electrified surfaces from the voltaic apparatus, are slowly acted on, and the alkaline, earthy, or acid matter carried to the poles in the common order. Not even the most solid aggregates, nor the firmest compounds, are capable of resisting this mode of attack; its operation is slow, but the results are certain; and sooner or later, by means of it, bodies are resolved into simpler forms of matter.

THE BLOW-PIPE:

By the blow-pipe every effect of the most violent heat of furnaces may be produced, by the flame of a candle or lamp, urged upon a small particle of any substance. This instrument consists merely of a brass pipe about one-eighth of an inch in diameter at one end, and the other tapering to a much less size, with a very small perforation for the wind to
escape. The smaller end is bent on one side. For philosophic or other nice purposes the blow-pipe is provided with a bowl or enlargement, in which the vapours of the breath are condensed and detained, and also with three or four small nozzles, with different apertures, to be slipped on the smaller extremity.

The results of the philosophical experiments made with this instrument are beautiful and truly surprising; but some precautions are required. In describing the blow-pipe invented by him, Mr. Newman remarks that it has been very generally used, to obtain a high temperature, by the combustion of oxygen and hydrogen gases. The mode of rendering this instrument safe, was by rejecting all jets but such as were of a very fine bore; and as any inflammation of gases may be arrested in its passage by an aperture sufficiently minute, all danger of the return of the flame was thus obviated. A desire, however, to increase the heat, has occasionally led to the use of tubes through which the flame could recede, and an explosion has consequentiy happened to the apparatus, to the destruction of the instrument, and the danger of the experimentalist.

Doctor Clarke, professor of mineralogy in the University of Cambridge, observes on this head, that the experiments should be made with tubes, whose diameters are, at the least, equal to \( \frac{1}{10} \)th of an inch, because the heat is thus rendered incomparably greater; but, as the danger is also greater, it is necessary to devise some expedient, by which, making allowance for the probability of an explosion, the operator may be protected from injury. His contrivance to afford him perfect security, whatever explosion may happen, consists merely of a screen, made of deal planks, about \( \frac{1}{4} \) inch thick, and reaching about 12 feet from the floor of the laboratory, so constructed that the one half opens like a door, the other half remaining fixed. The blow-pipe is placed behind the half that is fixed; and a small hole is bored through this half, barely large enough to allow the jet and top-cock to pass through.

The instrument, thus secured, is represented in the plate. A B is the deal screen in two parts; A being made to open, and B a fixture,—before the window C. D represents the gaseous reservoir of the blow-pipe. E, the bladder containing the gaseous mixture for compression. F, the hand of
the operator upon the stop-cock of the jet, on the outside of
the screen. G H, a tube of glass, or of brass, for the jet.
And I, the spirit lamp for igniting the gas.

Among the many very curious experiments made with the
blow-pipe by Doctor Clarke, the following may be adduced
as examples. Several oriental rubies being placed on char-
coal, their fusion was so rapid that he feared they would
volatilize. They ran together into a bead, and remained in
such a liquid state before the gas, that the current of it
penetrated like a stream of air upon oil, when urged by a
pair of bellows. The bead, when examined, was white and
opaque; all colour having disappeared. Being again exposed
to the ignited gas, and taken from the charcoal by iron
forceps, its surface was covered by a thin flaky metallic sub-
stance, which came off on the fingers, glittering like scales
of carburet of manganese. On being fused a third time, it
assumed a variety of shapes, like sapphire during fusion.—
The reduction of the oxide of tin afforded an easy and very
beautiful experiment. Wood-tin, exposed to the ignited
gas, communicated a beautiful blue colour, like that of
violets, to the flame. In employing a pair of iron forceps,
as a support, the iron became covered with an oxide of tin
of incomparable whiteness. The fusion was rapid; and
when the wood-tin was placed on charcoal, the metal was
revived in a pure and malleable state.—In effecting the
fusion and combustion of platinum, the largest drops which
fell from the melting of platinum wire, when exposed to the
utmost heat, weighed ten grains; but drops of metal weigh-
ing fourteen grains were obtained, when the current of gas
was diminished so as not to let the metal run off too quickly
from the wire. By placing several globules on a piece of
charcoal, and suffering the whole force of the gas to act upon
them, the metal was made to boil, and they all ran together
into one mass.

THE SAFETY LAMP.

The invention of the wire-gauze-safe-lamp, for preventing
explosions from fire-damp, and for giving light in explosive
atmospheres, is due to Sir Humphrey Davy, who
remarks that the dreadful accidents of explosions are
occasioned by the firing of light carburetted inflammable gas,
which is disengaged during the working of the coals, and from fissures in the strata; and which, when it has accumulated so as to form more than 1-13th part of the volume of the atmospheric air, becomes explosive by a lighted candle, or by any kind of flame. The apertures in the gauze should not be more than 1-20th of an inch square. As the fire-damp is not inflamed by ignited wire, the thickness of the wire is not of importance, but wire from 1-40th to 1-60th of an inch in diameter is the most convenient. If the wire of 1-40th is found to wear out too soon in practice, the thickness may be increased to any extent; but the thicker the wire, the more the light will be intercepted, for the size of the apertures must never be more than 1-20th of an inch square. In the working models which he has sent to the mines, there are 748 apertures in the square inch.

When the wire-gauze-safe-lamp is lighted and introduced into an atmosphere gradually mixed with fire-damp, the first effect of the fire-damp is to increase the length and size of the flame. When the inflammable gas forms as much as 1-12th of the volume of the air, the cylinder becomes filled with a feebly blue flame, but the flame of the wick appears burning brightly within the blue flame, and the light of the wick continues till the fire-damp increases to 1-6th or 1-5th, when it is lost in the flame of the fire-damp, which in this case fills the cylinder with a pretty strong light. As long as any explosive mixture of gas exists in contact with the lamp, so long it will give light, and when it is extinguished, which happens when the foul air constitutes as much as 1-3d of the volume of the atmosphere, the air is no longer proper for respiration. In cases in which the fire-damp is mixed only in its smallest explosive proportion with air, the use of the wire-gauze-safe-lamp, which rapidly consumes the inflammable gas, will soon reduce the quantity below the explosive point; and it can scarcely ever happen, that a lamp will be exposed to an explosive mixture containing the largest proportion of fire-damp: but even in this case the instrument is absolutely safe; and should the wires become red-hot, they have no power of communicating explosion. Should it ever be necessary for the miner to work for a great length of time in an explosive atmosphere by the wire-gauze-safe-lamp, it may be proper to cool the lamp occasionally by throwing water upon the top, or a little
cistern for holding water may be attached to the top, the evaporation of which will prevent the heat from becoming excessive.

THE GAS-LIGHT APPARATUS.

This apparatus consists of an iron retort, about three feet long, and two feet in diameter, open at one of its extremities, to which is screwed, by means of a flaunch, a door piece: to this the door is applied, and is shut close by a screw placed in the centre. The coals to produce the gas are shut up in the retort, and the whole heated to redness by a fire applied underneath, the retort being placed in a sort of oven or furnace, so that the heat surrounds every part, except that at which the coals are introduced. Around the space of this oven a flue leads from it to the chimney, the aperture of which is regulated by a small damper. A plate of cast iron preserves the retort from being injured by the intensity of the fire underneath it, and causes it to be heated more uniformly. A cast-iron pipe conveys all the volatile products of the coal to a refrigeratory of cast iron, in which the tar, &c. extracted from the coal are deposited, and whence they can be drawn off by means of a copper pipe. The gas is conveyed from the refrigeratory to the top of a cylindrical vessel or receiver, which is in that part air-tight: consequently the gas displaces the water in this receiver, to a level with the small holes made round its inferior edges, where it is suffered to escape, and rises in bubbles, through the water of the well, into the receptacle or gasometer.

This gasometer is made of wrought-iron, and is capable of rising, or of sinking down nearly to a level with the top of the well which contains the water, when it will consequently be nearly filled with that fluid; but it rises gradually as the elastic gas enters it from the pipe, and displaces the water. Weights are suspended to balance and keep it steady; it is strengthened within side by two sets of iron stays; its seams are luted to make them air-tight; and it is well painted inside and outside to preserve it from rust.

The use of the gasometer is to equalize the emission of the gas, which issues from the retort more quickly at some times than at others. When this happens, the vessel rises up to receive it; and when the stream from the retort
diminishes, the weight of the gasometer expels its contents, the balance-weight not being quite so heavy as the gasometer, in order that a suitable pressure may be exerted to force the gas out at the burners with a proper jet.

The gas, after it leaves the deposit-vessel, and before it reaches the gasometer, is passed through a vessel of lime-water, to deprive it of every bituminous and sulphureous smell. From the gasometer it enters a tube by small holes made at its top, and, passing on through other tubes, is conveyed by pipes to the burners, or lamps, where it is to be consumed. These burners are formed in various ways, either by a tube ending with a simple orifice, at which the gas issues in a stream, and, if once lighted, continues to burn with a steady and regular light as long as any gas is supplied. At other times a number of very minute holes are made in the end of a pipe, which form as many jets de feu, and have a very brilliant appearance. If the gasometer of a gas-light apparatus has a diameter of five feet, by seven feet high, it will contain a sufficient quantity of gas, at four cubic feet per light, per hour, to give forty hours light to a brilliant Argand lamp, or five hours to eight lamps, equal in intensity to one hundred and sixty common street oil-lamps. Such a gasometer will be filled by the distillation in the retort of about half a bushel, or a quarter of a hundred weight, of coals. The remains which are found in the retort, after the process is finished, consist of most excellent coke, which in value, for culinary fires, or manufactories, returns a considerable portion of the whole expences.

The experiments made by Mr. Brande, in a small gas apparatus erected in the laboratory of the Royal Institution, lead to the conclusion, that a chaldron of good Wallsend Newcastle coals would afford from 17,000 to 20,000 cubic feet of gas; but the process of distillation, as it has been carried on in the large establishments for lighting the metropolis, has seldom afforded a larger average produce than 12,000 cubic feet. There can, however, be little doubt that, by improvements in the construction and management of the retorts, the highest of the above averages may be obtained. In the month of April, 1816, at the three stations belonging to the chartered Gas-light Company, situated in Peter Street, Westminster, in Worship Street, and in Norton-
Falgate, twenty-five chaldrons of coals were daily carbonized, actually yielding 300,000 cubical feet of gas, equal to the supply of 75,000 Argand's lamps, each lamp giving the light of six wax-candles. If the full proportion of gas had been obtained, namely, 20,000 cubic feet from each chaldron of coals, the produce would then have been 500,000 cubic feet, equal to the supply of 125,000 lamps of the same size; and the light then afforded would have equalled that of 750,000 wax-candles, instead of 450,000, which was the real produce. Including that of the City Gas-works, in Dorset Street, Blackfriars Bridge, the total daily consumption of coals in London, for the purpose of illumination, then amounted to 28 chaldrons, and the number of light supplied to 76,500; but this amount has been since greatly augmented, and this invaluable discovery, which now bestows an additional lustre on our theatres, &c. &c. is rapidly communicating its benefits to every part of the United Kingdom.

LONDON WATER-WORKS.

Among works of great magnitude, and displaying a vast ingenuity in their contrivance, may be cited those of the various companies for supplying the metropolis with water, the modes of forcing which into the main pipes, at the heads of the respective establishments, and thence conveying it, by subordinate pipes, through the different streets, so as to afford an ample supply to the inhabitants, as well as to provide against fires, may be reckoned among the most useful of the wonders of art.

The NEW RIVER WORKS at Islington claim the earliest notice, as having supplied the capital with pure water for nearly two centuries, at an original cost to Sir Hugh Middleton of 500,000/. The reservoir is eighty-five feet above the level of the Thames; but, to give it the necessary force, it is raised thirty-five feet above that level, whence it rises into the second and third stories of most houses. The quantity it discharges every twenty-four hours is 214,000 hogsheads of sixty-three gallons each. There are besides, the LONDON-BRIDGE WATER-WORKS, in which a forcing engine serves the purpose of a high level, but the water is not strained nor purified; the YORK-BUILDINGS WORKS; the EAST LONDON WORKS; the SOUTH LONDON; the
West Middlesex, at Hammersmith and Kensington, on a grand scale, with contrivances for purifying the water; and the Grand Junction works, at Paddington. Iron pipes have been latterly substituted for wooden ones; and the general arrangements for the distribution of the water, are such as far surpass those of any similar establishments in the different capitals of Europe.

THE DIVING-BELL.

This invention, by the means of which an operator descends to any depth of water, and remains there for several hours, is founded on the elasticity of the air. Weights are placed at the bottom to prevent it from turning; and a forcing-pipe sends in fresh air, to supply the waste of vital air from the respiration of the operator.

The sinking and raising of the diving-bell, invented by Dr. Halley, depending entirely on the people at the surface of the water, and being besides of considerable weight, so as to occasion much labour, with a risk of the breaking of the rope by which it was to be raised, to the sure destruction of those within, a diving-bell has been invented by Mr. Spalding, of Edinburgh, to remedy these defects, and prevent the edges of the machine from being entangled by any ragged prominences of rock. His machine is of wood, suspended by ropes, and having leaden weights appended to it, by which the mouth of the bell is kept always parallel to the surface of the water, whether the machine, taken altogether, is lighter or heavier than an equal bulk of water. By these weights alone, however, the bell would not sink; another is therefore added, which can be lowered or raised at pleasure, by means of a rope passing over a pulley, and fastened to one of the sides of the bell. As the bell descends, this weight, called by Mr. Spalding the balance-weight, hangs down a considerable way below the mouth of the bell. In case the edge of the bell is caught by any obstacle, the balance-weight is immediately lowered down, so that it may rest upon the bottom. By this means the bell is lightened, so that all danger of oversetting is removed; for being lighter, without the balance-weight, than an equal bulk of water, it is evident that the bell will rise as far as the length of the rope affixed to the balance-weight will allow it. This weight, therefore, serves as a kind of
anchor to keep the bell at any particular depth which the
divers may think necessary; or, by pulling it quite up, the
descent may be continued to the very bottom.

By another very ingenious contrivance, Mr. Spalding has
rendered it possible for the divers to raise the bell, with all
the weight appending to it, even to the surface of the water,
or to stop it at any particular depth, as they think proper;
and thus they would still be safe, even though the rope des-
signed for pulling up the bell should be broken. For this
purpose the bell is divided into two cavities, both made as
tight as possible. Just above the second bottom are small
slits in the sides of the bell, through which the water, enter-
ing as the bell descends, displaces the air originally con-
tained in its cavity, which flies out at the upper orifice of a
cock expressly fitted for that purpose. When this is done,
the divers turn the handle which stops the cock; so that if
any more air were to get into the cavity, it could no longer
be discharged through the orifice as before. If, therefore,
the divers wish to raise themselves, they turn the cock, by
which a communication is made between the upper and
under cavities of the bell. The consequence is, that a
quantity of air immediately enters the upper cavity, forces
out a quantity of the water contained in it, and thus renders
the bell lighter by the whole weight of the water which is
displaced. Thus, if a certain quantity of air is admitted
into the upper cavity, the bell will descend very slowly; if
a greater quantity, it will neither ascend nor descend, but
remain stationary; and, if a larger quantity of air be still
admitted it will rise to the top. It should be observed,
however, that the air which is thus let out into the upper
cavity, must immediately be replaced from the air-barrel;
and the air is to be let out very slowly, or the bell will rise
to the top with so great a velocity, that the divers will be
in danger of being shaken out of their seats. But by fol-
lowing these directions, every possible accident may be pre-
vented, and persons may descend to very great depths with-
out the smallest apprehension of danger. The bell also
becomes so easily manageable in the water, that it may be
conducted from one place to another, by a small boat, with
the greatest ease, and with perfect safety to those within.

THE END.
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IT is now above twenty years since the Proprieter of the undermentioned Works submitted to Conductors of Schools the first specimens of that series of improved Elementary Books, which he had planned for the purpose of facilitating the Instruction of Youth, and rendering the acquirement of Knowledge at once pleasant, rapid, and certain.

The system has since been known to the World under the denomination of the INTERROGATIVE SYSTEM; and as opposed to some popular mechanical systems, its Inventor has also defined it, by way of eminence, the THINKING, or INTELLECTUAL SYSTEM,—from the obligation to think, or mentally work, on the subject of study, which it imposes on the pupil; and from the general improvement of the INTELLECTUAL FACULTIES, of which habitual mental exercise is a necessary consequence. This system, in the popular Works published under the names of Goldsmith, Blair, Barrow, Adair, &c. has been introduced into nearly every School of character in the British Empire, and has met with a degree of approbation far exceeding the original expectation of its Author. The principle of teaching by Questions without Answers, which requires that the Pupil should furnish Answers to Questions often complicated from the scattered data of his Book, demanded various preparations on the part of the Tutor; but the publication of the TUTOR'S KEY, containing Answers to above Six Thousand Questions, has removed every difficulty in practice.

Among the competitors of the Interrogative System, the respected name of Pestalozzi has appeared; but it ought to be known, that his system is precisely that to which the public attention is now invited, but which was taught in England many years before the name of Pestalozzi in any manner transpired. The only variation consists in the Questions of the Swiss Philanthropist being confined chiefly to moral subjects, whereas the English System, besides its moral features, has been extended to almost every branch of education.

Others have annexed Questions to their Books, and claimed kindred merit; but by an unhappy misconception of the principle, their Questions accord in arrangement ex-
actly with the order of the data to which they refer, and therefore afford no exercise to the intellectual faculties.

Others again have so far mistaken the term “Interrogative System,” as to obtrude on the Public, under its sanction, a series of Books on the obsolete plan of Question and Answer. While others have basely imitated both the inventor’s plan and his books, and have produced various superficial, vulgar, and inadequate compilations, whose only recommendations have been their close imitation of his Title-pages, types, ornaments, and bindings.

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