

according to opinions from the time of Kant up to the present," by Herr Guizel, deals with the process of development of the heavenly bodies, the case of comets receiving the writer's special attention.

Among the notes are found a few words about the sun and magnetic storms, with reference to Lord Kelvin's recent views, types of weather in Australia, driving ice in southern latitudes, and several others.

GEOGRAPHICAL NOTES.

THE question of the death of Emin Pasha is again under discussion. It is one of the most difficult problems associated with Africa to estimate the amount of credence due to native or Arab reports. The dictum that bad news travels fast in Africa has been repeatedly proved, but rumours of the death of every explorer of note who has buried himself for a time in the interior have been so persistent and so often falsified, that hesitation is justified in believing Emin dead. It may very well be that he was killed, as Arab report affirms, in October last, while on his great journey across Africa, by the very route which brought Stanley to his rescue five years ago. But on the other hand, it may very well be that he is pushing on leisurely towards Lake Chad and keeping his movements secret for political purposes.

A NEW field of discussion in geography appears to be about to open if we read literally the title "An Undiscovered Island off the northern coast of Alaska," in the last part of the *National Geographic Magazine*. The existence of an island in $73\frac{1}{2}^{\circ}$ N. and $153\frac{3}{4}^{\circ}$ W., north of Point Barrow, is inferred from some rather vague reports of whalers, and some still vaguer stories of the Alaskan Eskimo. Mr. Marcus Baker, who introduces the new land, believes in it sufficiently to propose the name Keenan Island for it; but General Greely contributes a note to the paper in which he shows good reason for believing that the whalers were mistaken, the Eskimo misunderstood, and the new land non-existent.

THE *Revue de Géographie* commences a series of articles on "Questions Géographiques," with a paper on the gaps in our knowledge regarding the vertical relief of France, by M. A. Thalamas. To fill these he urges the importance of supplementing the ordinary hypsometrical maps by sections, and by a complete series of perspective photographic views taken from characteristic points.

THE Rev. R. P. Ashe, author of the standard work on Uganda, and for many years resident there as a missionary, has returned to this country, bringing much valuable information regarding the geography of Eastern Equatorial Africa, which will doubtless soon be made public.

A NEW Geographical Society has been established at Tunis, having for its special aim the study of that protectorate. Not only geography but history, archæology, anthropology, colonisation, commerce, and "natural science" have places on its programme.

THE INSTITUTION OF MECHANICAL ENGINEERS.

THE Institution of Mechanical Engineers held their annual summer meeting at Middlesborough, under the presidency of Dr. William Anderson, F.R.S., during last week. The meeting commenced on Tuesday, August 1, and lasted until the following Friday. Two sittings were held for the reading of papers, four of which were read and discussed, as follows:—On recent developments in the Cleveland iron and steel industries, by Mr. Jeremiah Head, past president, chairman of the reception committee.—On the Middlesborough salt industry, by Mr. Richard Grigg, of Middlesborough. Communicated through Mr. E. Windsor Richards, vice-president.—On some engineering improvements in the River Tees, by Mr. George Clarke, of Stockton, engineer to the Tees Conservancy Commission. Communicated through Mr. Thomas Wrightson, M.P., chairman of the works committee of the Tees Conservancy Commission.—Description of the electric rock-drilling machinery at the Carlin How Mines in Cleveland, by Mr. A. L. Steavenson, of Durham. Communicated through Sir Lowthian Bell, Bart., F.R.S., past president.

Mr. Head's paper, as its title denotes, was of a very complex nature. The author traces the rise and progress of the iron industry in the Cleveland district, which, before the development of the ironstone in the Cleveland hills, was practically a purely agricultural country. The opening of the Stockton and Darlington Railway inaugurated a new era, which was to dawn over this part of the kingdom, and substituted for the calm frugality of a pastoral calling the grime, smoke, wealth and squalor of a manufacturing industry. John Vaughan was the man who made Middlesborough, and rightly his statue stands in the middle of that unlovely town. He was a typical pioneer, dogged of purpose, shrewd yet kindly. He probably did more towards advancing the commercial supremacy of this country than any six statesmen the century has produced. The first blast furnaces were erected in the Cleveland district by his firm, Bolckow, Vaughan and Co., at Middlesborough, in 1852. These were quickly followed by others at Port Clarence near by. They were erected by Bell Brothers, and Sir Isaac Lowthian Bell, the head of the firm, attended at the meeting and spoke in the discussions on the papers. Although advanced in years he is still a keen man of business and of vigorous intellect; the present Mayor of Middlesborough is his son. After the date we have mentioned Middlesborough grew like a gourd and flourished like a bay-tree. Her prosperity seemed as firmly founded as her gigantic blast furnaces, which were then the wonder of the whole iron-making world; but a greater man than either Vaughan or Bell arose, and with the invention of Henry Bessemer, the iron age gave place to the age of steel. Happily for Middlesborough it is difficult, to divert the course of trade although the Cleveland ore is not suitable for steel making; or at any rate, was not until the basic process was introduced years afterwards. Middlesborough is well situated for communication by sea with the continent. The great deposits of hæmatite ore, from which by far the greater part of British steel is made, were discovered at Bilbao, in Spain, and Cleveland set vigorously to work to improve the naturally insignificant stream upon which she is situated. With characteristic northern energy the Tees was transformed from a creek with three and a half feet at low water, spring tides, to an estuary with twenty feet as a minimum depth and thirty-seven feet at high water. The ironmasters of the district, who had become numerous and influential, quickly laid down the necessary plant and machinery for making steel. Unfortunately, in a few instances, but those important ones, the vigorous parent stock was succeeded by a more debased growth and that for a time checked to some extent advance, or at any rate gave other districts an advantage; still the iron industry of Cleveland was so firmly established that it still remains the leading iron-producing district of England. At the present time Middlesborough is suffering, like all other parts of the kingdom, from the dulness of trade. There are more blast furnaces, more converters, more open hearth furnaces, and more steel and iron-producing machinery in the world than the world has call for. The engineer has so multiplied manufacturing facilities that we make more than we want, great as is the demand for iron and steel in modern economy. When process was cheapened by the ingenuity of inventors, those who first took advantage of the new means at their disposal became quickly rich. Investors and speculators crowded on to the field, and before the fact was known the producing power of man in the iron industry had been overdone. Sometimes in those strange fluctuations of trade which are the baneful characteristic of the present day, the demand more nearly reaches the power of supply; then for a few months, on the crest of this wave of inflated prosperity, works are busy and prices high. That lasts but a short time, and during the recent meeting the members of the Institution of Mechanical Engineers had the mournful spectacle presented to them of idle plant and unemployed workpeople, although each works manager put as bold a face as possible on his adversities, and strove to crowd as much work as his order book contained into the one day's visit of the institution.

To return, however, to Mr. Head's paper. We find that in 1872 there were thirty-seven iron works in the north-east district. Twenty-one have since disappeared or are now inoperative; whilst nineteen remain. The figures are delusive, for the size and power of production per works are now far beyond what they were at the earlier date. To show how steel has superseded iron, we find by the paper before us that the trade in iron rails has declined nearly 99% since 1872; whilst other kinds of

finished iron have declined to the extent of 36% since the same date. Instead of finished iron absorbing 40% of the Cleveland pig-iron made as in 1872, in 1891 it absorbed only about 23%. The quantity of ore raised in Cleveland in 1872 was about 6,300,000 tons, and the quantity of pig-iron made in the north-east district about 1,920,000 tons. During the year 1891 there were produced in the north-east district 795,487 tons of steel ingots. In the latter year 2,260,000 tons of ores other than Cleveland were smelted and of these about 2,100,000 tons were imported chiefly from Spain. On the whole, there has been produced in this district about 36% more pig-iron than in 1871.

It is rash indeed to prophesy in industrial matters, which are influenced by many complex problems, but it would seem that the great change which is impending over Middlesborough is the adoption of a new process in steel making. To bring ore from Spain—the greater part of which is converted into slag, simply to encumber the ground; whilst a smaller percentage ultimately finds useful application—seems an artificial proceeding. At first it was forced upon English steel-makers, from the fact that our native ores, with few exceptions, are phosphoric and therefore unfit for the pneumatic process of steel-making. Later discoveries have removed this disability and by the basic process phosphorus can be eliminated, and good steel made. The Cleveland district is richer in iron ore of high quality than any other in England, but this ore is not suitable for steel-making by the old acid process. It is therefore the manifest duty of Cleveland to foster and perfect the basic system of steel-making, and so use the phosphoric ores of her native hills. The problem is chiefly a commercial one. Happily the stagnation of trade will quicken the ingenuity and enterprise of steel-makers, and we shall no longer depend so fully on a foreign source for the raw material of the most important industry in the kingdom.

The discussion on Mr. Head's paper turned chiefly on the respective merits of Yorkshire iron and mild steel. Mr. Windsor Richards said that best Yorkshire iron was better than the best mild steel made. The statement is too sweeping, and those who use this material will be more likely to agree with Dr. White, the Director of Naval Construction, who spoke in praise of mild steel, laying emphasis on the lower price it costs compared to Yorkshire iron. Mr. Aspinall, the chief Locomotive Engineer to the Sheffield, Manchester, and Lincoln Railway, and one of the best mechanical engineers in the country, also spoke strongly in favour of steel, traversing Mr. Windsor Richards's statement that the mildest descriptions could not be case-hardened. The subject, however, is somewhat antiquated, and were it not for the high authority of Mr. Windsor Richards, would hardly be worth reopening. The difficulties that stood in the way of steel for engineering purposes have been overcome years ago.

The next paper on the list was a contribution by Mr. Richard Grigg, and dealt with the newest industry of Middlesborough, namely, that of salt manufacture. The late John Vaughan, boring for water, came upon salt, and the result has been that quite a brisk industry has sprung up. At first the wells were made by the diamond drill, but the process was so expensive that the industry would have been strangled in its birth, had it not been that American ingenuity came to its aid. The salt in the Middlesborough district is at a considerable depth below the surface; in some places 1700 feet. The strata that have to be bored through are difficult, and it was thought at one time that the salt was too deep to win with profit. Some shrewd person, who had travelled in Pennsylvania, remembered how the Americans make their oil wells, and the system has been transplanted to Middlesborough, so that in some parts one might also fancy one's self in the neighbourhood of Pittsburg, so closely have the characteristic timber derricks been copied in this heart of the iron country. The chief point of interest raised by Mr. Grigg's paper was whether the brine-pumping is going to lead to subsidence or not. On the other side of our island, in the salt districts of Cheshire, brine-pumping has led to most curious and, to those on the surface, unpleasant results. The houses in Northwich bear evidence of this; the house-line presents most devious and irregular courses; the houses themselves are iron strapped or wooden bound, so that they may be "jacked" to lift them, as the earth upon which they stand subsides, and it is no uncommon thing for a Northwich landlord to be called on to the rescue of his buildings, which are in process of disappearing beneath the surface. In one place a house has so far settled down that what was the

first-floor bed-room has become the basement, and the front door has been cut off between the two upstairs bed-room windows. Northwich Bridge has been lifted several times, or it would have been transformed into a dam; whilst large tracts of land have subsided bodily, and in one place there is, or used shortly ago to be, a line of rails which ended abruptly at the edge of a cliff, the remaining part being on a plain beneath. At one time these rails were continuous, and were only broken through subsidence caused by the abstraction of salt beneath. Probably, however, Middlesborough will not be served in this way. The salt there is deeper, and is surmounted by a stratum of rock. As the brine-pumping goes on, and large cavities are formed by the abstraction of salt, the roof of rock is left unsupported. The superincumbent mass of earth may, or may not, break this down. It is hoped that should a fall of the rock take place, the pieces descending will form themselves into a dome shape, and, therefore, be well calculated to resist the weight above. The hope appears too sanguine, for the rock would be more likely to give way over the centre of the cavity than at the sides, where it is nearer the supporting salt not dissolved; indeed, the dome would more likely be an inverted one. In the Cheshire district we believe the subsidences have invariably been of a gradual nature, so that inconvenience rather than danger has been the result. In Middlesborough the results may not be of the same gentle kind. It is true that the cavities are deeper in the earth, and that is an element of safety in one respect, but should the stratum of rock below give way suddenly serious results might follow, especially if some of Middlesborough's ponderous furnaces were above the spot affected. Near Nancy, in France, a subsidence of earth took place which was so sudden that it caused a report which was heard 12 miles away. Middlesborough is pumping salt close to the town, and what is, of course, worse, in the near neighbourhood of the docks. Authorities, however, differ as to what will be the result; time alone will prove; it may be in a manner more convincing than pleasant. Mr. Grigg's paper contains an excellent description of the machinery used, and illustrations of the same were exhibited on the walls of the Town Hall, where the meeting was held.

A paper by Mr. A. L. Steavenson, entitled, "Description of the Electric Rock-Drilling Machinery at the Carlin How Ironstone Mines in Cleveland," was next read. After briefly referring to the various means of drilling holes for blasting purposes, the author proceeded to describe the electric drill. We could not give a description of this without the illustrations which were exhibited on the walls. Mr. Steavenson, who is a mining engineer, has tried all kinds of drilling—hand, compressed air, hydraulic, and petroleum engine, but he gives preference to electricity as a means for transmission of power in this work, although he says that petroleum engines have done good work.

The last paper read at the meeting was a contribution by Mr. George J. Clarke, engineer to the Tees Conservancy. In this he describes briefly some of the works which have been done in making the harbour at Teesmouth and improving the navigation. Dredgers, training-walls, and breakwaters have been combined in this work which has proved of such signal value to the district; in fact they have made its large commerce possible.

During the meeting a number of excursions to various iron-works were made, and members had an opportunity of seeing the colossal proportions to which the machinery for the production of iron and steel has been carried in the present day.

THE WILLIAMS COLLECTION OF MINERALS.

A FEW words relative to the collection of minerals which has just been distributed among various museums by Mr. J. C. Williams, M.P. for the Truro Division of Cornwall, will be of general interest. This collection had been gradually brought together by the father and grandfather of Mr. Williams; it was removed nearly thirty years ago from Scorrier, where Mr. Michael Williams formerly lived, to Caerhays Castle, nine miles from the nearest railway station (St. Austell), and it has since been too remote from the ordinary line of travel to be of easy access to visitors. It was in this collection, while it was still at Scorrier, that my predecessor, Prof. Maskelyne, F.R.S., noticed in 1863 the specimen of connellite from which it seemed to him