section, Part iv., is entitled "Graphic Statics," and is devoted to the graphical determination of the stresses in the bars of framed structures, and to the theory on which these graphical constructions depend. The examples selected are comprehensive, and include most of the ordinary roof and bridge trusses; cranes, sheer legs, &c., are also studied. Bending moment and shear diagrams, which come very much better in Part v., are rather out of place in Lecture xxviii.; it would certainly have been far better, and less confusing to the reader, to have taken them up in the section on strength of materials, which forms Part v. of the book. This section is by no means as complete as the others preceding it. The lectures dealing with the stresses and strains in beams and shafts are full, and well worked out; but tension is treated in a very half-hearted way, while struts and their strains and stresses are simply entirely ignored: this is most unsatisfactory. It is to be hoped that in a new edition Prof. Jamieson will look to this. The omission detracts greatly from the practical value of Part v.

The last Section (vi.) is hardly entitled to the name of hydraulics, and it would have been far better to have omitted it altogether. There are only two chapters: one deals with the hydraulic plant in a modern gas-works; it is, however, almost exclusively descriptive, quite unlike all the rest of the book.

The last chapter is given up to refrigerating machinery; though what this has to do with hydraulics the author does not condescend to explain: it is, in fact, good matter in the wrong place. We confidently recommend the book to engineering students, who will find it of much use in their study of the various branches of practical mechanics touched upon by the author.

H. B.

Twenty-first Annual Report (1896) of the Department of Geology and Natural Resources, Indiana. By W. S. Blatchley, State Geologist. Pp. viii + 718. (Indianapolis, 1897.)

THE contents of this volume refer very largely to the economic natural resources of the State of Indiana, and embrace the results of the work accomplished by the different divisions of the Department under Mr. Blatchley's administration during the year 1896. The papers deal with the petroleum industry in the State, composition of Indiana coals, Indiana caves and their fauna, the geology of the middle and upper Silurian rocks of Clark, Jefferson, Ripley, Jennings and Southern Decatur Counties, the oolitic limestone of Indiana, the natural gas of the State, the geology of Vigo County, and the uncultivated ferns and fern allies and the flowering plants of the same county. Several excellent plates illustrate the report, and the whole volume shows that the State, which twenty years ago was noted mainly for her agricultural products, possesses great natural resources, and is rapidly assuming high rank as a mineral producing and manufacturing centre.

The Mines of New South Wales, 1897. Compiled and edited by C. W. Carpenter. Pp. 552 + lxxviii. (Sydney, London, &c.: George Robertson & Co.)

THE vast mineral resources of New South Wales may be judged by reference to this handy volume. The mines—which range from the mines of the Broken Hill Proprietary Company, with 6,512,000*l.* of dividends, to a coal mine worked by its proprietor in his spare time—are in the first place arranged geographically, and, in the case of each, particulars are given—as the proprietors, development, yields, area, &c. In the geological section of the book the mines are arranged under the names of the minerals obtained from them. The remainder of the volume is taken up with descriptions of batteries and ore-reducing works, and lists of directors of mining companies, New South Wales mining patents, and an alphabetical list of mines.

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

The Submerged River-Valleys and Escarpments off the British Coast.

IN connection with the observations of American geologists—especially those of Prof. J. W. Spencer and Mr. Warren Upham—on the "drowned" terraces and cañons of the American coast, the eastern borders of the North Atlantic afford some interesting results when examined with the aid of the Admiralty charts. It has long been known from the researches of the late Mr. Godwin-Austen, Prof. T. Rupert Jones, and others, that the British Isles are planted on a platform, of about 100 fathoms near its margin, and known under the name of "the 100-fathom platform." I am now engaged on a careful study of this physical feature, and the results, though as yet incomplete, are of such interest that I may be permitted to place them briefly before your readers. By tracing the contours, which may be drawn on the chart of the British Isles from the neighbourhood of Rockall as far south as the entrance to the Bay of Biscay by the aid of the very numerous soundings, two well-marked features may be recognised. The margin of the platform is very nearly defined by the 100-fathom line off the coast of Scotland, where it terminates along "the Vidal Bank"; but from this level it gradually falls away southwards, till at the entrance to the Bay of Biscay it reaches the 200-fathom contour; from this margin the floor of the ocean gradually slopes upwards to the coast, so as to constitute a shelving plain with little interruption. West of the coast of Ireland the platform is as broad as Ireland itself; that is, about 200 miles at its greatest breadth; and here it breaks off in a magnificent escarpment of no less than about 1300 fathoms (7800 feet) in height, its base giving place to a second gently sloping plain from 1500 to 2000 fathoms; or 9000 to 12,000 feet in depth, leading down to abyssal regions. This grand escarpment of about 7000 feet in height is continuous with the Vidal Bank, and opposite the English Channel bends sharply round to the eastward; in some degree conforming to the outline of the land. That this escarpment was once an emergent physical feature, corresponding to those of Eastern America, now submerged, or of the now unsubmerged terraces of Colorado, is a deduction of which I am now absolutely convinced, notwithstanding the stupendous physical changes which the deduction involves. We will now proceed to consider briefly some evidence of a corroborative kind, from which I cannot see any possibility of escape; I refer to the existence of river-valleys now traceable across the British platform, and opening out into gorges on approaching the edge of the escarpment. Some of the existing river-courses, like those of the Severn and the Kenmare rivers, are somewhat obscurely indicated by the soundings across the platform; but there are two distinctly traceable river-courses which are now altogether submerged: the first descending from the Irish Channel; the second through the English Channel. Assuming for a moment, what will scarcely be denied, that the platform down to a depth of 100 to 200 fathoms was formerly a land surface, it is clear that the streams entering from the existing lands must have had an outlet by means of rivers entering the Atlantic westwards. The examination of the soundings shows that this drainage was effected by means of two large rivers running near the centre of these channels, receiving the streams from either side. On tracing them across the platform, and on approaching the edge of the escarpment, we find the channels rapidly deepening, and within a mile or two of the edge taking the form of deep and narrow gorges, ultimately broadening out into "embayments," descending down to the very base of the escarpment itself; a condition corresponding to the "base levels of erosion" of the American geologists; and also represented by some of the Scandinavian fjords. Such physical features are altogether terrestrial. It is impossible (as it seems to me) that they could have been originated while the region referred to was in its present condition of ocean-bed. One portion of the river-valley which drained the English Channel is very clearly indicated on the chart under the name of the "Hard Deep." This gorge, about a quarter of a mile broad and seventy miles in length, occupies that narrow part of the channel between Cape de la Hague on the coast of France and the Bill of Portland. Throughout the

course of this old river-valley over the platform the channel has, to a great extent, been choked up and nearly obliterated by the deposit of sediment constantly going on for long ages; but along this part of its course, owing doubtless to the force of the tidal currents due to the narrowness of the channel, the sediment has apparently not been able to accumulate; hence the well-defined banks of rock which the soundings disclose. As regards the submerged channels of the existing rivers entering the Atlantic westwards, only faint indications can be obtained from the soundings; nor is this surprising when we recollect that the North Sea, the Irish Channel, and portions of the ocean bordering the north-western coasts of the British Isles have been covered in part by land ice, and altogether by the muddy waters of the later glacial seas, giving place to those of the present day; the mud, sand and shingle thus deposited have sufficed to cover the old floor of the platform for many feet in depth in most places, and to fill up the channels of the streams formed during earlier emergence. The total distance from north to south through which these observations extend is about 500 miles. I hope to be able to return to the subject later on. EDWARD HULL.

The Use of Compressed Coal Gas.

It may be of interest to users of the limelight to put on record the following occurrences.

A 40-foot cylinder was filled with coal gas at a pressure of 120 atmospheres by a leading London firm on March 15, 1897; a small quantity was used, and the cylinder stood till October 9. It was then used for a mixed jet, and at the end of half an hour the light began to decrease, and in another quarter of an hour practically no gases were issuing. On relighting the jet the light was found perfect, and the fault was ascribed to the Beard's regulator.

The cylinder was again used on March 5 last, and again after half an hour the light began to fail; but on turning the taps full on something audibly blew out of the nozzle, and the light was perfectly restored.

The lime blackened excessively: while white-hot, the "hydrogen" was turned off and the oxygen allowed to play on it, when the deposit turned a brilliant orange-red.

The coal gas was then passed through a glass tube gently heated in a Bunsen flame—a copious metallic mirror which gave the test for iron was formed.

It seems probable that the jet was choked by the decomposition of iron carbonyl at the high temperature. In any case there is an obvious disadvantage in storing for a considerable time compressed coal gas in steel cylinders, altogether apart from the possible damage to the cylinders, which has been shown to be small. C. E. ASHFORD.

Harrow, March 19.

THE SCIENCE BUILDINGS AT SOUTH KENSINGTON.

SINCE the nation acquired, a good many years ago now, a plot of ground from the Royal Commissioners of the Exhibition of 1851, at a cheap rate, on which to erect buildings to foster teaching and research in Science and Art, there have been many schemes put forward, but nothing done, till at last the teaching of Science has become desperate. The Government have known this fully, and a few years ago plans were designed to bring to a head the various schemes by erecting Science buildings on the west side of Exhibition Road, and the Art buildings on the east side, an allocation of the spare land which had been accepted in principle by everybody.

But now it appears there has been a sudden *volte face*. Seeing that at the present moment Art does not require all the space at its disposal on the east side, the interstices are to be filled up with certain of the science buildings as we gather from the statement made by the First Commissioner of Works, on Thursday last: "The Government asked for the large sum of 800,000*l.* for the completion of the buildings at South Kensington in connection with Science and Art. He was quite certain that the Committee would admit that the settlement of this question had been demanded both by the House and by the public for many years past. In 1891 the decision

was come to to proceed with the building to complete the accommodation for the Art Museum, and for housing the administrative departments of Science and Art. Plans were accordingly prepared by Mr. Aston Webb, and accepted, for a building to occupy the land on the south side of the Museum facing the Cromwell Road; but the sources at the disposal of Chancellors of the Exchequer, on both sides of the House, unfortunately did not permit of the grant of the necessary funds, and the scheme had since then been in abeyance. Since that scheme was formulated, and partly in consequence of the report of the Commission on Secondary Education, it was in contemplation to move to the Education Office the secretariat of the Science and Art Department, and further—in accordance with the recommendation of the Select Committee of last year on the South Kensington Museum—it was decided to remove the official residences and certain other temporary buildings, which were a source of danger from fire. With this additional space at disposal, it would now be possible to provide on the eastern side of Exhibition Road the necessary accommodation for both Science and Art. It was, therefore, intended to build, in addition to the building proposed in 1891, further buildings which would complete the frontage on the Cromwell Road and Exhibition Road sites; and, in the opinion of the Government, that would amply meet the requirements of both branches for many years to come."

On this proposal the *Times* remarks:—

"How far these projects, which the Government regard as all that can be reasonably demanded, will be satisfactory to those who take more than an official interest in the matter it would be premature to speculate."

We do not think it "premature" to state that it is to be hoped that the Government before they go further in this matter will obtain some opinions from men of science. The suggestion appears little short of disastrous, having regard for the future representation of scientific teaching and illustrations in our National Institutions, for surely the Empire will outlast another century. These remarks are not made because the sum asked is too little, for we do not believe a Committee, say of the Royal Society, or the President and Council of the Society itself, appointed to consider the matter, would see its way to spend more than 250,000*l.* to cope with the present needs of Science.

SKIAGRAPHY AFTER INJECTION OF THE BLOOD VESSELS WITH MERCURY.

TO elucidate the relations of the various opaque structures of the body to one another whilst undisturbed by the processes of dissection, is one of the numerous uses to which skiagraphy has been applied.

It is obvious that this process may be extended to the blood vessels in the dead body by filling them with some medium which is opaque to the X-rays, and in this way their relative situations to each other and to the bony skeleton may be studied with facility. Various experimenters have occupied themselves with the task of producing such skiagraphs, and amongst a considerable number who have obtained successful pictures may be mentioned Dutto, Raw, and Remy and Contremoulins, the former of whom employed a plaster injection mass, the latter one of wax in which bronze powder was suspended.

These results, though sufficiently encouraging, were not wholly satisfactory, and one of us (H. J. S.) determined to follow out a method which he had devised before he became acquainted with the work of other observers, and in which metallic mercury had been selected as the substance to be injected. The results of our experiments with it have been most satisfactory, and it seems probable that with the greater experience which we have now gained in the methods of carrying out the