

country. That, however, remains to be seen, and one must remember how difficult it is to shake trade customs, however much they may stand in the way of advancement in manufacturing processes.

Mr. Deas' paper on Clyde navigation improvements was another excellent contribution to the proceedings of the Institution, although perhaps rather of the nature of a civil than a mechanical engineering paper. We use the term "civil engineering" in its restricted but more generally accepted sense. The Clyde is probably the most artificial tidal river in the world. What man has done for the Clyde, and what the Clyde has done for Glasgow, every one has heard. Mr. Deas carries the details of the narrative a step further, showing how he built up good and enduring quay walls where the nature of the ground rendered the task one of the greatest difficulty. The most striking feature was the series of hollow concrete cylinders, sunk into the natural sand or gravel to form a foundation for the quay walls. The method of sinking was ingenious, and to those interested in these matters a perusal of the paper will be of great interest, both in regard to this and many other points.

Mr. Ellington's paper was one of great interest, as, indeed, were all the memoirs read at this meeting. The author has taken the foremost position in the introduction of the distribution of hydraulic power from a central station. The first example on a large scale was the installation at Hull, which was laid down in 1877. This was followed, after an interval of seven years, by the London scheme, which has now reached large dimensions, not far from ten million gallons of water being pumped per week at a pressure of 750 lbs. to the square inch; the mains extending over the most important parts of the metropolis. Since then the system has been applied in Liverpool, Melbourne, Birmingham, Sydney, and Antwerp; the latter city using over three million gallons per week. The latest examples are Manchester and Glasgow, where the pressure has been increased to 1120 lbs. to the square inch. It was the Glasgow scheme that Mr. Ellington chiefly described. These works have been carried out under the supervision of Mr. Corbet Woodall, acting for the Corporation. The engine-house is laid out to contain six sets of triple compound engines of 200-horse power each. There are two accumulators having rams 18 inches in diameter, and 23 feet stroke; each is loaded to 127 tons. The capacity is 57,500 gallons per hour at the standard pressure of 1120 lbs. to the square inch. The water supply is taken from the Corporation mains; in London Thames water is used. The mains are 7 inches in diameter, there being gutta-percha packing rings at the joints.

Speaking of the efficiency of the system, the author founded his remarks chiefly on his experience in London, and it was found that the average for ten years was 0.9243. The efficiency is determined by the fraction representing the ratio of the quantity of water registered by consumers' meters to the quantity pumped at the central stations. In Liverpool a still better coefficient is obtained, the efficiency being 0.9555. A Parkinson meter is used by the author; this is very like a gas meter. The Kent positive low-pressure meter is largely used in London.

Perhaps the most interesting part of Mr. Ellington's paper was that in which he compared the cost of hydraulic power supply and electric supply. The results were largely in favour of the water system, and were certainly somewhat surprising to many. In making this comparison data were taken from the records of the London Hydraulic Power Company and of the Westminster Electric Supply Corporation. In making the comparison 1000 gallons of water at 750 lbs. per square inch is taken as equivalent to 6.518 Board of Trade units of electricity. The analysis showed that the station cost of hydraulic power is 5.172*d.* per thousand gallons pumped at a pressure of 750 lbs. per square inch. The corresponding cost of an equivalent amount of electric energy, reduced to the same hydraulic standard, is 9.014*d.* per thousand gallons; on an electrical standard of Board of Trade units of 0.793*d.* and 1.383*d.* for hydraulic and electrical energy respectively. It was a curious coincidence that, in making this comparison, the capital outlay, output, quantity sold, and average price obtained were nearly the same; it was only in cost of production that the divergence was remarkable. A further point that came out in the discussion was that the dividends paid by the two companies respectively were not greatly different. The author could come to no other conclusion on the figures than that, from some cause not hitherto explained, hydraulic power is much less costly to produce than electricity. Prof. Kennedy, who occupied the

chair, and who is so largely responsible for the distribution of electrical energy, could find no fault with Mr. Ellington's figures; but we believe the matter is likely to become the subject of further investigation.

We do not propose dealing with the many excursions that were made, and which included visits to a large number of shipyards, engine works, iron and steel works, as well as the large Corporation undertakings, such as the gas and water works. To describe these at all adequately would require a volume rather than an article. It will suffice to say here that these excursions were well attended, and the meeting was highly successful generally.

#### THE INTERNATIONAL GEOGRAPHICAL CONGRESS.

THE closing meeting of the International Geographical Congress took place on Saturday morning (August 3), and there seemed to be no dissentients from the opinion that in all its departments the Congress has been a great success. In particular, the meeting is to be congratulated on accomplishing much important work, and combining therewith a large amount of entertainment and social intercourse, without unduly taxing the energies of its members. While there was no reason to expect, in a scientific body like the Congress, any serious complication of interests, it is specially satisfactory to recognise the spirit which showed itself in all the sittings from day to day, and found its most definite expression in the graceful and courteous speech in which General Greeley seconded the proposal that the Congress accept the invitation of the German delegates to hold the next meeting in Berlin. The Congress has not as yet met in Germany, and it was felt that a large number of members would have great difficulty in attending a meeting at Washington, although a visit to the United States offered many inducements to accept the cordial invitation which came from that country.

At the close of its proceedings the Congress gave deliverance on a number of important questions which we may take as representing the general views of geographical experts on matters of special moment in that branch of science. With regard to Africa it was agreed that it is desirable to bring to the notice of the Geographical Societies interested in Africa the advantages to be gained:—

(1) By the execution of accurate topographical surveys, based on a sufficient triangulation, of the districts in Africa suitable for colonisation by Europeans.

(2) By encouraging travellers to sketch areas rather than mere routes.

(3) By the formation and publication of a list of all the places in unsurveyed Africa, which have been accurately determined by astronomical observations, with explanations of the methods employed.

(4) By the accurate determination of the position of many of the most important places in unsurveyed Africa, for which operation the lines of telegraph already erected, or in course of erection, afford so great facilities.

Resolutions were passed as to the collection and cataloguing of cartographic materials, and urging that all maps should bear the date of their publication, and the report of an influential commission appointed at Berne to consider a proposed map of the world on a scale of 1:1,000,000 was adopted in a form embodying a resolution that:—

(1) The Commission has received the Report of the Berne Committee, and feels grateful for the work done by it.

(2) The Commission declares that the production of a map of the earth to be exceedingly desirable.

(3) A scale of 1:1,000,000 is recommended as being more especially suited for that purpose.

(4) The Commission recommends that each sheet of the map be bounded by arcs of parallels and of meridians. A poly-conical projection is the only one which is deserving of consideration. Each sheet of the map is to embrace 4 degrees of latitude and 6 degrees of longitude, up to 60 degrees north, and 12 degrees of longitude beyond that parallel.

(5) The Commission recommends unanimously that the meridian of Greenwich and the metre be accepted for this map.

(6) The Commission recommends governments, institutions, and societies, who may publish maps, to accept the scale recommended.

(7) The Commission lays down its mandate, and recommends

that the Executive Committee of the Congress be charged with the duty of carrying on its work, and be authorised to co-opt for this purpose scientific men representing various countries.

Support was given to the proposal for further international surveys in the North Atlantic, the North Sea, and the Baltic, by the adoption of a resolution, drawn up by a special Committee—"That the Congress recognises the scientific and economic importance of the results of recent research in the Baltic, the North Sea, and the North Atlantic, especially with regard to fishing interests, and records its opinion that the survey of these areas should be continued and extended by the co-operation of the different nationalities concerned on the lines of the scheme presented to the Congress by Prof. Pettersson."

The recommendation of the Education Committee was adopted, to the effect that—"The attention of this International Congress having been drawn by the British members to the educational efforts being made by the British Geographical Societies, the Congress desires to express its hearty sympathy with such efforts, and to place on record its opinion that in every country provision should be made for higher education in geography, either in the universities or otherwise."

Other resolutions were also carried, expressing the approval of the principle of State printed registration of literature, as the true foundation of national and international bibliography, urging the need of some agreement as to the writing of place-names, and acknowledging the scientific necessity of an international system of stations for the observation of earthquakes.

Besides the above, a number of resolutions were adopted in the course of the daily deliberations, of which the following is, perhaps, the most important of all the decisions of the Congress.

The resolution refers to the Exploration of the Antarctic regions, concerning which the Congress recorded its opinion that this is the greatest piece of geographical exploration still to be undertaken, and in view of the additions to knowledge in almost every branch of science which would result from such a scientific exploration, the Congress recommended that the several scientific societies throughout the world should urge in whatever way seemed to them most effective, that this work shall be undertaken before the close of the century.

The following is a summary of the proceedings of the Congress during the week. Previous meetings were reported in our last issue.

The general session on Monday (July 29) opened with a paper on Antarctic Exploration by Geheimrath Prof. Dr. G. Neumayer, and a discussion followed, in which the President, Sir Joseph Hooker—the only survivor of Sir James Clark Ross's Antarctic Expedition of 1843—Dr. John Murray, Sir George Baden-Powell, Mr. Arundell, M. de Lapparent, General Greely, and Prof. Guido Cora took part; and a committee was appointed to draft the resolution already quoted. The Congress then turned its attention to the Arctic regions, papers being presented by Admiral A. H. Markham, General Greely, Herr S. A. Andrée, and M. E. Payart. Herr Andrée's project for reaching the North Pole by means of balloons was somewhat severely criticised, but the author was confident of being able to meet all the difficulties suggested, and announced that he had already obtained the funds necessary for his expedition. A paper on Russian researches on a sea route to Siberia was afterwards read by Lieut.-Colonel de Shokalsky.

In the afternoon, General Annenkoff and Mr. J. Y. Buchanan presided over Section B, which dealt with papers relating to physical geography. M. le Comte de Bizemont presented a paper by M. G. Lennier on the modifications of the coasts of Normandy, and Prince Roland Bonaparte gave an account of researches on the periodic variations in French glaciers. After these were discussed, papers on the decimal division of time and angles, on the centesimal division of the right angle, on standard time, and on a system of symbolic hour zones, were read by M. le Dr. J. de Rey Pailhade, M. Louis Fabry (presented by M. Jacques Léotard), M. Bouthillier de Beaumont (presented by M. le Comte de Bizemont), and Prof. d'Italo Frassi, and a further discussion followed.

Section C, presided over by M. le Colonel Bassot and Colonel Sir Henry Thuillier, concerned itself with geodesy, and important papers were read on the geodetic operations of the Indian Survey, by General J. T. Walker, C.B., F.R.S., late Surveyor-General of India; the desirability of a geodetic con-

nection between the surveys of Russia and India, by Colonel T. H. Holdich, C.B. (read by Colonel Sir John Ardagh); the general levelling of France, by M. Charles Lallemand, Directeur du Service du nivellement général; the rise and progress of cartography in the Colony of the Cape of Good Hope, by A. de Smidt, late Surveyor-General of that colony; and on the geodetic survey of South Africa, by Dr. David Gill, F.R.S., Astronomer-General for Cape of Good Hope (communicated by Mr. A. de Smidt).

In the course of discussion the need of surveys of the Nile Valley in connection with the South African triangulation was emphasised.

On Tuesday, July 30, the general meeting was chiefly occupied with reports, and the discussion of resolutions already referred to. Section B was devoted to oceanography, under the presidency of Dr. John Murray. Mr. J. Y. Buchanan gave a retrospect of oceanography during the last twenty years, and read a paper, by the Prince of Monaco, on the work of the yacht *Princess Alice*. A paper on ocean currents and the methods of their observation, by Captain A. S. Thomson, was laid on the table; and Prof. W. Libbey, of Princeton, gave an account of some valuable researches on the relations of the Gulf Stream and the Labrador current. Prof. Libbey's investigations have afforded some remarkable results bearing on the migrations of fish on the eastern seaboard of the United States, and they form an interesting contribution to the study of certain problems in marine zoology. A paper by Prof. J. Thoulet, suggesting that geographical societies in towns situated near the coast should interest themselves in the oceanography of neighbouring seas, was laid on the table.

Section C, presided over by Prof. H. Cordier and Prof. J. J. Rein, discussed geographical orthography and definitions. Papers were read on the orthography of place-names by Mr. G. G. Chisholm; on geographical place-names in Europe and the East, by Dr. James Burgess; and on the transliteration and pronunciation of place-names, by Dr. Giuseppe Ricchieri.

Popular interest in the Congress probably reached its highest point at the general meeting on Wednesday (July 31), when the proceedings related exclusively to Africa and its development. Sir John Kirk read a paper on the suitability of tropical Africa for development by white races or under their superintendence, dealing with the possibilities of colonisation proper, the establishment of European settlements in places permitting of temporary residence, and the means whereby the native races may themselves be taught to aid in the development of the country. Count von Pfeil laid down the conditions of success in colonising tropical Africa, which he said were chiefly a thorough knowledge of the character of the country it was proposed to colonise, of tropical hygiene, and of the art of making the native take an active share in the work. Mr. Silva White's paper dealt with the problem from various points of view, the author concluding that tropical Africa is on the whole unsuitable for European colonisation, and that it is capable of only a limited degree of development as compared with other and still undeveloped regions of the world. Mr. H. M. Stanley, Mr. E. G. Ravenstein, M. Lionel Décle, and Slatin Pasha also presented communications to the meeting, and a discussion followed. General Chapman read a paper on the mapping of Africa, and a proposal was referred to a committee whose report includes the resolution given above. A paper on a cretographic map of Africa was read by Mr. Silva White, and another by M. Victor de Ternant, on French Africa, was laid on the table.

Only one of the sections met (Section C). The Presidents were Dr. A. Gregoriev and Prof. Libbey. Oceanographical papers were communicated by Prof. Otto Pettersson and Mr. H. N. Dickson, dealing with recent research in the North Sea. Prof. Pettersson submitted a scheme for an extension of the same work, and a committee was appointed to draw up the resolution afterwards adopted by the Congress. A paper on limnology as a branch of geography was then read by Prof. Forel, and after remarks by Prof. Anuchin, Prof. Halbfass, Prof. Fenck, Prof. Libbey, and M. de Krapotkine, Dr. H. R. Mill asked that his paper on "Limnology in the British Islands" be held as read. Señor F. A. Pezet gave an account of the counter-current "El Niño" on the coast of Northern Peru.

The general meeting of Thursday (August 1) opened with a return to the subject of Antarctic exploration. Mr. C. E. Borchgrevink, who had been unable to reach London in time for the meeting on Monday, read a paper on his voyage in the *Antarctic* to Victoria Land. Prof. C. M.

Kan read a paper on Western New Guinea, and future exploration in Australia was discussed by Mr. David Lindsay. A memoir on the Niger lakes, by M. Paul Vuillot, was laid on the table, and one on explorations in Madagascar, by M. E. F. Gautier, was communicated in abstract. In the absence of M. Maistre, who was to have read a paper on the hydrographic system of the Shari and Logone, Señor Don Torres Campos gave an account of the climatology of the Portuguese and Spanish colonies on the west coast of Africa.

Section B—Presidents, M. Levasseur and Mr. Ravenstein—received the following papers:—On the construction of a terrestrial globe on the scale of 1 : 100,000, by Prof. E. Reclus; on the construction of globes, by Signor Césare Pomba; the life and geographical works of Cassini de Thury, by M. Ludovic Drapeyron; an ethnographical map of Europe, by Herr V. von Haardt.

Prof. de Lapparent, Dr. John Murray, and Prof. Penck presided over Section C, where Prof. Palacky read a paper on the geographical element in evolution; Dr. E. Naumann, one on the fundamental lines of Anatolia and Central Asia; Dr. S. Passage, a third on laterite and red earth in Africa and India; and Mr. Henry G. Bryant, a fourth on the most northern Eskimos. The last paper described observations made in North and South Greenland during the Peary Relief Expeditions.

On Friday (August 2) the President communicated a paper to the general meeting, by Baron A. E. Nordenskiöld, on ancient charts and sailing directions. Prof. Hermann Wagner read a paper on the origin of the mediæval Italian nautical charts, which gave some interesting results as to the length of the mediæval nautical mile. Mr. Yule Oldham dealt with the place of mediæval manuscript maps in the study of the history of geographical discovery, and, in the course of remarks on this paper, Mr. Batalha-Reis announced the discovery of an authentic fifteenth century portrait of Prince Henry the Navigator, at Lisbon. The Congress received a number of presentations, and discussed various proposals and resolutions.

Section B—Presidents, Señor Don Torres Campos and M. le Prof. Levasseur—dealt with spæliology (or the science of caverns) and mountain structure. A paper on the method of investigating caverns, by M. E. A. Martel, was read; M. F. Schrader described new instruments and methods used in surveying the Pyrenees; and Prof. Rein gave an account of observations in the Spanish Sierra Nevada.

Dr. E. Naumann occupied the chair in Section C, in which Prof. Penck read an important paper on the morphology and terminology of land forms, and communications were received from Mr. Batalha-Reis on the definition of geography, and Prof. Gerland on earthquake observations.

On Saturday only a general meeting was held. General Annenkoff read a paper on the importance of geography in connection with the present agricultural and economical crisis, and the rest of the time was occupied with resolutions and reports. The President dissolved the Congress in a short concluding address, and bid the foreign visitors a hearty farewell.

After such well-filled days the Congress wisely devoted most of its evenings to recreation. Only two exceptions were made. On Monday night Prof. Libbey showed by the lantern a large number of photographs made in the north of Greenland; and on Thursday Dr. H. R. Mill gave a demonstration in the form of a lecture on the English lakes.

#### THE BRITISH MEDICAL ASSOCIATION.

THE sixty-third annual meeting of the British Medical Association, held in London last week, was the largest in the history of the Association, and one of the greatest assemblies of medical men ever known. Twenty-two years ago the Association held its annual meeting in London, but whereas at that time the membership was only 1500, the number now exceeds 16,000. A large number of foreign medical men were present at the meeting, among them being Prof. Stokvis, Dr. W. W. Keen, Dr. Apostoli, Prof. Mosso, Dr. Fraenkel, Dr. Farkas, Prof. Pozzi, Dr. Ottolighi, Prof. Lazarewitch, Prof. von Ranke, Prof. Baginsky, Dr. Hermann Biggs, Dr. Ball, Dr. Koster, Prof. Gayet, Dr. Meyer, Prof. Panas, Prof. Fuchs, Prof. Bowditch, Dr. L. A. Nékám, Prof. Baumlér, Prof. Martin, Dr. Cushine, Prof. Cordès, Prof. Hamburger, Prof. Marinesco, and Prof. Geikie. Sir T. Russell

Reynolds therefore presided over an assembly international in its main aims, and representing an Association as remarkable in its growth as it is high in its standing. It is only possible here to give a few extracts from some of the addresses and refer briefly to a part of the general work of the sections. For these reports we are indebted to the *British Medical Journal*, the organ of the Association. Sir T. Russell Reynolds took for the object of his address "the most striking fact of modern physiological, pathological, and therapeutical research, viz. the power of living things for both good and evil in the conservation of health and in the prevention or cure of disease." In the course of his remarks he said:—"The most important fact with regard to recent micro-biological research is the gradually-increasing appreciation of the fact that these lower forms of life exert, not necessarily mischievous, but, indeed, benignant influences on the human body, and that although the mode of their operation is not fully explained they take part in healthy processes, assisting normal functions, nay, indeed, it would seem sometimes producing them and warding off the malign effects of other influences to which we are habitually exposed. These bodies, to which we are indebted for this aid, operate partly by their chemic action and partly by what we must call a vital process, and by their cultivation outside the human body and their modification by passing through other organisms, can be made to exert a malign or a beneficial agency on man. It seems even in the range of possibility that at some time not very distant some other than 'the ancient mariner' may apply to them the far-reaching words of Coleridge, and exclaim—

O happy living things! no tongue  
Their beauty might declare;

\* \* \* \* \*

Sure my kind saint took pity on me,  
And I blessed them unaware.

"The third great revelation of the last twenty years is the wonderful protective and curative power of these living products. This, in a very wide sense, is not new. Of all the most powerful agents of destruction, the most violent have been derived from 'living' things; they are to be found in the animal and vegetable world, not in the mineral. In their most terrible malignity—such as in snake-bite, glanders, or hydrophobia—these need no human skill for their development; they are prepared in the laboratory of nature, and, alas! are only too ready to our hand. Next to these come the poisons of stinging things, and, after them, the more slowly operating and less deadly animal infections; some with indeed beneficial influence, as 'vaccinia'; others with local effects on the skin, but not often great disturbance of the general health.

"The vegetable kingdom can produce potent poisons, such as belladonna berries, aconite root and leaves, poppy juice, and the ignatium bean; but in order to render these more deadly the hand of man has to come in and prepare nicotine, strychnine, morphine, and the like; just as it may produce, from the mineral or quasi-mineral world, such potent agents as hydrocyanic acid, concentrated acids, and other dealers of destruction.

"The interest in these facts lies in the modern mode for their utilisation. The great potency of living products has led to very fanciful notions in therapeutics; and there have been those who, to cure diseases of organs, have given portions of the same but healthy organs of animals or of man or other animals. Again, the idea has been pronounced that even excreta were useful drugs, and that the diseased organs of man might effect a cure of those supposed to be afflicted in like manner.

"Curious as some of these details are, they are of real interest to us only as they lead up, through inoculation for small-pox, to our own Edward Jenner's discovery of vaccination, and then, through the researches of Pasteur, Lister, and Brown-Séquard, to our present state and plane of knowledge. It would seem now that there is scarcely any limit to what may be expected in the cure or prevention of disease; and the most striking of all phenomena is, to my mind, the probability of rendering an animal immune by the introduction into its organism of a healthy constituent of the body of another. This, if fully confirmed, will be the greatest veritable triumph of therapeutic and preventive medicine, instituted and guided by extended inquiry into comparative anatomy, physiology, and pathology. As in the human race or species there exist, as is well known, what may be termed 'idiosyncrasies'—by which is simply meant that as a matter of fact some people, and some people's families, escape epidemic diseases, whereas they are especially prone to take others to