

### COPENHAGEN CONGRESS ON THE TESTING OF MATERIALS OF CONSTRUCTION.

THE fifth Congress of the International Association for the testing of engineering materials met at Copenhagen on September 7-11. The attendance at this congress was very much larger than that at the previous meeting, which took place at Brussels three years ago. There was a particularly marked increase in the British representation, which had risen from about fifteen at Brussels to more than forty at Copenhagen. Among the British representatives were Mr. G. C. Lloyd, British member of council of the International Association, Mr. J. E. Stead, F.R.S., and Messrs. B. Blount, F. W. Harbord, L. Robertson, E. O. Sachs, F. Tomlinson, W. Rosenhain, and A. G. Roberts. Among the Continental members, Profs. Martens and Heyn (Berlin), H. Le Chatelier and L. Guillet (Paris), Messrs. Webster, Moldenke, Hatt, and Windsor-Richards (U.S.A.), were some of the best known. The membership of the congress thus very fully represented both engineering science and practice.

The formal opening of the congress took place in the presence of the King of Denmark in the large hall of the University of Copenhagen. The opening ceremony was performed in a few graceful words by the Crown Prince of Denmark. In his presidential address the president, Mr. Foss, explained the general aims of the association, and pointed out the fact that the present year was the twenty-fifth anniversary of the first inception of the association. He referred specially to the increased interest displayed in the present congress by British engineers, and said he hoped that this might lead to the establishment of a better mutual understanding between the Continental and the English-speaking engineers. An address by Mr. P. Larsen on the development of the Danish cement industry completed the proceedings, which were, however, considerably enlivened by the spirited rendering of a typically Scandinavian cantata by a choir of students.

The actual business of the congress, which occupied the mornings of September 8, 9, and 10, was divided into three sections, the meetings of which took place simultaneously in various rooms set apart for the purpose in the splendid Town Hall of Copenhagen, where every possible provision for the comfort and convenience of members had been thoughtfully made. Section A, being devoted to subjects connected with metals, was the largest as regards attendance, although Section B, devoted to cement and reinforced concrete, also attracted many members and much attention. Section C, devoted to miscellaneous materials, proved less important.

The papers and reports submitted to the three sections occupy the closely printed pages of several voluminous pamphlets, and these, as well as the discussions upon them, can only be indicated here in the briefest outline.

Section A devoted its first sitting to the subject of metallography, an official report of the progress of that science being presented by Prof. Heyn, of Berlin. The extent of this report, in which a considerable number of British papers are referred to in abstract, is striking evidence of the great strides which this new science has made—the period covered by this report marking an epoch through the loss of Dr. Sorby, the actual founder of the science. Although the report of Prof. Heyn referred to a large number of papers, some of considerable importance which have appeared in England and America were, no doubt inadvertently, omitted; in the discussion, therefore, it was suggested by Dr. Rosenhain that it would be desirable in the preparation of future progress reports of this kind to obtain the collaboration of competent members from each country with the view of compiling a complete triennial bibliography. Out of the subject-matter of this report a discussion arose as to the nature of the constituents of steel, in which Benedicks, Le Chatelier, and Heyn took part. A further and very satisfactory outcome of this discussion, followed by a private conference of some of the delegates, was the formulation of a set of international definitions referring to the nomenclature of the constituents of iron and steel; this set of definitions was placed before the congress under the unanimous recommendation of Messrs. Le Chatelier, Guillet, and Charpy (France), Heyn (Germany), Benedicks (Sweden), and Stead

and Rosenhain (England). The new term "meteral," suggested by Howe and Sauveur (U.S.A.), was accepted with the significance in the case of the constituent of a metal which attaches to the term "mineral" in the case of the constituents of a rock, complexes of two or more meterals to be known as "aggregates"; these terms having the great advantage of being of international applicability, and also fairly obvious in meaning, have met with general approval. The terms "martensite," "osmondite," "austenite," and "pearlite," as well as the already universal terms "ferrite" and "cementite," have received clear definitions; thus the new term "osmondite" is to denote that constituent which is present in partly hardened or tempered steels which no longer consist of either austenite or martensite, but contain an intermediate constituent which arises in the passage of martensite into pearlite; this constituent, which some authors have hitherto called "troostite," is now to be known as "osmondite," and it is hoped that the full definition adopted by the congress will free the term "osmondite" from the haze of controversy which has hitherto obscured the term "troostite." The two terms "troostite" and "sorbite" have been left entirely out of these international definitions in the hope that their use will either be entirely dropped or, at all events, accompanied in each case by a special definition.

The adoption of these definitions constitutes one of the few quite definite results attained by the congress; in most other matters the discussions either produced no definite conclusion or the questions under consideration were referred to international committees to be subsequently appointed by the council. Thus the question of slag-enclosures in steel, raised by a paper by Rosenhain, led to a discussion in which the general trend of opinion was strongly in the direction of attaching greater importance to these enclosures than has hitherto been done. Guillet proposed that in order to keep this matter before the congress a committee be appointed to consider the subject and to carry out investigations as to the nature of these slag-enclosures and their effect on the mechanical properties of steel, and this proposal was adopted.

The questions of hardness tests on the one hand and of impact tests on the other each occupied almost an entire day's session of Section A. In regard to hardness tests, the Brinell ball test found many ardent supporters, but, on the other hand, Dr. Ludwik, of Vienna, presented a paper emphasising the advantages of cone-indentation tests, and a cone-hardness testing machine of Swedish manufacture was shown which appeared to be a serious rival to the Brinell machine of Martens-Heyn, which is regarded as the standard machine in Germany. The British delegates directed attention to the "hardness" testing machines in which the rebound of a hardened falling weight is observed, as these appeared to be unknown on the Continent.

The importance of impact tests was recognised by all who took part in the lengthy discussion on this subject, but the importance of standardising what was still a purely empirical test was also insisted upon. After some opposition from the German section, the congress finally adopted a set of standard test-bars for notched bar single-blow impact tests, but although the Charpy impact tester appears to be widely recognised as a satisfactory machine, it was decided not to adopt definitely any one apparatus.

Perhaps the most difficult question with which the congress had to deal was that of the standardisation of specifications as between different countries; the acceptance of an international specification by the congress being a matter which would seriously affect the industrial interests of the countries concerned, much difficulty and some little friction inevitably arose. It was quite evident from the outset that the final adoption of any universal specification was not yet possible at the present congress, and in nearly every case the questions of unified specifications were referred back to their respective committees. Perhaps the largest amount of progress was reported by M. Guillet as chairman of the committee on specifications for copper; at a meeting of this committee, which took place just before the congress at Copenhagen, the members present were able to agree on most points of an international specification. Unfortunately, the attendance at this meet-



ing was not very large, but it is hoped that when the conclusions arrived at by this committee are circulated to all the members a universal agreement as to a specification very much on the lines of the British standard specification will be reached. In regard to iron and steel, the difficulties are much greater, but it is hoped that a nearer approach to agreement may be reached in time for the next congress; meanwhile, the only definite result in this direction is a carefully worded resolution indicating that the congress recommends the sale of pig-iron on a basis of chemical analysis alone, the old method of grading by fracture being discarded as too indefinite.

In Section B the papers dealing with reinforced concrete were first discussed, but the discussion was of a very general nature, the desire being widely expressed that methods of testing and experimenting should first of all be systematised and standardised. One of the subjects which received most attention was that of the action of sea-water on cement, the report by Poulsen describing the elaborate series of tests carried out on various points of the coast of Scandinavia from Esbjerg, in the south-west, to Vardö, at the extreme north of Norway, being very favourably received. Ultimately the section passed a resolution, combining one proposed by Mr. Sachs and another proposed by a French representative, setting up a committee to bring the whole question up to date for the next congress by preparing a summary of the papers already before the association, and also to carry out further experiments with specially prepared cements exposed to sea-water to test the influence of various percentages of sulphates.

In connection with cement-testing there was a good deal of heated discussion, principally as to the definition of a "standard sand," while Mr. Blount and his committee had to contend with some strong opposition in carrying their proposals in regard to volume-constancy tests.

A general business meeting of the congress took place on the concluding day (Saturday, September 11). After the formal business had been disposed of, Mr. J. E. Stead, F.R.S., was asked to deliver his lecture on the practical application of the microscopic examination of metals at the present time. So little time remained, however, that Mr. Stead could only give a very brief summary of his subject-matter, the lantern-slides being, however, shown in the afternoon by special request. While the report of Heyn on the progress of metallography had summarised the work of laboratories and investigators, Mr. Stead dealt with the use of the microscope in works practice, and was able to give an account of the manner in which microscopic methods were employed by a large number of firms both in England and in America. Examples of successful application of microscopic methods in the case of cast-iron, steel, copper, brass, and many other metals were given, the names of the firms in question being stated, including all those best known in their respective industries. The use of the microscope in the investigation of failures and breakages was finally described.

In addition to the actual business of the congress, the programme arranged by the reception committee included a large number of interesting visits and excursions; these included the new railway repair workshops, the works of Messrs. Burmeister and Wain, where shipbuilding is carried on, the Royal Danish Porcelain Works, and a number of municipal institutions, such as the electric power station, the refuse destructor, &c., as well as the newly organised State testing laboratories, the great breweries of Carlsberg and the fine museums endowed from their profits. The evenings of the congress week were occupied by a series of brilliant functions, including a reception by the Danish Society of Engineers, another by the Municipality of Copenhagen, a special performance at the Royal Opera House, and, finally, excursions to Sgodsborg and to Elsinore on the Oresund; the former, carried out by means of a steamer, which first took the party around the harbour of Copenhagen, was especially enjoyable, and it was followed by an informal dinner of huge dimensions (more than 900 sat down) at the beautifully situated Sgodsborg Hotel. Our Danish hosts were most warmly hospitable, and everything was done to make the impressions of Copenhagen as pleasant as possible—

even the weather was favourable, so that the 500 visiting engineers saw Copenhagen at its very best. Although it may perhaps be said that no very striking decisions have been reached at this congress, it has undoubtedly served a very valuable purpose in bringing together a large number of scientific and technical workers who had hitherto known one another by correspondence only. Linguistic difficulties were, of course, of frequent occurrence, but willing interpreters were generally at hand; the discussions of the congress were, as a rule, translated into the three official languages—a difficult task, in which one or two of the British delegates displayed considerable activity. In fact, it was a widely expressed feeling—not a little gratifying to the British representatives—that at this congress there was much evidence of the fact that a great revival in matters of applied science had taken place in England since the last meeting of the congress. It is to be hoped that when the congress meets next—in America in 1912—still further evidence of this revival will make itself felt. Adequate British representation at these congresses is of great importance, not only in securing the due consideration of British interests, but also in securing due respect for British achievements and British capacity—respect which will help to promote the cause of universal peace.

#### GERMAN BOTANICAL CONGRESS.

A FEW years ago the three German societies specially interested in one or other branch of botany agreed to meet in the same district and at the same time each year, and the arrangement has proved so advantageous that it has become permanent. This year the societies met at Geisenheim, on the Rhine, in the Rheingau. The Botanical Institute at Geisenheim, where the meetings were held, is liberally supported by the Prussian Government, and in most respects seems ideal. Both staff and students are well housed on the spacious premises, and the courses are arranged to suit many different types of students. Owing, however, to the continuity of courses throughout the year, there is no regular vacation for the staff, the members of which must in time, one would think, lose somewhat in vigour and freshness of teaching. The institute exists for the promotion of the interests, scientific and practical, of the vineyard, and its wine, and of the fruit and vegetable industries.

There are separate buildings for chemistry, plant physiology, pathology, and fermentation, each fully equipped and under its own chief. The connection between science and practice is very intimate, and research is encouraged. From the fermentation station pure yeast cultures are sent all over the world. The whole institute is under the able administration of Prof. Wortmann, to whom the success of this year's meeting is largely due.

Naturally, several papers on the vine and on wine, too specialised for general notice, were contributed by experts. Attention was directed to the fungus *Rhacodium cellare*, which lives on cork, and causes the deterioration of wine in store. Sound sterilised corks, replaced unconditionally each year, are a necessary precaution against the damage wrought by this trouble.

Much of the time of the economic botanists was occupied by papers on the potato and its diseases. Particular attention was directed to the disease called "leaf-roll," not to be confused with "leaf-curl." Alarmist reports of the extent of the disease and of the injury it was inflicting appeared in the German Press last year. Though these reports have been shown to be exaggerated, the disease is clearly doing much harm. It is, as the writer noticed, widely spread in many parts of Ireland, but not yet recorded for Great Britain, or for France (judging from a conversation recently with M. Maublanc at the Pathological Institute in Paris). There are several features of striking interest in connection with leaf-roll. It is generally recognisable by the more or less dwarfed, stunted haulms, and the inrolled, often more or less coloured, leaflets. In leaf-curl the surface of the leaflets is crumpled. In the first year of attack the tubers may appear sound and of normal weight. The disease is, however, in them, as shown by the next year's diminished, diseased crop. Appel's view, that *Fusarium* is generally present in the