



THE GREAT EXPOSITION—LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

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VIENNA WELT-AUSSTELLUNG, JUNE, 1873.

Probably every engineer who has come to visit the *Welt-Ausstellung* is greatly disappointed in his search for novelties in mechanism, or for evidence of important improvements in methods and processes of production. There seems almost nothing to be found, throughout this vast collection, which can be considered both new and important. What there is of machinery that is newest and most interesting is said, by the majority, if not all, of those who refer to the subject, to be in the United States section, where also may be found, frequently, the originals from which exhibits in other sections have evidently been copied. Not a day passes without some new example of imitation of American designs, and often of precise *fac similes* of our standard machines, presenting itself. Our own exhibit, with which we have been so greatly dissatisfied on the score of its small extent and its incompleteness, appears decidedly creditable in its marked characteristics of excellence and originality when compared with those of other nations. It is far in advance of them all.

GREAT BRITAIN

covers a larger area, in consequence of her requirements of space for textile machinery, but the number of her exhibits is less than those from the United States. Great Britain gives evidence, always observable in her departments at these exhibitions, that her mechanics are workmen of the very highest class, and that British machinery is as notable for its solidity, strength, and durability, and for excellence of workman hip, as is that from our own country for its originality and its ingenuity.

FRANCE

displays a considerable amount of machinery which, lacking preëminence in those qualities which distinguish the two great English speaking nations, is still excellent and highly creditable. In scientific apparatus, and machinery which must be classed by itself as intermediate in character between the industrial and the purely scientific, the French excel.

Other nations present exhibits which contain some exceedingly creditable examples of good design and workmanship, and which, particularly those of

GERMANY AND AUSTRIA,

are of great extent. They are almost invariably, however, very barren of really original designs, and, judging from this display, the observer is very much inclined to conclude that the talent for invention which is the leading characteristic of our mechanics is a very rare attribute among these people.

ITALY

has made a magnificent display in the Industrial Palace, and in the Fine Art gallery, where elegant textile fabrics, beautiful *bijouterie*, splendid paintings, and life like statuary prove that she is still foremost in all that most delights the artistic mind; but in the Machinery Hall she presents no single strikingly meritorious production, and the impression made upon the engineer who looks through the collection is that he is inspecting a museum of antiquities rather than of the newest and best machinery which that country has produced.

SWITZERLAND AND BELGIUM

exhibit some excellent examples of standard machines, neat in design, well built and well finished.

The most beautifully finished work in the whole exposition is probably that sent by the Creusot works, in the south of France. A small compound marine steam engine, of the Napier type, and a locomotive for heavy work, have been constructed of the best of materials, and have been given a finish which is simply magnificent.

Metal products, iron ores, and iron and steel particularly, are exhibited by all those nations which produce for the world—with the exception of the United States—in large quantity and of splendid quality. The steel is usually the product of

THE BESSEMER PROCESS,

and the facility with which every grade can be obtained is here illustrated, not only by beautiful specimens of every degree of carbonization, but by a wonderful variety of manufactured articles, in which every quality finds its most appropriate application. The fact that we are rapidly passing from the iron age to the age of steel is here most fully and

convincingly exhibited. In truth, it would seem as though the transition had actually taken place.

The low grades of Bessemer metal, containing in the neighborhood of one half per centum of carbon, are vastly stronger than iron; and this strength, together with its ductility, malleability, and homogeneity, makes it vastly preferable, for almost every use, to any iron. Bessemer metal is already becoming nearly as inexpensive as the better grades of iron, and it cannot be long before the rapid extension of Bessemer manufactures, and the still rapid succession of improvements in the details of the method and of the apparatus, shall so far reduce its cost as to permit its substitution for iron for nearly all uses.

Here, it may be said in parenthesis, may be found one of the most promising signs of the times for the prosperity of our own country. Really good Bessemer metal can only be made from superior qualities of ores, and nowhere in the world can these good ores be found in such quantities, so widely distributed or so accessible, as in the United States. There seems no reason why, in a very few years, these great advantages, together with our wealth in good fuels, should not place us in a position to supply not only our own great and rapidly growing market, but even—improbable as the idea may appear—to export largely to countries which have but limited mineral resources, or which, like Great Britain, are yearly finding both the natural and the politico-industrial obstacles to further progress becoming more and more serious.

The noble exhibits made in this department by well known English, French, Belgian, and German firms are precisely what the well informed might have anticipated; but probably few visitors were aware, until the evidence was presented here, of the vast mineral wealth, and of the degree of development of the resources of the Austrian empire. The

STAATS EISENBAHN

exhibit occupies a building by itself, and affords a most interesting illustration. Several hundred miles southeast of Vienna, among the Carpathian mountains, is the Hungarian town of Resicza, where the manufacturing establishments of this railroad are situated. There have been brought from thence and placed on exhibition some of the finest of iron ores, which are to be found there in great variety. A very excellent coal is obtained from a vein of which a large section is exhibited. The principal vein is said to be 29½ feet in thickness. Several immense ingots of Bessemer metal, made with this fuel from these ores, are exhibited, and also a large number of samples of every grade, broken to show the character of the material by the appearance of the fracture, or bent or tied into knots to exhibit its immense toughness and ductility. Parts of machines, as shafts and rods, difficult shapes, plates of various thickness, tools and manufactured articles of hundreds of different sorts, all made of steel, illustrate at once its wonderful power of adaptation to all purposes, and exhibit the extent to which the "Staats Eisenbahn Gesellschaft" have developed their Hungarian possessions.

Prince Schwarzenburg, who invited us to visit his immense estate at

WITTINGAU

a few days ago, and who there exhibited to our astonished republicans an illustration of the old feudal system in its most unobjectionable form, has also a *pavilion* of his own which is equally interesting. The most careless observer cannot fail to find the most interesting evidences on all sides of the magnificent, but as yet imperfectly developed, natural resources of this great Austro-Hungarian Empire. When the proprietors of this fertile soil shall have imbibed something of the energy and the enterprise of our venerable host of Horskysfeld, and shall have profited well by the opportunity which is now offered them of introducing the agricultural machinery which our inventors have brought to such perfection, and when these valuable mines shall have been developed, and manufactures shall have become well established here, the world is likely to see a national development which has been, as yet, quite unanticipated by foreigners generally.

There are still other illustrations to be observed here of the splendid future which may be secured to the country should a wise policy, liberalizing its government, wake up and educate its people and develop its natural advantages. The good work seems begun; and, if the management of affairs is allowed to remain in as good hands as those which have conducted the great enterprise which has now attracted representatives of all nations to Vienna, it may be confidently hoped that it will be uninterrupted.

GERMANY

is best represented by the contributions of Fred. Krupp, from his immense establishment at Essen. A block of crucible steel, weighing a hundred thousand pounds, illustrates the great capacity of the steel-making department. It has been worked into shape by the great fifty ton steam hammer, which is one of the wonders of Essen. A steel cranked axle for a locomotive is a splendid piece of work, and smaller straight axles, intended for cars and for tenders, are very fine examples of hammer finish; and a considerable number of specimens of locomotive work are of the same admirable quality. Some of these are of Bessemer metal. Krupp evidently takes much pride in his artillery manufacture, and if his exhibits here are average specimens of his work, he has most excellent reason for it. A considerable number of guns for both land and sea are exhibited. On one of the largest he has adopted the "Ericsson compressor," which is one of the most beautiful and effective contrivances of its inventor. The guns are generally breech loading, are rifled

with a large number of narrow grooves, and are mounted on iron carriages. The largest gun has a caliber of 305 millimeters—twelve inches—and weighs 36,600 kilogrammes, 80,000 pounds. It has a magnificent finish, and is made of beautifully homogeneous metal. These are built guns, or, as the maker describes them, are constructed upon the "ring system" of Armstrong. In most cases, the recoil of the gun is taken up by a very neat form of "hydraulic" gear, which we should expect to work well, and which experiment is claimed to have proved satisfactory.

Among British exhibitors, Cammell & Co., John Brown & Co., Vavasseur, and Armstrong & Co. compete to some extent with Krupp. The two first named present fine examples of heavy work, and their

ARMOR PLATES

attract much attention. Several are shown which heavy shot have been driven against, making deep indentations which are bordered, in some instances, by a sharp fin, forming a kind of collar and showing well the fine quality of the metal. The other firms exhibit heavy and well built guns. Several torpedoes are exhibited, which are principally noticeable as reminders of the revolution which seems impending in the methods of naval warfare—a revolution which was inaugurated as long ago, at least, as the time of our revolutionary war, and which has exhibited its greatest progress in the United States, where Bushnell, Robert Fulton, John P. Taylor, and other inventors of an earlier period, and Ericsson, Lay, and others of our contemporary engineers, have proved that it promises to change completely the tactics and the *matériel* of navies at a very early date.

There are many special exhibits which are nearly as interesting as any already referred to, and we may be able to find time for their examination at some future period.

R. H. T.

Correspondence.

Testing Steam Boilers.

To the Editor of the Scientific American:

In a late issue of your paper, you mention the need of an iron clad man to take charge of old worn out steam boilers. No doubt it would be a money-making invention; but as the demand would be greater than the supply, we should be no better off than we are now. But why do we not have the same system of boiler inspection and testing, and the examination of engineers, on land as we have on the sea? In this place, there are four saw mills; in two of them there are 130 men at work; and the engineers in both of these mills are men who know nothing about their business, except how to stop and start their engines. One of the boilers is worn out; but what remedy is there? None. On the other hand, there are four tug boats in this harbor (two of them are only allowed to run inside the harbor); and on these, each engineer has to have a license, for which he pays \$10. The boilers have to be tested once a year, and the engineers' certificates renewed. Now, have the engineers on those tugs (each carrying three persons) any more responsibility than those in the mills mentioned? What we want are a strict law in regard to testing boilers and a strict inspection of engineers, as we have on board boats. Let insurance companies refuse to take risks on buildings using steam power unless the owners have an inspector's certificate. Let a law be passed, compelling all men using steam power to employ no engineers but such as have passed the required examination. Who will set the ball rolling? We look to you to start it, and to all sensible men to keep it in motion.

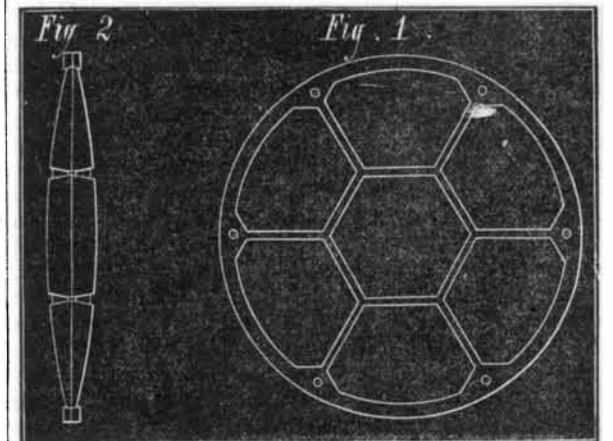
Frankfort, Mich.

ENGINEER.

The Million Dollar Telescope.

To the Editor of the Scientific American:

The plan, shown in Figs. 1 and 2, of constructing a large object glass, with polygonal lenses having the same focus and arranged in a metallic frame, has been suggested as the probable solution of the great telescope problem. I desire



to call further attention to this plan, and request those who have evidence of its impracticability to bring it forward. With means now at our command, an object glass of this kind can be constructed with a diameter of five feet, and very possibly six feet. If a 25 inch glass can be furnished for \$50,000, one of 60 inches should not exceed \$600,000. Of the proposed million dollars, this would leave \$400,000 for machinery, mounting, etc., which would probably be sufficient, although it is no small task to build a tube 75 or 100 feet long, and mount it in the air so that it shall have sufficient stability and yet be easily managed. Of course the field would be divided by dark bands into polygonal sections similar to the object glass; but would this be a serious objection? I think not.

F. H. R.

New Britain, Conn.