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THE AMERICAN IRON TRADE FOR 1896.

If a copy of the statistics of the American Iron Trade for 1896 were put into the hands of a student fresh from a course of lectures on political economy, his belief in one of the cardinal truths of this science would be liable to receive a rude shock in the first few pages of the pamphlet. If the "cost of production determines the selling price," how comes it, he will ask, that the first pages of the "statistics" are taken up very largely with an account of various influences which caused the violent fluctuations in price of the past year? The "wire nail pool" came to an end about December 1, 1896, and "prices dropped rapidly." Its fate is shared by the "billet pool," and a similar fall in prices is noted. In May the "beam pool went to pieces" and prices experienced a simultaneous fall. An examination by the author of the statistics into the causes of low prices and depression leads to the conclusion that, though some of them may be "occult and intangible," there are two that are plainly visible—the distrust of the country's future due to the silver movement, and the pressure upon prices and profits of a capacity of production which is greatly in excess of our powers of consumption. A similar cause to the last is the reckless construction of unnecessary railroads which have since become bankrupt; and the wrecking of other railroads, which were needed, by hostile State and national legislation is also noted.

It is satisfactory to note the great increase which has taken place during the last few years in both our exports and manufactures of iron and steel. This has been particularly marked in the calendar years 1895 and 1896, our exports for these years being respectively \$35,071,563 and \$48,670,218. In each of the last four years our exports have exceeded our imports, the aggregate exports amounting to \$143,844,873 and the aggregate imports being \$95,778,838. The decline in imports is due to decreased demand for foreign tin plates and to the low price of our iron and steel. Our increased exports are due to the same low prices, though this increase has brought no appreciable relief to our glutted markets.

Since the close of the civil war there have been four periods of particularly low prices for iron and steel, the first occurring after the panic of 1873. The rate given in the following table is per long ton, except for bar iron, which is quoted by the 100 pounds.

Table with 5 columns: Articles, 1873-9, 1884-5, 1891-3, 1896-7. Rows include No. 1 foundry pig iron, Gray forge pig iron, Bessemer pig iron, Old iron T rails, Best bar iron, Steel rails.

There is a decrease in the production of all kinds of material except open hearth steel. There was a decrease of 5 per cent in the amount of iron ore mined; the output of pig iron decreased 8.7 per cent; Bessemer steel ingots, 20.1 per cent; other steel than open hearth decreased 13.6 per cent; structural shapes, 4.3 per cent; Bessemer rails, 14 per cent; wire rods, 21.1 per cent; wire nails, 19.1 per cent; cut nails, 24.1 per cent; open hearth steel (the one exception) showing an increase of 14.2 per cent. The following table gives the totals of production for the years 1895 and 1896:

Table with 3 columns: Total production, 1895, 1896. Rows include Pig iron, Bessemer steel ingots, Structural shapes, Open hearth steel, Crucible steel, Bessemer rails, Wire rods, Wire nails, Cut nails.

Although there has been a decrease of nearly a million tons in the total production of pig iron, it is noteworthy that the growth of the industry in the Southern States continues, Alabama, Virginia and Tennessee coming fourth, fifth and sixth in the list. Pennsylvania, of course, stands first, its output being 4,024,166 tons or 46 per cent of the total production of pig iron in 1896; Ohio produced 14 per cent; Illinois and Alabama each produced over 10 per cent of the total, and Virginia over 4 per cent. All the other States fell below 3 per cent. The largest falling off is in Pennsylvania, where the decrease was over 675,000 tons.

There is a small increase in the production of Bessemer steel compared with the averages of recent years, which has been somewhat more than 3,500,000 tons. The falling off in the production of Bessemer steel rails will not surprise any one who is familiar with recent railroad history and present conditions in this country. The extraordinary activity in railroad construction between the years 1885 and 1892, when the total construction for one year alone reached a total of over 12,000 miles, will explain the enormous demand for steel rails. At the close of that period some of the ablest railroad men in the country gave warning that the country was being over-supplied and stated that most

of the country contained more railroads than would meet its needs for the next quarter of a century. The disaster which speedily overtook a large proportion of the roads, and the present depressed condition of those that did not go into the hands of receivers, has verified their forecast of the situation, and explains the great falling off in the total production of Bessemer rails. The total mileage upon which rails were laid in 1895 was 1,922 miles and in 1896 it was even less, being only 1,850. These figures are the lowest since the year 1875. Pennsylvania leads the States in the production of rolled iron and steel, having made 56.8 per cent of the total production of rolled iron and steel in 1896, against 56.4 per cent in 1895; Ohio made 13.9 per cent in 1896, against 14.4 per cent in 1895; Illinois made 10.7 per cent in 1896, against 10.1 per cent in 1895; and Indiana made 3.5 per cent of the total product in 1896. No other State produced 3 per cent in that year. Texas and Iowa were the only States having rolling mills located within their borders which did not roll either iron or steel in 1896.

One of the most interesting tables in the statistics is that of the world's great pig iron producers. In 1869 the United States produced 1,711,287 tons, Great Britain 5,445,757 tons, and Germany and Luxemburg combined 1,409,429 tons. A dozen years later, in 1881, the United States produced 4,144,254 tons, Great Britain 8,144,449 tons, and Germany and Luxemburg 2,914,009 tons. In the following ten years the United States not only doubled its own output but surpassed the total for Great Britain, the respective totals being 9,202,703 and 7,904,214 tons, Germany and Luxemburg producing 4,658,450 tons. We lost the lead to Great Britain in 1894 but regained it the following year, when we reached our maximum figure of 9,446,308 tons. The figures for 1896 are: United States, 8,623,127 tons; Great Britain, 8,563,209 tons; and Germany and Luxemburg, 6,374,816 tons. Of late years the most striking fact has been the rapid advance of the industry in other countries than the United States and Great Britain. At present, out of a total world's production of about 16,500,000 tons of crude steel, the latter countries together produce more than 9,500,000 tons, while all other countries combined produce 7,000,000 tons. When we bear in mind that half a dozen years ago all other countries produced only 4,400,000 tons, it is evident that if the present rates of increase continue, the combined output of the United States and Great Britain will be less than that of the rest of the world combined.

THE BRITISH ASSOCIATION MEETING.

To all who are interested in the promotion of useful knowledge for the general benefit of the race, the annual meetings of the British Association for the Advancement of Science have come to be looked forward to as seasons of special advantage, rich alike in their unfolding to the popular eye of the progress made in many branches of science for the preceding year and the promises held out and guide marks placed for future advancement.

In our last week's issue we gave a summary of the principal papers discussed at the meeting of the American Association, working on similar lines, and held a week earlier. The British Association meeting was held at Toronto, Canada, its sessions continuing from August 18 to August 25. The fact that the meeting this year was held on this side of the Atlantic, and that it came so soon after the magnificent celebration of the Queen's Jubilee, contributed not a little, no doubt, to the splendid enthusiasm with which the visiting scientists were received by our Canadian neighbors, and which was heartily participated in as well by a large delegation of American representatives of scientific advancement. The occasion also brought vividly to mind the former meeting of the British Association at Montreal, in 1884, the first that had ever been held outside of the United Kingdom, and the ensuing series of visits then made by representative foreign scientists to various great industrial establishments and notable engineering works in the United States. It was then that, for the first time, the gigantic strides which this country was making in many lines came to be fully appreciated, and, in the iron and steel manufacture, especially, it was felt that we were not only dangerous competitors in a field where England had heretofore claimed undoubted primacy, but that we were working in a direction and with a skill likely to give us the lead. The facts then so plainly set forth have acted as a spur to foreign manufacturers ever since, and consumers everywhere have reaped the benefit in better goods at lower prices.

At the meeting this year among the eminent foreigners present were Lord Kelvin, Lord Rayleigh, Prof. Roberts-Austen, and Messrs. Preece and Lodge, the famous electricians; Lord Lister, the father of antiseptic surgery, and last year's president; Prof. William Ramsay, who was associated with Lord Rayleigh in the discovery of argon, and who alone is entitled to the glory of first finding helium in terrestrial minerals; Sir John Evans, the new president; Prof. John Milne, recently of the University of Tokio, where he investigated the phenomena of earthquakes extensively; Prof. William Cawthorne

Unwin, one of the engineering experts who counseled the Cataract Construction Company when Niagara was harnessed; Sir Bosdin Leech, chief engineer of the Manchester Ship Canal; Prof. James Bryce, author of "The American Commonwealth;" and sixty or seventy others, who enjoy a high reputation in England, Scotland or Ireland, by reason of their professional activity in some department of science. A great many public and social or semisocial functions, with various excursions to different points of interest, including a visit to the Niagara Falls power plant, were pleasant features of the occasion, into which all seemed to enter most enjoyably.

In his opening address the president, Sir John Evans, said that he would undertake no general review of recent scientific progress, but would discuss a question belonging to his own special field of study.

ARCHÆOLOGY.

The relations which chemistry, mineralogy and history bore to this science, he said, were important, but the aid of geology and paleontology was imperative, if one inquired into the antiquity of man. When in 1859 human remains were found in the valley of the Somme, in France, in gravels that also yielded bones of the mammoth and the woolly rhinoceros, the coexistence of man with these animals in the quaternary period was established for a time. After the first excitement had subsided, there was a tendency among scientists to cut down the lapse of ages necessary to account for the changes in the earth's surface which had occurred since those gravels were deposited. He, however, sympathized with the view taken by Sir Charles Lyell that such penuriousness was a mistake. Many at the present day had got over this feeling, and of late years the general tendency of those engaged on the questions had been in the direction of seeking for evidence by which the existence of man on earth could be carried back to a period earlier than the quaternary gravels. The speaker cited some of the attempts in this direction. He was himself not satisfied with the supposed discovery of flint implements in pre-glacial deposits in the eastern counties of England, because they resembled too closely those of post-glacial times there, nor could he yet accept the evidence of the Norfolk Pliocene forest bed, where flints had been found within a few months that looked as if they had been worked by human hands. This alleged discovery and similar ones in France, Italy and Portugal were accepted by some geologists, but they were too few and too isolated to satisfy Sir John. Nevertheless, he did not despair of obtaining proof of man having lived in the tertiary period. Sir John did not indulge in specific figures, but effectively emphasized the remoteness of time to which belonged the earliest blunt stone implements of the paleolithic era in western Europe. He believed, however, that man existed before this in southern and eastern Asia. This, in fact, he considered the birthplace of the race, and he favored special investigations in that part of the globe.

This address will be published entire, as well as the other most valuable papers presented at the meeting, in current issues of the SCIENTIFIC AMERICAN SUPPLEMENT.

GEOGRAPHY.

Before the geographical section, Dr. J. Scott Keltie, for many years secretary of the Royal Geographical Society, said he considered the present problem of this science in Europe, the region most in need of exploration being Albania. In Asia there was work to be done in the Malay Peninsula and Southern and Central Arabia. But the chief stress was laid upon the district lying between the Himalayas and the forbidden city of Lhasa, in Thibet. Parts of China, too, were still a blank on the maps, and there was something to learn about the source of the Irrawaddy River. In Africa it was desirable to explore the Central and Western Sahara, the region south of Abyssinia and northwest of Lake Rudolf and the highlands of British East Africa. On the latter Dr. Keltie remarked that it might be necessary to find homes for future generations when the United States and Canada became over-populated. The discovery by the young geographer and biologist, Moore, of salt water fauna near Lake Tanganyika, showing that that country had once been beneath the ocean, was an important revelation and indicated what fine surprises yet awaited the intelligent investigator. In the Arctic region the archipelago of North America was one now most needing attention. The speaker enlarged also on the desirability of studying Antarctic territory.

MATHEMATICS AND PHYSICS.

In this section Prof. A. R. Forsyth, of Cambridge University, made a forcible plea for the study of mathematics, not only in its relation to other branches of knowledge, but for its own sake. Lord Kelvin dwelt on the immense practical importance of mathematics, and said such work as harnessing Niagara was impossible without a thorough grasp of the higher mathematics. He dwelt, too, on the rapid spread of the study of this science by engineers in the last twenty years. An hour later an eminent city engineer of Liverpool, George Frederick Deacon, uttered an opinion seemingly contradictory to Lord Kelvin's. Mr. Deacon once

worked in the laboratory of Sir William Thomson (now Lord Kelvin), and accompanied the latter on the expedition which laid the first successful Atlantic cable, in 1865. As president of the mechanical science section he discussed the education which young engineers ought to have. He commended the technical schools of the United States and Canada as superior to many in England in extent of the workshop practice provided for students. This he considered more valuable than some of the mathematical training given them. College bred men were not always the most successful engineers. Well directed observation and long experience were secrets of success.

THE WORLD'S FUEL SUPPLY.

At another session of this section, Lord Kelvin discussed the world's fuel supply and air supply in a highly original manner. By fuel he meant not only heat, coal and oil, but existing forests and mould; in fact, all ancient and modern vegetation. Referring to the familiar phenomenon of plant life, that it absorbs carbonic acid and throws off oxygen, he argued there was possibly, even probably, a distinct relation between the amount of oxygen gas in the earth's atmosphere and the amount of vegetation past and present. Three tons of oxygen are required to burn one ton of standard fuel. Consequently, he would assume that for every three tons of oxygen in the air one ton of fuel had come into existence. The outcome of this rough computation was 340,000,000 tons of fuel.

PROF. RAMSAY LOOKING FOR ANOTHER ELEMENT.

Prof. William Ramsay, of London, who divides with Lord Rayleigh the honor of discovering the new element in the atmosphere which they named argon, presided over the chemical section. His address was devoted to showing why he expected still another element would in time be found resembling both helium and argon in some respects. Chemists were familiar with several groups of three elements each, in which the difference in atomic weight between the first and the third members was 36. The atomic weight of helium was first placed at 4, and that of argon at 40. Eventually both of these figures would be reduced somewhat, but the interval would probably remain about the same. He was thus led to believe that another member would be found for this group to fill a vacancy between helium and argon. Such discoveries, based on Mendeleef's "Periodic Law," have been predicted and made before this. Prof. Ramsay and his assistant have already examined an extraordinary number of substances in the hope of finding the unknown gas, but so far without success. The speaker expressed his own confidence in the soundness of Mendeleef's law, in spite of some discrepancies between the actual atomic weights of many elements and the weights which the theory demands.

THE HUMAN STRUCTURE.

In the anthropological section, its president, Sir William Turner, of Edinburgh, spoke of "Some Distinctive Characters of Human Structure." Some of the peculiar features of man's frame, he said, are the curvature of his spine, the crooked way in which the thigh bone fits into the hip, the greater freedom and grace of the movements of the legs than are possible with apes and lower animals, the more highly developed hand and certain characteristics of the foot. All of these, interesting and significant as they are, are overshadowed by the superiority of the brain in relative weight and in complicated structure. Boys' brains at birth weigh more than girls'. The brains of men of intellectual eminence weigh fifty-five or sixty ounces on the average, while imbeciles may have only thirty ounces. The mean internal capacity of the craniums of adult Europeans is about one thousand five hundred cubic centimeters, and in Australian aborigines one thousand two hundred and eighty. That of adult male gorillas is about four hundred and ninety.

THE PARIS EXPOSITION OF 1900.

The French stand easily first among the peoples of the world in the matter of getting up fetes and shows and in arranging pageants which shall have the highest spectacular effects. The world of fashion has always looked to Paris for its leaders, and those in pursuit of pleasure for its own sake have made their Mecca on the banks of the Seine. How much of the idea of the Paris Exposition of 1900 is to be attributed to the desire to make of it something far larger and more splendid than ever before achieved, with the view of making Paris itself more attractive, and how much is due to French ambition for a comparison of their educational, industrial and material progress with the best the world can show, it is not at all important to define. The French government and people are working to make the exposition one which will far surpass all its predecessors, as well in the extent and variety of the exhibits as in the pomp and magnificence of the splendid accompanying fetes and entertainments, and it is safe to say that never before were plans for such a project more thoroughly elaborated or more completely worked out, down to the finest detail.

The importance of a good representation of the United States at the exposition is generally conceded,

primarily, from the fact that our growth in many lines of manufacture has now reached such proportions that further material increase cannot well be looked for, unless we can sell largely in foreign as well as the home markets.

Our ability to successfully compete with foreign manufacturers in their own markets, in many lines of manufactured goods, cannot be doubted, and some efforts in this direction have already met with marked success, but the exposition will afford an opportunity to put such representation on a better basis, and to effectively bring American goods more thoroughly before foreign buyers than ever before. To the end, therefore, that our participation in the exposition may be fully representative, and that American manufacturers may have sufficient space allotted them, Major Handy, the United States commissioner, intends to apply for 500,000 feet to be devoted to exhibits from the United States.

Commissioner Handy sailed for Europe last week, intending to return and report to Congress at its next session, giving all available information to intending exhibitors, and asking for a liberal appropriation from the government, that the United States may be creditably represented.

MOUNT ST. ELIAS ASCENDED.

Prince Luigi of Savoy and his party of Italian mountain climbers are now on their way back to Italy after accomplishing the feat of scaling Mt. St. Elias. The party included Prince Luigi, Lieut. Cagni, Dr. Phillippi and Vittorio Sella, the well known photographer of mountain views. The expedition sailed from Seattle in June and reached Yakutat Bay on July 22. A landing was made with some difficulty and the overland trip was begun. They took with them over 6,000 pounds of provisions. After six days travel inland Malaspina glacier was reached. The glacier is twenty miles wide, and it took four days to cross it. They crossed various other glaciers and passes and finally reached Mt. St. Elias. At the foot of Mt. Newton glacier the American party of Mr. Bryant was met; they had abandoned the project and were returning. Here the Italian members of Prince Luigi's party were left. The prince was, it seems, jealous that any save his countrymen should have the honor of climbing with him the summit of the lofty mountain, which was ungracious, to say the least.

The ascent of Mt. St. Elias began on Friday, July 30, and after seven hours hard climbing they arrived at the top of the divide; here a tent was pitched and a few hours of much needed rest were taken. Then the ascent began again, and four hours from the divide saw them standing on the top of the mountain. About two hours were spent on the peak, and during this time much was done in the way of scientific observations and Signor Sella secured some very fine negatives from the summit. The descent occupied about two hours, the mountaineers sliding most of the way down, and the camp was reached at nightfall. The dreary backward journey over the glaciers was accomplished without accident. The actual height is, according to Prof. Davidson, 18,060 feet. A number of previous attempts have been made to ascend Mt. St. Elias, which was discovered by Behring on St. Elias day, 1741.

WILL ASCERTAIN THE VALUE OF CALCIUM CARBIDE.

The American Druggist and Pharmaceutical Record, under the head of "Tariff Problems Considered," says the Treasury Department will send out a special agent to make an investigation of the value and market price of calcium carbide. This article is used in the manufacture of acetylene gas, a product which is now being extensively exploited by a large syndicate, which controls the patents under which it is manufactured. The tariff law levies an ad valorem duty on this product, and, as it has been brought in at several ports, collectors have varied more than 200 per cent in their valuations; but in all cases have materially exceeded the invoice valuation. The company controlling the patents have an important interest in keeping the apparent cost of the article as low as possible, as they are disposing of royalties in nearly all the States, and the economy of production necessarily depends upon the cost of the raw material. In view of the limited supply and circumscribed market, the department sees no way of ascertaining the value of the article without a special investigation.

The American and British Associations' Addresses and Papers.

Attention is called to the fact that in the SUPPLEMENT of last week and in the current issue there are a number of addresses and papers which were read at the meeting of the American Association for the Advancement of Science and at the British Association. Thus in the current number will be found a continuation of Prof. Gill's "Edward Drinker Cope, Naturalist," the presidential address by Sir John Evans before the British Association and the conclusion of Prof. W J McGee's "The Science of Humanity." In next week's SUPPLEMENT these papers will be continued and others will be given.