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NEW YORK, SATURDAY, MAY 15, 1880.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as Agricultural inventions, American industries, Ammonia manufacture, Assaying gold and silver, etc., with corresponding page numbers.

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT No. 228.

For the Week ending May 15, 1880.

Price 10 cents. For sale by all newsdealers.

Detailed table of contents for the supplement, categorized into sections like I. ENGINEERING AND MECHANICS, II. TECHNOLOGY AND CHEMISTRY, III. ELECTRICITY, HEAT, LIGHT, ETC., IV. MEDICINE AND HYGIENE, V. ASTRONOMY, GEOLOGY, ETC., VI. NATURAL HISTORY, ETC.

THE USE OF STEEL FOR STRUCTURAL PURPOSES.

At the last meeting, in Pittsburg, of the Engineers' Society of Western Pennsylvania, the subject which most interested the iron and steel men of Pittsburg was the topic ably handled by Mr. A. F. Hill, C.E., of New York, in his paper entitled "Steel in Construction." The points presented embodied a series of interesting tests conducted by the gentleman named, with open hearth Pittsburg steel from the establishment now supplying the steel for the wire used in the East River Bridge cables. These experiments were conducted at the works of the Keystone Bridge Company, Pittsburg, at J. M. & J. B. Cornell's works, New York, and at the United States testing machine at Watertown, N. Y. Following are the salient points in Mr. Hill's paper:

"Within the past few years there has been developed in this country a tendency toward steel construction, which today is so pronounced as to command the most thoughtful consideration alike of constructors and manufacturers. The adaptability of steel to purposes of construction is probably no longer questioned, yet there is still a certain distrust of the material in minds of many thoughtful men, who believe steel to be endowed, more than any other material, with that exasperating quality which might fitly be called the 'innate cussedness' of inanimate objects. This arises undoubtedly from some of the remarkable and seemingly inexplicable failures which have occurred in finished parts of steel, some of them breaking under loads utterly inadequate to produce rupture, others breaking in some instances without any apparent cause at all. I use the expression 'seemingly inexplicable' advisedly, for I believe that every such extraordinary failure is susceptible of rational explanation, and can almost invariably be traced, not to the inherent defect in the material itself, but to the wrong treatment of the steel during the process of manufacture into parts of the structure. I propose to lay before you the results of some steel tests made under such conditions as would naturally arise when the material is to be used in a structure."

The samples tested ranged from 0.30 per cent to 0.50 per cent carbon, and were in the form of eye bars, plates, and girders. In the first named, the eye bars were from the Kloman machine, which rolls the bar complete from end to end; the Keystone "upset" bar, and bars made by welding and die forging. The tests showed that the first two classes gave best results, and the last named second best, and the process of welding and die forging "could not be recommended for general practice." The tensile strength of these bars ranged from 93,000 lb. per square inch in the 0.30 per cent and 102,000 lb. in the 0.50 per cent steel.

The tests made on plate steel were crucial. A 3/4 steel plate was tested in the direction of rolling, and across the same; also as to the relative strength of sheared and punched plates, and the effects of annealing and tempering. To ascertain just what such a plate, would stand, Mr. Hill punched out the edges of such a plate and then reduced its gauge by cold hammering to 1/8 of an inch. The sample was then heated to a bright cherry, and annealed forty-eight hours in lime. A test showed an elastic limit of 55,000 lb., and an ultimate strength of 100,400 lb. In tempering sheared and punched plates from a low heat in oil, the effect was contrary to what might be expected; instead of rendering the material hard and brittle, it restored its ductility and increased its ultimate strength. The last test was with a steel girder of 1/2 web plate, 12 inches high, with 1/8 top and bottom plate, and 1/8 x 2 1/2 x 2 1/2 steel angle. For such a girder (6 feet long) in iron the test load would have been not quite 22 tons distributed load. The steel girder was tested up to 65 tons distributed safe load; and under a continued application of 103 tons distributed load, acquired only a permanent set of half an inch.

Mr. Hill concluded his paper as follows: "The foregoing tests are a fair indication of the wide range of application steel is capable of in construction, and they also show very conclusively that our present methods of dimensioning will have to undergo modification; that our present safety factors, based as they are entirely upon an assumed ultimate strength, become almost meaningless when we have to proportion in steel; and last but not least, that our mechanics must learn to test steel as steel, and not as iron. Steel construction is undoubtedly the construction of the near future. The conservative element in our profession which to-day opposes it will still oppose it twenty years hence, just as it took them twenty years to learn that iron was better than wood. This conservative element is not without its use by any means; nor are the sand bags to the aerial navigator; they help to steady the flight of his air ship at the lower levels. To make the comparison complete, let me add, that to reach a higher altitude, they must both be thrown overboard."

TWO TONS OF SILVER PER WEEK.

There are five establishments in the United States where the smelting and refining of silver-bearing lead ores is carried on. One of the most extensive, if not the most extensive, of these works is that of the Pennsylvania Lead Company, of Pittsburg, Pa. Here the "base bullion" of Leadville and of Utah is brought to meet the cheap coke and coal of Pennsylvania, and though the freight per car averages \$300, the business has grown to great proportions. President Schwartz, of the above company, gives figures showing that 60 per cent of the "base bullion" output of Leadville is shipped to the Pittsburg refining works, besides 75 per cent of the output of Utah lead mines. "Base bul-

lion" is the product of the ore smelters of the mining regions, and bears about the same relation to refined silver as pig metal to refined steel. At the Pittsburg refining establishment this base bullion is converted into lead, silver, and gold. The precious metals find their way to New York, while the lead is consumed by the makers of white lead. The Utah ores are the richest in gold, sometimes reaching 40 ounces per ton. Of silver, the Pennsylvania Lead Company ships 50,000 ounces per week, or two tons, representing in value, at \$1.14 per ounce, \$57,000. This metal leaves the works in pretty bars of 2,000 ounces each.

THE TELEGRAPH SET SCREW.

The decision of Judge Blatchford sustaining the Page Electrical Patent was noted in our issue of March 6.

April 4 Judge Blatchford heard motions by the American Union Telegraph Company, the Wabash, St. Louis and Pacific Railway Company, and the Union Pacific Railway Company, praying to have the decision referred to so modified as to exempt them from the payment of royalty to the Western Union Telegraph Company, on the grounds that they have always used the machine and devices invented and patented by Prof. Morse, and that it could be proved that the original Morse instrument on exhibition in the office of the Western Union Telegraph Company was made by Prof. Morse as early as 1835, and contained all the essential parts of the apparatus and devices set forth in the eleventh, twelfth, and thirteenth claims of the Page patent.

The petitioners allege further that the defense in the previous suit could have proved (though they did not) that the testimony of Page in the suit of French against Rogers related to these essential parts of the Morse apparatus and devices; they could have proved by Thomas Hall of Boston that in 1847 he manufactured a machine under the Morse patent, which contained a device and combination adjusting or regulating the length of the vibration at the armature of an electro-magnet by means of a set screw as described in the 13th claim of the Page patent; they could have produced an affidavit of Mr. Page himself, taken in 1848, in the suit of Morse against O'Reilly; also, the defendants could have proved by the Rev. S. Irenæus Prime that Mr. Page wrote to the Hon. Amos Kendall in 1848 that he had never claimed the invention of the receiving magnet used in the Morse telegraph; and the defendants could have made use of the depositions of Professor Morse, taken in 1850, in the suit of French against Rogers, and of Leonard D. Gale in the suit of Morse against O'Reilly.

The petitioners further asserted that they were ready to produce before the court one of the machines now and for many years past used by them in telegraphing, and the machines used by Mr. Hall, and if aided by the process of the court they will cause to be produced by the Western Union Company the machine used by Prof. Morse and presented to the company after his death; upon a comparison of which it would be seen that the machines now used by the petitioners and that made by Mr. Hall and that used by Prof. Morse are alike in their essential parts, and that all of them have the designs and appliances mentioned in the eleventh, twelfth, and thirteenth claims of the Page reissued patent.

Two weeks were allowed by Judge Blatchford for the plaintiffs to make answer. When the case was called the counsel for the Western Union Telegraph Company denied that due diligence had not been used in obtaining evidence in the previous trial, and produced the original model of the Morse telegraph instrument, to show that the disputed set screw governing the play of the armature was not there and never had been. It was held by the opposite side that the original screw had been removed and another substituted, whereat an excited colloquy ensued between the opposing counsel; but no evidence would appear to have been brought to show the real function of the screw which the model now carries.

The arguments of the counsel being unfinished for lack of time, the case was carried over to Monday April 26, and again to April 30.

STEAM INJECTORS.

Among the most reliable and effective devices in this class the Rue's Little Giant Injector occupies a prominent place. It is made by the Rue Manufacturing Company, Philadelphia, Pa. The lawsuit for infringement, recently mentioned in our paper, has, we learn, been fully settled, and the company is now increasing its facilities and extending its sales. The Rue Company's advertisement will be found in another column.

THE REGISTRATION OF TRADE MARKS.

A bill to provide for the registration and protection of trade marks was passed by the House of Representatives, April 27. It included the first thirteen sections of Bill No. 5088, submitted by the Committee of the Judiciary as a substitute for H. R. 2573, and H. Res. 125.

The committee sought to re-enact substantially the trade mark legislation of 1870 (Rev. Stat., sections 4937-4947 inclusive) with the act of 1876, save that the operations of the proposed law were confined to trade marks used in commerce with the Indian tribes and foreign nations.

Before its passage the House struck out all the penal and search-warrant clauses (sections 14 to 21 inclusive); so that the proposed law re-enacts only so much of the old trade mark laws as are embraced in sections 4937-4942 of the Revised Statutes.

The bill as passed also provides that applicants for regis-