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WROUGHT IRON TUBE FOR CABLE RAILWAYS.

In view of the success attending the introduction of the cable railway in San Francisco and Chicago, there can scarcely be any doubt that it is the street railway system of the future, destined to supersede the present mode of propelling street cars by horse power, owing to its many advantages, such as greater speed, economy of motive power, and occupancy of much less space in the streets.

The engraving we present in this issue illustrates a new system of tube for cable railways.

This tube is made up sections bolted together, each section being a self-contained girder, the upper chord of which has a continuous slot, admitting the grip bar to the interior of the cable tube. Each section consists of two opposite side plates, the upper portions of which are bent so as to converge toward each other. To their upper edges are riveted angle bars of proper shape, far enough apart to form the continuous slot above referred to. The lower edges of these side plates are connected with angle bars to a bottom plate. The side plates, and preferably also the bottom plate, and the top and bottom angles, extend throughout the entire length of the section, thus forming a self-contained girder, of which the upper angles form the top chord, the side plates, the webs, and the lower angles and bottom plate the bottom chord.

To provide against lateral pressure on the sides of the tube from the pavement and from vehicles crossing over the top chord angles, a series of braced frames are riveted to the sides and bottom of the tube, consisting of angle ribs, lower transverse channel beams, or heavy angles, and inclined brace bars, riveted to the upper end of the angle ribs, and to the ends of the lower transverse channel beams or angles.

The body of the girder or tube is about 33 inches deep; the transverse channel beams are 8 inches deep. The clear width of the body of the tube in its lower portion is 12 inches, and the length of the transverse channel beams is 40 inches; being the widest part of the tube at any point. The sections are made in convenient lengths of about 16 feet, the connection between two consecutive sections being made by bolts through angle ribs at their ends. Thus a continuous tube or conduit is formed, complete in itself.

The work of laying the tubes is extremely simple. A trench is dug 3 feet deep from the surface and 3 feet 8 inches wide, for a distance of a block at a time, into which are lowered the tubes, and, after having been properly leveled up and bolted together and connected to the track stringers by three-quarter inch round rods attached to the angle ribs on the tubes, the work of closing up the ditch begins. First the space under and alongside of the tube is filled with concrete to within a foot of the surface of the street, sand to the depth of several inches is then thrown on, and the whole paved over with Belgian blocks.

Every alternate tube is provided with a manhole in one of the web plates, affording access to the tube for the purpose of introducing or removing the cable, oiling the sheaves, etc. At each of these manholes a chamber is made in the concrete, accessible from the street through a square opening alongside the track, which is covered with a cast iron lid.

It will be seen that the whole process of laying these tubes is so very simple, that the advantages of this system of tubes are quite apparent. The limited width of the trench, which leaves the tracks wholly intact, enables the construction of the cable railway to proceed without interfering with the running of the horse cars, or requiring any temporary side tracks or movable bridges, where existing lines of horse railway are changed into cable railway. In this connection Mr. George Rice, Chief Engineer of the Cable Division of the Union Passenger Railway Company, of Philadelphia, which company is now completing the laying of 20 miles of this tube, writes in response to an inquiry:

"I have made a careful examination of the different cable roads in California and Chicago, and I believe our Philadelphia system of cable tubes is the best for several reasons. It is simple in its construction, and consequently cheaper than any of the existing systems of tubes that have any claim to permanency. These tubes can be laid more rapidly, and for construction on an existing line of horse railway, without interference with the traffic, this system has no rival.

"It would be impossible to build a cable line, such as is in use in Chicago or on Market Street, San Francisco, without side tracks or some device, such as a movable bridge, on which to pass the cars over the break in the street. In a narrow street the side tracks are not admissible, and the bridge device would be a cumbersome and expensive means of keeping the cars in motion over the work," etc.

Any further information in regard to the tube, relating to the construction, cost, etc., can be obtained on application to the inventor, A. Bonzano, Chief Engineer of the Phœnix Bridge Company, at Phœnixville, Pa. This system of tubes is patented in the United States and Great Britain.

Dynamite.

At a recent meeting of the Engineers' Club, of Philadelphia, Mr. J. J. De Kinder presented an illustrated description of a method of removing condemned machinery by dynamite, as practiced by him in the case of the side levers of the old Cornish pumping engine at Spring Garden Water Works, Philadelphia, which weighed 29,000 pounds each. Drilling, tapping, and breaking each beam in two, with a half pound of dynamite, and without injury to the building or other machinery, occupied thirteen hours. Even had dispatch been unnecessary, it might have taken two weeks to do this work by the ordinary methods.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 440,

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THE STATE OF MANUFACTURING.

Visits during the first half of May to the manufacturing towns in four counties of Connecticut show a condition of business activity much more favorable than the general reports in the newspapers, taken from all parts of the country, would seem to justify. Perhaps much of this difference is to be attributed to the varied character of the industries in those portions of the one State visited. Machine tools, guns, sewing machines, machine screws, bicycles, small tools, builders' hardware, bench hardware, nuts and bolts, screw taps and dies, butt hinges, pumps, drop and lever presses, steam, water, and gas fittings, and many other branches of productive work of which the general public are in continual need are in the usual demand. In no one department of productive industry is there evidence of a permanent falling off in demand, although there is a tendency to crowd down the prices. So, on the other hand, there is no unusual demand for the productions of any department. In some instances the hours of labor have been temporarily shortened; in others (two) the number of men has been curtailed. But in the first instance a return to the original full time is shortly expected, and in the other the men were discharged because of a glut in the specialties they produced. One establishment that in early spring shortened its hours of labor is now working overtime in its most important departments.

Some annoyance has been caused by the debates and delays in Congress on the matter of a tariff on foreign productions as affecting home manufactures, and some of the manufacturers attribute the falling off of orders to the uncertainty which this state of Congressional business produced. But there is a better feeling than there was during the pending and threatening of the Morrison bill, and it seems possible that the old notion of a presidential election year proving to be one of general business depression may be shown to be unfounded.

PORCELAIN HEADED NAILS.

One of the familiar illustrations of the benefit of rapid machinery in producing articles of use combined with elegance, is in the manufacture of the ornamentally headed nails used for picture hanging and similar purposes. The heads of these nails are of porcelain or glass, held in a gilt brass setting, and the shanks are of iron wire. The heads are moulded from opaque porcelain or transparent glass, and the settings are made from sheet brass in the dies of a press. A disk of brass is cut from a sheet, and a small hole made in its center. The disk is drawn down through the center of the die, forming a tube-like neck which is afterward tapped in a machine, thus forming a nut for the reception of the threaded head end of the wire shank.

The press forms the setting into a cup shape for the glass or porcelain head, and this, when inserted, is held in position by having its edges turned in over the head by a press. The wire shank is pointed in a rotary press which draws the wire down to a point in dies or scores that form the pointed portion four sided. On two of these sides a film or sprew is left that is removed by a trimming press.

The formation of the screw thread on the other end of the wire shank is somewhat interesting. The thread is not cut with dies—in fact, it is not cut at all. It is rolled up from the material of the shank, and the threaded portion becomes larger than the original wire. There is a fixed die in a press, the die having been milled on a slant to represent the V-threads of a certain pitch. The die is perfectly flat, and these scores are simply cuts of a V-form running diagonally across it. Another die exactly like the fixed one is attached to a reciprocating arm, so as to traverse across the fixed die. Between these dies the shank is passed under pressure, and the result is a perfect thread at the rate of at least one hundred gross per day, the only attendant being a boy.

SOFTENING AND HARDENING CAST IRON.

Questions have lately been asked as to the possibility of altering the texture or changing the qualities of cast iron by heating and chilling. In the respect of resistance to the superficial changes which are induced on steel by heating and sudden chillings, cast iron stands alone. It is amenable to the gradual influences of heat, but it will not contract nor harden, like steel or wrought iron, under sudden changes from heat to cold. And yet hard cast iron may be annealed, as it is done daily by tons, the heat being supplemented by the pyrogenous oxide of iron, the hot oxidized scale, such as is seen at the base of the blacksmith's anvil. It can be annealed also, if the articles are small enough, by being heated in a bituminous coal fire, and then buried until cool in a bed of the coal siftings. This sort of annealing is entirely unlike that for hard wrought iron or obdurate steel, as in these cases only clean charcoal is to be used, any taint of sulphur being a source of injury. But in annealing hard cast iron the softening qualities of the sulphur contained in bituminous coal is what is required. Some of the most intractable specimens of cast iron, no larger in diameter than a pipe stem, that refused to yield in a genial charcoal fire when packed with bone, lime, and charcoal, softened to usable condition by one heating in bituminous coal.

As to hardening of cast iron there is no ordinary process that is generally convenient, except that of casehardening. In this the cast iron article should be polished as well as finished—the surface being made as homogeneous as can be—so that the flux of casehardening be given as large a surface for action as possible; for the composition of cast iron is a honeycomb instead of a solid; and it is not even a series of layers of fibers, as is wrought iron, or of a network of fibers, as is cast steel, but it is a mass of material of which pure iron itself is not always the largest part. Recent improvements, however, have given the pure metal a preponderance over the foreign palpable matter and the air spaces. But this constitution is not common.

Even heating is necessary to caseharden cast iron; and yet the heat must be less than that allowed for wrought iron and low steel, for at much less than the white heat for wrought iron or the "high heat" for carbonized steel, the cast iron would disintegrate. The cast iron should be heated to a soft red heat and then sprinkled with powdered prussiate of potash and sal ammoniac in proportions of two of prussiate and one of sal ammoniac, and then immediately plunged into a cold water bath. It will not do, in the matter of casehardening cast iron, to return the iron to the fire, or to use the flux as a paste. Put it on as a powder, and plunge immediately into cold water.

The Petroleum Industry.

From recent statistics it appears that there are 20,000 producing oil wells in Pennsylvania, yielding at present 60,000 barrels of oil a day. It requires 5,000 miles of pipe line and 1,600 iron tanks, of an average capacity of 25,000 barrels each, to transport and store the oil and surplus stocks. There are now nearly 38,000,000 barrels of oil stored in the region in tanks. This oil would make a lake more than one mile square and ten feet deep. The money actually invested in petroleum production since 1860 is estimated to be more than $425,000,000, of which $200,000,000 was capital from New York city. Since 1880 more than $12,000,000 has been used in building iron tanks, and nearly as much in pipe lines, all by one corporation. The tanks cost on an average $8,000 each. A 35,000 barrel tank is 90 feet in diameter and 28 feet high; 100 tons of iron are used in constructing one. The annual loss from lightning by the use of iron tanks is very great, as they form an attractive path to earth for electricity.

The speculative transactions in petroleum represent more than $400,000,000 annually. The lowest price crude petroleum ever brought was 10 cents a barrel, in 1861. In 1859, when there was only one well in existence, Colonel Drake's Pioneer at Titusville, the price was $24 a barrel. Besides the 5,000 miles of pipe line in use in the oil regions, there are in operation 1,200 miles of trunk pipe lines connecting the region with Cleveland, Pittsburg, Buffalo, and New York, and lines building to Philadelphia and Baltimore. In the line between Olean and New York 16,000 barrels of oil are transported daily. These lines are all the property of the Standard Oil Company, except one between Bradford and Williamsport, Pa. The Standard employs 100,000 men. The product of its refineries requires the making of 25,000 oak barrels of 40 gallons each, and 100,000 tin cans holding 5 gallons each, every day. The first American petroleum ever exported was in 1862. Charles Lockart, of Pittsburg, sent nearly 600,000 gallons to Europe in that year, and sold it for $2,000 less than the cost of transportation. In 1883 nearly 400,000,000 gallons were exported, for which $60,000,000 were returned to this country.

Simple Intensifier for Gelatine Negatives.

The mercury intensifier for gelatine plates, now largely used by photographers, has been somewhat improved by Mr. H. J. Newton quite recently.

The advantages claimed for it are its simplicity, speed, and in giving to the negative a good color. The intensifier, combining mercury, iodide of potassium, and hyposulphite of sodium, sometimes gives to a negative a yellow color, which makes it a slow printer. The solution will not keep well, but soon precipitates.

Mr. Newton's formula overcomes these objections. He first takes 10 grains of bichloride of mercury, pulverizes it in a mortar, and dissolves in 10 ounces of water. He next dissolves 190 grains of iodide of potassium in 3 ounces of water, and gradually pours the same into the mercury solution. A red precipitate occurs, but will be redissolved when the whole amount of iodide of potassium has been added.

The 13 ounces of concentrated solution thus formed is now diluted by the addition of 24 ounces of water. The intensifier will keep clear for a long time, and so retain its strength.

To intensify, Mr. Newton pours a sufficient quantity of the intensifier into a tray, and immerses in the same the dry or dried negative. The action of the intensifier takes place in a few seconds, and the intensification is completed in two or three minutes.

The plate is then washed and immersed for a few seconds in a very dilute solution of hyposulphite of sodium, again washed, and dried. Negatives in which there was very little detail in the shadows have been very easily brought up to good printing density with this intensifier. It is essential that the hyposulphite of soda shall be eliminated from the plate before intensification. To avoid an extended washing for that purpose, Mr. Newton quickly dissolves out the hypo from the film by pouring over the latter, after fixing, a solution of 5 to 10 grains of nitrate of lead to the ounce of water.

Its action is easily observed by the formation on the film of a milky precipitate, which may be easily washed off.

AMONG the recent patents is one for the combination of a holy water font and a poor box.