IMPROVED FIRE-HOSE NOZZLE.

The engraving shows a novel and ingeniously contrived spreading or spraying nozzle for fire-hose, which is capable of throwing either a solid stream of water, or of breaking it up and spreading it so that it will cover a great surface and produce a sudden lowering of the temperature by the evaporation of water spread over the heated surface, and thus extinguish the fire without deluging the building with water. It is a notable fact that in many cases of fire the water used to extinguish the flames works far greater injury than the fire itself. It is to avoid this trouble that the nozzle shown in the engraving has been devised.

The double pointed levers shown in the larger cut are capable of being thrown into the stream of water by simply turning a movable collar. By this means the stream may be instantaneously changed from a more or less solid one to a spray which spreads out and covers a large area. This spray serves as a great protection to the pipe holder, and will enable him to approach very near the fire and produce effects which would be entirely impossible with the common nozzle.

Any one familiar with the principle upon which fire is extinguished by water will see that water applied with a nozzle of this kind would be far more efficient than a solid stream.

For steamboats and factories this nozzle, used in connection with an efficient force pump, would prove a valuable protection against fire. We are informed that the nozzle has been thoroughly tried by experienced firemen, and has proved itself to be very efficient.

Further information may be obtained by addressing the inventor, Mr. Charles Oyston, Little Falls, N. Y.

Automatic Printing of Light Signals.

BY M. MARTIN DE BRETTES.

Every printing apparatus, in order to act, requires the mechanical work of a force which is manifested to the purpose, that is to say, when and how the sender of the dispatches wishes.

This small force is required for the magnetization of an electro-magnet, and the mechanical work serves for the attraction of the keeper, the movement of which determines the action of the apparatus.

In order to solve the problem of printing telephotic dispatches at the receiving station, the light projected must have the power of producing there, during its continuance, which depends on the will of the sender, the magnetization of an electro-magnet, forming part of a local battery, or an augmentation sufficient for it to overcome the opposing spring of its keeper.

The illuminated part of the circuit of the battery must consequently be composed of a body endowed with the property of becoming suddenly conductive under the influence of light, and of ceasing to be so when the light is withdrawn. There exists, as is known, a body which possesses this property in a very high degree, namely, selenium.

The electric light produced at the receiving station in a Mangin's projector is sent there as a bundle of parallel rays, and received upon a converging lens, at the focus of which is fixed the selenium element forming part of the circuit of the local battery, which contains the coil of the electro-magnet moving the receiver.

The impression of the jets of light in black marks, long and short, according to the Morse alphabet, is made with the Morse apparatus. The jets of light are transmitted by the movement of a simple lever which displaces a screen. The printing of the dispatches in ordinary type is effected by means of a Breguet frame receiver, the needle of which is replaced by a type wheel, and to which is added a printing mechanism, which acts by means of a special battery, and only when it is wished to print some given letter.

The distance between two stations depends on the transparency of the air, on the latitude, and, all other things being equal, on the quantity of light received per unit of surface when the luminous rays are parallel. The law of the decrease of the intensity of light in this case is not known; but it depends solely on atmospheric absorption, for in a vacuum the intensity would remain constant. We cannot determine *a priori* the distance of the two stations for a given electrical focus; recourse must be had to experience.

The fine experiment of M. Fizeau for determining the speed of light shows that the distance of two stations might be considerable with the modern powerful electric lights which exceed 2,000 carcels.

We know, in fact, that in these experiments the light of a lamp gave after a course of 17 kilometers a brilliant focus of very appreciable intensity.—*Comptes Rendus.*

IN New York city there are 486 miles of water pipe, 391 of sewer pipe, 824 of gas pipe, 14½ of steam pipe, and 15 of underground electric wire.

River Obstructions, New York.

The great explosion at Hell Gate, in September, 1876, under the supervision of General Newton, did much to improve the channel from Long Island Sound to New York city. But there is another obstruction to be removed before the passage can be made wholly safe—Flood Rock, in the East River, off Ninety-third Street. General Newton thinks that the sum of $500,000 will be required on this work for the next year

OYSTON'S FIRE-HOSE NOZZLE.

IMPROVED SLEIGH.

The sleigh shown in our engraving is made after a design patented by Mr. Geo. Edward Watson, of Bismark City, Montana. The novelty consists in the peculiar form of the runners and in the ornamentation of the runners and body. The forward ends of the runners are in the form of a goose neck. There is in each runner a heart-shaped opening and an oval opening, and these openings, as well as the outer margins, are ornamented with color scallops, which contrast with the color of the main portion of the sleigh.

WATSON'S IMPROVED SLEIGH.

The goose neck at the front of the sleigh is designed to be adjustable, and is to be terminated in a swan's head or in any other ornamental figure that the fancy of the manufacturer may dictate.

The back seat is adjustable, and is fastened by means of hooks on the inside.

Further information in regard to this invention may be obtained by addressing the inventor as above.

The Country's Mineral Products.

From advance sheets of the "Mineral Resources of the United States," a report by Albert Williams, Jr., Chief of the Division of Mining Statistics, U. S. Geological Survey, a number of interesting facts are taken relating to the amounts and values of the mineral substances procured by labor in the United States during the year 1882, and estimates of the amounts during the first half of 1883.

In value coal heads the list, which comprises anthracite, bituminous, brown coal, and lignite, and it amounts to $146,632,581, of which nearly one-half is that of Pennsylvania anthracite. Pig iron ranks next, its value being $106,336,429, to which may be added the value of chrome iron ore, at Baltimore as a market, $100,000. Of silver, ranking next to coal, there was mined in 1882, $46,800,000, and of gold $32,500,000. The other metallic ores produced were copper, lead, zinc, quicksilver, nickel, antimony, platinum, and tin. Of platinum the total value was $1,000, and of tin the quantity was so small that no valuation is made of it. The total value of the metallic products of the country for 1882 was $219,756,004.

In the non-metallic products the one ranking next after gold in value is crude petroleum, $23,704,698; then lime, $21,700,000; building stone, $21,000,000; salt, next in value to building stone, is only $4,320,140. The total value of non-metallic substances, including clays, buhrstones, grindstones, lithographic stone, and other substances entering into manufactures, is $453,912,406.

Judging by the estimates made for the first six months of 1883, the value of iron produced is somewhat less than that of an equal period of 1882, the total local or "spot" value of iron and steel in the first stage of manufacture for 1882 being $171,336,429, while the estimates for the first half of 1883 are only $71,000,000, equal to $142,000,000 for the year. But this comparison of market values will be modified by the fact that the price of iron has been less in 1883 than in 1882, a difference of something over three dollars a ton.

Gold and silver were produced in increased amounts in 1882, the additional value over the product of 1881 being $1,600,000. For the first six months of the current year the production of petroleum has been 11,291,663 barrels, against 30,053,500 barrels in the previous twelve months. In copper there has been an increase, the estimate for the first six months of 1883 being 58,000,000 pounds, against 91,646,232 pounds in 1882.

A slight increase in the amount of lead mined is estimated for the present year, and also in zinc; but as these estimates are based on increases in former years, and not on actual statistics, they may be taken with some allowance.

Steel for Heavy Shafts.

An engineer at a meeting of the Society of Engineers at Aix-la-Chapelle gave some facts in regard to the qualities of mild steel for heavy forged work that tend to modify the growing confidence in that material as compared with iron. He said that a Bessemer steel shaft of a high speed engine belonging to a rolling mill broke suddenly while the engine was moving slowly. The shaft was replaced by one of iron. In an engine works on the Rhine a steel shaft of 15¾ inches diameter broke, and inside was found a hole large as a man's fist containing two steel balls that during the two years of the shaft's rotation had been worn quite smooth. Another engineer said that in casting steel ingots it is more frequent to have a porous casting in mild steel than in hard steel. If steel ingots have incomplete, hollow, or porous spots, these do not become welded together by further heating and working, but, after being rolled thin, they retain their porosity, as unwelded spots are retained in wrought iron. As these porous places are generally in the center of the ingot, the round bars, the piston rods, and axles made of it have also usually an internal weakness, which it is difficult to set right in the working, and which may cause breakages in the future.

In the course of the discussion it was shown that steel that hardened on the surface on sudden cooling ought not to be deemed mild steel, and was treacherous in its character. No material capable of considerable hardening should be called iron, and, if narrowly examined, it will be seen that a great deal of the ingot iron specified as "incapable of considerable hardening," is nevertheless capable of very considerable hardening under certain circumstances, such as a sudden cooling of a heated shaft. This "inconsiderable hardening" is just sufficient to shrink the surface, produce tension, small cracks, and finally breakages.

AN ingenious mechanic of Jamestown, N. Y., has constructed a perfect locomotive, said to be the smallest in the world. The engine is only 8½ inches long. The pumps throw a drop of water per stroke. As many as 585 screws were required to put the parts together. The engine itself weighs a pound and a half, and the tender two pounds and a half ounce. The mechanic was at work upon the locomotive at intervals for eight years.