[*Continued from first page.*]

trough; and to this extremity the torpedo, Fig. 7, a metal shell containing a hundred lbs. or so of powder, is fastened.

Fig. 4

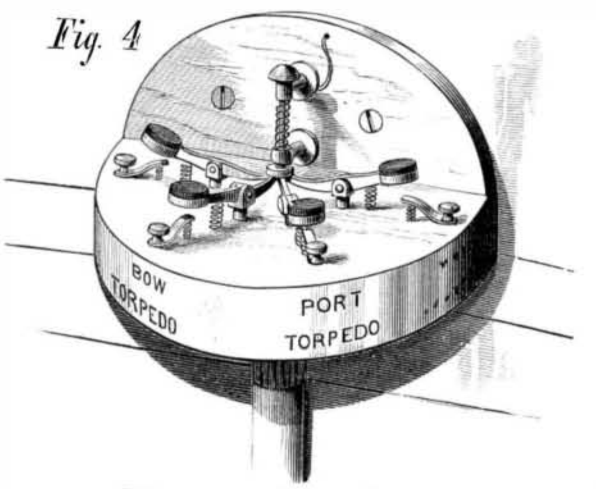
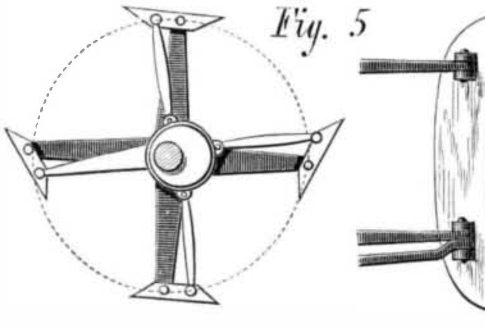
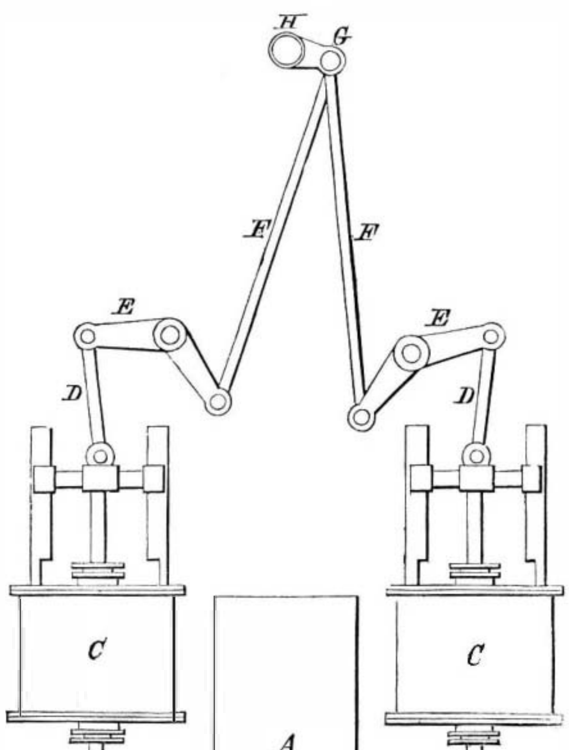


Fig. 5



An electric fuse, also shown in Fig. 7, is adjusted, so that its platinum wire will become white hot, and so fire the torpedo when the current passes. To the cradle in which the torpedo spar lies are attached heavy tackles hooked to the beams overhead, so that the spar can be tilted to different angles in order that its extremity, when pushed out, may be at a greater or less depth under water. The valve through which the spar passes through the side of the vessel is so constructed that no water can enter during the protruding of the spar. The latter operation is effected by a tackle brought to a steam winch provided for the purpose. The side spars are 18 feet and the bow spar 32 feet in length. On receiving the signal above noted, the men below affix the torpedo and run out the spar. If the vessel to be attacked has torpedo guards out (heavy nettings of rope sunk down to keep torpedoes at a safe distance from the bottom), an ingenious mechanical contrivance on the torpedo signals that fact, and the person stationed at the exploding wire does not press the key. The Alarm then tries to break or push through the obstruction, and her success is announced by the same signalling arrangement. Then the impact of the torpedo with the vessel's hull is announced,

Fig. 8.



and then the captain, in the wheel house, touches the key, and the explosion follows.

Fig. 6

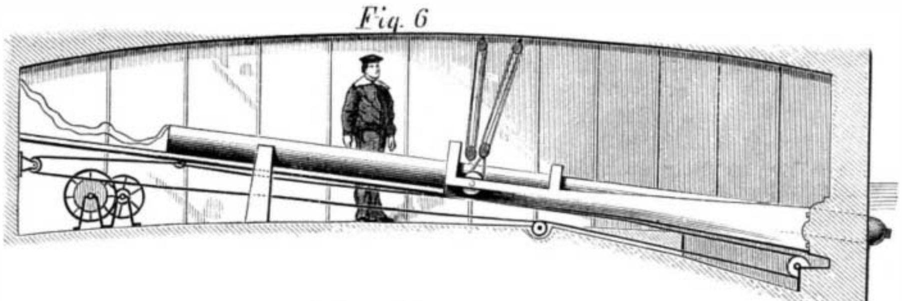


Fig. 7

ADMIRAL PORTER'S TORPEDO SPAR.

The firing may be done either below decks at the place where the torpedoes are pushed out or from the wheel house. In both places, electric machines are located which may be set in action by the ship's engines. Fig. 4 represents the firing keys in the wheel house; and in Fig. 2 the electric machine is indicated. By pressing one of the keys in Fig. 4, connection between the torpedo with which it communicates and the electric apparatus is at once established. The gun in the bow, Fig. 3, is mounted on an ordinary naval carriage, and is manœuvred by its tackles being carried to a steam capstan, which is also used for hoisting anchor. Shot and cartridges are whipped up from below by a tackle attached to a carriage which travels on the horizontal bar across from rail to rail, so that the charge can be easily swung directly in view of the muzzle. The gun, when run out, points directly ahead, as the large engraving indicates.

The engines of the Alarm, a diagram of which we give in Fig. 8, are of the compound variety, with four cylinders, the condenser, A, being placed between them. There are two high pressure cylinders, B, diameter 20 inches, stroke 30 inches, and two low pressure cylinders, C, 38 by 30 inches. The low pressure cylinders are jacketed. Short connecting rods from the crossheads are attached to two bell crank levers, E, which have a throw of 27 inches. The crank connectingrods, F, are attached to the other ends of these bell crank levers, and to a common pin in the driving crank, G, which latter crank has a throw of 15 inches. The valves (not shown in the engraving) are on top of the cylinders, and are operated by eccentrics working on an intermediate shaft, which is actuated by levers from the crossheads. No links are fitted to the valve gear of these engines, for the reason, already stated, that the engine need never be reversed. The propeller shaft, H, is, of course, vertical.

The air and circulating pumps for the condenser are independent. There are four cylindrical tubular boilers, with an aggregate heating surface of 4,600 square feet.

The question of how the Alarm herself would fare against the heavy guns of a modern ironclad at close quarters is really of little moment. As we have shown, it would require several hard hits delivered in a number of different places to cause her to sink. All her vulnerable parts are entirely submerged, and any injury to her engines, etc., must come through her steel-plated deck, at which no projectile can be fired other than at a sharp and consequently disadvantageous angle. Probably a second torpedo from the Alarm would not be necessary to insure the destruction of any war vessel now afloat. At the distance under water at which she explodes her mines, no plating is ever affixed to vessels; and the crushing-in of their timbers must inevitably follow the explosion. If the torpedo boat should become fastened in her enemy and go down with her, or succumb to a near fire, the loss would not be on our side. Lives are to be lost in war in any event; and if, by the sacrifice of a torpedo vessel costing a couple of hundred thousand dollars, we ever sink a great ironclad worth a million, the life mission of the former craft may well be deemed as fulfilled.

The Alarm was built according to designs prepared by Admiral David D. Porter. She is an admirable sea boat, rising lightly and buoyantly to the largest waves. Her ventilating arrangements are excellent, and the quarters of both officers and men remarkably large and commodious. Her present commander is Lieutenant Frederick H. Paine, U.S.N., to whom we are indebted for the greater part of the facts here presented.

British Patent Documents.

The clumsiness of the British Patent Office is exemplified in the form of its patent documents and the ponderosity of its printed copies. Although other nations discarded years ago the feudal method of sheepskins and dangling seals, the Britishers still adhere to it. A British patent document consists of an animal skin, 2½ feet long and 2 feet wide, filled with a long rigmarole reciting the titles of Her Majesty, and what she hath done by these presents. Scattered here and there on the margin of the skin are certain scrawls, supposed to be the official signatures of my lord this or his highness that, each of whom receives from twenty to fifty thousand dollars a year for suchlike exhaustive labor. The skin is further authenticated by the royal seal, consisting of a large disk of wax, bearing an embossed effigy of Her Majesty, seated on horseback, carrying a club or scepter. This beeswax seal is six inches in diameter, one inch thick, set in a round tin box, and attached to the skin by cords. The weight of the document, with seal and appurtenances, is two pounds four ounces avoirdupois. The object of this formidable affair is to let the common people know that the government has granted a patent to Smith for a birdcage or a flat iron.

In addition to the patent, the government also prints the drawings and specifications of each patent; and these are also unnecessarily spread out, covering a large area of paper. So bulky is the large majority of these copies that the government has been compelled to curtail; a smaller and more compact style of printing has lately been adopted. An order has also recently been given to destroy nearly all the copies of printed specifications of expired patents: 250 tons of these valuable documents have already been carted away, and the process of destruction still continues. The only reason given for this is that it is difficult to find storage room, and it has, therefore, been determined to reduce the stock of copies to five apiece. The amount which these have cost to print is over $3,500,000, more than that sum having been spent in this way since 1852, when the Patent Law Reform Act authorized the printing of specifications. Large numbers have, of course, been given away from time to time, and still greater numbers have been sold; but the stock which still remains is a very large one, and by far the greater part of it is in constant demand. This wholesale destruction of public property is causing bitter complaints among the patent agents and consulting engineers who have been informed of it, as it will give much additional trouble to those employed in patent cases. The usual practice has been to purchase copies of the specification required for such purposes, and the agents were then able to work in their own offices. It will now be necessary for them to do much of their work at the Patent Office Library. It is also stated that the library of the Patent Office is to be "weeded" in order to give more space.

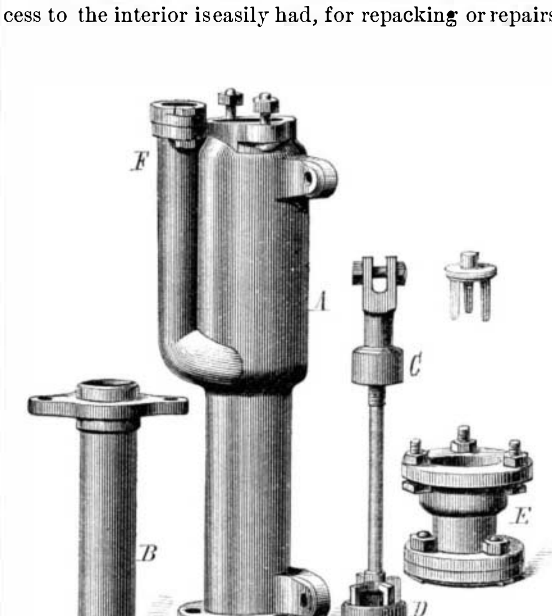
ROBAUGH'S LITTLE GIANT PUMP.

We illustrate herewith a new hand pump adapted for almost any purpose where such a machine is required. It combines the action of a lifting and a force pump, supplying a continuous stream of water, and working, we are informed, easily and regularly.

The various parts are represented separately in the engraving. A is the outer or main cylinder, the upper portion of which is enlarged. Extending down nearly to the bottom of said enlarged part is an interior tube, B, in which works a piston, C. Attached to an extension of the rod of piston, C, is a second piston, D, which moves in the smaller portion of tube, A, both pistons operating simultaneously. In piston, D, is an upward opening valve; and in the portion, E, by which the body of the pump is connected to its supply tube, is an ordinary conical valve. F is the discharge pipe.

The water is raised by the upstroke of the lower piston, through the bottom valve, into the lower part of the main tube. Thence it passes on the down stroke, through the valve in said lower piston, into the upper part of the main tube until the same is nearly filled. Each up and down stroke forces, then, by the joint action of the pistons, the water through the discharge pipe in a steady stream

The pump has metallic valves; and its action being only a direct vertical movement, uniform wear is produced. Access to the interior is easily had, for repacking or repairs, by



simply removing the bolts from the top of the pump, and lifting out the inside tube with piston, without disturbing either suction or discharge pipe. It is well adapted for windmill purposes, on account of equal pressure of the pistons on the up and the down stroke. It cannot freeze up, and may be operated in either deep or shallow wells.

Patented April 21, 1874. For further particulars, Messrs. Cook & McCue, general agents, of Ottumwa, Iowa, may be addressed.

Japanese Mushroom Culture.

The mushroom is gradually leaving its position as a luxury; and if the interest, which has been manifested in its cultivation in this country and in England of late years, continues, we may look to see the fungus as plentiful and as cheap in our markets as any other vegetable now in common use. Dried mushrooms, we learn, already constitute an important staple of Japanese and Chinese trade.

The best of the edible species of mushrooms of these countries are known as "matsu-take" and "shü-take." The difficulties attendant on preserving the former kind almost exclude them from the market for export; for not only do they decompose very rapidly, but even when successfully dried they are nearly tasteless, and thus useless in cookery. The shü-take species, however, have this peculiar excellence, that, though they are all but tasteless in their raw state, when they are dried they have an extremely fine flavor. The quantity that grows naturally on the decayed roots or cut stumps of the shü tree is not sufficient to meet the demand felt for them, consequently much skill has been brought to bear on their cultivation, notably by cutting off the trunks of the shü and other trees and forcing the growth of the mushroom on them. The shü tree grows abundantly in warm places having a southeasterly aspect; it attains to a height of about eighteen or nineteen feet. It has a long narrow leaf, thin and stiff, the front surface of a deep green color, the back of a brownish tint and glazed. The tree is an evergreen, the fruit (acorn) small, with a rough cupule. The acorns are steamed and eaten. The wood of the tree is used in the making of boats' oars, also for fuel and charcoal. Another oak, the kashiwa, from which mushrooms are obtained, is also plentiful in warm localities, and attains to a height of thirty or forty feet. The leaves are used in cookery, and the wood is in great demand for divining sticks, for which it is considered the best. The donguri, another species, is to be found all over the country; it grows to about eighteen or nineteen feet, has very thick branches and dense foliage; the leaf is slightly oval and slightly wrinkled. The fruit (acorn), after being pounded and steeped in water, is made into dumplings and eaten in this form. The wood is much used for boat-making and also for carts. Mushrooms are obtained from any of the above in the following manner: About the beginning of autumn the trunk, about five or six inches in diameter, of any one of these trees, is selected and cut up into lengths of four or five feet; each piece is then split down lengthwise into four, and on the outer bark slight incisions are either made at once with a hatchet or the cut logs are left till the following spring, and then deep wounds seven or eight inches long are incised on them. Assuming the first course to have been pursued, the logs, after having received several slight incisions, are placed in a wood or grove where they can get the full benefit of the air and heat. In about three years they will be tolerably rotten in parts. After the more rotten parts are removed, they are placed against a rack in a slanting position, and about the middle of the ensuing spring the mushrooms will come forth in abundance. They are then gathered. The logs are, however, still kept, and are submitted to the following process: Every morning they are put in water, where they remain till afternoon, when they are taken out, laid lengthwise on the ground, and beaten with a mallet. They are then ranged on end in the same slanting position as before, and in two or three days mushrooms will again make their appearance in plenty.

In Yenshin the custom is to beat the logs so heavily that the wood swells, and this induces mushrooms of a more than ordinarily large growth. If the logs are beaten gently, a greater number of small-sized mushrooms grow up in succession. In places where there is a scarcity of water, rain water should be kept for steeping the logs in. There is yet another plan. The cut logs are at once buried in the earth, and in a year's time are dug out and beaten in the manner as above described. The mushrooms thus grown are stored in a barn on shelves ranged along three sides, with braziers lighted under. Afterwards they are placed in small boxes, the bottoms of which are lined either with straw or bamboo mats. These boxes are then ranged on the shelves and all approaches carefully closed. An even degree of warmth is thus diffused. The boxes ranged on the upper or lower tiers are constantly changed, so that the contents of each are thoroughly dried. Another mode of drying is to string the mushrooms on thin strips of bamboos, which are piled together near the brazier; the heat is well kept in by inverting a closely woven basket over them. Dried mushrooms are much esteemed in China, and they are also largely consumed by Japanese either as a dish by themselves or as a condiment with other dishes. Dried mushrooms retain their flavor for a great length of time, and thus bear transport to any distance very well.

A New Use for Glycerin.

Physicians and dentists who use small mirrors to explore the throat and teeth, astronomers employing large mirrors out of doors, all who have occasion to use spy glasses in foggy weather, and especially those near-sighted persons who cannot shave themselves without bringing their noses almost in contact with the looking glass, are doubtless aware that the luster of mirrors becomes soon dimmed by the breath, by dew, and generally by water in a vaporous state. The way to prevent this troublesome fog is simply to wipe the surface of the mirror before using with a rag moistened with glycerin. By this substance, watery vapor is completely taken up.

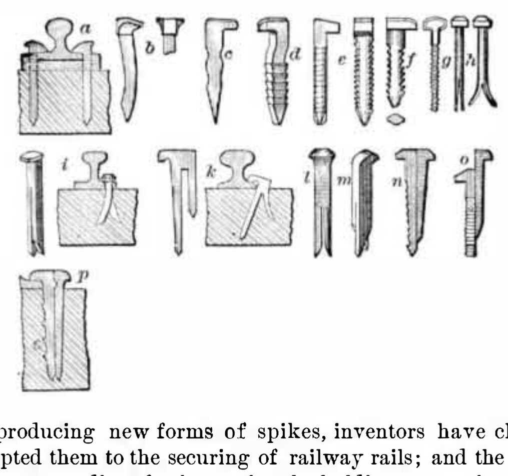
SPIKE MACHINERY.

We extract this week from Knight's "Mechanical Dictionary"* an interesting series of illustrations representing various forms of spikes and the mode of manufacturing the same.

SPIKES

are nails above the tenpenny size. Twelvepenny spikes are 3¼ inches long, and weigh 45 to the lb.; the succeeding sizes are sixteenpenny, twentypenny, and thirtypenny, and then follow the railroad spikes, of large size and various patterns.

Fig. 1.



In producing new forms of spikes, inventors have chiefly adapted them to the securing of railway rails; and the commonest expedient for increasing the holding power is to serrate the edge of the spike, or to construct it so that its points will spread apart on its being driven home. In Fig. 1 we illustrate several forms of spikes.

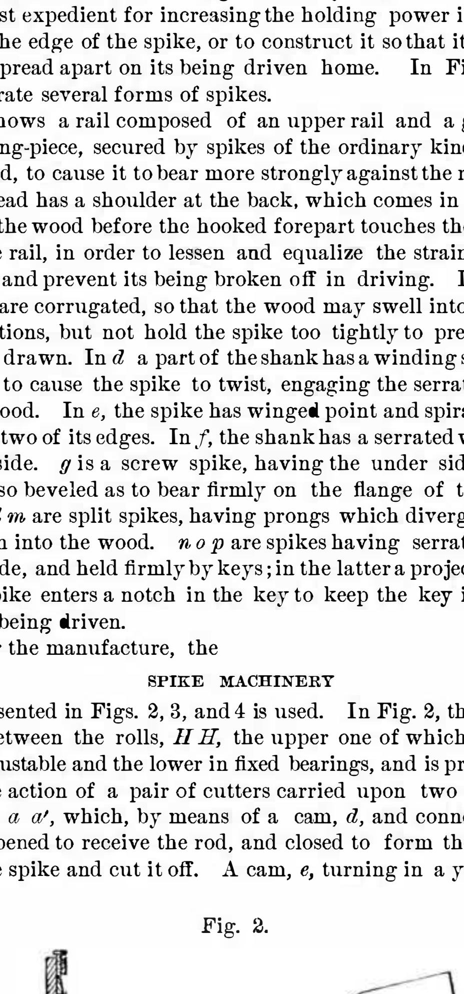
a shows a rail composed of an upper rail and a grooved bedding-piece, secured by spikes of the ordinary kind. *b* is curved, to cause it to bear more strongly against the rail, and the head has a shoulder at the back, which comes in contact with the wood before the hooked forepart touches the flange of the rail, in order to lessen and equalize the strain on the head, and prevent its being broken off in driving. In *c*, the sides are corrugated, so that the wood may swell into the indentations, but not hold the spike too tightly to prevent its being drawn. In *d* a part of the shank has a winding surface, so as to cause the spike to twist, engaging the serrations in the wood. In *e*, the spike has winged point and spiral barbs upon two of its edges. In *f*, the shank has a serrated wing on each side. *g* is a screw spike, having the under side of its head so beveled as to bear firmly on the flange of the rail. *h i k l m* are split spikes, having prongs which diverge when driven into the wood. *n o p* are spikes having serrations on one side, and held firmly by keys; in the latter a projection on the spike enters a notch in the key to keep the key in place after being driven.

For the manufacture, the

SPIKE MACHINERY

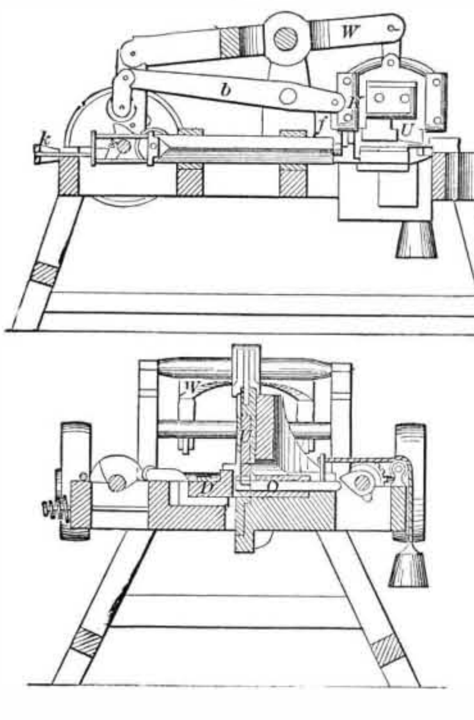
represented in Figs. 2, 3, and 4 is used. In Fig. 2, the rod is fed between the rolls, *H H*, the upper one of which rotates in adjustable and the lower in fixed bearings, and is presented to the action of a pair of cutters carried upon two vertical posts, *a a'*, which, by means of a cam, *d*, and connections, are opened to receive the rod, and closed to form the point of the spike and cut it off. A cam, *e*, turning in a yoke, *E*, imparts a traversing motion to the carriage, *B B*, and a cam, *F*, rocks the lever, *c*, which carries a die, *b'*, between which and the stationary die, *b*, the body of the spike is formed. The die, *b'*, is, by means of inclined parallel guides, *l l*, partially rotated, so as to close gradually on the body of the spike. While the spike is clamped between the dies, the header, *G*, having a slot, *i*, into which passes a pin, *i'*, connecting it loosely with the bed, advances with the bed, and is brought in contact with the end of the blank, which projects beyond the dies, at the same time turning on its pivot, so that its pressure is first applied to one side of the head, and is gradually brought to bear squarely upon it at the completion of its stroke.

Fig. 2.



In Fig. 3, a gage, *K*, is adjusted to determine the length of the spike or bolt, which is first grasped between two moving dies, *C D*, that shape the body. A vertically moving die, *U*, operated by the lever, *W*, forms the point, and a second vertically moving die, *f*, operated by the lever, *b*, the head. The levers, *W b*, have pivoted arms, which are turned down, so as to be acted on by cams when spikes are to be made, but are lifted out of contact with the cams in making plain bolts.

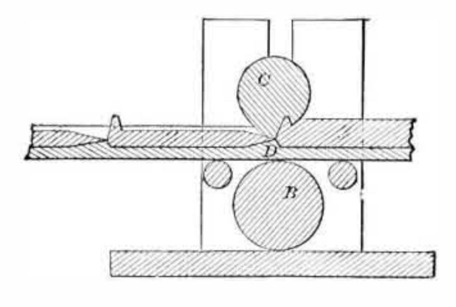
Fig. 3.



A cutter, *O*, advanced by a cam and retracted by a cord and weight, or a spring, severs the blanks.

In Fig. 4, the bed, *D*, is traversed by gearing from the roller, *B*, which also has gear connection with the cam roller, *C*. The bed is grooved to form the lower half of the spike, the upper half being formed by the cam roller, which has a transverse notch that shapes the head as the rod enters between it and the table, and the point is tapered as the spike emerges from between them. Small supporting rolls beneath steady the table and prevent it from tilting.

Fig. 4.



* Published in numbers by Messrs. Hurd & Houghton, New York city.

Slide Valve Friction.

We published in our SUPPLEMENT, No. 62, a communication on the subject of friction of plain slide valves, by Mr. John W. Hill, M.E., taken from the columns of the *Engineering and Mining Journal*. The writer quotes from an article in the SCIENTIFIC AMERICAN of September 20, 1876, wherein was contained a brief calculation as to the loss due to friction of an unrelieved valve, wherein it was stated that, under circumstances in nowise phenomenal, a total waste of 58 per cent. of the "power" of the engine would obtain. This error is so obvious that it scarcely needs the care which the above writer has taken to refute it; and we can only regret that our attention was not directed to the subject at an earlier date, in order that we might have more promptly made this correction. The loss referred to is clearly a very much less percentage of the power.

In any journal such as the SCIENTIFIC AMERICAN, where a large staff of contributors, selected on account of their superior attainments in the various branches of Science and Mechanics, is constantly employed, the editor is naturally apt to rely in some measure on the special knowledge of the writers; and for this reason their contributions are, as a rule, not subjected to close analysis, as experience proves the same rarely to reveal a material error. Mr. Joshua Rose, who is now in fault, is so able an expert in mechanical matters, and one usually so correct in his opinions, that the above inadvertence on his part will scarcely vitiate an otherwise excellent article.

A CONCRETE WALL.—The United States Government has built a concrete wall at Minneapolis, Minn., for the protection of St. Anthony's Falls. The wall, which cost $900,000 is 1,875 feet long, 40 feet high, 7 feet wide at the base, and 4 feet at the top.