SCIENTIFIC AMERICAN

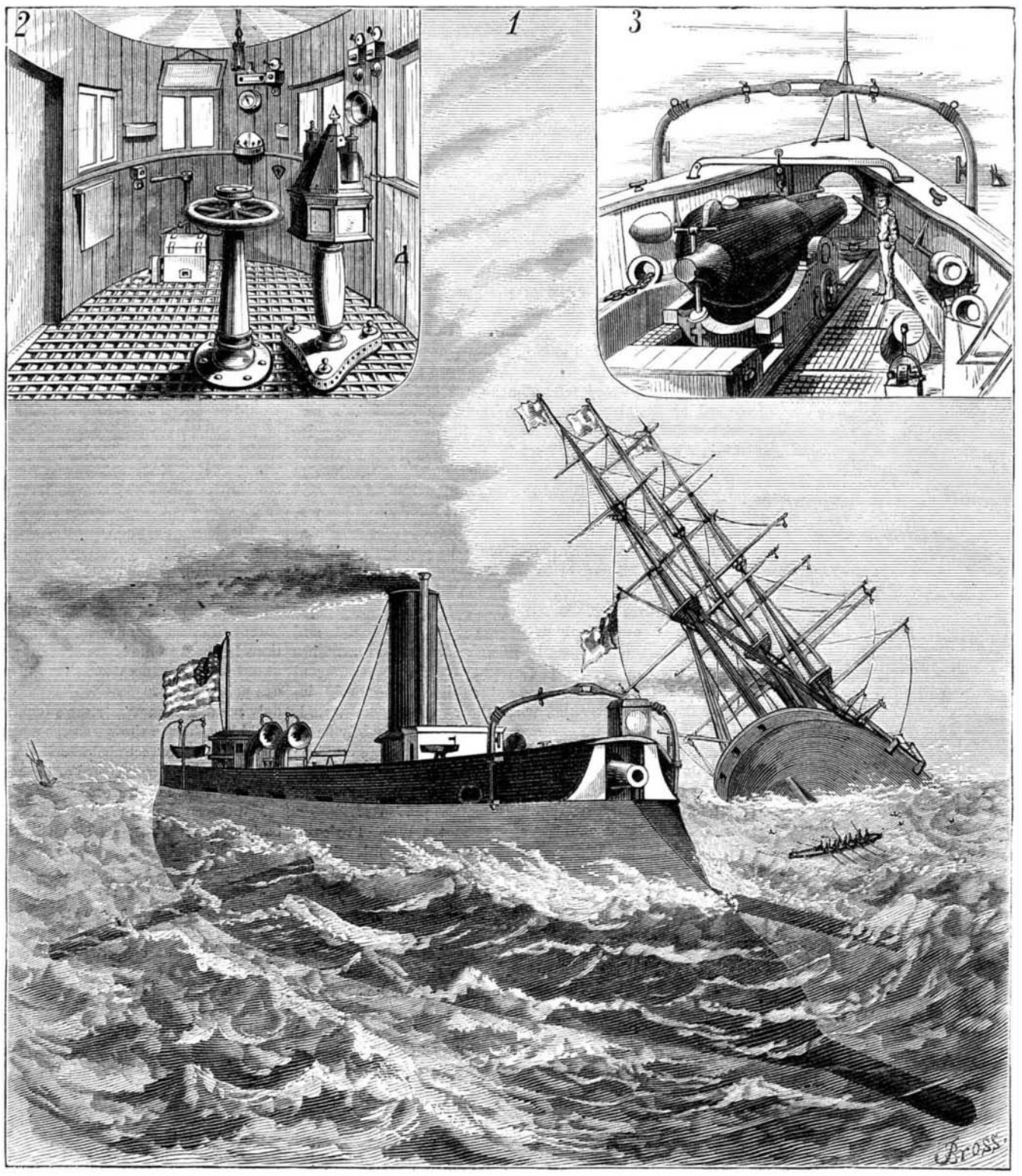
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXVI.--No. 11. [NEW SERIES.] NEW YORK, MARCH 17, 1877. [$3.20 per Annum. [POSTAGE PREPAID.]

THE UNITED STATES TORPEDO STEAMER ALARM.

While, in preparing for the wars of the future, foreign nations have bestowed chief attention upon immensely costly experiments on guns and armor, here, in the United States, the principal aim has been the perfection of the torpedo system. An admirably organized and thoroughly equipped torpedo school for the navy has for several years been in existence in Newport, R. I. The work which there is done is not published, but many of its results are of great importance. There is also an army torpedo station at Willet's Point, L. I. We have also constructed one torpedo vessel which is probably the most formidable craft afloat (not excepting the Italian ironclads with their 100-ton guns), and in time of war will form the model for a fleet of like steamers. This vessel is the Alarm; and in the annexed engravings we represent al- that we are permitted to make publicly known relative to her construction.

The Alarm, we should premise by explaining, does not fight according to any established rules of naval tactics. Having sighted an enemy—say at night—her compound engines drive her headlong at him at the rate of 15 knots per hour. As she nears him, the immense electric light on her bow flashes out its glare, blinding her adversary to her own hull (which is already sunk so low that her deck is but three feet above the sea), while displaying his every proportion. The roar of her 15-inch gun, as it hurls its huge shot or shell into the attacked vessel, is followed by the crash of the bow spar torpedo striking the devoted craft thirteen feet below the water line. Then, perhaps after a momentary check due to the torpedo recoil, the Alarm plunges forward, driving her immense ram into her adversary's crushed side. As she swings broadside on to her foe, another torpedo spar shoots out from her side, and another torpedo is exploded under the unguarded bottom of the enemy; while the machine guns on the torpedo boat's rail keep up a deadly fire of thousands of bullets per minute, sweeping her opponent's decks. We need scarcely add that the Alarm is a disagreeable craft for a heavy ironclad (one like the Vanguard, for instance, which went down like a shot on being slightly rammed) to encounter. She is well provided with defensive means, but of these we shall write further on.



ADMIRAL PORTER'S SYSTEM OF TORPEDO WARFARE.

An excellent idea of the shape of the Alarm may be obtained from the large illustration, Fig. 1. Her length is 172 feet, of which 32 feet is snout or ram; her beam is 27 feet 6 inches, and she draws 11 feet of water, displacing about 700 tons. She is built of thoroughly tested charcoal iron, and on the English bracket plate system: that is to say, she has really a double hull, one shell being constructed inside the other. Within the outside shell three longitudinals of great strength run the entire length of the vessel, and are connected with bars running in a horizontal direction by brackets. The different sections can be entered through man-holes, so that a person can pass from stem to stern between the inner and outer vessels. These compartments are all watertight, so that, in event of a leak, only one section could fill. The whole interior of the vessel is also built in compartments which may be hermetically closed, so that, in case of rupture of both shells at any point, it would still be impossible to fill the entire ship with water. The side plating is not thick, as it is not intended as armor, the vessel, as already explained, being almost wholly submerged while in action.

In order to attack an enemy suddenly, and to pursue him in case of flight with success, and also to be possessed of a very necessary mode of self-protection, it is evident that a vessel such as the Alarm requires not only the means of speed but of handling her with the utmost readiness. The theory is that she is always to meet her adversary bows on; and as her most formidable enemy is the ram, she must be able to turn in so small a space and so quickly that it would be impossible for her to receive a fair broadside blow. This is effected by the total abolition of a rudder, and by steering her with the same apparatus which propels her, the Fowler wheel, which is represented in Fig. 5. The wheel turns on a vertical shaft; and its paddles are feathered by an eccentric cam in such a manner that, at one part of their revolution, they have a pushing and drawing action on the water, while at another part they present only their edges. The device, in fact, is simply a feathering paddle wheel, turned horizontally instead of vertically. By suitably turning the cam wheel, which is done from the helm, the feathering of the paddles is caused to occur at different points; and in this way the ship may be turned, or rather her stern twisted, around as if on a pivot. At the same time, by suitably adjusting the paddles, the vessel goes ahead or backs, the engine meanwhile running always in the same direction.

The steering is accomplished from the wheel house located aft on the deck, an interior view of which is given in Fig. 2. By means of the hand lever, shown beneath the wheel, steam is admitted to the little engine which works the cam that adjusts the paddles. Then, by turning the horizontal hand wheel in either direction, the helmsman controls the movement of the cam as desired. Just above the wheel is a dial with a pointer, which enables him to note the exact position of the paddles, and so to place them as ordered. This contrivance shocks the feelings of ancient tars; for with the advent of the machinery the time-honored hand wheel and the yells of "starboard," "port," "steady," etc., to the helmsman, disappeared; and in lieu of the latter orders, the pilot quietly remarks "sixteen," "ten," "two," or other proper numbers on the dial, in accordance with which the man at the wheel places his paddles.

Inside the wheel house (which may or may not be used in action as desired, as all its appliances are duplicated below deck) are devices for communicating with the men working the big gun in the bow, Fig. 3, or those managing the torpedoes. For instance, on nearing an enemy, the captain would press a certain button. A signal sounds at the gun, meaning "get ready;" a bell then rings in the wheel house, meaning that the order is understood. At another signal, the gun is fired. Then another button pressed sounds a bell in the portion of the ship where the torpedo spars are located; and at once those in charge run out the designated spar. Fig. 6 shows the spar, which is a long hollow iron cylinder lying on its supports between decks. Its outboard end rests in a kind of

[*Continued on page* 162.]

[*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

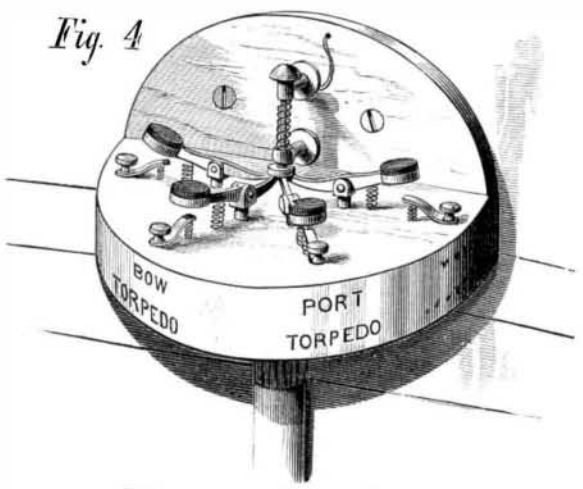
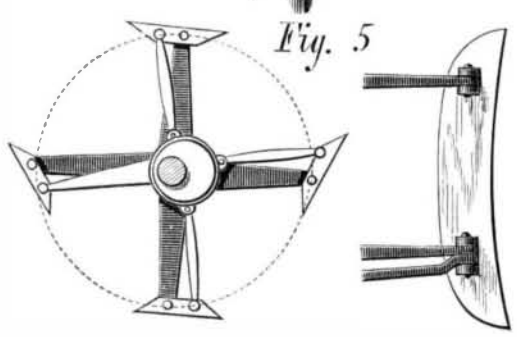
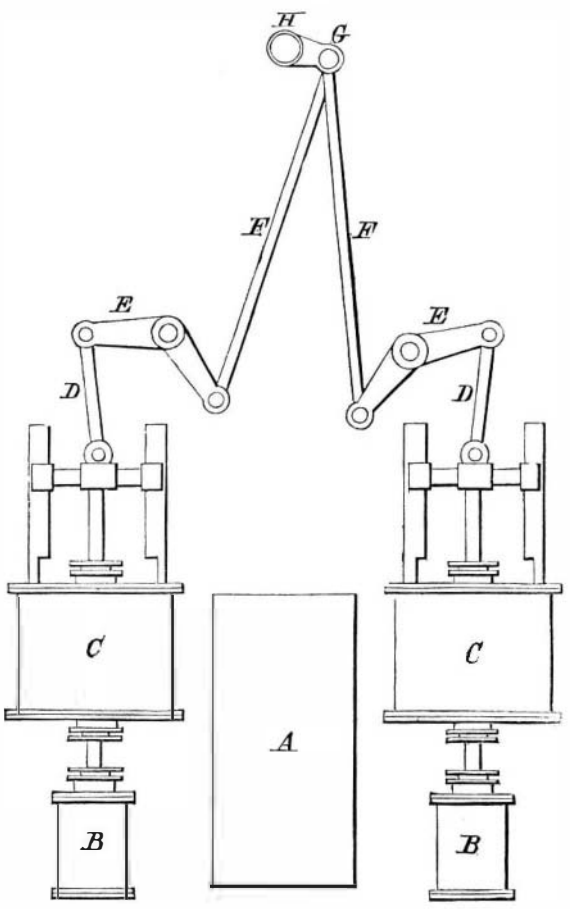


Fig. 5



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.

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.

Fig. 6

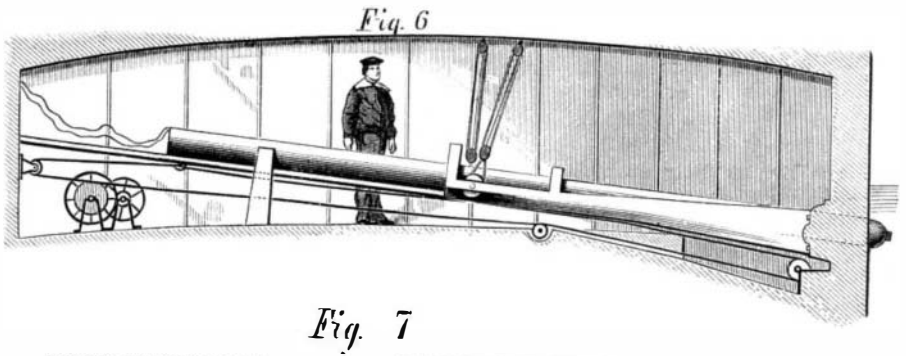
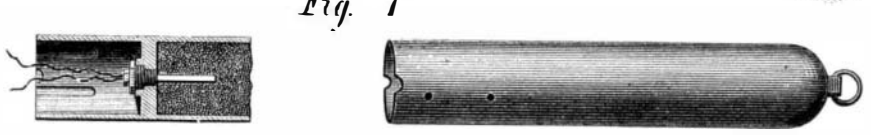


Fig. 7



ADMIRAL PORTER'S TORPEDO SPAR.

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.

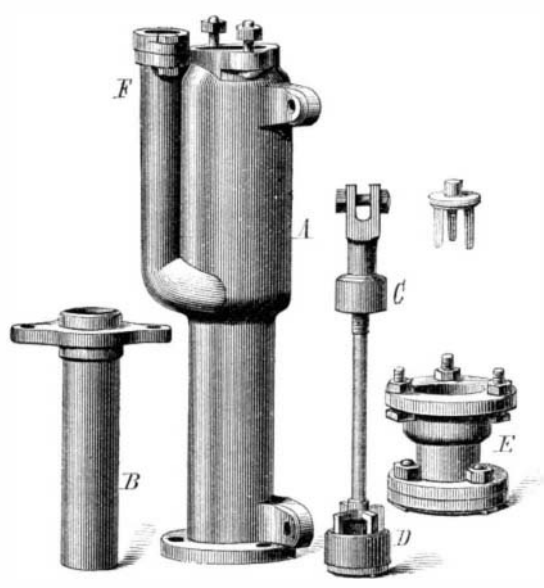
ROBAUGH'S LITTLE GIANT PUMP.

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 downstroke. 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.