# T. Hanson,

## Hydraulic Engine,

No. 27,218. Patented Feb. 21, 1860.

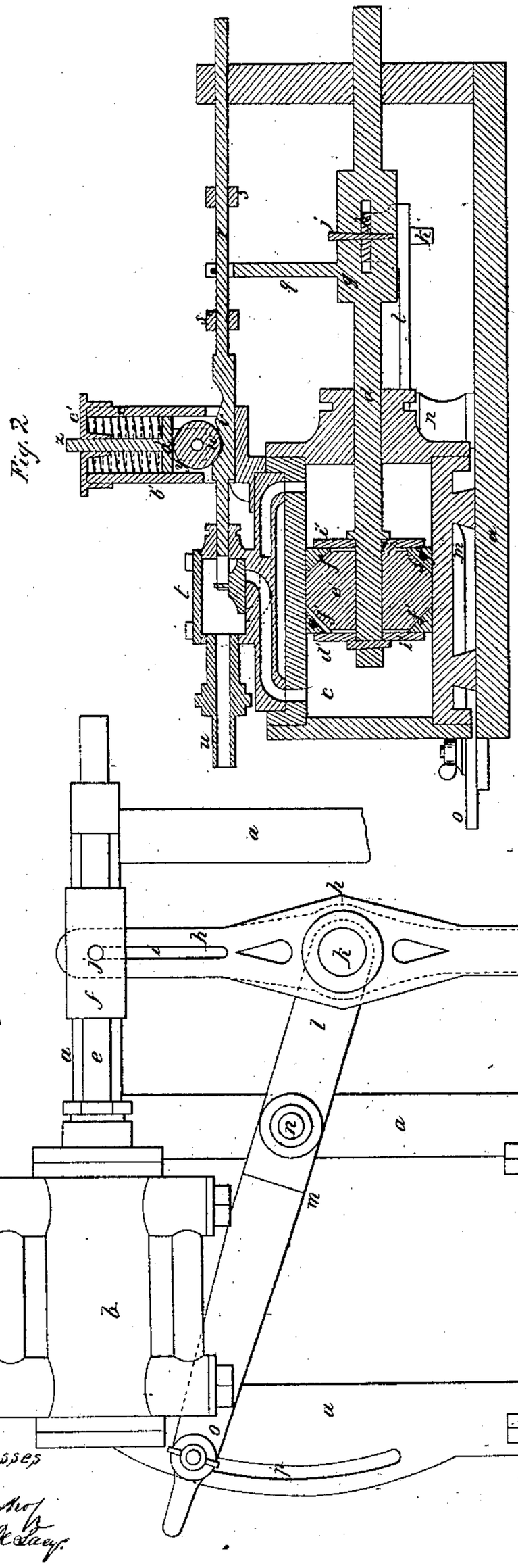

Fig. 2

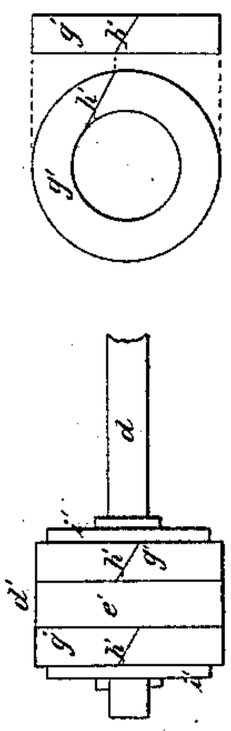

Fig. 3

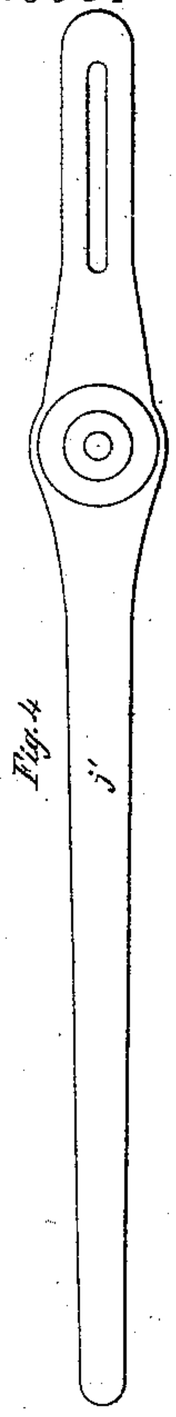

Fig. 4



Fig. 1

Witnesses

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# UNITED STATES PATENT OFFICE.

THOMAS HANSON, OF NEW YORK, N. Y.

## APPARATUS FOR SUPPLYING WATER IN BUILDINGS.

Specification of Letters Patent No. 27,218, dated February 21, 1860.

*To all whom it may concern:*

Be it known that I, THOMAS HANSON, of the city, county, and State of New York, have invented certain new and useful Improvements in the Apparatus for Supplying Water in Buildings; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a plan; Fig. 2 a longitudinal vertical section in the plane of the axis of the cylinder of the engine; and Fig. 3 a separate view of the piston of the engine.

The same letters indicate like parts in all the figures.

The object of my invention is to supply water to the upper stories of buildings in cities or other localities where the lower stories are supplied from a head of water not sufficient to force the water by hydrostatic pressure to the upper stories.

In many localities such as the elevated portions of the city of New York where the head of water in the reservoir is not sufficient to supply the upper stories with water the upper stories have been supplied from a reservoir in the upper part of the building into which water is forced from below by a pump operated in some instances by hand, and in many instances by an engine, actuated by the head of water from the street main when drawn for use in the lower stories, for which engine Letters Patent were secured to me bearing date the 24th day of February, 1857. And although the apparatus so patented by me is practically useful, nevertheless it presents serious difficulties which are avoided by my present invention. The apparatus so patented by me as aforesaid requires at all times the same power to force the water to the reservoir in the upper part of the building and as the head of water in the main reservoir varies considerably, it is necessary so to proportion the apparatus that it will force water into the reservoir in the upper part of the building with the minimum head of water in the main reservoir, and from this it follows that when the head in the main reservoir is above the minimum there will be a serious waste of power. Another inconvenience which has been experienced in the use of such engines is that when out of order water cannot be supplied to the upper part of the building. And still another inconvenience arises from the want of packing for the pistons, which will be self packing, as persons occupying buildings are seldom sufficiently acquainted with machinery to take it apart and repack the piston.

The waste of water I avoid by my present invention which consists in combining the hydraulic engine operated by the head of water from the main reservoir, with the pump which forces the water into the upper part of the building by means of a lever with an adjustable shifting fulcrum that the power of the engine to operate the pump may be graduated to suit any variation in the head of water in the main reservoir. And my said invention also consists in so arranging the engine and the lever which connects it with the pump that that lever may be removed and a hand lever substituted to work the pump by hand whenever the engine or its connections are deranged. And my said invention also consists in making the piston with a solid boss conical at each end in combination with conical packing rings fitted thereto, and each provided with a closed head outside of the boss and capable of sliding on the piston rod, the said rings being split so that their diameter can be enlarged by the pressure of the water and contracted when relieved of this pressure by means of which combination the pressure of the fluid forcing the rings onto the conical boss will expand them and thus render the piston self packing. And the last part of my said invention which relates to the mechanism for operating the valves of the engine consists in forming the valve rod with a double and reversed inclined plane in combination with a roller which rides on the said inclined plane and which is forced down by means of a spring so that after the valve stem has been moved a little more than half its range of motion by tappets on the piston rod, that is, after the summit of the two inclined planes has passed under the roller the pressure of the said roller on the inclined plane shall move the valves to the end of their range of motion independently of the piston so as to complete the shifting of the valves before the end of the stroke of the piston.

In the accompanying drawings (*a*) represents a suitable frame, and (*b*) a force pump with suitable water ways and pipes to receive water, and when forced to lead it wherever it may be required to be discharged

in the upper part of the building to be supplied. This pump is to be placed in the lower part of the building, or any other part where water can be supplied to the engine with the force of a head sufficient to drive the apparatus. By the side of the pump, and on the same frame, is placed the engine (*c*) which in its general structure is like a reciprocating steam engine. The piston rod (*d*) of this engine, is parallel with the piston rod (*e*) of the pump, and both are constructed in like manner, that is, with an enlarged part (*f*) and (*g*) mortised to receive each one end of a lever (*h*), the mortises being of sufficient size for free play. Both arms of the lever (*h*) are mortised longitudinally as at (*i*, *i*) to play on pins (*j*, *j*) so that the motion of the piston of the engine will, by this lever, impart motion to the piston of the pump, and the object of connecting the arms of the lever with the two piston rods by pins passing through the longitudinal mortises in the lever, is to allow the lever to be shifted so as to change the fulcrum of the said lever to vary the leverage as the head of water which impels the engine varies. To effect this the fulcrum pin (*k*) of the lever is inserted in the arm (*l*) of a lever (*m*) which has its fulcrum at (*n*) the other arm (*o*) being provided with a holdfast screw bolt, or equivalent therefor, passing through a sector slot (*p*) in the frame to secure the lever in any desired position. By this means the fulcrum of the lever (*h*) can be readily shifted and adjusted to any variation in the power of the engine, the quantity of water thrown up by the pump varying in the same proportion. And it will be obvious that the shifting lever (*h*) can be connected with the piston rods in various other and equivalent ways well known to machinists, and so with the movable fulcrum, any other equivalent mode may be substituted.

The piston rod (*d*) of the engine carries an arm (*q*) the upper end of which embraces and slides on the valve rod or stem (*r*) of the engine, which rod is provided with two tappets (*s*, *s*) which are alternately struck by the arm (*q*) to shift the valves toward the end of each stroke of the piston of the engine, and thereby control the parts for the induction and eduction of the water to and from the engine; the valves, which may be of any suitable construction used in steam engines, work in a water chest (*t*), similar to a steam chest, and provided with two pipes (*u*, *u*) one connected with any suitable head of water, such as the Croton reservoir in the city of New York, and the other is the discharge pipe which may be provided with a cock so that when water is drawn therefrom, say for use in the lower part of a building, this will bring into action the power of the head of water on the engine and thereby operate the pump to force water up to the upper reservoir or any other suitable receptacle in the upper part of a building which could not be reached by the hydrostatic pressure of the head. As the valves can only be shifted toward the end of the stroke of the piston, and it is essential to the proper working of the engine with water, which is a non-elastic fluid, that the valves should be completely shifted during the very last portion of the movement of the piston, the valve stem is formed with a boss or projection (*v*) on its upper surface which from the highest point inclines in opposite directions. A roller (*w*) rides on the surface of this boss and is forced down by the tension of a helical spring (*x*). The roller turns in jaws (*y*) on the lower end of a stem (*z*) provided with a plunger (*a'*) which fits and slides in a cylinder (*b'*) as a guide. The lower end of the helical spring (*x*), which surrounds the stem, rests on the plunger and its upper end against an adjusting nut (*c'*) by which the tension of the spring can be regulated. From this it will be seen that the arm on the piston rod acting on the tappet merely moves the valve a short distance, that is until the highest point of the projection (*v*) passes under the roller, and then the pressure of the roller on the oppositely inclined surface forces the rod with a very rapid motion to complete the shifting of the valves before the piston completes its stroke, so that the piston is prevented from striking the end of the cylinder by the water which enters to give the return stroke.

The piston (*d'*) of the engine consists of a boss (*e'*) on the end of the piston rod which boss is cylindrical for a short distance and the ends each in the form of a frustum of a cone as at (*f'*, *f'*). To each of these conical frustums is fitted a metallic spring ring (*g'*, *g'*) the outer periphery of each ring being cylindrical and of a diameter equal to the bore of the cylinder of the engine. These rings are cut diagonally as at (*h'*) so as to make a lap joint and yet permit them to be expanded, that is, to be forced outward, to make a tight fit in the cylinder, and this is done by forcing them onto the conical frustums (*f'*, *f'*) of the boss (*e'*). To effect this the outer end of each ring is secured to a plate or head (*i''*) which slides on the piston rod, but held by a nut or key so that it can only move from the boss to the required extent to relieve the packing rings from the cylinder. When the water or other fluid enters one end of the cylinder it presses against the plate or head (*i''*) and forces the packing ring at that end of the cylinder onto its frustum which expands the ring and effectually packs the piston, the other ring in the mean time being relieved of the pressure contracts and

does not make friction, but when the valves are reversed and the water admitted to the other end a like effect is produced on the other ring on the other end of the piston. In this way the piston is rendered self packing, and not liable to derangement.

Whenever any part of the engine is out of order or cannot be worked from any cause, the lever (*h*) is taken out and hand lever (*j'*) represented in the separate Fig. 4, and by red lines in Fig. 1, is substituted so that the pump can be operated by hand for temporary use. This is effected by simply taking out the bolt which forms the fulcrum pin and substituting the one lever for the other.

What I claim as my invention and desire to secure by Letters Patent is—

1. Combining the engine, which is operated by the head of water, with the pump forcing the water to the upper part of the building by means of a lever with a shifting adjustable fulcrum, substantially as and for the purpose specified.

2. I also claim the arrangement, substantially as described, of the engine, and pump, so that the connecting lever can be removed and a hand lever substituted, as described, that the pump may be operated by hand when, from any cause, the pump cannot be operated by the engine.

3. I also claim the split packing rings and plates secured thereto, substantially as described, in combination with the conical boss on the piston rod, substantially as described, to render the piston self packing by the pressure of the fluid.

THOMAS HANSON.

Witnesses:
WM. H. BISHOP,
PETER DE LACY.