T. J. Sloan,

Steam-Boiler Water-Feeder,

№ 52,898, Patented Feb. 27, 1866.

Fig: 6.

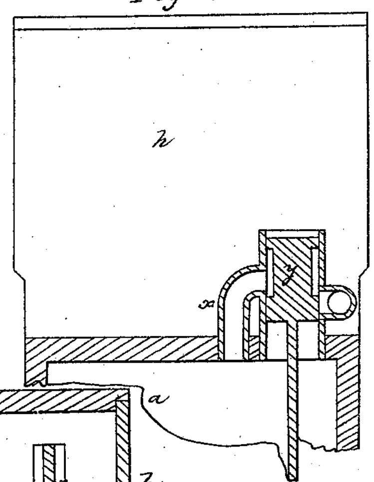


Fig: 4.

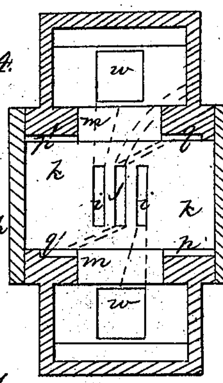


Fig: 5.

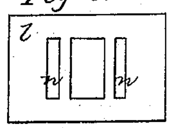


Fig: 3.

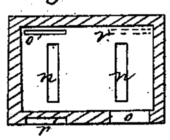


Fig: 1.

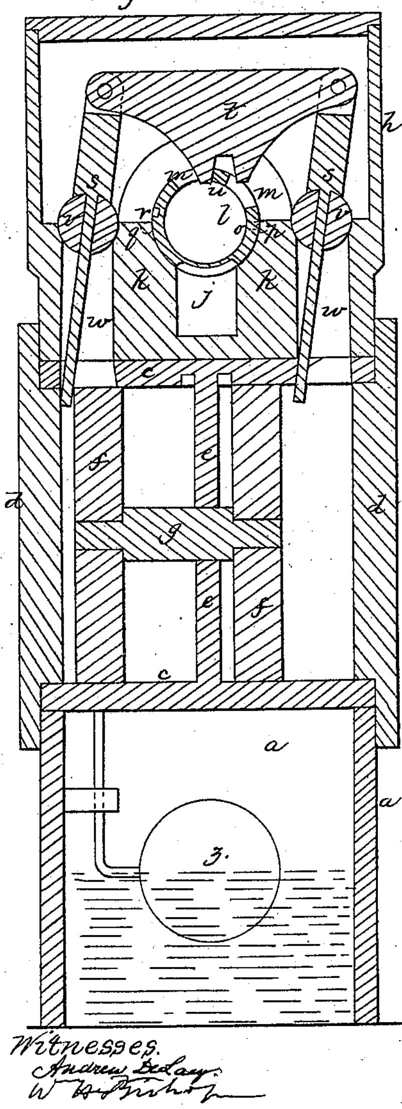
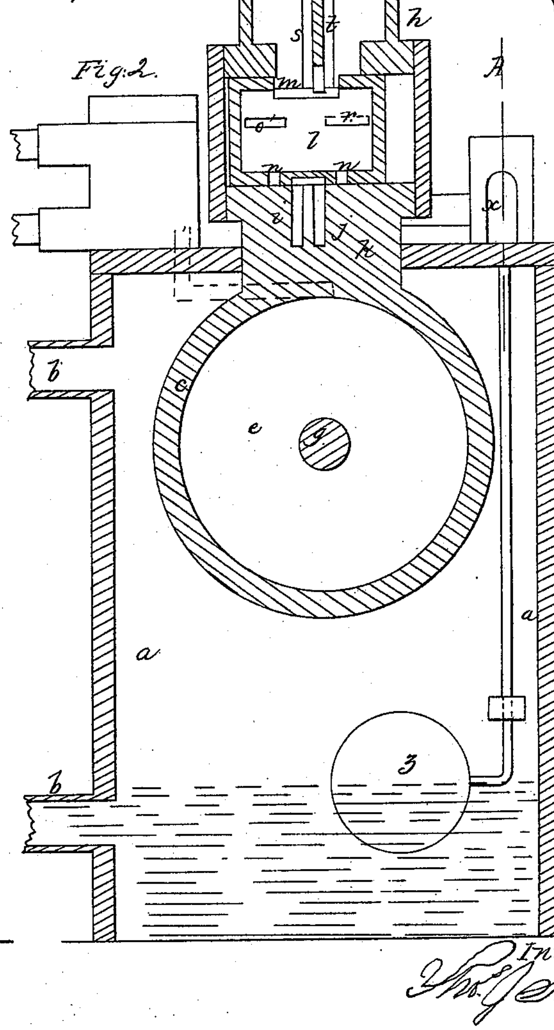


Fig: 2.



Witnesses.
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UNITED STATES. PATENT OFFICE.

THOMAS J. SLOAN, OF NEW YORK, N. Y.

IMPROVEMENT IN AUTOMATIC BOILER-FEEDERS.

Specification forming part of Letters Patent No. **52,898**, dated February 27, 1866.

To all whom it may concern:

Be it known that I, THOMAS J. SLOAN, of the city, county, and State of New York, have invented a new and useful Apparatus for Supplying Water to Steam-Boilers and Regulating the Supply thereof; 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 vertical section in the plane of the axis of the engine-cylinder; Fig. 2, another vertical section in the plane of the axis of the steam-valve; Fig. 3, a horizontal section taken in the plane of the axis of the steam-valve; Fig. 4, a horizontal section of the cylinder in which the steam-valve works; Fig. 5, a bottom view of the steam-valve; and Fig. 6, a cross vertical section at the line A of Fig. 2.

The same letters indicate like parts in all the figures.

The object of my said invention is to insure a sufficient supply of water to steam-boilers at all times, whether the boiler be used to generate steam for the purpose of operating an engine or for any other purpose, and if for the purpose of operating an engine whether such engine be in operation or at rest.

The first part of my said invention consists in combining with a vessel which is to be connected with a steam-boiler both above the high and below the low water mark a throttle-valve connected with a float to control the passage of the steam from the said vessel to the steam-chest of a pumping-engine which is to supply water to the boiler, and a valve for giving steam to the engine, which valve is itself operated by steam, and which is so formed as to stop the exhaust of the steam by which it is operated to leave a sufficient supply within its cylinder to cushion against, and thus insure the proper working thereof and prevent it from slamming, thus rendering the apparatus self-operating to regulate the supply of water to steam-boilers.

My said invention also consists in operating the valve of the engine by a mechanism inclosed in the steam-chest and extending from the steam-chest into the cylinder of the engine to be actuated by the piston.

My said invention also consists in composing the engine and pump of two pistons connected by a piston-rod extending from one to the other, the pistons being fitted to work in a cylinder provided with a head at each end and a diaphragm or partition in the middle of its length and between the two pistons, and combined with the steam-chest and steam and exhaust valves for the admission of steam to and exhausting it from the cylinder at each end between the pistons and the heads of the cylinder, and with induction and eduction valves communicating with the cylinder between the diaphragm or partition and the two pistons, the cylinder of the engine being surrounded by a steam-chamber communicating with the boiler to maintain it in a heated state.

In the accompanying drawings, *a* represents a vessel which communicates freely with the boiler by means of two pipes, *b b*, one above the high-water mark and the other below it, so that the water and steam shall be at the same level in the said vessel as in the boiler.

Within the vessel *a*, and as near the upper part thereof as convenient, is placed the cylinder *c* of the engine and pump, so that the steam in the vessel shall surround it. For the convenience of repairs the heads *d d* of this cylinder are outside of the vessel *a*. The cylinder is divided into two compartments by a partition or diaphragm, *e*, placed in the middle of its length, and each of the two compartments of the cylinder is fitted with a piston, *f*, the two being connected to move together by a piston-rod, *g*, fitted to slide water-tight in a central hole in the partition *e*. The cylinder is provided with steam and exhaust ports near each end, as is usual in engines with a single piston. And both compartments of the cylinder, near the partition *e*, are provided with ports leading to induction and eduction water-valves, the induction water-valves communicating by suitable pipes with the hot-well, or with any other suitable reservoir of heated water, and the eduction-valves communicating with the boiler in the usual manner for supplying water to the boiler.

Above the engine there is a steam-chest, *h*, with steam ports and ways *i i* and exhaust-way *j*, for the admission and discharge of the steam to and from the cylinder. These ports are formed through the lower part of a horizontal hollow cylinder, *k*, which makes part of the steam-chest, and within this cylinder *k* is fitted a hollow cylindrical piston-valve, *l*, both

ends of which are closed. The upper middle portion of the cylinder *k* and cylindrical valve *l* are open, as at *m*, that the steam in the steam-chest may have free access to the inside of the valve *l*, and thence to pass through the steam-ports *n* of the valve, when in the required position, to the steam-ports leading to the engine. The steam-valve *l* is moved longitudinally to admit steam to work the engine by the steam in the steam-chest, and for this purpose steam is admitted alternately to the opposite ends of the hollow cylinder *k*, beyond the ends of the piston-valve *l*, through apertures or ports *o o'* made through the said valve *l*. This is accomplished in the following manner: Near each end the hollow cylinder is formed with a cavity, *p p'*, extending to the ends thereof, and when the valve *l* is turned on its axis to the right the port *o* in the valve communicates with the cavity *p* in one end of the cylinder *k*, and in that position of the valve the other port, *o'*, does not communicate with the cavity *p'* at the other end of the cylinder *k*, and steam will then be admitted to that end of the cylinder *k* to force the valve *l* to the opposite end of the cylinder *k*, and then, by turning the valve *l* in the opposite direction, the port *o* will be turned away from the cavity *p* to shut off the steam from that end, and the port *o'* will communicate with the cavity *p'* at the other end to admit steam to the opposite end of the cylder *k* to move the valve in the opposite direction. But when steam is admitted to one end of the cylinder *k* it must be exhausted from the other end to permit the valve to be moved. For this latter purpose there are two other cavities or ways, *q q'*, made in the cylinder *k*, one near each end, and extending to within a short distance of the ends of the cylinder; and in the outer surface of the valve *l* there are two cavities or ways, *r r'*, one near each end, and so located relatively to the ways *q q'* in the cylinder and to the main exhaust-passage *j* that when the valve is turned to admit steam to one end of the cylinder—say through the port *o*—the cavity *r'* in the valve will connect the cavity *q'* in the cylinder *k* with the way exhaust-passage *j*, to exhaust steam from the opposite end of the cylinder, and vice versa.

As stated before, the small exhaust-cavities *q q'* do not extend to the ends of the cylinder *k*, so that the moment the end of the valve passes over the extreme outer end of the cavity the passage of the steam from the cylinder *k* to the exhaust is closed, thus leaving sufficient steam in the cylinder and beyond the end of the valve to form an elastic cushion to stop the valve without slamming, and to insure the valve's being in a position at all times to admit steam to the cylinder of the engine when the steam-chest is in open communication with the boiler.

The valve *l* is turned alternately in opposite directions to admit steam to the cylinder *k* for working the valve to admit steam to the engine by two levers, *s s*, in the steam-chest, and connected at their upper ends by a bar, *t*, notched out to embrace a rod, *u*, which extends across the aperture *m* in the valve, so that the valve will be turned by the vibration of either of the said levers. The journals *v* of these levers rest and turn in semi-cylindrical cavities, as boxes, in the bottom of the steam-chest, and apertures *w w* are formed in the bottom of these boxes, and extending through to the inside of the steam-cylinder of the engine, and the lower arms of the said levers *s s* extend down through these apertures to the inside of the cylinder of the engine, and one at each end, so that when the pistons reach the end of their strokes first one and then the other of the said levers is struck and vibrated in one direction and then the other in the opposite direction, and as both levers are connected by the bar *t*, and this bar is connected with the valve *l*, the required turning of this valve alternately in opposite directions is effected at the times required by the reciprocating motions of the pistons without any mechanism extending outside of the steam-cylinder and steam-chest.

The steam for working the engine is taken from the vessel *a* through a steam-pipe, *x*, extending from the upper part of the said vessel to the steam-chest, which pipe is provided with a throttle-valve, *y*, which I prefer to make in the form of what is well known as a "balance-throttle," and to this valve is connected a float, *z*, so that when the water is above a certain level in the boiler and in the vessel *a* the float *z* keeps the throttle closed, and the pumping-engine, not being supplied with steam, will remain at rest; but the moment the water gets below the required level the float descends, opens the throttle and admits steam to the steam-chest of the engine, and as the steam-valve, in whatever position, is in condition to receive steam to operate it to give steam to the engine, water will be immediately supplied to the boiler.

In this way the boiler will at all times receive the required supply of water for whatever purpose steam may be generated, and however negligent the engineer may be.

As the exhausting of the steam that has operated the valve is only partial, leaving a sufficient quantity of it for the valve to cushion against, there will be no slamming, and the engine will work smooth and without noise; and as the pumping-engine and all its connections are entirely inclosed, the wearing of the parts in consequence of the deposit of dust and ashes, heretofore experienced in engines for supplying boilers, is successfully avoided.

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

1. The combination of the vessel to be connected with a steam-boiler above the high-water mark and below the low-water mark, the throttle-valve in the pipe which conveys steam to the steam-chest of the pumping-engine, the said valve being controlled by a float, the

steam-chest of a pumping-engine for supplying the boiler, and the valve operated by steam and provided with an exhaust substantially such as described, the combination being substantially such as described, and for the purpose specified.

2. The devices, substantially as herein described, for exhausting the steam which operates the steam-valve of the engine, to insure the proper working of the valve and prevent it from slamming, as set forth.

3. Operating the valve to take the steam by which it is shifted to give steam to the engine by the mechanism, substantially as described, inclosed in the steam-chest and extending from the steam-chest into the cylinder of the engine to be actuated by the piston, substantially as and for the purpose described.

4. The cylinder of the pumping-engine, with the partition in the middle of its length, in combination with the two pistons, one each side of the partition, and connected by a piston-rod, substantially as described, and for the purpose set forth.

THOS. J. SLOAN.

Witnesses:
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