2 Sheets—Sheet 1.

A. I. STERNBERG.

BOILER-FEEDERS.

No. 190,383. Patented May 1, 1877.

Fig. 1.

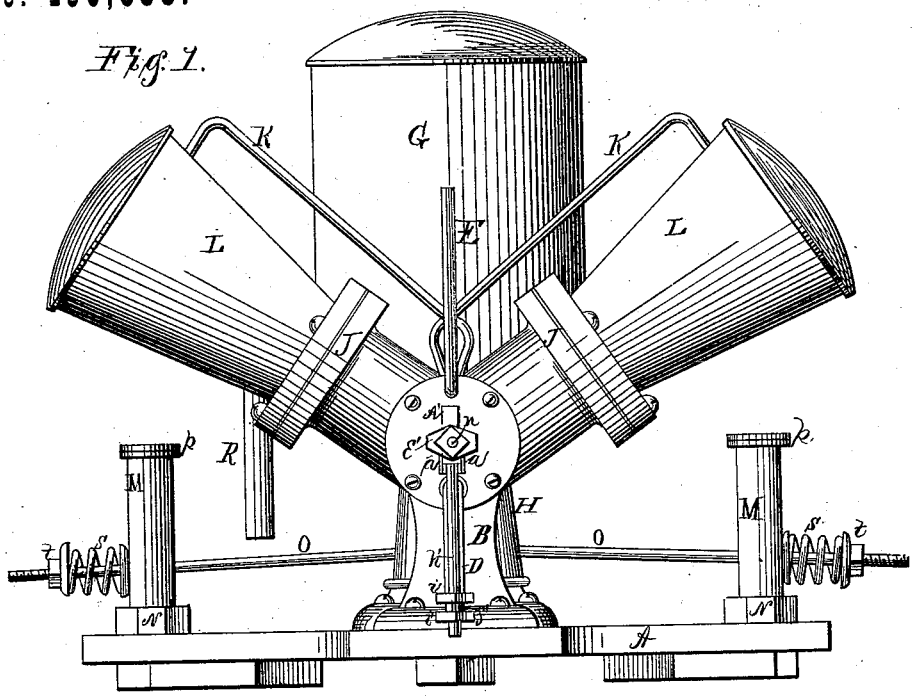
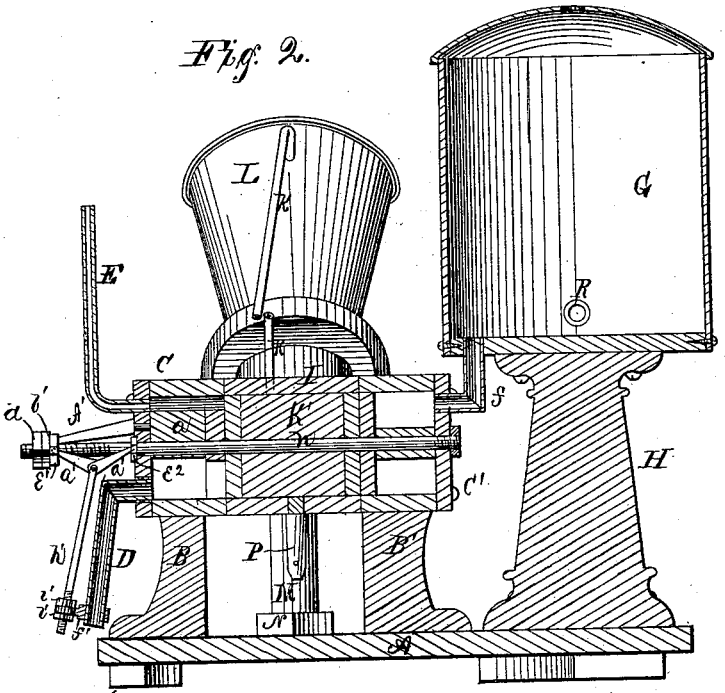


Fig. 2.



WITNESSES

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2 Sheets—Sheet 2.

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Fig. 3.

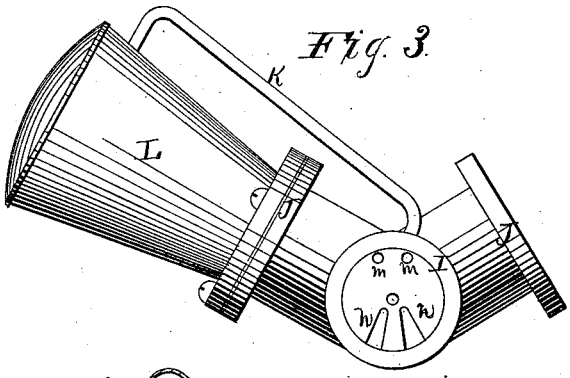


Fig. 4.

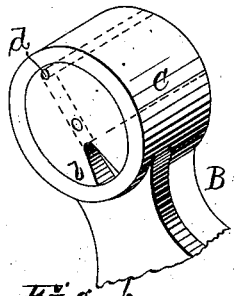


Fig. 5.

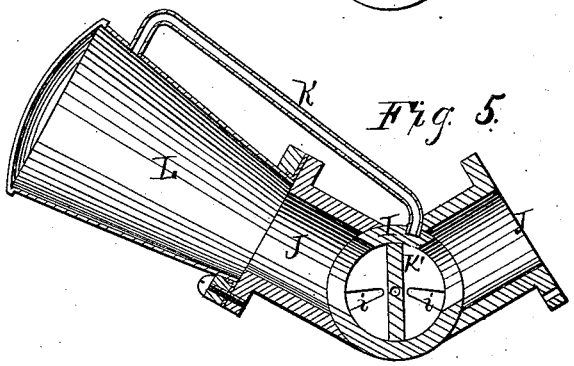


Fig. 6.

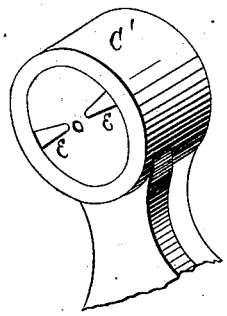
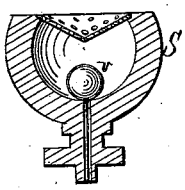


Fig. 7.



WITNESSES

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UNITED STATES PATENT OFFICE.

A. IRVING STERNBERG, OF CARTHAGE, NEW YORK.

IMPROVEMENT IN BOILER-FEEDERS.

Specification forming part of Letters Patent No. **190,383**, dated May 1, 1877; application filed November 20, 1876.

To all whom it may concern:

Be it known that I, A. IRVING STERNBERG, of Carthage, in the county of Jefferson, and in the State of New York, have invented certain new and useful Improvements in Boiler-Feeder and Force-Pump; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

The nature of my invention consists in the construction and arrangement of a machine that will draw water from a well, cistern, or other source of supply, and deliver the same into a steam-boiler as fast and whenever it is required to keep up the requisite amount of water in the boiler automatically, at any and all times without the presence or assistance of an engineer or other employee, and which machine can also be used as a steam force-pump, delivering where and with whatever force of discharge required, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawings, in which—

Figure 1 is a front elevation of my entire machine.

The entire machine is constructed of cast-iron, or other suitable material, except the conical water-chambers, which should be made of sheet-steel, or such material as will give the greatest strength with the least weight.

A represents the bottom or bed-plate, upon which are bolted two standards, B B′, formed at their upper ends with the hollow heads C and C′, respectively. The head C is formed with an interior rib or partition, *a*, extending vertically down from the top below the center of the head, and below this partition in the inner end of the head is the water-delivery port *b*, through which the water is delivered into the head, and from the head it passes through an outlet-pipe, D. In the upper part of the partition *a* is a steam-passage, *d*, through which the steam passes from the steam-inlet pipe E.

The head C′ has in its inner end two suction-ports, *e e*, and its outer end communicates by a pipe, *f*, with the bottom of a chamber, G, which is supported upon a pedestal, H.

Between the heads C C′ is placed the oscillating barrel or cylinder I, provided at one end with the ports *h h*, to work in connection with the water-delivery port *b*, and at the other end with ports *i i*, to correspond with the suction-ports *e e*.

This barrel or cylinder is formed with two tubular flanged side projections, J J, to which are secured the two conical vessels L L, and in the center of the cylinder is a partition, *k*, dividing the same into two parts, forming with the vessels L L two separate and independent chambers, each provided with the ports *h* and *i*, as shown, which open and close alternately, by the oscillation or movement of the cylinder and vessels, the discharge-port *b*, and suction-ports *e e*.

Each vessel L has a steam-pipe, K, running to a steam-passage, *m*, in the top of the cylinder I, on the opposite side of the partition, and these passages or ports *m m* alternately get opposite the steam-port *b* in the head C.

The cylinder I, with the water-vessels L L and steam-pipes K K, swing or oscillate upon a steel center or axle, *n*, and the space or distance of oscillation, to have the ports properly open, close, and cover, is regulated by raising or lowering the adjustable standards M M, by means of the screw-nuts N N, at their attachment to the bed-plate A. These standards are provided with cushions *p*, of rubber or other suitable material, at their upper ends, to receive the blow of the fall of the vessels L, when filled with water.

The standards M also have slotted holes, through which pass rods O O, connecting at their inner ends with an arm, P, projecting from the oscillating cylinder I. At the outer end of each rod O is a spiral spring, *s*, and nut *t*. The object of these springs is to assist in overcoming the friction of the valves or port faces in the small-sized machines, where the quantity of water in the vessel L is not of sufficient weight to do so. The nuts *t* are used to adjust the force of the springs, so as to allow the vessels L to move when the discharging-vessel is empty and the one nearly upright is full.

In the larger-sized machine, where the vessels L are of greater capacity, it is necessary to reverse the action of the springs and adjust them, so as to prevent the falling of the vessel L just filled before the opposite one is empty.

The port or valve faces of the three several parts, C C′, and I are held together, so as to maintain a steam-tight joint by means of the steel rod or axle *n*, and nuts on the end thereof.

The suction-chamber G has attached to it a suction-pipe, R, which is to lead into the well, and the pipe *f* connects it with the head C′. On top of the chamber G is a cup, S, with ball-valve *v*, to allow the escape of air or steam, should it not all have been driven out in starting, or the steam not immediately condensed, as when pumping warm water. This device is, however, not absolutely necessary, yet there should be some cock or valve at that point for the purpose of pouring in water to expel the air and fill the chamber and suction-pipe when first setting up and starting a machine, and at such other times as may be necessary to alter or change the suction-pipe or source of supply.

Suitable cocks and valves should be arranged in the steam-pipe, discharge-pipe, and suction-pipe.

The operation of my machine is substantially as follows: Steam is let on through the pipe E from the boiler, and from thence it passes through the ports *b* and *m* up through the pipe K into the vessel L on the left—for instance, when it fills this vessel driving out the air. When the air is all out it is tipped so as to close its steam and discharge ports and open its suction-port, when the steam enters the chamber G, which has been previously filled with water, and the steam is condensed therein, creating a vacuum in the left vessel L, which vacuum is at once filled with water. This vessel L being now full of water will, by force of gravity, drop down to its former position, resting upon the rubber cushion *p* on the standard M. In so doing, it opens the same ports again, allowing the steam from the boiler into the vessel L above the water, so that the pressure in said vessel and in the boiler is equalized, and the water, by its own gravity, flows through the pipe D into the boiler. By the descent of this vessel filled with water the other vessel is raised to receive its supply, and while one vessel is discharging the other is filling, and so on alternately, automatically without the assistance of any other machinery or appliances, or the aid of any attendant, until the boiler is full to the desired line. The steam-supply pipe E is so attached to the boiler at the water-mark that when the water rises high enough to cover the end of said pipe and cut off the supply of steam, the machine will stop the delivery of water into the boiler; for, as long as there is no steam passing into the vessel L, it cannot discharge its water, and, therefore, will not relieve itself of its weight, so that the opposite vessel can descend with a fresh supply; but, as soon as the steam-supply pipe becomes uncovered in the boiler by the use of the water so as to let any steam pass out to the machine, a corresponding amount of water will be supplied to the boiler.

The central bolt or axle *n* is extended forward, projecting a suitable distance in front of the machine, as shown in Fig. 2. Above this is an arm, A′, projecting from the head C of the machine, and resting on the bolt *n*, near the outer end, to form a support, and prevent the springing of the bolt upward by the action of the levers *a′ a′* below. This arm A′ is to be cast solid on, and form part of, the head. The central bolt *n* is also provided with a nut, *b′*, and check-nut *d′*, to regulate the required firmness necessary to make the valve-faces steam-tight, and also a washer, e^1, of suitable shape, having recesses to receive the ends of the levers pressing against it. The front of the head also has similar recesses, at e^2, to receive the ends of the opposite levers.

The discharge-pipe D has a collar, *f′*, firmly attached, near its lower end, through which passes a rod, *h′*, with a nut, *i′*, above and below the collar, to accurately adjust it; and on the upper end of said rod is attached a set of jointed levers, *a′*, which are operated by said rod.

This latter device obviates the following difficulty: In operating the feeder, when circumstances require it to remain idle for some time—say, twelve to twenty-four hours—the valve or port faces might become set, and require more power to start them than the gravity of the water in the full vessel L over the one just discharged, if the springs were so adjusted before it stopped as to have the discharging-vessel completely discharge before allowing the full one to descend; and hence the machine might not operate satisfactorily unless it were kept constantly at work.

With this part of my invention the valve or port faces are held sufficiently close to keep a tight joint by means of the nuts *b′ d′* on the rod *n*, the pressure being transmitted through the levers *a′ a′* to the head, and the levers prevented from doubling together by means of the nuts *i′* on the rod *h′*, through the collar *f′* on the discharge-pipe D. Now, when the feeder is at rest or idle it will be full of water; and when the water again gets below the steam-supply pipe in the boiler, and the feeder begins to feed, it will continue until all the water is exhausted from the then discharging vessel; and if the other does not then descend with a new supply of water and begin its discharge, the water remaining in the discharge-pipe D will continue to flow into the boiler, followed by the steam, and the steam will give additional heat to the discharge-pipe, which is made of brass, causing it to lengthen itself sufficiently to draw the rod *h′* downward, and thus relaxing the pressure on the levers, and allowing the valve-faces to

move freely, and the exhausted water-vessel to be raised up by the descent of the full one. On the descent of the full one, water immediately flows into the discharge-pipe, and again cools it to its original temperature, and thus contracting it, forcing the rod upward and extending the levers, making the steam-joints or valve-faces as close and tight as they were before, and the feeder will then continue to operate without the relaxing of the levers until the boiler is full and necessitates its lying idle for some time.

In using my invention as a force-pump or as an ordinary supply-pump, the operation is the same as above, except that its position need not have any reference to the boiler, and the steam-supply may be from whatever is most convenient. Used as supply-pump, employing suction only, and not forcing, it may be operated with the exhaust steam from the engine, if desired.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The barrel or cylinder I, provided with central partitions *k*, flanged projections J J, water-vessels L L, steam-pipes K K, and ports *h h*, *i i*, and *m m*, in combination with the heads C C′ and their respective ports, substantially as and for the purposes herein set forth.

2. The combination of the tank G with pipes R *f*, the head C′ with ports *e e*, rocking cylinder I with water-vessels, steam pipes and ports, as described, and the head C with ports *b d*, steam-pipe E, and discharge-pipe D, substantially as and for the purposes herein set forth.

3. The combination of the oscillating cylinder I with its water-vessels, the arm P, rods O O, adjustable cushioned standards M M, and springs *s s*, and nuts *t t*, as and for the purposes herein set forth.

4. The combination, with the heads C C′ and oscillating cylinder I, of the central rod *n*, with nuts *b′ d′* and washer e^1, the levers *a′*, rod *h′*, with nuts *i′ i′*, and the stationary collar *f′* on the expansible discharge-pipe D, substantially as and for the purposes herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 14th day of November, 1876.

A. IRVING STERNBERG.

Witnesses:
GEO. GILBERT,
JNO. E. STRICKLAND.