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FEED PUMP.

(No Model.) (Application filed Feb. 6, 1900.)

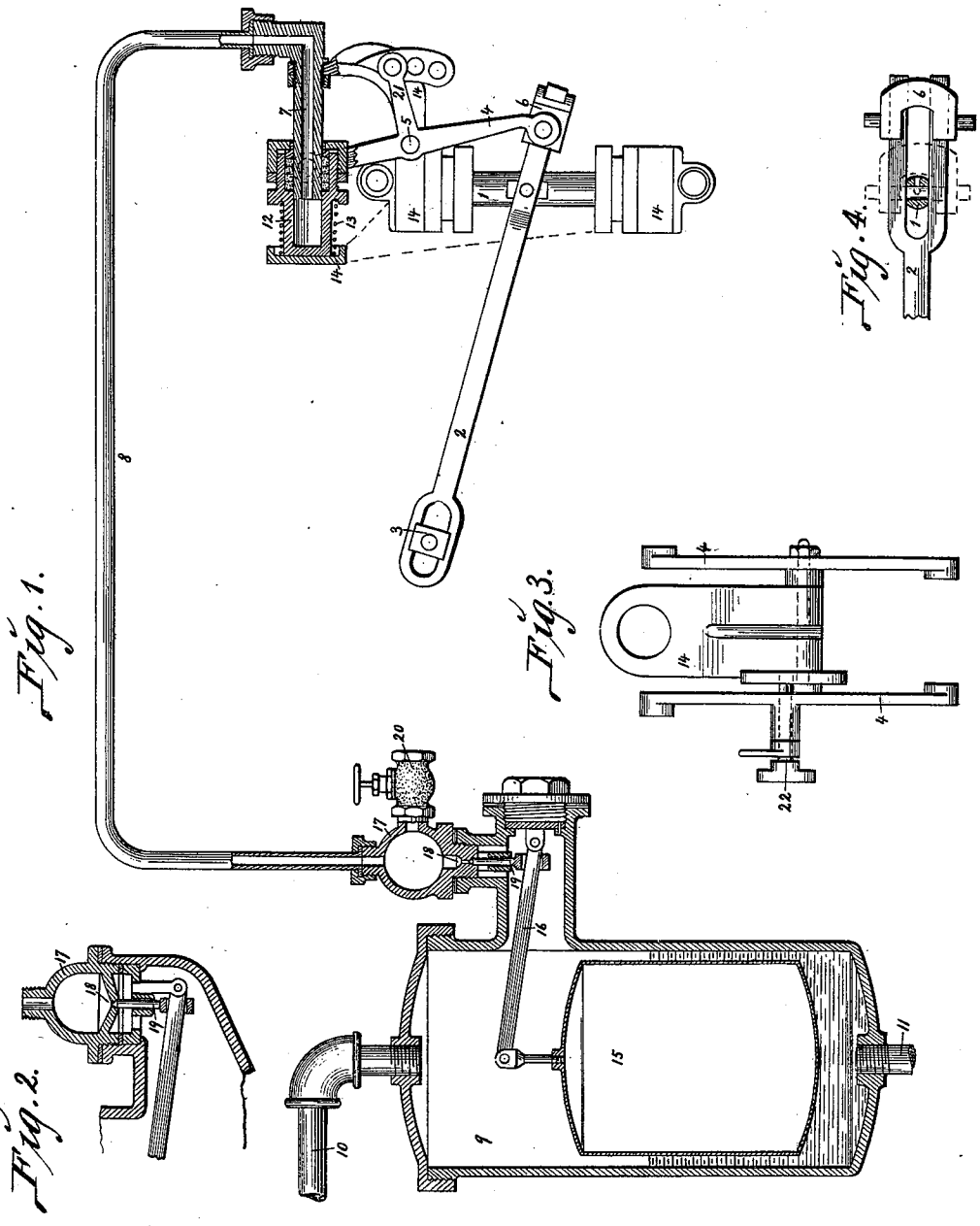

Fig. 1.

Fig. 4.

Fig. 3.

Fig. 2.

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FEED-PUMP.

SPECIFICATION forming part of Letters Patent No. 667,147, dated January 29, 1901.

Application filed February 6, 1900. Serial No. 4,185. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM L. GARRELS, a resident of the city of St. Louis, and CLINTON KIMBALL, a resident of the city of Kirkwood, St. Louis county, Missouri, citizens of the United States, have invented certain new and useful Improvements in Feed-Pumps, of which the following is a specification.

Our invention relates to feed-pumps for boilers, and has for its principal objects to automatically and reliably control the operation of the pump according to the level of the water in the boiler, to insure certainty in the operation of the pump, to economize the power required for the operation of the pump, and to secure advantages hereinafter described.

To these ends our invention consists in making the stroke of the pump automatically adjustable, as hereinafter described.

It also consists in the combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings, which form part of this specification and wherein like symbols refer to like parts wherever they occur, Figure 1 is a vertical view, mainly sectional, of our device. Fig. 2 is a vertical sectional detail of a modified form of the steam-valve operated by the float and of the chamber for receiving and discharging the water of condensation, this construction constituting an adjustment for the water-level. Fig. 3 is a detail view of a lever for shifting the fulcrum of the lever which drives the pump-piston, and Fig. 4 is a detail view of the connection between the pump-operating lever and the shifting-lever.

The pump-piston 1 is reciprocated by means of a lever 2, pivotally fastened to said piston by any suitable connecting device and having one end connected by a slide 3 to the cross-head or other moving part of the engine to receive motion therefrom. The other end of said lever is pivotally connected to a shifting-lever 4, having a fulcrum 5 in the framework of the engine. A convenient means for making a connection between the piston-driving lever 2 and the fulcrum-shifting lever 4 consists in the block 6, slotted to fit over the end of the piston-driving lever, so as to slide thereon and carry lugs or trunnions at its sides over which fit the perforated ends of the shifting-lever. By this arrangement when the shifting-lever is moved the block 6 slides endwise along the piston-driving lever 2, and thereby shifts the fulcrum of said piston-driving lever. The effect of shifting the fulcrum of the piston-driving lever is to vary the length of the stroke of the pump-piston, the stroke of said piston being at a maximum when the fulcrum of the piston-lever is farthest from the piston and decreasing to zero when the fulcrum is moved by said shifting-lever into alinement with the pivotal connection of the piston-driving lever.

The means for automatically regulating the shifting-lever, as shown in Fig. 1, consist of a pipe or tube 7, mounted in a framework and connected by means of a pipe 8 to a water column or chamber 9, which connects through a pipe 10 at its top or upper portion to the steam-space of the boiler and through a pipe 11 at its bottom with the water-space of the boiler. At the end of the pipe or tube 7 is a cylinder 12, arranged to slide endwise thereon. This cylinder 12 is when the pump is not in operation pressed against the end of tube 7 by means of a helical spring 13, surrounding said cylinder and bearing at one end against a shoulder thereon and bearing at its other end against a portion of the framework 14. The fulcrum-shifting lever 4 is connected to this cylinder 12 by means of any suitable connection that will permit of a pivotal and sliding movement of the connected parts, respectively, whereby when the cylinder slides along on the tube 7 it oscillates the fulcrum-shifting lever, and thereby shifts the position of the fulcrum of the piston-driving lever 2.

The cylinder 12 is moved by the boiler-pressure in one direction and by the spring 13 in an opposite direction, the boiler-pressure being automatically regulated as follows: Inside the water column or chamber is a large float 15, and to the top of this float is pivotally fastened one end of a lever 16. This lever extends through a lateral extension of the tank or chamber 9, provided for the purpose of permitting the use of a longer lever

than could be used without such extension. The outer end of this lever is pivotally mounted on a lug or plate, which is held in place by means of a threaded nut which works in the threaded end of said lateral extension of the water-column. Obviously the boiler itself may constitute the float-chamber. The pipe 8, which constitutes the connection between the float-chamber and the cylinder 12, opens into the chamber near the end of the lateral extension and is furnished with a valve operated by the float. The pipe 8 has a chamber 17 at its end for receiving and discharging the water of condensation. Said chamber is mounted upon the upper end portion of said lateral extension. The bottom of said chamber has a small hole or port 18 through it to constitute the passage for the steam. This hole is closed by means of a plug or valve 19, whose stem or lower end has a slot in which the lever 16 fits and works, and said stem is mounted in suitable guides to center it in alinement with the hole 18. By this arrangement the valve is raised and lowered by means of the float, which acts with a long leverage, and thereby insures certainty of the operation of the valve, and the float itself rises and falls, according to the level of the water in the boiler. When the valve 19 is lowered, it opens the valve-port 18 and admits the steam from the boiler through the condenser into the pipe 8, and this pressure forces the cylinder 12 to slide along the tube 7 until it comes in contact with a portion of the framework 14, carrying with it the fulcrum-shifting lever 4. This movement of the fulcrum-shifting lever shifts the fulcrum of the piston-operating lever 2 to its outermost position, and thereby causes said piston to reciprocate the full length of its stroke. When the pump thus actuated has filled the boiler to the required level, the float 15, acting through the lever 16, raises the valve 19 against its seat, and thereby closes the port 18. Thereupon the steam in the pipe 8 and in the chamber 17 condenses and the spring 13 gradually forces the cylinder 12 back until it comes in contact with the piston 7. During the return movement of the cylinder the fulcrum-shifting lever 4 is pushed gradually back, whereby the fulcrum of the piston-driving lever approaches the piston itself. The obvious result of this operation is to continually shorten the stroke of the piston until when the fulcrum of the piston-driving lever is in alinement with said piston there is no stroke at all. The principal advantage of this construction is that the pump ceases to operate and therefore requires no power whenever the water in the boiler has reached the required level. The chamber 17, mounted just above the valve 19, is arranged to cause the water formed by the condensed steam to flow back into the tank as soon as the valve opens. For this purpose the bottom of the chamber inclines downwardly to the centrally-located port 18. The water which condenses at the other end of the pipe 8 and in the tube 7 is allowed to remain there and act as a fluid-piston. An air-vent 20 may be provided at some point in the pipe 8 or the chamber 17 to prevent the device becoming air-bound, or one of the union-joints at the ends of the pipe 8 may be used for this purpose.

In case it is desired to regulate the stroke of the pump independently of the automatic controlling device above described the fulcrum-shifting lever is provided with a perforated arm 21, and the framework is provided with a series of notches or perforations therein arranged to permit the hole in the arm to register with each of the series in turn. A pin 22, passing through the framework and the arm, locks the fulcrum-shifting lever in any desired position, and thereby adjusts the stroke of the pump.

Our device admits of considerable modification and variation of construction without departing from our invention and we do not desire to limit ourselves to the construction shown. Thus the means for applying the boiler-pressure to the shifting of the fulcrum of the pump-driving lever admits of considerable variation. For instance, the fulcrum-shifting lever may be entirely dispensed with and the fulcrum be connected directly or through other devices to the steam-actuated part. So, also, instead of a cylinder mounted on a tube and which constitutes a piston the steam-actuated part might be an ordinary piston located inside of the tubular member. So, also, the source of power for regulating the stroke may be different from that which drives the engine. So the pump-driving lever may be connected to a rotary part as well as to a reciprocating part of the engine. So the fulcrum-shifting lever may be permanently connected to the pump-driving lever. In this case the shifting of the fulcrum moves the pump-driving lever endwise bodily and the lever is slotted at its opposite end to slide on its connecting-pin.

What we claim is—

1. A pump, comprising a lever connected to a moving part of an engine, a fulcrum for said lever, a connecting device connecting said lever to the pump-piston to actuate the same, said fulcrum and connecting device being relatively movable, and means for effecting such movement, said means comprising a passage-way arranged to communicate with a source of pressure, an automatically-acting device for controlling said passage-way, and adjunctive devices for transmitting such pressure to the movable part, substantially as described.

2. A pump comprising a lever connected to a moving part of an engine, a movable fulcrum for said lever and means for shifting said fulcrum, said lever being connected to the pump-piston to actuate the same, said means comprising a passage-way adapted to communicate with a source of pressure and an automatically-acting device for control-

ling said passage-way, and adjunctive devices for transmitting power to said fulcrum, substantially as described.

3. A pump comprising a lever driven by an engine and operatively connected to the pump-piston to actuate the same, a source of pressure, power-transmission devices actuated by said pressure, a movable connecting device connecting said lever to said power-transmission devices, and a device controlled by the water-level for controlling the admission of pressure to said power-transmission devices, substantially as described.

4. A pump comprising a lever driven by an engine and operatively connected to the pump-piston to actuate the same, a source of pressure, power-transmission devices actuated by said pressure, a movable connecting device connecting said lever to said power-transmission devices, and a device comprising a float for controlling the admission of pressure to said power-transmission devices, substantially as described.

5. A pump comprising a lever driven by an engine and operatively connected to the pump-piston to actuate the same, a controlling device, a device controlled by the water-level, adjunctive devices connecting said water-level device to said controlling device, and a movable device for connecting said controlling device to said lever, substantially as described.

6. A pump comprising a lever driven by an engine and operatively connected to the pump-piston to actuate the same, a controlling device, a float for controlling said controlling device, adjunctive devices connecting said float to said controlling device, and a movable device for connecting said controlling device to said lever, substantially as described.

7. A pump comprising a lever connected to a moving part of an engine, a movable fulcrum for said lever, and automatically-acting means comprising a float for shifting said fulcrum, said lever being connected to said pump-piston to actuate the same, substantially as described.

8. A pump comprising a lever connected to a moving part of an engine, a movable fulcrum for said lever, and means for shifting said fulcrum, said lever being connected to the pump-piston to actuate the same, and said means comprising a spring-actuated piston operatively connected to an automatically-controlled source of steam-pressure to be actuated thereby and operatively connected to said fulcrum to shift the same, substantially as described.

9. A pump comprising a lever connected to a moving part of an engine, said lever being connected to the pump-piston to actuate the same and a tube connected with a source of pressure, a piston therefor and a valve for controlling said connection and a float arranged to control such valve, said piston being operatively connected to said lever by a movable joint arranged to be actuated by said piston, substantially as described.

10. A boiler feed-pump comprising a lever connected to a moving part of an engine, said lever being connected to the pump-piston to actuate the same and a tube connected with a source of steam-pressure, a piston therefor and a valve for controlling said connection, a chamber in connection with the boiler and a float in said chamber arranged to control such valve, said piston being operatively connected to said lever by a movable joint arranged to be actuated by said piston, substantially as described.

11. A boiler feed-pump comprising a lever connected to a moving part of an engine, said lever being connected to the pump-piston to actuate the same and a water-level chamber connected to the boiler above and below the water-line, a spring-actuated piston mounted on a pipe connected to the upper portion of said chamber, a valve for controlling said pipe and a float in said chamber for actuating said valve, said piston being operatively connected to said lever by a movable joint arranged to be actuated by said piston, substantially as described.

12. In a pump, a device for automatically regulating the stroke of the pump, comprising a lever connected to a moving part of an engine and connected to the pump-piston to drive the same, and a piston operatively connected to a source of pressure, and an intermediate connecting device for operatively connecting said last-mentioned piston to said lever, and automatically-acting means comprising a float for controlling the pressure on said last-mentioned piston, substantially as described.

13. In a pump, a device for regulating the stroke of the pump comprising a lever connected to a moving part of an engine, and operatively connected to the pump-piston to actuate the same, a source of pressure, and a piston operatively connected to said source of pressure, a movable connecting device operatively connected to said lever and to said piston respectively, whereby said connecting device is adapted to be shifted by said piston, and means for automatically controlling the connection to the source of pressure, substantially as described.

14. A pump comprising a controller, said controller comprising a pipe connected to a source of steam-pressure and having a piston adapted to be actuated by the pressure in said pipe and a chamber in said pipe for receiving and discharging the water of condensation and means for connecting said controller to the pump, substantially as described.

15. A pump comprising an automatic controller, said controller comprising a pipe connected to a source of steam-pressure and having a piston adapted to be actuated by the pressure in said pipe and a chamber in said pipe for receiving and discharging the water of condensation and means for draining the

condensed steam from said chamber and means for connecting said controller to the pump, substantially as described.

16. A pump comprising a controller, said controller comprising a pipe connected to a source of steam-pressure and having a piston adapted to be actuated by the pressure in said pipe and a chamber in said pipe for receiving and discharging the water of condensation and means for automatically controlling the connection to a source of steam-pressure and means for connecting said controller to the pump, substantially as described.

17. A pump comprising a controller, said controller comprising a pipe connected to a source of steam-pressure and having a piston adapted to be actuated by the pressure in said pipe and a chamber in said pipe for receiving and discharging the water of condensation and a float-actuated lever for automatically controlling the connection to a source of steam-pressure and means for connecting said controller to the pump, substantially as described.

18. In a pump, a device for automatically regulating the stroke of the pump, comprising a lever connected to a moving part of an engine and connected to the pump-piston to drive the same, and a piston operatively connected to said lever to shift the connection between said last-mentioned piston and said lever, said piston being operatively connected to a source of steam-pressure and a chamber in said connection for receiving and discharging the water of condensation, substantially as described.

19. A pump comprising a lever connected at one end to a moving part of an engine, a movable joint for said lever and automatically-acting means for shifting said joint, said lever being connected to the pump-piston to actuate the same, and said means comprising a tube connected with a source of steam-pressure and having a chamber therein for receiving and discharging the water of condensation, a float-controlled valve for controlling said connection, and a piston operatively connected to said tube and to said joint, substantially as described.

20. A pump comprising a lever connected to a moving part of an engine, a movable joint for said lever and automatically-acting means for shifting said joint, said lever being connected to the pump-piston to actuate the same and said means comprising a tube connected with a source of steam-pressure and having a chamber therein for receiving and discharging the water of condensation, a spring-actuated piston mounted on said tube, a valve for controlling said connection with a source of pressure, and a float for actuating said valve, said piston being operatively connected to said joint, substantially as described.

21. A pump comprising a lever driven by an engine and operatively connected to the pump-piston to actuate the same, a second lever, having its fulcrum in the framework, operatively connected to said first-mentioned lever and automatically-acting means comprising a device controlled by the water-level for actuating said second-mentioned lever to shift the connection between the two levers, substantially as described.

22. A pump comprising a piston-driving lever connected to a moving part of an engine, a second lever having its fulcrum in the framework and carrying the fulcrum for said first-mentioned lever, and automatically-acting means comprising a float for actuating said second-mentioned lever to shift said fulcrum lengthwise of said first-mentioned lever, substantially as described.

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In presence of—
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