No. 610,913. Patented Sept. 20, 1898.

C. B. MITCHELL.

BOILER FEED REGULATOR.

(Application filed Nov. 24, 1897.)

(No Model.)

FIG. 1.

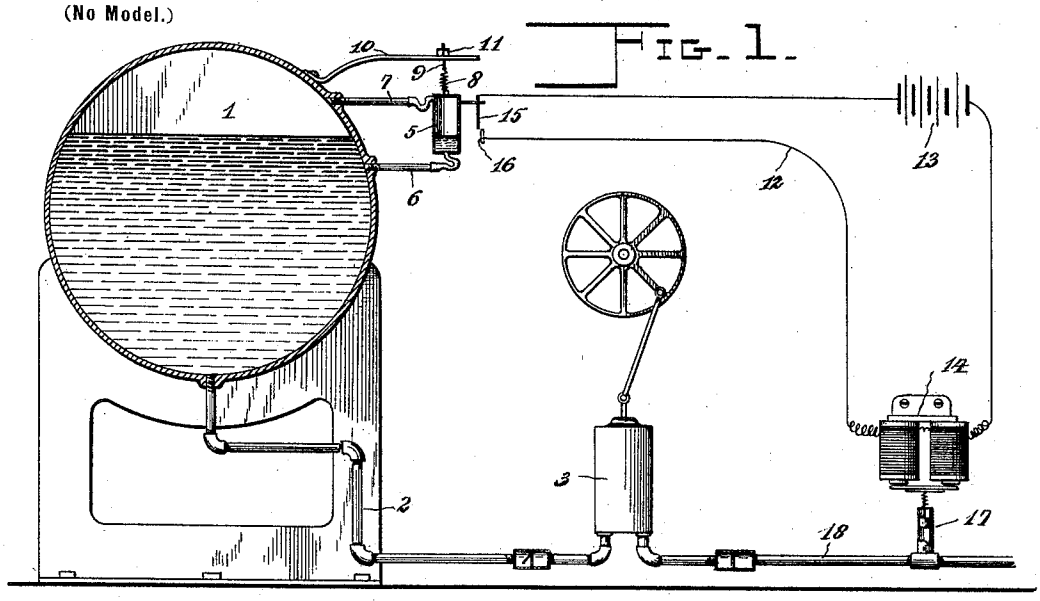
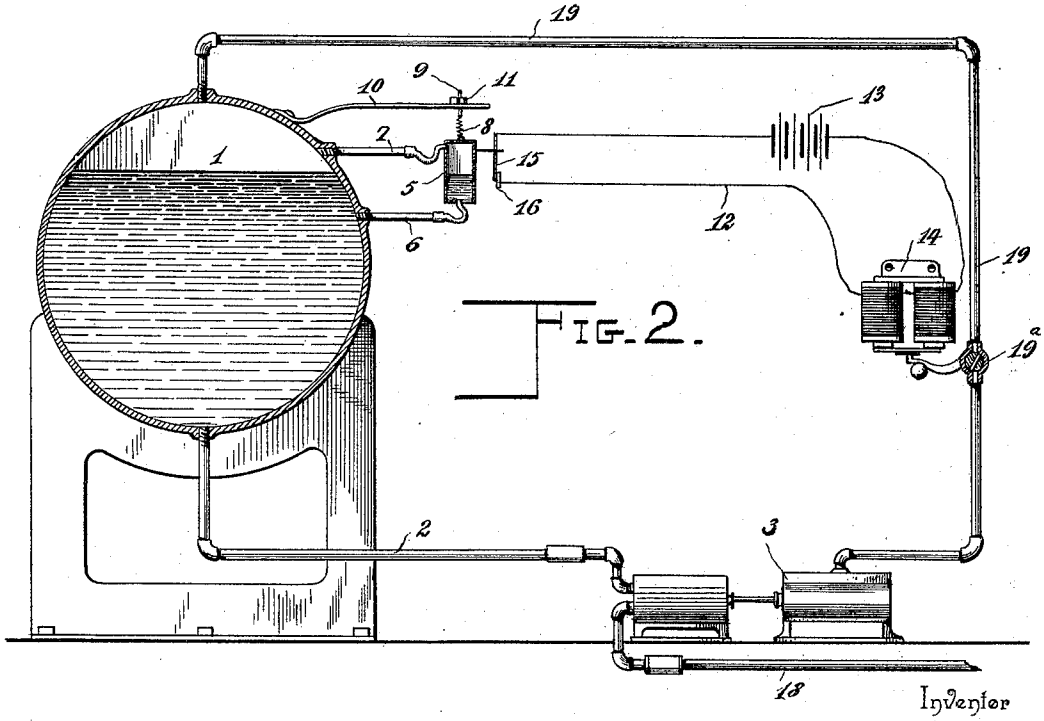


FIG. 2.



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CHARLES BRADLEY MITCHELL, OF HAYS, TEXAS.

BOILER-FEED REGULATOR.

SPECIFICATION forming part of Letters Patent No. 610,913, dated September 20, 1898.

Application filed November 24, 1897. Serial No. 659,700. (No model.)

To all whom it may concern:

Be it known that I, CHARLES BRADLEY MITCHELL, a citizen of the United States, residing at Hays, in the county of Robertson and State of Texas, have invented a new and useful Boiler-Feed Regulator, of which the following is a specification.

My invention relates to improvements in boiler-feed regulators; and the object of the invention is to provide an improved regulator of simplified construction by which the water in the boiler may be kept at the required level by the operation of automatic, electrical, and mechanical contrivances which are active under normal conditions and are brought to a period of rest when the water rises above the desired level in the boiler.

With these ends in view my invention consists in the novel combination of elements and in the construction and arrangement of parts, which will be hereinafter fully described and claimed.

To enable others to understand my invention, I have illustrated the same in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional elevation of one type of boiler-feed regulator embodying my invention. Fig. 2 is a similar view illustrating a modified construction embracing the generic features of my improvement.

Like numerals of reference denote corresponding parts in each figure of the drawings.

In Fig. 1 I have illustrated my invention as applied to a boiler in which the feed-water is forced thereto by the operation of a belt-driven pump; but in Fig. 2 the regulating mechanism is shown in operative relation to a steam-actuated pump. My invention is therefore susceptible of modification to enable it to be used in connection with either of the described systems of boiler-feeders.

1 designates a boiler, and 2 the feed-water pipe, which is attached to the boiler at the lower part thereof. With this feed-water pipe 2 communicates a power-driven pump which is indicated in Fig. 1 as a belt-operated pump 3.

5 indicates a gage vessel which is arranged alongside of the boiler at substantially the level of the water-line in said boiler, and this gage vessel is flexibly suspended and is connected by flexible connections with said boiler in order that the vessel may be capable of a limited vertical movement and that it may contain a quantity of water, which is to be supplied thereto by one of its flexible connections with the boiler. This gage vessel may be of any suitable form and capacity, and at its bottom it has a flexible connection 6, which is attached to the boiler 1 at a point below the water-line therein, while the upper end of said gage vessel is provided with a like flexible connection 7, attached to the boiler 1 to communicate with the steam-space therein. The detailed construction of the flexible connections 6 7 is not material, as any suitable means known to the art may be employed, although I may state that in one embodiment of the invention each flexible connection consists of a length of metallic pipe rigidly fastened to the boiler and a short length of pliable or flexible hose attached to the rigid length of pipe and to the gage vessel.

The described connections 6 7 communicate, respectively, with the water and steam spaces in the boiler 1, and water and steam are thus supplied to the gage vessel 5 to permit the water in said vessel to rise therein to the level of the water in the boiler.

The gage vessel 5, which, as before indicated, is capable of a limited vertical play, is suspended by the employment of a coiled metallic spring 8, the lower end of which is fastened to the upper end of said gage vessel, while the other end of said spring is attached to a threaded suspension rod or stem 9, which passes through a suitable fixed support 10—as, for instance, a cross-bar of metal—so as to move or play freely therein. This threaded stem or rod 9 receives an adjusting nut or nuts 11, adapted to bear against the fixed support 10, and by adjusting said nut or nuts to raise or lower the stem or rod the coiled spring may be distended more or less in order to vary its tension and increase or diminish the vertical play or adjustment of the gage vessel 5.

12 indicates an electric circuit which includes a battery 13 or other suitable source of electric energy and an electromagnet 14. This electrical circuit is normally open and

it is designed to be closed by the rising-and-falling motions of the gage vessel 5 through the medium of a circuit-closer 15. One of the conductors of the electrical circuit 12 terminates in a fixed contact 16, situated in proximity to the circuit-closer 15, and this circuit-closer is attached to and movable with the gage vessel 5 so as to project or recede from the fixed contact 16 of the electrical circuit. The circuit-closer 15 may be in the form of an arm or rod which is fastened to but insulated from the gage vessel 5, and to this rod or arm, constituting the circuit-closer, is attached the other conductor of the electrical circuit. The electromagnet 14 is designed to be energized by a current from the battery 13 when the circuit is closed by the descent of the vessel 5 and the engagement of the circuit-closer 15 with the contact 16 of said circuit. Said electromagnet 14 is situated adjacent to an air-valve 17, which is provided in a suction-pipe 18, that leads to the belt-operated pump 3, and the armature of said electromagnet 14 is connected to the air-valve 17 in a manner to lie within the field of the magnet-cores. The air-valve 17 is closed normally by a suitable spring or retractor, the tension of which is sufficient to keep the valve closed under normal conditions, but which is not strong enough to resist the attraction of the magnet when the latter is energized by current from the battery owing to the closing of the electrical circuit. This air-valve 17 is of a construction suitable to preserve the continuity of the suction-pipe leading to the pump 3 when normal conditions prevail; but when the circuit is closed the air-valve is raised by the attraction of the magnet and permits air to flow into the pipe 18, thus destroying the water-suction through the pipe 18 to the pump 3, thereby throwing the pump out of action due to the interruption of the water-supply thereto.

Under normal conditions the tension of the spring 8 is such that it will maintain the gage vessel 5 in a raised position when the water-level in the boiler is at the desired line. As the water rises above the proper level in the boiler it of course flows in increased volume into the gage vessel 5, and the increased weight of the accumulated volume of water in said vessel 5 overcomes the tension of the spring 8 sufficiently to cause the vessel 5 to descend and bring the circuit-closer 15 in engagement with the contact 16. The electrical circuit is thus closed and the magnet 14 energized to open the air-valve 17 and interrupt the suction through the pipe 18, thus cutting off the supply of water to the pump 3. The pump thus remains inactive in so far as feeding water to the boiler is concerned until the water is evaporated in the boiler to such an extent as to bring the water down to or below the desired level, and under these conditions the decreased volume of water and the consequent decrease in the weight contained in the vessel 5 permit the spring 8 to again lift the vessel 5 and interrupt the electrical circuit, thus permitting the valve 17 to close and restore the proper connection between the pipe 18 and the pump 3. It will be understood that the pump 3 is a continuously-acting pump which remains in service under normal conditions, as when the electrical circuit is open; but when the circuit is closed in the manner heretofore described the pump is thrown out of operation and ceases to supply water to the boiler.

In Fig. 2 of the drawings the belt-operated pump is replaced by a steam-actuated pump (indicated in a general way by the numeral 18) and the air-valve is omitted, and in lieu thereof I employ a "butterfly" or balanced valve, which is arranged in the steam-pipe 19, leading from the steam-space of the boiler to the pump 18. This butterfly-valve is arranged to be controlled by the magnet 14 of the electrical circuit, and said circuit is opened and closed by a circuit-closer attached to and movable with a suspended gage vessel having connections 6 7 with the boiler in the manner hereinbefore described. The valve 19 is normally opened to supply steam to the pump for the operation of the latter; but when the water-level is raised above the desired point the gage vessel is operated in the manner hereinbefore described to close the butterfly-valve, and thereby arrest the operation of the pump.

It is evident that changes in the form and proportion of parts and in the details of construction may be made without departing from the spirit or sacrificing the advantages of my invention.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In an automatic boiler-feed regulator, the combination with a pump and the feed and suction pipes, of a suction-valve located in the suction-pipe and arranged to be opened for the admission of air to said pipe to break the suction to the pump, an electric circuit having a magnet in operative relation to the suction-valve for controlling the latter, a vertically-movable gravity vessel having connections with the steam and water spaces of a boiler, means for counterbalancing said vessel, and a circuit-closer movable with the vessel and arranged to close the electric circuit on the descent of the vessel due to the gravity of accumulated liquid therein, substantially as described.

2. In an automatic boiler-feed regulator, the combination with the pipes attached to a boiler to communicate with the water and steam spaces therein, of a gravity vessel having flexible connections with said pipes, a fixed support above the vessel, a suspending-spring attached to the support and the vessel and having means for regulating the tension thereof, an open electric circuit having a

valve-magnet, a circuit-closer supported on the gravity vessel and arranged to close the circuit on the descent of the vessel, a feed-pump, pipe connections therefor, and a valve in operative relation to the valve-magnet of said electric circuit, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

CHARLES BRADLEY MITCHELL.

Witnesses:
HAMMET B. HURT,
JAMES W. MCCRARY.