No. 690,445. Patented Jan. 7, 1902.

F. LEADBEATER.

AUTOMATIC BOILER FEEDER.

(Application filed Apr. 8, 1901.)

(No Model.) 2 Sheets—Sheet 1.

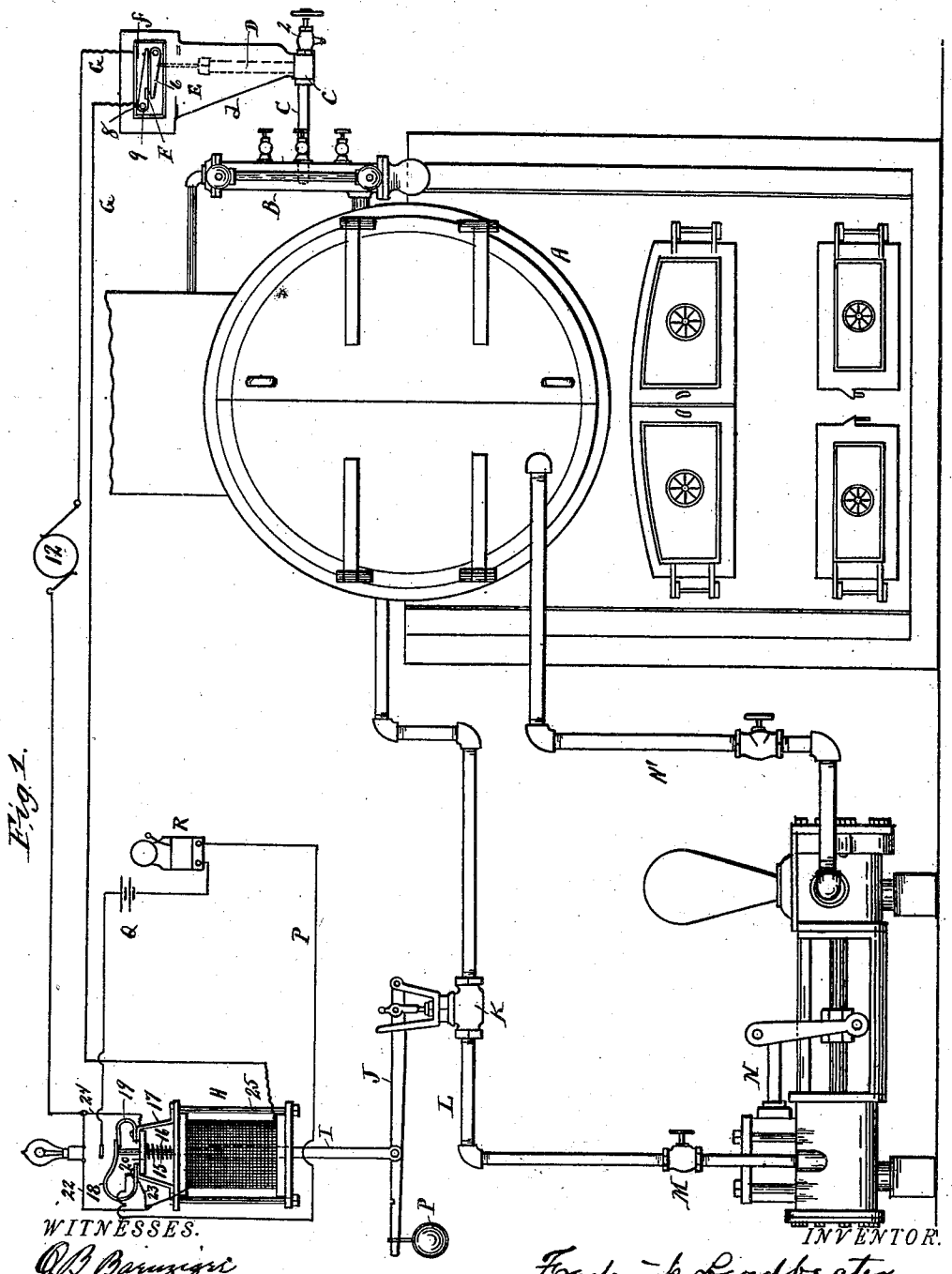


Fig. 1.

WITNESSES.

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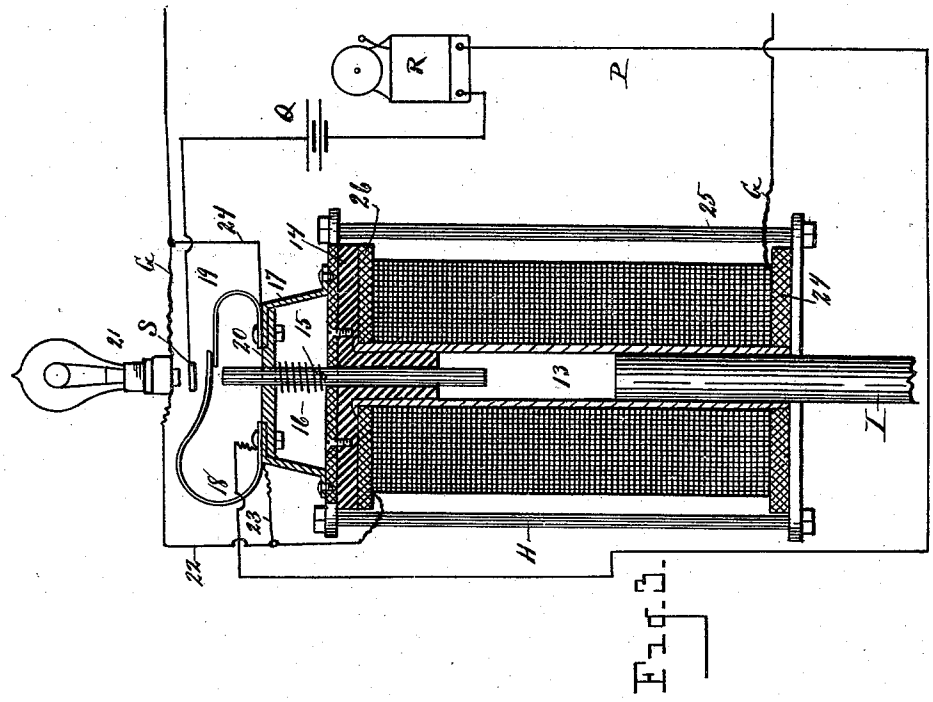


FIG. 1.

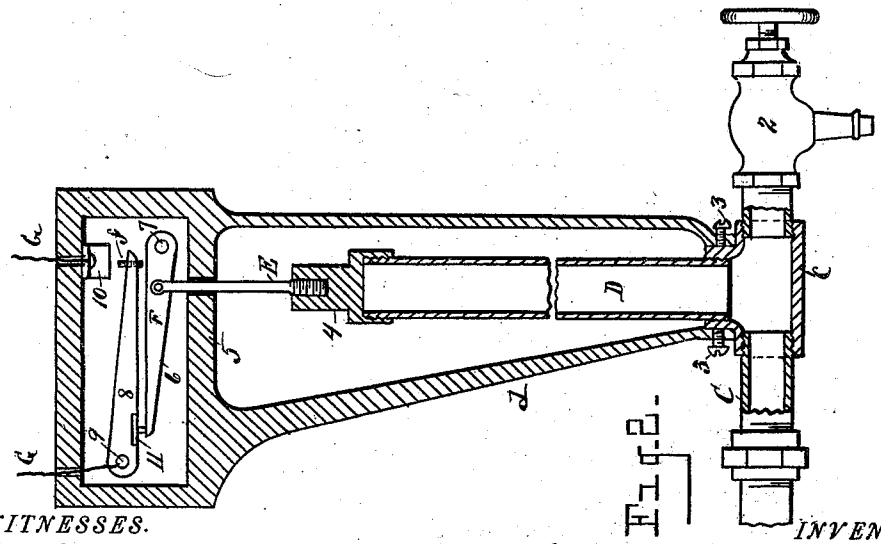


FIG. 2.

WITNESSES.

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UNITED STATES PATENT OFFICE.

FREDERICK LEADBEATER, OF DETROIT, MICHIGAN.

AUTOMATIC BOILER-FEEDER.

SPECIFICATION forming part of Letters Patent No. 690,445, dated January 7, 1902.

Application filed April 8, 1901. Serial No. 54,781. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK LEADBEATER, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Automatic Boiler-Feeders; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention has for its object certain new and useful improvements in an automatic boiler-feed; and it consists of the construction, combination, and arrangement of devices hereinafter specified and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a view in elevation illustrating my invention. Fig. 2 is a view in vertical section through the expansion-tube and related parts, showing parts in elevation. Fig. 3 is a view in vertical section through the electromagnet.

My invention is designed to provide a boiler-feed wherein by means of an electrical circuit a valve in the steam-pipe leading from the boiler to the pump is actuated to control the supply of water to the boiler, the electric circuit being governed by an expansion-tube connected into the water-column of the boiler.

The utility of a boiler-feed by which the supply of water to the boiler will be automatically controlled, so that when the water is low the governing-valve in the steam-pipe will be open to start the pump to force into the boiler a proper supply of water, and whereby when the water is a sufficient height in the boiler the supply will be cut off, is very evident. Heretofore, as is well known, various devices have been constructed to give an alarm when there is no water in the boiler; but it is obviously of much greater importance to provide mechanism whereby the supply will be governed automatically as required. I carry out my invention, to this end, as follows:

In the drawings, A represents a boiler, and B a water-column, which may be of usual construction.

C is a pipe communicating with the water-column and with an expansible pipe D, said pipe being preferably housed in a casing *d*. The pipe D may be connected with the pipe C in any suitable manner, as by a union *c*, which may be provided with a suitable valve, as indicated by the numeral 2. The housing or case *d* may be engaged with the union *c* in any suitable manner, as by screws 3.

The expansible pipe D is provided with a cap 4, with which is engaged a rod E to actuate suitable electrical contact devices of any suitable construction and arrangement—as, for example, a system of levers F, housed in the casing *d*, the housing being preferably provided with an internal guide-arm or diaphragm 5, through which the rod E is guided. The system of contact-levers shown preferably consists of a lever 6, fulcrumed, as at 7, said lever arranged to contact with a lever 8, fulcrumed, as at 9, the lever 8 arranged to make contact at *f* with a contact-plate 10. An electric circuit G is connected with the contact-plate 10 and with the lever 8, the lever 8 preferably being provided with insulation, as at 11, so that the circuit will pass simply through the lever 8 when the circuit is closed. The electric circuit G may be connected with any suitable source of electrical supply, as at 12. Preferably this source of supply is a dynamo, but might be a suitable battery. The electrical circuit is also provided with an electromagnet, (indicated at H,) arranged to attract a rod or plunger I, connected with a lever J, controlling a valve K in a steam-supply pipe L, leading to the pump. The steam-supply pipe is also preferably provided with an additional controlling-valve, as at M, the pipe L leading to a feed-pump of any desired construction, (indicated at N.)

N′ denotes the water-supply pipe leading from the pump to the boiler.

It will be evident that the electrical circuit controls the valve K, while the valve M may be controlled by hand to shut off the steam-supply, as when the boiler is not in use.

When the water is low in the column B, steam entering the pipes C and D will expand the pipe D by heat, thereby closing the electrical circuit, whereby through the magnet H the valve K will be open to admit steam to the pump. Water admitted to the boiler will

of course cut off steam from entering the pipe C, permitting the pipe D to contract, the cold water admitted to the boiler aiding in cooling the pipe D and contracting the same, so as to break the electrical circuit. When the electrical circuit is broken, the valve K will close, the lever J being preferably weighted, as indicated at P, or otherwise retracted to automatically close when the electrical circuit is broken. The closing of the valve K will of course stop the pump and cut off the supply of water to the boiler.

The magnet is preferably constructed with an interior arm, (indicated at 13,) secured to a headpiece 14 of the magnet. The lower portion of said arm is preferably made hollow, as shown, to receive the upper end of the rod or plunger I, which is arranged to reciprocate in the hollow portion of said arm. Through the headpiece 14 and the upper end of the arm 13 projects a contact-rod 15, said rod having a reciprocatory engagement in said head and the upper portion of said arm, a spring 16 normally exerting its tension upon the rod 15 to normally depress said rod.

Upon a bracket 17 are supported spring contact-arms 18 and 19, the same being insulated from the bracket, as indicated at 20. When the magnet is in circuit and the plunger or rod I is lifted, said rod coming in contact with the rod 15 will counteract the tension of the spring and lift the rod 15, so as to lift the contact end of the spring-arm 18 out of electrical contact with the arm 19 and break the electrical circuit. A light 21 is placed in the circuit G, the light being visible when the magnet is cut out of the circuit. The spring-arm 18 is electrically connected with the body of the magnet by a conductor 22, forming a part of the circuit G. The conductor 22 is also connected to the bracket 17 by a conductor 23 at one side the insulation 20, while the bracket on the opposite side to the insulation is connected by a conductor 24 with the circuit G. It will thus be seen that when the arm 18 is lifted off the arm 19 the circuit through the magnet will be broken. The head 14 of the magnet is insulated, as indicated at 26, from the wires of the magnet, the wires being also insulated at the base, as at 24, from the frame 25 of the magnet. When the magnet is in circuit, the rod I will be lifted into contact with the rod 15, as above described. The arm 13 is in electrical connection with the coil or body of the magnet. It is designed that the rod 15 shall be depressed by the spring so that the arm 18 shall be restored to contact with the arm 19. The rod 15 is a non-conductor. The rod E has an adjustable connection with the expansion-tube D.

If it should be desired to place an alarm in the electrical circuit, to be sounded when the water is low in the boiler, an additional circuit P might be employed, provided with a battery Q and bell or other signal R, the circuit P being connected with one arm of the bracket 17, as shown, while the opposite extremity of the circuit or conductor should be led to a contact-strip S, adjacent to the end of the arm 18, so that when the arm 18 is lifted out of contact with the arm 19 it will close the circuit through the signal R.

The arrangement of the light in the circuit G, as well as of other parts of the apparatus, is designed for the purpose of crowding the coil of the magnet with current while it is lifting the plunger I. Then when the plunger rises the lamp is thrown into circuit, giving the coil just enough current to hold the plunger. The lamp is thrown into circuit after the magnet has done its chief work, and by this construction the magnet is kept from burning out. The headpiece 14 is in the nature of a pole-piece.

While I have shown the valve actuated by the electromagnet in the steam-pipe leading to the pump, it might be placed in the water-pipe leading into the boiler within the scope of my invention.

What I claim as my invention is—

1. The combination with a boiler provided with a water-column, of a pipe communicating therewith, an expansible tube carried by said pipe and communicating with the water-column therethrough, a housing for said tube supported upon said pipe, a rod carried by the expansible tube guided in said housing, contact devices carried by said housing actuated by the elevation of said rod, an electrical circuit connected with said contact devices, an electromagnet in the circuit, and a valve in said pipe governed by said magnet.

2. The combination with a boiler provided with a pipe communicating therewith and with a water-column, of an expansible tube communicating with the water-column, a housing for said expansible tube, an adjustable rod carried by said tube, an electrical circuit, a system of levers carried by said housing to close said circuit and actuated by the elevation of said rod, an electromagnet in the circuit, and a valve in said pipe controlled by said magnet.

3. The combination with a boiler provided with a pipe communicating therewith, of an expansible tube arranged to be expanded when the water is low in the boiler, a housing for said tube, an electrical circuit, contact devices actuated by the expansion of said tube to close said circuit, a valve in said pipe, an electromagnet in said circuit to govern said valve, and means to cut the magnet out of said circuit.

4. The combination with a boiler provided with a pipe communicating therewith, of an expansible device arranged to be expanded when the water is low in the boiler, an electric circuit to be closed by the expansion of said device, a valve in said pipe, an electromagnet in said circuit to govern said valve, said magnet provided with means for breaking the circuit therethrough when the valve is open.

5. The combination with a boiler provided with a pipe communicating therewith, of an expansible device arranged to be expanded when the water is low in the boiler, an electric circuit to be closed by the expansion of said device, a valve in said pipe, an electromagnet in said circuit to govern said valve, said magnet provided with contact-arms in said circuit, and means to break the circuit through said contact-arms.

6. The combination with a boiler provided with a pipe communicating therewith, of an expansible device arranged to be expanded when the water is low in the boiler, an electric circuit to be closed by the expansion of said device, a valve in said pipe, an electromagnet in said circuit to govern said valve, said magnet provided with contact devices in said circuit, with a spring-actuated rod to break the circuit through said contact devices, and said valve provided with a plunger to be lifted by the magnet the descent of the plunger actuating said rod.

7. The combination with a boiler provided with a pipe communicating therewith, of an expansible device arranged to be expanded when the water is low in the boiler, an electric circuit to be closed by the expansion of said device, a valve in said pipe, an electromagnet in said circuit to govern said valve, said valve provided with a plunger attracted by said magnet, and said magnet provided with means for breaking the circuit therethrough when the plunger has been lifted to open the valve.

8. The combination with a boiler provided with a pipe communicating therewith, of an expansible device arranged to be expanded when the water is low in the boiler, an electric circuit to be closed by the expansion of said device, a valve in said pipe, an electromagnet in said circuit to govern said valve, said valve provided with a plunger attracted by said magnet, and said magnet provided with means for breaking the circuit therethrough when the plunger has been lifted to open the valve, and an additional electrical circuit provided with an alarm to be thrown into operation when the plunger is lifted.

9. The combination with a boiler provided with a pipe communicating therewith, of an expansible device arranged to be expanded when the water is low in the boiler, an electric circuit to be closed by the expansion of said device, a valve in said pipe, an electromagnet in said circuit to govern said valve, an additional circuit provided with an alarm, said valve provided with a plunger to be lifted by said magnet, and said magnet provided with contact devices to open and close the circuit through the magnet, and also to open and close a circuit through the alarm.

10. The combination with a boiler provided with a pipe communicating therewith, of an expansible device arranged to be expanded when the water is low in the boiler, an electric circuit to be closed by the expansion of said device, a valve in said pipe, an electromagnet in said circuit to govern said valve, a light in said circuit, and means connected with the magnet to open and close the circuit through the light when the valve is open.

In testimony whereof I sign this specification in the presence of two witnesses.

FREDERICK LEADBEATER.

Witnesses:

N. S. WRIGHT,

M. HICKEY.