No. 862,562. PATENTED AUG. 6, 1907.

C. JONES.

WATER FEEDING APPARATUS.

APPLICATION FILED FEB. 28, 1906.

Fig. 1.

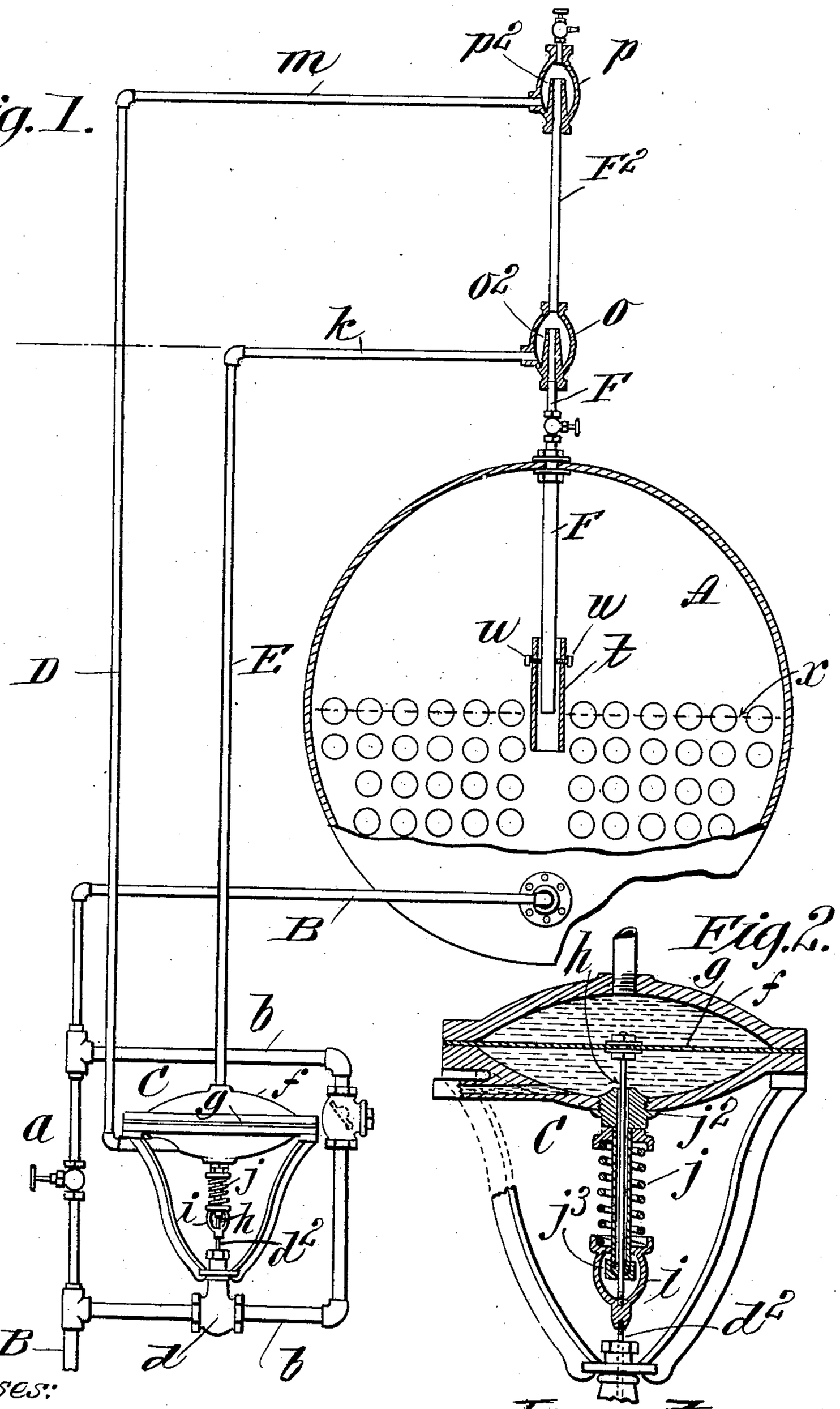

Fig. 2.

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UNITED STATES PATENT OFFICE.

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WATER-FEEDING APPARATUS.

No. 862,562. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed February 28, 1906. Serial No. 303,427.

To all whom it may concern:

Be it known that I, CHAUNCEY JONES, a citizen of the United States of America, and a resident of Holyoke, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Automatic Water-Feeding Apparatuses for Boilers, of which the following is a full, clear, and exact description.

This invention aims to provide in a manner as hereinafter set forth an apparatus by means of which the falling of the water in a boiler below the desired level will result in the automatic opening of a valve in the water feed pipe connecting into the boiler to restore the water in the latter to its normal level,—such reestablishment of the water to the proper height then automatically closing the valve and for the time shutting off the further water feed.

The object of the invention is to provide in a manner as hereinafter set forth an apparatus of the general character indicated which is composed of very few, inexpensive, and easily combined parts whereby the device is structurally extremely simple, and reliable for protracted automatic operation without derangement or the necessity of repair or attention.

The invention furthermore consists in certain arrangements of the parts and conduits comprised within the invention as above stated, as hereinafter particularly described in conjunction with the drawings.

In the drawings,—Figure 1 is an elevation of the apparatus, the boiler and some other portions being represented in vertical section. Fig. 2 is a vertical sectional view, on a larger scale, of the fluid pressure controller for the feed pipe valve.

In the drawings,—A represents the boiler, *x* representing the normal water level required to be maintained therein.

B represents the feed pipe for carrying the water as pumped or otherwise forced into the boiler, such pipe having the hand operated valve *a;* and the feed pipe is made with a branch or detour portion *b* provided in the lower section of which is a valve *d* of which d^2 represents a vertically sliding stem operating in conjunction with which is a fluid pressure controller. This controller in the species thereof here illustrated consists of a suitably supported diaphragm casing *f* having a flexible diaphragm *g* therein affixed to the center of which is a depending stem *h* connecting through the medium of the fixture *i* with the stem d^2 of the valve *d*. The diaphragm stem plays through a tubular extension *j* of a bushing plug j^2 which screws into the under portion of the diaphragm casing, and through a stuffing box j^3 provided at the lower end of said tubular extension.

The aforementioned fixture made in the form of a yoke embraces the tubular extension just above its lower end, receives by screw engagement therewith the lower end of the diaphragm stem and in turn is screw connected with the valve stem d^2; and the spiral spring surrounding the tubular extension *j* is in more or less compression between the yoke *i* and the under portion of the diaphragm casing, and the reaction of this spring is such as to exert a downward valve closing force on the valve stem d^2.

D and E represent vertical pipes for containing columns of water, the one D connecting into the chamber in the diaphragm casing below the diaphragm, being extended to a greater height than the other vertical pipe E which connects into the chamber in the diaphragm casing above the diaphragm.

F represents a pipe extending from above the boiler downwardly entering the latter, terminating at the required water-level and open thereat and having by a conduit *k* the connection with the upper portion above the less high pipe E; and the said water column pipe E is in communication through the horizontal conduit *k* with the vertical pipe section F^2, which to all intents and purposes may be considered an upward continuation of the vertical boiler entering pipe F. The other and higher water column pipe section D has connected therewith a horizontal conduit and is thereby in communication with the interior of the boiler; and in practice, for the purpose of simplifying the construction, although not essentially, the communication between the pipe D and its conduit *m* is through coupled connection with the aforesaid vertical pipe section F which is an upward extension in common to both the boiler entering pipe and the less high water column pipe E.

The connections between the portions of pipes F and F^2 and the adjacent end portions of the conduits *k* and *m* are made by the coupling casings *o* and *p* having suitable pipe connection openings and chamber enlargements as shown; and each of these coupling casings has a nipple o^2 and p^2 extending therewithin from the bottom of the coupling casing and with its upper open end as high or higher than the sidewise opening for the junction of the horizontal pipe therewith.

In operation, the water being up to the pipe indicated by the line *x* in the boiler, the lower end of the pipe F will be water sealed, preventing the entrance of steam which is in the upper portion of the boiler, from passing upwardly through the pipe F; and the water in the boiler being subject to the "boiler pressure", that is of the steam therein, will cause a quantity of the water in the boiler to pass upwardly, completely filling the vertical conduit F, F^2 and the chamber enlargements *o* and *p* forming part thereof and the hydrostatic pressures both above and below the diaphragm will be balanced or equal,—it being remembered that the

water in the pipe section F will supplement the water column in pipe E to an extent equal to the water which is in the pipe D between its top and down to the level of the top of pipe E,—and thus the diaphragm of the controller being in an equilibrium of pressures, the valve closing spring *h* is effective for the closing of the valve *d*. When the water falls below the open end of the pipe F, the water contained in such pipe falls therefrom into the boiler, being replaced by steam, and yet all of the water in the vertical pipe D remains therein in column of a length in excess of that in the pipe E equal to the distance pipe D towers above the top of the one E, effective for multiplied force proportionate to the area of the diaphragm chamber to quickly and positively upwardly force the diaphragm against the stress of the valve closing spring, and also against the opposing water column in the pipe E above the diaphragm, and the valve *d* will be, therefore, moved upwardly and opened assuring an inflow of water into the boiler until the normal water level is reached or slightly exceeded, whereupon the steam which had been in the vertical pipe F, F^2 becoming condensed as hastened by the enlargement of the couplings *o* and *p* becomes replaced by water, as was before the case, so that the water columns oppositely effective on the diaphragm controller are again balanced. In order that, when the level falls below the open end of the pipe F there may not be such a concentration of the steam pressure in the boiler adjacent the end of the pipe against the water directly under the latter I provide a sleeve or pipe section *t* surrounding and separated from the pipe section F and terminating below the lower end of the latter,—this sleeve, as shown, being supported on the pipe F by set screws *u u;* the steam, therefore, reaches the lower open end of the pipe F by having to pass therethrough from the upper end of the sleeve.

In the use of this apparatus it may in many cases be considered best to open the valve *a* in the direct portion of the feed pipe to an extent to permit the continuous ingress to the boiler of water approximately of the quantity required leaving my automatic apparatus to regulate the exact quantity of water which should be automatically supplied into the boiler.

I claim:—

In an automatic water feeding apparatus for steam boilers, the combination with the boiler, of a pipe depending into the same and having a nipple at its upper end, a pipe arranged in alinement with the first mentioned pipe and having a nipple at its upper end, hollow coupling member inclosing said nipples and connected thereto, one of said members connecting said pipes together, a feed pipe communicating with the boiler, a normally closed valve for the feed pipe, a diaphragm controller for said valve, a tubular extension depending from the controller, a diaphragm stem operable through said extension means for connecting the diaphragm stem to the stem of the valve, a spring surrounding said extension and interposed between the controller casing and said means for exerting a closing pressure upon the valve, a pair of conduits extending from the said coupling members, one of said conduits arranged above the other, a pipe communicating with said controller below the diaphragm and with the upper of said conduits, and a pipe communicating with said controller above the diaphragm thereof and the lower of said conduits.

Signed by me at Springfield, Mass., in presence of two subscribing witnesses.

CHAUNCEY JONES.

Witnesses:
WM. S. BELLOWS,
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