No. 742,294. PATENTED OCT. 27, 1903.

H. J. DAVIS & P. G. AULT.

BOILER FEEDER.

APPLICATION FILED FEB. 21, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

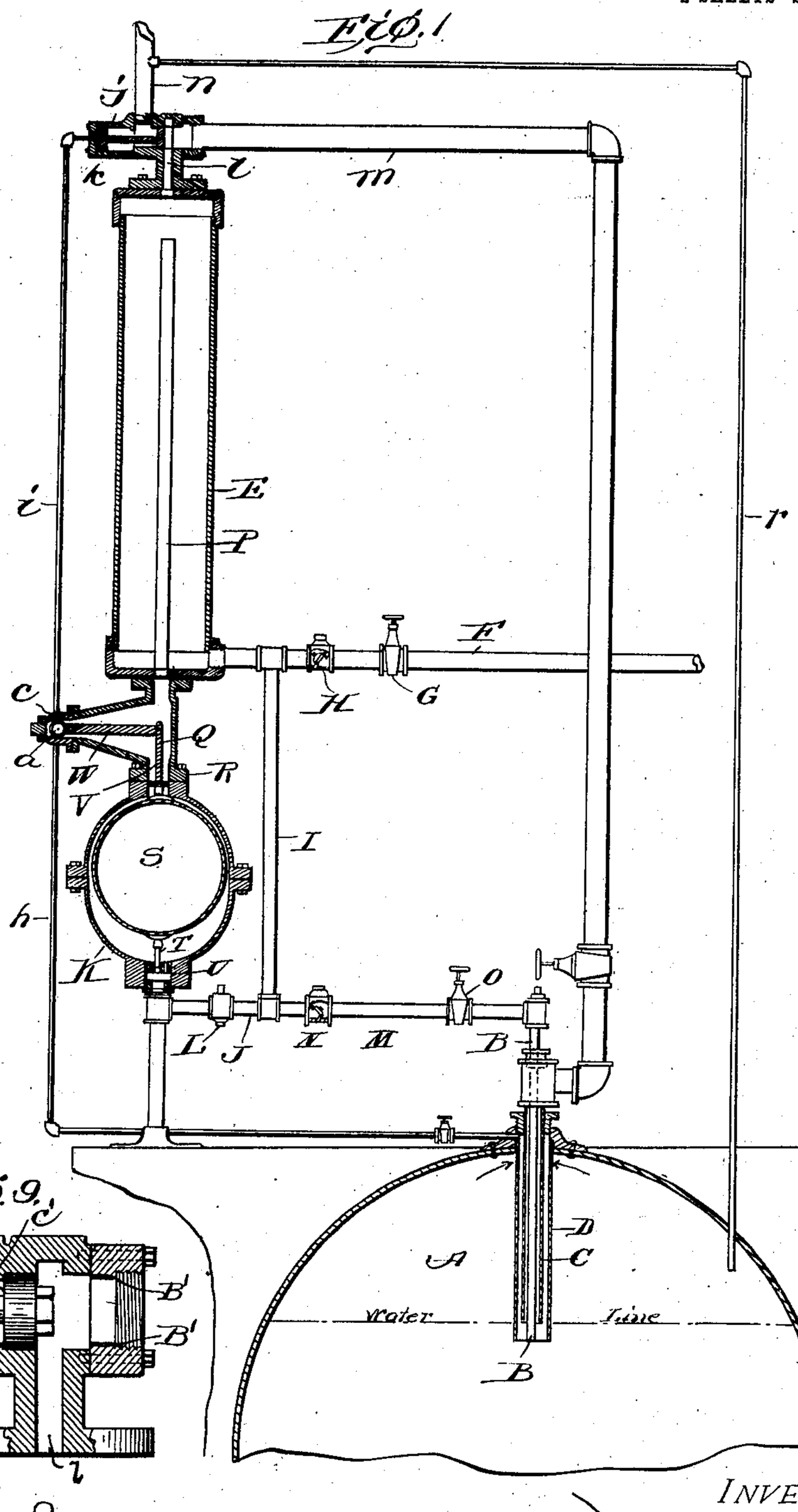

Fig. 9.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

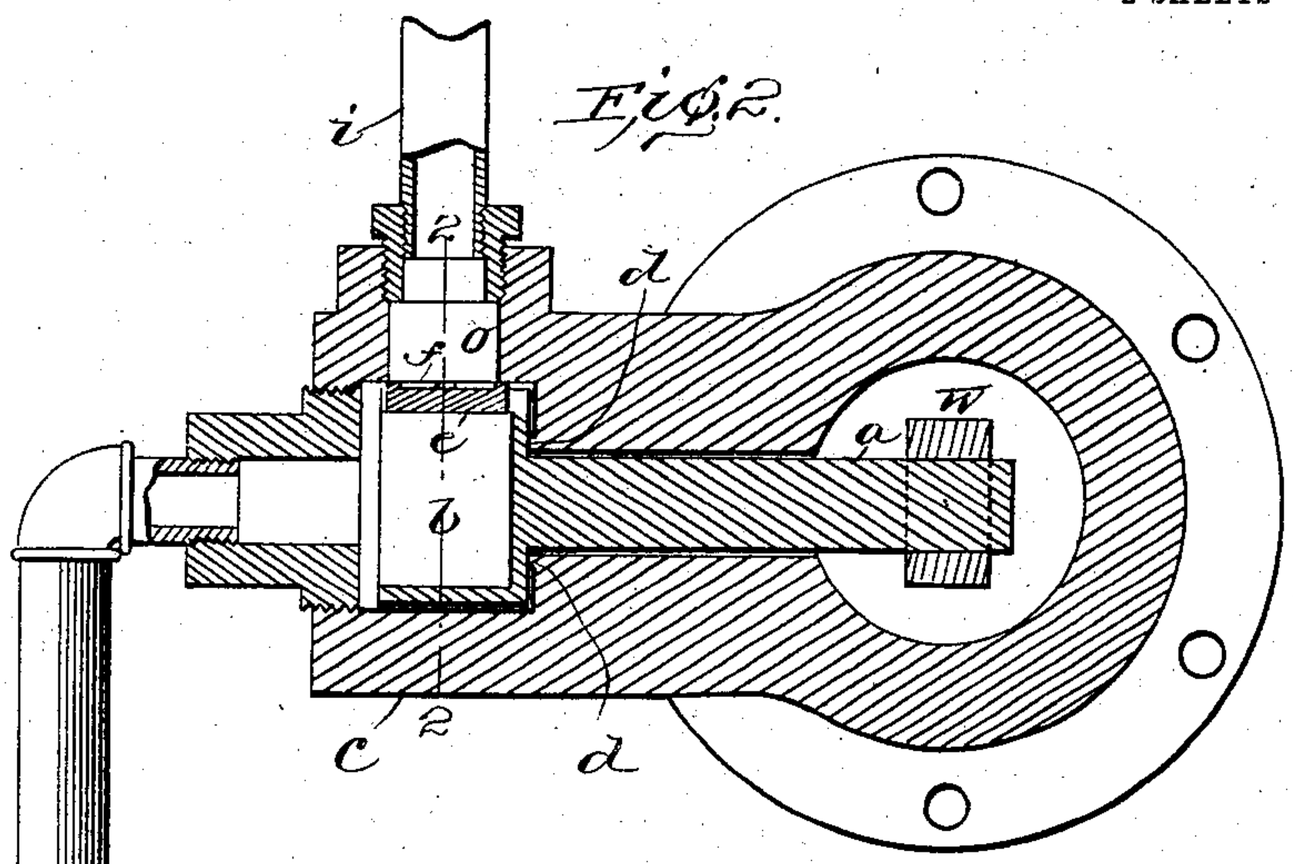


Fig. 3.

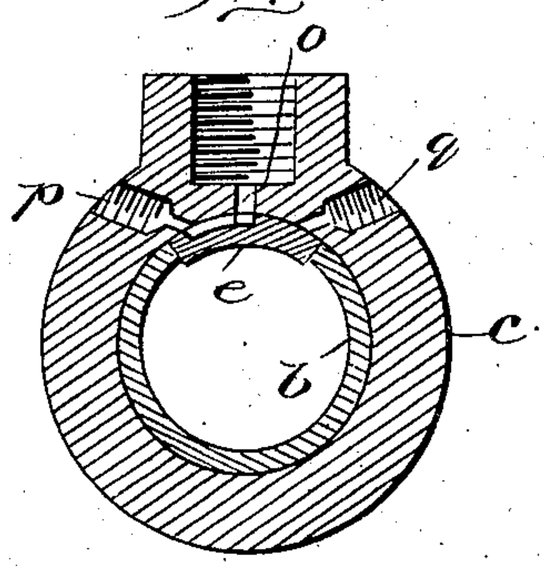


Fig. 4.

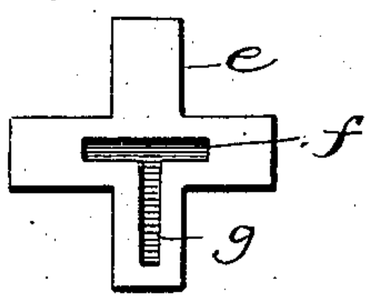


Fig. 5.

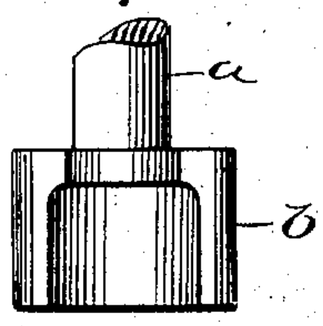


Fig. 6.

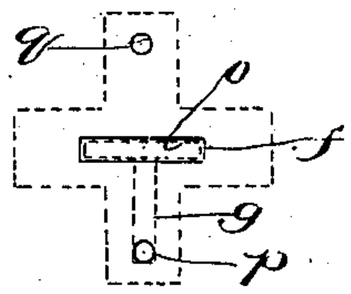


Fig. 7.

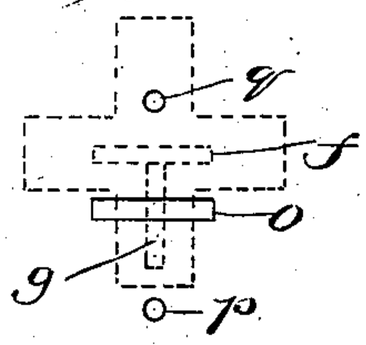
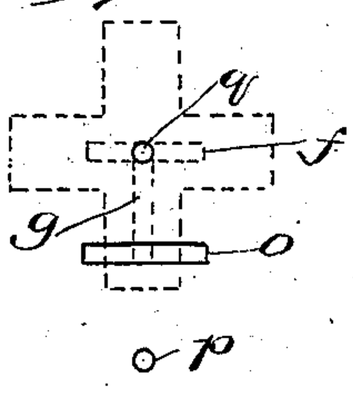


Fig. 8.



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No. 742,294. Patented October 27, 1903.

UNITED STATES PATENT OFFICE.

HENRY JACKSON DAVIS AND PLAYFAIR GOODWIN AULT, OF BIRMINGHAM, ALABAMA, ASSIGNORS TO DAVIS AUTOMATIC BOILER FEED COMPANY, OF BIRMINGHAM, ALABAMA, A CORPORATION OF ALABAMA.

BOILER-FEEDER.

SPECIFICATION forming part of Letters Patent No. 742,294, dated October 27, 1903.

Application filed February 21, 1903. Serial No. 144,500. (No model.)

To all whom it may concern:

Be it known that we, HENRY JACKSON DAVIS and PLAYFAIR GOODWIN AULT, citizens of the United States, residing at Birmingham, in the county of Jefferson and State of Alabama, have invented certain new and useful Improvements in Boiler-Feeders, of which the following is a specification.

Our present invention pertains to improvements in steam-boiler feeders, the construction and advantages of which will be hereinafter set forth, reference being had to the annexed drawings, wherein—

Figure 1 is a vertical sectional view of the apparatus; Fig. 2, a sectional view of a portion of the valve mechanism; Fig. 3, a similar view taken on the line 2 2 of Fig. 2; Fig. 4, a top plan view of the valve proper; Fig. 5, a similar view of the valve-carrier; and Figs. 6, 7, and 8 diagrammatic views showing different positions of the valve and its relation to the various ports or openings in the valve-casing. Fig. 9 is an enlarged vertical section of the piston-valve casing.

The object of our invention is to provide a simple and efficient feeder by which water may be fed to the boiler by gravity, the apparatus coming automatically into operation as the water-level in the boiler falls below a predetermined point.

Referring to the drawings, A denotes the boiler, into which depends the water-discharge pipe B, which is surrounded by the steam-pipe C, a shield D being placed around the two pipes and extending down below the normal water-line, as does also the water-pipe B. The shield is provided with a series of openings near its upper end to admit steam into the same and permit the steam to pass up into the steam-pipe C when the water-line falls below the mouth of said pipe. The shield also serves to prevent the foam or scum from entering the steam-pipe. It is not necessary that the steam and water pipes should be tapped into the boiler at the same point; but, as will be seen, only one tapping is required in the arrangement shown.

E denotes the water tank or reservoir, the lower end of which is connected to a water-supply pipe F. A suitable shut-off valve G is located in said pipe, and a check-valve H, closing against the outflow of water, is likewise mounted in the pipe F. A branch pipe I is connected to pipe F and extends downwardly and communicates with a pipe J, which in turn is connected to the lower end of a float-chamber K. A suitable valve L is mounted in the pipe J, and by proper adjustment thereof the float-chamber and the tank E may be caused to fill simultaneously.

A pipe M is connected to the pipes I and J and is likewise connected to the water-discharge pipe B, hereinbefore referred to. A check-valve N is located in the pipe M and serves to prevent the water from being forced up through pipes B and M into the pipe I or J. A suitable shut-off valve O is likewise located in the pipe M.

A pipe or tube P is placed within the tank or reservoir E, the upper end of the pipe being open at a point near the top of the tank, while the lower end of said pipe communicates with a shell or casing Q, which surmounts and is connected to the float-chamber K. This shell or casing Q opens directly into the float-chamber through ports or passages formed in the washer or guide-block R, mounted in the upper end of the float-chamber.

A float S is placed within the chamber K and properly positioned therein by means of a stem T, extending from its lower end and passing through a ported washer or guide-block U. To the upper end of the float is attached an arm V, which in turn is pivotally connected to a lever W. Said lever is detachably secured to the end of an arm or stem *a*, which has formed at its outer extremity a valve-carrier *b*. This valve-carrier is cylindrical in form and works within a steam-chest or valve-casing *c*.

As will be seen upon reference to Fig. 2, the wall of the chest or casing adjacent to the rear face of the valve-carrier *b* is provided with a shoulder *d*, against which the valve-carrier works, said carrier being free from contact with the walls of the casing except at this particular point. The carrier is cut away on one side, and in said cut-away portion is mounted a valve *e*, the outer face of which bears directly against the wall of the steam-

chest and makes a close joint therewith. The valve is fitted closely in the carrier, so that any movement which is given to the carrier is imparted to the valve. Upon reference to Figs. 4, 6, 7, and 8 it will be noted that the valve is cruciform in its general contour and is provided with a groove or channel *f*, which extends nearly across one member thereof. There is also a second groove or channel *g*, formed in one of the arms of the valve, which groove leads into the main cross groove or channel *f*, the two grooves forming, in effect, a T-shaped channel. Steam is admitted to the valve-casing through a pipe *h*, which extends into the upper end of the shield D. Thus it will be seen that steam at boiler-pressure is always present in the pipe *h*, and consequently in the valve-casing. A second pipe *i* leads from the steam-chest *c* to a valve-casing *j*, in which is mounted a piston-valve *k*. This valve is arranged so as to open a port *l*, leading into the tank or reservoir E and to a steam-pipe *m*, which is connected to pipe C, or when the piston-valve is drawn to the opposite position from that shown in Fig. 1 the port *l* is connected directly to a vent *n*. The pipe *i* communicates with a port *o*, formed in the valve shell or casing, which port is in the form of a slot of dimensions substantially the same as those of the groove or channel *f*, formed in the valve *e*. An exhaust-port *p* is also formed in the shell or casing, while a third port *q* is likewise formed therein, and to this latter port may be connected a whistle or other suitable alarm, for a purpose which will presently appear. As the float moves up and down it oscillates the valve-carrier *b*, and consequently shifts the position of the valve with relation to the ports just referred to. With the ports in the positions shown in Fig. 6 the groove or channel *f* will be in line with the port or opening *o*, while the laterally-extending channel *g* will be in direct communication with the exhaust-port *p*. This position of the ports is also illustrated in Fig. 3. When, however, the water (as will be hereinafter set forth) has passed out of the tank and the float-chamber, the position of the valve will be changed, by reason of the downward movement of the float, to that illustrated in Fig. 7. In this position it will be noted that the cross member of the valve has moved to one side of the elongated slot or opening *o*, and as a consequence steam in the casing *c* may pass directly through the port *o* into the pipe *i* and thence into the piston-valve casing *j*, forcing the valve to the right or to the opposite position from that shown in Fig. 1. At the same time the valve *e* will pass to the exhaust-port and close the same. The position of the valve shown in Fig. 8 is an extreme or unusual one and is designed to open the alarm-port when the float has collapsed and permitted the lever W to drop down to an unusual extent.

A pipe *r* may be directly connected to the vent-pipe *n* and brought down into a position in line with the boiler, where it may be readily seen by the attendant. This comes into operation when for any reason the piston-valve *k* fails to move back to the left, thereby permitting the tank E to fill continuously. The water will then be discharged through the pipe *r*, and the attendant will at once perceive that the piston-valve is not properly working and that the apparatus is out of order in some particular.

The operation of this device is as follows: Water enters pipe F past the check-valve H and fills the tank E and also the float-chamber K. At such time, however, the valve *k* is forced to the right by reason of the fact that the piston-head at the left is larger than that at the right, so that the tank and the float-chamber are vented directly to the atmosphere through opening *l* and pipe *n*. When the tank is full, the float will have moved up, and the valve *e* will be positioned as shown in Figs. 3 and 6—that is, the exhaust-port will be open, so that the steam may pass from the piston-valve casing *j*, through the pipe *i*, and thence through port *o* out through the valve to the exhaust-port *p*. By reason of the fact that there is a small passage *g* and a relatively small exhaust-port *p* for the same the piston-valve *k* is moved back against a steam-cushion, so that the valve will be prevented from chattering. The steam in pipe *m* of course will force the valve to the left or to the position shown in Fig. 1. When the piston-valve reaches the position just referred to, it will be seen that the steam-pressure will be exerted upon the water within the tank E and also upon the water in the float-chamber K by reason of the communication between the same through the pipe P. The water will then flow down by gravity through pipes I, J, M, and B into the boiler. Immediately the float is lowered the valve will be shifted, so as to again admit steam into the pipe *i*, and consequently into the piston-valve chamber or casing *j* back of the relatively large piston-valve *k*. As a consequence the piston-valve will be moved to the right and the steam-pressure cut off from tank E. The tank and float-chamber will again fill, and the same cycle of operations will be repeated so long as the water-level in the boiler is below a predetermined point or so long as it fails to seal the lower end of the steam-pipe C. The check-valve H, located in the water-supply pipe F, will prevent the water from being forced back therethrough by reason of the steam-pressure which is exerted upon the water within the tank E when said tank is being emptied. The check-valve N also prevents the boiler-pressure from forcing the water up through pipe B into the apparatus when the steam-pressure is not counterbalanced by reason of the pipe *m* being cut off from the tank by the piston-valve.

In the construction shown the tank is placed directly over the float-chamber and commu-

nication between them is made through the pipe P, as heretofore stated. The tank, however, may be placed on a separate stand and at any elevation, provided outlet therefrom is maintained in proper relation to the float-chamber. The tank may also be placed horizontally at any elevation above the middle of the float-chamber, in which case communication between the tank and the float-chamber may be made by a pipe tapped into the tank near the top thereof and connected to the float-chamber at or near its upper end.

It is to be noted that with a valve made in the form shown and described there is but slight surface contact, and therefore less friction, than in other constructions. It will also be observed that it takes but a relatively small movement to change the position of the valve with reference to the ports.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In an apparatus of the character described, the combination of a boiler; a feed-water tank in communication with said boiler; a float-chamber also in communication with said boiler and likewise in connection with the tank; a float mounted in said float-chamber; a valve-chest; a valve-carrier mounted in said chest and connected to the float and operated thereby; a valve mounted in said carrier and controlling suitable ports formed in the valve-chest; means for supplying steam to said valve-chest; and a piston-valve operating to vent the tank or to admit steam-pressure thereto, substantially as set forth.

2. In an apparatus of the character described, the combination of a boiler; a water-tank in communication with said boiler; a float-chamber likewise in communication with said boiler and in communication with the upper portion of the tank; a float mounted in said float-chamber; a valve chest or casing; a valve-carrier working in said chest or casing and connected to the float and operated thereby; a cruciform valve mounted upon said carrier and working over an elongated port and a relatively small exhaust-port; means for admitting steam to said valve chest or casing; a piston-valve operating to vent the tank or to admit steam-pressure thereto; and suitable connections between said piston-valve and the elongated port substantially as set forth.

3. In an apparatus of the character described, the combination of a water-tank; a piston-valve for venting said tank and alternately admitting steam thereto; and a valve for controlling the admission of steam to said piston-valve, the controlling-valve having a T-shaped channel formed in the face thereof and working across an elongated opening which is in direct communication with the piston-valve, and also over a small exhaust port or opening, substantially as set forth.

4. In an apparatus of the character described, the combination of a float, a valve-carrier connected to said float; a cruciform valve mounted upon said carrier, said valve having a T-shaped groove or channel formed in the face thereof; and a valve chest or casing for said carrier and valve, said casing having an elongated port designed to register with the cross-channel in the valve and likewise provided with a small exhaust-port to register with the other portion of the groove or channel when said valve is brought to a position to exhaust the piston-valve or the like which it controls.

5. In combination with a valve chest or casing, means for admitting steam thereto; a valve-carrier rotatably mounted within said chest or casing; a cruciform valve mounted upon said carrier and having grooves or channels *f*, *g* formed therein; and means for oscillating said carrier to bring the valve carried thereby into operative relation to ports *o*, *p* formed in the valve-casing.

6. In combination with a valve chest or casing, means for admitting steam thereto; an oscillating valve-carrier mounted within said chest or casing; a cruciform valve mounted upon said carrier, said valve having channels or grooves *f*, *g*, formed in the face thereof; and means for oscillating the carrier and bringing the valve into position to control the passage of steam through ports *o*, *p* and *q* formed in the valve chest or casing.

7. In an apparatus of the character described, the combination of a boiler; a feed-water tank; a float-chamber; means for admitting water to said tank and chamber; connections intermediate said tank and chamber leading to the water-space of the boiler; a float mounted in the float-chamber; a valve chest or casing located adjacent to said chamber; a valve-carrier working in said casing; connections intermediate said carrier and the float for oscillating the carrier; a steam-pipe leading from said casing to the steam-space of the boiler; a cruciform valve mounted upon said carrier, said valve having grooves or channels *f*, *g* formed therein; a pipe extending from the casing in line with an elongated opening or port *o* formed therein; a piston-valve casing in communication with the tank and likewise in communication with the pipe leading from the elongated port; a piston-valve working in said casing; a vent-pipe; and a steam-pipe communicating with the piston-valve casing, said pipes being brought alternately into communication with the tank by the movement of the piston-valve, substantially as set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY JACKSON DAVIS.
PLAYFAIR GOODWIN AULT.

Witnesses:
H. W. COFFIN,
WM. W. FRENCH.