

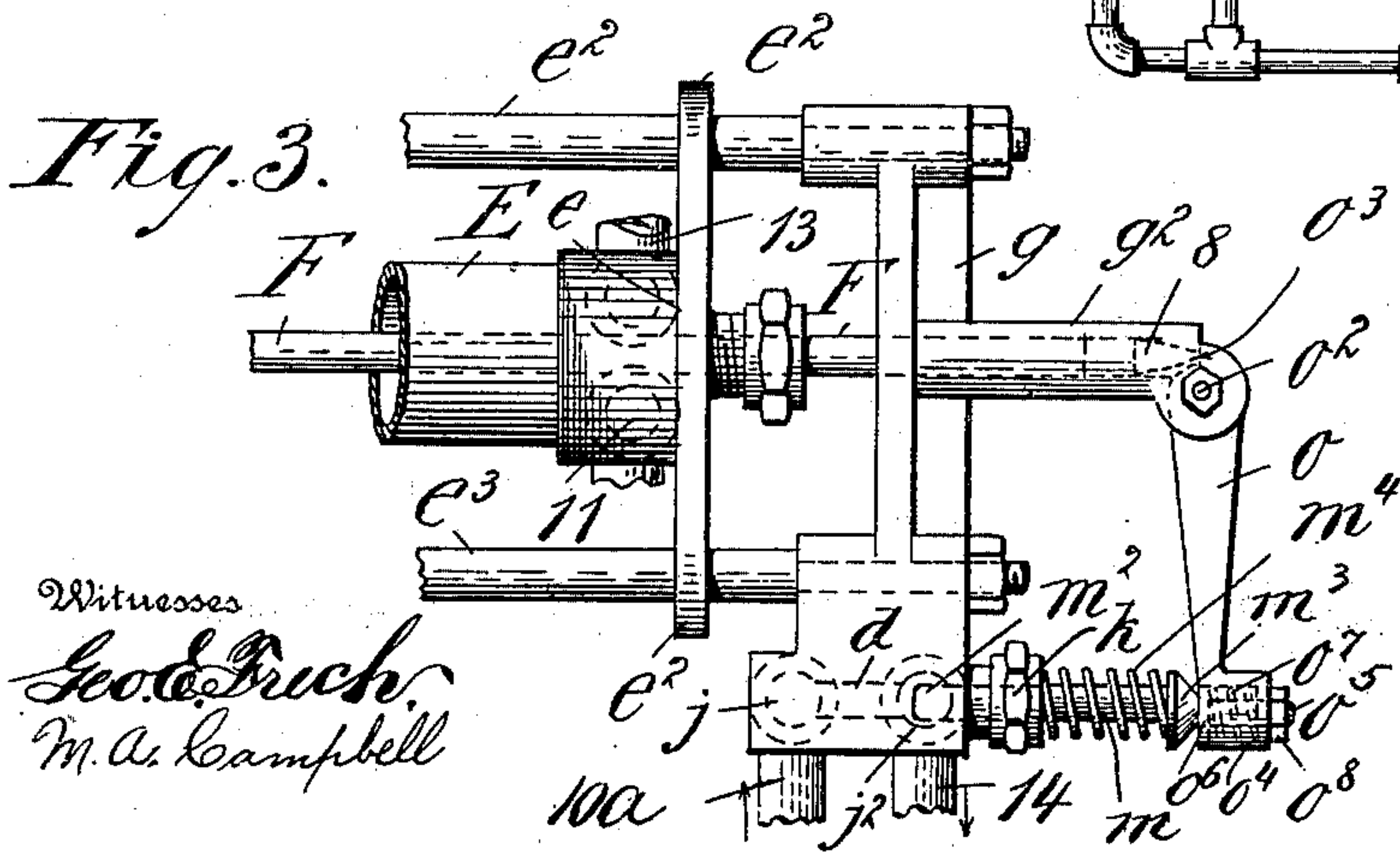
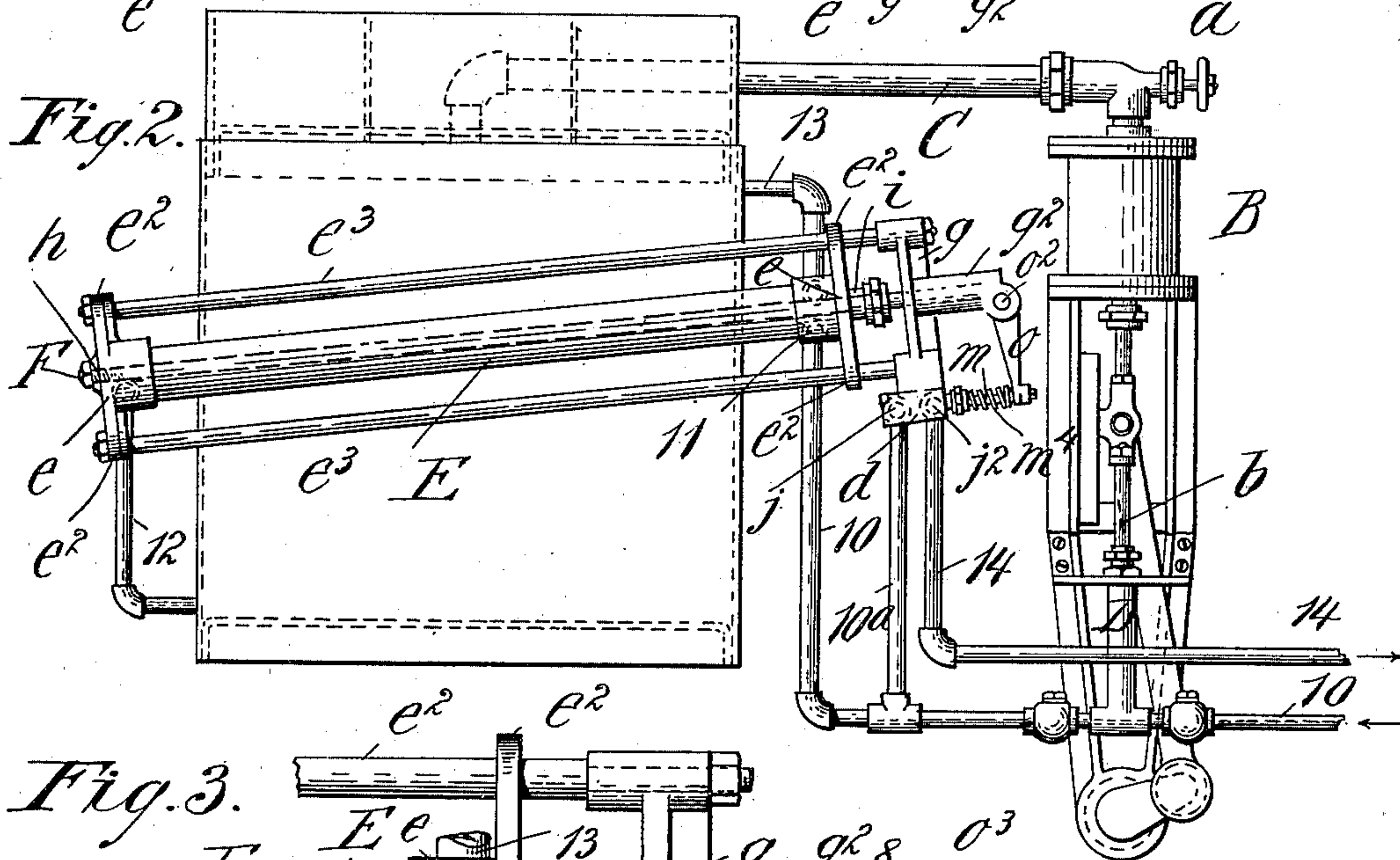
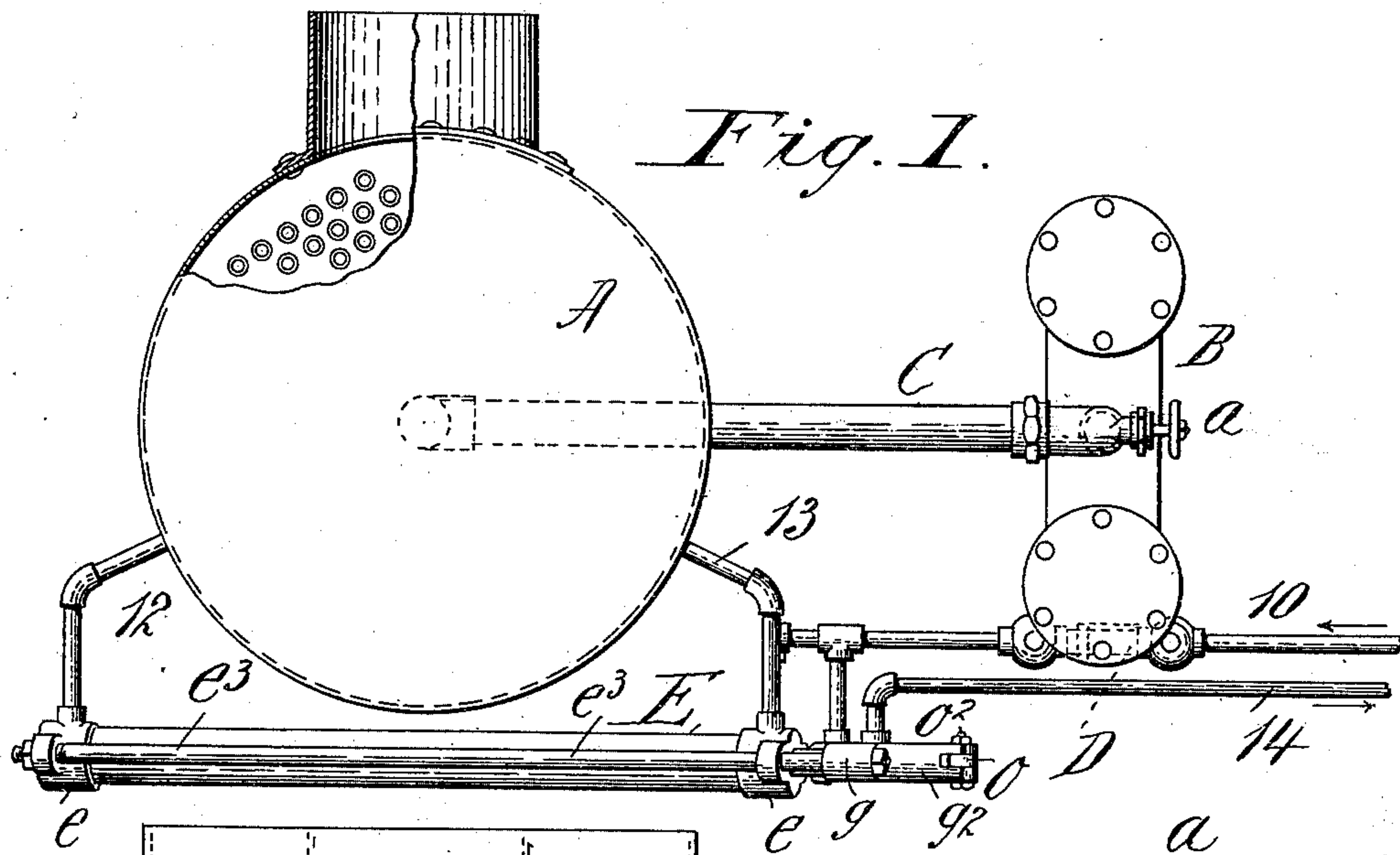
No. 663,828.

Patented Dec. 11, 1900.

J. F. DURYEA.
STEAM BOILER FEEDER.

(Application filed Mar. 7, 1900.)

(No Model.)



Witnesses

Geo. Truch
M. A. Campbell

Inventor

J. Frank Duryea
by
Wm. J. Bellon
Attorney

UNITED STATES PATENT OFFICE.

JAMES FRANK DURYEA, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO
THE UNITED POWER VEHICLE COMPANY, OF NEW YORK, N. Y.

STEAM-BOILER FEEDER.

SPECIFICATION forming part of Letters Patent No. 663,828, dated December 11, 1900.

Application filed March 7, 1900. Serial No. 7,661. (No model.)

To all whom it may concern:

Be it known that I, JAMES FRANK DURYEA, a citizen of the United States of America, and a resident of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Steam-Boiler Feeders, of which the following is a full, clear, and exact description.

10 This invention relates to improved means for automatically governing or controlling the feeding or supplying of water to a boiler; and it more particularly relates to an apparatus of the character indicated wherein the
15 thermostatic condition of a bar or rod (as produced either by the lowering of the temperature thereof when a considerable supply of cold water is being or has been introduced into the boiler or by the raising of the tem-
20 perature when the water becomes lowered and the steam-pressure excessive) controls the course of the water being forced by the pump which is operated by the engine taking steam from the boiler or forced by other
25 means, so that for the proper time, as required, much or all of the water forced from the supply toward the boiler will enter the boiler and so that thereafter when the water has been supplied into the boiler in sufficient
30 quantity a considerable portion of the water being pumped will have a return course back to the supply or at least diverted away from the boiler.

This invention is particularly available in
35 connection with the boilers for supplying steam to engines with which motor-vehicles are equipped, especially for the purpose of relieving the factor of danger which might otherwise exist by reason of the water running low in the boiler.

The invention in part consists in the combination, with a steam-boiler, of a water-conduit in connection with the boiler and with which is connected a water-feed pipe, a branch
45 or portion of said feed-pipe having a valved connection with a conductor, the course of which is diverted away from the boiler, a thermostat or member located in said conduit and subject to temperature changes as occasioned by excessive or deficient water-supply
50 in the boiler, which bar operates the valve

which opens and closes communication between the water-feed pipe and the said diverted conductor; and the invention furthermore consists in the inclusion in the apparatus above characterized of the aforementioned
55 conduit, in which the thermostat-bar is inclosed, arranged obliquely to the water-level in the boiler for increased efficiency of action; and the invention also consists in an automatic feed-water apparatus for boilers comprising particular combinations and arrangements of parts, all substantially as hereinafter fully described, and set forth in the claims.

Reference is to be had to the accompanying
65 drawings, in which—

Figure 1 is a plan view of a steam-boiler, an engine, and pump, showing the arrangement in conjunction therewith of the automatic water-supplying apparatus for the boiler. 70
Fig. 2 is a side elevation of the same. Fig. 3 is a side elevation, on a larger scale, of some of the important parts comprised in this invention which are shown in the preceding figure.

Similar characters of reference indicate
75 corresponding parts in all of the views.

In the drawings, A represents a steam-boiler of any ordinary or suitable type, leading from which to the steam-chest of the engine B is the steam-pipe C, as usual, provided with the throttle-valve *a*. Combined
80 with the engine is the pump, (indicated at D,) of which *b* is the operating-piston, the pump involving no novelty in itself. The pump has connected therewith the pipe 10, which is understood as leading thereto from the water supply or tank, said pipe being continued beyond the pump and entering at 11 into the tubular jacket, drum, or conduit E. This
85 conduit E is located obliquely, as shown in Fig. 2, relatively to the level of the water in the boiler and externally thereof. It has end heads *e e*, provided with extension-lugs *e*², connected with which are the tie-rods *e*³. Adjacent one of the end heads is a bracket or
95 casting *g*, also connected with the extremities of the tie-rods. The said casting *g* is provided with an extension-boss *g*², having a hole or passage from end to end therethrough which is axially coincident with the axis of
100 the comparatively large tube or drum E. F represents a bar or rod inclosed as to the

greater portion of its length axially within the said drum E, one end thereof being confined at h by being threaded and screw-engaged in the one end head for the drum and receiving the confining-nut, while its other end portion is extended through the gland or stuffing-box i , with which the other end head is provided, and is also extended more or less nearly through the passage in the aforesaid boss g^2 of the bracket-casting g . The said bracket-casting is provided with two ports or openings j and j^2 , with which the pipes 10^a and 14 , hereinafter more particularly referred to, are connected.

The passage d or by-pass having its length parallel with the bar F connects the two ports j and j^2 ; said passage being continued through the gland or stuffing-box k and receiving therein the rod or stem m , the extremity of which constitutes, as indicated at m^2 in Fig. 3, the valve proper to close communication between the by-pass d and the port j^2 and pipe 14 , or if the valve-rod is moved to the right more or less to correspondingly more or less open communication between said passages. The stem of the valve is provided with the enlarged conical head m^3 , between which and the gland k is the spring m^4 , the action of which is to force the valve toward the right and to open the by-pass.

o represents a lever fulcrumed at o^2 in ear-pieces formed on or affixed to the outer extremity of the aforesaid boss-provided bracket. o^3 represents the short arm of the said lever, in contact against which is the hardened end bushing 8 , provided at the outer end of the aforesaid bar F, which latter bar may advantageously be composed of zinc or other metal subject to maximum expansion and contraction as effected by temperature changes. The end bushing 8 may advantageously consist of a hardened-steel block. The extremity of the long arm of the lever is formed with the socketed hub o^4 , playing in which is the stem o^5 , having at its end toward the valve-stem m the circular flange or piston o^6 , between which and the end wall of the socketed hub is interposed under suitable compression the spiral spring o^7 , and the nut o^8 constitutes a limiting-abutment.

The pipe 10 , which is the feed-pipe through which the water is pumped from the tank or supply into the drum (and which water passes, after coursing the length of the drum, into the boiler by way of the pipe 12 , which leads from the left-hand end of the drum in a downward direction to enter the boiler at a lower portion thereof) has the branch 10^a thereof connected to the aforesaid port j , while the pipe 14 , which leads from the other port j^2 , is a conduit for diverting more or less of the water when the same is being excessively supplied into the boiler from entrance to the latter, and this pipe 14 may lead back to the supply-tank or elsewhere, as deemed desirable.

The pipe or conduit 13 leads from the drum

E upwardly to communication with the interior of the boiler at a high portion thereof.

The aforesaid point of entrance 11 of the feed-pipe 10 into the drum is, as indicated, below the thermal bar F, while the point of connection which the pipe 13 has with the drum is above the bar F.

In explanation of the capability and operation of the apparatus described it will, for instance, be assumed that the water in the boiler is below the desired or normal level, which is understood as usually being below the axis of the inclined drum or conduit at about the middle of its length. Now comparatively little or perhaps none of the thermal bar will be submerged in water, owing to the lowered level; but the steam from the boiler filling all of the space in the drum which is unoccupied by water will expand the bar, its endwise elongation and thrust being sufficient to swing the lever over to force the stem m of the valve against its spring to cause the valve to close the by-pass. Now therefore there is no diverted course or back track open for the course of any considerable portion of the water being forced by the pump through the feed-pipe. Hence a greater proportion of water will be entered into the boiler in a given time than would be the case were the water-level higher; but so soon, however, as the water rises in the boiler, whereby from the setback or hydrostatic conditions established the drum becomes more nearly filled, a larger proportion or perhaps all of the thermal bar will be immersed or submerged in the cold incoming water, and by the direct action of the latter on the bar to lower the temperature thereof the bar will become shortened, permitting the lever o to be swung to follow the bar, as it will be caused to do by the retractile action of the spring m^4 of the valve. The purpose of providing the yielding or compensating medium of contact between the end of the valve-stem and the lever is to insure that in the event of the valve being forced firmly to contact at and to close the end orifice of the by-pass there will be no buckling, crippling, or undue strain upon any of the movable parts occasioned by a further distention of the bar F. Of course in practice or operation it will be understood that ordinarily the thermal action on the bar will effect such gradual changes thereof and corresponding changes in the conditions or relations of the movable parts controlled thereby that the actions and controlling or regulation of the water-feed will be comparatively gradual, the extremes of opening and closing at the valved by-pass not often under ordinary circumstances occurring.

It will be apparent that by reason of the inclination of the drum and the thermal bar axially therewithin under the usual water-level conditions in the boiler the bar will be subject at the lower portion thereof to the effect of the water in contact therewith and

surrounding the same, while another portion of the bar will be subject to the heating action of the steam thereabout. The mechanism or apparatus is thus rendered more gradual and less violent or abrupt in its effect on the by-pass valve than would be the case if the parts were level, in which event a slight lowering of the water-level would completely expose the entire length of the bar to be heated by the steam, while again a comparatively slight rising of the water-level would entirely submerge the bar.

The part E, which for brevity has been herein termed the "drum," is in effect a portion of the water-feed conduit, and its details of form and construction may be altered without departing from this invention.

I may, if desired, in lieu of having the feed-pipe 10 connect directly with the drum, have said feed-pipe carried to connection with one of the tie-bars e^3 , which may be tubular and have connection with the opposite tie-bar e^3 , also tubular, and the latter tie-bar will in such case be connected with the drum.

By giving the feed-water the circuitous course through the drum-supporting frame before permitting it to enter the drum the whole apparatus is kept more nearly at the desired temperature, and the undue heating of the structure E and e^3 by radiation of heat from the boiler may be thus overcome.

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

1. The combination with a steam-boiler and its feed-pipe, of a water conduit or drum, with which the feed-pipe is connected and from which drum leads a pipe for conveying the water fed into the drum to the boiler for supplying the latter, a pipe or conductor for diverting portions of the water being fed through the feed-pipe from entrance to said drum, said feed-pipe and secondary pipe being connected by a passage at which is provided a valve for opening and closing the same, a thermally-actuated device located in said drum, and controlling, by its changing conditions, the operation of the valve for said passage, for the purposes set forth.

2. The combination with a steam-boiler and its feed-pipe, of a water conduit or drum with which the water-feed pipe is connected and from which leads a pipe for conveying the water fed into the drum to the boiler for supplying the latter, a conduit leading from an upper portion of the boiler back to said drum, a pipe or conductor for diverting portions of the water being fed through the feed-pipe from entrance to said drum, said feed-pipe and secondary pipe being connected by a passage at which is provided a valve for opening and closing the same, a thermally-actuated device located in said drum, and controlling by the expansion or contraction thereof, the operation of the valve for said passage, for the purposes set forth.

3. The combination with a steam-boiler and

its feed-pipe, of a water conduit or drum located externally of the boiler and in an oblique or inclined position, with which drum the feed-pipe is connected and from which drum a pipe leads to a lower portion of the boiler, a secondary pipe or conductor connected to the feed-pipe by a passage at which is provided a valve for opening and closing the same, a thermally-actuated device located in said drum, and subject to the action of both the fed water, and the steam in the boiler, and controlling, by its changing conditions, the operation of the valve for said passage.

4. The combination with a steam-boiler and its feed-pipe, of an obliquely-arranged water conduit or drum, with one end of which, and at a low portion of which the feed-pipe is connected and from the other end of which drum a pipe downwardly leads to the boiler, a conduit between the upper portion of the boiler and an upper portion of the drum, a pipe or conductor for diverting portions of the water being fed through the feed-pipe from entrance to said drum, said feed-pipe and secondary pipe being connected by a passage at which is provided a valve for opening and closing the same, a thermally-actuated device located in said drum, and controlling, the operation of said valve.

5. The combination with a steam-boiler and its feed-pipe, of a water conduit or drum, with which the feed-pipe is connected and from which drum leads a pipe for conveying the water fed into the drum to the boiler for supplying the latter, a pipe or conductor for diverting portions of the water being fed through the feed-pipe from entrance to said drum, and a by-pass connecting said pipes, provided with a valve, a thermally-actuated bar located in said drum, a lever subject to the action of said bar, and actuating said valve, for the purpose set forth.

6. The combination with the steam-boiler and the drum E having the thermal bar centrally therewithin, one end thereof being fixed and the other extended beyond the end of the drum, a water-feed pipe leading into the drum, a pipe leading from the drum to the boiler, another pipe for steam leading from an upper part of the boiler back to the drum, a pipe connected by a by-pass with the feed-pipe, a valve for closing said by-pass having an opening-spring, a lever operated by said bar in one direction and in turn exerting a closing action on the valve against the valve-opening spring, substantially as described.

7. The combination with the steam-boiler, and the drum E, a pipe leading from the drum to the boiler, a pipe connected by a by-pass with the feed-pipe, a valve for closing said by-pass having an opening-spring, a thermal bar in said drum, a lever operated by said bar in one direction and in turn exerting a closing action on the valve against the valve-opening spring, there being a medium of yielding contact between the lever and valve, for the purpose set forth.

8. The combination with the boiler and the drum having the end heads one thereof being provided with a gland; and the bracket or casting g having the boss g^2 with the passage therethrough, and constructed with the ports j and j^2 , connected by the by-pass d , to which the spring-equipped valve m is provided, the thermal bar having one end secured in said drum and its other end projecting through the said gland and into the passage in the bracket, the lever o pivoted to the bracket and with which the thermal bar coacts, and also cooperating with the valve, the pipes or conductors 10, 10^a, 12, 14, and 13, all arranged as shown and for the purposes set forth.

9. The combination with the boiler, of the drum E, having the end heads $e e$ provided with the extension-lugs $e^2 e^2$, and one head provided with a gland i , the tie-rods $e^3 e^3$ connected with the lugs and supporting at their extremity casting g having the portion g^2 provided with a passage therethrough axially

coincident with the drum, and constructed with the ports j and j^2 and the uniting by-pass, the valve m , the lever o coacting with the valve and pivoted to the said part g^2 , the thermostat-bar F, one end of which is secured to the one end head of the drum, and projecting by its extremity into the said passage in part g^2 , and hardened section 8 at the end of the bar and in contact on the short arm of the lever, the feed-pipe 10 leading into the drum, and having the branch 10^a leading to said port j , the return-pipe 14 connecting with the port j^2 , the pipe 12 connecting the drum with the boiler and the pipe 13 leading from an upper part of the boiler back to the drum, all substantially as and for the purposes set forth.

Signed by me at Springfield, Massachusetts, this 24th day of February, 1900.

J. FRANK DURYEA.

Witnesses:

WM. S. BELLOWS,
M. A. CAMPBELL.