

No. 840,252.

PATENTED JAN. 1, 1907.

J. E. PROCTOR.  
FEED WATER HEATER.  
APPLICATION FILED SEPT. 14, 1906.

Fig. 1

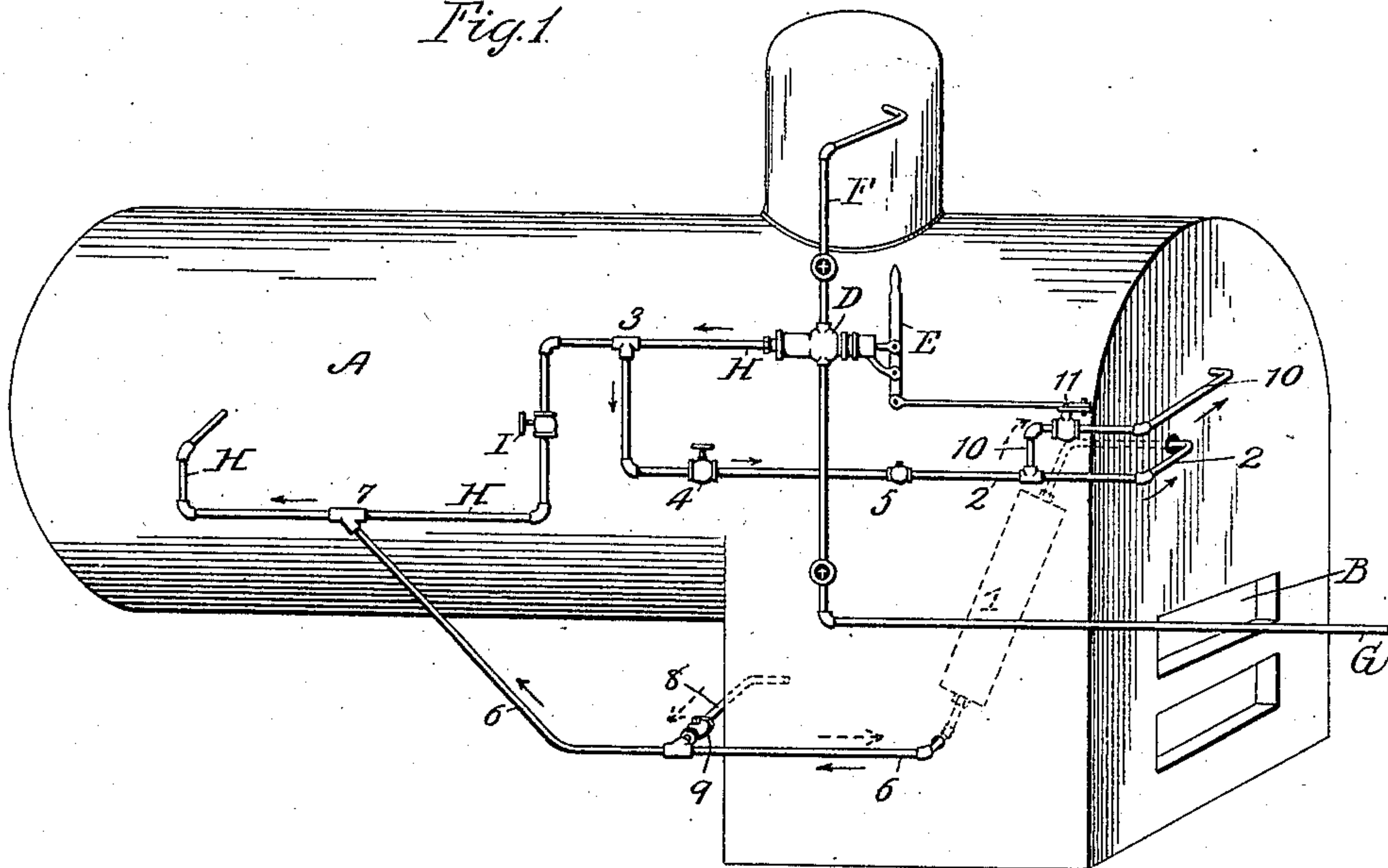


Fig. 3

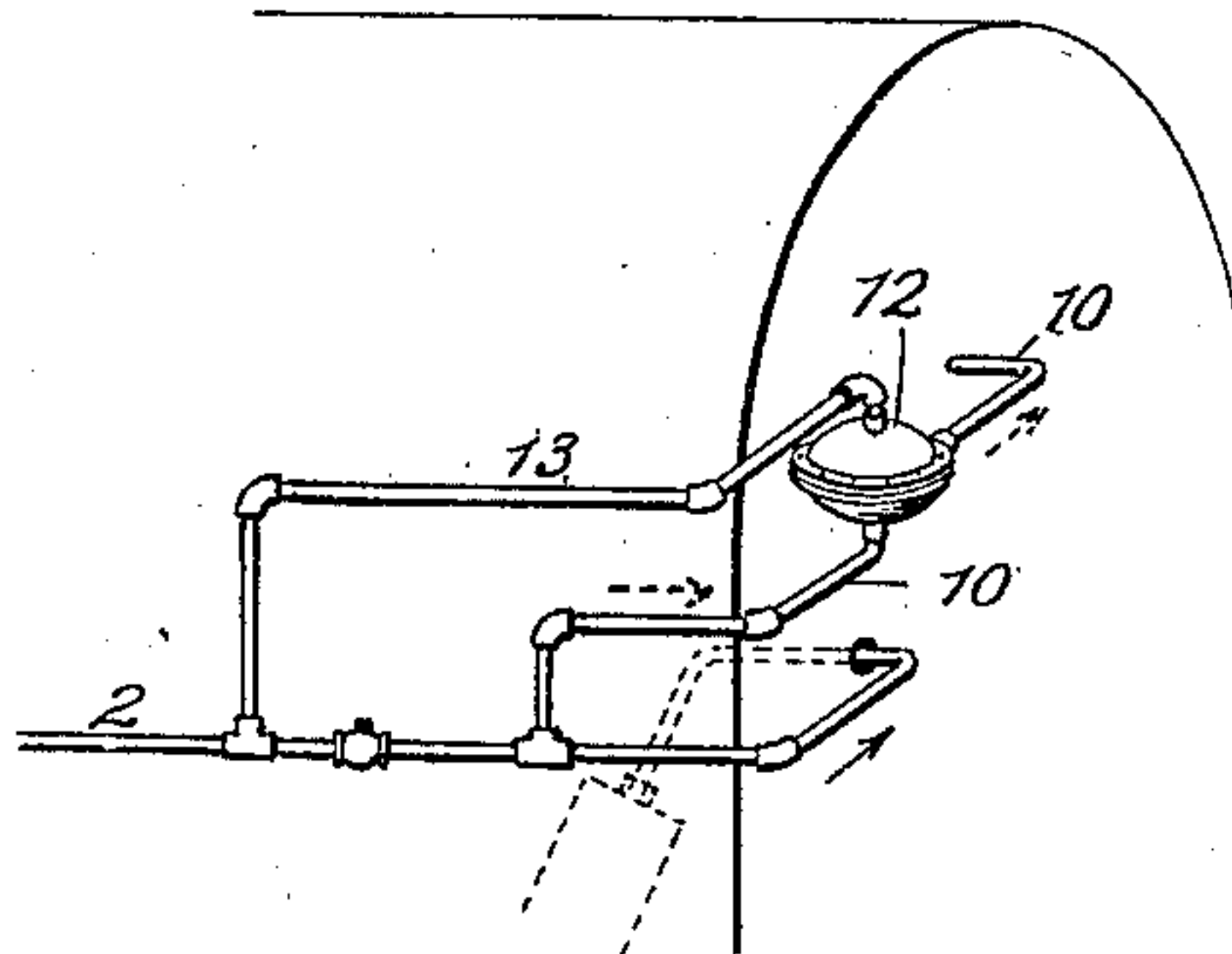


Fig. 2

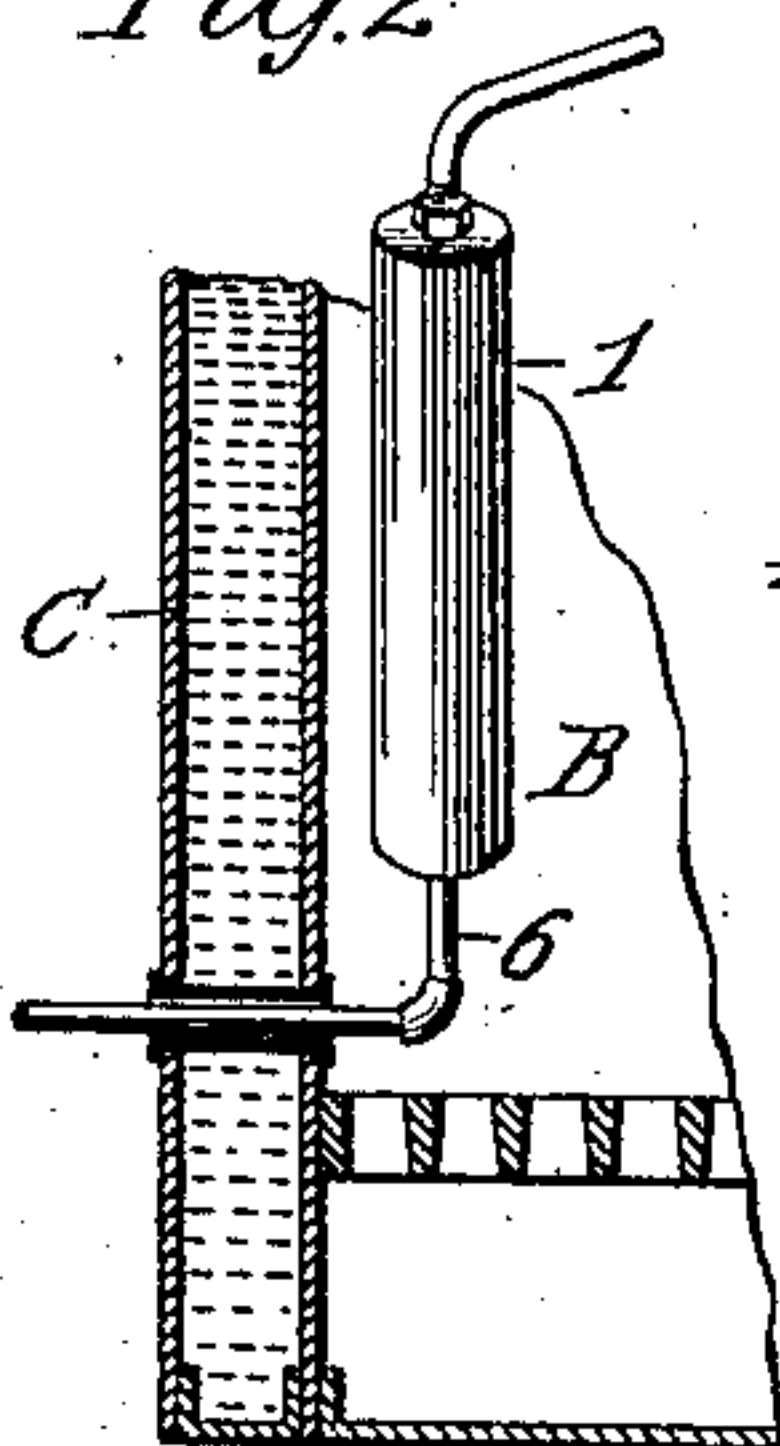
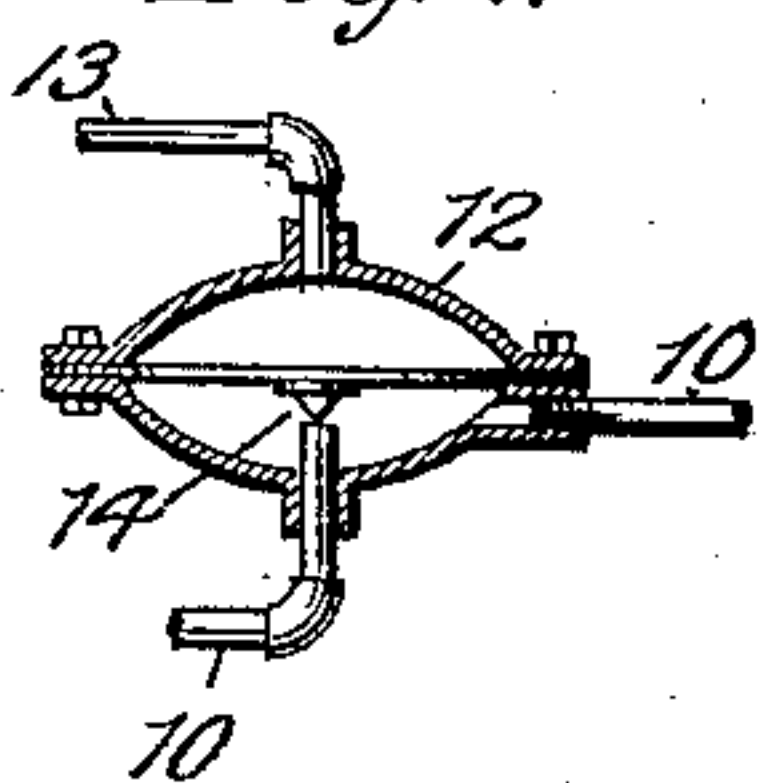


Fig. 4



WITNESSES:  
Charles B. Shumway  
Anna M. Dorr.

John E. Proctor  
INVENTOR  
BY *[Signature]*  
ATTORNEYS



# UNITED STATES PATENT OFFICE.

JOHN E. PROCTOR, OF DETROIT, MICHIGAN.

## FEED-WATER HEATER.

No. 840,252.

Specification of Letters Patent.

Patented Jan. 1, 1907.

Application filed September 14, 1906. Serial No. 334,681.

*To all whom it may concern:*

Be it known that I, JOHN E. PROCTOR, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Feed-Water Heaters and Circulators, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to that class of devices by means of which the feed-water is superheated by conducting it through the fire-box of the boiler while on its way into the boiler; and the invention consists in the novel arrangement and connections of a heating-drum with the boiler and boiler-feeding devices, all as more fully hereinafter described and shown in the accompanying drawings, in which—

Figure 1 is a diagrammatic perspective view showing invention as applied to a locomotive-boiler provided with the usual feed-injector. Fig. 2 is a fragmentary cross-section through the fire-box of the boiler. Fig. 3 is a modification of parts of Fig. 1, hereinafter more specifically referred to. Fig. 4 is a section through the automatic valve shown in Fig. 3.

A represents a locomotive-boiler in its conventional form, having the usual fire-box B, surrounded upon its sides by the usual water-legs C.

D represents a feed-injector having the starting-handle E and connected with the steam-supply pipe F and water-supply pipe G and a delivery or feed pipe H, extending from the injector alongside the boiler and provided with a stop-valve I, all arranged and operated in a well-known manner in which injectors are used for boiler-feeding purposes.

According to my invention I place a drum 1 within the fire-box, close to the side thereof, adjacent to the pipe H and in a substantially upright position, preferably slightly inclined forwardly, as shown, so that it will be exposed to a maximum of the direct heat from the burning fuel. The upper end or top of this drum I connect by a pipe 2, which passes out through the water-leg of the fire-box and thence rearwardly below the feed-pipe, with the pipe H at a point 3, which is intermediate between the stop-valve I and the injector. This top connection of the drum is provided with a stop-valve 4 and a check-valve 5, the latter permitting the flow

of the water in the direction of the arrow shown on pipe 2. The bottom or lower end of the drum is similarly connected by a pipe 6 with the pipe H at a point 7, which is between the stop-valve I and the delivery end of the pipe H. From this bottom connection 6 a branch pipe 8 leads into the water-space of the boiler at or near the bottom thereof, preferably into the water-leg in rear of the fire-box, and this branch pipe is provided with a check-valve 9, which permits the flow of the water in the direction of the dotted arrow. Another branch pipe 10 leads from the top connection 2 of the drum into the water-space of the boiler at or near the top thereof. This branch pipe has its connection with the pipe 2 at a point intermediate between the check-valve and the drum. This branch pipe 10, as shown in Fig. 1, is provided with a valve 11, mechanically operated by a suitable connection with the starting-lever E (or starting-valve) of the injector, all in such manner that the operation of starting and stopping the injector, respectively, closes and opens the valve 11, the valve being open when the injector is closed, and vice versa.

In the modification shown in Fig. 3 there is shown a diaphragm-valve 12, automatically controlling the passage of the water through the pipe 10 by the pressure of the feed-water exerted upon one side of the diaphragm through a connection 13 with the pipe 2 at a point intermediate between the stop-valve 4 and check-valve 5.

The operation of the device is as follows: The pipes 2 and 6 with the drum form a by-pass around the valve I in the feed-pipe. The valve I being normally closed and the valve 4 normally open the discharge from the injector or other boiler-feeding appliance when in operation will force its way through said by-pass into the boiler, and thus become superheated on its passage through the drum. Upon shutting down the operation of the boiler-feeding appliance the valve 11 will be opened and a circulation of the water in the boiler will take place by way of the pipes 8 and 6, drum 1, pipes 2 and 10, the flow of this water being in the direction of the dotted arrows shown in Fig. 1. The circulation takes this direction by reason of the water in the drum being exposed to the direct heat of the fire, and the water in the top of the boiler will thus be maintained in a more heated condition and the boiler will steam more freely, making a saving in fuel and preventing any



injury to the drum and its connections from the heat. These connections lead through the water-legs of the boiler through a tube, as shown in Fig. 2.

5 Where it is not expedient or advisable to operate the valve 11 by mechanical connection with the injector, an automatic valve of some suitable construction is employed, such as the diaphragm-valve shown in Fig. 3, which  
10 is automatically operated by the pressure of the feed-water exerted through the branch pipe 13 upon one side of the diaphragm, causing the valve-plug 14 to close the mouth of the pipe 10 where it enters the valve-casing.  
15 In one respect it has the advantage over valve 11, in that it automatically reestablishes the circulation in the boiler whenever the injector should break without being shut down.

20 My device forms a mere attachment to the ordinary boiler-feeding appliance, and in its practical installation I place stop-valves and union connections (not shown) wherever needed to permit the drum and its connections, which are all accessibly located, to be  
25 readily removed for repair if anything should get out of order, the usual boiler-feeding appliance (which may be an injector, as shown, or its equivalent, a pump) remaining intact  
30 and serviceable at all times.

My device is of simple construction, it is calculated to effect a large saving of fuel, and it works perfectly automatic.

Having thus fully described my invention,  
35 what I claim is—

1. The combination with the boiler and feed-pipe connecting it with the appliance for feeding the boiler and provided with a stop-valve of a drum in the fire-box located  
40 at one side thereof in a substantially vertical position, pipes separately connecting the top and bottom of said drum with the feed-pipe on opposite sides of its stop-valve, the pipe leading into the top of the drum provided  
45 with a stop-valve and a check-valve, a branch pipe connecting the pipe which leads from the bottom of the drum with the water-space of the boiler at or near its bottom and provided with a check-valve and a branch pipe  
50 connecting the pipe which leads into the top of the drum at a point between its check-valve and the drum with the water-space in the boiler at or near the top thereof and a

valve in said branch pipe controlled by the operation of the boiler-feed appliance to close  
55 and open said pipe.

2. The combination with the boiler and feed-pipe extending alongside the boiler and connecting it with the appliance for feeding the boiler, of a drum in the fire-box located  
60 near the side wall thereof adjacent to the feed-pipe and extending in a substantially vertical and forwardly-inclined position, pipes separately connecting the top and bottom of said drum with the feed-pipe, said  
65 pipe passing through the sides of the fire-box and extending below the feed-pipe alongside the boiler, a stop-valve in the feed-pipe between the points of connections of the afore-said pipes with the feed-pipe, a stop-valve  
70 and a check-valve in the pipe leading from the feed-pipe into the top of the drum, a branch pipe from the pipe which connects from the bottom of the drum into the water-space of the boiler at or near the bottom  
75 thereof and provided with a check-valve and a branch pipe from the pipe which connects with the top of the drum into the water-space of the boiler at or near the surface thereof, said branch pipe provided with a valve the  
80 opening and closing of which is controlled by the operation of the feed appliance of the boiler.

3. The combination with the boiler, of an injector having a discharge-pipe leading into  
85 the boiler and provided with a stop-valve, a drum in the fire-box, top and bottom connections between the drum and feed-pipe forming in connection with the drum a by-pass around the stop-valve in the feed-pipe, the  
90 top connection being provided with a stop-valve and with a check-valve, and branch pipes from said top and bottom connecting with the water-space of the boiler at or near the top and bottom thereof respectively, that  
95 from the bottom connection being provided with a check-valve and that from the top connection with a valve operated by mechanical connection with the starting mechanism of the injector.  
100

In testimony whereof I affix my signature in presence of two witnesses.

JOHN E. PROCTOR.

Witnesses:

OTTO F. BARTHEL,  
CHARLES B. SHUMWAY.