No. 717,335. Patented Dec. 30, 1902.

A. P. BROOMELL.

STEAM HEATING APPARATUS.

(Application filed Apr. 30, 1902.)

(No Model.) 2 Sheets—Sheet 1.

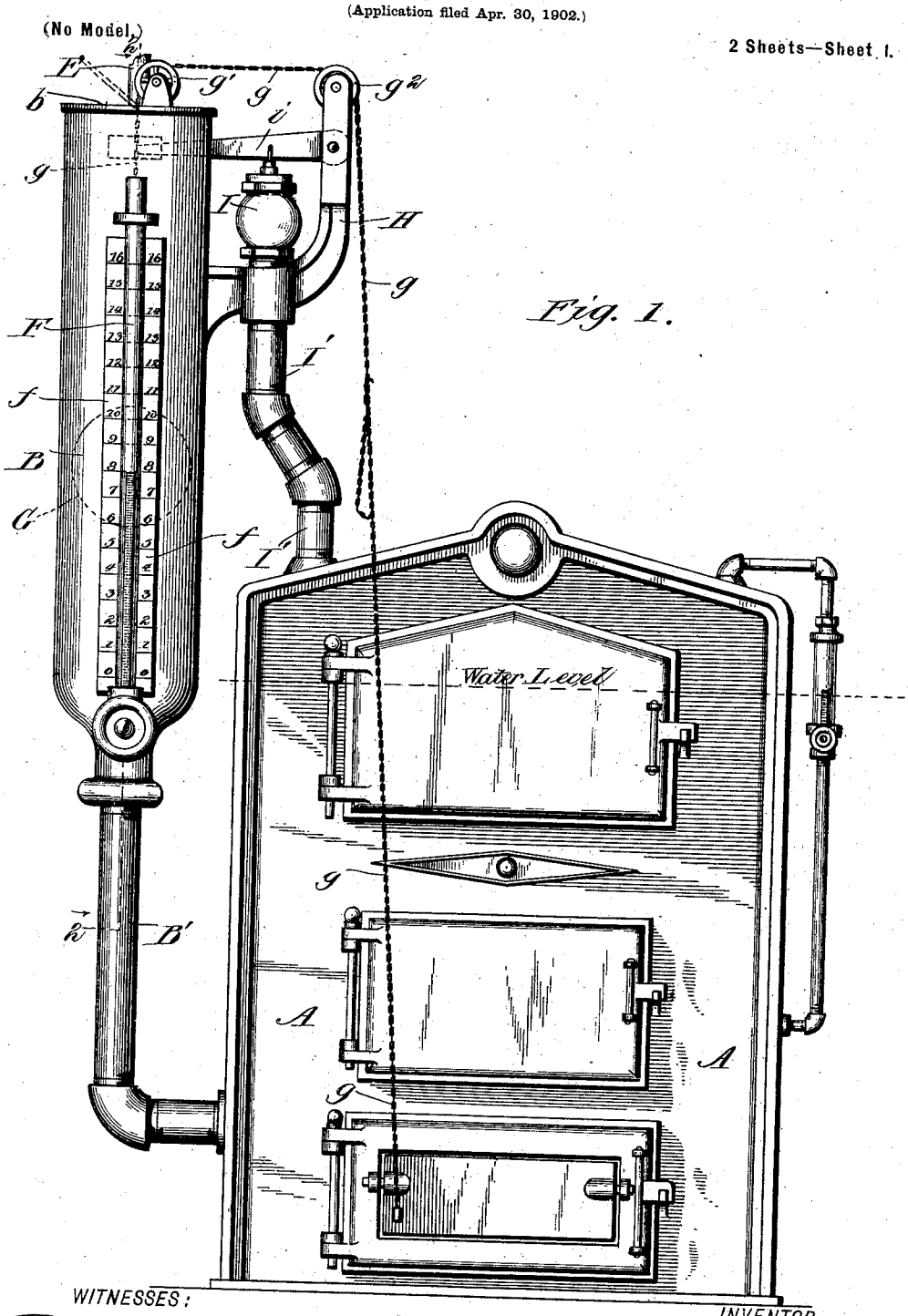

Fig. 1.

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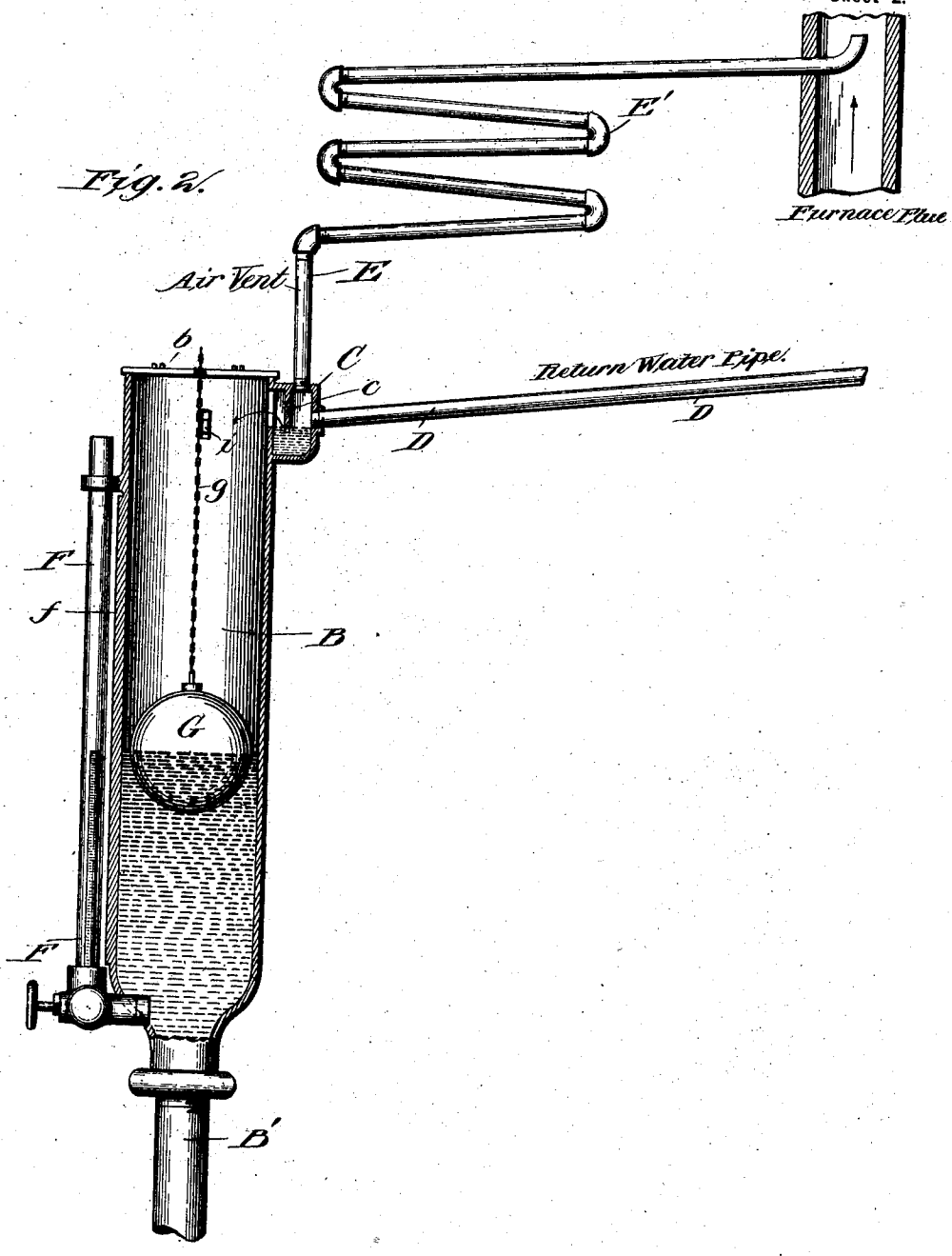
Fig. 2.



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UNITED STATES PATENT OFFICE.

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STEAM HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 717,335, dated December 30, 1902.

Application filed April 30, 1902. Serial No. 105,338. (No model.)

To all whom it may concern:

Be it known that I, ALBERT P. BROOMELL, of York, in the county of York and State of Pennsylvania, have invented a new and useful Improvement in Steam Heating Apparatus, of which the following is a specification.

My invention covers certain improvements in the steam heating apparatus for which Letters Patent were granted me May 2, 1900, No. 650,778. In this system, which I term the "vapor-heating" system, or heating by steam with little or no pressure, I employed an apparatus termed a "receiver," which received the water of condensation from the radiators of the building and any air that accompanied it, sending the air out into the atmosphere and returning the water to the boiler. This receiver had two floats, one of which operated a lever controlling a draft-damper of the furnace to regulate the fire automatically and the other of which floats opened a safety-valve when a pressure of steam forms in the boiler, so that high steaming is impossible. My present invention relates to this part of the apparatus and is designed to afford a simpler, more practical, and more efficient construction of receiver, which I will now proceed to describe with reference to the drawings, in which—

Figure 1 is a front elevation of the receiver shown applied to a boiler, the size of the receiver in relation to the boiler being somewhat exaggerated to more clearly show the parts of said receiver. Fig. 2 is a section through the receiver on line 2 2 of Fig. 1, showing at the top the return connections for condensed water from the radiator and the vent-pipe for air and uncondensed vapor leading to a supplemental condenser which discharges its air into the chimney-flue and by which a slight partial vacuum is created at the discharge end of the return-pipe by the draft of the chimney to aid in the circulation of vapor through the radiators and to positively draw out the air.

In the drawings, A represents the boiler, which may be of any desired form, but which should be one having a low-water line.

B is the receiver, which is a cast-iron upright cylinder with an open top covered by a hinged lid *b*. The bottom end of the cylinder is contracted and connected by a pipe B′ with the boiler at a point below the water-line, and through this pipe B′ the water of condensation from the radiators is returned to the boiler. At the top of this receiver there is connected the return-pipe for the condensed water coming from the various radiators of the building. This return-pipe has a special connection as follows: A chamber C is cast or formed on the back wall of the cylinder at the top, which chamber projects outwardly for a short distance and has a downwardly-depending wall or diaphragm *c*, which does not quite reach the bottom, and forms with the water which accumulates in the bottom of chamber C a small trap. Into the side of this chamber outside of the diaphragm is tapped the return-pipe D for the water of condensation from the radiators of the building, and into the top of this chamber is tapped an air-vent pipe E, which extends to a supplemental condenser E′ and thence through said condenser into the chimney-flue. This supplemental condenser condenses the last vestiges of vapor and returns the ultimate condensation either into the return water-pipe D, to be carried by it to the receiver, or into the receiver direct, as shown, and thence into the boiler again. By connecting this air-vent pipe in this way to the draft of the chimney the full induction of the hot currents rising in the chimney takes the air all out of the radiators without the use of air valves or pumps, and also by a slight partial vacuum positively aids in the circulation of the low-temperature vapors through the radiators in better fulfilment of my principle of vapor heating without any considerable steam-pressure.

On the face of the receiver there is a glass gage F, open at the top and connected at the bottom with the water-space of the receiver, and behind this glass gage is a scale *f*, graduated in ounces and running from zero at the bottom to sixteen ounces, more or less, at the top. In this receiver and in the glass gage the water stands at a level, depending upon the slight steam-pressure in the boiler. When standing at zero, there is no pressure whatever, and when at 8 it indicates eight ounces of pressure.

Inside the receiver is placed a copper float G, of globular shape. This float is connected to a chain *g*, that runs over two pulleys g' g^2

at the top and then descends to and is connected to a draft-damper of the furnace either at the ash-pit, as shown, or in the smoke-pipe of the furnace, or to both, in the well-known way, so that the rise of the float from the rise of the water-column and an increase of pressure will close the drafts of the furnace and diminish the heat of the latter. This float may be adjusted to come into action at any desired height of the water-column, so as to maintain a slight but definite pressure in the boiler of a few ounces to insure circulation of the vapor through the radiators.

On the side of the receiver-cylinder is formed or to it is attached a bracket-arm H, which carries at its upper end one of the pulleys g^2 and also supports a safety-valve I, whose lever i is fulcrumed to the said bracket-arm and after extending across the stem of the safety-valve, to which it is connected by a link, enters the top of the receiver through a slot and rests in a position above the float, to be acted upon by the rise of the latter. This safety-valve is connected by a pipe I′ with the steam-space of the boiler. This valve does not open by any direct pressure of steam on it; but if at any time after the float has turned off the drafts the furnace still continues to make steam then the steam-pressure in the boiler causes the water-column to rise in the receiver, and the float rising on top of the water lifts the lever of the safety-valve to which the valve itself is attached by a link or hook and gives relief to the steam until the water-level is lowered to the point at which it is desired to maintain the pressure. By this means any considerable rise of steam is absolutely prevented and danger from steam-pressure is rendered impossible.

All the return-pipes from the building are connected to discharge into the trap-chamber at the top of the receiver, and by lifting the hinged lid at any time the amount of condensation returning to the receiver can be seen. If there is no pressure in the boiler, the water in the receiver will stand on an exact level with the water in the boiler, which should be at the zero-mark of the indicator. When any pressure is produced in the boiler, the water will rise in the receiver until it balances the pressure in the boiler, and any additional accession of water of condensation will flow into the boiler by gravity. If the float which controls the damper is set at eight ounces, when the water rises in the receiver to that point it will come in contact with the float and lift it, which will cause the furnace-damper to close. If the closing of the damper prevents any increase in steam-pressure, the water will remain stationary in the glass gage. If, however, the steam-pressure continues to increase, the water will rise higher in the receiver and will lift the lever of the relief-valve, as before described. The great advantage of this new form of receiver is its simplicity and freedom from fixtures and steam-joints and the fact that it is possible to close the damper at any point between zero and the full pressure of sixteen ounces. In moderate weather it is sometimes desirable to close the damper on one or two ounces of pressure, while in cold weather the float may be set to close the damper at eight or ten ounces.

By means of the trap-chamber at the top of the receiver I prevent any air from returning to the receiver, and by connecting the air-pipe to the chimney the air is automatically removed and the circulation of vapor is stimulated without the use of air-pumps or any other mechanical appliances.

It will be seen that my vertically-arranged receiver is of substantially uniform cross-section, being just large enough to easily receive the spherical float which is guided in its rise and fall by the walls of the receiver. The chain for the float also is directly connected to the same and passes out the top of the receiver, which does away with all levers extending through the side of the receiver. By locating the trap-chamber on the outside of the receiver it is out of the way of the float as it rises to contact with the relief-valve lever, and yet the water is trapped without the use of cumbersome pendent pipes, and the receiver and all of its accessories are reduced to minimum size and cost and the heating apparatus rendered very simple, compact, and efficient.

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

1. In a steam heating apparatus, a receiver for the return water of condensation constructed as a vertical chamber having a pipe connection at its upper end for the return-water and a pipe connection at its lower end for returning the said water to the boiler, a draft-damper, a single float fitting within and guided vertically by said chamber, a chain or cord connecting the float to the draft-damper, and a pressure-relief valve with lever extending into the chamber and arranged to be opened by the contact of the float with said lever substantially as described.

2. In a steam heating apparatus, a vertical receiver having an opening at the bottom for the return of the water of condensation to the boiler, said receiver being made of substantially uniform cross-section and having an external chamber formed on the upper end of the same constructed as a trap having communication with the upper end of the receiver and also an opening for the return-water pipe, and a float arranged in the vertical receiver and adapted to be guided in its rise and fall by the said vertical chamber and to be connected to the draft-damper substantially as and for the purpose described.

3. In a steam heating apparatus, a smoke-flue, a receiver for the return of the water of condensation having a trap-chamber at the top with a return circulation-pipe tapped into

the same, and an air-vent pipe extending from this trap-chamber to the smoke-flue for taking off the air and energizing the circulation of vapor by a suction or partial vacuum substantially as described.

4. In a steam heating apparatus, a smoke-flue, a receiver for the return of the water of condensation having a trap-chamber at the top with a return circulation-pipe tapped into the same and an air-vent pipe extending from this trap-chamber, a condenser connected to the pipe, and an outlet-pipe from the condenser connected to the smoke-flue for a suction from the draft of the flue substantially as described.

5. In a steam heating apparatus, a receiver for the return water of condensation constructed as a vertical cylinder having a pipe connection at its upper end for the said return water, and a pipe connection at its lower end for the boiler, a float guided vertically within the cylindrical receiver, a chain or cord attached to the float and connected to the draft-damper of the furnace, and a relief-valve for the steam-boiler arranged externally to the receiver and having a lever extending through the side of the receiver to be operated upon by the direct contact of the float substantially as described.

6. In a steam heating apparatus, a receiver for the return water of condensation constructed as an upright cylinder having a water-gage at its side, a pulley on its top and a projecting bracket-arm bearing a relief-valve, a lever for the same projecting into the receiver, a pulley on top of the bracket, a float arranged in the receiver, a chain passing over the pulleys and connecting the float to the draft-damper of the furnace, said float being also arranged to act upon the lever of the relief-valve substantially as described.

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