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A. H. BARKER.

APPARATUS FOR HEATING AND CIRCULATING WATER BY MEANS OF STEAM.

APPLICATION FILED OCT. 12, 1903.

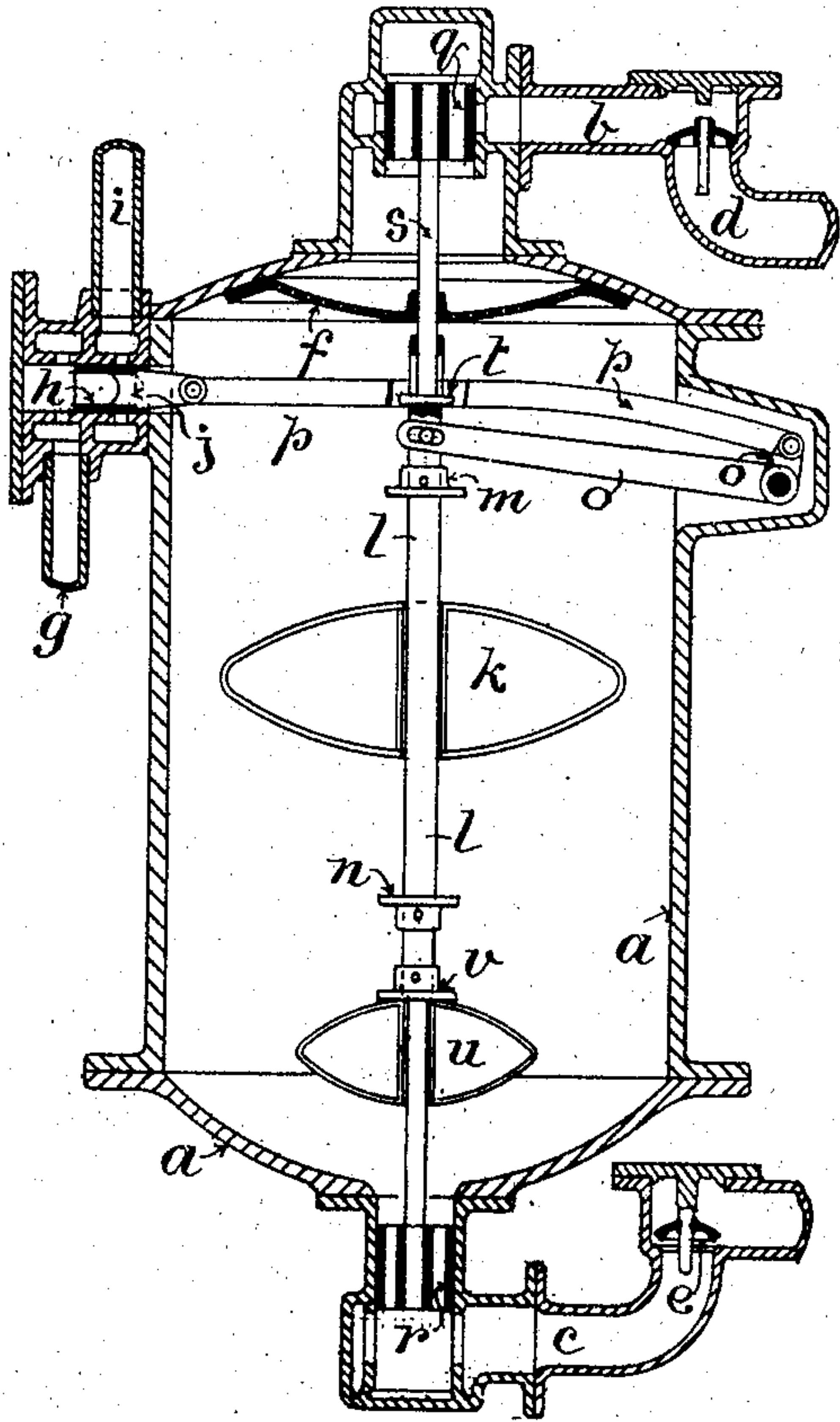


Fig. 1.

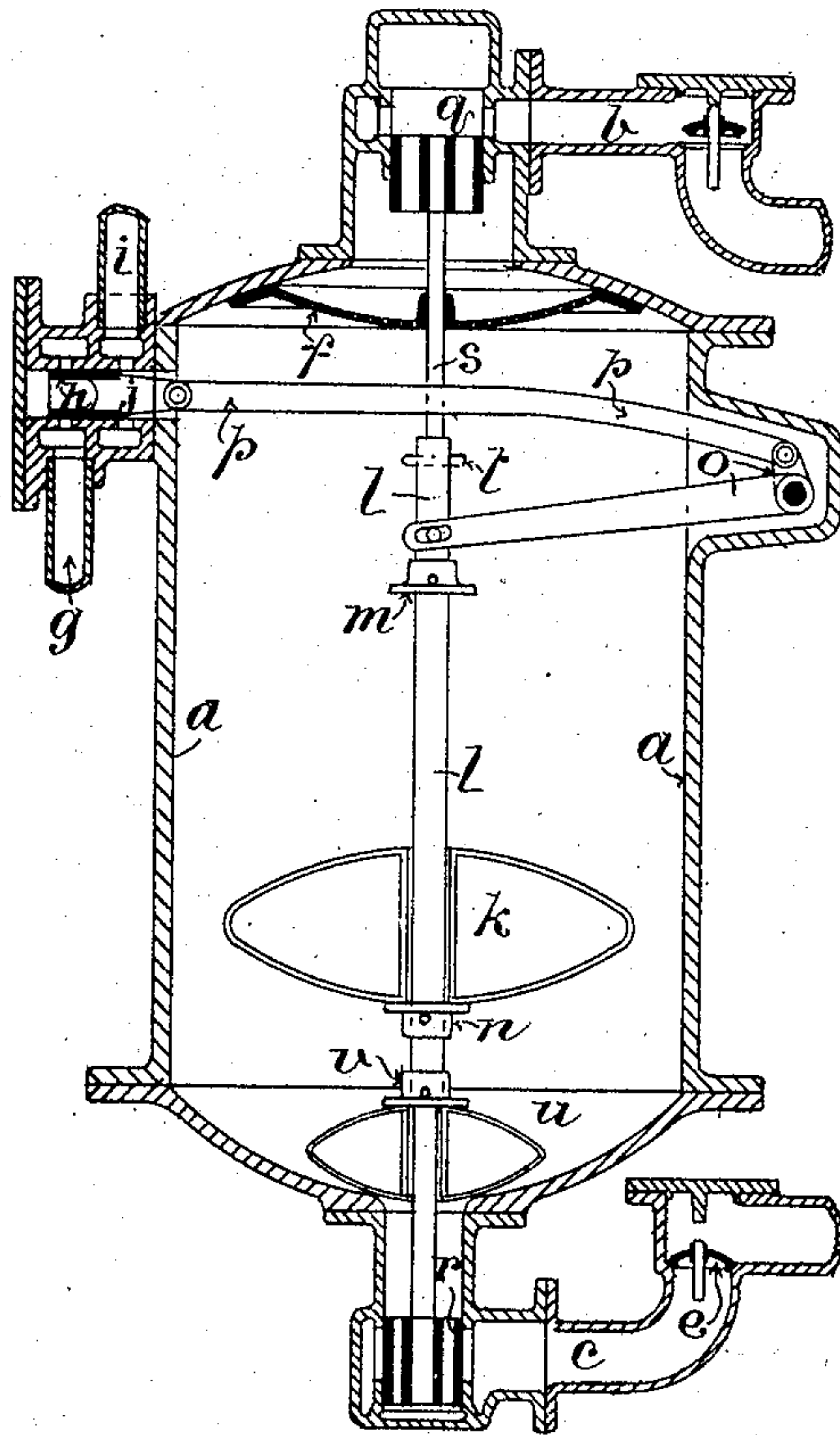


Fig. 2.

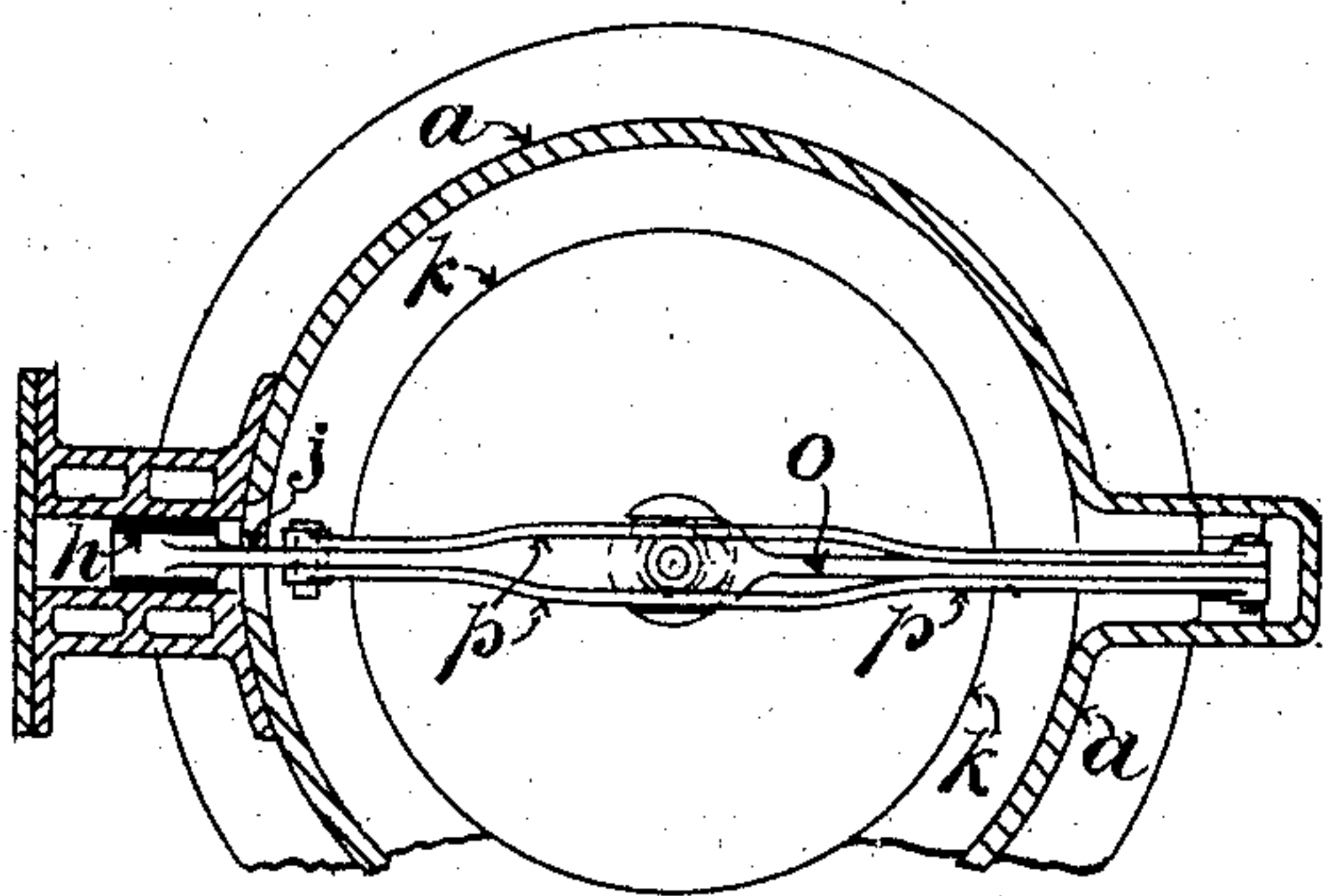


Fig. 3.

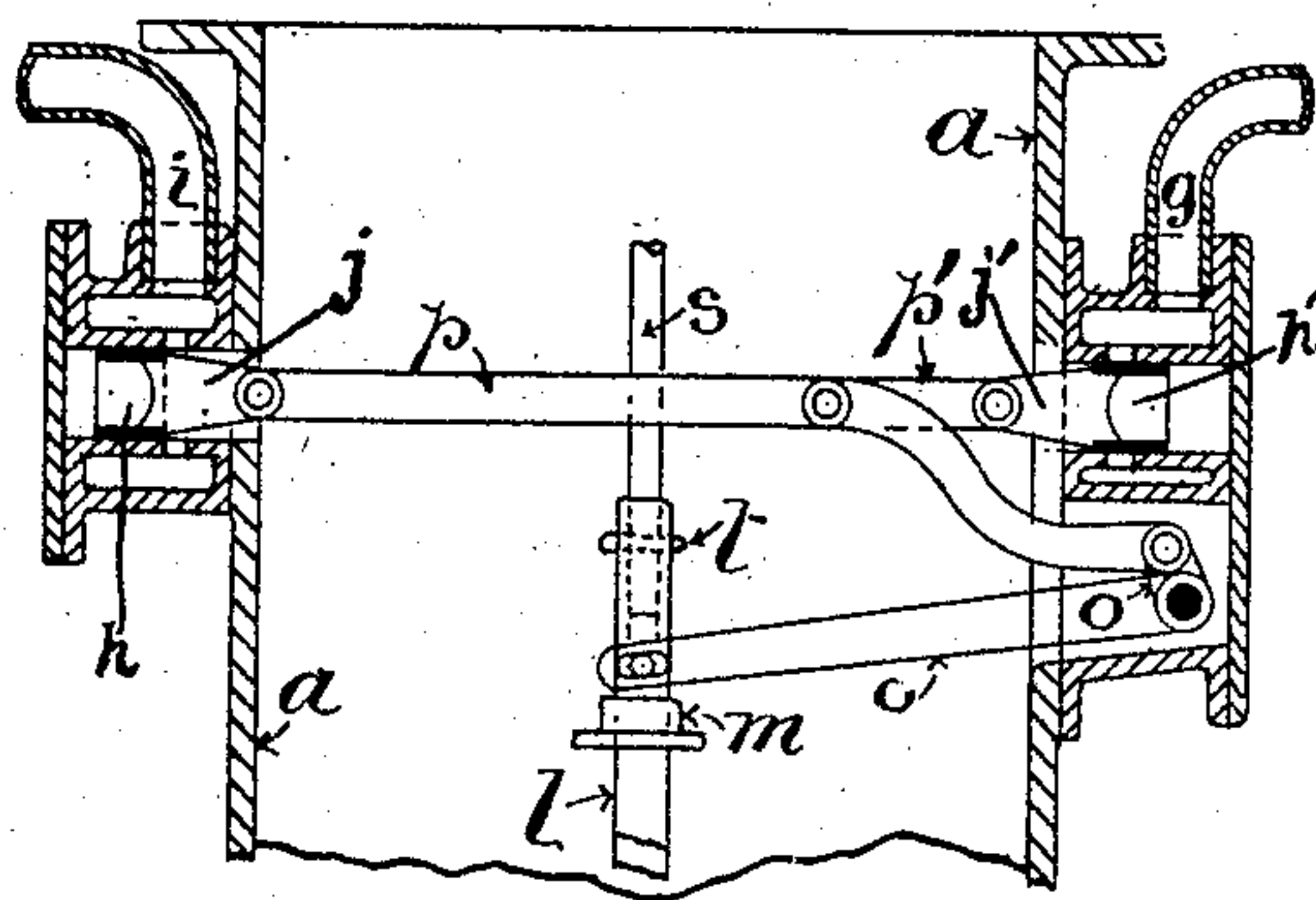


Fig. 4.

Witnesses
James E. Babcock
H. B. Williams

Inventor
Arthur H. Barker
by H. B. Babcock
Attorney.

UNITED STATES PATENT OFFICE.

ARTHUR HENRY BARKER, OF TROWBRIDGE, ENGLAND.

APPARATUS FOR HEATING AND CIRCULATING WATER BY MEANS OF STEAM.

SPECIFICATION forming part of Letters Patent No. 780,773, dated January 24, 1905.

Application filed October 12, 1903. Serial No. 176,746.

To all whom it may concern:

Be it known that I, ARTHUR HENRY BARKER, a subject of the King of Great Britain and Ireland, residing at Trowbridge, in the county of Wilts, England, have invented a new and useful Improvement in Apparatus for Heating and Circulating Water by Means of Steam, of which the following is a specification.

This invention relates to apparatus for heating and circulating the heated water in any system of pipes, whether the service is for heating only, or for a warm-water supply, or for both combined. Its object is to effect both the heating and the circulation by means of steam in an automatic manner and by means of an apparatus more or less self-contained. These objects I attain by means of an apparatus comprising a closed vessel with a water-inlet and a water-outlet, each provided with a non-return valve, a steam inlet or inlets, and a float controlling the valve or valves of the steam inlet or inlets, so that at the higher level of the float steam at a sufficiently high pressure is admitted to force the water out of the vessel and to circulate it in the system of pipes, while when the float is at the lowest level and during its rise to its highest level steam is admitted at a lower pressure insufficient to force the water out of or back from the vessel, but capable of heating the water which the lower pressure allows to flow into the vessel through or from the return of the said system of pipes. Such an apparatus is illustrated by the accompanying drawings, of which—

Figure 1 is a vertical section with the working parts shown in the positions which they occupy when the water is being forced out of the vessel by the high-pressure steam. Fig. 2 is a vertical section with the working parts shown in the positions which they occupy when water is being admitted to the apparatus and simultaneously heated by the low-pressure steam. Fig. 3 is a horizontal section taken immediately above the valve-rod *p* and partly broken away. Fig. 4 is a vertical section of a modification on the same plane as Figs. 1 and 2—that is to say, in proximity to rod *l* on the side to which lever

o is applied—the lower part of the vessel and contents being broken away.

In all the figures the same reference-letter indicates the same or corresponding part.

a is the closed vessel, the upper end of which is provided with a water-inlet pipe *b*, forming the termination of or return from the system of pipes in which the heated water is to be circulated. *c* is a water-outlet pipe to the commencement of the said system of pipes and communicating with the bottom of the vessel *a*. Both the pipes *b* and *c* are provided with non-return valves (lettered *d* and *e*, respectively) to prevent any movement of water in the wrong direction. The water-inlet opening to the vessel *a* is covered by a perforated plate or rose *f* to distribute the water in a uniform shower as it falls in the vessel, and thereby facilitate the heating of the water by the low-pressure steam, which fills the vessel during the inflow of the water.

g is a steam-pipe, conveying steam of a high pressure to the apparatus, and *h* is a valve controlling the admission from the pipes *g* and *i* to the vessel.

i is a steam-pipe, conveying steam of lower pressure to the vessel *a*, and *j* is a bracket connected to valve *h*.

Instead of placing the pipe *i* and the bracket *j* close to the pipe *g* and valve *h* they may be placed away from these latter—for example, diametrically opposite, as illustrated in Fig. 4. This modification employs a shorter valve *h* than the one thus lettered in Fig. 1 and uses it to govern the inlet of steam-pipe *i* only. The opposite end of rod *p* is provided with an arm *p'*, carrying a bracket *j'*, similar to bracket *j*, and a valve *h'*, similar to valve *h*, governing the inlet from steam-pipe *g*. The operation is the same as in the case of the mechanism described in Figs. 1, 2, and 3.

k is a float, fitted capable of rising and falling up and down the vertical rod *l*, which latter is provided with stops or collars *m* and *n*. The rod *l* is connected, by means of a bell-crank lever *o*, with the steam valve-rod *p*, connected to the steam-valve *h*. *q* is a shut-off valve inserted about the connection of the inlet-pipe *b* to the top of the vessel *a*, and *r* is a

shut-off valve inserted about the connection of the water-outlet pipe *c* with the bottom of the vessel *a*. The valve *q* is fitted to the upper end of the rod *s*, the lower end of which enters the upper end of the hollow vertical rod *l*. By means of a slot or slots in the upper end of the rod *l* and a cross-pin *z*, fixed to the lower end of the valve-rod *s*, the valve *q* is lifted—that is, closed—during the last portion of the upward movement of the rod *l* and is drawn down, opening the water-inlet by the last portion of the downward movement of the rod *l*. The valve *r* is attached to a second smaller float *u*, of such a size that its buoyancy is sufficient to sustain the valve *r* and balance the weight of the vertical rod *l*, which passes through an opening in the center of the float *u*. *v* is a stop or collar on the rod *l* serving to take the upward thrust of the float *u*, so that the valve *r* is kept open during the fall of the float *h*, when the latter no longer supports the rod *l*. When the level of the water falls so low that the float *u* is nearly completely unsupported by the water, the weight of the rod *l* and valve *r* are sufficient to move down the valve *r* and close the water-outlet, thus preventing the high-pressure steam blowing through the outlet-pipe *c*. The said floats, rods, stops, levers, and valves constitute as a whole the valve mechanism of this apparatus.

The working of the apparatus is as follows: Commencing with the float *h* in its lowest position resting on the stop *n* of the vertical rod *l*, also in its lowest position, and with the valve *r* closed and the valve *q* open, the corresponding position of the steam valve-rod *p* keeps the high-pressure-steam pipe *i* closed by the inner part of cylindrical valve *h* and the low-pressure-steam pipe *g* open by reason of the forward or outer position of said valve *h*, so that low-pressure steam fills the vessel. The pressure of this steam is insufficient to keep the non-return valve *d* closed against the pressure of the water on its under side, so that water enters the vessel *a* through the valve *q* and is distributed in its fall by the rose *f*, so as to expose a large surface of the water to the heating action of the steam filling the vessel *a* and part of which is at the same time condensed. As the level of the water in the vessel *a* rises it lifts the float *h* until when the surface of the water reaches a predetermined level the float *h* comes in contact with the collar or stop *m*, thus lifting the vertical rod *l*, and thereby lifting the valve *q* and closing water-inlet pipe *b*, also by the intermediate connections *o p* retracting the valve *h* sufficiently to close the low-pressure-steam pipe *i*. The same movement of this valve continued immediately opens the high-pressure-steam pipe *g*, and the float *u* then rises sufficiently to open the water-valve *r*, whereupon as the pressure of the high-pressure steam is greater than the water-pressure past the non-return valve

e the now heated water is forced out of the vessel *a* and the circulation of the water in the system of pipes caused to take place to a corresponding extent. As the level of the water falls, so the float *h* sinks until it comes in contact with the stop *n*, when the rod *l* is drawn down and the steam-valve *h* and the water-valves *q* and *r* are operated in the reverse direction and in the reverse order to those just above described, thereby admitting water from the return-pipes of the system to the vessel *a* and low-pressure steam to heat the same. This alternate admission of the water to and heating of the same in the vessel *a* and the subsequent expulsion of the heated water from the vessel *a* and circulation of water in the system of pipes is thus continuously and automatically repeated.

This apparatus allows of exhaust-steam being used for heating the water, while live steam is then only used for circulating it, or live steam may be used for both purposes, being first throttled for heating the water.

I am aware that float-actuated steam-valves have previously been used—as, for example, in steam-traps—for expelling water from a vessel in which it has gradually accumulated, and I make no broad or general claim to such; but,

Having now described my invention, I declare that what I do claim as my invention, and desire to secure by Letters Patent, is—

1. In an apparatus for heating and circulating heated water, the combination of a closed vessel, a water-inlet thereto provided with a non-return valve, a water-outlet therefrom provided with a non-return valve, means controlling said inlet and outlet, means for admitting steam of relatively high or low pressure to the vessel, valve mechanism for controlling the steam admission, a float, and means operated by said float for regulating the movement of the controlling means for the water and steam passages.

2. In apparatus for heating and circulating water in pipes, the combination of a closed vessel with its water-inlet, a valve controlling the same, a pair of inlets respectively for steam of relatively lower and higher pressure, a valve opening these steam-inlets alternately, a float and devices arranged and adapted to operate the said valves for opening in succession as the said float rises and falls for the purpose set forth.

3. In apparatus for heating and circulating heated water in pipes, the combination of a closed vessel with its water-inlet, a valve controlling the same, two steam-inlets, a valve controlling the latter, a rod *s* connected to the former valve, a rod *l* in alinement with the said rod *s* and connected thereto by means allowing them limited independent motion, devices connecting rod *l* to the valve controlling the steam-inlets, stops, arranged at an interval on the rod *l*, and a float sleeved on rod *l*,

moving freely up and down on the same and arranged for contact with said stops as it rises and falls substantially as set forth.

4. In apparatus for heating and circulating water through pipes, a closed vessel, having a water-inlet, a steam-inlet and a water-outlet, in combination with valves controlling the said inlets and outlet, a rod provided with three stops, a float controlling the water-outlet valve and adapted to sustain the said rod by contact with one of the said stops, a larger float guided by said rod and arranged for contact with one or the other of the remaining two stops as it rises or falls, means operated by the said rod for opening the valve controlling the water-inlet and means connecting the said rod to the valve controlling the steam-inlet, for the purpose set forth.

5. In apparatus for heating and circulating water through pipes, a closed vessel, provided with a water-inlet, a steam-inlet and a water-outlet and valves respectively controlling them, in combination with a pair of independently-moving floats, a rod arranged and adapted to be lifted by one of these floats and supported by the other at certain points of their upward movements, means connecting the said rod to the valve controlling the water-inlet, and means connecting the said rod to the valve controlling the steam-inlet substantially as set forth.

6. In apparatus for heating water and circulating it in pipes, a closed vessel provided with a water-outlet, a water-inlet and two steam-inlets, valves controlling these inlets, a rod *l* within the said vessel having a stop thereon, a float sleeved on said rod and adapted to rise independently of the same to the said stop, thereafter lifting the said rod with it, means connecting the said rod to the steam-controlling valve, and a valve-rod *s* connecting the said rod *l* to the valve controlling the water-inlet, substantially as and for the purpose set forth.

7. In apparatus for heating water and circulating it in pipes, a closed vessel, provided with a water-outlet, a water-inlet, steam-inlets, two valves controlling these water and steam inlets respectively, a rod *l* provided with a stop, a float guided by said rod and arranged to strike against said stop at a certain point of its upward motion thereby lifting the said rod, a lever connected to the said rod, a rod *p* connecting the said lever to the steam-controlling valve, and a rod *s* connecting the rod *l* to the valve controlling the water-inlet, substantially as set forth.

8. In an apparatus for heating and circulating water, the combination of a closed vessel provided with water inlet and outlet openings, governed by non-return valves, means for supplying steam at high pressure or low pressure to said vessel, valve mechanism for governing the steam-supply and a float so connected to said valve mechanism as to supply the low-pressure steam and to cut off the supply of the high-pressure steam when the float falls and to supply the high-pressure steam and to cut off the supply of low-pressure steam when the float rises.

9. In apparatus for heating and circulating heated liquid in pipes, the combination of a closed vessel having an inlet for liquid and two inlets, supplying vapor at low pressure and vapor at high pressure respectively, automatic devices for opening one of these three inlets and closing the other two as the liquid accumulates in the said vessel, an outlet for liquid from the same and means for automatically opening and closing the said outlet substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR HENRY BARKER.

Witnesses:

ROBERT EWING,

ADELAIDE CAROLINE PAYTHERCH COTTERELL.