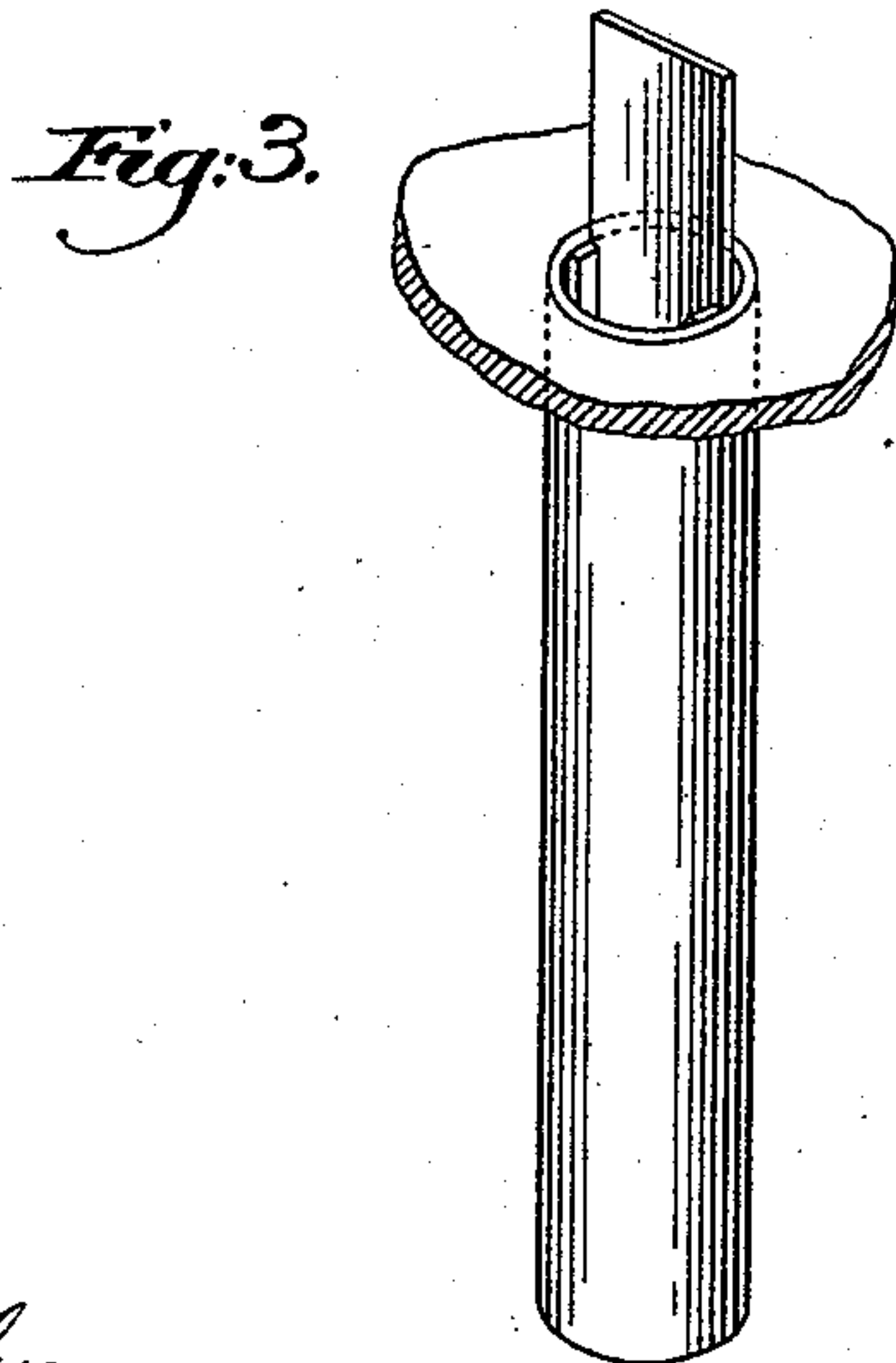
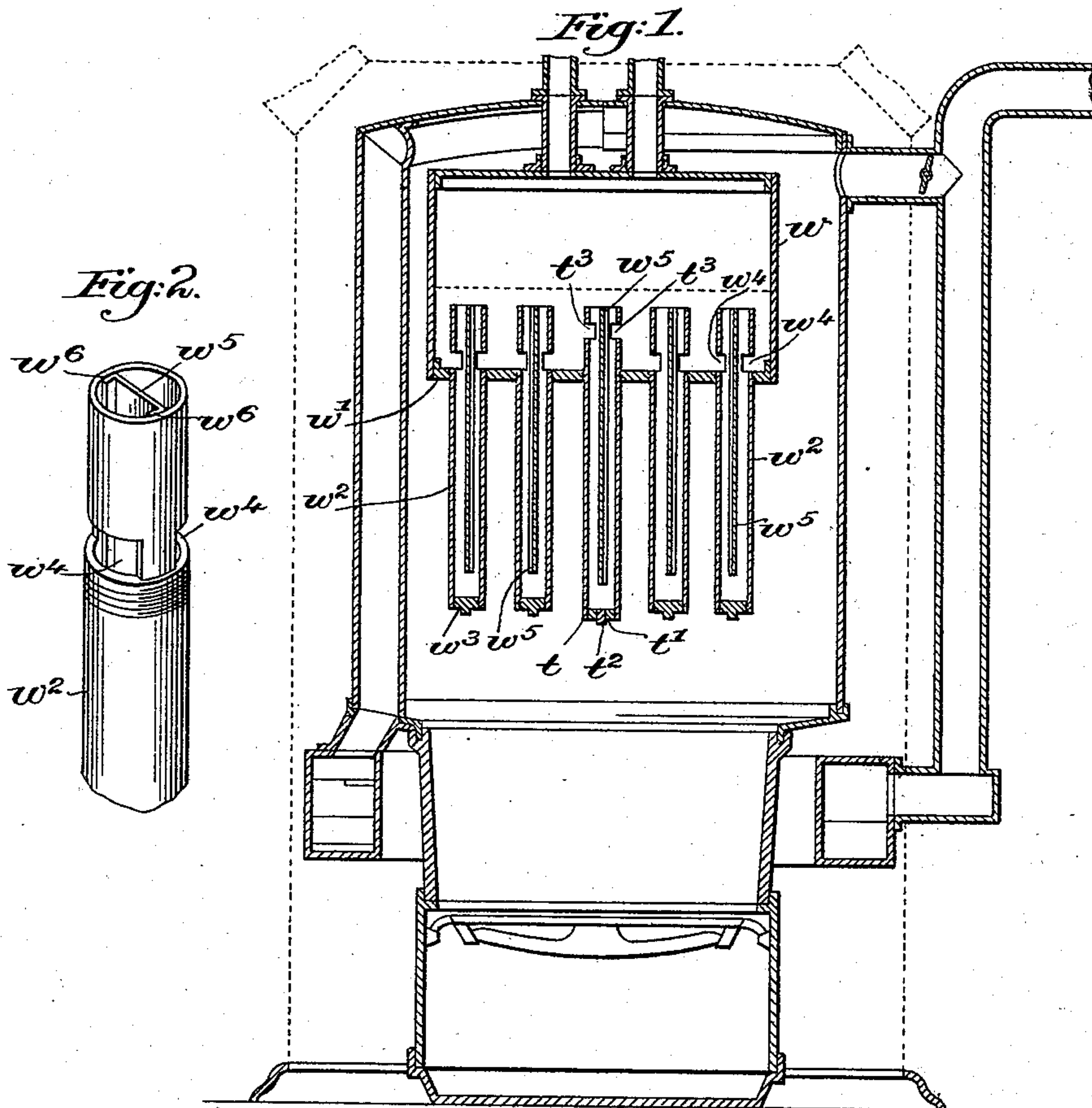


(No Model.)

J. DEMAREST.
DROP TUBE BOILER.

No. 539,980.

Patented May 28, 1895.



Witnesses.
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UNITED STATES PATENT OFFICE.

JOHN DEMAREST, OF MALDEN, MASSACHUSETTS.

DROP-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 539,980, dated May 28, 1895.

Application filed December 14, 1894. Serial No. 531,783. (No model.)

To all whom it may concern:

Be it known that I, JOHN DEMAREST, of Malden, county of Middlesex, State of Massachusetts, have invented an Improvement in Drop-Tube Boilers, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention in drop tube boilers has for its object to simplify the construction of the same, and to improve the water circulation in the tubes.

In my experiments to improve drop tube boilers, I have found that it is unwise to provide fixed paths or courses for the water, inasmuch as under varying conditions, the water seeks or pursues different paths, and I have, accordingly, adopted that type of boiler in which the tubes are provided with central division plates, the water being free to descend or rise at either side said plate. I find it desirable that the water rising from the tubes should be prevented from meeting and mixing with the water just entering the tubes, to thereby avoid agitation and retardation of the circulation and to attain this desideratum I project said central division plates above the inlet openings at opposite sides the same at the top ends of the tube, so that the water rising at one side said division plates is kept separate from the water descending at the opposite side.

In the preferred embodiment of my invention, the drop tubes are projected, in the boiler or header, to a considerable distance above the tube sheet and close to the water level, the inlet openings being cut in opposite sides of the tubes close to the level of the tube sheet, the object of this preferred construction to be hereinafter fully explained.

My invention also comprehends a peculiar arrangement of fusible or safety plug to prevent the water being exhausted from the boiler or tubes to the damage of the same. In accordance with this part of my invention, I arrange a safety or fuse plug, preferably at the bottom end of a drop tube, which latter is also preferably so constructed as to fulfill the office of a circulation tube in the normal operation of the boiler. This tube is extended above the level of the tube sheet or the inlet ends of the remaining tubes if the boiler be

a drop tube boiler, in order that its supply of water may be cut off before the others, should the water level fall below the normal line. As soon as the water supply is cut off, the water which is trapped in the safety tube is quickly evaporated under the action of the fire beneath, and leaves the tube dry, so that the safety plug blows out or fuses, and permits steam from within the boiler or header to be discharged through the safety tube upon and to extinguish the fire, and thereby prevent serious damage to the boiler or its tubes.

In the drawings, Figure 1, in vertical section, shows a boiler constructed in accordance with one embodiment of my invention, said boiler being shown as arranged within a suitable heating apparatus. Fig. 2 is a perspective view looking downwardly upon the upper end of one of the drop-tubes shown in Fig. 1, and Fig. 3 a modification to be described.

Referring to the drawings in which one embodiment of my invention is illustrated, it is not deemed necessary to describe the construction of the heating apparatus in which the boiler is shown arranged, the said apparatus being, however, substantially like that shown and described in my application Serial No. 517,635, filed July 16, 1894, to which reference may be had, it being understood, however, that my improved boiler is not limited in its use to this or any particular kind of heating apparatus, and it may be used by itself, independent of any hot air heater.

Referring to the drawings, Fig. 1, the boiler proper, or, as I shall hereinafter call it, the "header" w , has its bottom or tube sheet w' perforated, and its perforations preferably threaded to receive one or more, preferably a plurality of drop tubes w^2 of suitable material screwed therein, as shown. These drop tubes are preferably provided at their lower ends or bottoms with screw or other plugs w^3 .

In the preferred embodiment of my invention shown in Figs. 1 and 2, the tubes w^2 are projected vertically above the tube sheet within the header w , and, for the best results, to a level close to the normal water level within the header, indicated in dotted lines in Fig. 1, the said tubes terminating at such a distance below the water level as to provide proper margin for the usual variations in the water level in the normal operation of the

boiler, it being necessary, for the best results, that the ends of the tubes be always covered by the water. Within the header, and close to the tube sheet w' , the drop tubes are provided at opposite sides, in suitable manner, with inlet openings w^4 , and within the said tubes and between these inlet openings are arranged the preferably central division plates w^5 which latter extend nearly, but not quite, to the plugs closing the ends of the tubes. As herein shown, the division plates w^5 are flanged at their edges, as indicated at w^6 and sprung into the tubes, the resiliency of the metal in itself being normally sufficient to retain them in position, or they may be brazed or otherwise suitably secured within the tubes, if desired. These division plates may terminate at the level of the inlet openings, but they are preferably extended vertically above the said openings, and, in the construction Figs. 1 and 2, they are shown extended quite to the tops of the tubes.

The operation is as follows, viz: Assuming the header and tubes to be filled with water to the level indicated in dotted lines, when the fire is started in the fire-pot beneath the drop tubes, the latter are heated and the water within the same begins to circulate, it entering through one of the openings w^4 in each tube, descending at that side the division plate to the bottom of the tube, and rising at the opposite side of the division plate, establishing a thorough and strong circulation of water calculated to generate steam in a short space of time. I have found that under the action of the usual fire, the water descending at one side the division plate, and rising at the other side, is impelled at such speed that it will shoot past the side opening w^4 at said other side and issue at the top of the tube, very little of the water escaping through the said side opening as it rises, so that the water while taken from a level close to the tube sheet, is delivered at a higher level nearly that of the water line within the header. This is of great advantage, for where the water is delivered into the header close to the point at which the water enters the tube in its descent within the latter, there is apt to be great disturbance, which retards the proper circulation of the water and makes an objectionable noise.

I prefer to carry the tube end above the tube sheet for the reasons specified, but good results may be obtained by a construction, such for instance as is illustrated in Fig. 3, wherein the tube is terminated at a level with the top or inner face of the tube sheet, the division plate, however, being extended to a considerable distance above the end of the tube to prevent, to a large extent, the mixing of the inflowing and the outflowing water at the tube end.

Referring now to Fig. 1, I have shown the central tube t as dropped slightly below the others to enable it to be more easily distinguished, and provided, like the others, with a central division plate w^5 . The screw plug

t' at the bottom of the said tube, is, however, provided with a safety or fuse plug t^2 , and the inlet openings t^3 are shown as arranged at a higher level within the header than the inlet openings w^4 for the other tubes of the boiler. In the normal condition of the boiler, the water circulates within the tube t , precisely as in the remaining tubes, except the water is taken from a higher level than by the remaining tubes. Should the water level, by accident or otherwise, fall below the normal, before it can fall to such an extent as to leave the tube sheet dry, it will fall below the inlet openings t^3 in the safety tube t , and will thereby, cut off the said safety tube from its supply, leaving it full of water trapped therein. The circulation in the safety tube being now stopped, the intense heat of the fire quickly evaporates the water which is trapped within it, leaving it dry, I having found that the water will be completely evaporated from a tube in which the water is so trapped in a very short time. As soon as the water is evaporated, and the tube left dry, the safety plug t^2 fuses and permits steam from the header to discharge through the safety tube upon and to extinguish the fire before the water level has fallen to such a line as would leave the tube sheet bare, or cut off the circulation within the remaining tubes.

So far as known to me I am the first to provide a drop tube with a safety plug located below the tube sheet, and I am also the first, so far as known to me, to equip one of the regular circulation tubes of a boiler with a safety plug in the manner described, whereby it normally fulfills the function of a circulating tube, and the added function of a safety tube when the water level falls below normal.

My invention is not limited to the particular construction herein shown, for it is obvious the same may be varied without departing from the spirit and scope of my invention.

I claim—

1. A drop tube boiler comprising a header, one or more drop tubes leading from the tube sheet of said header, each provided above said tube sheet with a plurality of inlet openings, longitudinal division plates in the respective tubes and arranged between the inlet openings thereof to form alternate paths for the circulating water, whereby the latter may enter either inlet opening, descend at one side said division plate and rise at the opposite side thereof, the said division plate being carried vertically above said inlet openings to prevent intermixing of the inflowing and outflowing water in circulation, substantially as described.

2. A drop tube boiler, containing a header, one or more drop tubes extended through the tube sheet thereof, and projected vertically above the tube sheet within the said header, and provided close to the tube sheet and below the tube ends with opposite inlet openings at substantially the same level; and di-

vision plates arranged in the respective tubes, between said inlet openings to form alternate paths for the circulating water, whereby the latter may enter either opening and descend at either side the said division plate, rising at the opposite side thereof, said division plate terminating short of the bottoms of the tubes and extended vertically above and between the said openings, substantially as described.

3. In a drop tube boiler, the combination with a header, and one or more drop tubes depending therefrom, of division plates in the respective tubes and having their edges flanged, as at *w*⁶, to form bearings to support the plates within the respective tubes, substantially as described.

4. In a boiler, the combination with a header, of a drop tube depending therefrom, and a fusible plug in the said tube below the said header, substantially as described.

5. A drop tube boiler, consisting of a header,

and one or more drop circulating tubes communicating therewith, and a safety tube divided to provide a circulation course for the water, and provided below the said header with a safety plug, substantially as described.

6. In a drop tube boiler, the combination with a header, and a plurality of circulation drop tubes communicating therewith and provided within said header with one or more inlet openings, of a circulation tube also provided with an inlet opening, but arranged above the level of the inlet openings for the remaining tubes, and provided below said header with a fusible plug, to operate, substantially as described.

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

JOHN DEMAREST.

Witnesses:

FREDERICK L. EMERY,
M. J. SHERIDAN.