

No. 677,291.

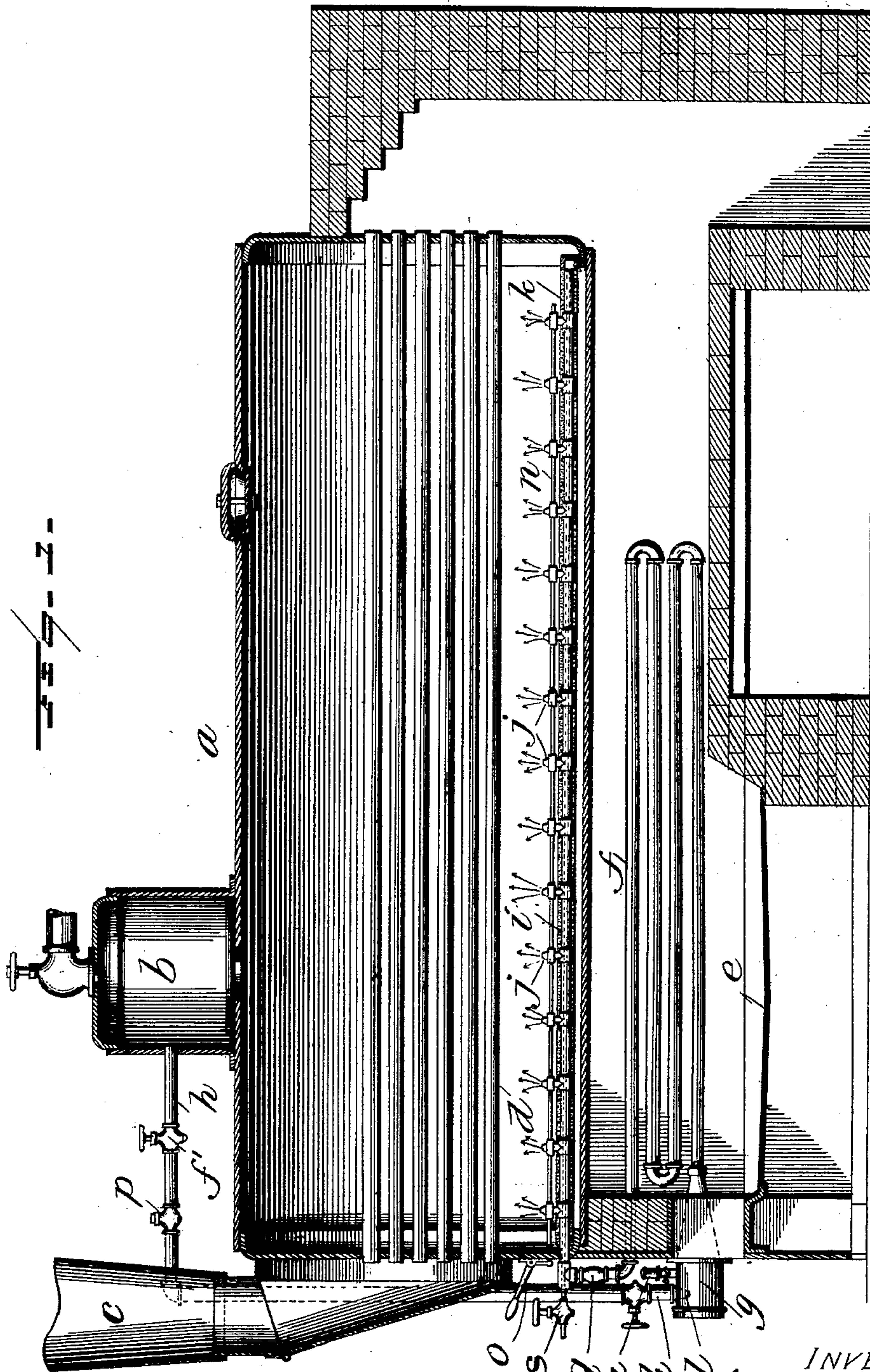
Patented June 25, 1901.

S. M. TRAPP.
APPARATUS FOR GENERATING STEAM.

(Application filed July 5, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

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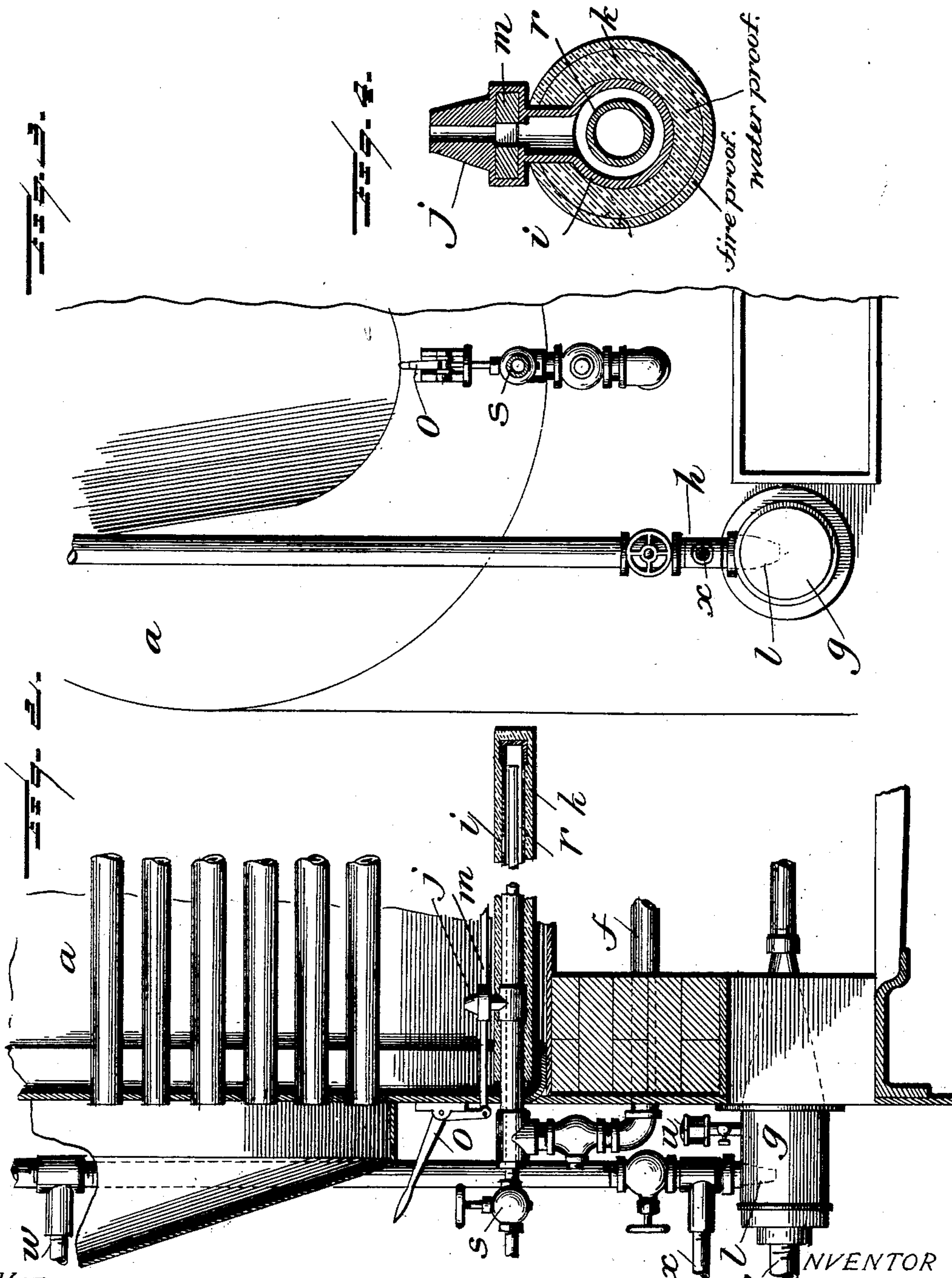
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UNITED STATES PATENT OFFICE.

SAMUEL M. TRAPP, OF SEATTLE, WASHINGTON, ASSIGNOR OF ONE-HALF TO
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APPARATUS FOR GENERATING STEAM.

SPECIFICATION forming part of Letters Patent No. 677,291, dated June 25, 1901.

Application filed July 5, 1900. Serial No. 22,594. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL M. TRAPP, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Apparatus for Generating Steam; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention consists in an apparatus adapted to generate steam in a boiler by the action of superheated steam or hot air, which is passed into direct contact with the water in the boiler. Such steam or hot air is heated in a superheater, and means are provided to cause the superheated steam or air to force its way into the water in the boiler and impart its heat thereto. In case superheated steam is used I may take the steam from the boiler itself and passing it through a superheater and through devices which cause or permit it to move in only one direction during its expansion in superheating cause the steam to enter by its own expansive and evaporative force into the water in the boiler.

The advantages of such a system of steam generation are that the water is evaporated by direct contact of the heating agent instead of by radiated or conducted heat and the heat is applied and distributed in a uniform manner throughout the boiler, thus conducing to the durability and safety of same. To insure such uniform distruction, I provide a distributing and regulating device within the boiler which admits the superheated steam or air to the boiler under the surface of the water therein in a definite, regulatable, and distributed manner. The superheated steam does not heat the water by radiation, but by direct contact, and such steam is only in contact with parts of the apparatus much hotter than the water, so that there is no exposure of metal on one side to the comparatively cool water and on the other side to the red-hot steam. This fact conduces materially to the durability of the boiler.

In the accompanying drawings, Figure 1 is a vertical longitudinal section through the apparatus. Fig. 2 is a vertical longitudinal section through the forward portion of the apparatus, on an enlarged scale; and Fig. 3 is a front elevation with a portion of the front broken away, showing the delivery device in section, the parts being on an enlarged scale; and Fig. 4 is a cross-section through the delivery, on an enlarged scale.

In the drawings the letter *a* represents the boiler with steam-dome *b*, stack *c*, flue or flues *d*, and furnace or fire-pit *e*.

Arranged in any convenient location in the fire-pit is the superheater *f*, here shown as consisting of a coil of pipes, connected at one end to an expansion-chamber *g*, which in turn is connected by pipe *h* with some part of the boiler above the water-line, so as to draw steam therefrom, it being for purposes of illustration shown as connected with the steam-dome *b*. The other end of the superheater is connected to a regulating delivery and distributing tube or device *i*, provided with a plurality of outlets or nozzles *j*, leading into the water in the boiler. I prefer to place the tube *i* itself within the boiler, as shown, and to surround it with an insulating-coating *k*, the inner part of which is fireproof and the outer part waterproof.

All of the outlets or nozzles *j* are provided with regulating valve devices or gates *m*, adapted to operate in unison, being connected for this purpose to a common operating-rod *n*, having a handle or operating-lever *o* outside of the boiler, so that the delivery-apertures of all the nozzles can be simultaneously adjusted to correspond to the requirements at any particular time. At suitable places in the superheater connections—for example, at *p* in the intake-pipe, and at *q* in the delivery-pipe—are arranged check-valves, which permit passage of steam only in one direction—namely, toward the delivery end, as indicated by the arrows. The expansion-chamber *g*, moreover, is tapered, as shown, and the pipe *h*, where it enters same, has a focusing or contracting nozzle, as indicated at *l*, this construction also giving a tendency of the steam to flow in the desired direction. The regulating and delivery tube *i* contains

a smaller tube *r*, extending almost its entire length and opening at an end into the outer tube *i* and at its other end to the atmosphere, so that when a valve *s* in said tube *r* is opened 5 steam will pass from the superheater the whole length of tube *i* and thence through inner tube *r* to the outer air. A hand-valve *f'* is provided in the intake-pipe *h*.

The operation of the apparatus is as follows: Steam having been raised in the boiler in the usual manner, the valves *f'* and *s* are opened, while the gates or valves *m* are still closed, and steam is allowed to blow through the superheater until the delivery-tube *i* is 15 sufficiently hot. At this time the steam coming from the superheater should be "red-hot," or substantially so, and the delivery and regulating tube *i* will be so hot that there will be no chilling of the incoming superheated steam in the subsequent operations. The 20 valve *s* is then closed and the hand-lever *o* is operated to open the gates *m*, and the superheated steam is forced by its own expansive tendency into and through the water in the 25 boiler, imparting to the latter the heat which it has received in the superheater. That the steam will thus force its way into the boiler will appear upon consideration of the fact that as the steam receives heat in the superheater its expansive tendency is increased, 30 and as the check-valves will not allow of any back movement of the expanding steam it must expand forwardly—that is, through the regulating-tube and into the boiler. The 35 tapering shape of the expansion-chamber and the focusing action of the intake-nozzle *l* thereof also conduce to the same effect. The steam also being red-hot when it strikes the water in the boiler will cut or evaporate its 40 way into such water, and by the gravitating action of the water the steam will be forced upwardly through the same. The injection of this red-hot steam into the boiler-water produces a most powerful heating effect, supplements the heating action of the 45 ordinary heating-tubes, and, in fact, if parts are properly proportioned this supplementary heating means will form the main steam-producing element in the boiler. The evaporative capacity of the boiler will thus be largely 50 increased.

It will be understood that the superheater-coils *f* will be arranged within the fire-pit according to considerations of convenience— 55 say with a coil on each side of the fire-pit, or one at the back, or otherwise; but only one coil is shown, and that on the side, as such is sufficient, and the others are left to the judgment of the mechanic and their arrangement 60 involves no invention. An oil-supply means, such as oil-cup *u*, is arranged at any suitable place—for example, in the expansion-chamber *g*, as indicated, so as to prevent oxidation of the interiors of the superheater by the highly 65 superheated steam.

If a more rapid passage of superheated steam into the boiler is desired than can be

effected by the above-described means, I may use a pump to effect such result, and in such case the pump connections with the steam-pipe *h* may be at the points *w* and *x*, and if 70 there is more than one boiler I may arrange one of them to maintain a higher pressure than the other, so that it will deliver steam through a superheater directly into the water 75 in the other. Moreover, the superheater may be connected to coils located within the water in the boiler, so as to evaporate the latter by radiation, the steam then passing from those evaporating-coils to an independent steam-dome and thence to the steam-using machinery. 80 I have not illustrated, however, such various additions named in this paragraph, for the reason that the same are not claimed specifically in this application and are merely 85 given as suggestions to indicate what is embraced generically within the scope of the invention claimed herein. Finally, when using air as the heating means I may compress air by an air-pump and force the same through 90 the superheater into the regulating-tube, which delivers it to the boiler-water just as above described for steam. When such is the case, an air-pump (not shown) may connect by pipe *v* or otherwise with the superheater *f*, from whence the hot air will be delivered to the water in the boiler, as above 95 indicated.

Having now described my invention, what I claim as new, and desire to secure by Letters 100 Patent, is—

1. In a steam-generating apparatus, the combination of a boiler, a delivery device having openings into the boiler below the water-level, means for opening and closing said 105 openings, a blow-off for said delivery device, a superheater and means for passing a current of steam or air through the superheater, and through such delivery device and its openings, into the water in the boiler, substantially as described. 110

2. In a steam-generating apparatus, the combination of a boiler, a delivery device having openings into the boiler below the water-level, a waterproof and non-conducting covering to said device, a superheater, and means 115 for passing a current of steam or air through the superheater and through such delivery device and its openings into the water in the boiler, substantially as described. 120

3. In a steam-generating apparatus, the combination of a boiler, a delivery device having openings into the boiler below the water-level, regulating means for controlling such openings, a superheater, and means for passing 125 a current of steam or air through the superheater, and through such delivery device and its openings, into the water in the boiler, substantially as described.

4. In a steam-generating apparatus, the combination of a boiler, a delivery device having openings into the boiler below the water-level, regulating means operated from outside the boiler for controlling such openings, 130

a connection including a valve from such delivery device to the outer air, a superheater connected at one end to such delivery device, and at its other end with the boiler at a point 5 above the water-level, and means for permitting movement of steam in the superheater and its connections only in the direction toward the aforesaid delivery device, such means comprising check-valves, substantially 10 as described.

5. In a steam-generating apparatus, the combination of a boiler, a delivery device having openings into the boiler below the water-level, regulating means operated from outside the boiler for controlling such openings, 15 a connection including a valve from such delivery device to the outer air, a superheater connected at one end to such delivery device, and at its other end with the boiler at a point 20 above the water-level, and means for permitting movement of steam in the superheater and its connections only in the direction toward the aforesaid delivery device, such

means comprising a tapering expansion-chamber connected to the superheater, with a tapering intake connected to the steam-supply connection from the boiler, substantially as described. 25

6. In a steam-generating apparatus, the combination with a boiler and its fire-pit, of a superheater located in the fire-pit, means 30 for supplying such superheater with steam or air, a device located within the boiler and adapted to receive the superheated steam or air from the superheater and to impart the heat thereof to the water in the boiler, and 35 a blow-off to said device whereby the device may be preliminarily heated by blowing the heating agent through it, substantially as described. 40

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

SAMUEL M. TRAPP.

Witnesses:

SIDNEY PLUMMER,
W. H. REMINGTON.