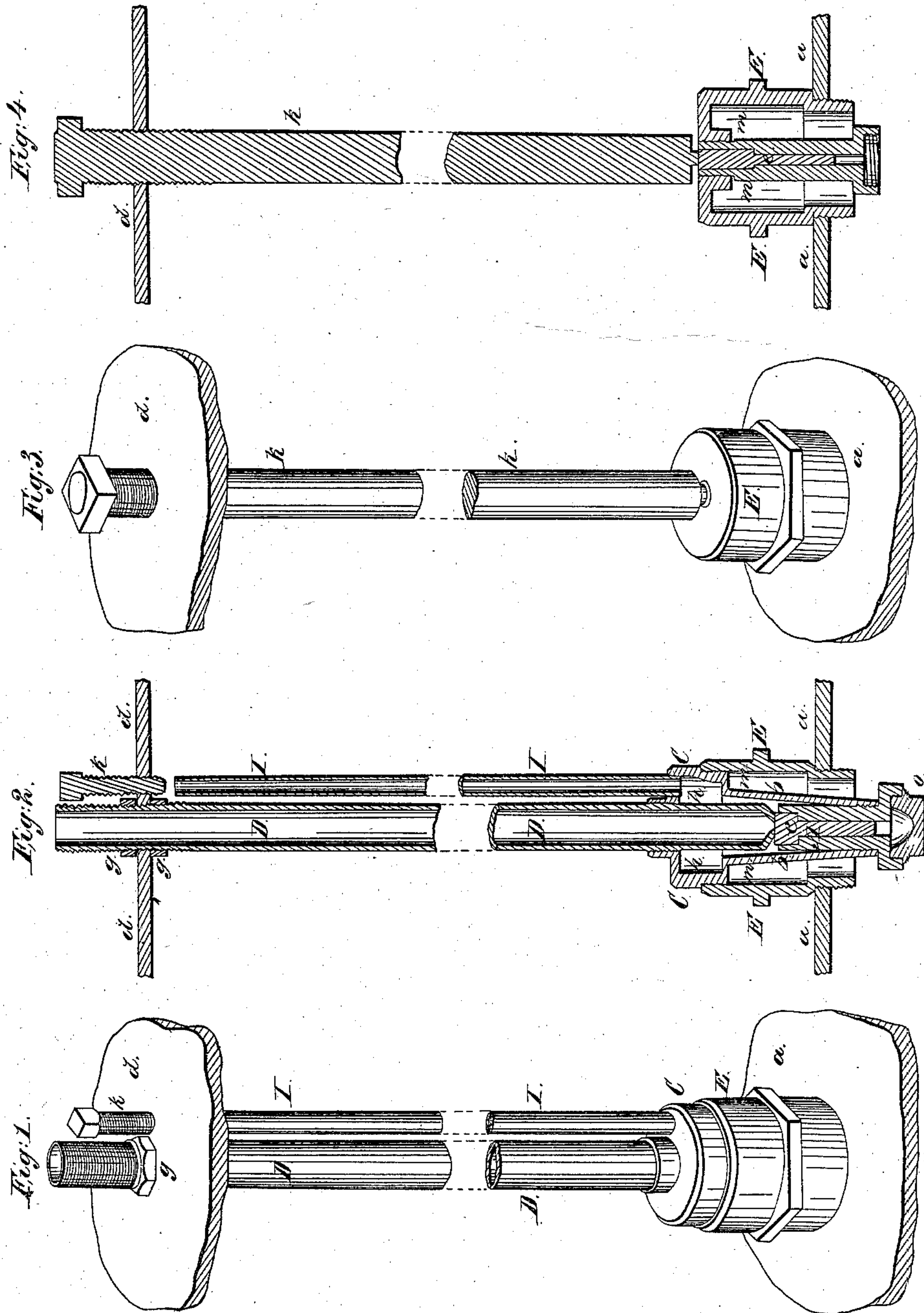


2 Sheets. Sheet 1.

E. H. Ashcroft,
Steam Safety Valve.

N^o 7,934.

Patented Feb. 18, 1851.



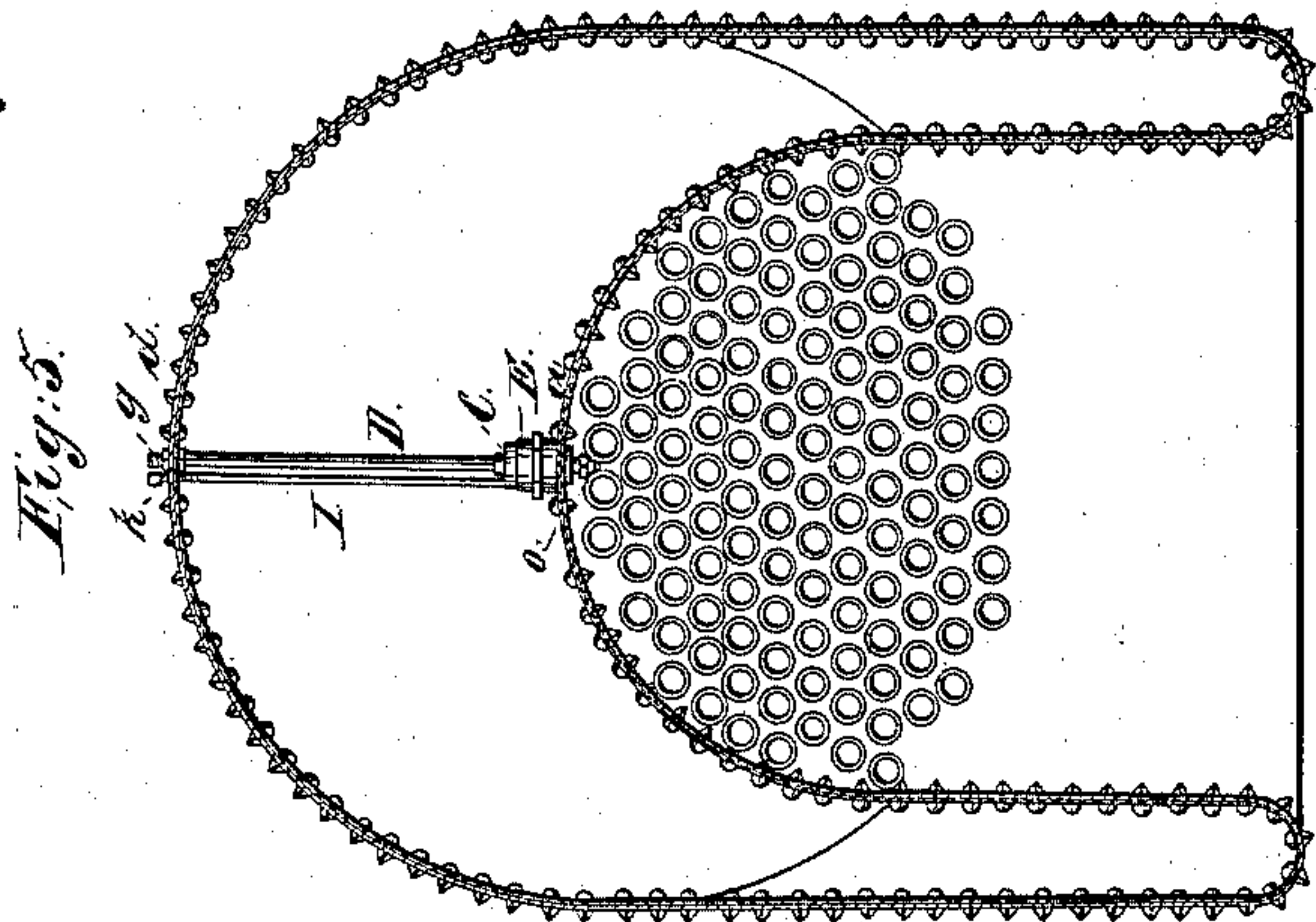
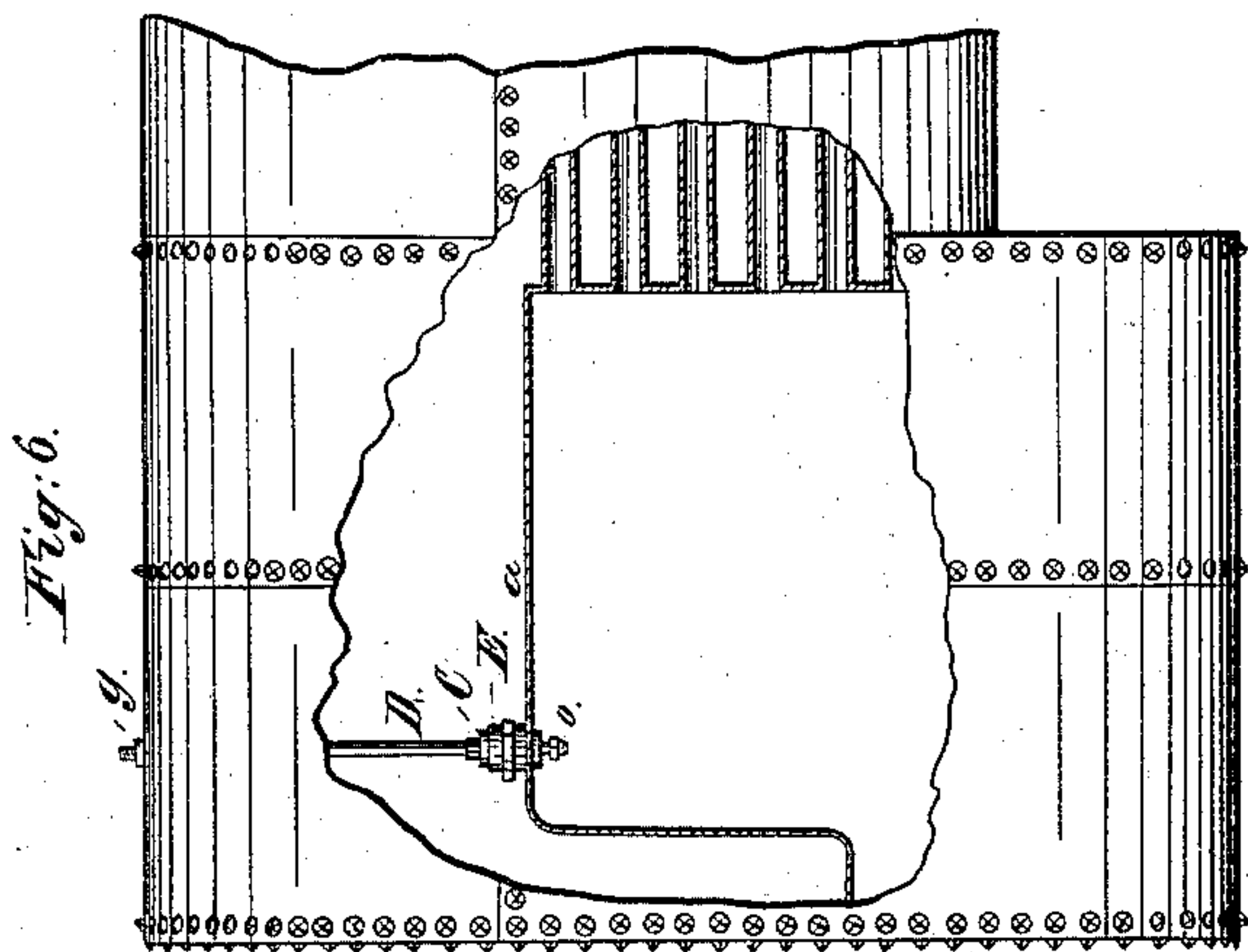
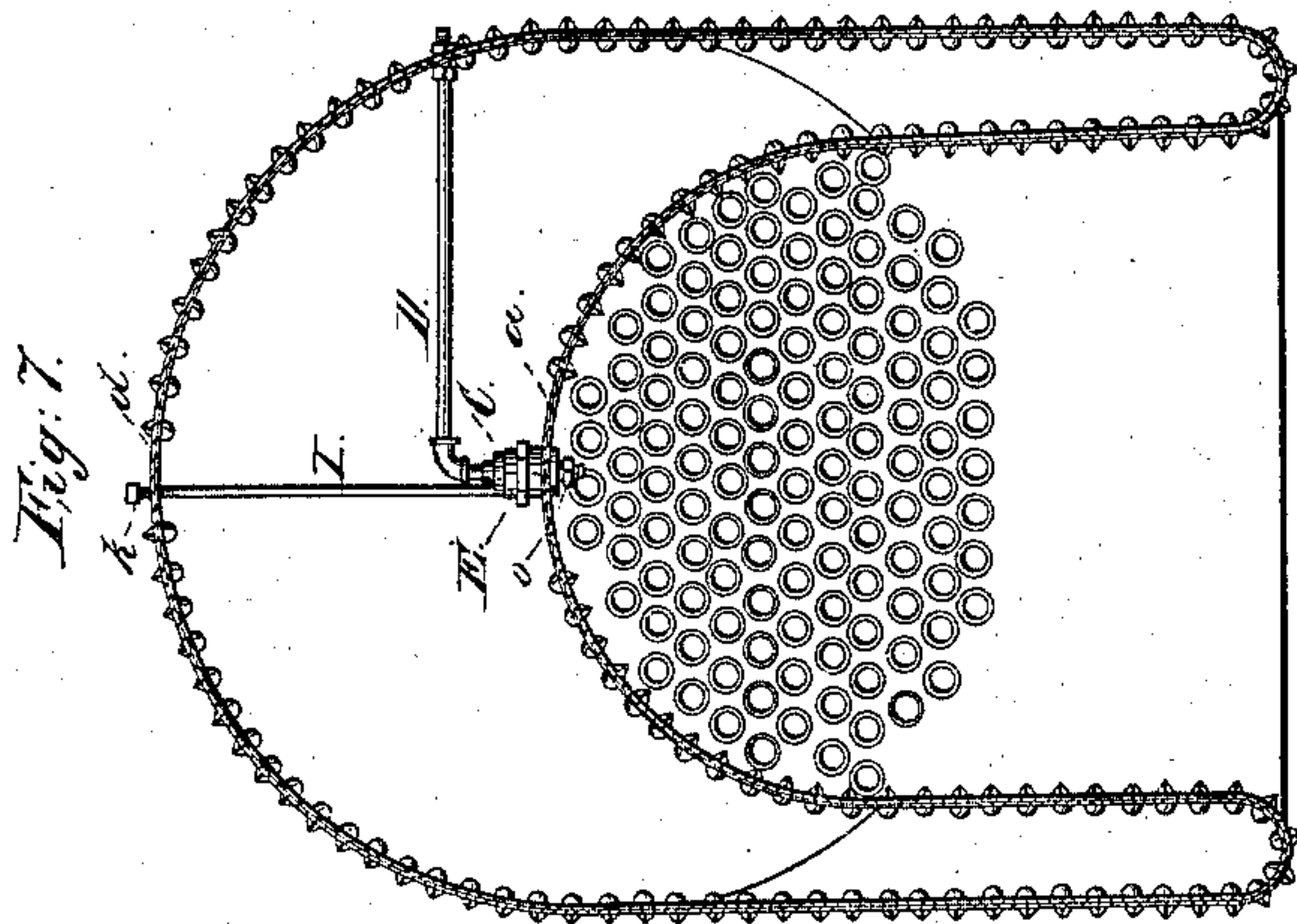
E. H. Ashcroft,

2 Sheets. Sheet 2.

Steam Safety Valve.

N^o 7,934.

Patented Feb. 18, 1851.



UNITED STATES PATENT OFFICE.

E. H. ASHCROFT, OF BOSTON, MASSACHUSETTS.

INSULATED FUSIBLE PLUG FOR STEAM-BOILERS.

Specification of Letters Patent No. 7,934, dated February 18, 1851.

To all whom it may concern:

Be it known that I, E. H. ASHCROFT, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and
5 useful Method of Applying Fusible Safety-Plugs to Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings,
10 which form part of this specification, and in which—

Figures 1, 2, 3, and 4 represent two varieties of my insulated fusible plug in perspective and in section, and Figs. 5, 6, and
15 7, represent sections of boilers with insulated plugs applied thereto.

The first part of my invention consists in inserting the fusible plug in a case in such a manner that both plug and case are pro-
20 truded into the fire chamber or flues of a boiler in such manner that both plug and case are insulated from the water immediately in contact with the boiler plates by a stratum of air; the latter prevents the trans-
25 mission of heat from the plug-case to a stratum of water of merely sufficient depth to cover the plates of the boiler to which the plug case is affixed, but does not prevent its transmission to the water above,
30 hence as long as the boiler is properly supplied with water the plug will remain unfused, for the heat imparted to it by the flame will be transmitted to the water; but
35 whenever the water evaporates down to a predetermined limit the plug, being insulated by the air from the water still covering the boiler plates will melt and, allowing the steam to escape, will give warning of the
40 deficiency of water and approach of danger before the plates have become bare, and consequently before the danger of an explosion has become imminent.

The second part of my invention relates to the construction and arrangement of a
45 fusible plug which is such that when one of my plugs has melted and allowed steam to escape from the boiler and give warning of a deficiency of water, the escape of steam can be stopped and a new plug can be in-
50 serted without blowing off the steam or water in the boiler.

In the accompanying drawing, *a a* is the plate of the fire or flue surface of a boiler to which my safety apparatus is applied.
55 In the variety represented at Figs. 1 and 2 the plug case A is screwed into the tubular

shank *b* of a hollow block C. The latter is perforated to admit a tube D which is screwed at its lower extremity into the block C while its opposite extremity is passed
60 through the exterior shell *d* of the boiler and is open to the air. The lower extremity of the tube D is closed by screwing it down firmly upon the head of the fusible plug *e* in the plug case, and that part of the tube
65 which passes through the shell of the boiler is secured by double nuts *g, g*, or in any other convenient manner which will hold it firmly and prevent the leakage of steam. The block C is secured to the upper part of
70 an air chamber E whose lower extremity is passed through and secured to the boiler plate *a*. The hollow space *h* in the block C is connected by a small tube I with that portion of the boiler occupied by the steam,
75 the upper end of this tube is open so that steam can pass freely through it into the hollow space *h*. A screw stopper *k* is inserted through the shell of the boiler immediately opposite the open end of this tube,
80 its outer extremity being formed into a head to which a wrench can be applied to screw the stopper downward until its inner extremity, which is conical, enters the open
85 extremity of the steam tube I and closes it.

The plug case A, hollow block C, and air chamber E should be made of some material (copper for example) which is a good conductor of heat and the plug *e* should be
90 made as usual of either lead or tin, or of some alloy still more fusible, as for example an alloy of lead and bismuth, according to the temperature at which it is desired it should melt.

It will be perceived from the foregoing
95 description and the accompanying drawing that the stratum of air *m* by which the plug case is surrounded prevents the direct transmission of heat from it to any water which
100 may surround the air chamber, while the block C will transmit the heat from the plug case to any water which may be above the air chamber; consequently as long as there is a sufficient quantity of water in the boiler
105 to cover the block C the temperature of the plug case will be kept below the fusing point of the plug, but if the water in the boiler be evaporated down slightly below the level of the upper surface of the stratum
110 of air surrounding the plug case, the latter being insulated by the air, (which is an extremely bad conductor of heat), from the

water still remaining in the boiler, will no longer have the heat conveyed from it as fast as it is imparted to it by the fire; the plug will consequently melt and will run down to the lower part of the plug case, leaving the lower extremity of the tube D, unclosed to permit the steam passing down the steam tube I to escape and give warning of the low state of the water. As this warning is given while the boiler plates are still covered with a stratum of water extending nearly to the top of the air chamber they are still in their usual comparatively cool state, and consequently the warning is given before the boiler has arrived at a dangerous condition by the undue heating of the boiler plates which takes place when they are no longer covered by water.

When the warning has been given the first duty of the engineer is to see that the feed pumps supply a sufficient quantity of water to make good the deficiency, he may then screw down the stopper *k* and close the steam tube, by which means the further escape of steam is stopped. The fire should then be dampened sufficiently to enable the engineer to insert proper tools through the fire door of the boiler to unscrew the plug case and to replace it with another having a new plug in it. The stopper *k* can then be screwed up to open the steam tube I and the apparatus will be ready to indicate any renewed deficiency in the supply of water. In order to prevent the loss of the fused metal of the plug and the escape of steam into the fire chamber the lower extremity of the socket of the plug case is closed by a screw stopper *o*.

The apparatus represented at Figs. 3 and 4 is simpler in its construction than that above described. In this example the tubes are dispensed with and a screw stopper *k* is inserted through the shell of the boiler immediately opposite the inner extremity of the fusible plug *e*. The lower extremity of this stopper is of such shape that when the plug melts it can be screwed downward upon the orifice of the socket in the plug case to close it. The lower extremity of the

socket is open so that when the plug melts through a deficiency of water the steam blows it downward and escaping into the fire-chamber gives warning of the low state of the water at the same time acting to dampen the fire. The stopper may then be screwed down to arrest the escape of steam and, water being supplied, the boiler is again in working order. If it be deemed advisable a new plug case may be inserted in the same manner as above described.

I have found it most convenient to form the air space *m* by securing a separate chamber E to the boiler plates, but it may in some instances be expedient to form the air chamber out of the boiler plate itself by bulging it up at this point to the requisite height.

What I claim as my invention and desire to secure by Letters Patent is—

1. The arrangement herein described for surrounding a fusible plug and its case by a stratum of air in such manner that the plug shall promptly melt and give warning after the water gets low in the boiler but before the boiler plate to which the apparatus is applied is left bare of water substantially as herein set forth.

2. I also claim the arrangement of the stopper and plug case substantially as herein described for stopping the escape of steam to admit of the replacement of the fusible plug without blowing off the steam or water from the boiler after the plug has melted substantially as herein set forth.

3. I likewise claim the method of preventing the waste of the metal of the plug after it has melted by supporting it in a closed socket the lower unoccupied part of which is of sufficient capacity to receive and retain the metal when melted and to allow the steam to pass over it to escape.

In testimony whereof I have hereunto subscribed my name.

E. H. ASHCROFT.

Witnesses:

I. A. ANDREW,
GEO. W. COLLAMORE.