

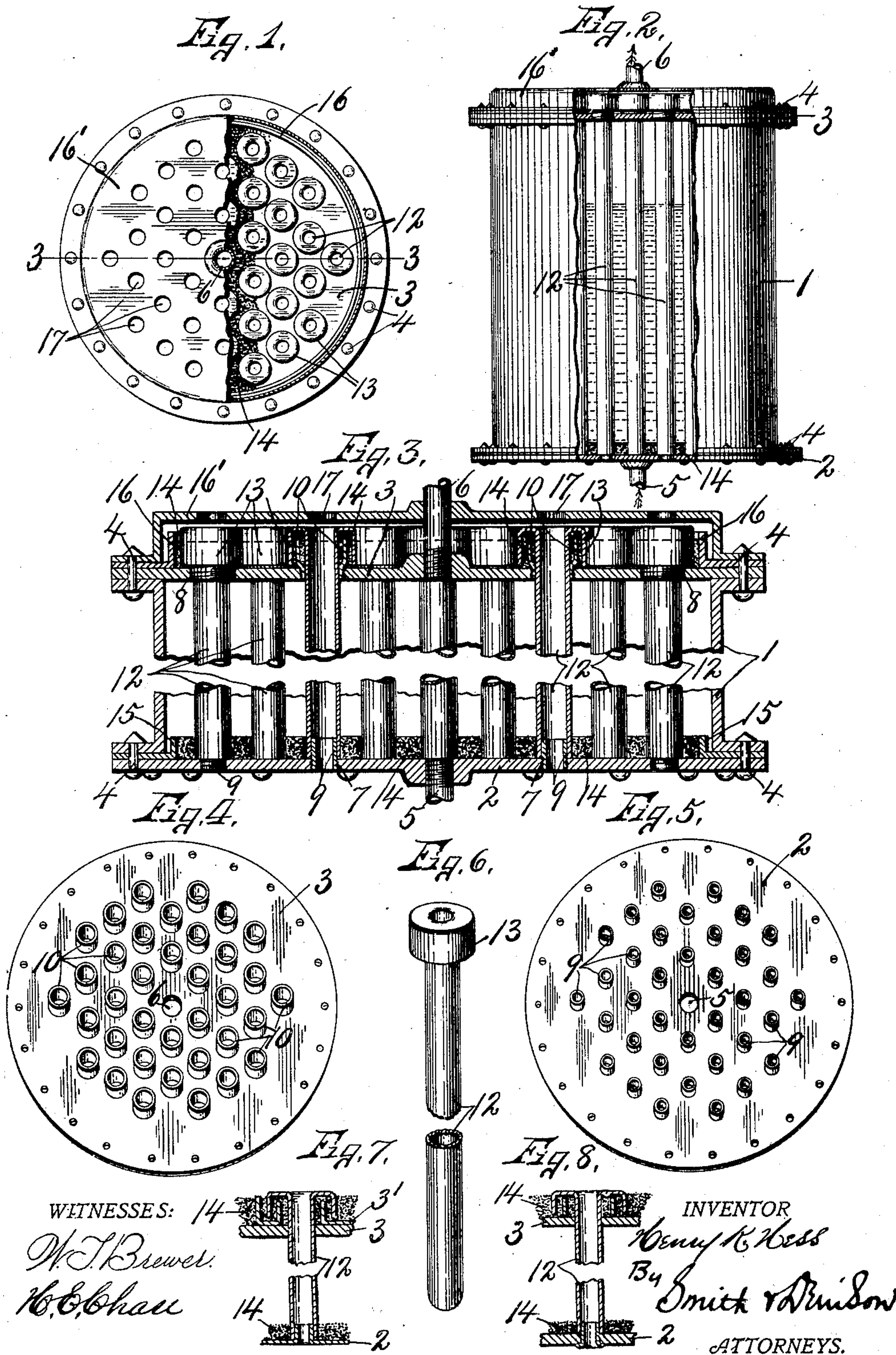
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Patented Oct. 14, 1902.

H. K. HESS.
STEAM BOILER.

(Application filed June 14, 1902.)

(No Model.)



UNITED STATES PATENT OFFICE.

HENRY K. HESS, OF PHILADELPHIA, PENNSYLVANIA.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 711,311, dated October 14, 1902.

Application filed June 14, 1902. Serial No. 111,756. (No model.)

To all whom it may concern:

Be it known that I, HENRY K. HESS, of Philadelphia, in the county of Philadelphia, in the State of Pennsylvania, have invented new and
5 useful Improvements in Steam-Boilers, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention relates to improvements in
10 steam-boilers, and refers more particularly to upright-flue boilers adapted for steam-propelled vehicles. The usual method of manufacturing this class of boilers is to expand their flues rigidly against the walls of the flue-
15 openings in the opposite heads; but it is commonly known that this method is insecure and unreliable, and particularly so in the hands of inexperienced operators. These vehicles being largely used by persons unskilled in
20 mechanics and the proper care of boilers, it frequently happens that the water in the boilers is allowed to become exhausted to such an extent that the heat of the burner causes an excessive and unequal expansion of the parts,
25 and particularly of the flues, which under such conditions are usually subjected to the greatest heat and expand endwise with sufficient force to break the seal at their junction with the head, and thus permits the leakage of
30 steam and water. Another cause of these leakages is that the boiler is necessarily subjected to a high degree of pressure and to other severe strains incidental to the jolting and torsional movements of the vehicle. In
35 view of these difficulties I have sought to provide some means whereby the parts of the boiler, and particularly the flues, might expand and contract independently of the heads without liability of producing a leak.

40 My object, therefore, is to render the boiler self-repairing to a certain extent by utilizing the causes of the leak, such as excessive heat, to again seal the broken or leaky joint by confining a fusible bonding metal or metal flux
45 in juxtaposition to the joints of the flues with the heads, which bonding metal under normal conditions is substantially as tenacious as the boiler and flue metal, but is fusible under a much lower temperature than would
50 be required to melt the boiler or flue metal. In addition to this I support the flues in such manner as to be capable of lengthwise ex-

pansive movement independently of the head and without drawing out of the bonding metal.

To this end the invention consists in the
55 combination, construction, and arrangements of the parts of a boiler, as hereinafter fully described, and pointed out in the claims.

Referring to the drawings, Figures 1 and 2
are respectively top plan and side elevation, 60 partly broken away, of an upright-flue boiler embodying the features of my invention. Fig. 3 is an enlarged vertical sectional view taken on line 3-3 of Fig. 1, the central portion being broken away and showing particularly the
65 opposite end heads and the means for mounting the flues thereto. Figs. 4, 5, and 6 are perspective views showing, respectively, the detached upper and lower heads and one of
70 the flues partly broken away. Figs. 7 and 8 are detailed sectional views of one of the flues and slightly-modified means of securing the same in position.

Similar reference characters indicate corresponding parts in all the views. 75

The boiler-shell proper, containing the water and steam chambers, may be of any desired form, size, or material adapted to receive and cooperate with the various parts of
80 my invention and usually consists of an upright cylindrical casing 1, of suitable boiler-iron, and provided with lower and upper end heads 2 and 3, of the same material, and secured to the end of the casing by a suitable
85 fastening means, as rivets or bolts 4.

The end heads 2 and 3 are provided with inlet and outlet conduits 5 and 6 for the water and steam, respectively, and with a series of alined flue-openings 7 and 8, which are arranged as closely together as possible in each
90 head by staggering without depreciating the strength of the metal.

Projecting upwardly from the upper face of the lower head 2 are a number of tubular nipples or hollow projections 9, corresponding to and alined with the flue-openings
95 7 in such manner as to form continuations of said openings 7 and at the same time form telescoping connections with the flues presently described. These nipples 9 are preferably threaded and secured in the openings
100 7; but it is apparent that they may be otherwise held in alinement with said openings either by forming them integrally from the

metal of the head 2, as seen in Fig. 7, or by securing them in place wholly by swaging or expanding, as seen in Fig. 8.

Projecting upwardly from the upper face of the upper head 3 and surrounding the individual openings 8 are a series of nipples or hollow projections 10, which are of sufficient height to confine a body of bonding metal capable of properly sealing the joints between the flues and head 3. These nipples 10 may be secured in position in any desired manner, either by threading the same in the apertures 8, as seen in Fig. 3, or by the bonding metal, as seen in Fig. 8, or the nipples may be stamped from a plate 3' of suitable metal, as seen in Fig. 7.

The flues previously mentioned preferably consist of metal tubes 12 of special construction and corresponding to the number of openings in each head of the boiler and are inserted through the nipples and openings in the upper head with their lower ends telescoping with and surrounding the nipples in the lower head and normally resting on the upper face of said lower head.

The body or main portion of the flues extending through the steam and water chambers are preferably of uniform diameter; but their upper ends exterior to the upper head are each expanded outwardly and downwardly to form a depending annular flange 13, surrounding the corresponding nipple 10. The lower ends of these flanges 13 normally lie in close proximity to the upper face of the head 3 in a plane beneath the upper ends of the nipples 10, said flange being slightly separated from the nipples and telescoping therewith and serves to confine a body of bonding metal at the junction of the flues with the head, so that under excessive heat the bonding metal will readily fuse and seal the joint in case it is broken by the undue expansion of the parts. It will thus be seen that the upper ends of the flues form suitable caps or crowns for the upper ends of the nipples 10 and together with the bonding metal form a positive seal against the leakage of steam and water at the junction of the flues and head 3.

The spaces between and surrounding the upwardly-projecting nipples of both the lower and upper heads 3 and 4 are filled to a suitable height sufficient to properly protect the joints with a bond or metal body 14 of suitable material—such as lead, antimony, or zinc, or other metal flux—which is fusible at a less temperature than the boiler or flue metal, and is confined within the desired limits by retaining-walls or annular shoulders 15 and 16 rising, respectively, from the upper surfaces of the lower and upper heads 2 and 3 and inclosing all of the nipples of each respective series.

Prior to introducing the metal bond or flux the adjacent metal parts coming in contact therewith are usually tinned or galvanized, so that the bonding metal will more readily

and positively adhere and close the joints. This bonding metal may be placed upon the upper surfaces of the heads 2 and 3 within their respective confining-walls 15 and 16 either before or after the assembling of the parts and filled to the level of the tops of the nipples either in a molten or congealed state, it being understood that when the bonding metal is placed in position, before the flues are inserted, suitable openings are left for the lower ends of the flues and flanges 13, so that the heads may be readily bolted to the cylindrical casing 1. In either case after the parts are assembled with the bonding metal in position on the head the boiler is subjected to a sufficient degree of heat to again melt the fusible metal, which causes the full expansion of the flues and other parts, thereby opening up any loose joints and permitting the flux to flow therein and to seal said joints. As the temperature of the boiler reduces the bonding metal congeals and the flues and other parts contract, and this contracting of the parts serves to additionally pack the bonding metal at the joints and further adds to the efficiency of the seal against subsequent leakages. It is apparent that by this means of assembling the parts of the boiler any excessive heat which would tend to open the joints would soften the bonding metal and cause the same to flow into and close said joints, and thus render the boiler self-repairing in this respect, and at the same time the flues are free to expand and contract without any injurious effect.

I usually provide the upper end of the boiler with an abutting wall or cap 16' for the upper ends of the flues to prevent undue endwise displacement of the flues and also to protect the bonding metal on the upper head, this cap being generally secured to the boiler-shell by the same rivets or bolts which secure the parts 1 and 3 to each other, and is provided with a series of openings 17, which are alined with and serve as extensions of the flues.

The operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawings, and it will be noted that other modifications than those shown may be made without departing from the spirit thereof.

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

1. A steam-boiler comprising a shell having lower and upper heads, each provided with a series of flue-openings, upright hollow projections rising from the upper faces of the upper and lower heads and alined with their respective openings, flues telescoping with the projections, and a bonding metal at the junction of the flues and projections with the heads for the purpose described.

2. A steam-boiler comprising a shell having lower and upper heads, each provided with a series of flue-openings, tubular nipples sur-

rounding the openings, flues incasing the nipples, and a bonding metal encircling the tubes and nipples at their junctions with the heads.

3. A steam-boiler comprising a shell having
5 lower and upper heads provided with flue-openings, nipples rising from the heads in alinement with their openings, and flues having their inner ends incasing the nipples on the lower wall and their opposite ends flanged
10 outwardly and downwardly over the nipples of the upper wall.

4. In combination with the opposite heads of an upright-flue boiler, said heads having flue-openings, flues inserted in the openings
15 in the upper head and resting on the lower head in alinement with its openings, nipples projecting upwardly from the lower head into the flues, the upper ends of the flues projecting above the upper wall, and a bonding
20 metal surrounding the upper ends of the flues adjacent to the upper heads.

5. In an upright-flue boiler, the combination of a head having flue-openings, nipples rising from the head and alined with the openings, flues telescoping with the nipples, and
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a bonding metal fusible at a lower temperature than the boiler metal and surrounding the junction of the flues and nipples with the heads.

6. An upright-flue boiler comprising a shell 30 having end heads provided with flue-openings, nipples rising from the lower head and alined with its openings, flues telescoping with the nipples and extending through and above the upper head, an annular retaining-wall inclosing the projecting ends of the
35 flues, and a bonding metal inclosed within the retaining-wall and surrounding the junctions of the flues with the upper head.

7. In an upright-flue boiler, the combination 40 of a head and flues, of a bonding metal supported at the junction of the head and flues and fusible at a less temperature than the head and flues for the purpose described.

In witness whereof I have hereunto set my
45 hand on this 7th day of June, 1902.

HENRY K. HESS.

Witnesses:

ROBERT MAYER,
MILTON WOLF.