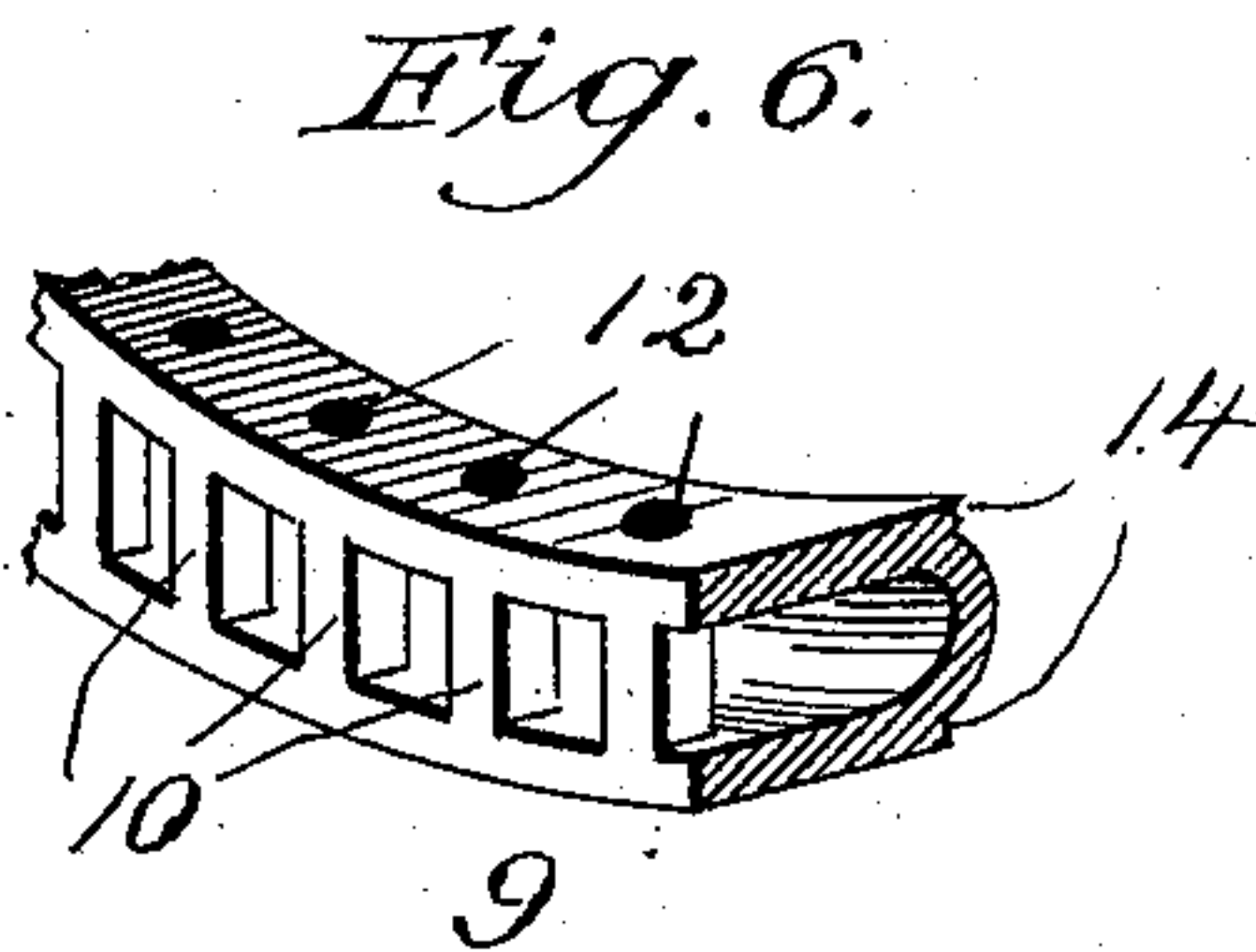
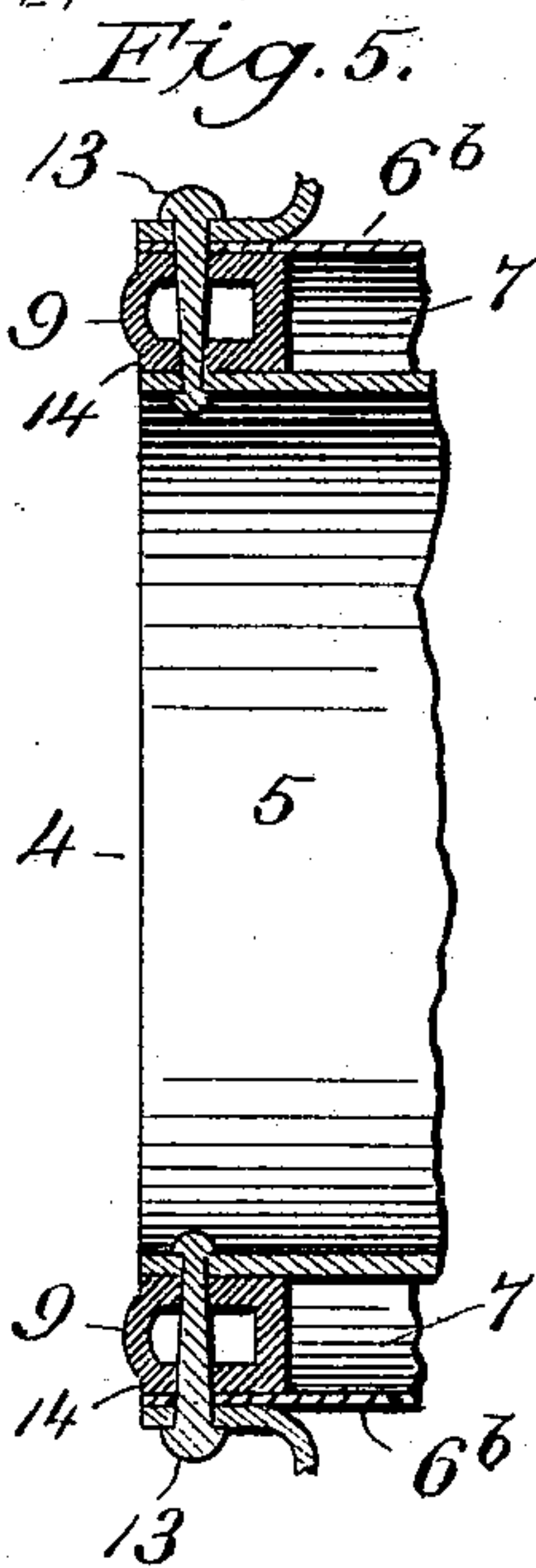
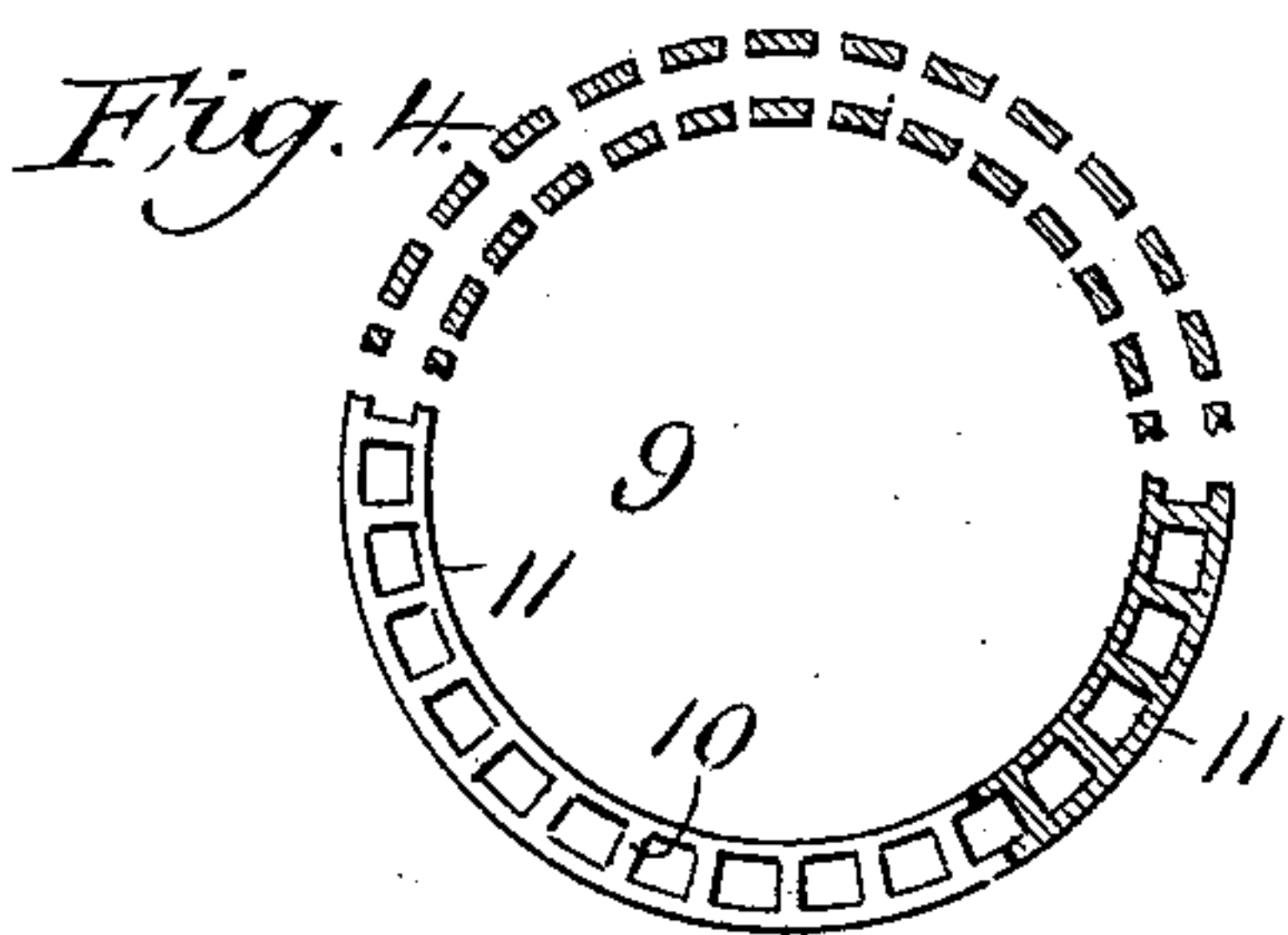
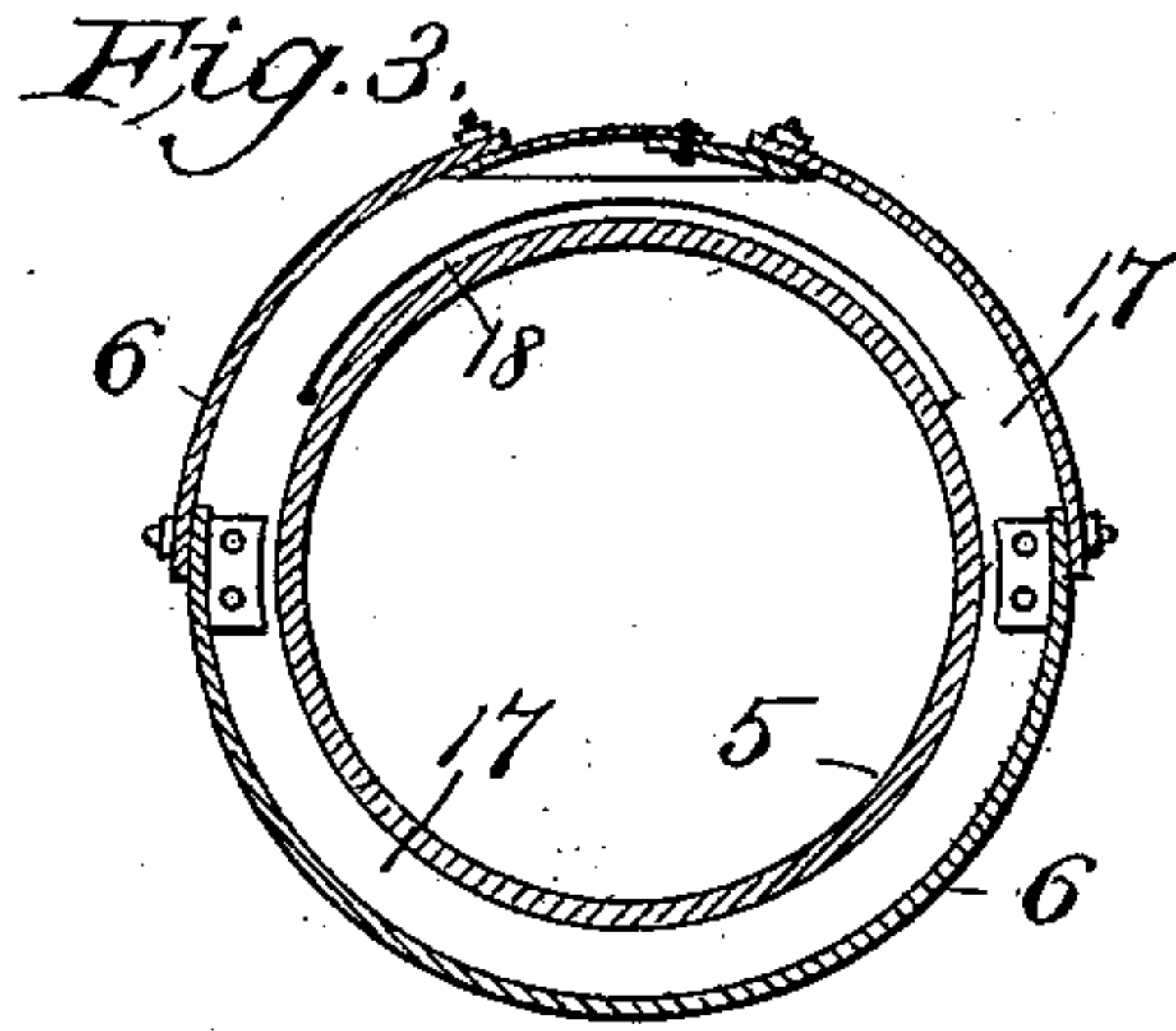
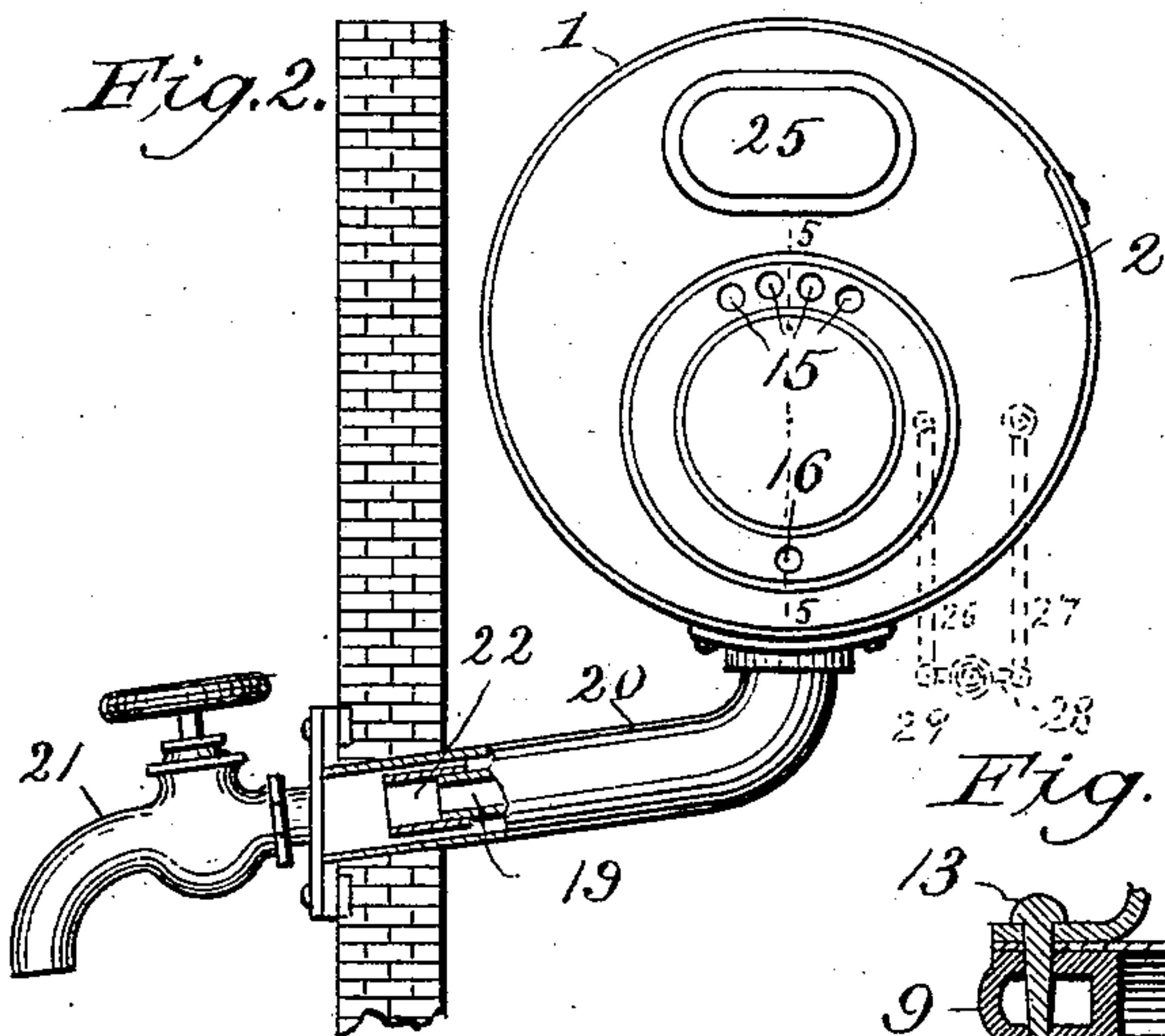
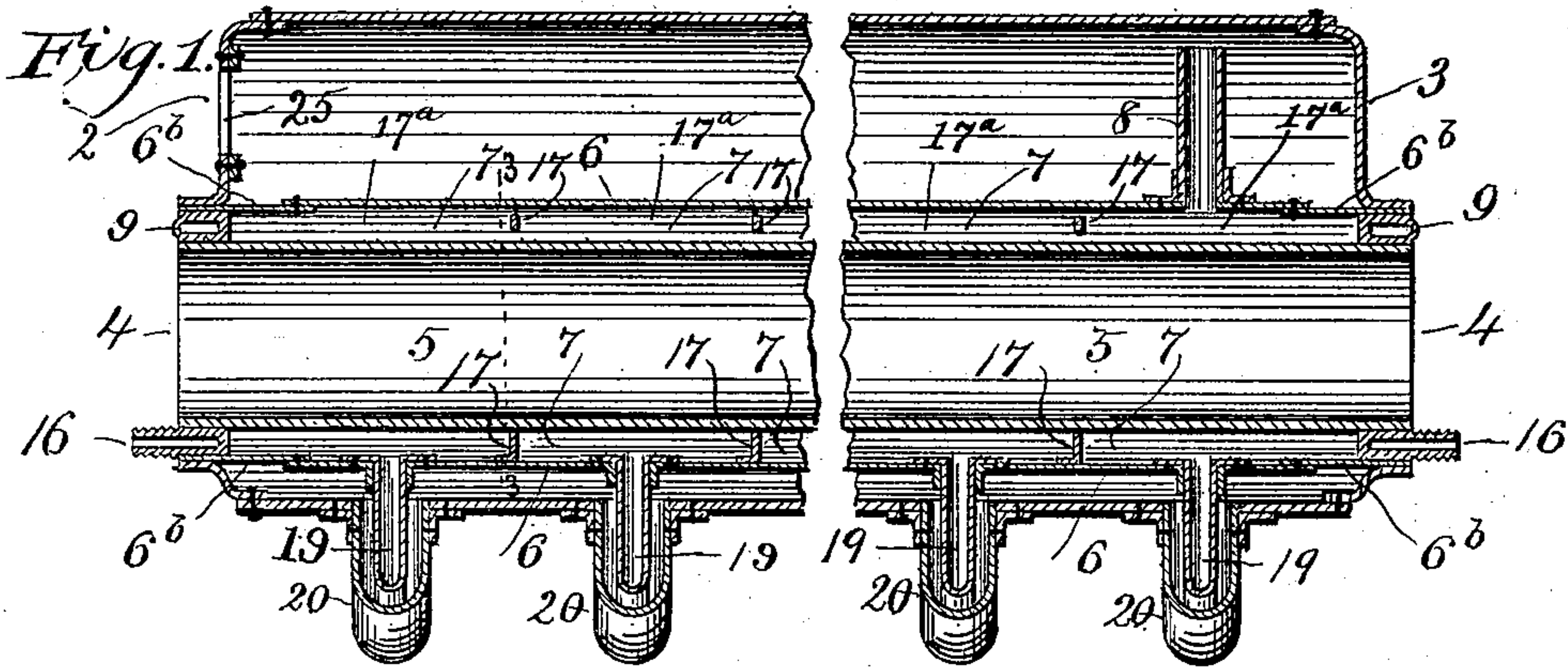


(No Model.)

D. KING.
STEAM BOILER.

No. 472,731.

Patented Apr. 12, 1892.



Witnesses:
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UNITED STATES PATENT OFFICE.

DANIEL KING, OF FINKSBURG, MARYLAND.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 472,731, dated April 12, 1892.

Application filed May 25, 1891. Serial No. 393,991. (No model.)

To all whom it may concern:

Be it known that I, DANIEL KING, a citizen of the United States, residing at Finksburg, in the county of Carroll and State of Maryland, have invented a new and useful Steam-Boiler, of which the following is a specification.

This invention relates to steam-boilers; and it has for its object to provide a device of this class which shall be simple in construction, durable, and comparatively inexpensive, and in which a heating-surface of considerable extent shall be developed, thereby enabling the water to be quickly and economically converted into steam.

A further object of the invention is to so construct the boiler as to enable sediment and deposits of all kinds inside and outside the flue-jacket to be quickly and effectually disposed of.

A further object of the invention is to so construct the boiler as to enable the flue to be readily removed for repairs when necessary.

With these ends in view my invention consists in the improved construction, arrangement, and combination of parts, which will be hereinafter fully described, and particularly pointed out in the claims.

In the drawings hereto annexed, Figure 1 is a longitudinal vertical sectional view of a boiler constructed in accordance with my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a transverse sectional view taken on the line 3 3 in Fig. 1. Fig. 4 is a rear elevation, partly in section, of the bushing connecting the flue with the jacket. Fig. 5 is a sectional view on a larger scale, taken through the front end of the boiler, the flue, the jacket, and the connecting-bushing, on the line 5 5 in Fig. 2. Fig. 6 is a perspective detail view of a portion of said bushing.

Like numerals of reference indicate like parts in all the figures.

1 designates the boiler shell or casing having the heads or ends 2 and 3, which are provided with flanged openings 4 for the reception of the flue 5, only a single flue being used, as will be apparent from the drawings. The flue is of less diameter than the openings 4.

6 designates a shell or jacket, the ends of which are provided with extension-pieces 6^b and which surrounds the flue 5, an annular space 7 being left between said flue and

jacket. The latter is provided within the boiler with a stand-pipe 8 for the passage of steam from the annular space 7 to the crown of the boiler. The extension-pieces 6^b are riveted to or otherwise suitably connected with the body of the shell or jacket 6, from which they may be readily detached when it is desired to gain access to the flue for the purpose of moving or repairing the latter.

Between the ends of the flue 5 and jacket 6 are interposed the rings or bushings 9, which have been clearly shown in Figs. 5 and 6 of the drawings. These bushings, which are made, preferably, of copper, although other suitable material may be substituted, are made U-shaped in cross-section, their open ends being provided with cross-bars 10, connecting the sides or flanges 11 of said bushings. The latter are provided with tapering rivet-holes 12, extending through the side walls 11 between the cross-bars 10, for the reception of the rivets 13, by means of which the ends of the flue, the flue-jacket 6, and the bushings are connected with each other and with the flanged boiler-heads. The bushings are arranged with their open ends turned inward to form the ends of the water-space between the flue 5 and the jacket 6. The rivets, the shanks of which extend through the said bushings, are thus surrounded by water and protected from injury by excessive heat. The bushings are provided on their outer sides with annular projecting beads or shoulders 14. These shoulders or beads are made to serve as calking-strips, the metal composing them being forced or upset into the joints between the bushing, the flue, and the flanges of the boiler-heads, thus forming perfectly steam and water tight joints. The bushing at the front end of the boiler is provided with feed-openings 15 for the attachment of pipes through which water may be supplied to the annular space 7. The bushings at both ends of the boiler are provided at their lower ends with openings 16, to which pipes may be attached for blowing off the contents when desired.

17 17 designate flanges, which may be composed of angle-irons arranged in the annular space 7 between the flue and its surrounding jacket, thus converting the said annular space into a number of compartments 17^a. The upper portions of the flanges 17 are provided

with recesses or cut-away portions, as shown at 18, the spaces between the said flanges being in this manner connected. The bottom of the jacket 6 is provided between the individual flanges 17 with downwardly-extending flues or pipes 19, and the bottom of the boiler-casing is provided with corresponding pipes 20 of larger diameter, into which the pipes 19 are extended. The pipes 20 are extended through the combustion-chamber of the furnace and through the side wall of the latter and are provided with blow-off cocks 21. The pipes 19 are extended nearly to the ends of the pipes 20 and are provided with nozzles 22 of a cross-sectional area suitably proportioned to the cross-sectional area of the spaces between them and the shells or casings forming the pipes 20.

When boilers constructed according to my invention are arranged in a battery, the pipes 19 and 20 of each individual boiler should extend to the furnace-wall most distant from such boiler in order to provide as extensive a heating-surface as possible, the greatest advantage being derived from extending these pipes horizontally, or approximately so, through the combustion-chamber of the furnace.

The front boiler-head is provided with a man-hole 25, through which access may be had to the interior of the boiler for the purpose of making repairs when necessary. Valved pipes 26 and 27 may be connected, respectively, with the annular space 7 between the flue and the flue-jacket and with the water-space of the boiler, said pipes being connected by a branch pipe 28, having a check-valve 29 opening toward the space 7, all as is shown in dotted lines in Fig. 2 of the drawings. The purpose of these connecting-pipes will be presently set forth.

In operation the feed-water is supplied through the pipes 15 and is forced to take its course through the annular spaces 7 between the flue and the flue-jacket and the flanges 17. Most of the sediment and impurities contained in the feed-water will settle in the annular space 7 near the front end of the boiler, and the feed-water will pass through the pipes 19 and back through the pipes 20 into the boiler-space proper, where it rises around the flue-jacket 6. The steam developed in the annular space 7 will rise through the stand-pipe 8 into the steam-space of the boiler. It will be observed that a very extensive heating-surface is provided, composed of the flue 5 and the pipes 20, which latter are of considerable length and capacity. It will also be observed that the feed-water passing through the tubes 20 and exposed to the direct action of the burning gases in the combustion-chamber of the furnace is first heated by its passage through the annular space 7 and the tubes 19. By this construction and arrangement the feed-water will be heated to the temperature in the boiler before it reaches the water-space proper in the boiler, owing to

its passage along the flue 5, as well as through the pipes 19 and 20. Strains upon the boiler-shell due to variable temperatures are thus avoided, such strains being borne by the jacket and pipes. Any impurities in the water that may be precipitated by heat will be deposited in the space between the flue and the jacket and in the pipes 19 and 20, from which such impurities may be effectually blown out as often as may be desired or found necessary by simply opening the valves 21 (one at a time) at the ends of the pipes 20. The proper bushings make safe and effective joints between the flue, the jacket, and the heads of the boiler, and, being provided with calking-shoulders, the joints may be easily and perfectly made without necessity of employing auxiliary packing of any kind. By the use of these bushings the flue may also be readily removed when desired by simply removing the rivets, when the said flue may be readily drawn out for repairs or for the purpose of substituting a new one. The tapering rivets employed for connecting the flue, the jacket, and the bushings with the boiler-heads form tight joints and may be conveniently fitted and driven—cold, if desired—as will be readily seen by reference to the drawings. The connecting-pipes 26 and 27, having check-valves 28, will allow the water to pass from the boiler-space to the flue-space whenever the feed ceases, thus maintaining an equilibrium between the water in the boiler-casing and in the annular space 7 and causing the circulation to be kept up in the proper direction without interruption. The said connecting-pipes and check-valves are preferably arranged outside the furnace-wall, at the front end of the same, where they may be readily inspected and manipulated when desired. The absence of these connecting-pipes and valves, however, would not seriously interfere with the operation of my invention, inasmuch as it would only involve a reversal of the circulation in the event of the feed being temporarily suspended.

I have in the foregoing described what I consider to be the preferred construction of my invention; but I desire it to be understood that I do not limit myself to the details of construction herein described, but reserve the right to any changes and modifications to which recourse may be had without departing from the spirit of my invention.

Having thus described my invention, what I claim is—

1. In a steam-boiler, the combination of the boiler-casing, the flue extending through the same, the jacket surrounding the flue, and the hollow bushings interposed between the ends of the flue and jacket and having the interior thereof communicating with the water-space inclosed between said jacket and flue, substantially as set forth.

2. In a steam-boiler, the combination of the boiler-casing, the flue extending through the same, the jacket surrounding the flue, and the

rings or flanges arranged in the space between the flue and the jacket, substantially as set forth.

3. The combination of the boiler-casing, the flue extending through the same, the jacket surrounding the flue and having an upwardly-extending stand-pipe, the bushings between the ends of the flue and the jacket, and the ribs or flanges arranged in the space between said flue and jacket, substantially as set forth.

4. The combination of the boiler shell or casing, the flue extending through the same, the jacket surrounding the flue, pipes extending from the bottom of the boiler-casing through the furnace-wall and provided with blow-off cocks, and pipes extending from the annular space between the flue and the cap into the said pipes extending from the boiler-casing, substantially as and for the purpose set forth.

5. The combination of the boiler-casing, the pipes extending from the bottom of the same and having blow-off cocks at their outer ends, the flue extending through the boiler-casing, the jacket surrounding said flue, the ribs or flanges arranged in the annular space between the flue and the jacket, and the pipes extending from the latter into the pipes extending from the boiler-casing and nearly to the ends of said pipes, substantially as set forth.

6. The combination of the boiler-casing, the flue extending through the same, the jacket surrounding the flue, the ribs or flanges arranged in the annular space between the flue and the jacket, the upper portions of the said ribs or flanges being provided with recesses or cut-away portions, substantially as and for the purpose set forth.

7. The combination of the boiler-casing, the flue extending through the same, the jacket surrounding the flue and having an upwardly-extending stand-pipe, the ribs or flanges arranged in the annular space between the flue and the jacket and having recesses or cut-away portions in their upper sides, the pipes extending from the bottom of the boiler-casing and having blow-off cocks, the pipes extending from the spaces of the flue-jacket between the ribs or flanges and into the pipes extending from the boiler-casing, and means for supplying feed-water to the annular space between the flue and its surrounding jacket, substantially as and for the purpose set forth.

8. The combination of the boiler-casing, the flue extending through the same, the flue-jacket, and the hollow bushings of copper or equivalent material interposed between the

ends of the flue and the jacket and having open ends communicating with the water-space between said flue and jacket and secured by means of rivets driven through the ends of said flue or jacket and through flanges upon the boiler-heads, substantially as set forth.

9. In a steam-boiler of the class described, the herein-described bushings, consisting of rings approximately U-shaped in cross-section and provided at their open inner ends with cross-bars connecting the sides or flanges of said bushings, substantially as set forth.

10. The herein-described annular bushing, provided with beads or flanges adapted to be upset into the adjacent joints for the purpose of calking the latter, substantially as set forth.

11. The combination, with the boiler-casing having heads provided with flanged openings, the flue, and the flue-jacket, of the bushings consisting of rings U-shaped in cross-section arranged between the ends of the flue and jacket, with their open ends facing the annular water-space between said flue and jacket, whereby the shanks of the connecting-rivets are surrounded by the water in said water-space, substantially as set forth.

12. The herein-described bushings, consisting, essentially, of rings approximately U-shaped in cross-section and provided on their outer sides with annular ribs or shoulders, substantially as and for the purpose set forth.

13. The combination of the boiler-casing having flanged heads, the flue extending through said casing, the flue-jacket, the bushings interposed between the ends of the flue and the jacket, and the tapering rivets connecting said bushings, flue, and jacket with the flanges of the boiler-head, said bushings being approximately U-shaped in cross-section, with their open ends facing the annular space between the flue and the jacket, substantially as and for the purpose set forth.

14. In a steam-boiler, the combination of the boiler-casing, the flue extending through the same, the jacket surrounding the same and having readily-removable extension-pieces fitted to flanged openings in the boiler-head, and the hollow bushings interposed between the ends of the flue and the jacket, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

DANIEL KING.

Witnesses:

R. W. DAYTON,
E. G. SIGGERS.