

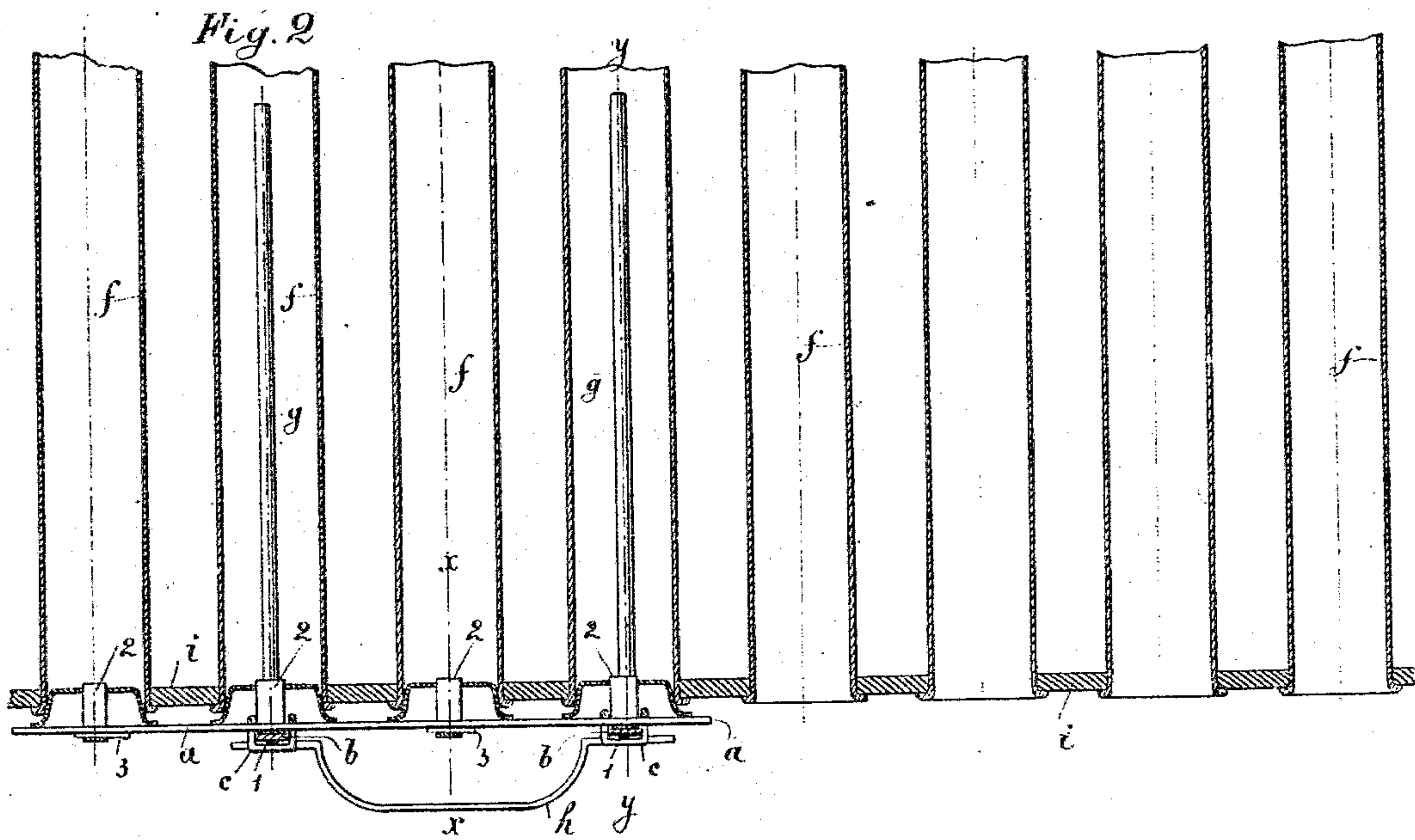
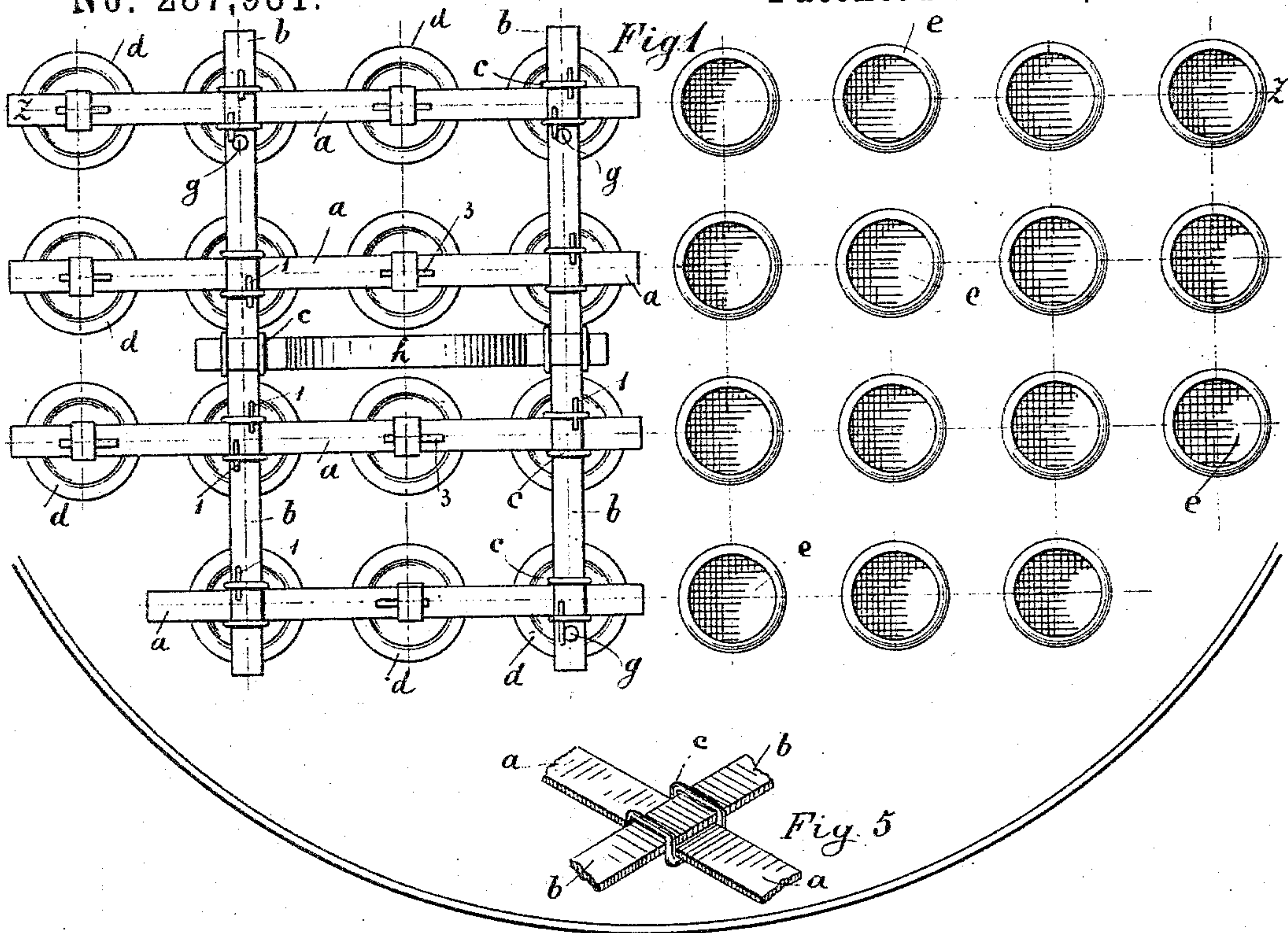
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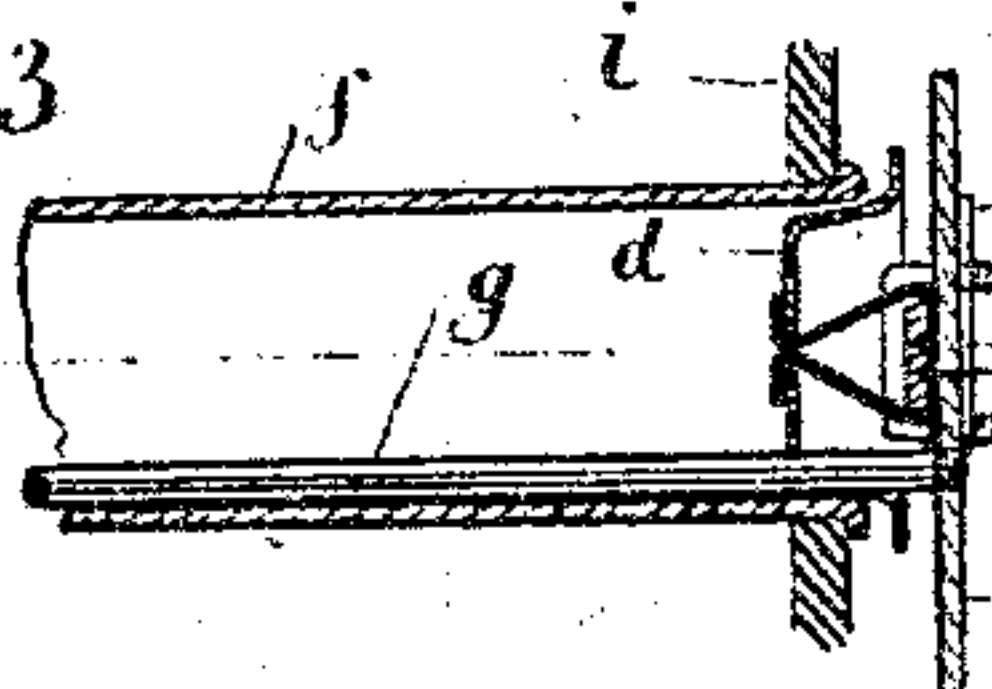
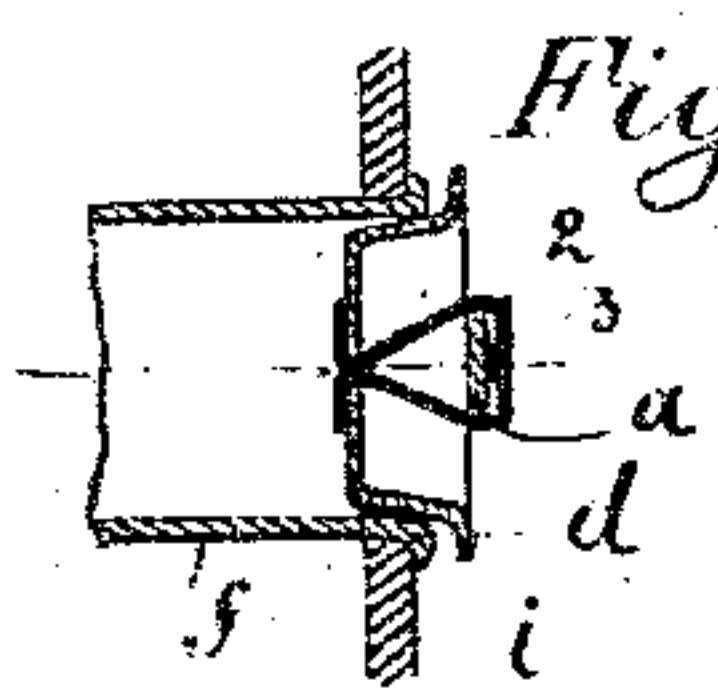
G. C. HICKS.
TUBE CLOSER FOR STEAM BOILERS.

No. 287,931.

Patented Nov. 6, 1883.



Witnesses:
J. Lorum.
L. Holmberg.



Inventor:
George Cleveland Hicks
By James Fisher
His Attorneys.

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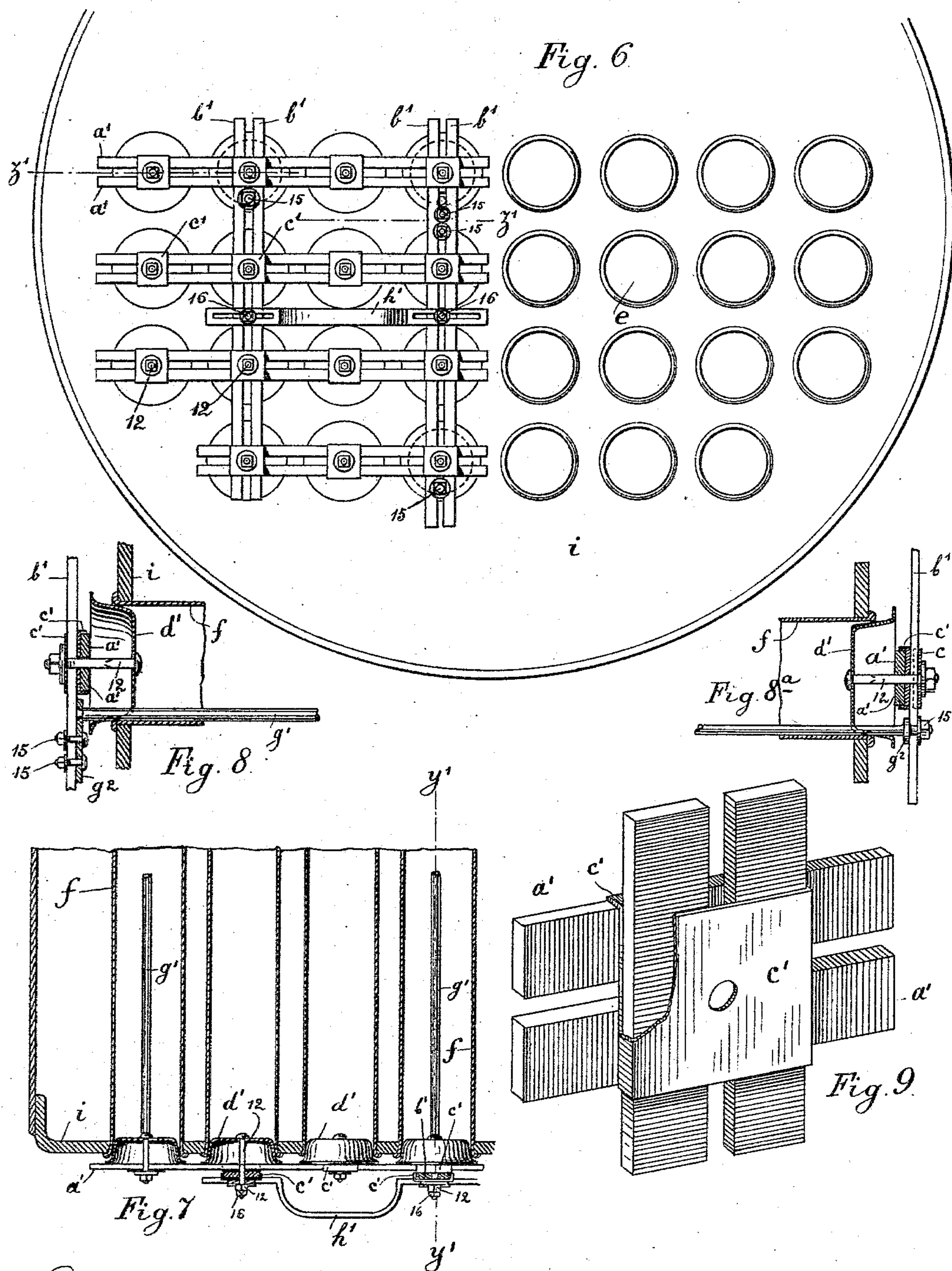
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UNITED STATES PATENT OFFICE.

GEORGE C. HICKS, OF CHICAGO, ILLINOIS.

TUBE-CLOSER FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 287,981, dated November 6, 1883.

Application filed June 20, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE CLEVELAND HICKS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Tube-Closers for Steam-Boilers, of which the following is hereby declared to be a full, clear, and exact description.

The invention relates to tube-closers which obstruct the exit-ports of the series of tubes in an ordinary steam-boiler; and said invention has for its object to improve the construction of tube-closers designed more particularly to cover the ends of the flues when the boiler is in temporary disuse.

In an application for Letters Patent filed by me February 14, 1883, (Serial No. 85,047,) and allowed April 21, 1883, it was shown that the rapid loss of heat, and consequent decrease of steam-pressure, when a boiler is no longer fired and is out of use for a short period (as, for example, over night) may be attributed in substantial measure to certain local gaseous convection-currents established between the boiler-flues and the closed damper in the cooler escape-passages or stack, which gaseous currents continually abstract the heat to lose it in said passages, and thence return again to the boiler for fresh portions. The method of retaining the heat of the water and steam of the boiler during such periods of temporary disuse was based upon the discovery of the existence of said local convection-currents, and of how they might be practically suppressed. One form of tube-closer designed to effect this suppression was shown and described in said application, and it consisted in the main of a plain flat sheet of metal, or the like, which closed down upon the exit-ports of the boiler-flues, and excluded the gaseous currents in circuit from any contact with the surface of said flues. The efficiency of the suppression of these mischievous currents is plainly dependent upon the successful closing of the exit-ports of the flues; for should the tube-closer be ill-fitting, or for any other reason should leaks occur, then in so far are the convection-currents at once established between the exposed flues and the escape-passages or stack, and an unnecessary loss of heat results.

In avoidance of these objections, the present invention consists of a tube-closer readily adapted to boilers of various size or diameter, and having an independent stopper for each flue of the series. Any of said stoppers may be quickly and cheaply replaced, if defective, without impairing the value of the closer, and each stopper is intended not merely to fit tubes of various diameter, but as well is capable of separate adjustment upon the frame of the closer, so that should the flues of the several rows in the same or different boilers be set at various distances apart in the tube-sheet the closer may be none the less readily adapted to these variations, and each stopper be made to snugly cover the orifice to which it is opposite.

In the accompanying drawings, illustrating the invention, and having like reference-letters to designate like parts, Figure 1 is a view in elevation of the front end of a tubular boiler, the bonnet being removed to show at the right the exit-ports of the flues, and at the left the tube-closer in position against said ports. Fig. 2 is a sectional view on line *z z* of Fig. 1. Figs. 3 and 4 are detail sectional views on lines *x x* and *y y*, respectively, Fig. 2. Fig. 5 is a perspective view, showing in detail the junction of two cross-bars of the closer, and the link for retaining the same. Fig. 6 is a view in elevation of the front end of a tubular boiler, showing a modified form of the closer in position. Fig. 7 is a sectional view on line *z z*, Fig. 6; Figs. 8 and 8^a, detail sectional views of one of the stoppers and its connections on line *y' y'*, Fig. 7; Fig. 9, a detail perspective view of the sets of cross-bars and the tie-plates for holding them.

Referring, first, to the form of the closer shown in Figs. 1 to 5, inclusive, it will be seen that the frame of the tube-closer consists of two series of bars, *a* and *b*, crossing each other, and secured together at their points of junction by bent links *c*, passing over and under said bars, in manner clearly shown by Fig. 5. These bent links are conformed to the sets of bars in such wise that either of said bars, together with its links, may in turn be shifted lengthwise along the cross-bars, by which expedient it is plain that the bars *a* or *b* of either series may be brought nearer together or be separated farther from each other, as desired,

and when once in proper position be thereafter firmly secured, to prevent further shift, if not sufficiently tight, by use of wedge-pins 1, driven between the links *c* and the bars.

5 The stoppers *d* for the flue-orifices *e* consist, preferably, of light metallic cups, either stamped or spun into shape, and having a sloping face where fitted to the tubes *f*, so as to snugly close the ports, and at the same time, by reason of said slope, to be capable of easy adaptation to tubes of various diameter.

10 The stoppers *d* are secured at suitable distance apart on the frame of the closer, either at the junction of the cross-bars or intermediately, as shown in Fig. 1, the distance apart of said stoppers being determined by that of the tube-orifices into which they are designed to fit.

20 Strap-irons 2, bent at their middle portion over cross-bars *a*, have their ends passed through a slit in the crown of each stopper *d*, said ends being turned down thereon, so that the stoppers are held firmly in place, and with their flaring rims bearing against the bars *a*. Wedge-pins 3 may be driven between straps 2 and bars *a*, to further clamp the stoppers tightly in place, if necessary.

30 Rods *g*, projecting from the frame of the closer, enter the tubes of the boiler and serve to sustain the frame in position thereon.

35 A handle, *h*, adjustably secured by bent links 1 to the upright bars *b*, and by reason of this connection, as already explained, capable of being shifted on said bars, and at the same time permitting said bars to be moved to and from each other, enables the tube-closer to be lifted out from the boiler or to be set in place, as desired.

40 For convenience, the closer is made up in two separate parts or frames, each of which covers one-half of the tube series, though, if desired, there need be but a single frame, (particularly if the boiler be small;) or, again, there may be a greater number than two frames or sections, if deemed preferable. In any event, the general construction will be the same as hereinbefore set forth, and the mode of applying said closer to boilers of various size be after the manner now to be detailed.

50 Access to the boiler having been obtained, the operator presses a plain sheet of stiff paper down against the tube-sheet *i* and upon the ends of the tubes *f*, set therein, whereby the position of said tubes, their distance apart, line of curvature, &c., will be plainly traced upon the paper by adhesion of the soot. With this pattern-trace before him the operator, having determined the lengths of the cross-bars necessary to the size of boiler, may shift the upright bars *b* and the upper transverse bars *a* along upon each other and through the bent links *c* until their lines of juncture come about opposite the centers of the tubes into which the upper rods *g* are to project. The upper row of stoppers *d* having been positioned carefully with reference to

the ports they are to close, the rods *g* are fastened permanently to bars *b*, projecting thence through the cups or stoppers in proper relation to rest upon and within the tubes *f*, by which the frame is sustained. All adjusted parts having been wedged tightly in place by pins 1 and 3, if necessary, it is easy to shift the lower transverse bars *a* and lower rows of stoppers *d* together with handle *h* in such wise that these shall occupy the desired positions marked out for them by the trace, and thereafter to wedge them up, as already set out.

80 At the lower end of one of the upright bars *b* a hole is drilled and tapped to admit lower supporting-rod *g*, so that said rod shall bear squarely upon its appropriate tube.

85 It is obvious that a tube-closer frame made and adjusted as herein described may be quickly adapted to any size of boiler and to any difference in distance apart of the boiler-flues. Individual stoppers upon said closer-frame may be quickly removed and replaced, while the frame as a whole is stiff and strong, and may be easily set in place against the flues or taken away when obstruction of the flue-outlets is no longer desired. The stoppers *d* soon become coated with soot, which insures closeness of fit for said stoppers against their seats on the tubes and, as well, reduces conductivity.

100 The tube-closer shown in drawings, Figs. 6 to 9, inclusive, is in general characteristics the same as that heretofore described, but differs therefrom in details. Thus the cross-bars *a'* *b'* are in sets of two, arranged parallel to each other, the bars at their points of junction being retained by front and back tie-plates, *c'*, having bent-over edges to clasp the sides of the bars. A bolt, 12, passing through the crown of stoppers *d'*, through tie-plates *c'*, and between the bars *a'* *b'* of the sets, has nut and washer thereon, which enable the cross-bars and stoppers to be rigidly coupled together at any desired point. By loosening the nut on bolt 12 it is plain that the relation of tie-plates *c'* to the bars is such that transverse bars *a'*, together with stoppers *d'*, may be moved up or down over upright bars *b'*, or, again, that these latter, with the stoppers, may be moved crosswise upon transverse bars *a'*. It is this facility of adjustment which enables the closer to be adapted to any size of the ordinary tubular boiler.

125 The supporting-rods *g'*, by which the closer is sustained in place, may be riveted to a separate plate, *g''*, which, by bolts and set-nuts 15, is tightly clamped to the upright bars *b'*. The handle *h'* is slotted near its ends, and there are suitable set-bolts, 16, which enable the handle to be adjusted to variations in position of upright bars *b'*, or again allow said handle to be moved up or down in said bars.

130 The sets of stoppers *c'* between the upright bars *b'* are bolted to the transverse bars *a'*, in manner similar to that already detailed, and it is to be observed that by having the transverse

bars *a'* in sets of two each a broad base or bearing-surface for the rims of the stoppers is afforded, which contributes much to their stability in position.

5 In setting the stoppers for use a preliminary trace of the relations of the tubes in the boiler is of value, and is to be preferred, as heretofore set forth, though it will be understood that any other expedient may be adopted for
10 determining the proper location of the several stoppers on the closer-frame.

In some instances the individual stoppers may be omitted and the closer-frame consist, merely, of a series of cross-bars, as in Fig. 1,
15 capable of adjustment with respect to each other, and having their faces, where serving as a stop against the tube-orifices, covered with asbestos, felt, or the like, to effect the necessary tightness of fit.

20 In Fig. 8^a the supporting-rod *g'* is shown threaded at its outer end and secured by set-nut and washer directly to the upright bar *b*.

Not limiting myself to the precise details of structure herein set out, and having thus de-
25 scribed my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A tube-closer adapted to boilers of various size, the same consisting simply of sets of upright and transverse bars adjustably united at
30 their points of intersection, in combination with individual stoppers for the several flue-orifices, and with mechanism, substantially as described, for sustaining said closer against the flues, substantially as set forth.

2. The combination, with the boiler-flues, of 35 a tube-closer consisting of a series of upright and transverse bars adjustably united at their points of intersection, the individual stoppers *d*, and the supporting-rods *g'*, substantially as described.

3. A tube-closer adapted to steam-boilers of various size, the same consisting simply of sets of upright and transverse bars having in-
40 dividual stoppers secured thereto, in combination with the double tie-plates *c'* and the retaining-bolts 12, substantially as described.

4. A tube-closer consisting simply of the combination, with the upright bars *b* and trans-
45 verse bars *a*, of the links *c*, adjustably uniting said bars together at their points of intersection, and the rods *g*, for sustaining said closer in position, substantially as described.

5. The combination, with the stopper *d* and the bar *a*, of the bent strap 2, which secures
50 said stopper to the bar, substantially as described.

6. The combination, with the tube-closer, of the adjustable handle therefor, substantially
55 as described.

7. The combination, with the tube-closer 60 frame, of the individual stamped metal cups or stoppers, substantially as described.

In testimony whereof I have hereunto set my hand this 18th day of June, A. D. 1883.

GEORGE CLEVELAND HICKS.

In presence of—

JAMES H. PEIRCE,
GEO. P. FISHER, Jr.