No. 661,868. Patented Nov. 13, 1900.

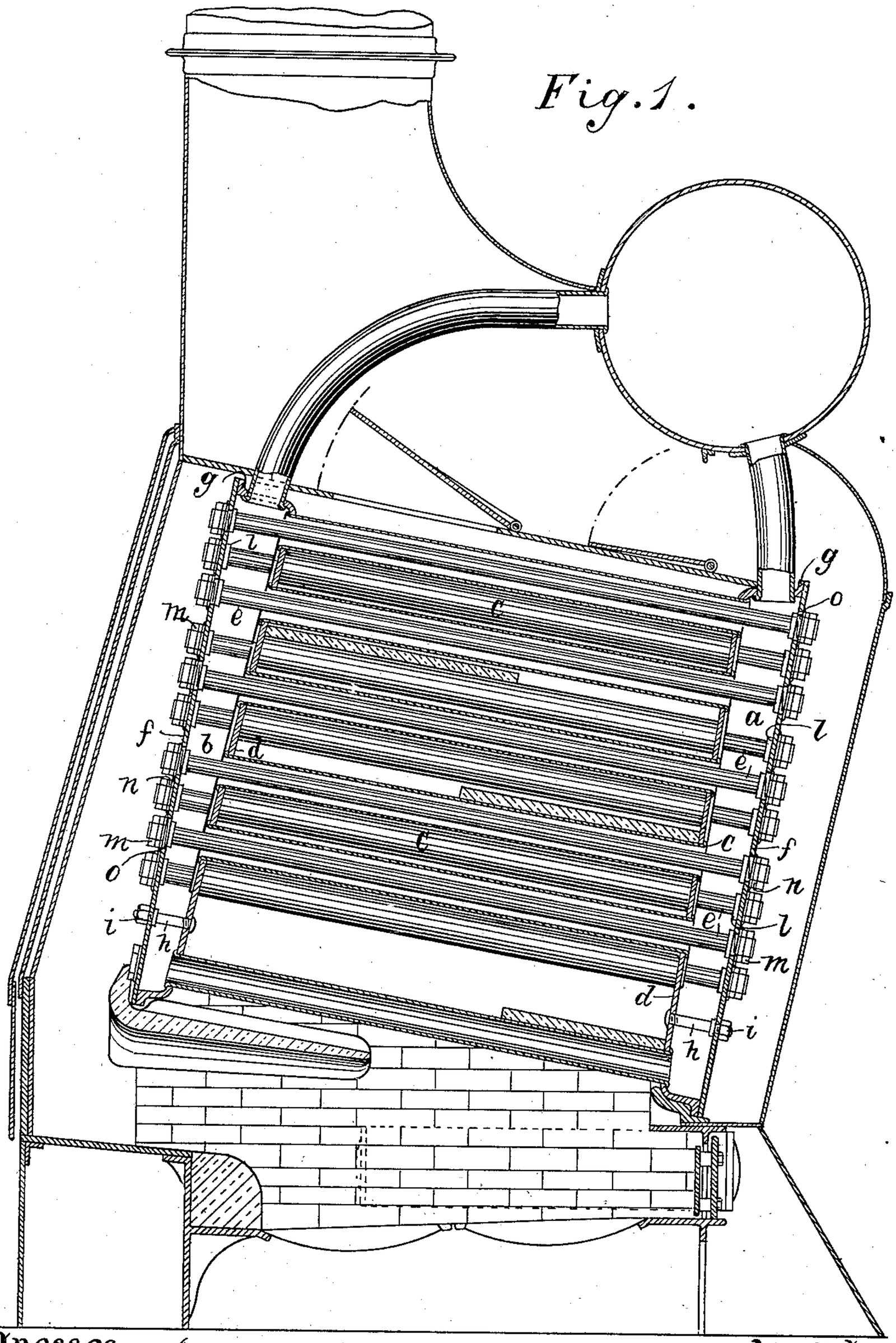
# J. HALLETT & G. HALLIDAY.

## STEAM GENERATOR.

(Application filed Jan. 20, 1900.)

(No Model.) 2 Sheets—Sheet 1.

*Fig. 1.*




Witnesses
Geo. E. Beck
Emily R. Beck

Inventors
Joseph Hallett
George Halliday
per Hubert E. Peck Atty

No. 661,868. Patented Nov. 13, 1900.

# J. HALLETT & G. HALLIDAY.

## STEAM GENERATOR.

(Application filed Jan. 20, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

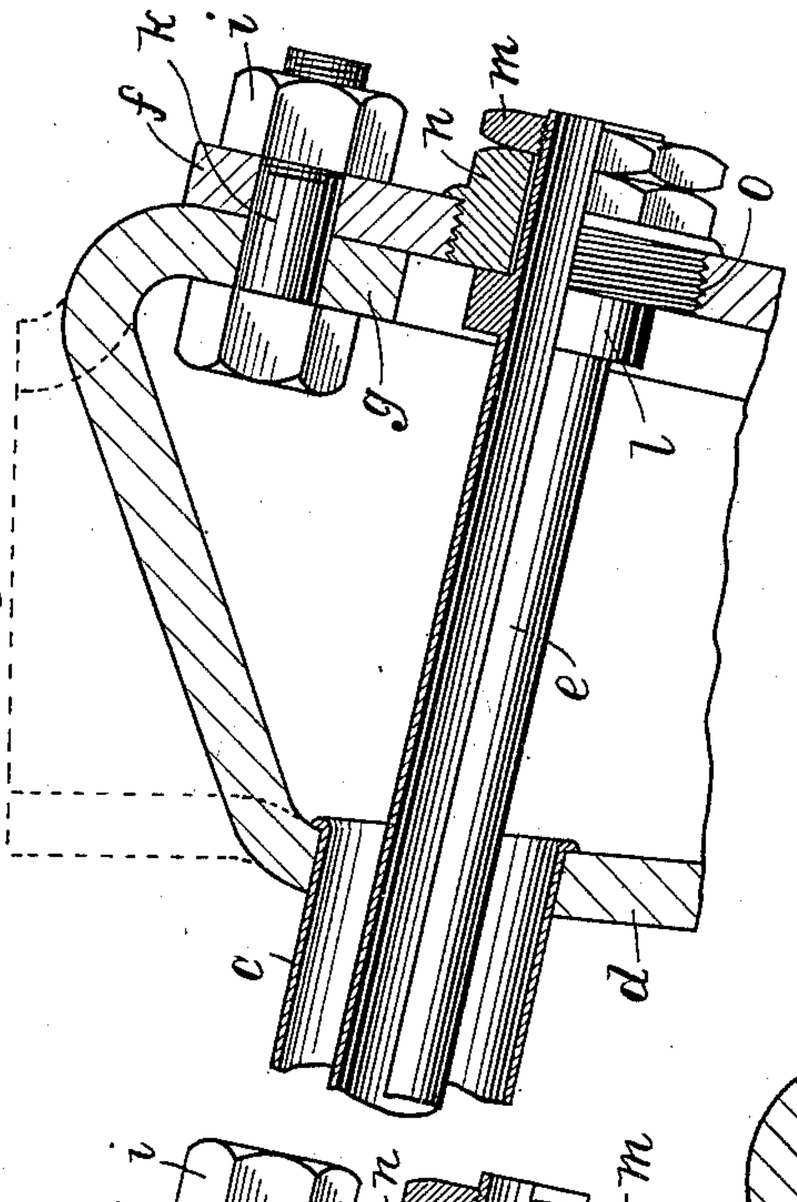



Fig. 2.

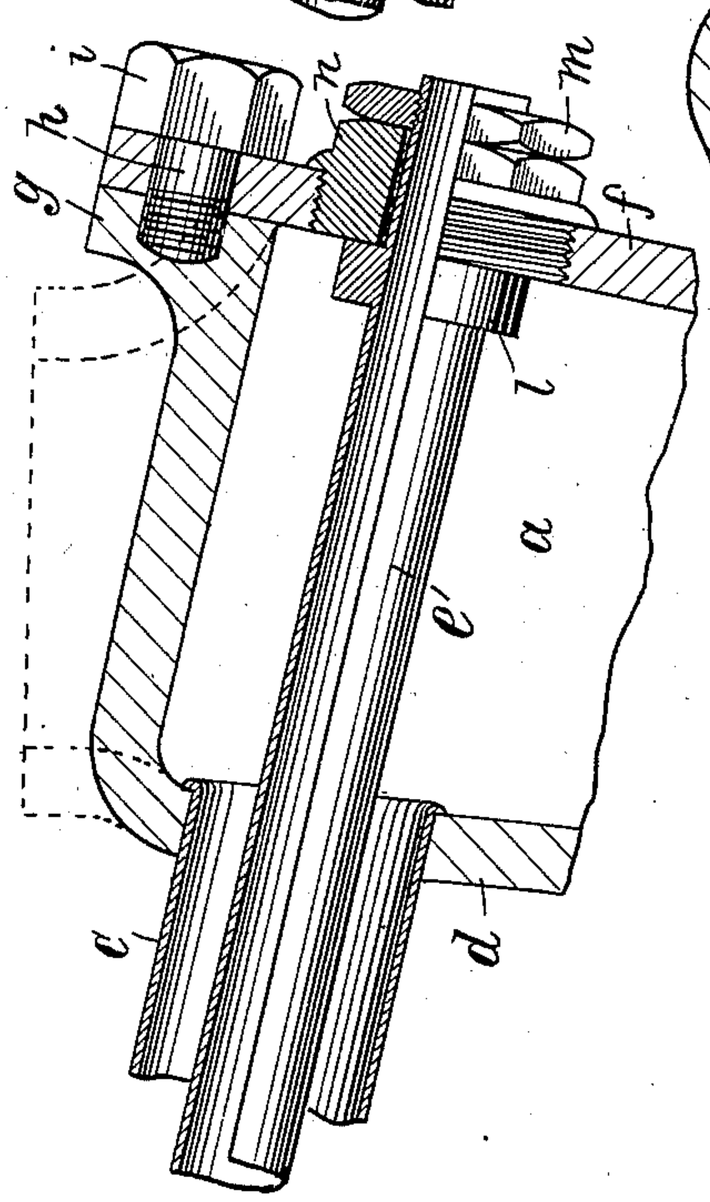
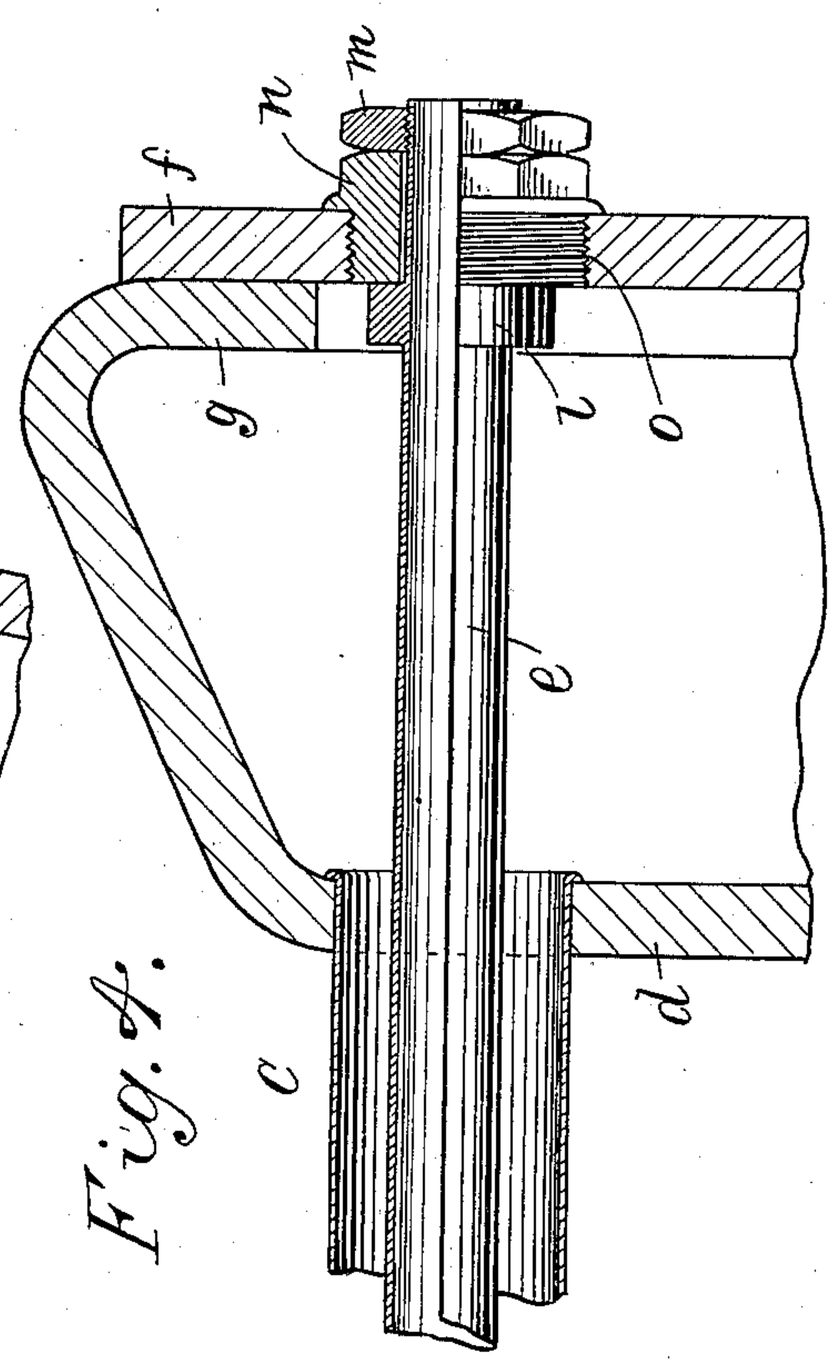



Fig. 4.




Witnesses.
Geo. E. Frech.
Emily R. Peck.

Inventors
Joseph Hallett,
George Halliday
per
Hubert E. Peck
Atty

# UNITED STATES PATENT OFFICE.

JOSEPH HALLETT AND GEORGE HALLIDAY, OF LONDON, ENGLAND.

## STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 661,868, dated November 13, 1900.

Original application filed October 2, 1899, Serial No. 732,364. Divided and this application filed January 20, 1900. Serial No. 2,136. (No model.)

*To all whom it may concern:*

Be it known that we, JOSEPH HALLETT and GEORGE HALLIDAY, subjects of the Queen of Great Britain and Ireland, residing, respectively, at the city of London and Bedford Square, London, England, have invented Steam-Generating Elements for Steam-Boilers, of which the following is a specification.

This invention has reference to water-tube boilers of the kind having one or more steam-generating elements or sections (hereinafter called "elements") arranged within a suitable casing and comprising or each comprising two water chambers or headers (hereinafter called "headers") connected to one or more steam and water drums arranged above them, inclined water-tubes connecting the inner walls of said headers and arranged above a fire grate or grates, and flue-tubes connecting the outer walls of the headers and extending centrally through the water-tubes or some of them, so as to form therewith annular water-spaces, the arrangement being such that flame and hot gases can pass over and among the water-tubes and also through the flue-tubes on their way to the chimney.

In such steam-generating elements it has heretofore been usual to make each of the headers practically in one piece as a casting or of a plate of wrought metal bent upon itself or of plates permanently fixed at the required distance apart by riveting and to introduce the water-tubes through holes in the outer plate and secure them in holes in the inner plate, the flue-tubes being subsequently fixed in the outer plates of the two headers. With this construction great difficulty is experienced in securely fixing the water-tubes in the inner plates or walls of the headers and access cannot readily be gained to such water-tubes for the purpose of cleaning, stopping, withdrawing, or replacing them or for gaining access to the interior of the headers for examining or cleaning the same.

Now this invention, which is a division of our application for Letters Patent, filed October 2, 1899, Serial No. 732,364, is designed to obviate the foregoing disadvantage, for which purpose the inner wall or plate of each header is dished and flanged, and the outer plate is fixed thereto by studs or bolts and nuts, so that it can be readily removed therefrom together, it may be, with the whole of the flue-tubes secured thereto if the other ends of such tubes be detached from the outer wall or plate of the opposite header.

Figure 1 of the accompanying illustrative drawings shows partly in end elevation and partly in transverse section a boiler having a steam-generating element constructed according to this invention. Figs. 2, 3, and 4 are enlarged sectional detail views.

*a* and *b* are the two headers, *c* the water-tubes secured to the inner walls *d* of the said headers, and *e* flue-tubes extending through the water-tubes *c* and connected, as hereinafter described, to the outer walls *f* of the headers.

To enable access to be gained in a simple and ready manner to the interior of the headers for inspecting and cleaning the same and for gaining access to the water-tubes *c* for the purpose of cleaning, stopping, or withdrawing and replacing such tubes, the inner wall *g* of each header is made of a dished shape and is provided with a removable outer wall *f*, that is attached to the flanged part *g* of the inner wall *d* by studs or bolts and nuts, the arrangement being such that the outer wall *f* can be easily removed when desired. In Figs. 1 and 2 the flanged part *g* is turned outwardly and the outer wall *f* is secured to it by studs *h* and nuts *i*. In Figs. 3 and 4, which are respectively part vertical and horizontal sections, the flanged part *g* is turned inward and the outer wall *f* is secured to it by bolts *k* and nuts *i*, as shown in Fig. 3.

To enable the flue-tubes *e* to be securely fixed in a simple and readily-detachable manner to the outer walls *f* of the headers *a* and *b*, each end of each flue-tube is provided with a collar *l* and nut *m*, that are adapted to be fixed against opposite sides of a plug *n*, which surrounds the tube end and is screwed into a hole *o* in the outer wall *f* of the header, the collar *l* being of such size as to admit of its being passed through the corresponding water-tube *c*. By making the plugs *n* and holes *o* of sufficiently large diameter the water-tubes *c* can be cleaned, stopped, or withdrawn and replaced, as may be desired, without removing the outer wall *f* of the header. By

fixing the flue-tubes *e* in the manner described such tubes can be easily detached from the outer wall *f* of one header and be simultaneously withdrawn from the water-tubes *c* by removing the outer wall *f* of the other header.

As will be obvious, various changes can be made in the details of construction of the elements without departing from the spirit and scope of the invention so long as the relative arrangement of parts shown in the drawings described in the specification is preserved.

What we claim is—

1. A steam-generating element having two headers and concentrically-arranged water and flue tubes connecting the same, each header comprising a single inner dished wall to which the water-tubes are secured, and provided with a flanged rim, and a separate single outer plane wall to which the corresponding ends of the flue-tubes are attached said outer wall being removably secured to the flanged rim of said inner wall, substantially as described.

2. A steam-generating element having two headers and concentrically-arranged water and flue tubes connecting the same, each header comprising a single inner dished wall to which the water-tubes are secured, and provided with a flanged rim, a separate single removable outer plane wall to which the corresponding ends of the flue-tubes are attached, and studs or bolts and nuts connecting said inner and outer plates, substantially as described.

3. A steam-generating element having two headers and concentrically-arranged water and flue tubes connecting the same, each header comprising a single inner dished wall to which the water-tubes are secured, and provided with a flanged rim, a single outer plane wall removably secured to said flanged rim and formed with holes arranged opposite the ends of said water-tubes, hollow plugs screwed into said holes, and flue-tubes extending through said water-tubes and through the holes in said plugs and carrying abutting parts bearing against opposite sides of said plugs, substantially as described.

4. A steam-generating element having two headers and concentrically-arranged water and flue tubes connecting the same, each header comprising a single inner dished wall to which the water-tubes are secured, and provided with a flanged rim, a single outer plane wall removably secured to said flanged rim and formed with holes arranged opposite the ends of said water-tubes, hollow plugs screwed into said holes, and flue-tubes extending through said water-tubes and through the holes in said plugs, and each provided at each end with a collar and nut abutting against the inner and outer sides respectively of the corresponding plug substantially as described.

5. In a steam-generating element having two headers and concentrically-arranged water and flue tubes connecting the same, the combination in each header of the inner wall *d* having the outwardly-inclined portion, and the inwardly-flanged portion *g* approximately parallel with the inner wall *d*, the removable outer plane wall *f*, and the bolts and nuts connecting said outer wall to said inwardly-flanged portion, substantially as described.

6. In a steam-generating element having two headers and concentrically-arranged water and flue tubes connecting the same, the combination in each header of the inner dished wall *d* the removable outer plane wall *f* formed with holes *o*, the hollow plugs *w* screwed into said holes, and the flue-tubes *e* extending through said plugs and provided with the collar *l* and nut *m* abutting against opposite sides of said plugs, substantially as described.

7. A steam-generating element comprising two headers each composed of a single dished inner plate having a flanged rim and a single outer plate detachably connected to the said flanged rim of the inner plate, water-tubes secured to and connecting the inner walls of said headers, screw-plugs extending through holes formed in each outer plate opposite water-tubes connected to said inner plate, each of said holes being of larger cross-sectional area than the water-tube opposite which it is located, flue-tubes extending through some of the water-tubes and through the corresponding screw-plugs and each formed near its ends with collars that are of smaller diameter than the internal diameter of the water-tube through which the flue-tube extends and which abut against the inner ends of the corresponding screw-plugs, and nuts screwed on the outer ends of said flue-tubes and abutting against the outer ends of said plugs, substantially as described.

Signed at 77 Cornhill, in the city of London, England, this 6th day of January, 1900.

JOSEPH HALLETT.
GEORGE HALLIDAY.

Witnesses:
WM. O. BROWN,
PERCY E. MATTOCKS.