(No Model.) 3 Sheets—Sheet 1.

J. A. HOPKINSON.

FLUE TUBE FOR STEAM BOILERS.

No. 305,593. Patented Sept. 23, 1884.

Fig. 1.

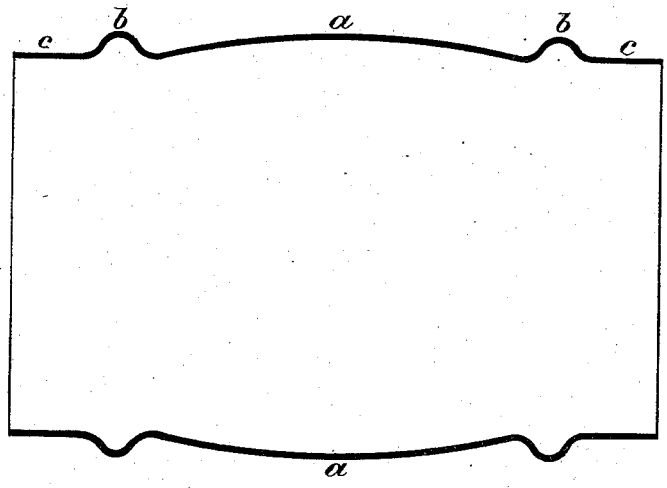
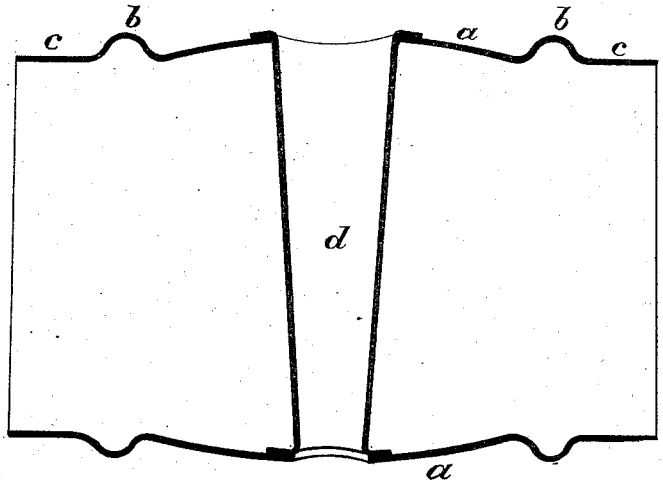


Fig. 2



Witnesses.
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(No Model.) 3 Sheets—Sheet 2.

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FLUE TUBE FOR STEAM BOILERS.

No. 305,593. Patented Sept. 23, 1884.

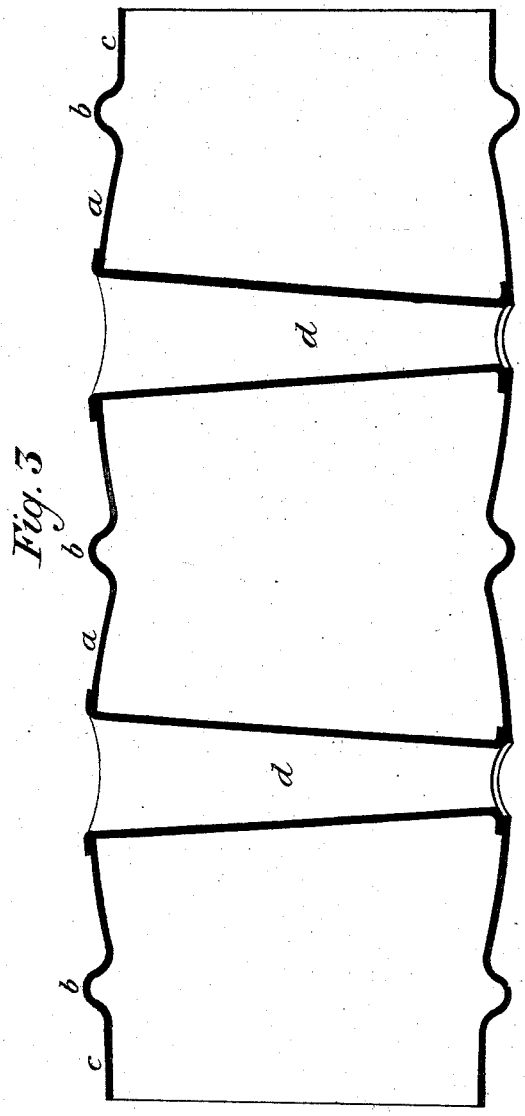

Fig. 3

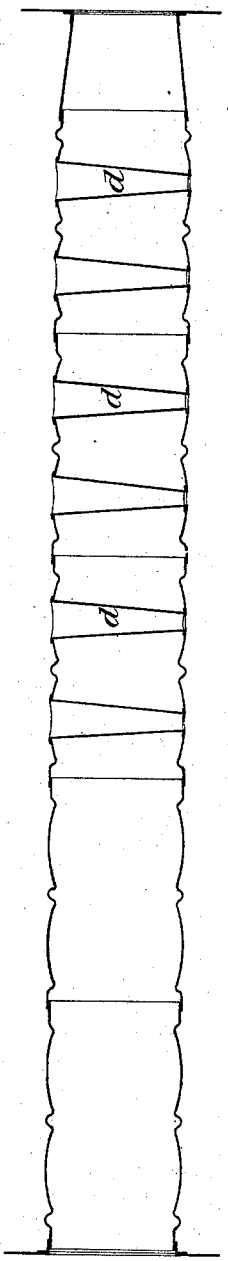

Fig. 3b.

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(No Model.) 3 Sheets—Sheet 3.

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FLUE TUBE FOR STEAM BOILERS.

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Fig. 6.

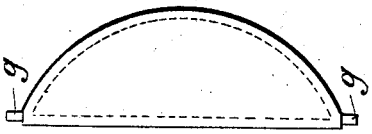


Fig. 5

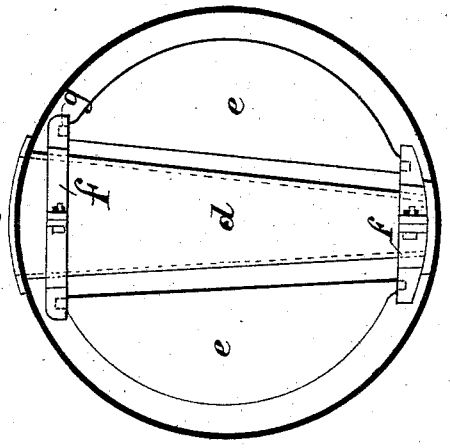


Fig. 3a.

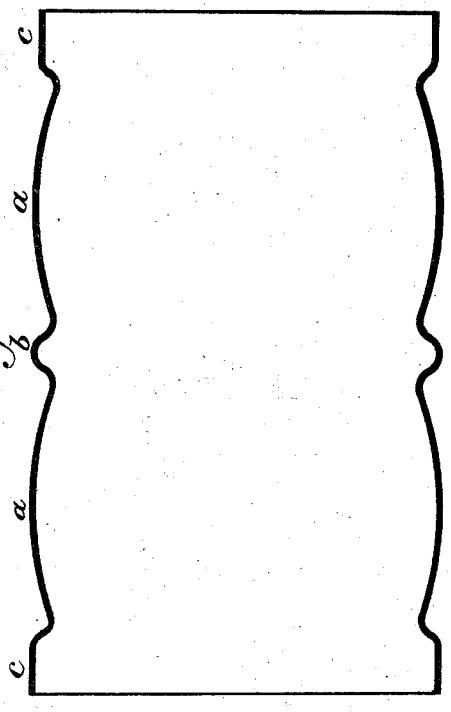
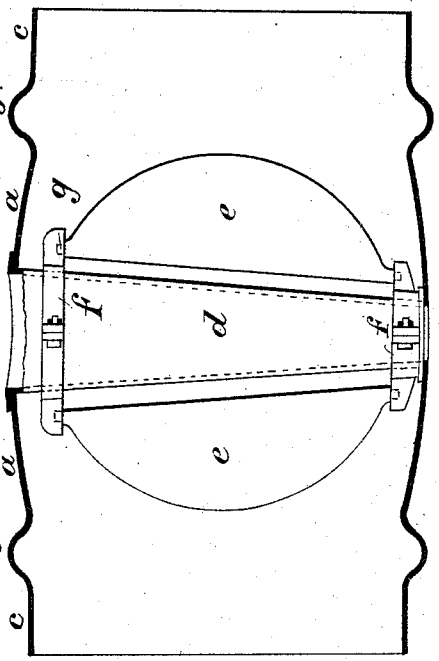


Fig. 4.



Witnesses.
Jos. L. Coombs
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UNITED STATES PATENT OFFICE.

JOHN ADDY HOPKINSON, OF HUDDERSFIELD, ENGLAND, ASSIGNOR OF ONE-HALF TO JOSEPH HOPKINSON, OF SAME PLACE.

FLUE-TUBE FOR STEAM-BOILERS.

SPECIFICATION forming part of Letters Patent No. 305,593, dated September 23, 1884.

Application filed November 6, 1883. (No model.) Patented in England May 1, 1883, No. 2,209.

To all whom it may concern:

Be it known that I, JOHN ADDY HOPKINSON, of Huddersfield, England, engineer, have invented new and useful Improvements in and Relating to Flues or Flue-Tubes for Steam-Boilers, (for which I have obtained a patent in Great Britain No. 2,209, bearing date May 1, 1883,) of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to flues or flue-tubes for steam-boilers.

One part of my said invention consists in so constructing the said flue-tubes that separate strengthening hoops, rings, or flanges may be dispensed with and conical or other water-circulating tubes or pipes can be readily inserted and efficiently secured in the said flue-tubes.

Another part of my invention, which is applicable, generally, to flues having transverse circulating-pipes, is designed to provide means whereby the flame and heated products of combustion will be more effectually caused to impinge upon the surfaces of the said flues and circulating-pipes than in any heretofore known or existing arrangements of such flues and pipes.

According to my invention I construct a flue-tube with one or more longitudinally-protuberant bulbous or convex portions—that is to say, with a portion or portions whereof the longitudinal section is delineated by convex lines, the curves being preferably segments of a circle. At one end (in some instances at each end) of the said curved portion is a ring somewhat resembling in appearance a so-called "Bowling" hoop, but made integral with the flue-tube instead of being riveted thereto. The circulating-pipes are inserted in the largest part of the said protuberant or curved portions, and are riveted, welded, or otherwise secured in the same. By constructing the flue-tubes in this manner I impart to them great strength, and in joining two lengths of tube I require only one line of ring-seam rivets instead of the two lines of such rivets which are required with hoops applied in the ordinary manner. To increase the useful effect of the heat in the flue, I provide, in combination with one or more of the circulating-pipes, devices which I term "baffle-plates"—that is to say, semi-circular or other suitably-shaped plates which serve to retard and distribute the heat. The said plates are so formed that they occupy the greater part of the cross-sectional area of the flue, so that they will close the flue with the exception of passages or spaces, hereinafter described. But the said plates are fitted to turn upon or around or partially around the circulating-pipes, so that they can be adjusted to regulate the area of the flue-space, or can be set parallel with the axis of the flue-tube to permit a man to pass through the latter on either side of the circulating-pipe.

My improvements are illustrated in the accompanying drawings, in which Figure 1 is a longitudinal central section of a tube to serve either as a boiler furnace or flue or any part thereof. Fig. 2 is a longitudinal section of a similar tube provided with a transverse circulating-pipe. Fig. 3 is a longitudinal section of a flue-tube, constructed with two protuberant or bulbous portions, and rings or hoops formed integrally therewith, the said tube being provided with transverse circulating-pipes. Figs. 3^a 3^b illustrate modifications in the construction of these tubes. Fig. 4 is a longitudinal section of a flue with a circulating-pipe fitted with the aforesaid baffle-plates. Fig. 5 is a transverse section of Fig. 4. Fig. 6 is a side view illustrating a modification in the construction of these baffle-plates.

Like letters indicate the same parts throughout the drawings.

a a are the protuberant or bulbous portions of the tube. *b b* are the rings or hoops formed integrally with the same. *c c* are the ends or plain portions through which are passed the rivets for uniting these tubes when two or more of them are required to form a boiler-flue. In the form of tube shown in Fig. 3^a the ends are constructed to make what we term a "thimble lap-joint," which may be riveted or welded. By our improved construction we obviate the necessity of providing at the ends of the bulbous portions of the tubes flanges which would be always liable to fracture at

the angles by the expansion and contraction of the flue. Fig. 3ᵇ, which is drawn to a reduced scale, shows a complete boiler-flue consisting of tubes formed as in Fig. 3ª. *d d* are the transverse circulating-pipes. *e e* are the baffle-plates mounted thereon. To support these plates I provide two rings or annular clamps, *f*, of cast-iron or other suitable material formed in two pieces, so that they can be conveniently fitted upon the circulating-pipes *d*, and secured by bolts and nuts or cotters. These clamps *f* are made with holes or recesses to receive projections *g* on the said plates, which are thus provided with pivots or hinges. The said baffle-plates *e* may be made of cast-iron, brick, fire-clay, tile, asbestus or other suitable material. The said pivots permit each plate to be turned upon its axis, so as to present it to the action of the heated gases at any desired angle, and also permit it to be adjusted for enabling any person employed in cleaning the flue to turn the baffle-plates parallel with the axis of the flue, so that he can pass conveniently through the flue at the side of the said baffle-plate. I prefer that the said baffle-plates should be so constructed and arranged as to leave a space between their straight or inner edges and the circulating-tubes on which they are mounted, to allow the heated gases to come in contact with the said circulating-tube and to pass between the same and the plates, so as to economize to the fullest extent the thoroughfare of heat for evaporative duty. The manner of fixing or mounting the said baffle-plates may be varied; but preferably, when the plates are formed of brick or like material, I adopt the construction shown in Fig. 6, in which the plate has around its periphery a groove or recess into which I fit an encircling metal band, strap, or holdfast provided with pivots *g*, for mounting it on or attaching it to the rings or clamps *f*, at the upper and lower portions of the circulating-pipe. The flanges inclosing the groove in the baffle-plate, if extending around its entire periphery, shield the metallic strap or holdfast from the action of the flame or heated gases. In some instances I secure the said baffle-plates to the rings or annular supports by passing bolts through holes extending from their outer to their inner sides, the said bolts being screwed into a metallic piece adjoining the circulating-tube; or I may adopt any other convenient manner of securing the said plates and supporting them upon the said rings, so that they will be adjustable with or upon the same.

It is obvious that I can apply this part of my said invention to the flues of existing boilers in which circulating-tubes are employed.

Having thus fully described my said invention and the manner of performing the same, I wish it understood that I do not claim, generally, the use in a boiler-flue of plates for baffling or obstructing the passage of the heat, as I am aware that such devices have been employed, although not in combination with the circulating-tubes as herein described, nor do I claim a corrugated tube nor a bulbous tube broadly; but

What I claim is—

1. A furnace or flue tube consisting of one or more protuberant, bulbous, or longitudinally-convex portions having formed integrally therewith, between its ends or meeting flanges, a raised portion, *b*, resembling in form a Bowling hoop or ring, substantially as described.

2. A furnace or flue tube consisting of one or more protuberant, bulbous, or longitudinally-convex portions having formed integrally therewith, between its ends or meeting flanges, a raised portion, *b*, resembling in form a Bowling hoop or ring, in combination with transverse circulating-pipes passing through the tubes and secured thereto, substantially as described.

3. A heat-distributing or baffling device consisting of a plate or plates of metal, fire-clay, asbestus, brick, or other suitable material mounted adjustably on a circulating-pipe within a flue, substantially as and for the purposes specified.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

JOHN ADDY HOPKINSON.

Witnesses:

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