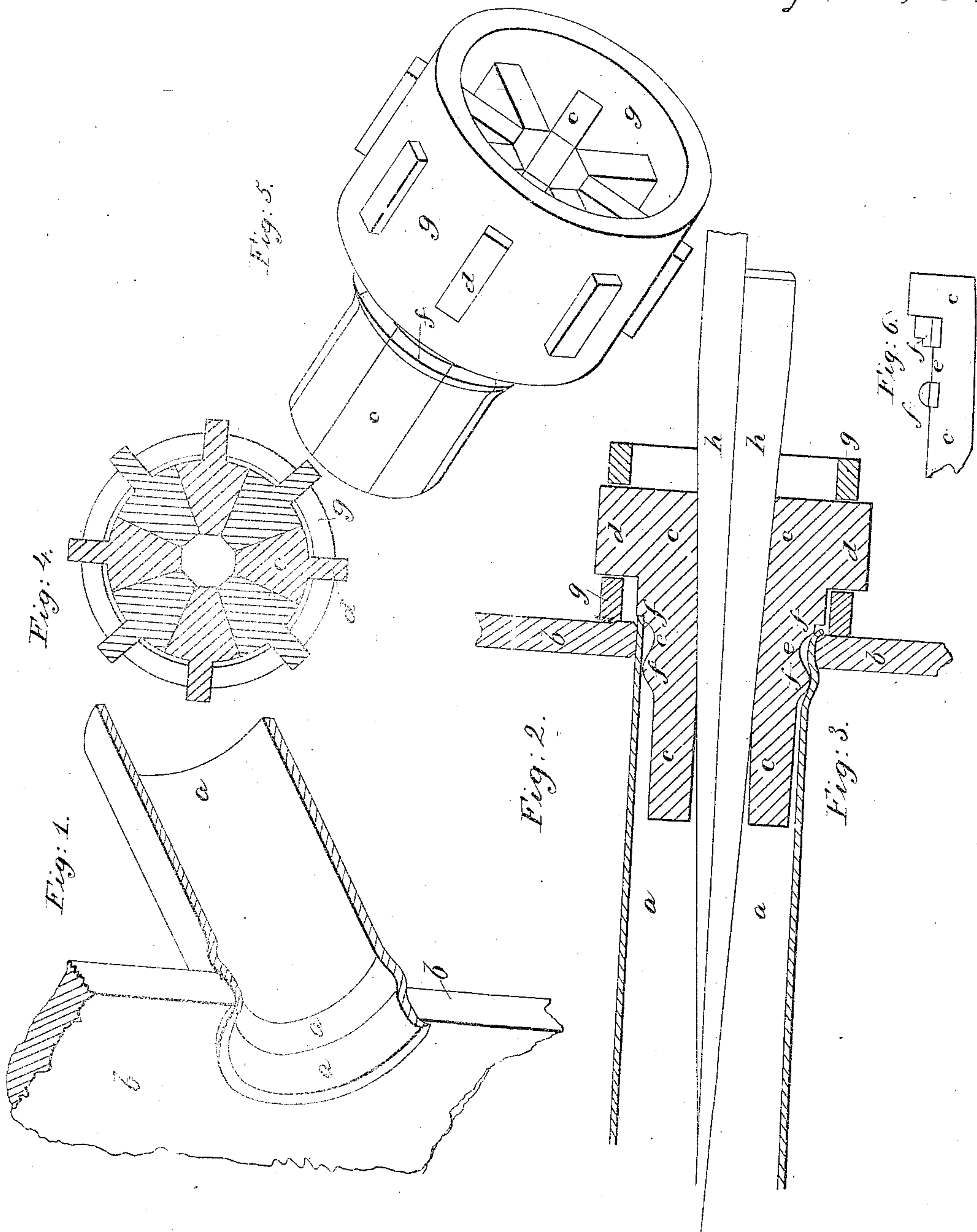


T. Prosser,
Pipe Expander.
N^o 6,360.
Patented Apr. 17, 1849.



UNITED STATES PATENT OFFICE.

THOMAS PROSSER, OF NEW YORK, N. Y.

TOOL FOR ATTACHING TUBES TO BOILERS.

Specification of Letters Patent No. 6,360, dated April 17, 1849.

To all whom it may concern:

Be it known that I, THOMAS PROSSER, of the city, county, and State of New York, have invented a new and Improved Mode of Fastening the Tubes into the Tube-Sheets of Boilers; and I do hereby declare that the following is a full and exact description.

Figure 1, is an isometrical section through the center at one end of a tube (*a*), showing that it is secured to the tube sheet (*b*) by means of the projections or swellings produced on the external periphery of the tube (*a*) on both sides of the tube sheet (*b*). Fig. 2 is a half section of a tube, with a piece of the tube sheet ready for the operation of expanding the tube, so as to appear like Fig. 1, by means of the segment (*c*) having rectangular projections at (*d*) for the purpose of keeping the segments at uniform distances from each other (when expanded) by means of mortise holes cut into the mortise rings (*g*) for that purpose, when the mandrel (*h*) is driven in among the segments. Fig. 3 is the same as Fig. 2 but after the operation of expanding or double calking has been performed.

It is important to observe that the part of the segment marked (*e*) although it is opposite to the tube sheet where the real joint is made, does not touch the tube, but that the parts or projections marked *f* and *f* are alone available for that purpose, by exciting the elasticity of the metal in a longitudinal direction, while at the same time the tube is enlarged until the hole in the tube sheet is entirely filled, but note, that when the tool is removed there is no tendency in the tube to contract in diameter opposite the tube sheet (as is the case when a mere plug or common calking tool is used, which has a tendency either merely to crush the metal, or to loosen one part by the operation of fastening another) because the longitudinal extension of the tube tends to reduce it in diameter within the hole in the tube sheet, while the expansion of the tube on both sides of the tube sheet has a contrary effect; when therefore the tool is removed the elasticity of the metal causes the tube to enlarge somewhat within the tube sheet and the projection on the tube to close upon it and thus a most perfect joint is produced, and the great difficulty heretofore existing with regard to the fitting in iron tubes is obviated and the objections no longer exist which were pointed out by Professor W. R. John-

son at the monthly meeting of the Franklin Institute held ——— 17th, 1847, as related in the 14 vol. of the Journal of the Franklin Institute, page 112.

Fig. 4 is a cross section of the tool through the line *x* Fig. 3.

Fig. 5 is an isometrical view of the tool but without the mandrel. The mandrel is simply a conical or pyramidal plug tapering about 1 in 10 which is driven in among the segments.

In using the tool the following instructions should be attended to. The holes in the tube sheets should not be larger than is absolutely necessary to get the tubes in, and those holes through which the tubes are first to be passed should be rather larger than the others. The tubes should be driven in when necessary with a piece of hard wood against the ends of them, to receive the blows of the hammer. The tube sheet for a two inch tube is calculated to be three-eighths of an inch thick, and countersunk on each side the thirty-second part of an inch, so as to make the cylindrical part of the hole two inches in diameter and five-sixteenths of an inch long; but if the tube sheet is more than three eighths of an inch long the countersink must be more also and in the same proportion; for one and-a-half and one and three-fourth inch tubes, the tube sheet should be five-sixteenths of an inch thick. The tube should project one tenth of an inch in front of the tube sheet, and a sledge hammer being held against one end, the tool should be used at the other, care being taken that the segments are all free to act before striking the mandrel, which must be driven up until the tube is expanded a little, and then tapped on the sides and well shaken to free the segments so that the tool will turn round one sixteenth of a revolution, and thus bring the center of each segment opposite to that part of the tube which the tool could not reach in the previous operation. This should be repeated five or six times with care, both with regard to turning the tool round correctly one sixteenth of a revolution after each loosening of the mandril, and also driving up the mandrel by degrees, to facilitate which the tool should be well payed and also the inside of the tube with grease and plumbago.

In some cases there may not be space enough to admit of a blow being given with

a hammer, and a modification of the tool then becomes necessary, and consists in running the mandrel through the whole length of the tube, having a finely pitched screw on the end and a long nut which may be screwed up by means of a pall-wrench, the nut working against a thick hardened steel washer, bearing against the opposite end of the tube to the one to be expanded; or the mandrel may be reversed, and so pulled through by similar means at the end to be expanded; in which case the hardened steel washer, must bear against the mortise guide ring; or still another method may be employed, to wit; a crosshead with a screw through it bearing against the mandrel, while another crosshead bears against the other end of the tube; or that also may have a tool placed in it, and so expand both ends at one operation, either from one or both ends; in either case the two crossheads may be connected together by long bolts passing through the boiler or otherwise.

Having thus fully described the tool, and the method of using it; I declare my invention to consist of an improvement in the tool or tools, and the method used for the purpose of calking, fixing, or securing the tubes of steam boilers or other vessels, to the tube sheets, by expanding their whole periphery simultaneously on both sides of the tube sheet at one and the same operation, which has heretofore been done by expanding a part only of the periphery at once, and that only on one side of the tube sheet.

Although it is desirable that the whole of the internal periphery of the tube should be supported as nearly as is practicable at the commencement of the operation of expansion, it is obvious that such cannot be the case after the expansion has taken place, and therefore, the tube is not supported by absolute contact with the segments at that

time, should any difficulty however arise from this circumstance it may be obviated by the use of expansion rings, of the form of the projections and in the place of those on the segments, in the manner shown in Fig. 6 or in any other manner analogous thereto.

The rings which form the projections instead of those on the segment, are marked the same as before described on Fig. 2, and need no other, being simply volutes similar to the rings used for keeping the keys of locks together and overlapping on the periphery or otherwise.

What I claim as my invention, and desire to secure by Letters Patent is—

1. The combination of the guide ring, having mortises therein, with the segmental expanders, and conical or pyramidal mandrel; constructed and operating substantially as herein described.

2. I claim as separate and component parts of the same, the double projections on the segments, having a hollow between them to be placed opposite to the tube sheet while the tube is being expanded within it.

3. I claim the guide ring, and the mortises in the same, together with the projections on the segments to fit into them; I do not however confine myself to any specific number of segments, form of projection on the segments to fit into the mortise guide ring, or position of the mortise guide ring itself, which may be placed inside the tube if required.

All in the manner, and for the purpose substantially, as hereinbefore fully described and set forth.

THOS. PROSSER.

Witnesses:

WILLIAM BRUNTON,
THOS. PROSSER, Jr.