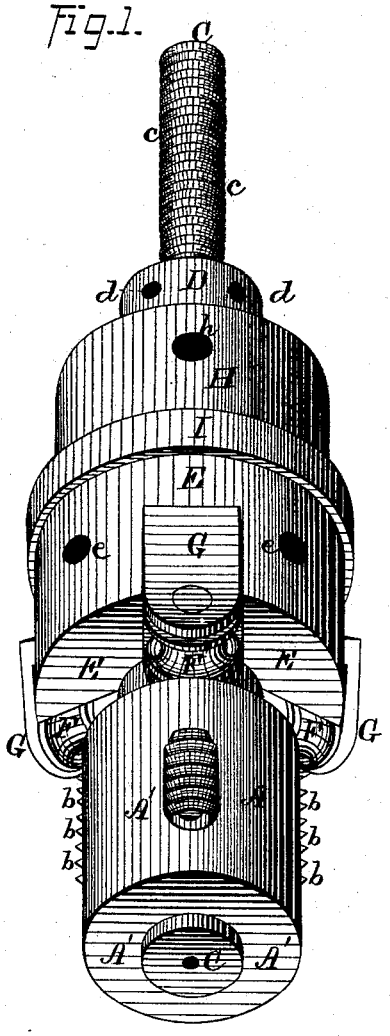
2 Sheets--Sheet 1.

P. FITZGIBBONS.
Tube-Expander.

No. 165,320. Patented July 6, 1875.

Fig. 1.



WITNESSES-

Jas. E. Hutchinson

John R. Young

INVENTOR-

P. Fitzgibbons, by

Prindle and Lysle Attys

2 Sheets--Sheet 2.

P. FITZGIBBONS.

Tube-Expander.

No. 165,320.

Patented July 6, 1875.

Fig. 2.

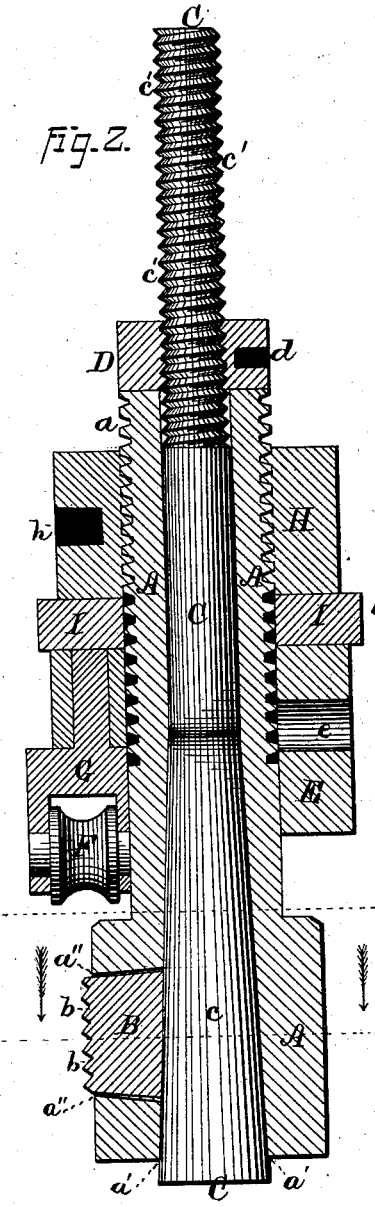


Fig. 3.

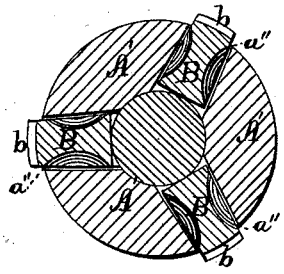
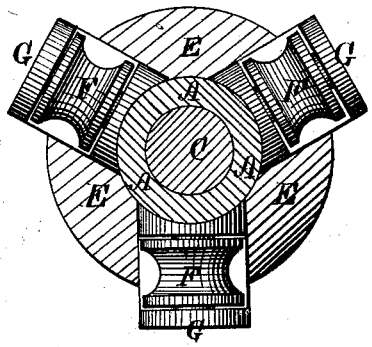


Fig. 4.



WITNESSES:

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UNITED STATES PATENT OFFICE.

PATRICK FITZGIBBONS, OF OSWEGO, NEW YORK.

IMPROVEMENT IN TUBE-EXPANDERS.

Specification forming part of Letters Patent No. **165,320**, dated July 6, 1875; application filed March 15, 1875.

To all whom it may concern:

Be it known that I, PATRICK FITZGIBBONS, of Oswego, in the county of Oswego and in the State of New York, have invented certain new and useful Improvements in Tube-Expanders; and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of my improved device as arranged for use. Fig. 2 is a central longitudinal section of the same; and Figs. 3 and 4 are cross-sections upon lines *x x* and *y y*, respectively, of Fig. 2.

Letters of like name and kind refer to like parts in each of the figures.

The design of my invention is to render more easy and certain the operation of beading the ends of boiler-flues; and it consists, principally, in the means employed for securing the mandrel or frame of the device within a flue, substantially as and for the purpose hereinafter specified. It consists, further, in the device as a whole, its several parts being combined to operate in the manner and for the purpose hereinafter set forth.

In the annexed drawings, A represents a round mandrel, having at one end an enlargement, A′, and provided upon the periphery of its smaller portion with a screw-thread, *a*, which extends from its end nearly to said head. Within the mandrel A is formed a central longitudinal opening, *a′*, which extends entirely through the same, and, for about one-half its length within the head portion, has a regularly-increasing diameter from within outward. At equidistant points within the head A′ are formed three radial slots, *a″ a″*, &c., within each of which is placed a block, B, that has slightly-greater radial dimensions than said head from the opening *a′* outward, and upon its outer face is provided with serrations or teeth *b b*, &c. A mandrel, C, corresponding in general size and shape to the like features of the opening *a′* within the hollow mandrel A, but having considerably greater length, is fitted into said opening, and, at its largest tapered portion *c*, furnishes a bearing for the inner faces of the blocks B B, &c. The smaller end of the mandrel C is provided with a screw-thread, *c′*, and upon the same is fitted a nut, D, which, when turned downward, bears against the corresponding end of the hollow mandrel A, and draws said inner mandrel C longitudinally through the same, such movement causing a larger portion of the tapered portion *c* to be brought between the inner faces of the blocks or jaws B and B, so as to move the latter radially outward.

As thus constructed, it will be seen that by placing the head A′ within the end of a tube, and expanding the jaws, the latter may be caused to engage so firmly within the interior of said tube as to prevent their displacement by any strain less than would cause breakage.

The smaller portion of the hollow mandrel A, which, when in position, projects beyond the end of a boiler-tube, furnishes a bearing for a cylindrical head, E, which fits loosely over, and may be revolved upon, said part. Three rollers, F F, &c., each provided within its periphery with a half-round groove, *f*, are pivoted within suitable bearings G G, &c., that are secured within the end of the head E adjacent to the head A′, the axis of each roller being placed upon a line radially with the center of motion of said head E. A nut, H, fitted upon the threaded portion *a* of the hollow mandrel A, furnishes a means whereby the revolving head E may be pressed toward the head A′. In order that the friction between said head E and nut H may not cause the latter to turn, a washer, I, is interposed between said parts. Suitable radial holes *d*, *e*, and *h*, respectively, provided within the nut D, head E, and nut H, for the insertion of pins for rotating said parts, complete the device, the operation of which is as follows:

The end A′ of the mandrel A is inserted within the end of a boiler-tube, and locked in position, after which the nut H is turned inward until the rollers F F, &c., bear against the end of said tube, and the head E rotated, so as to cause said rollers to travel around said end. The nut H is moved slightly inward at each revolution of the head E, so as to cause a considerable pressure of the rollers F F, &c., to be constantly maintained upon the end of the tube, by which means the latter is gradu-

ally upset or beaded until a steam-tight joint is formed between said flue end and the flue-sheet.

There being no outward support required for the device, it is capable of use in places where, from lack of space, other forms of tools could not be employed, and, in addition thereto, can be used in any place with as great economy of time and labor as can tools of other construction.

I am aware that radially-moving jaws, operated by means of a tapering central mandrel, are not new, and therefore do not claim the same, broadly.

Having thus fully set forth the nature and merits of my invention, what I claim as new is—

1. In combination with the hollow mandrel A A′, provided with the radial openings *a″ a″*, &c., the toothed jaws B B, &c., placed within said openings, and the mandrel C, fitted into the axial opening *a′* within said mandrel A, provided with the nut D, and having its tapered portion *c* bearing against the inner faces of said jaws, substantially as and for the purpose specified.

2. The mandrel A, A′, *a*, *a′*, and *a″*, the jaws B B, &c., the mandrel C *c c′*, the head E, carrying the grooved rollers F F, &c., the nuts D and H, and the washer I, all constructed and combined to operate in the manner and for the purpose substantially as set forth.

In testimony that I claim the foregoing, I have hereunto set my hand this 8th day of March, 1875.

PATRICK FITZGIBBONS.

Witnesses:
WILLIAM TIFFANY,
EDMUND QUILK.