R. Blackwood,

Pipe Expander.

No. 42,159. Patented Apr. 5, 1864.

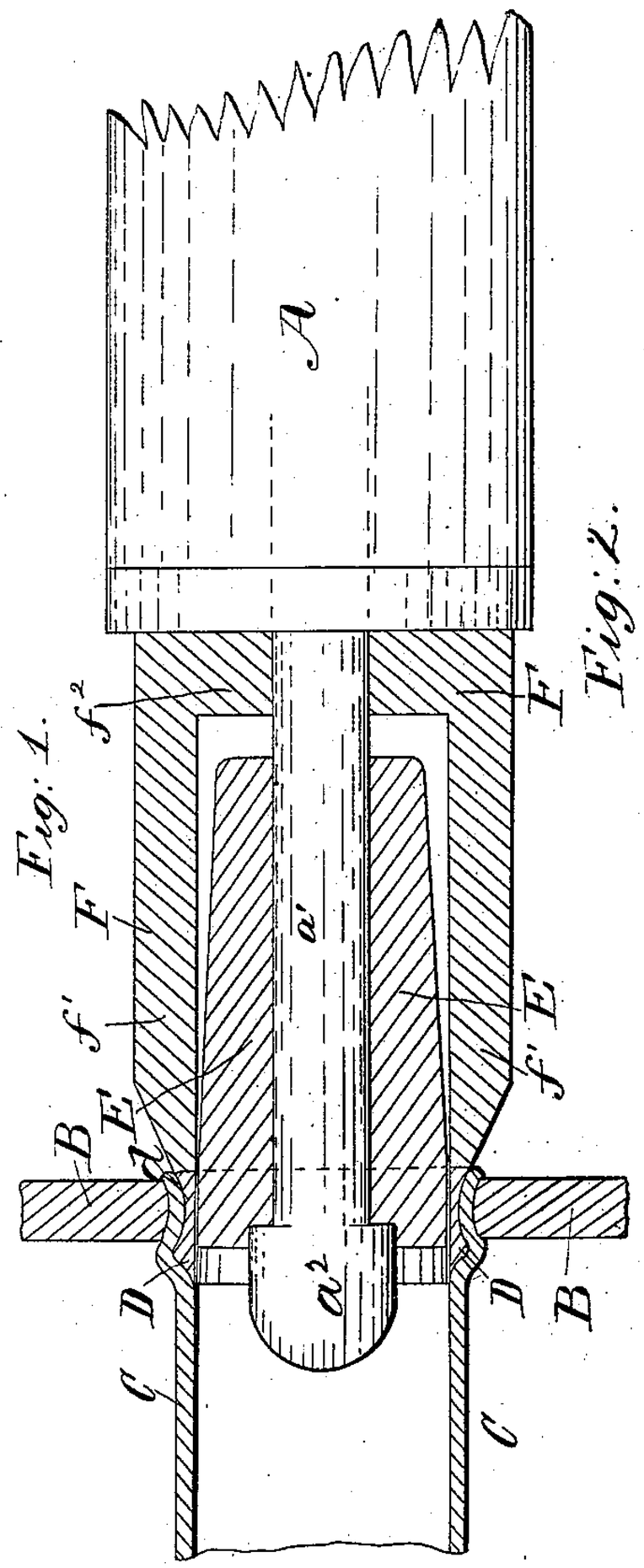

Fig. 1.

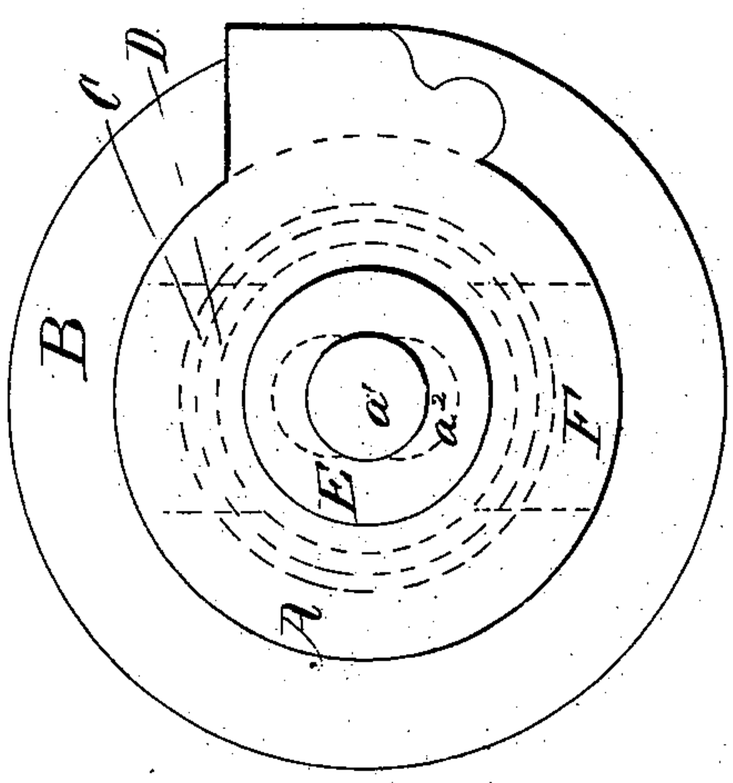

Fig. 2.

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REUEL BLACKWOOD, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVED METHOD OF EXPANDING TUBES IN TUBE-SHEETS.

Specification forming part of Letters Patent No. **42,159**, dated April 5, 1864.

To all whom it may concern:

Be it known that I, REUEL BLACKWOOD, of the city of Philadelphia, in the State of Pennsylvania, have invented a new and useful Improvement in the Mode of Expanding the Ferrules in Securing Flues in Tubular Boilers; and I do hereby declare that the following is a full and exact description of the construction and operation of the same, reference being had to the accompanying drawings, making a part of this specification, and to the letters of reference marked thereon.

My invention relates to the application of the grooved ferrules, intended for securing the ends of the flues in the tube-sheets of locomotive and other tubular boilers, patented by J. H. Knickerbocker, June 24, 1862; and it consists in the employment of hydraulic pressure for the purpose substantially in the manner hereinafter described and specified.

In the drawings, A is a portion of a small or portable hydraulic hand-press, having on the projecting stem a' of the main piston an oblong or T head, a^2; B, a portion of the tube-sheet of a boiler, and C one of the tubes or flues, as secured therein; D, the grooved ferrule; E, an adjustable hollow conical frustum, and F an adjustable clamp, represented as abutting both against the ferrule D and the main cylinder-head of the press A. The main cylinder of the press A may be made about eight or ten inches long and three inches diameter, (more or less,) and the whole press constructed so as to be easily operated by a hand-lever in the usual manner, but with a head, a^2, on the main stem a', and so, also, that after the stem has been pushed out to its full extent it can be retracted by the positive power of the press. The said head a^2 is oval or oblong in its transverse position on the stem, and the hole in the conical frustum E is of the same form, though a little larger in its transverse direction, so that the said head and stem may be easily passed through the frustum and then turned a quarter round therein to bring the larger diameter of the said head across the oval hole in the frustum, and thus prevent the withdrawal of the stem in a longitudinal direction when the whole apparatus is in operation. The frustum E is about three inches long, and its larger diameter at least equal to the inner diameter of the tube or flue C, while its smaller diameter is a little less than the inner diameter of the ferrule D before the latter has been stretched in its application, as represented in Figure 1.

The clamp F consists of a pair of springy steel arms, f' f', projecting from a boss, f^2, through a hole in which latter the stem a' of the press may slide, as represented in Fig. 1. The arms f' f' are curved in their transverse section at their ends, and are also made so that while they will fit over the smaller end of the frustum E in their normal state they will also yield apart sufficiently for the reception of the larger end of the same as the said frustum is gradually drawn between them in the operation of expanding the ferrule D, as will hereinafter be described. The ferrule D has a curved groove, d', around in its outer side, and its greatest exterior diameter is such as will just permit it to be easily slipped into the open end of the tube or flue C before the latter is expanded, and the hole through the boiler-sheet B, for receiving the end of the said tube, exceeds the said exterior diameter of the latter by a little less than twice the thickness of the shell of the ferrule at its groove d', so that after the flue has been secured in the sheet D, as will be immediately described, the inner surfaces of the said ferrule and flue will be even or of equal diameters, as seen in Fig. 1.

Operation: The flue C having been inserted in its appropriate hole in the sheet B, and the stem a' of the press A having been pushed out to its full extent, with the clamp F applied thereto, the ferrule D is slipped upon the smaller end of the frustum E, and the latter then slipped over the head a^2 of the stem a', entering the stem at the smaller end of the frustum, until the said head has passed entirely through it, when the said frustum is then turned a quarter round thereon, and the stem thus consequently secured against being withdrawn by a longitudinal motion. The parts being thus connected together are lifted up and the frustum and ferrule inserted into the tube C until the thicker end of the ferrule thereon is brought flush with the end of the tube C, when the press is operated by means of its appropriate hand-lever, and one end of the clamp F abutting against the end of the ferrule D, while its other end abuts against the main cylinder head of A, until the frustum has been drawn entirely through the said fer-

rule, and thus the latter, together with the end of the tube C, expanded as desired, or as represented in Fig. 1.

The grooved ferrule D produces the best fastening known for the purpose of securing the end of the flues of tubular boilers; but the difficulties hitherto attending their expansion in place have prevented their general use, a screw and nut, with an operating-lever necessarily five or six feet long, being the only means found sufficient for the purpose, and consequently the said ferrules could not, for want of sufficient room in the fire-chamber, be expanded in any of the tubes or flues which were not opposite to the fire-door opening, to say nothing of the constant liability of the screw-threads to be stripped in the operation. It will be seen that my mode, as herein described, obviates these difficulties entirely, because the small hydraulic press can be readily introduced, handled, and operated, as described, entirely within the fire-chamber of a locomotive or other tubular boiler, and the pressure required to expand the ferrules afforded by the expenditure of a small amount of hand-power.

The clamp F may be made in the form of a hollow cylinder, divided longitudinally into three or four parts, so as to permit it to expand with the ferrule as the frustum is drawn forward; but it is believed the form first described is the more simple and inexpensive of construction and quite as effective. I therefore do not intend to confine myself in the construction of the different parts to the precise forms set forth in the drawings, as it is obvious that variations may be made in the forms of the different parts without deviating from the principle of their mode of operation; but,

Having fully described my improvement and pointed out its superior utility, what I claim as new therein of my invention, and desire to secure by Letters Patent, is—

The employment of a hydraulic press, provided with a head, a^2, on its projecting main stem a', in combination with the frustum of a cone, E, and a suitable clamp, F, arranged to operate together, substantially in the manner described, for the purpose specified.

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Witnesses:

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