I. HAMILTON.

FLUE EXPANDER.

No. 121,513. Patented Dec. 5, 1871.

Fig. 1.

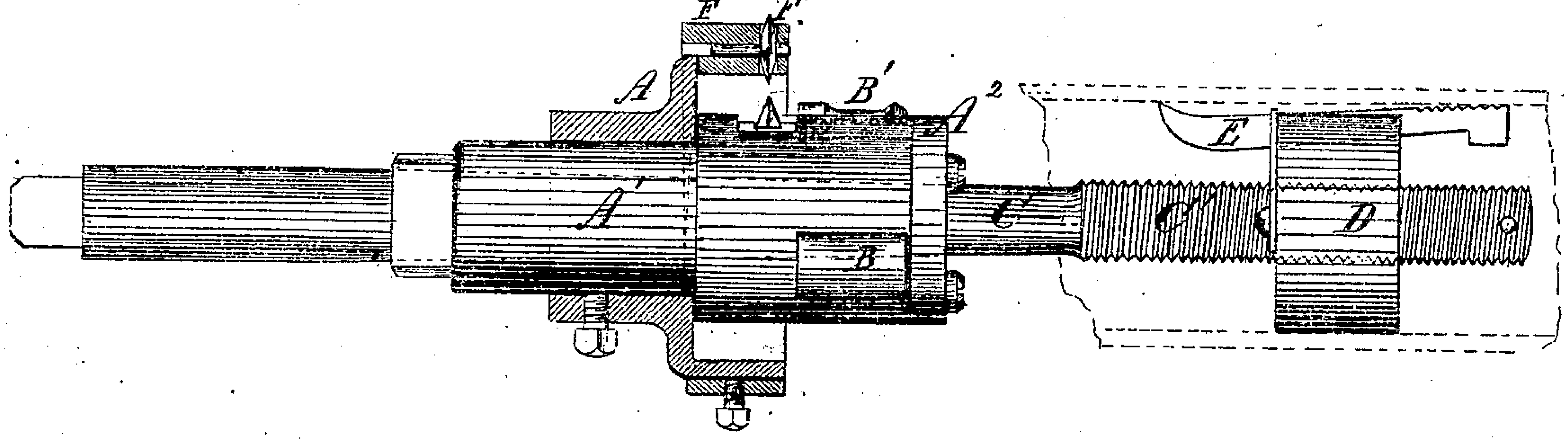


Fig. 2.

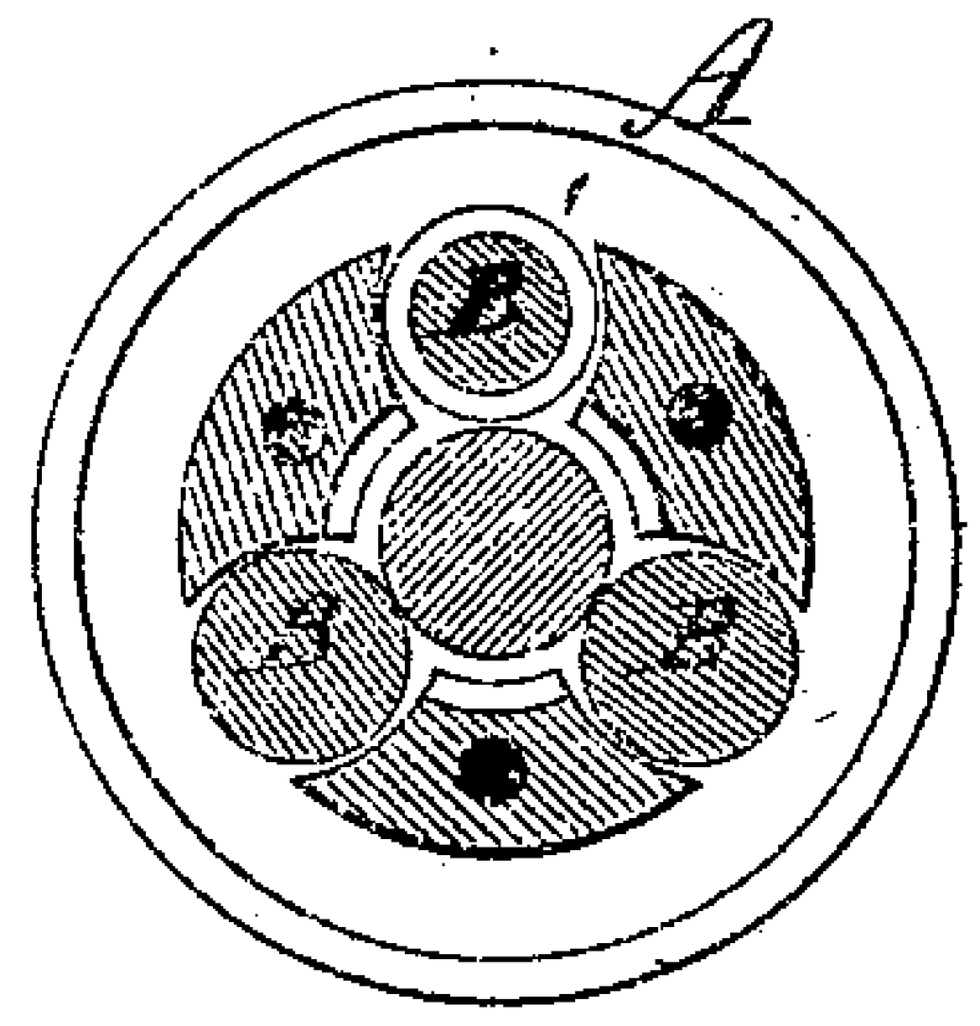


Fig. 3

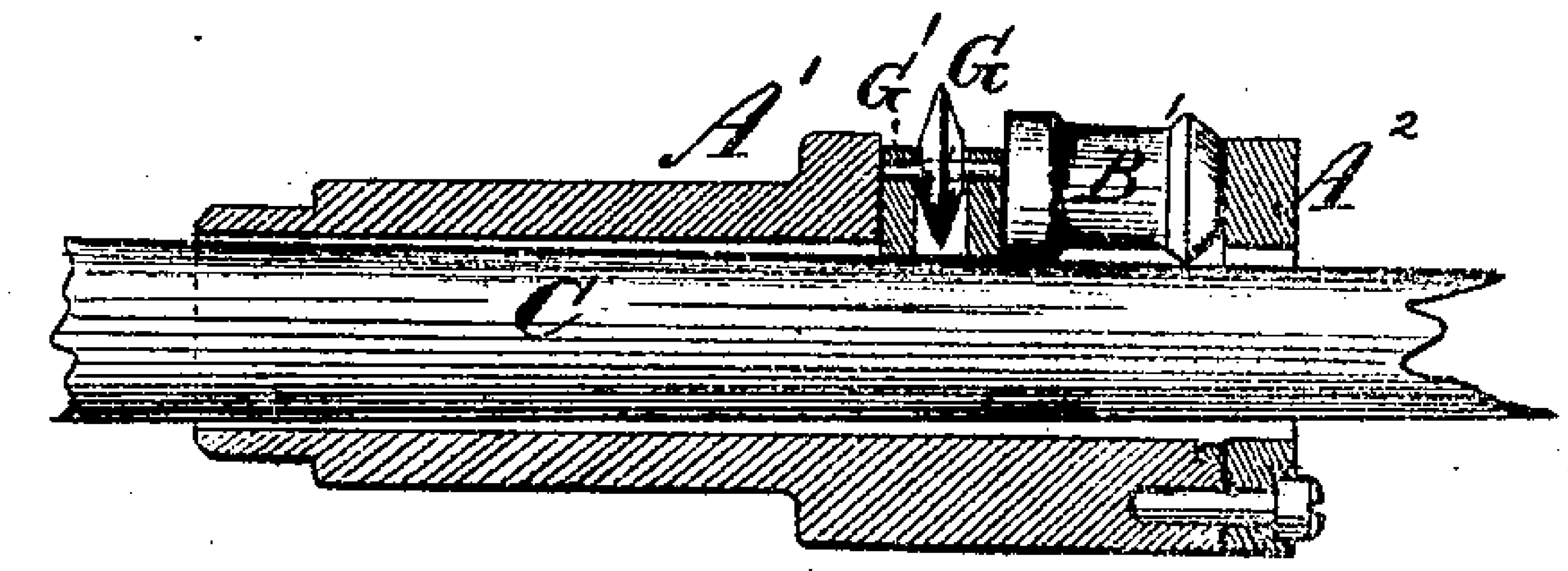


Fig. 5.

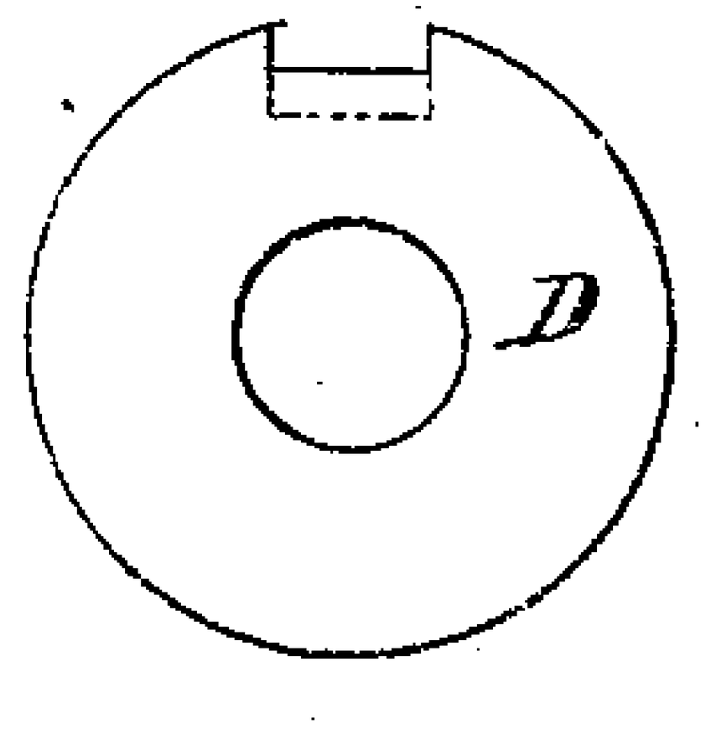
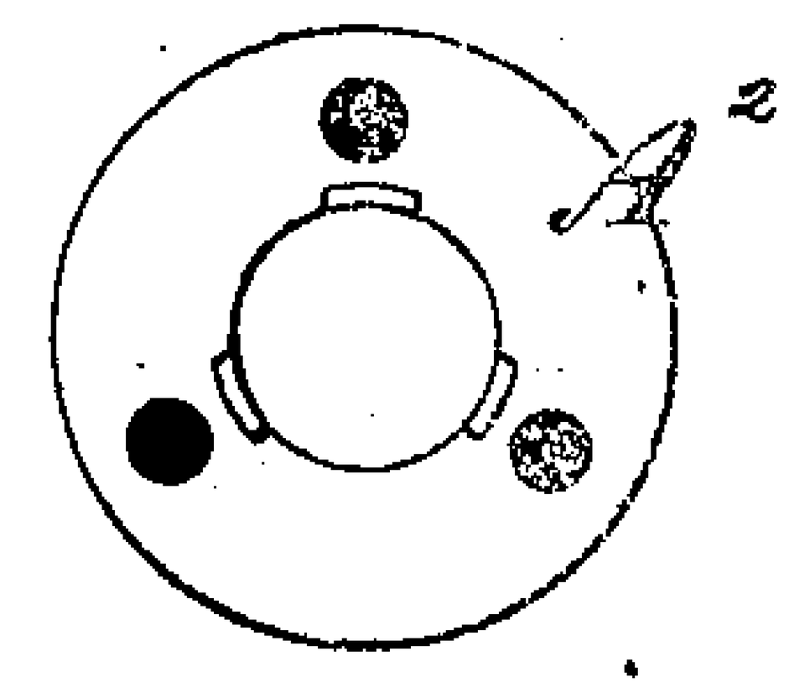


Fig. 6

Fig. 4



Witnesses.

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121,513

UNITED STATES PATENT OFFICE.

IRA S. HAMILTON, OF HAMILTON, OHIO, ASSIGNOR TO HIMSELF AND OWENS, LANE, DYER & CO.

IMPROVEMENT IN TOOLS FOR EXPANDING AND CUTTING OFF BOILER-TUBES.

Specification forming part of Letters Patent No. 121,513, dated December 5, 1871; antedated November 25, 1871.

To all whom it may concern:

Be it known that I, IRA S. HAMILTON, of Hamilton, in the county of Butler and State of Ohio, have invented certain Improvements in Flue-Expanders; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawing making part of this specification, in which—

Figure 1 is a sectional elevation of my improved instrument, showing the socket for the reception of the end of the flue, the cutters, the rollers, and the socket in which the rollers are carried, the tapering mandrel screw-threaded at one end, and the dog for holding the nut through which such screw works. Fig. 2 is a transverse section on line *x x* of Fig. 1, showing the arrangement of the expanding rollers in their sockets and the position of the mandrel with reference thereto. Fig. 3 is a longitudinal section, showing the beading-roller, the movable cutter, and the manner in which they are acted upon by the tapering mandrel. Fig. 4 is a view of the inside of the collar which holds the rollers in position within their sockets. Fig. 5 is an end view of the nut through which the mandrel passes. Fig. 6 is an elevation of one of the cylindrical rollers.

Corresponding letters refer to corresponding parts in the several figures.

This invention relates to that class of tools known as flue or tube expanders; and it consists, first, in the construction and arrangement of the expanding-rollers; secondly, in the means employed for feeding the expanding-mandrel between the rollers; thirdly, in the employment of revolving knives for cutting off the end of the flue; and, finally, in the combination and arrangement of some of the parts of which it is composed, as will be more fully set forth hereinafter.

In instruments for securing flues or tubes in the tube-sheets of steam-generators and other similar devices as they have heretofore been constructed, three or more expanding-rollers have been employed, the shape or configuration of the outer surfaces of which were all alike, they being generally of the concave form shown in Fig. 3 of the drawing accompanying this specification. These rollers as they have heretofore been used have required to be provided with journals upon their ends, which have necessarily been made small, and hence are liable to be broken off in use, thus causing delay and expense.

This invention has for one of its objects the removal of this objection, and the providing of rollers so constructed that journals upon their ends may be entirely dispensed with and yet their functions be performed in a manner equal to if not better than that in which they are now performed. Another of the objects of this invention is to provide the means of forcing out the expanding-rollers more readily and regularly than has heretofore been done by providing for that purpose a tapering mandrel which shall be controlled by a screw on its end.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

A refers to a socket which is to be made of metal, and of a form similar to or like that shown in Fig. 1, the aperture or hole in its forward end being of just sufficient size to receive within it the end of the flue or tube which it is intended to set, while the aperture or hole in the rear end is of the proper size to receive the shank A^1 of the socket which carries the expanding-rollers, to which it is secured by a set-screw. A^1 refers to the socket which carries the expanding-rollers, it consisting of a piece of steel or other metal having a hole in it longitudinally for the reception of the mandrel C. The outer or rear end of this socket is reduced in diameter and made to pass through the socket A, as above described, while the inner or forward end thereof is of sufficient diameter to admit of there being formed in it three or more recesses, as shown in Fig. 2, for the reception and retention of the expanding-rollers. Upon the forward or inner end of this socket there is placed a collar or cap, A^2, which has the effect to prevent the rollers from passing out longitudinally. B B refer to two metal cylinders or rollers, their outer surfaces being parallel, except that they are rounded slightly at their ends in order that they may more readily enter the flue or tube. These rollers are placed in the slots formed in the socket A^1, and move outward and inward in such slots. B′ refers to a roller or die which is placed in a slot in the socket above named and has the same motion as have the rollers B B. It, however, differs from them in that it has a concave surface in order that the flue or tube in being set in its sheet may have a shoulder or projection formed in it upon each side of such sheet. The arrangement of these rollers and of those marked B B is such that as the mandrel C is

drawn inward by means of the screw formed upon its end they will be forced outward, and the two rollers B B will be made to bear firmly against the surface of the interior of the hole in the tube-sheet, while the roller or die B′ will be forced out to a greater distance and thus form the shoulder or projection on such flue or tube. When it is desirable to use tube-sheets of varying thicknesses the tubes in them may be set or swaged out by changing the roller or die B′ and putting in its place one having the concavity in its surface of varying lengths or curvatures so as to cause it to fit different thicknesses of sheets. C refers to a mandrel the outer end of which is made square or of suitable form to receive a wrench or other device for turning it. That portion which passes through the socket A^1 is tapering for a considerable portion of its length, as shown in Fig. 1, the object being to cause it, as it is drawn inward by the screw upon its end, to force the rollers outward against the flue or tube. This mandrel should be made of steel, and sufficiently hard to prevent its wearing away much by use. Upon the inner end of this mandrel there is formed a fine screw-thread, C′, which works in a nut for the purpose of drawing the mandrel inward when in use. D refers to a nut which is cylindrical in form, and of such a diameter as to permit it to be passed into the flue or tube which is to be secured in its sheet. In the periphery of this nut there is formed a tapering slot, as shown in Figs. 1 and 5, which slot is for the reception of a dog or catch which is shown at E in Fig. 1, such dog or catch consisting of a piece of steel hardened at its ends and placed in the slot in the nut D, so that when the instrument is to be used the nut is to be thrust into the tube or flue, as shown in Fig. 1, and pushed inward until such flue or tube rests against the shoulder formed upon the socket A^1, when the mandrel is to be turned until a pin which is inserted in a hole formed in the end of the mandrel comes in contact with the heel or inner end of the dog E, which will carry it from the position shown in the drawing to the lower side of the tube, when, by reversing the motion of the mandrel, the outer end of the dog will engage with the interior surface of the tube and thus hold the nut stationary while the mandrel will be drawn inward and the rollers forced outward. While this last-named action is taking place it will be necessary to rotate the sockets A and A^1, which may be done by furnishing the one A with a lever or crank, which may be attached to it in any suitable manner; or it may be caused to rotate by the friction caused between them and the mandrel. It is desirable that the flues or tubes should project a uniform length through the tube-sheet, just sufficient to set them. To accomplish this I have provided a pair of revolving circular knives for cutting off any superfluous length of the tube in the act of setting it. One of these knives or cutters, F, revolves on a stationary spindle in a ring, F′, which is slipped on the larger end of the socket A and clamped thereon by means of a set-screw or other suitable devices. A slot is formed in the rim of the socket, through which the edge of the cutter projects into the interior of the socket to come in contact with the outer surface of the flue or tube. The journals of the other cutter G have their bearings in a block, G′, which is inserted in a mortise or aperture formed in the socket A^1 just in advance of the expanding-rollers. The block of this cutter slides freely in its seat, and is forced outward by the tapering mandrel C in the same manner as the rollers, and cuts off the tube as the socket is revolved. The cutters are so arranged with reference to each other that the movable one just passes the edge of the stationary one, as indicated in Fig. 1.

The cutters may be readily removed when their service is not required; or they may be used independently of the expanding-rollers, in which case the latter are taken out of the socket temporarily.

After the tube or flue has been secured in the sheet and it becomes necessary to withdraw the instrument therefrom the mandrel is to be turned in an opposite direction until the pin in its end comes in contact with the end of the dog E, which will carry it to the upper side of the tube or flue, when it will fall away from contact with such flue so that it may be easily withdrawn.

I claim—

1. As my improvement in flue-expanders, the construction herein described of the head A with slots therein for the reception of the rollers of equal length with the rollers, and with concave walls that shall at the same time support the rollers and prevent their displacement from the slots, and, jointly therewith, cylindrical rollers without journals.

2. The combination of the tapering mandrel C, sliding cutter G, band F, and cutter F′ revolving in stationary bearings, substantially as set forth.

3. The combination and arrangement of the mandrel C C′, nut D, and dog or stop E, substantially as and for the purpose set forth.

4. The combination of the sockets A A^1, rollers B B B′, mandrel C C′, nut D, and dog or stop E, substantially as and for the purpose set forth.

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

IRA S. HAMILTON.

Witnesses:
M. L. SEWARD,
JOHN SEWARD.

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