(No Model.)

J. DUFFY.

TUBE EXPANDER.

No. 383,111. Patented May 22, 1888.

Fig. 1.

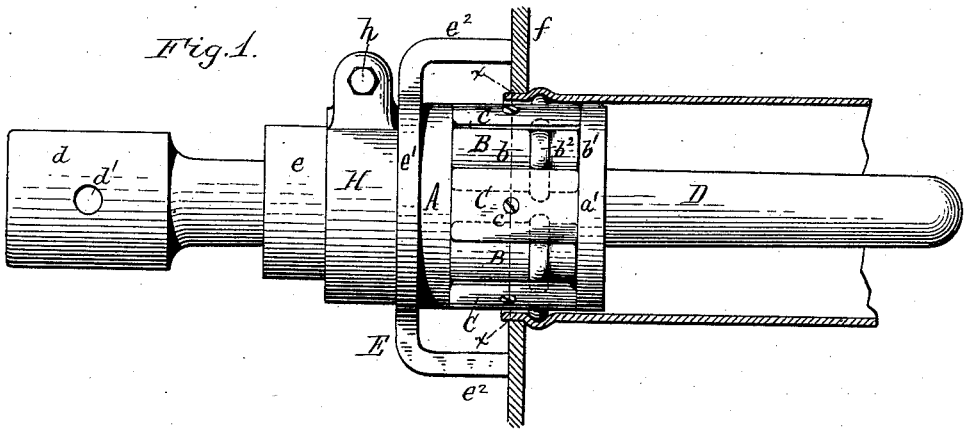


Fig. 2.

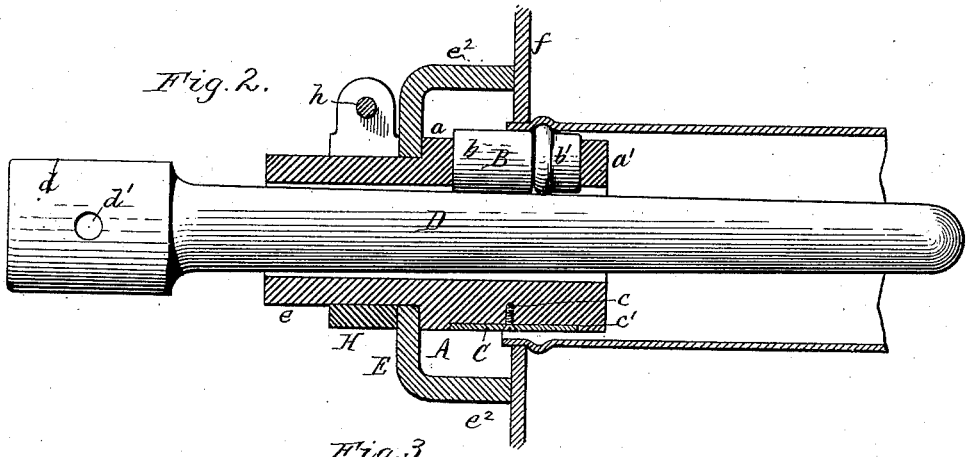


Fig. 3.

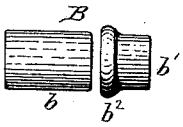


Fig. 4.

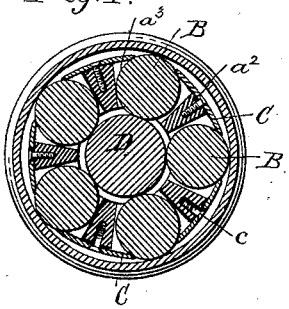
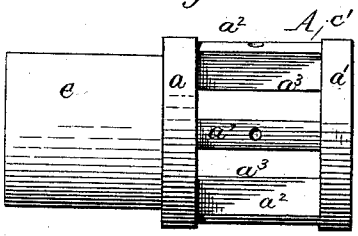


Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES DUFFY, OF BUFFALO, NEW YORK.

TUBE-EXPANDER.

SPECIFICATION forming part of Letters Patent No. 383,111, dated May 22, 1888.

Application filed September 1, 1887. Serial No. 248,439. (No model.)

To all whom it may concern:

Be it known that I, JAMES DUFFY, of the city of Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Tube-Expanders, of which the following is a specification.

This invention relates to improvements in that class of tube-expanders which consist of a stock or holder in which a series of pressure or swaging rollers are arranged, which are forced outwardly against the tube by a tapering plug or mandrel inserted into the holder.

The object of my invention is to simplify the construction of the tube-expander and to provide the same with an adjustable bearing-piece, which rests against the tube-sheet, and whereby the tool can be used in connection with tube-sheets of different thicknesses.

The invention consists of the improvements, which will be hereinafter fully set forth, and pointed out in the claim.

In the accompanying drawings, Figure 1 is a side elevation of my improved tube-expander applied to the end of a tube, the tube and a portion of the tube-sheet being shown in section. Fig. 2 is a sectional elevation of the same. Fig. 3 is an elevation of one of the pressure-rollers and beading-roller. Fig. 4 is a cross-section in line *x x*, Fig. 1. Fig. 5 is a side elevation of the stock or holder with the pressure-rollers and connecting parts removed therefrom.

Like letters of reference refer to like parts in the several figures.

A represents the cylindrical stock or holder, which is composed of an inner ring, *a*, an outer ring, *a'*, and longitudinal connecting-ribs a^2, formed in one piece.

a^3 represents longitudinal openings formed between the ribs a^2, and B represents the pressure or swaging rollers arranged in the openings a^3, and which are composed of two separate parts, *b b'*. The part *b* is cylindrical in form and adapted to bear against that portion of the tube resting in the opening of the tube-sheet. The part *b'* of the roller is also cylindrical and provided at one end with a projecting rim, b^2, which is adapted to form a bead on the tube on the inner side of the tube-sheet. By constructing the pressure-rollers in two sections in this manner the part *b'* can be removed from the holder when it is desired to expand the end of the tube without forming a bead on the same.

The openings a^3 are made tapering from their inner toward their outer ends, as shown in Fig. 4, and are made of such a size as to permit a portion of the rollers B to project through the inner ends of the openings into the bore of the holder without, however, allowing the rollers to drop through the openings.

C represents flat or slightly-curved springs, which are secured by screws *c* to the ribs a^2 of the holder A, and which are seated in depressions *c'*, formed in the ribs a^2, so as to stand flush with or below the face of the holder. The springs C project beyond the edges of the ribs a^2 and partly cover the openings a^3, so as to retain the rollers B in the openings, as shown in Fig. 4. The rollers B are inserted into the openings a^3 from the outer sides of the holder, and the springs C are then secured in place. The springs C extend from end to end of the pressure-rollers, as shown in Fig. 1, so as to cover the ends of the openings a^3 and prevent dirt, &c., from entering the bore of the holder and interfering with the free operation of the tool.

D represents the tapering plug or mandrel, which is inserted into the bore of the holder A, and which bears against the inner portions of the rollers B. The plug D is provided at its outer end with a head, *d*, having an opening, *d'*, in which is inserted a bar or handle for turning the plug.

E represents an adjustable bearing-piece, which is arranged upon a hub, *e*, formed on the outer end of the holder A and resting against the outer side of the tube sheet *f*. The bearing-piece E consists of a ring, *e'*, which surrounds the hub *e*, and two inwardly-projecting legs, e^2, formed on diametrically-opposite sides of the ring *e'* and bearing with their inner ends against the tube-sheet.

H represents a split clamping ring or collar secured to the hub *e* of the holder in front of the bearing-piece E and bearing against the latter. The ring H is provided with a clamping-bolt, *h*, which passes through the split ends of the ring. Upon loosening the clamping-ring H the bearing-piece E can be adjusted on the hub of the holder A so as to permit the holder to project into the tube a greater or less distance, as may be required by the thickness

of the tube-sheet. When the bearing-piece has been adjusted, it is held in place by tightening the clamping-ring H.

By providing the holder with an adjustable bearing-piece the same can be employed for expanding tubes which are seated in tube-sheets of varying thickness, thereby dispensing with the use of separate holders for operating upon different-sized tube-sheets.

In using my improved tool the holder A, with the plug or mandrel D removed therefrom, is inserted into the end of the tube, and the bearing-piece E is adjusted so that the holder projects into the tube the proper distance. The mandrel is then inserted into the bore of the holder and turned and at the same time forced inwardly. The mandrel comes first in contact with the bead of the beading-roller *b'*, which bead is somewhat larger in diameter than the face of the main swaging-roller *b* and projects inwardly farther than the face of the main swaging-roller. The mandrel forces the beading-roller *b'* outwardly before it moves the main swaging-roller *b* outwardly, thereby forming the bead partly before pressure is applied to the main swaging-roller. After the beading-roller *b'* has been forced out far enough to bring the mandrel in contact with the face of the main swaging-roller, as represented in Fig. 2, the pressure is applied to the face of the main swaging-roller also, and in the further operation of the tool both the main swaging-roller and beading-roller are forced outwardly together. In this manner the beading-roller operates somewhat in advance of the main swaging-roller, and when the pressure is applied to both of these rollers a large part of the pressure is directly applied to the face of the main swaging-roller and not solely to the bead of the beading-roller, as would be the case if the beading and swaging rollers were formed in one piece. By this means a tighter joint is produced between the tube and the part into which the tube is expanded. Upon withdrawing the mandrel from the holder the springs C force the rollers B inwardly to their former position and permit the holder to be removed from the tube.

I claim as my invention—

The combination, with the holder A, provided with a series of tapering openings, a^3, of the pressure or swaging rollers B, arranged in said openings, and springs C, secured to the holder and partly covering said openings, whereby the rollers are retained in the openings, substantially as set forth.

Witness my hand this 23d day of August, 1887.

JAMES DUFFY.

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