T. J. DIXON.

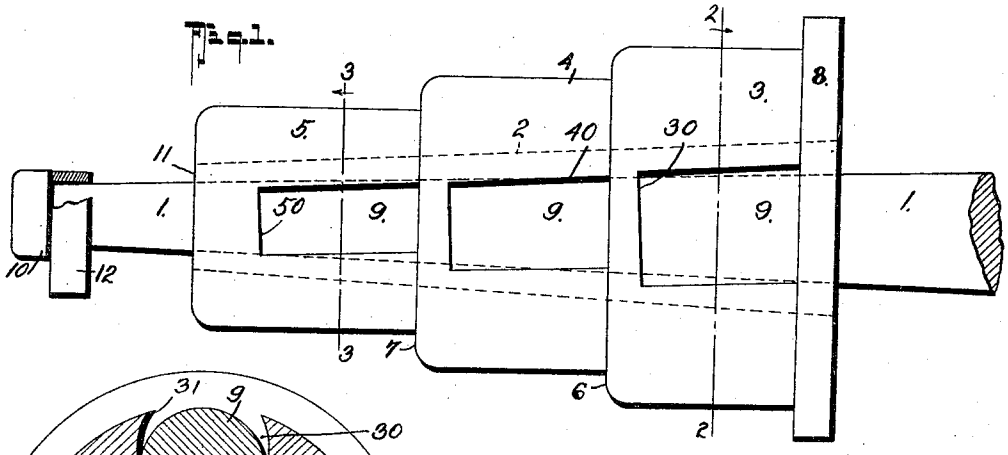
MULTIPLE TUBE EXPANDER.

APPLICATION FILED DEC. 1, 1920.

1,417,979.

Patented May 30, 1922.

Fig. 1.



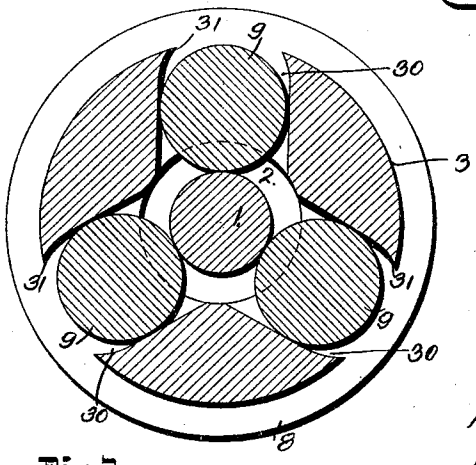


Fig. 2.

Fig. 3.

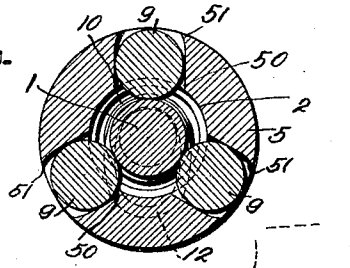


Fig. 5.

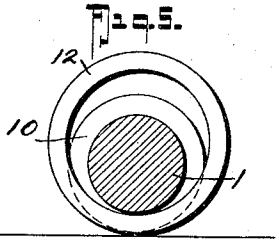


Fig. 6.

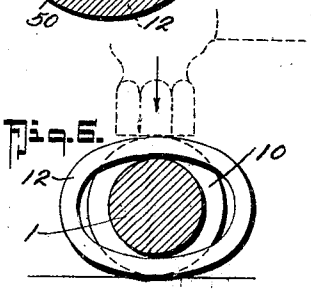
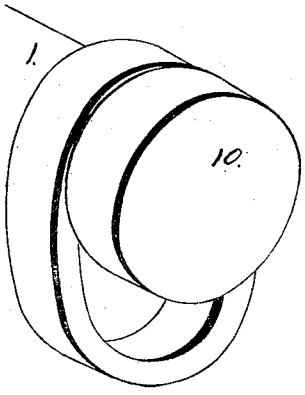


Fig. 4.



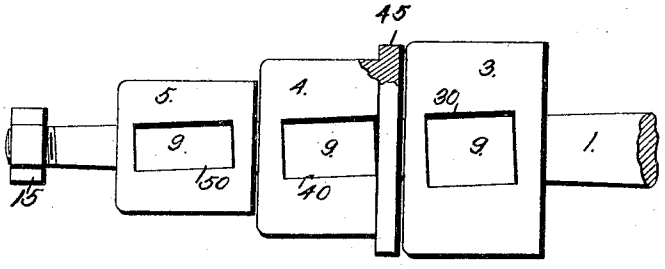


Fig. 7.

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MULTIPLE-TUBE EXPANDER.

1,417,979. Specification of Letters Patent. Patented May 30, 1922.

Application filed December 1, 1920. Serial No. 427,568.

To all whom it may concern:

Be it known that I, THOMAS J. DIXON, a citizen of the United States, residing at Madison, in the county of Dane and State of Wisconsin, have invented a new and Improved Multiple-Tube Expander, of which the following is a specification.

My present invention has reference to improvements to tools more especially adapted for expanding boiler tubes, and primarily it has for its object to provide a tool of the general character stated, of such improved design and construction that a single tool is provided which may be conveniently and expeditiously used, without any special adjustment of the parts thereof for expanding a number of different sizes of tubes, which is of few parts of simple construction, that can be cheaply made, is durable and is capable of easy manipulation for serving its intended purpose.

Another object of my present invention, is to provide an improved construction of boiler tube expander of the general type stated, having the tube expanding elements so arranged and adapted for being cooperatively applied upon and removed from the forward end of the expanding mandrel, which constitutes a part of the complete tool, and in which is included a simple means for holding the expanding element from freely working off the end of the mandrel and which serves as an inexpensive and practical substitute for the stop nut devices usually employed for such purposes and which, when applied, cannot work off the end of the mandrel, as is possible in the common type of stop nut which threads onto the mandrel end.

With other objects in view that will hereinafter be mentioned, my invention is an improved boiler tube expander, that embodies the peculiar features of construction and novel arrangement of parts, all of which are fully set forth in the following detailed description, specifically pointed out in the appended claims and illustrated in the accompanying drawings, in which:

Figure 1 is a plan view of a boiler tube expander that embodies my invention.

Figure 2 is a cross section thereof on the line 2—2 on Figure 1, looking in the direction of the arrow.

Figure 3 is a similar view taken on the line 3—3 on Figure 1, looking in the direction of the arrow.

Figure 4 is a detail perspective view of the retainer device cooperative with the mandrel, and which serves to prevent the expanding roller carrying heads from slipping off the front or smaller end of the mandrel.

Figures 5 and 6 are diagrammatic cross sectional views of the mandrel and illustrates the normal shape of the retainer element, when applied upon the mandrel end, and the manner in which the said element is changed in its shape for being held from passing over the enlargement or head portion of the front end of the mandrel.

Figure 7 is a diagrammatic plan view that illustrates a somewhat modified arrangement of my invention, as hereinafter described in detail.

The preferred form of my boiler tube expander, illustrated in Figures 1 to 6, comprises essentially a tubular body, the bore 2 of which gradually tapers from the rear to the forward end, which bore is large enough to accommodate the usual mandrel 1.

In the preferred form stated, the body of the tool is composed of a plurality of stepped hub-like portions 3, 4 and 5, the outer one (3) being of the largest diameter, the next one (4) of a lesser diameter than the part 3, whereby, at the juncture of the two hub portions 3 and 4, an annular stop shoulder 6 is provided, a like stop shoulder 7 being formed on the outer end of the part 4 by reason of the reduced diameter of the third hub-like portion 5.

8 designates a stop shoulder or abutment flange which is integral with the front end of the hub portion, the reason for which will be presently explained.

Each of the body portions 3, 4 and 5 is provided with a series of radially disposed pockets 30, 40 and 50 that merge with the bore 2 and which are of progressively reduced sizes, and in each set of the said pockets, that is the three pockets of the several portions 3, 4 and 5, are held the expanding rollers 9—9, which rollers and the several pockets in which they are held and adapted for being radially projected by the mandrel feed, as will be presently further explained, are somewhat diagonally disposed with respect to the longitudinal axis of their respective body or hub portions and the

mandrel, whereby to provide for the usual self-feeding of the expander, since my present form of expander is adapted for being operated like all self-feeding types of tube expanders.

The several sets of expanding rollers 9, when assembling the parts that constitute my present form of expander, shown in Figures 1, 2 and 3, are entered through the larger end of the bore 2 and the several radial pockets and the said rollers for each body portion, 3, 4 and 5, are readily moved to seat within their respective pockets by the insertion of the mandrel 1, it being understood that the farther the mandrel is fed forward, the more will the radially disposed sets of expanding rollers be projected beyond the peripheral face of their respective body or hub portions 3, 4 and 5.

To prevent the rollers 9 from dropping out through the radial pockets, in which they are held for rotation as the expander is fed into the tube, when the tool is withdrawn from the tube, the outer or peripheral ends of the several pockets are somewhat restricted in their width by the lip-like portions 31 and 51, as is clearly shown in Figures 2 and 3 of the drawings.

At the outer end, the mandrel 1, in my construction of expander tool, has an integral head 10 of sufficient small diameter to permit of freely passing the mandrel through the smaller end 11 of the bore 2 in the shell or body of the tool.

In the common types of flue expanders, the outer or smaller end of the tapering mandrel is threaded for the reception of a nut which acts as a retainer to keep the body or head portions that carry the expander rollers from slipping off the outer end of the mandrel.

The use of a nut for retaining the parts upon the mandrel is not always reliable, since such nuts frequently work loose from the threaded end of the mandrel.

In my present construction of expander, to insure a positive connection of the mandrel with the shell or body and thereby insure the holding of the expanding rollers in proper place, I provide a simple and inexpensive substitute for the common type of nut retainer, which is in the nature of a flat band or ring 12 of sufficient diameter for being freely passed over the mandrel head 10, as indicated in dotted lines on Figure 5.

The band or ring 12 is of flexible metal and, when slipped over the mandrel head, by resting it and the mandrel head on a solid base as indicated in Figures 5 and 6 and giving the ring or band a tap with a hammer, it is reduced to an oval shape with its openings so restricted transversely (see Figure 6) that under ordinary conditions of handling the mandrel, the ring or band cannot be slipped therefrom, making it impossible to separate the shell or body and the mandrel without first straightening, or in other words, rounding the band or ring 12 in the same manner in which it was flattened.

So far as described, it will be readily apparent, to those familiar with the use of boiler tube expanders of the type to which my present invention relates, that my improved tool can be readily used for expanding tubes of different standard diameters.

When the tool is arranged, as in Figure 1, with the several units, i. e. the body portions 3, 4, and 5 of different diameters, when, say the smallest tube, is adapted for being expanded by the smallest unit or body portion 1, the said body portion, during the operation of expanding the tube, is constantly fed forward in the usual manner until the shoulder 7 of the next unit 4 engages the outer end of the tube and thereby limits the further inthrust of the unit 5.

The same conditions are present when a larger diameter tube is being expanded by the unit or body 4 and its rollers, the infeed being limited by the shoulder 6 of the unit engaging with the end of the largest or outermost expanding unit, and the latter being the last of the series of units has the integral annular flange 8, before referred to, which constitutes the stop for limiting the inthrust or feed of the unit 3 into the tube being expanded thereby.

In Figure 7 is illustrated a somewhat modified form of my expander, and, in this form, the parts have the same general arrangement as in Figures 1, 2, and 3, except that the several units or portions 3, 4 and 5 are in the nature of a plurality of individual bodies or shells, each containing its set of expanding rollers arranged the same as in the other or preferred form described.

In this modified form of my invention, I have shown one of the units, the central one, as provided with an integral annular flange 45 which constitutes the tube end abutting element for limiting the infeed of the unit and, if desired, all of the individual units shown in Figure 7 may have integral abutment flanges, although for ordinary uses, the end of the next adjacent unit may be utilized as an abutment, the same as in the integral arrangement shown in Figure 1.

Making the several units independently shiftable along the mandrel and providing each shiftable unit with an integral abutment flange, has its advantages, since it will be readily apparent that the unit or units not in immediate use, may be slipped back, a couple of inches, out of the way of the flue sheet and any rivets or other objects projecting therefrom.

In the modified form of my invention, I have shown the mandrel equipped with the

common type of retainer nut 15 engaging the threaded end of the mandrel.

What I claim is:

1. In a tube expander, the combination with an expanding unit including a set of radially shiftable expanding rollers, and a mandrel that engages the said set of rollers and holds them to their operative position, the said mandrel having an annular enlargement or head at the forward end; of a ring of flexible metal adapted for being slipped onto the mandrel over the head, and for being compressed around the mandrel to constitute a retainer to prevent the separation of the mandrel and the expanding unit.

2. In an expander of the character described, the combination with a tapering mandrel having an annular enlargement or head at its outer end, an expanding unit having an axial bore through which the headed end of the mandrel can pass, the said unit having a plurality of radial pockets from its bore through its peripheral face, expander rollers adapted for being placed through the axial bore in the expanding unit into their respective radial pockets and shiftable to their expanded adjustments by the mandrel and an elongated ring on the outer end of the mandrel adapted for engaging with the head of said mandrel and which operates to hold the mandrel and the expanding unit thereon from disconnection.

THOMAS J. DIXON.