Nov. 4, 1924. 1,514,099

A. B. PRING

TUBE EXPANDER

Filed Jan. 24, 1921

Fig. 1.

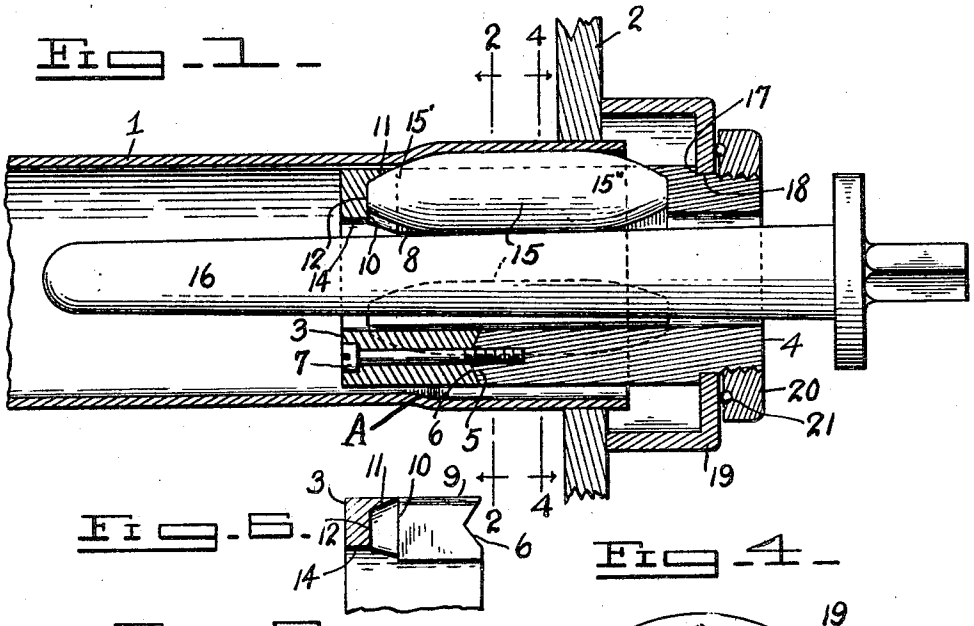


Fig. 6.

Fig. 4.

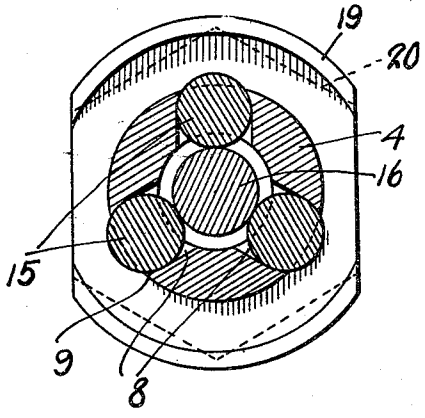


Fig. 2.

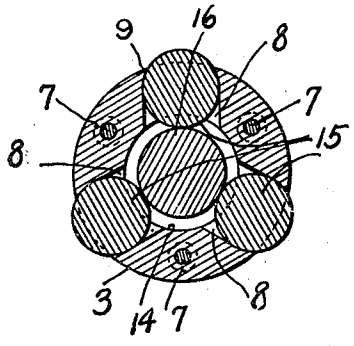


Fig. 5.

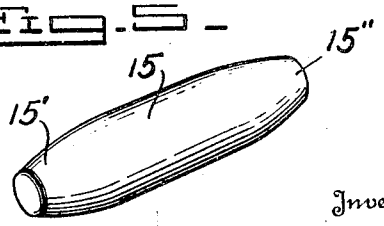
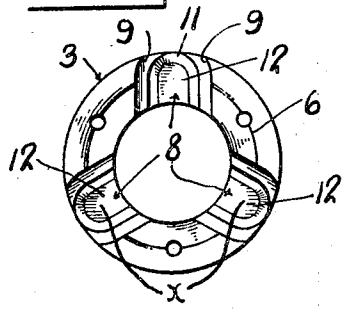


Fig. 3.



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Patented Nov. 4, 1924. 1,514,099

UNITED STATES PATENT OFFICE.

ARTHUR B. PRING, OF HUNTINGTON, WEST VIRGINIA.

TUBE EXPANDER.

Application filed January 24, 1921. Serial No. 439,625.

To all whom it may concern:

Be it known that I, ARTHUR B. PRING, a citizen of the United States, residing at Huntington, in the county of Cabell and State of West Virginia, have invented new and useful Improvements in Tube Expanders, of which the following is a specification.

The object of this invention is to provide a self-centering tool, which, owing to the shape of the expanding rollers employed, will not cut the tube at the point where the expansion takes place.

A further object of the invention is to construct a tool of this nature which will be comparatively cheap to manufacture and highly efficient in its operation.

With these and other objects in view as will be more specifically pointed out in the following description, reference will be had to the accompanying drawing forming a part of this specification and wherein like reference characters designate corresponding parts throughout the several views, in which:—

Fig. 1 is a view in vertical section taken through the longitudinal axis of the tube and the tube expanding tool,

Fig. 2 is a transverse vertical sectional view taken through line 2—2 of Fig. 1,

Fig. 3 is an end view in elevation of the outer cage section,

Fig. 4 is a transverse vertical sectional view taken on line 4—4 of Fig. 1,

Fig. 5 is a perspective view of one of the expanding rolls, and

Fig. 6 is a vertical sectional detail view of a fragment of the outer cage section.

Referring to the drawing, reference numeral 1 designates the tube, such as a boiler tube, to be expanded for tight fit within the tube sheet 2. The expanding tool is composed of a cage made up of two tubular sections 3 and 4. The outer end of the section 4 is formed with a rib 5 which fits within an annular groove 6 to take the strain off the screws 7 which secure the sections 3 and 4 together. Obviously, instead of these screws or other separate fastening means, the two sections 3 and 4 may be welded together, since the cage is only made in two sections to facilitate manufacture, particularly the shaping of the pockets 8 which receive the expanding rollers. In the production of the cage, each section 3 and 4 is drilled on the centers marked "x" in Fig. 3, thereby producing the said pockets 8 with their overhanging walls 9, shouldered end wall portions 10, inclined bearing surfaces 11, and end bearing wall portions 12. Then, because the expanding rollers must have radial movement to fit various sizes of tubes, these parts 9, 10, 11, and 12 are cut inwardly toward the center of the bore 14 of the cage, but on lines parallel with the radius thereof. Within these pockets 8 are arranged the expanding rollers 15, and these are substantially barrel shape, having tapered end portions 15′ and 15″ gradually merging into the central portion which throughout the greater portion of the length of the roll is substantially constant. These rollers, which are preferably three in number, are inserted through the bore of the cage and then moved radially into their respective pockets, and confined therein by the axial tapered core 16. The outer end of the cage member 4 is formed with a shoulder 17 and unthreaded reduced portion 18 upon which is swiveled or journaled a bearing-cup 19 secured rotatably by a thrust bearing nut 20 threaded on the extreme end of the cage section 4 and provided with ball bearings 21 which are in engagement with bearing cup 19. Obviously, by elongating the cage section 4 between the rollers 15 and the cup 19, the tool may be used to flange tubes set in headers and the cup thereby permitted to bear on the outer header sheet and the rollers to work adjacent the inner header or tube sheet.

In operation, the rollers are entered through the bore of the cage and moved radially outward into their respective pockets and the tapered expanding and operating core inserted axially of the cage. The cage is then moved endways into the tube to be expanded and because of the tapered portions 15′, the rollers will enter of themselves and the operator will not have to reach in and assist with his hands the entry of the rollers into the tube as is customary with square ended rollers. The rollers, having been entered into the boiler tube, and the cup 19 bearing against the tube or header sheet, the operator then rotates the expanding core 16 to rotate the rollers 15 while expanding them. The limit of expansion is when the rollers bear against the bearing surface 11 as illustrated in Fig. 1.

The thrust, which is considerable, is amply borne by the ball thrust nut 20 and without materially affecting the ease of operation.

It will be observed that because of the gradual enlargement of the rollers, the expansion takes place gradually and also that because of the absence of sharp corners or shoulders on the rollers, there is no cutting, abrading or scoring of the tube at the point indicated by reference character A, and this is important since it is an established fact that any cutting, abrading or scoring of the tube at that point will materially hasten the penetration of the tube by rust, and the like. The tapering of the front ends of the rollers is to facilitate entry of the same into the tube and expansion of the tube without cutting as already stated, while the tapering of the rear ends of the rollers is to facilitate the entry of the expanding pin or core 16 between the rollers. Obviously, any approved means may be employed for locking the thrust bearing nut.

What I claim and desire to secure by Letters Patent is:

A tube expander comprising a cage formed of mating sections with interengaging tongue and groove connections and having a reduced, threaded end defining an external shoulder, expander rollers arranged in said cage, a cup-shaped bearing member angular in cross section and having its bottom portion rotatable on said cage and abutting said shoulder, an adjustable bearing member threaded on the reduced end of the cage and arranged outwardly of the first mentioned bearing member, and friction reducing devices arranged intermediate the first and second mentioned bearing members.

In testimony whereof I have hereunto set my hand.

ARTHUR B. PRING.