

May 6, 1941.

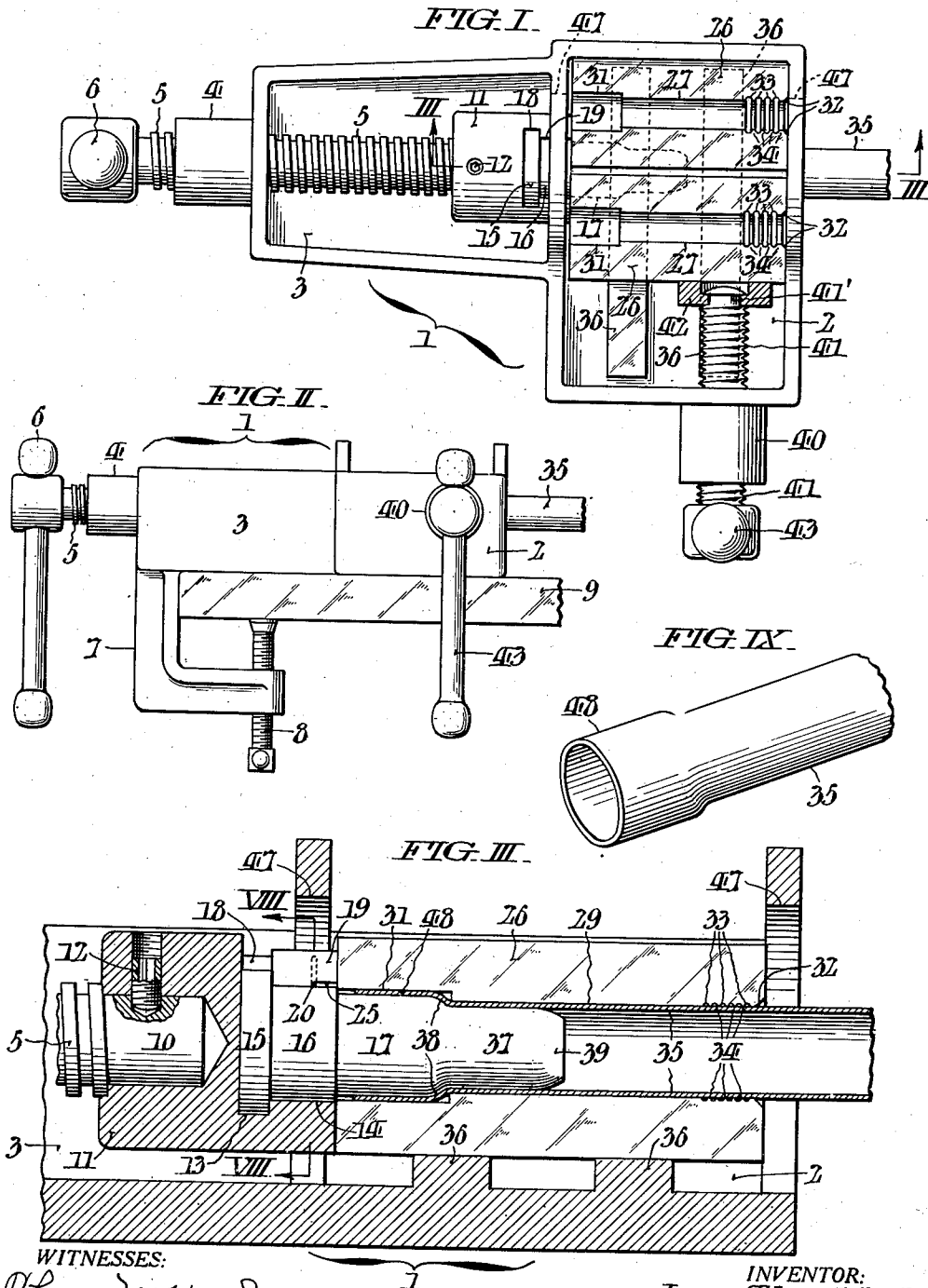
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2,241,091

TUBE-END EXPANDER

Filed June 8, 1939

3 Sheets-Sheet 1



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FIG. V.

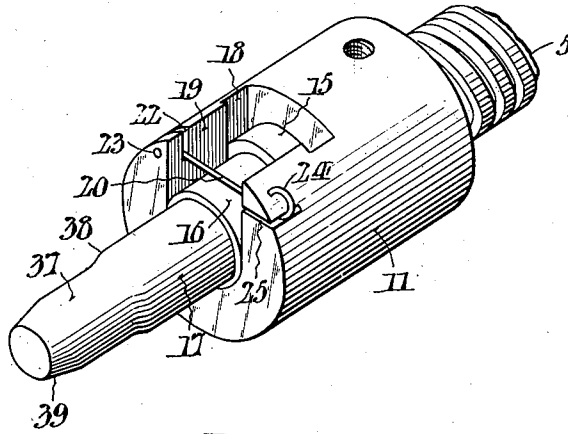


FIG. VI.

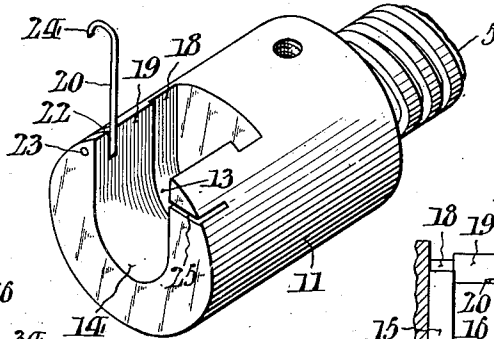


FIG. IV.

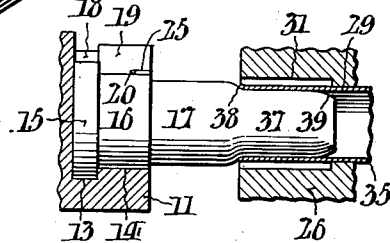


FIG. XI.

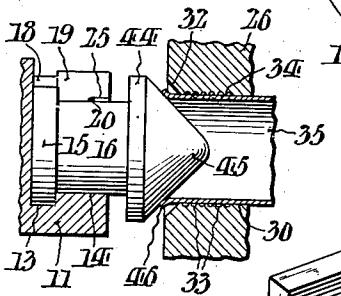
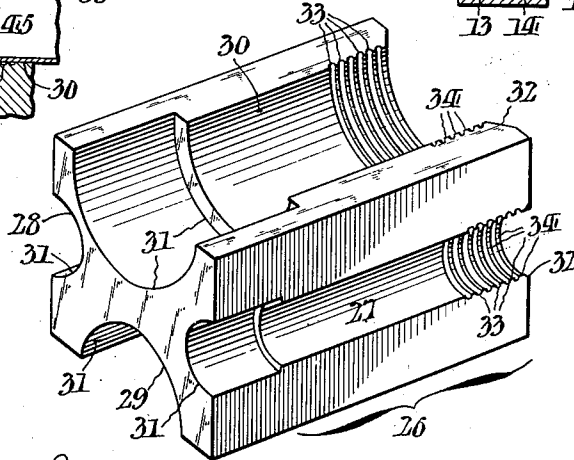


FIG. VII.



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FIG. X.

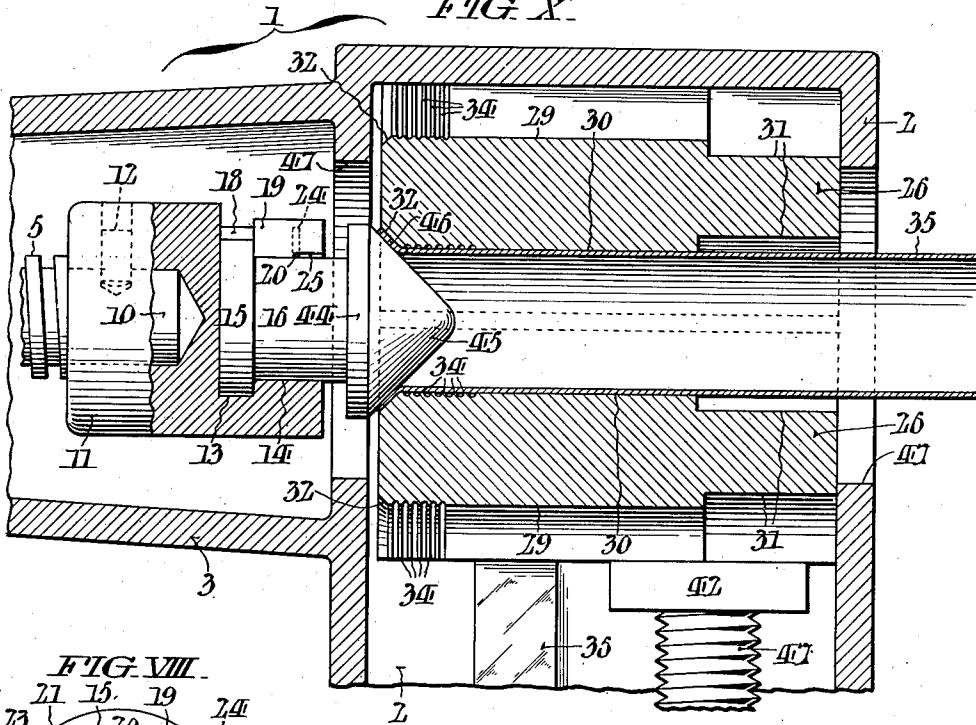


FIG. VIII.

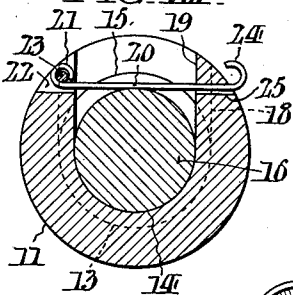
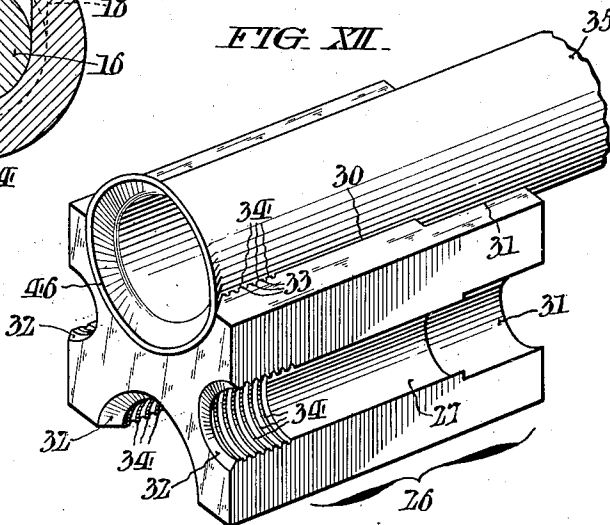


FIG. XII.



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# UNITED STATES PATENT OFFICE

2,241,091

## TUBE-END EXPANDER

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Application June 8, 1939, Serial No. 278,061

3 Claims. (Cl. 153—80.5)

This invention relates to means or devices adapted for expanding the ends of metal tubes, and more particularly to tubes of relatively small diameter. Pipes of the type referred to are usually connected together by expanding the one end of one length of the piping for socket-reception of the non-expanded end of another length and then "wiping" the connection with a suitable sealing medium.

Joints of the type above referred to frequently prove weak and unsatisfactory, and the primary object of this invention is to provide a novel device for expanding or flaring the ends of copper and analogous metal tubing, said device being of rugged structure and easily operated with pre-assurance of accurate results.

Another object is to provide a manually-operable tube-end expander or end-flaring device which is readily adapted for either purpose with a minimum of labor.

A further object is the provision of a simple device for the purpose, for shop or "in the field" usage, which is compact and portable.

The invention, accordingly, comprises the elements and combinations of the same, features of construction and arrangements of parts as hereinafter disclosed, illustrated by the accompanying sheets of drawings, and the scope of the application whereof is more particularly defined in the concluding claims.

In the drawings:

Fig. I is a top plan view of a typical embodiment of this invention.

Fig. II is an elevation of the same, as viewed from below Fig. I, and drawn to a reduced scale.

Fig. III is a broken sectional view, on a larger scale, as viewed in the direction of the arrows III—III in Fig. I.

Fig. IV is a fragmentary and part-sectional illustration showing the tube-end expander means in position ready to initiate the expansion of a tube-end.

Fig. V is a perspective view of the expander tool and carrier or chuck-head.

Fig. VI is a similar perspective view, with the expander tool removed.

Fig. VII is a perspective view of one of the complementary die blocks, hereinafter fully described.

Fig. VIII is a vertical section, taken on the arrowed plane VIII—VIII of Fig. III.

Fig. IX is a fragmentary perspective view of the tube-end after expansion.

Fig. X is a plan section illustrating usage of

the device of this invention for flaring a tube-end.

Fig. XI is a fragmentary view similar to Fig. IV but showing the commencement of the tube-end flaring operation; and,

Fig. XII is a perspective view of one of the dies with the flared end portion of a treated tube reposing therein.

Referring more in detail to the drawings, the novel tube-end expander or flaring device of this invention therein illustrated comprises a cellular or open-top box-like structure 1 including separate sections or compartments 2, 3, the former of which is rectangular in contour while the latter is outwardly-tapering and conveniently at right angles to the section 2. The section 3 has an end bearing 4, suitably bored and threaded to support an operating screw 5, fitted with a vice-like or ball-ended manipulator 6; said section also having an angle bracket 7 with a clamp-screw 8 whereby the device is securable to a work bench 9, Fig. II, or to any other appropriate and rigid structure.

The inner end of the operating-screw 5 is reduced at 10 for snug reception of a tool-holder or chuck 11, which is rigidly held in place by a radial key-screw 12; said chuck embodying inner and outer concentric grooves 13, 14, respectively, for reception of the diametrically corresponding head 15 and shank portion 16 of the expander tool 17, with longitudinal cut-outs 18, 19 to accommodate free entry and removal of said tool, or substitution of another one in an obvious manner. In order to hold the tool head and shank portions 15, 16 securely engaged with the shank 11, use is made of a retainer in the form of a spring-wire key 20 having one end 21 fulcrumed in a circumferential cut-out 22 by a pin 23, and the other end rounded at 24 to form a finger-grip, whereby said key may be moved into and out of snap engagement with an opposing longitudinal retainer slot 25 and disposed tangential across the tool shank portion 16, as clearly understandable from Figs. V, VI and VIII, more particularly.

Referring now to the section 2 which houses the pipe end clamping blocks or dies 26 of somewhat rectangular, approximately equal, cross-section, to provide a slight clearance therebetween when in assembled relation, as clearly shown in Fig. I. Each die block 26, as best understood from Figs. VII and XII, is hollowed-out centrally of each longitudinal face to provide differential half-round grooves 27, 28, 29 and 30, for example, to accommodate tube-ends of half-

inch, five-eighths, seven-eighths, and one-and-one-eighth inch external diameter respectively, when the counterparts of both die blocks 26 are placed in confronting relation, in an obvious manner. It is also to be observed that each groove 27-30 is formed at the corresponding ends with an annularly related larger diameter or expander groove 31, and at the remote portion with an outer flare 32 and spaced groovings 33 functional to define gripping teeth 34 for firmly holding a pipe section 35 against axial displacement, as later on again referred to. The section 2 is also provided with spaced ribs 36 for support of the blocks 26 in axial alignment with the axis of the tool chuck 11 and operating screw 5. It is to be noted the respective blocks are accurately gauged and designed so that when the counterpart groovings 27-30 are brought into confronting relation they align with the longitudinal axis of the corresponding expander tool 17 which is provided with an extension 37 and mergent roundings 38 into the adjoining end of said expander tool, while said extension 37 is of a diameter to snugly fit the bore of the tube end to be operated upon with an entrant reduced part 39 to prevent any scraping or deflecting action.

To securely retain the die blocks 26 in cooperative position with the desired half-round groovings 27-30 in registration, the section 2 is provided with a bearing 40 having a suitable screw-threaded bore for operation therein of a clamp-screw 41 having a pivoted plate or grip-piece 42, fulcrumed to the reduced end 41', Fig. I, of said screw, for coaction with the subjacent rib 36 to prevent its rotation and the adjoining die-block 26 at the inner end, and a ball-ended manipulator 43 at the outer end.

Referring now to Figs. X-XII, all parts previously described have like reference indicia applied thereto to avoid repetitive explanation, while it is to be observed the expander tool 17 is substituted by a flaring-implement 44 arranged for seating in the grooves 13, 14 and retention in operative position by the wire key 20, as hereinbefore set forth. The flaring-implement 44, however, has a conical head 45 for coaction with the end flares 32 of the positionally reversed die blocks 26, whereby the tube end is taperingly expanded at 46, as readily appreciated from Figs. X, XI and XII.

It is also to be noted the paralleling walls of the section 2 between which the dies 26 are located have apertures 47, Figs. III and X, for operative movement of the expander tools 17 and 44 as well as projection of the tube-ends 35 outwardly therefrom.

In operation it will be readily understood the operating screw 5 is retracted, and the clamp-screw 41 released, so as to set the desired groovings 27-30 in confronting registration, whereupon the corresponding expander tool 17 is secured in the chuck 11, as hereinbefore set forth. The tube end or pipe section 35 to be operated on is next inserted between the die blocks 26 from the outer end inwardly until it approximately registers with the inner end of said blocks, see Fig. IV, whereupon the blocks 26 are securely clamped to the pipe section 35 by the means 41-43 in an obvious manner. The expander tool 17 is next entered into the confronting end of the pipe section by its extension 37 and forwardly forced until the pipe end 43 is expanded into the groove 31 as clearly shown in Fig. III, without any outward axial movement

due to the impinging section of the gripping teeth 34, and thus form a cupped end into which unexpanded end of another pipe section can be inserted and sealed by hot lead in the known manner. To release the pipe section 35, the movements above described are reversed; also when the pipe section end is to be flared as shown by Figs. X-XII, it is to be noted the pipe section is pushed inwardly slightly beyond the adjoining end of the die blocks 26, as clearly shown in Fig. XI, or a sufficient distance to ensure the requisite extent of flare 48 producible by the tool 44.

From the foregoing the merits and advantages of this invention will be clearly apparent and while one practical embodiment has been somewhat minutely explained, it will be apparent that variations in details and sizes of the parts are changeable to meet differing service requirements. Accordingly, the right is reserved to all such modifications as the following claims reasonably cover and the prior art permits.

Having thus described my invention, I claim:

1. A tube-end expander of the type described comprising a box-like open structure embodying rectangularly-related communicating sections and means for securing said structure in rigid position, an operating screw journaled centrally lengthwise in one of the sections, a chuck at the inner end of said screw, a tangentially active fulcrumed means carried by the chuck for holding differential expander tools therein, coactive rectangular-section die blocks in the other section adjoining one wall, means for supporting said blocks in slightly spaced relation relative to the bottom inner face of the box-like structure and in planar alignment with the operating screw, each said die block having a substantially half-round groove centrally lengthwise of each longitudinal face and respectively of differential curvature with an annularly-related expander portion of greater curvature at one end and an inwardly located series of spaced groovings defining tube-gripping arcual teeth at the other end, and a screw journaled in a bearing in the second mentioned section with a follower-head operative to clamp the die blocks in mating relation.

2. A tube-end expander as defined in claim 1, wherein one of the box-like structure compartments embodies spaced ribs in its bottom for support of the rectangular die blocks, an end bearing in said compartment, a clamp screw rotative in said bearing with a pivotal follower at its inner extremity, and said follower being restrained against rotation by slidable coaction with one of the spaced ribs.

3. A tube-end expander as defined in claim 1, wherein the operating-screw chuck is in the form of a holder device having inner and outer differential-diameter concentric grooves with associated cut-outs of corresponding widths to the respective differential diameters of said grooves to permit free entry and removal of complementary portions of the expander tool, a springy element tangentially coacts with the tool to secure the latter against displacement, said element being fulcrumed at one end by a pin transversely of a circumferential groove in the holder body with remote engagement in an opposing longitudinal retainer slot in said body, and the free end of said springy element is formed as a finger hold for manipulating purposes.

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