No. 746,579. PATENTED DEC. 8, 1903.

C. ROEDMANN.

TUBE EXPANDING TOOL.

APPLICATION FILED SEPT. 3, 1903.

NO MODEL. 4 SHEETS—SHEET 1.

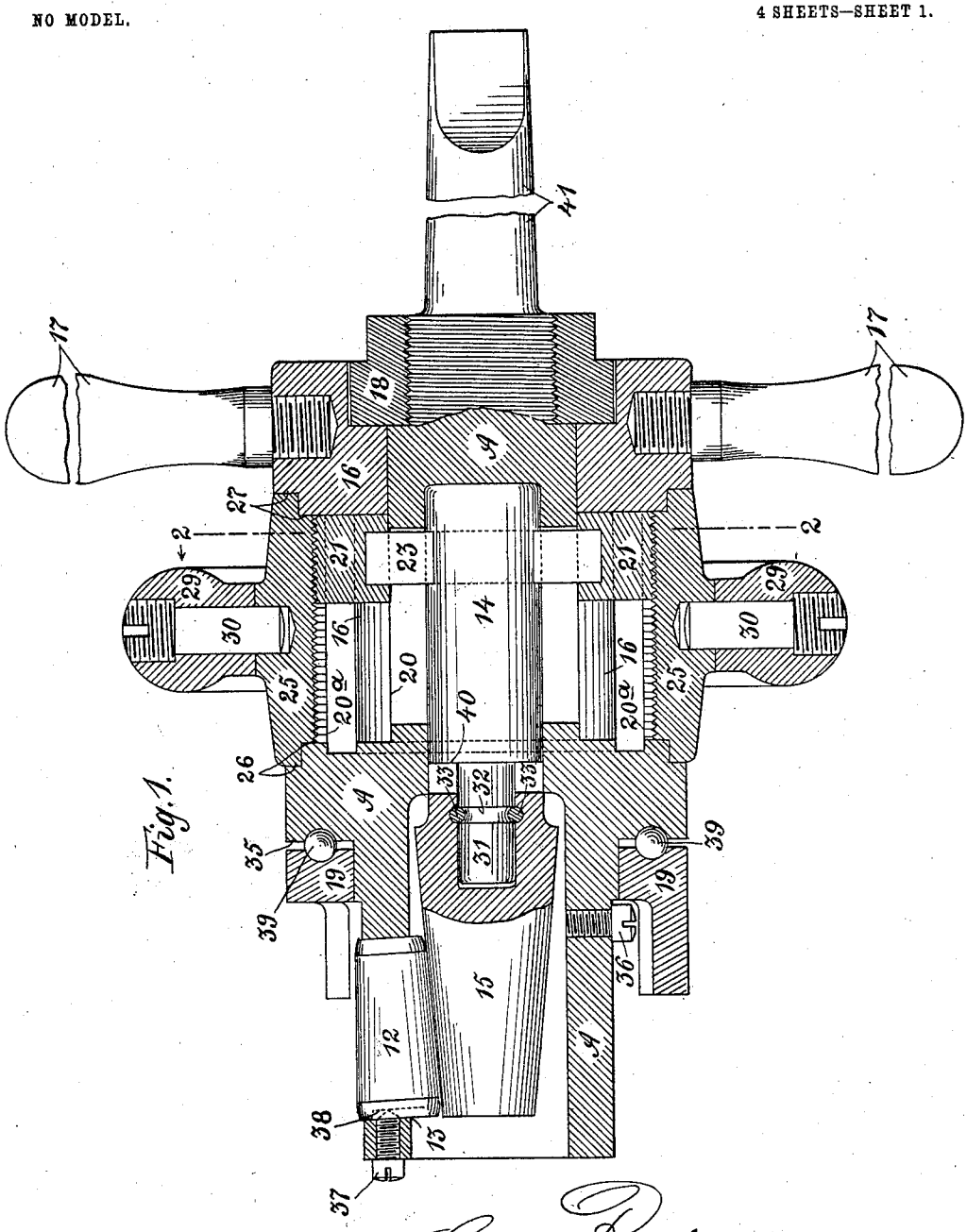


Fig. 1.

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his Att'ys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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NO MODEL. 4 SHEETS—SHEET 2.

Fig. 3.

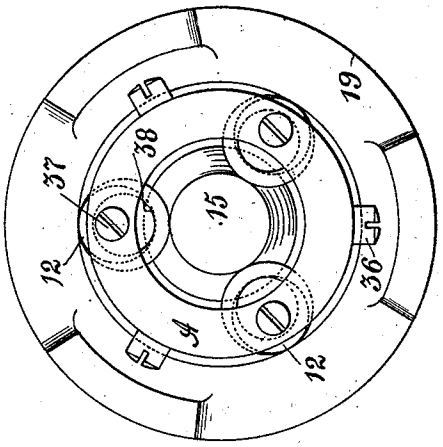
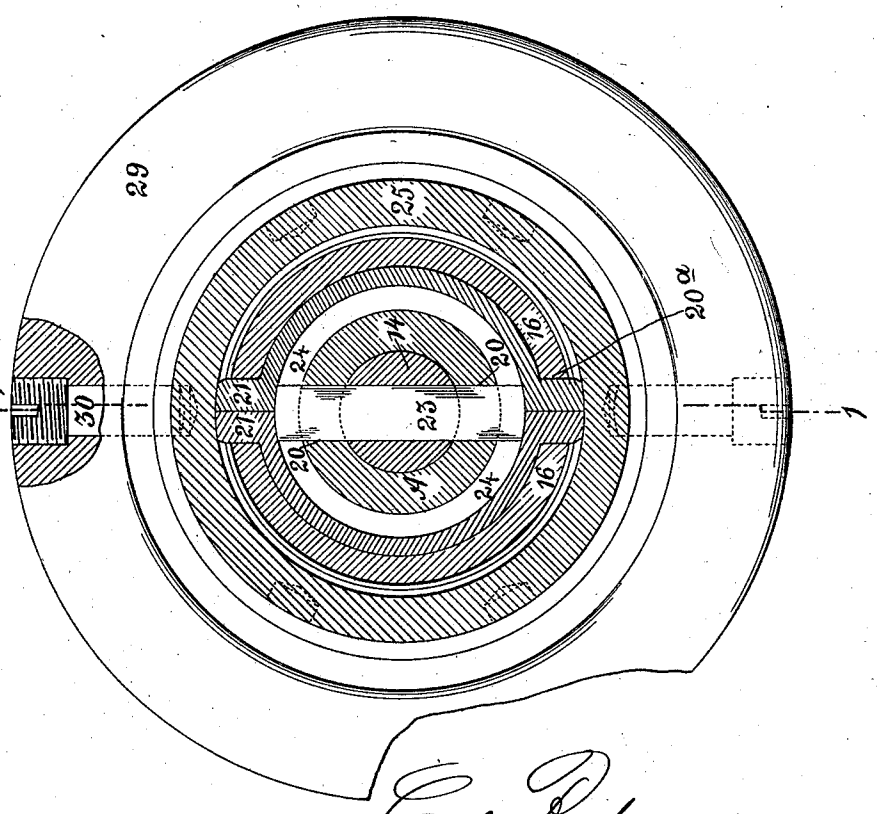


Fig. 2.



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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 4.

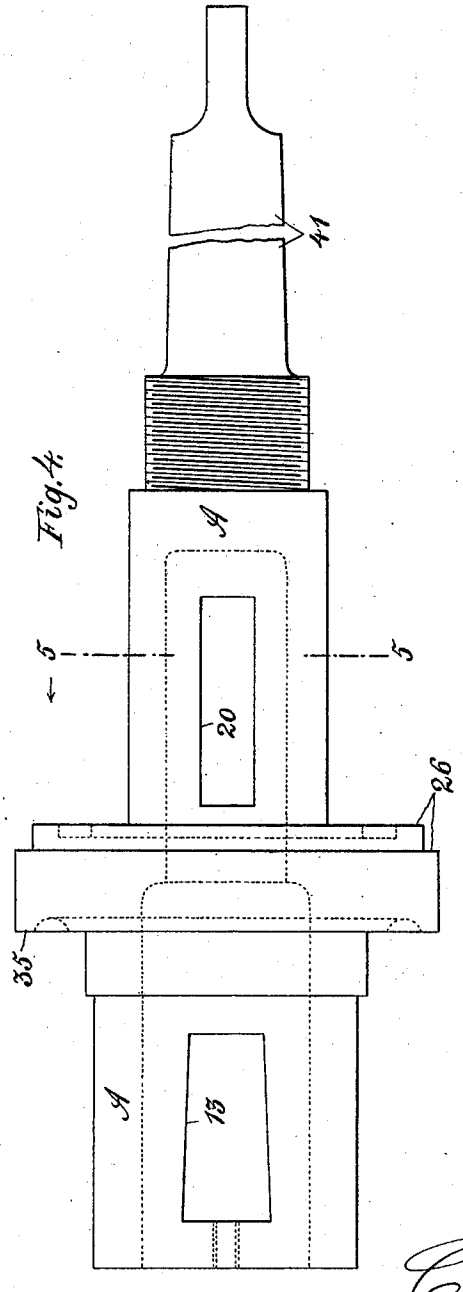


Fig. 6.

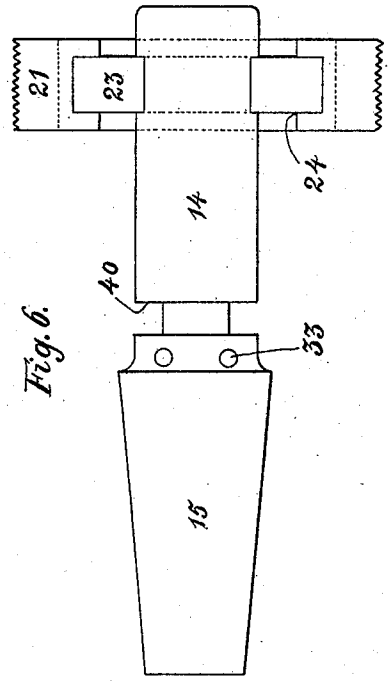
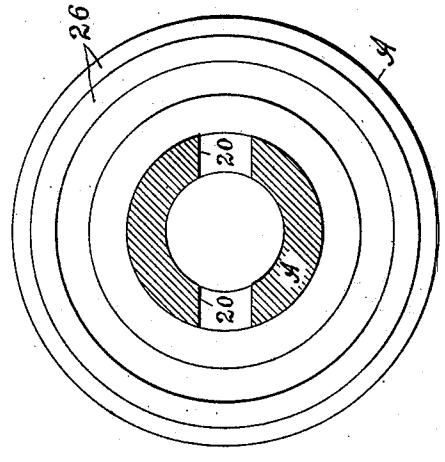


Fig. 5.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 9.

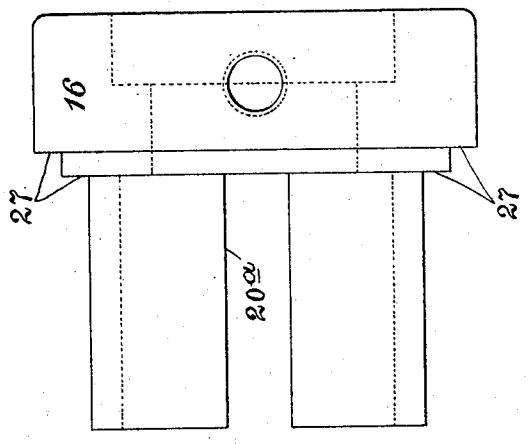


Fig. 8.

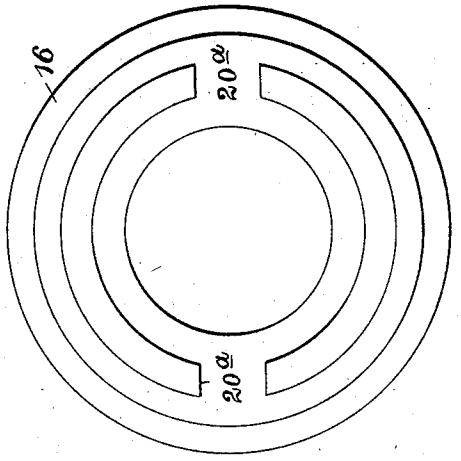
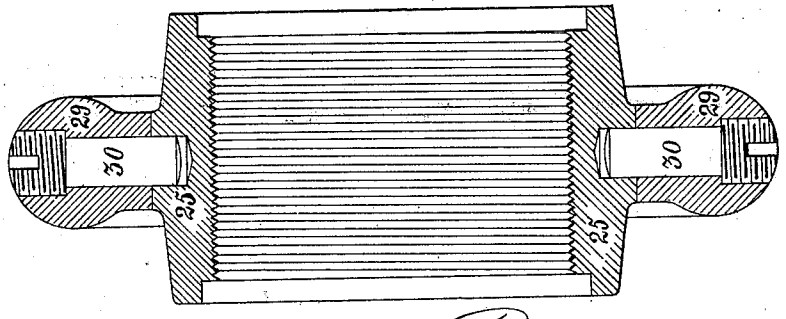


Fig. 7.



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No. 746,579. Patented December 8, 1903.

UNITED STATES PATENT OFFICE.

CARL ROEDMANN, OF PHILADELPHIA, PENNSYLVANIA.

TUBE-EXPANDING TOOL.

SPECIFICATION forming part of Letters Patent No. 746,579, dated December 8, 1903.

Application filed September 3, 1903. Serial No. 171,780. (No model.)

To all whom it may concern:

Be it known that I, CARL ROEDMANN, of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Tube-Expanding Tools, of which the following is a full, clear, and exact specification, reference being had to the accompanying drawings, wherein—

Figure 1 is a longitudinal sectional view on line 1 1, indicated in Fig. 2, partly elevation; Fig. 2, a cross-sectional view, partly elevation, on line 2 2, indicated in Fig. 1, looking to the left; Fig. 3, an end view; Fig. 4, an elevation at right angle to Fig. 1 of the hollow mandrel; Fig. 5, a cross-sectional view on lines 5 5, indicated in Fig. 4; Fig. 6, an elevation, partly-sectional view, of a part of the feeding mechanism; Fig. 7, a sectional view of the feed-ring, (sleeve.) Figs. 8 and 9 are an end view and elevation of the socket of the tool.

My improved tool consists principally of a hollow mandrel A, (shown independently of the other parts in Fig. 4 of the drawings;) a set of expanding-rollers 12, mounted in the hollow mandrel in slots 13; spindle 14, set rotatably in the cavity of the mandrel and concentrically with the axis thereof and longitudinally movable therein; a conical roller 15, set on the recessed forward end of spindle 14; socket 16, rotatably mounted on the mandrel and wherein handles 17 are secured, screw-nut 18 holding the socket in position upon the mandrel, collar 19, and the mechanism for moving longitudinally spindle 14, and thereby feeding the conical roller 15, which will be described more particularly farther on.

To facilitate the explanation of the particular features of my improved expanding-tool, a brief reference to the use of such tools may be made. The primary object of the use of such tools is to enlarge the interior diameter of a tube at its end or such other place where it is joined to another or to some other part—as, for instance, in boiler-making, where the ends of tubes set in the boiler-plates are enlarged (expanded) by such tool where they are set in the boiler-plate—the object being to make a safe and absolutely steam-tight joint. This expanding of the tube is effected by inserting the forward end of the tool, carrying rollers 12, into the end of the tube, and while the tool is rotated the conical roller 15 is forced forwardly to drive apart rollers 12, thus gradually enlarging the diameter of the circle of their rotation, and thereby correspondingly expanding the tube.

The feeding of the conical roller 15 forwardly, or, as it is expressed in the art, "driving" it, should be uninterruptedly in the control of the workman operating the tool. The speed of the feed will depend on the character of the material and the character of the work performed. A jerky or rapid feed might burst the pipe or break the tool.

Such tube-expanding tools as were heretofore constructed require the entire tool to be rotated, and as such a tool must of necessity rotate at considerable speed, and as also the mechanism for feeding the conical roller rotates with it, it readily appears that workmen using such tool could not so regulate the feeding as required, and therefore such tools are less effective in work and more liable to be broken or to burst the tube which is to be expanded. Moreover, as these tools are required to be rotated *in toto* there is no means for holding the tool and for handling it during the work. It was therefore necessary to stop the motion of the tool when setting it to work and again when withdrawing. It was also necessary to stop the rotation of the tool repeatedly during the progress of the work to enable the workman to see the progress of the work, which results in loss of time and energy.

The object of my invention is to remedy these defects, and this I accomplish by the following improvements in the construction of such tools:

Hollow part of mandrel A, wherein spindle 14 is set, is slotted on diametrically opposite points, as shown at 20 in Figs. 4 and 5. A cross-pin 23, set in spindle 14, engages in the slots and projects therethrough on both ends beyond the diameter of the mandrel for some distance, as shown in Figs. 1 and 2. Collar 21 is set upon the mandrel. It is interiorly grooved, as shown at 24 in Fig. 2, and in this groove the projecting ends of pin 23 rotate. Socket 16, slid on the mandrel over the collar 21, is also slotted, (see 20^a in Figs. 8 and 9,) and the flanges of ring 21 engage in these

slots. Nut 18 holds the socket in position upon the mandrel. Thus while mandrel A and spindle 14, conical roller 15, and the rollers 12 rotate the socket 16 and collar 21 stand still. By this arrangement the workman operating the tool is enabled to hold it by handles 17 and to move it, setting it to work and withdrawing it again, and changing it from one tube to another without requiring the rotation of the tool to be stopped, and may feed roller 15 forwardly by moving collar 21 in the direction of the axis of the tool. For better convenience in the feeding or moving of spindle 14 and conical roller 15, connected therewith, the feed ring or sleeve 25 is provided. This sleeve is superimposed on socket 16 and is held in position relatively to the mandrel A by shoulders 26 of the mandrel and shoulders 27 of the socket. The flanges of collar 21 and feed-sleeve 25 are correspondingly screw-threaded and fitted together.

Feed-sleeve 25 is nowhere connected with any of the rotating parts of the tool, and therefore stands still, while mandrel A rotates when the tool operates. The feeding of roller 15 is effected by turning feed-sleeve 25 on the socket. For better convenience in doing this a wheel 29, secured to the feed-sleeve 25 by screws 30, is provided; but this hand-wheel 29 is not essential or necessary for the operation of the tool. Feed-sleeve 25 may be made polygonal and turned by hand, or bores may be provided in its periphery into which a pin may be inserted to facilitate the turning of the sleeve.

Conical roller 15 may be made integral with spindle 14 or may be connected thereto in the manner as shown in the drawings. For this purpose spindle 14 is recessed at 31, the recessed part entering a concentrical bore in roller 15. A groove 32 is provided on the recessed portion 31 of spindle 14 and the roller secured thereto by pins 33, set in tangential cross-bores. This arrangement, however, is not essential for the proper operation of my tool, and any known manner of connecting the roller 15 with spindle 14 may be employed.

Collar 19, set on the mandrel adjoining its shoulder 35 and held in its place by set-screws 36, is employed to hold rollers 12 in place on one end, while on the other end they are held in place by set-screws 37 in the front end of the mandrel and engaging with their pointed ends in recesses 38 of the rollers. This arrangement retains rollers 12 in their position and enables them to be moved laterally outwardly from the mandrel and receded again as the conical roller 15 is operated forward and backward. Collar 19 also serves to set the tool against the tube or boiler-plate, and as it thus stands still while the mandrel A is rotated ball-bearings 39 are provided to reduce the frictional contact between the two parts and avoid loss of energy by friction. Similar ball-bearings or other antifriction device may be provided between the roller 15 and the shoulders 40 of spindle 14, or any other antifriction device may be used in their place. Similar antifriction-bearings may be provided between the adjoining surfaces of nut 18 and socket 16, if necessary.

Mandrel A is usually extended into a shank 41, which is recessed or otherwise shaped on its end to enable it to be readily coupled to a motor for driving (rotating) the mandrel; but any other means for coupling the tool to a motor may be used.

I claim as my invention—

1. A tube-expanding tool comprising a hollow mandrel, a set of rollers loosely mounted in the mandrel and means for retaining the rollers in position, a conical roller rotatably mounted in the interior of the mandrel in position to contact with the other rollers; slots in the mandrel; a cross-pin set in the stem of the conical roller and projecting through the slots beyond the periphery of the mandrel; an interiorly-grooved ring, having radially-disposed flanges, set upon the mandrel and over the projecting ends of the cross-pin, a slotted tubular socket set over the ring, the flanges of the ring engaging in the slots of the socket; and means for moving the ring along the mandrel.

2. A tube-expanding tool comprising a hollow mandrel, a set of rollers loosely mounted in the mandrel and means for retaining the rollers in position, a conical roller rotatably mounted in the interior of the mandrel in position to contact with the other rollers; slots in the mandrel; a cross-pin set in the stem of the conical roller and projecting through the slots beyond the periphery of the mandrel; an interiorly-grooved ring having radially-disposed flanges, screw-threaded on their ends, set upon the mandrel and over the projecting ends of the cross-pin; a slotted tubular socket rotatably set on the mandrel and over the flanged ring, the flanges of the ring projecting through the slots beyond the periphery of the socket; an interiorly-screw-threaded sleeve rotatably mounted upon the mandrel and over the socket and engaging with the screw-threaded flanges of the ring, and means for holding the socket and the sleeve in position upon the mandrel.

3. A tube-expanding tool comprising a hollow mandrel, a set of rollers loosely mounted in the mandrel and means for retaining the rollers in position, a conical roller rotatably mounted in the interior of the mandrel in position to contact with the other rollers; slots in the mandrel; a cross-pin set in the stem of the conical roller and projecting through the slots beyond the periphery of the mandrel; an interiorly-grooved ring having radially-disposed flanges screw-threaded on their ends set upon the mandrel and over the projecting ends of the cross-pin; a slotted tubular socket rotatably set on the mandrel and over the flanged ring, the flanges of the ring projecting through the slots beyond the periphery of the socket; handles secured in the socket; an interiorly-screw-threaded sleeve rotatably

mounted upon the mandrel and over the socket and engaging with the screw-threaded flanges of the ring, and means for holding the socket and the sleeve in position upon the mandrel.

4. A tube-expanding tool comprising a hollow mandrel, a set of rollers loosely mounted in the mandrel and means for retaining the rollers in position, a conical roller rotatably mounted in the interior of the mandrel in position to contact with the other rollers; slots in the mandrel; a cross-pin set in the stem of the conical roller and projecting through the slots beyond the periphery of the mandrel; an interiorly-grooved ring having radially-disposed flanges screw-threaded on their ends set upon the mandrel and over the projecting ends of the cross-pin; a slotted tubular socket rotatably set on the mandrel and over the flanged ring, the flanges of the ring projecting through the slots beyond the periphery of the socket; an interiorly-screw-threaded sleeve rotatably mounted upon the mandrel and over the socket and engaging with the screw-threaded flanges of the ring, handles secured in the socket; and means for holding the socket and the sleeve in position upon the mandrel.

5. A tube-expanding tool comprising a hollow mandrel, a set of rollers loosely mounted in the mandrel and means for retaining the rollers in position, a spindle set in the interior of the mandrel and concentrically therewith; a conical roller set to loosely revolve upon the spindle in position to contact with the other roller; slots in the mandrel; a cross-pin set in the stem of the conical roller and projecting through the slots beyond the periphery of the mandrel; an interiorly-grooved ring having radially-disposed flanges set upon the mandrel, and over the projecting end of the cross-pin, a slotted tubular socket set over the ring, the flanges of the ring engaging in the slots of the sockets; and means for moving the ring along the mandrel.

6. A tube-expanding tool comprising a hollow mandrel, a set of rollers loosely mounted in the mandrel and means for retaining the rollers in position, a spindle set in the interior of the mandrel and concentrically therewith; a conical roller set to loosely revolve upon the spindle in position to contact with the other rollers; slots in the mandrel; a cross-pin set in the stem of the conical roller and projecting through the slots beyond the periphery of the mandrel; an interiorly-grooved ring having radially-disposed flanges screw-threaded on their ends set upon the mandrel and over the projecting ends of the cross-pin; a slotted tubular socket rotatably set on the mandrel and over the flanged ring, the flanges of the ring projecting through the slots beyond the periphery of the socket; an interiorly-screw-threaded sleeve rotatably mounted upon the mandrel and over the socket with the screw-threaded flanges of the ring, and means for holding the socket and the sleeve in position upon the mandrel.

7. A tube-expanding tool comprising a hollow mandrel, a set of rollers loosely mounted in the mandrel and means for retaining the rollers in position, a spindle set in the interior of the mandrel and concentrically therewith; a conical roller set to loosely revolve upon the spindle in position to contact with the other rollers; slots in the mandrel; a cross-pin set in the stem of the conical roller and projecting through the slots beyond the periphery of the mandrel; an interiorly-grooved ring having radially-disposed flanges screw-threaded on their ends set upon the mandrel and over the projecting ends of the cross-pin; a slotted tubular socket rotatably set on the mandrel and over the flanged ring, the flanges of the ring projecting through the slots beyond the periphery of the socket; handles secured in the socket; an interiorly-screw-threaded sleeve rotatably mounted upon the mandrel and over the socket and engaging with the screw-threaded flanges of the ring, and means for holding the socket and the sleeve in position upon the mandrel.

8. A tube-expanding tool comprising a hollow mandrel, a set of rollers loosely mounted in the mandrel and means for retaining the rollers in position, a spindle set in the interior of the mandrel and concentrically therewith; a conical roller set to loosely revolve upon the spindle in position to contact with the other rollers; slots in the mandrel; a cross-pin set in the stem of the conical roller and projecting through the slots beyond the periphery of the mandrel; an interiorly-grooved ring having radially-disposed flanges screw-threaded on their ends set upon the mandrel and over the projecting ends of the cross-pin; a slotted tubular socket rotatably set on the mandrel and over the flanged ring, the flanges of the ring projecting through the slots beyond the periphery of the socket; an interiorly-screw-threaded sleeve rotatably mounted upon the mandrel and over the socket and engaging with the screw-threaded flanges of the ring, handles secured in the socket; and means for holding the socket and the sleeve in position upon the mandrel.

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