No. 734,274. PATENTED JULY 21, 1903.

L. D. LOVEKIN.

EXPANDING AND FLANGING TOOL.

APPLICATION FILED MAR. 28, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

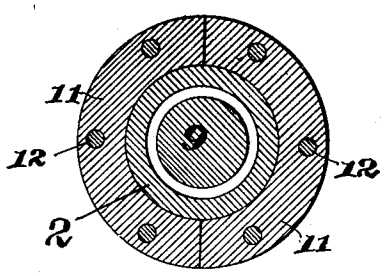


Fig. 3

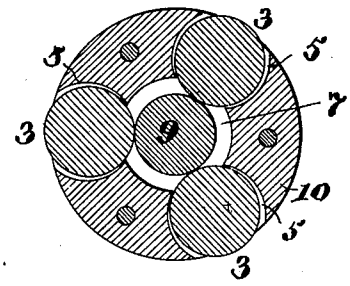


Fig. 2

Fig. 1

Fig. 7

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

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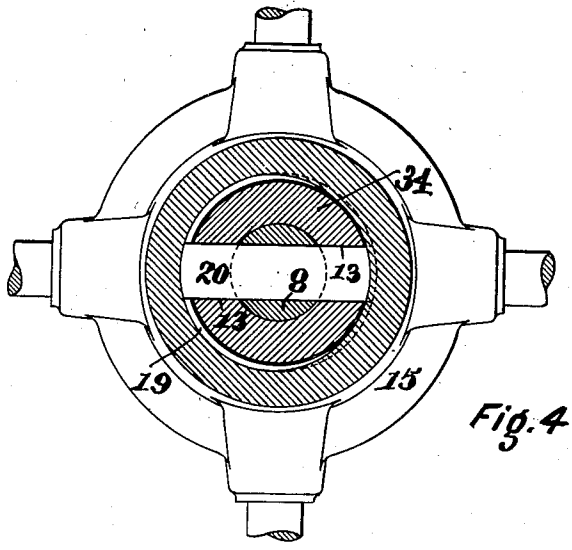


Fig. 4

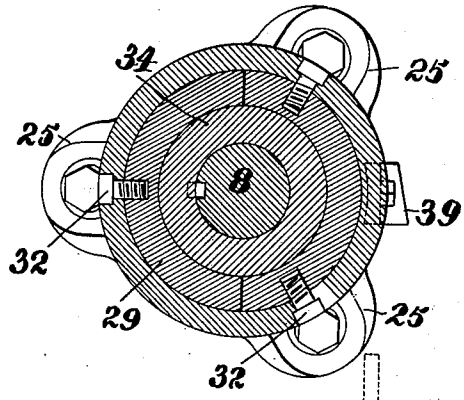


Fig. 5

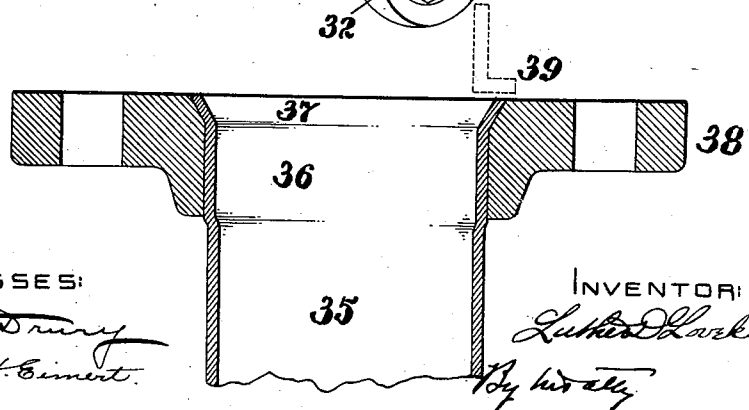


Fig. 6

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No. 734,274. Patented July 21, 1903.

UNITED STATES PATENT OFFICE.

LUTHER D. LOVEKIN, OF PHILADELPHIA, PENNSYLVANIA.

EXPANDING AND FLANGING TOOL.

SPECIFICATION forming part of Letters Patent No. 734,274, dated July 21, 1903.

Application filed March 28, 1902. Serial No. 100,355. (No model.)

To all whom it may concern:

Be it known that I, LUTHER DANIEL LOVEKIN, of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Expanding and Flanging Tools, of which the following is a specification.

My invention has reference to expanding and flanging tools; and it consists of certain improvements fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

The object of my invention is the provision of a simple and efficient tool capable of being easily and expeditiously handled to expand and flange the ends of pipes or tubes of sheet metal, and more especially those of comparatively small diameters.

My invention is more particularly an improvement upon the type of flanging-machine set out in Letters Patent to me, No. 682,726, dated September 17, 1901, and is distinguished therefrom principally in expanding and flanging rollers and the manner of supporting and operating them.

In carrying out my invention I provide a suitable mandrel adapted to be operated in any convenient manner, the lower end of which is rotatable and is furnished with expanding-rollers preferably made slightly tapered. Within the mandrel I arrange a thrust-follower tapered on its end and adapted to press upon the expanding-rollers for the purpose of causing them to spread as the work may require and also to act as a support upon which the expanding-rollers may travel while the end of the mandrel is rotating, and thereby reduce the resistance to rotation upon their own axes to a minimum. The structure is designed to secure the desired results with the least expenditure of power and also with a simple and practicable construction of the operative parts making up the organized tool. The follower is arranged to be fed gradually in a longitudinal direction through the mandrel to shift the position of the tapered end relatively to the expanding-rollers, and its movement may be secured and regulated by hand manipulation, as pointed out hereinafter. I also arrange flanging-rollers on the mandrel above the expanding-rollers, said flanging-rollers being combined with an internal thrust-roller located within the hollow mandrel and upon which the flanging-rollers rotate when in the act of flanging a pipe or tube. In this structure I prefer that the mandrel and flanging-rollers shall be free to revolve about the thrust-roller. I further prefer to combine in the organized tool a cutter for turning the edge of the pipe when flanged to make it perfectly true with the surface of the pipe flange or ring into which the pipe is to be expanded and flanged.

It is evident that my invention may be confined to either the expanding or the flanging devices; but I prefer that it shall contain them both.

The details of construction will be better understood by reference to the drawings, in which—

Figure 1 is a sectional elevation of an expanding and flanging tool embodying my invention. Fig. 2 is a cross-section of the same on line 2 2 of Fig. 1. Fig. 3 is a cross-section of the same on line 3 3 of Fig. 1. Fig. 4 is a cross-section of the same on line 5 5 of Fig. 1. Fig. 5 is a cross-section of the same on line 4 4 of Fig. 1. Fig. 6 is a sectional elevation of a pipe and flange after the pipe is expanded or flanged, and Fig. 7 is an elevation of two complete pipe ends and flanges united.

2 is the middle portion of the mandrel and is in the main a cylindrical body chambered at 28 and having a rotatable hollow or tubular lower part 10, forming a chamber at 7. The upper portion of the mandrel 34 terminates in a tapered shank 33, adapted to be received and held in the tail-stock of a turret-lathe or other tool suitable for the purpose of supporting it. The particular shape of the shank is immaterial and would be made to suit the tool available. This upper portion 34 of the mandrel is slotted, as at 13, and its body immediately above the slot is screw-threaded and provided with a nut 17. A controller-ring 15, provided with suitable handles or parts for the operator to grasp, is loosely sleeved over the mandrel-body 34 and journaled in bearings 18 on the mandrel and 16 in the nut 17. In this manner the controller-ring may be freely rotated for purposes to be set out later on. The mandrel-body is bored through almost to the shank 33 and is fitted with a vertically-adjustable thrust-follower shaft 8, having at its upper

end a transverse key 20, which is guided in the vertical slots 13 of the mandrel, so as to prevent it from turning within the mandrel, the ends of said key projecting beyond the mandrel-body and connecting with the controller-ring by means of screw-threads upon the outer ends of the key-engaging screw-threads 19 on the internal face of the ring. It will be seen that by turning the controller-ring while the mandrel is stationary the follower-shaft will be caused to move longitudinally through the mandrel.

The lower end of the thrust-follower shaft 8 is tapered on its end, as at 9, and is extended downward into the space 7 of the mandrel. This thrust-follower constitutes a conical bed upon which the expanding-rollers travel. When this thrust-follower is retracted within the space 7, it is practically inclosed and protected within the mandrel.

The lower rotatable end 10 of the mandrel is provided with expanding-rollers 3, preferably three in number, said rollers being tapered with the taper directed upward. The expanding-rollers 3 are set into sockets 5, formed with curved walls, which hold the rollers from falling out of the mandrel, and they are retained in the sockets by an annular plate 6, screwed to the bottom of the portion 10 of this mandrel. These expanding-rollers 3 extend through the apertures 5, resting against the thrust-follower 9 with their inner faces and having their outer faces projected beyond the outer surface of the mandrel.

The lower portion 10 of the mandrel is annular in shape and attached to the part 2 of the mandrel by means of a collar or ring 11, secured to it by screws 12 and fitting into an annular groove 4 in the part 2, so as to be adapted to rotate about the axis of the follower 9. The object of this is to allow the rollers 3 under the expanding operation to roll upon the thrust-follower 9 to reduce their friction, and in doing this they carry around the frame 10. The joint between the parts 2 and 10 may be of any other suitable construction. As the taper on the rollers 3 is inversely that of the follower 9, it is evident that as the former roll upon the latter in the expanding operation the outer or active faces or expanding-surfaces are parallel to the axis of the thrust-follower, and consequently the expanding tube or pipe will retain a cylindrical shape during the expanding operation and at its completion. However, this extent of taper may be varied to suit the nature of the work, and hence I do not limit my invention in this regard.

The expanding-rollers 3 may be made with plain or smooth surfaces or may have roughened or knurled peripheries, as preferred.

At some distance above the rollers 3 the outer portion of the mandrel 2 is provided with annular bosses 25, which are perforated, and the mandrel is slotted at preferably three places 26 equidistant about the mandrel and desirably above or in longitudinal alinement with the expanding-rollers 3. These slots 26 open through the mandrel into the hollow space 28 within the same. Into the boss above each of the recessed portions is screwed at 24 inclined spindles 23, the lower ends of which are stepped in the mandrel-body. Loosely journaled upon these spindles 23 are the flanging-rollers 21. In this manner the flanging-rollers are adapted to rotate on oblique axes and the three flanging-rollers, in effect, have their axes radiating from the same point of the axis of the mandrel. However, this is only necessary when the several flanging-rollers are the same size and shape. To reduce the friction, these rollers 21 rest upon antifriction-collars 27, arranged between their upper portion and the under surface of the bosses 25. The outer flanging-surface of these rollers 21 is tapered longitudinally of the roller, giving them a conical shape, so as to cause the metal of the tube to be flanged in the form of a conical surface, as clearly shown in Fig. 6. While I prefer this type of flanging-roller, I do not confine myself thereto, as the flanging may be done in other shapes to suit the character of the work to be performed.

To reduce the friction and take up the thrust of the flanging-rollers 21, I provide a conical antifriction or thrust roller 30, located within the hollow space 28 of the mandrel and through which the follower-shaft 8 passes with freedom of longitudinal motion, but preferably keyed at 31, so that the thrust-roller may be held stationary, if desired. The key may be omitted, if preferred, and the roller permitted to rotate. The flanging-rollers 21 press at points equidistant upon this roller 30, and thus the thrusts of said rollers 21 are centralized upon it.

The part 2 of the mandrel is free to rotate upon the part 34 by being provided with a collar or ring 29, fitting an annular groove in the part 34 and secured to part 2 by screws 32. Any other mode of attachment may be employed which is found suitable for the purpose. In this manner provision is made for the mandrel and its flanging-rollers to rotate under the flanging-pressure, and the flanging-rollers 21 are thus enabled to roll upon the central roller or thrust-bearing 30 with but little friction. It is also evident that this rotary joint between the parts 2 and 34 will, if desired, answer for the rotary action required for the part 10, and hence the parts 10 and 2 may be rigidly secured together. It is also evident that the part 10 may be rotatable, while parts 2 and 34 may be integral or rigid, if so desired; but in this latter case it is preferable to omit the key 31.

Secured to the side of the mandrel 2 is a turning tool or cutter 39 for the purpose of turning the edge of the flanged pipe or tube to make it true with the surface of the pipe-flange, as shown in Fig. 6, so that two such pipes and flanges may be clamped tightly together, as in Fig. 7. This turning tool or cut-

ter 39 is clamped to the mandrel by a screw 40, extending through a slot in the cutter, as shown in Fig. 1, so that the cutter may be adjusted to suit the requirements due to variations in thickness of metal to be flanged, which would change the relative positions of the cutter and flanging-rollers, necessitating the cutter to be farther from the end of the mandrel for thin tubes than for thick ones. The form of the cutter may be varied to suit the requirements of the work.

To show the adaptability of my improved tool, I will now refer to Figs. 6 and 7. In Fig. 6 is shown the end of the pipe or tube 35 to be expanded and flanged in the ring or flange 38. This flange is properly turned and formed with the annular tapered end. These parts are clamped in the face-plate of the lathe and adapted to be rotated. The end of the mandrel 2 is then inserted into the tube, and while the latter rotates the control-ring 15 is turned by hand with the object of moving the thrust-follower and its tapered end 9 toward the tube and the expanding-rollers 3 outward. The result of this is that the metal of the tube 35 is expanded to fit tightly into the bore of the flange 38, as shown in Fig. 6. In this operation the rollers rotate by frictional contact with the pipe or tube 35, and their rotation is accomplished with but little friction, first, because of the freedom to rotation of the part 10 carrying the rollers, and, secondly, because the thrust of the traveling rollers 3 is received upon a circular body. When the expansion of the tube has been completed, the controller-ring is rotated in a reverse direction and the pressure by the rollers 3 relieved. The mandrel is then advanced within the tube and guided thereby until the flanging-rollers 21 touch the outwardly-extending edge of the tube. The tail-stock and tool is then moved gradually toward the tube and flange 38, and the result is that the rollers 21 gradually flange outwardly the edge of the tube, as shown in Fig. 6, causing it to fit tightly down upon the conical edge of the flange-ring, as at 37. The part 2 of the mandrel, together with rollers 21, are free to revolve upon the part 34 of the mandrel, and as the rollers 21 roll upon the central thrust roller or body 30 much of the friction which would otherwise result is overcome. Simultaneously with this flanging operation the cutter 39 on the mandrel turns off the surplus metal from the flanged end of the tube and makes it perfectly flat and true with the upper surface of the flange, as shown in Fig. 6.

Now while I have described my invention as adapted to be used in the lathe of the turret or other suitable type it is to be understood that the same results can be secured by revolving the tool and holding the pipe or tube stationary, or both may have rotary motion given to them. My invention is independent of the particular means employed for holding the tool and is not to be restricted thereby.

While I prefer the construction shown as being excellently adapted for the purposes of my invention, I do not limit myself to the details, as they may be modified without departing from the spirit of the invention.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a tool for expanding tubes, the combination of a mandrel adapted to be held when using the tool and having its end independently rotatable, expanding-rollers carried by the rotatable end of the mandrel and adapted to project beyond the outer surface thereof, and a longitudinally-adjustable follower having a tapered end carried by the mandrel and adapted to receive the thrust of the expanding-rollers when in act of expanding the tube.

2. In a tool for expanding tubes, the combination of a mandrel adapted to be held when using the tool and having its end independently rotatable, expanding-rollers carried by the rotatable end of the mandrel and adapted to project beyond the outer surface thereof, a longitudinally-adjustable follower having a tapered end carried by the mandrel and adapted to receive the thrust of the expanding-rollers when in the act of expanding the tube, and a turning tool or cutter carried by the mandrel above the rotatable end.

3. In a tool for expanding tubes, the combination of a mandrel adapted to be held when using the tool and having its end independently rotatable, tapered expanding-rollers carried by the rotatable end of the mandrel and adapted to project beyond the outer surface thereof, a longitudinally-adjustable follower carried by the mandrel and having a tapered end adapted to receive the thrust of the expanding-rollers when in the act of expanding the tube, and flanging-rollers carried by the body of the mandrel above the expanding-rollers and rotatable end.

4. In a tool for expanding tubes, the combination of a mandrel adapted to be held when using the tool and having its end independently rotatable, tapered expanding-rollers carried by the rotatable end of the mandrel and adapted to project beyond the outer surface thereof, a longitudinally-adjustable follower carried by the mandrel and having a tapered end adapted to receive the thrust of the expanding-rollers when in the act of expanding the tube, flanging-rollers carried by the mandrel above the expanding-rollers and rotatable end, and a turning tool or cutter secured to the body of the mandrel in transverse alinement with the flanging-rollers.

5. In a tool for expanding tubes, the combination of a mandrel-shank adapted to be held when using the tool and having an independently-rotatable body and end, expanding-rollers carried by the rotatable end of the mandrel and adapted to project beyond the outer surface thereof, a longitudinally-adjustable follower carried by the mandrel hav-

ing a tapered end adapted to receive the thrust of the expanding-rollers when in the act of expanding the tube, means to move the follower longitudinally through the mandrel, and flanging-rollers journaled to the rotatable body of the mandrel-shank.

6. In a tool for flanging tubes, the combination of a hollow mandrel adapted to be held when using the tool having a rotatable body portion, flanging-rollers carried by the rotatable portion of the mandrel and projecting beyond the outer surface thereof, and a tapered thrust roller or bearing within the rotatable portion of the mandrel and adapted to receive the thrust of the flanging-rollers when they are traveling with the mandrel part in the act of flanging the tube.

7. In a tool for flanging tubes, the combination of a mandrel adapted to be held when using the tool having a hollow rotatable part, flanging-rollers carried by the hollow rotatable part of the mandrel and projecting beyond the outer surface thereof, a tapered thrust roller or bearing within the rotatable portion of the mandrel and adapted to receive the thrust of the flanging-rollers when in act of flanging the tube, and a turning tool or cutter attached to the mandrel in transverse alinement with the flanging-rollers.

8. In a tool for flanging tubes, the combination of a mandrel adapted to be held when using the tool having a rotatable hollow portion, flanging-rollers carried by the rotatable hollow portion of the mandrel and projecting beyond the outer surface thereof, a tapered thrust roller or bearing within the mandrel and adapted to receive the thrust of the flanging-rollers when in act of flanging the tube, and means for holding the thrust roller or bearing against rotation.

9. In a tool for expanding pipe, the combination of a mandrel-shank having an independently-rotatable part to enter the pipe, expanding-rollers carried in the rotatable annular wall of the mandrel, a tapered thrust-follower within the hollow mandrel and adapted to receive the thrust of the expanding-rollers and spread them in the act of expanding the tube, and means for feeding the thrust-follower longitudinally without rotating it in the mandrel.

10. In a tool for flanging and expanding tubes, the combination of a mandrel adapted to be held when using the tool and having two freely-rotatable hollow portions mechanically connected so as to be movable as a unit, expanding-rollers carried by one of the hollow rotatable portions of the mandrel and adapted to project beyond the outer surface thereof, a longitudinally-adjustable follower carried by the mandrel having a tapered end adapted to receive the thrust of the expanding-rollers when in the act of expanding the tube, one or more flanging-rollers journaled upon the other of the hollow rotatable portions of the mandrel at considerable distance from its end so as to be out of transverse alinement with the expanding-rollers, and a thrust roller or bearing within the last-mentioned hollow rotatable portion of the mandrel for receiving the thrust of the flanging-rollers.

11. In a tool for flanging pipe, the combination of a mandrel-shank having an independently-rotatable portion, a series of flanging-rollers carried by the rotatable portion of the mandrel, and an adjustable turning or cutting tool secured to the rotatable portion of the mandrel in transverse alinement with the flanging-rollers for turning the flanged end of the pipe.

12. In a tool for flanging pipe, the combination of a hollow mandrel having a rotatable part, a series of flanging-rollers carried by the rotatable part of the mandrel and having their operating-surfaces in lines obliquely to the axes of the mandrel, and a central thrust roller or bearing located wholly within the hollow mandrel and against which the flanging-rollers rest and upon which they revolve when doing their work of flanging the tube.

In testimony of which invention I have hereunto set my hand.

L. D. LOVEKIN.

Witnesses:
R. M. HUNTER,
GEORGE H. EIMERT.