No. 766,633. PATENTED AUG. 2, 1904.

L. D. LOVEKIN.

TOOL FOR EXPANDING AND FLANGING PIPE.

APPLICATION FILED JULY 10, 1903.

NO MODEL.

Fig. 1

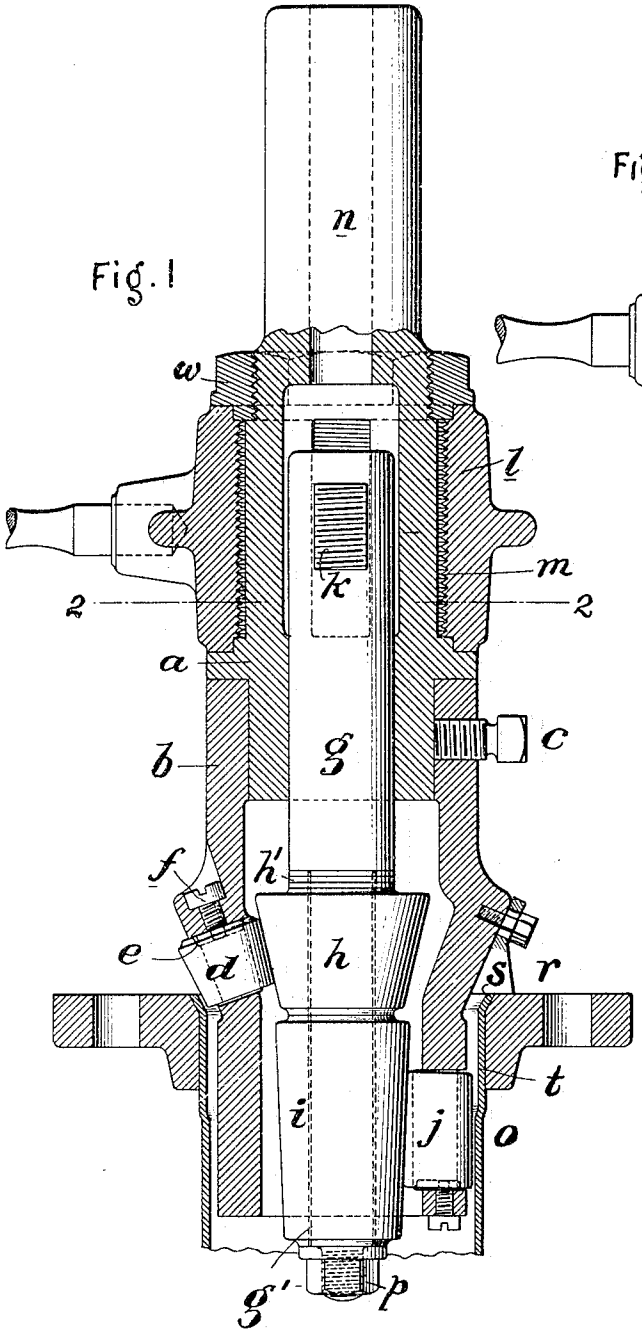
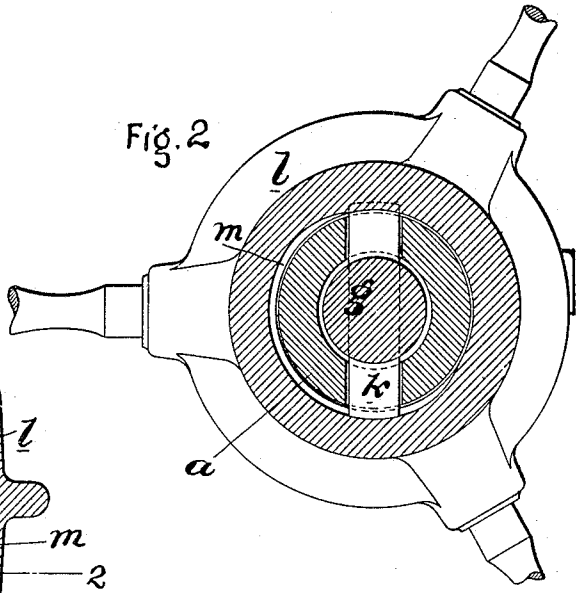


Fig. 2



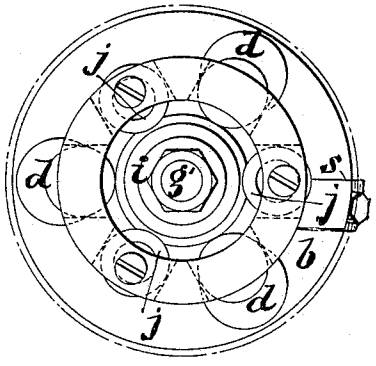


Fig. 3

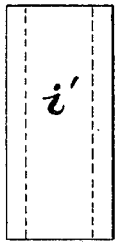


Fig. 4

ATTEST

P. M. Kelly

Wm. Roomby.

INVENTOR

Luther D. Lovekin

By his atty

Thos. L. Wilson

No. 766,633. Patented August 2, 1904.

UNITED STATES PATENT OFFICE.

LUTHER DANIEL LOVEKIN, OF PHILADELPHIA, PENNSYLVANIA.

TOOL FOR EXPANDING AND FLANGING PIPE.

SPECIFICATION forming part of Letters Patent No. 766,633, dated August 2, 1904.

Application filed July 10, 1903. Serial No. 164,932. (No model.)

To all whom it may concern:

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

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

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 furnished with expanding-rollers which are preferably made slightly tapered. Within the mandrel I arrange a follower carrying upon its lower end a tapered roller adapted to press upon the expanding-rollers for the purpose of causing them to spread as the work may require and also to reduce their resistance to rotation upon their own axes. The structure is designed to secure the desired results with the least expenditure of power and also with the simplest practicable construction of the operative parts making up the organized tool. The mandrel is further provided with tapered flanging-rollers located upon its outer surface at a considerable distance from its end for the purpose of flanging the free edges of the expanded tube end, and thereby secure it in position within a pipe-flange. The flanging-rollers are adjustably supported and rest against a central roller carried by the follower. These tapered follower-rollers are, moreover, supported by a follower-shaft in such a manner that their end thrust may be taken up by antifriction devices. The follower is arranged to be fed gradually in a longitudinal direction through the mandrel to shift the position of the follower-rollers relatively to the expanding and flanging rollers, and its movement may be secured and regulated by hand manipulation, as pointed out hereinafter.

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. Fig. 3 is an inverted end view of the tool, and Fig. 4 is an elevation of a substitute collar.

a b represent the mandrel, which is in the main a cylindrical body hollow or tubular on the lower part and having its upper portion *a* terminating in a tapered shank *n*, 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. The mandrel-body is made of two parts secured together at *c*. The portion *a* of the mandrel is slotted, and the upper portion of its body immediately above the slot is screw-threaded and provided with a nut *w*. A controller-ring *l*, provided with suitable handles or parts for the operator to grasp, is loosely sleeved over the mandrel-body and journaled in bearings on the mandrel *a* and on the nut *w*. 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 *n* and is fitted with a vertically-adjustable follower-shaft *g*, having at its upper end a transverse key *k*, which is guided in the vertical slots 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 *m* on the internal face of the ring. It will now 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 follower-shaft *g* is reduced in diameter to form a spindle, as at *g'*, and is extended downward into the space at

the lower part of the mandrel. This reduced portion constitutes a spindle, upon which is loosely sleeved conical or tapered rollers *i* and *h*, the taper of which is downward or toward the end of the mandrel. The roller *i* may be removed from the spindle when necessary by removing a nut *p* on the end of the spindle and which normally holds the tapered rollers in place. As these rollers are subjected to heavy strain in an upward direction, I find it most important to provide means to take this thrust with the least possible liability of wear from friction. To this end I provide the follower with a series of antifriction-rings *h'* of a diameter preferably equal to the diameter of the larger or body portion of the follower and encircling the spindle *g'* thereof, so as to be interposed between the end of the larger portion of the follower and the end of the roller *h*.

The lower end of the part *b* of the mandrel is provided with expanding-rollers, preferably three in number, said rollers being tapered with the taper directed upward. They are held against disengagement by screws entering recesses on their lower ends.

As the taper on the rollers *j* is inversely that upon the follower-roller *i*, 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 follower, and consequently the expanded tube or pipe will retain a cylindrical shape during the expanding operation and at its completion.

At some distance above the rollers *j* the outer portion of the mandrel portion *b* is provided with a conical swelling, which is slotted at preferably three places equidistant about the mandrel and desirably out of longitudinal alinement with the expanding-rollers *j*. The slots open through the mandrel into the hollow space within the same. These slots are fitted with adjustable flanging-rollers *d*, which are recessed upon their upper ends and held in place by screws *f*. These flanging-rollers rest against the thrust-roller *h*. The outer or flanging surface of these rollers *d* 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. 1. 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 *d*, I provide the above-mentioned conical antifriction or thrust roller *h*. The flanging-rollers *d* press at points equidistant upon this roller *h*, thus centralizing it. As it is pressed upward this end thrust is received upon the antifriction-collars *h'*.

Secured to the side of the mandrel *b* is a trimming tool or cutter *s* for the purpose of trimming the edge of the flanged pipe or tube to make it true with the surface of the pipe-flange, as shown in Fig. 1, so that two such pipes and flanges may be clamped tightly together. This trimming tool or cutter *s* is clamped to the mandrel by a screw extending through a slot in the cutter, 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.

In Fig. 1 is shown the end of the pipe or tube *o* to be expanded and flanged in the ring or flange *r*. 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 *b* is then inserted into the tube, and while the latter rotates the controller-ring *l* is turned by hand, with the object of moving the follower and its roller *i* toward the tube and the expanding-rollers *j* within it. The result of this is that the metal of the tube *o* is expanded to fit tightly into the bore of the flange *r*, as shown at *t* in Fig. 1. In this operation the rollers rotate by frictional contact with the pipe or tube and their rotation is accomplished with but little friction—first, because of the freedom to rotation of the roller *i* of the follower, due to the use of the antifriction rings or collars *h'*, and, secondly, because the thrust of the rollers *j* is received upon a rotating 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 *j* is relieved. The roller *i* may then be removed and, if desired, the collar or sleeve *i'*, Fig. 4, substituted. The mandrel is then advanced within the tube and guided thereby until the flanging-rollers *d* touch the outwardly-extending edge of the tube. The tail-stock and tool may then be moved gradually toward the tube and flange *r*, and the result is that the rollers *d* gradually flange outwardly the edge of the tube, causing it to fit tightly down upon the conical edge of the flange-ring. Instead, however, of moving the mandrel and the rollers *d* forward to flange the tube the mandrel *g* and thrust-roller *h* may be moved forward, and thereby force the flanging-rollers *d* apart to flange the tube. The antifriction-rings *h'* receive the end thrust and reduce the friction. Simultaneously with this flanging operation the cutter *s* on the mandrel trims 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. 1.

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 under-

stood 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 as follows:

1. In a tool for flanging pipe, the combination of a hollow mandrel, outwardly-adjustable flanging-rollers extending through the mandrel and rotating on oblique axes and presenting oblique operating-surfaces, a conical thrust-roller within the mandrel and adapted to spread the flanging-rollers, a longitudinally-adjustable follower-shaft adapted to move the thrust-roller longitudinally in the mandrel, and means for adjusting the follower-shaft.

2. In a tool for flanging pipe, the combination of a hollow mandrel, outwardly-adjustable flanging-rollers extending through the mandrel and rotating on oblique axes and presenting oblique operating-surfaces, a conical thrust-roller within the mandrel and adapted to spread the flanging-rollers, a longitudinally-adjustable follower-shaft adapted to move the thrust-roller longitudinally in the mandrel, expanding-rollers arranged in the lower end of the mandrel, a thrust-roller for the expanding-rollers also carried by the follower-shaft, and means for adjusting the follower-shaft.

3. In a tool for flanging pipe, the combination of a hollow mandrel, outwardly-adjustable flanging-rollers extending through the mandrel and rotating on oblique axes and presenting oblique operating-surfaces, a conical thrust-roller within the mandrel and adapted to spread the flanging-rollers, a longitudinally-adjustable follower-shaft adapted to move the thrust-roller longitudinally in the mandrel, expanding-rollers arranged in the lower end of the mandrel, a thrust-roller for the expanding-rollers also carried by the follower-shaft and resting against the thrust-roller of the flanging-rollers, antifriction-collars surrounding the follower-shaft and between a shoulder upon it and the thrust-roller of the flanging-rollers, and means for adjusting the follower-shaft.

4. A tool for flanging pipe consisting of a mandrel made hollow at its lower end, combined with outwardly-adjustable flanging-rollers having operating-surfaces greatly inclined relatively to the axis of the mandrel, a longitudinally-adjustable follower-shaft having a shoulder, a conical follower or thrust-roller carried by the follower-shaft for spreading the flanging-rollers, and antifriction collars or rings interposed between the conical follower or thrust-roller and the shoulder of the follower-shaft.

5. In a tool for flanging pipe, the combination of a hollow mandrel, outwardly-adjustable flanging-rollers extending through the mandrel and rotating on oblique axes and presenting oblique operating-surfaces and formed with recessed ends, screws carried by the mandrel and whose ends extend down into the recessed ends of the rollers, a conical thrust-roller within the mandrel and adapted to spread the flanging-rollers, a longitudinally-adjustable follower-shaft adapted to move the thrust-roller longitudinally in the mandrel, and means for adjusting the follower-shaft.

6. A tool for flanging pipe consisting of a mandrel made hollow at its lower end, combined with outwardly-adjustable flanging-rollers having operating-surfaces greatly inclined relatively to the axis of the mandrel, a longitudinally-adjustable follower-shaft having a shoulder, a conical follower or thrust-roller carried by the follower-shaft for spreading the flanging-rollers, antifriction collars or rings interposed between the conical follower or thrust-roller and the shoulder of the follower-shaft, and a trimming-cutter secured to the mandrel adjacent to the flanging-rollers.

7. In a tool for flanging pipe, the combination of a hollow mandrel, outwardly-adjustable flanging-rollers extending through the mandrel and rotating on oblique axes and presenting oblique operating-surfaces, a conical thrust-roller within the mandrel and adapted to spread the flanging-rollers, a longitudinally-adjustable follower-shaft adapted to move the thrust-roller longitudinally in the mandrel, means for adjusting the follower-shaft, and a trimming device secured to the body of the mandrel in transverse alinement with the flanging-rollers.

In testimony of which invention I hereunto set my hand.

LUTHER DANIEL LOVEKIN.

Witnesses:
R. M. KELLY,
WM. ROONEY.