April 27, 1926. 1,582,525

C. W. LUCAS

MACHINE FOR SPINNING, TRIMMING, OR FLANGING THIN METAL TUBES

Filed Dec. 18, 1922 5 Sheets-Sheet 1

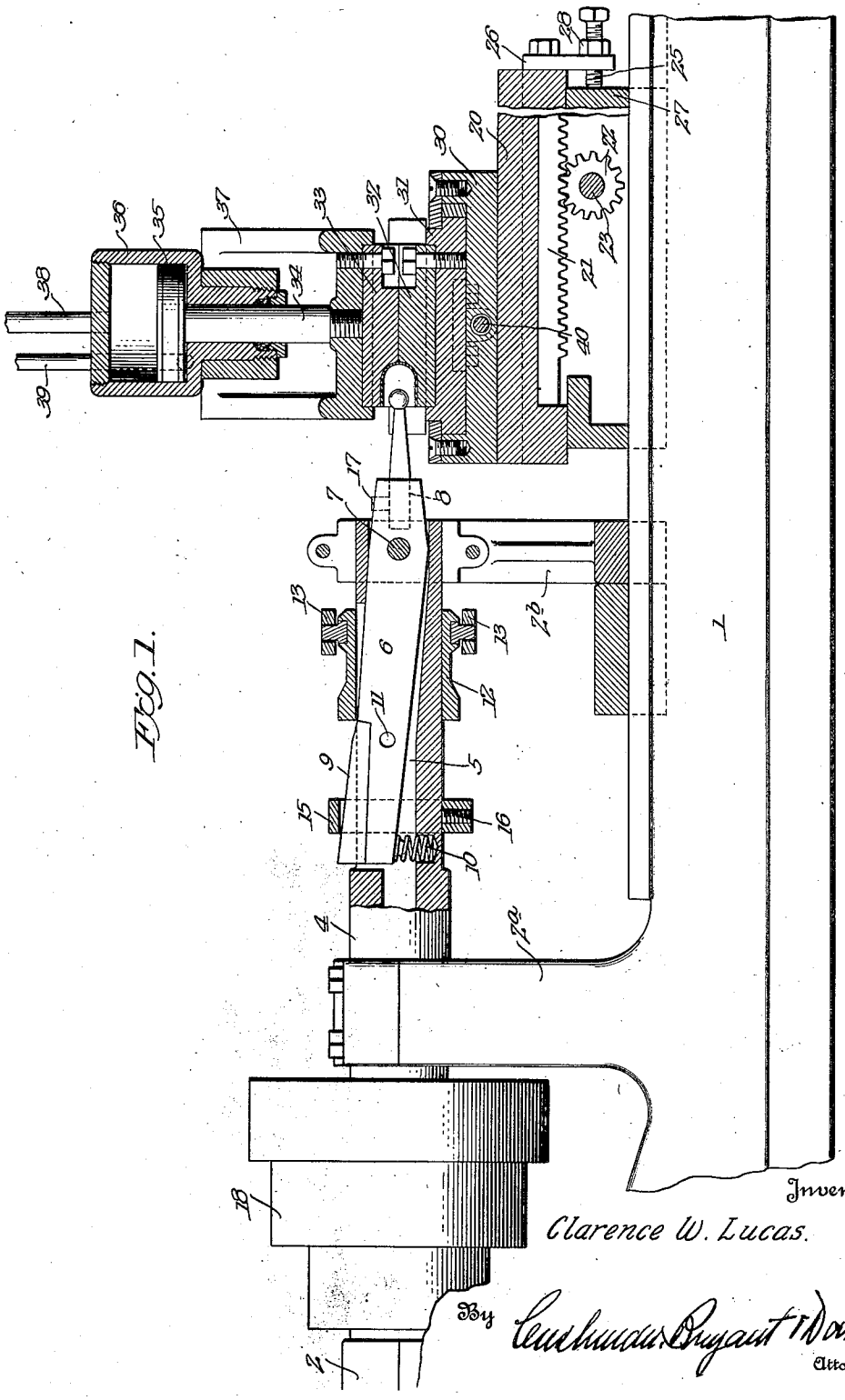


Fig. 1.

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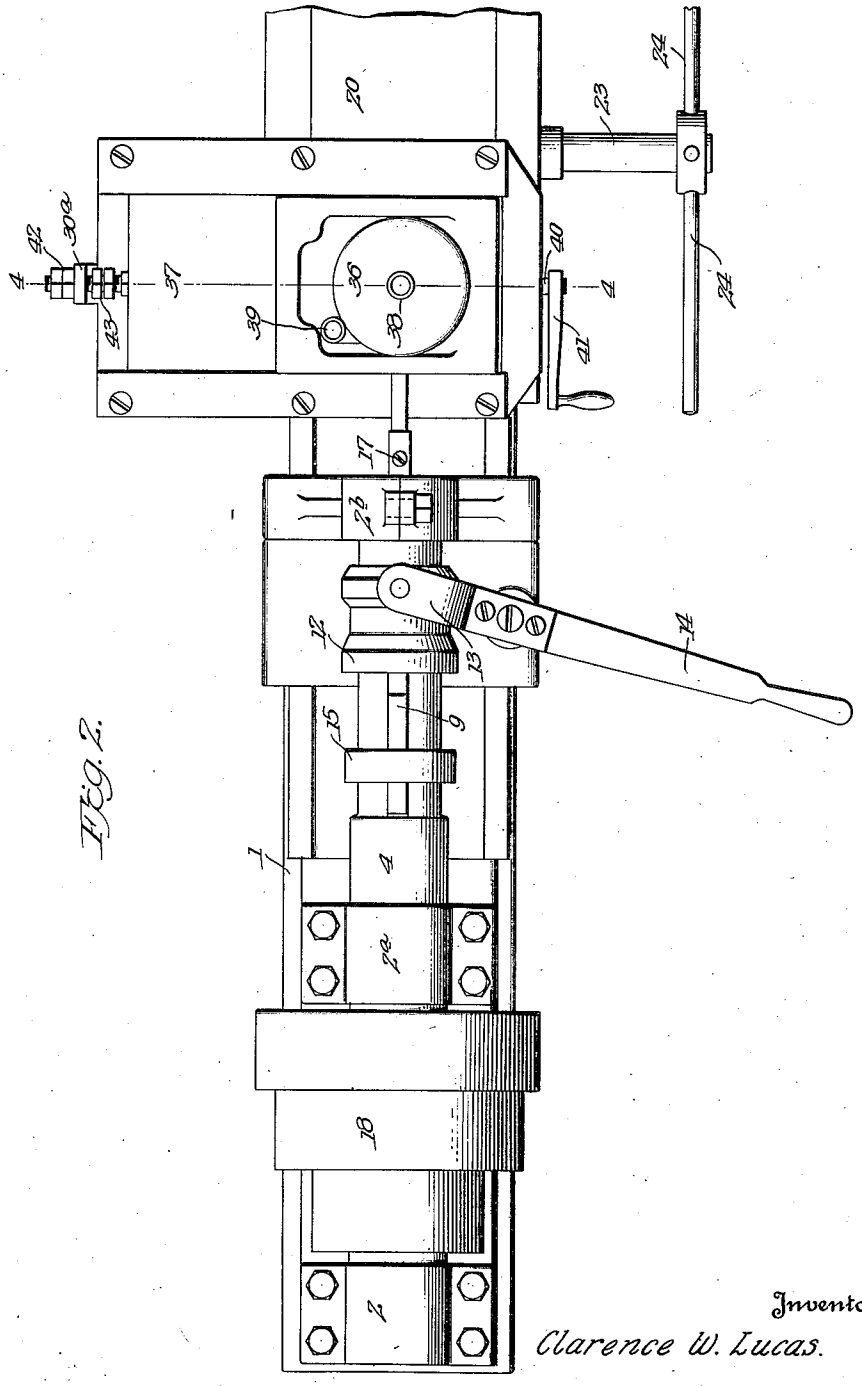


Fig. 2.

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Fig. 3.

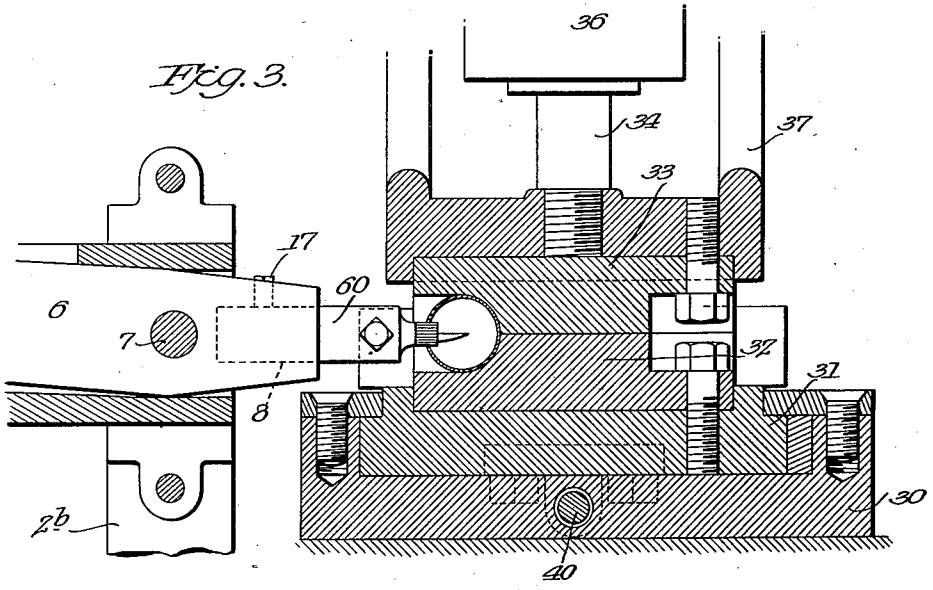
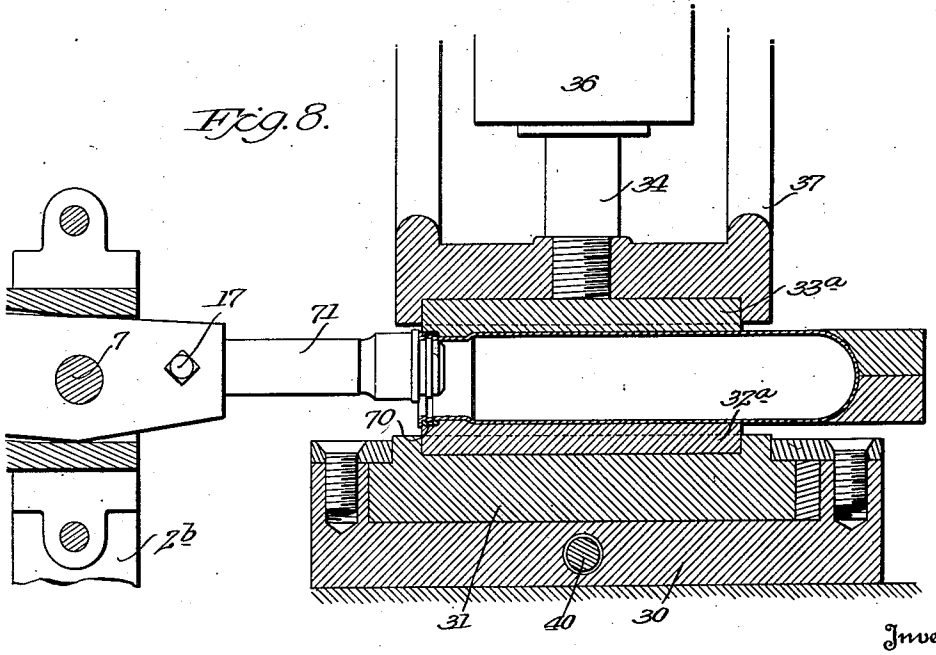


Fig. 8.



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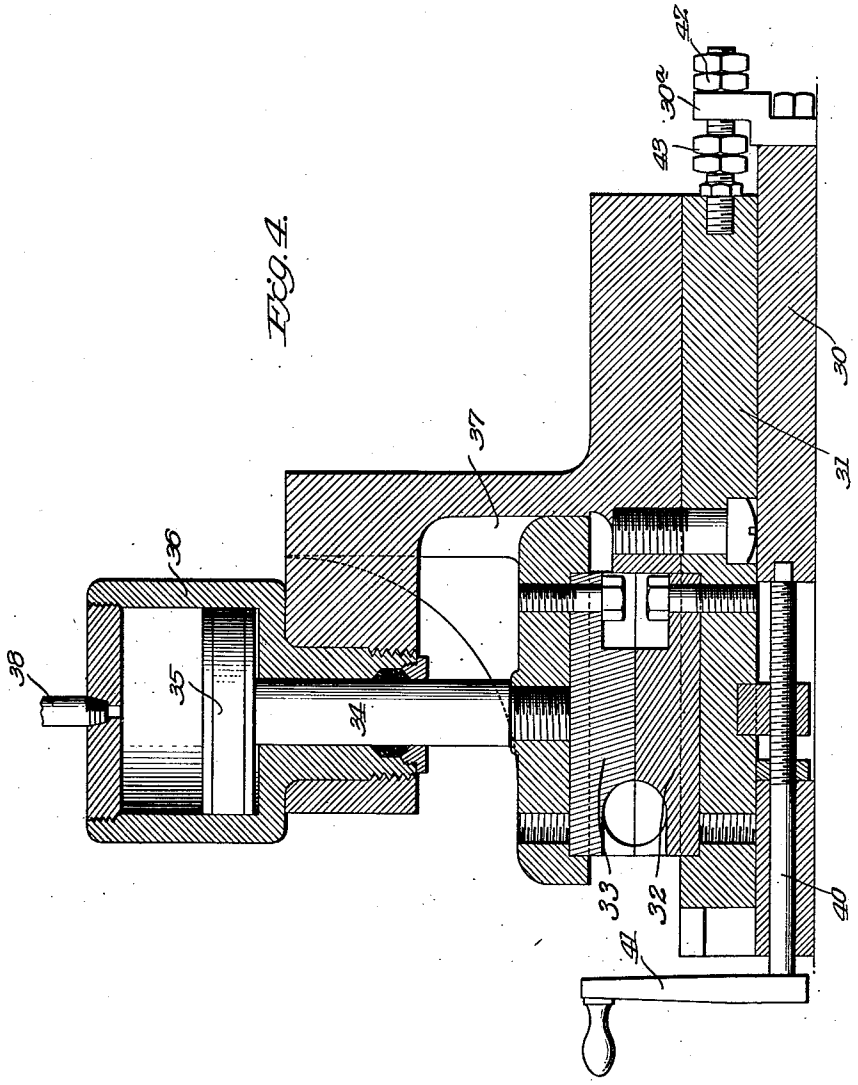
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Fig. 4.



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MACHINE FOR SPINNING, TRIMMING, OR FLANGING THIN METAL TUBES

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Fig. 9.

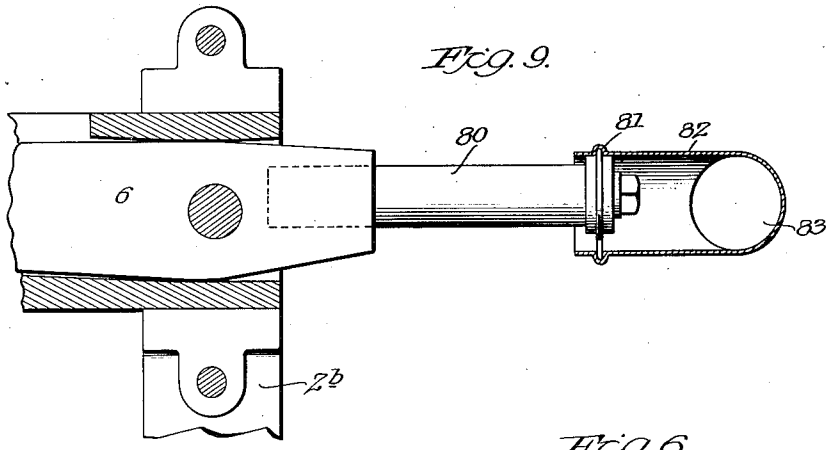


Fig. 6.

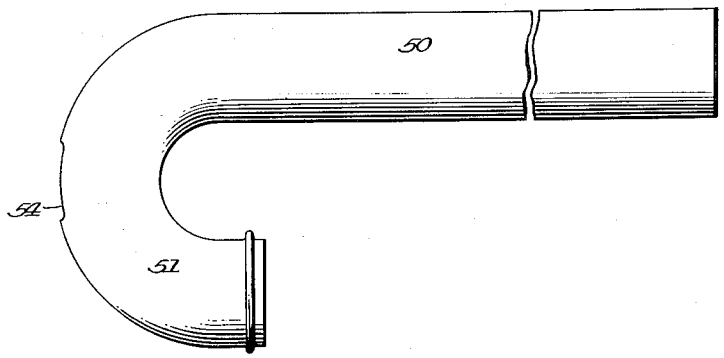


Fig. 5.

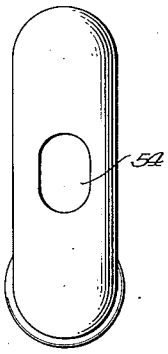
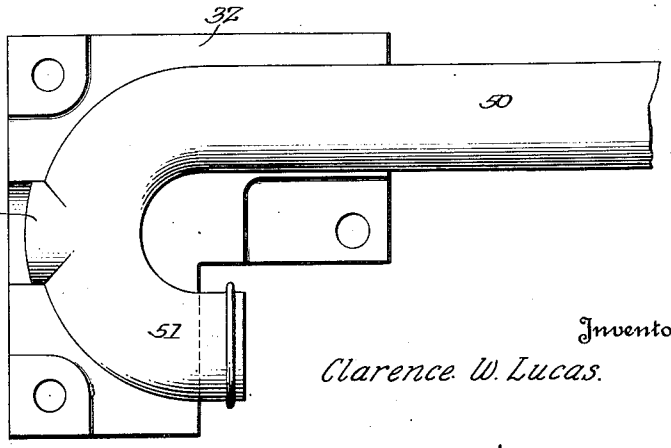


Fig. 7.



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Patented Apr. 27, 1926. 1,582,525

UNITED STATES PATENT OFFICE.

CLARENCE W. LUCAS, OF DECATUR, ILLINOIS, ASSIGNOR TO ADOLPH MUELLER, TRUSTEE, OF DECATUR, ILLINOIS.

MACHINE FOR SPINNING, TRIMMING, OR FLANGING THIN METAL TUBES.

Application filed December 18, 1922. Serial No. 607,600.

To all whom it may concern:

Be it known that I, CLARENCE W. LUCAS, a citizen of the United States, residing at Decatur, in the county of Macon and State of Illinois, have invented new and useful Improvements in Machines for Spinning, Trimming, or Flanging Thin Metal Tubes, of which the following is a specification.

The present invention relates to an improved means for spinning, trimming or flanging thin metal tubes, and has for its general object to provide a single machine by means of which an unskilled workman may perform efficiently and accurately all of the foregoing operations, which are necessary in the manufacture of bent tube plumbing traps, and the like.

It has heretofore been customary in operating on tubes of the character referred to, to secure the tube to be operated on to the spindle of a lathe and mount the tool on the slide rest of the machine. In spinning out tubular projections from the sides of thin metal tubes with the machines heretofore commonly employed, the spindle and tube thereon are revolved, the spherical working end of the tool inserted in an opening formed in the wall of the tool and the tool pressed against the edge of such opening. The tool is moved back and forth, being maintained in forcible contact with the edge of the opening while the tube is revolving by adjusting the slide rest through suitable feed screws, such operation being continued until the projection is spun outward to the desired extent.

A serious disadvantage of this method of spinning is that it is necessarily slow and a skilled workman is required to properly operate the machine, as good judgment must be exercised in carrying out the different steps of the operation. Another objection, or disadvantage, is that in a bent tube having a long, straight section, or limb, some of the spinning operations cannot be performed on a lathe, or similar machine, for the reason that the slide rest is in the way of the long section of the revolving tube.

In contra-distinction to machines of the character above generally described, the present invention contemplates a machine in which the tube is held stationary while the tool is revolved, means being provided for causing the working end of the tool to travel in an orbital path as the tube revolves, the diameter of such path being gradually increased, by suitable manipulating means, as the work proceeds.

While the invention relates particularly to a machine for operating on bent metal tubes, and such an embodiment is specifically illustrated in most of the figures of the accompanying drawing, it will be evident that some of the features of the invention may be employed for operating on straight tubes.

Further it will be understood that the accompanying drawings are intended to be illustrative, rather than restrictive of the broader aspects of the invention, and that the same is not intended to be limited to the exact details shown, except where the same are specifically referred to in the following claims.

In the accompanying drawings:—

Figure 1 is an elevation, partly in section, of an embodiment of the invention, showing the parts arranged for spinning a tubular projection extending outward from the curved portion of a plumbing trap.

Figure 2 is a plan of the machine illustrated in Figure 1.

Figure 3 is a vertical sectional view, on an enlarged scale, of part of the mechanism illustrated in Figures 1 and 2, showing a cutting tool forming an initial opening in a bent tube, or trap.

Figure 4 is a transverse vertical section substantially on the line 4—4 of Figure 2.

Figure 5 is an end elevation of a bent tube or trap after the initial opening has been formed therein.

Figure 6 is a side elevation of such a bent tube or trap.

Figure 7 is a detail plan of one of the tube clamping members showing a bent tube in position thereon, and the tubular projection from the curved member of the trap spun outward.

Figure 8 is a view generally similar to Figure 3 showing the arrangement of parts when one end of a pipe is being flanged over a threaded collar or sleeve.

Figure 9 illustrates a different form of tool in the tool holder.

Referring to the drawings, and particular-

ly to Figs. 1 and 2, 1 designates a suitable base or supporting frame and in uprights, 2 2^a and 2^b, rising from said frame, is suitably mounted a rotatable spindle 4.

The spindle 4 may be tubular, throughout its length, or provided with an interior chamber 5 that opens through the end thereof supported in the upright 2^b, and within such chamber is mounted a tool holder 6.

The tool holder is pivotally connected, as at 7, to the spindle 5, so that it may rock about a transverse axis relative to the length of the spindle and is of such form that when the tool receiving socket 8 at the end thereof which projects forwardly from the spindle is in axial alignment with the spindle, the rear portion of the tool holder, or a reinforcement member 9 thereon, extends outward through a slot formed in the body of the spindle. A spring 10 acts to hold the tool holder and spindle in the relation shown in Figure 1 and the parts may be rigidly maintained in such position by passing a suitable pin through an aperture 11 and aligned openings formed in the walls of the chamber 5 of the spindle.

A sleeve 12 surrounds the spindle 4 and, by means of a yoke 13 connected to a hand lever 14, said sleeve may be moved rearward over the spindle and when the retaining pin, above referred to, is withdrawn from the opening 11, such rearward movement of the sleeve 12 will rock the tool holder against the action of the spring 10 so that the axis of the tool receiving socket 8 will be moved from alignment with the spindle axis and the free end of the tool mounted in said socket caused to travel in an orbital path as it rotates with the spindle. Such rearward movement of the controlling sleeve 12 is limited by a collar 15 secured to the spindle as by a set screw 16.

Any suitable tool, depending on the particular character of the work to be performed is detachably secured in the socket 8 of the tool holder 6 by a set screw 17. In Figure 1 a spinning tool provided with a spherical operative head is illustrated in position in the tool holder.

The spindle may be rotated by any suitable means, a stepped pulley 18 being shown as secured thereto between the uprights 2, 2^a, for this purpose.

The tube to be operated on is supported on a reciprocating carriage comprising a bed plate 20 suitably supported on the frame 1 and provided with a rack 21 that is engaged by a gear 22 secured on a shaft 23 that is mounted in bearings in the frame 1 and provided at one end with suitable handles 24 by means of which it may be rotated and caused to move the carriage 20 toward and from the spindle. Movement of the carriage toward the spindle is limited by an adjustable stop comprising a screw 25 mounted in an arm 26 depending from the rear end of the carriage base member 20, and adapted to contact with a stationary carriage guide 27 at the desired termination of movement toward the spindle. By means of a lock nut 28 the position of the stop screw 25 with relation to the arm 26 may be varied as desired.

The carriage includes an upper member 30 suitably secured to the base plate or member 20 and extending laterally beyond one side of the main frame 1. In suitable guideways formed on this laterally extending top member of the carriage is mounted a slide 31 to which is detachably secured the lower member 32 of a vertically separable tube clamp. The upper member 33 of the tube clamp is detachably connected to the lower end of a piston rod 34, the piston 35 of which works within a cylinder 36 that is supported by a suitable bracket 37 rising from the slide 31. Suitable fluid pressure supply pipes 38, 39, communicate with the cylinder 36, respectively, above and below the piston 35 therein, so that by controlling the flow of pressure fluid through said pipes 38, 39, the tube clamp 33 may be moved vertically to and from cooperating relation with the tube clamp member 32 and both said tube clamping members are movable transversely of the direction of travel of the carriage and the axis of the spindle. As shown, this transverse adjustment of the tube clamping members is effected by a shaft 40 having a threaded portion engaging a threaded passage in a projection on the slide 31 and provided at one end with a handle 41 by means of which it may be rotated. Movement of the slide 31 in either direction is limited and controlled by the following means. To the end of the slide opposite the handle 42 there is secured a threaded stem which extends through a lug 30^a rising from the carriage member 30. On said screw, at opposite sides of said lug are arranged stop nuts 42, 43, each being rigidly secured in the desired adjusted position on the threaded stem by suitable lock nuts. The extent of movement permitted the slide 31 is, therefore, determined by the distance separating the nuts 42 and 43.

The tube clamping plates 32, 33, being detachably connected to the slide 31 and piston stem 34, respectively, may be readily detached and replaced according to the shape or particular form of tube to be operated on.

As the machine embodying the present invention is particularly designed for use on plumbing traps, the plates 32, 33, of Figures 1 to 7 inclusive, are shown as having cooperating grooves adapted to receive the substantially parallel portions 50, 51, of such a trap and the tubular projection 52 extending from the curved section connecting said parallel members.

The manner of using the machine for

forming the tubular projection 52 from the curved portion of a plumbing trap, as illustrated, will be briefly described.

The tube is initially bent into substantially the form shown in Figure 6, and clamping members 32, 33, adapted to closely embrace such bent tube are properly secured to the slide 31 and piston rod 34. A suitable cutting tool, such as 60 in Figure 3, is secured in the socket 8 of the tool holder 6 and the latter is fastened to the spindle in the position shown in Figure 1 by passing a pin through the opening 11. By manipulating the handles 24 the carriage and parts supported thereby are moved toward the spindle and the rotation of the latter causes the cutter at the forward end of the tool 60 to penetrate the wall of the tool. By manipulation of the screw shaft 40 the tube clamping means are moved transversely of the path of travel of the carriage and the rotating tool so that an oblong shaped opening 54 is formed in the curved section of the trap.

The carriage is then moved away from the tool and spindle and the cutting tool replaced by a spinning tool, such as shown in Figure 1. The securing pin is then withdrawn from the passage 11 in the tool holder and as the carriage is fed toward the spindle by turning the shaft 23, the lever 14 is suitably moved to adjust the tool holder 6, so that the free, operative, end of the spinning tool therein will describe an orbital path as the spindle rotates, whereby the walls of the oblong shaped opening 54 will be spun outward, as shown in Figures 1 and 7 providing the desired tubular projection from the lower curved portion of the trap. The stop screw 25 is so adjusted that the movement of the carriage toward the spindle will be stopped when the spherical head of the spinning tool is at the center of the tube being operated on considered transversely.

If desired, a flanging tool may then be substituted for the spinning tool in the tool holder 6 and caused, by feeding the carriage and manipulating the hand lever 14, as above described, to flange the projecting end of the tubular projection of the trap over a collar, such as shown at 70 in Figure 8. Preferably, however, for this flanging operation a tool holder differing slightly from that employed for the cutting and spinning operations is substituted. That is, for the flanging operation it is preferred to employ a tool holder in which the socket receiving the stem of the flanging tool 71 is bored at such an angle to the axis of the spindle that when the flanging tool has reached the maximum diameter of its orbital path the flanging end of such tool will be at an exact right angle to the axis of the tube, if straight, or the tubular projection, if the tube is bent, on the end of which the flange is formed. It will be understood that in the flanging operation the bushing or collar 70 is placed on the end of the tube, which projects slightly beyond said bushing, to allow enough metal to form a flange and both the tube and bushing are clamped between the vertically separable jaws on the carriage. The carriage is then fed forward until stopped by the adjustable stop 25 and the flanging tool enters the end of the tube. As the spindle is then rotated the hand lever 14 is moved to cause the sleeve 12 to move longitudinally of the spindle forcing the flanging tool to travel in an orbital path. When the flange has been completely formed the sleeve 12 is restored to the position shown in Figure 1 and by operating the shaft 23 the carriage is moved to withdraw the tube from the flanging tool.

The tube clamping jaws 32^a, 33^a, shown in Figure 8, and the form of tube engaged thereby, are slightly different from those shown in Figures 1 to 7, and it will be understood that the form of jaws or clamping members employed depends upon the particular shape of tube which is to be operated on. As before noted, the jaws are detachably connected to the carriage and piston stem, so that they may be readily removed and replaced by others, which will conform to the particular shape of tube whether straight or bent, that is to be treated.

It will also be evident that various other forms of tool may be substituted for the cutting, spinning and flanging tools specifically hereinbefore described.

For example, in Figure 9 there is illustrated a tool 80 adapted to form a bead 81 in a section 82 projecting from the body of a pipe 83. Similarly a suitable flange trimming tool might be substituted for the forms of tools before referred to.

It will be seen that all of the described operations may be performed accurately and at a high rate of production by an unskilled operator or workman. After the stops which limit the longitudinal movement of the carriage on the supporting frame and the transverse adjustment of the slide carrying the tube clamping members have been properly adjusted the operator's work is of a simple and routine nature, regardless of whether the work is spinning, trimming or flanging.

The machine, therefore, provides a very simple and readily operated means for performing the several steps incident to providing bent metal tubes, such as the plumbers' traps with tubular projections and flanging the same against bushings or collars fitted thereabout.

It will be seen that as the tube engaging means is arranged at one side of the spindle there is no possibility of the tube therein interfering with the operation of the tool

and the machine may be employed for working on tubes of any length. The fact that the machine is equally applicable to operating on tubes of maximum length, as well as relatively short tubes makes it practically superior to those heretofore proposed in which the tube is secured to the spindle during the operation and therefore if it exceeds a relatively short length will interfere with the proper operation of the shaping tool.

Having thus described the invention, what is claimed is:—

1. In a machine of the character described, the combination of a supporting frame, a rotary spindle mounted in relatively stationary bearings on the frame, a tool holder supported by the spindle, a support for a tube mounted on the frame, means for moving the tube support toward and from a position to be operated on by a tool in the tool holder, adjustable means for limiting the movement of the tube support toward the spindle, means for adjusting the tube transversely of said support, and adjustable means for limiting the reciprocation of the tube transversely of its support in either direction.

2. In a machine of the character described, the combination of a supporting frame, a rotary spindle mounted in relatively stationary bearings on the frame, a tool holder carried by the spindle and adapted to support a tool which extends beyond the end of the spindle, a support for a tube mounted on the frame, means for moving the tube support toward and from a position to be operated on by a tool in the tool holder, adjustable means for limiting the movement of the tube support toward the spindle, means for adjusting the tube transversely of said support, adjustable means for limiting movement of the tube transversely of its support in either direction, and means for causing the free end of a tool in the tool holder to describe an orbital path as it rotates with the spindle.

3. In a machine for operating on thin bent metal tubes, the combination with a relatively stationary supporting frame, of a rotatable spindle mounted in bearings on the frame, a tool holder secured to and projecting from one end of the spindle, a slide or carriage on the frame movable toward and from the tool holder, means on the carriage adapted to engage a bent tube and hold it in position to be operated on by a tool in the tool holder when the carriage is moved toward the spindle, adjustable means for limiting the movement of the carriage toward the tool holder, and means for causing the free, operative, end of the tool to describe an orbital path as it rotates with the spindle for the purpose described.

4. In a machine of the character described, the combination with a relatively stationary supporting frame, of a rotatable spindle mounted in bearings on said frame, a tool holder secured to the spindle and projecting from one end thereof, a carriage mounted on the frame and adapted to move toward and from the spindle, a rack and pinion for moving the carriage, guide ways on the carriage extending transversely of the line of movement thereof, a plate fitted to move in said guide ways and shaped to receive a bent tube on its upper surface, means for adjusting said plate in the guide ways on the carriage and holding it in any adjusted position, means for clamping a bent tube against the upper face of said plate, and means for causing the free, operative, end of a tool in the tool holder to describe an orbital path as it rotates with the spindle.

5. In a machine of the character described, the combination with a relatively stationary supporting frame, of a rotatable spindle mounted in bearings on said frame, a tool holder secured to the spindle and projecting from one end thereof, a carriage mounted on the frame and adapted to move toward and from the spindle, a rack and pinion for moving the carriage, guide ways on the carriage extending transversely of the line of movement thereof, a plate fitted to move in said guide ways and shaped to receive a bent tube on its upper surface, means for adjusting said plate in the guide ways on the carriage and holding it in any adjusted position, fluid pressure actuated means for clamping a tube in position on the said plate, and means for causing the free, operative, end of a tool in the tool holder to describe an orbital path as it rotates with the spindle.

6. In a machine for operating on thin bent metal tubes, the combination with a relatively stationary supporting frame, of a rotatable spindle mounted in bearings on the frame, a tool holder secured to and projecting from one end of the spindle, a slide or carriage on the frame movable toward and from the tool holder, adjustable means for determining the length of travel of the carriage on the supporting frame, separable clamping members mounted in guides on the carriage, and extending transversely to the line of movement of the carriage, adapted to engage a tube and support it in position to be operated on by a tool in the tool holder as the carriage is moved toward the spindle, means for adjusting the tube clamping members in their guides, means for reciprocating the carriage, and means for causing the free, operative end of the tool to travel in an orbital path while rotating with the spindle.

7. In a machine for operating on thin bent metal tubes, the combination with a relatively stationary supporting frame, of a rotatable spindle mounted in bearings on the frame, a tool holder secured to and project-

ing from one end of the spindle, a slide or carriage on the frame movable toward and from the tool holder, vertically separable tube clamping plates removably mounted on the carriage, means for adjusting said plates on the carriage in a direction transverse to the path of movement of the carriage, adjustable means for determining the extent of such transverse movement of the tube clamping plates in either direction, means for reciprocating the carriage, and means for causing the free end of a tool in the tool holder to describe an orbital path while rotating with the spindle.

In testimony whereof I have hereunto set my hand.

CLARENCE W. LUCAS.