Jan. 1, 1935. D. N. UEBELHART 1,986,691

TUBE DRAW BENCH

Filed Nov. 16, 1932 5 Sheets-Sheet 1

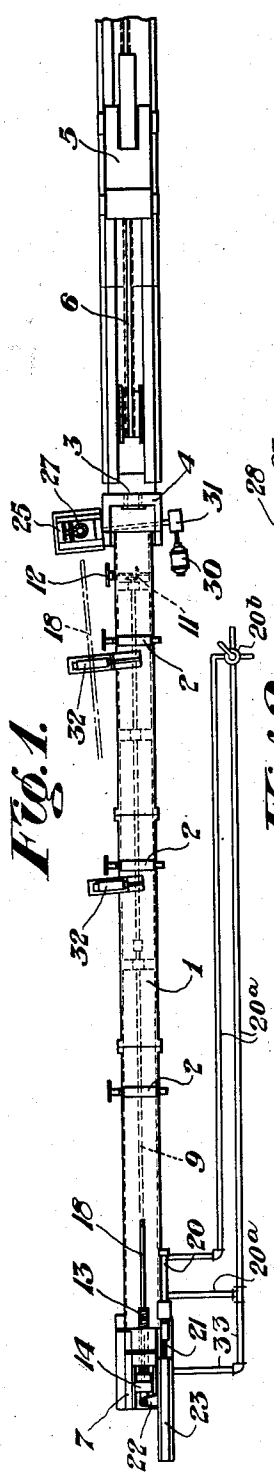


Fig. 1.

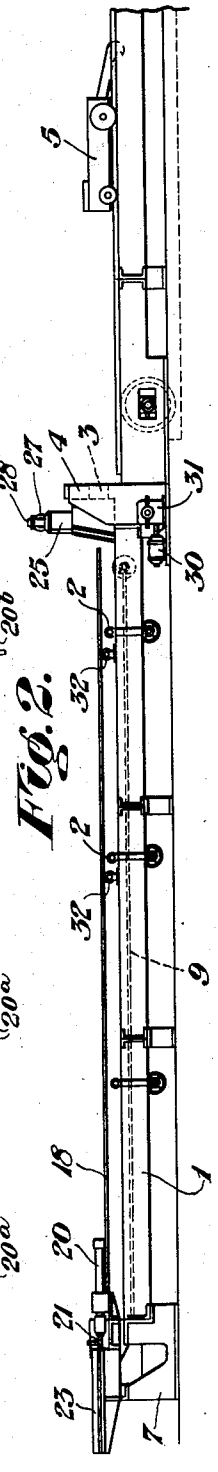


Fig. 2.

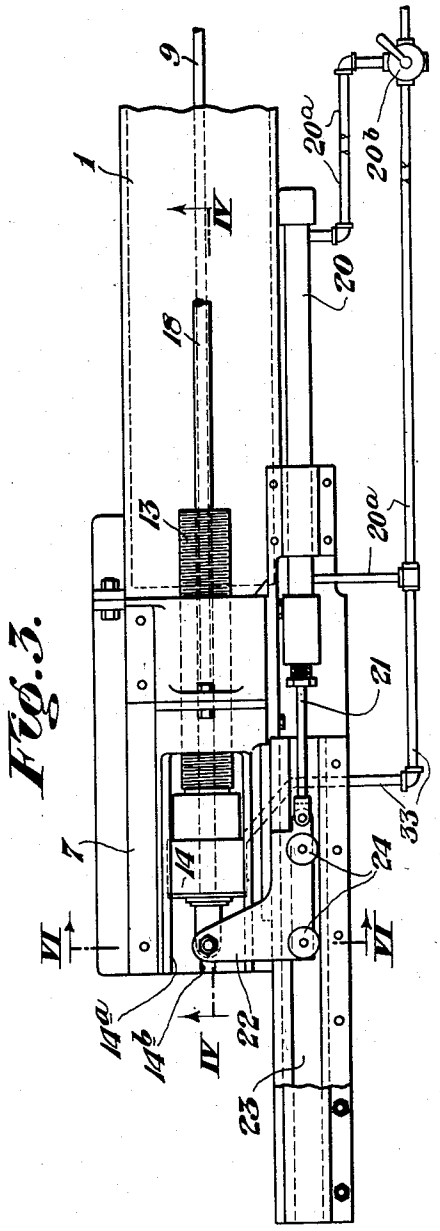


Fig. 3.

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TUBE DRAW BENCH

Filed Nov. 16, 1932 5 Sheets-Sheet 2

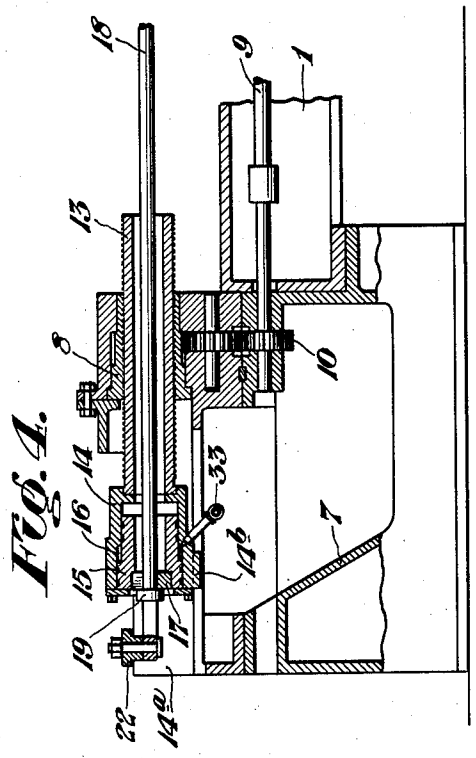


Fig. 4.

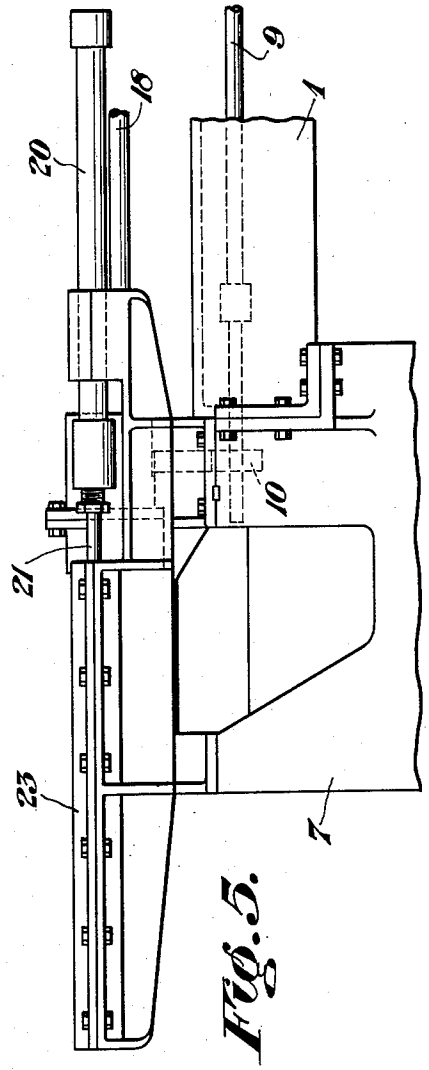


Fig. 5.

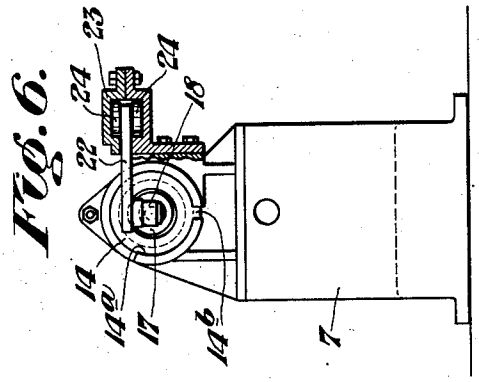


Fig. 6.

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Jan. 1, 1935. D. N. UEBELHART 1,986,691

TUBE DRAW BENCH

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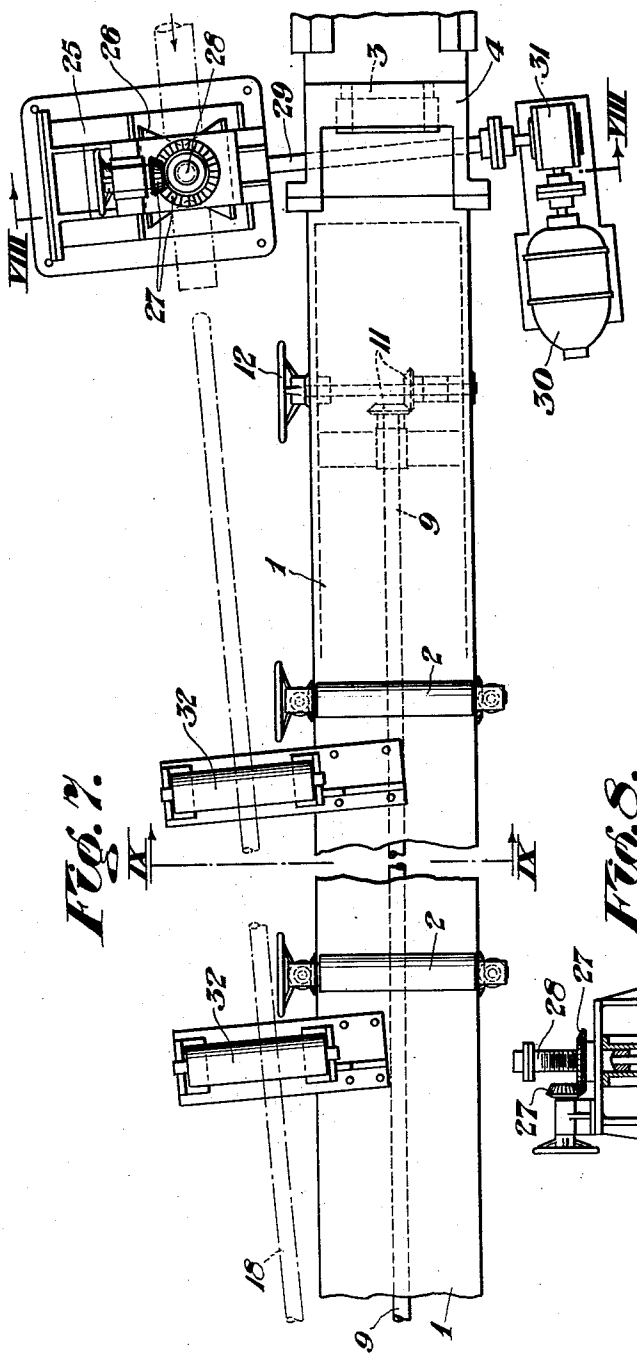


Fig. 7.

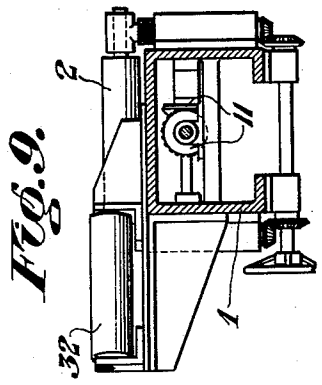


Fig. 9.

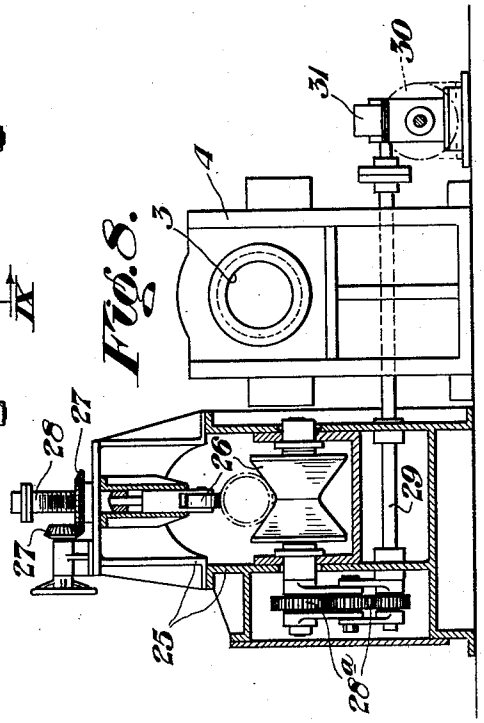


Fig. 8.

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Jan. 1, 1935. D. N. UEBELHART 1,986,691

TUBE DRAW BENCH

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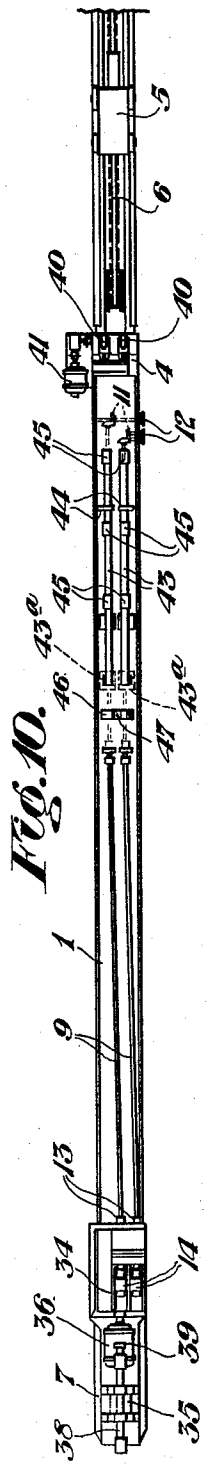


Fig. 10.

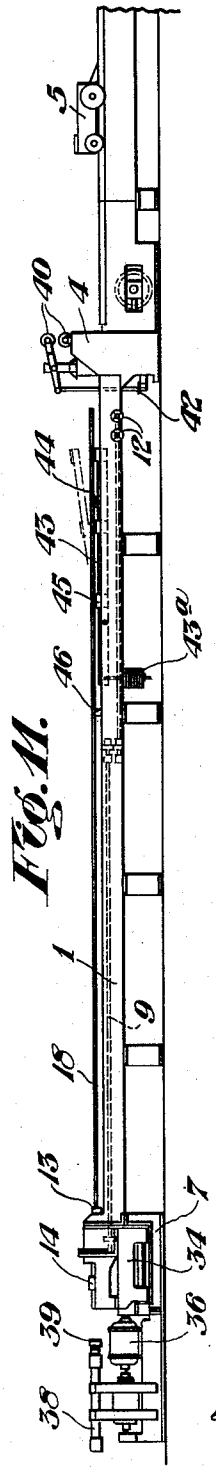


Fig. 11.

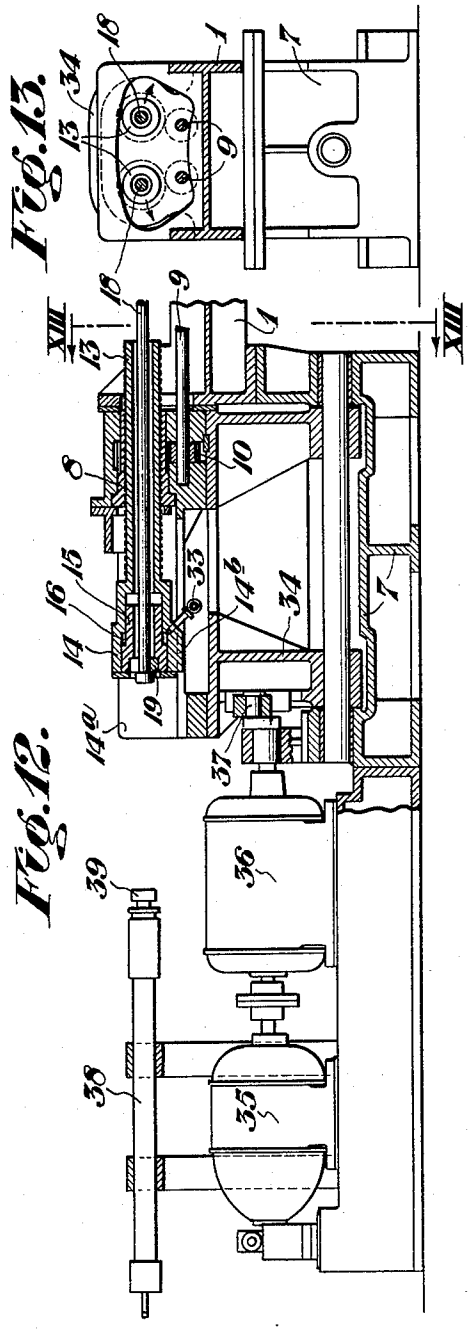


Fig. 13.

Fig. 12.

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Jan. 1, 1935. D. N. UEBELHART 1,986,691

TUBE DRAW BENCH

Filed Nov. 16, 1932 5 Sheets-Sheet 5

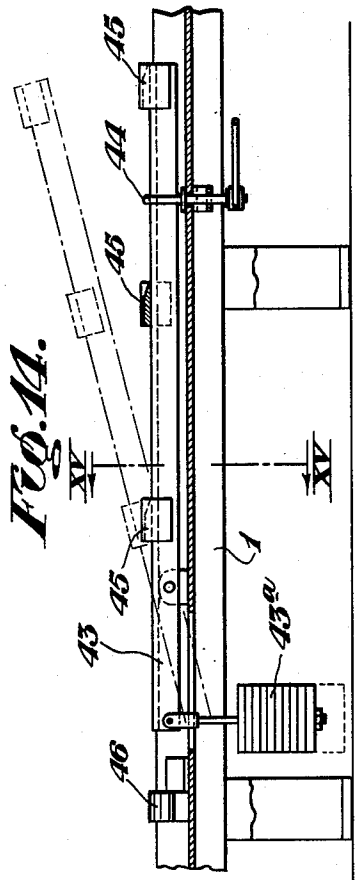


Fig. 14.

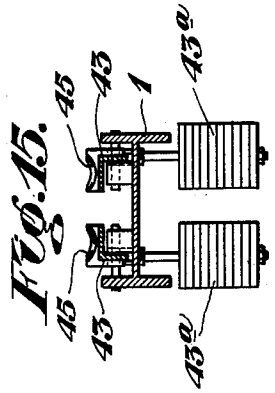


Fig. 15.



Fig. 16.

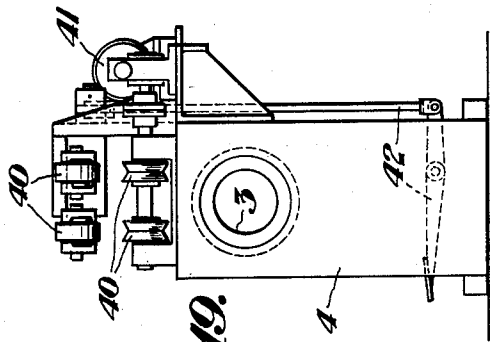


Fig. 19.

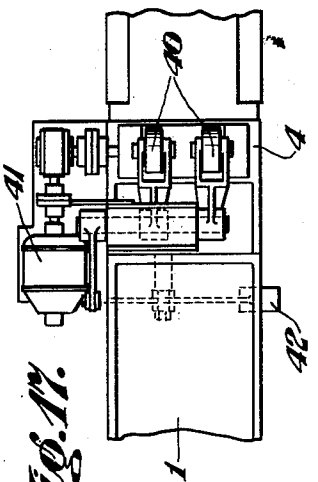


Fig. 17.

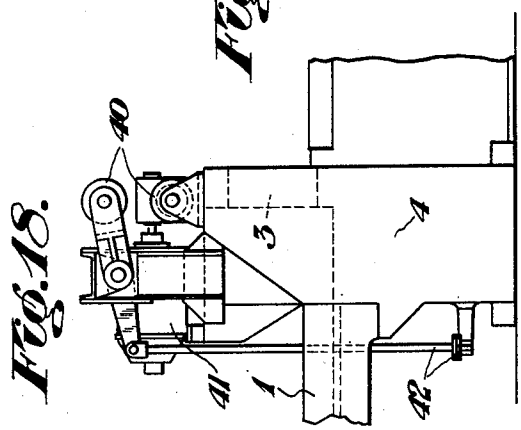


Fig. 18.

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Patented Jan. 1, 1935 1,986,691

UNITED STATES PATENT OFFICE

1,986,691

TUBE DRAW BENCH

Donald N. Uebelhart, Ellwood City, Pa., assignor to National Tube Company, a corporation of New Jersey

Application November 16, 1932, Serial No. 642,973

4 Claims. (Cl. 205—3)

This invention relates to tube draw-benches. It is intended to reduce the manual labor ordinarily involved in their operation and also the number of torn ends occasioned by exceeding the metal's elastic limit during the tubes' initial deformation. It is also intended to accomplish other objects which may be inferred from the following disclosure of illustrative forms of the same.

Referring to the drawings:

Figure 1 is a top plan of one form.

Figure 2 is a side elevation.

Figure 3 is an enlarged detail from Figure 1.

Figure 4 is a cross-section from the line IV—IV in Figure 3.

Figure 5 is a side elevation of Figure 3.

Figure 6 is a cross-section from the line VI—VI in Figure 3.

Figure 7 is an enlarged detail from Figure 1.

Figure 8 is a cross-section from the line VIII—VIII in Figure 7.

Figure 9 is a cross-section from the line IX—IX in Figure 7.

Figure 10 is a top plan of another form.

Figure 11 is a side elevation of this second form.

Figure 12 is a vertical cross-section of a detail in Figure 11.

Figure 13 is a cross-section from the line XIII—XIII in Figure 12.

Figure 14 is an enlarged detail from Figure 11.

Figure 15 is a cross-section from the line XV—XV in Figure 14.

Figure 16 is an end view of Figure 14.

Figure 17 is a detail from Figure 10.

Figure 18 is a side elevation of Figure 17.

Figure 19 is an end elevation of Figure 17.

The first form shown by the above includes a long table 1 provided with rollers 2 and arranged to feed tubes through a die 3 carried by a mounting 4. It may be assumed that these tubes have the usual pointed ends which are engaged by tongs 5 powered by a chain 6. These parts are arranged in the conventional manner.

A base 7 is at the back end of the table 1. This base rotatively mounts an externally toothed internal screw 8. This screw may be turned by a shaft 9 through a gear train 10 which meshes with its external teeth. The shaft 9 extends along the table 1 to a point adjacent the die mounting 4 where it is driven through gears 11 by a hand-wheel 12.

The screw 8 engages an externally threaded bored elongated member 13 axially alined with the die 3 in the mounting 4. The back end of this member 13 is enlarged to form a cylinder 14 which carries a bored piston 15. This cylinder and piston are respectively constructed in inwardly and outwardly stepped form to provide an air chamber 16. This piston 15 mounts an upwardly slotted stop 17. The cylinder 14 is reciprocatively carried by a cylindrically shaped guide 14^a having a groove in its bottom in which slides a lug 14^b fixed to the former. This prevents rotation of the cylinder 14 and elongated member 13 while permitting its longitudinal sliding motion.

The bored elongated member 13 and the bored cylinder 15 cooperate to mount a mandrel-bar 18 which loosely passes therethrough. This mandrel-bar has a shouldered back end 19 which butts the stop 17 and is of a length so its mandrel carrying end is properly positioned in the die 3 when the whole is thrust forwardly so the piston 15 is at the end of its forward stroke.

The mandrel-bar 18 is reciprocated by an air cylinder motor 20. The motor 20 is mounted on the base 7 parallel to the mandrel-bar and its operating rod 21 fixed to the back end of the bar by a connecting-arm 22. A suitable laterally slotted guide 23 is alined with the motor 20, and the connecting-rod 21 is mounted therein on rollers 24. This arm projects through the lateral slot of the guide 23 and reciprocates therein during operation of the motor 20.

A housing 25 is arranged adjacent the die mounting 4. This housing supports a stand of pinch-rolls 26 suitably shaped to engage varying sized tubes. The distances between these rolls is varied by a screw-down mechanism 27. When set by this mechanism they may quickly engage or disengage a tube by a slight variation of this setting secured by an air cylinder motor 28 which mounts one of the rolls. The drawings illustrate one of these rolls as having a V-shaped groove, the adjustable roll carried by the piston of the air cylinder 28 being much smaller and functioning only to hold the tubes against the larger. The grooved roll is fixed in position and powered through a gear train 28^a and a shaft 29 by a motor 30 driving through a suitable gear reduction unit 31.

These pinch-rolls are arranged so their pass-line intersects that of the die 3 at a point adjacent the back portion of the mandrel-rod 18. Rollers 32 are offset from the rollers 2 and are in alinement with the pass-line of the pinch-rolls 26. The first mentioned rollers 2 are preferably arranged in any suitable manner for vertical adjustment so that differently sized tubes may be accommodated.

Compressed air may be introduced to the chamber 16 through a pipe 33.

The operation of the just described machine may be as follows.

The tubes to be drawn are piled beside the machine in front of the pinch-rolls 26 and beside the draw-chain 6. The operator stands beside the die mounting 4 and operates the air cylinder motor 20 through a suitable remote control to reciprocate the mandrel-bar 18 to the limit of its backward position. He is now able to manually swing the mandrel end of this bar 18 up on the rollers 32 so that it is substantially alined with the pass of the pinch-rolls 26.

It is to be assumed that these pinch-rolls as well as the rollers 2 have been suitably adjusted to accommodate the size of the tube to be drawn. The position of the bored elongated member 13 has also been adjusted by means of the hand-wheel 12 to bring the end of the bar 18 to its proper position in the die, it being assumed that differently sized mandrel rods will sometimes be used.

The operator now feeds the back end of one of the tubes to the pinch-rolls 26, and brings these together by means of the small roller's cylinder motor 28 which he also operates through a suitable remote control. These remote controls are not specifically shown, because they may consist merely of conventional control valves and suitable piping, all connected to a compressed air source.

The pinch-rolls 26 now force the tube over the mandrel-bar to its end, when the operator manually replaces the loaded mandrel-bar in line with the die 3. He now operates the air motor 20 to reciprocate the mandrel-bar 18 forwardly to force the pointed end of the tube through the die 3 for engagement by the tongs or pliers 5. This also forces the shouldered back end of the mandrel-bar against the stop 17 where it is held by the piston 15.

If the cylinder 14 of this piston 15 is connected to the air motor 20 this stoppage of the mandrel will be effected automatically. Then upon the release of air in this motor the tube started and now passing through the die will draw the mandrel gradually into its working position. This prevents the tube's tearing, because full working pressures will not be attained until deformation has actually begun.

A specific example of the above idea is shown by Figures 1 and 3 of the drawings. Compressed air is admitted to the opposite ends of the air motor 20 through lines 20^a controlled by a suitable valve 20^b. The pipe 33 is connected to that one of the pipes 20^a which supplies air to the back end of the air motor 20. When the valve 20^b is operated to admit air to the back end of the motor 20 for the purpose of effecting forward movement of the mandrel rod, air is simultaneously admitted through the pipe 33 to the cylinder 14. As soon as the drawing operations are under way, the valve 20^b is operated so that pressure on the air in the lines 20^a is released. This relieves the pressure in the cylinder 14 so that the mandrel bar may move forwardly and allow the mandrel to occupy its proper working position.

The other form of the invention illustrated by the drawings differs from the first in that a plurality of mandrel-bars 18 are provided with a corresponding number of mounting members 13 each carrying the same piston 15 and cylinder 14 as before.

Here, however, the members 13 and cylinder ends 14 are carried in guides similar to the guide 14^a by a rocking carriage 34 constructed to selectively bring them into registration with the die 3. The movement of this carriage is accomplished by operation of a motor 35 which drives through a gear reduction unit 36 and a sliding eccentric connection 37. Also, the shouldered ends of the mandrel-bars 18 are flat and not provided with any connecting means for a reciprocative motor drive. The mandrel-bars 18 must be manually withdrawn when their ends are to be swung into registration with tube loading pinch-rolls.

An air cylinder motor 38 is alined with the pass line of the die 3. It has a flat-ended operating rod 39 which registers with the flattened shouldered ends of the mandrel-bars 18 when they are brought into registration with the die 3 and may be used to thrust the mandrel-bars forwardly so that the pointed ends of the tubes are forced through the die for engagement by the tongs. The air cylinders on these members apply the restraint to the mandrels on the ends of the bars 18 in the same manner described in connection with the first form.

Pinch-rolls 40 are in this case mounted directly on the top of the die mount and suitably powered by a motor 41. In this form there are two mandrel-bars so that one may be loaded while the tube on the other is being drawn. It may be desirable to provide two stands of the pinch-rolls 40 slightly on either side of the vertical center line of the die so that one or the other of the mandrel-bars may be brought into registration with one or the other of them. The pinch-rolls in this case are brought together by a foot lever 42 through a suitable leverage system.

To further eliminate manual labor, automatic lifting means may be provided to swing the mandrel-bars 18 into registration with the pinch-rolls 40. These means may consist of a pair of levers 43 which register with the mandrel-bars when the latter are moved to either side of the pass line of the die by the rocking mechanism described. These levers are provided with counterweights 43^a proportioned to lift an unloaded bar but too light to hold the weight of the same bar when loaded with a tube. These levers are normally held downwardly by releasable catches 44 which may be controlled by the operator from his position at the die and in any suitable manner, and each carries a number of forwardly flared tube seats 45. The forward flare of these seats permits the tube to slide between them and the mandrel-bar during loading operation.

An arcuate steadying rest 46 is also preferably provided to steady the mandrel-bars during their movement by the rocking mechanism. This last may have a central depression 47 which aids to aline a loaded mandrel-bar with the die.

This latter form of the invention operates substantially the same as the first, except that one of the mandrel-bars may be loaded while a tube is being drawn from the other. This naturally results in an increased production over the first form.

The swinging motion of the mandrel-bars described in connection with both forms is accomplished by reason of the bars' inherent flexibility coupled with the fact that they fit rather loosely in the elongated members 13. The extreme length of these bars and the short throw of their moving ends permits this motion with perfect freedom.

The specific forms disclosed are in compliance with the patent statutes and are not intended as limiting the scope of the invention, except as defined by the following claims.

I claim:

1. A tube draw-bench including the combination of a die, means for drawing tubes through said die, a mandrel-bar having its back end reciprocatively fixed in line with the pass of said die and constructed and arranged for swinging movement of its front end therefrom, a stop for releasably limiting the forward motion of said mandrel-bar, pinch-rolls arranged so their pass line intersects that of said die at a point adjacent the back end of said mandrel-bar, tube conveying rollers beneath said mandrel-bar when the latter is in line with the pass of said die and other tube conveying rollers offset from the first and constructed and arranged to support a tube passing through said pinch-rolls towards the latter's intersecting line with the pass line of said die.

2. A tube draw-bench including a table, a die at one end of said table, pinch-rolls adjacent said die, a member at the opposite end of said table having a bore that is enlarged at its back end to form a cylinder, a bored piston fitting said cylinder, a mandrel bar loosely arranged through said piston and extending toward said die, and means for longitudinally reciprocating said mandrel bar independently of said piston, said mandrel bar being constructed so that it may be moved from a position in line with said die to one in line with said pinch-rolls and having means for engaging said piston when moved toward said die by the first named means.

3. A tube draw-bench including a table, a die at one end of said table, pinch-rolls adjacent said die, a member at the opposite end of said table having a bore that is enlarged at its back end to form a cylinder, a bored piston fitting said cylinder, a mandrel bar loosely arranged through said piston and extending toward said die, means for longitudinally reciprocating said mandrel bar independently of said piston, said mandrel bar being constructed so that it may be moved from a position in line with said die to one in line with said pinch-rolls and having means for engaging said piston when moved toward said die by the first named means, and supports arranged adjacent said table so as to be beneath said mandrel bar when it is in the second named position.

4. A tube draw-bench including a table, a die at one end of said table, pinch-rolls adjacent said die, a member at the opposite end of said table having a bore that is enlarged at its back end to form a cylinder, a bored piston fitting said cylinder, a mandrel bar loosely arranged through said piston and extending toward said die, means for longitudinally reciprocating said mandrel bar independently of said piston, said mandrel bar being constructed so that it may be moved from a position in line with said die to one in line with said pinch-rolls and having means for engaging said piston when moved toward said die by the first named means, and means for automatically admitting fluid to said cylinder when the first named means operates to move said mandrel bar toward said die.

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