June 3, 1924.

1,496,137

A. SUNDH.

DRAWBENCH APPARATUS

Filed Sept. 22, 1921

3 Sheets-Sheet 1

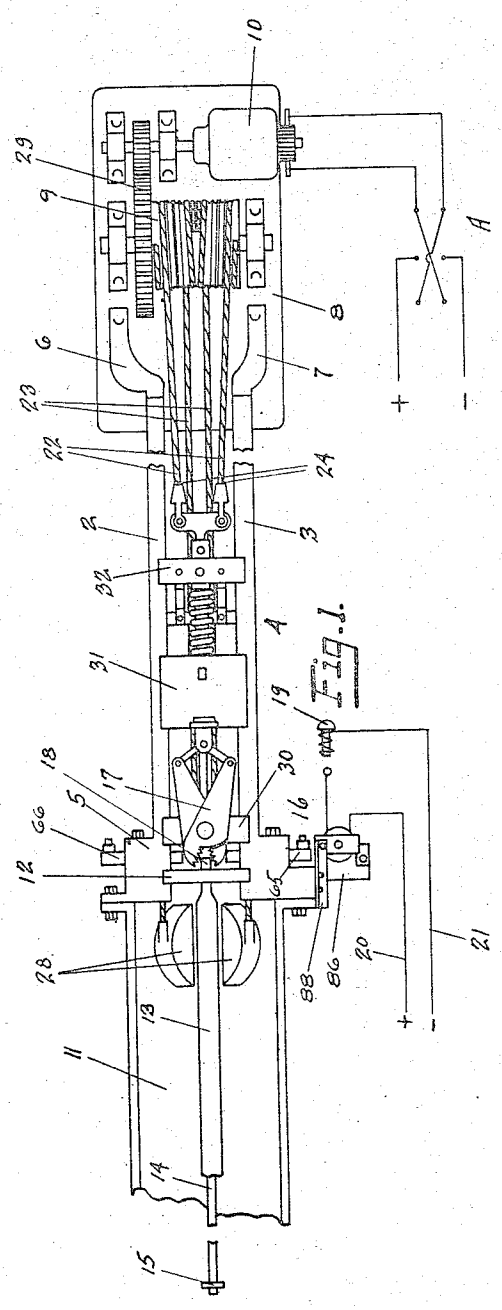



Fig. 1.

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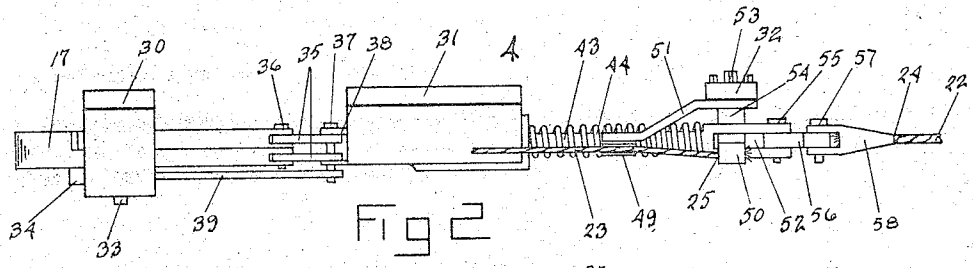



Fig 2

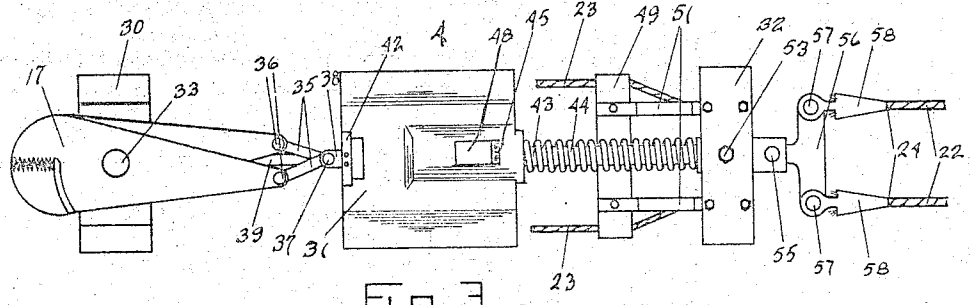



Fig 3

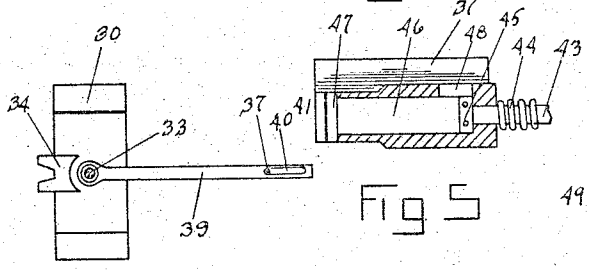



Fig 5

Fig 4

Fig 6

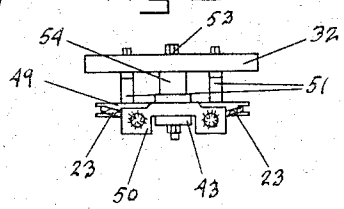
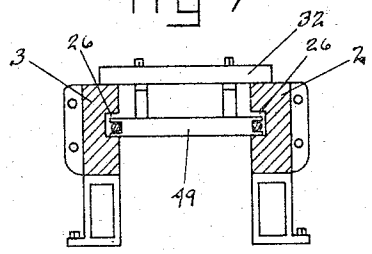



Fig 7



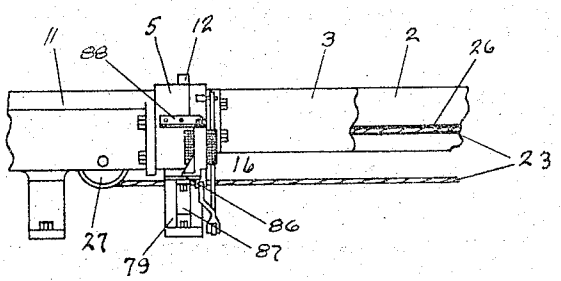




Fig 8

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Fig 9

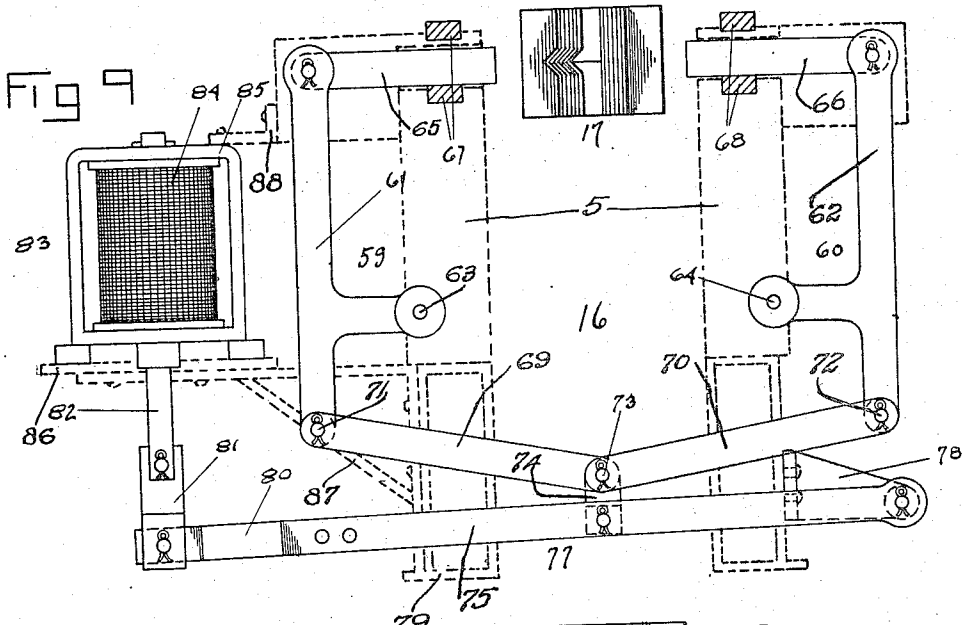



Fig 10

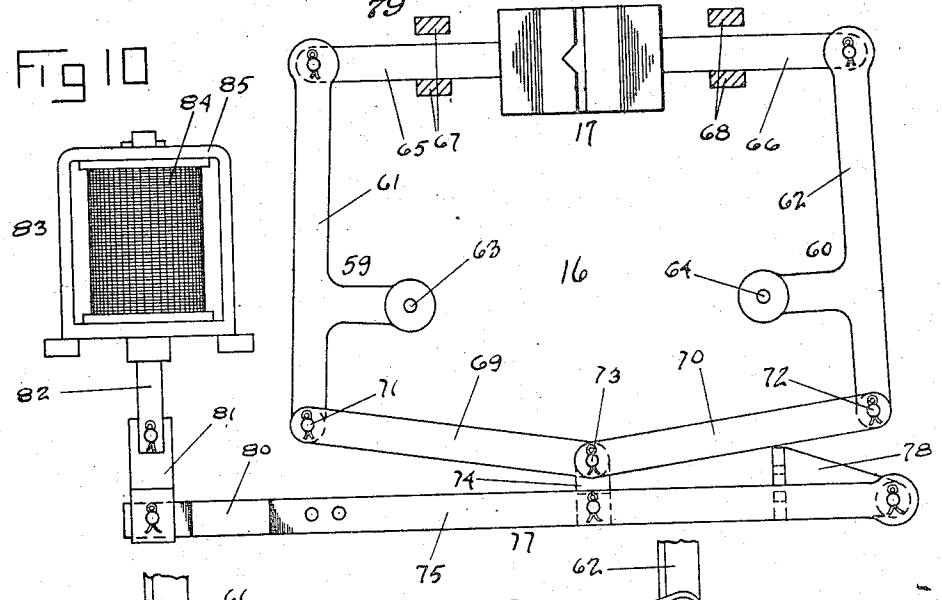
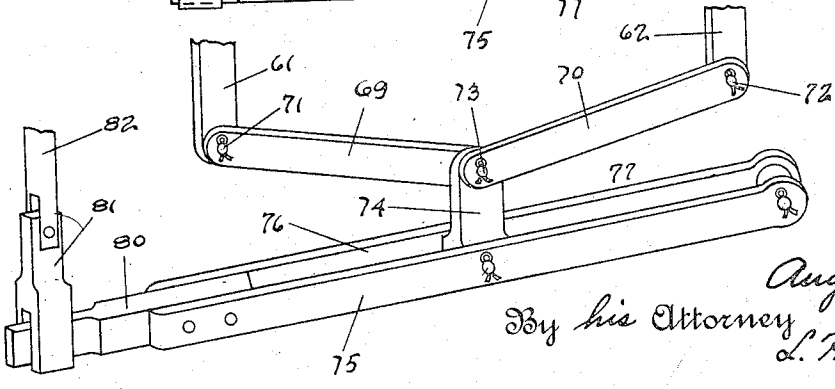



Fig 11




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Patented June 3, 1924. 1,496,137

# UNITED STATES PATENT OFFICE.

AUGUST SUNDH, OF HASTINGS-UPON-HUDSON, NEW YORK, ASSIGNOR TO SUNDH ENGINEERING AND MACHINE COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

## DRAWBENCH APPARATUS.

Application filed September 22, 1921. Serial No. 502,559.

*To all whom it may concern:*

Be it known that I, AUGUST SUNDH, a citizen of the United States, residing in Hastings-upon-Hudson, in the county of Westchester and State of New York, have invented a new and useful Improvement in Drawbench Apparatus, of which the following is a specification.

My invention relates to improvements in drawing apparatus and more especially to apparatus for drawing tubes through a die or the like, to suit the gage and shape of the material to be drawn.

Among the objects of my invention is to provide means to cushion the drawing mechanism against the tube drawing die, means to permit lost motion in the drawing mechanism, and power means to close the jaws of the tube drawing tongs on the tube.

With the above objects in view, the invention consists in the apparatus hereinafter described and illustrated in the accompanying drawings, in which:

Figure 1 is a fragmentary plan view of a suitable bench with my invention applied thereto.

Figure 2 is a longitudinal vertical view of a drawing mechanism for a draw bench, embodying the principles of the present invention.

Figure 3 is a top or plan view of the same.

Figure 4 illustrates a top or plan view of a part of the drawing mechanism.

Figure 5 is a longitudinal vertical view showing a section of another part of the drawing mechanism.

Figure 6 is an end view of the drawing mechanism, illustrating some of the novel features of the same.

Figure 7 is a sectional end view of a draw bench embodying Figure 6, in a simplified form, illustrating its position on the draw bench.

Figure 8 is a fragmentary longitudinal view of a draw bench illustrating the embodiment of the toggle joint, together with other parts of the invention.

Figure 9 is a longitudinal vertical view of the toggle joint, illustrating the parts of the device in their normally inoperative relations to each other.

Figure 10 is a similar representation of the toggle joint, but illustrating the parts of the device in their operative relation to each other.

Figure 11 is a fragmentary perspective view of the toggle joint.

Similar characters of reference are employed in the above described views to indicate corresponding parts.

My invention, as heretofore stated, applies to improvements in drawing apparatus in general, but more especially to apparatus for manufacturing tubing, and as it can be as well illustrated in connection with the latter, I will so describe it.

Referring to Figure 1, therein is illustrated, as suitable for my purpose, a fragmentary view of a draw bench, 1, comprising a structure built up of longitudinal frame bars, 2 and 3, to form a track and guide for the travelling draw mechanism, 4. The bars, 2 and 3, being secured at their front ends to one side of an abutment, 5, and their rear ends to standards, 6 and 7, the latter being fastened to a bed plate, 8, which supports a drum, 9, and a motor, 10. Secured to the other side of the abutment, 5, is a tank, 11, to contain a liquid into which the tubes are dipped before being drawn. Recessed into the abutment, 5, is a die, 12, held in a vertical position, through which a tube, 13, is adapted to be drawn over a mandrel, 14, the mandrel being adapted to be butted at its end, 15, against the end of the tank, 11, which end is not shown. Also to the abutment, 5, is secured the toggle-joint, 16, which is adapted to close tongs, 17, of the drawing mechanism, 4, upon the end portion, 18, of the tube, 13, when said tube is caused to be drawn through a die, 12. A button, 19, is provided to operate the toggle joint. Closing of the button operates the toggle joint, by means of current obtained from a source of supply through the wires, 20 and 21. Various mechanism may be employed to propel the drawing mechanism upon the tracks of the draw bench, 1. For illustrating my invention, I prefer to use cables or other flexible connections, 22 and 23. The cables, 22, which are the drawing or pulling means are secured at one of their ends to the draw mechanism, 4, at 24, their other ends being secured to the drum, 9, upon which they are wound. The cables, 23, which are the returning means, that is the means for

returning the draw mechanism to the die after the completion of the draw, are also secured to the draw mechanism at one of their ends at 25; for illustration of same, see Figure 2. The cables then continue through grooves, 26, Figure 8, in the inner sides of the longitudinal frame bars, 2 and 3, over pulleys, 27, not seen in Figure 1, as they are shown incased in covers, 28, a part of one of the said pulleys however being seen in Figure 8, a part of which pulley extends from within the cover, underneath the tank, the cables thence extending underneath the bench to the drum, 9, to which they are secured and on which they are wound, in the opposite direction to that in which the draw or pulling cables, 22, are wound. As a consequence, when the drum is rotated in a direction to wind thereon the draw or pulling cables, it is unwinding the return cables. The drum may be driven by any suitable or convenient mechanism, as for instance, from the electric motor, 10, through gearing, 29. Means for operating, and power for the motor, 10, being had by the switch, A, and from the plus and minus mains.

Referring to Figures 2 and 3, therein are shown assembly views of the drawing mechanism, 4, which comprises supports, 30, 31 and 32. The supports, 30 and 31, have their ends adapted to have sliding contact on the frame bars, 2 and 3, of the draw bench, 1. The support, 32, is a crosspiece, and like the other supports, it bridges the frame bars, 2 and 3, and has sliding contact thereon. The support, 30, carries the tongs, 17, they being centrally pinned to the support by a pin, 33, and adapted to rest on a boss, 34, on the support, and which boss is shown in Figure 4. To the tongs is pinned connection, 35, by means of pins, 36, the other ends of the connections being pinned by a pin, 37, to a link, 38, in the support, 31. A rod, 39, see Figure 4, is fastened to the support, 30, by the pin, 33; it extends underneath the tongs and is engaged at its other end by the pin, 37, of the link, 38, engaging a slot, 40, in the rod. The purpose of the rod will be explained later. The link, 38, is held in the support, 31, by means of a slot, 41, see Figure 5, formed for its reception. There is also a crosspiece, 42, fastened to the link to hold the link in its slot in the support, 31. The support, 31, also supports at its end opposite to the end which holds the link, a draw rod, 43, which draw rod is encompassed by a spring, 44. The support, 31, is cored out as seen in the Figure 5 for the reception of the draw rod, 43, and a nut, 45, fastened to the end of the draw rod. The nut, 45, is placed in the cored hole, 46, in the support, 31, through the part of the slot, 41, in the support, 31, indicated by 47, after which it is screwed to the pin, through an opening, 48, above the cored hole by a tool, engaging the holes in the nut. The support, 32, supports the other end of the draw rod, 43, together with other parts not spoken of heretofore of the drawing mechanism, and which are a crosspiece, 49, and an equalizing cable hitch bar, 50. The crosspiece is connected to the support, 32, through the intermediation of connections, 51, which are fastened at one of their ends to the under side of the support, 32, and their other ends to the top side of the crosspiece, 49. The said crosspiece is slotted at each end, as seen in Figure 6, to engage the cables, 23, the crosspiece, 49, guiding the cables in the grooves, 26, see Figure 7, in the inner sides of the longitudinal frame bars, 2 and 3, when the drawing mechanism is in operation. To the equalizing cable hitch bar, 50, is fastened the ends, 25, of the cables, 23, the cable hitch bar being placed in the fork, 52, of the draw rod, 43, and held therein by a bolt, 53, which bolt also is the fastening means of the draw rod, 43, to the support, 32. 54 indicates a spacer or bushing between the draw rod, 43, and support, 32. Also placed in the fork of the draw rod, 43, and held thereto by a pin, 55, is an equalizing cable hitch, 56, and to which is fastened by pins, 57, cable cups, 58, in which are fastened the ends, 24, of the cables, 22.

Referring particularly to Figures 9, 10 and 11, therein are shown views of the toggle joint, 16, for operating the tongs of the drawing mechanism, consisting of bell crank levers, 59 and 60. Arms, 61 and 62, of the levers are somewhat T-shaped, their pivotal points, 63 and 64, respectively, being loosely journalled to the bench side of the abutment, 5, shown in Figure 9.

To the uppermost end of each arm, 61 and 62, are loosely journalled bars, 65 and 66, respectively, adapted to be moved toward each other, closing the tongs, 17, of the drawing mechanism when the same are between them. The hatched squares, 67 and 68, in Figure 10 either side of the bars 65 and 66 represent a guide for the bars, which in the case of the draw bench shown in Figure 1, are in the form of slots cut in the abutment, 5, as shown in Figure 9. The other arms, 69 and 70, of the levers are loosely pivoted at one of their ends to the lower ends of the T-shaped arms, 61 and 62, of the lever at 71 and 72, respectively, their other ends being pivoted together at 73 to an end of a link, 74, the other end of the link being pivoted between rods, 75 and 76, of a lever, 77, which is pivoted at one of its ends to a bracket, 78, secured to a leg on the opposite side of the bench, opposite the leg, 79, shown in Figure 9.

Between and secured thereto, to the other ends of the rods, 75 and 76, of the lever, 77, is a bar, 80, which is also loosely journalled

in the fork of a bar, 81, the said bar being secured between the fork formed in the plunger, 82, of an electro-magnet, 83. The coil, 84, and frame, 85, for the coil of the electro-magnet is mounted upon a base, 86, supported by a bracket, 87, affixed to the leg, 79, as illustrated in Figures 8 and 9. An angle iron, 88, secured to the abutment, 5, and to the frame, 85, of the magnet, is used also as a support therefor. The action of the toggle insures that the tongs will securely grip the tube to the end that the tongs will not slip on the tube in the beginning of the operation of drawing a tube.

The operation of the draw mechanism and toggle joint will be clearly evident from the above description, and from an inspection of the accompanying drawings.

The operation of the above mentioned devices is briefly as follows: The tube to be drawn over a mandrel and through a die is caused to assume the position indicated in Figure 1, of the drawings, the pointed or end portion, 18, of the tube, projecting through the die, 12, into the opened tongs of the drawing mechanism, which is caused to assume this open position. The button, 19, in Figure 1, is pressed, completing a circuit from the plus main wire, 20, through the coil, 84, of the electro-magnet of the toggle joint, button 19, wire 20, to the minus main. The coil is then energized, drawing its plunger, 82, into itself, the toggle joint assuming a position as in Figure 10, the bars, 65 and 66, of the toggle joint, will have moved the tongs of the drawing mechanism to cause it to be closed upon the end portion of the tube to be drawn, after which the button, 19, is released, and the bars allowed to become free of the grip. The drawing mechanism is then started to travel by means of the motor, 10, causing the drawing mechanism to be pulled along the track formed by the frame bars, 2 and 3, towards the rear end of the draw bench, drawing the tube, 13, over a mandrel, 14, and through the die, 12. It can readily be seen that, as a result of the initial grip of the tongs upon the end of the tube, by the action of the toggle, and by the design of the clamping tongs, the harder the pull required to draw the tube, the greater will be the gripping action of the tongs upon the tube. The initial grip of the tongs upon the tube, caused by the toggle joint, insures a positive grip upon the tube in the beginning of the drawing operation.

Upon completion of the draw the tongs releases its hold upon the tube, as there is no resistance to overcome, namely the resistance of the die, as the tube has been entirely pulled through it, the tube falling out of the tongs of the grip due to its own weight, and in the case of the draw bench in mind, the tube falls into a container located underneath the bench, thus eliminating any manual means for removing the tube from the bench. The drawing mechanism is then caused to travel back to the front end of the bench through a reversal of the motor, 10, by means of switch, A. At the start of the return operation, the tongs automatically open, the resistance offered by the joint connection formed by the connections, 35, between the grip and the support, 31, being less than the resistance to be overcome in causing the support, 30, which carries the tongs to be moved. Accordingly the pin, 37, in the link, 38, in the support, 31, will travel in the slot, 40, in the rod, 39, underneath the tongs, until it assumes a position as shown in the Figure 4, which shows a cross-section of the pin. The support, 30, will then be caused to travel with its opened tongs, being virtually pushed by the other supports, 31 and 32, behind it. As will be seen from the aforegoing explanation the tongs are always open in the return operation, consequently, being in that position at arriving at the front end of the bench to be in a position to engage another tube to be drawn as before.

Should the operator fail to stop the drawing mechanism in time or should the automatic means used on some draw benches fail to render the power mechanism inoperative, the drawing mechanism, 4, will abut against the die, 12, with undue shock to the bench, and in the instance where cables or other flexible means are used as a return means, the said means may be broken as a consequence. This however is eliminated by the buffer effect embodied in the drawing mechanism, whereas when the drawing mechanism abuts against the die the support, 32, to which the return cables, 23, are fastened, will still be allowed to move through the movement imparted to the draw rod, 43, affixed to it, the draw rod and nut, 45, affixed to it, being projected into the hole, 46, in the support, 31, compressing the spring, 44.

The tongs, 17, of the drawing mechanism, 4, are always in an open position when returned to the die, 12, for reasons before stated, and that when the drawing mechanism abuts against the die, that the motion of all its parts are not stopped, by the effect, but that through the further motion of other parts, by the driving motor, 10, through the intermediation of return cables, 23, the draw rod, 43, and nut, 45, are projected against the spring, 44, into the hole, 46, of the member, 31, until the driving motor, 10, is stopped, all of which has been stated before. As a consequence the motor for operating the draw bench mechanism will be allowed to start under no load, before it commences actually to draw a tube, the motor, 10, in starting pulling the draw rod, 43, and nut,

45, from its projected position through the intermediation of the pulling cables, 22, at the end of which it will commence actually to draw the tube. The above described loose connection between the pulling cables 22 and drawing tongs, broadly stated, at the beginning of the movement of the cables in the operation of pulling the tongs to draw a tube, may be referred to as a lost motion device or connection between said cables and tongs.

The above illustrates the step taken in the operation of drawing a tube, and when electric switches are used for controlling the operation of the draw bench, heavy arcing between the contacts of the switch are eliminated as a comparatively small current is required to start the motor under no load, as is done in the present invention.

To give the motor, 10, an increase or greater no load start, before actually drawing the tube, the length of the member, 31, could be increased, lengthening the cored hole, 46, the stroke of the draw rod, 43, would then be greater, the length of the draw rod, and also the spring, 44, to be increased if necessary.

Having thus described my invention, I claim as new and desire to secure by Letters Patent of the United States:

1. In an apparatus for drawing metal tubes having a stationary tube drawing die and traveling tube drawing mechanism, adapted to travel from and to the die, a spring adapted to cushion the drawing mechanism against the die in its return travel thereto.

2. In an apparatus for drawing metal tubes having a stationary tube drawing die and traveling tube drawing mechanism, adapted to travel from and return to the die, a rod in said drawing mechanism and a spring on said rod to cushion the drawing mechanism against the die upon its return thereto.

3. In a drawing mechanism for drawing metal tubes, the combination of a stationary tube drawing die, tongs to grip the tube to draw it through the die, actuating means to move the tongs to draw the tube through the die and a lost motion device between the tongs and actuating means.

4. An apparatus for drawing metal tubes consisting of the combination of a stationary tube drawing die, a pair of traveling tongs for drawing the tube through the die adapted to travel from the die in drawing a tube, an electric motor for moving the tongs from the die to draw a tube, and connections including a lost motion device between the motor and tongs, whereby the motor can be started from rest to be brought up to a desired speed before it moves the tongs to draw a tube.

5. In an apparatus for drawing metal tubes, the combination of a stationary tube drawing die, a pair of traveling tongs to grip the tube to be drawn and travel from the die in drawing a tube through it, a traveling support for the tongs and to which they are fastened, a draw rod, one end adapted to engage the support and be partially drawn through it, means fastened to the other end of the rod for moving it, whereby the rod is allowed to move a distance in said support before it begins to move the support and the tongs to draw the tube through the die.

6. In an apparatus for drawing metal tubes, the combination of a stationary tube drawing die, a pair of traveling tongs adapted to grip the tube to be drawn through the die and travel from the die in drawing the tube through it, a traveling support for the tongs and to which they are fastened, a draw rod, one end sleeved into and adapted to be partially drawn through and engage the support, means fastened to the other end of the rod for moving it and a coiled spring on the rod for cushioning the tongs against the die in their return travel to the die.

7. In an apparatus for drawing metal tubes, the combination of a pair of tongs for gripping the tube to be drawn, bell crank levers to close the tongs, a toggle joint device between the bell crank levers, another lever connected to the toggle joint device, and electric means to actuate said last mentioned lever to actuate the toggle joint device and the bell crank levers to close the tongs on the tube.

In testimony whereof, I have signed my name to this specification.

AUGUST SUNDH.