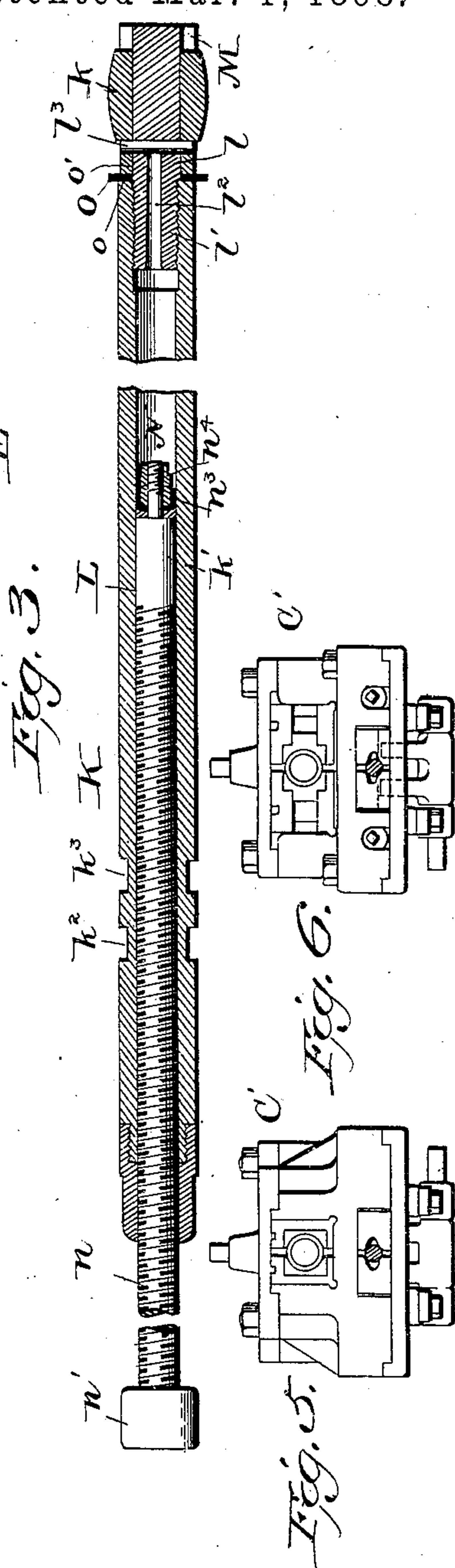
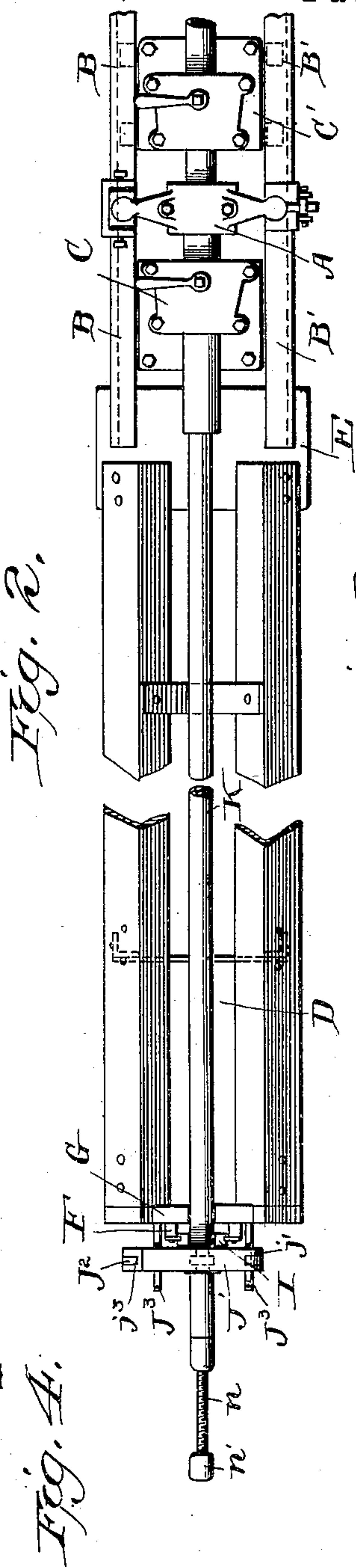
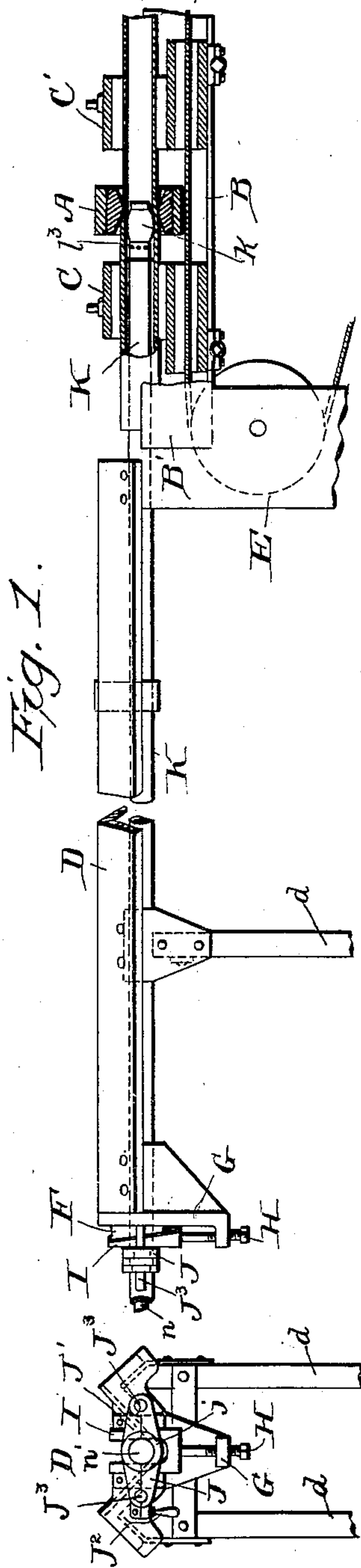


W. A. McCOOL.
METAL DRAWING MACHINE.

Patented Mar. 1, 1898.



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WILLIAM A. MCCOOL, OF BEAVER FALLS, PENNSYLVANIA.

METAL-DRAWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 600,014, dated March 1, 1898.

Application filed May 13, 1897. Serial No. 636,390. (No model.) Patented in England November 14, 1896, No. 25,686; in France September 14, 1897, No. 270,462, and in Belgium September 24, 1897, No. 130,827.

To all whom it may concern:

Be it known that I, WILLIAM A. MCCOOL, a citizen of the United States, residing at Beaver Falls, in the county of Beaver and State of Pennsylvania, have invented certain new and useful Improvements in Metal-Drawing Machines, (for all or parts whereof there have been issued to me in the Kingdom of Great Britain and Ireland Letters Patent No. 25,686, dated November 14, 1896; in France, No. 270,462, dated September 14, 1897, and in the Kingdom of Belgium, No. 130,827, dated September 24, 1897;) and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

Figure 1 is a side elevation of a sufficient portion of a drawing-bench to illustrate my invention. Fig. 2 is a plan view of the same. Fig. 3 is a longitudinal section of the mandrel on a larger scale. Fig. 4 is an end elevation. Figs. 5 and 6 are end elevations of one of the draw-heads.

In the drawings, A indicates a die-holder such as is used in connection with a drawing-bench. On each side of the die there is a guideway at B B and B' B'. On one side of the die there is a carriage at C, adapted to be propelled by a cable, chain, or other suitable driver, this carriage having means for gripping it to a tube or rod which can be pushed by the carriage more or less through the die. On the other side of the die there is a carriage C', also adapted to be intermittingly engaged with the tube or rod for the purpose of drawing it through the die and with which the cable or chain can be engaged.

D indicates a V-shaped trough-like support extending outward from the delivery end of the bench, it being preferably secured to the latter at or near the upright or standard E. The support D is held by one or more standards d, rising from the floor or base and rigidly secured to it. At the outer end of this supporting-trough there is a thrust-block F.

G is a downward and rearward projecting step or bracket which supports a screw H. Upon this screw there is a wedge-faced block I, which bears against the inclined or wedged face on the thrust-block F.

J is a cross-head adapted to be adjusted inward or outward and formed with a bearing at j.

J' is a cap-bar hinged at j' and having a lock-handle J², which can be fitted in or withdrawn from the slot at j³.

By means of the screw H the wedge-block I can be moved up or down and the cross-head J be adjusted inward or outward, it sliding on the guides J³.

The devices last above described are intended for supporting and adjusting the mandrel, which is placed within the tube which is to be subjected to the action of the drawing-bench. This mandrel is indicated as a whole by K. It comprises more particularly the bulb or head k and the stem k'. The stem part is formed of the hollow or tubular portion L and the forward-extending spindle l. At its forward end the tube L is threaded internally, and to the thread is fitted the threaded part l' of the spindle.

l² is an aperture formed longitudinally in the spindle and communicating at its forward end with a series of radial apertures l³. The ball or bulb k is fitted to the projecting part of the spindle and is fastened rigidly thereon by means of the washer or flange M.

The tubular portion L of the mandrel-stem serves as a receptacle for a lubricant. I employ a viscid or semisolid lubricant adapted to be forced through the chamber in the tube and also through the longitudinal aperture l² and the radial apertures l³. To positively force the lubricant forward, I employ a plunger, as illustrated at N. It is carried by a threaded rod n, which at the rear end has a head n' for receiving a wrench or spanner. The plunger may be made in any suitable way, though I at present prefer to employ a leather cup n³, fastened upon a stem n⁴ at the inner end of the threaded rod. When the threaded rod is rotated by a tool applied at its outer end n', the plunger imparts pres-

sure to the mass of lubricant and forces it forward through the apertures $l^2 l^3$. The latter are adjacent to the operative parts of the surface of the mandrel-bulb k , and the lubricant is fed forward by the tube and acts to reduce the friction and wear at the bulb. To confine the lubricant and prevent its escaping outward, I employ a leather washer O , which is placed around the mandrel-stem, it fitting against the shoulder at o and being held in place by a collar o' .

The stem part k' of the mandrel is at the rear or outer end formed with grooves $k^2 k^3$, by which it is held in place in the above-described adjustable bearing in the cross-head J .

The manner of employing the mandrel which I have described will be readily understood. After its outer end has been properly adjusted in the cross-head J and the bulb k has been properly placed with respect to the die A a tube is arranged ready to be drawn over the bulb or ball and through the die. The tube is first grasped by the gripper in the carrier C , and the latter is connected with the propelling device, whereupon the tube is pushed through the die and over the mandrel-bulb, the diameters of the die-aperture and of the bulb and the relative positions of these parts being such that the proper compression is applied and the desired shape given to the tube.

If at any time the friction upon the mandrel becomes too severe, it can be lessened by advancing the plunger at N sufficiently to force out lubricant, which is quickly carried by the inner surfaces of the tube to the surface of the bulb.

As the bearing for the mandrel at the rear end is formed in two parts, the cross-head J and the cap-bar J' , which are separable by a movement on lines transverse to the mandrel, the latter can be instantly withdrawn at any time for the insertion of a tube. All of the parts behind or outside of the head or bulb are of such diameter that the whole mandrel-stem can be easily inserted into a tube as soon as the lock-handle and cap-bar at J' and J^2 are released. The latter may be considered as a holder, and the parts can be made so as to serve merely that purpose, as the bearing depression or cavity at j can be of the nature of a slot into which the reduced part of the mandrel can be fitted.

It will be seen that the adjustment of the mandrel relative to the die is accomplished without requiring any rotation of the mandrel and that such adjustment can be effected even when a tube is in place, there being no resisting friction, such as would result if rotation of the mandrel-head were required. I am aware of the fact that it has been proposed to form a screw-thread upon a mandrel-stem at its rear end and engage said thread with a thread in an aperture in the abutment-piece, the threads being intended to adjust the mandrel by rotating the latter and

also intended to receive the entire thrust or draft experienced by the mandrel; but it is impossible to maintain the nicety of adjustment which is requisite in successful drawing of tubes with such devices, because there are no means for positively holding the mandrel to adjustment, the pressure or draft on the mandrel making it liable to turn more or less on the threads. In my case the adjustment is effected by applying force on lines longitudinal only of the mandrel, and the latter is held positively in a fixed position after adjustment by means of the walls of the deep grooves $k^2 k^3$ and the cross-head seated therein, the mechanism in this respect being contradistinguished from both that above referred to having a rotary threaded mandrel and others in which a yielding feed or pressure was applied by means of a piston and water or equivalent agent under pressure.

It will be seen that the parts at C and C' may be regarded, respectively, as a tube-pushing carrier and a tube-pulling carrier. There is in each a passage-way for the tube adapted to be made large enough to permit either carrier to move independently of the tube or to permit the tube to move independently of either carrier. Consequently the pulling-carrier C' can be pushed backward along the tube and caused to attain engagement therewith at new points from time to time, and the pushing-carrier C is, first, assisted by the mandrel in supporting the tube in proper line for the die, and, secondly, it in turn assists the mandrel in properly supporting the tube after it (the carrier) has been disengaged from the tube and while the latter is being pulled through the die by the carrier C' —that is to say, when the mandrel and the pushing-carrier are used the tube is supported both on the outside and the inside.

With respect to the details of the gripping parts which connect the carrier and the tube and which connect the carrier to the traction device it will be understood that any suitable form can be employed. One set of such details is shown in my other application, Serial No. 605,657, filed September 12, 1896; but there can be modification in that respect, if desired.

What I claim is—

1. The combination with a drawing-bench, of a mandrel-supporting frame extending backward from the bench, the die on the bench, the mandrel, and means for positively adjusting the mandrel longitudinally, rectilinearly, and holding it stationary after adjustment, against movement toward the die, substantially as set forth.

2. The combination with a drawing-bench, and the die thereon, of a mandrel extending rearwardly from the die, a rearward-extending mandrel-supporting frame, a bearing for the rear end of the mandrel, and means for adjusting the bearing longitudinally of the mandrel and fastening it after adjustment,

against movement toward the die, substantially as set forth.

3. The combination with a draw-bench, and the die thereon, of the mandrel having a bulb adjacent to the die and a rearward-projecting stem, a bearing for the rear end of the mandrel, a guideway for said bearing, and means for positively moving the bearing along said guideway longitudinally of the mandrel and holding it against movement toward the die, substantially as set forth.

4. The combination with a draw-bench, and the die thereon, of a mandrel having its active head adjacent to the die and a rearward-projecting stem, a bearing for the rear end of the mandrel, means for locking the mandrel from longitudinal movement in said bearing, and a holder for retaining the mandrel in said bearing, said holder being adapted to be thrown into inactive position to permit the mandrel to be moved away from the bearing on transverse lines, substantially as set forth.

5. The combination with a draw-bench, and the die thereon, of the mandrel having its active head adjacent to the die and a rearward-extending stem, a thrust-block receiving the forward thrust of the mandrel, a movable bearing engaging longitudinally with the mandrel, and adjusting devices abutting against said bearing and said thrust-block for adjusting the bearing and the mandrel longitudinally, substantially as set forth.

6. The combination with a draw-bench, and the die thereon, of a mandrel having an active head adjacent to the die and a rearward-projecting stem, a two-part holder for the rear part of the mandrel engaging with it longitudinally and of which one part is movable transversely of the mandrel toward and from the other to permit the mandrel to be fastened or removed from its operating position, guides, J^3 , engaging with said holder independent of the mandrel, and means for moving said holder and mandrel longitudinally of said guides, substantially as set forth.

7. The combination with a draw-bench, and the die thereon, of a mandrel having its active head adjacent to the die and a rearwardly-projecting stem, a holder for the mandrel at the rear end engaging with it longitudinally and movable toward and from the die, said holder having two parts separable on lines transverse of the mandrel, substantially as set forth.

8. The combination with a draw-bench, and the die thereon, of the mandrel having its active head adjacent to the die and a rearward-projecting stem, an adjustable bearing for the rear end of the mandrel, and an abutment for the bearing formed in two parts one of which is wedge-like or cam-shaped, and one of which is movable relative to the other to adjust the bearing, substantially as set forth.

9. In a metal-drawing mechanism, a mandrel having an interior lubricant-chamber, an active head, and orifices communicating with

said chamber for conveying lubricant therefrom to the surface of the metal being drawn, substantially as set forth.

10. In a metal-drawing mechanism, a mandrel having an active head, an interior lubricant-chamber, one or more ducts from said lubricant-chamber to the exterior of the mandrel, and a holder behind the said ducts to prevent the backward flow of the lubricant away from the mandrel-head, substantially as set forth.

11. In a metal-drawing mechanism, a mandrel having an active head or surface, an interior lubricant-chamber, a duct for conveying lubricant from said chamber to the exterior of the mandrel adjacent to the head, and means for positively forcing lubricant from said chamber through said duct, substantially as set forth.

12. In a metal-drawing mechanism, a mandrel having an active head or surface, an interior lubricant-chamber, and a duct for conveying lubricant from said chamber to the exterior of the mandrel, in combination with a plunger, and means extending through the rear end of the mandrel for actuating said plunger, substantially as set forth.

13. In a metal-drawing machine, the combination with the mandrel-stem, having a lubricant-chamber, of the head, k , and the spindle provided with ducts, l^2 , l^3 , and with a seat for said head and rigidly secured to the end of the stem, substantially as set forth.

14. In a metal-drawing machine, the combination of the die, the traction device, the carrier on one side of the die, connected to the traction device and adapted to be moved thereby away from the die, a tube-gripper on the carrier adapted to engage with the outer surface of the tube, a mandrel, having an enlarged head for the interior of the tube, on the other side of the die, from said carrier, and having a stem supported at its rear end, outside of the tube, substantially as set forth.

15. The combination of the die, the traction device, the tube-carrier on one side of the die having an aperture through which the tube can be moved independently of the carrier, a tube-gripper on the carrier, and a mandrel, having at one end an enlarged head for the interior of a tube, on the opposite side of the die from said carrier and having its rear end supported outside of the tube, substantially as set forth.

16. The combination of the die, the traction device, the tube-carrier, on one side of the die, means for detachably connecting the tube-carrier to the traction device, and a mandrel, for the interior of a tube, having at one end an enlarged head, and having its other end supported outside of the tube on the opposite side of the die from the tube-carrier, substantially as set forth.

17. The combination of the die, the traction device, a tube-pulling carrier on one side of the die, a tube-pushing carrier on the other

side of the die, and having a passage-way
through which a tube can move loosely, means
for detachably connecting said carrier to the
traction device, and a mandrel for the inte-
rior of the tube having an enlarged head and
5 having its stem on the same side of the die
with the tube-pushing carrier, substantially
as set forth.

In testimony whereof I affix my signature
in presence of two witnesses.

WILLIAM A. McCOOL.

Witnesses:

H. W. REEVES,
HUNTER ECKERT.