June 5, 1956 E. J. McILVRIED 2,748,924

DRAW BLOCK MECHANISM

Filed Feb. 28, 1952 6 Sheets-Sheet 1

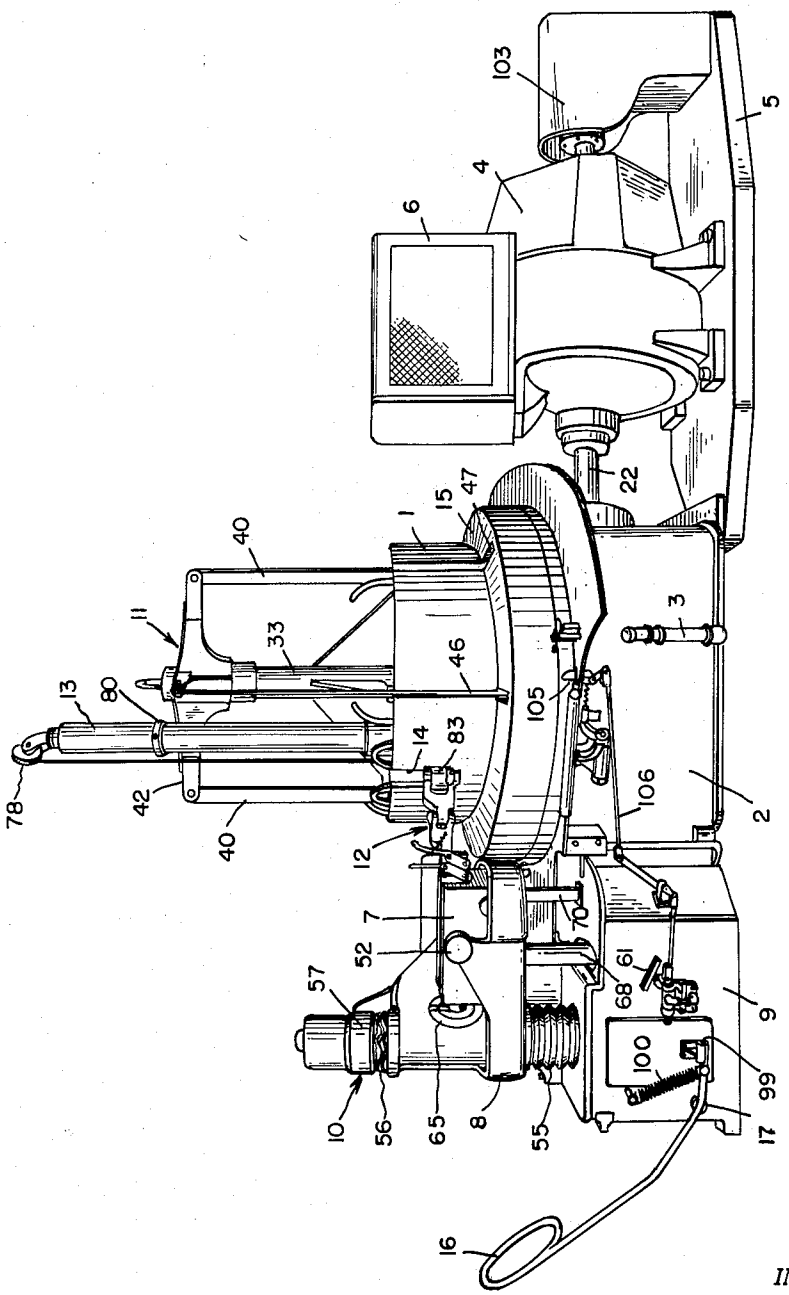


Fig. 1

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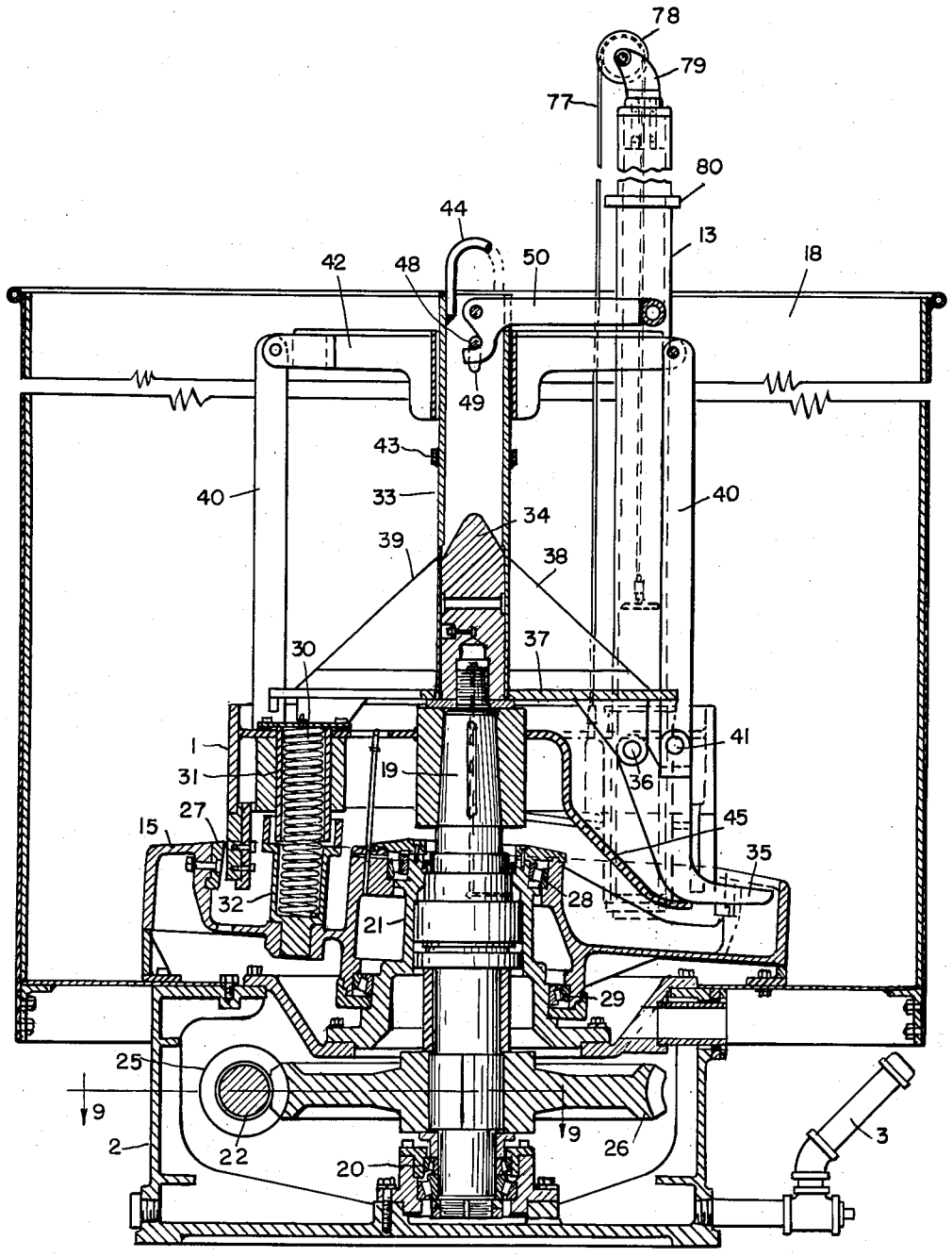


Fig. 2

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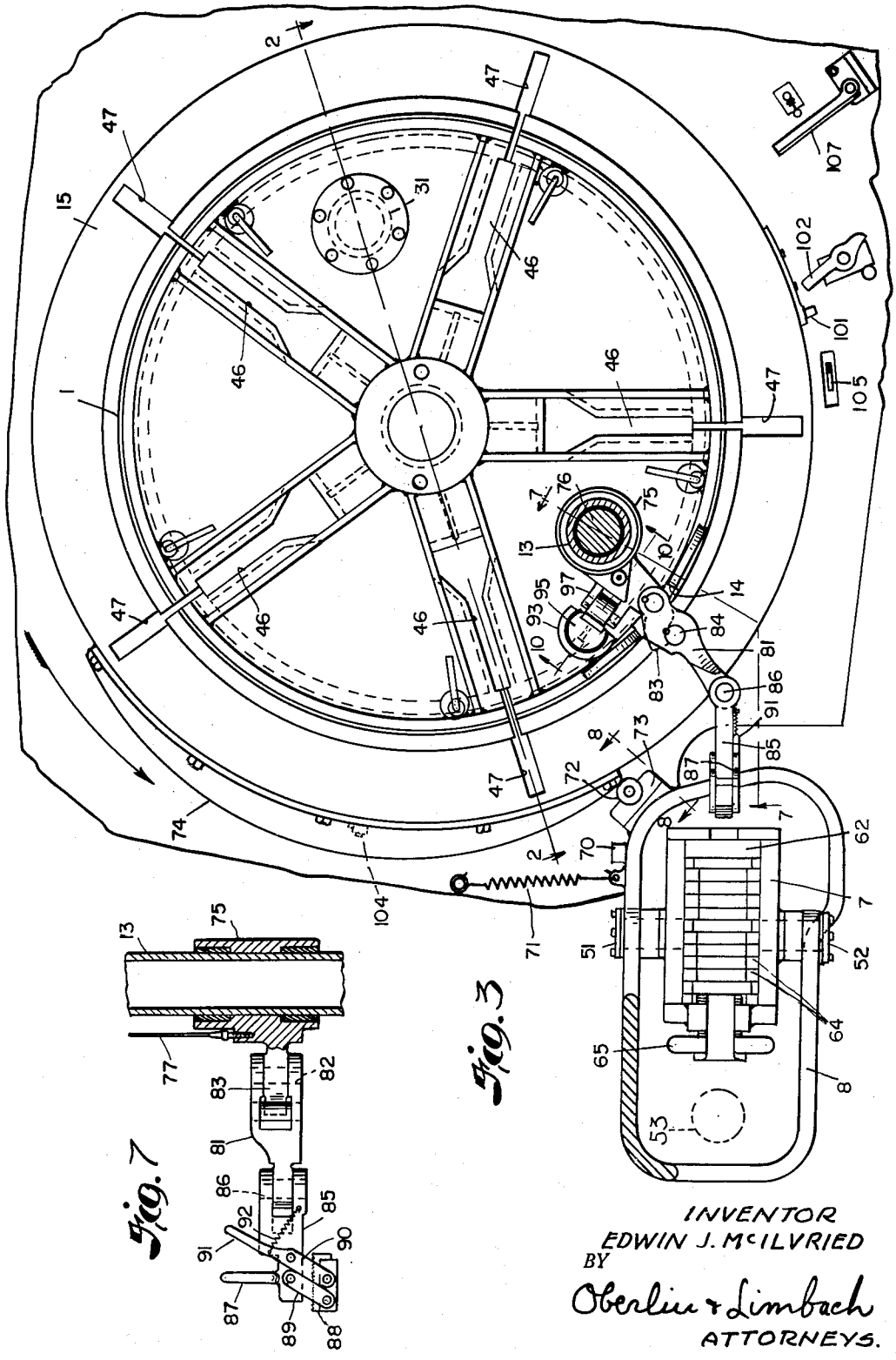


Fig. 3

Fig. 7

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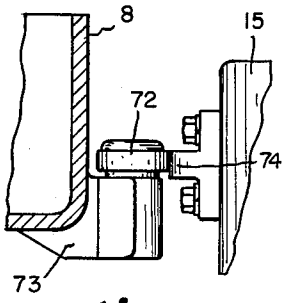


Fig. 8

Fig. 4

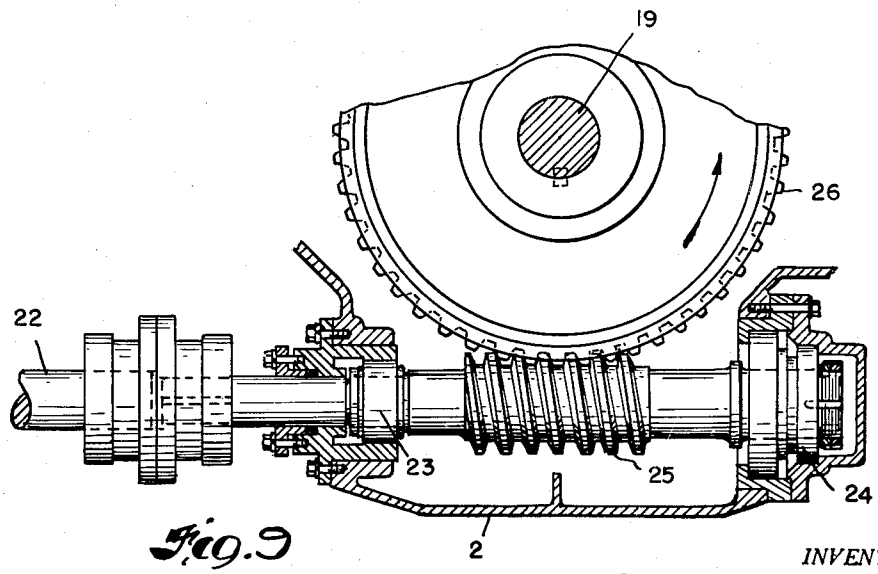


Fig. 9

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DRAW BLOCK MECHANISM

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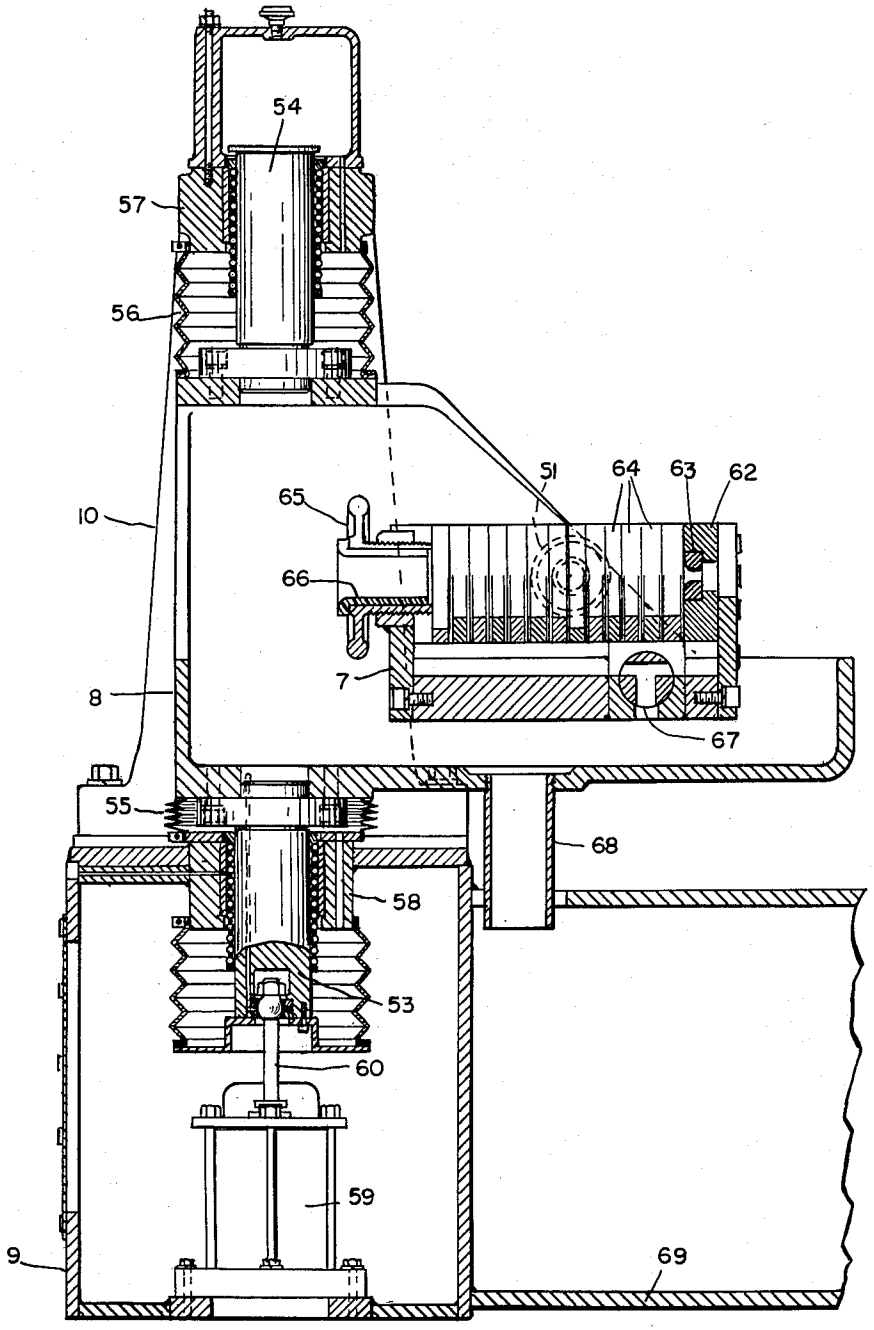


Fig. 5

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DRAW BLOCK MECHANISM

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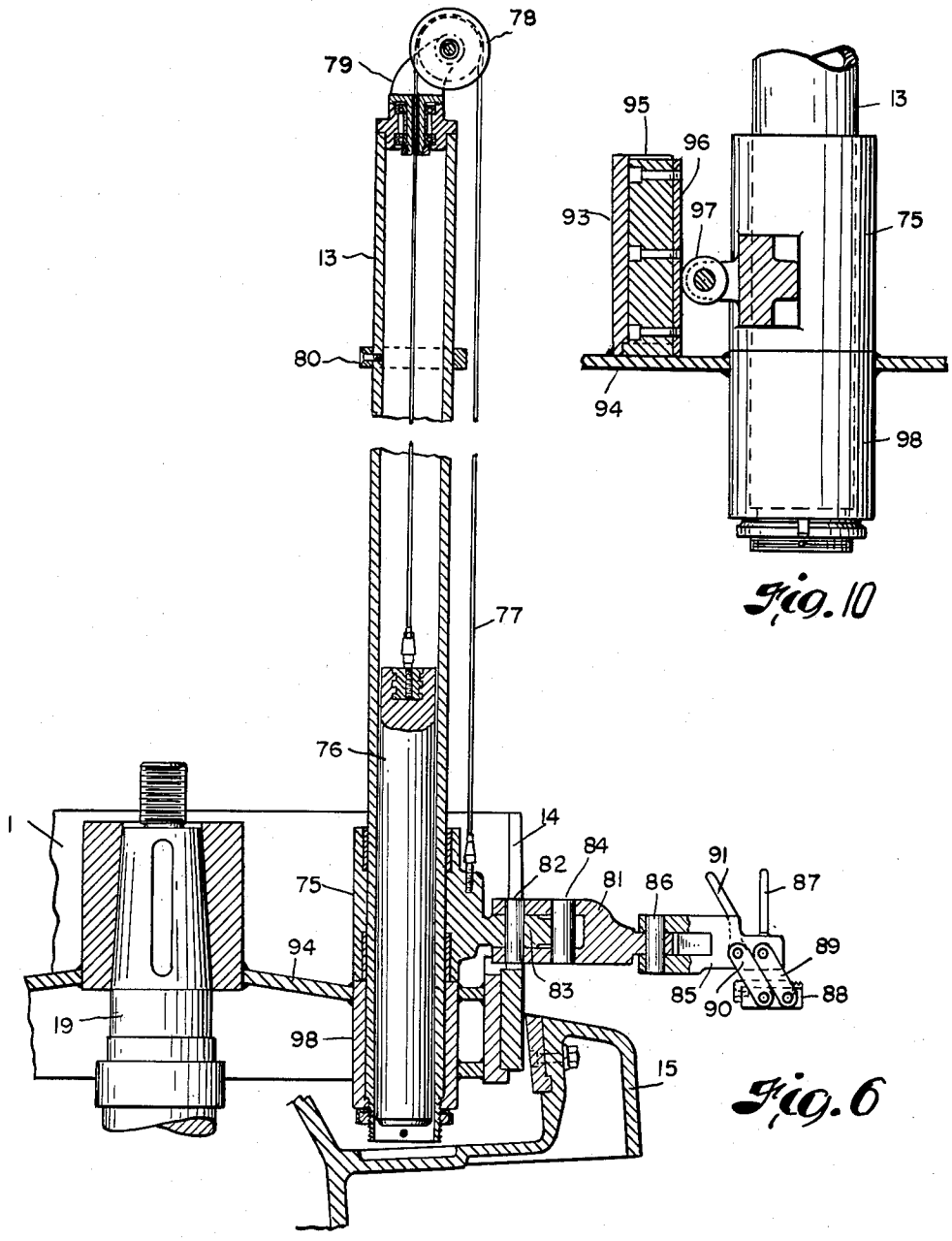


Fig. 10

Fig. 6

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United States Patent Office 2,748,924 Patented June 5, 1956

2,748,924

DRAW BLOCK MECHANISM

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Application February 28, 1952, Serial No. 273,966

20 Claims. (Cl. 205—3)

This invention relates as indicated to draw block mechanism, and more particularly to a draw block especially adapted and designed for the drawing of metal tubing, both ferrous and non-ferrous.

It is common practice to draw tubing through a die provided with an internal plug on a mandrel bar to elongate and reduce the tubing, but usually this operation is performed on a straight draw bench which is capable of handling but relatively short lengths of tubing. On the other hand, wire and the smaller sizes of relatively thick-walled tubing have long been drawn through dies by means of a rotating drum or draw block, but with thin-walled tubing much difficulty has been encountered due to breaking off at the die. When drawing tubing by means of a draw block, a simple die may be employed to perform a sinking operation or a floating plug may be used to establish a definite wall thickness. When such plug is utilized it becomes of especial importance to pull the tubing in a manner to maintain an accurate axial alignment of the tubing, die, and plug to prevent pinching and breaking of the tubing in the die. When initiating the draw this problem is particularly critical as breakage due to misalignment is most apt to occur when the plug is first seating itself in the die.

The gripper on the block which holds the leading end of the work should not be permitted to swing against the smooth polished side of the block or scratching of the latter will result with consequent scratching of the tubing in mechanism where the turns of the latter about the block are caused to slide axially of the block.

It is highly desirable to obtain several snug turns of the tubing about the block in order to ensure a secure purchase thereon before the turns are caused to slide axially of the block as additional turns are wound on the latter. While not as important, this is also advantageous in the drawing of rod and wire and it is to be understood that the mechanism of my invention, while especially useful in the drawing of tubing, is also suited for the drawing of rod, wire and the like.

It is accordingly a principal object of my invention to provide draw block mechanism especially adapted for the drawing of metal tubing wherein the initial pull exerted on the work will be in a straight-line direction.

Another object is to provide such mechanism by which one or more turns of tubing may be wound upon the draw block without any initial shifting of such turns axially of the block but which will be effective thereafter thus axially to shift the accumulated turns.

A further object of my invention is to provide draw block mechanism adapted to draw relatively large diameter metal tubing without damage to the latter and ensuring a uniform high quality product.

Still another object is to provide such mechanism in which the drum and gripper mechanism are arranged and designed to prevent scratching of the tubing wound upon the former.

Other objects of my invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a general perspective view of my new mechanism;

Fig. 2 is a vertical section taken through the draw block along the line 2—2 on Fig. 3 and also showing the circular guard or shield which may be provided to enclose the same as a safety precaution;

Fig. 3 is a top plan view of such draw block and the associated die housing;

Fig. 4 is a diagrammatic top plan of such block and die housing illustrating several positions of the same and the gripper means on the block immediately following initiation of the drawing operation;

Fig. 5 is a vertical section on a somewhat enlarged scale through such die housing and the mounting means therefor;

Fig. 6 is a fragmentary vertical section through the block and gripper means mounted thereon;

Fig. 7 is a fragmentary detail view of the gripper means taken on the line 7—7 on Fig. 3;

Fig. 8 is a fragmentary detail view of the cam and follower on such block and die housing respectively, taken on the line 8—8 on Fig. 3;

Fig. 9 is a horizontal section through the drive means of the block taken on the line 9—9 on Fig. 2; and

Fig. 10 is a fragmentary elevation partly in section of the gripper supporting means taken on the line 10—10 on Fig. 3.

General construction and operation

Referring now more particularly to the drawing and especially Fig. 1 thereof, the embodiment of my invention there illustrated comprises a large diameter block or drum 1 mounted for rotation about a vertical axis in box frame 2 which is also adapted to serve as a gear case, lubricant being introduced through filler pipe 3. Such drum or block is adapted to be driven by means of a powerful electric motor 4 mounted on base 5 and provided with an air filter 6 through which cooling air is adapted to be drawn by a fan (not shown) within the motor housing for ventilating such motor. A die holder 7 is carried in a trunnion mount 8 supported in base frame 9 and stand 10 bolted on such frame.

A riding stripper 11 is adapted to be mounted on the block as shown, so that a large number of turns of tubing may be accumulated thereon. A work-piece gripper generally indicated at 12 is mounted for reciprocation vertically of a tubular supporting column 13, a slot 14 extending part-way into drum 1 from the upper edge thereof permitting such gripper to slide downwardly to a point approximately one-third the vertical extent of such drum above apron 15. In mechanism designed for the drawing of two-inch diameter aluminum tubing, for example, drum 1 may be approximately nine feet in diameter.

The tubing to be drawn will be conducted through loop 16, pivoted at 17, and its leading end pinched for insertion through the die in die holder 7. The leading end of the tube protruding through the die will be seized by gripper 12 in the position shown in Fig. 1 and block 1 then driven in a counterclockwise direction to pull the work through the die and wind the same about the drum. Gripper 12 and die block mounting 8 are constructed in a manner described below whereby the work will be

initially pulled through the die with a uniform straight-line pull thereon.

As block 1 turns, die holder mounting 8 is caused to drop until the die is generally aligned with the lowermost exposed portion of block 1 so that the first turn or two of tubing will be wound on the block in a downward direction until push-up apron 15 is encountered. The die then remains in this lowermost position and succeeding turns of tubing wound upon the drum act to slide the previously accumulated turns upwardly axially of the drum, gripper 12 moving upwardly therewith on its supporting column 13. After a large number of turns have been accumulated (and ordinarily after the work has been drawn entirely through the die), gripper 12 will be released and the riding stripper 11 will be lifted from the drum with such accumulation. A new drawing operation may then be commenced after returning the gripper to the Fig. 1 position in slot 14 and again elevating the die mount 7 into alignment therewith. A circular enclosing guard or shield 18 (Fig. 2) will desirably be provided to enclose the block as a safety precaution, a door therein affording convenient access.

Draw block operating means

Referring now more particularly to Figs. 2 and 9 of the drawing, block 1 is keyed to a vertical spindle 19 journalled at its lower end in thrust bearing 20 and also supported at 21 in the upper portion of frame 2. Drive shaft 22 from motor 4 is journalled in frame 2 at 23 and 24 with worm 25 thereon in driving engagement with worm gear 26 keyed to spindle 19.

The push-up apron 15 designed positively to force the turns of tubing on the block upwardly thereof as such block rotates may be of the general type shown and described in my co-pending application Serial No. 196,806, now Pat. No. 2,658,611 granted November 10, 1953 filed November 21, 1950. Briefly, such apron comprises a ring having a hardened insert 27 adjacent the face of the block, such ring being journalled on bearings 28 and 29 generally concentric with the axis of spindle 19 but slightly inclined thereto. The block and apron are interconnected for rotation together by means of a heavy coil spring 30 fitting in opposed sockets 31 and 32 in such drum and apron respectively. Such spring will permit a degree of rocking action of such apron relative to the drum while causing the apron to be turned by rotation of the drum. Various other forms of wobble connections may be utilized instead of such spring, including a wobble pin, for example. It will accordingly be seen that as the tubing is wound upon the rotating drum (after the die holder has been lowered to lowermost position) the lowermost turn will be engaged by apron 15 and forced upwardly along the surface of the drum through the relative rocking action of the apron.

The riding stripper

While block or drum 1 may be provided with a plurality of upstanding pins to increase its capacity for accumulating turns thereon, and a stripper subsequently inserted in well-known manner to lift the accumulated bundle from the drum, in the embodiment illustrated I have provided a riding stripper 11 adapted to be mounted on the block prior to the drawing operation so that upon completion of the latter the accumulated bundle of tubing may at once be lifted from the block. As best shown in Figs. 1 and 2, such stripper may comprise a vertical tubular center member 33 adapted to be seated upon the tapered extension 34 of spindle 19. A plurality of feet 35, in this case five, are pivotally attached at 36 to members 37 welded to the lower end of tube 33 and braced by flanges such as 38 and 39. Corresponding vertical links 40 are pivotally connected at 41 to the respective feet 35 and at the upper ends to a spider 42 slidably mounted on the upper end portion of tube 33, the downward extent of such sliding movement being limited by collar 43. When the riding stripper is in course of being mounted on the drum, being suspended from an overhead crane by means of clevis 44, spider 42 will rest against collar 43 and the feet 35 will accordingly be folded inwardly. It is accordingly thus feasible to insert such stripper within a bundle of tubing which has accumulated on the drum and pins (not shown) extending upwardly therefrom. When the feet engage the sloping bottoms 45 of the slots 46 designed to receive the same, they are cammed outwardly so that the outer end of such feet project into slots 47 in apron 15. This action likewise causes spider 42 to slide upwardly along tube 33 so that pin 48 will likewise be caused to slide upwardly in slot 49 in such tube into position to be engaged and there locked by latch 50. Feet 35 will accordingly now be held in their outwardly projecting positions to support the bundle of tubing when the stripper is lifted from the drum.

The die mounting

Referring now more particularly to Figs. 1, 3 and 5, the die holder 7 is carried in horizontal trunnion bearings 51 and 52 on mount 8, and such mount 8 is in turn supported by vertical trunnions 53 and 54 journalled respectively in base frame 9 and upper stand 10 bolted on such frame. Bellows 55 enclose trunnion 53 where the latter projects above the upper surface of base frame 9, and bellows 56 enclose trunnion 54 where the latter is exposed between mount 8 and bearing 57 on stand 10.

Provision is made for vertical sliding movement or reciprocation of trunnions 53 and 54 in their respective bearings 58 and 57, whereby mount 8 and thus die holder 7 may be positioned in either elevated or lower position as desired. In Fig. 1 it will be noted that the mount and die holder are shown in elevated position whereas in Fig. 5 the same are illustrated in their lower position. A fluid pressure piston-cylinder assembly is mounted in base frame 9 comprising a cylinder 59 and a piston having a vertically extending rod 60 engaged with and adapted to support lower trunnion 53. By stepping on foot valve 61, fluid pressure may be admitted to the lower end of cylinder 59 to elevate mount 8 and die holder 7 as shown in Fig. 1. Such valve is of the type which stays in the position in which it is thus set until reversed in the manner explained below.

The die holder 7 is of generally conventional design, and its precise construction is not a part of the present invention. A die seating member 62 is supported within holder 7 and itself carries the die 63 through which the work is to be drawn. A plurality of generally U-shaped spacer members 64 are clamped against member 62 by means of slotted hand-wheel 65 having an axial opening 66 therethrough aligned with die 63. A valve 67 may be turned as shown in Fig. 5 to permit lubricant to drain into the trough-shaped lower portion of mount 8 whence it may flow through downwardly extending tube 68 into enclosure 69 in base frame 9 and thence to sump.

As best shown in Figs. 1, 3, 4 and 8, an upstanding member 70 mounted on base frame 9 is adapted to engage the rear side of trunnion mount 8 to limit swinging movement of the latter in a counterclockwise position as viewed in Figs. 3 and 4. A tension spring 71 acts resiliently to hold mount 8 against stop 70.

A cam roller 72 is mounted for rotation about a vertical axis in a small depending bracket 73 on trunnion mount 8 where the latter most nearly approaches the side of apron 15 encircling drum 1. An arcuate cam track 74 is bolted to the side of such apron in position to engage roller 72 when mount 8 is in elevated position as shown in Fig. 1, although such roller will be unable thus to engage such cam when mount 8 has been lowered as above described. As best shown in Fig. 4, rotation of drum 1 and apron 15 in a counterclockwise direction (arrow) will thus serve to rock mount 8 and die holder 7 first in a clockwise direction about the vertical axis of trunnions

53 and 54 and then back again until cam track 74 no longer engages roller 72, whereupon spring 71 is effective to hold mount 8 in engagement with stop 70. In this latter position the axis of die 63 will be aligned substantially tangentially of the periphery of drum 1. In actual practice, the projected axis of such die will be spaced from such point of tangency by an amount equal to the radius of the tubing being wound upon the drum.

The tube gripping means

The work-piece gripper generally indicated at 12 in Fig. 1 is shown in more detail in Fig. 7 and comprises a generally tubular slide 75 mounted on tubular column 13 for movement up and down the latter. A counterweight 76 within such column is connected to slide 75 by means of cable 77 passing over pulley 78 carried by swivel 79 at the top of the column (in broken Figs. 2 and 6 such counterweight is shown at its lowermost position within column 3 but it will be understood that such will only be the case when slide 75 and gripper 12 have moved to an upper position on such column, and conversely when such slide and gripper are in lowermost position as shown such counterweight will in fact be in its uppermost position). A collar 80 is secured to column 13 to limit movement of slide 75 in an upward direction.

A member 81 is pivotally mounted at 82 on a lateral projection 83 of slide 75, such projection being provided with a curved end portion adapted to engage a stop 84 mounted in member 81 adapted to limit swinging movement of member 81. The upper jaw member 85 of the gripper proper is pivotally mounted at 86 on the outer end of member 81 and is provided with a rigid upstanding handle 87. The lower jaw member 88 is joined to such upper jaw member by means of two pairs of links 89 and 90, one of the latter having an upward extension 91 adapted to serve as a handle similarly to handle 87. A tension spring 92 extending from such latter handle 91 and secured to upper jaw member 85 normally serves to swing such links to bring lower jaw member 88 into cooperative gripping relationship relative to upper jaw member 85. As shown in Fig. 7, such links need not be arranged to bring the two jaw members into actual engagement inasmuch as the work to be gripped is of substantial thickness. It will be seen that the operator, by squeezing handles 87 and 91 together may space jaws 85 and 88 to release the work but that, when the pressure on handle 91 is released, jaw 88 will automatically move to grip the work cooperatively with jaw 85 and the exertion of a pull upon the work-piece will merely serve to enhance the gripping action.

A tubular post 93 (Figs. 3 and 10) is mounted on flange 94 of drum 1 adjacent tubular column 13, a vertical section of tube 93 being cut away on the side toward projection 83 of slide 75. A flat-faced bar 95 is fitted within tubular post 93 for swiveling action about its vertical axis and provided with a wear strip 96 secured to such flat face. A roller 97 is mounted for rotation about a horizontal axis in a bracket on projection 83 of slide 75 and is adapted to engage such wear member 96 to prevent swinging movement of slide 75 and members 81 and 83 about the axis of column 13 during the initiation of the drawing operation when such members 81 and 83 will be projecting through slot 14 in drum 1 as shown in Figs. 1 and 3. After sufficient turns of tubing have been wound upon the drum to cause the gripper to move upwardly out of slot 14, such support of the gripper is no longer required and roller 97 will rise above the top of post 93 and be inoperative thereafter.

Operation

Other elements of the construction may best be understood in connection with a consideration of the operation thereof.

With drum 1 turned to a position generally as shown in Fig. 1, the operator will pull the gripper device down into slot 14 until slide 75 engages base 98 seating column 13 in flange 94 of drum 1 (Figs. 6 and 10). The operator next steps on foot valve 61 to actuate the fluid pressure piston-cylinder assembly 59 to elevate trunnion mounting 8 to its uppermost position as likewise shown in Fig. 1. The tube will be indented slightly at a point spaced somewhat from its leading end and a lubricant injected into the tube. Then the leading end of the tube will have a floating bulb or plug inserted therein and the extreme end will be swaged and pointed for insertion through die 63. Such leading end of the tube is then passed through loop 16 from left to right as viewed in Fig. 1 and threaded through passage 66 of clamping member 65. When the drawing operation is initiated the plug will automatically advance into proper position relative to the die and thereafter maintain such position.

The member including loop 16 is pivoted on base frame 9 at 17 and its lower end is engaged beneath stop 99, a tension spring 100 assisting in maintaining such member in this position. A limit switch (not shown), operable by rotation of fulcrum pivot 17, is adapted immediately to stop the machine when loop 16 is rocked toward the die. This device is a conventional safety feature more or less standard in drawing machines and is not itself a part of my invention.

When slide 75 is against stop 98, the gripping device carried thereby will project through slot 14 in drum 1 at a point a very short distance above the bottom of such slot as shown in Fig. 6 and at a level corresponding to that of die 63 and the tube end projecting through the latter when the die mount has been elevated as above described. The operator now inches drum 1 in a forward direction (counterclockwise as shown in Figs. 3 and 4) to bring dog 101 past the grip position limit switch operating lever 102 (i. e. to the right of the latter as viewed in Fig. 3) mounted on the housing of the machine. This sets up the machine.

Now inching drum 1 in the opposite (clockwise) direction, dog 101 will engage limit switch operating lever 102 to set air brake 103 to stop motor 4 with the gripper in the precise position for initiation of the drawing operation, as shown in Fig. 3. Dog 101 is mounted on apron 15 of drum 1 for a limited adjustment in its position peripherally of such apron to permit exact determination of the point where the gripper thus stops.

The operator manually squeezes handles 87 and 91 of the gripper together further to space jaws 85 and 88 to receive the pointed end of the tube which projects through the die. When such handles are released, spring 92 serves to hold the lower jaw in firm clamping engagement with the work.

The "start" button may now be pressed and subsequent operation of the machine is automatic. Referring more particularly to Fig. 4 of the drawing, several stages in the initiation of the drawing operation are there indicated, the gripper and die mounting being shown in solid line in their positions immediately before starting rotation of the drum. As the drum starts to turn, cam 74 on apron 15 rocks mount 8 in a clockwise direction about its vertical trunnion bearings at a rate and to an extent comparable to the arcuate path of the gripper means so that the die will be held in exact alignment therewith. It will consequently be appreciated that the tube will be drawn through the die in a straight line during the initial stages of the drawing operation and out of contact with the surface of drum 1 until the side of the tube engages the block so that there is no tendency to pinch and break the tube in the die. Once the drawing operation has been thus initiated, the tube may be wound upon the drum without damage thereto. As indicated in Fig. 4, the gripper will continue its travel on an arcuate path until the side of the tube engages drum 1, die mount 8 having now swung back into original starting position so that the tube passes through the die on a line tangential to the side of the drum.

After the drum has made approximately one-third of a revolution (and roller **72** is no longer in engagement with cam **74**), the small dog **104** on the side of apron **15** below cam **74** (Fig. 3) will engage lever **105** to operate valve **61** through a series of links and levers **106** (Fig. 1) to admit fluid to double-acting piston-cylinder assembly **59** to lower die mount **8** from the Fig. 1 position to the Fig. 5 position. The rate of lowering of the die will be regulated to ensure that the cam follower roller **72** will be below the level of cam **74** by the time drum **1** has made a complete revolution. Die mount **8** will accordingly not be again rocked as it was at the initiation of the drawing operation but will be held by spring **71** firmly against stop **70**.

Generally after about one to three turns of the drum, depending upon the diameter of the tubing and other considerations, the tubing will engage the surface of push-up apron **15** (this coinciding with the lowermost position of the die) and the accumulated turns on the drum will now be pushed upwardly as the drum continues to turn, lifting the gripper **12** therewith. After sufficient turns have accumulated, the gripper will have been lifted beyond the top of the drum and out of engagement with its supporting post **93**, but sufficient turns will now be wound upon the drum to afford a non-slip grip for continuing the drawing operation without any substantial tension on the gripper.

Depending on the tube diameter and other circumstances, the accumulated turns may or may not tend to nest as they rise above the top of drum **1** and are thereafter supported on upstanding pins or the legs of a riding stripper. When the trailing end of the tube pulls through the die, it will strike a rubber-surfaced plate **107** hinged about a vertical axis and thereby operate a limit switch to apply dynamic braking or load braking to stop motor **4**.

The operator now inches the drum in a forward (clockwise) direction to bring the gripper into a conveniently accessible position, ordinarily more or less vertically above the position shown in Fig. 1, releases the gripper from the tube end and folds it back out of the way by swinging members **85** and **81** about their respect pivots **86** and **82**. Clevis **44** of the riding stripper may now be engaged by the hook of an overhead crane and the bundle of tubing lifted from the machine. The operator again pulls the gripper down into slot **14** and operates valve **61** to elevate the die to starting position, whereupon he is ready to commence a new drawing cycle as above described.

It will thus be seen that I have provided mechanism for the drawing of tubing which is adapted to handle much longer lengths of tubing than is possible on the usual straight draw bench and at a much higher rate of speed. Moreover, my new mechanism does not have the disadvantages which have been encountered in the past when attempting to employ draw blocks for the drawing of tubing, and more particularly danger of damaging the tubing during initiation of the drawing operation is avoided. The tubing is wound in a downward direction upon the rotating block before the accumulated turns are started sliding upwardly of the block. Since the gripper never swings into contact with the outer surface of the draw block, the latter stays smooth and highly polished and scratching of the tubing wound thereon is avoided.

While particularly advantageous for use in the drawing of tubing, and especially relatively thin-walled tubing of the larger diameters, my new mechanism may also be utilized in the drawing of rod, wire and the like. The jointed arm composed of members **81** and **83** projects rigidly outwardly from the surface of block **1** sufficiently, and the pivoted work gripping member **85** is short enough, that the work gripping means does not swing in against such surface when in a position tangential thereto (see Fig. 4). The vertical trunnions **53, 54** and the horizontal trunnions **51, 52** afford a dual swivel action which permits the die to be maintained in alignment with the pull exerted on the work. The mounting of the work gripping means outwardly from the surface of the block and the movement of the die transversely of the axis of such block serve to hold the work out of contact with the block surface for a longer period than would otherwise be the case during the initial stage of the drawing operation. By winding one or more turns of the work on the block before such turns are caused to slide along the block, the frictional engagement of the work and the block becomes sufficient to maintain the necessary pull therefore and relieves the strain on the gripper, making it easier for the latter to travel upwardly.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. The method of drawing elongated work which comprises threading the end thereof through a die, securing such end for winding on a rotatable drum to draw such work through such die, rotating such drum to wind such work thereon, shifting such die relative to the longitudinal extent of such drum to wind such work toward one end of such drum, stopping such shifting movement of such die, and thereafter shifting all the accumulated turns of work, including such end of the work, bodily along such drum in the axial direction opposite to that in which such die was shifted while continuing to wind work thereon.

2. The method of drawing tubing which comprises threading the end thereof through a die with a floating mandrel bulb therein immediately behind such die, securing such end for winding on a rotatable drum to draw such tubing through such die, rotating such drum to wind such tubing thereon, holding such end of such tubing spaced outwardly from the surface of such drum to ensure a uniform straight pull on such tubing during initiation of the operation, rocking such die about an axis parallel to the axis of such drum to maintain alignment of such die and tubing during initiation of the drawing operation, shifting such die relative to the longitudinal extent of such drum to wind such tubing toward one end of such drum without slipping of the turns of tubing relative to the latter, stopping such shifting movement of such die, and thereafter pushing all the accumulated turns of tubing, including such end of the tubing, bodily along such drum in the axial direction opposite to that in which such die was shifted while continuing to wind tubing thereon.

3. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatable block adapted to be driven to wind such work thereon to draw the same through such die; means adjacent one end of said block adapted to engage work wound on said block to force the turns of work to slide axially of said block, die mounting means, means operative to shift said die mounting means from a starting position selected initially to wind work on said block in a region spaced from said work-engaging means to a position to wind work on said block in engagement with said work-engaging means, and work-gripping means on said block mounted for movement axially of said block from such starting position in a direction away from said work-engaging means, whereby work may initially be wound on said block in one axial direction to engage said work-engaging means and thereafter the accumulated turns will be bodily axially shifted in the other direction together with said work-gripping means.

4. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatable block adapted to be driven to wind such work thereon to draw the same through such die; a push-up apron at one end of said block adapted to engage work wound on said block to force the turns of work to slide axially of said

block, die mounting means mounted for oscillation about an axis parallel to that of such block, means operative to shift said die mounting means along such first axis from a starting position selected initially to wind work on such block in a region spaced from said apron to a position to wind work on such block in engagement with said apron, whereby accumulated turns of work on such block will not be bodily shifted axially of such block until said apron is thus engaged, and work-gripping means on such block mounted for movement axially of such block from such starting position in a direction away from said apron, said work-gripping means extending from such block and adapted to hold the end of the work gripped thereby a substantial distance from the surface of such block, whereby work may initially be wound on said block in one axial direction to engage said apron and thereafter the accumulated turns will be bodily axially shifted in the other direction together with said work-gripping means.

5. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatable block adapted to be driven to wind such work thereon to draw the same through such die; mounting means for such die mounted for oscillation about an axis parallel to the axis of such block, a fluid pressure piston-cylinder assembly operative to reciprocate said mounting means along such first axis, and time delay means operative to actuate said assembly thus to reciprocate said mounting means after an interval following initiation of the drawing operation by rotation of such block.

6. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatable block adapted to be driven to wind such work thereon to draw the same through such die; work gripping means on such block adapted to grip the leading end of such work comprising a member protruding generally radially of such block, work clamping means pivotally mounted on said member for swinging movement about a pivotal axis parallel to the axis of such block, and means adapted to maintain such pivotal axis spaced substantially outwardly from the work-engaging surface of the block when a pull is exerted on said clamping means.

7. In mechanism for the drawing of elongated work such as tubing and the like, including a rotatable draw block adapted to be driven to wind such work thereon; work gripping means on such block adapted to grip the leading end of such work comprising a member mounted for reciprocation parallel to the axis of such block and protruding generally radially therefrom, work clamping means pivotally mounted on said member for swinging movement about a pivotal axis parallel to the axis of such block and spaced substantially from the work-engaging surface of the latter, and means adapted to engage and support said member to assist the latter to resist a strong pull exerted thereon by such work until said member has been reciprocated a substantial distance parallel to the axis of such block.

8. In mechanism for the drawing of elongated work such as tubing and the like, including a rotatable draw block adapted to be driven to wind such work thereon; means operative to engage turns of work wound on such block to shift them bodily axially thereof, a support on such block extending parallel to the axis of the latter in the direction such turns are thus shifted, a member mounted on said support for reciprocation therealong and adapted to project substantially radially beyond the outer periphery of such block, such block having a slot therein for entry of said member, work gripping means pivotally mounted on said member for swinging movement about a pivotal axis parallel to the axis of such block and spaced substantially outwardly from the work-engaging surface thereof, and additional supporting means for said member mounted on such block and adapted to brace said member on the side from which a pull is adapted to be exerted by such work.

9. In mechanism for the drawing of elongated work such as tubing and the like, including a rotatable draw block adapted to be driven to wind such work thereon; means operative to engage turns of work wound on such block to shift them bodily axially thereof, a tubular column on such block extending vertically upwardly parallel to the axis of the latter in the direction such turns are thus shifted, an arm sleeved on said column for reciprocation up and down the same and adapted to project substantially radially beyond the outer periphery of such block, such block having a slot therein for entry of said arm, a member pivotally mounted on said arm for swinging movement about a pivotal axis parallel to the axes of said column and such block and spaced substantially outwardly from the work-engaging surface of such block, work-gripping jaws on said member, a counterweight reciprocable within said column connected with said arm for relative up-and-down movement, a vertically extending supporting surface on such block adjacent said arm on the side from which a pull is adapted to be exerted by such work, and anti-friction means on said arm engaging said surface.

10. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a block mounted for rotation about a vertical axis and adapted to be driven to wind such work thereon to draw the same through such die; a push-up apron encircling the lower end of such block and mounted for rotation therewith but about an axis slightly inclined to the axis of such block to afford a relative rocking action, whereby turns of work wound on such block may be shifted bodily upwardly thereof, a vertically upwardly extending tubular column on such block, an arm sleeved on said column for reciprocation up and down the same and adapted to extend generally radially of such block, an extension of said arm mounted on the latter for swinging movement about a vertical axis, work gripping means mounted on said extension for swinging movement about a vertical axis, stop means adapted to support said arm on the side from which a pull is adapted to be exerted by such work, stop means on said arm limiting such swinging movement of said extension in the direction of such pull to substantial alignment with said arm, such block having a vertical slot therein for entry of said arm and extension, said work gripping means being spaced substantially outwardly from the work-engaging surface of such block with said arm and extension thus aligned, a counterweight for said arm, extension, and work gripping means reciprocable within said column, a pulley mounted at the top of said column for rotation about a horizontal axis, a cable passing over said pulley connecting said arm and counterweight for relative up and down movement; vertical trunnion mounting means for such die for oscillation of the latter about an axis parallel to the axis of such block, cam means on said apron and follower means on said die mounting means operative to oscillate said mounting means and such die to maintain alignment of such die and said work gripping means as such block turns during initiation of the drawing operation, a fluid pressure piston-cylinder assembly operative to lower said die mounting means to wind such work toward said push-up apron, and control means for said assembly adapted to be actuated by rotation of such drum and said apron thus to lower said mounting before said cam means on said apron makes a complete revolution again to engage said cam follower, whereby work may initially be wound on said block in one axial direction to engage said apron and thereafter the accumulated turns will be bodily axially shifted in the other direction together with said work-gripping means.

11. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a block mounted for rotation about a vertical axis and adapted to be driven to wind such work thereon to draw the same through such die; a push-up apron encircling the lower end of such block and mounted for rotation there-

with but about an axis slightly inclined to the axis of such block to afford a relative rocking action, whereby turns of work wound on such block may be shifted bodily upwardly thereof, a member protruding generally radially of such block and mounted for vertical reciprocation, such block having a vertical slot therein for entry of said member, work gripping means mounted on said member for swinging movement about a vertical axis spaced substantially from the work-engaging surface of such block; means mounting such die for oscillation about a vertical axis, cam means on said apron and follower means on said die mounting means operative to oscillate said mounting means and such die to maintain alignment of such die and said work gripping means as such block turns to ensure a uniform straight pull on such work during initiation of the drawing operation, a fluid pressure piston-cylinder assembly operative to lower said die mounting means from starting position toward said push-up apron to wind such work toward said apron on such block, control means for said assembly, and means on said apron adapted to engage said control means as said apron turns to actuate said assembly to lower said die mounting before said cam means on said apron makes a complete revolution again to engage and rock said cam follower, whereby work may initially be wound on said block in one axial direction to engage said apron and thereafter the accumulated turns will be bodily axially shifted in the other direction together with said work-gripping means.

12. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatable block adapted to be driven to wind such work thereon to draw the same through such die; means adjacent one end of such block adapted to engage work wound on such block to force the turns of work to slide axially of such block, work-gripping means on such block mounted for movement axially of such block in a direction away from said work-engaging means, said work-gripping means projecting a substantial distance outwardly from the work-engaging surface of such block; means mounting such die for oscillation about an axis parallel to that of such block, cam means rotatable with such block adapted to engage said die mounting means to oscillate such die to maintain alignment of such die and said work-gripping means as such block turns to ensure a uniform straight pull on such work during initiation of the drawing operation, means operative to shift said die mounting means from starting position toward said work-engaging means in a direction parallel to the axis of such block to wind such work on such block toward said work-engaging means, and control means adapted to be actuated in timed relation to rotation of such block operative to actuate said die mounting shifting means to shift said mounting and die after initiation of the drawing operation sufficiently before said cam means makes a complete revolution again to avoid further oscillation of said die mounting means and die, whereby work may initially be wound on said block in one axial direction to engage said work-engaging means and thereafter the accumulated turns will be bodily axially shifted in the other direction together with said work-gripping means.

13. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatable block adapted to be driven to wind such work thereon to draw the same through such die; a work-gripping means support on such block mounted for reciprocation parallel to the axis of such block and adapted to extend rigidly outwardly beyond the work-engaging surface of such block, work-gripping means on said support spaced substantially from such work-engaging surface of such block; mounting means for such die mounted for oscillation about an axis parallel to the axis of such block, cam means adapted to rotate with such block and to engage and oscillate said die mounting means to maintain such die and said work-gripping means in alignment during initiation of the drawing operation, and means operative to shift said mounting means parallel to such axis of such block during the first revolution of such block in the drawing operation to avoid subsequent oscillation of said mounting means by said cam means.

14. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatable block adapted to be driven to wind such work thereon to draw the same through such die; work-gripping means on such block adapted to grip the leading end of such work, mounting means for such die adapted to be shifted transversely of the axis of such drum, and power means operative to shift said mounting means transversely during initiation of the drawing operation in timed relation thereto to maintain the work between such die and said gripping means out of any pressure contact with the surface of such block longer than would otherwise be the case.

15. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatble block adapted to be driven to wind such work thereon to draw the same through such die; work-gripping means on such block adapted to grip and hold the leading end of such work spaced substantially outwardly from the surface of such block, mounting means for such die adapted to be shifted transversely of the axis of such drum, and power means positively operative to shift said mounting means transversely during initiation of the drawing operation to maintain the work between such die and said gripping means out of any pressure contact with the surface of such block longer than would otherwise be the case.

16. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatable block adapted to be driven to wind such work thereon to draw the same through such die; an arm adapted to protrude rigidly beyond the outer work-engaging surface of such block, means adapted to support said arm thus rigidly extending during the initial stages of the drawing operation and work-gripping means mounted on said arm spaced substantially outwardly from the surface of such block adapted to grip the leading end of such work to exert a drawing pull thereon, thus postponing contact of such work with such surface during the intial stage of the drawing operation.

17. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatable block adapted to be driven to wind such work thereon to draw the same through such die; work-gripping means mounted on such block, means adapted rigidly to support said work-gripping means spaced substantially outwardly from the surface thereof, said gripping means being adapted to grip the leading end of such work to exert a drawing pull thereon while postponing contact of such work with such surface during the initial stage of the drawing operation.

18. In mechanism for the drawing of elongated work such as tubing and the like, including a block mounted for rotation about a vertical axis and adapted to be driven to wind such work thereon; a vertical tubular column mounted on such block, work gripping means mounted on said column for reciprocation therealong, a counterweight reciprocable within said column, and means connecting said work gripping means and counterweight for relative up-and-down reciprocation.

19. In a draw block mounted for rotation about a vertical axis and having work-gripping means mounted thereon for reciprocation parallel to such axis; counterweight means connected with said work-gripping means to facilitate upward movement of the latter, and vertical guide means for said work-gripping means extending above the top of said block.

20. In mechanism for the drawing of elongated work such as tubing and the like, including a die and a rotatable

block adapted to be driven to wind such work thereon to draw the same through such die; a member adapted to extend generally radially outwardly from such block, means supporting said member in such position projecting beyond the greatest diameter of the work-engaging periphery of such block and work-gripping means pivotally axis parallel to the axis of such block and spaced substantially from the surface of such block, said gripping means being too short to contact such surface when swung into a position with such work tangential to such surface.

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