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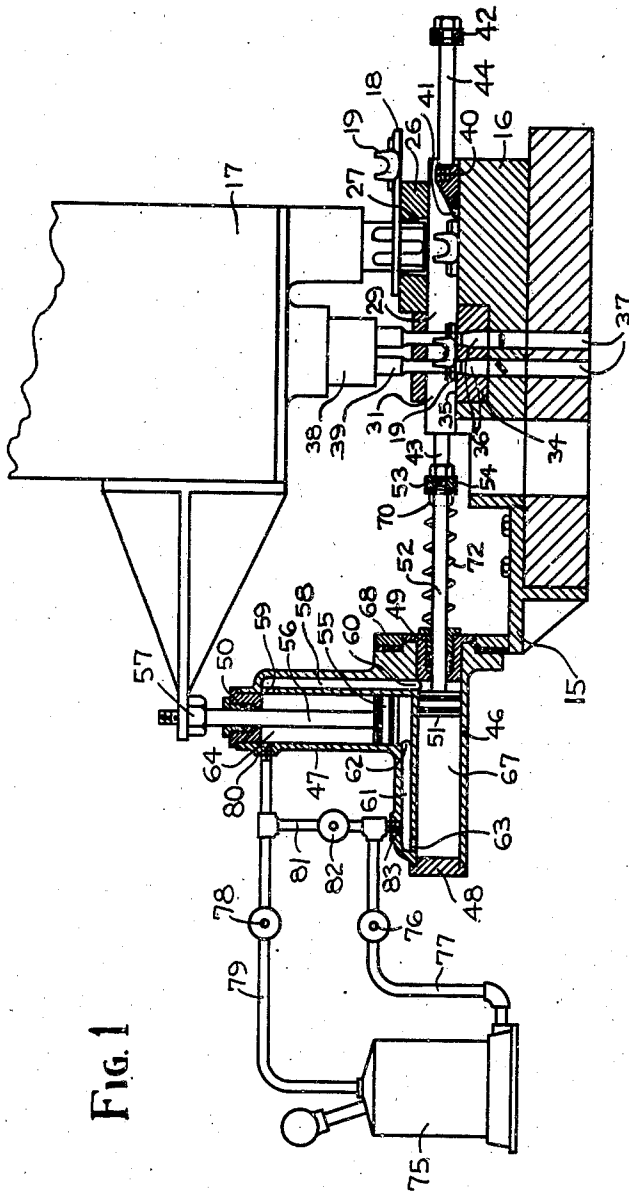
L. A. WELSCH

2,409,968

MACHINE FOR OPERATING ON MATERIALS

Filed Aug. 24, 1945

3 Sheets-Sheet 1



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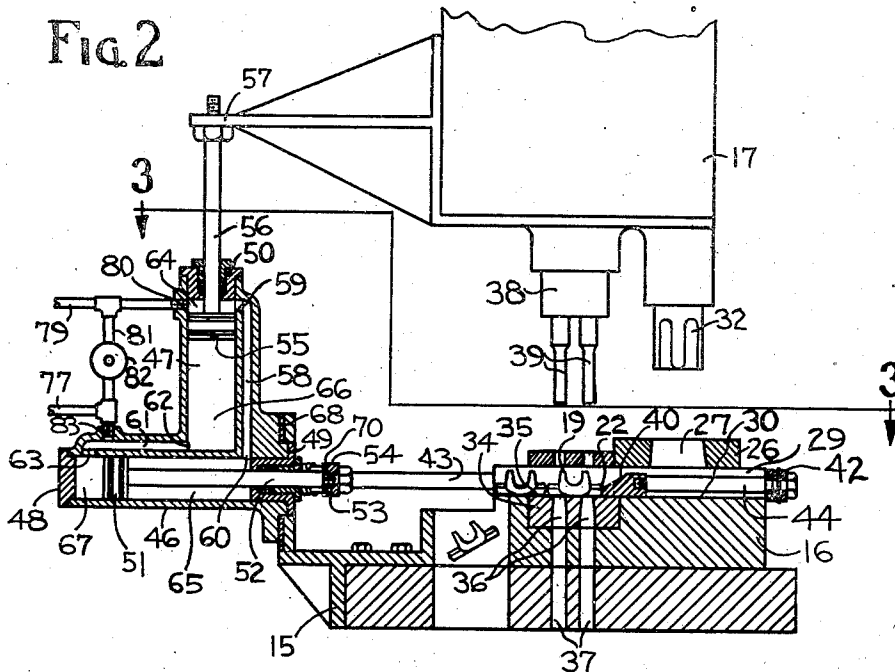
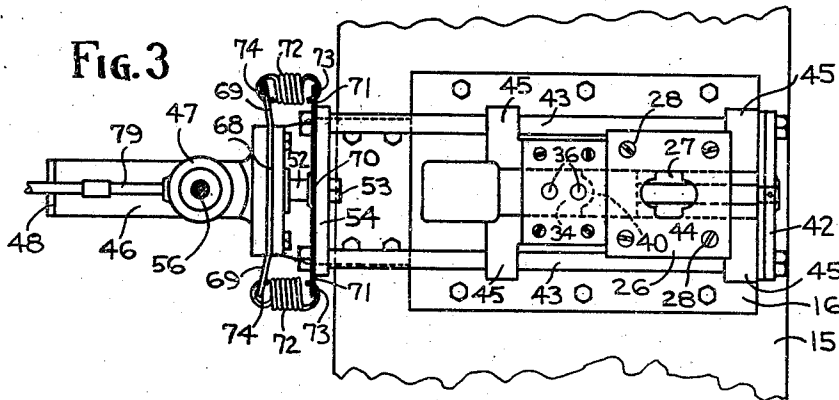
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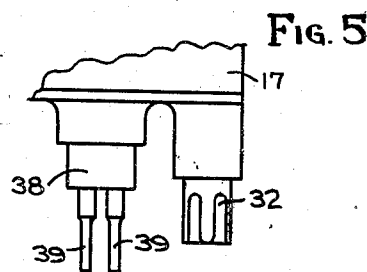
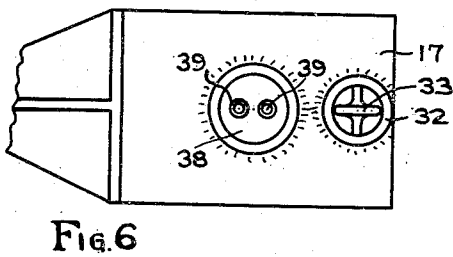
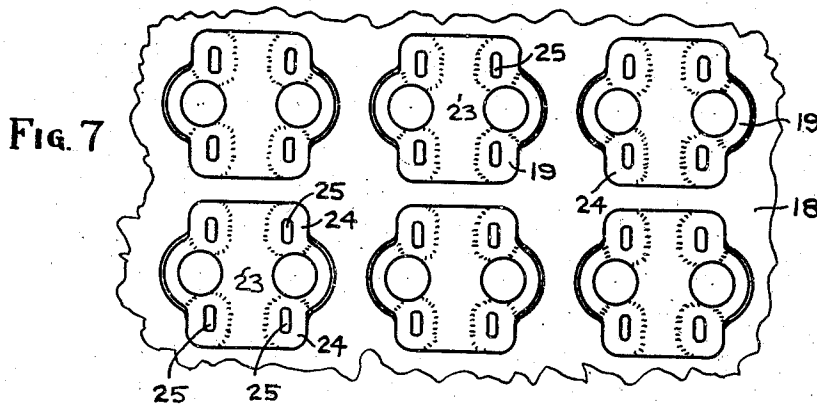
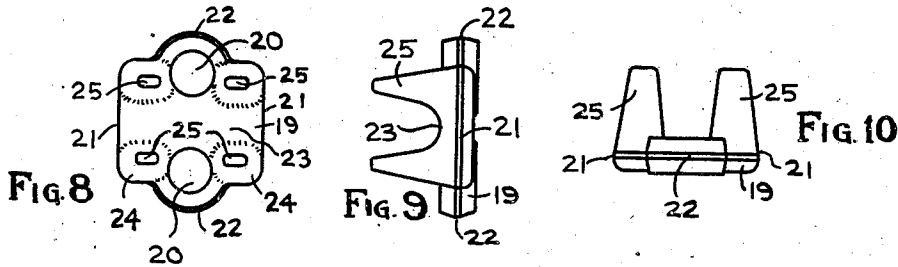
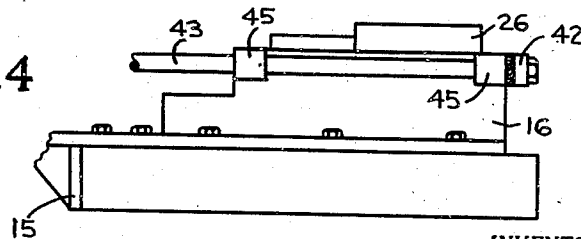


Fig. 4



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MACHINE FOR OPERATING ON MATERIALS

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Application August 24, 1945, Serial No. 612,510

5 Claims. (Cl. 164—117)

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This invention has relation to a machine for operating on materials. As herein illustrated and described, the machine has been devised to be especially useful to the purpose of trimming and punching metal blanks, but it is to be understood that the principles of the invention also are applicable to machines for performing various types of operations, such as forming, bending and shaping operations, etc., upon metals or other materials. That is to say, although the disclosed embodiment of the invention presents a machine for trimming and punching metal blanks, a machine including features and characteristics of the invention may be equipped to perform various different types of operations upon metals and other materials.

An object of the invention is to provide a machine for operating upon materials which will be of novel and improved construction.

A further object is to provide a machine of the character here presented wherein will be incorporated various improved features and characteristics of construction which will be novel both as individual entities of the machine and in combination with each other.

A further object is to provide a machine for operating on materials which will include a novel and improved construction and arrangement for accomplishing feed of the materials from station to station in the machine, as well as feed of the materials out of said machine.

A further object is to provide in a machine of the character here presented, novel and improved mechanism including cylinders, each having a piston, arranged at right angular relation to each other for accomplishing feed of an article or articles to be operated upon in the machine from station to station of said machine.

And a further object is to provide a machine for operating on materials which will include features and characteristics of construction as hereinafter set forth.

With the above objects in view, as well as others which will appear as the specification proceeds, the invention comprises the construction, arrangement and combination of parts as now to be fully described and as hereinafter to be specifically claimed, it being understood that the disclosure herein is merely illustrative and intended in no way in a limiting sense, changes in details of construction and arrangement of parts being permissible so long as within the spirit of the invention and the scope of the claims which follow.

In the accompanying drawings forming a part of this specification,

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Fig. 1 is a longitudinal sectional view, partially in side elevation and partially broken away, of a machine for operating on materials made according to the invention;

Fig. 2 is a fragmentary longitudinal sectional view, partially in side elevation and partially broken away, substantially agreeing with the disclosure of Fig. 1, but showing operative parts of the machine in different positions;

Fig. 3 is a sectional view, taken on line 3—3 in Fig. 2, disclosing a lower stationary die and horizontal and vertical cylinders of the machine in plan;

Fig. 4 is a fragmentary side elevational view of the lower stationary die of the machine;

Fig. 5 is a fragmentary side elevational view of an upper movable die of the machine;

Fig. 6 is a fragmentary bottom plan view of the disclosure of Fig. 5;

Fig. 7 is a plan view, on an enlarged scale, of a piece of metal prepared to have or include blanks intended to be first trimmed or struck from said metal and later punched out;

Fig. 8 is a plan view of a blank as when removed from the piece of metal disclosed in Fig. 7;

Fig. 9 is an end elevational view of the blank of Fig. 8; and

Fig. 10 is a side elevational view of the blank of Figs. 8 and 9.

With respect to the drawings and the numerals of reference thereon, 15 denotes a frame of the machine adapted to be supported in any suitable and convenient manner, 16 indicates a lower stationary die suitably and conveniently rigidly supported by the frame 15, and 17 represents an upper movable die adapted to be reciprocated in a vertical plane, toward and away from the lower stationary die, in any suitable and convenient manner. Power can be employed in any ordinary or preferred manner, forming no part of the present invention, to cause the upper movable die 17 to be reciprocated.

In Fig. 7 of the drawings, there is disclosed a piece 18 of metal including or having separate blanks, each denoted 19, ready to be trimmed or struck from said piece of metal, and in Figs. 8 to 10 there is disclosed one of the blanks 19 as when struck from the piece 18 of metal.

In the disclosure as made, each blank 19 is for providing a so-called clamping block or shoe to be constituted as a part of a rope or cable clamp. Conveniently, the clamping blocks or shoes can be constituted as drop forgings of steel, and in Fig. 7 of the drawings the blanks 19 in the piece 18 of metal are drop forgings intended first to

be trimmed or struck from said piece 18 of metal and afterwards to be punched out, at 20, 20, thus to provide clamping blocks or shoes, such as the clamping block or shoe, or blank 19, disclosed in Figs. 8, 9 and 10, adapted to constitute parts of rope or cable clamps.

It will be seen that the blank 19, or clamping block or shoe, as disclosed has dimension in crosswise direction substantially equal to the dimension of said blank, or clamping block or shoe, in lengthwise direction, although the crosswise dimension of the blank, or clamping block or shoe, could in instances be greater or less than the lengthwise dimension of said blank, or clamping block or shoe. The straight marginal edges 21, 21 of each blank 19 are considered to be the ends of the blank, and the curved marginal edges 22, 22 of each blank are considered to be the sides, simply because the clamping blocks or shoes are adapted to be applied to a rope or cable so that the marginal edges 21, 21 are disposed transversely of the rope or cable. When the corresponding clamping block or shoe is applied to a rope or cable, its holes or openings or punched out portions 20, 20, for receiving a U-bolt, will be at opposite sides of said rope or cable and in aligned relation to each other in direction transversely of the rope or cable. Stated otherwise, the bolt holes or openings 20, 20 are in a plane aligned with and equally spaced from the opposite ends 21, 21 of the corresponding clamping block or shoe 19. Also, the bolt holes or openings 20, 20 are in a plane perpendicular to the corresponding clamping block or shoe at its lateral axis. The clamping blocks or shoes are duplicates. Each has length considerably greater than a measurement representing the diameter of either bolt hole or opening 20, and each includes an intermediate portion 23 thereof disposed between the bolt holes or openings 20, 20 and opposite end portions 24, 24, 24 of the clamping block or shoe disposed at opposite sides of the lateral axis of the clamping block or shoe, as well as at opposite sides of the aligned bolt holes or openings 20, 20. The end portions 24, 24, 24 integrally support lugs or prongs 25, 25, 25, 25 disposed at the rope or cable engaging side of the clamping block or shoe, and said lugs or prongs constitute separate pairs of lugs or prongs upon the opposite side portions of the clamping block or shoe. The lugs or prongs 25, 25, 25, 25 of each pair will be in spaced, aligned relation transversely of a rope or cable upon which a rope or cable clamp having the clamping block or shoe is fastened, and lugs or prongs of each set will be in spaced, aligned relation longitudinally of the rope or cable. As disclosed, the lugs or prongs are situated in equally spaced relation to the lateral axis of the corresponding clamping block or shoe 19 and at opposite sides of and adjacent to the bolt holes or openings 20, 20. As shown, the lugs or prongs are adjacent what may be termed the four corners of the corresponding clamping block or shoe and are set a trifle inwardly of the bolt holes or openings.

A working element of the lower stationary die 16 is constituted as a female die entity 26 having an opening 27 therethrough of substantially the shape and overall size of each blank or clamping block or shoe 19. That is to say, the opening 27 through the female die entity 26 is of shape and size snugly to permit passage of each of the duplicate blanks 19 when trimmed or struck from the piece 18 of metal through said opening 27. Said working element or female die entity 26 is supported, as at 28, upon the lower stationary die

16 so that the opening 27 is situated above a longitudinal guideway 29 of the machine extending longitudinally of said lower stationary die 16. More explicitly, the longitudinal guideway 29 is defined at its base by a horizontal surface 30, provided by the lower stationary die 16 and situated beneath and in spaced relation to the working element or female die entity 26, and at its opposite sides by spaced apart, parallel, vertically and longitudinally extending surfaces 31, 31, also provided by said lower stationary die 16. The vertical, longitudinal surfaces 31, 31 are spaced from each other a distance substantially equal to, or slightly greater than, a measurement representing the length, or distance between the ends 21, 21, of each of the duplicate blanks 19, and the working element or female die entity 26 is parallel with the horizontal surface 30 and spaced from said horizontal surface a distance somewhat greater than a measurement representing the thickness of each of said blanks 19. The guideway 29 is open at each of its opposite ends.

A working element of the upper movable die 17 is constituted as a male die entity 32 having a working surface 33 of substantially the shape and overall size of each blank or clamping block or shoe 19. That is to say, the working element or male die entity 32 includes a working surface 33 of shape and size to cause each blank, clamping block or shoe when situated over the opening 27 in the working element or female die entity 26 to be trimmed or struck from the piece 18 of metal when said working element or male die entity 32 is lowered to sufficient extent and to be deposited in the guideway 29, upon its horizontal surface 30, when the working element or male die entity 32 is lowered to further extent. Stated otherwise, the working element or male die entity 32 is of shape and size to cause each blank 19 to be sheared from the piece 18 of metal, and, desirably, said working element or male die entity 32 will be of shape and size to enter the opening 27 in about the manner as disclosed in Fig. 1 of the drawings, thus to cause the sheared off blanks positively to be pushed downwardly through the opening 27 in the working element or female die entity 26, with downward movement of the upper movable die 17 to position beneath that adapted to cause a blank 19 to be trimmed, struck or sheared from the piece 18 of metal. Each blank 19 when removed from said piece 18 of metal will, naturally, have tendency to fall by gravity to the horizontal surface 30, between the side surfaces 31, 31, of the guideway 29. The male die entity 32 desirably will be made to enter the female die entity 26 during the final stage of each downward movement of said male die entity 32 to an extent sufficient to make sure that the blanks not only will be severed from the piece 18 of metal but also will be deposited past said female die entity 26 into the guideway 29. Save for the described function of the male die entity 32, a blank 19 might possibly at some time or other become stuck in the female die entity 26.

A second working element of the lower stationary die 16 is constituted as a female die entity 34 (imbedded in said lower stationary die so that its upper surface 35 in fact constitutes or provides a part of the horizontal surface 30 of the guideway 29), having spaced apart openings 36, 36 therethrough each of substantially the shape and size of each of the bolt holes or openings 20, 20. The spaced apart openings 36, 36 are in alignment in direction longitudinally of the

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guideway 29, said openings 36, 36 are spaced apart the same distance as are the bolt holes or openings 20, 20 of each blank, and each of the openings 36, 36 through the female die entity 34 is of shape and size to permit passage of metal struck from a blank 19 to provide a bolt hole or opening 20 through the corresponding opening 36. Continuing portions of the openings 36, 36, extending downwardly through the lower stationary die 16, are denoted 37, 37.

A second working element of the upper movable die 17 is constituted as a male die entity 38 including spaced apart punches 39, 39 each of substantially the shape and size of each of the spaced apart openings 36, 36 through the female die entity 34. The spaced apart punches 39, 39 are in alinement in direction longitudinally of the guideway 29, said punches are spaced apart the same distance as are said spaced apart openings 36, 36, and the punches 39, 39 are of shape and size to be capable of causing metal to be struck from the blanks 19 and deposited into the openings 36, 36 through the female die entity 34, whence the metal can pass from the machine by gravity, with lowering of said punches 39, 39 to sufficient extent. Stated otherwise, the punches 39, 39 are of shape and size to be capable of causing metal intended to be removed from the blanks 19 thus to provide the bolt holes or openings 20, 20 to be sheared from said blanks and deposited into the outlet openings 36, 37 leading away from the machine. Desirably, the punches 39 will be caused to enter upper reduced portions of said openings 36 in about the manner as disclosed in Fig. 1 of the drawings thus to insure that the metal struck from the blanks to cause the bolt holes or openings to be produced will not become struck in the female die entity 34.

The construction and arrangement of course will be such that the opening 27 of the female die entity 26 and the working surface 33 of the male die entity 32 will be in vertical alinement, as will also the openings 36, 36 of the female die entity 34 and the punches 39, 39 of the male die entity 38. In practical operation of the machine, a piece, such as 18, of metal having blanks, such as 19, to be trimmed or struck, or otherwise removed, therefrom will be placed upon the female die entity 26 so that a blank to be removed will be over and alined with the opening 27 through said female die entity 26. Then the upper movable die 17 will be depressed thus to cause a blank to be removed from the piece of metal and deposited to the portion of the guideway 29 directly beneath said opening 27 in the manner as before made plain. During the succeeding upward movement of said upper movable die 17, the blank will be fed ahead, in a manner to be set forth, to the location of the female and male die entities 34 and 38 and so that portions of the blank intended to be removed to the provision of the bolt holes or openings, such as 20, 20, will be alined with the openings and punches 36, 39 and 36, 39, respectively. Then another of the duplicate blanks to be removed from a piece, such as 18, of metal will be placed upon the female die entity 26. With the next downward movement of the upper movable die 17 said last mentioned blank will be trimmed or struck from the piece of metal and deposited in the guideway 29, and, also, bolt holes or openings, such as 20, 20, will be produced in the blank then at the location of the female and male die entities 34 and 38. During the next upward movement of said upper movable die 17, the blank then di-

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rectly beneath the opening 27 will be fed ahead to the location of the female and male die entities 34 and 38, and feeding of this mentioned blank to position where it is to be provided with bolt holes or openings, such as 20, 20, will cause the blank which was provided with bolt holes or openings during the immediately preceding downstroke of the upper movable die 17 to be pushed clear of the punches 39, 39 and the openings 36, 36. Eventually, the blanks will be pushed, one by another, clear of the inner end of the guideway 29, whence said blanks will be free to fall one by one out of the machine.

The disclosure includes mechanism now to be described for accomplishing feed of the blanks from station to station in the machine, and eventually clear of the machine.

Each blank 19 is deposited in the guideway 29 so that its straight end edges 21, 21 are parallel with and adjacent to the vertical side surfaces 31, 31 of said guideway 29 and its curvilinear side edges 22, 22 are situated forwardly and rearwardly and disposed transversely of the guideway.

A feed member 40, situated within the guideway 29 adjacent to or contiguous with its lower horizontal surface 30 and adapted to be reciprocated within and longitudinally of said guideway, includes a forward curvilinear working surface 41 thereof adapted to be engaged against a rearward curvilinear surface 22 of each blank 19 while at the first station in the machine, beneath the female and male die entities 26 and 32, when said feed member is moved inwardly, thus to cause the blank to be fed to the second station in the machine, over the openings 36, 36 of the female die entity 34 and under the punches 39, 39 of the male die entity 38. A yoke for the feed member 40 includes an outer base portion 42, adjacent an end of the lower stationary die 16, and spaced apart, parallel arms, denoted 43, 43, perpendicular to and rigid with said outer base portion 42 and extending longitudinally inwardly of said lower stationary die at opposite sides of the die entities 26, 32, 34, 38. A central part of the feed member 40 is rigidly connected to the midlength of the outer base portion 42 through the instrumentality of a bar 44 between said feed member and outer base portion, and the spaced apart, parallel arms 43, 43 of the yoke are mounted in guides 45, 45, 45, 45 upon the lower stationary die 16 for slidable movement in direction longitudinally of said lower stationary die. It will be apparent that the feed member 40 will be moved inwardly with movement of the yoke toward the left in the drawings and will be moved outwardly with movement of said yoke toward the right.

The frame 15 of the machine suitably and conveniently rigidly supports a horizontal cylinder 46 and a vertical cylinder 47. As disclosed, said horizontal and vertical cylinders are constituted as a more or less unitary structure. The horizontal cylinder 46 includes closure heads, indicated 48 and 49, respectively, and the vertical cylinder 47 includes a closure head 50. A piston 51 within the horizontal cylinder 46 is rigid with a connecting rod 52 slidably situated in the closure head 49 and extending outwardly away from said horizontal cylinder 46 in horizontal direction toward the lower stationary die 16 and the feed member 40. As disclosed, the horizontal connecting rod 52 is in longitudinal alinement with the bar 44 and in a vertical plane passed through the midwidth of the guideway 29 as well as cen-

trally through the feed member 40. The outer end portion of said horizontal connecting rod 52 is rigidly connected, as at 53, to the midlength of an inner base portion 54, parallel with the outer base portion 42, of the yoke, and the opposite ends of said inner base portion 54 are rigidly connected to the adjacent or inner ends of the yoke arms 43, 43. A piston 55 within the vertical cylinder 47 is rigid with a connecting rod 56 slidably mounted in the closure head 50 and extending outwardly away from said vertical cylinder 47 upwardly in vertical direction. The vertical connecting rod 56 is situated at a side of the upper movable die 17 and is rigidly connected to said upper movable die as indicated at 57.

A passageway 58 for oil, or other fluid, extends between the upper end portion of the vertical cylinder 47 and the inner end portion of the horizontal cylinder 46. A port between the passageway 58 and the vertical cylinder 47 is denoted 59, and a port between said passageway 58 and the horizontal cylinder 46 is indicated 60. Also, a passageway 61 extends between the lower end portion of said vertical cylinder 47 and the outer end portion of said horizontal cylinder 46. A port between the passageway 61 and the vertical cylinder 47 is denoted 62, and a port between said passageways 61 and the horizontal cylinder 46 is indicated 63. The passageway 58 affords communication between a space 64 of the vertical cylinder 47 above the piston 55 and a space 65 of the horizontal cylinder 46 at the side of the piston 51 adjacent the stationary and movable dies 16 and 17. The passageway 61 affords communication between a space 66 of said vertical cylinder 47 below said piston 55 and a space 67 of said horizontal cylinder 46 at the side of said piston 51 opposite said stationary and movable dies 16 and 17.

The frame 15 of the machine rigidly supports, as at 68, an anchor plate having extension portions 69, 69 aligned with the arms 43, 43 of the yoke and situated at the side of the inner base portion 54 of said yoke opposite the feed member 40. An attachment plate rigidly supported, as at 70, upon the inner base portion 54 includes extension portions 71, 71 which project beyond the opposite ends of said inner base portion. Tension coil springs 72, 72, including a tension coil spring at the outer side of each yoke arm 42, have their inner ends connected, as at 73, 73, to the extension portions 71, 71 of the attachment plate upon the inner base portion 54 and their outer ends connected, as at 74, 74, to the extension portions 69, 69 of the anchor plate upon the frame 15. The tension coil springs 72, 72 are assembled with the frame and the yoke so as to exert resiliency upon said yoke tending to urge the feed member 40 inwardly.

A pump 75 is for forcing oil or other fluid into the spaces 64, 65, 66, 67 of the horizontal and vertical cylinders 46 and 47 and for causing pressure of hydraulic fluid in said spaces to be equalized. An outlet connection from the pump 75, controlled by a manually actuable valve 76, is denoted 77, and an inlet connection to said pump, controlled by a manually actuable valve 78, is indicated 79. The inlet connection 79 to the pump 75 leads, as represented at 80, from an upper portion of the space 64 of the vertical cylinder 47. A connection 81, controlled by a manually actuable valve 82, leads from a part of the inlet connection 79 between the manually actuable valve 78 and the space 64 and enters the passageway 61 at location, denoted 83, between the ports

62 and 63, and the outlet connection 77 leads into said connection 81 at location between the manually actuable valve 82 and said passageway 61.

Assuming that the horizontal and vertical cylinders 46 and 47 contain hydraulic fluid, it will be evident that with downward movement of the upper movable die 17 the connecting rod 56 and the piston 55 will be forced downwardly in the vertical cylinder 47, thus to cause hydraulic fluid to be forced out of the space 66 of said vertical cylinder 47 through the passageway 61 into the space 67 of the horizontal cylinder 46, and that hydraulic fluid forced into said space 67 of said horizontal cylinder 46 will cause the piston 51 and the connecting rod 52 to be moved in direction toward the lower stationary die 16, thus to cause the yoke and the feed member 40 to be moved outwardly against resilient action of the tension coil springs 72, 72. In Fig. 1 of the drawings, the piston 55 is disclosed at the lower limit of its stroke, the piston 51 is disclosed at the outer limit of its stroke, and the feed member 40 is disclosed at the outer side of the opening 27 through the female die entity 26. During downward movement of the piston 55 and resultant outward movement of the piston 51, which, naturally, causes the spaces 66 and 65 in the vertical and horizontal cylinders 47 and 46 to be decreased and the spaces 64 and 67 in said vertical and horizontal cylinders to be increased, hydraulic fluid also will be forced from the space 65 in the horizontal cylinder 46 through the passageway 58 into the space 64 in the vertical cylinder 47. With upward movement of said upper movable die 17 the connecting rod 56 and the piston 55 will be moved upwardly in the vertical cylinder 47 thus to cause hydraulic fluid to be forced out of the space 64 of said vertical cylinder 47 through the passageway 58 into the space 65 of the horizontal cylinder 46. The hydraulic fluid forced into said space 65 of said horizontal cylinder 46 will cause the piston 51 and the connecting rod 52 to be moved inwardly, away from the lower stationary die 16, and the tension coil springs 72, 72 will assist said piston 51 and connecting rod 52 in their action to force the feed member 40 to be moved inwardly. In Fig. 2 of the drawings, the piston 51 is disclosed at the inner limit of its stroke, the piston 55 is disclosed at the upper limit of its stroke, the outer base portion 42 of the yoke is disclosed against an adjacent surface of the lower stationary die 16 thus to limit inward movement of the feed member 40, and said feed member is disclosed at position situating a blank 19 at location between the openings 36, 36 in the female die entity 34 and the punches 39, 39 of the male die entity 38. During upward movement of said piston 55 and inward movement of said piston 51, which causes the spaces 64 and 67 in the vertical and horizontal cylinders 47 and 46 to be decreased and the spaces 66 and 65 in said vertical and horizontal cylinders to be increased, hydraulic fluid also will be forced from the space 67 in the horizontal cylinder 46 through the passageway 61 into the space 66 in the vertical cylinder 47.

During normal operation of the machine, all of the manually actuable valves 76, 78, 82 will be closed. Clearly, the positions of the pistons 51 and 55 in the horizontal and vertical cylinders 46 and 47 can be adjusted in simple and easy manner while the manually actuable valve 82 is in open position. Stated otherwise, should it be desired to adjust the piston 55 in the vertical cylinder 47, or to adjust the position of the piston 51 in

the horizontal cylinder 46, adjustment can be readily and easily accomplished with the manually actuable valve 82 open obviously to cause the cylinder spaces 64, 65, 66, 67 to be in open relation to each other.

Inasmuch as outward movements of the piston 51 and the feed member 40 are accomplished solely by pressure of fluid within the spaces 66 and 67 of the vertical and horizontal cylinders 47 and 46, against resilient action of the tension coil springs 72, 72, while inward movements of said piston and said feed member are accomplished by cooperative action of pressure of fluid in the spaces 64 and 65 of said vertical and horizontal cylinders and the tension coil springs 72, 72, it will be obvious that diminution of fluid in said spaces 64 and 65 may not have appreciable effect upon efficient and satisfactory operation of the machine while equal or less diminution of fluid in said spaces 66 and 67 of said vertical and horizontal cylinders may appreciably affect efficient and satisfactory operation. Should pressure within the spaces 66 and 67 become diminished to extent affecting proper operation of the machine, hydraulic fluid can be forced into said spaces 66 and 67 simply by opening the manually actuable valves 76 and 78 and operating the pump 75. Operation of said pump will cause hydraulic fluid to travel under pressure through the outlet connection 77, the connection 81 and the passageway 61 into the spaces 66 and 67. Should the piston 51 be moved outwardly by pressure of hydraulic fluid pumped into said spaces 66 and 67, the tension coil springs 72, 72 will cause said piston 51 to be returned to its intended and proper position after operation of the pump 75 is completed and before the valves 76 and 78 are moved to closed position. Operation of said pump 75 while the manually actuable valves 76 and 78 are in open position and the manually actuable valve 82 is in closed position can cause pressure of hydraulic fluid in the system to be equalized. That is to say, hydraulic fluid forced into the spaces 66 and 67 by the pump also can be forced past the pistons 51 and 55 into the spaces 65 and 64. Operation of the pump 75 after said spaces 65 and 64 become full of hydraulic fluid merely will cause overflow of hydraulic fluid from the space 64 through the inlet connection 79 back to the pump.

It will be seen that the new and improved machine is equipped to cause inward movement of the feed member 40 to be accomplished at uniform rate of speed thus to cause the blanks to be fed ahead, from station to station, in the machine in regular, steady and even manner. Although the tension coil springs 72, 72 have potential normally to draw or pull the feed member inwardly, inward movement of said feed member obviously will be accomplished in synchronism with upward movement of the upper movable die 17.

What is claimed is:

1. In combination, a structure including a first and a second cylinder arranged at angular relation to each other, a first piston in said first cylinder, a second piston in said second cylinder, a first space in said first cylinder at one side of said first piston, a first space in said second cylinder at one side of said second piston, a first connecting passageway between said first spaces of said first and second cylinders, a second space in said first cylinder at the opposite side of said first piston, a second space in said second cylinder at the opposite side of said second piston, a second connecting passageway between said second spaces

of said first and second cylinders, a pump for delivering hydraulic fluid to all of said spaces and connecting passageways, an inlet to said pump leading from said first space in said first cylinder, a first valve in said inlet, a connection from said second space of said second cylinder leading to a portion of said inlet between said first space in said first cylinder and said first valve, a second valve in said connection, an outlet from said pump leading to a portion of said connection between said second valve and said second space in said second cylinder, and a third valve in said outlet.

2. In combination, a stationary die, a movable die adapted to be reciprocated toward and away from said stationary die, a feed member adapted to be reciprocated along a line at angular relation to the line of reciprocation of the movable die in response to reciprocation of said movable die, a unitary structure providing a first and a second cylinder arranged at angular relation to each other, a first piston in the first cylinder connected to said movable die, a second piston in the second cylinder connected to said feed member, a first connecting passageway in said unitary structure between a first space of the first cylinder at a side of the first piston adjacent the movable die and a first space of the second cylinder at a side of the second piston adjacent the feed member, hydraulic fluid in said first connecting passageway and first spaces of the first and second cylinders, a second connecting passageway in the unitary structure between a second space of said first cylinder at a side of said first piston opposite said movable die and a second space of said second cylinder at a side of said second piston opposite said feed member, and hydraulic fluid in said second connecting passageway and second spaces in the first and second cylinders.

3. In combination, a stationary die, a movable die adapted to be reciprocated toward and away from said stationary die, a feed member adapted to be reciprocated along a line at angular relation to the line of reciprocation of the movable die in response to reciprocation of said movable die, a unitary structure providing a first and a second cylinder arranged at angular relation to each other, a first piston in the first cylinder connected to said movable die, a second piston in the second cylinder connected to said feed member, a first connecting passageway in said unitary structure between a first space of the first cylinder at a side of the first piston adjacent the movable die and a first space of the second cylinder at a side of the second piston adjacent the feed member, hydraulic fluid in said first connecting passageway and first spaces of the first and second cylinders, a second connecting passageway in the unitary structure between a second space of said first cylinder at a side of said first piston opposite said movable die and a second space of said second cylinder at a side of said second piston opposite said feed member, hydraulic fluid in said second connecting passageway and second spaces in the first and second cylinders, and means for resiliently urging said feed member to be actuated in a single direction along its line of reciprocal movement.

4. In combination, a feed member and mechanism for accomplishing reciprocation of said feed member, comprising a unitary structure, a first cylinder in said unitary structure arranged at angular relation to the line of reciprocation of said feed member, a first piston in the first cylinder, a first connecting rod secured to said first

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piston at a side thereof adapted to be actuated to accomplish reciprocation of said first piston, a second cylinder in the unitary structure arranged parallelly of the line of reciprocation of said feed member, a second piston in the second cylinder, a second connecting rod secured to said second piston at a side thereof, means securing said second connecting rod to said feed member, a first space in said first cylinder at the side of said first piston having said first connecting rod, a first space in said second cylinder at the side of said second piston having said second connecting rod, a first connecting passageway in said unitary structure between said first spaces in the first and second cylinders, hydraulic fluid in said first spaces of said first and second cylinders and in said first connecting passageway, a second space in said first cylinder at the side of said first piston opposite said first connecting rod, a second space in said second cylinder at the side of said second piston opposite said second connecting rod, a second connecting passageway in the unitary structure between said second spaces in the first and second cylinders, and hydraulic fluid in said second spaces of said first and second cylinders and in said second passageway.

5. In combination, a feed member and mechanism for accomplishing reciprocation of said feed member, comprising a unitary structure, a first cylinder in said unitary structure arranged at angular relation to the line of reciprocation of said feed member, a first piston in the first cylin-

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der, a first connecting rod secured to said first piston at a side thereof adapted to be actuated to accomplish reciprocation of said first piston, a second cylinder in the unitary structure arranged parallelly of the line of reciprocation of said feed member, a second piston in the second cylinder, a second connecting rod secured to said second piston at a side thereof, means securing said second connecting rod to said feed member, a first space in said first cylinder at the side of said first piston having said first connecting rod, a first space in said second cylinder at the side of said second piston having said second connecting rod, a first connecting passageway in said unitary structure between said first spaces in the first and second cylinders, hydraulic fluid in said first spaces of said first and second cylinders and in said first connecting passageway, a second space in said first cylinder at the side of said first piston opposite said first connecting rod, a second space in said second cylinder at the side of said second piston opposite said second connecting rod, a second connecting passageway in the unitary structure between said second spaces in the first and second cylinders, hydraulic fluid in said second spaces of said first and second cylinders and in said second connecting passageway, and means for resiliently urging said feed member to be actuated in a single direction along its line of reciprocal movement.

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