

Aug. 18, 1959

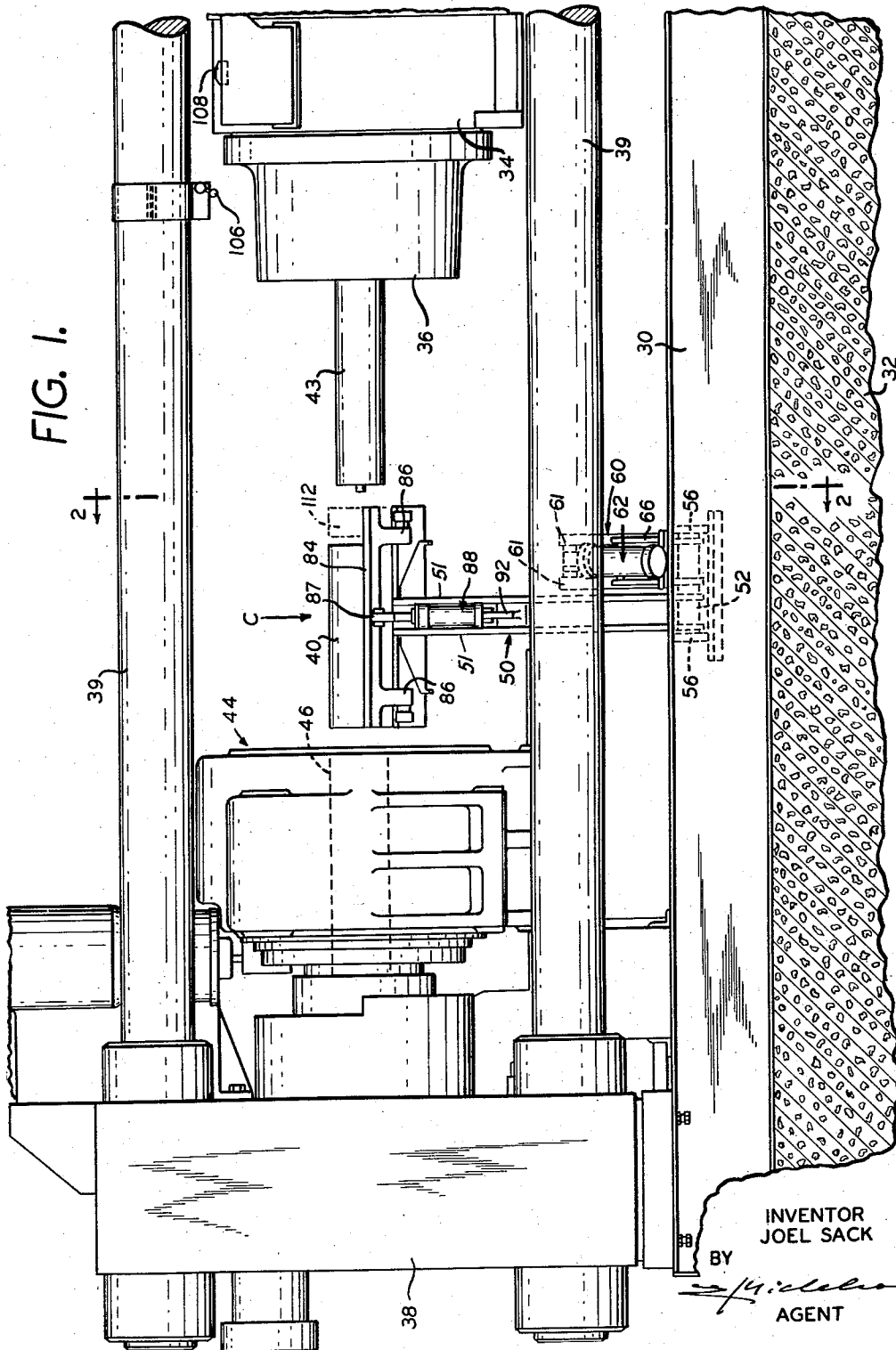
J. SACK

2,900,090

LOADING APPARATUS FOR HORIZONTAL METAL WORKING MACHINES

Filed Oct. 25, 1957

11 Sheets-Sheet 1



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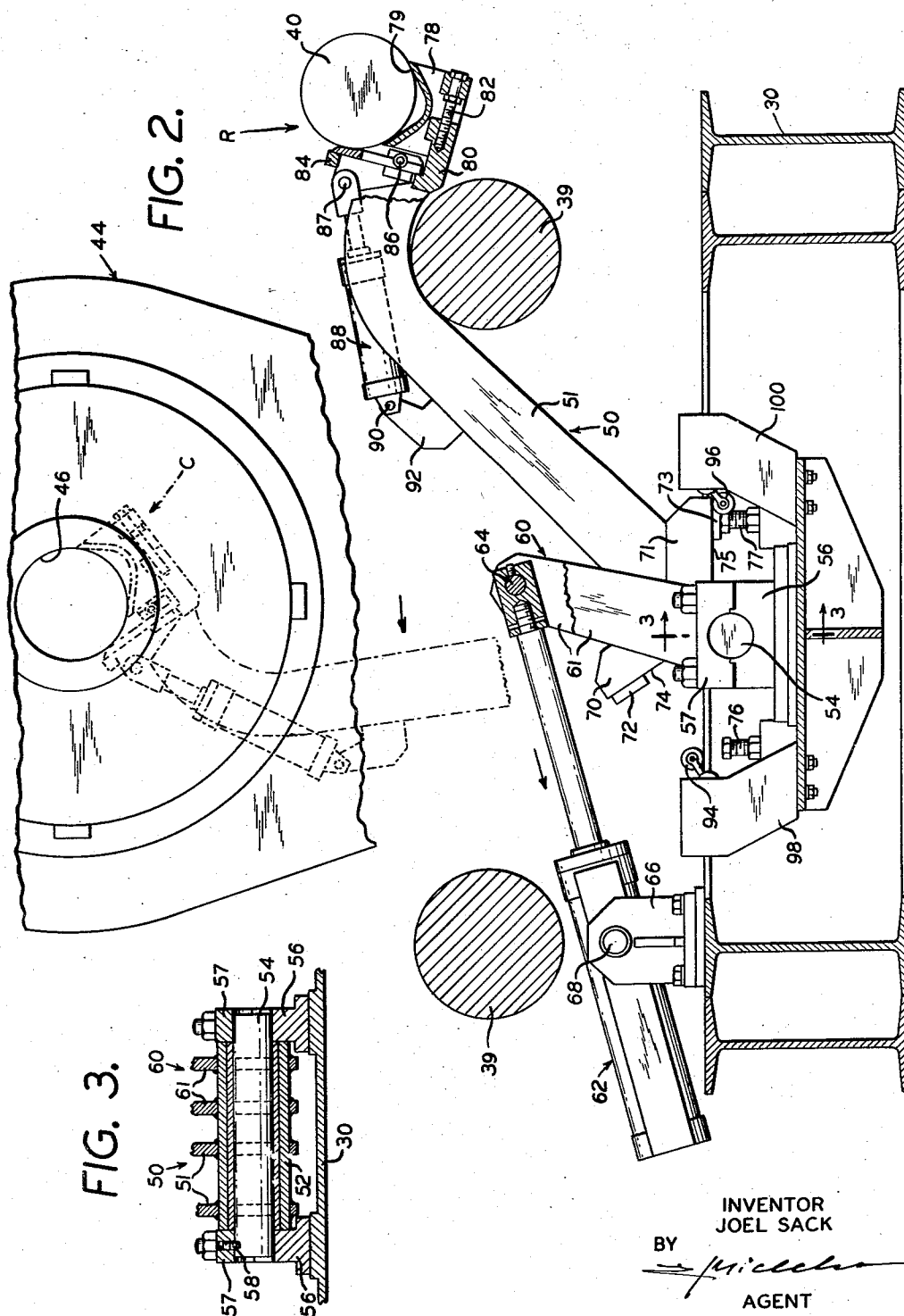
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LOADING APPARATUS FOR HORIZONTAL METAL WORKING MACHINES

Filed Oct. 25, 1957

11 Sheets-Sheet 2



Aug. 18, 1959

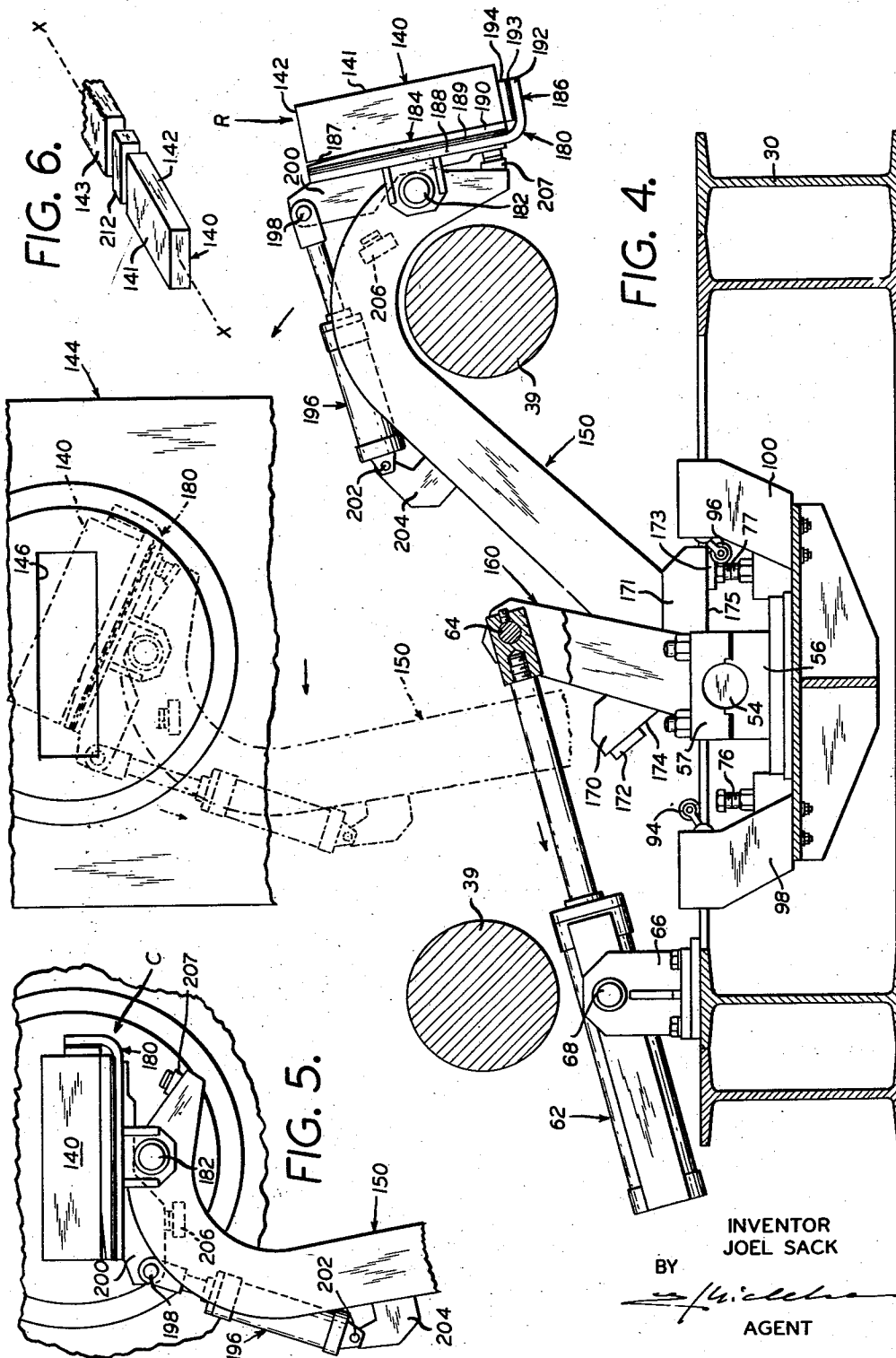
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11 Sheets-Sheet 3



Aug. 18, 1959

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LOADING APPARATUS FOR HORIZONTAL METAL WORKING MACHINES

Filed Oct. 25, 1957

11 Sheets-Sheet 4

FIG. 7.

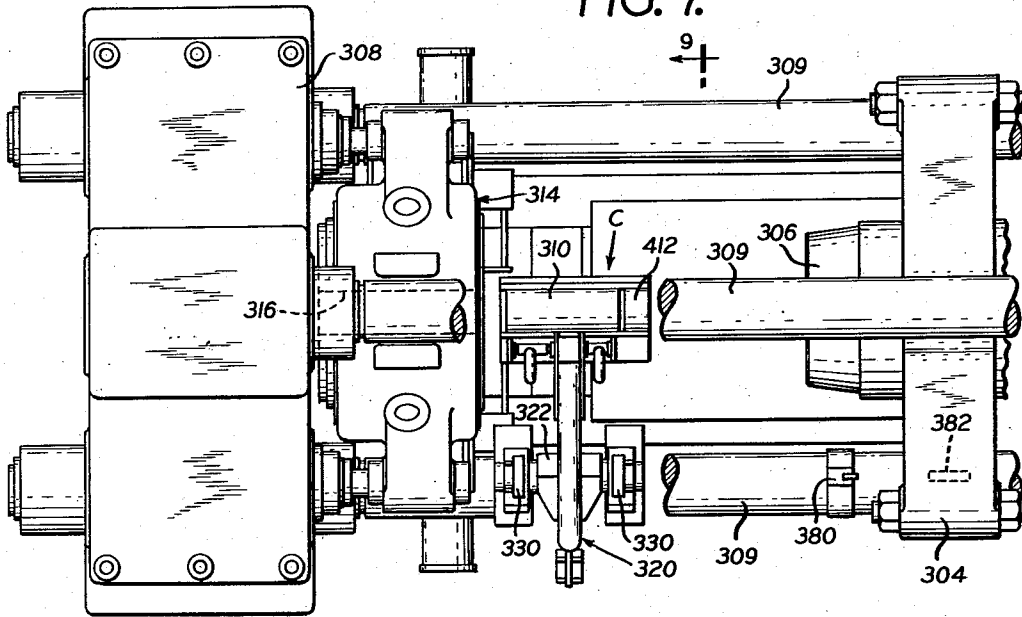
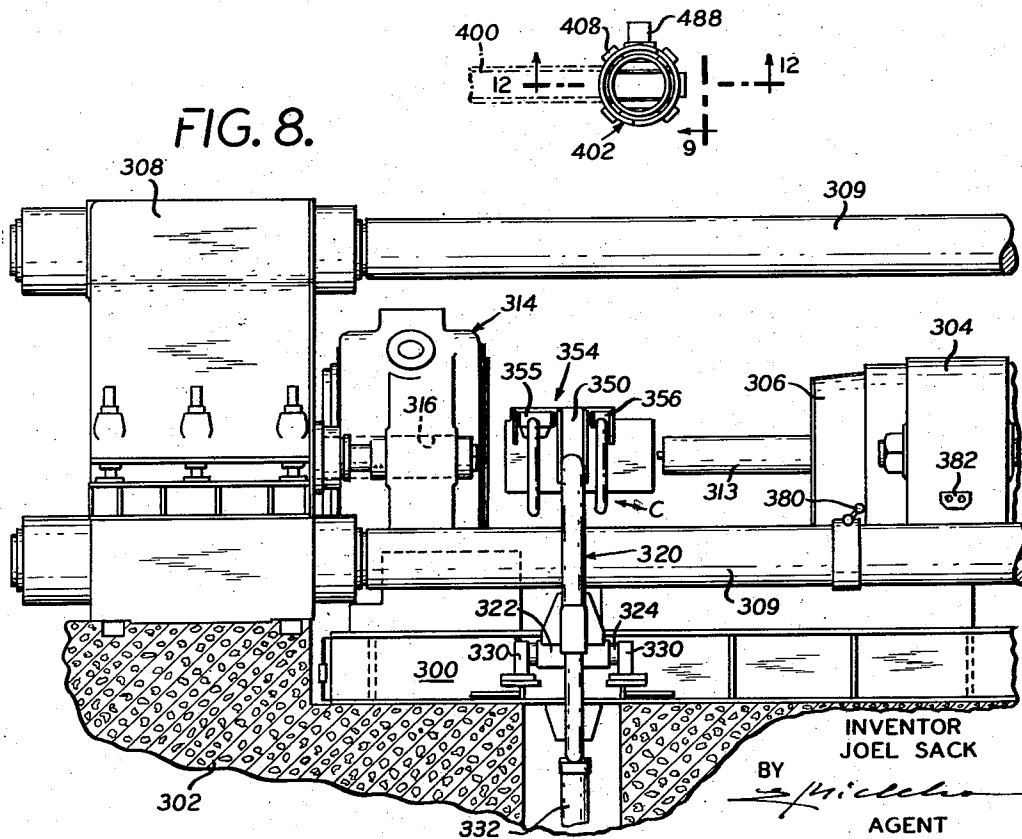


FIG. 8.



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11 Sheets-Sheet 5

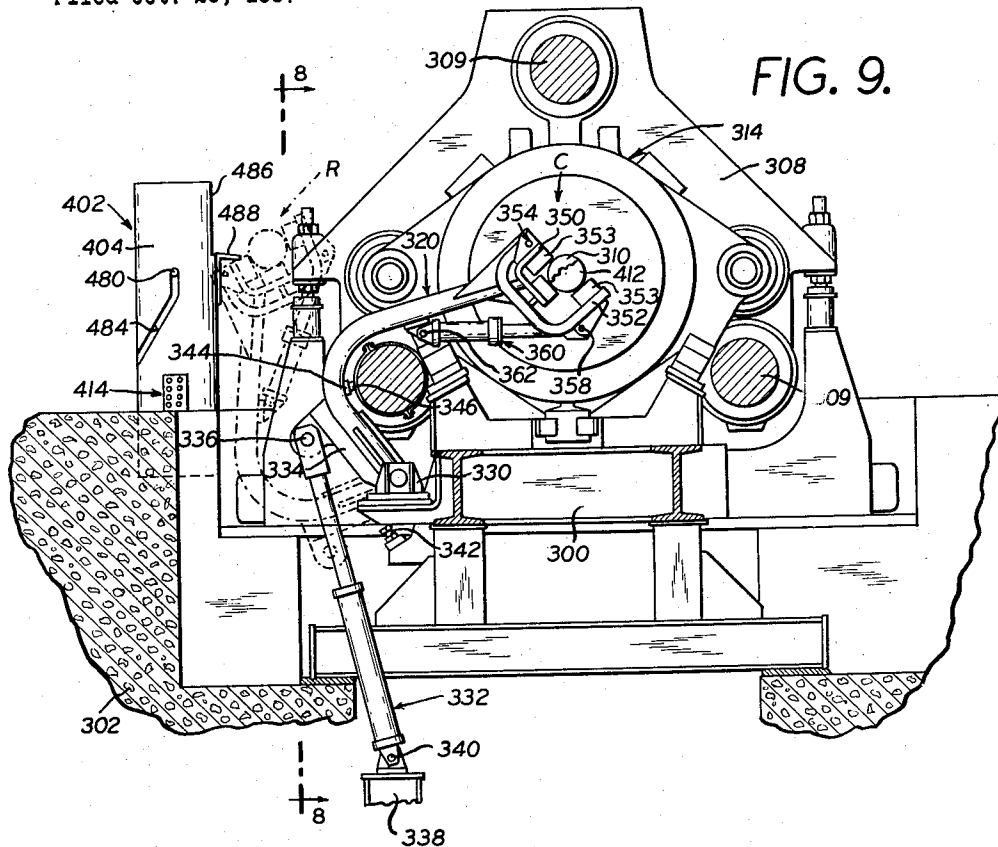
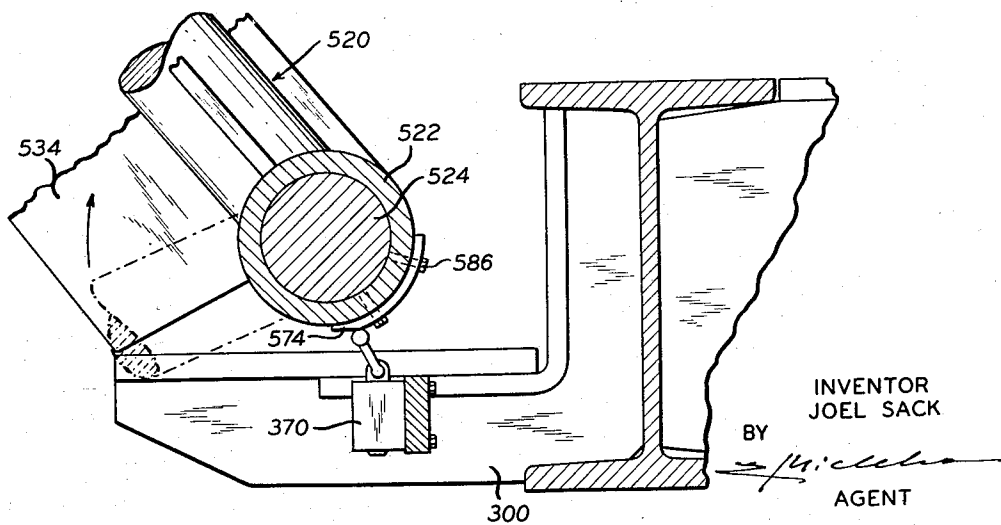


FIG. 21.



Aug. 18, 1959

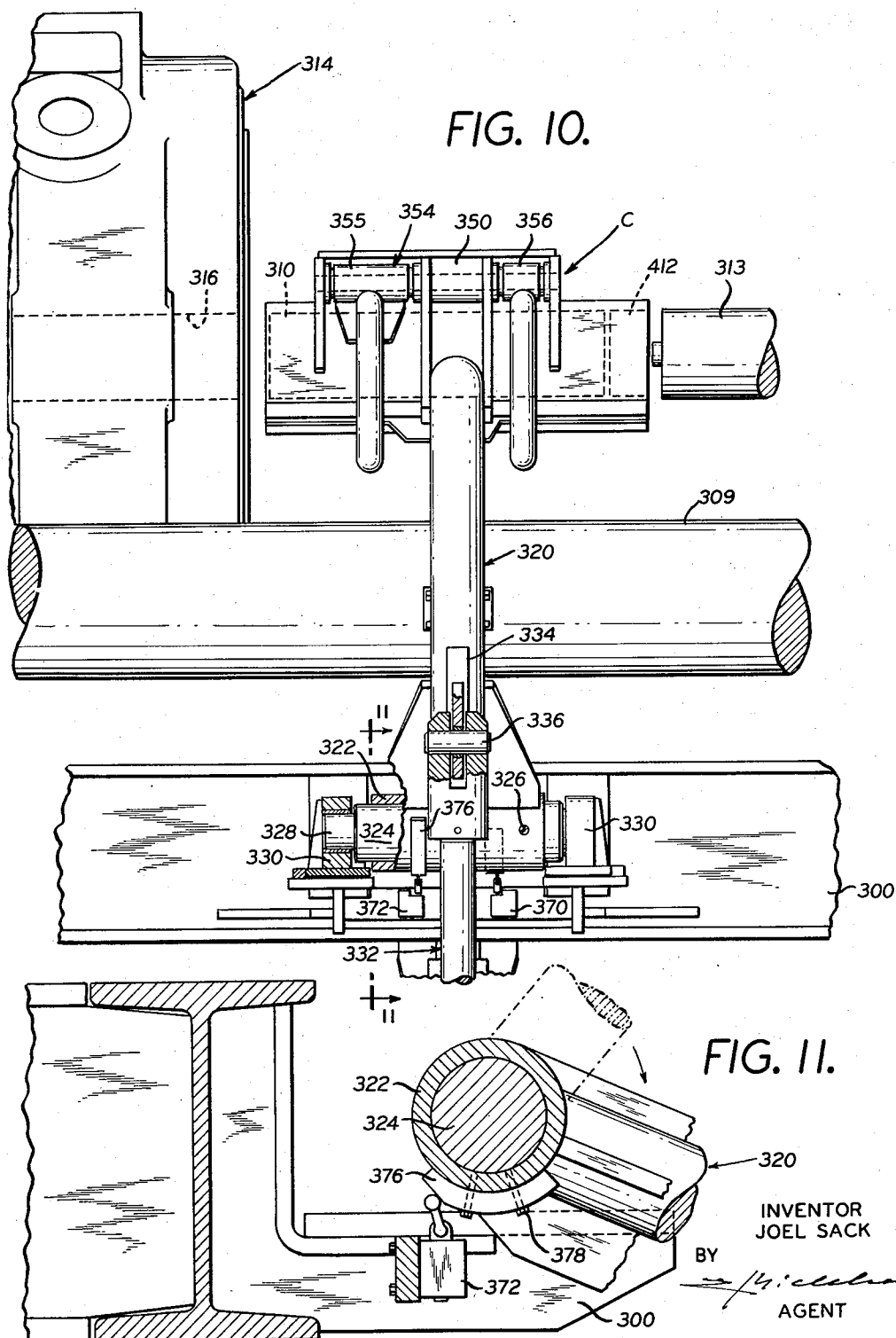
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Filed Oct. 25, 1957

11 Sheets-Sheet 6



Aug. 18, 1959

J. SACK

2,900,090

LOADING APPARATUS FOR HORIZONTAL METAL WORKING MACHINES

Filed Oct. 25, 1957

11 Sheets-Sheet 7

FIG. 12.

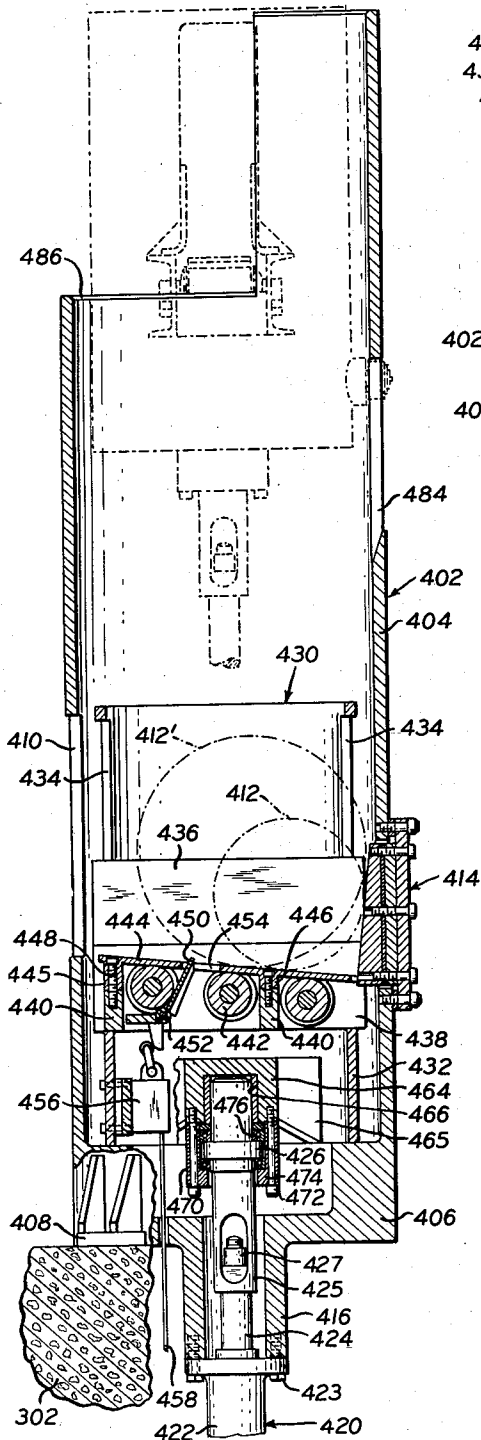


FIG. 13.

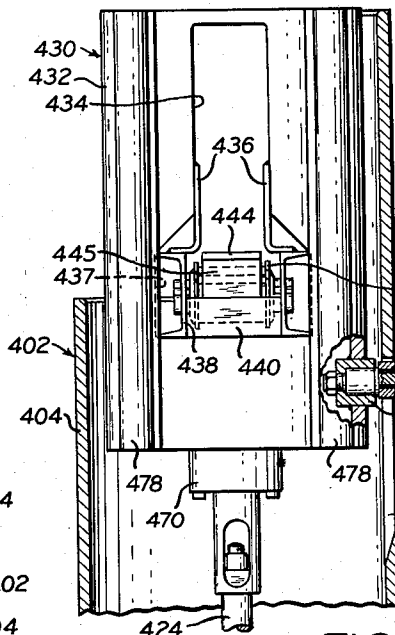
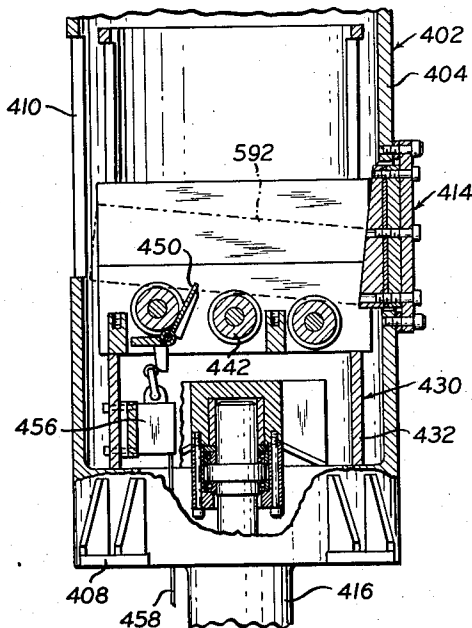


FIG. 14.



FIG. 15.



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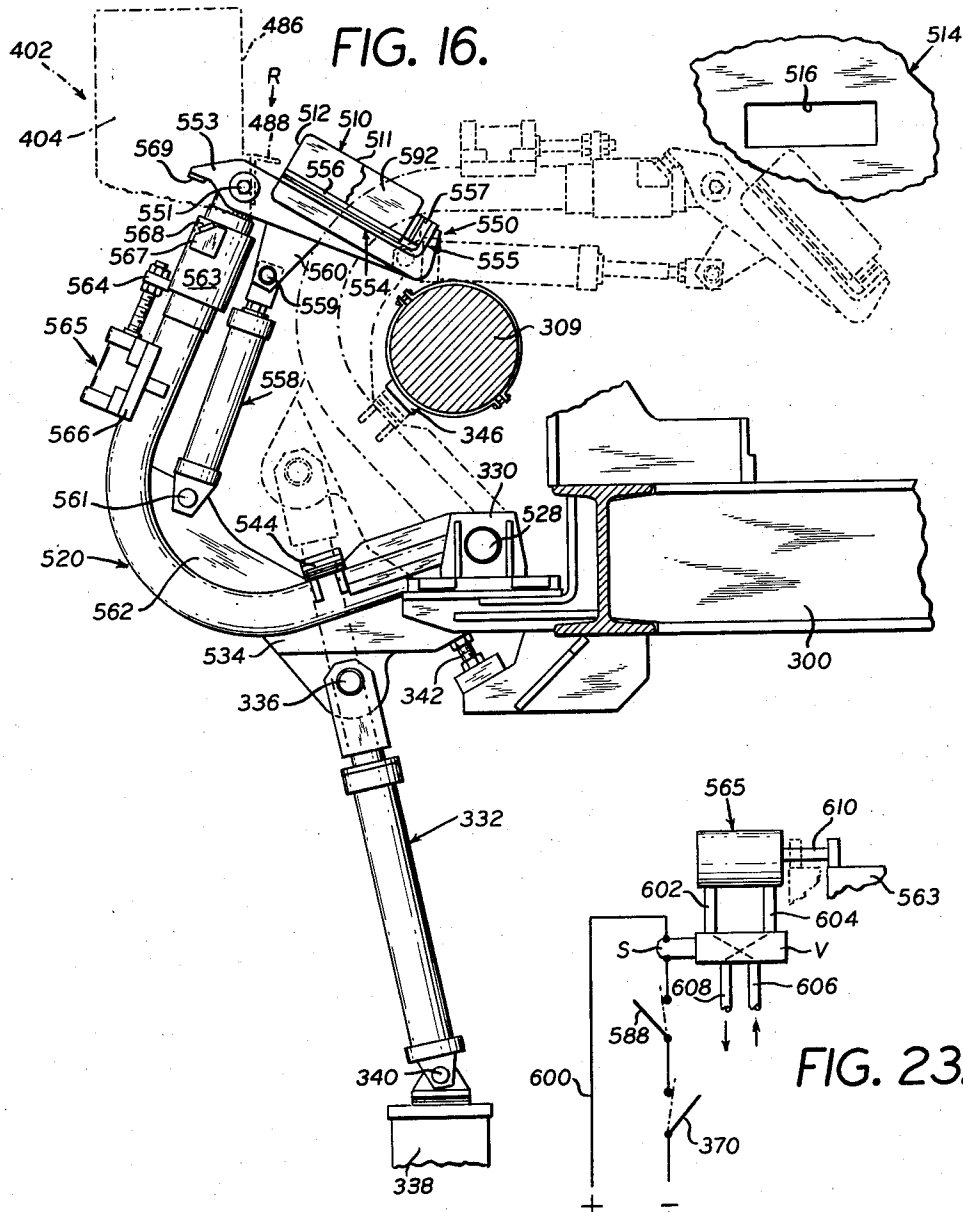
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Filed Oct. 25, 1957

11 Sheets-Sheet 8



Aug. 18, 1959

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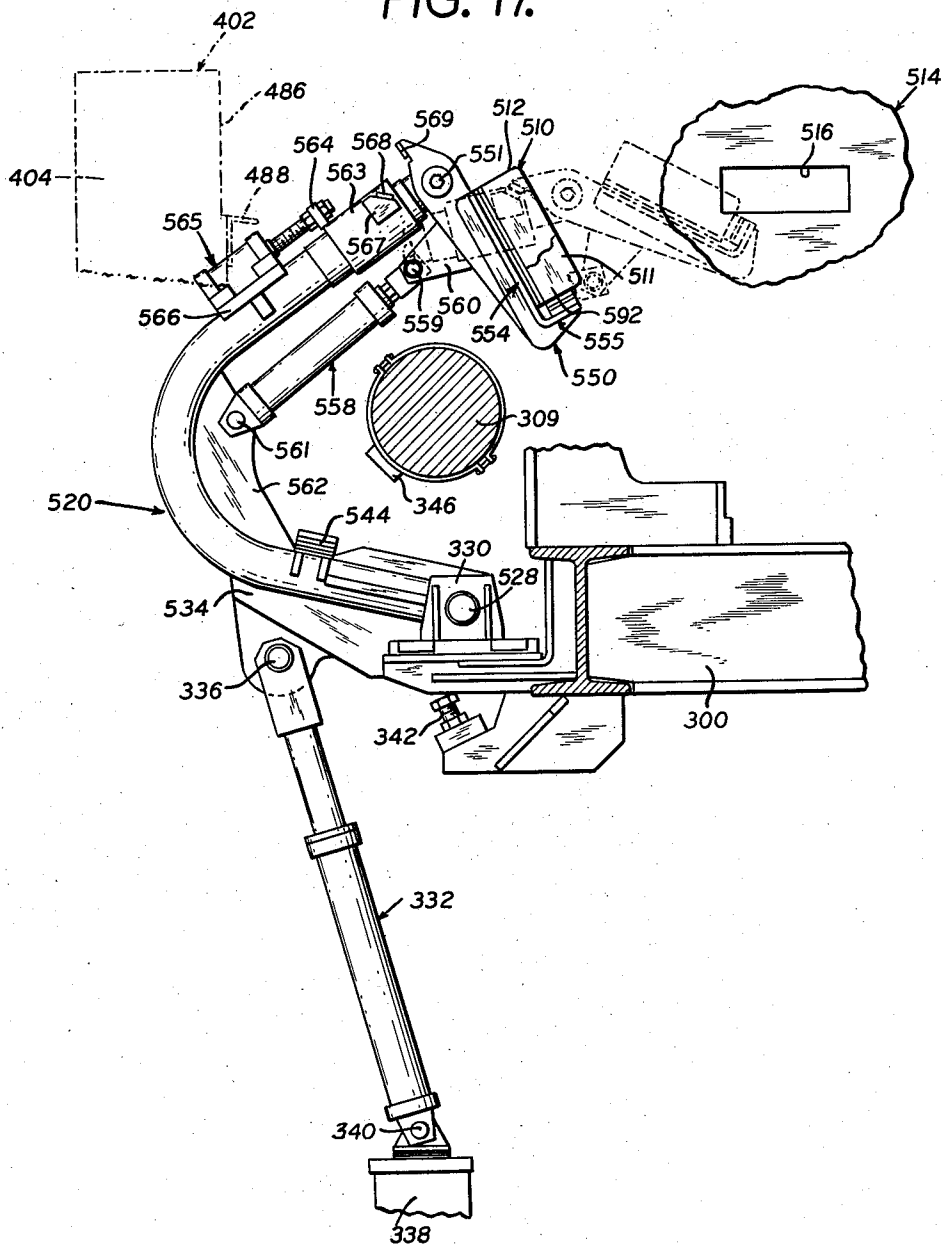
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LOADING APPARATUS FOR HORIZONTAL METAL WORKING MACHINES

Filed Oct. 25, 1957

11 Sheets-Sheet 9

FIG. 17.



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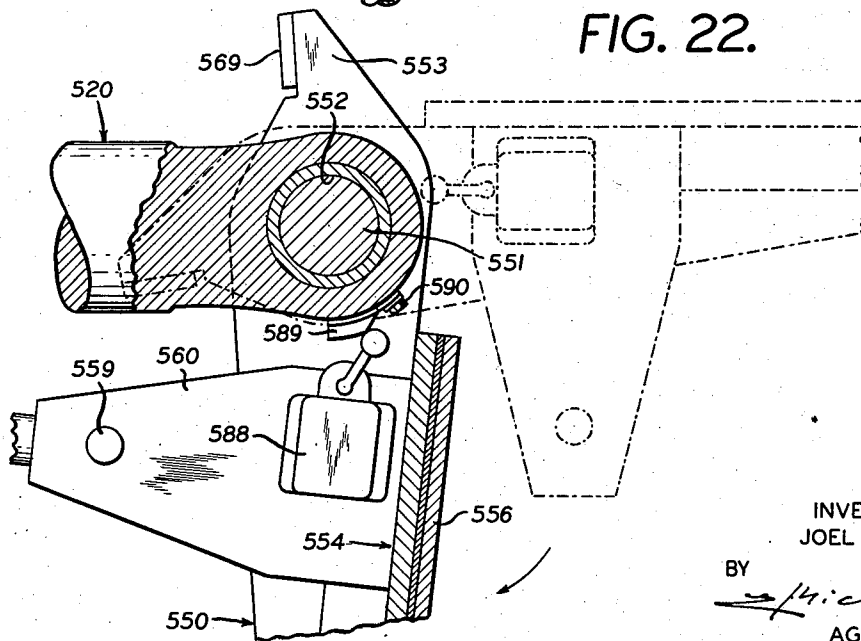
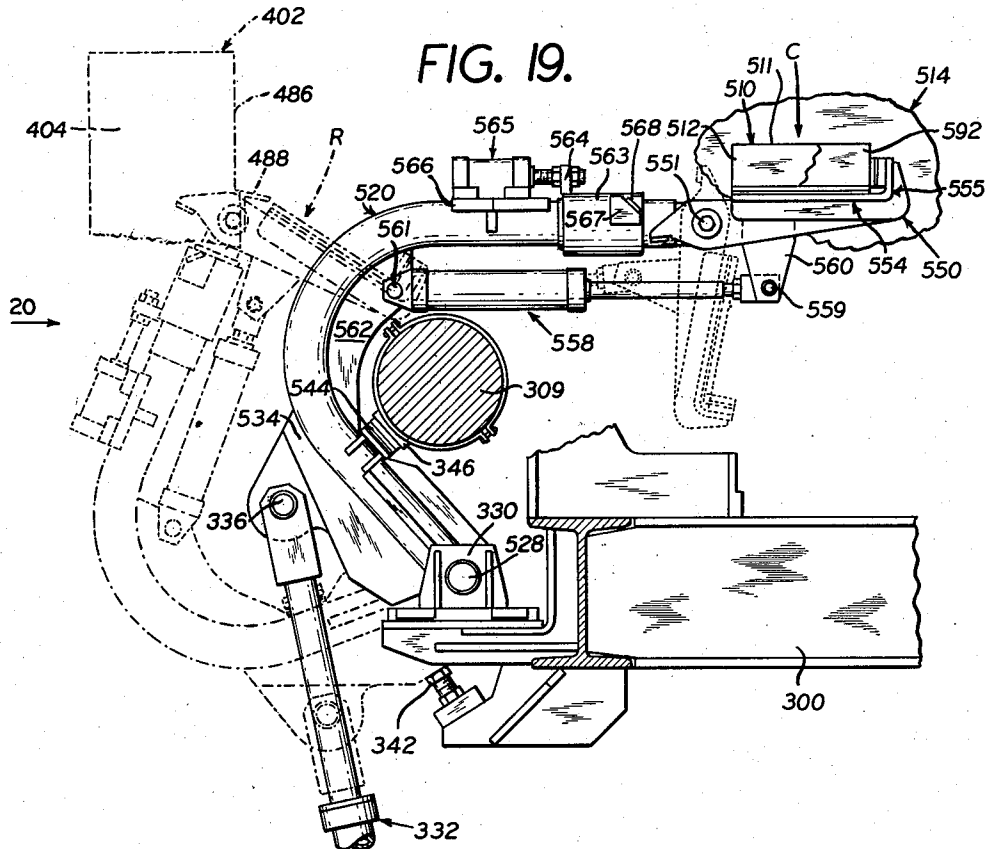
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LOADING APPARATUS FOR HORIZONTAL METAL WORKING MACHINES

Filed Oct. 25, 1957

11 Sheets-Sheet 10



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2,900,090

LOADING APPARATUS FOR HORIZONTAL METAL WORKING MACHINES

Filed Oct. 25, 1957

11 Sheets-Sheet 11

FIG. 20.

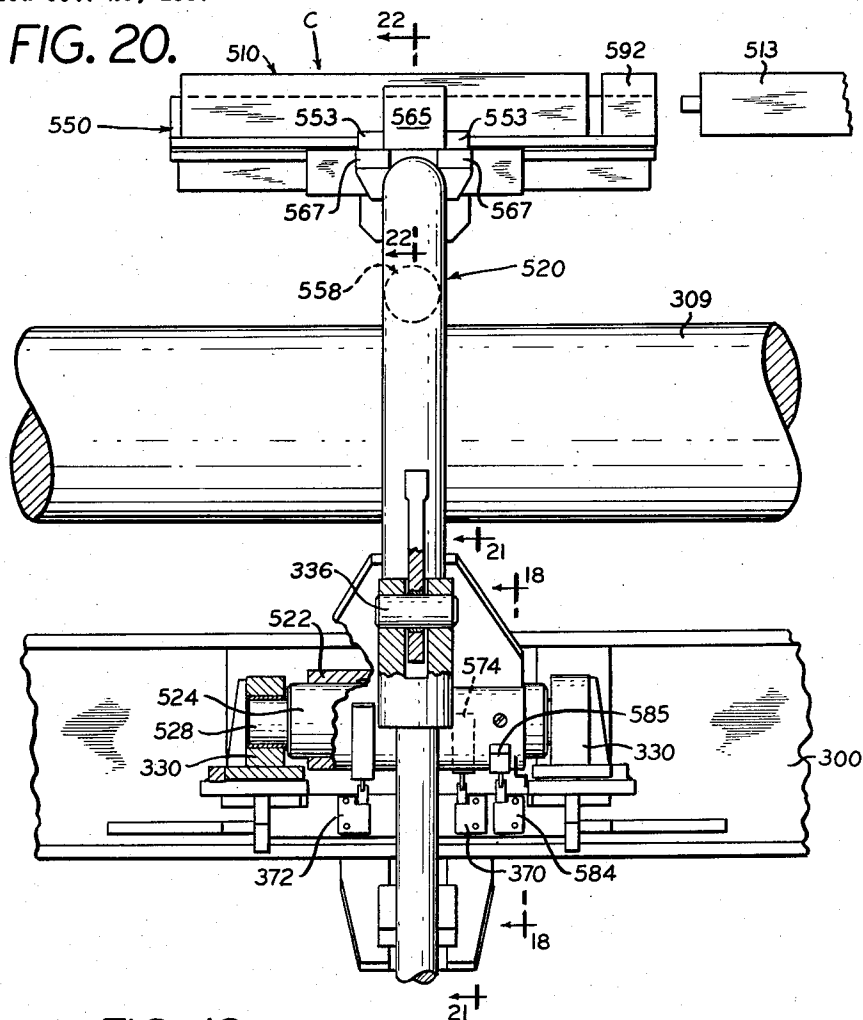
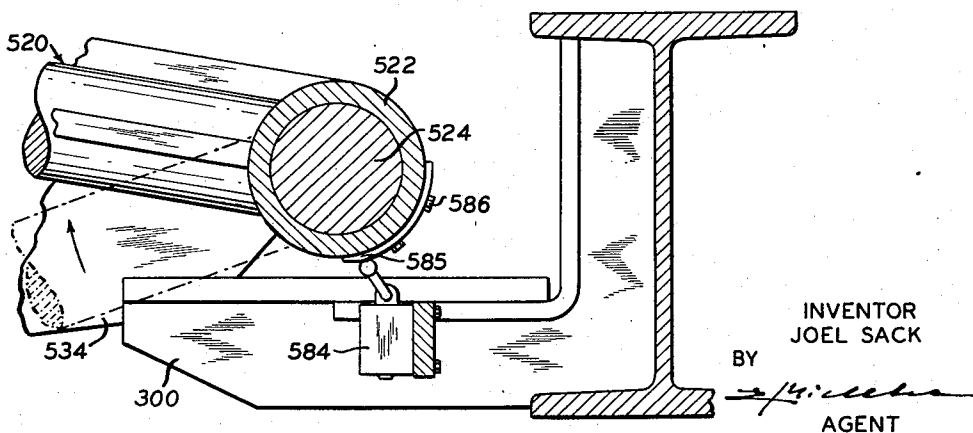


FIG. 18.



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LOADING APPARATUS FOR HORIZONTAL METAL WORKING MACHINES

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Application October 25, 1957, Serial No. 692,443

7 Claims. (Cl. 214—1)

This invention relates to loading apparatus for horizontal metal working machines, in particular horizontal metal extrusion presses.

In presses of the above type, a heated billet is inserted into the container of the press and then extruded through a die by means of a plunger or pressing stem. A dummy block is arranged between stem and billet to protect the stem and prevent the billet material from adhering thereto.

Normally, the billets are of circular cross section and are inserted in a round billet chamber. Loading apparatus used for this purpose frequently comprises a member pivoted for movement crosswise of the press and arranged to align the billet with the chamber in substantially coaxial relationship so that the billet may be pushed into the chamber by the advancing stem. The apparatus must be retractable during advance of the stem without interference therewith. Round dummy blocks usually roll down a chute which is curved so that each block arrives at the billet loader with its axis parallel to the axis of the press. The block is deposited on the billet loader and may be charged into the press together with the billet.

On the other hand, if relatively wide extrusions of oblong cross section are to be produced, it is of great advantage to employ billets of corresponding oblong cross section, which are inserted in an oblong billet chamber. By making the shape of the billet similar to that of the product, a more uniform flow of material is obtained in the chamber and the required press capacity is reduced. When loading such oblong billets into the press, however, it is necessary not only to bring the billet into coaxial relationship with the billet chamber, but also to control the angular disposition of the billet so as to align it fully with the chamber. As the dummy blocks likewise will be of oblong shape, special means will be required if it is desired to feed such blocks mechanically to the billet loader so that they may be charged into the press together with the billet.

It is an object of the invention to provide a loader for oblong billets, which is relatively simple and meets all operating requirements.

It is also an object of the invention to provide an oblong billet loader on which the billet can be easily and freely deposited but the position of the longitudinal axis of the billet relative to the loader is accurately determined.

It is another object of the invention to provide an oblong billet loader, various movements of which are controlled automatically.

It is a further object of the invention to provide simple means for withdrawing the oblong billet loader underneath the advancing stem.

It is a still further object of the invention to provide an oblong billet loader which is readily interchangeable with a loading device for round billets.

It is yet another object of the invention to provide a simple convertible device for selectively feeding circular

2

or oblong dummy blocks to the billet loader of the press.

It is an additional object of the invention to provide a method of loading an oblong billet, which allows rapid operation while ensuring proper alignment of billet and billet chamber.

Various other objects, features and advantages of the invention will become apparent as the description proceeds.

In the drawings which illustrate two embodiments of the invention by way of example,

Fig. 1 is a fragmentary elevational view of an extrusion press equipped with a loader for round billets;

Fig. 2 is an enlarged fragmentary section generally taken along line 2—2 of Fig. 1 but showing the loader for round billets in two operating positions;

Fig. 3 is an enlarged section taken along line 3—3 of Fig. 2;

Fig. 4 is a section similar to Fig. 2 but showing a loader for billets of oblong cross section in two operating positions;

Fig. 5 is a fragmentary section similar to Fig. 4 but illustrates a further position of the oblong billet loader;

Fig. 6 is an isometric view of details of a billet and tools on a reduced scale;

Fig. 7 is a fragmentary plan view of a larger extrusion press equipped with a round billet loader;

Fig. 8 is an elevational view taken in the direction of the arrows 8—8 in Fig. 9;

Fig. 9 is a section taken along line 9—9 of Fig. 7 but showing the loader in two operating positions;

Fig. 10 shows a portion of Fig. 8 on a greater scale, partly in section;

Fig. 11 is an enlarged fragmentary section generally taken along line 11—11 of Fig. 10 but showing the parts in full lines in a different operating position;

Fig. 12 is an enlarged sectional view taken generally along line 12—12 of Fig. 7 and showing a dummy block feeding device adjusted for the handling of round dummies with the parts illustrated in full lines in the initial position and in chain lines in the discharge position;

Fig. 13 is a fragmentary view similar to Fig. 12, partly in section, and shows the upper portion of the feeding device with the parts illustrated in full lines in the discharge position;

Fig. 14 is a diagram illustrating a detail on a reduced scale;

Fig. 15 shows the lower portion of Fig. 12 with the parts adjusted for feeding oblong dummy blocks;

Fig. 16 is a section generally similar to Fig. 9 but showing a loader for oblong billets;

Fig. 17 is a section similar to Fig. 16 but showing the parts in other operating positions;

Fig. 18 is an enlarged fragmentary section generally taken along line 18—18 of Fig. 20 but showing the parts in full lines in the full line position of Fig. 17;

Fig. 19 is a section generally similar to Fig. 16 but showing still other operating positions;

Fig. 20 is an enlarged fragmentary view generally taken in the direction of the arrow 20 in Fig. 19 and partly shown in section;

Fig. 21 is an enlarged fragmentary section taken along line 21—21 of Fig. 20;

Fig. 22 is an enlarged fragmentary section generally taken along line 22—22 of Fig. 20;

Fig. 23 illustrates control details diagrammatically.

FIRST EMBODIMENT

Referring to Figs. 1 to 6 of the drawings, the horizontal metal extrusion press illustrated therein comprises a frame 30 fixed to a foundation 32, a hydraulically operated crosshead 34 supported for movement along the longitudinal axis of the press, a stem holder 36 attached

3

to the crosshead, a platen 38 supporting a die (not shown), and tie rods 39 connecting the platen to the other end of the machine. The press is equipped with one set of elements for extruding billets of circular cross section, and another set of elements for extruding billets of oblong cross section as will be described in detail.

Round billets

Figs. 1 to 3 illustrate the machine adjusted for extruding a round billet 40 by means of a tool in the form of a round plunger or stem 43 attached to the holder 36. The round stem 43 cooperates with a container generally indicated at 44 which has a circular billet chamber 46.

The loading device for round billets is to some extent of a conventional type but will be described since it is a part of the apparatus and such description will facilitate the understanding of, and establish interchangeability with, the oblong billet loader. A loading arm generally indicated at 50, which is movable crosswise of the press, that is, transversely of the longitudinal axis thereof, comprises a pair of spaced portions 51 (Fig. 3) and a bushed hub 52. The arm 50 is mounted on a pivot 54 which is received in a pair of supports 56 fastened to frame 30 and having caps 57, the pivot being secured against rotation by a set screw 58.

To actuate arm 50, a lever 60 comprising a pair of spaced portions 61 is rigidly attached to the hub 52. A double-acting cylinder and piston unit 62 is pivotally connected to lever 60 at 64 intermediate the spaced portions 61, and to a pair of supports 66 on frame 30 at 68. Extensions 70, 71 which are joined to arm 50 and have projections 72, 73 on surfaces 74, 75, cooperate with adjustable screws 76, 77 to limit the stroke of arm 50 in both directions.

A cradle member 78 having a suitably shaped surface 79 serves for supporting the circular billet. Member 78 is attached to a boss 80 of arm 50 by means of a screw 82 so that the apparatus may be adjusted for handling round billets of various diameters. If such adjustment is not required, surface 79 may be provided on the arm 50 proper. To prevent the billet from rolling off arm 50 during movement of the latter, a jaw 84 is hinged to arm 50 at 86 and in its operative position is adapted to contact the billet. The jaw is pivotally connected at 87 to a double-acting cylinder and piston unit 88 which in turn is pivotally mounted at 90 on a rigid extension 92 of arm 50 intermediate the portions 51 thereof, the unit 88 serving to withdraw the jaw when required.

To control certain movements automatically, a pair of limit switches 94, 96 are mounted on frame members 98, 100 for cooperation with surfaces 74, 75 of the extensions 70, 71, respectively. A further limit switch 106 (Fig. 1) is mounted on one of the tie rods 39 and operated by a cam 108 attached to the movable crosshead 34.

At the start of the operation, the loading arm 50 is at a receiving station R and in the position shown in full lines in Fig. 2. The round billet 40 which has been heated is deposited on member 78 with the jaw 84 in its upright or closed position. A round dummy block 112 indicated in chain lines in Fig. 1 may likewise be placed on member 78. After checking the delivery of the parts, the operator causes pressure fluid to enter the unit 62 so that a downstroke is performed. Arm 50 is moved to a charging station C and will then be in the position shown in full lines in Fig. 1 and in chain lines in Fig. 2, the projection 72 of extension 70 engaging screw 76. If the screws 76 and 82 have been properly set, the billet will be readily aligned with the billet chamber 46. Upon arrival of arm 50 at the charging station, limit switch 94 is engaged by surface 74 but does not participate in the control steps described here for the handling of round billets. Forward movement of crosshead 34, holder 36 and stem 43 is now started by the operator so that the dummy block 112 and billet 40 will be pushed into chamber 46 by the advancing stem. When cam 108 engages

4

limit switch 106, the cylinder and piston unit 88 is caused to withdraw jaw 84 from its operative position, and pressure fluid is simultaneously admitted to unit 62 so as to start the return movement of arm 50. As the jaw 84 is withdrawn, the advancing stem will be cleared. When arm 50 arrives again at the receiving station R where it is stopped by the projection 73 contacting screw 77, limit switch 96 is engaged by surface 75 and this causes the cylinder and piston unit 88 to return jaw 84 to its operative position. Stem 43 will continue to advance and, after the billet and dummy have been pushed completely into the container, the billet will be extruded by the stem to produce the desired shape. The press is ready for the next cycle after the extrusion tools have been cleaned and returned to their initial positions.

Oblong billets

Figs. 4 to 6 illustrate the apparatus adjusted for handling a billet generally indicated at 140 which is of oblong cross section and has wider sides 141 and narrower sides 142. Instead of the round stem, an oblong stem 143 (Fig. 6) is now attached to the holder 36. The container for round billets has been replaced by a container 144 provided with an oblong chamber 146 in level position. In the example shown, the oblong cross sections of the billet, chamber, and stem are of substantially rectangular shape.

The oblong billet loader according to the invention, which is interchangeable with the loading device for round billets, comprises a loading arm generally indicated at 150, the lower part of which is in every respect equal to that of arm 50. Thus arm 150 is readily mountable on pivot 54, and its lever 160 is connectible to the actuating unit 62 at 64. Extensions 170, 171 having projections 172, 173 on surfaces 174, 175 are equivalent to the corresponding parts 70 to 73 and surfaces 74, 75 associated with the loading arm for round billets.

A tray or cradle generally indicated at 180 is pivotally attached to arm 150 at 182 and has a bottom wall generally indicated at 184 and an upright wall generally indicated at 186, the upright wall being of limited height and thus smaller than wall 184. The bottom wall has a bevel 187 at its open end opposite wall 186. To facilitate adjustments, wall 184 is composed of a base 188, shims 189, and a wear plate 190. Similarly the upright wall 186 comprises a base 192, shims 193, and a wear plate 194. The tray 180 is operated by a motor such as a double-acting cylinder and piston unit 196 which is pivotally connected at 198 to an extension 200 of the tray and at 202 to an extension 204 of arm 150. A pair of abutments 206, 207 on arm 150 serve to limit the movement of tray 180 relative to the arm.

The limit switches 94, 96, 106 which are the same as described in connection with the round billet loader are now connected so that the unit 196 is included in the control operations as will be clear from the following description.

At the start of the operation, loading arm 150 is at the receiving station R as shown in full lines in Fig. 4. The extension 200 of tray 180 is in contact with the abutment 207 and the tray is inclined in such a way that its upright wall 186 is lowered. The heated oblong billet 140 is now deposited on the tray with one of the wider sides 141 of the billet contacting the bottom wall 184, and one of the narrower sides 142 contacting the upright wall 186. An oblong dummy block 212 which is indicated only in Fig. 6 may also be placed on the tray. When, after checking the parts, the operator causes the actuating unit 62 to perform a downstroke, arm 150 is moved until projection 172 thereof engages screw 76, that is, until the arm proper is at the charging station in the position shown in chain lines in Fig. 4, the tray 180 being in contact with the abutment 207 throughout the swinging motion of the arm with the upright wall 186 forming the trailing portion of the tray.

When arm 150 arrives at the charging station, limit switch 94 is engaged by surface 174 and will cause unit 196 to move the extension 200 of the tray into contact with the abutment 206 so that the tray is in the level position shown at the charging station C in Fig. 5 and the billet and dummy block are aligned with the chamber 146. Forward movement of crosshead 34 and stem holder 36 (see Fig. 1) with the oblong stem 143 (Fig. 6) attached thereto is now started by the operator, and the billet and dummy are charged into chamber 146 by the advancing stem. When cam 108 (see Fig. 1) engages limit switch 106, unit 62 is caused to swing arm 150 (Fig. 4) towards the receiving station R. Tray 180 will clear the advancing stem due to the bevel 187 at the open end of the tray. In this connection, it should be noted that as shown in the drawings the horizontal axis of pivot 54 is parallel to but somewhat offset from a vertical plane through the longitudinal axis of the press, the pivot axis being positioned to the left of such plane in Fig. 4, and the beveled portion 187 of the tray being disposed in the direction of the offset. When arm 150 arrives again at the receiving station where it is stopped by the projection 173 contacting screw 77, limit switch 96 is engaged by surface 175 and this will cause the unit 196 to return tray 180 to its initial inclined or tilted position. After the extrusion has been completed and the tools have been cleaned and returned to their starting positions, the press is ready for the next cycle.

It will be clear that the oblong billet and dummy block can be placed easily on tray 180 since the latter is open at three sides, only one upright wall 186 being provided. On the other hand, the position of the longitudinal axis $x-x$ (Fig. 6) of billet and dummy block relative to the tray is determined accurately due to the inclined position of tray 180 at the receiving station, the billet and dummy being caused by gravity to engage the bottom wall and upright wall of the tray. The tilted position of tray 180 is maintained during the entire movement of arm 150. When the arm stops at the charging station, there may be a tendency of the billet and dummy to shift to the left in Fig. 4, but as the tray is still inclined, gravity will cause the billet and dummy to maintain contact with both walls of the tray without changing the predetermined position of the axis $x-x$ relative to the tray. Not until arm 150 has reached the charging station will the unit 196 start to move the tray 180 relative to the arm, and only upon completion of the latter movement will tray 180 be in the level position of Fig. 5. As the predetermined position of axis $x-x$ relative to the tray is such that billet and dummy are aligned with chamber 146 in the Fig. 5 position, the charging operation will proceed smoothly.

SECOND EMBODIMENT

Referring to Figs. 7 to 23, the extrusion press illustrated therein is of a relatively large capacity but in principle is similar to the machine described hereinbefore in that it comprises a frame 300 fixed to a foundation 302, a hydraulically operated crosshead 304 supported for movement along the longitudinal axis of the press, a stem holder 306 attached to the crosshead, and a platen 308. One upper and two lower tie rods 309 connect the platen to the other end of the machine.

Round billets

Figs. 7 to 14 show the machine adjusted for extruding a round billet 310 by means of a round plunger or stem 313 attached to the holder 306. The round stem cooperates with a container generally indicated at 314 which has a circular billet chamber 316.

The loading apparatus is modified in certain respects as compared with the first embodiment but likewise comprises a swinging arm generally indicated at 320 which has a hub 322 (Fig. 10) mounted on a pivot 324. The pivot is secured against rotation relative to arm 320 by a

set screw 326 and has reduced ends 328 which are received in a pair of bushed supports or bearings 330 mounted on frame 300. A double-acting cylinder and piston unit 332 (Fig. 9) is pivotally connected to a rib 334 of arm 320 at 336, and to a fixed support 338 at 40. To limit the stroke of arm 320, the rib 34 cooperates with an adjustment screw 342 while an adjustable abutment 344 attached to arm 320 cooperates with a pad 346 comprising shock absorbing material and mounted on one of the lower tie rods 309.

A rigid top portion 350 of arm 320 and a jaw 352 cooperate in receiving and supporting the billet 310. The top portion 350 and jaw 352 carry wear plates 353 which may be replaced by plates of different thickness to adjust the apparatus in accordance with changes in the billet diameter. Jaw 352 is mounted on arm 320 by means of a hinge connection generally indicated at 354 which has a wider portion 355 (Fig. 10) and a narrower portion 356. As shown at 358 in Fig. 9, the jaw 352 is pivotally connected to a double-acting cylinder and piston unit 360 which in turn is pivotally connected to arm 320 at 362.

A pair of limit switches 370, 372 (Figs. 10 and 11) are attached to frame 300. Limit switch 372 cooperates with a cam 376 mounted on hub 322 by means of screws 378, whereas limit switch 370 does not participate in the steps described here for loading round material. A further limit switch 380 (Fig. 7) is attached to one of the lower tie rods 309 and operated by a cam 382 mounted on the movable crosshead 304.

The loading apparatus for the relatively large press shown in Figs. 7 et seq. includes a device for conveying dummy blocks to the billet loader. This device is convertible for selectively handling round or oblong dummies. As usual, an inclined chute 400 indicated in chain lines in Fig. 7 is provided which extends generally parallel to the press axis to return used dummy blocks from the discharge end of the press to the loading region. In conventional arrangements which deal with round dummies only, the chute is curved near the billet loader so that the feeding direction is changed by 90 degrees and the round dummy blocks roll down towards the axis of the press and are deposited on the loader. Such arc-shaped path, however, would not be suitable for oblong billets since the latter would jam in the curved section of the chute. To overcome these difficulties, a device is here provided for turning the dummy blocks through an angle of 90 degrees while their forward motion is interrupted. At the same time, the blocks are moved vertically to the level of the billet loader.

Referring in particular to Figs. 12 to 14, a housing generally indicated at 402 comprises a cylindrical or tubular portion 404, a bottom 406, and brackets 408 for supporting the housing on the foundation 302. The housing has an opening or window 410 registering with the chute 400 (Fig. 7) so that a dummy block such as the round block shown in chain lines at 412 in Fig. 12 may enter the housing. The largest round block which may be handled in the device is indicated at 412' in Fig. 12. Opposite to the opening 410, the housing is provided with a wear plate assembly 414 for the stopping of dummy blocks in the housing. The bottom 406 has a tubular extension 416 and carries a double-acting cylinder and piston unit generally indicated at 420. Cylinder 422 of the unit is secured to the extension 416 by screws 423 while piston rod 424 extends upwardly into the tubular extension 416. A connector 425 having a collar 426 intermediate its ends is attached to the piston rod 424 at 427.

A welded table structure generally indicated at 430 is movable in housing 402 and comprises a pipe section 432 having a pair of opposite lateral openings or windows 434 which receive guide plates 436 and are of increased width at their lower ends 437 (Fig. 13) where they accommodate channel sections 438, the plates and channels

7

being joined to the walls of the windows so as to bridge the space therebetween. The channel sections 438 are connected by two cross bars 440 (Fig. 12) and carry a set of rollers 442 arranged in a sloping manner. A cover plate 444 has one relatively high rib 445 and one lower rib 446 and is releasably fastened to the cross bars 440 by means of screws 448 to form an inclined path above the rollers 442. It should be noted that the cover plate 444 and its ribs do not extend through the entire width of the space between channel sections 438, the cover plate being interposed between lateral shoulders 449 (Fig. 13) of rollers 442. A bell crank lever 450 is pivotally mounted at 452 between channels 438 so that one of its arms extends upwardly between rollers 442 into an opening 454 of cover plate 444 while the other arm of lever 450 cooperates with a limit switch 456 which is secured to the pipe section 432 and has a flexible electric cord 458 connected thereto.

To actuate table 430, the pipe section 432 has a bottom lug 464 joined thereto by means of ribs 465, and the bottom lug has a bushed bore 466 to accommodate the upper end of the connector 425. A sleeve 470 is secured to the bottom lug 464 by means of screws 472 and has an internal shoulder 474 adjacent the lower side of collar 426 of the connector 425. Anti-friction bearings 476 are interposed between lug 464, collar 426, and shoulder 474 in a manner such that the table 430 is freely rotatable relative to the piston rod 424 but will be taken along by the piston rod in the vertical direction when the rod is lifted or lowered. To guide the table 430 in housing 402 during such movements, bars or strips 478 (Fig. 13) are joined to the outer wall of pipe section 432 and engage the inner wall of the tubular portion 404. A roller 480 is mounted on a boss 482 of pipe section 432 and engages a curved slot 484 in the tubular portion 404 so that table 430 is caused to turn through an angle of 90 degrees when the piston rod 424 performs a full stroke. The shape of slot 484 is shown diagrammatically in Fig. 14. It will be clear that the housing 402 and its slot 484 serve as fixed guide means for the table 430. As indicated at 486, the tubular portion 404 is partly cut away at its upper end to allow for the discharge of dummy blocks onto a bracket 488 (Fig. 9) attached to the tubular portion.

The operation is normally started by causing one round dummy block to roll down the chute 400 with its axis disposed transversely of the longitudinal axis of the press. The dummy enters housing 402 and continues its movement on the inclined cover plate 444 between guide plates 436. When passing over the cover plate 444, the dummy depresses the upper arm of bell crank lever 450 and is thereafter stopped upon contact with the wear plate assembly 414. Due to the movement of lever 450, limit switch 456 is actuated and causes pressure fluid to enter cylinder 422 so that the piston rod 424 moves upwards and lifts the table 430. Dummy 412 will move off the inclined face of wear plate assembly 414 and travel along the inner wall of tubular portion 404 during the upward movement. As roller 480 is guided in slot 484, the table 430 while rising will at the same time make the desired turning motion so that the axis of dummy 412 will be disposed parallel to the longitudinal axis of the press. The table will finally be stopped in the discharge position shown in chain lines in Fig. 12 and in full lines in Fig. 13. Since the wall of housing 402 is cut away at 486, the dummy block is free to roll off table 430 onto bracket 488 shown in Fig. 9. At this time, the loading arm 320 is at the receiving station R as indicated in chain lines in Fig. 9, and bracket 488 overlies the arm in the space available due to the limited width of hinge portion 356. Thus, the dummy will roll onto the top portion 350 of the arm, the jaw 352 being in its closed or upper position.

The heated billet 310 is now deposited on the loader next to the dummy block and after checking proper

8

delivery of the material the operator, preferably by a single control motion, causes unit 420 to perform a down stroke and unit 332 to perform an up stroke. Table 430 is thus returned to its lower starting position, and arm 320 is moved to the charging station C where its position will be as shown in full lines in Figs. 7 to 10, the abutment 344 (Fig. 9) engaging pad 346. If the parts have been properly adjusted, the billet and dummy will be readily aligned with the billet chamber 316. Forward movement of crosshead 304, holder 306, and stem 313 will now be started by the operator so that the dummy 412 and billet 310 will be pushed into chamber 316 by the advancing stem. When cam 382 engages limit switch 380, the unit 360 is caused to withdraw jaw 352 from its operative or closed position, which is accomplished rapidly due to the short stroke involved. Pressure fluid is simultaneously admitted to unit 332 so as to start the return movement of arm 320. Due to the rapid withdrawal of jaw 352, the advancing stem 313 will be cleared. When arm 320 arrives again at the receiving station R where it is stopped by the rib 334 contacting screw 342, limit switch 372 (Fig. 11) is actuated by cam 376 and this will cause the unit 360 to return jaw 352 to its operative or closed position. The loading apparatus is now ready for the next cycle.

Oblong billets

Figs. 15 to 23 illustrate the apparatus of the second embodiment adjusted to handle an oblong billet generally indicated at 510 which has wider sides 511 and narrower sides 512. The stem and container for round billets have been replaced by an oblong stem 513 (Fig. 20) and a container 514 (Fig. 16), respectively, the container 514 having an oblong chamber 516 in level position. In the example shown, the oblong parts are of substantially rectangular cross section.

The oblong billet loader, which is interchangeable with the loading device for round billets, comprises a loading arm generally indicated at 520, the lower part of which is to a certain extent similar to that of arm 320. Thus, hub 522 (Fig. 20) of arm 520 is provided with a pivot 524 having reduced ends 528 which are readily mountable in the supports 330, and rib 534 of arm 520 is connectible to the actuating unit 332 at 336. The pad 346 is now in a slightly different angular position in that it has been turned somewhat relative to its tie rod 309 for engagement with an adjustable abutment 544 on arm 520 as shown in Fig. 16.

A tray or cradle generally indicated at 550 is pivotally attached to arm 520 by means of a pin 551 which extends through a bushed bore 552 (Fig. 22) in arm 520 and also extends through a pair of prongs 553 (Figs. 20 and 22) of tray 550, the upper end of arm 520 being positioned between the prongs 553. Tray 550 has a bottom wall generally indicated at 554 and an upright wall generally indicated at 555, the latter being of limited height and thus smaller than wall 554. Both walls comprise wear plates and shims for adjustment as shown at 556 and 557, respectively. The tray 550 is operated by a double-acting cylinder and piston unit 558 which is pivotally connected at 559 to an extension 560 of the tray and at 561 to a rib 562 of arm 520. An abutment or stop member 563 is slidable on arm 520 in the manner of a sleeve and connected at 564 to a double-acting cylinder and piston unit 565 which serves to shift the stop member 563 and is rigidly secured to a bracket 566 of arm 520. The stop member 563 has lateral projections 567 (Figs. 16 and 20), each of which is provided with an oblique surface 568 for cooperation with pads 569 made of shock absorbing material and mounted on the prongs 553 of tray 550.

The limit switches 370, 380 which are the same as referred to in connection with the round billet loader are now connected to include units 558, 565 in the control operations set forth hereinafter. A cam 574 is secured to

the hub 522 of arm 520 for cooperation with limit switch 370. It should be noted that limit switch 372 does not participate in the steps described here for loading oblong material. An additional limit switch 584 is provided on frame 300 for cooperation with a cam 585 mounted on hub 522 of arm 520. The cams 574, 585 are fastened to hub 522 by screws such as shown at 586 in Figs. 18 and 21. A further limit switch 588 (Fig. 22) is mounted on the extension 560 of tray 550 for cooperation with a cam 589 fastened to arm 520 by screws 590.

Referring to Fig. 15, the dummy block handling device is converted for feeding oblong dummies simply by removing the screws 448 and cover plate 444. The oblong or rectangular dummies will thus be supported by the rollers 442, which will facilitate the feeding operation. The chute 400 may likewise be provided with rollers or may be replaced entirely by a rollerway. Limit switch 456 is again used for the control of table 430.

At the start of the operation, one oblong dummy indicated in chain lines at 592 in Fig. 15 is caused to enter housing 402 so that it is received on the table 430. When passing over the rollers 442, the dummy moves bell crank lever 450 so that limit switch 456 is actuated. Table 430 is then lifted and turned in the manner described in connection with the handling of round dummy blocks and the dummy will be discharged onto bracket 488 indicated in chain lines in Fig. 16. At this time, the loading arm 520 is at the receiving station R as shown in full lines in Fig. 16 so that the dummy will slide onto tray 550 which is in a sloping or inclined position with its upright wall 555 lowered.

The heated oblong billet 510 is now deposited on the tray next to the dummy block. After checking the parts the operator, preferably by a single control motion, causes unit 420 to perform a downstroke and unit 332 to perform an upstroke. Table 430 is thus returned to its lower initial position, and arm 520 is moved in the direction towards the charging station. The billet and dummy block are securely supported on the tray during this movement as long as it is tilted with one of the wider sides 511 of the billet contacting the bottom wall 554 of the tray and with one of the narrower sides 512 contacting the upright wall 555. This desired condition is maintained in the following manner. After arm 520 has travelled through an angle of approximately 30 degrees from the receiving station R to the position shown in full lines in Figs. 17 and 18, limit switch 584 is actuated by cam 585 and will cause unit 558 to swing tray 550 upward on arm 520 while the arm continues its own swinging movement. Since the stop member 563 is in its starting or forward position, the pads 569 of prongs 553 will engage the surfaces 568 of member 563 when the approximate position shown in chain lines in Fig. 17 is reached. Tray 550 is thus temporarily arrested in an intermediate inclined position relative to arm 520 and will remain in this relative position until the arm proper arrives at the charging station as shown in chain lines in Fig. 16. Throughout the movement of arm 520, therefore, the tray is inclined in a manner such that, due to the action of gravity, the billet and dummy are caused to engage both the bottom and upright walls of the tray. It should be noted that in this embodiment the upright wall 555 forms the leading portion of the tray during the loading movement of arm 520.

Upon arrival of the arm 520 proper at the charging station with the abutment 544 engaging pad 346, limit switch 370 is actuated by cam 574 (Fig. 21) and will cause the shifting unit 565 to withdraw the stop member 563 so as to remove it from the path of the prongs 553 of tray 550. The unit 558 is now free to complete its forward stroke and will swing tray 550 relative to arm 520 until the level position shown in full lines in Fig. 19 is reached and billet and dummy are aligned with the chamber of container 514 at the charging station C.

Forward movement of crosshead 304, holder 306, and stem 513 is now started by the operator and the dummy and billet are pushed into chamber 516 by the advancing stem. When cam 382 (Fig. 8) engages limit switch 380, this will first cause unit 558 to swing tray 550 downward relative to arm 520 as indicated in dotted lines in the right hand portion of Fig. 19 and in full lines in Fig. 22. Consequently, limit switch 588 will be engaged by cam 589 and will cause unit 565 to return the stop member 563 to its initial forward or active position. After a short delay by means of a conventional timer (not shown), the limit switch 380 will further cause unit 332 to start the return movement of arm 520. As the tray 550 is now in its withdrawn position, the advancing stem 513 will be cleared. When arm 520 arrives at the receiving station R as shown in chain lines at the left hand side of Fig. 19, rib 534 engages the screw 342 again and the loading apparatus is ready for the next cycle.

It will be apparent from a comparison of the embodiments described that the loading arm 50 or 150 of the first machine extends from its pivot point through the space between the lower tie rods 39 in all positions while the loading arm 320 or 520 of the second machine is substantially outside the region of the tie rods 309 at the receiving station R and extends laterally into the machine above one of the lower tie rods at the charging station C. Tray 180 of the first loading apparatus is initially inclined at a relatively great angle which decreases during the loading movement, the upright wall 186 of the tray being at the trailing end. On the other hand, tray 550 of the second apparatus is initially inclined at a relatively small angle which tends to increase during the loading movement, the upright wall 555 of the tray being at the leading end. It is chiefly due to these differences that the second apparatus is provided with the mechanism 563, 565 for adjusting the angular position of the tray relative to the loading arm at an intermediate stage of the movement. The relatively slight tilt of tray 550 at the receiving station R is of advantage for the mechanical feeding of oblong dummies and billets to the apparatus from certain types of conveyors. The position of the axis of the billet, as well as of the dummy, is maintained relative to the tray in the same accurate manner as set forth in connection with the first embodiment since tray 550 is tilted with its upright wall lowered throughout the movement of arm 520.

The various limit switches described control the individual cylinder and piston units by conventional means such as solenoid operated valves, pilot operated valves, etc. As an example, the control arrangement for the shifting unit 565 (Fig. 16 et seq.) is illustrated in the diagram of Fig. 23 which shows a wire 600 connected to a source of electric power. Arranged in series are the limit switch 370 which is normally open, limit switch 588 which is normally closed, and a solenoid S which operates a four-way valve V either directly as indicated, or through a pilot valve if desired. Pipes 602, 604 connect the cylinder and piston unit 565 to valve V which in turn is connected by a pipe 606 to a source of fluid pressure and by a pipe 608 to exhaust. At the start of the operation, limit switch 370 is disengaged from cam 574 (Fig. 20) and, therefore, the switch is open as shown in full lines in Fig. 23. The normally closed limit switch 588 is in engagement with cam 589 (Fig. 22) and thus is likewise open as shown in full lines in the diagram. Solenoid S is deenergized and this results in the valve V connecting pipe 606 to pipe 602, and pipe 608 to pipe 604 as indicated in dotted lines. Piston rod 610 is in the forward position shown in full lines so that the stop member 563 is in its active position. When arm 520 has moved upwardly through an angle of about 30 degrees and tray 550 is rotated relative to arm 520, switch 588 moves off cam 589 and is allowed to close

(see the chain line position in the diagram) but this will not affect the setting of the valve immediately since the other limit switch is still open. Upon arrival of arm 520 at the charging station, however, cam 574 (Fig. 21) closes limit switch 370 so that the switch is in the chain line position of Fig. 23. As both switches are now closed, the solenoid S is energized, which results in the valve connecting pipe 606 to pipe 604, and pipe 608 to pipe 602 so that the shifting unit 565 is reversed. Consequently, piston rod 610 is moved to its chain line position (Fig. 23) for withdrawal of the stop member 563, which will allow tray 550 to move to its level position. When the tray moves downwards again and reaches its initial position relative to the loading arm, limit switch 588 rides again onto cam 589 (Fig. 22) and is opened so that the solenoid is deenergized to reverse the valve and return unit 565 and stop member 563 to their starting positions. When arm 520 moves to the receiving station, limit switch 370 is allowed to open so that it likewise returns to its initial position.

Where in the various embodiments stroke limits are not shown externally, they are provided within the cylinder of the respective actuating unit. Internal stroke limits may be used instead of the abutments 206, 207 shown in Figs. 4 and 5. The cylinder and piston units may be operated pneumatically or hydraulically.

The presses and apparatus illustrated are suitable for the handling of metals such as aluminum and its alloys, magnesium and its alloys, copper and copper alloys, etc.

While certain preferred embodiments of the invention have been described, it will be understood that various modifications and changes may be made without departing from the scope and spirit of the invention as defined in the appended claims.

Having described my invention, what I claim and desire to secure by Letters Patent is:

1. Apparatus for loading a billet of oblong cross section in a horizontal metal working machine, comprising support means, a loading member mounted on said support means for pivotal movement crosswise of said machine, actuating mechanism on said support means for moving said member between a billet-receiving station and a billet-charging station, a tray having a bottom wall for cooperation with the bottom of the billet and a smaller upright wall for engaging one side of the billet, said tray being movably mounted on said member and disposed thereon in an inclined position at the billet-receiving station with its upright wall lowered, and operating means on said member for moving said tray to a level position at the billet-charging station, whereby the billet will be maintained in engagement with said upright wall of the tray throughout the loading movement of said member to secure alignment of the billet with said machine when said tray is leveled at said charging station.

2. Apparatus for loading a billet of oblong cross section in a horizontal metal working machine, comprising support means, a loading arm mounted on said support means for pivotal movement crosswise of said machine, actuating mechanism on said support means for moving said arm between a billet-receiving station and a billet-charging station, a tray having a bottom wall for cooperation with the bottom of the billet and a smaller upright wall for engaging one side of the billet, said tray being pivotally mounted on said arm and disposed thereon in an initial inclined position at the billet-receiving station with its upright wall lowered, and a cylinder and piston unit on said arm for moving said tray to a level position at said charging station to align the billet with said machine.

3. Apparatus as specified in claim 2, including an additional loading arm interchangeable with said first-mentioned arm and shaped for handling round billets, said additional arm being mountable on said support means and connectible to said actuating mechanism for

pivotal movement between said receiving and charging stations.

4. Apparatus for loading a billet of oblong cross section in a horizontal metal working machine, comprising support means, a loading arm mounted on said support means for pivotal movement crosswise of said machine, actuating mechanism on said support means for moving said arm between a billet-receiving station and a billet-charging station, a tray having a bottom wall for cooperation with the bottom of the billet and a smaller upright wall for engaging one side of the billet, said tray being pivotally mounted on said arm and disposed thereon in an initial inclined position at the billet-receiving station with its upright wall lowered, a motor mounted on the arm for moving said tray relative to said arm, control means actuated by said arm at the billet-receiving station for causing said motor to move the tray to said inclined position, and additional control means actuated by said arm at the billet-charging station for causing said motor to move the tray to a level position for alignment with said machine.

5. Apparatus for loading a billet of oblong cross section in a horizontal metal working machine having a reciprocable tool, comprising support means, a loading member mounted on said support means for movement about a horizontal pivot axis substantially parallel to, but in a predetermined direction offset from, a vertical plane through the longitudinal axis of said machine, actuating mechanism on said support means for moving said member between a billet-receiving station and a billet-charging station, a tray having a bottom wall for cooperation with the bottom of the billet and a smaller upright wall for engaging one side of the billet, said upright wall extending along one side of the tray and forming the trailing portion thereof during movement to said charging station, the opposite side of the tray being open and facing in said predetermined direction, said tray being movably mounted on said member and disposed thereon in an inclined position at the billet-receiving station with its upright wall lowered, and operating means on said member for moving said tray to a level position at said charging station so that the billet to be charged may be pushed into said machine by advancing said tool, said bottom wall of the tray having a beveled portion along its open side to permit pivotal withdrawal movement of the loading member during said advance of said tool.

6. Apparatus for loading a billet of oblong cross section in a horizontal metal working machine, comprising support means, a loading arm mounted on said support means for pivotal movement crosswise of said machine, actuating mechanism on said support means for moving said arm between a billet-receiving station and a billet-charging station, a tray having a bottom wall for cooperation with the bottom of the billet and a smaller upright wall for engaging one side of the billet, said tray being pivotally mounted on said arm and disposed thereon in an initial inclined position at the billet-receiving station with its upright wall lowered, said upright wall forming the leading portion of the tray during movement of said arm to the charging station, a stop member movably mounted on said arm, shifting means on said arm for moving said stop member between an active position in the path of said tray and a withdrawn position, and operating means on said arm for moving the tray relative to said arm in succession from said initial inclined position to an intermediate inclined position in engagement with said stop member when in the path of the tray, and then to a level position with the stop member withdrawn to bring the billet to be charged into alignment with said machine.

7. Apparatus for loading a billet of oblong cross section in a horizontal metal working machine having a reciprocable tool, comprising support means, a loading arm mounted on said support means for pivotal move-

13

ment crosswise of said machine, actuating mechanism on said support means for moving said arm between a billet-receiving station and a billet-charging station, a tray having a bottom wall for cooperation with the bottom of the billet and a smaller upright wall for engaging one side of the billet, said tray being pivotally mounted on said arm and disposed thereon in an initial inclined position at the billet-receiving station with its upright wall lowered, a stop member movably mounted on said arm, shifting means on said arm for moving said stop member between an active position in the path of said tray and a withdrawn position; an operating unit on the arm for moving said tray relative to the arm between said initial inclined position, an intermediate inclined position in engagement with said stop member, and a level position; first control means actuated by said arm upon a predetermined movement thereof away from said receiving station, said actuated control means causing the operating unit to move said tray to its intermediate position relative to the arm and in engagement with said stop member; second control means actuated by said arm at the charging station for causing said shifting means to withdraw said stop member and thereby permit said operating unit to move the tray to a level position and align the billet to be charged relative to said machine;

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third control means actuated in response to a predetermined advance of said tool, said actuated third control means causing said operating unit to return the tray to its initial position relative to the arm and further causing said actuating mechanism to return said arm to the receiving station; and fourth control means actuated by said tray in its initial position relative to the arm for causing said shifting means to return said stop member to said active position.

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