Dec. 27, 1955 H. D. THWEATT ET AL 2,728,453

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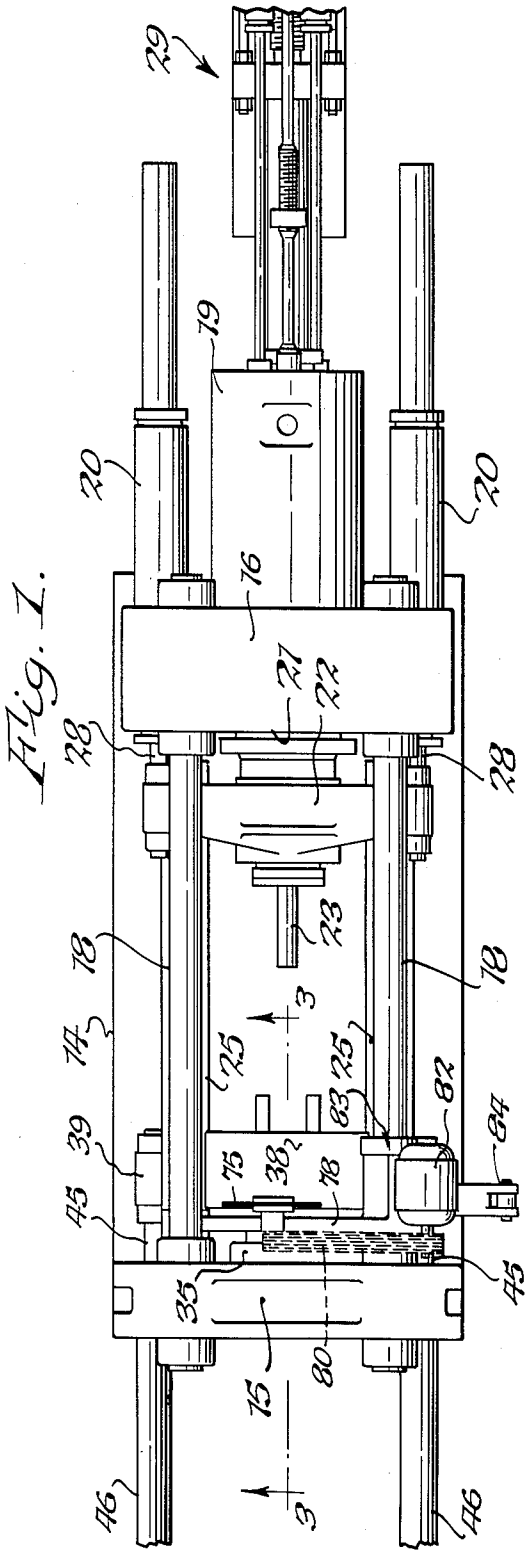


Fig. 1.

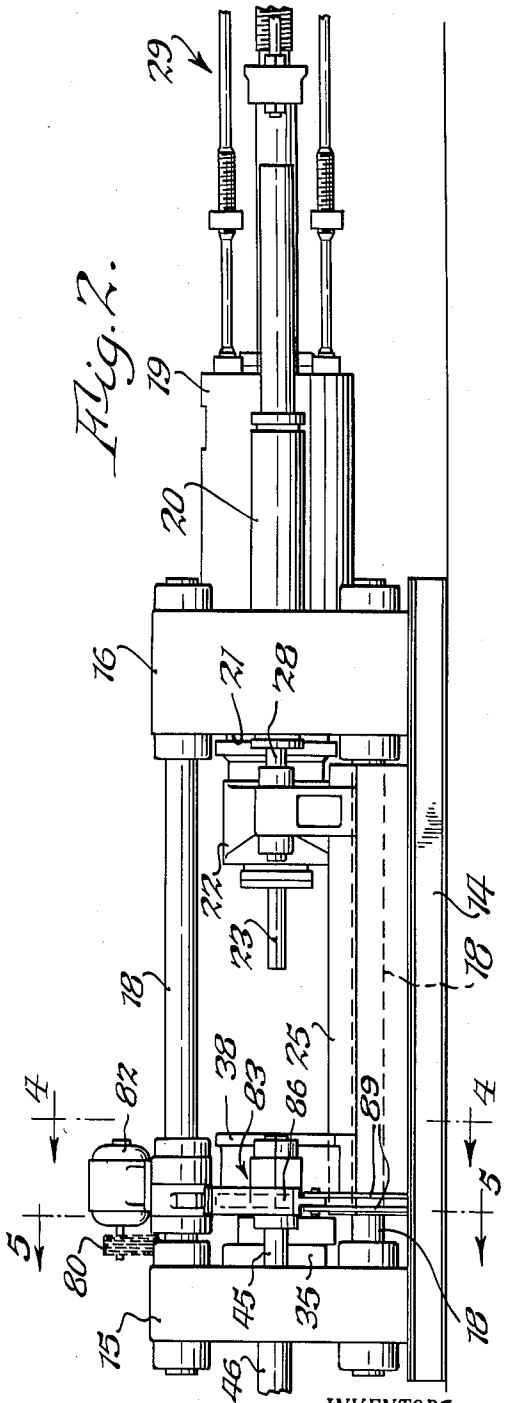


Fig. 2.

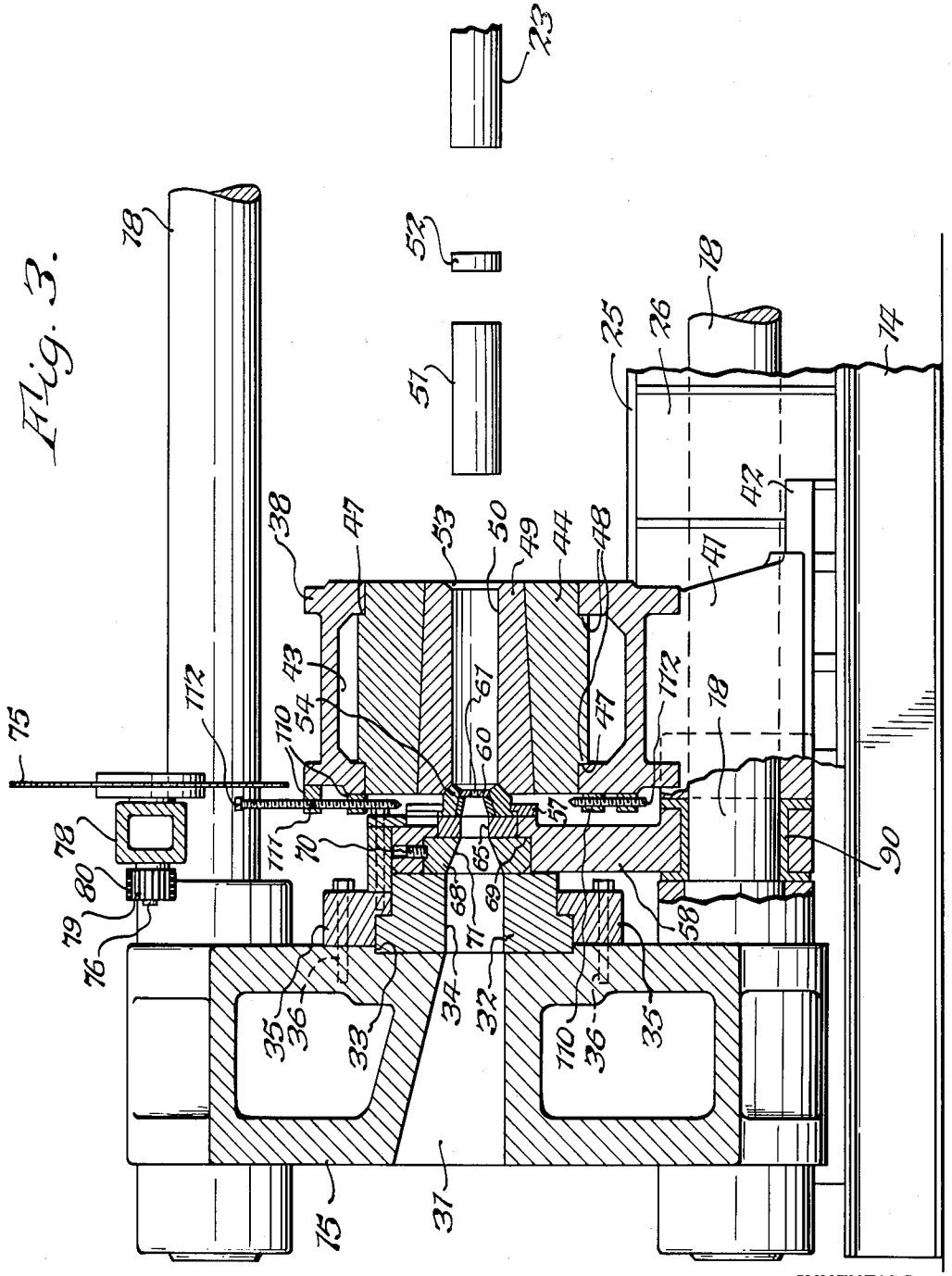
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Fig. 3.



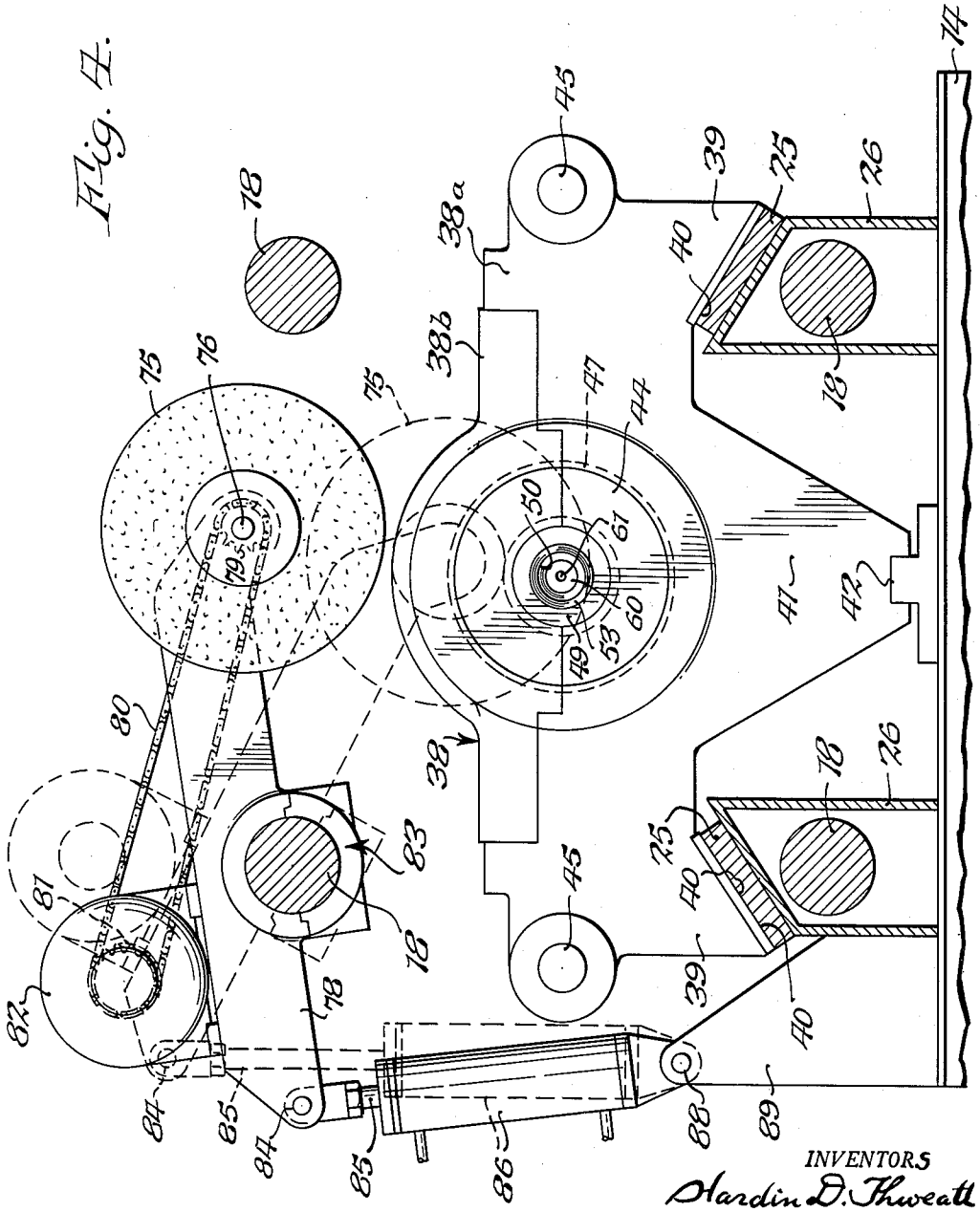
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Fig. 4.

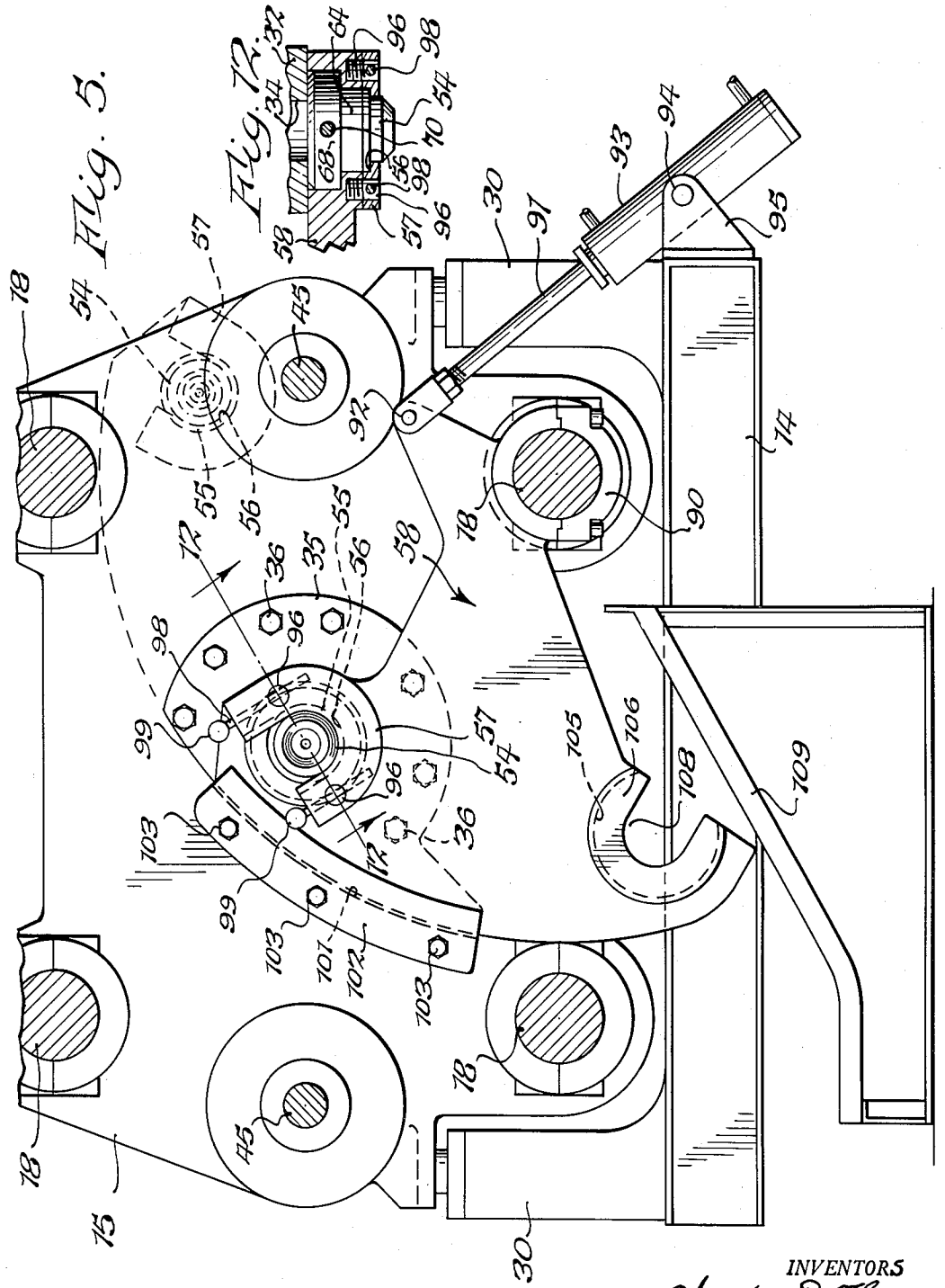


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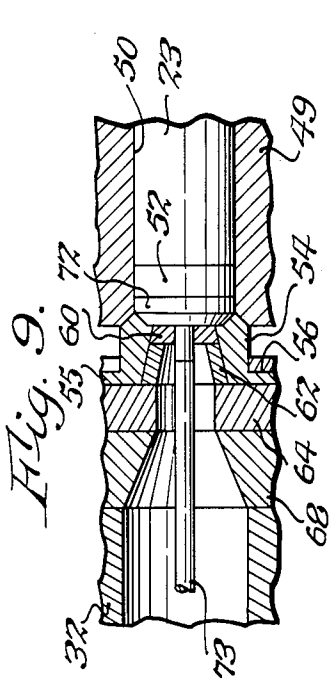


Fig. 9.

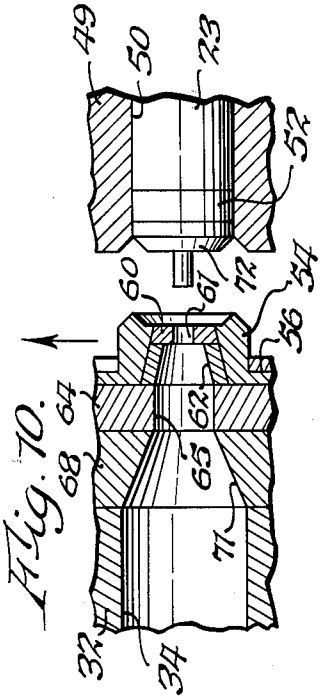


Fig. 10.

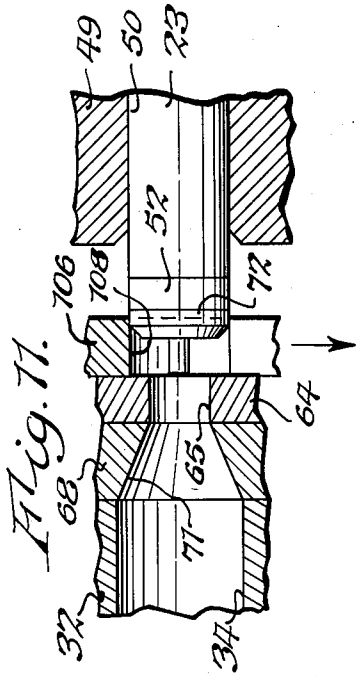


Fig. 11.

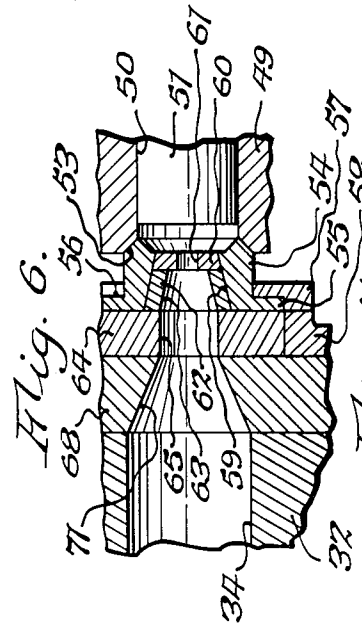


Fig. 6.

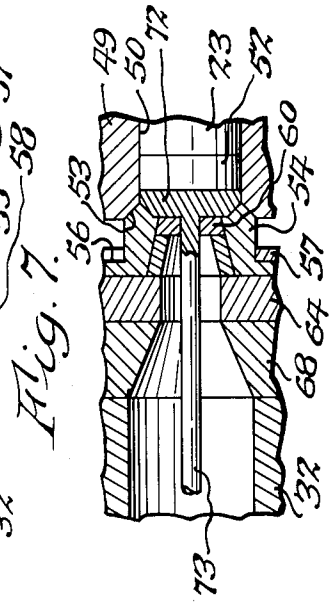


Fig. 7.

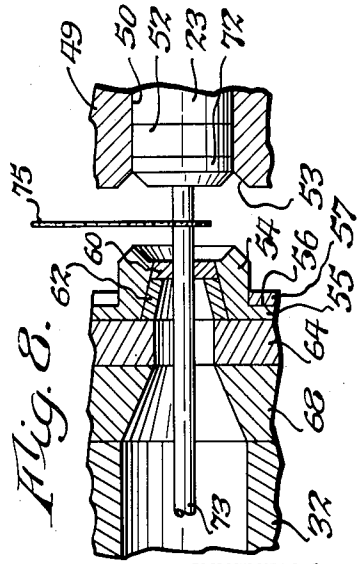


Fig. 8.

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EXTRUSION PRESS

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Application August 17, 1951, Serial No. 242,382

7 Claims. (Cl. 207—2)

This invention relates to an extrusion press and more particularly to a heavy duty horizontal hydraulic press for extruding large metal shapes and tubes from hot billets.

One of the principal objects of the present invention is to increase the speed of operation of such a heavy duty metal extrusion press, particularly in cutting the extrusion from the discard, removing the severed extrusion, separating the discard from the die, and removing the separated discard and die from the press.

Another object is to eliminate the run-off table usually required for removal of the extrusion from the press.

Another object is to eliminate abrasion of equipment when the lubricant used in facilitating extrusion of the billet has abrasive qualities when cold.

Another object is to provide such an extrusion press which reduces accident hazard to a minimum.

Another object is to provide such a press in which there is a minimum amount of time lost on encountering operational difficulties such as the discard becoming stuck in the die.

Another object is to provide such a press which is simple and rugged in construction and not liable to get out of order or require repairs even under conditions of severe and continuous use.

Other objects and advantages of the invention will be apparent from the following description and drawings in which:

Fig. 1 is a fragmentary top plan view of a heavy duty metal extrusion press embodying the present invention.

Fig. 2 is a fragmentary side elevational view thereof.

Fig. 3 is a fragmentary enlarged vertical section taken on line 3—3, Fig. 1.

Figs. 4 and 5 are enlarged vertical cross sections taken on the correspondingly numbered lines on Fig. 2.

Figs. 6–11 are enlarged fragmentary sectional views similar to Fig. 3 and illustrating the sequence of operations in producing an extrusion.

Fig. 12 is a fragmentary section taken on line 12—12, Fig. 5.

The extrusion press forming the subject of the present invention is mounted on a bed 14 and the main section of the press comprises a die platen 15 and a cylinder platen 16 securely held together at the four corners thereof by four large horizontal columns 18. The usual main cylinder 19 and pullback cylinders 20 are inserted in the cylinder platen 16. The forward end of the main ram 21 is supported on a main ram cross head 22 and terminates in a main plunger 23. The opposite ends of the main ram cross head 22 slide on elevated angular bearing surfaces provided by longitudinal elevated guide wear plates 25 which, as best shown in Fig. 4, are rectangular in cross section and are supported in an elevated position to incline upwardly toward the center of the press on castings 26 which are mounted on the bed 14 on opposite sides of the press and extend longitudinally of the press and have their upper surfaces inclined to correspond to the angularity of the bearing plates 25 which are suitably secured to these surfaces. The opposite ends of the main ram cross head 22 connect with the piston rods 28 of the pistons within the pullback cylinders 20. The mechanism for controlling and adjusting the movement of the main ram 21 and pullback piston rods 28 is generally illustrated at 29.

As best shown in Figs. 3 and 5 the die platen 15 rests at its ends on upright extensions 30 of the bed 14 and this die platen 15 is provided with a horizontal through opening 31 in line with the main plunger 23 and through which the extrusion passes. A large rear die backup block 32 is set into a recess 33 in the rear face of the die platen 15 and is provided with a through opening 34 through which the extrusion passes and which registers with the opening 31 in the die platen 15. A retaining ring or annular holder 35, shown as sceured by screws 36, retains this secondary backing block 32 in place on the die platen to project from the rear face of the die platen 15. It will be seen that the backup block 32 and its retaining ring 35 constitute a part of the die platen 15 and this composite structure is referred to as a die platen in the claims.

A container holder 38 is slidably mounted on the angular bearing surfaces provided by the guide wear plates 25 intermediate the die platen 15 and the cylinder platen 16. As best shown in Figs. 3 and 4, this container holder 38 is provided with arms 39 having angular bearing faces 40 which slide on the guide wear plates 25 so that the container holder is movable horizontally lengthwise of the press. Additionally this container holder 38 is provided with a downward extension 41 at the centerline of the press and which has sliding engagement with a center rail 42 on the bed. The container holder is also made in two sections 38*a* and 38*b* which are separable to provide ready access to a central chamber 43 formed jointly in these two sections for housing the container 44.

In the operation of the press the container holder 38 is reciprocated lengthwise of the press on the guide wear plates 25 and the center rail 42. For this purpose a pair of piston rods 45 is fixed to the extremities of the arms 39 and project horizontally rearwardly therefrom and are connected with pistons (not shown) each contained within a cylinder 46 each secured to the die platen 15 and projecting rearwardly therefrom as best shown in Figs. 1 and 2.

The container 44 is of generally cylindrical form and to retain it in coaxial relation with the main plunger 23 it is provided with reduced end necks providing annular shoulders 47 which fit corresponding annular shoulders 48 formed in the two sections 38*a* and 38*b* of the container holder. The container 44 has a tapered bore receiving an externally tapered liner 49, this liner having a cylindrical bore 50 of the same diameter as the main plunger 23 with which it alines and which is adapted to receive the billet 51 (Fig. 6) as well as a dummy block 52 (Fig. 7). Bevels 53 are provided at opposite ends of the liner 49 around its bore 50.

Into the forward bevel 53 of the liner 49 is fitted the beveled rear end of an annular die holder 54, this die holder having at its forward end a concentric outwardly projecting annular flange 55 fitted in a U-shaped slot 56 between a U-shaped die holder receiver 57, and a swinging arm, indicated generally at 58 in a manner to be described in greater detail. This die holder 54 is provided with a tapered bore 59 which enlarges in a forward direction or away from the main plunger 23 and in the smaller or rear end of this tapered bore 59 is fitted the die 60. The periphery of this die is tapered to fit the bore 59 and it is provided with a central opening 61 of cross sectional size and shape to conform to the cross sectional shape of the part being extruded. A die sleeve 62

is also fitted in the tapered bore 59 of the die holder 53, this die sleeve being externally tapered to fit this bore 59 and having an internally rearwardly enlarging bore 63. The rear end of the die sleeve 62 fits against a small front backup block 64 fitted in a bore provided in the swinging arm 58 and having a bore 65 alining with the bore 63 of the die sleeve 62. This small front backup block 64 is backed by an intermediate backup block 68 fitted in a counterbore 69 in the swinging arm 58 and shown as held thereon by a set screw 70. The rear face of this intermediate backup block 68 is coplanar with the rear face of the swinging arm 58 and both are backed and slidingly engage the front face of the rear and largest backup block 32 previously described as forming part of the cylinder platen 15. The intermediate backup block 68 is provided with a rearwardly enlarging tapered bore 71 registering with the bores 65 and 34 of its companion front and rear backup blocks 64 and 32, respectively.

In the extrusion of the part, a discard 72 is left at the end of the extruded part or piece 73. This discard must be severed from the extruded part and removed, together with the die, preparatory to the next extrusion.

To sever the discard 72, a rotary saw blade 75 is employed. This saw blade 75 is fast to a spindle 76 journalled on the end of a swinging saw arm 78 and fast to a sprocket 79. This sprocket is connected by a drive chain 80 with the drive sprocket 81 on the shaft of an electric motor 82, the latter being mounted on the saw arm 78. The saw arm 78 is journalled, by a bearing 83 near its center, on one of the main horizontal columns 18 of the main section of the press. The tail end of the saw arm is pivotally connected at 84 to the upper end of the piston rod 85 of a generally vertical hydraulic cylinder 86, the latter being pivoted at 88 to the upper end of a standard 89 rising from the bed 14 of the press. The axes of the several pivots and of the saw blade are arranged so that the saw blade 75 is moved from the elevated inoperative full line position shown in Fig. 4 to the depressed dotted line position shown in this figure so as to saw through the extrusion and sever the discard 72 from the extruded piece 73.

The invention is essentially concerned with the removal of the discard 72 and also the die holder 54 together with its die 60 and die sleeve 62 immediately following each extruding operation.

To this end the swinging arm 58 is journalled by a bearing 90 on one of the lower horizontal columns 18 of the main section of the press and is swung about the axis of this column by a piston rod 91 pivoted to the swinging arm 58 at 92, the piston rod being fast to a piston contained in a hydraulic cylinder 93. This hydraulic cylinder 93 is shown as pivoted, as at 94 to a bracket 95 on the bed 14 of the press.

The swinging arm is of segmental shape and, as previously indicated, has fast to its rear face the U-shaped die holder receiver 57. For ready removability, this U-shaped die holder receiver 57 is mounted on two horizontal pins 96 (Fig. 5) which project rearwardly from the swinging arm 58 through holes provided in the two arms of the U-shaped die holder receiver. The die holder receiver 57 is retained on these pins 96 by a pair of locking pins 98 each of which is removably fitted in a bore extending lengthwise of one of the legs of the U-shaped die holder receiver and through a transverse hole through the corresponding pin 96. It will be seen that upon pulling out the pins 98, the U-shaped die holder receiver 57 is free to be removed rearwardly from the pair of pins 96. Such removal is facilitated by heads 99 provided for each locking pin 98.

The swinging arm 58 is adequately supported against the forward force imposed thereon in extruding a shape by virtue of the engagement of its forward face with the rear face the largest or rear backup block 32. However this swinging arm is also subject to reverse or rearward forces as in withdrawing the dischard 72 and extruded shape 73 to a position to be sawed by the saw blade 75. To resist such backward forces imposed against the free end of the swinging arm 58, an arcuate bar 101 is secured to the retaining ring 35 on the die platen with its inner face closely adjacent the periphery of the swinging arm 58 and arranged concentric with the axis of this swinging arm 58. To the rear face of this arcuate bar is secured an arcuate plate 102 which extends along the rear face of the swinging arm 58 at its margin. Both the arcuate bar 101 and the arcuate plate 102 can be secured to the retaining ring 35 by screws 103. It will be seen that the arcuate plate 102, extending along the marginal portion of the rear face of the swinging arm 58, prevents rearward displacement of this swinging arm when it is subjected to backward forces.

To guide the discard 72 on being ejected from the press, the swinging arm is provided along its lower edge, as viewed in Fig. 5 with a semicircular recess 105, which when swung into register with the axis of extrusion opens downwardly. To avoid wear of this recess 105 by the discards 72 it is preferably provided with a U-shaped liner 106 having a U-shaped recess 108 generally conforming to the semicircular recess 105. The discard 72 is ejected into this U-shaped recess 108 when the recesses 105 and 108 are so registered and it will be seen that the U-shaped recess 108 guides the discard to fall directly downwardly. In falling from this U-shaped recess 108, the discard falls into the upper end of a discard chute 109.

In the event the extrusion 73 sticks in the die 60, means are provided for clamping the die holder 54 to the billet container holder 38 so that the stuck parts can be pulled back far enough to saw off the extrusion 73 on the front side of the die holder 54. To this end a plurality of pairs of lugs 110 are secured to the forward face of the billet container holder 38, each pair being radially disposed with respect to the axis of extrusion. The lugs 110 of each pair are severally provided with aligning threaded holes 111 also radially disposed with respect to the axis of extrusion. Each pair of these threaded holes 111 receive a long clamping screw 112 which screws, when tightened down into engagement with the periphery of the die holder 54, clamping this die holder to the billet container holder 38.

Operation

A succession of die assemblies are used in the extrusion of the metal shapes, it being necessary to cool and clean each die assembly following each extrusion. Each of these die assemblies consists of the circular die holder 54 with its annular flange 55, and the die 60 and die sleeve 62 mounted thereon.

With the swinging arm 58 in the dotted line position shown in Fig. 5, the operator inserts such a die assembly in the U-shaped die holder receiver 57, after removing the die assembly used in the previous extrusion. The die assembly is inserted with its annular flange 55 entering the U-shaped groove or slot 56 formed between the U-shaped die holder receiver 57 and the front backup block 64. When fully inserted in this U-shaped slot or groove 56, the die opening 61 is in concentric register with the bore 50 of the liner 49 and also with the bores 65, 71 and 34 of the front, inetrmediate and rear backup blocks 64, 68 and 32, respectively. The die holder 54 also protrudes rearwardly when the die assembly is so fully inserted in the groove or slot 56.

At the time of so loading the die assembly, the billet container holder 38 has been retracted toward the cylinder platen 16, this being accomplished by fluid pressure in the cylinders 46 exerted against the piston rods 45 of the billet container holder and the billet container holder sliding on the guide wear plates 25 and center track 42. With the billet container holder 38 so retracted, the operator then swings the swinging arm 58 to the full line position shown in Fig. 5 in which position the die assembly is in axial alinement with the bore 50

of the liner 49 of the billet container 44 and also with the bores 65, 71 and 34 of the front, intermediate and rear backup blocks 64, 68 and 32, respectively. With the die assembly in this position it will also be noted that the front faces of the die holder 54 and its die sleeve 62 are solidly against the rear face of the rear backup block 64. The swinging arm 58 is so swung by the introduction of fluid pressure within the cylinder 93 (Fig. 5) to move its piston rod 91 and the swinging arm 58 in a corresponding direction.

Contemporaneously with so loading the die assembly a billet 51 is also brought in line with the bore 50 of the liner 49 of the container 44 by a billet loader (not shown) which also inserts the billet 51 in the bore 50 of the container 44. At this time the dummy block 52 is also arranged in line with the billet to also be inserted in the bore 50 in rear of the billet. The dummy block 52 is then pushed into the bore 50 by forward movement of the plunger 23 of the main ram 21. This forward movement of the main ram 21 and plunger 23 is effected through introduction of fluid pressure in the main cylinder 19 and while the plunger 23 is so moving forwardly to push the billet 51 and dummy block 52 into the bore 50, the billet container holder 38 is also being moved forwardly along the guide wear plates 25 and center rail 42 by introduction of fluid pressure into the cylinders 46 housing the pistons for the piston rods 45 of the billet container holder 38. The billet container holder 38 is so moved forwardly until the front bevel 53 of its liner 49 is firmly engaged with the rear bevel of the die holder 54. This position of the parts is illustrated in Fig. 6.

Following this full pressure is introduced in the main cylinder 19 to drive the ram 21 and plunger 23 forwardly. This plunger 23 moves forwardly in the liner 49 of the billet container and presses against the dummy block 52 at the rear end of the billet 51 so as to force the forward end of the billet through the die opening 61 in the die 60 and form the extrusion 73. The ram 21 encounters the rear face of the container 44 which forms a fixed stop so that a discard 72 is left attached to the extrusion 73. This position of the parts is illustrated in Fig. 7.

The operator then introduces fluid pressure in the cylinders 46 to move through the piston rods 45, the billet container holder 38 rearwardly against the cross head 22. This moves this main cross head 22 rearwardly; moves the main ram 21 and plunger 23 rearwardly; also, of course, the liner 49 of the container 44 and thereby (1) partly withdraws the extrusion 73 rearwardly through the opening 61 in the die 60 and (2) separates the mating beveled faces of the die holder 54 and the liner 49, thereby to expose the discard end of the extrusion. This position of the parts is illustrated in Fig. 8.

The operator then energizes the saw motor 82 and introduces fluid pressure in the cylinder 86 (Fig. 4) to swing the saw arm 78 and revolving saw blade 75 from the full to the dotted line position shown in this figure. This revolving saw blade 75 enters the space between the die 60 and liner 49 for the container 44, as illustrated in Fig. 8, and saws through the extrusion 73 so as to separate the discard 72 therefrom. The saw is then immediately returned to the starting position through fluid pressure applied to the cylinder 86.

The operator then introduces fluid pressure into the main cylinder 19 to move the main ram 21 forwardly. Since this main ram 21 is now engaged with the container holder 38, this container holder is moved forwardly on its ways 25, 42, and the main plunger 23, while held stationary with respect to the container holder 38, moves forwardly to push the extrusion 73 through and beyond the die 60 following which the extrusion 73 is removed from the press. This position of the parts is illustrated in Fig. 9.

The operator then introduces fluid pressure in the cylinders 46 so as to move, through the piston rods 45, the billet container holder 38, ram 21, main plunger 23, and discard 72 rearwardly. This again separates the mating faces of the liner 49 of the container 44 from the die holder 54 and spaces these parts as illustrated in Fig. 10. At the same time the discard 72 adheres to the liner 49 of the container 44 so that its stub end is withdrawn from the opening 61 in the die 60 as also illustrated in Fig. 10.

The operator then introduces fluid pressure in the cylinder 93 (Fig. 5) to move, through the piston rod 91, the swinging arm 58 from the full to the dotted line position shown in this figure. This (1) moves the die assembly, comprising the die holder 54, die 60 and die sleeve 62, to an elevated position where it is readily accessible for manual removal and (2) brings the recess 108 of the liner 106 (Fig. 5) into register with the axis of extrusion. The die assembly is then manually removed from the swinging arm 58, the operator having asbestos glove protection. This removal is effected by simply lifting the die assembly out, the U-shaped groove 56 of the U-shaped die holder receiver 57, in which the annular flange 55 of the die holder 54 is fitted, now opening upwardly and permitting such lifting out. The die assembly is then sent on for cleaning, cooling and reuse, and a fresh die assembly is inserted in its place in the groove 56 of the U-shaped holder.

The operator now admits fluid pressure to the main cylinder 19 to move the main ram 21 and plunger 23 forwardly, the container holder 38 remaining stationary or in the position shown in Fig. 10. This shoves the discard 72 and dummy block 52 out of the liner 49 of the billet container 44 and into the U-shaped recess of the liner 106 carried by the swinging arm 58. Since this U-shaped recess 108 is directed downwardly, the discard 73 and dummy block 52 fall, being guided by this recess so as to fall, as shown in Fig. 11 into the chute shown in Fig. 5.

The apparatus is now in the condition first assumed and ready for a repetition of the cycle of operation.

In the event the extrusion 73 sticks to the die 60, this condition is discovered when fluid pressure is introduced into the cylinders 46 to move, through the piston rods 45, the billet container holder 38 back along its ways 25, 42 and against the main ram 21 to pull back the extrusion 73 through the die opening 61 for sawing off the discard 72 as shown in Fig. 8. When this occurs (Fig. 3) the long screws 112 are turned in the radially alining threaded holes 111 of the several pairs of lugs 110 and tightened against the periphery of the die holder 54 so as to clamp this die holder to the billet container holder 38. The pins 96 and 99 for the U-shaped die holder retainer 57 (Fig. 5) are then withdrawn, this permitting this U-shaped retainer to drop out of the way. Fluid pressure is then admitted to the cylinders 46 to move, through the piston rods 45, the billet container holder 38 rearwardly along its ways 25 and 42. This rearward movement of this billet container and holder 38 is continued for an abnormal distance (as compared with the normal extent, Fig. 8) so as to carry the die assembly 54, 60, 62 rearwardly beyond the plane of the saw blade 75. The saw arm 78 (Fig. 4), with the saw motor 82 energized is now swung down, through fluid pressure admitted to the cylinder 86, to the dotted line position shown in Fig. 4 so that the extrusion 73 is sawed off this leaving an abnormally long neck on the discard 72 and which is, of course, stuck in the die 60. Pressure is then admitted to the cylinder 93 (Fig. 5) to swing the arm 58 upwardly to the dotted line position shown in Fig. 5. The screws 112 are then withdrawn so as to unclamp the die assembly 54, 60, 62, together with the discard 72 stuck therein and this drops into the chute 109.

From the foregoing it will be seen that the present invention provides an extrusion press in which the discard and die can rapidly be separately removed from the ex-

trusion and press following each extrusion thereby to increase the capacity of the press. It will further be seen that even when the extrusion sticks in the die, the die assembly with the discard stuck therein is readily removed from the extrusion and press.

We claim:

1. In a metal extrusion press having a die platen having an opening through which the extrusion is projected, a cylinder platen carrying a main cylinder having a main ram with a plunger projectable toward said opening, and a billet container holder interposed between said platens and movable therebetween parallel with the axis of said plunger and openings; the combination therewith of means for movably supporting the die for movement into and out of coaxial relation to said axis and between said die platen and billet container holder, comprising a swinging arm mounted to swing about an axis generally parallel but remote from said first axis and along the face of said die platen opposing said billet container holder and to swing to a position adjacent said first axis, said swinging arm having an opening positioned to be brought into and out of register with said first axis on swinging said swinging arm, a U-shaped die holder retainer arranged against the face of said swinging arm opposing said billet container holder with its arms embracing said opening in said swinging arm and projecting generally radially relative to the axis of said swinging arm and projecting upwardly when said opening in said swinging arm is so positioned, a conforming U-shaped groove provided around the inside of said U-shaped die holder retainer in the face opposing said swinging arm, an annular die holder for said die and having a radially outwardly projecting annular flange arranged to fit in said U-shaped groove, means arranged to swing said swinging arm, means arranged to secure said U-shaped die holder retainer to said swinging arm, comprising a first pair of pins generally parallel with said first axis projecting from the face of said swinging arm opposing said billet container holder severally through transverse holes provided in the arms of said U-shaped die holder retainer, and a second pair of pins each extending through a bore provided longitudinally in the corresponding arm of said U-shaped die holder retainer and through a hole provided in the corresponding pin of said first pair, said second pair of pins projecting and being withdrawable from the ends of the arms of said U-shaped die holder retainer, and means arranged to move said billet container holder parallel with said axis toward said die holder to compress said die holder against said die platen and away from said die holder to release it from compressed relation with said die platen.

2. In a metal extrusion press having a die platen having an opening through which the extrusion is projected, a cylinder platen carrying a main cylinder having a main ram with a plunger projectable toward said opening, and a billet container holder interposed between said platens and movable therebetween parallel with the axis of said plunger and opening; the combination therewith of means for movably supporting the die for movement into and out of coaxial relation to said axis and between said die platen and billet container holder, comprising a swinging arm mounted to swing about an axis generally parallel but remote from said first axis and along the face of said die platen opposing said billet container holder and to swing to a position adjacent said first axis, a die holder for said die, means removably securing said die holder to said swinging arm in a position to be brought into and out of register with said first axis, means arranged to swing said swinging arm, a clamping device mounted on said billet container holder and arranged to clamp said die holder to said billet container holder, and means arranged to move said billet container holder parallel with said axis toward said die holder to compress said die holder against said die platen and away from said die holder to release it from compressed relation with said die platen.

3. In a metal extrusion press having a die platen having an opening through which the extrusion is projected, a cylinder platen carrying a main cylinder having a main ram with a plunger projectable toward said opening, and a billet container holder interposed between said platens and movable therebetween parallel with the axis of said plunger and opening; the combination therewith of means for movably supporting the die for movement into and out of coaxial relation to said axis and between said die platen and billet container holder, comprising a swinging arm mounted to swing about an axis generally parallel but remote from said first axis and along the face of said die platen opposing said billet container holder and to swing to a position adjacent said first axis, a die holder for said die, means removably securing said die holder to said swinging arm in a position to be brought into and out of register with said first axis, means arranged to swing said swinging arm, a plurality of pairs of lugs projecting from the face of said billet container holder opposing said die platen, each pair of said lugs severally having threaded holes jointly alining with said first axis, a clamping screw in each of said pairs of threaded holes and engageable with said die holder to clamp said die holder to said billet container holder, and means arranged to move said billet container holder parallel with said axis toward said die holder to compress said die holder against said die platen and away from said die holder to relese it from compressed relation with said die platen.

4. In a metal extrusion press having a die platen having an opening through which the extrusion is projected, a cylinder platen carrying a main cylinder having a main ram with a plunger projectable toward said opening, and a billet container holder interposed between said platens and movable therebetween parallel with the axis of said plunger and opening; the combination therewith of means for movably supporting the die for movement into and out of coaxial relation to said axis and between said die platen and billet container holder, comprising a swinging arm mounted to swing about an axis generally parallel but remote from said first axis and along the face of said die platen opposing said billet container holder and to swing to a position adjacent said first axis, said swinging arm having an opening positioned to be brought into and out of register with said first axis on swinging said swinging arm, a U-shaped die holder retainer arranged against the face of said swinging arm opposing said billet container holder with its arms embracing said opening in said swinging arm and projecting generally radially relative to the axis of said swinging arm and projecting upwardly when said opening in said swinging arm is so positioned, a conforming U-shaped groove provided around the inside of said U-shaped die holder retainer in the face opposing said swinging arm, an annular die holder for said die and having a radially outwardly projecting annular flange arranged to fit in said U-shaped groove, means arranged to swing said swinging arm, means arranged to secure said U-shaped die holder retainer to said swinging arm, comprising a first pair of pins generally parallel with said first axis projecting from the face of said swinging arm opposing said billet container holder severally through transverse holes provided in the arms of said U-shaped die holder retainer, and a second pair of pins each extending through a bore provided longitudinally in the corresponding arm of said U-shaped die holder retainer and through a hole provided in the corresponding pin of said first pair, said second pair of pins projecting and being withdrawable from the ends of the arms of said U-shaped die holder retainer, a clamping device mounted on said billet container holder and arranged to clamp said die holder to said billet container holder, and means arranged to move said billet con-

tainer holder parallel with said axis toward said die holder to compress said die holder against said die platen and away from said die holder to release it from compressed relation with said die platen.

5. In a metal extrusion press having a die platen having an opening through which the extrusion is projected, a cylinder platen carrying a main cylinder having a main ram with a plunger projectable toward said opening, and a billet container holder interposed between said platens and movable therebetween parallel with the axis of said plunger and opening; the combination therewith of means for movably supporting the die for movement into and out of coaxial relation to said axis and between said die platen and billet container holder, comprising a swinging arm mounted to swing about an axis generally parallel but remote from said first axis and along the face of said die platen opposing said billet container holder and to swing to a position adjacent said first axis, a bore through said swinging arm positioned to be brought into and out of register with said first axis on swinging said swinging arm, said bore being provided with an enlarged counterbore at the end thereof adjacent said die platen, a large annular backup block having a coaxial opening therethrough and fixed in said counterbore and engaging the opposing face of said die platen, a smaller annular backup block having a coaxial opening therethrough and arranged in said bore and engaging the opposing face of said large backup block, a die holder for said die, means removably securing said die holder to the face of said swinging arm opposing said billet container holder in register with the opening in the smaller backup block and in mating engagement with the opposing face of said smaller backup block, and means arranged to swing said swinging arm, and means arranged to move said billet container holder parallel with said axis toward said die holder to compress said die holder against said die platen and away from said die holder to release it from compressed relation with said die platen.

6. In a metal extrusion press having a die platen having an opening through which the extrusion is projected, a cylinder platen carrying a main cylinder having a main ram with a plunger projectable toward said opening, and a billet container holder interposed between said platens and movable therebetween parallel with the axis of said plunger and opening; the combination therewith of means for movably supporting the die for movement into and out of coaxial relation to said axis and between said die platen and billet container holder and of means for guiding the discard of the extrusion from the press, comprising a swinging arm mounted to swing about an axis generally parallel but remote from said first axis and along the face of said die platen opposing said billet container holder and to swing to a position adjacent said first axis, a die holder for said die, means removably securing said die holder to said swinging arm in a position to be brought into and out of register with said first axis, means arranged to swing said swinging arm, said swinging arm also having a U-shaped recess therein arranged to be brought to a position in register with said first axis and when in said position opening downwardly to guide the discard withdrawn from said die holder to fall downwardly from the press, and means arranged to move said billet container holder parallel with said axis toward said die holder to compress said die holder against said die platen and away from said die holder to release it from compressed relation with said die platen.

7. In a metal extrusion press having a die platen having an opening through which the extrusion is projected, a cylinder platen carrying a main cylinder having a main ram with a plunger projectable toward said opening, and a billet container holder interposed between said platens and movable therebetween parallel with the axis of said plunger and opening; the combination therewith of means for movably supporting the die for movement into and out of coaxial relation to said axis and between said die platen and billet container holder and of means for guiding the discard of the extrusion from the press, comprising a swinging arm mounted to swing about an axis generally parallel but remote from said first axis and along the face of said die platen opposing said billet container holder and to swing to a position adjacent said first axis, said swinging arm having an opening positioned to be brought into and out of register with said first axis on swinging said swinging arm, a U-shaped die holder retainer arranged against the face of said swinging arm opposing said billet container holder with its arms embracing said opening in said swinging arm and projecting generally radially relative to the axis of said swinging arm and projecting upwardly when said opening in said swinging arm is so positioned, a U-shaped groove provided around the inside of said U-shaped die holder retainer in the face opposing said swinging arm, means arranged to removably secure said U-shaped die holder retainer to said swinging arm, an annular die holder for said die and having a radially outwardly projecting annular flange arranged to fit in said U-shaped groove, means arranged to swing said swinging arm, said swinging arm also having a U-shaped recess therein arranged to be brought to a position in register with said first axis and when in said position opening downwardly to guide the discard withdrawn from said die holder to fall downwardly from the press, and means arranged to move said billet container holder parallel with said axis toward said die holder to compress said die holder against said die platen and away from said die holder to release it from compressed relation with said die platen.

References Cited in the file of this patent

UNITED STATES PATENTS

888,299	Benjamin	May 19, 1908
1,935,286	Born	Nov. 14, 1933
2,172,867	Dreyer	Sept. 12, 1939
2,176,364	Skinner et al.	Oct. 17, 1939
2,188,076	Dinzl	Jan. 23, 1940