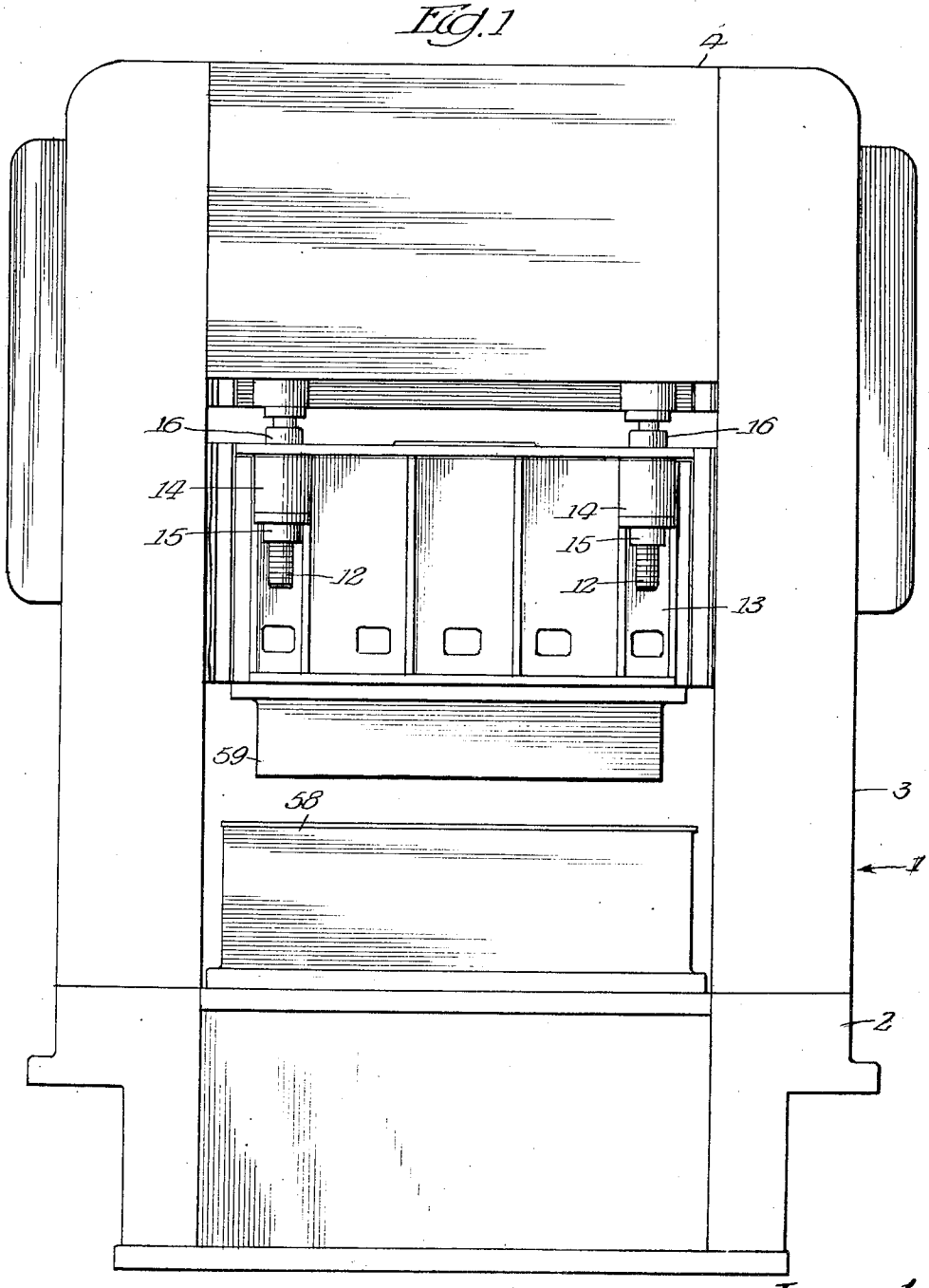
April 24, 1951 W. E. WARD 2,550,064

DOUBLE ACTION METAL DRAWING PRESS

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Fig. 1



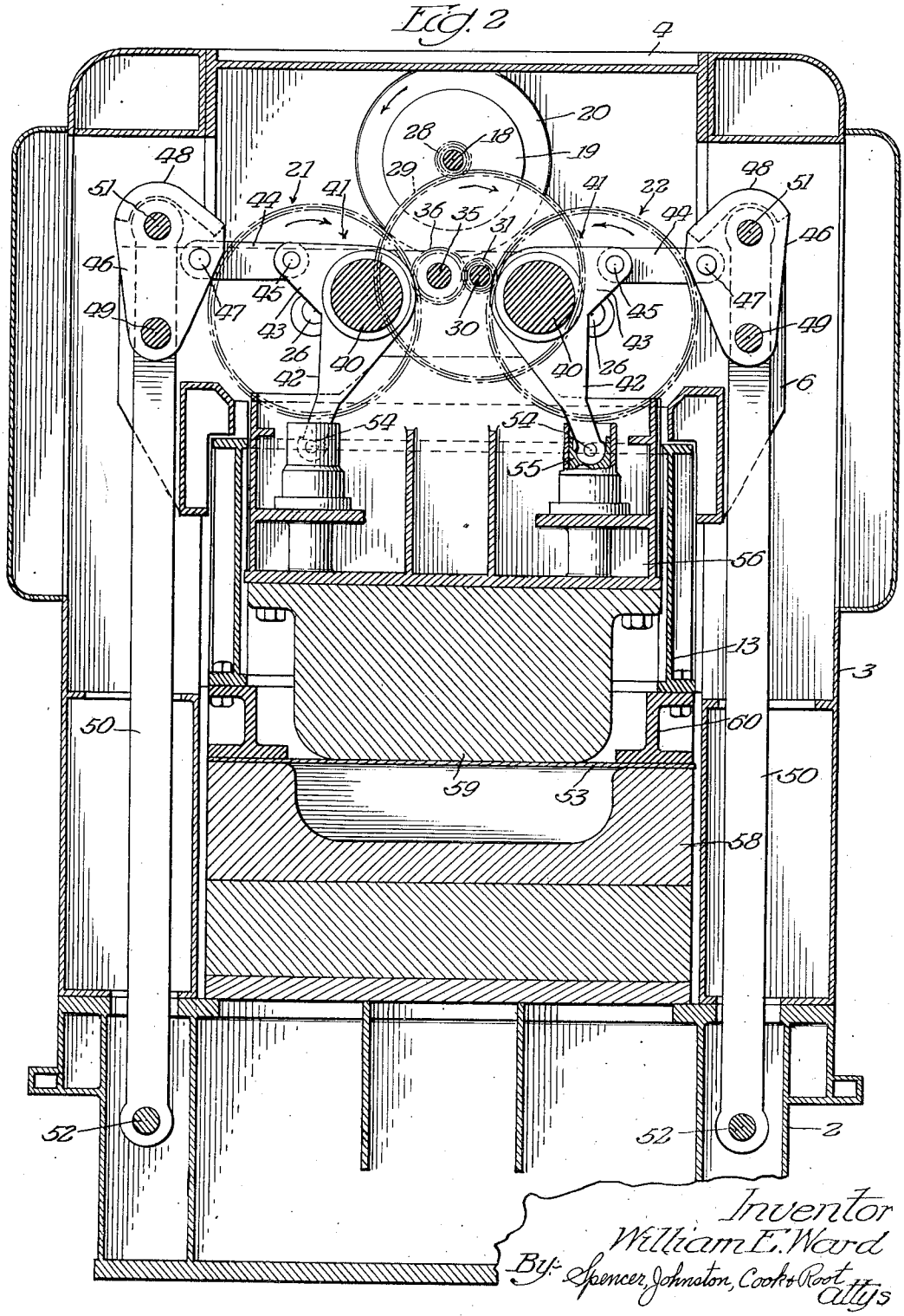
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DOUBLE ACTION METAL DRAWING PRESS

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Fig. 2



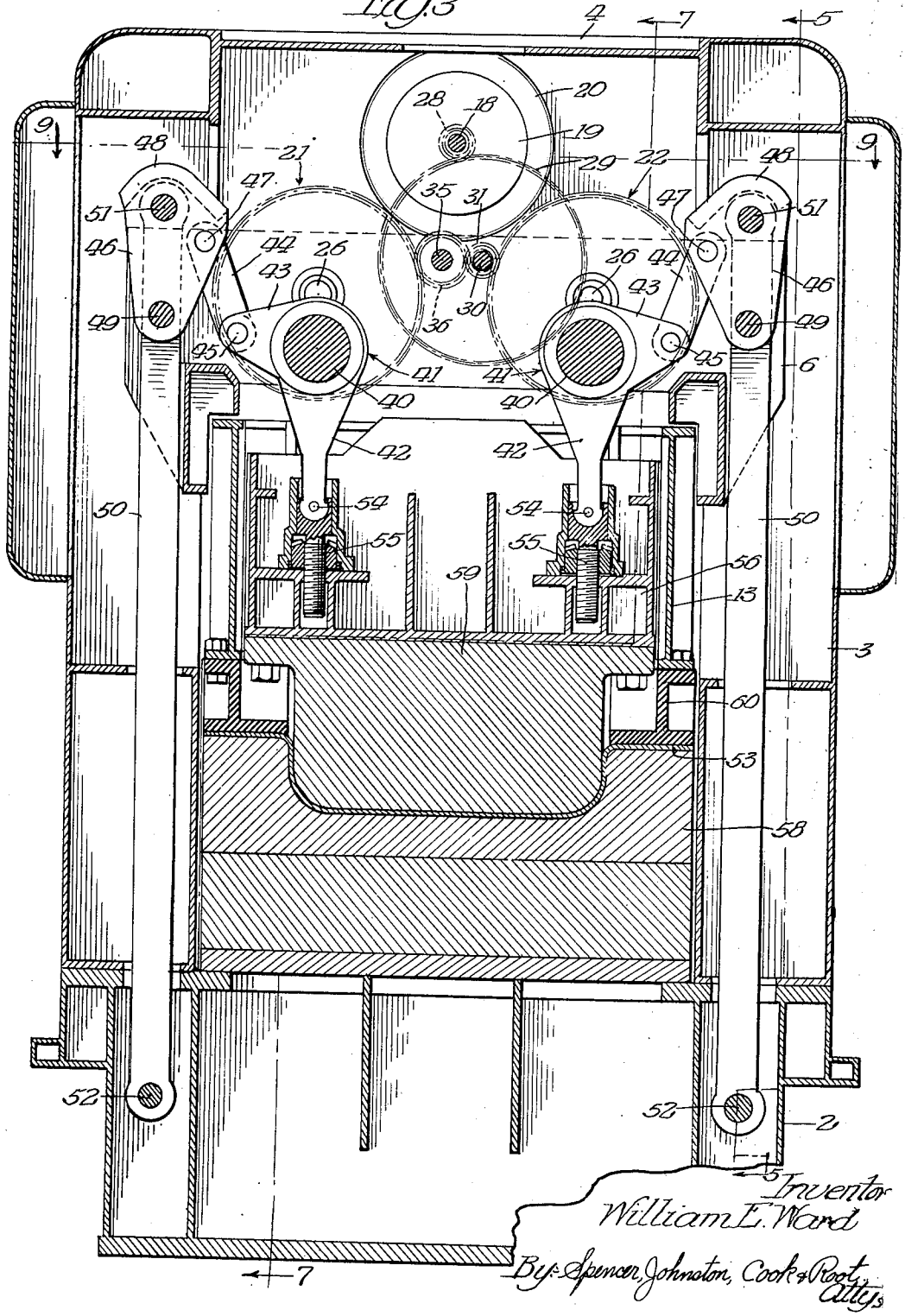
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DOUBLE ACTION METAL DRAWING PRESS

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FIG. 3



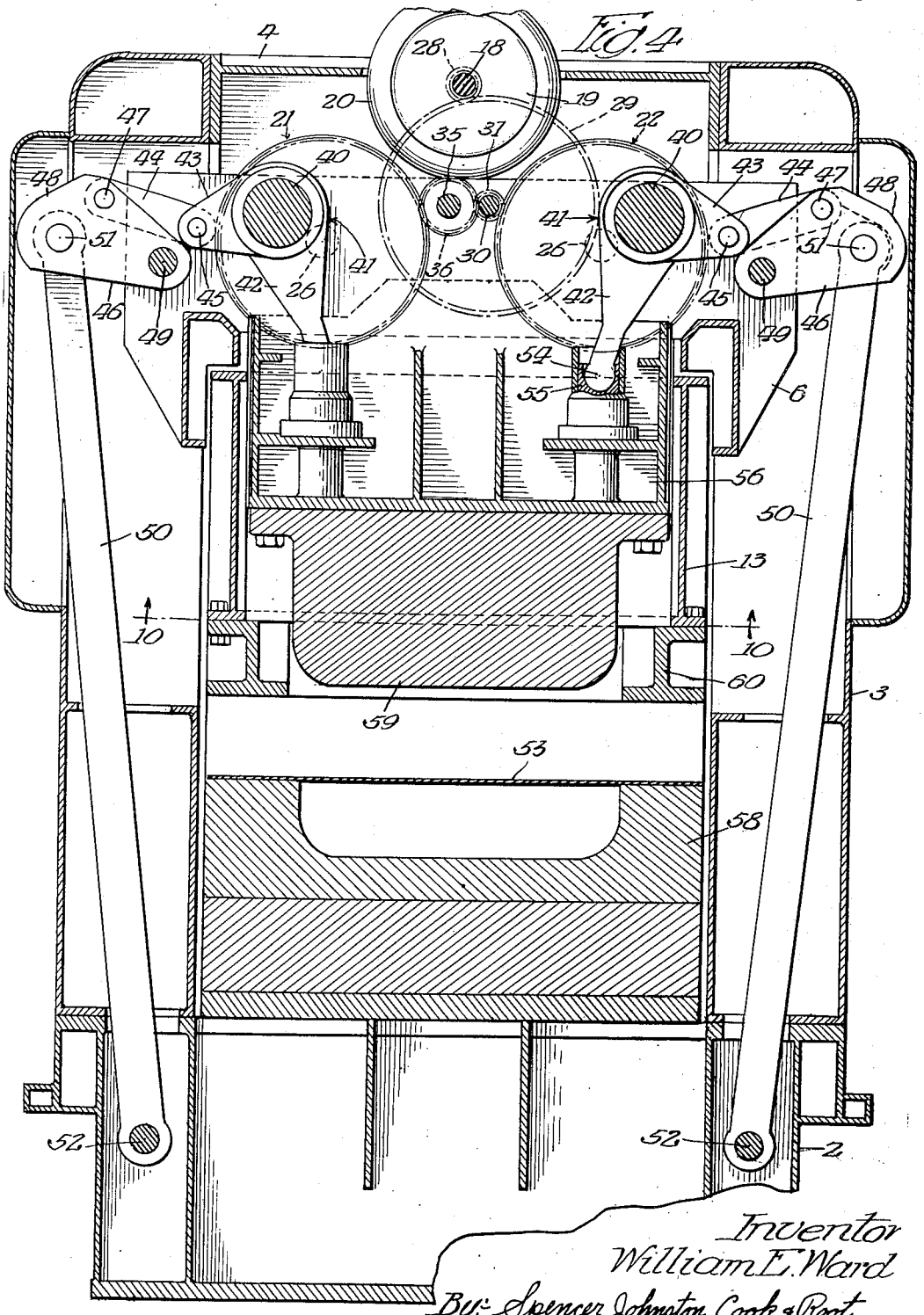
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DOUBLE ACTION METAL DRAWING PRESS

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Fig. 4.



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Fig. 5

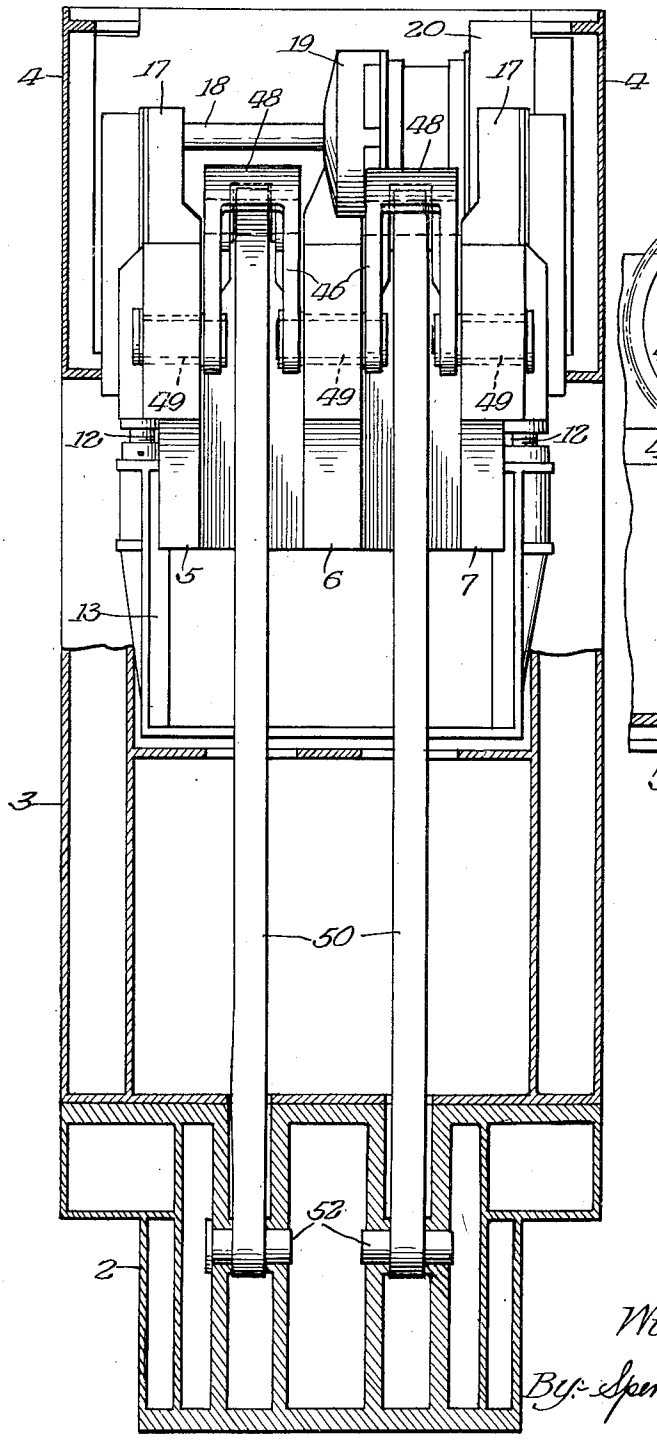
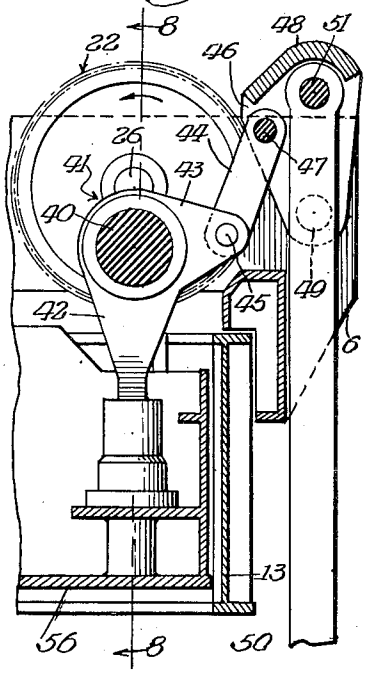


Fig. 6



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FIG. 7

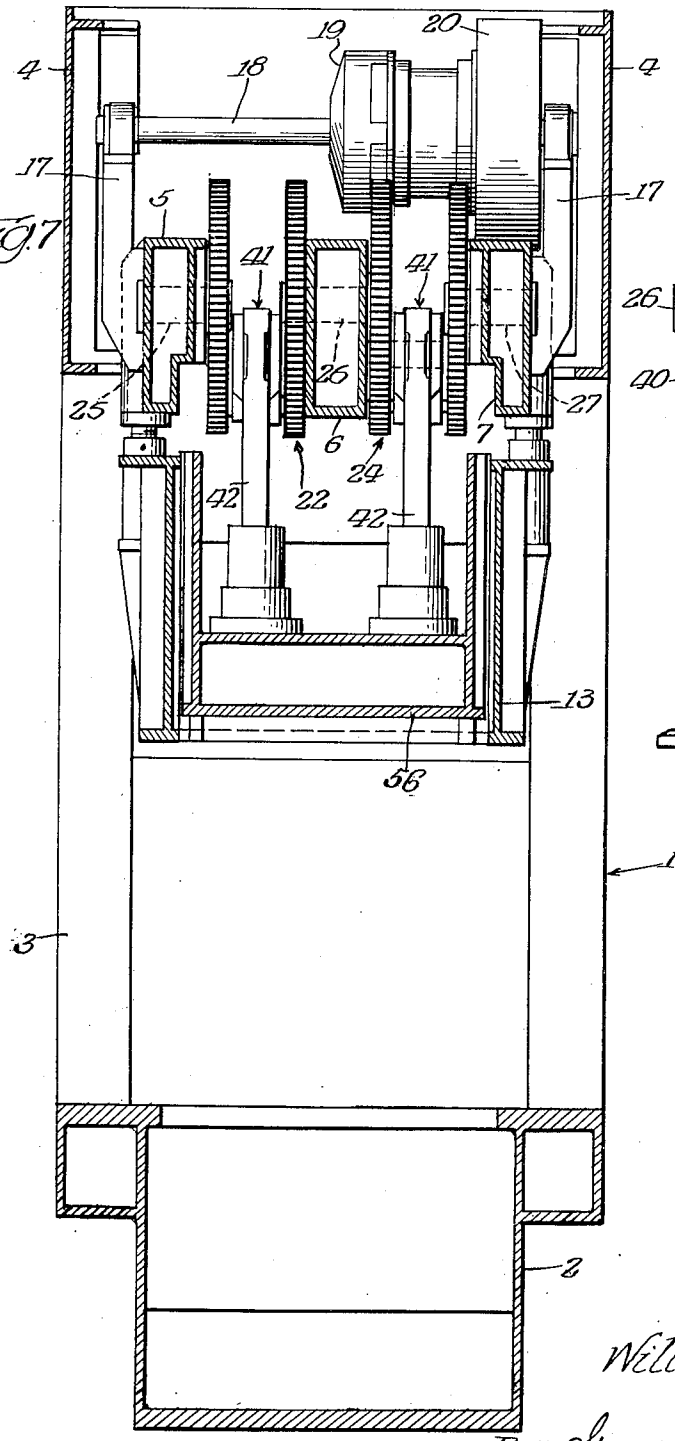
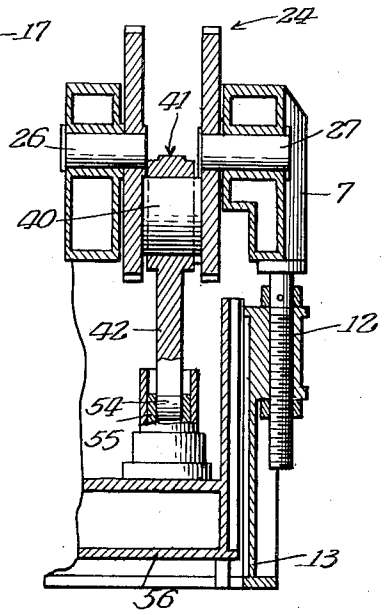


FIG. 8



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Fig. 9

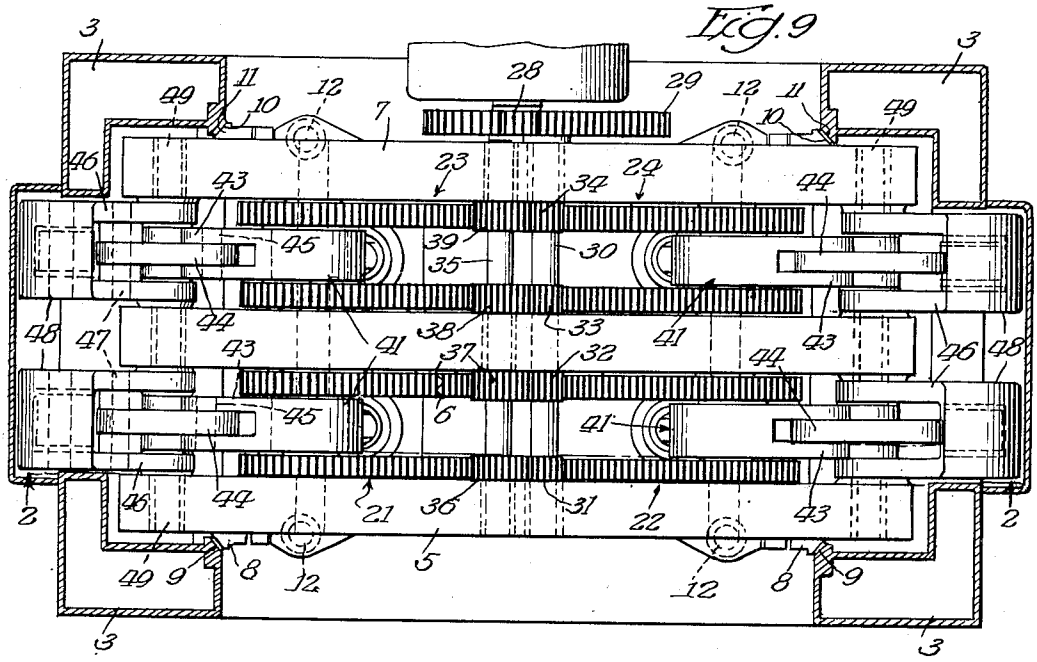
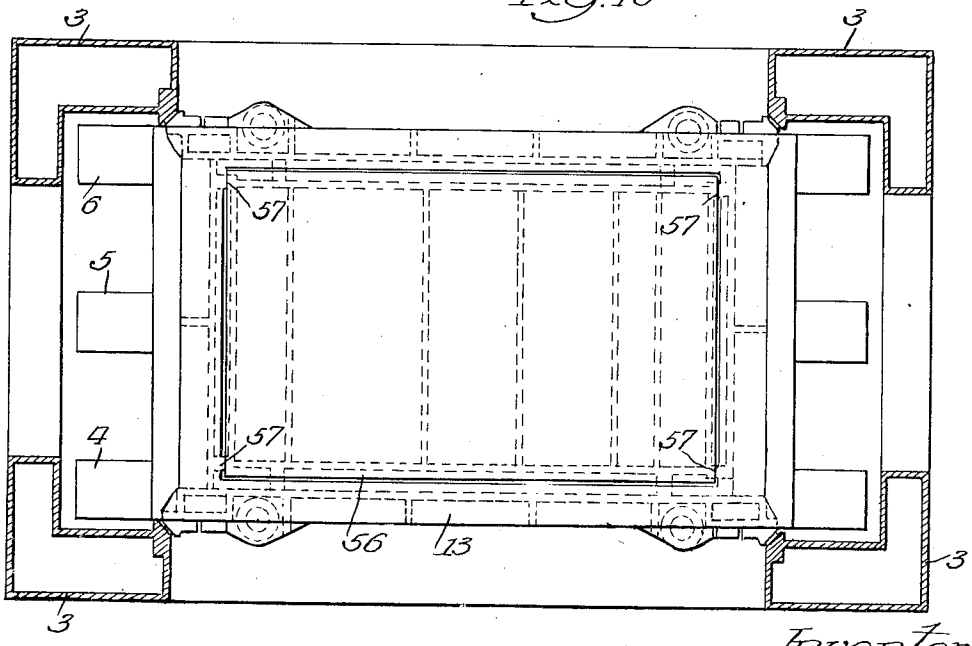


Fig. 10



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Fig. 11

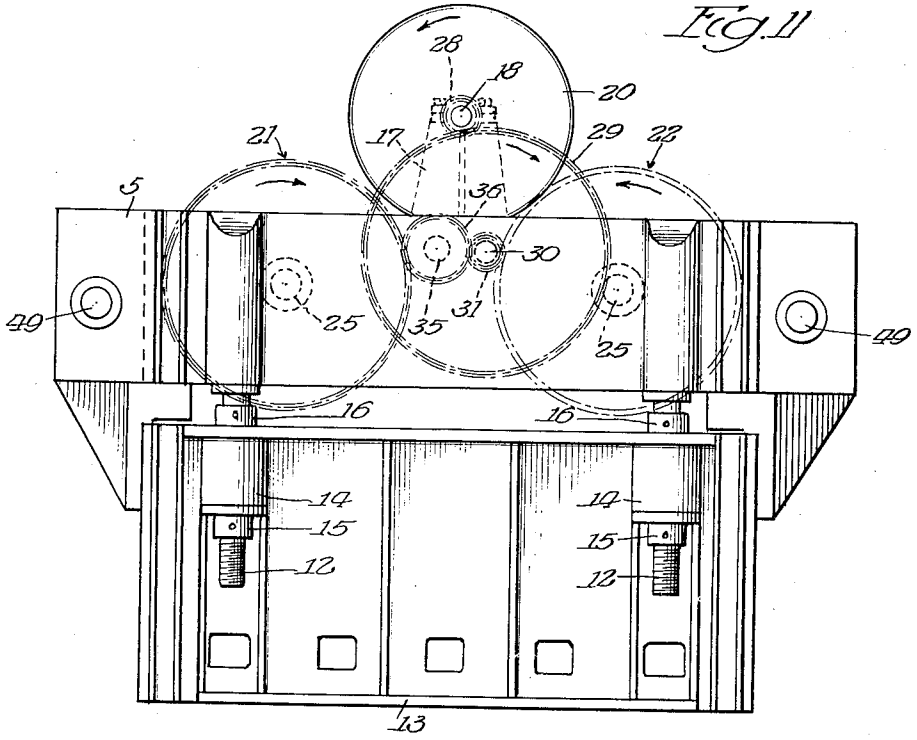
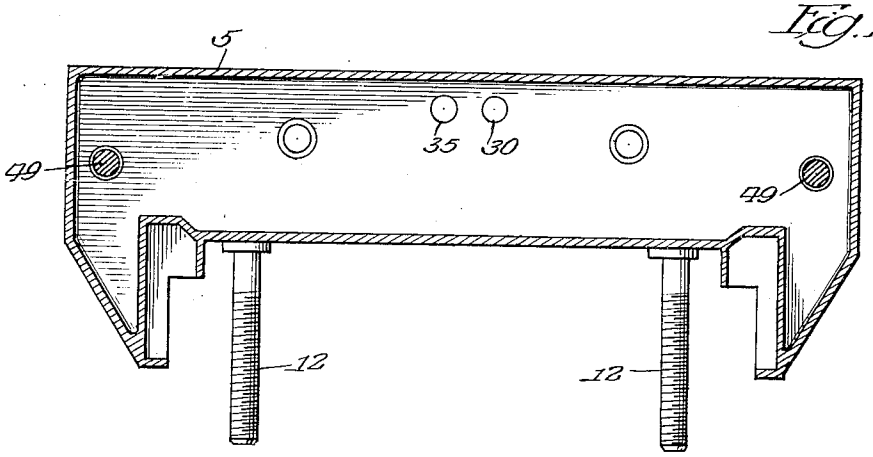


Fig. 12



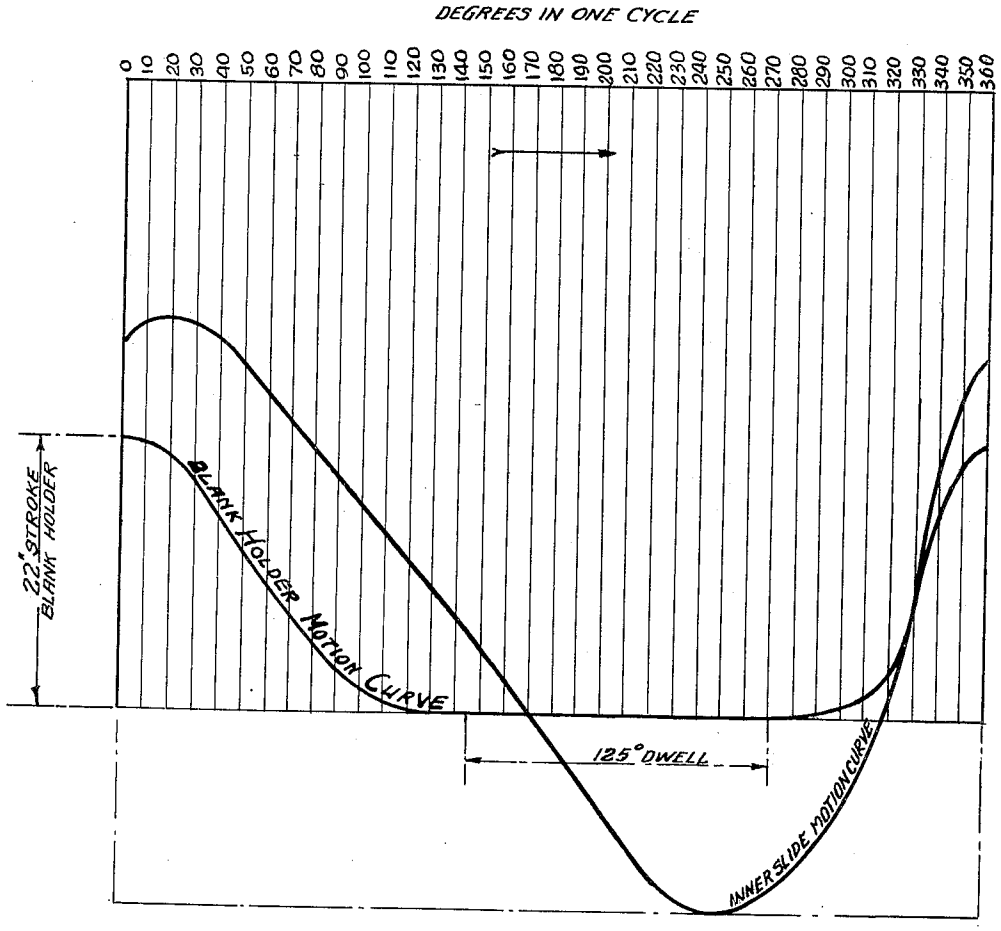
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DOUBLE ACTION METAL DRAWING PRESS

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Fig. 13



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Patented Apr. 24, 1951

2,550,064

UNITED STATES PATENT OFFICE

2,550,064

DOUBLE-ACTION METAL DRAWING PRESS

William E. Ward, Cleveland, Ohio, assignor to Clearing Machine Corporation, Chicago, Ill., a corporation of Illinois

Application August 7, 1950, Serial No. 177,983

8 Claims. (Cl. 113—38)

1

This invention relates in general to presses of the type for forming, shaping or drawing sheet metal and, particularly, to mechanically operated presses for performing such functions as distinguished from hydraulically operated presses. More specifically, the invention relates to mechanically operated presses of the so-called double action type consisting only of an outer or blank holding slide and an inner or draw slide, although the mechanism of the invention may also be embodied in a triple action press without departing from the spirit thereof by the addition of a third action draw slide located in the press bed.

Mechanically operated metal drawing presses of the double-action type as presently used employ an outer slide or blank holder which clamps a sheet metal blank or work piece, and an inner slide which forms, draws or shapes the sheet metal blank after it has been clamped in position by the outer clamping slide. These present presses have proven very satisfactory in general, but they have the disadvantage in that they are unable to produce the desired production quantity principally because the number of operating cycles per period of time is limited. The inadequacy of the number of operations or operating cycles per period of time retards the production line and, therefore, limits and prevents rapid production. The reasons for the lack of more rapid production because of the limited number of cycles of operation within a given time limit is due to the construction, position and arrangement of the parts. These prior mechanical presses are ordinarily operated by a crank or eccentric, and the forming or drawing of the sheet metal must be consistent with the type of sheet metal which is now available. The present available sheet steel ordinarily has an approximate drawing or flowing speed of about sixty feet per minute; therefore, the actual speed of the drawing sheet steel is limited by the flowing or draw speed of the metal. Should the draw speed of the metal be increased, the sheet metal would fracture, break or otherwise prevent a proper metal draw.

Conventional mechanical crank operated metal presses, therefore, have the disadvantage in that the throw of the crank determines the depth of the draw, or the depth of the draw to be performed on the metal determines the throw of the crank to be used. For instance, should a metal draw of twelve inches be required, the vertical movement of the inner or draw slide must be at least twenty-four inches, plus and additional amount to permit the finished drawn metal or article to be withdrawn from the dies. The metal draw slide must move twelve inches from the point it first engages the blank to finish the twelve inch draw. The draw slide must then be raised twelve inches to withdraw it from the finished piece where it will be at the same point where the metal drawing operation began. It is then necessary to raise the draw slide an additional twelve inches so that the finished or drawn sheet may be withdrawn from the press. Of course, there must be more than twenty-four inches over-all travel so that the finished drawn piece may be withdrawn freely from the press. In any event, the metal drawing slide must have at least a twenty-four inch travel or movement for a twelve inch metal draw. The crank which operates a draw slide to form a twelve inch draw must necessarily have at least a twenty-four inch stroke, inasmuch as the crank rotates and the crank connections operate in a circular path, the actual circumference of the circle about which the crank connection travels in one cycle of the press will be diameter times pi ($2\times3.1416-$) or approximately 6.2832 feet. The drawing speed of sheet steel as used at the present time having an approximate speed of only sixty feet per minute, the movement of the crank must be limited in speed according to the maximum drawing speed of the metal, viz., sixty feet per minute. Therefore, to effect a twelve inch draw, the peripheral rotative speed of the crank will be 6.2832 feet per minute. Because the maximum metal drawing speed of the metal is limited to approximately sixty feet per minute, the number of cycles that the machine can perform with a crank of this given size is 60 divided by 6.2832 or approximately nine and one-half (9.54) cycles per minute.

Being limited by the length of the depth of the draw, and the speed at which metal may be drawn, the crank must have a proportional throw and, therefore, it is impossible to increase the production rate of the present crank-operated presses.

The present invention has to do with increased production of metal drawn articles without increasing the actual drawing speed of the metal, the metal drawing operation still being limited by the conventional type of sheet steel available which has an approximate drawing speed of sixty feet per minute.

The result of increased production without increasing the actual drawing speed of the metal may be accomplished in various specific ways. One design of a mechanism for accomplishing

this result is disclosed in the co-pending application of Rudolph W. Glasner and Einar K. Johansen, Serial No. 122,208, filed October 19, 1949, assigned to the same assignee as the present invention.

Still other ways in which the result of increased production may be accomplished in a double action mechanical press are disclosed in the co-pending applications of Einar K. Johansen, Serial Numbers 177,981 and 177,982, both filed August 7, 1950, also assigned to the same assignee.

The primary object of the present invention, therefore, is to maintain the present drawing speed to which sheet steel is limited, but to provide a new system of operating mechanism to effect a greater number of cycles of operation of a mechanical press over a given period of time.

Another object of the invention is the provision of new and improved operating mechanism for a double action press whereby simultaneous travel of the blank holder slide and draw slide is effected to the point of blank clamping position of the outer slide, and whereby the draw slide continues to move to effect the draw while the blank holder slide is in clamping position, whereupon the draw slide is withdrawn slightly from its position after completion of the draw and then both slides move simultaneously to their original positions.

A further object of the invention is the provision of new and improved means for operating the blank holder slide and the inner or draw slide of a double action press, the draw slide having a metal drawing speed not exceeding the maximum draw speed of the metal but increasing the number of operating cycles per minute over the conventional mechanically operated double action press.

A still further object of the invention is the provision of new and improved mechanism for operating a mechanical double action metal drawing press so as to increase the number of cycles of operation of the draw slide for a given period of time without exceeding the maximum draw speed of the metal blank. The construction is such that the bed of the press is allowed to be maintained at its usual lower position with the draw slide and blank holder slide operating above the press bed, whereby the finished and completed drawn article may be withdrawn from the press in the usual manner without inverting the dies.

Still another object of the invention is the provision of a new and improved mechanism for operating the draw slide of a mechanical press so as to increase the number of operating cycles per minute by reducing the usual effective vertical movement of the draw slide by eliminating the ordinary crank throw employed in connection with the conventional crank type operated draw slide and causing the draw slide to move downwardly with the blank holder slide during the initial portion of the cycle and to move upwardly therewith at the completion of the drawing operation.

A still further object of the invention resides in the mechanical connections between the driving mechanism and the two slides, whereby a single drive means may be utilized for driving the actuating mechanism to effect the movement of the two slides, as described hereinabove.

Another object of the invention is to provide a new and improved form of slide actuating mechanism which is mounted for movement with the blank holder slide wherein the same actuating mechanism is utilized for operating the draw slide.

Still another and more specific object of the invention is to provide in a double action mechanical metal working press a new and improved form of slide actuating mechanism wherein a part of the mechanism is connected with the draw slide and another part thereof is connected with an auxiliary slide to which the blank holder slide is appended, whereby the draw slide will move downwardly with the blank holder slide from the initial position thereof to clamping position and will return with the blank holder slide to initial position after completion of the drawing operation.

Other objects and advantages of the invention will become apparent upon reading the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a front elevational view of a press embodying the present invention;

Fig. 2 is a vertical sectional view through the press showing some of the parts in section and some in elevation and taken substantially along the plane of line 2—2 of Fig. 9, the slide actuating mechanism being shown in position at the beginning of the drawing operation;

Fig. 3 is a vertical sectional view similar to Fig. 2 but showing the slide actuating mechanism in position at the completion of the drawing operation;

Fig. 4 is a view similar to Figs. 2 and 3 showing the slide actuating mechanism in position where the blank holder slide is at the top of its stroke;

Fig. 5 is a vertical transverse sectional view taken substantially along the plane of line 5—5 of Fig. 3;

Fig. 6 is a fragmentary vertical sectional view showing one of the slide actuating mechanisms in position with the draw slide at the completion of the drawing operation;

Fig. 7 is a vertical transverse sectional view taken substantially along the plane of line 7—7 of Fig. 3;

Fig. 8 is a fragmentary vertical transverse sectional view taken substantially along the plane of line 8—8 of Fig. 6;

Fig. 9 is a horizontal sectional view taken substantially along the plane of line 9—9 of Fig. 3;

Fig. 10 is a horizontal sectional view taken substantially along the plane of line 10—10 of Fig. 4 looking in the direction of the arrows;

Fig. 11 is an elevational view of the auxiliary slide showing the blank holder slide mounted thereon;

Fig. 12 is a vertical longitudinal sectional view through one of the members which make up the auxiliary slide; and

Fig. 13 is a motion curve illustrating the relative movements of the blank holder slide and the draw slide.

Briefly described, the present invention involves the novel expedient of utilizing an auxiliary slide on which the blank holder slide is mounted and on which the slide actuating mechanism is also mounted for movement therewith. Conventional double action metal working presses customarily have the slide actuating mechanism mounted either in the crown or in the base of the press and the slides reciprocate with respect thereto. The slide actuating mechanism embodied in the present invention, as well as the drive means including the motor, are mounted for reciprocation with the blank holder slide. The same actuating mechanism is utilized to

reciprocate both the blank holder slide and the draw slide, as will be more apparent hereinafter.

Referring now more particularly to the drawings, the press embodying the present invention consists of a press frame 1 including a bed 2, side members 3 and spaced crown members 4 secured together by any suitable means. It is unnecessary to utilize a tie rod construction in the press of this invention.

An auxiliary slide is mounted for reciprocation within the press frame and constitutes a plurality of spaced members 5, 6 and 7 (Figs. 5 and 9). These members making up the auxiliary slide may be secured together by any suitable means, such as bolts, as well as the various shafts which extend therethrough, and on which the gears of the actuating mechanism are mounted. The auxiliary slide and blank holder slide mounted thereon are provided at one side thereof with guide members 8 cooperating with guideways 9 located in the side members 3. The opposite side of the auxiliary slide and blank holder slide have similar guides 10 cooperating with guideways 11 in the side members 3, whereby to guide the auxiliary slide and blank holder slide in their reciprocating movements.

The auxiliary slide made up of the members 5, 6 and 7 is provided with a plurality of downwardly extending adjusting screws 12 on which the blank holder slide 13 is adjustably mounted. The number of these adjusting screws 12 may vary, if desired, depending upon the size of the press, but in the present instance four such screws 12 have been shown for purposes of illustration.

The blank holder slide 13 is provided with a plurality of bosses 14 adapted to receive the adjusting screws 12. Adjusting nuts 15 and 16 are disposed respectively below and above each of the bosses 14 whereby the blank holder slide 13 may be held in any adjusted position.

The entire slide actuating mechanism including the various gear trains, motor, flywheel and clutch are carried entirely by the auxiliary slide. The upper side of each of the outer members 5 and 7 of the auxiliary slide has a mounting member 17 thereon in which the ends of a shaft 18 are journaled for rotation. The clutch 19 is adapted to be engaged in any suitable and well-known manner for the purpose of driving flywheel 20 and the remainder of the slide actuating mechanism by means of a motor (not shown) also mounted at any suitable place on the auxiliary slide.

The slide actuating mechanism consists, in the present instance, of four sets of eccentric gear devices indicated generally at 21, 22, 23 and 24 (Fig. 9). Each eccentric gear device comprises a pair of spaced gears. The outer gear of each set 21, 22 is mounted for rotation on a pin or stub shaft 25 journaled in the member 5 of the auxiliary slide. The inner gear of each set 21 and 22 and the inner gear of each set 23 and 24 is mounted on a shaft 26 journaled in the intermediate member 6 of the auxiliary slide. The outer gear of each set 23, 24 is mounted on a pin or stub shaft 27 journaled in member 7 of the auxiliary slide (Fig. 7).

Shaft 18 has mounted adjacent one end thereof a pinion 28 in mesh with gear 29 mounted on shaft 30 (Figs. 2, 3, 4 and 9). Four pinions 31, 32, 33 and 34 are spaced along shaft 30 and are secured thereto and each pinion engages one of the gears of gear sets 22, 24. A second shaft 35 also mounted in the auxiliary slide and parallel with shaft 30 has mounted thereon four pinions 36, 37, 38 and 39. Each of these latter pinions is in mesh with one of the pinions 31, 32, 33 or 34 (Fig. 9).

Thus far it will be evident that engagement of clutch 19 to rotate shaft 18 will drive shaft 30 through pinion 28 and gear 29. Rotation of shaft 30 will carry with it the pinions 31, 32, 33 and 34 so that the gears on the right-hand side of the press, as viewed in Figs. 2, 3, 4 and 9, will rotate in the direction indicated by the arrow. The engagement of pinions 36, 37, 38 and 39 with the gears of the gear sets 21 and 23 and with the respective pinions 31, 32, 33 and 34 will thereupon cause rotation of the gears in sets 21 and 23 at the left-hand side of the press, as viewed in Figs. 2, 3, 4 and 9 in the opposite direction to the direction of rotation of the gears at the right-hand side of the press.

An eccentric pin 40 is connected between each of the gear sets 21, 22, 23 and 24. Each eccentric pin 40 has mounted thereon a bell crank lever 41 provided with arms 42 and 43. The outer end of arm 43 is pivotally secured to a link 44 by means of pivot pin 45. The outer end of link 44 is pivotally connected to a rocker member 46 by means of a pivot pin 47. Rocker member 46 is preferably constructed with spaced side members connected together at the top thereof by means of a connecting web 48. Each rocker member 46 is pivotally connected at each side thereof to the auxiliary slide between the individual members 5, 6 and 7 thereof by means of pins 49 (Fig. 5). A link 50 is associated with each rocker member 46 and each link 50 is pivotally mounted at its upper end to the associated rocker member 46 by means of a pivot pin 51. The lower end of each link 50 pivots directly to the bed 2 of the press on a pin 52.

Thus far, it will be seen that as the eccentric pin 40 is caused to move as each of the gear sets 21, 22, 23 and 24 is rotated, the arm 43 of bell crank 41 will cause the associated rocker member 46 connected thereto, through the medium of link 44, to rock outwardly to the position shown in Fig. 4 where the auxiliary slide and blank holder slide are in elevated position, and thereafter to rock inwardly to the position shown in Fig. 2 where the blank holder 13 is in its lowermost position clamping the metal work piece 53. Each rocker member 46 and link 50 remains in dead center position while eccentric pin 40 moves from its position shown in Fig. 2 to its position shown in Fig. 3 whereupon the blank holder slide 13 dwells in its clamping position. As eccentric pin 40 continues to move past its position shown in Fig. 3, arm 42 will immediately begin to raise the draw slide as will presently be seen, but the blank holder slide will not be moved from its clamping position until after the draw slide starts upwardly, thereby to provide a stripping action.

Each arm 42 of bell crank lever 41 extends downwardly and has a pivotal connection as at 54 with the upper part of an adjusting screw 55. The lower threaded portion of each adjusting screw 55 threadedly engages a part of the inner or draw slide 56 which draw slide is mounted within the blank holder slide 13 and is guided in its reciprocating movement by means of guideways 57 provided within the blank holder slide 13.

The rotary movement of each eccentric pin 40 will cause the draw slide to reciprocate by means of the connection between arm 42 and

draw slide 56. Thus, the single drive mechanism will actuate both the blank holder slide 13 and the draw slide 56 in properly timed and synchronized relationship to accomplish the desired result.

In practice, the base 2 is provided with a female die 58 of any suitable or desired configuration. The draw slide has thereon a suitable male die 59 adapted to cooperate with female die 58 on the bed to produce the desired shape of the metal blank 53. The blank holder slide 13 also has affixed to the underside thereof a suitable ring 60 adapted to bear against the metal blank 53 around the edge thereof to hold the blank in position while the drawing operation is being performed.

The arrangement of each bell crank lever 41 and the linkage mechanism including links 44 and 50 and rocker member 46 is such that a single drive which rotates the plurality of gear sets will reciprocate both the auxiliary slide with the blank holder slide mounted thereon and the draw slide in properly timed sequence.

Reference to the motion curve of Fig. 13 will illustrate the relative timed movement as between the blank holder slide and the draw slide. The linkage arrangement actuated by rotation of the gear sets carrying the eccentric pins 40 will cause the auxiliary slide and blank holder slide to move downwardly at the beginning of the cycle from the position thereof shown in Fig. 4 to the position of Fig. 2 where the pivotal connection 49 between rocker member 46 and the auxiliary slide and pivotal connection 51 between link 50 and rocker member 46 are in dead center position. The cycle of the press will then have covered approximately 145 degrees, as shown in Fig. 13.

While eccentric pins 40 are moved from their position in Fig. 4 to the position of Fig. 2, there will be a slight movement upwardly and then downwardly of the draw slide with respect to the blank holder slide. On the other hand, since the blank holder slide is moving downwardly during this portion of the cycle to clamping position, the draw slide will also move downwardly therewith since it is mounted on the auxiliary slide from which the blank holder slide is suspended. Thus, Fig. 13 illustrates that the draw slide will move drownwardly substantially to its position at the beginning of the drawing operation solely because it is carried to that position by movement of the auxiliary slide.

As soon as the blank holder slide begins its period of dwell which consumes approximately the next 125 degrees of cycle, the eccentric arm 42 of bell crank lever 41 will move the draw slide downwardly to perform the drawing operation. The parts will thus move from their positions of Fig. 2 to their positions of Fig. 3 where it will be noted that the two pivot points 49 and 51 are still on dead center.

The draw is then completed at substantially 250 degrees of the cycle, whereupon continued rotation of the gear sets will begin movement of eccentric pins 40 in upward direction to withdraw the draw slide and male die from the position thereof in Fig. 3. The design is such that the blank holder slide continues to dwell for a short period of time after completion of the draw and after the male die begins its upward movement to insure stripping the drawn metal from the die.

After approximately 270 degrees of the cycle has been completed, upward movement of eccentric pins 40 will not only carry the draw slide upwardly, but will also actuate the linkage mechanism to move the auxiliary and blank holder slides upwardly. Thus, the draw slide will be returned to its uppermost position at a much greater rate of speed than is possible in conventional presses because of the combined action of the linkage mechanism and the eccentric pins. The blank holder slide and draw slide are both returned to substantially their uppermost position in the final 90 degrees of the cycle.

From the foregoing, it will be clear that the speed of movement of the draw slide will be greatly increased over that of conventional presses during the nondrawing movement thereof. The actual drawing speed is not increased beyond the limit provided by the metal being drawn, but the increased speed of the slide during the nondrawing movement thereof will enable the press to complete a cycle in a much shorter period of time.

It is desirable that the bed of the press and the metal forming die be located at or near the bottom of the press with the blank holder and draw slides disposed thereabove. The invention, however, contemplates a reversal of parts so that the stationary bed will be above the blank holder slide and the draw slide. In this latter arrangement the metal blank or work piece would have to be supported on the blank holder slide and moved therewith to clamping position, whereupon the draw slide would then move upwardly to effect operation in the die secured in the fixed or stationary upper bed.

In addition to the increased productivity afforded by the present invention, the press herein has many other advantages. For example, since the operating mechanism for the slides moves therewith, the over-all height of the press may be less than the conventional type. The mechanism is simpler than in the conventional press thereby enabling the number of main moving parts to be considerably reduced. Furthermore, while the maximum depth of draw may be held the same, the over-all stroke of both the blank holder slide and draw slide may also be reduced. The reduction in length of stroke increases the mechanical advantage thereby permitting a reduction in the size of the main gears. The draw slide reciprocating in guideways within the blank holder slide which, in turn, is guided in ways in the main frame prevents the blank holder from being adjusted out of line with the draw slide. Finally, the reduction in over-all height and number of parts required, as well as the reduction in weight of some of the members, results in decreased cost of manufacture.

Changes may be made in the form, construction and arrangement of parts from those disclosed herein without in any way departing from the spirit of the invention or sacrificing any of the attendant advantages thereof, provided, however, that such changes fall within the scope of the claims appended hereto.

The invention is hereby claimed as follows:

1. A mechanical metal working press comprising a frame structure, a blank holder slide guided for reciprocation within said frame structure, a draw slide guided for reciprocation within said blank holder slide, linkage mechanism comprising a plurality of pivoted links pivotally connected at one end thereof to the frame and at the other end thereof to the blank holder slide, crank means mounted on said blank holder slide and reciprocable therewith, means connecting

the crank means with said draw slide, and means connecting said crank means with the other end of said linkage mechanism at a point thereon different from the connection thereof with the blank holder slide, said linkage mechanism, crank means and the several connecting means being so arranged and coordinated that operation of said crank means will move said blank holder slide to clamping position carrying with it said draw slide and then will cause further movement of said draw slide to effect a drawing operation.

2. A mechanical metal working press comprising a frame structure, a blank holder slide guided for reciprocation within said frame structure, a draw slide guided for reciprocation within said blank holder slide, a plurality of crank means mounted on said blank holder slide and reciprocable bodily therewith, a bell crank lever mounted on each of said crank means, means connecting one arm of each of said bell crank levers with said draw slide for reciprocating said draw slide for a drawing operation, linkage mechanism associated with each of said crank means and comprising a plurality of pivoted links pivotally connected at one end thereof to said frame and at the other end thereof to said blank holder slide, and means connecting the other arm of each said bell crank lever to said other end of the associated linkage mechanism at a point thereon different from the connection thereof with the blank holder slide, said bell crank, linkage mechanism and said several connecting means being so arranged and coordinated that operation of said crank means will move said blank holder to clamping position carrying with it said draw slide, and then will cause further movement of said draw slide to effect a drawing operation, and drive means also mounted on said blank holder slide for driving all of said crank means.

3. A mechanical metal working press comprising a frame structure, a blank holder slide guided for reciprocation within said frame structure, a draw slide guided for reciprocation within said blank holder slide, a plurality of crank means mounted on said blank holder slide and reciprocable bodily therewith, a bell crank lever mounted on each of said crank means, means connecting one arm of each of said bell crank levers with said draw slide for reciprocating said draw slide for a drawing operation, a linkage arrangement associated with each of said crank means, each linkage arrangement including a link connected at one end thereof to said frame structure, a rocker member pivotally connected to the other end of said link, means pivotally connecting said rocker member with said blank holder slide, and a second link connecting said rocker member with the other arm of said bell crank lever, whereby operation of said crank means will also reciprocate said blank holder slide, and drive means also mounted on said blank holder slide for driving all of said crank means.

4. A mechanical metal working press comprising a frame structure, a blank holder slide guided for reciprocation within said frame structure, a draw slide guided for reciprocation within said blank holder slide, a plurality of crank means mounted on said blank holder slide and reciprocable bodily therewith, a bell crank lever mounted on each of said crank means, means connecting one arm of each of said bell crank levers with said draw slide for reciprocating said draw

slide for a drawing operation, a linkage arrangement associated with each of said crank means, each linkage arrangement including a link connected at the lower end thereof to the base of said frame structure and extending upwardly toward said blank holder slide, a rocker member pivotally connected to the other end of said link, means pivotally connecting said rocker member with said blank holder slide, and a second link connecting said rocker member with the other arm of said bell crank lever, whereby operation of said crank means will also reciprocate said blank holder slide, and drive means also mounted on said blank holder slide for driving all of said crank means.

5. A mechanical metal working press comprising a frame structure, an auxiliary slide guided for reciprocation within said frame structure, a blank holder slide mounted on and movable with said auxiliary slide, a draw slide guided for reciprocation within said blank holder slide, linkage mechanism comprising a plurality of pivoted links pivotally connected at one end thereof to the frame and at the other end thereof to the auxiliary slide, crank means mounted on said auxiliary slide and reciprocable therewith, means connecting the crank means with said draw slide, and means connecting said crank means with the other end of said linkage mechanism at a point thereon different from the connection thereof with the auxiliary slide, said linkage mechanism, crank means and the several connecting means being so arranged and coordinated that operation of said crank means will move said auxiliary slide and blank holder slide to clamping position carrying with them said draw slide and then will cause further movement of said draw slide to effect a drawing operation.

6. A mechanical metal working press comprising a frame structure, an auxiliary slide guided for reciprocation within said frame structure, a blank holder slide mounted on and movable with said auxiliary slide, a draw slide guided for reciprocation within said blank holder slide, a plurality of crank means mounted on said auxiliary slide and reciprocable bodily therewith, a bell crank lever mounted on each of said crank means, means connecting one arm of each of said bell crank levers with said draw slide for reciprocating said draw slide for a drawing operation, linkage mechanism associated with each of said crank means and comprising a plurality of pivoted links pivotally connected at one end thereof to said frame and at the other end thereof to said auxiliary slide, and means connecting the other arm of each said bell crank lever to said other end of the associated linkage mechanism at a point thereon different from the connection thereof with the auxiliary slide, said bell crank, linkage mechanism and said several connecting means being so arranged and coordinated that operation of said crank means will move said auxiliary and blank holder slides to clamping position carrying with them said draw slide, and then will cause further movement of said draw slide to effect a drawing operation, and drive means also mounted on said auxiliary slide for driving all of said crank means.

7. A mechanical metal working press comprising a frame structure, an auxiliary slide guided for reciprocation within said frame structure, a blank holder slide mounted on and movable with said auxiliary slide, a draw slide guided for reciprocation within said blank holder slide,

a plurality of crank means mounted on said auxiliary slide and reciprocable bodily therewith, a bell crank lever mounted on each of said crank means, means connecting one arm of each said bell crank levers with said draw slide for reciprocating said draw slide for a drawing operation, a linkage arrangement associated with each of said crank means, each linkage arrangement including a link connected at one end thereof to said frame structure, a rocker member pivotally connected to the other end of said link, means pivotally connecting said rocker member with said auxiliary slide, and a second link connecting said rocker member with the other arm of said bell crank lever, whereby operation of said crank means will also reciprocate said auxiliary and blank holder slides, and drive means also mounted on said auxiliary slide for driving all of said crank means.

8. A mechanical metal working press comprising a frame structure, an auxiliary slide guided for reciprocation within said frame structure, a blank holder slide mounted on and movable with said auxiliary slide, a draw slide guided for reciprocation within said blank holder slide, a plurality of crank means mounted on said auxiliary slide and reciprocable bodily therewith, a bell crank lever mounted on each of said crank

means, means connecting one arm of each of said bell crank levers with said draw slide for reciprocating said draw slide for a drawing operation, a linkage arrangement associated with each of said crank means, each linkage arrangement including a link connected at the lower end thereof to the base of said frame structure and extending upwardly toward said auxiliary slide, a rocker member pivotally connected to the other end of said link, means pivotally connecting said rocker member with said auxiliary slide, and a second link connecting said rocker member with the other arm of said bell crank lever, whereby operation of said crank means will also reciprocate said auxiliary and blank holder slides, and drive means also mounted on said auxiliary slide for driving all of said crank means.

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