A. J. LEWIS.

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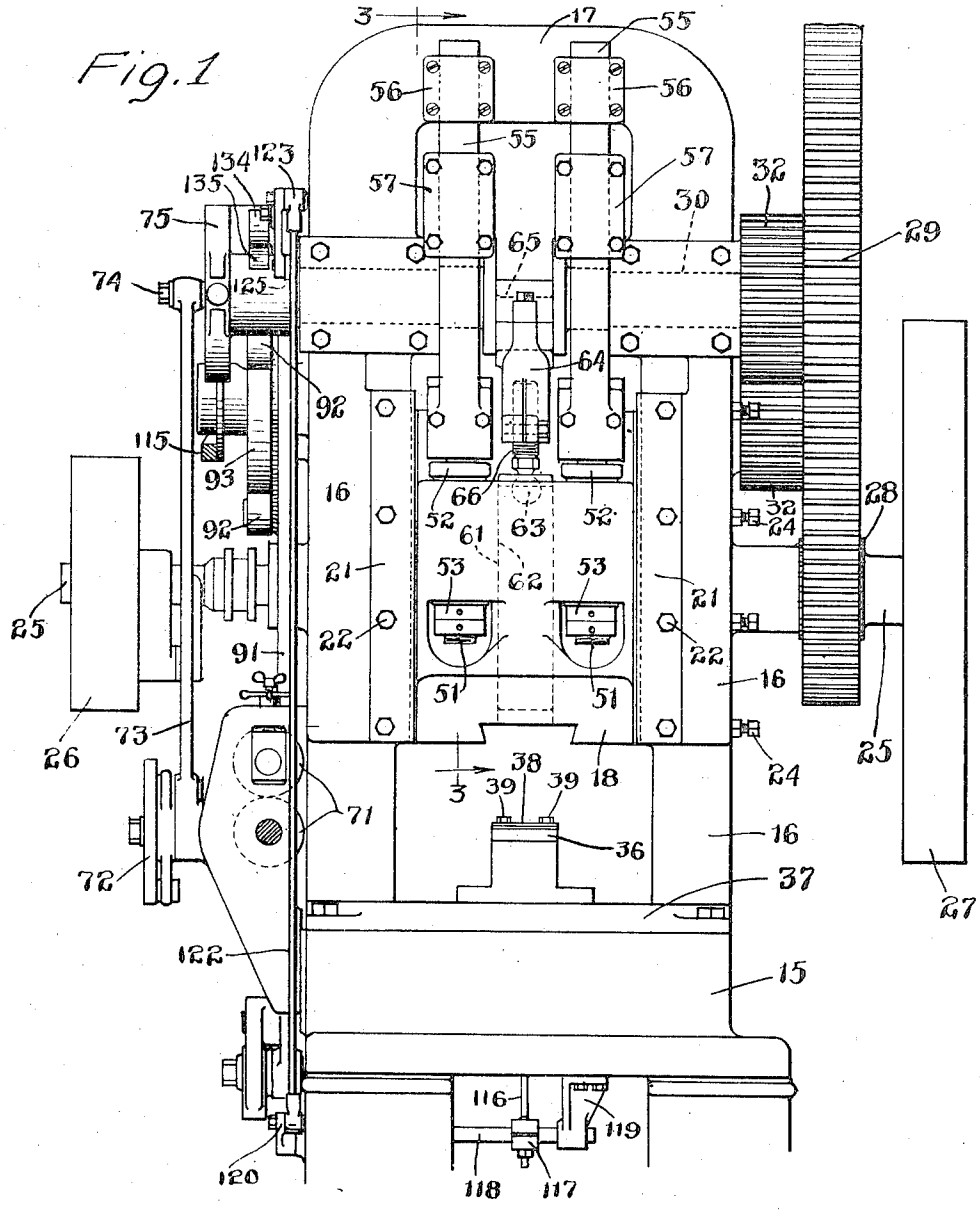
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1,106,571.

Patented Aug. 11, 1914.

6 SHEETS—SHEET 1.

Fig. 1



WITNESSES:

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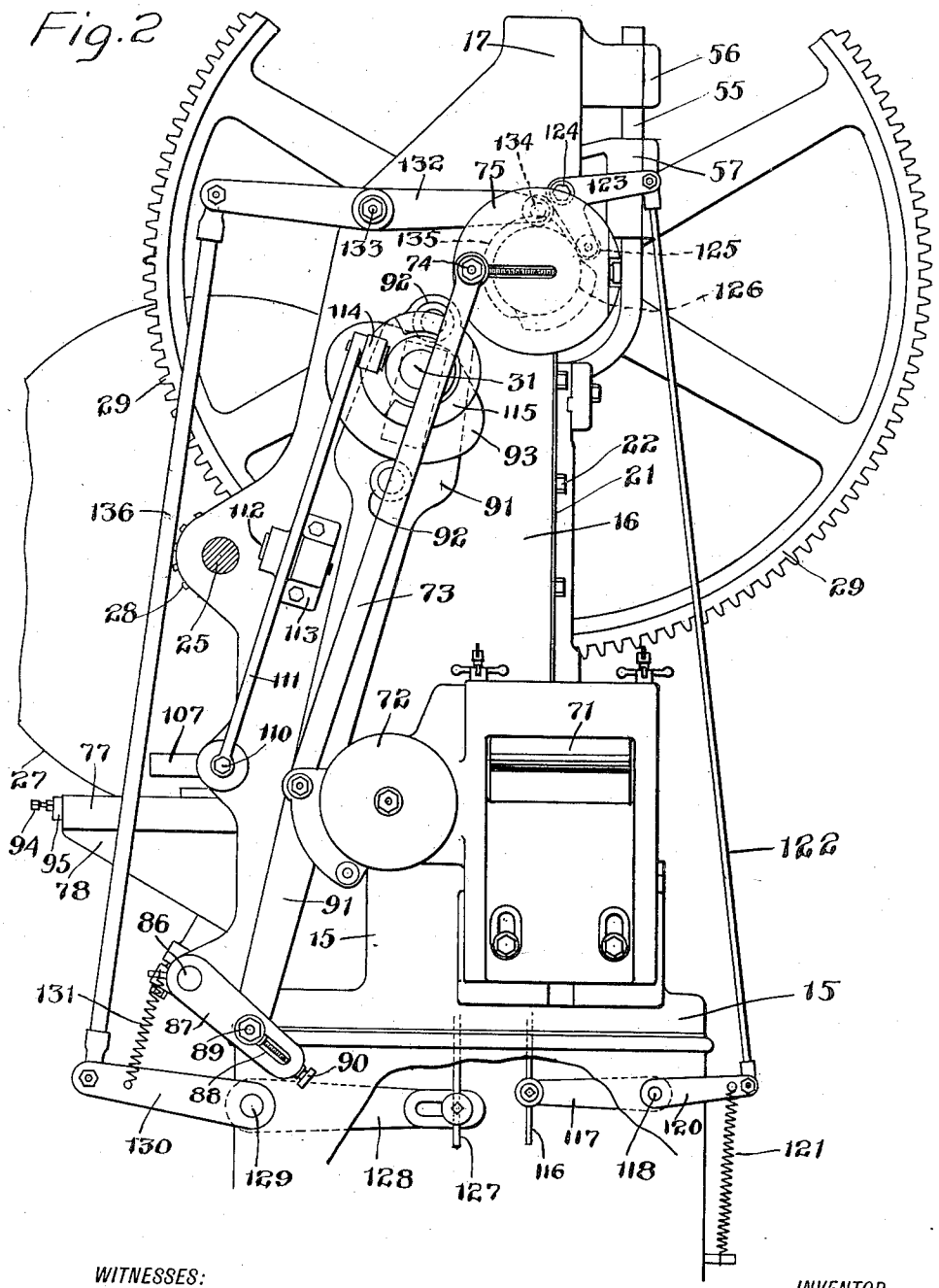
APPLICATION FILED MAR. 15, 1913.

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5 SHEETS—SHEET 2.

Fig. 2



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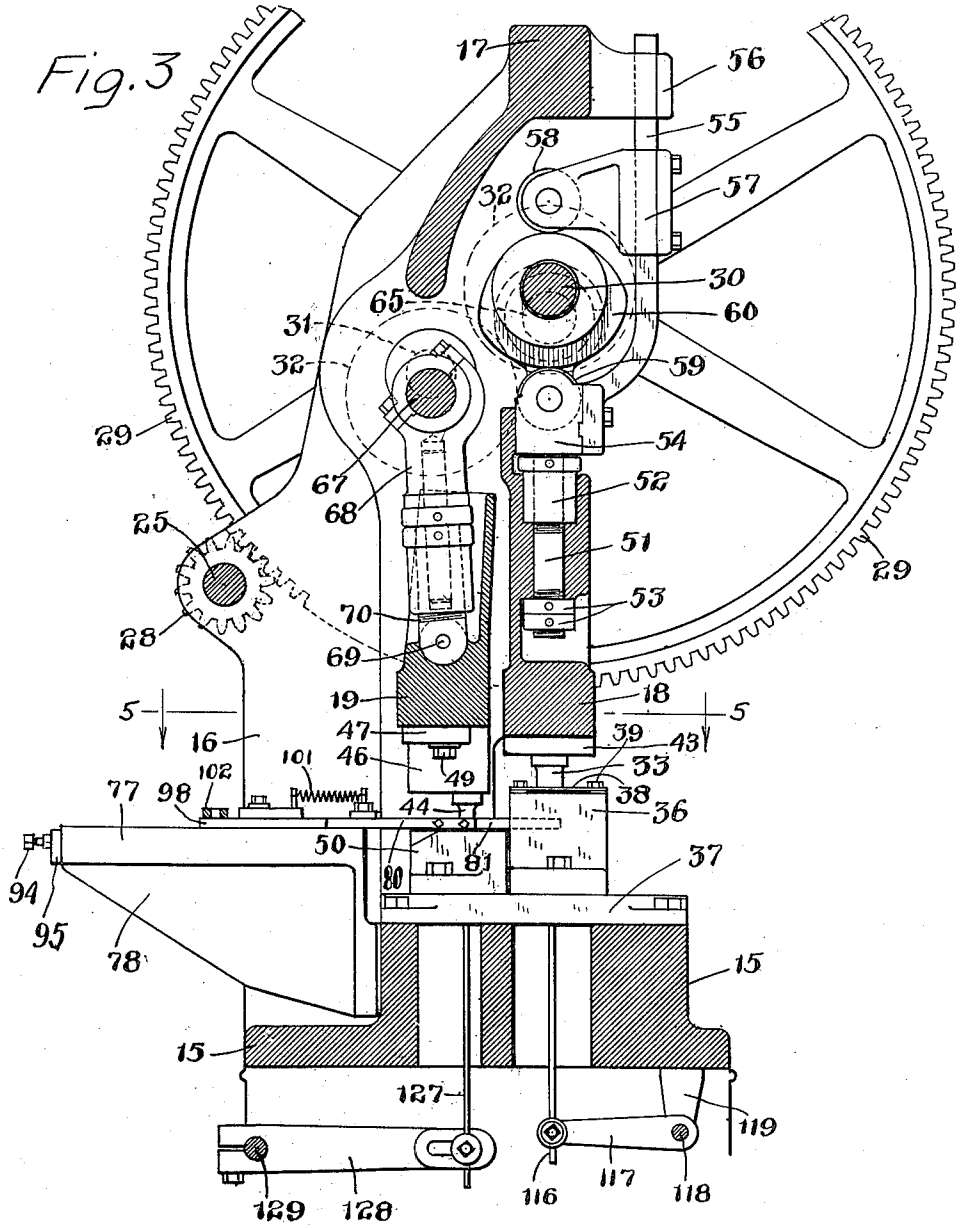
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5 SHEETS—SHEET 3.

Fig. 3



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5 SHEETS—SHEET 4.

Fig. 4

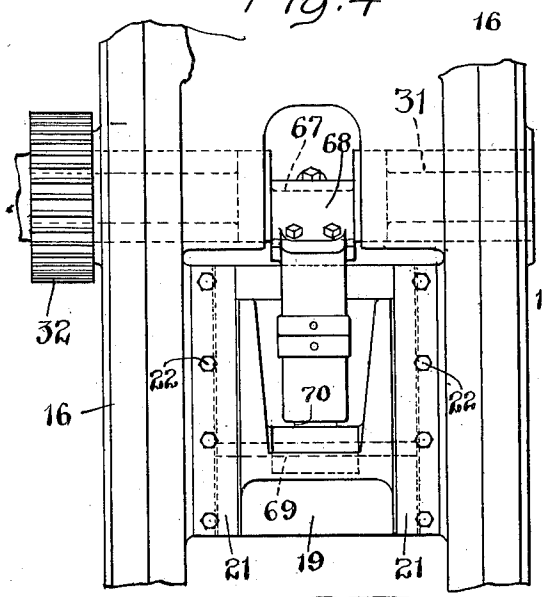


Fig. 5

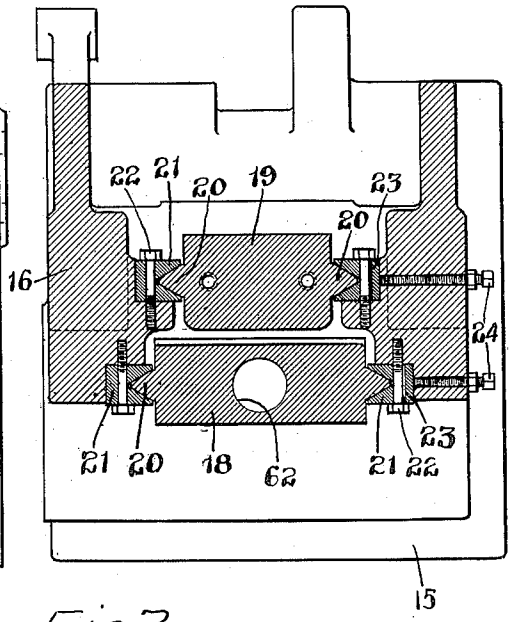


Fig. 6

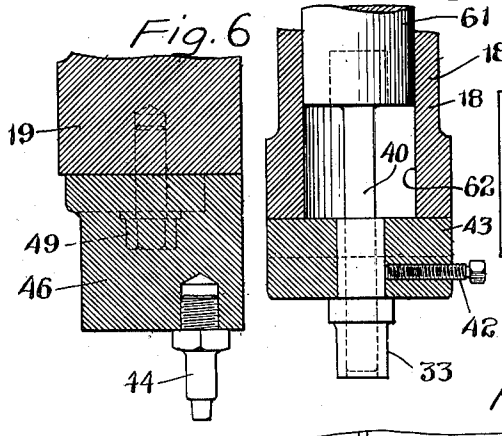


Fig. 7

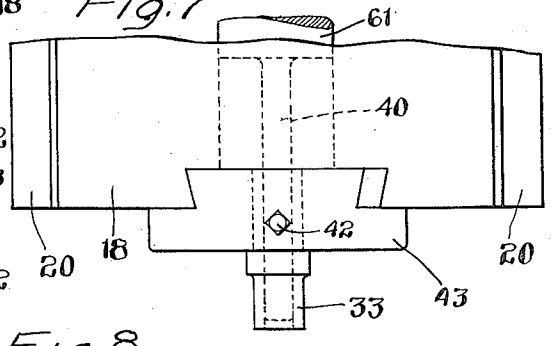
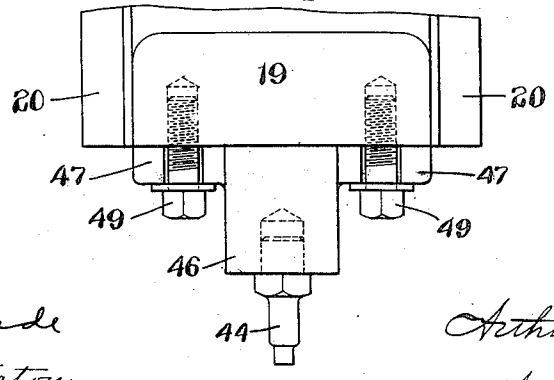


Fig. 8



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APPLICATION FILED MAR. 15, 1913.

1,106,571. **Patented Aug. 11, 1914.**

5 SHEETS—SHEET 5.

Fig. 9

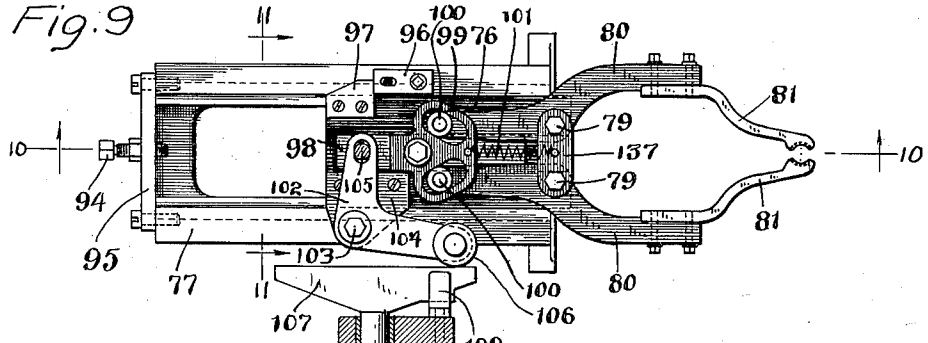


Fig. 10

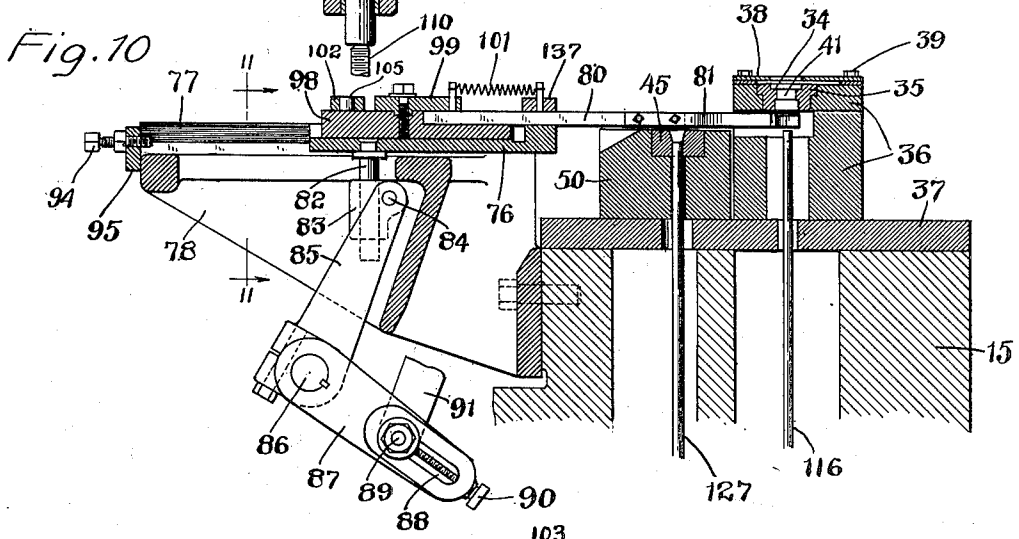
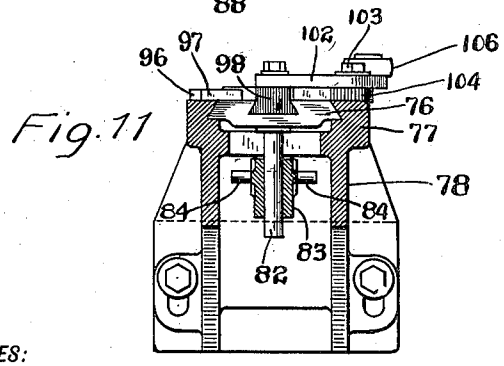


Fig. 11



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UNITED STATES PATENT OFFICE.

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TANDEM PRESS.

1,106,571. Specification of Letters Patent. Patented Aug. 11, 1914.

Application filed March 15, 1913. Serial No. 754,599.

To all whom it may concern:

Be it known that I, ARTHUR J. LEWIS, a citizen of the United States, residing at Stratford, county of Fairfield, State of Connecticut, have invented an Improvement in Tandem Presses, of which the following is a specification.

This invention relates to presses, more particularly to those of the type employing a plurality of punches, dies, formers, or other tools designed to operate successively upon the same piece of work.

In presses of this type, for example those employed in forming articles out of sheet metal, it has been customary to mount the several tools in the same reciprocating head or gate and to move the work step-by-step from one tool to the next to cause said tool to operate successively thereon, a new piece of work being introduced at each operation, so that at each reciprocation of the gate all of the tools carried thereby are caused to operate simultaneously upon different pieces of work in various stages of completion.

By reason of the fact that the several steps in the process of producing a finished article usually require the the exertion of different degrees of power, since the work in its various stages offers different degrees of resistance to the several tools, the reaction of the tools is unevenly distributed over the head or gate. The eccentric stresses thus induced produce a tendency on the part of the gate to tilt in its guideways, causing uneven wear and carrying the punches or other tools out of proper alinement with the dies or other members with which they cooperate.

The present invention has for its objects to overcome the difficulties above mentioned and also to provide a construction which will be strong and durable, which will permit the tools to be placed in close proximity to one another, which will facilitate the removal and replacing of the tools, and which otherwise will be efficient and convenient in use.

With these and other objects in view the invention comprises the provision of a plurality of independently operated gates, equal in number to the number of tools employed, each carrying a separate tool. The gates are arranged immediately adjacent one another and are mounted to reciprocate in separate guide-ways which, however, are preferably all mounted in the same upright portions of the machine frame.

The invention further comprises the provision of certain other mechanisms and instrumentalities whereby the operation of machines of this character is facilitated.

A preferred form of the invention is illustrated in the accompanying drawings, it being understood however that the invention is not limited to the precise construction shown, but that many changes may be made therein without departing from the scope of the invention as defined by the claims hereunto appended.

In said drawings, Figure 1 is a front elevation and Fig. 2 a side elevation, both partly broken away, of a machine constructed in accordance with the invention; Fig. 3 is a vertical section on the line 3—3, Fig. 1; Fig. 4 is a detail elevation of the rear gate with the tool removed; Fig. 5 is a horizontal section on the line 5—5, Fig. 3; Fig. 6 is a detail vertical section of the lower portions of the gates, taken on a substantially central plane extending through the machine from front to rear; Fig. 7 is a detail elevation of the lower portion of the front gate, and Fig. 8 a similar view of the lower portion of the rear gate, both views showing the tools in place on the gates; Fig. 9 is a plan view of a portion of the carrying mechanism; Fig. 10 is a vertical section on the line 10—10, Fig. 9; Fig. 11 is a vertical section on the line 11—11, Fig. 10.

15 denotes the machine frame, said frame including a pair of integral uprights 16 connected at their upper ends by a preferably integral top piece or cap 17. Arranged immediately adjacent one another and guided for vertical movement in the uprights 16 are a plurality (herein shown as two) of gates 18 and 19. Said gates 18 and 19 are formed on their edges with V-shaped flanges 20 (see Fig. 5) which are received in correspondingly V-shaped grooves in guides 21 secured to the uprights 16 by bolts 22. Preferably one of the guides 21 of each pair is arranged to be adjustable in the corresponding upright 16 to compensate for wear, and to this end is provided with slots 23 through which the corresponding bolts 22 pass, said guide being movable when said bolts are loosened by means of adjusting screws 24.

25 denotes a power shaft journaled in the uprights 16 and provided with a belt pulley 26 and a fly wheel 27.

28 denotes a pinion fixed upon the shaft 25 and meshing with a gear 29 on a shaft 30, also journaled in the uprights 16. The gates 18 and 19 are independently operated, the one by the shaft 30 and the other or others from one or more shafts 31, also journaled in the uprights 16 and connected with the shaft 30 by gears 32.

As herein shown the gate 18 carries a punch 33 coöperating with a recess 34 (see Fig. 10) in a die 35 to punch out a disk from a strip of sheet metal fed to said die. The die 35 is held in a die block 36 mounted on a bolster plate 37 supported by a portion of the frame 15.

38 denotes a stripper plate located above the die 35 and secured to the die block 36 by screws 39.

40 (see Figs. 6 and 7) denotes a plunger working within the punch 33 and coöperating with a reduced portion 41 of the opening in the die 35 to bend upwardly the edges of the disk cut out by the punch 33.

The particular formation of the die is of course not of the essence of the invention. In many instances, the die may be formed without the reduced portion 41, a blank being cut from a strip of metal as just described and then carried through the die between the end of the plunger and a holding rod presently to be described.

The punch 33 is held in place by a set screw 42 in a block 43 having a dove-tail connection with the gate 18.

As herein shown the gate 19 carries a punch or former 44 which coöperates with a die 45 to further shape the article produced by the punch 33 and plunger 40. The former 44 is carried by a block 46 having ears 47 (see Fig. 8) which are slotted to receive bolts 49 by which said block 46 is secured to the gate 19. The die 45 is held in a die-block 50 mounted on the bolster plate 37.

The gate 18 is reciprocated from the shaft 30 by the following means: 51 (see Figs. 1 and 3) denotes bolts passing through portions of the gate 18 and held in adjusted position in said gate by screw sleeves 52 and nuts 53, the gate being recessed to afford spaces for said sleeves and nuts. By adjusting the sleeves 52 and nuts 53 the stroke of the punch 33 may be varied. The bolts 51 are provided with heads 54 to which are bolted guide members or arms 55 which extend upwardly and coöperate with guides 56 on the top member 17. 57 denotes brackets bolted to the arms 55 and in which are journaled rollers 58. 59 denotes similar rollers journaled in the heads 54 of the bolts 51. The rollers 58 and 59 engage opposite sides of cams 60 on the shaft 30.

The plunger 40 is secured to or formed integral with a second plunger 61 guided for vertical movement in a bore 62 in the gate 18 and connected at its upper end by a ball and socket joint 63 with a pitman 64 coöperating with a crank 65 on the shaft 30. In order to permit adjustment of the stroke of the plunger 40 the pitman 64 is preferably made in two parts connected by a threaded joint 66.

The gate 19 is reciprocated by a crank 67 on the shaft 31 with which it is connected by a pitman 68 pivoted to said gate at 69, said gate being suitably recessed to receive said pitman. In order to permit adjustment of the stroke of the former 44 the pitman 68 is preferably made in two parts connected by a threaded joint 70.

71 (see Figs. 1 and 2) denotes feed rollers adapted to feed sheet material to the space between the die 35 and stripper plate 38, said rollers being operated by a pawl and ratchet mechanism 72 connected by a rod 73 with an adjustable crank pin 74 on a crank disk 75 mounted on the end of the shaft 30. This feed mechanism specifically forms no part of the present invention, and being of a general type well known in the art will not be described in detail herein.

For carrying the partly finished work from the die 35 to the die 45 the following mechanism is provided, reference being had particularly to Figs. 9, 10 and 11: 76 denotes a slide mounted to reciprocate in guides 77 on a bracket 78 bolted to the frame 15. Pivoted at 79 to the slide 76 are a pair of grippers 80 provided with preferably detachable gripping jaws 81 bolted thereto. The slide 76 is movable to carry the operative end of the jaws 81 from a position directly beneath the die 35 (whose opening extends entirely therethrough so that the plunger 40 can force the partly finished article therefrom into the jaws 81) to a position directly over the opening in the die 45. To this end the following mechanism is provided: The slide 76 is provided with a downwardly projecting pin 82 extending through a slot in the bracket 78. 83 denotes a sleeve sliding on the pin 82 and provided with trunnions 84 by which it is pivotally connected to a bifurcated arm 85 secured to a rock shaft 86. 87 (see Figs. 2 and 10) denotes a second arm fixed to the shaft 86 and having at its outer end a slot 88 in which a slide carrying a pivot pin 89 is adjustably positioned by means of an adjusting screw 90. 91 denotes a connecting rod pivoted at its lower end to the pivot 89 and carrying at its upper end rollers 92 which engage a cam 93 on the shaft 31, said connecting rod 91 being slotted at its upper end to receive said shaft, whereby said rod is guided and the rollers 92 held in proper cooperative relationship to the cam 93. By

operating the screw 90 to adjust the position of the pivot 89 the movement of the slide 76 may be varied. 94 denotes an adjustable stop screw carried by a plate 95 bolted to the bracket 78 to limit the movement of the slide 76 toward the left in Figs. 9 and 10. 96 denotes an adjustable stop plate carried by the bracket 78 and coöperating with a stop plate 97 on the slide 76 to limit the movement of said slide toward the right. 98 denotes a second slide guided on the slide 76 for movement longitudinally thereof. 99 denotes a cam plate secured to the slide 98, as by a screw, and provided with oppositely inclined cam slots arranged to receive studs 100 on the grippers 80, said studs being preferably provided with cam rollers. The arrangement is such that movement of the slide 98 toward the right (as shown in Figs. 9 and 10) on the slide 76 will cause the jaws 81 to be closed, while movement in the opposite direction will cause said jaws to be opened. Said slide is moved toward the right to close the jaws 81 by means of a spring 101 secured at one end to the cam plate 99 and at the opposite end to a plate 137 connecting the pivots 79 of the grippers 80. The slide 98 is moved in the opposite direction against the tension of the spring 101 to open the jaws 81 by means of a bell crank lever 102 pivoted at 103 to a plate 104 secured to the slide 76. The lever 102 is provided at the extremity of one arm with a slot to receive a pin 105 projecting from the slide 98, and at the extremity of the other arm with a roller 106. The roller 106 cooperates with a head 107 on the end of a rod 108 guided to slide longitudinally in a suitable bore in one of the uprights 16. The rod 108 is held against turning in its bore by means of a bifurcated lug 109 secured to the upright 16 and embracing the head 107. The head 107 is of sufficient length to remain in engagement with the roller 106 throughout the travel of the slide 76, and movement thereof inwardly toward the bracket 78 causes the lever 102 to be rocked upon its pivot in the proper direction to open the jaws 81 against the tension of the spring 101. This movement is caused by a screw 110 which engages the end of the rod 108 and is carried by one end of a lever 111 (see Fig. 2) pivoted at 112 to a bracket 113 secured to one of the uprights 16. At its opposite end the lever 111 carries a roller 114 coöperating with a cam 115 on the end of the shaft 31.

116 denotes a follower or holding rod, the upper end of which is adapted to coöperate with the lower end of the plunger 40 to hold the partly finished article in place thereon after it has been forced out of the opening in the die 35, and to insure its proper positioning between the gripping jaws 81. The rod 116 is connected at its lower end to an arm 117 fast on a rock shaft 118 which is journaled in the frame 15 and in a bracket 119 secured thereto. At its end the shaft 118 has fixed thereto an arm 120 connected by a spring 121 with a suitable portion of the frame. The action of the spring 121 is normally to hold the rod 116 elevated and in a position to engage the partly finished article on the end of the plunger 40 when the latter is depressed.

122 denotes a connecting rod pivoted at one end to the arm 120 and at the other to a bell crank lever 123 pivoted at 124 to one of the uprights 16 and carrying a roller 125 which coöperates with a cam 126 on the shaft 30. Oscillation of the lever 123 by the cam 126 causes the rod 116 to be depressed to release the work held thereby on the end of the plunger 40.

127 denotes an ejecting rod adapted to force the completely finished article from the recess in the die 45. Said rod 127 is connected at its lower end to an arm 128 fast on a rock shaft 129 which carries at its outer end a second arm 130. 131 denotes a spring secured at one end to the arm 130 and at the other to the frame 15 and whose function it is normally to depress the rod 127. In order to elevate the rod 127 to eject the article from the die at the proper time, there is provided a lever 132 pivoted at 133 to one of the uprights 16, said lever carrying at one end a roller 134 coöperating with the cam 135 on the shaft 30 and connected at the opposite end, by a rod 136, with the arm 130.

The complete operation of the machine is as follows: Power applied to the pulley 26, as through a suitable belt (not shown), causes the shaft 25 to be continuously rotated and, through the pinion 28 and gears 29 and 32, to rotate the shafts 30 and 31. The stock, as for example a strip of sheet metal, is fed by the rollers 71 into the space between the stripper plate 38 and the top of the die 35. The cams 60 on the shaft 30, acting through the rollers 58 and 59 and bolts 51, cause the gate 18 to descend, whereupon the punch 33 coöperating with the recess 34 in the die 35 punches a suitable blank from the stock. Immediately thereafter the crank 65 on the shaft 30, acting through the pitman 64, depresses the plunger 40 and forces the blank into and through the restricted portion 41 of the opening in the die 35. As the blank is forced through the die it is engaged and held upon the end of the plunger 40 by the rod 116 which is held elevated by the spring 121. The slide 76 is at this time substantially in the position shown in Figs. 9 and 10. At substantially the time at which the blank is forced through the die 35 the cam 115 permits the lever 111 to rock and release the end of the rod 108 whereupon the spring 101 moves the

cam plate 99 to cause the jaws 81 to close upon the blank. The holding rod 116 is immediately depressed by the cam 126 acting through the lever 123, rod 122, arm 120, rock shaft 118, and arm 117. The cam 93 acting through the rod 91, arm 87, rock shaft 86, arm 85, sleeve 83, and pin 82, thereupon moves the slide 76 toward the left, causing the jaws 81 to carry the blank into a position directly over the die 45. Thereupon the crank 67 on the shaft 31, operating through the pitman 68, depresses the gate 19 and causes the punch or former 44 to force the blank into the recess in the die 45. At substantially the same time the cam 115, acting through the lever 111, screw 110, rod 108, head 107, and lever 102, moves the cam plate 99 to open the jaws 81, while the cam 93, acting through the instrumentalities above enumerated, returns the jaws 81 into their initial position beneath the die 35 so as to receive another blank therefrom. It will be understood that the gate 18 has meanwhile been returned to its initial position and that the two gates pass through their complete cycles of operations simultaneously, the tools carried thereby operating upon two blanks at each complete cycle of the machine. After the punch 44 has risen, the cam 135, acting through the lever 132, rod 136, rock shaft 129 and arms 128 and 130, elevates the rod 127 to eject the finished article from the recess in the die 45.

By reason of the fact that the tools 33 and 34 are carried by separate gates independently operated, it will be seen, that all eccentric stresses upon the gates will be eliminated and also that the tools may be more easily removed and replaced than in a construction in which these tools are all carried by the same gate. By arranging the gates, as shown herein, immediately adjacent one another in a direction from front to rear of the machine (*i. e.*, in tandem) and guiding them in the same pair of frame uprights, an extremely strong and compact construction is provided, permitting the tools to be arranged very close together so that the time and power required in transferring the work from one tool to another is reduced to a minimum.

Having thus described my invention I claim:—

1. In a press of the character described, in combination, a plurality of tool carrying gates arranged immediately adjacent one another in a direction from front to rear of the machine, separate means for guiding each gate, means common to all the gates on each respective side for supporting said guides, and means for independently operating said gates.

2. In a press of the character described, in combination, a plurality of tool carrying gates arranged immediately adjacent one another in a direction from front to rear of the machine, means for guiding said gates, a power shaft at right angles to the common center line of the gates, and means actuated by said shaft for independently operating said gates.

3. In a press of the character described, in combination, a plurality of tool carrying gates arranged immediately adjacent one another in a direction from front to rear of the machine, uprights for supporting said gates and means for independently operating said gates.

4. In a press of the character described, in combination, a frame comprising uprights, a plurality of tool carrying gates arranged immediately adjacent one another in a direction from front to rear of the machine and guided in said uprights, and a plurality of operating shafts mounted in said uprights at right angles to the common center line of said gates.

5. In a press of the character described, in combination, a plurality of tool-carrying gates arranged immediately adjacent one another, means for guiding said gates, a plurality of shafts, and means on said shafts for independently operating said gates respectively.

6. In a press of the character described, in combination, a frame comprising a pair of uprights, a plurality of tool-carrying gates arranged immediately adjacent one another and guided in said uprights, a power shaft journaled in said uprights, a plurality of operating shafts journaled in said uprights, gears connecting said power shaft with one of said operating shafts, gears connecting said operating shafts with each other, and means on said operating shafts for independently operating said gates respectively.

7. In a press of the character described, in combination, a pair of tool-carrying gates arranged immediately adjacent one another, means for guiding said gates, a pair of shafts, a crank on one of said shafts operatively connected with one of said gates, and a cam on the other of said shafts operatively connected with the other of said gates.

8. In a press of the character described, in combination, a frame comprising a pair of uprights, a top member connecting said uprights, a gate guided in said uprights, an additional guide member carried exteriorly by said gate, and a guide carried by said top member and coöperating with said exterior guide member.

9. In a press of the character described, in combination, a frame comprising a pair of uprights, a top member connecting said uprights, a plurality of tool-carrying gates arranged immediately adjacent one another and guided in said uprights, an additional

guide member carried exteriorly by one of said gates, a guide carried by said top member and coöperating with said exterior guide member, and means for independently operating said gates.

10. In a press of the character described, in combination, a frame comprising a pair of uprights, a top member connecting said uprights, a gate guided in said uprights, a pair of additional guide arms detachably secured exteriorly to said gate, and a pair of guides carried by said top member and coöperating with said exterior guide arms.

11. In a press of the character described, in combination, a frame comprising a pair of uprights, a top member connecting said uprights, a gate guided in said uprights, an additional guide member carried exteriorly by said gate, a guide carried by said top member and coöperating with said exterior guide member, a shaft journaled in said uprights, a cam on said shaft, and rollers carried by said gate and guide member respectively and coöperating with said cam.

12. In a press of the character described, in combination, a frame comprising a pair of uprights, a top member connecting said uprights, a gate guided in said uprights, a pair of guide arms detachably secured to said gate, a pair of guides carried by said top member and coöperating with said guide arms, a shaft journaled in said uprights, a pair of cams on said shaft, and rollers carried by said gate and guide arms respectively and coöperating with said cams.

13. In a press of the character described, in combination, a gate, a punch carried by said gate, a plunger operating in said punch, a shaft, a cam on said shaft, means for operatively connecting said cam and gate, a crank on said shaft, and means for operatively connecting said crank and plunger.

14. In a press of the character described, in combination, a pair of gates arranged immediately adjacent one another, means for guiding said gates, punches carried by each of said gates, a pair of shafts, a crank on one of said shafts operatively connected with one of said gates, a cam on the other of said shafts operatively connected with the other of said gates, a plunger operating in the punch carried by said last-named gate, and a crank on said last-named shaft operatively connected with said plunger.

15. In a press of the character described, in combination, a die having an opening therethrough, a plunger coöperating with said die for forcing a blank through said opening, and means for holding said blank in engagement with the end of said plunger after leaving said die.

16. In a press of the character described, in combination, a die having an opening therethrough, a plunger coöperating with said die for forcing a blank through said opening, and a spring-pressed rod for holding said blank in engagement with the end of said plunger after leaving said die.

17. In a press of the character described, in combination, a die having an opening therethrough, a plunger coöperating with said die for forcing a blank through said opening, means for holding said blank in engagement with the end of said plunger after leaving said die, and means for operating said holding means to release said blank.

18. In a press of the character described, in combination, a die having an opening therethrough, a plunger coöperating with said die for forcing a blank through said opening, a shaft provided with means for operating said plunger, means for holding said blank in engagement with the end of said plunger after leaving said die, and means actuated by said shaft for operating said holding means to release said blank.

19. In a press of the character described, in combination, a die having an opening therethrough, a plunger coöperating with said die for forcing a blank through said opening, a shaft provided with means for operating said plunger, a spring-pressed rod for holding said blank in engagement with the end of said plunger after leaving said die, a cam on said shaft, a lever operated by said cam, a rock shaft, an arm on said rock shaft connected with said rod, and a second arm on said rock shaft connected with said lever.

20. In a press of the character described, in combination, a plurality of tool-carrying gates arranged immediately adjacent one another, means for guiding said gates, means for independently operating said gates, and means for carrying a blank from one of said gates to another.

21. In a press of the character described, in combination, a die having an opening therethrough, a plunger coöperating with said die for forcing a blank through said opening, a second die, means for carrying said blank from said first-named die to said last-named die, and means for holding said blank in engagement with the end of said plunger after leaving said first-named die and prior to its engagement by said carrying means.

22. In a press of the character described, in combination, a pair of dies, a reciprocating slide, a pair of gripping jaws carried by said slide, a pin projecting from said slide, a rock shaft, an arm on said rock shaft, a sleeve sliding on said pin and pivoted to said arm, a second arm on said rock shaft, a cam, and a rod connected to said last-named arm and having means for engaging said cam.

23. In a press of the character described, in combination, a pair of dies, a reciprocating slide, a pair of gripping jaws carried by said slide, a pin projecting from said slide, a rock shaft, an arm on said rock shaft, a sleeve sliding on said pin and pivoted to said arm, a second arm on said rock shaft, said last-named arm having a slot, a slide in said slot, a screw for adjusting said slide in said slot, a cam, and a rod pivoted to said slide and having means for engaging said cam.

24. In a press of the character described, in combination, a pair of dies, a reciprocating slide, a pair of gripping jaws carried by said slide, means for reciprocating said slide to cause said jaws to carry a blank from one of said dies to the other, a second slide on said first-named slide having cam slots, and studs carried by said jaws and engaging said slots.

25. In a press of the character described, in combination, a pair of dies, a reciprocating slide, a pair of gripping jaws carried by said slide, means for reciprocating said slide to cause said jaws to carry a blank from one of said dies to the other, means for opening and closing said jaws, a lever pivoted to said slide and operatively connected with said opening and closing means, and means for operating said lever.

26. In a press of the character described, in combination, a pair of dies, a reciprocating slide, a pair of gripping jaws carried by said slide, means for reciprocating said slide to cause said jaws to carry a blank from one of said dies to the other, a second slide on said first-named slide having cam slots, studs carried by said jaws and engaging said slots, a lever pivoted to said first-named slide and operatively connected with said last-named slide, and means for operating said lever.

27. In a press of the character described, in combination, a pair of dies, a reciprocating slide, a pair of gripping jaws carried by said slide, means for reciprocating said slide to cause said jaws to carry a blank from one of said dies to the other, means for opening and closing said jaws, a lever pivoted to said slide and operatively connected with said opening and closing means, and a longitudinally sliding rod having a head adapted to engage and operate said lever in all positions of said slide.

28. In a press of the character described, in combination, a pair of dies, a reciprocating slide, a pair of gripping jaws carried by said slide, means for reciprocating said slide to cause said jaws to carry a blank from one of said dies to the other, means for opening and closing said jaws, a lever pivoted to said slide and operatively connected with said opening and closing means, a longitudinally sliding rod having a head adapted to engage and operate said lever in all positions of said slide, and means engaging and guiding said head for preventing said rod from turning.

29. In a press of the character described, in combination, a pair of dies, a reciprocating slide, a pair of gripping jaws carried by said slide, means for reciprocating said slide to cause said jaws to carry a blank from one of said dies to the other, means for opening and closing said jaws, a lever pivoted to said slide and operatively connected with said opening and closing means, a longitudinally sliding rod having a head adapted to engage and operate said lever in all positions of said slide, a lever provided with means for engaging and operating said rod, and a cam for operating said last-named lever.

30. In a press of the character described, in combination, a pair of dies, a reciprocating slide, a pair of gripping jaws carried by said slide, means for reciprocating said slide to cause said jaws to carry a blank from one of said dies to the other, a pin projecting from said slide, a rock shaft, an arm on said rock shaft, a sleeve sliding on said pin and pivoted to said arm, a second arm on said rock shaft, a cam, a rod connected to said last-named arm and having means for engaging said cam, means for opening and closing said jaws, a lever pivoted to said slide and operatively connected with said opening and closing means, a longitudinally sliding rod having a head adapted to engage and operate said lever in all positions of said slide, a lever provided with means for engaging and operating said rod, and a cam for operating said last-named lever.

31. In a press of the character described, in combination, a pair of dies, a pair of gates, tools carried by said gates respectively and coöperating with said dies, shafts provided with means for operating said gates, mechanism for carrying a blank from one of said dies to the other, and means on one of said shafts for actuating said carrying mechanism.

32. In a press of the character described, in combination, a die, a former coöperating with said die, an ejecting rod coöperating with said die, a rock shaft, an arm on said rock shaft connected with said rod, a cam, a lever operated by said cam, and a second arm on said rock shaft connected with said lever.

33. In a press of the character described, in combination, a die, a tool coöperating with said die, a shaft provided with means for operating said tool, a second die, a second tool coöperating with said second die, a second shaft provided with means for operating said last-named tool, an ejector cooperating with said last-named die, mechanism for operating said ejector, and means

on said first-named shaft for actuating said operating mechanism.

34. In a press of the character described, in combination, a die having an opening therethrough, a plunger coöperating with said die for forcing a blank through said opening, a shaft provided with means for operating said plunger, means for holding said blank in engagement with the end of said plunger after leaving said die, a second die, a former coöperating with said last-named die, a second shaft provided with means for actuating said former, an ejector coöperating with said last-named die, mechanism for carrying a blank from one of said dies to the other, devices on said first-named shaft for actuating said holding means and ejector, and devices on said last-named shaft for actuating said carrying mechanism.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR J. LEWIS.

Witnesses:

WALTER B. CAIN,

EDSON H. BLATCHLEY.