Nov. 17, 1925. 1,562,075

G. W. BERRY

PRESS FOR DRAWING SHEET METAL

Filed Dec. 16, 1924 4 Sheets-Sheet 1

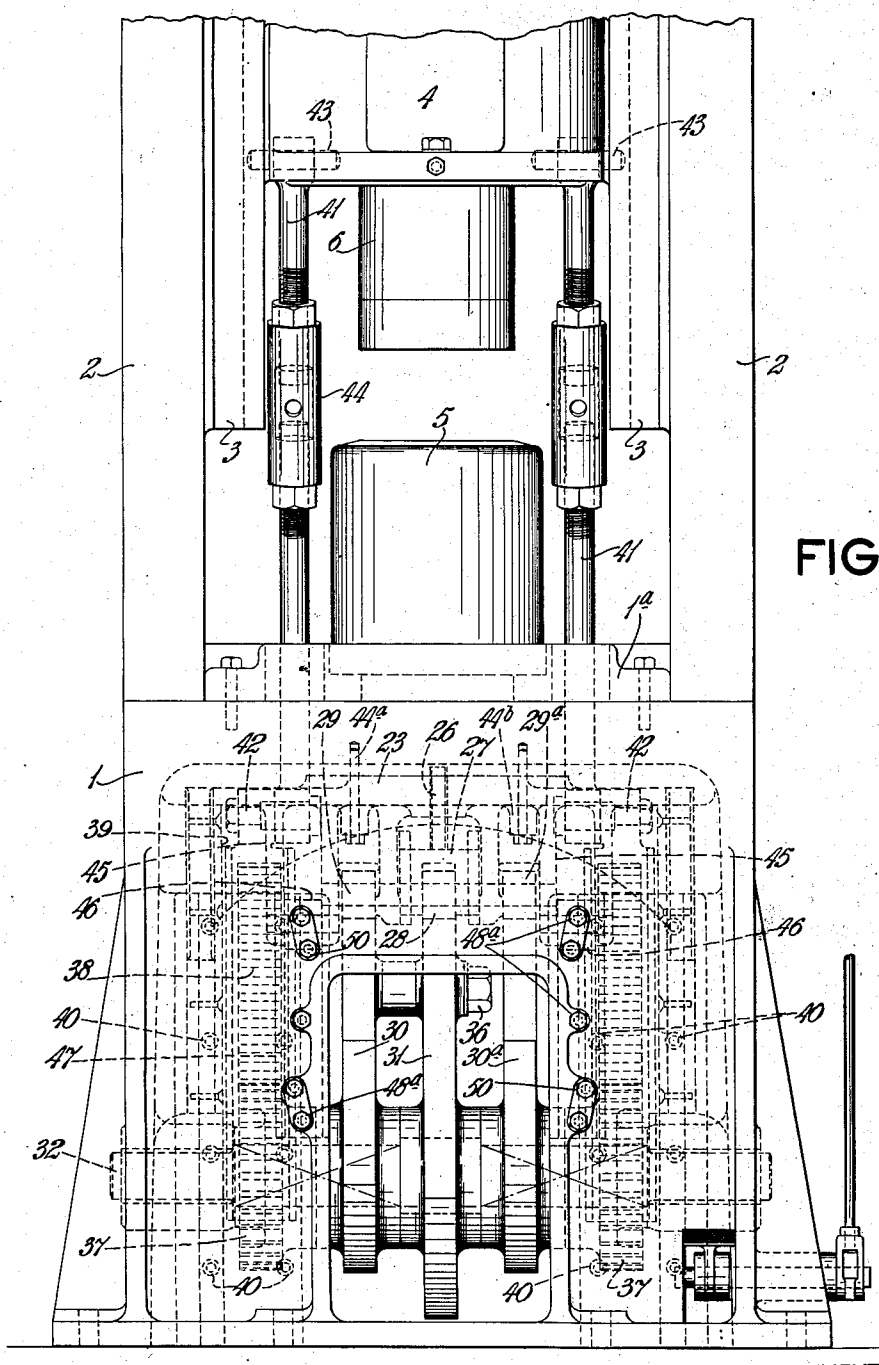


FIG.1.

INVENTOR:

GEORGE WILLIAM BERRY.

ATTORNEY: A. J. Walker

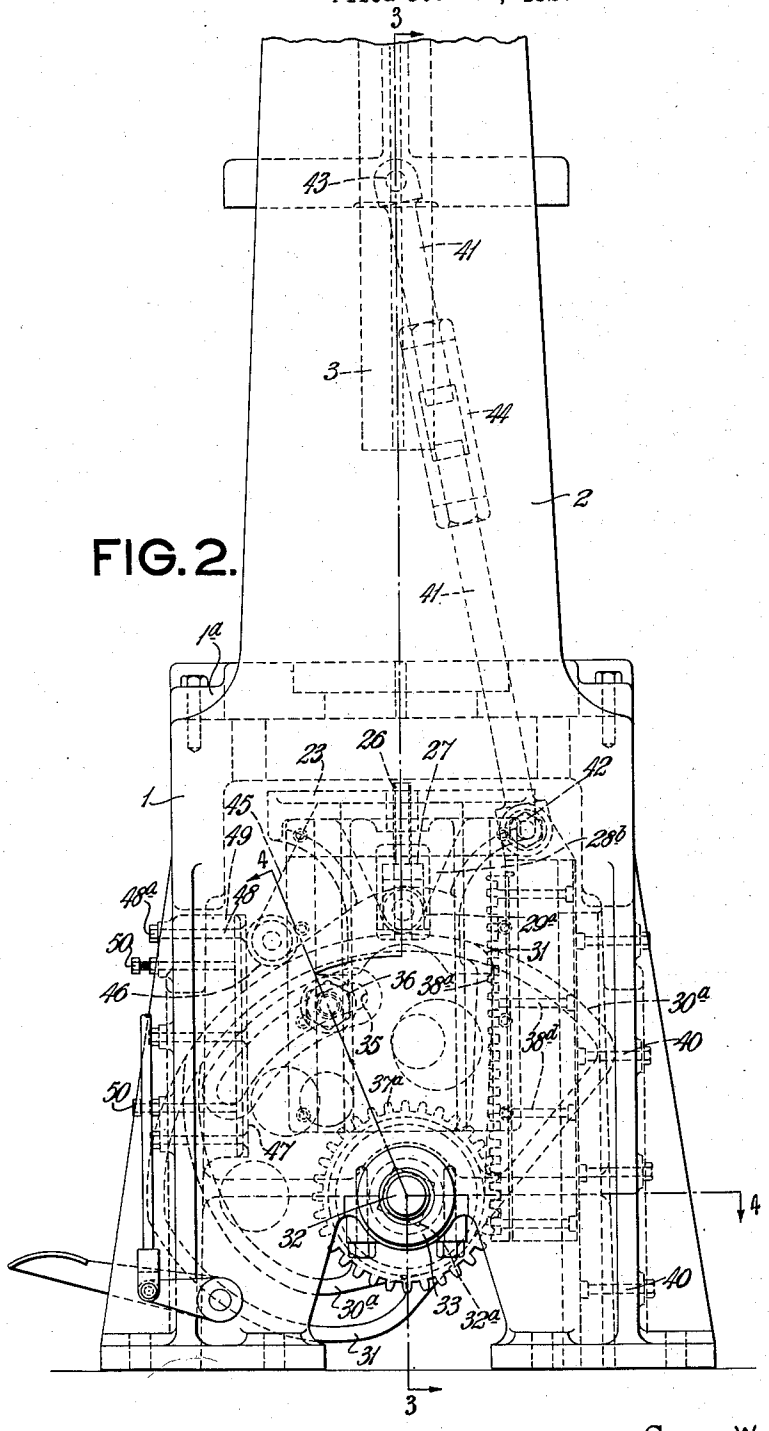
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PRESS FOR DRAWING SHEET METAL

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FIG. 2.



INVENTOR:

GEORGE WILLIAM BERRY.

ATTORNEY: O. M. Walker

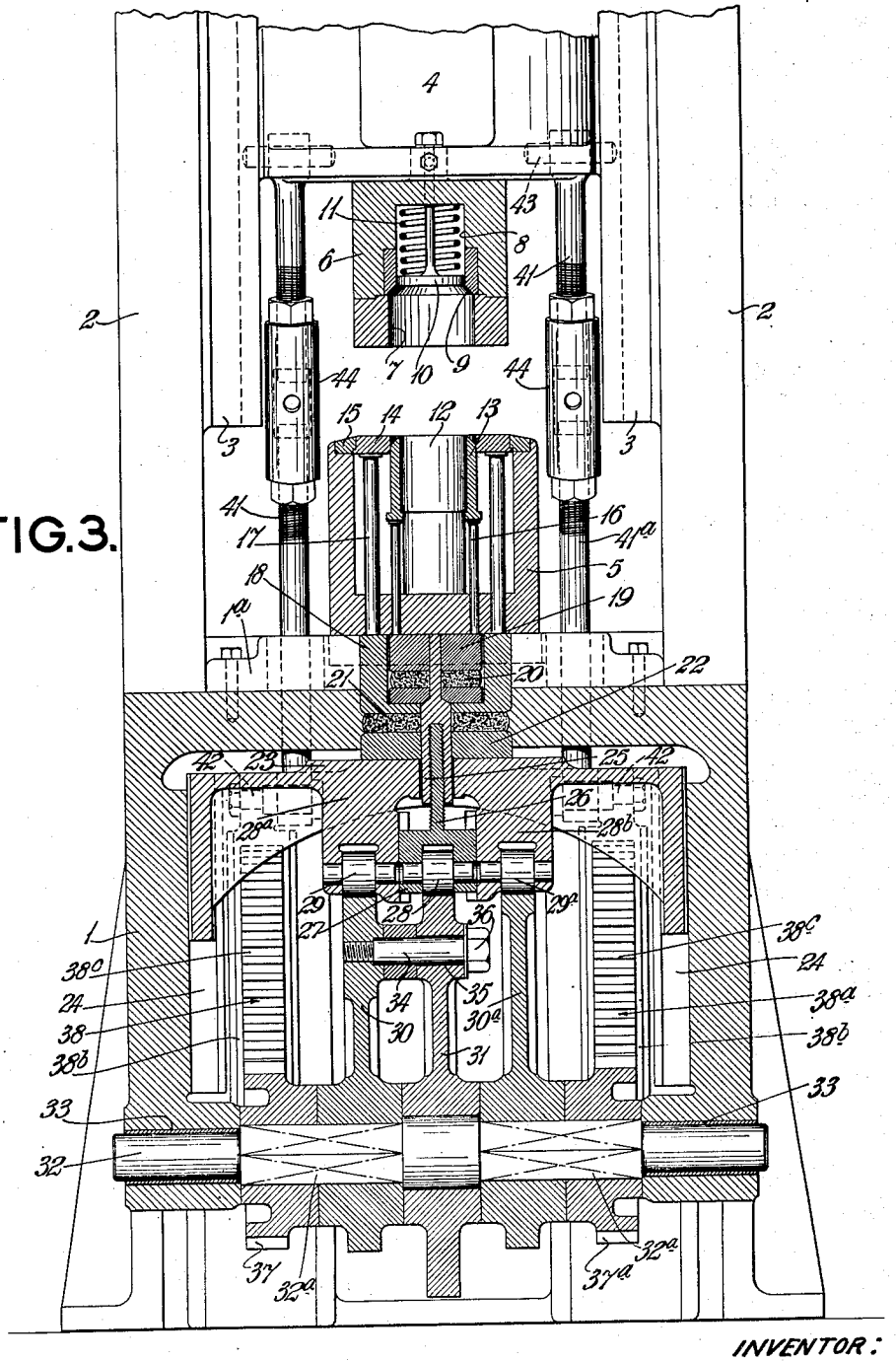
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G. W. BERRY

PRESS FOR DRAWING SHEET METAL

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FIG.3.



INVENTOR:

GEORGE WILLIAM BERRY.

ATTORNEY: A. H. Haddan

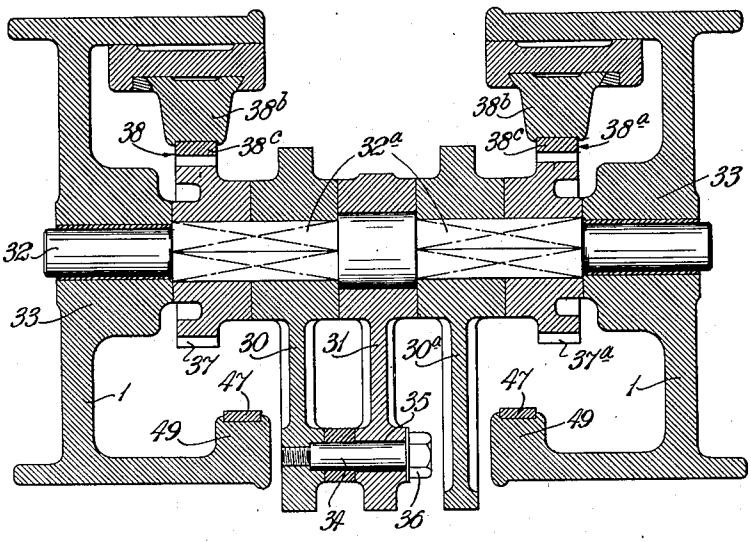
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G. W. BERRY

PRESS FOR DRAWING SHEET METAL

Filed Dec. 16, 1924 4 Sheets-Sheet 4

FIG. 4.



INVENTOR:

GEORGE WILLIAM BERRY.

ATTORNEY: A. J. Harkins

Patented Nov. 17, 1925. 1,562,075

UNITED STATES PATENT OFFICE.

GEORGE WILLIAM BERRY, OF WAKEFIELD, ENGLAND, ASSIGNOR OF ONE-HALF TO CHARLES JOSEPH RHODES, OF WAKEFIELD, ENGLAND.

PRESS FOR DRAWING SHEET METAL.

Application filed December 16, 1924. Serial No. 756,179.

To all whom it may concern:

Be it known that I, GEORGE WILLIAM BERRY, residing at Wakefield, in the county of York, England, a subject of the King of Great Britain and Ireland, have invented certain new and useful Improvements in Presses for Drawing Sheet Metal, of which the following is a specification.

This invention relates to presses having cooperating movable and stationary dies for drawing sheet metal, particularly hollow ware, such as vessels or receptacles of considerable depth which are drawn in one or more stages in a single stroke of the press, suitable dies for the purpose being such as disclosed in my co-pending applications Serial Nos. 694,221 and 695,931, the lower die including one or more drawing members or rings the movements of which during the drawing operation are controlled by cam or other mechanism in unison with the movements of the movable die whereby uniform pressure is maintained on the work during the entire drawing operation.

The object of the present invention is to provide improved operating and controlling mechanism for the drawing member or members of the stationary die and associated buffer device or buffer devices when provided, in order to produce very much deeper draws than hitherto possible whilst maintaining the aforesaid uniform pressure on the work without distortion or deformation of the metal of the drawn article.

The invention comprises the novel features, combinations and arrangements of parts as set forth in appended claims and the essential elements of which are hereinafter fully described with reference to the accompanying drawings in which:—

Fig. 1 is a front elevation of the press with the main operating mechanism for the upper or movable die carried by the ram removed; Fig. 2 is a side elevation of Fig. 1; Fig. 3 is a central vertical section on the line 3—3 of Fig. 2; and Fig. 4 is a horizontal section on the line 4—4 of Fig. 2.

In said drawings, 1 designates the bed of the press and 2 the usual side frame members provided with guides 3 for guiding the movements of the ram 4 in its vertical reciprocation. The bed 1 supports by means of an interposed block 1^a the lower or stationary die 5 and the ram 4 carries the upper or movable die 6 this latter having a bore of two diameters 7 and 8 with a shoulder 9 between same and containing an ejector plunger 10 under the action of a helical spring 11. The lower or stationary die comprises the hollow block 5 containing the central punch 12 surrounded by two concentric drawing members or rings, viz, the inner member 13 and the outer member 14, this latter being in turn surrounded by a blanking or cutting ring 15 let into the upper edge of the block 5 for cutting the blank out of the sheet of metal placed between the dies 5 and 6. The said pressure members 13 and 14 are each carried by a series of annularly disposed pins or rods 16 and 17 respectively which extend through the base of the die block 5 and are in turn supported by blocks 18 and 19 the latter lying within the former and having a buffer of rubber or other resilient material 20 interposed between the block 19 and the base of the block 18. The said block 18 also bears upon a buffer of rubber or resilient material 21 located between it and a plate 22 which bears on a table or platform 23 adapted to vertically reciprocate in guides 24 within the press bed 1. Attached to the block 19 of the inner pressure member 13, is an interiorly threaded sleeve 25, which passes through the block 18 and buffer 21 of the outer pressure member and into which is screwed a spindle 26 extending from a member 27 in which is mounted an antifriction roller 28. The table or platform 23 is provided at each side of the member 27 with depending portions 28^a, 28^b in which are also mounted antifriction rollers 29 and 29^a respectively.

With the said rollers 29 and 29^a there cooperate two cams 30, 30^a which may be termed the first draw cams and with the roller 28 there cooperates a cam 31 which may be termed the redraw cam all said cams being mounted on a shaft 32 the ends of which are journalled in bushes 33 in the press bed 1, the axis of this shaft being located in alignment with the common axis of the dies 5 and 6 or intersecting the vertical axis of the press. The cams 30 and 30^a are rigidly secured to the cam shaft 32 by providing them with squared or like apertures fitting over similarly shaped parts 32^a on the shaft in order to avoid the use of keys and the cam 31 is loosely mounted on the

shaft and is secured to the cam 30 by means of a bolt 34 tapped into said cam and extending through a slot 35 in the cam 31 where it may be secured by a nut 36 so that the relative positions of the "draw" cams and the "redraw" cam may be adjusted to determine and vary the time at which the redraw operation shall commence in relation to the first draw, the redraw cam 31 being secured by the nut 36 when the required setting has been effected.

Also mounted rigidly on the cam shaft 32, on the squared portions 32^a thereof, are two pinions 37, 37^a the teeth of said pinions meshing respectively with the teeth of two racks 38 38^a adapted to slide vertically in guides 39, 39^a attached by bolts 40 to the inside of the press bed 1.

The racks are formed of separate members viz, a support 38^b and the toothed portion 38^c this latter being connected to the support 38^b by means of bolts 38^d.

The said racks are reciprocated in the guides by means of connecting rods 41, 41^a pivoted below the bolts 42 to the upper ends of the racks and pivoted above by pins 43 to the press ram 4. The said rods 41, 41^a are formed in two parts connected by screw couplings 44 so as to provide for variations in the setting of the cams.

From the above description it will be apparent that the cam shaft 32 is oscillated in unison with the movements of the movable die 6 carried by the ram and that through the cams 30, 30^a and 31 the movements of the drawing members of the stationary die 5 are controlled also in unison with the movable die to maintain uniform pressure on the work during the entire drawing operation whether the same is a single draw or a draw and redraw operation.

The predetermined pressure on the drawing member 14 may be varied by the provision of a number of set screws 44^a passing through bosses 44^b on the platform 23 and extending through the latter into the lower surface of the bed 1. The pressure on the redraw member 13 is adjustable by screwing the spindle 26 more or less into the sleeeve 25.

The table or platform 23 which supports the first or outer draw member 14 and rides on the two cams 30 and 30^a as described, is provided with means to counteract any lateral thrust which may arise due to possible unequal pressure taking place on the draw member or members 13, 14 of the stationary die consequent upon the particular contour of the cams such lateral thrust having the tendency to tilt the table. These means are shown as comprising lateral extensions 45 on the table, one at each side thereof and located opposite the connection of the operating rods 41, 41^a, and carrying an antifriction roller 46 which bears upon a guiding or wearing plate 47 carried inside the press bed.

The said wearing plates 47 are each connected by studs 48 and nuts 48^a to an inward extension 49 of the press bed 1 and adjustment for wear may be effected by screws 50 extending through said extension 49 and bearing at their forward ends against the rear face of the wearing plate. When carrying out such adjustments it is obvious that the nuts 48^a must be slacked off.

In the case of a press having the two drawing or pressure members 13, 14 as above described the operation is as follows. The action of the cams 30 30^a, 31 is such that as the ram 4 first descends or makes its drawing stroke the first or outer drawing or pressure member 14 recedes at an exact distance in front of the ram or of the movable die 6 carried thereby and at exactly the same speed. The effect produced is that the metal to be drawn is gripped at a pressure, determined by the adjusting means provided between the lower face of the movable die 6 and the upper face of said drawing or pressure member 14. Immediately thereafter the blank is drawn into the form of a shallow cup over the second or inner drawing or pressure member 13 the outside of the cup then resting in the large diameter bore 7 of the movable die. On reaching the maximum extent of draw permitted by the first draw member 14, the second draw member 13 commences to recede in precisely the same manner as said first member. The metal is thus gripped between the upper face of the second draw member 13 and the shoulder 9 between the large 7 and small diameter 8 of the movable die whilst it is drawn over the fixed punch 12 of the stationary die 5. The fact that the drawn cup has a tendency to expand causes it to be retained in the movable die whilst the latter is ascending or returning to original position but it is ejected. when the dies are clear of one another, by means of the ejector plunger or stud 10 within said movable die which is operated by any appropriate means (not shown).

It will be readily understood that by suitable modification of the dies, drawing or pressure members and cams, the drawing operation may be performed either in a single stage or in more than the two stages mentioned as requirements or the class of work being produced may demand.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In drawing sheet metal, die mechanism including co-operating movable and stationary dies, a movable drawing member embodied in the stationary die, a cam, a shaft carrying said cam having a fixed axis which intersects the vertical axis of the die mechanism, and means operative from the movement of the movable die member, to oscillate said shaft and cam to control the

movement of the drawing member and maintain the same under a constant pressure during the drawing operation.

2. In drawing sheet metal, die mechanism including co-operating movable and stationary dies, a movable drawing member embodied in the stationary die, resilient pressure means associated with said movable drawing member to yieldingly clamp the work to the movable die member, a cam having a fixed axis which intersects the vertical axis of the die mechanism, and means operative from the movement of the movable die member to oscillate said cam whereby said drawing member and pressure means are placed and maintained under a constant predetermined pressure during the drawing operation.

3. In drawing sheet metal, die mechanism including co-operating movable and stationary dies, a plurality of independently movable drawing elements embodied in said stationary die and co-operating with the movable die to effect the drawing operation in successive stages, a fixedly journaled shaft disposed transversely of the vertical axis of the die mechanism having cams thereon, and means operative from the movement of the movable die to oscillate said shaft, and cams to control said drawing elements to effect movement thereof in sequence by the movable die and maintain the same under predetermined and constant forces to effect the drawing of the metal in successive stages in a single operation of the die mechanism.

4. In drawing sheet metal, a fixed die and a drawing element movable relatively thereto, a die reciprocatory toward and away from the fixed die, a cam whose axis intersects the vertical axis of the dies, a shaft mounted in fixed bearings carrying said cam, and means operative in unison with the reciprocatory die to oscillate said shaft and cam to control the movement of the movable drawing element by the movable die and maintain the same under a predetermined and constant force, and said reciprocatory die co-operating with fixed die and movable drawing element to effect the drawing of the metal.

5. In drawing sheet metal, a fixed die and a plurality of independently movable drawing elements movable relatively thereto, a die reciprocatory toward and away from the fixed die, a shaft mounted in fixed bearings and having its axis intersecting the vertical axis of the dies, cams mounted on said shaft, and means operative to oscillate said shaft and cams in unison with the movement of the reciprocatory die to place said drawing elements under a constant force, during their movements, and the reciprocatory die co-operating with said drawing elements and the fixed die to effect a drawing of the metal in successive stages in a single movement of the reciprocatory die.

6. In drawing sheet metal, a fixed die and a drawing element movable relatively thereto, a die reciprocatory toward and away from the fixed die, a cam whose axis intersects the vertical axis of the dies, a shaft mounted in fixed bearings carrying said cam, and means including rack and pinion mechanism operative in unison with the reciprocatory die to oscillate said shaft and cam to place the movable drawing element under a predetermined and constant force, and said reciprocatory die co-operating with fixed die and movable drawing element to effect the drawing of the metal.

7. In drawing sheet metal, die mechanism including co-operating movable and stationary dies, a movable drawing member embodied in the stationary die, a cam having a fixed axis which intersects the vertical axis of the die mechanism, means operative from the movement of the movable die member to oscillate said cam whereby said drawing member is placed under a constant pressure during the drawing operation, and means for correcting lateral thrust of the cam on said drawing member.

8. In drawing sheet metal, die mechanism including co-operating movable and stationary dies, a plurality of independently movable drawing elements embodied in said stationary die and co-operating with the movable die to effect the drawing operation in successive stages, a fixedly journaled shaft disposed transversely of the vertical axis of the die mechanism having cams thereon, means operative from the movement of the movable die to oscillate said shaft and cams to control said drawing elements and place same successively under predetermined and constant forces to effect the drawing of the metal in successive stages in a single operation of the die mechanism, and means for correcting lateral thrust of certain of said cams on the drawing member pertaining thereto.

9. In a press for drawing sheet metal, the combination of a fixed die and a plurality of independently movable drawing members movable relatively thereto, a die reciprocatory towards and away from the fixed die, a reciprocatory platform affording support for one of said drawing members, a fixedly journaled shaft disposed transversely of the vertical axis of the dies, cams mounted on said shaft having their axes intersecting the vertical axis of the dies, one of said cams being in operative connection with one drawing member and others of said cams in operative connection with the platform, means including rack and pinion mechanism operative from the reciprocatory die to control said drawing elements through their respective cams and place same successively

under constant force to effect the drawing of the material in successive stages in a single operation of the reciprocatory die, and means for compensating for lateral thrust on the platform by its cams to ensure equal circumferential pressure on the drawing member supported by said platform.

10. In drawing sheet metal, die mechanism including co-operating movable and stationary dies, a plurality of independently movable drawing elements embodied in said stationary die and co-operating with the movable die to effect the drawing operation in successive stages, a fixedly journaled shaft disposed transversely of the vertical axis of the die mechanism having cams thereon, means operative from the movement of the movable die to oscillate said shaft and cams to control said drawing elements and place same successively under predetermined and constant forces to effect the drawing of the metal in successive stages in a single operation of the die mechanism, and means for relatively adjusting said cams to control the period of commencement of a drawing stage in relation to the stage preceding.

11. In drawing sheet metal, die mechanism including co-operating dies one of which is stationary and the other movable relative thereto, a movable drawing member embodied in the stationary die and adapted to be moved during the movement of the movable die, resilient pressure means associated with said movable drawing member to yieldingly clamp the work to and resist the movement of the movable die member, a cam having a fixed axis which intersects the vertical axis of the die mechanism, means operative from the movement of the movable die member to oscillate said cam to control the movement of said drawing member and pressure means and maintain the pressure means under a constant predetermined pressure during the drawing operation, and means for adjusting the predetermined pressure on said pressure means and drawing member.

12. In drawing sheet metal, die mechanism including co-operating movable and stationary dies, a plurality of independently movable drawing elements embodied in said stationary die and co-operating with the movable die to effect the drawing operation in successive stages, a fixedly journaled shaft disposed transversely of the vertical axis of the die mechanism having cams thereon, means operative from the movement of the movable die to oscillate said shaft and cams to control said drawing elements and place same successively under predetermined and constant forces to effect the drawing of the metal in successive stages in a single operation of the die mechanism, and means for separately adjusting the pressure of the cams on said drawing members.

In witness whereof I have signed this specification.

GEORGE WILLIAM BERRY.