

Nov. 17, 1925.

G. W. BERRY

1,561,902

PRESS FOR DRAWING SHEET METAL

Filed Feb. 29, 1924

4 Sheets-Sheet 1

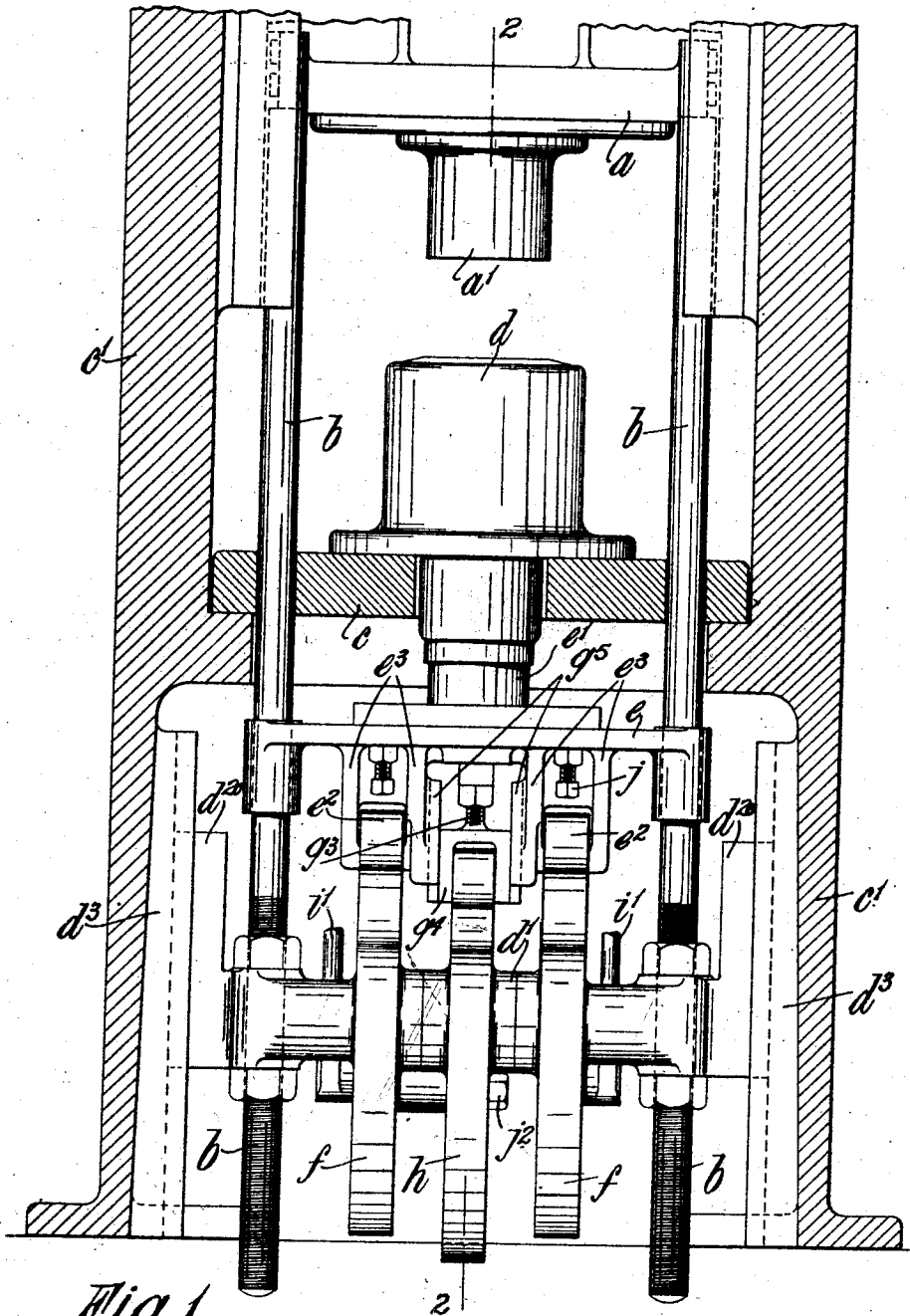


Fig. 1.

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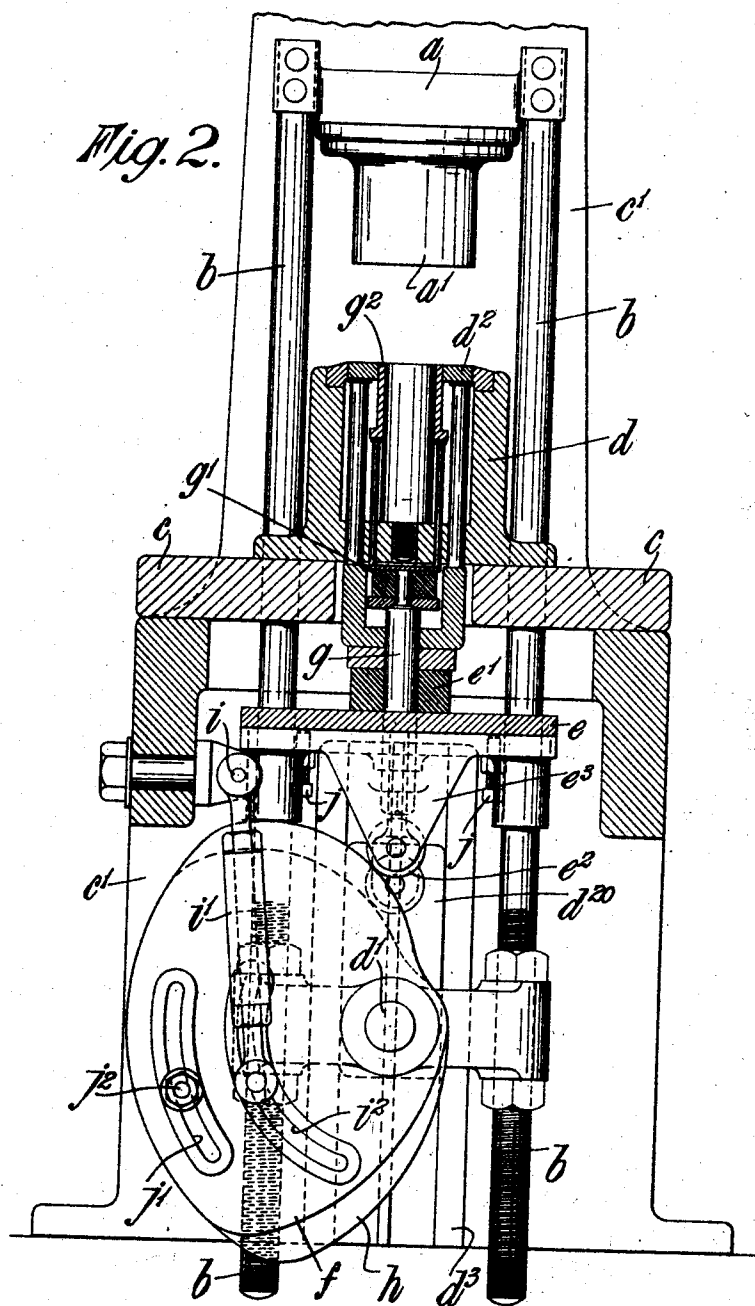
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4 Sheets-Sheet 2



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PRESS FOR DRAWING SHEET METAL

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4 Sheets-Sheet 3

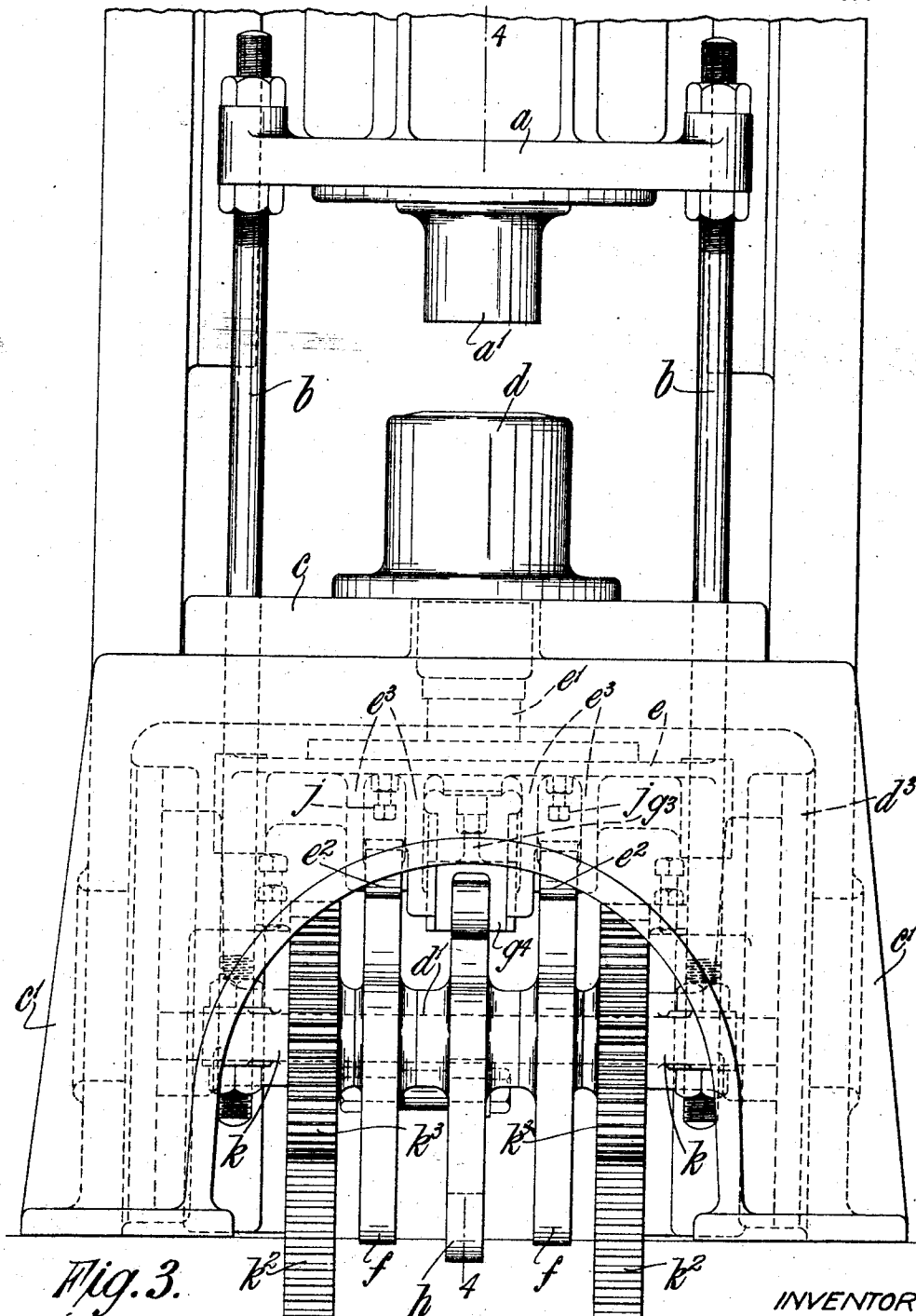


Fig. 3.

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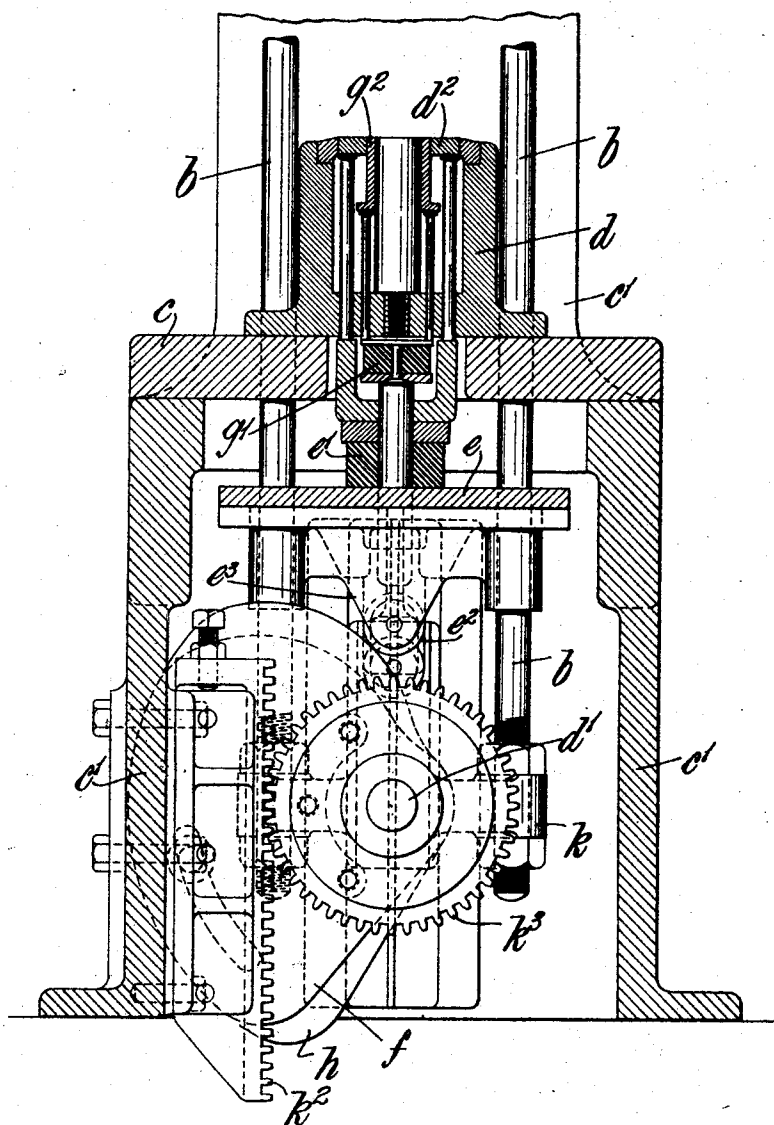
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PRESS FOR DRAWING SHEET METAL

Filed Feb. 29, 1924

4 Sheets-Sheet 4

Fig. 4.



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Patented Nov. 17, 1925.

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 February 29, 1924. Serial No. 695,931.

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 co-operating dies for drawing sheet metal hollow ware such as vessels or receptacles of considerable depth in a plurality of stages, for example two, which may be termed the "draw" and "re-draw" operations and suitable dies used for this purpose may be such as disclosed in the specification of our application for Letters Patent No. 694,221.

The object of the present invention is to provide improved or novel operating and adjusting mechanism for the dies and associated buffer devices.

According to the invention therefore there are provided connections operated from the ram of the press for causing the oscillation of cams mounted on a single shaft, said cams controlling pressure elements of one of the dies to perform drawing operations in successive steps in a single stroke of the press.

The invention further comprises improved means for regulating the pressure on and timing of the operations of the die elements for the successive steps in the drawing operation all as set forth in appended claims and hereinafter fully described with reference to the accompanying drawings in which:—

Fig. 1 is a sectional fragmentary front elevation showing one form of the press having the present improvements applied thereto. Fig. 2 is a part central vertical section on line 2—2 of Fig. 1 with parts removed. Figs. 3 and 4 are similar views to Figs. 1 and 2 of a second form of the press, Fig. 4 being in section on line 4—4 of Fig. 3.

In the embodiment of the invention illustrated in Figs. 1 and 2 a ram a which carries the upper die a^1 , is slidably mounted at opposite ends in the press frame members c^1 , and by rods b fixed to the ram slidably in the bed c of the press. Brackets d^{20} are adjustably mounted on the lower ends of the rods below the press bed in which a cam shaft d^1 is journaled to extend transversely of the vertical axis of the press, said brackets slidably engaging in guideways d^2 in the press

frame c^1 . The ram with the upper die is reciprocated by a crank shaft journaled in the upper part of the press ram as is usual. The lower die d is mounted in fixed position upon the bed c in alinement with the upper die A^1 . On the said rods is slidably mounted a table e supporting a buffer e^1 associated with the outer or main pressure ring d^2 of the lower die and which may be operated as described in the specification above referred to for the purpose of maintaining uniform pressure on the work. This table or buffer support e engages an operating or "draw" cam or cams f , two such being shown, fixed on the cam shaft d^1 , the table being provided with rollers e^2 or other antifriction means carried by brackets e^3 on the table for engagement with the cams f .

There is also provided at or about the centre of the table a re-draw spindle g extending through the first buffer and associated parts and acting on a second buffer g^1 associated with the inner or redraw pressure ring g^2 , said re-draw spindle being adjustably connected as by screw g^3 with a slide or equivalent g^4 guided in guides g^5 below the table e and co-operating with another cam h on the cam shaft d^1 which may be termed the "redraw" cam.

The main or first "draw" cams f are connected to the frame or back of the press at adjustable connecting rods i^1 each slidably in a groove i^2 in the respective cam, the construction being such that as the ram a descends the said cams oscillate about their centres. The contour of the cams f is so designed that the buffer table e does not descend until its rollers engage a particular portion or "dwell" of the cam at which moment the upper die a^1 engages the lower die d and the whole operating mechanism moves or descends as a whole. The amount of pressure required for the main or first draw on the work is determined and applied by adjusting screws j acting on the buffer table and the pressure required for the "redraw" is controlled or determined by adjusting the redraw spindle g which is threaded as at g^3 aforesaid to receive an extension of its slide whereby the pressure of the "re-draw" buffer g^1 may be varied. The contour of the "re-draw" cam h above referred to is such that it operates at a later time than the main or first draw cams f so that the redraw spindle

g which supports its associated buffer g^1 does not start its active movement or descent until the first draw has been completed.

Relative adjustment of the cams on the cam shaft d^1 can be effected by means of slots j^1 and bolts or screws j^2 .

In the embodiment illustrated in Figs. 3 and 4 the same general construction is present and the operation of the dies and pressure rings for draw and re-draw are the same. Similar reference characters have been given in these figures to the same parts already described. In this construction however the oscillation of the first draw cams f and the redraw cam h is produced by rack and pinion mechanism, the rods b connected above to the ram being coupled below to frames k which carry the cam shaft d^1 , the latter having mounted thereon, one near each end a pinion k^2 which meshes with a rack k^3 carried by the press frame c^1 , one at each side thereof.

The pinions k^2 are anchored to the first draw cams f and all oscillate on the cam shaft; the latter itself however does not oscillate.

In the present instance the dies are of circular form and the drawing elements g^2 and d^2 are in the form of rings arranged one concentric to the other and concentric to a plug 1 fixed axially of the die d . The reciprocatory die is arranged with two internal diameters 3 and 4 with a plunger 5 engaging in the portion of less diameter, said plunger being carried by a rod 6 slidably mounted axially of the die and normally urged outward to a predetermined position by a spring coiled about the rod within the die, the outward movement of the plunger being limited by a nut 8 on the plunger rod abutting at the outer side of the die. As the die d^1 descends the wall about the part of larger diameter of the die will engage ring d^2 and the die will move said ring with it during its continued descending movement, the resilient buffer c^1 urging the ring against said portion of the die and firmly though yieldingly clamping the blank to the die. As the die continues to descend the shoulder formed by the wall portion of smaller diameter of the die will engage the ring g^2 and the die will move said ring with it during the continued descending movement thereof and impart a redraw to the blank. The cams f and h are so constructed and timed as to permit of the movement of the rings in proper timed sequence with the die d^1 as they are engaged thereby.

The outer member of the lower die d has a cutter block 7 fixed in a recessed portion at the top and inner wall concentric with the rings d^2 and g^2 which cooperates with the outer edge of the upper die d^1 to cut a blank from a sheet preparatory to the drawing operation. The members d^2 and g^2 are

in the nature of a combined die and drawing member since during the initial drawing operation the member d^2 will co-operate with the upper die as a drawing member and the member g^2 will co-operate with said die as a drawing member to effect the drawing over the central block 1.

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

1. In a press for drawing sheet metal, reciprocatory and stationary co-operating dies, the stationary die comprising a fixed central member and a plurality of concentrically arranged members movable relatively to said central member and one relative to the other through the movement of the reciprocatory die, cams pivotally supported to have movement on an axis transverse to the direction of movement of the dies to control the movement of said members and place said members under a constant force to resist the movement thereof by the reciprocatory die, said cams being adapted to be reciprocated by the reciprocatory die in unison therewith, and means operative through the reciprocatory movement of the cams to effect actuation of the cams and movement of the movable members in successive sequence by the movement of the reciprocatory die.

2. In a press for drawing sheet metal, a movable ram, a die carried by said ram, a stationary die with which the movable die co-operates, a plurality of drawing members arranged concentrically of the stationary die to have movement relative thereto and to each other, cams to control the movements of said drawing members during a drawing operation, means to carry said cams to have oscillatory movement coupled to the ram to participate in the reciprocatory movements thereof, a stationary rack, and a pinion anchored to the cams meshing with said rack and operative to oscillate the cams as the cams are reciprocated with the ram.

3. In a press for drawing sheet metal, co-operating dies including a stationary die and a die reciprocatory relative to the stationary die, a plurality of concentrically arranged members associated with and movable relative to one of said dies and to each other through the movement of the reciprocatory die, cams to co-operate with and control the movements of said members to participate in the movement of the reciprocatory die and resist such movement with a predetermined force during the drawing operation, and connections associated with the reciprocatory die for reciprocating said cams from and in unison with the movement of the reciprocatory die and to effect actuation of the cams.

4. In a press for drawing sheet metal,

reciprocatory and stationary co-operating dies, a plurality of concentrically arranged members associated with and movable relative to the stationary die and to each other through the movement of the reciprocatory die, cams to control the movements of said members by the reciprocatory die and exert a force on said members to resist the movement thereof by the reciprocatory die during the drawing operation, a shaft extending transverse to the movement of the reciprocatory die and said members carrying said cams, connections associated with the reciprocatory die for imparting participating reciprocatory movement to said cam shaft and to effect actuation of the cams, and a resilient buffer interposed between each of said members and controlling cam therefor.

5. In a press for drawing sheet metal, reciprocatory and stationary co-operating dies, and a plurality of members associated with and movable relative to the stationary die and each other and co-operating with the reciprocatory die to effect the drawing of a blank in successive stages in a single movement of said die, an independently reciprocable support for each of said members, cams pivotally supported to have movement on an axis transverse to the direction of movement of the reciprocatory die to co-operate with said supports to control the movements of said members, a shaft carrying said cams, a support for the cam shaft, connections between the cam shaft support and reciprocatory die for reciprocating said cam shaft in unison with the movable die, means operative from the movement of the reciprocatory die and cam shaft support to effect actuation of the cams, a resilient buffer interposed between each of said members and its support, and means for adjusting the buffers to regulate the pressure of said buffers exerted on said members by the buffers during the drawing operation.

6. In a press for drawing sheet metal, a reciprocatory ram, a die carried by said ram, a stationary die with which the reciprocatory die co-operates, a plurality of members associated with and having movement relative to the stationary die and each other and successively co-operating with the movable die to effect the drawing of a blank in successive steps in a single movement of the die, cams to support and control the movements of said members during a drawing operation, a shaft carrying said cams, means coupled to the ram carrying the cam shaft whereby the latter and the members participate in the reciprocatory movements of the ram, a stationary rack, a pinion on the cam shaft meshing with said rack to oscillate the cams as the shaft is reciprocated, a resilient buffer interposed between each of the re-

spective members and its controlling cam, and means for adjusting the buffers to regulate the pressure exerted by said buffers on the drawing members during the drawing operation.

7. In a press for drawing sheet metal, reciprocatory and stationary co-operating dies, a plurality of combined die and drawing rings arranged concentrically of the stationary die to have movement imparted thereto in successive sequence relative to said die and each other through the movement of the reciprocatory die, cams adapted to support and control the movements of said rings during a drawing operation, a shaft carrying said cams, means carrying the cam shaft to extend transverse to the direction of movement of and associated with the reciprocatory die for reciprocating said cam shaft in unison therewith, means operative through the reciprocatory movements of the cams with the cam shaft to effect oscillation of the cams, and means for adjusting said cams to vary the period of control thereof on the respective drawing rings.

8. In a press for drawing sheet metal including a ram, a die, a plurality of concentrically arranged elements associated with and movable one independently of the other and in unison relative to said die, and a shaft intersecting the vertical axis of the press, connections from the ram of the press for effecting reciprocation of said shaft, cams carried by said shaft, and a connection with said cams adapted to oscillate said cams through the reciprocation thereof to control the movement of the movable elements associated with the die.

9. In a press for drawing sheet metal including a ram, a pair of co-operating dies one of which is reciprocatory with the ram and one of which embodies a central plug and a plurality of independently movable annular elements concentrically arranged around said plug, a floating shaft disposed in and intersecting the vertical axis of the press, connections from the ram of the press for reciprocating said shaft in unison with the reciprocatory movement of the ram, cams mounted on said shaft, and means connected to said cams adapted to impart oscillatory movement to the cams through the reciprocatory movement of the shaft to control the movements of the elements embodied in the one die whereby to perform a drawing operation in co-operation with said dies in successive stages during a single stroke of the press.

10. In drawing sheet metal, die mechanism including a fixed die and a reciprocatory die, a plurality of concentrically arranged independently movable elements to co-operate with said reciprocatory die to effect the drawing operation, a shaft

disposed transversely of the vertical axis of the die mechanism having cams thereon and reciprocatory in the direction of the vertical axis of the die mechanism, and means operative through the movement of the reciprocatory die to reciprocate said shaft and oscillate the cams to control the movement of the movable elements and place said elements under a predetermined and constant force to effect the drawing operation in successive stages in one movement of the reciprocatory die.

11. In drawing sheet metal, a fixed die and a plurality of elements arranged concentrically of and movable independently relative thereto, a die reciprocatory toward and away from the fixed die, said reciprocatory die being constructed and arranged to be successively brought into operative relation with the movable elements and co-operate therewith to effect movement of said elements in successive sequence, pressure means to exert a force upon and urge said elements in a direction toward and resist the movement of the movable die, cams whose axis intersects the vertical axis of the dies and reciprocable in a direction of said vertical axis of the dies, means operative to reciprocate said cams from the movement of and in unison with the movement of the reciprocatory die and means connected to the cams operative through the reciprocatory movement thereof to simultaneously oscillate said cams to control the movements of the movable elements and maintain said pressure means under predetermined and constant

forces, and the reciprocatory die co-operating with said movable elements and the fixed die to effect the drawing operation in successive stages in a single movement of the reciprocatory die.

12. In a press for drawing sheet metal, a pair of dies, one of which is fixed and the other reciprocable relative to the fixed die, a plurality of rings associated with one die supported to have movement relative to said die and each other in successive sequence and co-operate with the other die to effect a drawing of a blank in successive stages during a single movement of the reciprocatory die, pivotally supported cams to control the movement of said rings, and a connection between said cams and reciprocatory die to reciprocate said cams from and in unison with the reciprocatory die and effect oscillation of the cams during the reciprocatory movement thereof to control the movement of the rings in predetermined sequence with the movement of the reciprocatory die and maintain the rings under a constant pressure for the entire movement thereof.

13. A press as claimed in claim 8 wherein the connection with the cams operative to oscillate said cams through the reciprocatory movement thereof comprises a fixed rack and a gear fixed to the cams meshing with the rack.

In witness whereof I have signed this specification.

GEORGE WILLIAM BERRY.