

L. BAUROTH.
POWER PRESS.

APPLICATION FILED NOV. 13, 1911.

1,060,662.

Patented May 6, 1913.

6 SHEETS—SHEET 1.

Fig. 1.

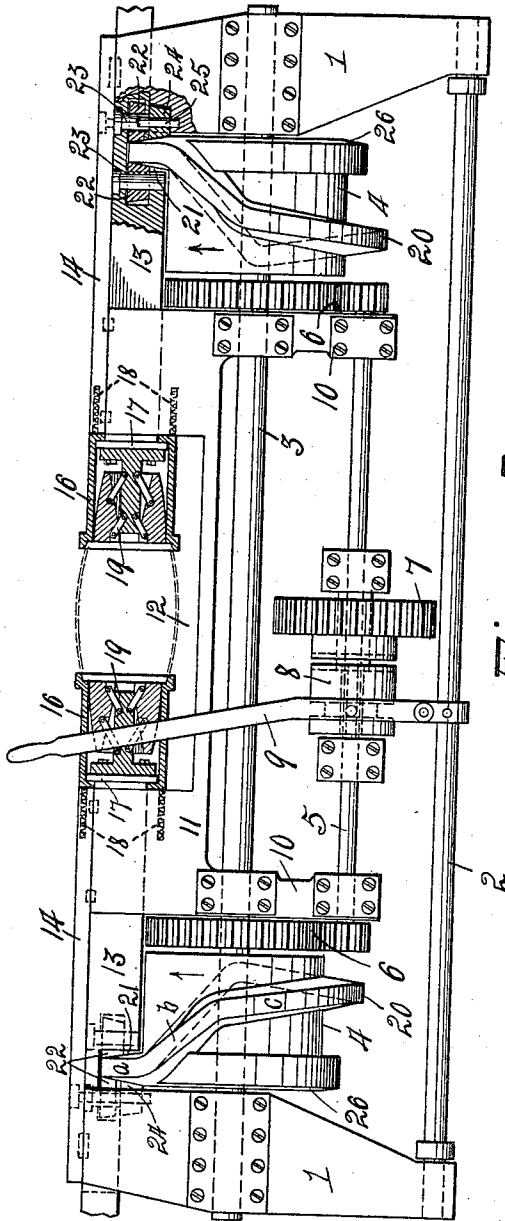
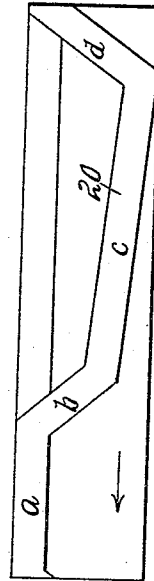


Fig. 2.



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6 SHEETS—SHEET 2.

Fig. 3.

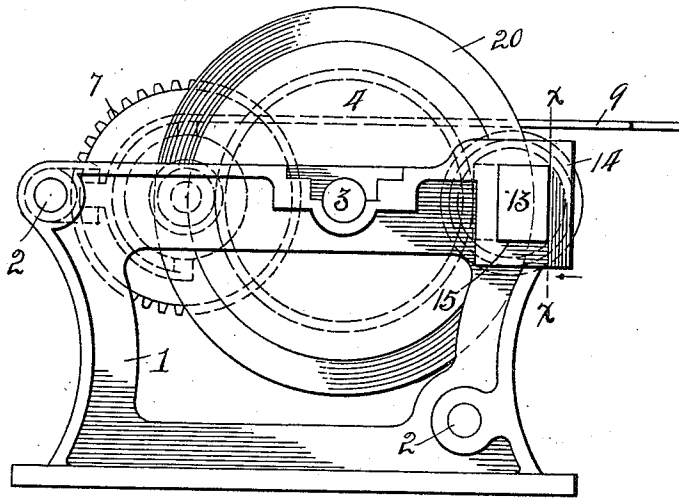
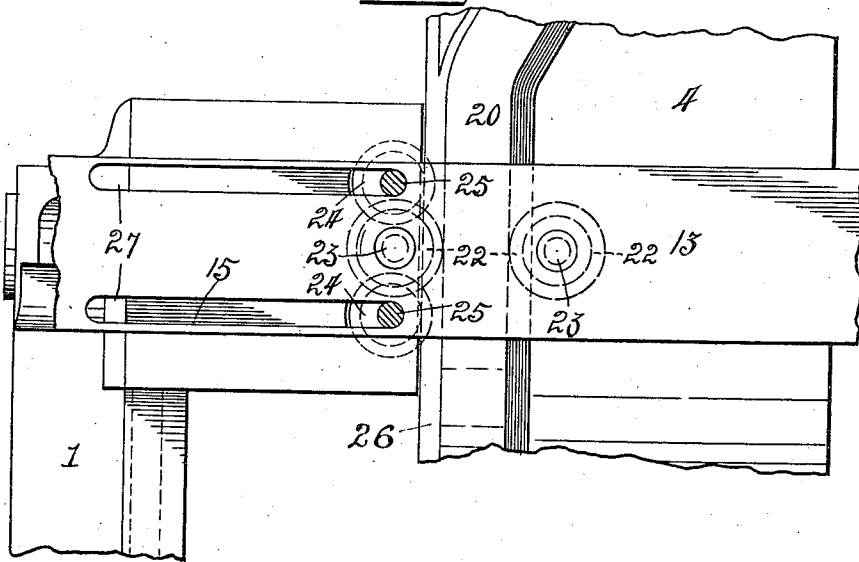


Fig. 4.



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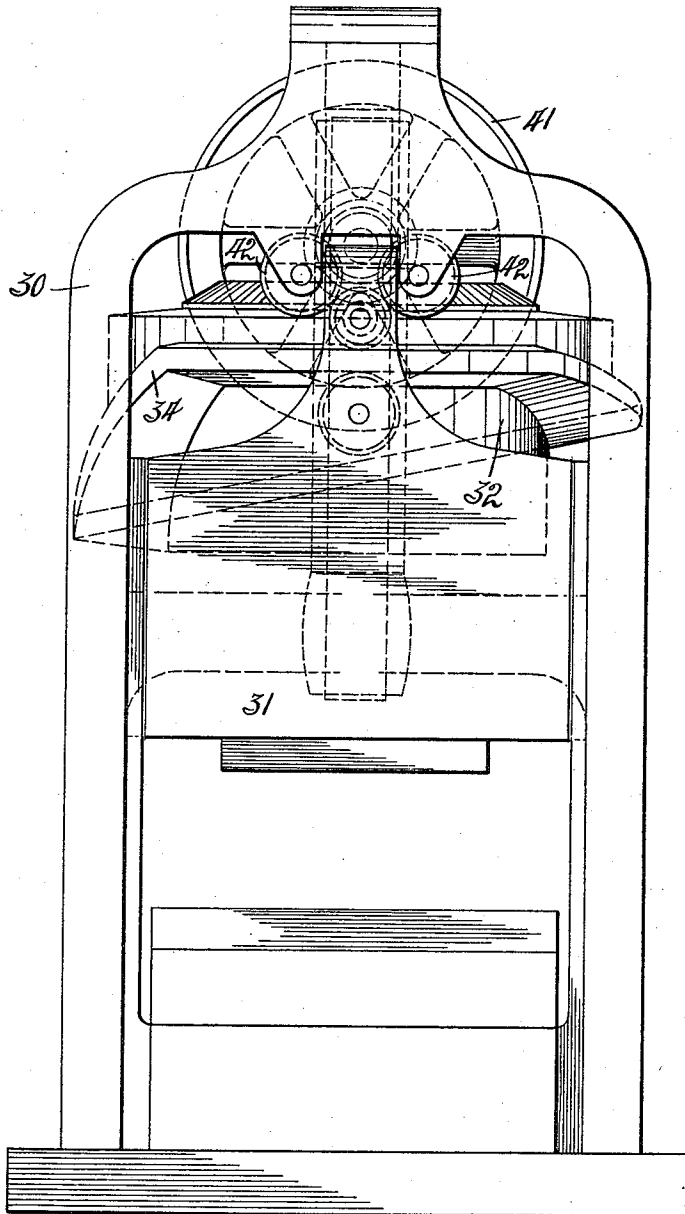
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6 SHEETS—SHEET 3.

Fig. 5.



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6 SHEETS—SHEET 4.

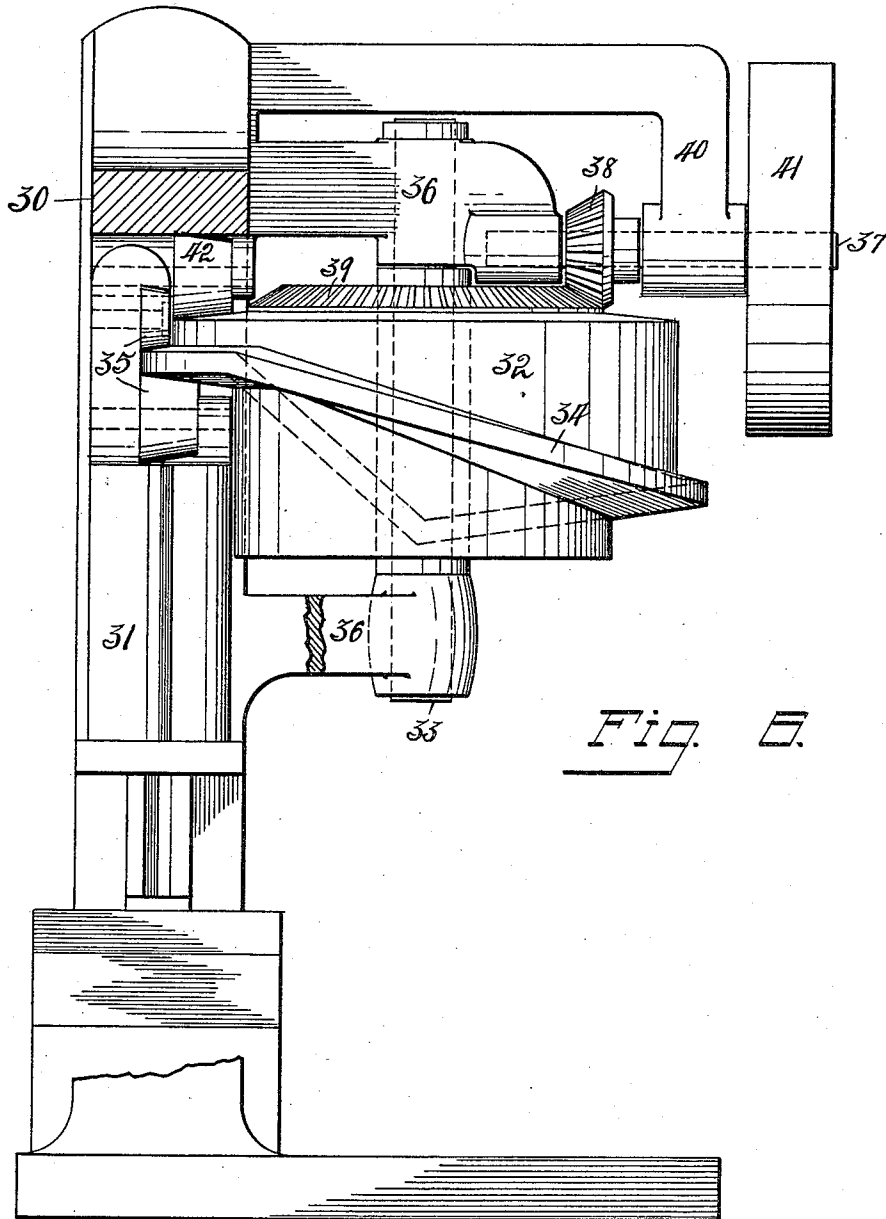


Fig. 6.

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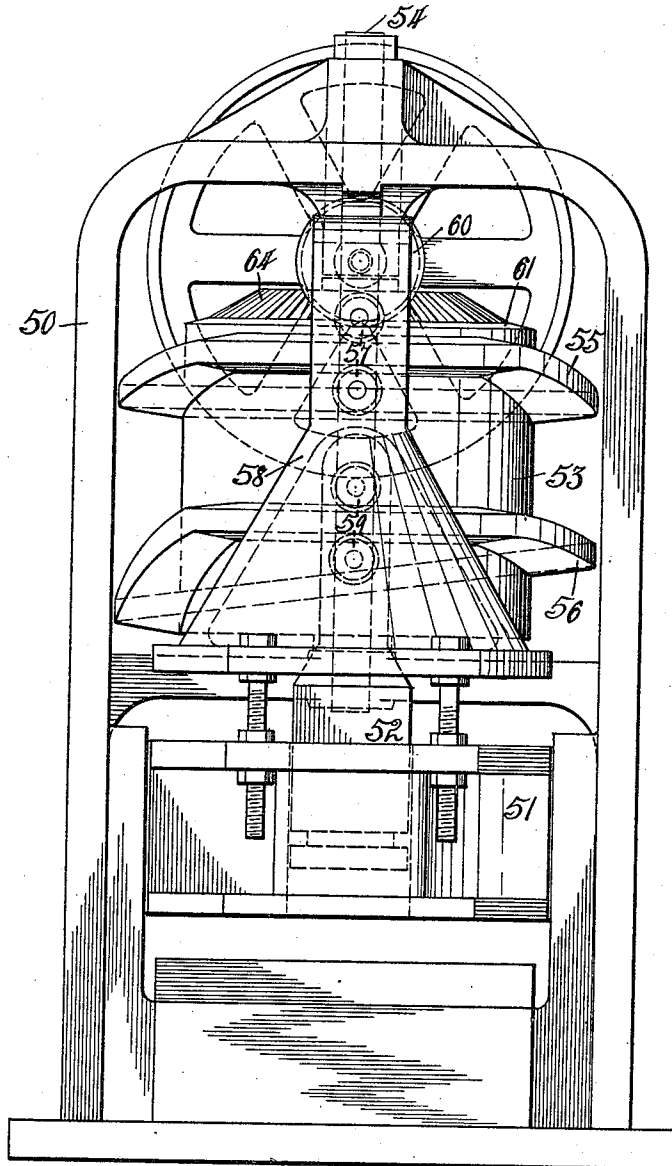
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6 SHEETS—SHEET 5.

Fig. 7



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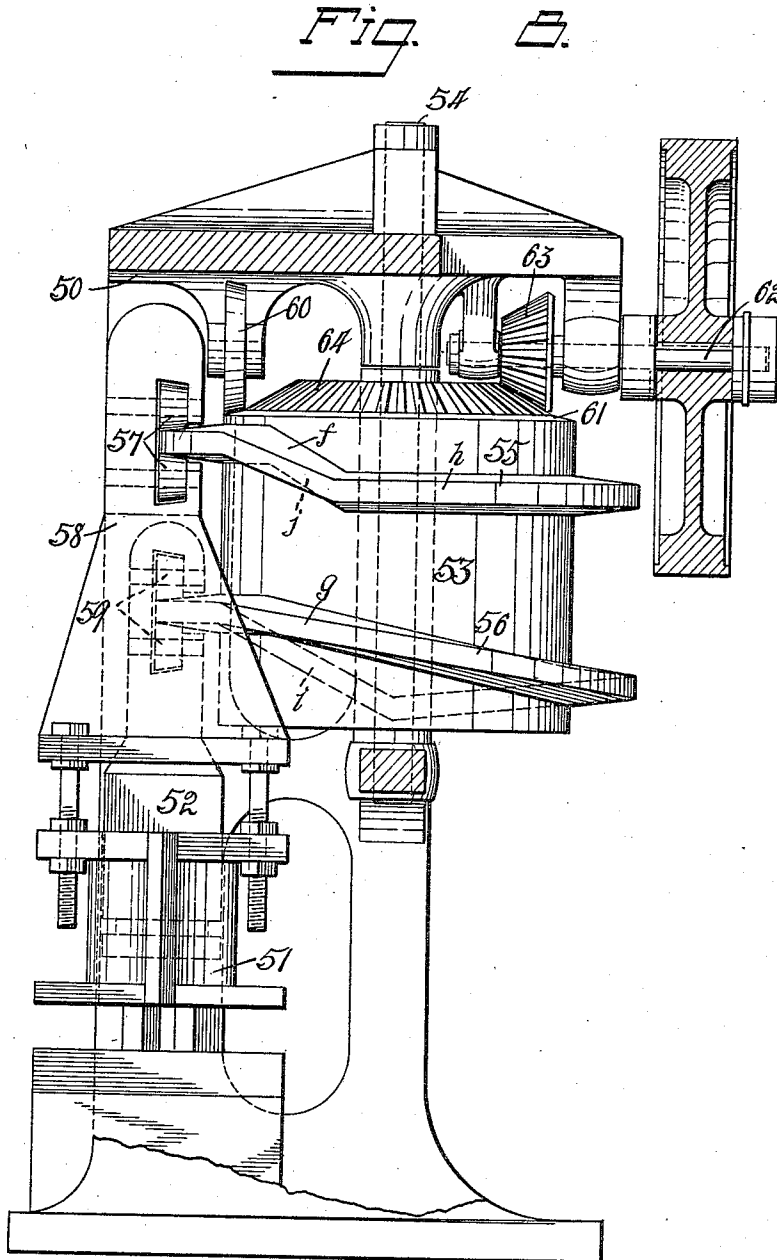
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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

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POWER-PRESS.

1,060,662.

Specification of Letters Patent.

Patented May 6, 1913.

Application filed November 13, 1911. Serial No. 660,039.

To all whom it may concern:

Be it known that I, LEONHARD BAUROTH, a citizen of the United States, and a resident of Toledo, in the county of Lucas and State of Ohio, have invented a certain new and useful Power-Press; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to metal working machines, and particularly to means for imparting movements to reciprocal members, and is intended for use in connection with any of such machines in which a reciprocally movable pressure part is employed and for which it may be adapted or appropriate, as, for instance, metallic package expanding machines, hub-ring setting machines, punch presses, drawing presses, and the like.

The object of my invention is the provision of simple and efficient mechanism for imparting movements at varying or differential speeds to a reciprocal part, as the performance of the desired work may require.

Further objects of my invention will be apparent from the following description and appended claims.

The invention is fully described in the following specification, and while, in its broader aspect, it is capable of use in numerous connections, three applications only of the same are illustrated in the accompanying drawings, in which,—

Figure 1 is a top plan view of an expanding machine embodying the features of my invention, with parts in section. Fig. 2 is a diagram of one of the cams thereof. Fig. 3 is an end elevation of the machine. Fig. 4 is an enlarged section on the line $x-x$ in Fig. 3 with portions broken away. Fig. 5 is a front elevation of a single-acting punch or drawing-press embodying my invention. Fig. 6 is a side elevation thereof with a portion of the frame broken away, and Figs. 7 and 8 are front and side elevations of a double-acting drawing press embodying my invention, with portions of the latter in section.

Referring to Figs. 1 to 4 of the drawings, 1, 1 designate the end standards of a ma-

chine frame of any suitable construction, which standards are shown as being rigidly connected by tie-rods 2. A shaft 3 is journaled at its ends within the two standards 1, 1, and has a cam-drum 4 fixed thereto adjacent to each standard. The shaft 3 is geared in the present instance to a drive shaft 5 by two sets of properly proportioned gears 6, and the shaft 5 has a gear or drive member 7 loosely mounted thereon for connecting to any suitable source of power. A clutch member 8 is feathered to the shaft 5 and is shifted into and out of clutch engagement with the member 7 by a shift-lever 9, which is fulcrumed to one of the rods 2. The shaft 5 is journaled, in the present instance, in arms 10, which project rearward from a frame part 11 disposed in advance of the shaft 3 and have bearings on such shaft.

The frame part 11 has its front central portion cut-away, as at 12, to receive the work coacting parts of the machine and the work to be acted on, and has plunger-ways provided longitudinally through the front portions of its ends, as indicated by dotted lines in Fig. 1, in which plungers 13, 13 are mounted for reciprocal movements. The front sides of these plunger-ways are closed by plates 14, 14, which also extend outward to and cover the front sides of similar ways 15 provided in the front sides of the standards 1, 1 in longitudinal register with the first mentioned ways for the outer ends of the plungers 13 to work in. The plates 14 are secured to the standards 1 and frame part 11 in any suitable manner.

Each plunger 13 has its inner end projecting within the frame part opening 12 and slidingly carrying a hollow work-holder 16. The inner end of the holder, or that opposed to its work engaging end, is flanged inwardly to have a close sliding fit around the plunger, while the associated plunger end is outwardly flanged or shouldered, as at 17, to coact with the holder flange to limit the relative movements thereof. The adjacent ends of the work-holders 16 are flanged or suitably shaped to fit over or coact with the ends of a work blank to hold the same. When the plungers 13 are in full retracted positions their shouldered ends act upon the inner flanged ends of the work-holders 16 to retain such holders retracted from work gripping positions, and

upon inward movements of the plungers coiled expansion springs 18, which are mounted in sockets in the frame part 11 and plates 14, act upon the work-holders to
 5 force them outward to grip the work between them.

The plungers 13, 13, are shown, in the present instance, as carrying work expanding means 19, 19 at their inner ends, which
 10 means are entirely drawn within their respective blank-holders 16 when the plungers are retracted, and adapted to be forced together into the work blank and to expand the same into bilge or other desired form
 15 upon a meeting of their ends. The means 19 may be of any suitable construction for the purpose intended, or they may be removed and other means attached to the plunger ends for acting in any desired manner
 20 in opposition upon the work ends, as for instance, to force flanges or collars upon wheel hubs.

The means employed for imparting the requisite movements in unison to the plungers 13, 13 to perform their respective functions consists in providing an endless cam-rib 20 on each drum 4 circumferentially thereof, which rib works within a transverse recess 21 in the associated plunger 13
 30 between opposing rolls 22 mounted in such recess. The pins 23 upon which the rolls 22 are mounted are carried by the plungers 13 in any suitable manner. The cam-ribs 20, in the present instance, are of like form,
 35 but reversely arranged upon the respective drums, to impart like movements in opposite directions to the plungers 13, 13, and each has a neutral portion *a* with which the rolls 22 coact when the respective plungers
 40 are in full retracted position. The neutral portions of the cams continue, in the present instance, for approximately one-quarter of a revolution of the respective drums, in opposition to the direction of turning thereof,
 45 after which the cams abruptly angle therefrom, as shown at *b* to effect a quick movement of the plungers 13 to approximately points where the means 19 carried thereby begin to act on the work. The portions *b* of the cams, in the present instance,
 50 accomplish about three-quarters of the in or working strokes of the plungers, the remainder of the throw or the maximum power portion thereof being accomplished by the prolonged gradually tapering portions *c* of the cam ribs, which extend around
 55 substantially one-half of the circumferences of the respective drums. During this portion of the plunger strokes the greatest power is required as the shaping or other treatment of the work then takes place, and for such reason the cam portions *c* are prolonged and only slightly inclined transversely of the respective drums to impart
 60 powerful actions to the plungers when ac-

tuated thereby. When the working or power strokes of the plungers are completed they are quickly returned to neutral positions by the coaction of the abruptly angled portions *d* of the cam ribs with the respective plunger rolls. The cam portions *d*
 70 connect the adjacent ends of the associated cam-rib portions *c* and *a* and are preferably so angled as to complete the outstrokes of the plungers in approximately one-quarter
 75 of a turn of the respective drums. It is apparent that the forms of the cam-ribs 20 may be changed as desired to suit the requirements of the work to be performed.

The thrust of the cam-rib 20 upon the inner plunger roll 22 of each plunger during the in or power stroke thereof is opposed by one or more, in the present instance, two, thrust-rolls 24, which are carried by pins
 80 25 suitably mounted within the associated standard 1 or other rigid frame part, and work against an annular surface 26 at the outer edge of the cam-drum. The surface 26 is disposed within the circle described by the portion of the cam rib with which the
 90 outer roll 22 coacts, as shown, thus requiring the placing of the thrust-rolls 24 within the arcs of action of the rolls 22. The pins 25 carrying the thrust-rolls 24 are shown as being anchored at their outer ends in the
 95 respective plates 14 and at their inner ends in the standards 1, and as working through longitudinally-extending slots 27 in the associated plungers, said slots being at opposite sides of the pins 23 carrying the rolls 22.
 100

In the operation of the machine described, the operator places, in the present instance, a cylindrical metallic package in position to be gripped between the work-holders 16, 16 and then throws the clutch lever 9 to move
 105 the clutch member 8 into engagement with the drive member 7, to communicate rotation to the cam-drums 4. Upon such rotation of the drums the portions *b* of the cam-ribs act upon the plunger rolls 22 to move the plungers inwardly into position for the adjacent ends of the expanding means to abut, at which point the power portions *c*
 110 of the cams act upon the rolls 22 to cause a retarded completion of the power strokes of the plungers during which time the means are actuated to expand the work into bilge-form. Upon the beginning of the power strokes of the plungers the work-holders 16, 16 move therewith under the influence
 115 of the springs and grip the work ends to hold it centered while being acted on and also to prevent an expansion of the package ends. The work-holders are retracted from work gripping positions by the plungers
 120 during the last portions of their out strokes.

In the application of my invention illustrated in Figs. 5 and 6, 30 designates the frame of a punch or drawing press; 31 a plunger reciprocally movable therein; 32 a 130

cam-drum, which is carried by a vertical shaft 33 and has its cam-rib 34 working between rolls 35 carried at the upper end portion of the plunger to coact with such rolls to impart reciprocal movements to the plunger upon a rotation of the drum, and 36, 36 designate arms which project from the frame and form bearings for the drum-shaft.

10 The cam-drum is driven from a drive-shaft 37 by a bevel gear 38 meshing with an annular series of teeth 39 on the upper end of the drum. The shaft 37 is suitably mounted in a frame arm 40 and the upper one of the arms 36 and carries a pulley 41 on its outer end. A pair of thrust rolls 42 are carried in suitable manner by the frame 30 in position to work against an annular surface on the upper end of the drum to oppose the thrust of the lower roll 35 against the rib 34 during the working stroke of the plunger. The upper roll 35 does not need to be as heavy as the lower roller as its function is only to coact with the cam-rib to retract the plunger from working position.

25 The cam-rib 34 is preferably of such form as to cause a comparatively rapid lowering of the plunger to work drawing position upon a rotation of the drum and then to impart a slower and more powerful work drawing or punching movement to the plunger to the end of its working stroke, after which the plunger is quickly retracted to inoperative position.

35 The machine shown in Figs. 7 and 8 is similar in its action to the one just described, and in addition the drum is provided with a second circumferential cam rib for acting upon a blank-holder to impart the requisite movements thereto relative to the plunger during an operation of the machine. In these figures, 50 designates the frame of a drawing press, 51 a blank-holder, which is guided for reciprocal movements therein, 45 and 52 a plunger, which is reciprocally movable through the blank-holder. A cam-drum 53 is mounted upon a vertical shaft 54 which is suitably mounted in the frame and has double circumferential cam-ribs 55 and 56, 50 the former of which works between rolls 57 carried by a head part 58, which rises from and is adjustably attached to the blank holder 51, while the cam-rib 56 works between rolls 59 carried by the plunger 52 at its upper end. The forms of the cam-ribs 55 and 56 are such that upon a rotation of the drum 53 from neutral position the blank-holder 51 will precede the plunger in its engagement of the work due to the engagement of the cam portion *f* of the rib 55 with the blank holder rolls 57, and the engagement of the less abruptly declining cam portion *g* of the cam-rib 56 with the plunger rolls 59. When the blank-holder has assumed its blank holding position it is posi-

tively and firmly held at dwell in such position due to the prolonged neutral portion *h* of the rib 55 coacting with its rolls 57 during the continued work drawing movement of the plunger. When the drawing of the work has been completed the plunger is rapidly returned to neutral position by the coaction of the relatively abruptly rising cam portion *i* of the rib 56 with its rolls 59, and when the plunger has receded from within the drawn work an abruptly rising cam portion *j* of the rib 55 acts upon the blank holder rolls 57 to return the blank holder to inoperative position. The upward thrust of the lower one of the blank-holder rolls 57 is opposed by a thrust-roll 60, which is carried by the frame 50 in suitable position to work on an annular surface 61 at the upper edge of the drum when such drum is rotated. Rotation is communicated to the drum 53 from a drive shaft 62 through the medium of a bevel-gear 63 thereon in mesh with an annular series of bevel teeth 64 on the upper end of the drum. It is apparent with this means of imparting the requisite differential movements to the blank-holder and plunger of a press of this nature that the complicated mechanism customarily employed for such purposes is entirely eliminated and a simple cam device substituted therefor, thus reducing to a minimum the cost of manufacture, maintenance and repair of presses of this class and enhancing the practicability and commercial value thereof. It is also apparent with this form of blank-holder operating means that the blank-holder is caused to have a positive dwell in blank clamping position during the entire period of operation of the plunger upon the work and its withdrawal from within the same, thus producing an even and smooth drawing of the blank without the wrinkling or buckling which occurs where there is any relaxation of the pressure of the blank-holder upon the work during the drawing process, which feature is of vital importance to the practical operation of presses of this character.

I wish it understood that my invention is not limited to any specific construction, form or arrangement of the parts except in so far as such limitations are specified in the claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is,—

1. In a metal working machine having a reciprocal part, a rotatable member having a circumferentially extending cam-rib, rolls carried by said part and between which said cam-rib works to cause reciprocal movements of the part when the member is rotated, said rib having in succession a neutral portion, a cam portion which, when in coaction with said rolls, causes a rapid and then a slower movement of the part in the

same direction and then a comparatively rapid return of the part to neutral position.

2. In a metal working machine having a reciprocal part, a rotatable member having
5 a cam portion for coacting with said part to impart predetermined reciprocal movements thereto when the member is rotated, and means acting on a portion of said member in opposition to said part to resist the thrust
10 in one direction of the part thereon.

3. In a metal working machine having a reciprocal part, a rotatable member having a circumferentially extending cam-rib and an annular thrust surface, said rib being
15 adapted to act on said part to impart reciprocal movements thereto when the member is rotated, and a thrust roll working on the thrust surface of said member to resist the thrust of said part in one direction on said
20 member.

4. In combination, a frame, a part reciprocally movable in said frame, a rotatable member having a circumferentially extending cam-rib for acting on said part to impart
25 reciprocal movements thereto and having an annular thrust surface, and a roll anchored to the frame and working on said thrust surface to oppose the thrust of said part in one direction on the member.

5. In a metal working machine having a plurality of reciprocal parts, rotatable means having endless cam surfaces for acting on
30 respective ones of said parts to impart predetermined reciprocal movements thereto when said means is rotated, and means opposed to each of said parts for resisting the thrust thereof in one direction of its movement upon said rotatable means.

6. In combination, a frame, a plurality of
40 parts reciprocally movable in said frame, rotatable means having endless cam surfaces for acting on respective ones of said parts to impart differential reciprocatory movements thereto when said means is rotated,
45 and thrust-rolls carried by said frame and acting on said means to resist the thrust of each part in one direction of its movements thereon.

7. In combination, a frame, a plurality of
50 parts reciprocally movable in said frame, rotatable means having endless cam ribs for acting on said parts to impart predetermined reciprocal movements thereto when said means is rotated, opposing rolls carried
55 by each of said parts for the cam-rib to operate between, and thrust rolls carried by the frame and acting on said means to resist the thrust of each part in one direction thereon.

8. In combination, a rotatable part having a circumferential cam surface, a reciprocally movable member having means coacting
60 with said cam surface to impart reciprocal movements to the member from a rotation of said part, and means acting directly on a

portion of said part at one side of its axis to resist the thrust in one direction of the member thereon.

9. In combination, a rotatable member having an endless circumferential cam portion, a plunger having a plurality of parts
70 coacting with said cam portion to impart reciprocal movements to the plunger when the member is rotated, said cam portion having in succession a neutral part, a part abruptly inclined relative to the neutral
75 part, a gradually inclined power stroke part and an abruptly inclined part for quickly returning the plunger from the end of its power stroke to neutral position, and means acting on said member to resist the thrust
80 in one direction of the plunger thereon.

10. In combination, a reciprocal part having a transverse recess, rolls carried by
85 said member at opposite sides of said recess, a rotatable member having a circumferential cam rib working through said recess in opposite contact with said rolls to impart reciprocal movements to said part when
90 said member is rotated.

11. In combination, a reciprocally movable part having a transverse recess in one side thereof, rolls carried by said part at
95 opposite sides of its recess, a rotatable member having a circumferential cam rib working in said recess between said rolls for contact therewith to impart reciprocal movements to the part when the member is rotated, and a frame carrying said guide
100 and member and having anti-friction means for resisting a thrust of said part in one direction on said member.

12. In combination, a rotatable member having a circumferential cam rib, a reciprocally movable part, rolls carried by said
105 part for working on opposite sides of said cam rib, and a thrust roll adjacent to said first rolls for acting on an edge of said member and having its axis anchored to resist the thrust in one direction of the part
110 on said member.

13. In combination, a plunger, rolls carried by said plunger in spaced relation longitudinally thereof, stationary guide
115 means for said plunger, a rotatable member having a circumferential cam rib working between said plunger rolls, and rolls carried by said guide means adjacent to the path of movement of said plunger and acting on a part of said member to resist
120 a thrust of the plunger thereon in one direction.

14. In combination, a rotatable member having a circumferential cam rib and an annular thrust surface, a plunger having
125 parts coacting with opposite sides of said rib to impart reciprocal movements to the plunger when the member is rotated, and rolls anchored adjacent to the plane of longitudinal movement of said plunger and
130

acting on the thrust surface of said member to resist a thrust in one direction of the plunger thereon.

5 15. In combination, a frame part, a plunger reciprocally movable therein, a rotatable member adjacent to said plunger and having a circumferential cam surface, rollers carried by the plunger for coacting with said cam surface to impart reciprocal movements to the plunger when the member is rotated, and rolls arranged on opposite sides of the plane of movement of the plunger for resisting a thrust of the plunger in one direction thereon.

10 16. In combination, a frame forming a plunger guide, a plunger mounted in said

frame, a rotatable member journaled in said frame and having a circumferential cam rib, opposing rolls carried by said plunger for the cam rib to operate between, and anti-friction thrust means anchored to the frame adjacent to the plunger guiding part thereof and operating against an annular portion of said member to resist a thrust in one direction of the plunger thereon.

25 In testimony whereof, I have hereunto signed my name to this specification in the presence of two subscribing witnesses.

LEONHARD BAUROTH.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."