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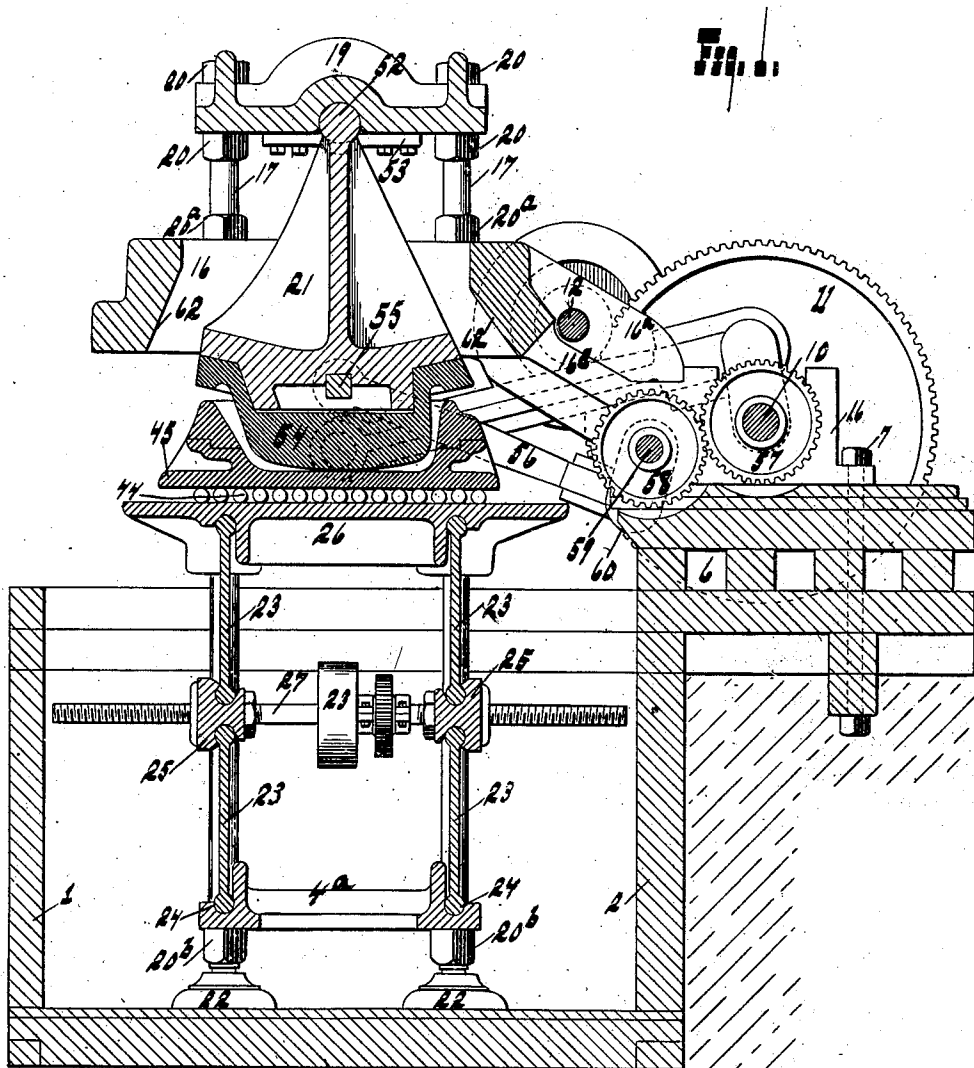
PATENTED JUNE 25, 1907.

C. A. & C. F. MURDOCK.

ROCKER PRESS FOR SHAPING METAL.

APPLICATION FILED MAR. 16, 1901. RENEWED APR. 11, 1904.

5 SHEETS—SHEET 1.



WITNESSES.

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J. C. Massey

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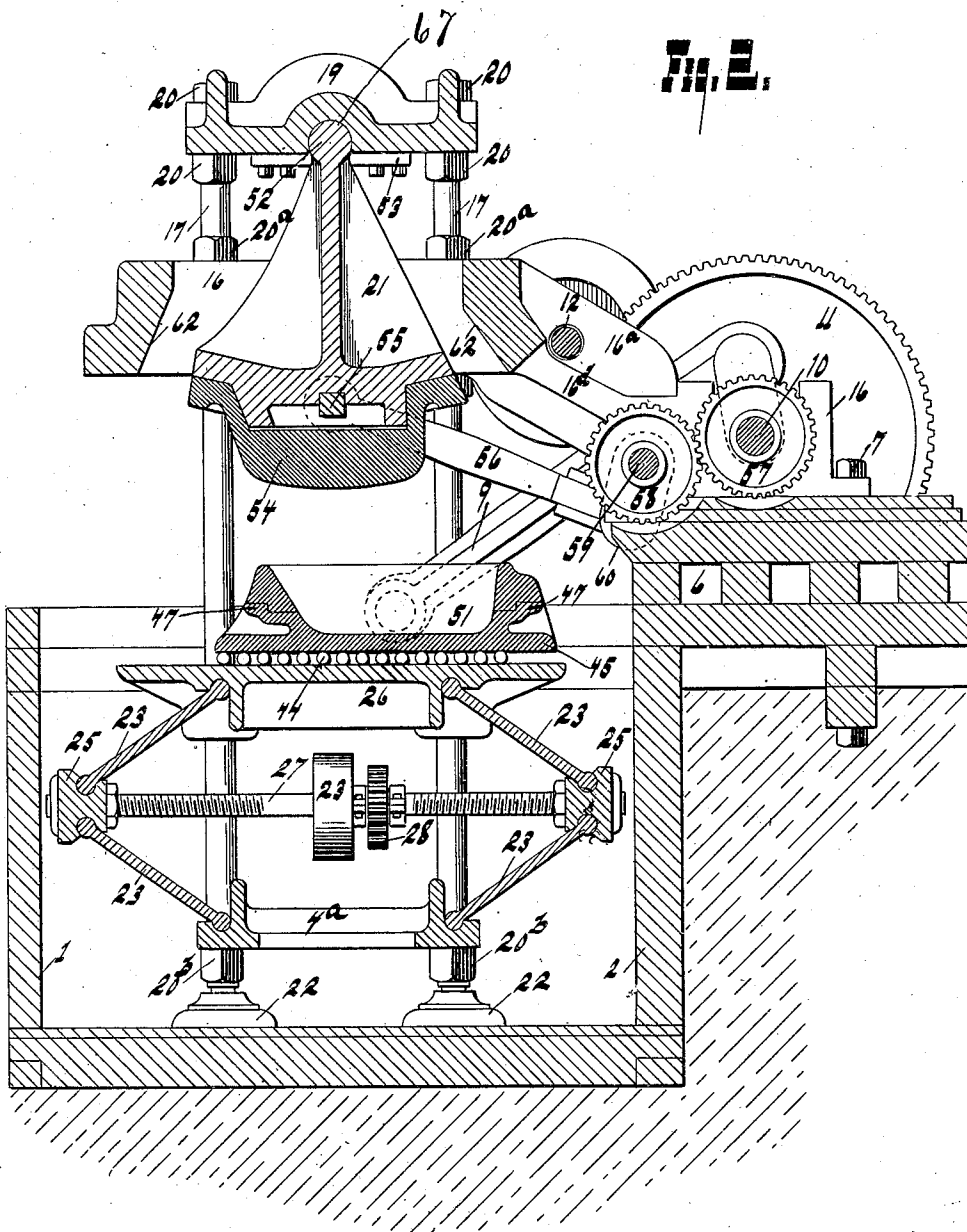
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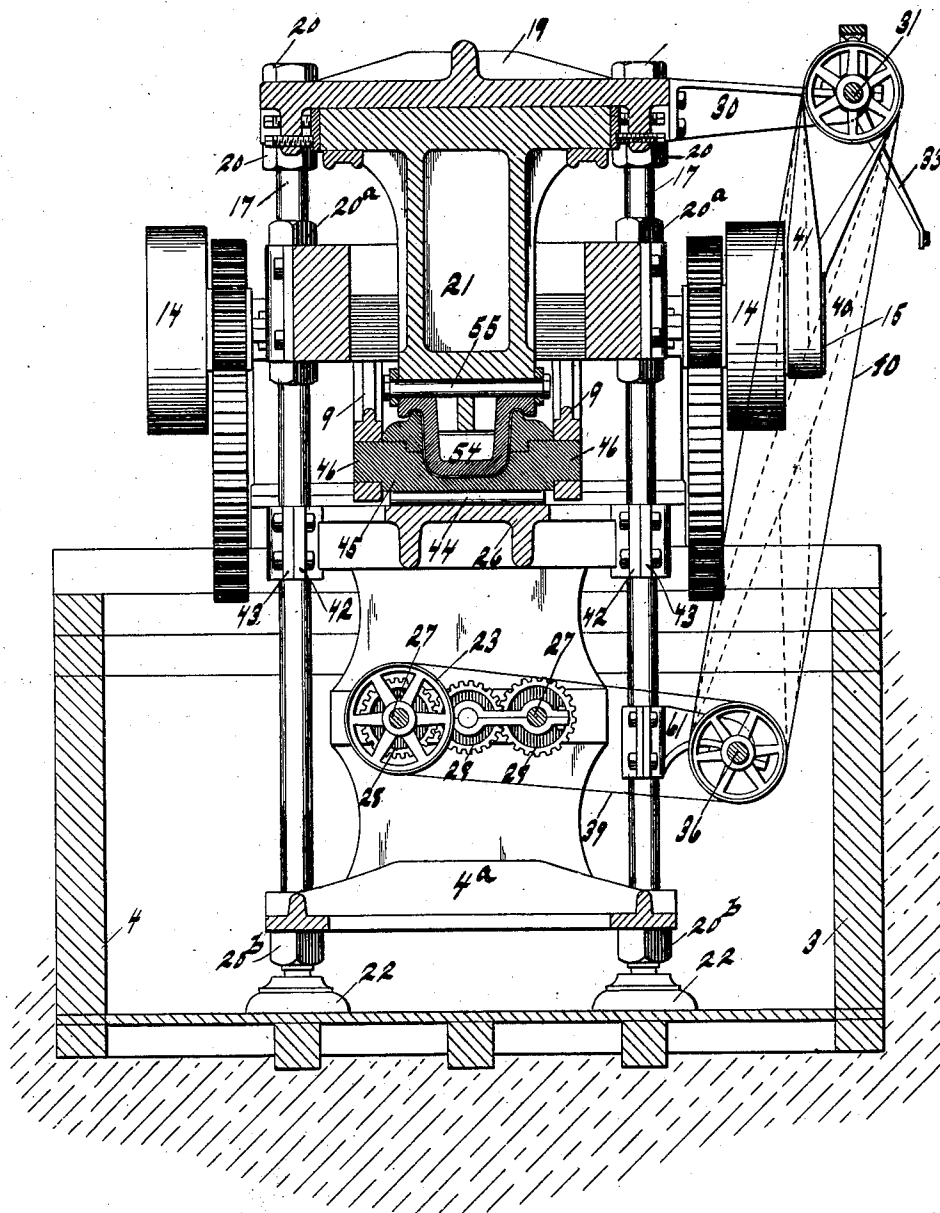
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6 SHEETS—SHEET 3.

Fig. 3.



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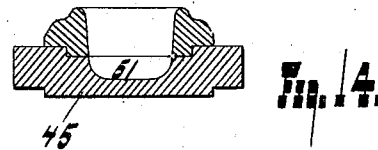
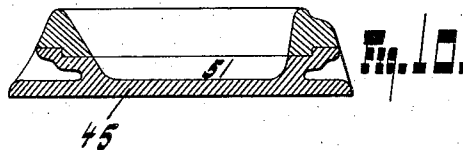
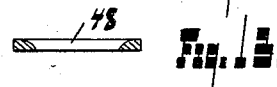
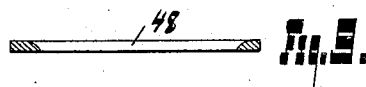
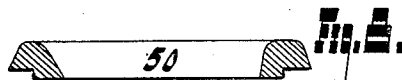
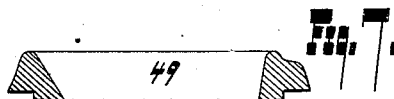
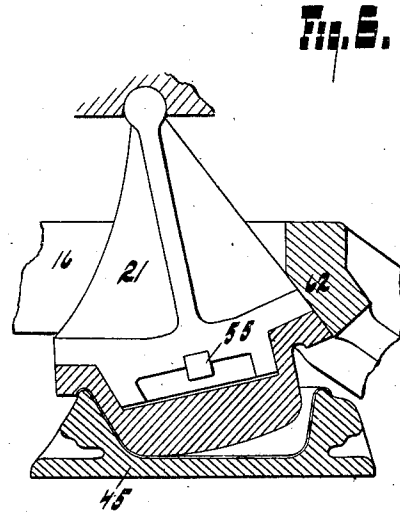
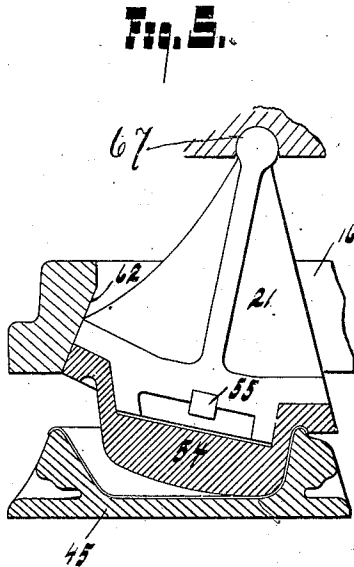
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5 SHEETS—SHEET 5.



WITNESSES.

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UNITED STATES PATENT OFFICE.

CHARLES A. MURDOCK AND CHARLES F. MURDOCK, OF DETROIT, MICHIGAN,
ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO EUGENE H.
SLOMAN, OF DETROIT, MICHIGAN.

ROCKER-PRESS FOR SHAPING METAL.

No. 858,096.

Specification of Letters Patent.

Patented June 25, 1907.

Application filed March 16, 1901. Renewed April 11, 1904. Serial No. 202,520½.

To all whom it may concern:

Be it known that we, CHARLES A. MURDOCK and CHARLES F. MURDOCK, citizens of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Rocker-Presses for Shaping Metal; and we declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to pressing; drawing, swaging, forming and rolling metal, either cold or heated as the nature of the metal may require.

The object of this invention is to produce articles of any required size and depth having a size as large as any plate or bar that can be produced in a rolling mill, and at the same time, the shape and form of any article that could be produced by the press or drawing process.

That we may more easily describe our mode of operation and manufacture, we will call the machine which embodies the invention, a rocker press.

We are not aware of any process or of any instrument carrying out a process in which a matrix member fashioned to the external shape of the article to be produced, is used in conjunction with a member which may be called a punch member, which does not nearly fill the matrix, but leaves space to enable the punch member to rock and force the metal endwise and sidewise underneath it, thinning out that portion of the metal which is immediately between it and the matrix, gradually, by acting upon a small part of it at a time. The machine which embodies our invention, employs this latter process and makes use of a matrix member which has a shape to correspond to the external surface of the object to be produced, and it makes use of a member which we will call a rocking punch member, that is not shaped like the interior of the matrix member, but so that it will rock into such close proximity with the interior faces of the matrix member, that at one time during its oscillation it will closely approach to one part of the interior surface of the matrix member, and at another time

during its oscillation will approach to another surface of the matrix member.

Under the operation of the machine the metal is pressed between the moving members; the greatest pressure is primarily on a line directly under the point of suspension of the rocking member, but as the reciprocating member shifts and the rocking member oscillates, the line of pressure travels correspondingly. The pressure between the two members is maintained by the upward movement of the matrix and the operation is continued until the metal under treatment is brought to the desired shape, and any irregularities or wrinkles that may have been formed in the first part of the process are rolled out and obliterated.

In the drawings, we illustrate a machine made to produce a hollow article of thin metal, (the article selected for illustrative purposes being a bath-tub) in which the walls of the article are irregular in shape and in which there is not only the hollow or cup form of the article, but a returned rim surrounding it which requires a specially adapted shape of the rocker punch.

The machine consists of a matrix member mounted to reciprocate on a horizontal table, which table is provided with means to bring it into pressure engagement with the punch member, and the punch member is held opposite to the matrix member in bearings, which permit it to swing and to have a rolling action on the metal interposed between itself and the matrix member as the matrix and punch members are forced together.

We have illustrated our invention in the accompanying drawings in which we have designated the parts by numerals, referring to like parts by like numerals.

Figure 1, is a longitudinal section of the matrix and rocker punch, and parts immediately connected therewith; the driving mechanism is shown in elevation. In this figure the rocker punch is shown in the hollow of the matrix. Fig. 2, shows the same parts as Fig. 1, but the matrix member is shown as lowered. Fig. 3, is an end elevation with the matrix and punch members shown in cross-section. Some parts of the frame work are also shown in cross-section. Fig. 4, is a plan view of a machine. Figs. 5 and 6, are diagrammatic, and are intended

to indicate the action of the machine in turning and shaping the reverse or rim part of the hollow article. Figs. 7, 8, 9, 10, 11, 12, 13, and 14, show detail suggestions for the making of a built up matrix member, the use of which will be fully explained hereafter.

In mounting the machine it is important in view of its great weight, that it should be mounted upon a solid base. In this case, we have adopted the following:—We have excavated a pit and established a bed plate in the base of the pit as at 4. This pit has four vertical walls 1, 2, 3, 4, at one end of the pit and raised above the level of its top is the foundation 6, for the driving mechanism with anchor bolts 7, for securing the four branches of main casting 16. This main casting 16 is supported on the foundation 6, and by tension pillars 17, and it constitutes in one part an abutment block for the punch member and in another part is divided into four branches 16^a, 16^d, each of which constitutes a pillow block for the main crank shaft; the four branches are used as bearings for other parts of the operative mechanism also; the connecting rods 9, from the main cranks to reciprocating matrix 45, reach through the openings between the branches 16^a, 16^d. These branches also form bearings for the main driving shaft 12, on which driving shaft are pinions 13, driving pulleys 14 and 15.

In the center of the abutment casting 16, is a rectangular aperture through which the rocker punch hangs, this is of sufficient size to admit the punch and its oscillating movement. On each side of the main casting are concave grooves (not shown,) to receive the upright tension pillars 17. The four upright tension pillars 17, pass through a base plate 4^a, near the bottom of the pit, and extend upward through the grooves in the side of the main casting, and to a sufficient height above the main casting to pass through and receive the crown plate 19. These four tension pillars 17, are threaded to receive adjusting nuts 20, which hold the crown plate in position. The crown plate holds the upper end of the oscillating rocker punch 21. The four tension pillars are threaded upon each end and provided with suitable nuts 20^a, to lock onto and hold them to the main casting, also with nuts 20^b, to hold and adjust the base in position; their lower ends rest in concave socket steps 22. In the top of the base plate 4, and near each of its sides are concave recesses 24, to receive the end of the toggle arms 23. The toggle arms engage heads 25, which are each provided with two recesses, each corresponding to the concave recess 24, in the base plate, and they receive the upper ends of the lower, and the lower ends of the upper toggle arms 23. Above these toggle arms 23, and resting upon them is the main moving table 26 of the

machine; on the lower side of this table are concave recesses corresponding to those in the base plate 4, to receive the upper ends of the upper toggle arms. Through the toggle heads 25, are passed two screws 27, each having right and left hand threads. The screws are moved in unison by intermeshing gears 28. Upon one of the screws is mounted a pulley 23^a, to receive a driving belt for their operation. Connecting and extending from the crown plate 19 are two brackets 30, for the purpose of receiving the friction clutch shaft 31. Upon this shaft 31, are two friction clutch pulleys 32, having clutch arms 33, which clutch arms are connected together with a shipper handle 34. This shaft is also provided with driving pulley 35, which is driven by pulley 15, and belt 41. Extending from two of the tension pillars are two arms 61, which carry a counter-shaft 36. This shaft 36, is provided with three pulleys, one of which pulleys 38, receives the belt 39, which drives the pulley 23^a, and two pulleys 37, which carry two vertical belts 40, running from friction clutch pulleys 32, one of these is a direct and the other a crossed belt. On the side of the moving table 26, are flanged recesses 42, to receive the perpendicular tension pillars 17, upon which flanged recesses are bolted caps 43, which caps and the recesses on the table encircle the pillars forming sliding bearings, thus keeping the table 26 in its proper horizontal condition and guiding it in its vertical reciprocations. On top of this table is placed a gang of rollers 44. 45, is a matrix having concave surface 51, and flanges 47, on its upper surface, and a flat lower surface which rests and travels on rollers 44. On either side are trunnions 46, which receive connecting rods 9, by which it is reciprocated. This matrix may be formed of only one piece, but it is found in practice that the punch and matrix illustrated in this case, is more practical if built up of sections. We have illustrated in Figs. 7, 8, 11, 12, 49, and 50, two upper sections of the matrix which we use as is required in the process of manufacturing.

21, is a segment which we have styled a rocker punch having a transverse head 52, adapted to fit in concave socket 67, of the crown plate 19, which transverse head 52, is held in position by caps 53. On the lower end of this segment are punch heads or faces 54. Running through the segment 21, is a cross-head 55, which cross-head has trunnions upon each end to engage the connecting rods 56. The opening in the segment 21, is of sufficient size to allow the cross-head 55, to have a slight lateral movement, and will allow the cross-head 55, to move slightly forward or backward when the segment 21, is at rest.

57, is a spur gear located about the center of main crank shaft 10, and drives gear 58,

which gear in turn drives crank shaft 59. Upon each end of this crank shaft is located crank arm 60, having crank pins inserted in the outer ends. These crank pins are not shown, but are constructed slightly eccentric so that by turning them in the crank arm, the throw of the arm and travel of the connecting rod 56, will be lengthened or shortened, the object being to adjust the travel of the connecting rods 56, so that they and the segment 21, will travel through the required space to act in unison with the travel of the matrix 45.

The operation of this machine is as follows:—The draw plate 48, is placed between the flanges 47 of the matrix 45. Power is then applied to pulleys 14, and transmitted through pinions 13 to spur gear 11, through crank shaft 10 to connecting rods 9, and thus to matrix 45. The crank shaft 10, also propels the spur gear 57 and 58, which in turn transmits through shaft 59, crank arm 60 and connecting rods 56, power to oscillating punch or segment 21. If the friction clutch shipper handle 34 is moved in one direction, the toggle head will be actuated to lower the matrix 45. Now, if a piece of metal be inserted between the draw plate 48. and the rocker punch 41, and the shipper handle be reversed, the other belt extending from friction clutch 32, will cause the upward movement of the matrix 45, bringing the plate to be operated upon in contact with the face of the rocker punch 21. As the matrix reciprocates and the punch oscillates, the sheet of metal will be forced down into the matrix and be reduced in thickness, in about the same manner as it would be reduced between a pair of rolls, but the ends will be reduced by the pressure produced by the connecting rod 9, as it forces the matrix and rocker punch into the positions shown in Figs. 5 and 6. The forming of the metal on the sides and ends of the matrix will be in proportion to the velocity with which the matrix is pressed toward the punch, gradually forcing the metal from under the oscillating member toward the sides and ends of the matrix member. If the distance between the matrix and punch be still further reduced, the metal will also be reduced and forced upward around the sides of the matrix until the bottom of the article to be produced is drawn to the proper thickness, at which time this blank, or partly formed article is removed from the matrix and another plate inserted and equally operated upon, and this process continued until the required number of articles or blanks are produced. The draw plate 48 will then be removed and one of the upper sections 49 or 50, inserted in its place, and the partly drawn blank or article is treated again, until the article is completed. It may require more than two sections of a matrix to draw deep articles, but a sufficient number

can be used to get any required depth. The connecting rods 56 are not intended to withstand the end thrust of the matrix upon the punch, their function being to cause the oscillation of the punch in the matrix, when one is not operating upon the other, and also to compensate for want of uniformity in the movement of the punch, caused by frictional contact while forming the sides of the tub. When they have controlled the oscillation of the punch to the point of movement, where the punch and the matrix begins to operate upon the ends of the tub, their function ceases for the time, and the onward movement of the matrix is opposed by the punch which is stopped in its onward movement by one of the abutments 62, in the main casting 16, as shown in Figs. 5 and 6. It will be noted that the stopping of the punch does not entirely arrest the onward movement of the matrix and the connecting rods 56, as it is the object to reduce the metal between the punch and matrix. The opening in the segment 21, is of sufficient size to admit of cross-head 55, moving to allow the rods 56 to complete their movement. By raising the crown plate 19, by the adjusting nuts 20, the rocker punch will be drawn up between the abutments 62, in casting 16, thus reducing the length of the arc through which the punch travels, and thereby bringing it nearer to the inside of the matrix at the end of its horizontal movement, (and by this means regulating the thickness of the end or ends of the tub,) and by lowering the crown plate 19, the arc through which the punch travels will be lengthened and thereby the ends of the tub thickened; under these conditions the travel of the connecting rods 56, will have to be lengthened and shortened to correspond with the length of the arc through which the punch travels, which is accomplished by turning the eccentric crank pins in the crank arm 60. By raising or lowering the base plate 4, with the adjusting nuts 20^b, the thickness of the bottom of the tub will be decreased or increased as may be desired.

The machine is capable of acting on nearly any size or shape of metal, and producing therefrom a finished article, but of course for practical work, the metal should be prepared in that shape which can be worked to best advantage. Experience will show how the metal will "flow" and the best form of sheet or ingot can be readily fixed on.

What we claim is:

1. In a metal forming press, in combination with a matrix member, means for producing a reciprocating movement thereof, a punch member and means for producing an oscillatory movement thereof and means for producing a pressure of the one member toward the other, substantially as described.
2. In a metal forming press, the combination of a reciprocating member, an oscillating

member, means for producing the reciprocation and the oscillation, and means for forcibly moving one member toward the other, substantially as described.

5 3. In a metal forming press, the combination of a reciprocating member, an oscillating member, and an abutment member arranged to engage against the oscillating member, substantially as described.

10 4. In a metal forming press, the combination of a punch member and a matrix member, the punch being mounted to oscillate and the matrix to reciprocate, and means to limit the oscillation of the punch member, and means for forcibly bringing the punch
15 and matrix toward each other, substantially as described.

5 5. In a metal forming press, the combination of a punch and matrix, the punch being
20 mounted to oscillate and the matrix to reciprocate, said punch and matrix being formed to register together in their respective reciprocal and oscillatory movements, and means to press them together and to re-
25 ciprocate the matrix, substantially as described.

6 6. In a metal forming press, the combination of a punch and matrix, the punch being
30 mounted to oscillate and the die to reciprocate, with means to limit the extent of the movement of the punch and means to reciprocate the matrix, and means to press the punch and die together, said punch and matrix being formed to register together as the
35 matrix is reciprocated, substantially as described.

7 7. In a metal forming press, the combination of a punch and matrix, the punch being
40 mounted to oscillate with means to control the rate and extent of its movement, the matrix being mounted to reciprocate with means to reciprocate the same, the punch and matrix being formed to register together under the operation of their respective controlling mechanism, with means to engage
45 and disengage the punch and matrix and means to press the same together, substantially as described.

8 8. In a metal forming press, the combination of a punch and matrix, the punch being
50 mounted to oscillate with means to control the rate and extent of its movement, the matrix being mounted to reciprocate with means to reciprocate the same, the punch being
55 formed in an arc of less radial dimension than that of the matrix, with means to engage and disengage the punch and matrix and to press the same together, substantially as described.

9 9. In a metal forming press, the following
60 elements in combination: a punch member axially mounted and carrying a convex punch on its periphery with abutments interposed in the path of the movement of the punch member to limit its pendulous move-
65 ment, a table mounted to reciprocate verti-

cally and levers interposed between said table and a fixed base, and means to operate the same to lower and raise the table and force the punch against the matrix, a concave matrix adapted to register with the punch in their cooperative movement herein described, the matrix being mounted to reciprocate and means to reciprocate the same, substantially as described.

10 10. In a metal forming press, the following
75 elements in combination: a punch member axially mounted and carrying a punch on its oscillating extremity, abutments interposed in the path of said punch member to limit its movement, a table mounted to reciprocate
80 vertically, and levers interposed between said table and a fixed base, said levers being controlled by right and left-hand screws, and means to operate said screws, a matrix
85 mounted to reciprocate on the table and means to reciprocate the same, a controlling arm journaled to the punch member and to the driving mechanism, the operation of the same being so timed with reference to the reciprocal movement of the matrix as to insure
90 registration between the punch and matrix, substantially as described.

11 11. In a metal forming press, the following
95 elements in combination: a segment axially mounted with a punch secured to the periphery of said segment, abutments interposed in the path of said segment to limit its pendulous movement in each direction, with means to adjust the position of said punch, a table
100 mounted to reciprocate vertically with a flat top and transverse sockets on its underside, an adjustable baseplate with corresponding sockets on its upper side, two pressure heads having transverse sockets in their upper and
105 lower faces, and toggle plates having transverse socket heads at their upper and lower edges, said heads being mounted respectively in the sockets of the plate base, pressure head and table, screws with right and left-hand threads, suitably mounted in the pressure
110 heads, and means to revolve said screws, a matrix mounted to reciprocate on the table with rollers interposed between it and the table, with means to reciprocate the matrix, suitable connecting rods journaled at one end
115 to the segment and at the other to the driving mechanism of the press, the latter being so timed as to restrain the movement of the segment by its contact with the matrix within prescribed limits, the punch and matrix being formed to register together when
120 the movement of the segment is controlled by the driving mechanism and by the abutments interposed in its path, and when the die is reciprocated by the driving mechanism, both
125 being adjusted according to a fixed scale of movement, substantially as described.

12 12. In a machine for forming hollow ware from metal, the combination of a matrix member having an internal shape of the size
130

and form of the exterior of the article to be formed, and a punch member having a face to engage with the metal on the interior of the matrix shaped to form with the motion employed the interior of the article, means for reciprocating one of said members, means for oscillating the other of said members, and means for moving one of said members toward the other, substantially as described.

13. In a machine for forming hollow ware from metal, the combination of a matrix member having an internal shape of the size and form of the exterior of the article to be formed and a punch member having a face to engage with the metal on the interior of the matrix shaped to form with the motion employed the interior of the article, means for producing a relative reciprocating and oscillating motion of said members, substantially as described.

14. In a metal forming press, the combination of a matrix member, a punch member having oscillatory movement with relation thereto and means for causing relative reciprocation between said members, substantially as described.

15. In a metal forming press, the combination of a matrix member, a punch member, means for causing relative reciprocatory and rocking movement, and means for limiting the degree of oscillation, substantially as described.

16. In a metal forming press, the combination of a matrix member, a punch member, the area of whose active face is less than that of the matrix member, and means for producing a relative rocking and reciprocatory movement of the members and thereby varying the distance between them substantially as described.

17. In a forming press, in combination with a matrix member, a punch member, the area of whose active face is less than that of the matrix member, and means for producing relative oscillatory and reciprocatory movement of the members and thereby successively moving the punch into action with the entire matrix surface, substantially as described.

18. In a forming press, in combination

with a matrix member, a punch member and means for varying the distance between them contemporaneously with the production of relative oscillation and reciprocation, substantially as described.

19. In a forming press, the combination of a matrix member, a complementary punch member, and means for producing a rocking and reciprocatory movement of one of said members with respect to the other, substantially as described.

20. In a forming press, in combination with a matrix member and a punch member, means for causing relative rocking and reciprocatory movement thereof, substantially as described.

21. In a metal forming press, a matrix member, a punch member, means whereby said punch member is caused to enter the matrix, means for rocking the punch member with respect to the matrix to successively contact all points in the active surface of the matrix, and means for producing contemporaneous relative reciprocation of said punch and said matrix, substantially as described.

22. In a metal forming press, in combination with matrix and punch members, means for reciprocating one of said members, and means for bringing the other of said members into engagement therewith contemporaneously with the production of relative rocking motion thereof with respect to the other member, substantially as described.

23. In a forming press, the combination with a punch member, of a matrix, and means for reciprocating the matrix when the punch member is within the same.

24. In a forming press, in combination with a matrix member and a punch member, means for causing said punch to enter the matrix and for setting up relative rocking and reciprocatory movement while the members are thus adjacent, substantially as described.

In testimony whereof, we, sign this specification in the presence of two witnesses.

CHARLES A. MURDOCK.

CHARLES F. MURDOCK.

Witnesses:

CHARLES F. BURTON,
MAY E. KOTT.