M. F. CAHILL.

MACHINE FOR STAMPING AND FORMING SHEET METAL ARTICLES.

APPLICATION FILED JAN. 10, 1910.

1,016,547.

Patented Feb. 6, 1912.

3 SHEETS—SHEET 1.

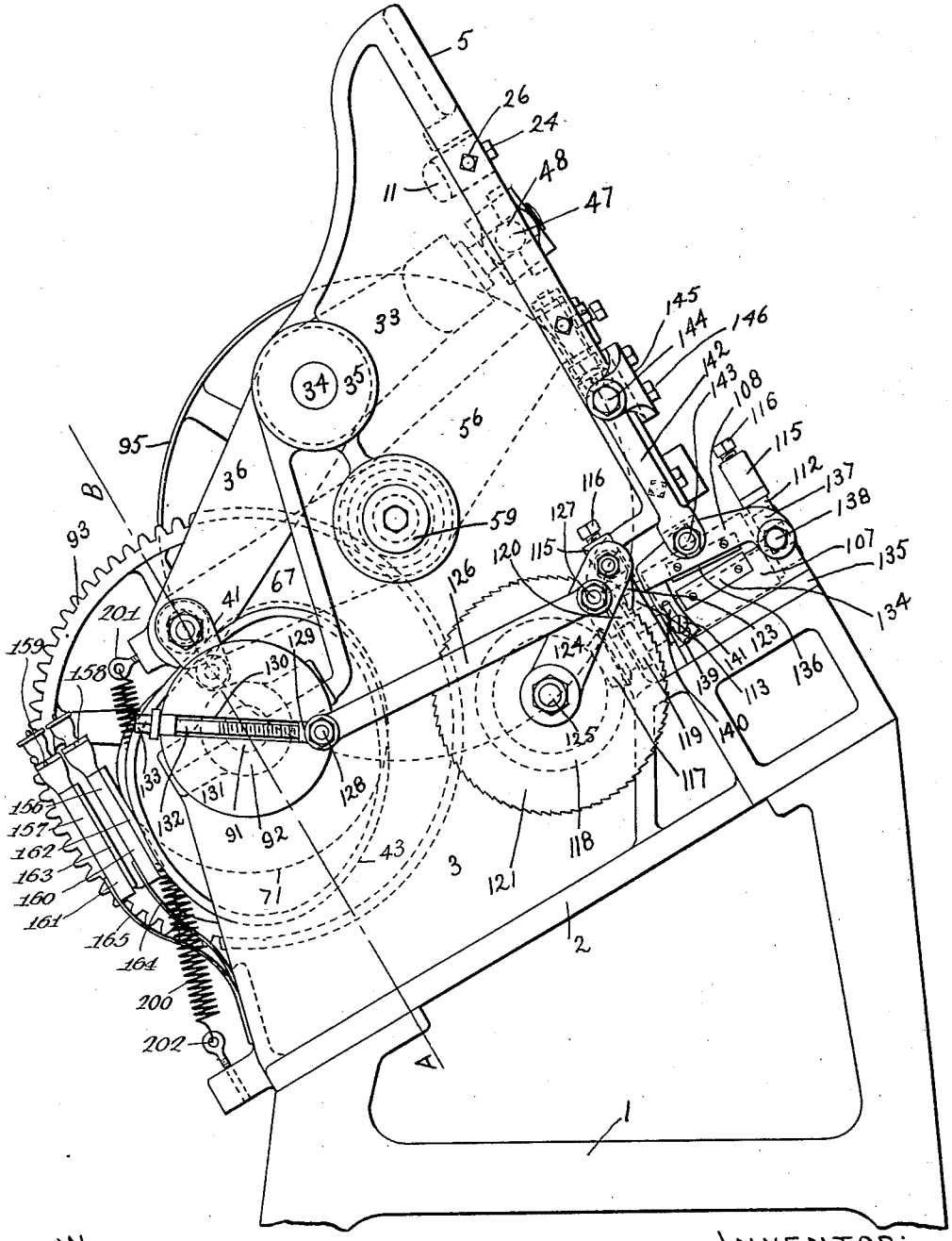

FIG. 1.

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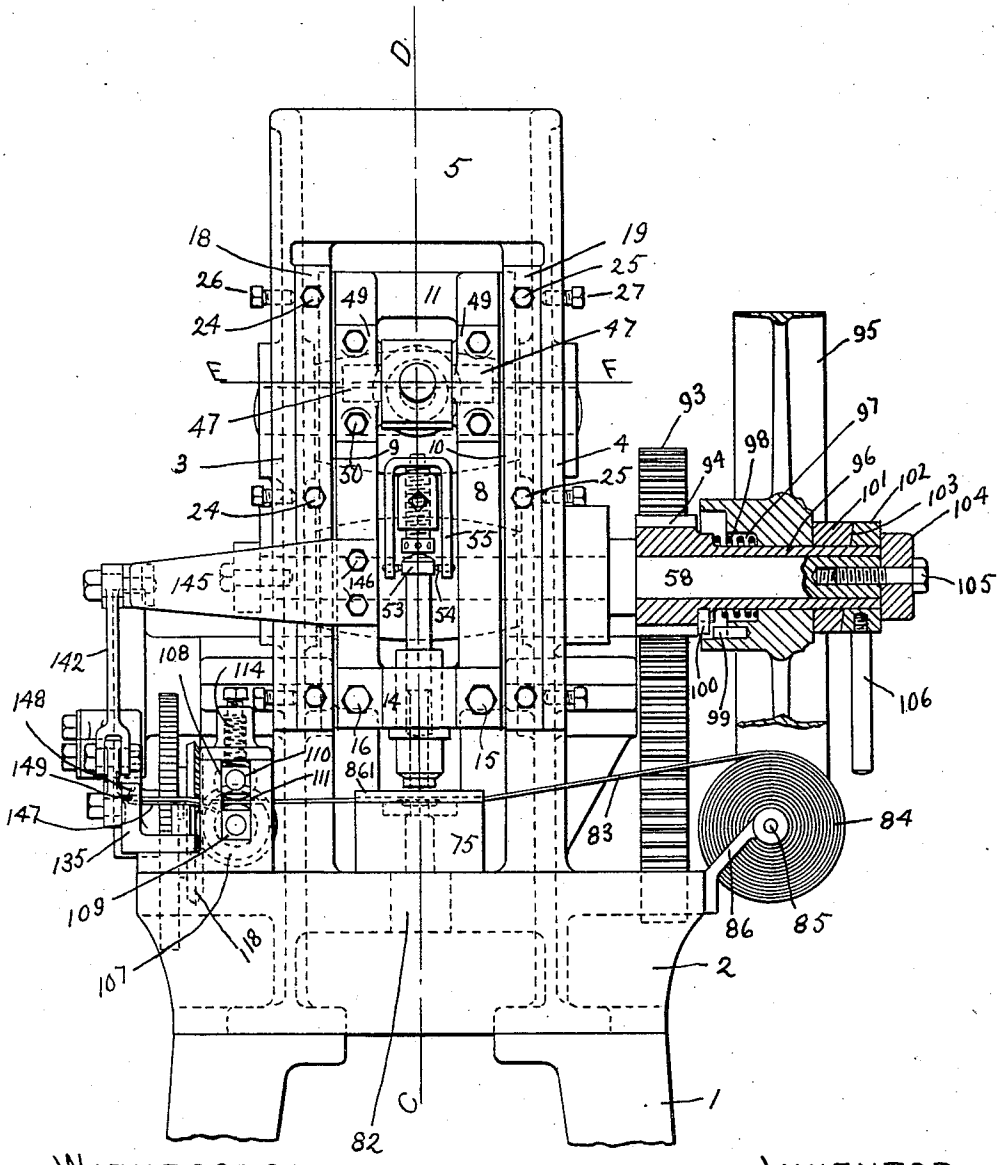

FIG. 2

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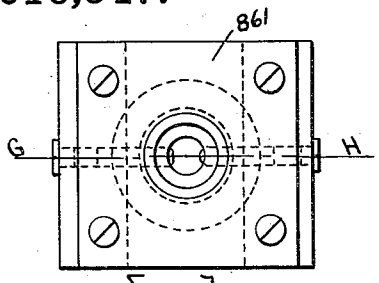


FIG. 7

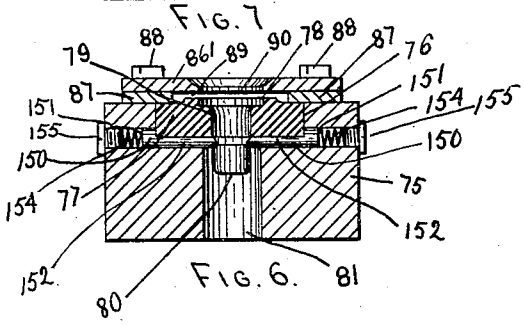


FIG. 6.

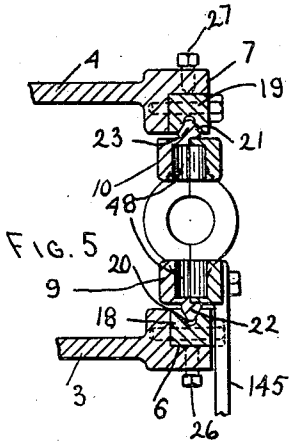


FIG. 5

FIG. 3

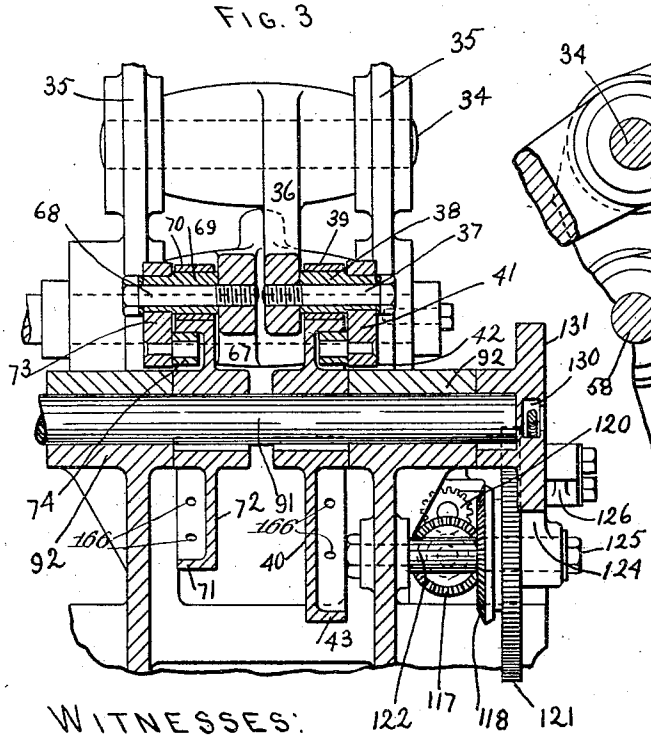
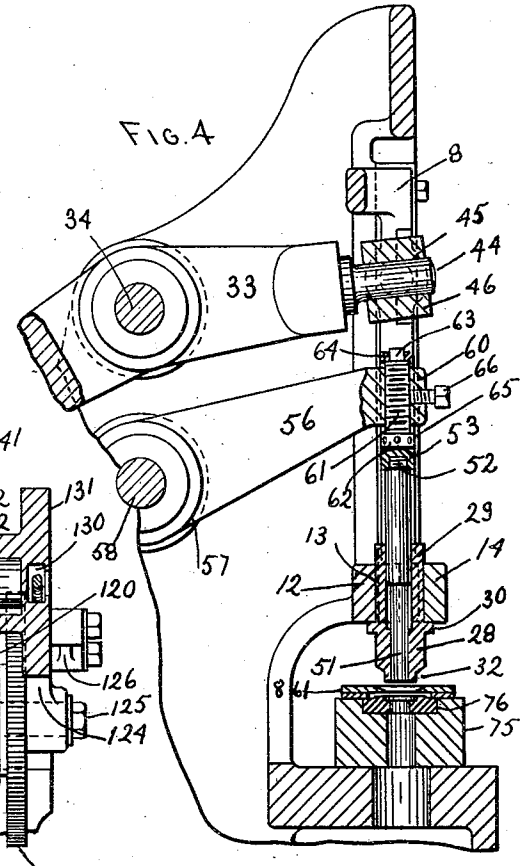


FIG. 4



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MACHINE FOR STAMPING AND FORMING SHEET-METAL ARTICLES.

1,016,547. Specification of Letters Patent. Patented Feb. 6, 1912.

Application filed January 10, 1910. Serial No. 537,215.

To all whom it may concern:

Be it known that I, MICHAEL F. CAHILL, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machines for Stamping and Forming Sheet-Metal Articles; 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.

My invention relates to presses for stamping and forming sheet metal articles and more particularly to a press for making sheet metal shells or cups.

The object of my invention is to produce an automatic machine embodying forming dies which coöperate to form the cup or shell and to combine therewith a cutting mechanism to sever the strip of waste material into small pieces.

The particular object of the invention is to improve the construction and mode of operation of the dies and to combine therewith an automatic feeding mechanism, and further to produce an improved and automatic waste cutting mechanism.

To the above ends the present invention consists of the devices and combinations of devices which will be hereinafter described and claimed.

The invention is illustrated in the accompanying drawings, in which:—

Figure 1 shows the machine in side elevation, looking at the left hand side of the machine. Fig. 2 shows the machine in front elevation with a portion of the driving mechanism shown in vertical section. Fig. 3 shows a sectional view taken on the line A—B, in Fig. 1, and looking toward the front of the machine, or toward the right as the machine is shown in Fig. 1. Fig. 4 shows a vertical sectional view taken on the line C—D, in Fig. 2. Fig. 5 shows a horizontal sectional view taken on the line E—F, in Fig. 2. Fig. 6 shows a vertical sectional view through the female die, and Fig. 7 shows a top plan view of the female die.

Similar reference characters will be employed throughout the specification and drawings to designate corresponding parts.

The machine comprises a frame of suitable size and arrangement to support the operating parts and, as shown in the drawings, it consists of a stand or base 1, supporting in an inclined position the bed or table 2. Rising upwardly from the bed or table and extending in an inclined direction are the side plates 3 and 4, connected at their upper ends by a cross head 5. These parts may, if desired, be formed separately and connected together in any suitable or desired manner, but as shown in the drawings the bed or table 2, the side plates 3 and 4 and the cross head 5 are formed in a single integral casting. At their forward ends the side plates 3 and 4 are provided with the rabbeted recesses 6 and 7 supporting guide strips 18 and 19, in which is guided for vertical reciprocations the frame 8, comprising the side bars 9 and 10 and the upper cross bar 11, all of which may be formed of a single integral casting, as shown.

The lower cross bar 12 forms one member of a clamp or bearing having a semi-cylindrical recess 13, the other member of said bearing, 14, being held to the side bars 9 and 10 by means of the bolts 15 and 16 passing through ears 17 of said bearing part 14. The frame 8 must reciprocate freely and smoothly and for this reason the rabbeted recesses 6 and 7 are provided with the guide strips 18 and 19 provided upon their inner faces with the grooves 20 and 21 to receive the beveled ribs 22 and 23 on the sides of the side bars 9 and 10, the said guide strips 18 and 19 being held in their rabbeted recesses by means of the bolts 24 and 25 and arranged to be adjusted toward each other by means of the adjusting screws 26 and 27. Of course it is understood that these guide strips are made of comparatively hard metal in order to reduce to a minimum the wear caused by the rapid reciprocations of the frame 8 and by loosening the screws 24 and 25 the guide strips may be adjusted toward each other or toward the sides of the side bars 9 and 10 by means of the adjusting screws 26 and 27 to secure an accurate free sliding fit between the frame 8 and the guide strips 18 and 19 and to compensate for the wear caused by the reciprocating movements of the frame.

The frame 8 supports at its lower end the male cutting die 28, which has a hollow cylindrical stem or shank 29 held in the clamp or bearing 13 and 14, and it is provided with a shoulder or collar 30 which engages the under side of the clamp or bearing 13 and 14 to resist the thrust incident to the cutting operation of the die. The lower

end, 32, of said die will be shaped in cross section to correspond to the shape of the piece of metal which it is desired to cut from the stock, and inasmuch as the machine of the drawing is intended to produce cups or shells substantially cylindrical in cross section the shape of the end 32 of the cutting die 28 will be circular in cross section to cut a circular blank, which, by other instrumentalities will be formed into a cup or shell.

The frame 8 in the machine of the drawings is reciprocated positively in both directions by means of a lever 33, fulcrumed upon a shaft 34 supported in bearings 35 in the side frames 3 and 4, the lever 33 carrying at its rear end, 36, a stud 37 upon which is mounted an eccentric sleeve 38 carrying a roller 39 engaging the outer periphery of the flange 43 of an eccentric 40 and also carrying a short link 41 which carries an inwardly extending roll 42 engaging the inner surface of the peripheral flange 43 of the eccentric 40, the arrangement being such that a rotation of the eccentric 40 will, through the rolls 39 and 42, impart a rocking movement to the lever 33 and reciprocating movements to the frame 8. The lever 33 at its upper end carries a cylindrical stud 44, which is seated in a bearing 45 of the block 46, the block 46 having trunnions 47 (see dotted lines Fig. 1), which are supported in bearings 48 formed partially in the side bars 9 and 10 and partially in the plates 49 attached to the front of said side bars by means of the screws or bolts 50.

It will be noted that the connection between the lever 33 and the frame 8 is such as to permit the slight sliding movement of said lever in the block 46 incident to the reciprocations of the frame. It will be further noted that the eccentric sleeve 38, which supports the roller 39 engaging the outer surface of the peripheral flange 43 of the eccentric 40 and the link 41 which carries the roll 42 which engages the inner surface of the peripheral flange 43, is held to the arm 36 of the lever 33 by the headed stud 37, which clamps the eccentric sleeve between the head of the stud and the side of the lever, holding it in a fixed position, and that by this means the rolls 39 and 42 may be accurately adjusted to engage the inner and outer surfaces of the flange 43, as by loosening the headed stud 37 the eccentric sleeve 38 may be turned until the desired adjustment is secured, and thereafter the headed stud 37 be set up to firmly clamp the eccentric sleeve 38 in its adjusted position.

The die 28, coöperating with another die to be described, cuts from the sheet of material a circular disk, which is thereafter by means of a plunger die forced through a female forming die to form the cup or shell. This plunger die 51 is arranged to reciprocate through the tubular die 28, as shown clearly in Figs. 2 and 4 of the drawing, and it is detachably connected, as by means of the threaded connection 52, to a head 53. The head 53 is pivotally connected, as by the conical trunnions 54, to a yoke 55. The yoke 55 receives the forward end 56 of a lever 57 fulcrumed upon a shaft 58, held in bearings 59 in the side plates 3 and 4 of the frame, and the extreme forward end 56 is provided with a threaded bearing 60 to receive a threaded stud 61 having a head 62 which rests upon the rounded upper surface of the head 53 carrying the plunger die 51.

The upper end of the threaded stud 61 has a short cylindrical projection 63 which fits a cylindrical bearing 64 in the cross head of the yoke 55. The head 62 of the stud 61 is provided with means, such as the holes 65, whereby it may be turned by a spanner in its threaded bearing to secure the proper adjustment of the connection of the lever with the yoke 55 and with the rounded top of the head 53. A set screw 66 is provided to engage the threaded stud 61 to maintain it in its desired adjusted position.

The rear end 67 of the lever carries a headed stud 68 which is threaded in a bearing in the rear end of said lever and supports an eccentric sleeve 69 carrying a roller 70 to engage the outer surface of the peripheral flange 71 of an eccentric 72 and also supporting a link 73 carrying an inwardly extending roll 74 which engages the inner surface of the peripheral flange 71, the arrangement being like that described in connection with the operative connection of the rear end 36 of the lever 33 with the eccentric 40, and by turning the eccentric sleeve 69 on its headed stud 68 the rollers 70 and 74 may be accurately adjusted to engage the inner and outer surfaces of the peripheral flange, and thereafter retained in an adjusted position by setting up the stud 68. Thus it will be noted that the male cutting die and the plunger die are reciprocated by means of the eccentrics 40 and 72, and that the reciprocating movements in both directions are positive, the arrangement being such that for a part of the downward throw the two dies move together and that after the male cutting die has operated to cut a circular blank, its downward movement will be arrested, but that the plunger die continues its downward movement to coöperate with the female forming die, as will be hereinafter described.

The female die consists of a block 75 supported upon the bed or table 2 between the side plates 3 and 4 and in line with the reciprocating dies 28 and 51. In its upper surface is formed a circular recess 76 in which is fitted the combined female cut-

ting and forming die 77, which, as shown in the drawings, is provided with a circular cutting edge 78 which coöperates with the portion 32 of the die 28 to cut from a strip of material a circular blank, and with a forming die opening 79, through which the circular blank will be forced by the plunger die 51 to form the shell or cup. Such a cup is shown at 80 in Fig. 6 as having been pushed through the die opening 79 and as about to fall through the opening 81 in the block 75 and the alined opening 82 in the bed or table 2 (see Fig. 2 of the drawing), and into a suitable receptacle (not shown) which may be placed beneath the machine to receive the same.

The strip of metal 83 from which the disks and cups are formed is of a width suitable for the purpose and is preferably supported in the form of a coil 84, mounted on a shaft 85, held by brackets 86 to the right hand side of the frame of the machine, and thence the strip 83 is led beneath a guide plate 861 supported upon strips 87 upon the upper surface of the block 75, and held thereto by means of screws 88, leaving a narrow passage or guide 89 between said plate 86 and the upper surface of the die 77. The plate 86 has a circular opening 90 to permit the passage of the dies 32 and 51 through the same. The strip of metal 83 will thus be firmly held and guided beneath the plate 86 and over the female die and will be prevented from rising with the male cutting die as it is elevated for another operation.

The eccentrics 40 and 72 are mounted upon the main shaft 91, mounted in bearings 92 in the side plates 3 and 4 and at one end said shaft 91 is provided with a large gear 93. This gear 93 is in mesh with and is driven by a pinion 94 mounted upon the shaft 58, which supports the lever 57. The pinion 94 is arranged to be connected with and disconnected from a belt pulley 95 which is supported to revolve on a sleeve 96 of said pinion 94. The belt pulley 95 is arranged to turn freely on the sleeve 96 and to have a sliding movement along said sleeve for connecting the pulley 95 with the pinion 94, and for disconnecting it therefrom, and as shown in the drawing it is provided with a chamber 97 which receives a spring 98 which normally holds the belt pulley 95 in its disconnected position. When the pulley 95 is moved toward the left, as shown in Fig. 2, against the tension of the spring 98 it will, by means of a pin 99 on the hub of the pulley 95, engage a pin 100 carried by the pinion 94, and thus the pinion 94 will be revolved with the belt pulley 95.

To slide the pulley 95 along the sleeve 96 there are provided the collars 101 and 102 having the complementary inclined faces 103, the collars being supported to have a relative turning movement on the sleeve 96 and held on said sleeve by means of a nut or washer 104, and a headed screw 105 tapped into the end of the shaft 58. The collar 101 is mounted to slide but not to turn on the sleeve 96 and the collar 102 is provided with a handle 106 whereby it may be turned on the sleeve 96, and thus cause the complementary inclined faces 103 to operate either to force the belt pulley along said shaft 96 toward the left, as shown in Fig. 2, against the tension of the spring 98 to connect said pulley with the pinion 94, or, by turning said collar in a reverse direction, to permit the spring to disconnect the belt pulley from the pinion 94.

The feeding mechanism for the strip of material 83 consists of the feeding rolls 107 and 108, journaled in boxes 109 and 110 held in the guides 111 of the stands 112 and 113, the boxes 110 of the upper roll 108 being acted upon by springs 114 carried by caps 115 and acted upon by adjusting screws 116, whereby the upper roll 108 is yieldingly held in contact with the lower roll 107. The lower roll 107 is positively turned by means of a beveled pinion 117 which meshes with and is driven by a beveled gear 118 and it in turn drives the upper roll 108 by means of a gear 119 mounted upon the shaft of the roll 107 meshing with a gear 120 on the shaft of the roll 108. Thus as the roll 107 is driven by its beveled gears, it will, through its gear connection with the upper roll 108 turn said roll in the opposite direction, and as the rolls are held in frictional engagement with each other by means of the springs 114, they will draw the strip 83 from the coil 84 and beneath and between the dies. It is of course understood that the operation of these feeding rolls is intermittent, the feeding taking place during the upward movement of the dies and during the downward or punching and forming movement the strip of material remains stationary, and therefore the beveled gear 118 which turns the feeding rolls is arranged to be intermittently rotated. This is secured by means of the large ratchet wheel 121, which is connected to the beveled gear, the beveled gear and ratchet wheel being mounted upon a short shaft 122 (see Fig. 3 of the drawing). The ratchet wheel 121 is engaged by a spring-pressed pawl 123 carried by the outer end of a lever 124, fulcrumed at 125. The lever 124 which carries the pawl is rocked by means of a link 126 pivotally connected at 127 to the lever 124, and at its opposite end pivotally connected at 128 to a block 129, adjustably mounted in a dove-tailed groove 130 in a disk 131 secured to the left hand end of the main shaft 91. The block 129 is connected to a threaded rod 132 in said groove 130, which is provided at one end with a square or other shaped head

133, whereby said rod 132 may be turned and, by its threaded connection with the block 129, move said block diametrically across the disk 131 for the purpose of adjusting the pivotal connection 128 toward and from the axis of the shaft 91, thus adjusting the throw of the link 126 and the pawl-carrying lever 124, to adjust the feed movement of said pawl.

It is of course understood that the rotations of the shaft 91 will, through the link 126, rock the pawl-carrying lever 124 and, by means of the spring-pressed pawl and the ratchet wheel 121, impart intermittent rotations to the feed wheels 107 and 108. From the feed wheels the strip of material from which has been punched the circular disks is fed to a cutting or shearing mechanism which chops up the waste into small pieces. This shearing mechanism consists of a fixed cutting blade 134 mounted upon a stand 135. This cutting blade 134 cooperates with a movable cutting blade 136 carried by a rocker arm 137 pivoted at 138 to the stand 135. To insure against the springing of the blades during the cutting operation, the rocker arm 137 is provided at its free end with a down-turned plate 139 which is provided with a curved slot 140, through which passes a headed screw 141, tapped into the stand 135, which plate permits an upward and downward swinging movement of the rocker arm 137 and holds the cutting blades against any liability of springing away from each other during the cutting operation. The rocker arm 137 is moved by means of a link 142 which is pivotally connected at 143 to said rocker arm and at its upper end is pivotally connected at 144 to an arm or bracket 145 projecting from, and attached to, the reciprocating frame 8 by means of the screws 146. Thus as the reciprocating frame 8 moves up and down, it will, through the arm 145 and link 142, impart up and down rocking movements to the rocker arm 137.

The strip of material as it passes from the feed rolls is received on a table 147, which is supported by a block or stand 148 and at its left hand end adjacent to the cutters the table 147 is turned upwardly as shown (see Fig. 2), the upturned portion being provided with a slot 149, through which the strip of material passes to the cutting blades. Thus the end of the material will be held down against any tendency of the movable plate to carry it up. The plunger die forces the disk through the female forming die, as hereinbefore described, and thereafter is withdrawn and elevated, and for the purpose of preventing the cup 80 from returning with the plunger die I have provided the strippers 150, which are received and arranged to slide in the substantially cylindrical bearings 151 of the block 75, the strippers 150 being reduced in thickness, as shown at 152, to slide beneath the die block 77, and the inner ends being beveled, as shown at 153, and projecting slightly beneath the opening 79. They are yieldingly forced toward each other or toward the opening 79 by means of the springs 154 acted upon by the set screws 155. As the cup is forced through the opening 79, it will engage the beveled ends 153 of the strippers and force them yieldingly outward in opposite directions against the tension of the springs 154, and after it has passed below said strippers they will spring in over the upper edge of the cup and against the plunger die. Thus, as the plunger is withdrawn, they will strip the cup therefrom.

For the purpose of lubricating the flanges 43 and 71 of the eccentrics 40 and 72, there are provided the lubricating devices indicated generally by reference numerals 156 and 157, comprising the oil receptacles 158 and 159 carried by the plates 160 and 161 which receive oil from the receptacles and deliver it to the fibrous pads 162 and 163 attached to the inner faces of the plates 160 and 161, which bear respectively against the outer faces of the flanges 43 and 71, they being yieldingly held against the flanges by the spring shanks 164 and 165, which support the lubricators and which at their lower ends are attached to the frame of the machine. The flanges 43 and 71 of the eccentrics are provided with several holes 166, whereby the lubricating oil received from the pads 162 and 163 may pass to the inner surfaces of the flanges.

For the purpose of preventing any lost motion or back lash in the movement of the rocking levers which operate the reciprocating frame 8 and the plunger die 51, helical springs are connected between the rear ends 36 and 67 of said levers and the frame of the machine and tend to draw the rear ends of the levers downwardly. The helical spring which is connected to the rear end of the lever 33 is indicated by reference numeral "200" in Fig. 1 and is connected at 201 and 202 to the rear end of the lever 33 and the machine frame respectively. The spring which is connected to the rear end of the lever 57 is connected between the rear end of the lever 57 and the machine frame in an exactly similar manner and is situated, as viewed in Fig. 1, directly behind and in line with the spring 200.

The operation of the machine, it is thought, has been sufficiently described in the foregoing description of its construction and arrangement and a further description of its operation is deemed unnecessary.

Having described my invention I claim as new and desire to protect by Letters Patent of the United States:—

1. In combination, a reciprocating frame,

carrying a punching die, a rocking lever for operating said frame, a flanged eccentric for operating said lever, rolls carried by said lever engaging the inner and outer surfaces of the flange of said eccentric and an eccentric sleeve for adjusting said rolls, substantially as described.

2. In combination, a tubular punching die, a lever for operating it, a plunger die operating through said tubular die, a lever for operating it, a bail for connecting said plunger die to said lever and a threaded adjustable stud carried by said lever and bearing upon the head of the plunger die, substantially as described.

3. In combination, a reciprocating frame carrying a punching die, a rocking lever for operating said frame, a flanged eccentric for operating said lever, rolls carried by said lever engaging the inner and outer surfaces of the flange of said eccentric, an eccentric sleeve for adjusting said rolls, and means for lubricating the flange.

4. In combination, a reciprocating frame carrying a punching die, a rocking lever for operating said frame, a plunger die arranged to reciprocate through said punching die, a rocking lever for operating said plunger die, rolls carried by said levers, and flanged eccentrics, the inner and outer surfaces of which are engaged by said rolls to operate said dies in timed relation to each other, substantially as described.

5. A machine for stamping and forming articles from sheet metal, having, in combination, a punching die, a forming die arranged to reciprocate through the punching die, and means including two continuously rotating eccentrics for reciprocating the dies in timed relation so that the punching and forming dies simultaneously move toward the work, the punching die operates to cut a blank from the work and then stops, and the forming die continues its movement to shape the blank cut out by the punching die, substantially as described.

6. A machine for stamping and forming articles from sheet metal, having, in combination, a punching die, a forming die, means for reciprocating the dies in timed relation comprising two flanged eccentrics mounted on the same shaft and two rocking levers, each connected to one of the dies and each bearing two rolls for engaging the inner and outer surfaces of the flange of one of the eccentrics, substantially as described.

7. A machine for stamping and forming articles from sheet metal, having, in combination, a punching die, a forming die, means for reciprocating the dies in timed relation comprising two flanged eccentrics mounted on the same shaft and two rolls for engaging the inner and outer surfaces of the flange of each of the eccentrics, substantially as described.

8. A machine for stamping and forming articles from sheet metal, having, in combination, fixed female punching and forming dies, movable male punching and forming dies to coöperate therewith, the male punching die being in the form of a hollow cylinder and the male forming die being in the form of a plunger arranged to reciprocate through the hollow male punching die, rocking levers connected to the male dies, eccentrics for oscillating the rocking levers to reciprocate the dies in timed relation, and means for adjusting the connection between one of the male dies and its rocking lever whereby the relative position of the two male punching dies may be adjusted, substantially as described.

9. A machine for stamping and forming articles from sheet metal, having, in combination, fixed female punching and forming dies, means for feeding the sheet metal over said dies, male punching and forming dies to coöperate with the female dies, a reciprocating frame carrying the male punching die, a male forming die comprising a plunger adapted to reciprocate through the male punching die, the frame carrying the punching die being recessed to receive the upper end of said plunger, means for reciprocating the two male dies in timed relation comprising two rocking levers connected respectively to the frame of the punching die and to the forming die plunger, and two eccentrics for oscillating the levers, substantially as described.

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

MICHAEL F. CAHILL.

Witnesses:

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L. K. ALLEN.