

J. E. DOBSON.
MACHINE FOR FORMING METAL CUPS.
APPLICATION FILED JUNE 4, 1910.

1,056,012.

Patented Mar. 18, 1913.

4 SHEETS—SHEET 1.

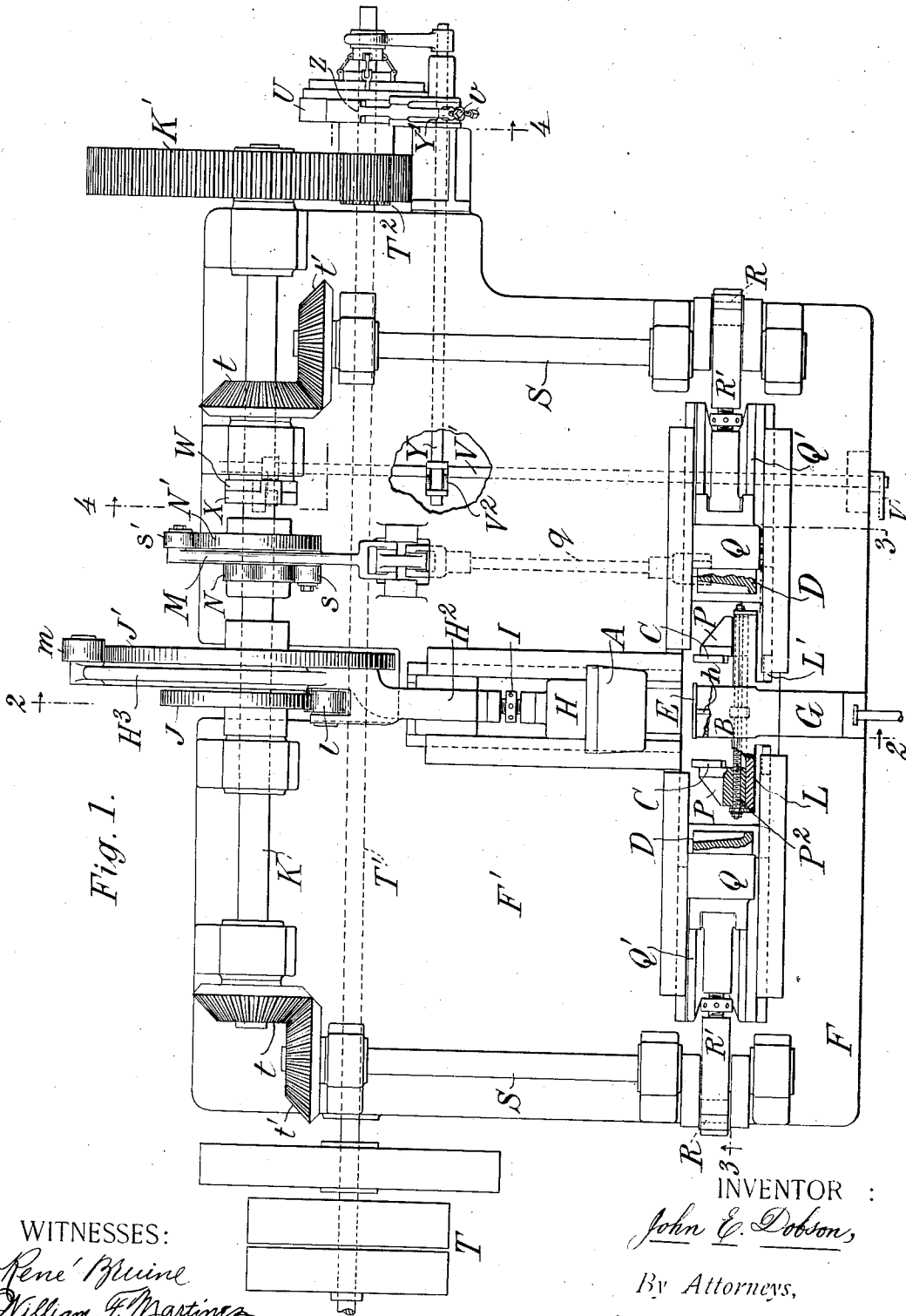


Fig. 1.

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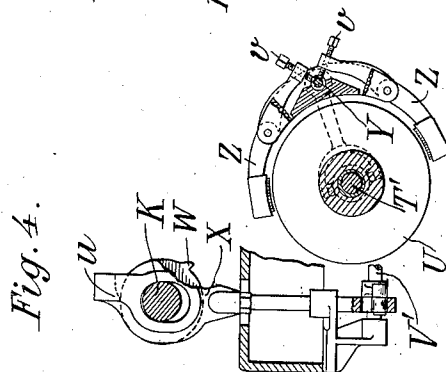
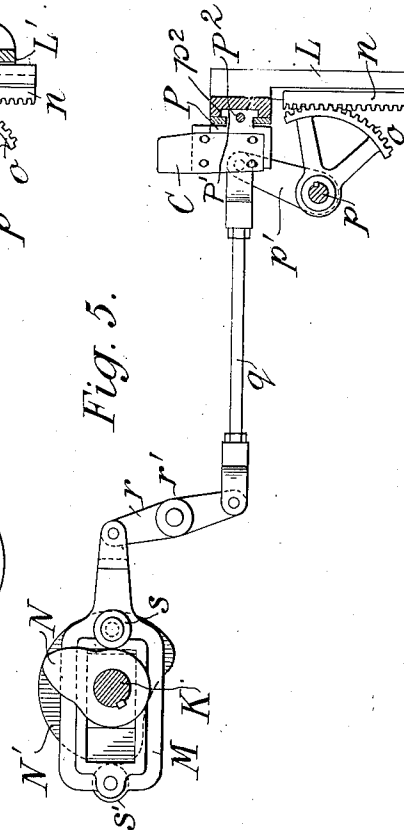
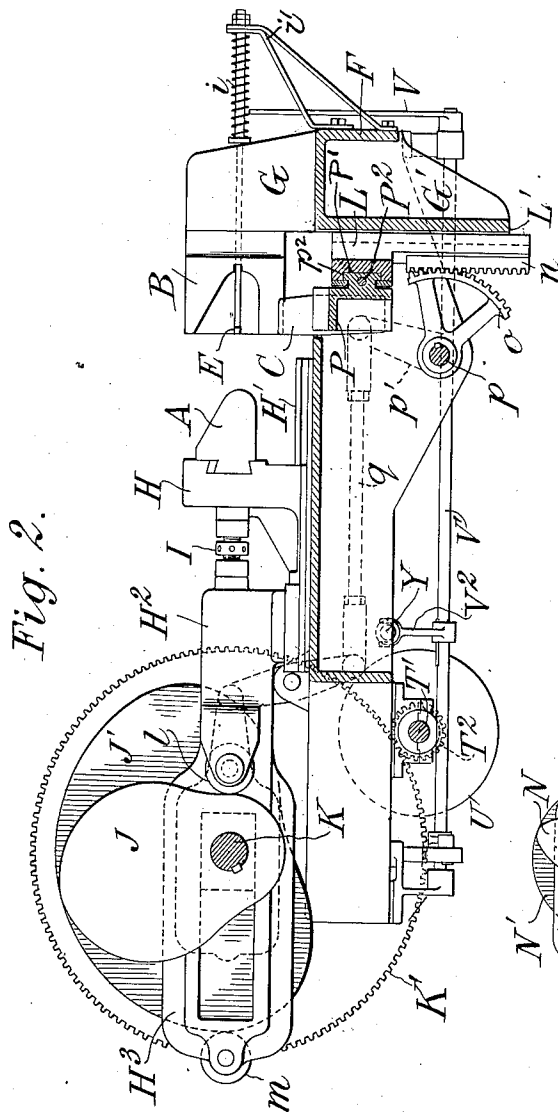
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4 SHEETS-SHEET 2.



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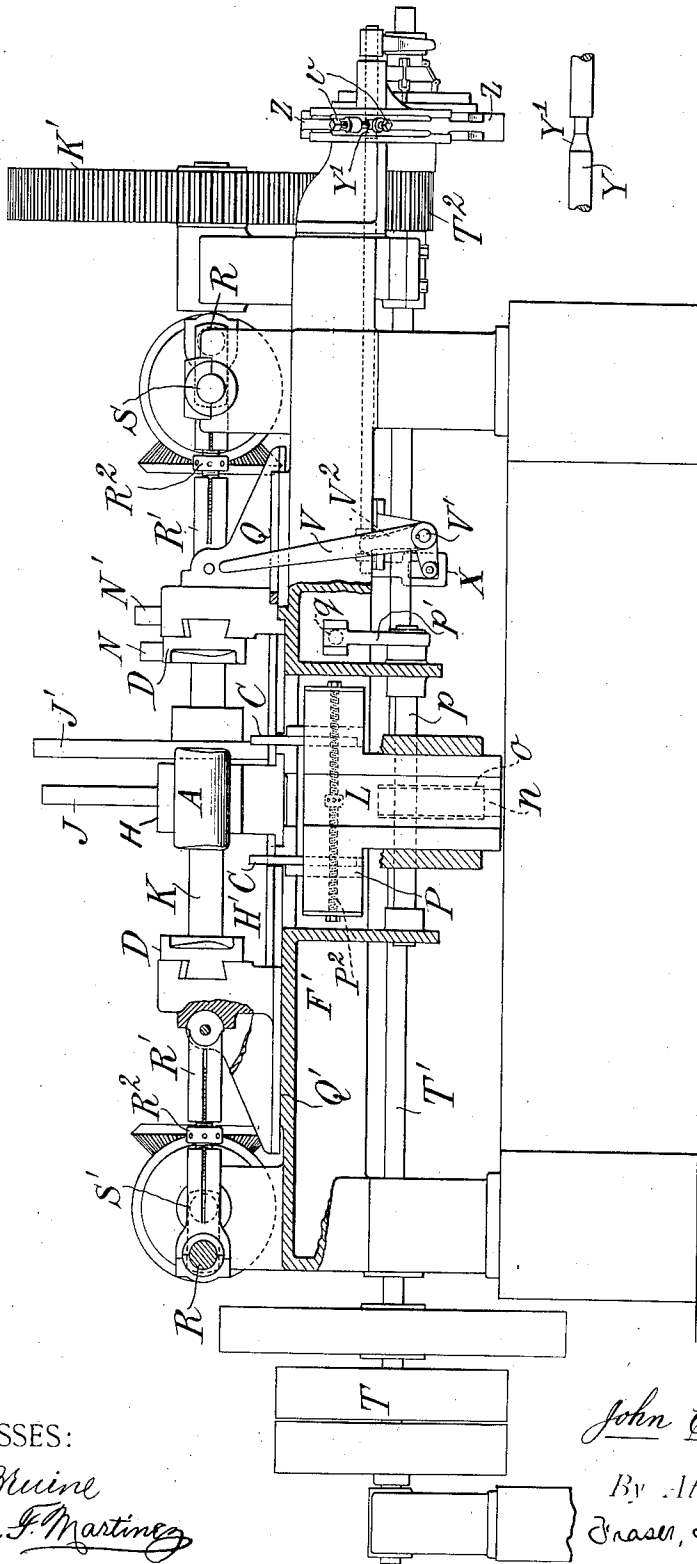
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4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

Fig. 7.

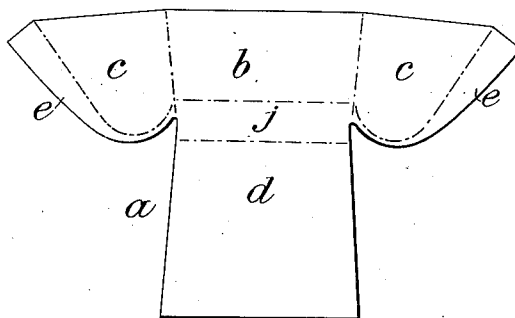


Fig. 6.

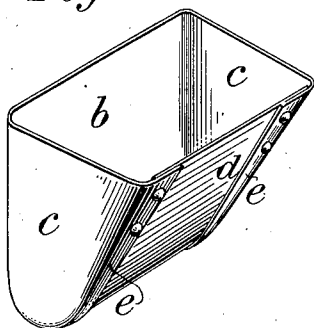


Fig. 8.

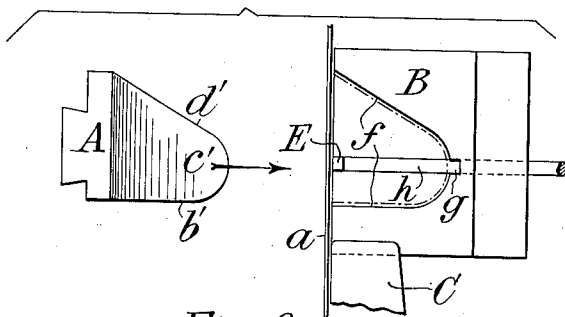


Fig. 10. Fig. 11.

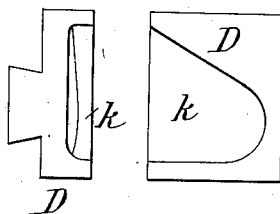
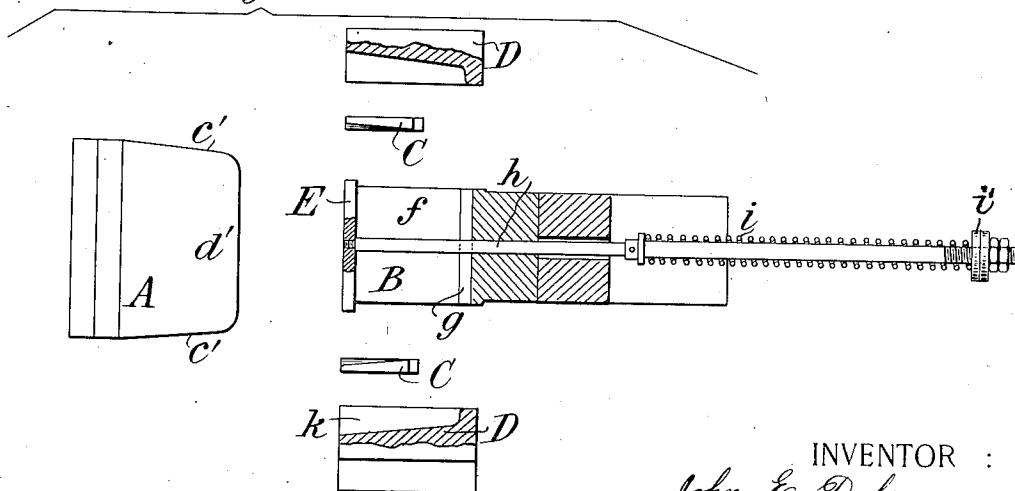


Fig. 9.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR FORMING METAL CUPS.

1,056,012.

Specification of Letters Patent.

Patented Mar. 18, 1913.

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To all whom it may concern:

Be it known that I, JOHN E. DOBSON, a citizen of the United States, residing in the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Machines for Forming Metal Cups, of which the following is a specification.

This invention relates to apparatus designed especially for forming elevator buckets, but adapted also for bending or shaping other sheet metal articles of similar cupped shape or of such shape as to be capable of being made by a like or analogous series of operations.

Elevator buckets of small size or those made of ductile metal can in some instances be drawn as seamless cups by means of ordinary drawing dies. But for buckets of larger size or where the use of ductile metal is not suitable, it is necessary to seam the buckets, and in such case they are bent up from a previously-stamped-out blank of sheet metal, and after being bent to shape the overlapping portions or seams are united by rivets or by brazing as may be required. It is for such seamed buckets that the machine of the present invention has been especially designed.

The accompanying drawings show a machine for forming elevator buckets or the like constituting the preferred embodiment of this invention.

Figure 1 is a plan of the machine. Fig. 2 is a vertical transverse section thereof on the plane of the line 2—2 in Fig. 1. Fig. 3 is a front elevation partly in section upon the line 3—3 in Fig. 1. Fig. 4 is a fragmentary transverse section on the planes of the line 4—4 in Fig. 1. Fig. 5 is an elevation viewed transversely of the machine and in the same direction as in Fig. 2, showing the mechanism for operating the vertically-moving folders. Fig. 6 is a perspective view of the completed cup or bucket. Fig. 7 shows the metal blank from which this is formed. Fig. 8 is a side elevation of the die and accessory parts which directly act upon the sheet metal blank. Fig. 9 is a plan of the parts shown in Fig. 8 including the lateral dies for completing the ends of the bucket. Figs. 10 and 11 are front and side elevations of one of the lateral dies.

Referring to the drawings Fig. 6 shows the finished cup or bucket to be formed by the machine, and Fig. 7 shows the sheet metal blank from which it is to be made. This blank *a* which is destined to be bent upon approximately the dotted lines shown, consists of a portion *b* which will form the back *b* of the bucket, two wings *c c* which will form the sides or ends *c c* of the bucket, a projection *d* which will form the curved front *d* of the bucket, and marginal portions *e* to the wings which upon being turned over form the flanges *e e* of the bucket.

The machine is designed to be fed by hand or otherwise with successive blanks *a*, to bend these into proper form for the bucket and to deliver the bent-up but not riveted bucket out of the machine ready to be finished by punching the rivet holes and inserting and setting the rivets.

The several bending operations are performed by bending dies comprising a former *A* which conforms approximately to the interior contour of the bucket and which is shown in side view in Fig. 8 and in plan in Fig. 9; a rear bending die *B* which is shown in side elevation in Fig. 8 and in plan in Fig. 9; two opposite side folders *C C* which are shown in side elevation in Fig. 8 and plan in Fig. 9; and two side-forming dies *D D* which are shown in plan in Fig. 9 and one of which is shown in side elevation in Fig. 10 and in front elevation in Fig. 11.

Referring to Fig. 8 the blank *a* is set up in a vertical plane in front of the die *B*, being held in place by any suitable gages or stops; the die then advances in the direction of the arrow and bends the blank into the hollow *f* of the die *B*. To insure that the blank shall not become displaced during this bending operation a spring-pressed clamping pad or cross-head *E* is mounted within this hollow of the die *B* so that upon the approach of the die *A* the blank is gripped tightly between the latter and this clamping pad and consequently as the die *A* enters the hollow of the die *B* the blank is held firmly in position and drawn without displacement into the hollow *f*, the pad *E* receding as the die *A* advances until when the die *A* has entered fully into the hollow *f* the blank has been set to the conforming outlines of the die *A* and the hollow *f* of the

die B (as shown by dotted line in Fig. 8), and the pad E has been forced back into a notch *g* in the die B. The clamping device E may be variously constructed, but as shown it has a cross-head mounted upon a rod *h* which is acted on by a spring *i* to press it firmly forward. The operation performed on the blank by the dies A and B as thus described turns the portion *b* of the blank into a horizontal position against the under part *b'* of the die A and folds the portion *d* of the blank against the upper face *d'* of the die A. Thus the curved bottom of the cup or bucket, being approximately the portion *j* between the dotted lines in Fig. 7, is conformed to the curved end portion of the die A. The operation thus described leaves the wings *c c* of the blank projecting to both sides in approximately horizontal direction. These wings are then folded up by the side folders C C which ascend from beneath and fold the wings against the ends *c'* of the die A. During this operation the side dies D D are located so far away from the dies A B on either side, that there is ample room for the folding-up of the projecting wings *c c*. As soon, however, as these wings have been thus folded up the dies D D move toward each other and thus approach the intervening dies A B. The function of these dies is to force the wings *c c* of the blank against the end faces *c'* of the die A and to turn the marginal portions *e e* of the wings around the edge of the die and to overlap the portion *d* of the blank, to the positions shown at *e e* in Fig. 6. Just before the approaching dies D D begin to act upon the side wings of the blank the side folders C C descend by a rapid motion so as to get out of the way and enable the dies D D to act. These dies have each a hollow *k* conforming to the end portions of the die A and adapted to turn the flanges *e e* and flatten the wings *c c* against the die A. The operation just described completes the forming of the cup or bucket. The dies D D then recede, moving away from the intervening dies A B, and leaving the newly-formed cup upon and embracing the die A and within the hollow of the die B. The die A then recedes, moving out from the interior of the newly-formed cup, leaving the latter held in the hollow of the die B. It might be removed therefrom by hand preparatory to feeding in the next blank; but it is preferable to eject it from this hollow automatically, a function which is conveniently performed by the clamp E, which being pushed forward by its rod *h* forces the cup out from the hollow of the die B. The cup thus ejected may be dropped out beneath or removed in any other desirable manner from the machine.

The die B might be made of nearly the full width of the die A, but in practice it

is quite sufficient to make it narrow and conform only to the middle portion of the die A, as clearly shown in Fig. 9.

The mechanism by which the dies and other parts described are operated, will now be explained with reference to Figs. 1 to 5 inclusive.

The machine is constructed with a frame F of any suitable kind or construction and which is preferably constructed to form a table F'. The die B, which is preferably stationary, is shown as fastened to a bracket G fixedly attached to the frame. The die A is fastened to a slide H which slides in ways H' on the frame, and said slide is connected through any suitable adjustable connection I to a slide H² shown as mounted upon the slide H, and sliding thereon when the parts H H² are adjusted. This slide H² is reciprocated by any suitable mechanism, preferably by cams. For this purpose it carries a roller *l* which is acted upon by a cam J upon a cam shaft K to force the slides H² H forwardly in order to impart to the die A its working stroke. The slide H² is prolonged to form an extension or yoke H³ which carries a roller *m* which is acted upon by a cam J' to impart to the slides H² H their rearward movement to retract the die A.

For imparting to the vertically-moving folders C C their proper movements the following-described mechanism is provided: These folders are carried upon a vertically-reciprocating frame L which slides in ways L' upon a bracket G' projecting downward from the main frame. The slide L carries a rack *n* which meshes with a toothed sector *o* fixed upon a rock shaft *p* on which is fixed an arm *p'* all as best shown in Figs. 2 and 5. To this arm *p'* is jointed a connecting bar *q*, the opposite end of which is jointed to one arm of a rock lever *r* fulcrumed at *r'* in fixed bearings on the frame, while its upper arm connects with a slide or yoke M best shown in Fig. 5 which carries opposite rollers *s s'* which are engaged respectively by cams N and N' also fixed on the shaft K. Thus the reciprocations imparted by the cams N N' to the slide M are communicated through the intervening parts to the upright slide L carrying the folders C C. To enable these folders to be adjusted to varying distances apart, either for adjusting to a nicety their folding connection with respect to the die A, or for enabling the machine to be adjusted for making cups of different sizes by the use of correspondingly altered dies A, B and D, the connection between the folders C C and the slide L is made laterally adjustable by the use of intermediate slides P P to which the respective folders are fixed and which are mounted in horizontal ways P' formed on the slide L. For adjusting the slides P P simultaneously a horizontal screw

P² is provided having right- and left-hand threads for engaging the respective slides P P so that by turning this screw the slides are simultaneously and equally moved toward or from the center.

For giving the dies D D their simultaneous movements toward and from the dies A B they are mounted on slides Q Q sliding in ways Q' on the main frame and reciprocated by means of cranks R R carried by revolving shafts S S which revolve synchronously, the crank studs being connected to the slides by connecting rods R' R' which are adjustable in length by means of an intervening right and left screw R², whereby to adjust the approach of the dies D D to the die A and whereby also to vary the location of the slides Q Q for changing the machine from one set of dies for making one size of cups to another set for making a different size.

The several moving parts thus described may be variously driven. In the construction shown the machine is arranged to be driven by a belt on fast-and-loose pulleys T, Fig. 1, whereby a driving shaft T' is normally driven continuously. Loosely mounted on this shaft is a pinion T² which is coupled to the shaft at intervals through the medium of any suitable clutch U. The pinion T² meshes with a gear wheel K' fixedly mounted on the shaft K so that whenever the pinion T² is clutched to the driving shaft T' the shaft K is driven. This shaft carries two miter gears t t, Fig. 1, which drive miter-gears t' t' on the shafts S S whereby the three shafts K, S and S from which all the dies and actuating parts are driven, are revolved in unison. To each complete revolution of these shafts the active dies and folders perform one cycle of movements sufficient to form one cup or bucket. It is desirable that after performing these movements the machine should stop automatically in order to give ample time for the operator to remove the cup already formed and to place a new blank in proper position in the machine. When this is done the operator by means of a starting lever V throws the clutch U into engagement and starts the machine which then turns through one complete revolution performing the necessary movements for bending this blank into a cup, and then automatically stops.

The automatic stopping of the machine is performed by means of a stopping cam which may be carried on any one of the shafts K, S, S. It is shown as a cam W carried upon the shaft K. This cam, as shown in Fig. 4, has a single lug or tooth which at the end of its revolution passes beneath a projection u carried by a vertically movable slide X which slide is thus lifted by the cam tooth, and is connected beneath the table to a transverse shaft V' through any suitable

connection, such as a rack and pinion, or a slot and arm, as shown, whereby its lifting movement oscillates this shaft. The shaft V' is connected to a longitudinal shaft or slide Y in any suitable manner, as through a rack and pinion or an arm V² (Fig. 3) such that upon such oscillation of the shaft V' by the cam W the shaft Y shall be moved endwise in such direction as to release the clutch U and apply a brake to stop the machine. The shaft Y has a conically reduced neck Y' which acts as a cam to rock levers Z Z carrying the brake shoes. These levers have adjusting screws v v which act against the neck Y' (Fig. 4) to adjust the force with which the brake is applied. The starting lever V is applied upon the same shaft V' and to start the machine this lever is moved to oscillate the shaft V' in contrary direction, and thereby impart the contrary movement to the sliding shaft Y to release the brake and reengage the clutch U. The clutch shown is an ordinary toggle-action friction clutch. The particular construction of the clutch is not illustrated in detail, such clutches being well understood, and forming no novel part of this invention.

The clamping pad or cross-head E carried on the rod h as already described, may be operated in either of two ways. Its spring i shown in Fig. 9 as reacting against the bracket i' may be sufficiently stiff to not only clamp the blank against the die A with the requisite force, but may also have sufficient stress to push the completed cup out of the hollow f of the die B as the die A is retracted, so as to release the cup. If, however, the spring i is not sufficiently stiff to perform this latter function so that there would be liability that the completed cup might remain jammed fast in the hollow f the clamping pad E may be made to perform the function of a "knockout" by connecting its rod h to some suitable moving part so that it will forcibly expel and dislodge the completed cup. To this end a suitable connection may be made with the slides H or H², as by means of a rod and lever, the latter arranged to strike the end of the rod h at a suitable point in the retracting movement of the die A.

It must not be inferred from the particularity with which I have described the details of construction of my machine that my invention is by any means limited to such details, since its construction may be varied within wide limits according to the particular construction of cup or bucket or like article which it is desired to form. The mechanical construction and connections may also be varied in accordance with the skill or judgment of the mechanical engineer or constructor. The invention is applicable generally for bending up cup-

shaped or box-shaped articles of sheet metal or similar material, where the article to be formed can be bent or folded around a die or former and against four sides thereof.

5 What I claim is:—

1. A machine for forming round-bottomed sheet metal cups from flat blanks having lateral wings, comprising a rounded forming die conforming approximately to the interior of the cup to be formed, folding means coacting with said forming die to wrap the blank around the opposite sides thereof, independently - moving folders adapted to subsequently fold the projecting wings of the blank against the ends of such forming die, lateral dies hollowed to conform to the ends of said forming die, and movable against such die to shape and flange the wings of the blank, connected driving mechanism for operating said parts in the described succession, starting means adapted to set in motion said driving means, and stopping means adapted automatically to stop said driving means at the end of the cycle of operations for completing one cup.

2. A machine for the purpose described,

comprising a forming die, means for folding a blank around it, end folders, a slide carrying said folders, an oscillating shaft having a sector engaging rack teeth on said slide and having an arm, a cam shaft, a cam thereon, a reciprocating slide moved by said cam, and connections from said slide to said rock shaft arm.

3. A machine for the purpose described, comprising a forming die, end folders coacting therewith, a reciprocating slide for moving said folders, means for reciprocating said slide, auxiliary slides mounted to slide laterally upon said reciprocating slide and carrying the respective folders, and means for adjusting said auxiliary slides upon said reciprocating slide to adjust the folders toward or from each other.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

JOHN E. DOBSON.

Witnesses:

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