3 Sheets—Sheet 1.

T. R. MORGAN, Sr.

Pan-Forming Machine.

No. 213,126. Patented Mar. 11, 1879.

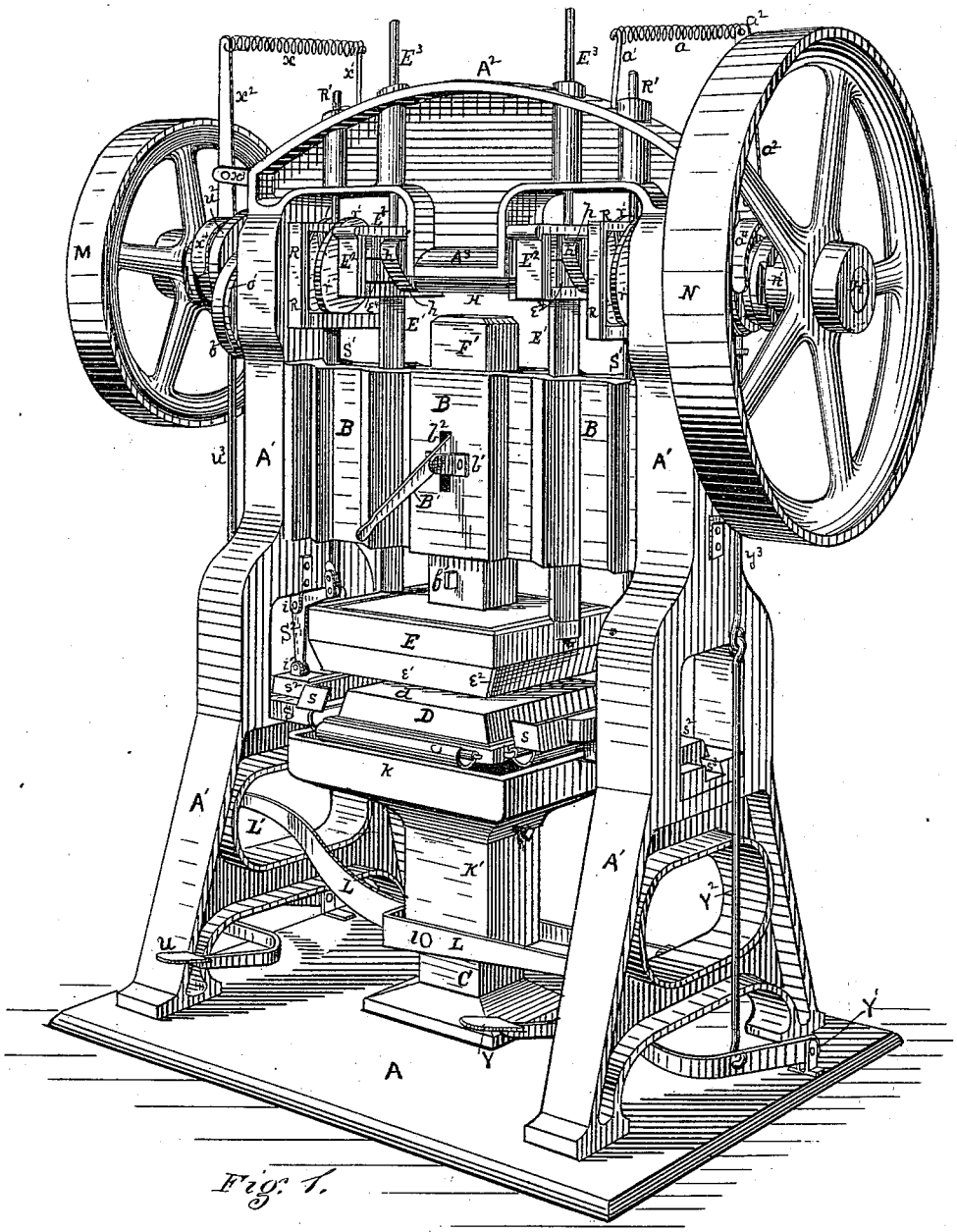

Fig. 1.

Witnesses
Stephen F. McCormick
Claudius L. Parker

Inventor Thomas R. Morgan Sr.
By Attorney George H. Christy.

3 Sheets—Sheet 2.

T. R. MORGAN, Sr.

Pan-Forming Machine.

No. 213,126. Patented Mar. 11, 1879.

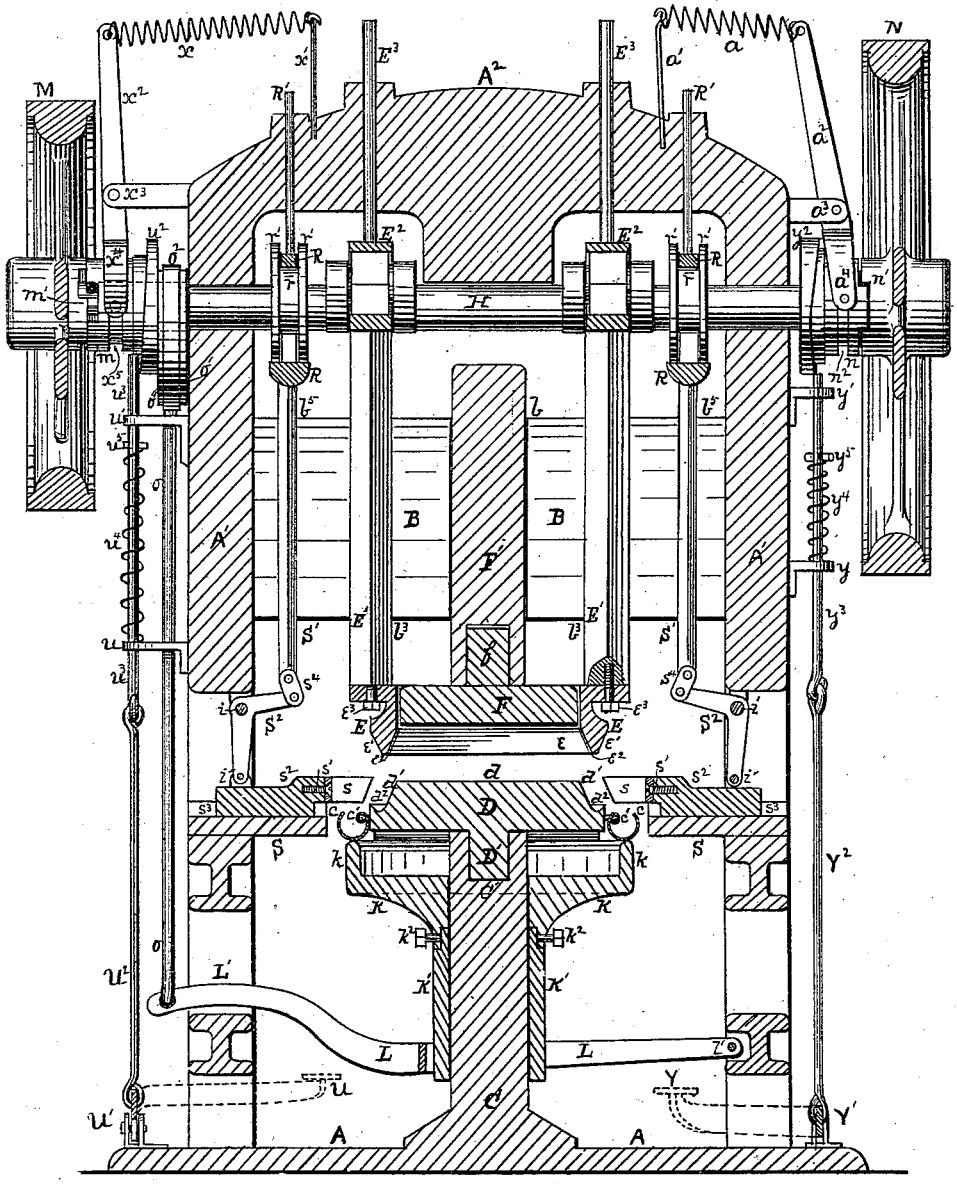

Fig. 2.

Witnesses.
John F. McCormick
Claudius L. Parker

Inventor Thomas R. Morgan Sr.
By Attorney George H. Christy

T. R. MORGAN, Sr.
Pan-Forming Machine.

No. 213,126. **Patented Mar. 11, 1879.**

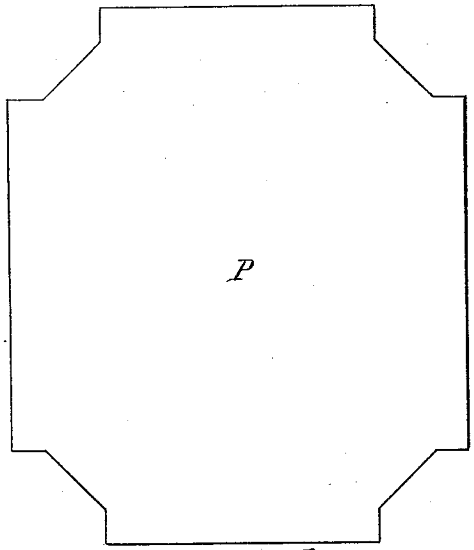

Fig. 5.

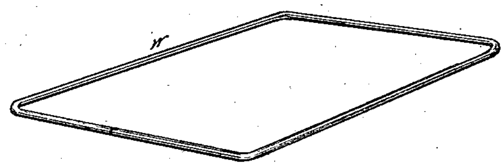

Fig. 4.

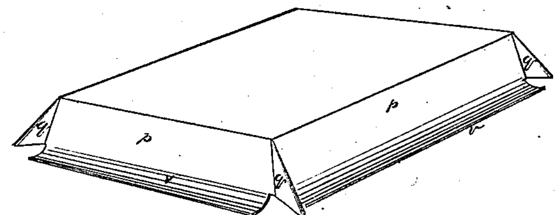

Fig. 6.

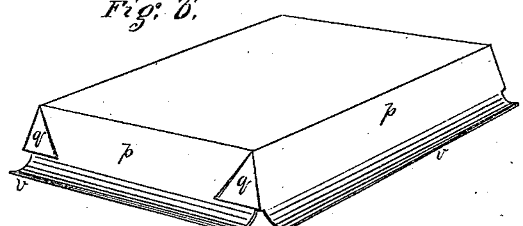

Fig. 7.

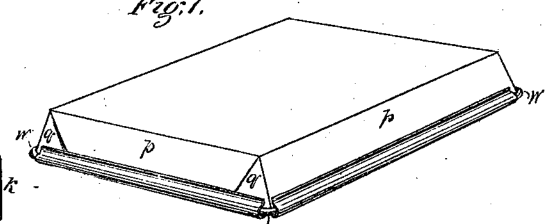

Fig. 8.

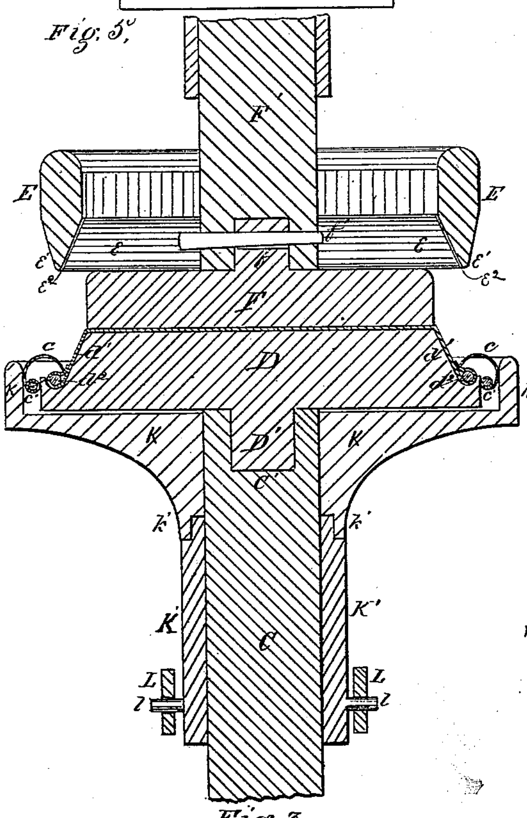

Fig. 3.

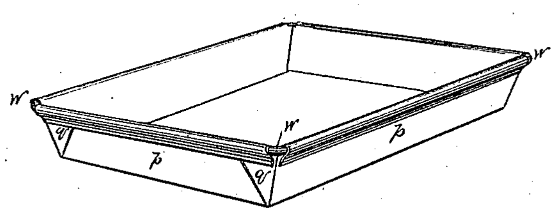

Fig. 9.

Witnesses:
John J. McCormick
Claudius L. Parker

Inventor Thomas R. Morgan Sr.
By Attorney George H. Christy

UNITED STATES PATENT OFFICE.

THOMAS R. MORGAN, SR., OF ALLIANCE, OHIO, ASSIGNOR TO W. D. WOOD & CO., OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN PAN-FORMING MACHINES.

Specification forming part of Letters Patent No. **213,126**, dated March 11, 1879; application filed December 30, 1878.

To all whom it may concern:

Be it known that I, THOMAS R. MORGAN, Sr., of Alliance, county of Stark, State of Ohio, have invented or discovered a new and useful Improvement in Machines for Making Baking-Pans; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—like letters indicating like parts—

Figure 1 is a perspective view of my improved machine for forming bake-pans. Fig. 2 is a vertical sectional view of the same, the main driving-shaft and connecting-rods being shown in elevation. Fig. 3 is a vertical sectional view, drawn to an enlarged scale, of the formers, the clamping device, the wiring device, and the pan, these parts being arranged in proper relation to each other. Fig. 4 is a perspective view of the wire bent ready for being applied to the pan. Fig. 5 is a plan view of the blank from which the pan is formed. Figs. 6, 7, and 8 illustrate different stages or steps in the manufacture of the pan; and Fig. 9 is a perspective view of the pan complete.

My invention relates to mechanism for forming rectangular bake-pans from sheet-metal blanks previously cut and trimmed, such pans being bent and folded from an integral sheet, so as to be without seams, and having a stiffening-wire secured to the rim.

Such a pan is represented in Fig. 9 of Sheet 3. The sheet-metal blank from which it is formed is represented at P, Fig. 5, and such formation is accomplished by my improved machine in three successive steps or operations, as represented in Figs. 6, 7, and 8, respectively. The first operation is the folding or bending over of the edges of the blank to form the sides and ends *p* of the pan, the blank P being first trimmed to size and notched at the corners. The second operation results in folding the wings *q* upon the ends of the pan. These wings are formed in bending down the sides and ends in the first step or operation, as presently described. And, third, the wire *w* is attached by looping the edge of the rim over it, provision also being made for this final step or operation during or by means of the first operation, as hereinafter described.

While these three steps or operations are performed in succession, yet the parts of the machine are so adapted and arranged with relation to each other that they co-operate in performing their separate functions automatically.

I will describe my improved machine with respect to these three steps or operations in the order in which they have been enumerated.

In Figs. 1 and 2, A represents the foundation or bed plate, on which are erected upright standards A^1, connected at the top by a cross head or beam, A^2, and at a point a little below by a cross-beam, B. A central post or support, C, is also erected from the base A. These parts constitute the main or supporting frame of the machine.

On the top of the post C the lower or inside former, D, is seated, and secured by a pin, D′, on the former fitting into a socket, C′, in the post. The former may thus be readily removed and another of different form or size be substituted. The upper face, *d*, of this former corresponds in size and form to the bottom of the pan, and the side walls, d^1, are sloped outward somewhat, as shown, to give the desired flare to the sides of the pan, and such sloping sides end at their bases in reflex curves, forming grooves d^2 around the former, the purpose of which will presently appear.

A clamping-die or follower, F, is secured to a guiding-stem, F′, by a pin-and-socket connection, *f*, and key *f′*, so as to be readily removable. The stem F′ moves in a mortise, *b*, through the center of the beam B, and is guided thereby. An operating-lever, B′, having its fulcrum on brackets b^1, passes through an opening, b^2, in the side of the beam and is pivoted to the stem F′. By means of this lever the follower or clamp F can be raised or lowered at the will of the operator. The lower face of this clamp or follower corresponds in form and size to the bottom of the pan and to the face *d* of the former D.

The upper or outside forming-die, E, is adapted to close down over the former D, leaving space between the sloping faces *e* and d^1 equal to the thickness of the blank operated

on. The outer faces, e^1, of the upper forming-die are also sloped, as shown, so as to reduce the lower edges to a thickness adapted to enter the grooves d^2. Openings or slots e^2 are made at the angles of this former E, which extend from the under edge up to the limit of the sloping faces e. This forming-die E is made movable up and down by attachment, by means of screws or bolts e^3, to guide-bars E^1, which extend up through mortises b^3 in the beam B and connect with yokes or stirrups E^2, which inclose U-shaped cranks h on the main driving-shaft H, which is journaled in suitable boxes or bearings in the uprights A^1, between the cross-head A^2 and beam B.

The yokes E^2 are rectangular in form, and the cranks h are journaled within them in sliding boxes or bearings e^4 in such way that the revolution of the cranks will give the yokes a vertical movement only; and as an additional guide in this vertical movement rods E^3 extend up from the yokes through suitable passages in the cross-head A^2.

A center stay is provided for the shaft H by means of the depending block A^3, the under surface of which is so shaped as to form a bearing for the shaft, to prevent springing when under strain by the operation of the former E. The shaft H is driven by band-wheel N, the arrangement of which will presently be described.

The parts thus far described are those which operate directly in bending down the sides and ends p of the pan, and they operate as follows, their relative adjustment being that shown in Figs. 1 and 2: The blank P is placed and properly centered on the former D, and the follower or clamp F is lowered upon it, which, by its weight, holds the blank on the face of the former and prevents upward bulging of the bottom of the pan as the sides are bent. This being done the upper former, E, is forced down over the former D by the cranks h, and the overlying edges of the blank are bent down upon the sloping faces d^1, the surplus metal or part of the blank being forced out through the corner openings e^2 in the upper former, making triangular-shaped wings q, one at each corner of the pan. The lower edge of the former E also forces the rim of the blank into the grooves d^2, making an outwardly-bent flange, v, around the edge, which is afterward looped over the wire.

As the shaft H continues its revolution the former E is carried upward again, and the devices which perform the second step in the operation—namely the folding down of the wings q—come into action. These devices consist of folders s, one on either side of the lower former, D. They are made of bars having their ends bent inward at right angles, and the bar is of such length that these bent ends may pass along or across the ends of the former D by being moved forward and backward, and on being moved forward they will fold the projecting wings q down tight upon the ends of the pan. These folders are fastened by screws or bolts s^1 to sliding blocks s^2, so as to be readily removable therefrom, and the blocks are secured to tables S by dovetail tongues and grooves s^3, the tables being supported on the uprights A^1 in the proper position and in any convenient way.

Connecting-rods S^1, guided by suitable mortises b^5 through the beam B, are coupled with the sliding blocks s^2 by bell-crank levers S^2 and links s^4. The levers S^2 are fulcrumed to the uprights A^1, as at i, and pivoted to the blocks, as at i'. The upper ends of the rods S^1 are attached to yokes R, which inclose double cams $r\ r'$. These cams have an interior eccentric or cam face, r, inclosed by collars r' on either side. These collars are cut away on the side opposite the greatest enlargement of the inner cam.

The upper bars of the yokes R are made of such width that the collars r' will inclose them on both sides, and thus serve as a guide to keep the yokes in place, while the lower bars of the yokes are widened, so as to be operated on by the full part of the collars. As thus arranged the cams r operate to raise the yokes, which will, through the described connections, move the folders s inward or toward each other, so as to fold down the corners q, as described, and the full part of the collars r', acting against the lower bars of the yokes, will move them down and draw the folders back and hold them there until the full part of the collars has passed the yoke-bars. Thus vertical motion only is given to these yokes by the cams $r\ r'$, and a period of rest secured between successive forward movements of the folders.

Top guides R′ may be extended upward from the yokes R, which, passing through the cross-head A^2, serve to steady and direct the motion of the yokes R.

This folding down of the wings q is effected immediately after the former E has been raised, and upon the backward movement of the folders s the shaft H is thrown out of gear with the driving-wheel N by a clutch device presently to be described, so that the several devices thus far described which are driven by this shaft remain at rest during the final or wiring operation.

This operation is effected by first raising the follower F, and dropping a previously-bent wire, w, of proper size, over the pan onto the outwardly-bent flanges v. These flanges are then bent or looped over the wire, as shown in the finished article, Fig. 9, by means of concave or curved leaves c, which are hinged to the lower part of the former D, one on each side, as at c', below the grooves d^2, and in such relation to the grooves that when turned upward on their hinges, as shown in Fig. 3, their extreme edge will bear against the flanges and loop them over the wire w. By using curved leaves, as shown, I secure their direct action upon the flanges, and I also secure a preponderance of weight in the leaves outside of the vertical line through their hinges, so that they

will recede by their own weight when the device which forces them up is withdrawn.

This device consists of a table, K, arranged to slide up and down on the post C. A rim, *k*, projects up from the margin of the table, and acting against the under side of the leaves *c* raises them all at one operation as the table itself is raised, and as the table is withdrawn the leaves follow it by their own weight and take the positions shown in Figs. 1 and 2 until again carried upward. A pivoted connection may, if desired, be made between the rim *k* and each of the leaves *c*, but I prefer the arrangement shown. The table K is coupled by a socket-connection, k^1, to a box, K′, which also incloses and slides on the post C, and this connection may be secured by a set-screw, k^2, if desired. The table may thus be removed and one of different form or size substituted.

The box K′ is moved up and down upon the post by means of a bifurcated lever, L, pivoted to opposite sides of the box, as at *l*, and to one of the uprights A^1, as at *l′*. This lever is carried through an opening, L′, in the opposite upright A^1. A pitman-rod, *o*, connects the outer end of this lever with an eccentric, o^1, the eccentric having sufficient breadth of face to allow some range of endwise motion within the pitman-ring o^2, which encircles the eccentric. Suitable slots are made in the guide-brackets *u* u^1, through which the pitman plays. The eccentric o^1 is connected with a sleeve-clutch, *m*, which runs loose on the extended shaft H, and is adapted to engage a counter-clutch, *m′*, on the drive-wheel M. This drive-wheel runs idle on the shaft H, and it is prevented from endwise motion on the shaft by a key projecting from the wheel-hub into a circumferential slot in the shaft. The sleeve *m* is thrown into engagement with the wheel M by a spring, *x*, attached at one end to a fixed post, x^1, and at the other end to a vibrating lever, x^2, pivoted to the main frame, as at x^3, and clasping the sleeve by a fork, x^4, working in groove x^5. A collar, w^2, on the sleeve *m* has a lateral cam-face acting against a rod, w^3, which has vertical motion in the guides *u* u^1. By the action of this cam w^2 upon the rod w^3 the sleeve-clutch *m* is drawn out of engagement with the wheel M, and by drawing down the rod w^3 out of engagement with the cam w^2 the sleeve *m* will be moved into engagement with the drive-wheel by the spring *x*.

The rod w^3 is operated by a treadle, U, pivoted to the base, as at U^1, and connected to the rod by link U^2. An expansion coiled spring, w^4, is seated on the lower guide, *u*, and attached to the rod w^3 by pin w^5. This spring will carry the rod upward when pressure is removed from the treadle U, and the cam w^2 is so shaped, both as to its side face and outer face, that when in engagement with the drive-wheel, through sleeve *m*, the end of the rod w^3 will bear against the outer face until the cut-away part of the cam comes around to the rod, when it will, by action of the spring w^4, pass into engagement with the cam-face and operate to disengage the clutch *m* until again drawn down by the treadle U. The clutch will thus be thrown out of engagement automatically at each revolution, and during such revolution the table K and leaves *c* are raised through the connections and devices described, the wire looped to the pan, and the devices again returned to the position shown in Figs. 1 and 2.

The cut-away part of the cam w^2, which allows the rod w^3 to return to engagement with the cam, being short in extent, the foot of the operator may be removed from the treadle U soon after it is depressed.

A similar clutch device is employed to throw the shaft H out of gear with the wheel N, as before mentioned, Y being the treadle, pivoted, as at Y^1, to the base; Y^2, the link connecting the treadle to rod y^3, which is guided by brackets *y* y^1. The spring operating this rod is shown at y^4, connected by pin y^5 to the rod. The cam-collar is shown at y^2, and the sleeve-clutch at *n*, which in this case is connected with the shaft H by ordinary feather and groove.

N is the drive-wheel, with which the sleeve *n* engages by counter-clutch n^1, the drive-wheel running idle on the shaft, and held in place by key and circumferential groove. The spring which throws the sleeve-clutch into engagement is shown at *a*, the post to which it is secured at a^1, the vibrating lever at a^2, pivoted, as at a^3, and clasping the sleeve, as at a^4, in the groove n^2.

If preferred, the sleeves *n* and *m* may be moved into engagement by a spring arranged on the shaft, one end of which abuts against the sleeve, while the other end abuts against a stop on the shaft; but when the shaft is of considerable size I prefer the arrangement shown.

By means of this clutch device the shaft will be thrown out of gear automatically at each revolution, and during such revolution the first and second steps in the operation of forming the pan are performed through the devices which are driven by this shaft, as before described. This being done, these devices remain at rest while the wire *w* is introduced and looped to the rim of the pan, as also described.

These operations are all performed without removing the pan until completed, and the several devices are so arranged and adapted that they co-operate in forming the finished article, and perform their various functions in proper relation and succession.

When the operation is completed the follower or clamp F is raised and the pan removed.

It is an important feature of my improved machine that the several devices which act directly on the pan in forming it are made removable. Others of different size can thus be substituted, and the same machine be adapted to form pans of different sizes.

I claim as my invention—

1. The former D, having grooves d^2 at the base of its sloping walls d^1, in combination with clamping-die F, and outside forming-die, E, the latter having interior and exterior sloping working faces e e^1, substantially as set forth.

2. In a machine for making sheet-metal pans having central clamping-dies, an exterior or outside forming-die, E, arranged to operate by a direct motion, and having in each corner a slit, e^2, Fig. 1, of suitable size and depth for the gathering of rings q on the corners of the blank, substantially as set forth.

3. Curved bending or folding leaves c, pivoted to and in combination with the former D, having sloping sides d^1 and grooves d^2, substantially as set forth.

4. A vertically-moving table, K, having rim k, in combination with leaves c, former D, and follower F, substantially as set forth.

5. The combination of former D, follower F, exterior forming-die, E, folders s s, and pivoted leaves c, whereby the operations of bending the sides, folding the corners, and wiring the edges of a pan shall be effected by successive steps in one machine without changing the position of the blank, substantially as set forth.

6. As a device for operating the folders s s, and, by suitable interposed connections, in combination therewith, a cam having a grooved operating face, the bottom face, r, of the groove operating against one bar of the surrounding yoke, and the faces r' r' of the collars at each side of the groove operating against the opposite yoke-bar, substantially as set forth.

7. The combination of grooved cams r r', yokes R, guides R′, connecting-rods S^1, links s^4, bent levers S^2, sliding blocks s^2, and folders s, substantially as described.

8. The follower F, mounted by a stem, F′, in the cross-beam B, and raised or lowered at pleasure by a hand-lever, B′, in combination with the exterior and surrounding forming-die, E, and the described mechanical means by which it receives a direct motion in the same line of travel as the follower F, substantially as set forth.

In testimony whereof I have hereunto set my hand.

THOMAS R. MORGAN, SR.

Witnesses:
A. L. JONES,
JNO. R. MORGAN.