2 Sheets—Sheet 1.

L. WILLIAMS.

Machine for Making Pail-Bails.

No. 209,998. **Patented Nov. 19, 1878.**

FIG. 1.

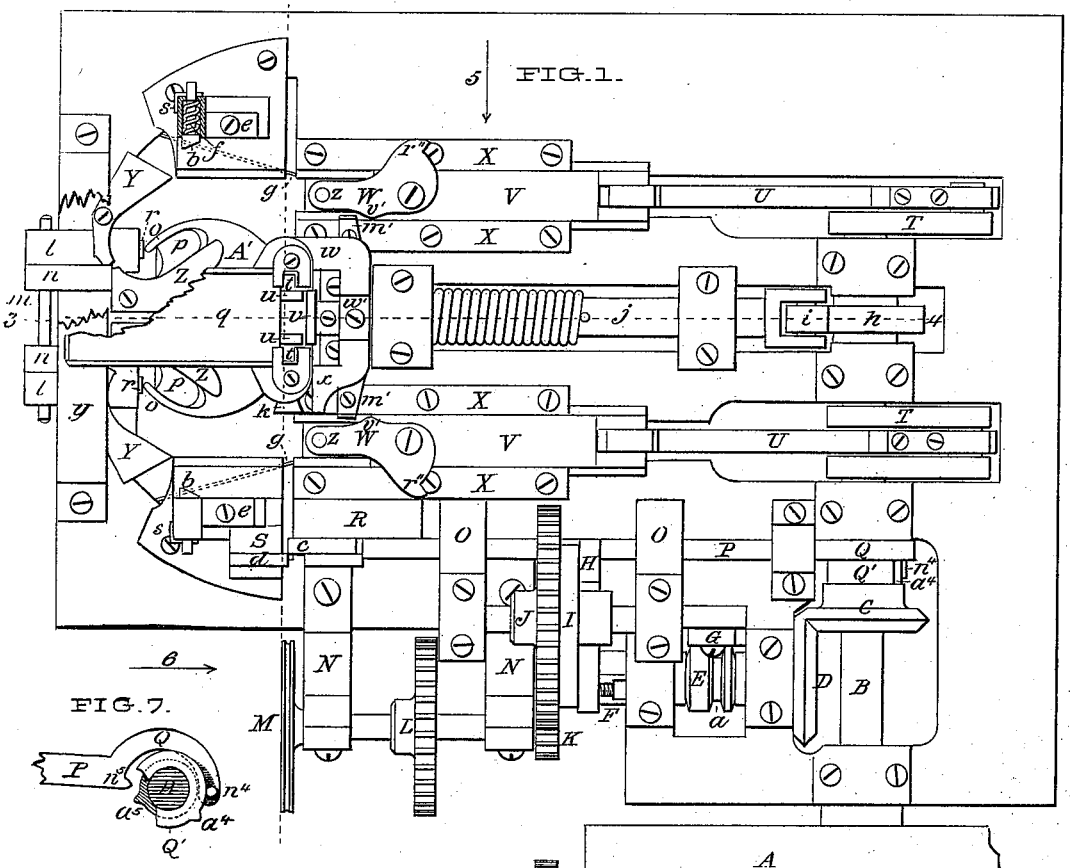
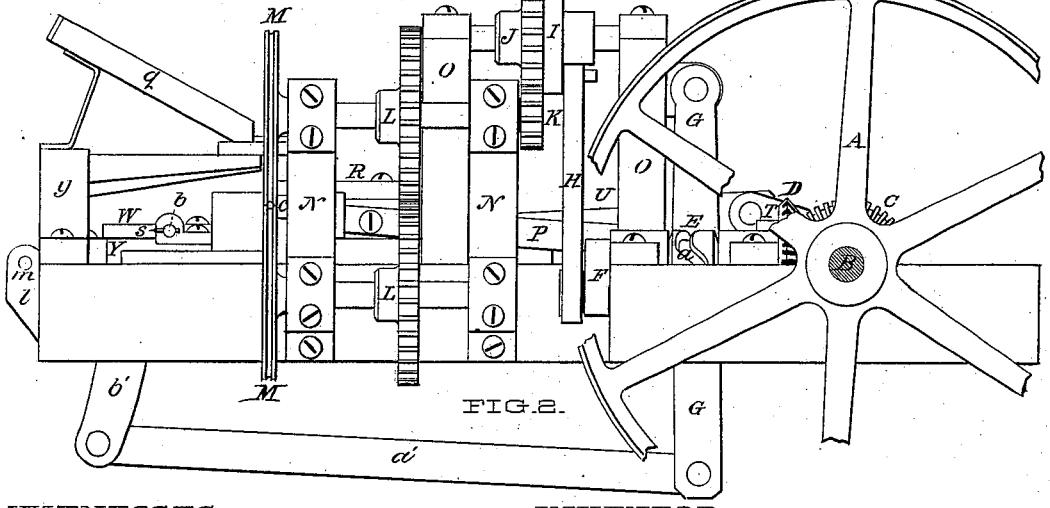


FIG. 7.

FIG. 2.



WITNESSES.

M. B. Scott

F. D. Fish

INVENTOR.

Lewis Williams,

by Franklin Scott, Atty.

L. WILLIAMS.

Machine for Making Pail-Bails.

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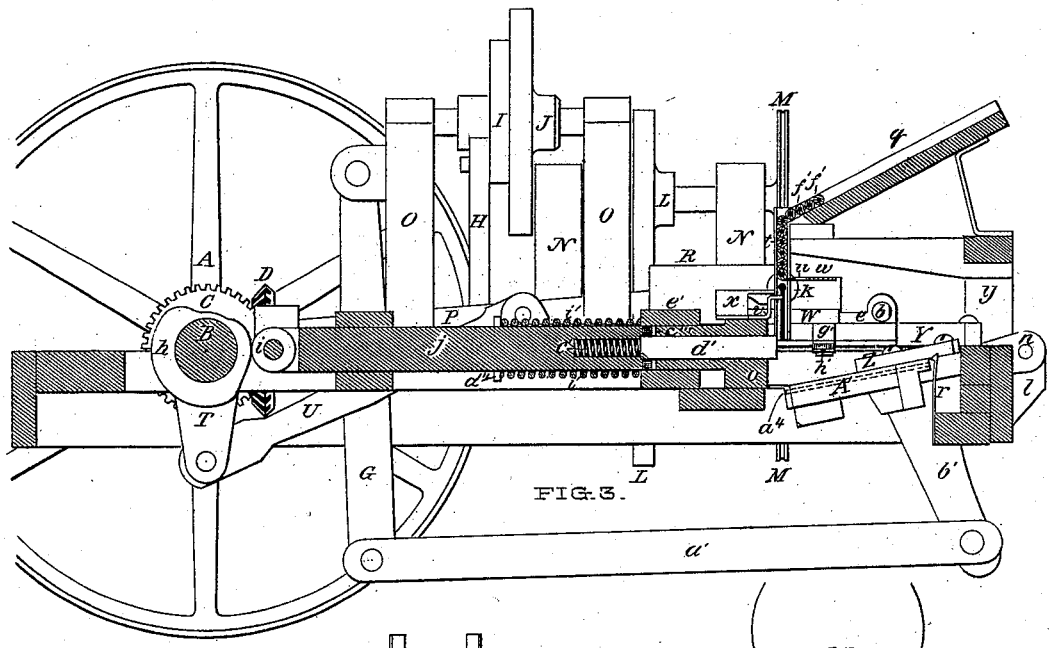

FIG. 3.

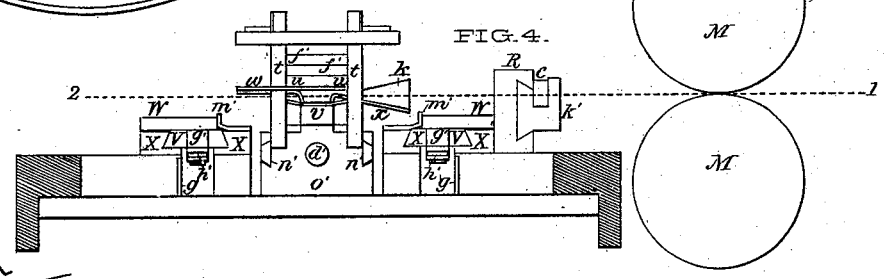

FIG. 4.

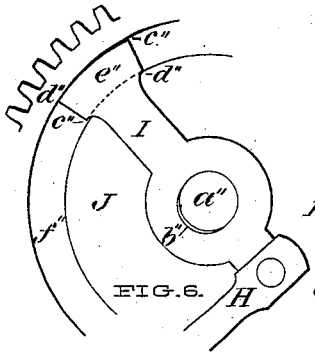

FIG. 6.

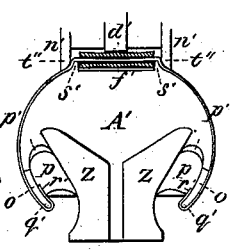

FIG. 5.

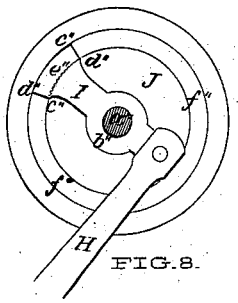

FIG. 8.

WITNESSES.

M. B. Scott

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UNITED STATES PATENT OFFICE.

LEWIS WILLIAMS, OF BENNINGTON, VERMONT.

IMPROVEMENT IN MACHINES FOR MAKING PAIL-BAILS.

Specification forming part of Letters Patent No. **209,998**, dated November 19, 1878; application filed July 10, 1878.

To all whom it may concern:

Be it known that I, LEWIS WILLIAMS, of Bennington, in the county of Bennington and State of Vermont, have invented an Improved Machine for Making Pail-Bails; and I do hereby declare the following to be a full, clear, and exact description of the construction and mode of operation thereof, reference being had to the accompanying drawings, consisting of two sheets, which form a part of this specification.

This invention relates to the manufacture of bails for ordinary tin, wooden, or paper pails from wire, by successively feeding the wire into the machine, cutting it off the desired length, passing it through a wooden or other handle, forming the bends or offsets at each end of the handle, bending the wire around a form into the desired shape of the bail, bending or forming the hooks or eyes, as the case may be, at the ends of the wire, whereby the bail is attached to the ears of the pail, and finally releasing the completed bail and delivering it from the machine.

Figure 1 of the drawings shows my invention in plan. Fig. 2 represents a side elevation of the machine, the view being of that side showing the feed mechanism. Fig. 3 exhibits a view in vertical longitudinal section, taken through line 3 4, of that aspect presented when seen in direction of the arrow 5 in Fig. 1. Fig. 4 shows an aspect of a vertical transverse section of the machine, taken in a vertical plane of the path of travel of the wire, viewed in the direction of the arrow 6, Fig. 1. Fig. 5 shows, in plan view, the form upon or around which the bail is shaped or bent, and the dies for swaging or shaping the offsets at the ends of the handle. Figs. 6 and 8 show the construction of certain parts of the feed mechanism, whereby a silent intermittent feed of the wire to the machine is secured. Fig. 7 is a detail view of devices for imparting to shear-blade *c* its proper reciprocating motion.

All the movements of this machine are automatic, and it is designed to make bails from a continuous coil of wire, such wire first passing, as it leaves the coil or reel, through a straightener, and thence to the machine.

The several operative parts are arranged or mounted upon a frame, table, or bench, as seen in plan in Fig. 1.

A is the driving-pulley, mounted on shaft B. To shaft B is attached miter-gear C, which engages miter-gear D, and thereby drives cam-grooved cylinder E, and, through crank F, pitman H, radial-arm I, and gears J K, L L, the friction feed-rolls M M, which supply the wire to the machine, the wire in such passage being confined in the grooves in the edges of rolls M M. Immediately in rear of gear C is collar Q′, equipped with lugs, for communicating to shear-blade *c*, through connecting-rod P and lugs thereon, the motion requisite to cut off the wire after the same has been fed into the machine. The shear-blades *c* and *d* are of ordinary construction, one being fixed in stock S, and the other attached to sliding stock *k′*, Fig. 4. Rod P is actuated by two lugs on collar Q′. One is seen at a^4, which produces a backward movement by engaging lug n^4 on rod P. The other, a^5, is located underneath the semi-annular part Q of rod P upon shaft B, and co-operates with a shoulder, n^5, on rod P to throw said rod in the opposite direction. Shaft B is provided with cranks T T. From these cranks, through the pitmen U U, motion is imparted to the horizontal slides V V. Upon the forward ends of these slides are mounted the wire-bending devices W W and their appurtenances, friction-rolls *g′ g′ h′ h′*, Figs. 3 and 4. Upon shaft B, between cranks T and T, is located cam *h*, Fig. 3. The function of this cam is to impart to slide *j* an irregular reciprocating movement. Said slide *j* is provided with a friction-roll, *i*, against which cam *h* works.

Sliding bar *j* is chambered out at its forward end, as shown in Fig. 3, to receive a piston-follower, *d′*. The forward or outward movement of this follower is limited by pin *c‴*, working in a short slot in bar *j*. In a smaller chamber in its rear works the coil-spring *c′*, which urges it forward to its work. The duty of this follower is to force the bail-wire forward against and into the notches or creases provided therefor in the edges of projections *s′ s′*, by pressing against and crowding forward the handle *f′*, but not so as to cause the handle to impinge against the inner edge of former A′, whereby the wire within the bore of the han-

dle is caused or compelled to assume the bent or slightly-curved form seen in Fig. 5. This is necessary to prevent the wire within the handles from recoiling after the pressure of the dies is relieved and assuming such a curvilinear form as would prevent the handle from turning or revolving on the bail-wire. By this arrangement I utilize the handle which is undergoing manipulation as a means for griping or confining the bail-wire against dies *s' s'*, so that when the dies *n' n'* advance against the wire on the outside of dies *s' s'*, and commence to bend the same across the sharp edges of dies *s' s'*, the tendency to leave the wire within the handle bowed up after the formation of the offsets at each end is effectually resisted and prevented by the position of the handle itself under the influence of the follower *d'*, and a more abrupt and shapely offset in the wire is formed.

The forward end of sliding bar *j* is constructed somewhat in the form of a rectangular or cubical form, which enlargement constitutes a head or stock, *o'*, Figs. 3, 4, and 5, for the attachment of various devices. On either side of stock *o'*, and opposite the wire when in position to be bent, are secured the dies *n' n'*, the front or forward ends of which are of the shape shown in Fig. 5 at *t'' t''*. These male dies *n' n'* operate in their advancing movement, in conjunction with projections *s' s'* constructed upon or attached to bending-form A', upon the bail-wire seized between them, and bends or swages it into the shape shown in Fig. 5. These bends of the wire are essential to confine the handle in proper position on this bail.

Upon the upper face of stock *o'* is attached the supporting-plate *v* and the guiding-plate *w'*. This guiding-plate *w'* is constructed with lateral wings *w* and *x*. Wing *w* extends around the column-guides *t t*, and is armed with separating-fingers *u u*. These fingers *u u* are located the dimensions of a single handle above supporting-plate *v*, and the inner extremities of said dividing-fingers are in the same perpendicular plane with the inner edge of supporting-plate *v*.

Wing *x* is designed, when the sliding bar is moved forward to its greatest extent, to close the slot or opening in funnel-guide *k*, so that the re-entering wire which is to form the next bail may be properly guided into and through the handle, resting upon supporting-plate *v* for that purpose.

The machine is provided with a chute, *g*, for the conduct of the handles from a hopper provided for that purpose to the column-guides *t t*. The bail-handles are arranged transversely therein, and by force of gravity roll down the incline of chute *q*, at the bottom end of which their ends enter the column-guides *t t*, as shown in Fig. 3. Guides *t t* are constructed so that they will receive but a single column of handles, and they lie within such guides piled one upon another, as shown in Fig. 3.

The former A', around or upon which the bail is shaped and hooks bent, is pivoted at its rear to ears *l l* of the table or frame, and is adapted to be dropped or lowered a short distance, to effectuate the release of the finished bail. Its position when so depressed is seen in Fig. 3. It is armed at its inner edge with the projections *s' s'*, which co-operate with male dies *n' n'* to bend the bail-wire at the ends of the handle. The lateral contour of former A' is about as seen in Figs. 1 and 5, and is of such shape that the extremities of the bail will be bent in toward each other sufficiently to allow the native spring or recoil of the wire when released from the former to restore the bail to a proper shape for use. Former A' is of horseshoe shape, and at each heel thereof the contour terminates in a thin curved vertical plate or former, *o o*, with rounded extremities *q' q'*, around or about which the end of the wire is bent by the friction-rolls *h' h'* of wire-bending devices W W. Friction-rolls *h' h'* are guided in their path of travel by the exterior guides Y Y and interior guides Z Z. Wire-bending device W is provided at or near its rear outside corner with a lug or projection, *r'''*. In its forward movement this lug passes over spring-latch *b*, working in socket of plate *e*, at the moment when the friction-roll *h'* has reached its limit of travel opposite extremity *q'* of former *o*; and the retreat of the friction-roll *h'* by the same path that it advanced to this point is prevented by the resistance offered by the latch *b* to lug *r'''*, which resistance at the same time forces friction-roll *h'* around onto the inside of hook-former *o*, so that by reason of the resistance and control of movement offered by guide Z the formation of the hook at the extremity of the bail is accomplished. Wire-bending devices W W are also provided with projections *v' v'*, which in the retrograde movement impinge against guards *m' m'*, and are thus restored to proper position for a repetition of their work. Former A' is recessed away inside the hook-formers, as shown at *p p*, to facilitate the withdrawal of the friction-rolls from their position at the completion of the hook. The depression of former A' is accomplished by means of cam-groove *a* of cam E acting upon a pin or lug on lever G, which lever is pivoted at its top to a projection on standard O and at its bottom to connecting-rod *a'*, which rod connects said lever G with the depending arm *b'*, attached to the under side of former A'.

Upon either side of former A', and attached to the frame of the machine, are the supporting-guides *g g*. After a wire has been fed through a handle and cut off, the supporting-plate *v* recedes and permits the wire with handle attached to drop, and find support by its extremities on the supporting-guides *g g*. The wire then lies in proper position for the bending devices to advance and act upon it. During such advance the rolls *g'*

g' revolve against guides Y Y and Z Z, while the rolls h' h' act upon the wire.

The release and discharge of the finished bail from its attachment to former A′ by the hooks at its ends grasping the hook-formers o o is accomplished by the depression of the former A′, as seen in Fig. 3, in connection with the action of spring-catches r r. These spring-catches are attached to the frame of the machine and project upwardly, as shown, just in rear of the hook-formers o o. When the former A′ is depressed, as seen in Fig. 3, the catches r r are forced back, so that the hook part thereof springs forward and catches over the hook of the bail. From this point or position, upon the former A′ resuming its normal horizontal position, the spring-catches r r relatively draw the bail-hooks down off the hook-formers o o, and the wire of the bail being then free to exert its elasticity the extremities fly outwardly, and the bail, being thus liberated from its attachment to the former, drops clear of the machine.

The irregular reciprocating motion given to slide j by cam h, among other things, effects the following result: The machine, starting from the position shown in Fig. 1, finds a pail-handle or series of handles resting on supporting-fingers u u in guides t t. The further forward movement of cam h throws slide j to its extreme limit of travel, thereby carrying fingers u u back out from under the pile of handles, thus allowing the whole pile to descend and rest on supporting-plate v. Further rotation of the cam permits a partial return movement of both fingers and supporting-plate, the fingers entering between the handle resting on plate v and the one just over it, thereby separating them, while supporting-plate v prevents further descent of the handle resting on it. These several parts maintain their relative positions while the wire is fed through the handle and is cut off. This accomplished, the receding movement of plate and fingers is completed, which results in the withdrawal of supporting-plate v from under the handle, and thus allows it to fall, when the extremities of the wire in their descent find lodgment on the supporting-guides g g.

A regular intermittent feed movement is imparted to feed-rolls M M, by means of driving-gear J and its appurtenances, with which said rolls are connected by train of wheels L L and K. The construction of gear J and its attachments is shown in Fig. 6. Upon the face of gear J is cut a concentric groove, f''. Pivoted upon the shaft a'' works the lever I. To one end of this lever is attached the pitman H, and upon the other end is constructed a concentric projection or lug, e'', which is adapted to work in groove f'', but the radial thickness of which projection is slightly less than the radial breadth of groove f''. The central bore of lever I, through which shaft a'' passes, is worked out on the side toward the advance movement of projection e'', so as to leave an oblong hole, which permits of transverse play of the lever on the shaft in the direction of the action of pitman H. The action is such that when the pitman is drawn down with a view of propelling the feed-rolls, it draws the elongated side of the bore of lever I down to the shaft a'', thus throwing said lever, so to speak, "off center," the true center being drawn one side as much as the bore is enlarged. This throws or cramps the concentric projection e'' around into the position in groove f'' shown in Fig. 6, which causes the inside forward corner and the outside rear corner of said projection e'' to bind in groove f'' at the points d'' d'' sufficiently tight to carry gear J around with lever I. The opposite movement of pitman H throws lever I onto its true center, thereby releasing the hold which projection e'' maintained in groove f'', and leaving said projection entirely free to be moved backwardly. Pitman H is attached to an adjustable wrist-pin on crank F, which is driven by gear D to the end of the shaft to which it is attached.

The several concomitant and consecutive movements of the various parts of this machine are as follows: The machine, as ready to commence work, is shown in Fig. 1. Assuming the hopper and guides t t to be stocked with handles and the feed-rolls with wire, the machine is started. First, the supporting-fingers u u are forced back by cam h so as to let a handle down onto supporting-plate v, so that the bore of the handle is coincident with the aperture in guide-funnel k. The same movement also carries wing x under the longitudinal slot in guide-funnel k, through which the wire subsequently drops, so that the wire in its forward movement shall surely find the bore of the handle. Next follows the operation of the feed-rolls, which feed in the requisite length of wire. Both wire and handle remain in this position until the wire-benders have traversed a little more than half their circuit, or until shaft B has completed a little more than half a revolution.

While wire-benders W W are on the last third of their traverse, or while shaft B is on the last part of its revolution, shear-blade c comes into play and severs the wire, while simultaneously fingers u u and supporting-plate v are brought into the position shown in Fig. 3. Here they rest momentarily, while the further rotation of cam E, through the intermediate connecting mechanism before described, accomplishes the release and discharge of the bail last formed (and still adhering to former A′) by means of the depression of former A′ in conjunction with spring-hooks r r. The finished bail being discharged, the remaining part of the complete revolution of cam h permits the withdrawal from its position in the path of the descending handles of the supporting-plate v, thus allowing the wire, with handle thereon, to descend and find lodgment by its ends on the supporting-guides g g. The commencement of a second revolution of shaft B will first cause the follower d' to ad-

vance and force the wood or handle against the wire running through the same, whereby it will be firmly held during the completion of the bending processes. At the same time male dies *n' n'* have forced the wire against the projections *s' s'*, and thus formed the bends or offsets at the ends of the handles necessary to maintain the position of the handles on the wire. This being accomplished, wire-benders W W advance, and the bail-wire lying in the path of grooved rollers *h' h'* is by them seized and bent around the edge of former A', said rollers *h' h'* being guided in their progress by the friction-rolls *g' g'* working against the edges of guides Y Y until lugs *r'' r''* have passed the spring-stops *b b*. At this point the cranks T T, which propel the wire-benders, are on or have but just passed the dead-center. Their further advance movement tends to draw the wire-benders back in the path by which they advanced; but this movement is instantly met and checked by the resistance offered by spring-stops *b b*, and, as a result of such backward movement and resistance, the bending-rollers *h' h'* are forced around the extremities *g' g'* of formers *o o*, carrying with them the extremities of the bail-wire, thus forming the hooks at the ends thereof, by which they are attached to the ears of a pail. The bail being thus completed, the former A' begins to drop, carrying, attached to it by the hooks aforesaid, the said bail. Such depression causes the rear part of the bail-hooks to force back the spring-latch hooks *r r*, which immediately spring forward over and catch the top of the bail-hook. The elevation of the former A', which next follows, causes the bail to be drawn off or disconnected from the hook-formers *o o*, and leaves it free to drop to the floor.

The last-described result may be accomplished by employing a fixed former, A', and using vertically-moving spring-hooks or claws to draw the wire off the formers. This last-described system I have in use, and regard it in principle and operation as substantially the same as the one above described.

From the foregoing it is apparent that two revolutions of the driving-shaft are necessary to begin and finish a bail; but the operations of the machine are so arranged that one bail is commenced and another finished by the same revolution, so that the machine turns out one complete pail-bail for each revolution of the main shaft. Hence

I claim as new—

1. As a means for imparting to the feed mechanism a regularly intermittent automatic movement, the combination of lever I, provided with oblong bore and concentric projection *e''*, with wheel J, having concentric groove *f''*, in which said projection *e''* works, the whole being actuated by a pitman, H, or any other suitable device for producing reciprocating motion, attached to the lever I, substantially as shown, all combined, arranged, and operating substantially in the manner described and shown.

2. The provisions shown for regulating the supply of handles to the machine, consisting of column-guides *t t*, for retaining the handles and keeping them arranged in order, in combination with separating-fingers *u u* and supporting-plate *v*, attached to the reciprocating slide *j*, all arranged to operate substantially as described and set forth.

3. The means provided for forming the offsets or bends in the bail at each end of the handle, consisting of follower *d'*, in combination with reciprocating male dies *n' n'* and projections *s' s'*, when constructed and arranged to operate substantially in the manner described and set forth.

4. The described means for making the principal bend of the bail-wire, consisting of the wire-bending devices W W, mounted on reciprocating slides V V, and provided with grooved friction-rollers *h' h'*, in combination with guides Y Y and former A', arranged and operating in the manner and for the purposes described and set forth.

5. The described means for forming the loops or hooks on the ends of the bail-wire, consisting of wire-bending devices W W, mounted and propelled as described, and provided with grooved friction-rolls *h' h'* and lugs *r'' r''*, spring-stops *b b*, interior guides Z Z, and hook-formers *o o*, all combined and arranged to operate substantially in the manner described and set forth.

6. The mechanism and movements employed for releasing and discharging the finished bail from the machine, consisting of former A', adapted to be depressed and elevated by suitable mechanism, and having the hook-formers so disposed that when such former A' is depressed the bail-hooks formed thereon will engage with spring-hooks *r r*, and when elevated the bail-hooks will be drawn off the hook-formers, said former A' and its attachments being combined and arranged to co-operate with spring-hooks *r r*, substantially in the manner specified.

7. The combination of follower *d'* with former A', armed with projections *s' s'*, as a means for confining the wire which passes through the handle *f'* in place during the formation of the offsets at either end of the handle, substantially as shown and described.

8. The means provided for rocking or tilting former A', consisting of grooved cam E, lever G, equipped with lug or pin to work in cam-groove *a*, connecting-lever *a'*, and depending arm *b'*, all combined and arranged to operate substantially as described and set forth.

9. In a machine for making pail-bails, the combination of mechanism for automatically feeding at regular intervals and in uniform lengths the wire to the machine and mechanism for cutting off the wire, of substantially the character shown and described, with the mechanism shown for regulating the supply and adjustment of the bail-handles, arranged to co-operate in the same machine substantially in the manner set forth.

10. The combination, in a machine for making pail-bails, of the described mechanism for automatically feeding forward at regular intervals the wire from which the bail is formed, with the described mechanism for bending the wire, substantially as and for the purposes set forth.

11. In a machine for making pail-bails, the combination of the described mechanism for griping and holding the handle, and at same time shaping or forming the offsets in the bail-wire at each end of the handle, with the mechanism described for successively presenting such handle for the insertion of the bail-wire, holding the same during such insertion, and, after such insertion has been made and the wire cut off, releasing the same, substantially as and for the purposes described and set forth.

12. In a machine for automatically making pail-bails, the combination of the several described interdependent and co-operative groups of mechanism—viz: the mechanism for confining and controlling the handles during their passage through the machine, the mechanism for automatically feeding the wire at regularly recurrent intervals to the machine, the devices for cutting off the wire, the mechanism for presenting the wire after being handled to the action of the wire-benders, the mechanism for confining both wire and handle and forming the offsets in the bail-wire at the ends of the handles, the mechanism for bending the wire to the form of the bail and turning the hooks at the ends thereof, and the mechanism shown for releasing and discharging the finished bail from the machine, arranged to operate substantially in the manner described and set forth.

In testimony whereof I have hereunto subscribed my name at Bennington, Vermont, this 5th day of July, A. D. 1878.

LEWIS WILLIAMS.

In presence of—

FRANKLIN SCOTT,

GEO. H. HARWOOD.