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I. W. HOLLETT.

MACHINE FOR MAKING PAPER VESSELS.

No. 537,640. Patented Apr. 16, 1895.

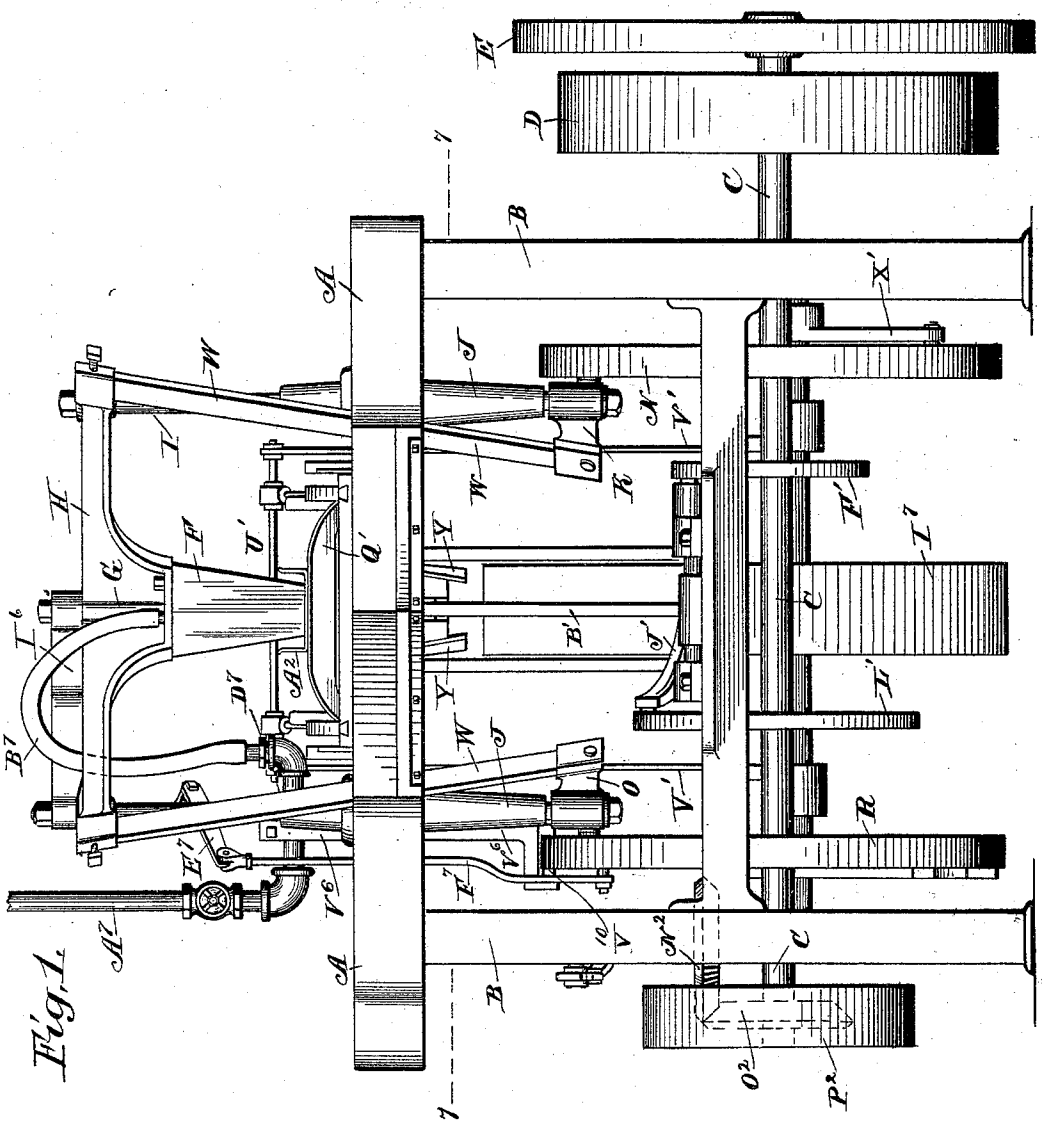

Fig. 1.

Witnesses,
Sidney W. Brainard Jr.
Martin A. Olsen

Inventor:
Isa W. Hollett
by Edward Rector
his atty

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I. W. HOLLETT.

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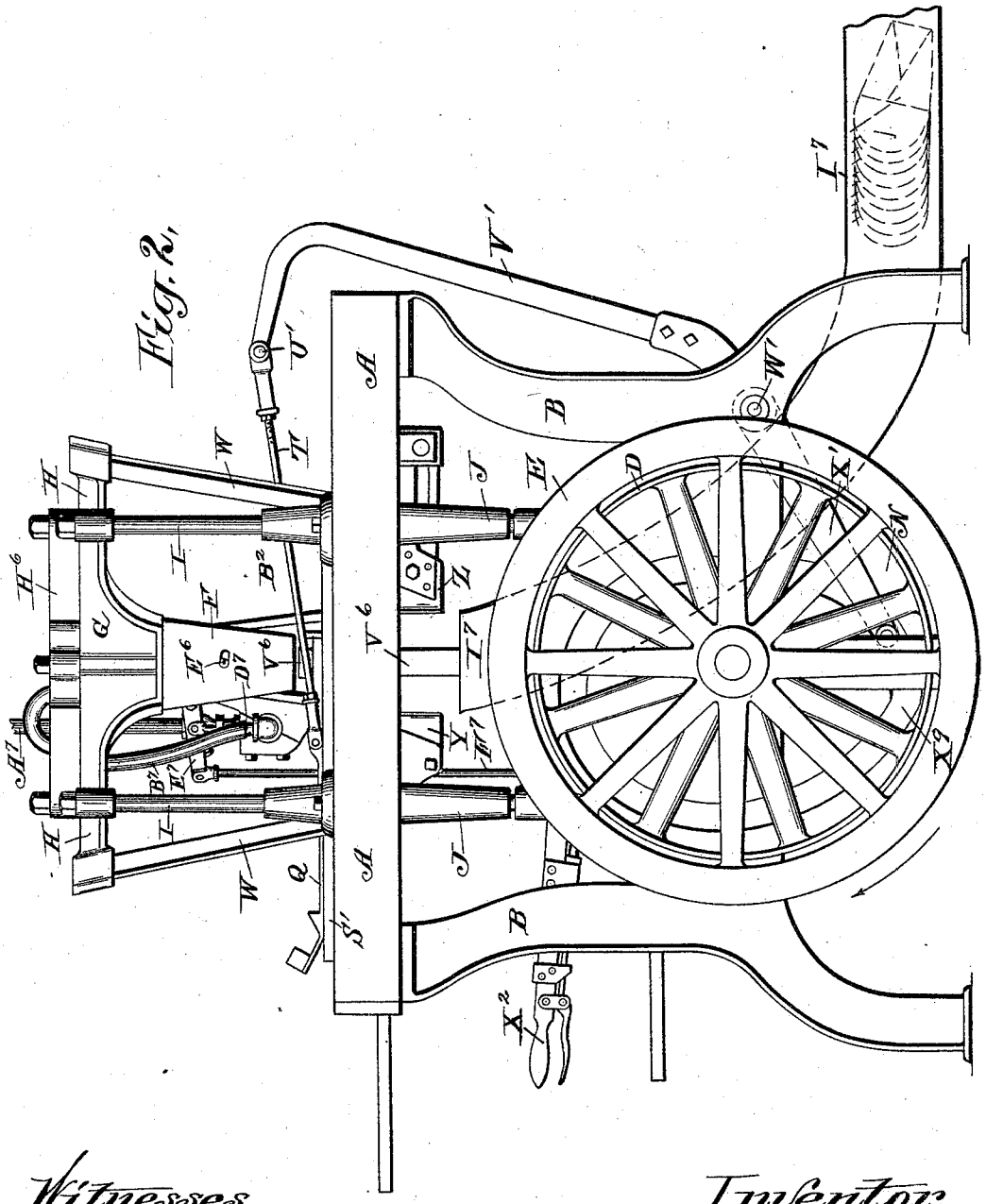
No. 537,640. Patented Apr. 16, 1895.

Fig. 2.



Witnesses.
Sidney M. Brainard
Martin A. Olsen

Inventor:
Isaac W. Hollett
by Edward Rector
his Atty

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I. W. HOLLETT.

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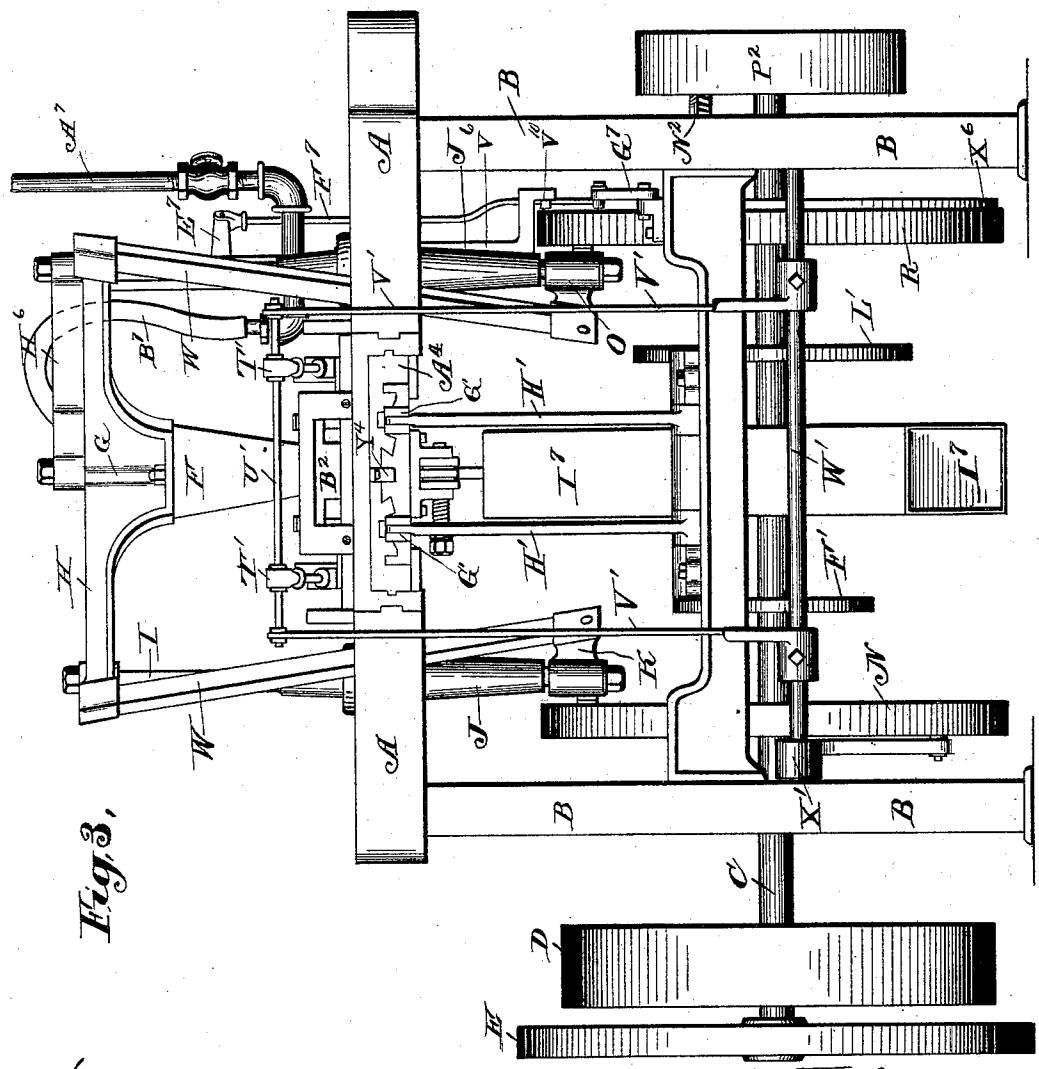

Fig. 3.

Witnesses.
Sidney W. Brainard,
Martin A. Olsen

Inventor,
Isa W. Hollett
by Edward Rector
his atty

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I. W. HOLLETT.

MACHINE FOR MAKING PAPER VESSELS.

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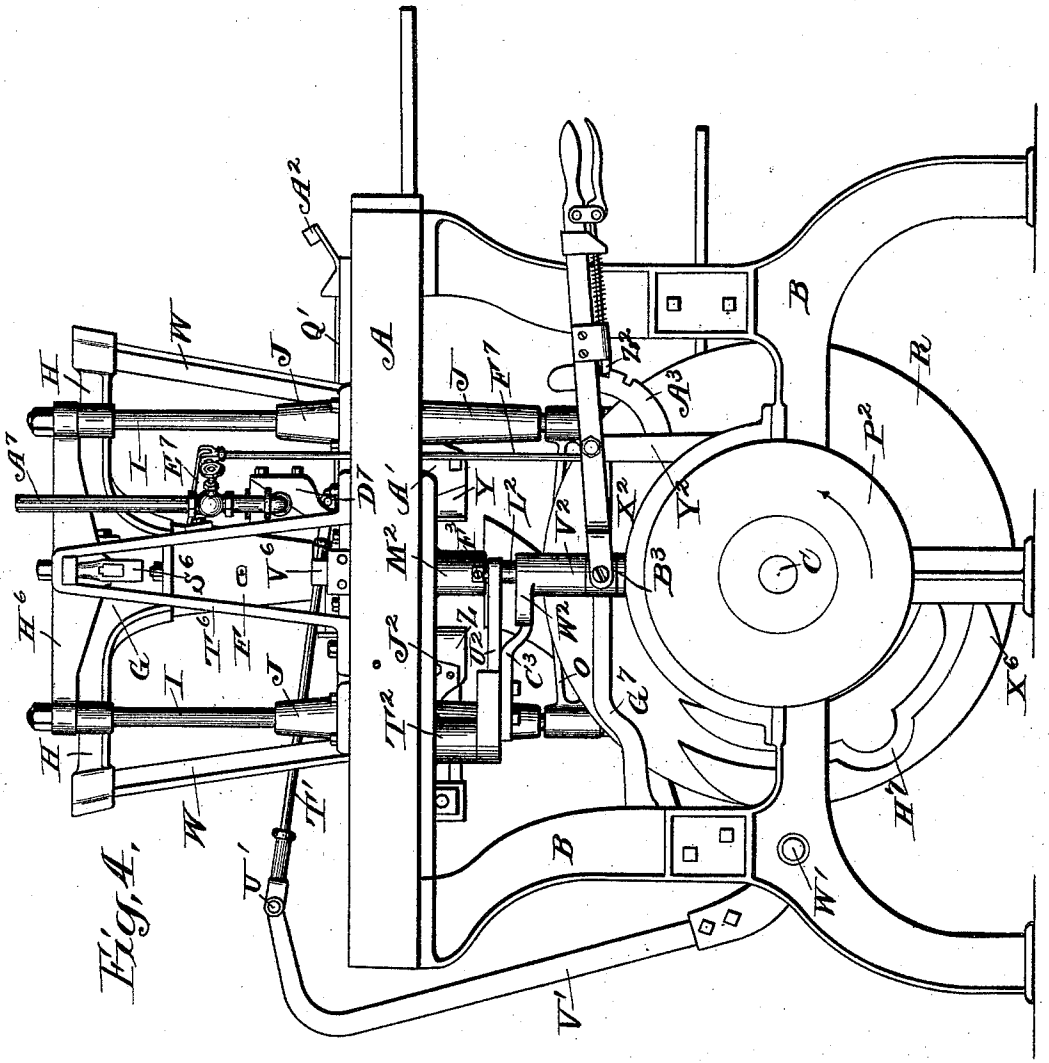

Fig. 4.

Witnesses,
Sidney M. Brainard
Martin A. Olsen

Inventor:
Isaac W. Hollett
by Edward Rector
his Atty.

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I. W. HOLLETT.

MACHINE FOR MAKING PAPER VESSELS.

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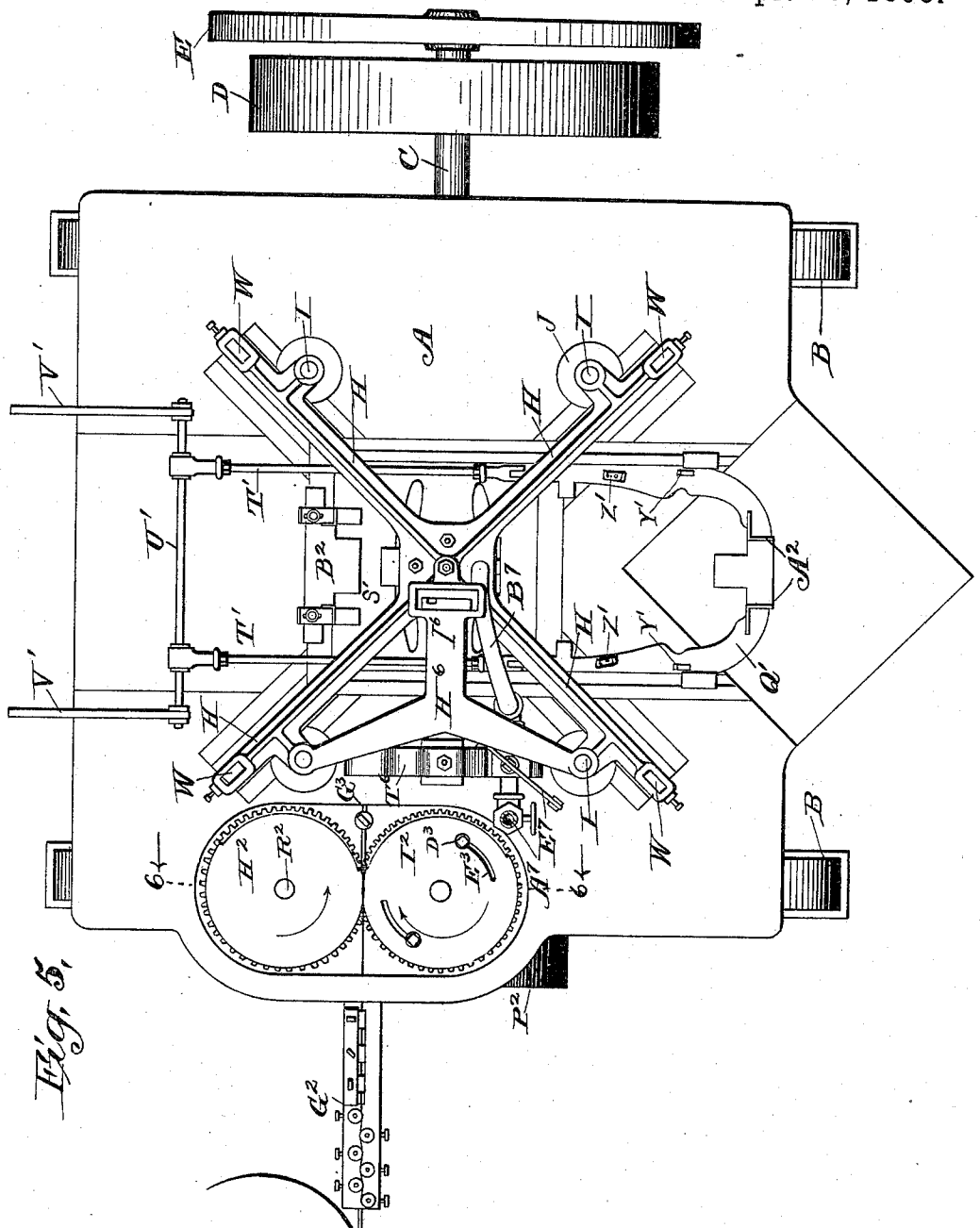

Fig. 5.

Witnesses,
Sidney N. Braisford,
Martin A. Olsen.

Inventor,
Ira W. Hollett
by Edward Rector
his attorney

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I. W. HOLLETT.

MACHINE FOR MAKING PAPER VESSELS.

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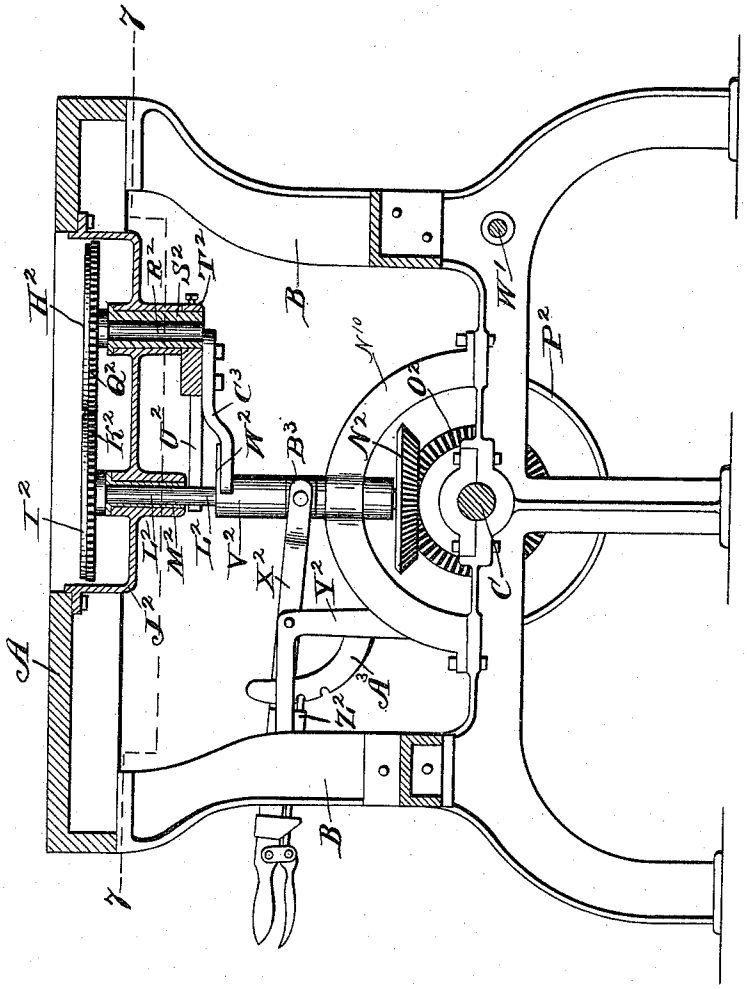

Fig. 6.

Witnesses.
Sidney W. Brainard
Martin A. Olsen

Inventor;
Isa W. Hallett
by Edward Rector
his atty

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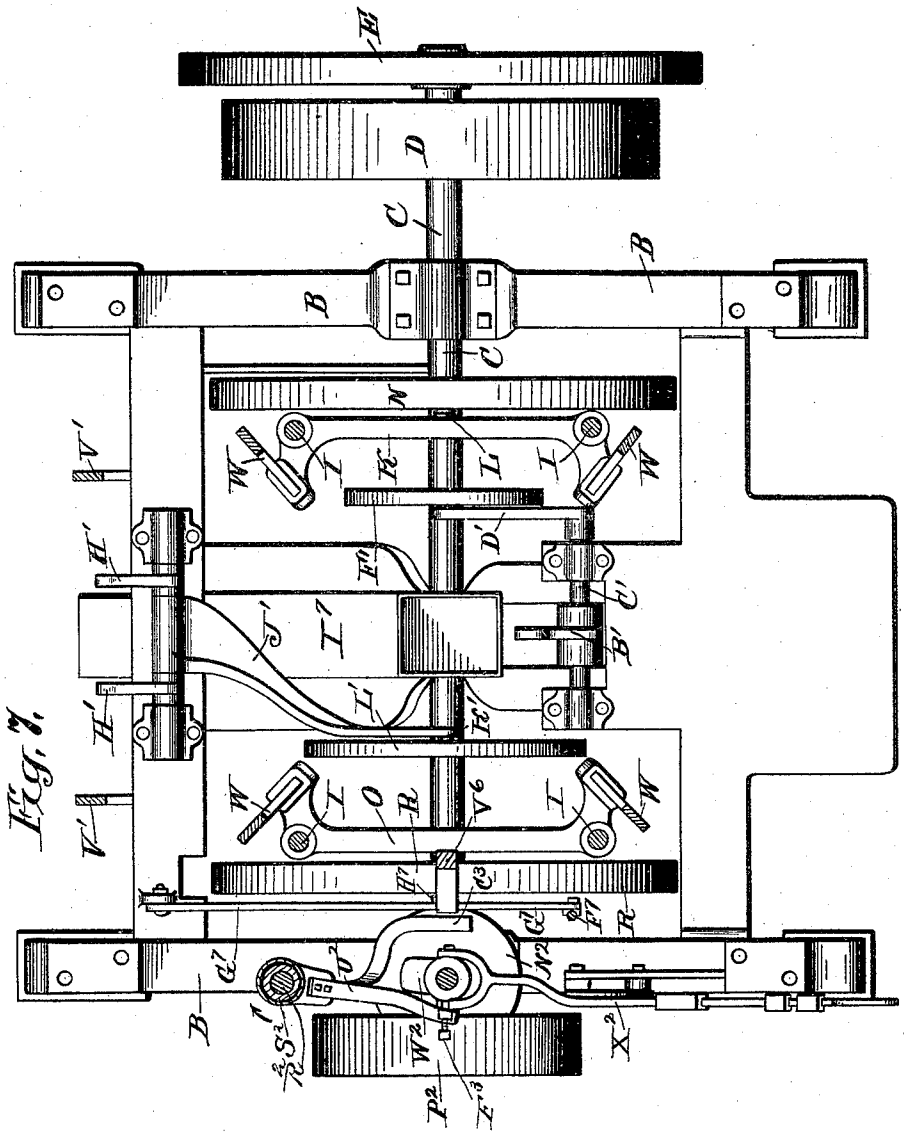

Fig. 7.

Witnesses.
S. W. Brainard
Martin A. Olsen

Inventor.
Isa. W. Hollett
by Edward Rector
his atty

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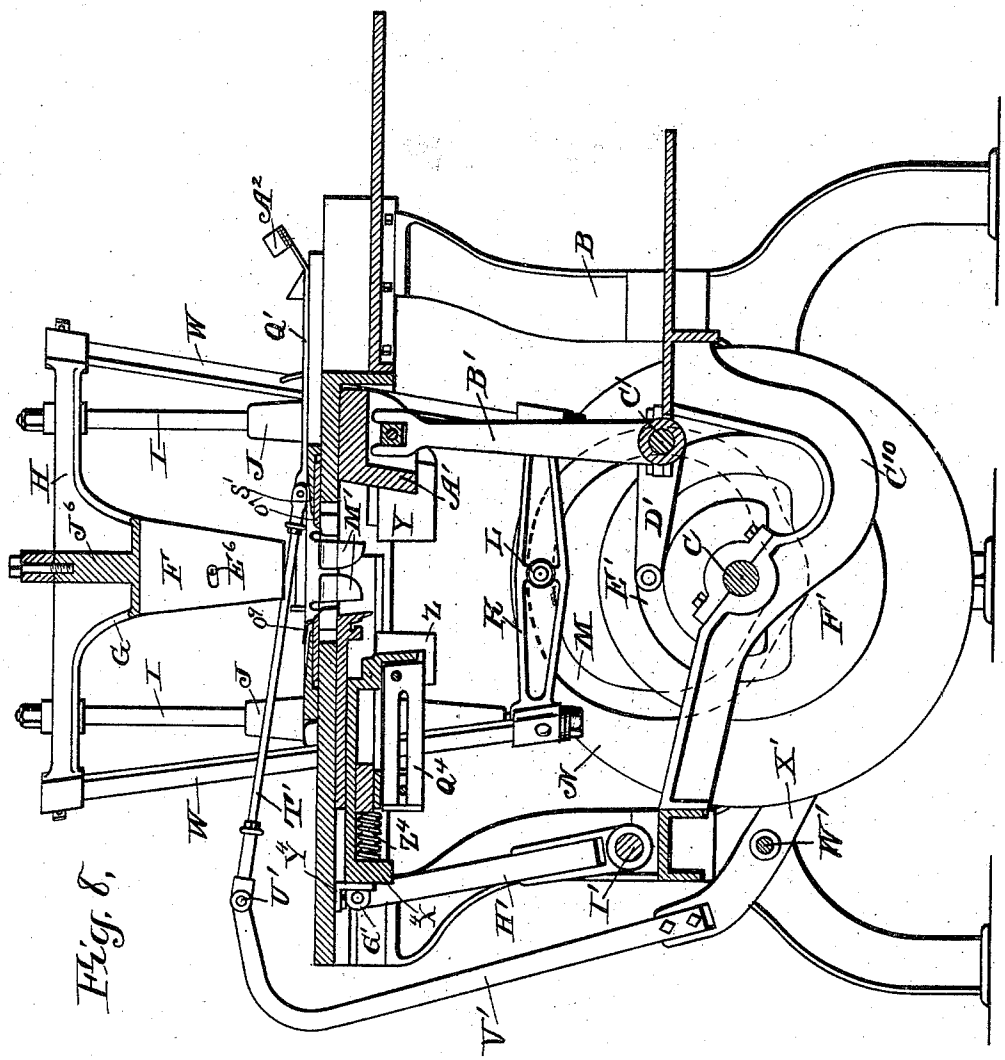

Fig. 8.

Witnesses.
Sidney H. Brainard.
Martin A. Olsen

Inventor.
Ira W. Hollett
by Edward Rector
his attty.

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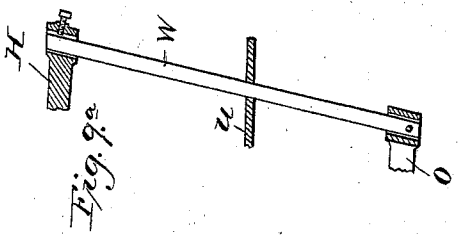

Fig. 9a.

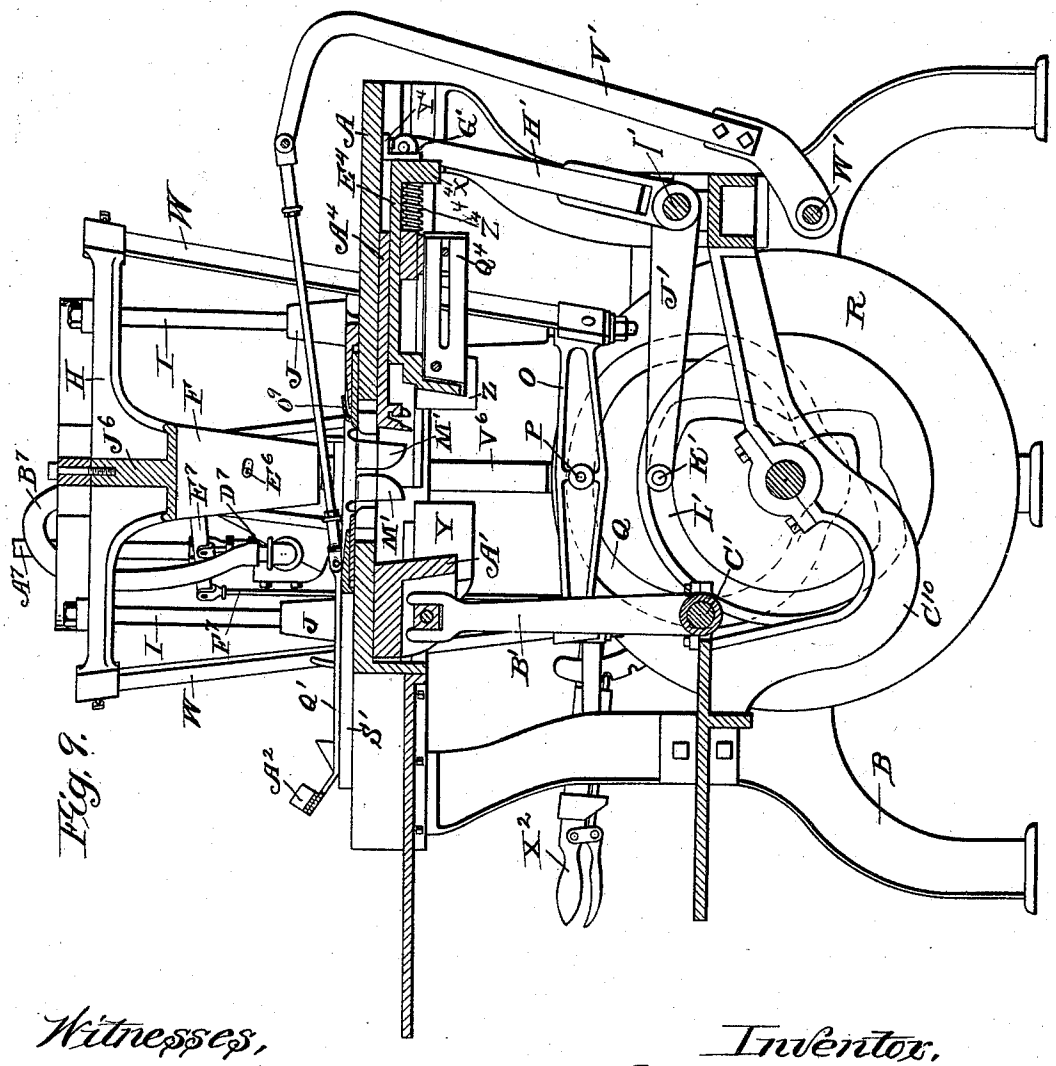

Fig. 9.

Witnesses,

Martin A. Olsen

Albert H. Means

Inventor,

Ira W. Hollett

by Edward Rector

his atty

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MACHINE FOR MAKING PAPER VESSELS.

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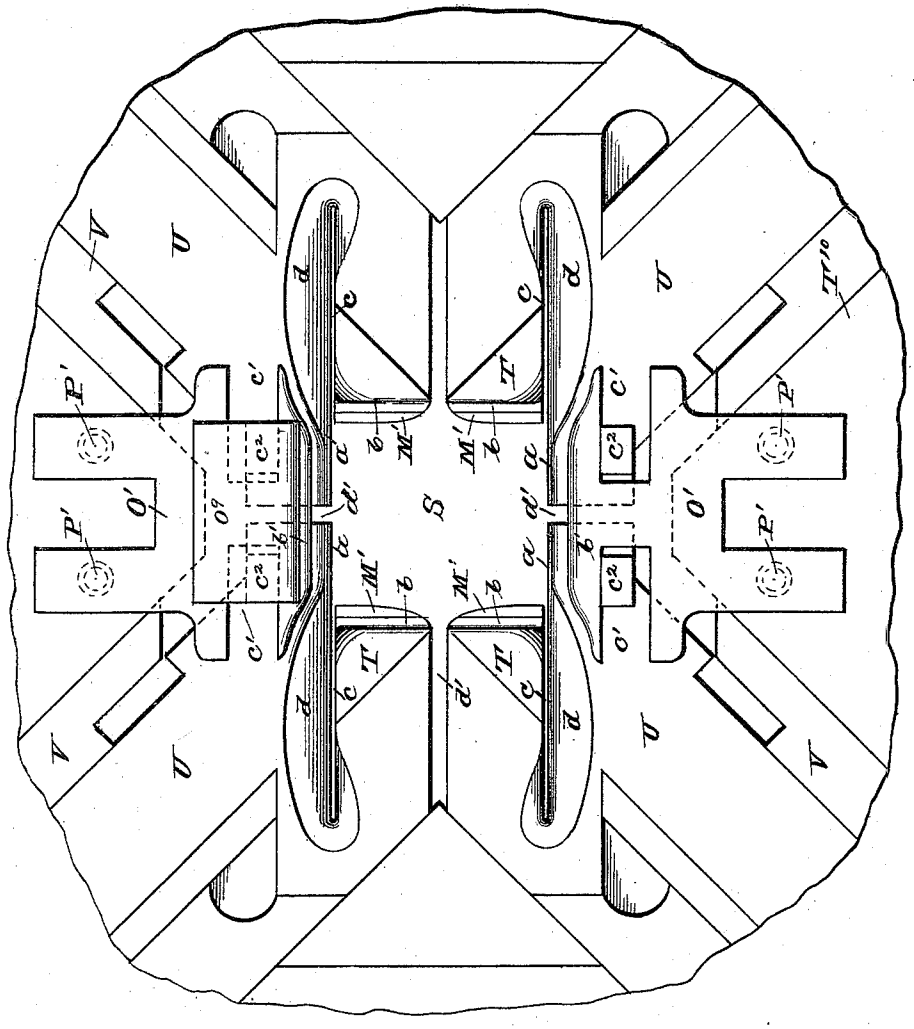
Fig. 10.



Witnesses:
Sidney W. Brainard
Martin A. Olsen.

Inventor
Ira W. Hollett
by Edward Rector
his Atty.

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MACHINE FOR MAKING PAPER VESSELS.

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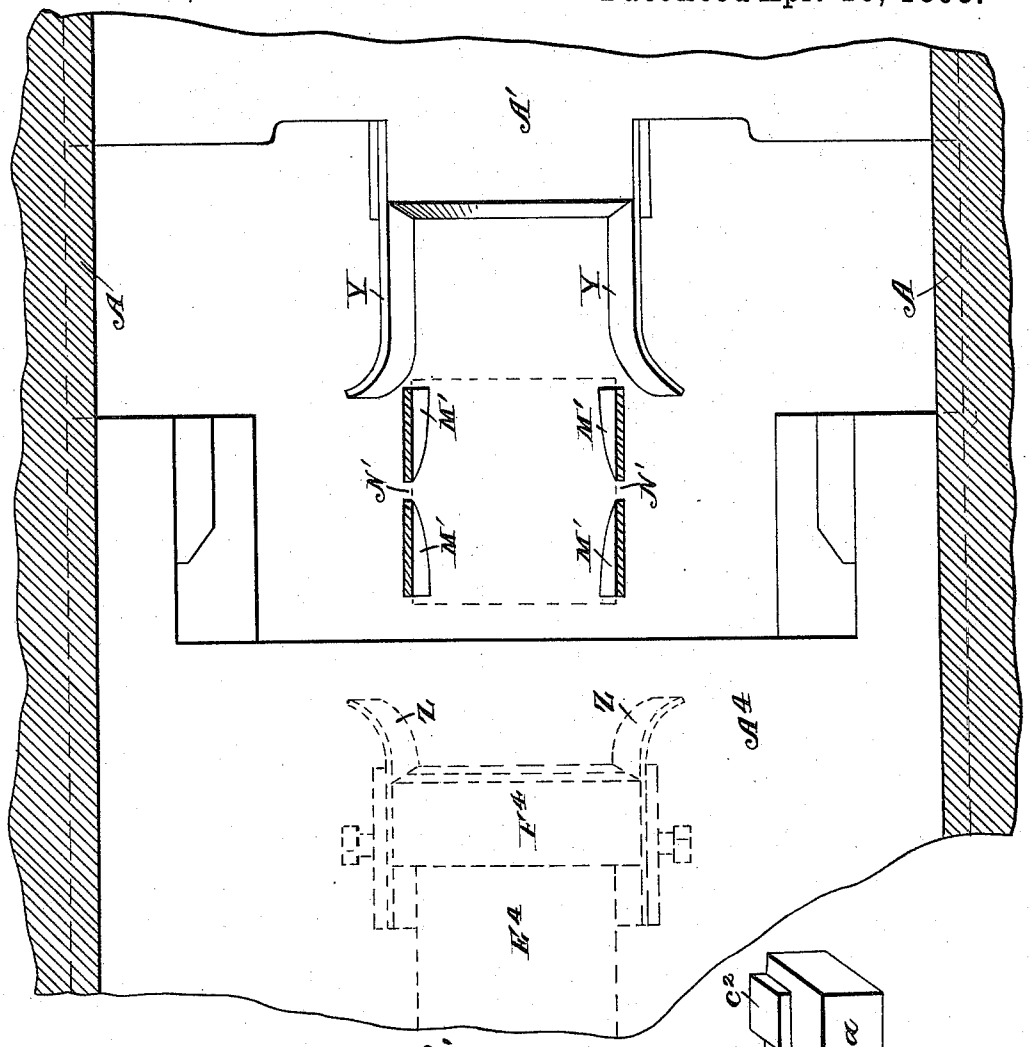


Fig. 12.

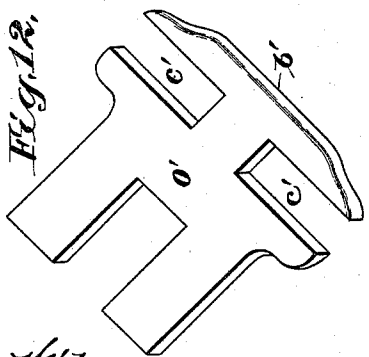
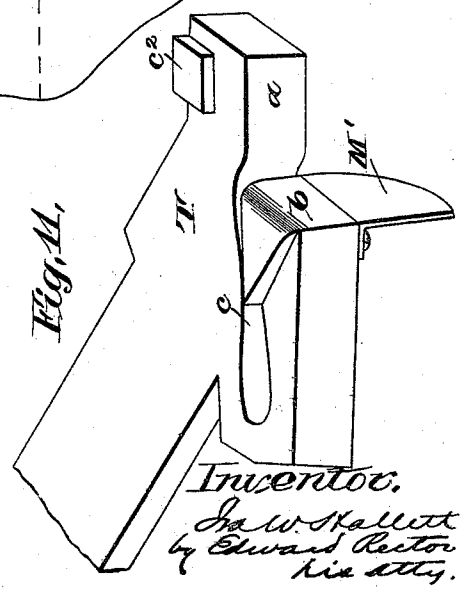


Fig. 13.

Fig. 14.



Witnesses,
Sidney W. Brainard
Martin A. Olsen

Inventor.
Ira W. Hollett
by Edward Rector
his atty.

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I. W. HOLLETT.

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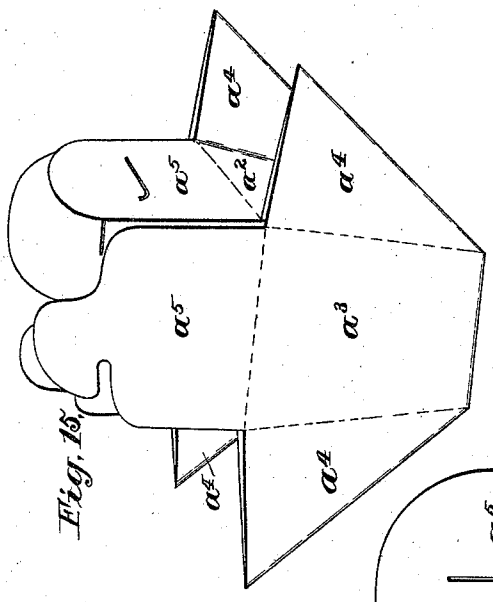

Fig. 15.

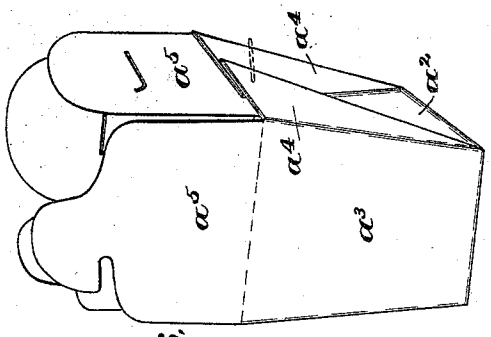

Fig. 16.

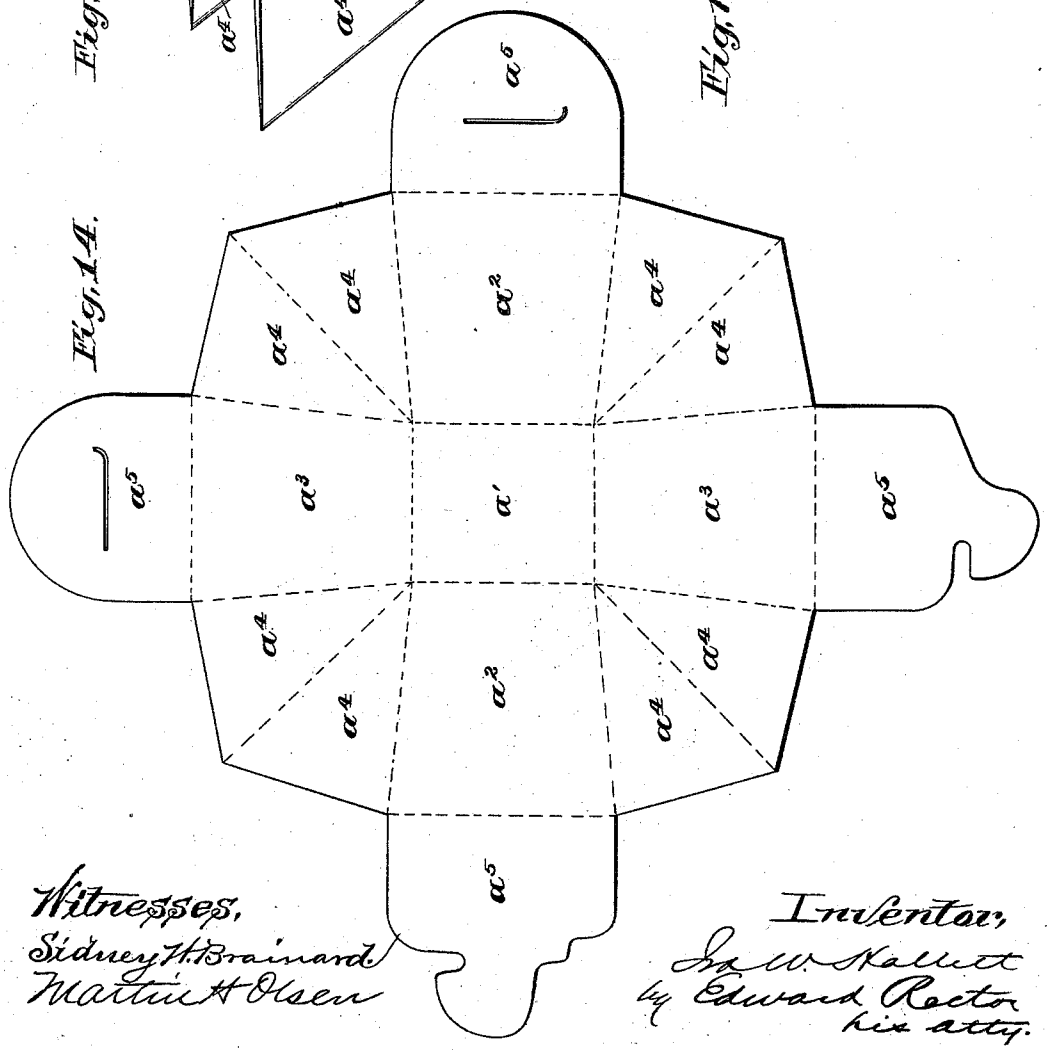

Fig. 14.

Witnesses,
Sidney H. Brainard
Mattie H. Olsen

Inventor,
Ira W. Hollett
by Edward Rector
his atty.

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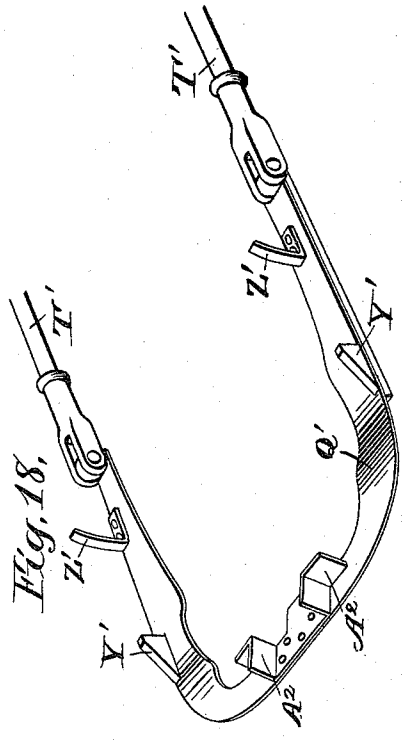

Fig. 18.

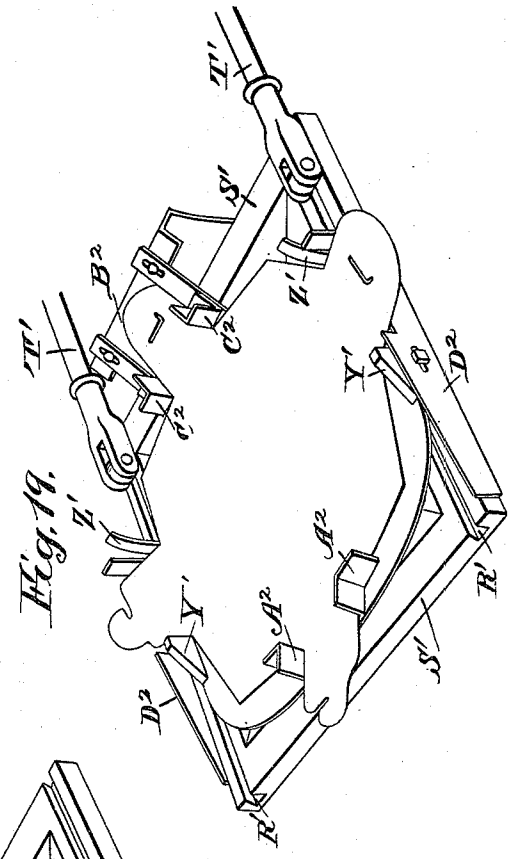

Fig. 19.

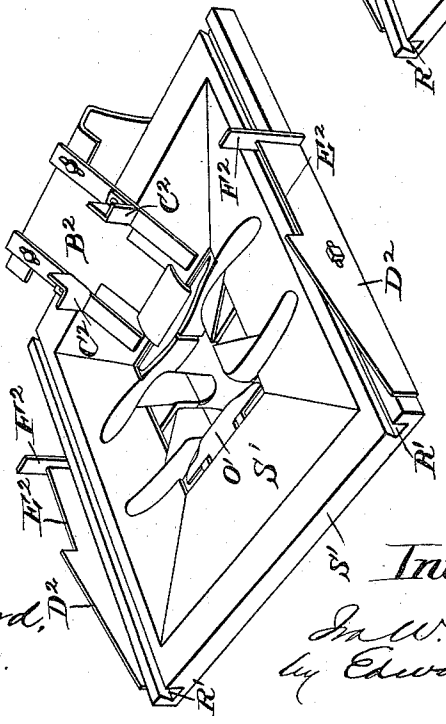

Fig. 17.

Witnesses,
Sidney W. Brainard,
Martin H. Olsen.

Inventor.
Ira W. Hollett
by Edward Rector
his atty.

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I. W. HOLLETT.

MACHINE FOR MAKING PAPER VESSELS.

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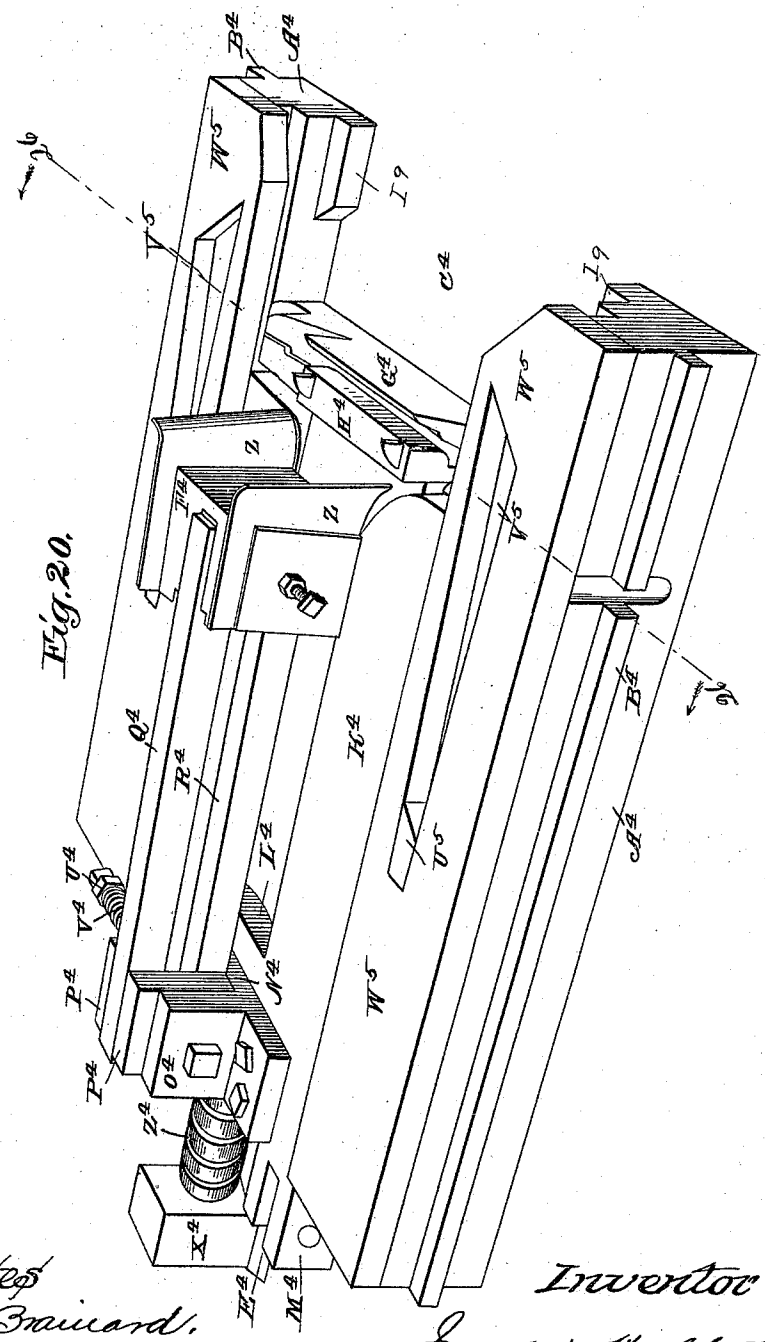

Fig. 20.

Witnesses
Sidney W. Bailard.
Martin A. Olsen.

Inventor
Isaac W. Hollett
by Edward Rector
his atty.

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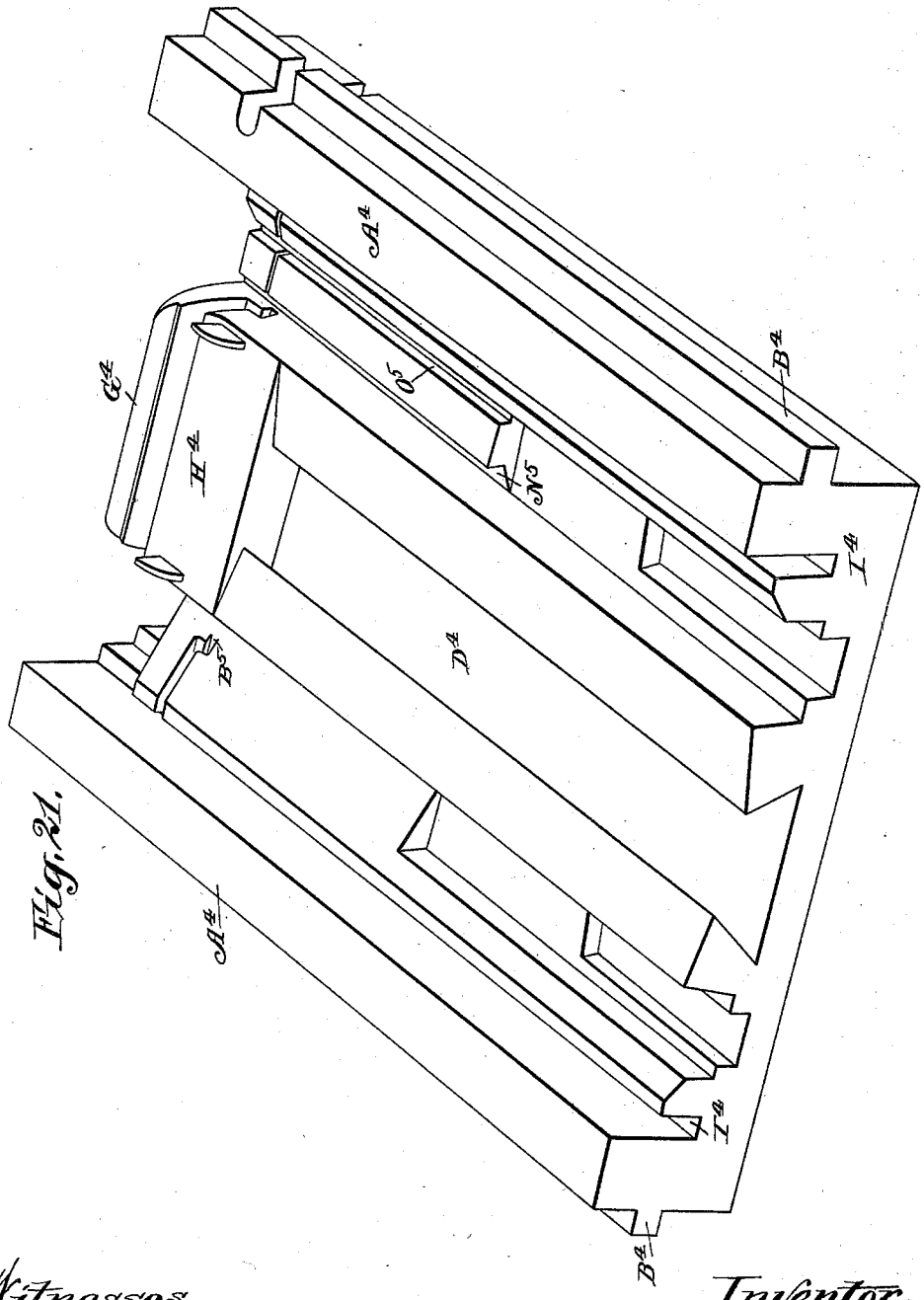

Fig. 21.

Witnesses,
Sidney W. Brainard
Martin A. Olsen.

Inventor,
Isaac W. Hollett
by Edward Rector
his atty.

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I. W. HOLLETT.

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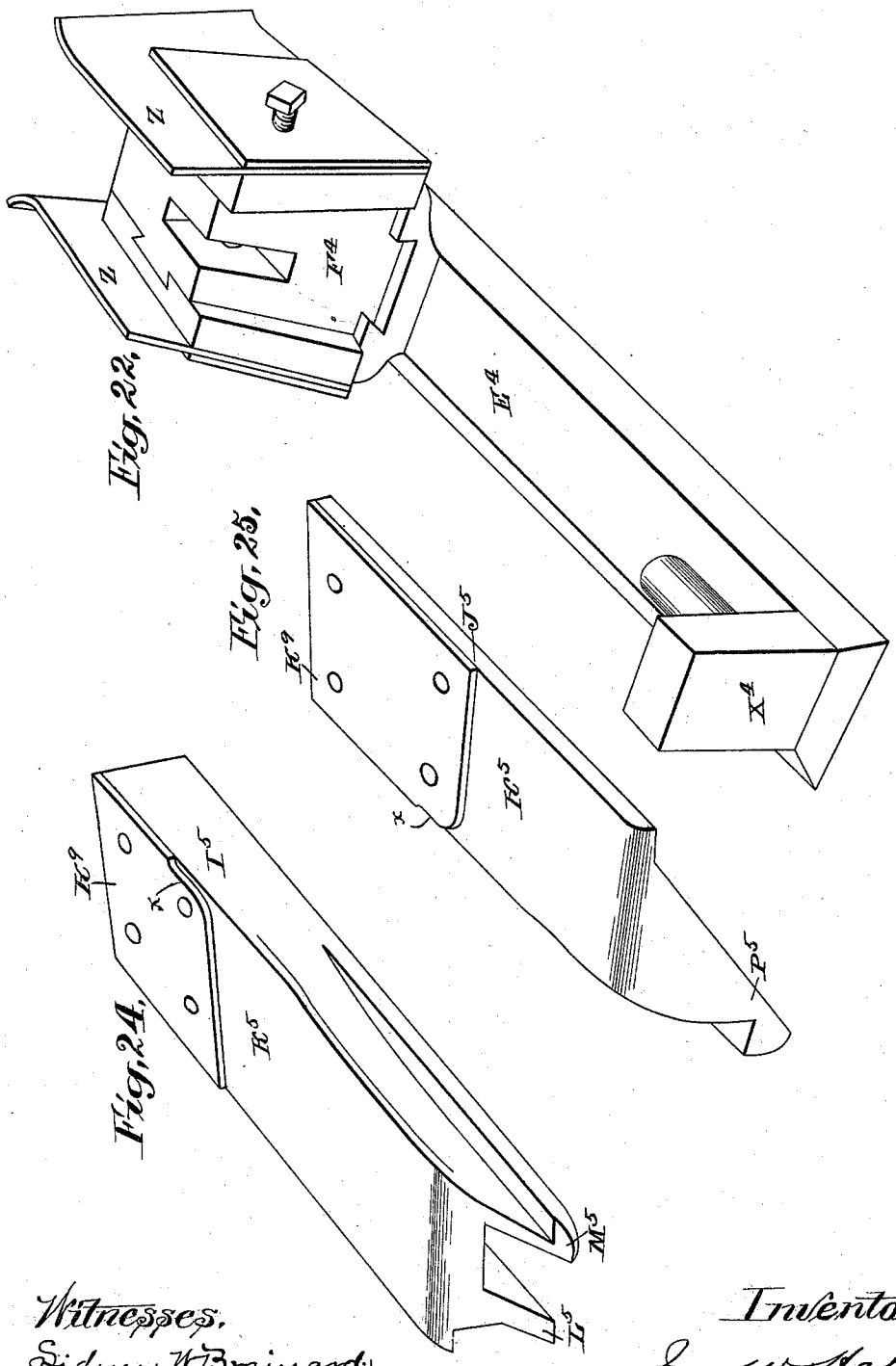

Witnesses.
Sidney W. Brainard
Martin A. Olsen.

Inventor.
Ira W. Hollett
by Edward Rector
his atty.

(No Model.) 22 Sheets—Sheet 17.

I. W. HOLLETT.

MACHINE FOR MAKING PAPER VESSELS.

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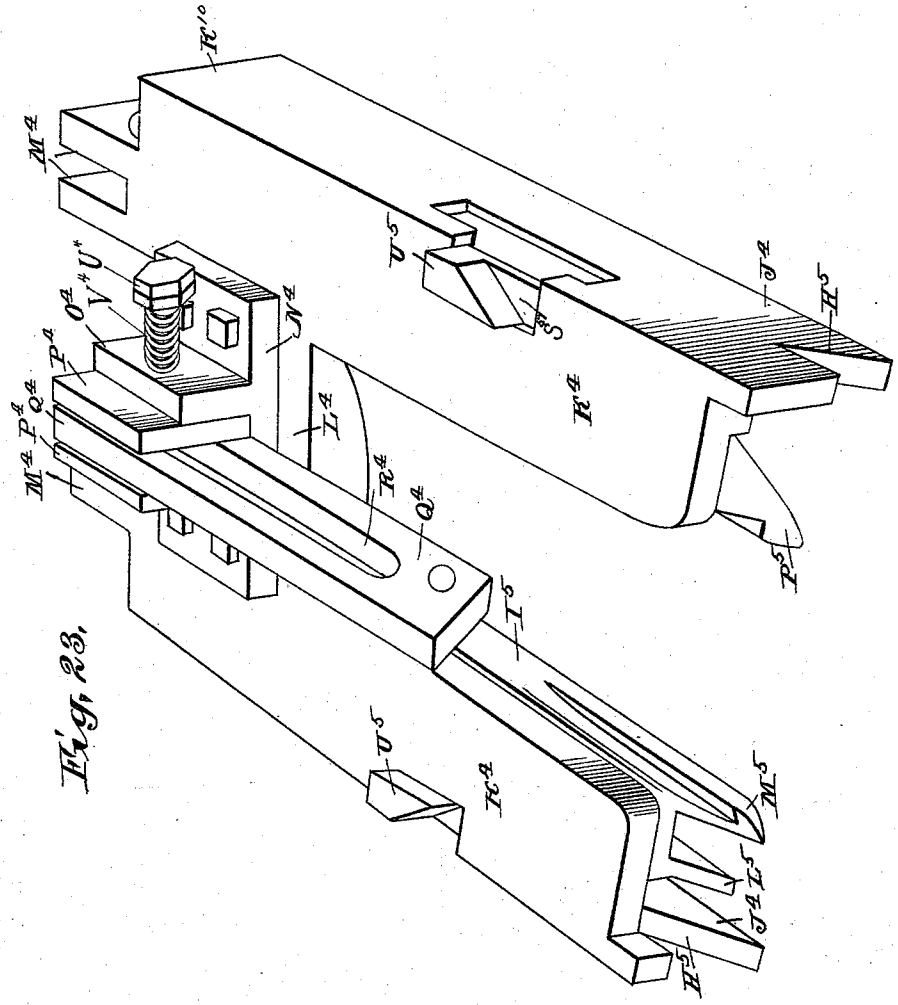

Fig. 23.

Witnesses
Sidney R. Brainard.
Martin A. Olsen

Inventor
Ira W. Hallett
by Edward Rector
his atty.

(No Model.) 22 Sheets—Sheet 18.

I. W. HOLLETT.

MACHINE FOR MAKING PAPER VESSELS.

No. 537,640. Patented Apr. 16, 1895.

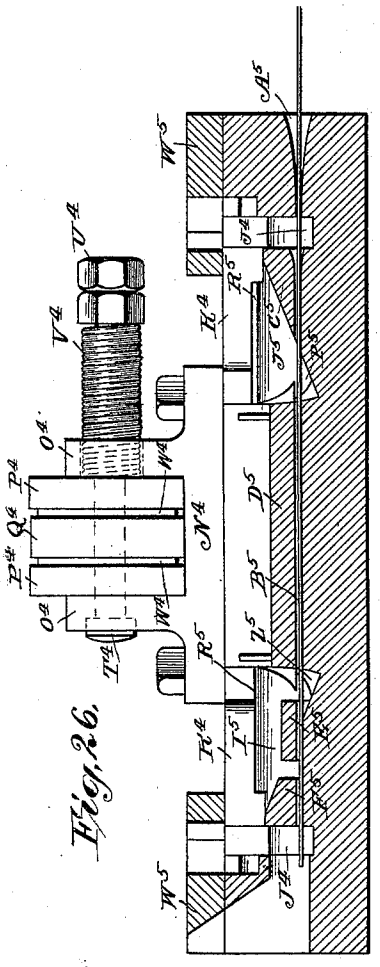

Fig. 26.

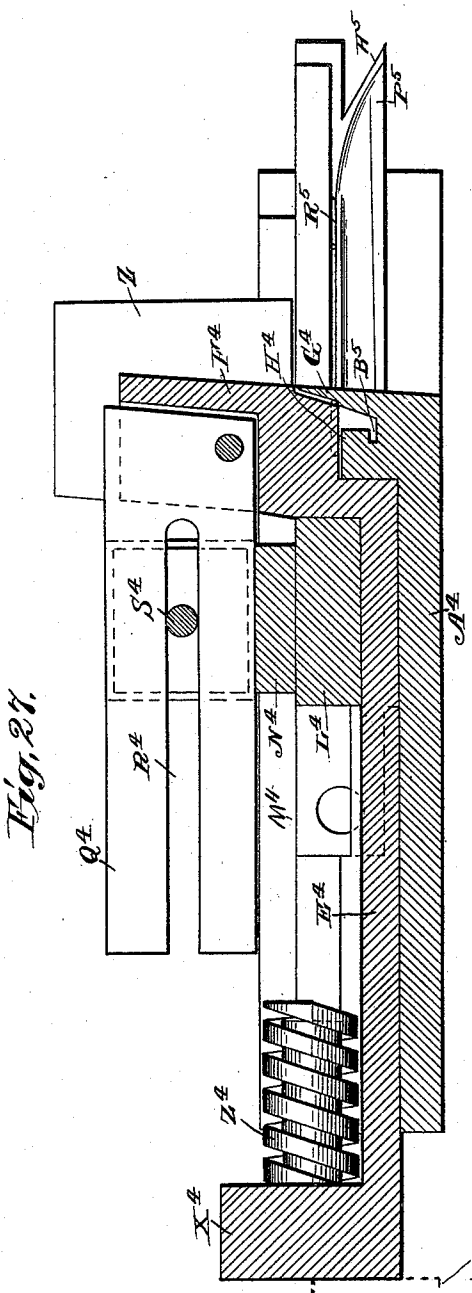

Fig. 27.

Witnesses.
Sidney W. Braiard
Martin H. Olsen

Inventor
Ira W. Hollett
by Edward Rector
his atty

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MACHINE FOR MAKING PAPER VESSELS.

No. 537,640. Patented Apr. 16, 1895.

Fig. 28a.

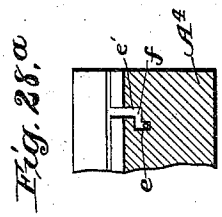
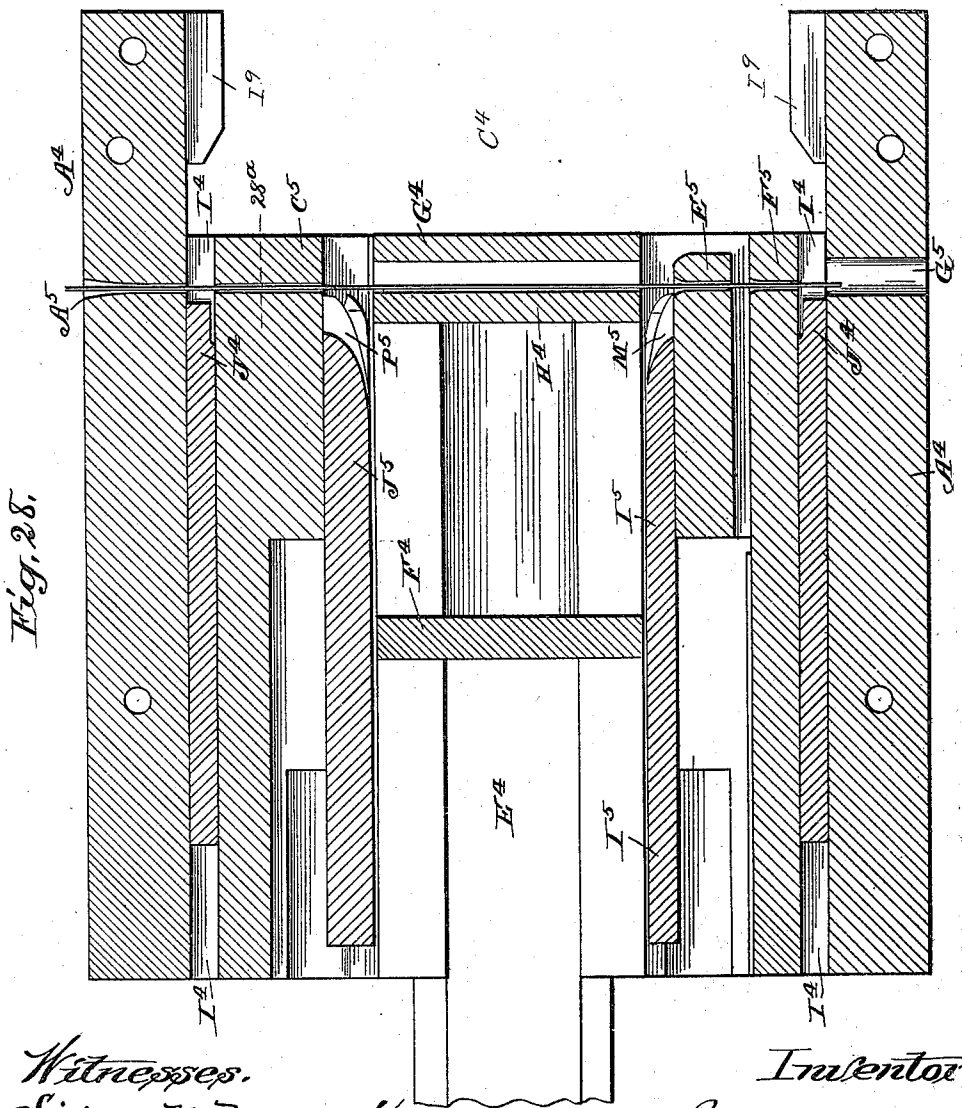


Fig. 28.



Witnesses.
Sidney W. Braynard.
Martin A Olsen

Inventor.
Ira W. Hollett
by Edward Rector
his attys.

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I. W. HOLLETT.

MACHINE FOR MAKING PAPER VESSELS.

No. 537,640. Patented Apr. 16, 1895.

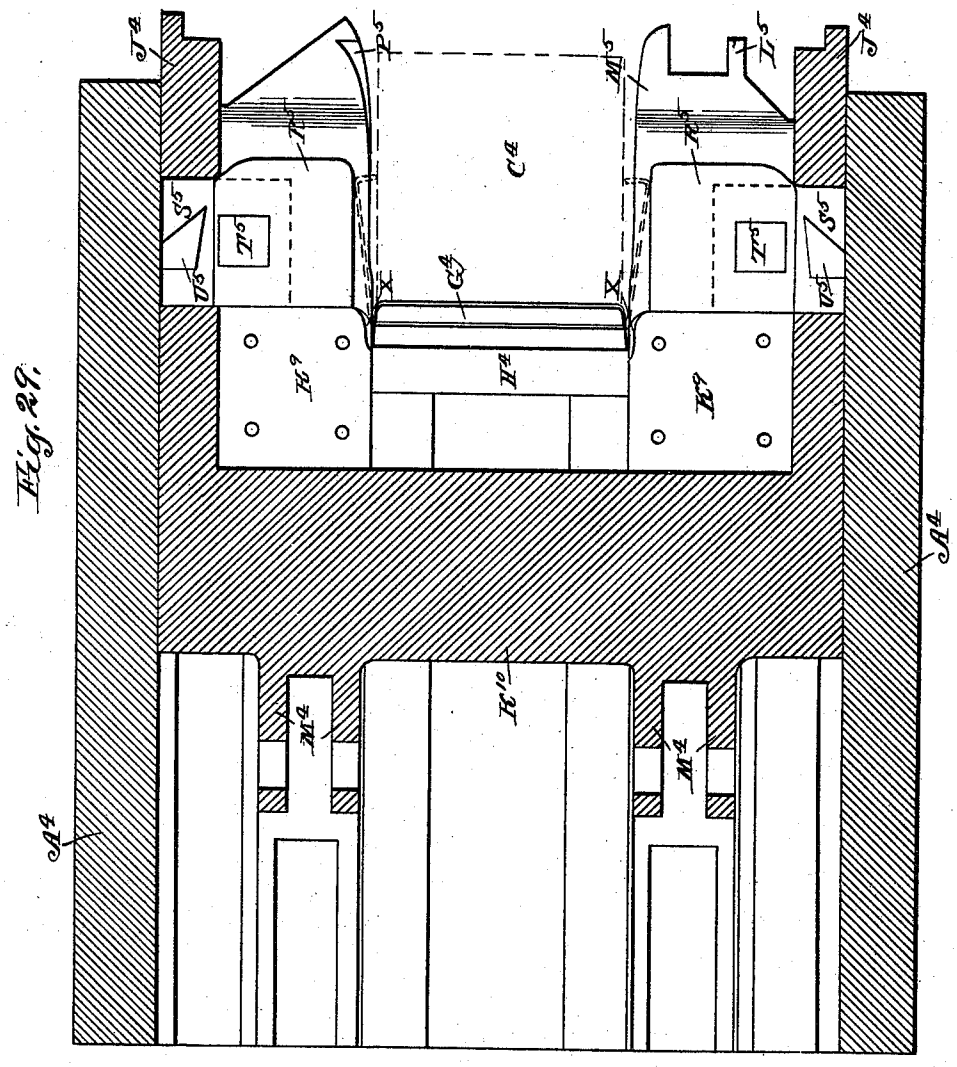

Fig. 29.

Witnesses.
Sidney W. Brainard.
Martin A. Olsen

Inventor.
Ira W. Hollett
by Edward Rector
his atty.

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I. W. HOLLETT.

MACHINE FOR MAKING PAPER VESSELS.

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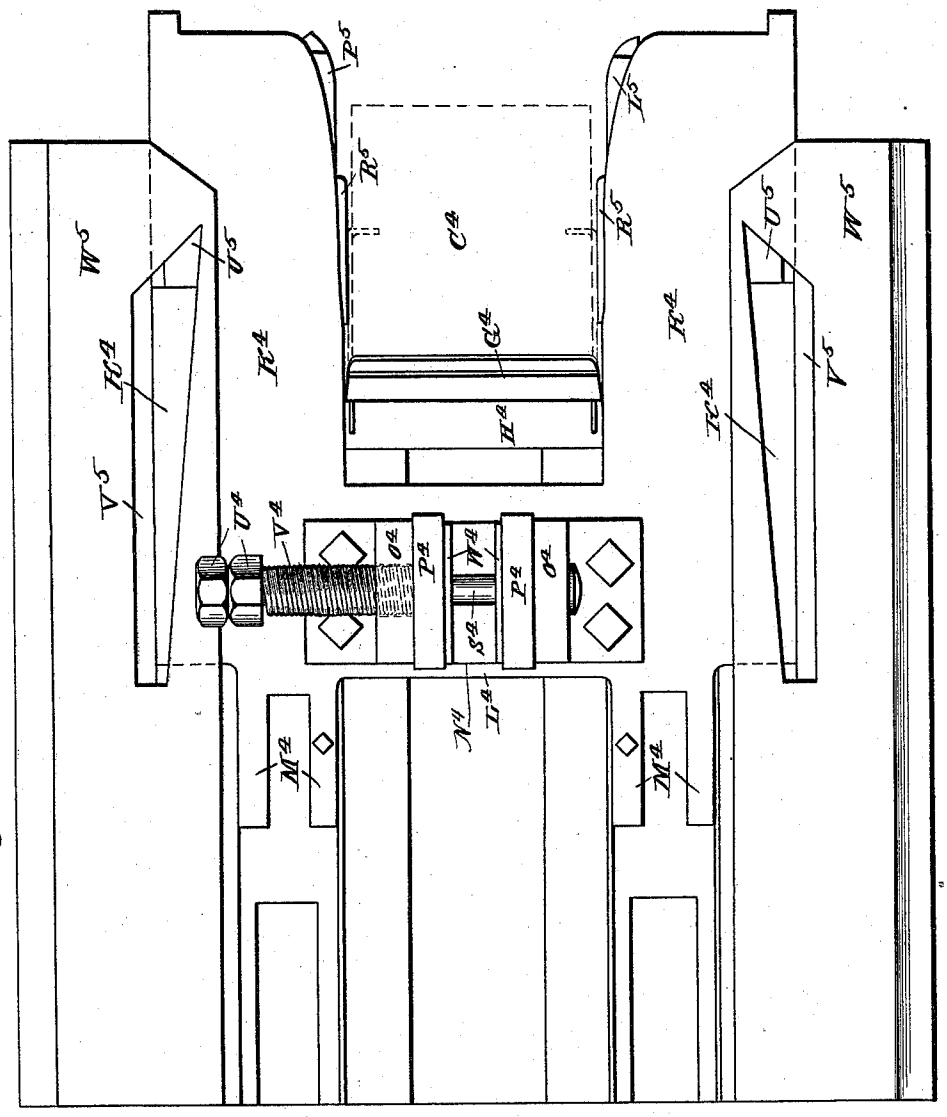

Fig. 30.

Witnesses,
Sidney W. Brainard.
Martin N. Olsen

Inventor:
Ira W. Hollett
by Edward Rector
his atty

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I. W. HOLLETT.

MACHINE FOR MAKING PAPER VESSELS.

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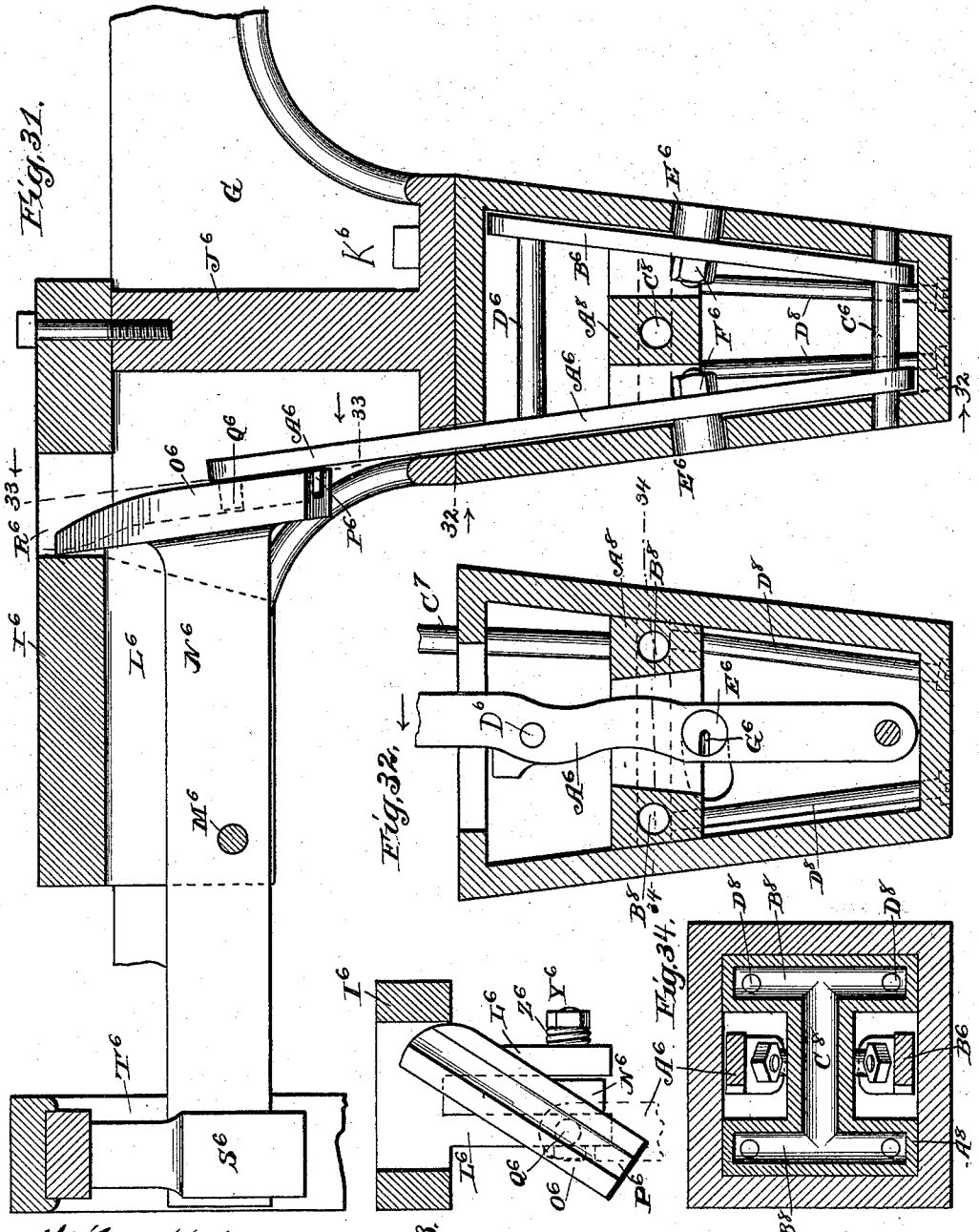

Witnesses
Sidney W. Brainard.
Martin A. Olsen.

Inventor
Ira W. Hollett
by Edward Rector
his attys

UNITED STATES PATENT OFFICE.

IRA W. HOLLETT, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE J. W. SEFTON MANUFACTURING COMPANY, OF INDIANA.

MACHINE FOR MAKING PAPER VESSELS.

SPECIFICATION forming part of Letters Patent No. 537,640, dated April 16, 1895.

Application filed July 13, 1894. Serial No. 517,404. (No model.)

To all whom it may concern:

Be it known that I, IRA W. HOLLETT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Machines for Making Paper Vessels, of which the following is a description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates more particularly to machines for making paper buckets provided with wire bails or handles, and consists of a novel folding mechanism for folding the paper blanks into bucket form and a novel bailing mechanism for forming the bails from a continuous strand of wire fed into the machine and attaching them to the buckets, together with various auxiliary devices co-operating with these two principal mechanisms.

The novelty of my invention is found in the folding mechanism, in the bail-forming and applying mechanism, as well as in the combination of those two mechanisms, and in the various other auxiliary mechanisms co-operating with them, and it consists in certain new combinations and modes of operation, and certain new constructions and arrangements of parts, which will be hereinafter fully explained and particularly pointed out in my claims.

In the accompanying drawings Figure 1 is a front elevation of the machine; Fig. 2, an elevation of the right side of the same; Fig. 3, a rear elevation; Fig. 4, an elevation of the left side of the machine; Fig. 5, a top plan view; Fig. 6, a vertical section through the wire-feeding devices; Fig. 7, a sectional plan view approximately on the line 7—7 of Figs. 1 and 6; Fig. 8, a vertical section approximately at the middle of the machine, looking toward the right; Fig. 9, a corresponding view looking toward the left; Fig. 9^a, a detail sectional view showing one of the inclined bars of the plunger frame, its connection with the frame at its upper and lower ends, and part of one of the reciprocating slides through which the bar passes; Fig. 10, an enlarged detail plan view of the yielding jaws of the folding mechanism; Fig. 11, a perspective view of one of said jaws; Fig. 12, a perspective view of one of the friction plates co-operating with the front and rear sides of the plunger; Fig. 13, a detail sectional plan view immediately below the folding jaws; Fig. 14, a top plan view of one form of blank adapted to be folded into bucket shape in this machine; Fig. 15, a perspective view of said blank in the shape into which it is folded by the folding jaws, before its corner flaps are bent over upon its sides; Fig. 16, a perspective view of the completely folded bucket; Fig. 17, a detail perspective view of the bucket-forming opening and parts adjacent thereto; Fig. 18, a perspective view of the reciprocating carriage by which the blanks are brought over the bucket-forming opening; Fig. 19, a perspective view of the parts with the carriage in position over said opening, ready for the plunger to descend upon the blank and carry it between the folding jaws; Fig. 20, a perspective view of the bail-forming mechanism in inverted position; Fig. 21, a corresponding view of the fixed supporting plate of said mechanism; Fig. 22, a perspective view of the slide fitting in the middle guideway in the plate shown in Fig. 21 and the block and rear pair of folding wings carried thereby; Fig. 23, a perspective view of the reciprocating frame fitting in guideways in the plate of Fig. 21 and straddling the slide of Fig. 22; Figs. 24 and 25, perspective views of the plates secured upon the under sides of the side bars of the reciprocating frame of Fig. 23; Fig. 26, a vertical section approximately on the line 26—26 of Fig. 20 (in the plane of the wire) with the block carrying the rear set of folding wings removed to expose the parts in rear thereof; Fig. 27, a vertical longitudinal section through the middle of the bail-forming mechanism of Fig. 20, with the parts advanced from normal position to their limit of movement; Fig. 28, a horizontal section of Fig. 20 in the plane of the wire, with the parts in normal position; Fig. 28^a, a sectional detail on the line 28^a—28^a of Fig. 28; Fig. 29 a horizontal section of Fig. 20 with the parts advanced from the position of Fig. 28 and in the plane occupied by the wire after the parts have been so advanced; Fig. 30, a plan view of Fig. 20 with the parts advanced to their limit of movement as in

Fig. 27; Fig. 31, an enlarged vertical section of the plunger and clinching devices; Fig. 32, a sectional detail approximately on the line 32—32 of Fig. 31; Fig. 33, a sectional detail approximately on the line 33—33 of Fig. 31, and Fig. 34 a horizontal section on the line 34—34 of Fig. 31.

The same letters of reference are used to indicate identical parts in all the figures.

Before proceeding to describe the various parts of the machine in detail it may be premised that the folding mechanism consists of a reciprocating plunger shaped to conform to the interior of the bucket to be folded, and a set of movable pressure jaws or dies co-operating with the several sides of the plunger to fold the paper blank into bucket form, and reciprocating folding wings or blades operating to fold the corner flaps of the bucket over upon the sides thereof after the blank has been carried by the plunger through the opening between the pressure jaws to form the body of the bucket. After the blank is thus folded, with its corner flaps bent to overlap each other upon two of its opposite sides, and while it is held upon the plunger the proper length of wire to form the bail is cut from a strand fed into the machine, bent into bail shape around one half of the bucket upon the plunger and its opposite ends driven through the sides of the bucket and overlapping flaps and clinched upon the inner surface thereof; after which the completed bucket is released by the pressure jaws and plunger and expelled from them into a suitable receptacle. The blanks from which the buckets are formed are separately fed beneath the plunger, between the same and its co-operating pressure-jaws, either automatically or by hand, in the present instance the blanks being placed separately by hand upon a reciprocating feeding carriage which then automatically carries them beneath the plunger.

With this general statement of the mode of operation of the machine the particular construction and arrangement of the parts as illustrated in the drawings may now be explained.

The main frame-work of the machine consists of a horizontal table A supported at the proper height by side-frames B connected at front and rear by suitable cross-bars.

The main driving shaft of the machine is a horizontal shaft C journaled near its ends in bearings in the side-frames B B and near its middle in a curved cross-frame C^{10}, Fig. 9, and projecting beyond the frames B B at each end. It has fast upon its right hand end a pulley D over which the driving belt from the counter-shaft is run, and also a hand wheel E by which the shaft may be readily turned by hand to move the various parts of the machine into any of their several positions desired for the purpose of inspection, repair, adjustment or otherwise. The reciprocating plunger or male die F is carried by a cross-head G having four divergent arms H, Fig. 5, and supported upon and secured to the upper ends of four vertical rods I mounted to reciprocate in tubular bearings J extending through and supported in the table A. The lower ends of the two right hand rods I are secured in the opposite ends of a cross-arm K, Figs. 7 and 8, which cross-arm is provided at its middle with a laterally projecting stud L covered by an anti-friction sleeve and fitting in a cam groove M in a disk N fast upon the driving shaft C. The lower ends of the two left hand rods I are connected by a similar cross-arm O, Figs. 7 and 9, which has projecting from its middle a stud P fitting in a cam groove Q in a second disk R also fast upon the shaft C. Under this construction the rotation of the shaft C imparts a reciprocating movement to the plunger F.

The table A is provided at its middle with a large opening S, which may be termed the bucket-forming opening, through which the plunger passes when lowered to its limit of movement, and around which are arranged the pressure-jaws T which co-operate with the plunger. These jaws, four in number, are of the irregular shape shown in Figs. 10 and 11. Each jaw has two operating faces, *a b*, at right angles to each other and adapted to embrace one corner of the plunger, while separating these two portions of the jaw is a long slot *c* extending vertically entirely through the jaw in line with the face *a*. These slots are adapted to receive the corner folds or flaps of the blank as the latter is forced downward between the jaws by the plunger, and to facilitate the forming of these corner folds and prevent mutilation of the blank the portion of each jaw adjacent the outer edge and end of its slot *c* is rounded out as at *d* to accommodate the corner of the blank as the latter is being folded. When the parts are in their inner normal position, Fig. 10, their adjacent faces on the four sides of the opening S are slightly separated by the narrow spaces *d'*. The two faces *a b* of each jaw, as before stated, embrace one corner of the plunger, and the jaws are mounted to reciprocate in diagonal lines passing from the center of the opening S through the four corners thereof. To this end the jaws are carried by the inner ends of slides U mounted in guide-ways V upon the table A, said guide-ways radiating from the four corners of the opening S. The respective slides U and the jaws carried by them are reciprocated back and forth by means of four inclined bars W secured at their lower ends in bearings upon the opposite ends of the cross-arms K O, Figs. 1, 3, 7, 8 and 9, passing upward through slots in the slides U, and confined at their upper ends in openings in the outer ends of the arms H of the cross-head G which carries the plunger. The inclination of the bars W conforms to that of the corners of the plunger, and when the latter is depressed the bars will force the slides U outward and thereby maintain the jaws in proper position relatively to the plunger during the descent

of the latter. The upper ends of the bars W fit loosely in the openings in the ends of the arms H, Figs. 5 and 9a, as do also their lower ends in the sockets or bearings in the cross arms K, O, so that the upper ends of the bars are capable of slight inward and outward play in line with the movement of the slides and jaws, (regulated by set screws in the ends of the arms H',) the result of which is that when the plunger is lowered the contact of the outer edges of the bars with the outer ends of their respective slots in the slides U will throw the upper ends of the bars inward to their limit of movement before they begin to force the slides and jaws outward, and, conversely, when the parts have reached their limit of downward movement and begun to ascend again the upper ends of the bars will be thrown outward to their limit of movement before they begin to force the slides and jaws inward. Consequently the plunger is permitted to move upward slightly after the bucket is formed, before the jaws follow it inward, thus releasing the formed bucket which has been held between them and permitting it to be expelled therefrom. The same result might be accomplished by making the slots in the slides U long enough to permit independent movement of the inclined bars.

The same mechanism may be employed to fold either covered or coverless buckets.

In Fig. 14 is shown a familiar form of blank for a covered bucket, in which a' is the bottom, a^2 a^2 the sides, a^3 a^3 the ends, a^4 the corner folds intermediate the sides and ends, and a^5 the flaps forming the cover. The descent of the plunger between the jaws will fold this blank to the shape shown in Fig. 15, leaving the corner flaps a^4, formed by the slots c in the jaws, projecting from the body of the bucket. The next step is to fold these corner flaps over upon each other against the sides of the bucket, to the shape shown in Fig. 16, and this is accomplished by means of two pairs of reciprocating folding wings or blades Y Z, Figs. 2, 4, 8, 9 and 13, mounted to reciprocate backward and forward beneath the jaws T upon the front and rear sides of the plunger and to snugly embrace the latter. The wings Y are carried by a slide A' mounted at its sides in guide-ways in the table A, Figs. 8, 9, and 13, and connected by a slot and pin to the upper end of an arm B' fast upon a rock-shaft C', Figs. 1, 7 and 8, which shaft has fast upon it a rearwardly extending arm D' provided with a stud fitting in a cam-groove E' in a disk F' fast upon the driving shaft C, the rotation of which shaft will serve to rock the shaft C' and reciprocate the wings Y backward and forward. The wings Z are in this instance carried by a reciprocating member of the bail-forming mechanism, hereinafter described, connected to the upper ends of arms H' fast at their lower ends upon a rock-shaft I', which shaft has fast upon it a forwardly extending arm J', Figs. 7 and 9, provided at its front end with a stud projecting laterally into a cam groove K' in a disk L' also fast upon the driving shaft C, the rotation of the latter shaft thereby reciprocating the wings Z backward and forward for the purpose described.

Secured to and depending beneath the face b of each of the jaws T, in position to bear against the opposite sides of the bucket, are four plates M', Figs. 8, 9 and 13, the two plates on each side of the bucket being separated by a narrow slot or open space N' co-incident with the narrow open space d' between the jaws T above. As the plunger completes its downward movement the corner flaps of the bucket, formed by the slots c in the jaws, will be carried out of the slots and beneath the jaws, and the lower ends of the two plates M' M' bearing against the right hand side of the bucket will stand between the two corner flaps projecting from the right side of the bucket, while the lower ends of the two plates M' M' bearing against the left side of the bucket will stand between the corner flaps projecting from the left side of the bucket. When the wings Z are moved forward the flaps at the rear corners of the bucket will be bent forward over the two rear plates and pressed against the sides of the bucket, and when the wings Y are moved rearward the flaps at the forward corners of the bucket will be bent rearward around the two forward plates M'. The movement of the rearward wings Z is so timed relatively to that of the forward wings Y that the wings Z will engage the rear flaps of the bucket and bend them forward against the sides of the bucket before the wings Y engage and bend rearward the forward flaps, and thus the rear flaps are in position against the sides of the bucket to be overlapped by the forward ones when the latter are bent rearward.

The plates M' M' above described are not absolutely essential in the operation of bending the corner flaps of the bucket over upon the sides thereof, since the creases formed by the slots c at the junction of said corner flaps with the sides and ends of the bucket are sufficiently defined to enable the flaps to be bent over upon the sides of the bucket by the folding wings Y Z without the interposition of the plates M' M', but the employment of the latter is advantageous in insuring perfect operation of the parts at all times.

Resting upon the folding jaws T in front and in rear of the bucket-forming opening S, and confined between said jaws and a superimposed plate S' hereinafter referred to, Figs. 10 and 17, are two backwardly and forwardly reciprocating plates O', Fig. 12. The edges b' of these plates adjacent the front and rear sides of the opening S correspond in plan view to the faces a a of the jaws and the curved rear edges of the hollowed-out portions d adjacent the faces a, Fig. 10. Each plate is provided with two recesses c' in which fit upwardly projecting blocks c^3 secured upon and

carried by the jaws T. The plates O′ are yieldingly held in position by suitably applied friction, in this instance by spring-plungers P′ bearing against their under sides, dotted lines Fig. 10. In the normal position of the parts, Fig. 10, the edges b' of the plates O′ rest a slight distance back from the faces a of the jaws, and the recesses c' and block c^2 are of such relative sizes that the jaws T can move outward some distance before the blocks c^2 contact with the outer walls of the recesses c' and begin to move the plates O′ with the jaws. This independent movement of the jaws is sufficient to carry their faces a to a position flush with or slightly beyond the edges b' of the plates O′, the result being that as the plunger descends the edges b' of the plates O′ will bear against the front and rear sides of the plunger, bridging the open spaces d' between the jaws and holding the front and rear sides of the blank up against the plunger. The opposite ends of the edges b', conforming to the shape of the rear walls of the concave portions d of the jaws, form upward continuations of said walls to bear against the front and rear sides of the corner flaps and aid in directing them through the slots c without mutilation of the blank. At the return inward movement of the jaws the plates O′ will remain stationary until the blocks c^2 have traveled across the recesses c' and come in contact with the inner walls of the recesses, whereupon the jaws will carry the plates inward with them and bring them to the position shown in Fig. 10. In the present instance there is shown secured to the rear one of the two plates O′ a supplemental plate O^9, to form a further vertical extension of the rear wall of the bucket-forming opening S. This plate is shown in full in Fig. 10 and in section in Figs. 8 and 9, where it will be seen that it is secured at its forward downwardly bent edge to the upper surface of the plate O′ just in rear of the front edge of the latter, whence it curves upwardly and rearwardly over said plate. This plate O^9 is not essential to the operation of the parts, and has been illustrated in the drawings in the present instance merely because it was found upon the machine from which the drawings were prepared.

The blanks may be placed beneath the plunger by hand, but in the present instance I have provided a reciprocating carriage upon which they may be separately laid and then automatically carried to exact position beneath the plunger. This carriage, shown in detail in Fig. 18, consists of a U-shaped plate or frame Q′ provided upon the under sides of its rearwardly projecting arms with ribs fitting in guideways R′ in a rectangular plate S′, Figs. 17 and 19, mounted upon the upper side of the table A and provided at its middle with an approximately rectangular opening having lateral entensions co-incident with the slots in the folding jaws. The rear ends of the arms of the carriage Q′ are connected to the front ends of links T′ whose rear ends are connected to a cross rod U′ carried by the upper forwardly bent ends of arms V′ fast at their lower ends upon a rock-shaft W′ journaled at its opposite ends in bearings in the side-frames B and having fast upon its right hand end a forwardly extending arm X′, Figs. 2, 7 and 8, whose front end is provided with a laterally projecting stud fitting in a cam groove X^9 in the outer face of the disk N fast upon the shaft C and heretofore described; the rotation of the latter shaft thus serving to reciprocate the carriage Q′. The opposite arms of the carriage Q′, Fig. 18, are provided upon their upper sides with lugs or retaining plates Y′ Z′ between which fit two opposite flaps of the blank, while upon the upper side of the front portion of the carriage are two angle plates A^2 between which fit a third flap of the blank, as in Fig. 19. The forward sides of the lugs or plates Y′ are preferably inclined as shown to facilitate the placing of the blank upon the carriage, the side flaps of the blank riding up over these inclined surfaces and then dropping behind the plates Y′, between them and the plates Z′.

To facilitate the folding of the blank it is desirable that its center be permitted to sag toward the bucket-forming opening, while its edges are held elevated as much as possible, and to that end in the present machine the parts surrounding the bucket-forming opening are so shaped and arranged as to form a sort of dish or bowl for holding the blank until the plunger descends and carries it between the jaws. As seen in Fig. 17 the upper surfaces of the four sides of the plate S′ are inclined toward the center of the bucket-forming opening, while at the rear of said opening there is provided an inclined frame B^2 up over which the rearwardly projecting flap of the blank rides when it is carried over the bucket-forming opening, said frame being provided with two upwardly projecting angle-plates C^2 between which said flap fits and is confined when the carriage comes to rest, Fig. 19. The front end of the carriage itself is bent upwardly as seen in Figs. 1, 2, 8 and 9, so that the forwardly projecting flap of the blank is held elevated above the middle of the blank in corresponding position to that of the rearwardly projecting blank, Fig. 19. At its opposite sides the plate S′ has secured to it vertical plates D^2 provided with off-sets E^2 opposite the bucket-forming opening and having vertical extensions or separate plates F^2 at their extreme rear ends. The plates D^2 are inclined upwardly from their front ends to the off-sets E^2, and as the carriage moves the blank rearward its laterally projecting flaps, confined between the plates Y′ Z′ of the carriage, ride up over the inclined surfaces of the plates D^2 and drop into the recesses E^2, where they are held and confined between the shoulders at the front ends thereof and the plates F^2 at their rear ends, in elevated position corresponding to that of the front

and rearwardly projecting flaps of the blank. The flaps at the four sides of the blank being held elevated above the surfaces of the plate S′ and top of the bucket-forming opening in this manner, the center of the blank will sag downward toward said opening, thereby causing the blank to assume the best possible position to facilitate the folding of it between the plunger and jaws, and the passage of its corner folds through the slots in the latter without mutilation, when the plunger descends.

The parts so far described may be employed as a folding mechanism, either alone or in conjunction with other mechanisms. In the present machine, as before stated, they co-operate with a bailing mechanism by which wire bails are cut from a strand of wire, bent into bail shape, and attached to the buckets while the latter are held in position upon the plunger. This bailing mechanism may be next described, reference being had more particularly to Figs. 3, 5, 6, 8, 9, and 20 to 30. The supply of wire for the bails is carried upon a reel mounted upon a suitable support at the left side of the machine, Fig. 5, and led thence through the usual straightening devices G^2 and then between a pair of rotary friction disks H^2 I^2 by which it is drawn from the reel and delivered to the machine. The disks H^2 I^2 are located in an elongated casing J^2, Fig. 6, fitting in an opening of corresponding shape in the table A and secured to the latter by a flange around its upper edge. The disk I^2 is secured upon the upper side of a gear K^2 fast upon the upper end of a rotary shaft L^2 mounted in a tubular bearing M^2 in the bottom of the casing J^2 and having fast upon its lower end, beneath a second bearing in an arch plate N^{10}, a beveled gear N^2 meshing with a second beveled gear O^2 fast upon the left hand end of the driving shaft C within a casing P^2 secured thereon. Rotary motion is thus imparted by the shaft C to the gear K^2 and disk I^2. The gear K^2 meshes with a gear Q^2 which carries the disk H^2 and which is fast upon the upper end of a rotary shaft R^2 journaled eccentrically in a sleeve S^2 mounted in a tubular bearing T^2 formed in the bottom of the casing J^2. The purpose of this eccentric bearing of the shaft R^2 is to permit the disks H^2 I^2 to be separated at will to stop the feeding of the wire, the oscillation of the sleeve S^2 in the direction of the arrow in Fig. 7 serving to carry the disk H^2 slightly away from the disk I^2, to that end. The lower end of the sleeve S^2 projects below the bearing T^2 and has fast upon it a forwardly extending arm U^2, Figs. 4, 6 and 7. Splined upon the shaft L^2 is a sleeve V^2 provided at its upper end with a cam W^2 adapted in its rotation to contact with the end of the arm U^2 when lifted into the horizontal plane of said arm and throw the latter to the left and thereby separate the disks H^2 I^2 and stop the feeding of the wire. As a means of lifting the cam into the plane of the arm there is provided a lever X^2 pivoted to the upper end of a standard Y^2 upon the frame and provided with a spring-detent Z^2 co-operating with a fixed rack A^3. The forked rear end of this lever embraces and is connected to a sliding collar B^3 mounted upon the shaft L^2 beneath the sleeve V^2. When the front end of the lever is depressed the sleeve will be lifted and the cam W^2 carried into the plane of the arm, to separate the disks. When the lever is returned to normal position and the cam lowered again it will at its next rotation strike the front end of a second arm C^3 also fast to the lower end of the sleeve S^2 (or to the under side of the arm U^2) and projecting forward upon the right side of the shaft L^2, Fig. 7, and will throw said arm to the right and bring the disks H^2 I^2 together again. In this manner the feeding devices are automatically thrown out of operation by moving the lever X^2 in one direction and into operation by moving it in the other.

A portion of the periphery of each of the disks H^2 I^2 is cut away, as usual, to cause the wire to be advanced intermittently, and for the purpose of enabling the disks to be adjusted to feed different lengths of wire, for bails of different sizes, one of the disks is adjustably mounted upon its supporting gear. To this end the disk I^2 is in the present instance secured upon the gear K^2 by means of screws D^3 passing through curved slots E^3 in the disk and entering the gear. By adjusting the disk in one direction or the other a greater or less portion of its periphery can be made to co-operate with the periphery of the disk H^2 and consequently a greater or less length of wire be fed into the machine at each revolution of the disks.

The arm U^2 carries in a block upon the upper side of its forward end a laterally adjustable set screw F^3, Figs. 4 and 7, whose inner end co-operates with the bearing M^2 of the shaft L^2 to limit the movement of the arms U^2 and C^3 toward the right and the consequent movement of the feeding disk H^2 toward the disk I^2. In the absence of something to limit such movement the disks would be liable to mash the wire between them. The provision of an adjustable stop, such as the set-screw, enables the distance between the two feeding disks to be regulated at will, according to the size of the wire being used. In the position of the parts shown in Fig. 7 it may be assumed that a relatively large sized wire is being used, so that the feeding disks are not brought nearer together than is done by the positive movement given the arm C^3 by the cam W^2; but by turning the set-screw to the left in its bearing the arms C^3 and U^3 will be permitted to move farther to the right and the disk H^2 to approach nearer the disk I^2, to feed a wire of smaller size.

From the disks H^2 I^2 the wire is conducted through a guide-tube G^3 to the devices for cutting it into bail lengths and shaping and applying the bails, which devices may be next

described. This mechanism is illustrated in detail in Figs. 20 to 30, and is also shown to a greater or less extent in Figs. 3, 8 and 9. In Figs 20 to 30 the parts are shown in inverted position, in order to better illustrate them, Fig. 20 being a perspective view of the under side of the mechanism with the parts in normal position, and so on through all the figures. The main supporting frame-plate of this mechanism consists of a rectangular plate A^4, Fig. 21, of suitable thickness to contain the necessary guide-ways for the parts to be supported by and moved upon it, and provided upon its opposite sides with ribs B^4 which fit in grooves in the side walls of an opening formed to receive the plate in the rear middle portion of the table, Fig. 3, said opening extending from the central bucket-forming opening in said table through to the rear edge of the latter. The plate A^4 is therefore free to be slid into position in the table A and secured in place by suitable means, and to be readily removed therefrom when desired. The upper surface of the plate A^4 is smooth and unbroken, while its lower surface is provided with grooves and guide-ways as seen in Figs. 3 and 21. At its inner end it is provided with a rectangular recess C^4, Figs. 28 to 30, co-incident with the rear half of the bucket-forming opening S, into which recess the rear portion of the plunger enters when depressed to its limit of movement. Fitting in a middle longitudinal dovetailed guide-way D^4 in the plate A^4 is a sliding bar E^4, Fig. 22, having secured upon its front end a block F^4 to whose opposite sides are removably secured the rearward pair of folding-wings Z heretofore described. The shape of the block F^4 in vertical longitudinal section is shown in Fig. 27, where it will be seen that when the bar E^4 is slid to its forward limit of movement the forward face of the block stands flush with the face of the rear wall of the recess C^4 in the plate A^4. As before stated the rear wall of this recess is co-incident with the rear side of the bucket-forming opening S, so that when the plunger is depressed to its limit of movement it fits snugly against the wall of this recess and the forward face of the block F^4, the latter and the wall of the recess having the same inclination as the rear side of the plunger. The rear wall of the recess C^4 projects upwardly (in the drawings, downwardly in reality) to form a fixed ledge or forming block G^4, Figs. 21 and 27, around which the wire is bent to form the body of the bail, as hereinafter described. The rear face of the ledge G^4 is inclined or beveled off and terminates at its lower end in a transverse slot through which the bail-wire passes when it enters the bail-forming mechanism, before the parts have been advanced to shape it into a bail, which slot separates the ledge G^4 from an integral cross-piece or block H^4 of the plate A^4 which closes the front end of the guide-way D^4, Fig. 21, and against which the front end of the bar E^4 abuts when slid to its forward limit of movement, Fig. 27. The portion of the sliding block F^4 in rear of the ledge G^4 is recessed and shaped to fit over the block H^4 and ledge G^4 and permit the forward face of the block to come flush with the forward face of the ledge when the block is advanced to its limit of movement.

Fitting in longitudinal guide-ways I^4 in the main frame-plate A^4 near the opposite sides of the latter, Figs. 21 and 28 to 30, are ribs J^4 upon the under sides of the side arms or bars K^4 of a sliding frame K^{10}, Fig. 23, composed of the members K^4 and an integral cross-plate L^4 connecting them near their rear ends. Formed upon the inner faces of the projecting portions of the frame A^4, at opposite sides of the recess C^4, Fig. 28, are supporting surfaces I^9 in line with the guide-ways I^4 in which fit the ribs J^4 upon the under side of the frame K^{10}, and upon which surfaces I^9 the front ends of said ribs rest and travel when the frame K^{10} is slid to the right as hereinafter described, Fig. 29. Each of the side-bars K^4 is provided at its rear end with a pair of ears M^4, between which are pivoted the front ends of short links G′ whose rear ends are pivoted to the upper ends of the arms H′ fast upon the rock-shaft I′, Figs. 3, 7, 8 and 9, and heretofore described, so that the rocking of said shaft and vibration of the arms H′ will reciprocate the frame forward and backward. Fast upon the upper side of the plate L^4 of the frame K^{10} is a plate N^4, Figs. 20, 23 and 26, provided with two vertically extending ears O^4 between which fit two friction plates P^4 abutting at their outer sides against the inner faces of the ears O^4 and having confined between them the rear end of a horizontal bar Q^4 whose front end is pivoted in a recess in the block F^4, Figs. 20, 23 and 27. This bar is provided with a longitudinal slot R^4 extending from a point adjacent its front end to, and in this instance entirely through, its rear end. A rod S^4 passes through co-incident holes in the ears O^4 of the plate N^4 and in the friction plates P^4 and through the slot in the bar R^4. The left hand end of this rod S^4, Fig. 26, is provided with a nut or head T^4 bearing against the outer face of the left hand ear plate O^4, while confined upon its right hand end by nuts U^4 is a coiled spring V^4. The opening in the right hand plate O^4 through which the rod S^4 passes is sufficiently enlarged to permit the spring V^4 to extend through it and bear against the right hand friction plate P^4, so that the spring will serve to compress the bar Q^4 between the two friction plates. The inner faces of these plates are provided with friction surfaces W^4 of suitable material, Fig. 26, so as to form a frictional connection between the frame K^{10} and the bar Q^4 and block F^4 and parts moving with it. When the frame K^{10} is advanced this frictional connection will cause it to carry the bar Q^4 and block F^4 with it until the latter are arrested by contact of the end of the slide E^4 with the block H^4 of the plate A^4, whereupon the connection will

yield and the frame K^{10} travel on forward alone, as hereinafter described. So, when the frame K^{10} is retracted the frictional connection will carry the slide E^4 and parts moving with it backward with the frame K^{10} until a block X^4 on the rear end of the slide E^4 contacts with a fixed stop plate Y^4 bolted to the under side of the table A, whereupon the frictional connection will yield and the slide and parts moving with it come to rest, while the frame K^{10} will move on alone to normal position. The block X^4 just referred to has projecting from its forward side a pin surrounded by a coiled buffer-spring Z^4 with which the rear side of the frame K^{10} contacts at the end of its rearward movement.

The wire passes from the guide-tube G^3 heretofore described through an opening in the table A and enters a hole in the right hand side of the frame-plate A^4 at A^5, Figs. 26, 28 and 29, thence across the guide-way I^4, immediately in front of the end of the rib J^4, Fig. 28, and thence through a guide slot B^5 extending transversely across the plate A^4 through the elevations thereof at C^5, H^4, E^5 and F^5, and thence across the left hand guideway I^4 in front of the left hand rib J^4, into a hole G^5 in the side of the plate A^4. The shape of this slot is shown in cross-section in Fig. 28^a, and a portion of it immediately in rear of the ledge G^4 in Fig. 27. It will be seen that it consists of three parts, two parallel vertical end portions *e e'* and a connecting horizontal portion *f*. The purpose of making the slot of this shape is to insure the retention of the wire in the slot in the inverted position of the parts when in the machine, and to permit it to be readily carried out of the slot in the forming of the bail. In its first position the wire will rest in the portion *e* of the slot at the rear end of the portion *f*, and in the forming of the bail will be moved through the portion *f* and out through the portion *e'* by means hereinafter described. In the middle portion of the slot behind the ledge G^4, Fig. 27, the projecting lip of the block H^4, will retain the middle portion of the wire in proper position but permit it to be moved forward out of the slot and upward (downward) along the inclined surface of the ledge G^4.

At the first forward movement of the frame K^{10} the front ends of the ribs J^4, Fig. 28, will shear off the wire against the outer walls of the guide-ways I^4 in which the ribs J^4 travel. To that end the front ends of the ribs are shaped as seen in Figs. 23 and 27 to form shearing edges H^5, while the inner surfaces of such ends are provided with grooves to permit the free ends of the wire to be bent inward against the outer sides of the elevated portions C^5 F^5 of the plate A^4. The first forward movement of the frame K^{10} therefore cuts off the proper length of wire for the bail and bends its extreme opposite ends at right angles, these short bent ends being the portions which are afterward driven through the sides of the bucket and clinched upon the inner surface thereof in the manner and by the means hereinafter described. The next step is to move the wire out of the slot in which it is confined, so that its opposite ends, projecting on each side of the ledge G^4, may be bent over said ledge, at right angles to the middle portion of the wire in rear of the ledge. To this end the side bars K^4 of the frame K^{10} have secured upon their under sides and projecting forwardly to their front ends plates I^5 J^5, Figs. 23, 24 and 25. These plates are secured to the under sides of the bars K^4 at their rear ends, thin plates K^9 being interposed between the plates and the bars to form recesses K^5 between the plates I^5 J^5 and the lower surfaces of the bars K^4, in front of the plates K^9, for a purpose hereinafter described. The plate I^5 is provided upon its under side with two ribs L^5 M^5 which fit in guideways N^5 O^5 in the plate A^4, Fig. 21, while the under side of the plate J^5 is inclined from its outer to its inner edge and rests upon the inclined surface of the elevated portion C^5 of the plate A^4. At its front end the plate J^5 is provided with a finger P^5 resting in the angular guideway at the base of the inclined surface C^5 and having a rounded or beveled upper side. The front ends of the ribs L^5 M^5 are beveled and rounded off as shown, and their points, resting in the bottoms of their respective guideways, travel beneath the horizontal plane of the wire, Fig. 26, as does also the point of the finger P^5 on the plate J^5. After the frame K^{10} has been advanced far enough to shear off the wire for the bail and bend its extreme opposite ends inward against the sides of the parts C^5 F^5, Fig. 28, the beveled front ends of the ribs L^5 M^5 and finger P^5 of the plates I^5 J^5 will engage the wire and lift it (in the drawings, depress it in reality) out of the portion *e* of the slot B^5 in which it has been resting, Fig. 28^a, moving it first through the horizontal portion *f* of the slot and then outward through its vertical mouth *e'*, bringing it to the horizontal position shown in Fig. 27, about midway up the ledge G^4, where it will rest beneath a shoulder or offset Q^5 upon the ledge. When the parts reach the position just described the front face of the block F^4 will have been brought flush with the front face of the ledge G^4 and the middle portion of the wire bail will have been caught and held between the block and rear face of the ledge. The block will be arrested at this point, so that during the further forward movement of the frame K^{10}, hereinafter described, the frictional connection between said frame and the block F^4 and parts moving with it will be overcome and the latter will remain at rest.

Resting upon the plates I^5 J^5 in the recesses K^5 heretofore referred to are two driving plates or hammers R^5, Fig. 29, hereinafter more fully described, and at the further forward movement of the frame K^{10} from the position above described the inner edges of these two plates will contact with the wire upon opposite sides of the ledge G^4 and bend its ends

at right angles over said ledge, bringing it to the position shown in Fig. 29, with the wire formed into bail shape and embracing the bucket upon the plunger (see dotted lines) ready for its ends to be driven through the sides of the bucket. The corners x x of the plates K^9, Figs. 24 and 25, which surfaces act upon the wire near the end of the bending movement of the parts to form the angles of the bail at the opposite ends of the ledge, are cut away sufficiently to accommodate the thickness of the wire between them and the ends of the ledge. The bail having been brought to the shape and position shown in Fig. 29, the next step is to drive its extreme opposite ends through the sides of the bucket upon the plunger. This is accomplished by means of the driving plates or hammers R^5 above mentioned, Figs. 29 and 30, confined in the recesses K^5, between the under surfaces of the side-bars K^4 of the frame K^{10} and the upper surfaces of the ends of the plates I^5 J^5. The plates R^5 are in this instance secured upon and actuated by sliding plates S^5, the latter being provided with square lugs T^5 over which the plates R^5 fit. The plates S^5 are provided near their outer edges with blocks U^5, which extend upwardly (downwardly) through openings in the bars K^4 and are capable of lateral play therein, Fig. 23. These blocks project above the surfaces of the bars K^4 and are adapted to travel back and forth in slots V^5 in fixed plates W^5 secured upon the face of the plate A^4 at its opposite edges and overlapping the bars K^4, Figs. 20 and 30. The forward ends of the slots V^5 are inclined inward to an acute angle with their inner walls, and the front ends of the blocks U^5 of the hammer plates are shaped to fit therein. The result of this construction is that when in the forward movement of the blocks U^5 with the frame K^{10} they strike the inclined front ends of the slots V^5 they will be forced quickly inward to the position shown in Fig. 30 and drive the ends of the bail through the sides of the bucket upon the plunger. In the return backward movement of the parts the blocks U^5 will ride against the inner walls of the slots V^5, and as said walls are inclined outwardly from front to rear the plates R^5 will be gradually drawn outward to normal position by the time the blocks U^5 reach the rear ends of the slots.

The purpose of providing the separate plates S^5 and mounting the hammer-plates R^5 upon them, instead of forming the plates R^5 of suitable shape to carry the blocks U^5, is to permit ready substitution of new plates for the plates R^5 when the latter become worn, &c.

From the foregoing description it will be understood that at the first forward movement of the parts the proper length of wire for the bail will be sheared off by the ribs J^4 J^4 and its extreme opposite ends bent at right angles to the main body of the wire; that then the entire bail will be moved out of the slot in which it has been confined and brought into the horizontal plane of the hammer-plates just described; that then the ends of the wire upon opposite sides of the ledge G^4 will be bent at right angles over said ledge, thereby bringing the wire to complete bail shape; and that thereupon the ends of the bail will be driven through the sides of the bucket upon the plunger by means of the hammer-plates R^5.

The portions of the mechanism above described, exclusive of the hammer-plates R^5 and their co-operating devices, may be employed as a bail-forming mechanism either alone or in any relation in which such a bail-forming mechanism may be desired. In the present machine, however, after the bail has been formed by such mechanism its ends are driven through the sides of the bucket in the manner described, and the next step is to clinch the ends of the bail upon the inner surfaces of such sides of the bucket. The clinching mechanism for this purpose is shown in detail in Figs. 31 to 34, and to a greater or less extent in the full views of the machine in Figs. 1 to 7. The interior of the plunger is hollow and has mounted in it two vibrating clinching arms A^6 B^6 fast at their lower ends upon a rock-shaft C^6 journaled in the opposite sides of the plunger, inclined outwardly from their lower to their upper ends to parallel the inclination of the sides of the plunger, and rigidly connected at their upper ends by a cross rod D^6. Each of these arms has secured to it about midway of the length of the plunger a cylindrical clinching head E^6 having a stem passing through the arm which carries it and held in position on the arm by a nut F^6 screwed upon the inner end of said stem. The heads E^6 project outwardly through horizontal slots in the sides of the plunger, their outer faces being flush with the surfaces of the plunger and inclined in the same plane. They are provided with horizontal clinching eyes or recesses G^6, Fig. 32, extending from the center of the heads to the peripheries thereof. When the ends of the bail are driven through the sides of the bucket upon the plunger they enter these eyes G^6, so that if the arms A^6 B^6 be then vibrated in the direction of the arrow, Fig. 32, the ends of the bail will be bent down upon the inner surfaces of the sides of the bucket by the heads E^6. The means for vibrating the arms A^6 B^6 for this purpose may next be described. Mounted upon the reciprocating cross-head which carries the plunger F is a three-armed plate H^6, Fig. 5, the right hand extremity of whose inwardly extending arm I^6 is secured to the central stem J^6 of the cross-head G to whose bottom plate K^6 the plunger is secured, Fig. 31. This arm I^6 of the plate H^6 has upon its under side two pendent ears L^6, Figs. 31 and 33, between which is pivoted at M^6 a lever N^6. Secured upon the inner end of this lever is a plate O^6 having an inclined groove P^6 in which fits a stud Q^6 upon the outer side of the upper end of the left hand clinching arm A^6, the latter being extended upward through

a slot in the upper end of the plunger and plate K^6 for that purpose. The upper end of the plate O^6 projects into the opening R^6 in the plate I^6. From this construction it will be seen that when the inner end of the lever N^6 is moved downward the upper end of the arm A^6, and consequently said arm and the arm B^6, will be vibrated rearward to effect the clinching of the ends of the bail in the manner heretofore described. At its outer end the lever N^6 has secured upon it a hammer-head or block S^6 adapted to play up and down within a yoke T^6, Fig. 4, secured at its lower end to the table A. When the plunger and parts moving with it are in their uppermost position, as shown in the drawings, the top of the hammer-head S^6 rests against the under surface of the top of the yoke T^6. When the plunger and parts moving with it are lowered to their limit of movement the lower end of the hammer head is brought adjacent the upper end of a vertically reciprocating striker bar V^6 mounted in a guideway in the table A, Figs. 1, 2, 3, 4, 7, and 9 the lower outwardly bent end of which bar carries an anti-friction roller V^{10} standing in the path of a cam X^6 upon the disk R heretofore described, Figs. 1, 3 and 4. Just after the plunger has reached its lower limit of movement and the ends of the bail have been driven through the side of the bucket and into the eyes of the clinching heads, in the manner before explained, the cam X^6 will contact with the end of the bar V^6 and throw the latter quickly upward, causing its upper end to give the hammer-head S^6 a sharp, quick blow and thereby throw the inner end of the lever N^6 downward and vibrate the clinching arms to effect the clinching. At their return upward movement of the parts the upper end of the hammer-head S^6 will contact with the under side of the top of the yoke T^6 just before the parts reach their limit of movement and the lever N^6 be thereby thrown back to its normal position, Fig. 31. The pivot M^6 of the lever N^6 consists of a rod having its left hand end provided with a head bearing against the outer face of the left hand ear L^6, Fig. 33, while its right hand end has confined upon it by a nut Y^6 a coiled spring Z^6, and the opening in the right hand ear L^6, through which the rod passes, is sufficiently large to accommodate the spring Z^6 and permit the inner end of the latter to bear against the side of the lever N^6, or against a suitable friction plate interposed between the spring and the lever. By this means the lever N^6 is frictionally held in the opposite directions to which it is moved in the manner above described.

After the ends of the bail have been bent down upon the inner surfaces of the sides of the bucket the next step is to release the bucket from the plunger and parts holding it thereon and to expel it therefrom. To this end the operation of the parts is so timed by means of the cams which actuate them that immediately after the clinching of the ends of the bail is effected the arm B′ will be thrown forward and carry the forward folding wings Y with it, while the arms H′ H′ by which the bail-forming mechanism is actuated will be thrown rearward and the block F^4 and folding wings Z carried by it withdrawn from contact with the bucket upon the plunger, the side-bars K^4 of the frame K^{10} moving rearward at the same time and the anvil-plates R^5 being drawn outward by the travel of the blocks U^5 along the inclined inner walls of the slots V^5. As the plunger begins to move upward the play permitted the upper ends of the inclined bars W in the outer ends of the arms H of the cross-head, as described in the early part of the specification, will allow the folding-jaws T actuated by the bars W to remain stationary, in their extreme outer position, until the plunger has moved sufficiently to entirely release the bucket from pressure between the plunger and the jaws. At this time the bucket will be supported at its upper edge by the plates M′ M′, Figs. 8 and 9, over which the corner flaps of the bucket are folded against its sides in the manner described in connection with the folding mechanism, and by the contact of the rear side of the bucket with the ledge G^4 of the frame-plate A^4 of the bail-forming mechanism, Fig. 27. The completed bucket is then expelled downward from these devices by a blast of air conveyed from a pipe A^7, leading from a suitable source of supply, through a flexible tube B^7 communicating with a pipe C^7 leading from the top of the plunger, Fig. 32, downward to a block A^8 secured in the plunger about midway of its length. This block is provided with two parallel transverse bores B^8, Fig. 34, connected by a cross-bore C^8. The pipe C^7 communicates with one of the bores B^8, while leading downward from each of the latter are two pipes D^8 secured at their lower ends in the bottom of the plunger and opening therethrough, Figs. 31 and 32. The blasts of air are automatically controlled by a valve interposed in the supply-pipe at D^7, Figs. 1, 2 and 4. The valve-stem of this valve is connected to a lever E^7 whose inner end is pivoted to a fixed support in the framework and to whose opposite end is connected the upper end of a vertically reciprocating rod F^7, Figs. 1, 3 and 4, whose lower end is pivoted to the front end of a lever G^7 pivotally mounted upon the framework at its rear end, Fig. 7, and carrying an anti-friction roller co-operating with a cam H^7 on the outer face of the disk R, Fig. 4. At each revolution of the latter the lever G^7 will be vibrated at the proper time to open and close the valve and admit a blast of air to the plunger to expel the bucket therefrom. From the plunger the completed buckets drop into the open upper end of a curved chute I^7 by which they are delivered in nest at the rear of the machine, Fig. 2.

I am aware that it is not broadly new to combine a folding mechanism with a bailing mechanism in a paper vessel making machine in such manner as to automatically fold the

blanks into vessel shape and form and apply the bails to them. Nevertheless my invention is not restricted to details of construction or arrangement of parts but contemplates broadly the new combinations and the new modes of operation set forth in my respective claims.

While the machine embodying my invention has been shown and described as employing a vertically reciprocating plunger and horizontally reciprocating jaws co-operating therewith, it will be understood, from the mode of operation of the machine, that the terms "vertical" and "horizontal" merely indicate the relative positions of the plunger and jaws to each other, and that the described operation of the machine in no way depends upon the movement of the plunger in a true vertical line, or the jaws in true horizontal lines, so long as their lines of movement are at right angles to each other. My invention, as set forth in my claims, is therefore not restricted to the vertical movement of the plunger and the horizontal movement of the jaws, and may not be evaded by arranging the plunger to move in a line inclined from the vertical and the jaws in lines correspondingly inclined from the horizontal. This fact is obvious from the description of the machine which has been given, but is expressly referred to because of the fact that in some prior machines the plunger has been arranged to move in a line inclined from the vertical and the folding devices correspondingly adjusted. My invention is not distinguished from such prior devices by the arrangement of my plunger to move in a vertical line and the jaws in horizontal lines, since such arrangement of plunger and jaws is also old; but the novelty of my invention depends upon other differences, as will be found set forth in my claims.

Having thus fully described my invention, I claim—

1. In a folding mechanism, the combination of a vertically reciprocating plunger constituting the male die, a series of horizontally reciprocating jaws, constituting the female die, co-operating with the plunger to fold the blank between them, and means for positively reciprocating said jaws in both directions, substantially as described.

2. In a folding mechanism, the combination of a vertically reciprocating frame, a plunger or male die carried thereby, a series of horizontally reciprocating jaws co-operating with the plunger to fold the blank between them, and means actuated by the plunger frame for positively reciprocating the jaws toward and from the path of the plunger, substantially as described.

3. In a folding mechanism, the combination of a vertically reciprocating plunger, a series of horizontally reciprocating jaws co-operating with the plunger to fold the blank between them, and a series of inclined bars reciprocating vertically with the plunger and co-operating with the jaws to move them horizontally toward and from the path of the plunger, substantially as described.

4. In a folding mechanism, the combination of a vertically reciprocating plunger, a series of reciprocating jaws carried by horizontal slides and co-operating with the plunger to fold the blank between them, and a series of inclined bars reciprocating with the plunger and passing through slots in the slides to reciprocate the latter and the jaws toward and from the path of the plunger, substantially as described.

5. In a folding mechanism, the combination of a vertically reciprocating cross-head having four divergent arms, a plunger carried by said cross-head, said plunger being rectangular in cross-section, four vertically guided rods secured at their upper ends to the respective arms of the cross-head, cross-arms connecting the lower ends of each pair of rods, rotary cams co-operating with said cross-arms to reciprocate the cross-head and plunger, a series of reciprocating jaws carried by horizontal slides and co-operating with the plunger to fold the blank between them, and four inclined bars secured at their upper ends in the arms of the cross-head and at their lower ends in the cross-arms above mentioned, said bars passing through slots in the slides and operating to reciprocate the jaws toward and from the path of the plunger, substantially as described.

6. In a folding mechanism, the combination of a vertically reciprocating plunger, a series of horizontally reciprocating jaws co-operating therewith to fold the blank between them, and operating connections between the plunger and jaws for positively reciprocating the latter in both directions and permitting slight independent movement of the plunger at the opposite ends of its strokes for the purpose described.

7. In a folding mechanism, the combination of a reciprocating plunger, a series of horizontally reciprocating jaws co-operating therewith to fold the blank between them, and a series of inclined bars reciprocating vertically with the plunger and co-operating with the jaws to move them horizontally toward and from the plunger, said bars having slight independent play in the line of movement of the jaws to permit a corresponding movement of the plunger independently of the jaws, substantially as described.

8. In a folding mechanism, the combination of a reciprocating plunger-frame, a plunger carried thereby, a series of reciprocating jaws carried by horizontal slides and co-operating with the plunger to fold the blank between them, and a series of inclined bars secured at their opposite ends in the plunger-frame and passing through slots in the slides, said bars being loosely confined in the plunger-frame at one end to permit slight play of them in the line of movement of the slots and jaws for the purpose described.

9. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross-section, four horizontally reciprocating jaws co-operating with said plunger to fold the blank between them, each jaw having two operating faces at right angles to each other and adapted to embrace one corner of the plunger, and each provided with a slot to receive the corner fold of the blank, and means for positively reciprocating the jaws toward and from the path of the plunger, substantially as described.

10. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross-section, four horizontally reciprocating jaws co-operating with said plunger to fold the blank between them, each jaw having two operating faces at right angles to each other and adapted to embrace one corner of the plunger, and each provided with a slot to receive the corner fold of the blank, and operating connections between the plunger and jaws for positively moving the latter toward and from the path of the plunger, substantially as described.

11. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross section, four co-operating jaws reciprocating horizontally toward and from the four corners of the plunger, each jaw having two operating faces at right angles to each other and adapted to embrace one corner of the plunger, and each having a slot to receive a corner fold of the blank, and four inclined bars reciprocating with the plunger and co-operating with the jaws to move the latter toward and from the corners of the plunger, substantially as described.

12. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross-section, four co-operating jaws carried by slides moving in guide-ways radiating from the four corners of the plunger, each jaw having two operating faces at right angles to each other and adapted to embrace one corner of the plunger, and each having a slot to receive the corner fold of the blank, and four inclined bars reciprocating with the plunger and each passing through a slot in one of the slides, to move the latter and its jaw toward and from the path of the plunger, substantially as described.

13. In a folding mechanism, the combination of a vertically reciprocating plunger-frame having four horizontal arms diverging at angles of ninety degrees, a plunger rectangular in cross-section secured to said plunger-frame with its four corners co-incident with said arms, four horizontally reciprocating slides arranged in guide ways beneath and in line with the four arms of the plunger-frame, four inclined bars carried by the plunger-frame, each bar having its upper end secured in the outer end of one of the arms thereof and passing through a slot in the corresponding slide, and four jaws carried by the inner ends of the respective slides and adapted to co-operate with the plunger to fold the blank between them, each jaw having two operating faces at right angles to each other and adapted to embrace one corner of the plunger, and each having a slot for the reception of the corner fold of the blank, substantially as described.

14. In a folding mechanism, a reciprocating pressure-jaw or female die adapted to co operate with one corner of a plunger or male die, said jaw having two operating faces at right angles to each other and a slot in line with one of said faces for the reception of the corner fold of the blank, substantially as described.

15. In a folding mechanism, a reciprocating pressure-jaw or female die adapted to co-operate with one corner of a plunger or male die, said jaw having two operating faces at right angles to each other and a slot in line with one of said faces for the reception of the corner fold of the blank, and having its surface adjacent one side of said slot hollowed out as described to facilitate the folding of the blank, substantially as described.

16. In a folding mechanism, the reciprocating pressure jaw T having the operating faces *a b*, the slot *c* in line with the face *a*, and the concaved portion *d* adjacent the slot *c*, substantially as described.

17. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross-section, and four horizontally reciprocating jaws co-operating with the four corners thereof to fold the blank between them, each jaw having two operating faces at right angles to each other and adapted to embrace one corner of the plunger, and each having a vertical slot through it in line with one of said faces to receive the corner fold of the blank, substantially as described.

18. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross-section, and four horizontally reciprocating jaws co-operating with the four corners thereof to fold the blank between them, each of said jaws having two operating faces at right angles to each other and adapted to embrace one corner of the plunger, and each having a vertical slot through it in line with one of said faces, for the reception of the corner fold of the blank, and a concaved portion adjacent said slot to accommodate said fold, substantially as described.

19. In a folding mechanism, the combination of the vertically reciprocating plunger with the four horizontally reciprocating jaws T co-operating with the four corners thereof, each jaw having the operating faces *a b*, the slot *c* in line with the face *a*, and the concaved portion *d* adjacent the outer side and end of the slot *c*, substantially as described.

20. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross-section, four horizontally reciprocating jaws co-operating with the four corners thereof, each jaw having two operating faces at right angles to each other and

adapted to embrace one corner of the plunger, and each having a slot in line with one of said faces for the reception of the corner fold of the blank, two horizontally reciprocating plates co-operating with opposite sides of the plunger, and a loose connection between each of said plates and the pair of jaws upon the same side of the plunger, substantially as and for the purpose described.

21. In a folding mechanism, the combination of the vertically reciprocating plunger, the four horizontally reciprocating jaws T co-operating with the four corners of the plunger and each having the two operating faces *a b*, the slot *c* in line with the face *a*, and the recessed portion *d*, the horizontally reciprocating plates O′ co-operating with the front and rear sides of the plunger and having their operating faces shaped to conform to the faces *a* of the jaws and the walls of the recesses *d*, and a loose connection between said plates and the respective pairs of jaws upon the front and rear sides of the plunger, as by the lugs c^2 upon the jaws fitting in the recesses *c′* in the plates O′, substantially as and for the purpose described.

22. In a folding mechanism, the combination of a vertically reciprocating plunger, a series of horizontally reciprocating jaws co-operating therewith to fold the blank between them, means for bending the corner folds of the blank over upon the sides of the vessel after the blank has been folded between the jaws and plunger, and a single driving mechanism for positively operating both the folding jaws and bending means, substantially as described.

23. In a folding mechanism, the combination of a vertically reciprocating plunger, a series of horizontally reciprocating jaws co-operating therewith to fold the blank between them, operating connections between the plunger and jaws for positively moving the latter toward and from the path of the plunger, and means for bending the corner folds of the blank over upon the sides of the vessel after the blank has been folded between the jaws and plunger, substantially as described.

24. In a folding mechanism, the combination of a vertically reciprocating plunger, a series of horizontally reciprocating jaws co-operating therewith to fold the blank between them, and two pairs of horizontally reciprocating folding wings or blades co-operating with the opposite sides of the plunger to bend the corner folds of the blank over upon the sides of the vessel after the blank has been folded between the jaws and plunger, and means for positively reciprocating the jaws and wings in both directions, substantially as described.

25. In a folding mechanism, the combination of a vertically reciprocating plunger rectangular in cross-section, four horizontally reciprocating jaws co-operating with the four corners thereof, each jaw having two operating faces at right angles to each other and adapted to embrace one corner of the plunger, and a slot for the reception of the corner fold of the blank, and means for bending the corner folds over upon the sides of the vessel after the blank has been folded between the jaws and plunger, substantially as described.

26. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross-section, four horizontally reciprocating jaws co-operating with the four corners thereof, each jaw having two operating faces at right angles to each other and adapted to embrace one corner of the plunger, and a slot for the reception of the corner fold of the blank, and two pairs of horizontally reciprocating folding wings or blades co-operating with opposite sides of the plunger to bend the corner folds of the blank over upon the sides of the vessel after the blank has been folded between the jaws and plunger, substantially as described.

27. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross-section, four horizontally reciprocating jaws co-operating with the four corners of the plunger and each having two operating faces at right angles to each other, adapted to embrace one corner of the plunger, and a slot in line with one of said faces for the reception of the corner fold of the blank, and means for bending said corner folds over upon the sides of the vessel after the blank has been folded between the jaws and plunger, substantially as described.

28. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross-section, four horizontally reciprocating jaws co-operating with the four corners of the plunger and each having two operating faces at right angles to each other, adapted to embrace one corner of the plunger, and provided with a slot for the reception of the corner fold of the blank, the slots in the forward pair of jaws being in line with the forward side of the plunger and those in the rear pair of jaws in line with the rear side of the plunger, and two pairs of horizontally reciprocating folding wings or blades at the forward and rear sides of the plunger operating to bend the corner folds of the blank over upon the sides of the vessel after the blank has been folded between the jaws and plunger, substantially as described.

29. In a folding mechanism, the combination of a vertically reciprocating plunger, a series of horizontally reciprocating jaws co-operating therewith to fold the blank between them, folding plates located beneath the jaws upon two opposite sides of the plunger, and means for bending the corner folds of the blank over said plates and against the sides of the vessel after the blank has been folded between the jaws and plunger, substantially as described.

30. In a folding mechanism, the combina-

tion of a vertically reciprocating plunger, a series of horizontally reciprocating jaws co-operating therewith to fold the blank between them, folding plates located beneath the jaws upon two opposite sides of the plunger, and two pairs of horizontally reciprocating folding wings or blades at the front and rear sides of the plunger operating to bend the corner folds of the blank over the folding plates above mentioned and against the sides of the vessel after the blank has been folded between the jaws and plunger, substantially as described.

31. In a folding mechanism, the combination of a vertically reciprocating plunger, a series of horizontally reciprocating jaws co-operating therewith to fold the blank between them, folding plates carried by and depending from the jaws at two opposite sides of the plunger, and means for bending the corner folds of the blank over these plates and against the sides of the vessel after the blank has been folded between the jaws and plunger, substantially as described.

32. In a folding mechanism, the combination of a vertically reciprocating plunger, a series of horizontally reciprocating jaws co-operating therewith to fold the blank between them, folding plates carried by and depending from the jaws at two opposite sides of the plunger, and two pairs of horizontally reciprocating folding wings or blades at the front and rear sides of the plunger operating to bend the corner folds of the blank over said plates and against the sides of the vessel after the blank has been folded between the jaws and plunger, substantially as described.

33. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross-section, four horizontally reciprocating jaws co-operating with the four corners thereof, each having two operating faces at right angles to each other, adapted to embrace one corner of the plunger, and a slot for the reception of the corner fold of the blank, folding plates carried by and depending from the faces of the jaws at two opposite sides of the plunger, and means for bending the corner folds of the blank over these plates and against the sides of the vessel after the blank has been folded between the plunger and dies, substantially as described.

34. In a folding mechanism, the combination of a vertically reciprocating plunger, rectangular in cross section, four horizontally reciprocating jaws co-operating with the four corners thereof, each having two operating faces at right angles to each other, adapted to embrace one corner of the plunger, and a slot for the reception of the corner fold of the blank, the slots in the forward pair of jaws being in line with the forward side of the plunger and those in the rear pair of jaws in line with the rear side of the plunger, and two pairs of horizontally reciprocating folding wings or blades at the front and rear sides of the plunger operating to bend the corner folds of the blanks over said plates and against the sides of the vessel after the blank has been folded between the plunger and jaws, substantially as described.

35. In a folding mechanism, the combination of a vertically reciprocating plunger, four horizontally reciprocating jaws T co-operating with the four corners thereof, each having the operating faces *a b*, the slot *c* in line with the face *a*, and the recessed portion *d* adjacent the slot *c*, the plates M′ M′ depending from the faces *b* of the jaws at the opposite sides of the plunger, and the reciprocating folding wings Y Z at the front and rear sides of the plunger co-operating with plates M′ M′ to bend the corner folds of the blank over said plates and against the sides of the vessel, substantially as described.

36. In a folding mechanism, the combination of the vertically reciprocating plunger, the horizontally reciprocating jaws co-operating therewith to fold the blank between them, the blank-supporting and retaining devices surrounding the bucket-forming opening above the jaws and adapted to hold the edges of the blank elevated and permit its central portion to sag, and the reciprocating feeding carriage provided with the blank-retaining devices co-operating with those around the bucket-forming opening when the carriage is moved over said opening, substantially as described.

37. In a folding mechanism, the combination of the vertically reciprocating plunger, the horizontally reciprocating jaws co-operating therewith to fold the blank between them, the inclined frame B^2 at the rear of the bucket-forming opening, provided with the vertical projection C^2 between which the rearwardly projecting flap of the blank is adapted to fit and be confined, the inclined plates D^2 at the opposite sides of the bucket-forming opening, having the off-sets E^2 in which the side flaps of the blank are adapted to fit and be confined, and the U shaped reciprocating carriage Q′ having the upwardly bent front end and provided with the projections A^2 for the forwardly projecting flap of the blank and the projections Y′ Z′ for the laterally projecting flaps thereof, and adapted to co-operate with the fixed parts about the bucket-forming opening in the manner and for the purpose described.

38. In a folding mechanism, the combination of the vertically reciprocating plunger, the horizontally reciprocating jaws co-operating therewith to fold the blank between them and having the slots for the corner folds of the blank, the plate S′ fitting over the bucket-forming opening and provided with a central opening co-incident therewith and having lateral extensions co-incident with the slots in the jaws, said plate being inclined from its outer edges toward its central opening, the inclined frame B^2 at the rear side of the opening, the inclined plates D^2 at the right and left sides thereof, having the off-sets E^2 and

projections F^2 at the rear ends thereof, and the U-shaped reciprocating carriage Q′ having ribs upon its under side fitting in guide-ways in the plate S′ and provided upon its upper side with the plates A^2 for the front flap of the blank and the plates Y′ Z′ for the side flaps thereof, substantially as and for the purpose described.

39. In a wire feeding mechanism, the combination of the two disks geared together, one having the eccentric bearing, and means controlled by the operator and actuated by the driving mechanism for shifting said bearing to throw the disks out of co-operative relation, substantially as described.

40. In a wire-feeding mechanism, the combination of the two disks geared together, one having the eccentric bearing, and means controlled by the operator and actuated by the driving mechanism for shifting said bearing to throw the disks into and out of co-operative relation, to start and stop the feeding of the wire, substantially as described.

41. In a wire-feeding mechanism, the combination of the two disks geared together, one having the eccentric bearing, a rotary cam geared to the driving mechanism for shifting said bearing to throw the disks out of co-operative relation to stop the feeding of the wire, and means for controlling the action of said cam, substantially as described.

42. In a wire-feeding mechanism, the combination of the two disks geared together, one having the eccentric bearing, the rotary cam geared to the driving mechanism and operating when in one position to shift the bearing in one direction to separate the disks and when in another position to shift it in the opposite direction to bring the disks together, and means for moving the cam from one position to another at will to stop and start the feeding of the wire, substantially as described.

43. In a wire-feeding mechanism, the combination of two parallel rotary shafts geared together and carrying the co-operating friction disks, one of said shafts being eccentrically mounted in a rocking bearing, an arm fast upon said bearing, a rotary cam geared to the driving mechanism, and means for moving said cam at will into position to strike said arm and rock the bearing of said shaft and separate the disks, substantially as described.

44. In a wire-feeding mechanism, the combination of two parallel rotary shafts geared together and carrying the co-operating friction disks, one of said shafts being eccentrically mounted in a rocking bearing, two arms fast upon said bearing, a rotary cam geared to the driving mechanism, and means for moving said cam at will into position to strike one or the other of said arms to separate the disks or bring them together and stop or start the feeding of the wire, substantially as described.

45. In a wire-feeding mechanism, the combination of two parallel rotary shafts geared together, co-operating friction disks carried thereby, a rocking bearing in which one of said shafts is eccentrically journaled, two arms fast upon said bearing, a rotary cam splined upon the other shaft and adapted in different positions to contact with one or the other of said arms to separate or bring together the disks, and a lever for shifting said cam along its shaft into the plane of one or the other of said arms at will, substantially as described.

46. In a wire-feeding mechanism, the combination of the rotary shafts L^2 R^2, the gears K^2 Q^2 fast upon the respective shafts and the disks I^2 H^2 fast upon the respective gears, the rocking bearing S^2 having the shaft R^2 eccentrically journaled in it, the arms U^2 C^3 fast upon the lower end of the bearing S^2, the sleeve V^2 splined upon the shaft L^2 and provided with the cam projection W^2, the sliding collar B^3 upon the shaft L^2 adjacent the sleeve V^2, the detent-lever X^2 for shifting the collar, and the rack A^3 co-operating with the lever, substantially as described.

47. In a bail-forming mechanism, the combination of a fixed frame across which the wire is led, a middle bending block or former around which the body of the bail is shaped, and a reciprocating frame having members for shearing off the wire, bending its extreme opposite ends at right angles and then bending the body of the wire into bail shape over the middle former, all by a single movement of the reciprocating frame in one direction, substantially as described.

48. In a bail-forming mechanism, the combination of a fixed frame across which the wire is led, fixed projections or bending surfaces upon said frame near the opposite ends of the wire, over which the extreme ends of the wire are bent, and a fixed middle bending block or former over which the body of the bail is shaped, and a reciprocating frame having members for shearing off the wire, bending its extreme opposite ends over the aforesaid projections, then moving the wire bodily out of the plane of said projections, and then bending it into bail shape over the middle former, substantially as described.

49. In a bail-forming mechanism, the combination of a fixed frame-plate containing longitudinal guide-ways for the reciprocating parts and a transverse slot for the wire and having a fixed ledge for the bending of the middle portion of the bail, and a reciprocating frame moving in the guide-ways of said plate and provided with members for shearing off the wire and bending its ends at right angles at the opposite ends of the slot, moving it bodily out of said slot, and then bending it into bail shape over the fixed ledge of the framework, all by a single movement of said reciprocating frame, substantially as described.

50. In a bail-forming mechanism, the combination of a fixed frame-plate containing longitudinal guideways for the reciprocating parts and a transverse slot for the wire, and having a fixed ledge for the bending of the middle portion of the bail, a reciprocating

frame having ribs or slides at its opposite sides fitting in guideways in the frame-plate and operating to shear off the wire and bend its ends at right angles at the opposite ends of its slot, and beveled fingers carried by said frame and operating to move the wire bodily out of its slot and into position to be bent into bail shape over the aforesaid ledge of the frame-plate by said reciprocating frame, substantially as described.

51. In a bail-forming mechanism, the combination of a fixed frame-plate containing longitudinal guideways for the reciprocating parts and a transverse slot for the wire, and having a fixed ledge for the bending of the middle portion of the bail, a reciprocating frame having two longitudinal side bars provided with ribs fitting in guideways in the frame-plate and operating to shear off the wire and bend its ends at right angles at the opposite ends of the slot, and plates carried by said side bars and having beveled fingers for moving the wire bodily out of its slot and then operating to bend it into bail shape around the aforesaid ledge of the framework, substantially as described.

52. In a bail-forming mechanism, the combination of a fixed frame-plate having longitudinal guideways for the reciprocating parts and a transverse slot for the wire, said slot in cross-section having a horizontal and a vertical portion, a fixed ledge for the bending of the middle portion of the bail, and a reciprocating frame having members moving in the guideways of the frame-plate and operating to shear off the wire and bend its ends at right angles at the opposite ends of its slot and then move it bodily through the horizontal portion of said slot and then bend it into bail shape over the fixed ledge, substantially as described.

53. In a bail-forming mechanism, the combination of a fixed frame-plate having longitudinal guideways for the reciprocating parts and a transverse slot for the wire, said slot in cross-section having two vertical portions connected by a horizontal portion, the wire normally resting in one of said vertical portions, a fixed ledge for bending the middle portion of the bail, and a reciprocating frame having members moving in the guideways in the frame-plate and operating to shear off and bend the opposite ends of the wire and then move it bodily first from one vertical portion of the slot into the horizontal portion and then through the latter into the other vertical portion and out through the same, and to then bend it into bail shape over the fixed ledge aforesaid, substantially as described.

54. In a bail-forming mechanism, the combination of the fixed frame-plate A^4 having the horizontal guideways I^4 and the transverse slot B^5 for the wire, and the fixed ledge G^4, the reciprocating frame K^{10} having the side bars K^4 provided with the ribs J^4 fitting in the guideways I^4 and operating to shear off the opposite ends of the wire against the outer walls of said guide ways and bend them at right angles over the inner walls thereof, and the plates I^5 J^5 secured to the side bars K^4 and provided with the beveled fingers M^5 P^5 for moving the wire out of its slot and operating to then bend it into bail shape over the fixed ledge G^4 of the frame-plate A^4, substantially as described.

55. In a bail-forming and applying mechanism, the combination of a fixed frame-plate having longitudinal guideways for the reciprocating parts and transversely across which the wire for the bails is fed, a reciprocating frame having members moving in said guideways and operating to shear off the wire and bend it into bail shape, and reciprocating driving devices moving at right angles to the line of movement of said frame and actuated by the latter to drive the opposite bent ends of the bail through the sides of the vessel, substantially as described.

56. In a bail-forming and applying mechanism, the combination with the fixed and reciprocating frames for shearing off the wire and bending it into bail shape, of two hammer plates moving at right angles to the line of movement of the reciprocating frame and actuated by the latter to drive the opposite ends of the bail through the sides of the vessel, substantially as described.

57. In a bail-forming and applying mechanism, the combination of a fixed frame-plate having longitudinal guideways for the reciprocating parts and transversely across which the wire for the bails is fed, a reciprocating frame having members moving in said guideways and operating to shear off the wire and bend it into bail shape, and hammer-plates moving with and actuated by the reciprocating frame and reciprocating at right angles to the line of movement thereof to drive the opposite bent ends of the bail through the sides of the vessel, substantially as described.

58. In a bail-forming and applying mechanism, the combination of a fixed frame-plate having longitudinal guideways for the reciprocating parts and transversely across which the wire for the bails is fed, a reciprocating frame having members moving in said guideways and operating to shear off the wire and bend it into bail shape, reciprocating hammer-plates carried by the reciprocating frame and moving at right angles to the line of movement thereof to drive the opposite ends of the bail through the sides of the vessel, and fixed cams co-operating with said hammer-plates to move them at right angles to the line of movement of the reciprocating frame, substantially as described.

59. In a bail-forming and applying mechanism, the combination of a fixed frame-plate having longitudinal guideways for the reciprocating parts and a transverse slot for the wire, and a fixed ledge for bending the middle portion of the bail, a reciprocating frame having members moving in the guideways in the frame-plate and operating to shear off the

wire and bend its opposite ends at right angles, and to then move it bodily out of its slot and bend it into bail shape over the fixed ledge, and means operated by the reciprocating frame for driving the opposite ends of the bail through the sides of the vessel, substantially as described.

60. In a bail-forming and applying mechanism, the combination of a fixed frame-plate having longitudinal guideways for the reciprocating parts and a transverse slot for the wire, and a fixed ledge for bending the middle portion of the bail, a reciprocating frame having members moving in the guideways and operating to shear off the wire and bend its opposite ends at right angles, and to then move it bodily out of its slot and bend it into bail shape over the fixed ledge, and reciprocating hammer plates carried by the reciprocating frame and operating at right angles to the line of movement thereof to drive the opposite bent ends of the bail through the sides of the vessel, said plates being actuated by the reciprocating frame, substantially as described.

61. In a bail-forming and applying mechanism, the combination of a fixed frame-plate having longitudinal guideways for the reciprocating parts and a transverse slot for the wire, and a fixed ledge for bending the middle portion of the bail, a reciprocating frame having members moving in said guideways and operating to shear off the wire and bend its opposite ends at right angles, and then move it bodily out of its slot and bend it into bail shape over said ledge, hammer-plates carried by the reciprocating frame, and fixed cams co-operating with said plates to move them at right angles to the line of movement of the reciprocating frame to drive the opposite ends of the bail through the sides of the vessel, substantially as described.

62. In a bail-forming and applying mechanism, the combination of a fixed frame-plate having longitudinal guideways for the reciprocating parts and a transverse slot for the wire, and a fixed ledge for bending the middle portion of the bail, a reciprocating frame having members moving in the guideways and operating to shear off the wire and bend its opposite ends at right angles and then move it bodily out of its slot and bend it into bail shape over said ledge, hammer-plates carried in recesses in the reciprocating frame and adapted to be moved at right angles to the line of movement of said frame to drive the ends of the bail through the sides of the vessel, fixed plates containing cam slots, and projections upon said hammer-plates traveling in said slots, substantially as described.

63. In a bail-forming and applying mechanism, the combination of a fixed frame-plate having longitudinal guideways for the reciprocating parts and a transverse slot for the wire, and a fixed ledge for bending the middle portion of the bail, a reciprocating frame having ribs at its opposite sides moving in two of said guideways and operating to shear off the wire and bend its opposite ends at right angles, two plates secured to said frame and provided with beveled fingers for moving the wire bodily out of its slot and then operating to bend it into bail shape over the fixed ledge, reciprocating hammer-plates confined in recesses between the aforesaid plates and the reciprocating frame, fixed plates containing cam slots, and projections upon the hammer-plates traveling in said slots and operating to move said plates at right angles to the line of movement of the reciprocating frame to drive the ends of the bail through the sides of the vessel, substantially as described.

64. In a bail-forming and applying mechanism, the combination of the fixed plate A^4 having the longitudinal guideways I^4, the transverse slot B^5 for the wire and the fixed ledge G^4, the reciprocating frame K^{10} composed of the side bars K^4 and cross-plate L^4, the members K^4 having the ribs J^4 fitting in the guideways I^4 and operating to shear off the wire and bend its opposite ends at right angles, the plates I^5 J^5 secured to the side bars K^4 and having the beveled fingers M^5 P^5 and operating to move the wire bodily out of the slot B^5 and bend it into bail shape over the ledge G^4, the hammer-plates R^5 confined in the recesses K^5 between the side bars K^4 and the plates I^5 J^5, the fixed plates W^5 secured to the plate A^4 and containing the cam slots V^5, and the blocks U^5 moving with the hammer-plates R^5 and confined in the slots V^5, substantially as and for the purpose described.

65. In a bail-forming and applying mechanism, the combination with means for shearing off the wire and bending it into bail shape, of the reciprocating hammer-plates R^5, the fixed plates W^5 having the cam slots V^5, and the blocks U^5 moving with the plates R^5 and confined in said slots, substantially as and for the purpose described.

66. In a bail-forming and applying mechanism, the combination, with means for shearing off the wire and bending it into bail shape, of the fixed plates W^5 containing the cam slots V^5, the reciprocating plates S^5 having the blocks U^5 traveling in the slots V^5, and the hammer-plates R^5 detachably mounted upon the plates S^5, substantially as and for the purpose described.

67. In a bail-forming and applying mechanism, the combination of the fixed frame-plate of the bail-forming mechanism, having the longitudinal guideways and the transverse slot for the wire, and the fixed ledge for forming the middle portion of the bail, the reciprocating frame and parts moving with and actuated by it for shearing off the wire, bending it into bail shape and driving the ends of the bail through the sides of the vessel, and the reciprocating block yieldingly connected with the reciprocating frame and co-operating with the fixed ledge to hold the bail in position

thereon while its ends are being driven through the sides of the vessel, substantially as described.

68. In a bail-forming and applying mechanism, the combination, with the fixed frame-plate A^4 having the longitudinal guideways and the transverse slot for the wire, and the fixed ledge G^4, of the reciprocating frame K^{10} and parts carried with and actuated by it for shearing off the wire, bending it into bail shape and driving its opposite ends through the sides of the vessel, of the reciprocating block F^4 co-operating with the ledge G^4, the slotted bar Q^4 connected to the block F^4, and the frictional connection between said bar and the frame K^{10}, substantially as and for the purpose described.

69. The combination, with the reciprocating plunger and jaws of the folding mechanism and the reciprocating frame of the bail-forming mechanism, of a reciprocating member yieldingly connected to said reciprocating frame and a pair of folding wings carried by said member and co-operating with the plunger in the manner and for the purpose described.

70. The combination, with the reciprocating plunger and jaws of the folding mechanism and the reciprocating frame of the bail-forming mechanism, of a reciprocating member frictionally connected with said reciprocating frame and a pair of folding wings carried thereby and co-operating with the plunger, substantially as described.

71. The combination, with the reciprocating plunger of the folding mechanism, of a pair of vibrating clinching heads mounted within the plunger and provided with eyes for the reception of the ends of the bail, means for forming the bail and driving its ends through the sides of the vessel into the eyes of the clinching heads, and means for vibrating said heads to clinch the ends of the bail upon the inner surfaces of the sides of the vessel, substantially as described.

72. The combination, with the reciprocating plunger of the folding mechanism, of a vibrating frame mounted within said plunger, a pair of clinching heads carried by said frame and projecting outward through the sides of the plunger, and each provided with an eye for the reception of one end of the bail, means for forming the bail and driving its ends through the sides of the vessel into the eyes of the clinching heads, and means for vibrating the clinching head frame to clinch the ends of the bail upon the inner surfaces of the sides of the vessel, substantially as described.

73. The combination, with the reciprocating plunger of the folding mechanism, of a pair of vibrating clinching heads mounted within the plunger and provided with eyes for the reception of the ends of the bail, means for forming the bail and driving its ends through the sides of the vessel into the eyes of the clinching heads, a rotary cam and connections for vibrating the clinching heads to effect the clinching at the end of the stroke of the plunger in one direction, and means for vibrating them in the opposite direction to normal position at the return stroke of the plunger, substantially as described.

74. The combination, with the reciprocating plunger of the folding mechanism, the vibrating frame mounted within said plunger, the clinching heads carried by said frame and provided with eyes for the reception of the ends of the bail, a lever for vibrating said frame, the cam and connections for moving the lever to effect the clinching at the end of the stroke of the plunger in one direction, and the stop engaging the lever at the end of the stroke of the plunger in the opposite direction to return the parts to initial position, substantially as described.

75. The combination of the hollow reciprocating plunger F, the vibrating frame mounted therein, composed of the arms A^6 B^6, the rock shaft C^6 and rod D^6, the clinching heads E^6 secured to the arms A^6 B^6 and projecting through the sides of the plunger and having the eyes G^6, the lever N^6 pivoted in a support reciprocating with the plunger and connected to the upper end of the arm A^6 by a cam slot and pin, a rotary cam for vibrating the lever N^6 in one direction at the end of the positive stroke of the plunger and a fixed stop with which the lever contacts to vibrate it in the other direction at the end of the return stroke of the plunger, substantially as described.

76. The combination, with the reciprocating plunger of the folding mechanism, of a pair of vibrating clinchers mounted within the plunger, a cam and connections actuated by the driving mechanism for vibrating the clinchers to effect the clinching at the end of the positive stroke of the plunger, and a fixed stop co-operating with such connections at the end of the return stroke of the plunger to restore the clinchers to normal position, substantially as described.

77. In a machine such as described, the combination of a vertically reciprocating plunger, a series of horizontally sliding jaws co-operating therewith to fold the blank into vessel shape, each jaw having a slot to receive the corner flap of the folded blank, a reciprocating carrier for moving the blanks beneath the plunger, means for bending the corner flaps over upon the sides of the vessel, and bailing mechanism for forming and applying the bail to the vessel upon the plunger, substantially as described.

78. In a machine such as described, the combination of a vertically reciprocating plunger, a series of horizontally sliding jaws co-operating therewith to fold the blank into vessel shape, each jaw having a slot to receive the corner flap of the folded blank, two pairs of reciprocating folding wings or blades on opposite sides of the plunger for bending the corner flaps over upon the sides of the vessel, and bailing mechanism for forming and

applying the bail to the vessel upon the plunger, substantially as described.

79. In a machine such as described, the combination of a vertically reciprocating plunger, a series of horizontally sliding jaws co-operating therewith to fold the blank between them, each jaw having a slot to receive the corner flap of the folded blank, means for bending the corner folds of the blank over upon the sides of the vessel after the blank has been folded between the jaws and plunger, bailing mechanism for forming the bail and driving its opposite ends through the sides of the vessel upon the plunger, and a pair of clinchers within the plunger for bending the ends of the bail down upon the inner surfaces of the vessel, substantially as described.

80. In a machine such as described, the combination of a vertically reciprocating plunger, a series of horizontally sliding jaws co-operating therewith to fold the blank between them, each jaw having a slot to receive the corner flap of the folded blank, two pairs of horizontally reciprocating folding wings or blades co-operating with the opposite sides of the plunger to bend the corner folds of the blank over upon the sides of the vessel after the blank has been folded between the jaws and the plunger, mechanism for forming the bail and driving its opposite ends through the sides of the vessel upon the plunger, and a pair of clinchers within the plunger for bending the inner ends of the bails down upon the inner surfaces of the vessel, substantially as described.

81. In a machine such as described, the combination of a vertically reciprocating plunger, a series of horizontally sliding jaws co-operating therewith to fold the blank between them, each jaw having a slot to receive a corner flap of the folded blank, two pairs of horizontally reciprocating folding wings or blades co-operating with the opposite sides of the plunger to bend the corner folds of the blank over upon the sides of the vessel after the blank has been folded between the jaws and plunger, mechanism for forming the bail and driving its opposite ends through the sides of the vessel upon the plunger, a pair of vibrating clinching heads mounted within the plunger and provided with eyes to receive the ends of the bail, and a rotary cam and connections for vibrating said clinching heads to effect the clinching, substantially as described.

82. In a machine such as described, the combination of a vertically reciprocating plunger, a series of horizontally reciprocating jaws co-operating therewith to fold the blank between them, folding plates carried by and depending from the jaws at two opposite sides of the plunger, means for bending the corner folds of the blank over these plates and against the sides of the plunger after the blank has been folded between the plunger and jaws, mechanism for forming the bail and driving its opposite ends through the sides of the vessel, and a pair of clinchers within the plunger for bending the ends of the bail down upon the inner surfaces of the vessel, substantially as described.

83. In a machine such as described, the combination of a vertically reciprocating plunger, rectangular in cross section, four horizontally reciprocating jaws co operating with the four corners thereof, each having two operating faces at right angles to each other and a slot for the reception of the corner folds of the blank, means for bending said corner folds over upon the sides of the vessel after the blank has been folded between the plunger and jaws, and mechanism for forming the bail and driving its opposite ends through the sides of the vessel, substantially as described.

84. In a machine such as described, the combination of a vertically reciprocating plunger, rectangular in cross section, four horizontally reciprocating jaws co-operating with the four corners thereof, each jaw having two operating faces at right angles to each other and a slot for the reception of the corner fold of the blank, the slots in the rear jaws being in line with the rear side of the plunger and those in the two front jaws being in line with the front side of the plunger, means for bending the corner folds of the blank over upon the sides of the vessel after the blank has been folded between the plunger and jaws, and mechanism for forming the bail and driving its opposite ends through the sides of the vessel upon the plunger, substantially as described.

85. In a machine such as described, the combination of a vertically reciprocating plunger, rectangular in cross-section, four horizontally reciprocating jaws co-operating with the four corners thereof, each jaw having two operating faces at right angles to each other and a slot for the reception of the corner fold of the blank, the slots in the rear jaws being in line with the rear side of the plunger and those in the two front jaws being in line with the front side of the plunger, folding plates carried by and depending from the jaws upon two opposite sides of the plunger, two pairs of horizontally reciprocating folding wings for bending the corner folds of the blank over these plates and against the sides of the vessel after the blank has been folded between the plunger and jaws, and mechanism for forming the bail and driving its opposite ends through the sides of the vessel upon the plunger, substantially as described.

86. In a machine such as described, the combination, with the vertically reciprocating plunger and the folding and bailing mechanisms co-operating therewith to fold the blank into vessel shape and form and apply the bail, of an air blast supply, a flexible tube leading therefrom to the plunger and communicating with passages therein extending through its bottom, a valve intermediate the air supply and plunger for controlling the admission of air to the plunger, connections with the driving mechanism of the machine for automatically operating said valve to intermittently admit blasts of air to the plunger, and a guide

chute beneath the folding and bailing mechanisms into which the completed vessels are blown from the plunger and nested by the blasts of air, substantially as described.

87. The combination, with the reciprocating plunger and the mechanisms co-operating therewith to fold the vessel and form and apply the bail, of the air-blast pipe A^7 having a flexible connection B^7 with passages in the plunger extending through the bottom thereof, a valve D^7 in said pipe, a lever E^7 connected to the stem of said valve, the lever G^7, the rod F^7 connecting the levers E^7 and G^7, and the rotary cam co-operating with the lever G^7 to operate the valve, substantially as described.

IRA W. HOLLETT.

Witnesses:
JAMES E. CLENNY,
JOHN L. SEFTON.