(No Model.) 4 Sheets—Sheet 1.

D. A. FLAVELL.

MACHINE FOR STAYING THE ANGLES OF PAPER BOXES.

No. 465,845. Patented Dec. 29, 1891.

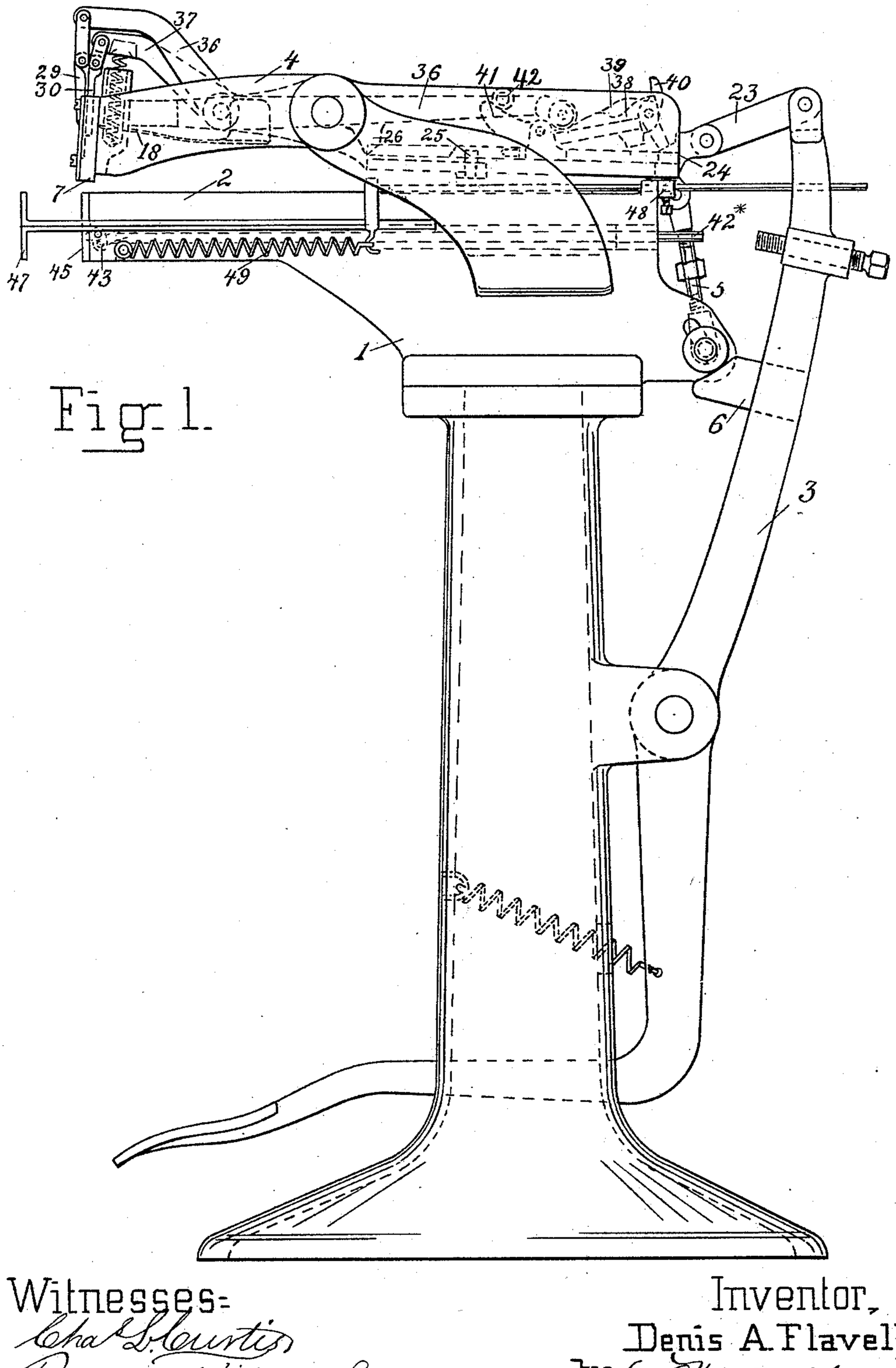

Fig. 1.

Witnesses:
Chas. L. Curtis
Robt. O. Pinkwood.

Inventor,
Denis A. Flavell,
by C. W. Balch Attorney

(No Model.) 4 Sheets—Sheet 2.

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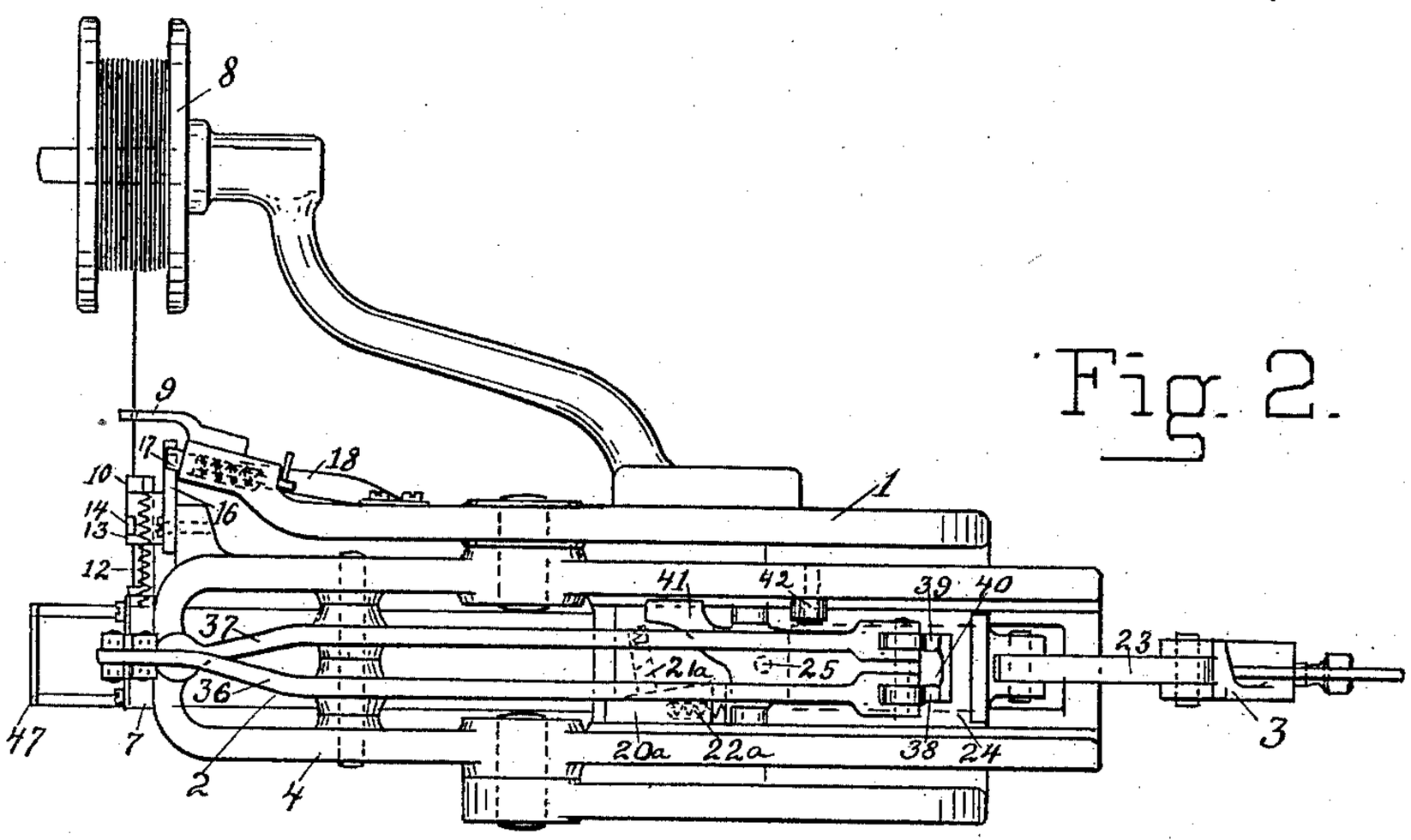

Fig. 2.

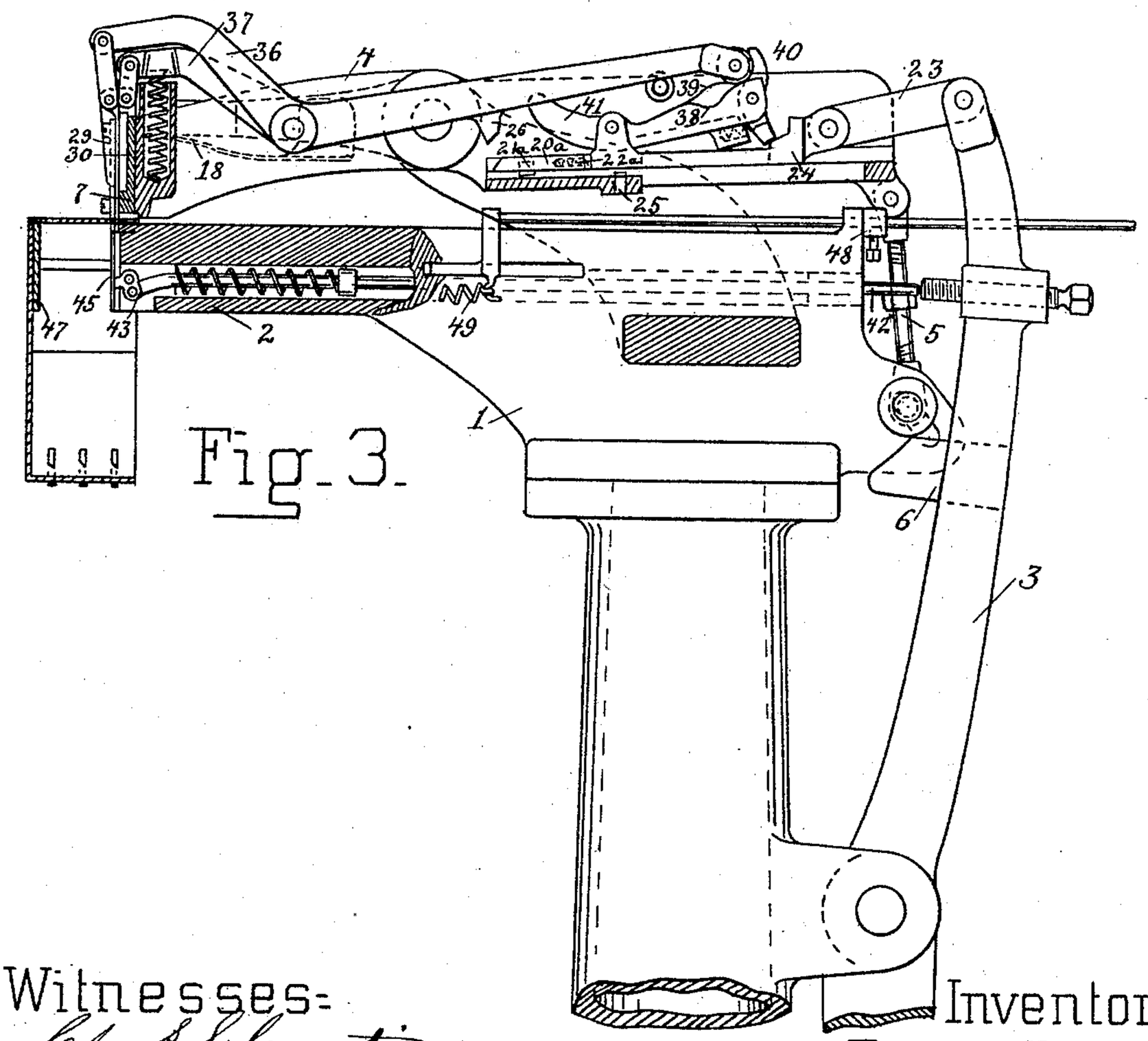

Fig. 3.

Witnesses:
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(No Model.) 4 Sheets—Sheet 3.

D. A. FLAVELL.

MACHINE FOR STAYING THE ANGLES OF PAPER BOXES.

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Fig. 4

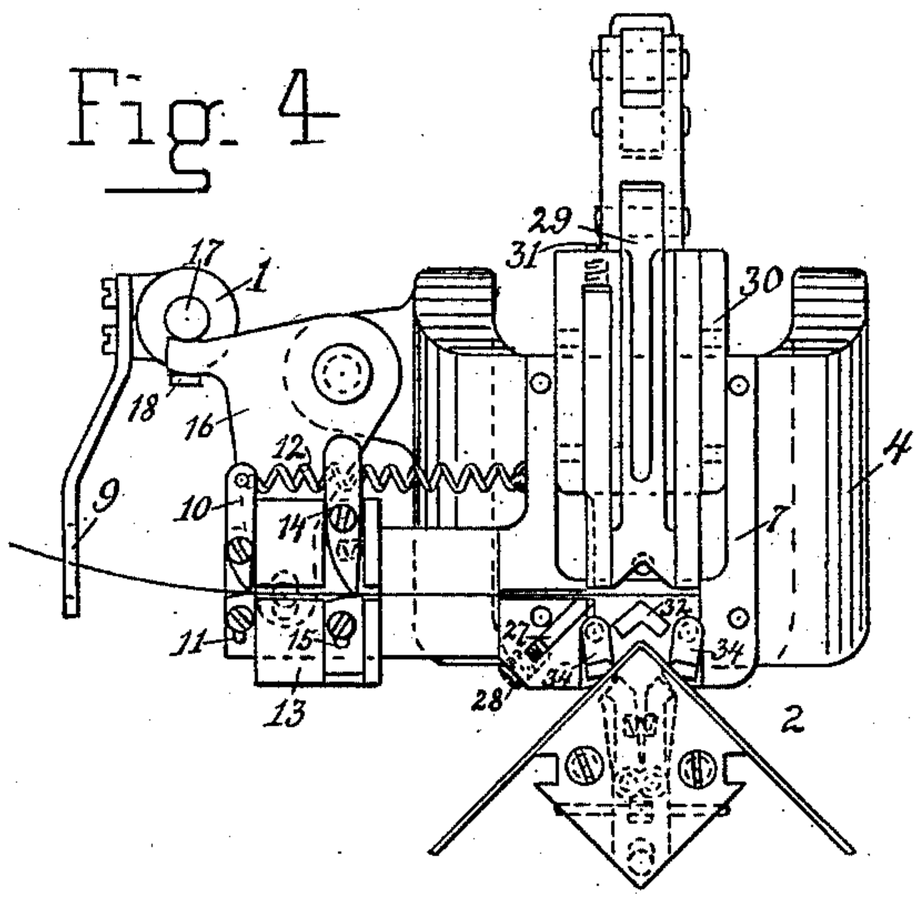


Fig. 5.

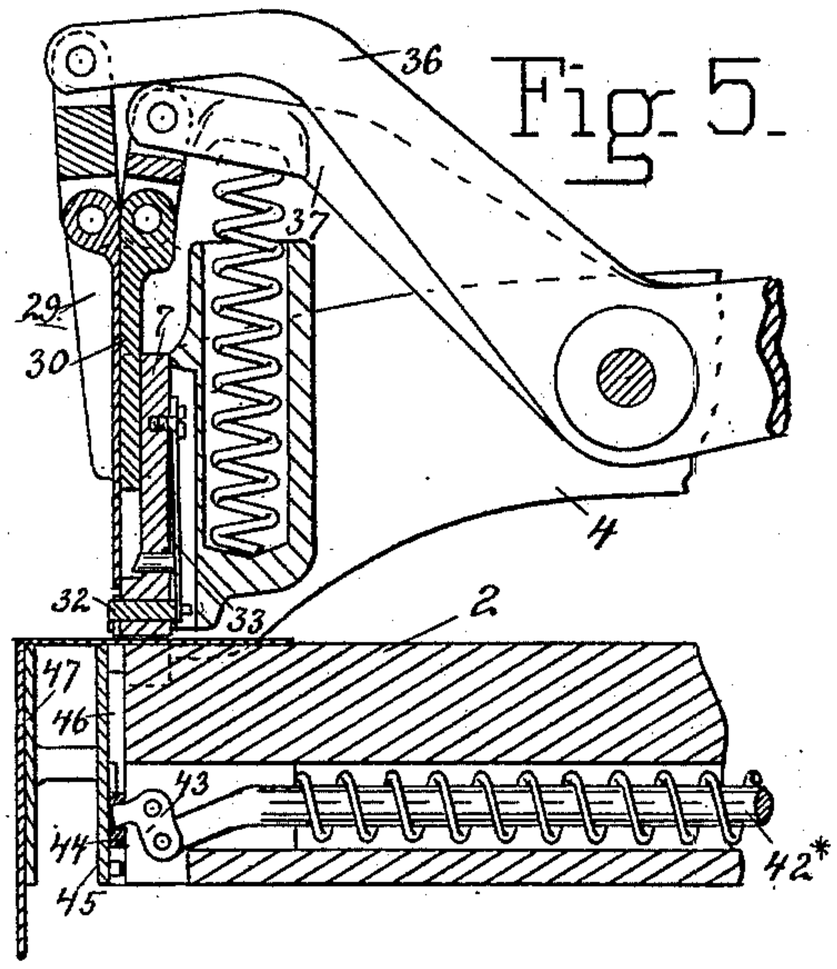


Fig. 6.

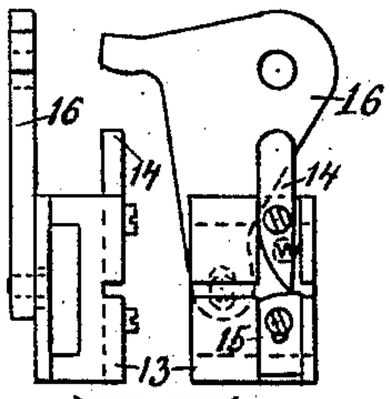


Fig. 7.

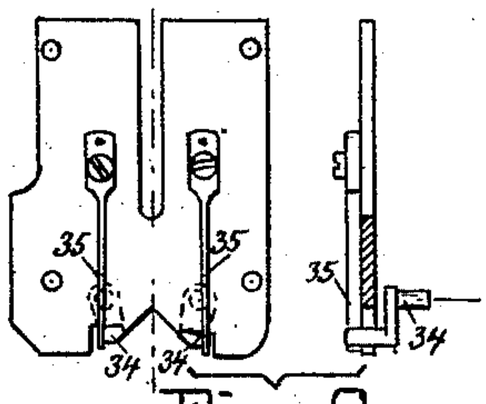


Fig. 8.

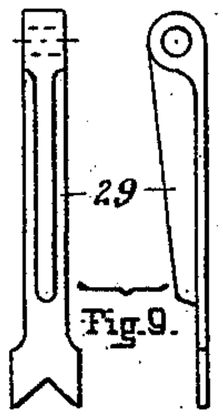


Fig. 9.

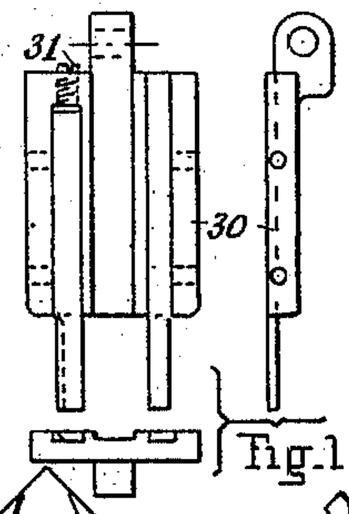


Fig. 10.

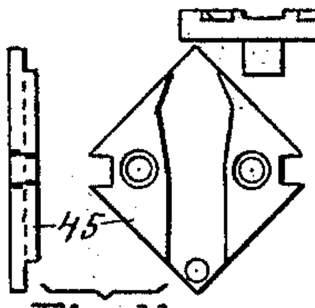


Fig. 11.

Fig. 12.

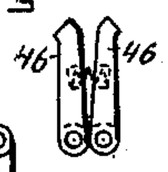


Fig. 13.

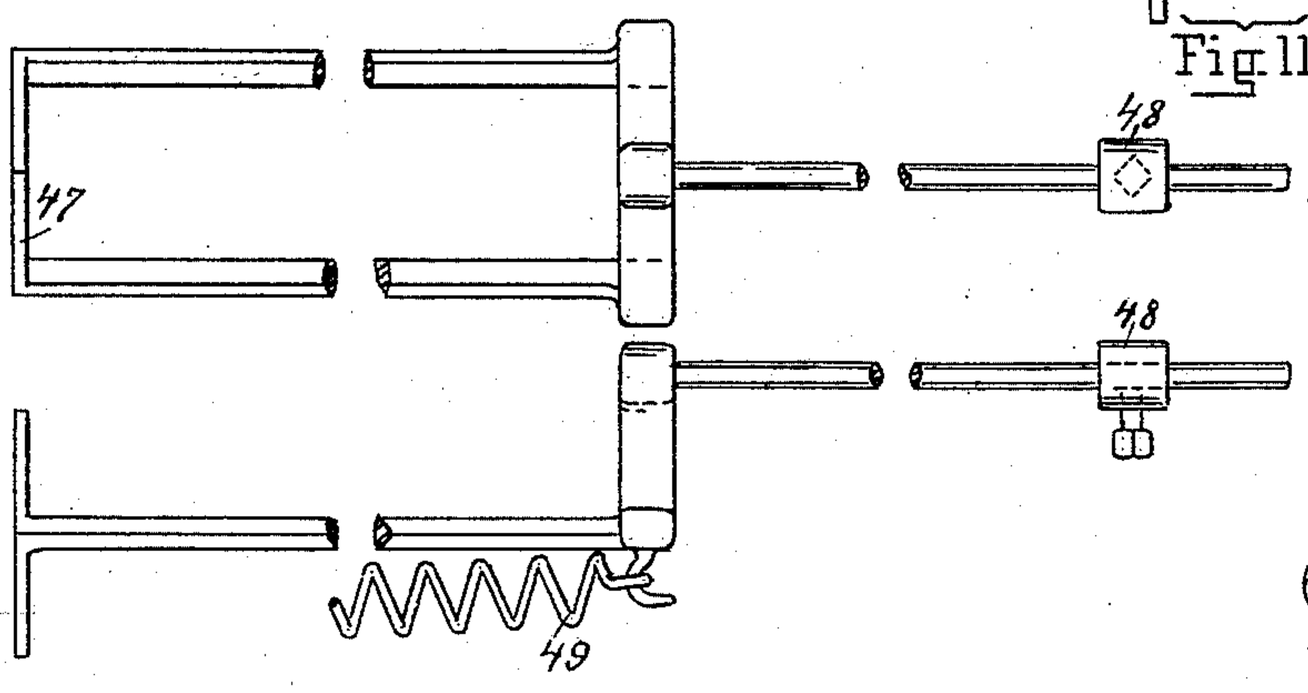
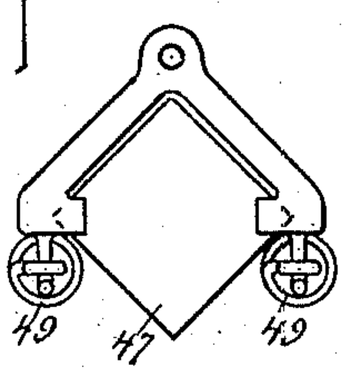


Fig. 14.



Witnesses:
Chas. L. Curtis
Robt. O. Kirkwood.

Inventor,
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(No Model.) 4 Sheets—Sheet 4.

D. A. FLAVELL.

MACHINE FOR STAYING THE ANGLES OF PAPER BOXES.

No. 465,845. Patented Dec. 29, 1891.

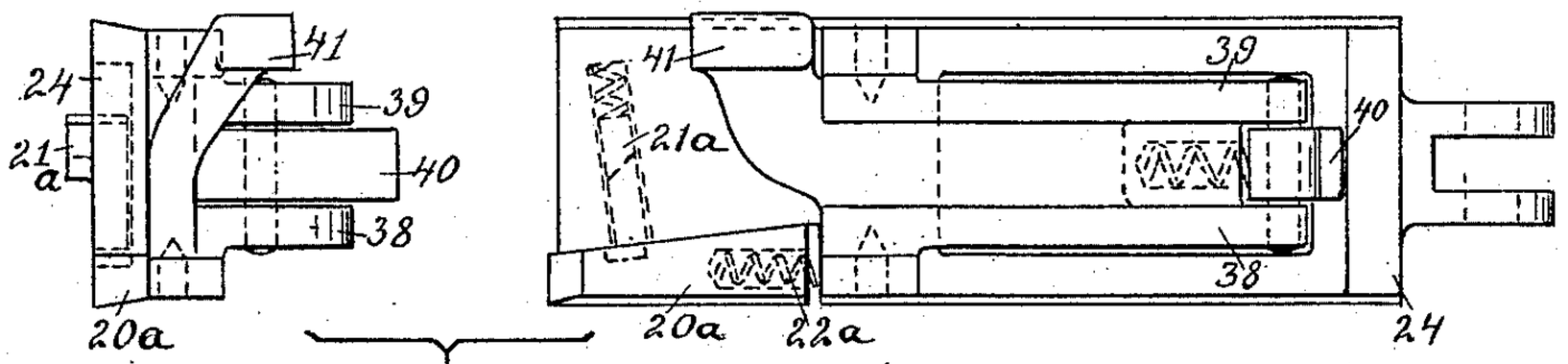
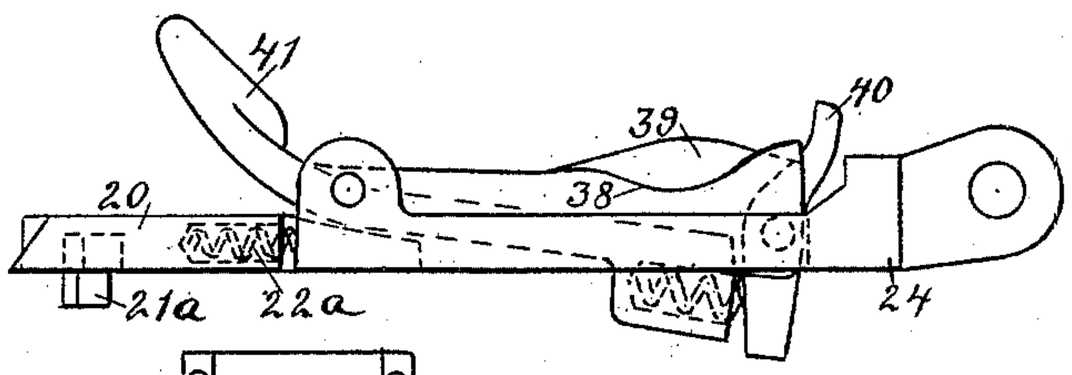


Fig. 15.



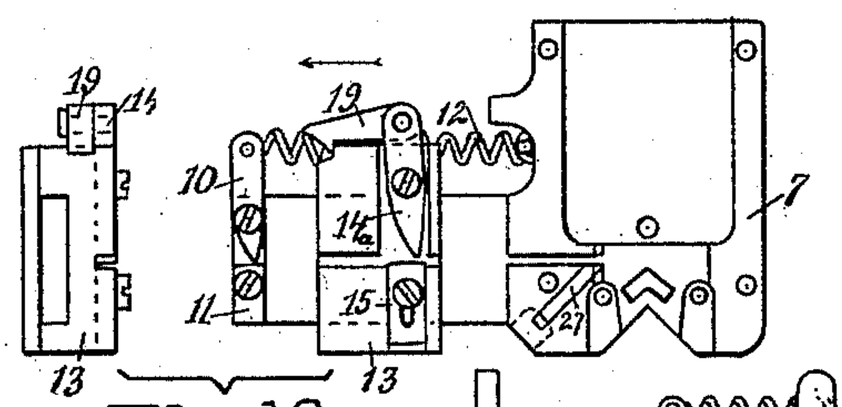


Fig. 16.

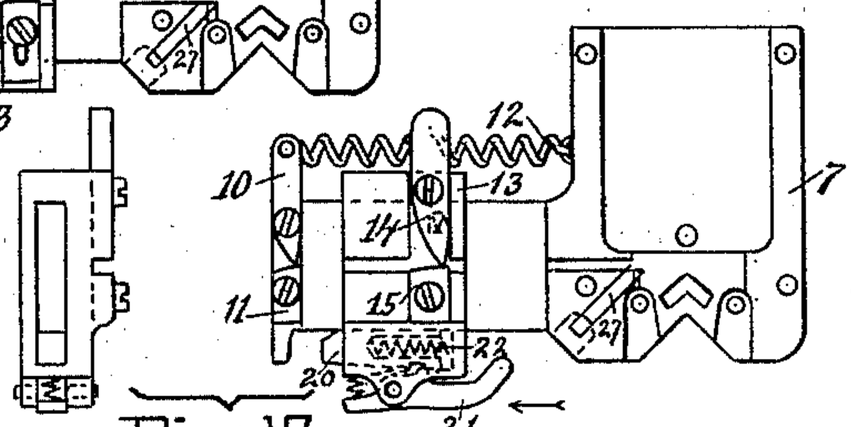


Fig. 17.

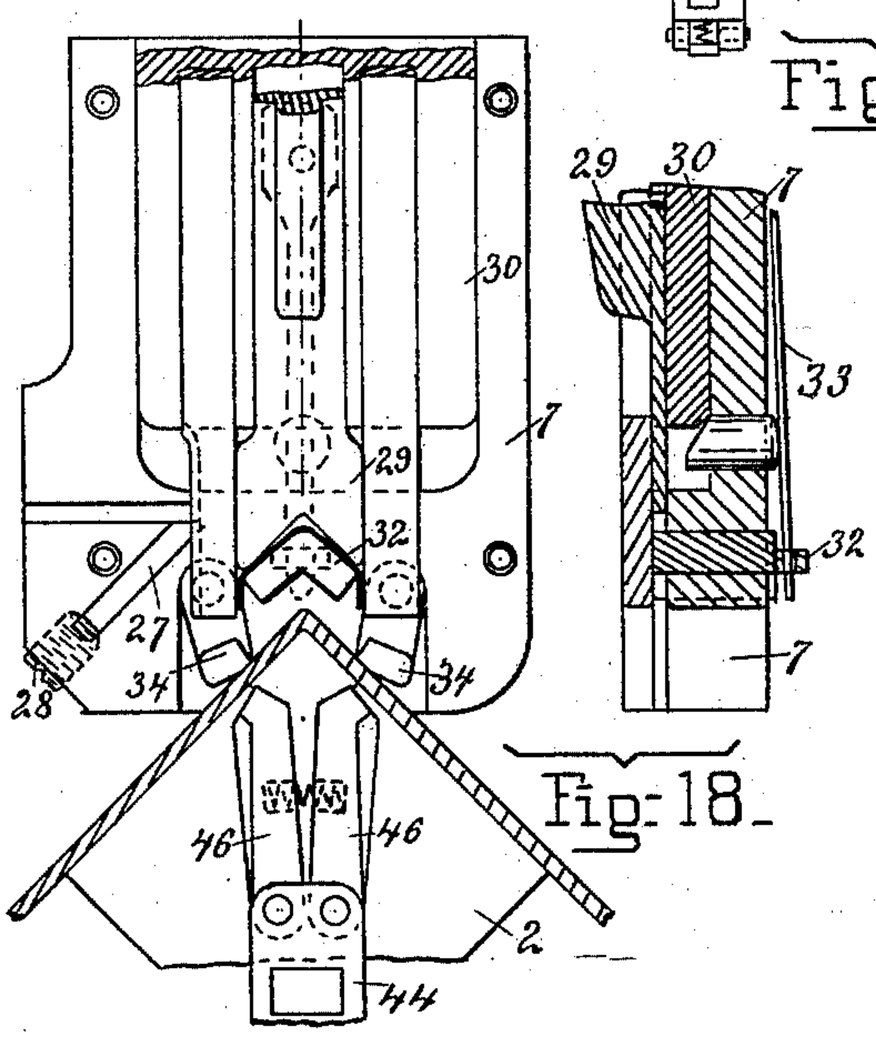


Fig. 18.

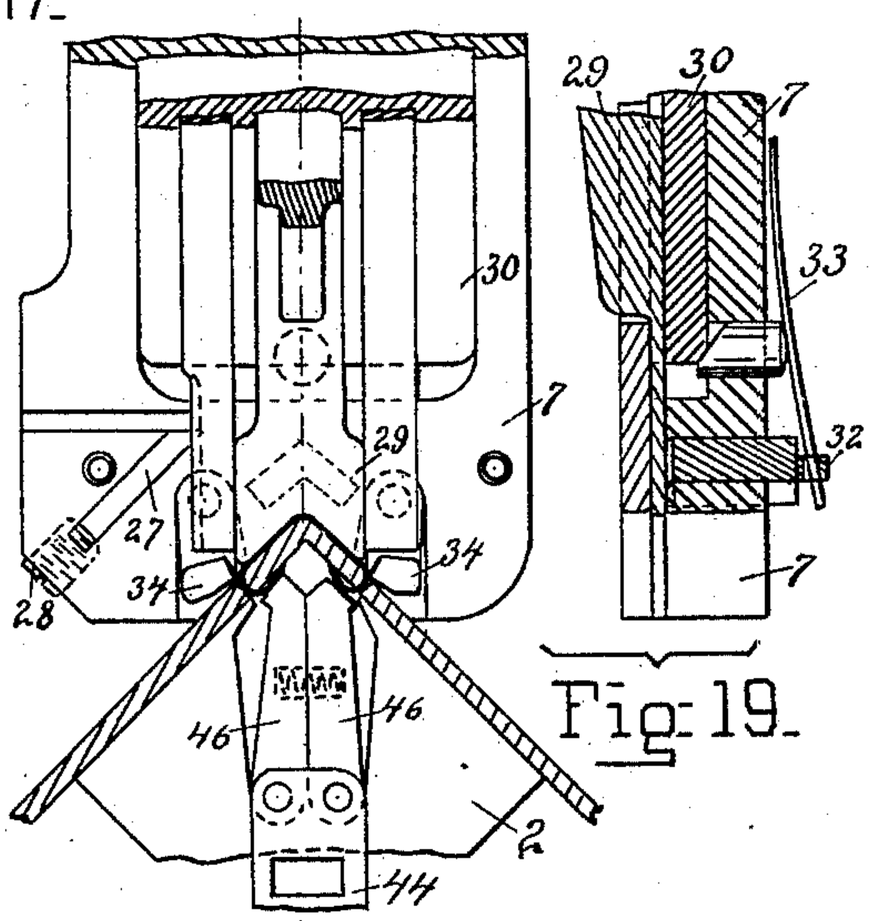


Fig. 19.

Witnesses:
Chas. L. Curtis
Robt. O. Kirkwood.

Inventor,
Denis A. Flavell,
by E. W. Balch Attorney.

UNITED STATES PATENT OFFICE.

DENIS A. FLAVELL, OF NEW YORK, N. Y.

MACHINE FOR STAYING THE ANGLES OF PAPER BOXES.

SPECIFICATION forming part of Letters Patent No. 465,845, dated December 29, 1891.

Application filed March 16, 1891. Serial No. 385,220. (No model.)

To all whom it may concern:

Be it known that I, DENIS A. FLAVELL, a citizen of the United States of America, residing at New York city, State of New York, have invented certain new and useful Improvements in Machines for Staying the Angles of Paper Boxes, of which the following is a specification.

This machine forms and inserts metallic stays in the corners of paper boxes and paper-box covers for the purpose of re-enforcing these corners when formed by the bending of the pasteboard and for the purpose of uniting its edges when they meet at the angle.

My machine consists of mechanism actuated from a main lever with a treadle, by which wire, preferably flattened into a band, is fed from a reel into the machine, formed into an angular stay, inserted into the sides of a pasteboard box meeting to form the corner, and clinched.

My invention introduces improvements simplifying the mechanism and improving the work that it produces. Devices have been added which operate, in connection with the feeding of the wire, to prevent partial vibrations of the main lever from feeding extra wire, and thereby clogging the machine. The necessity for special devices for puncturing the pasteboard for the entrance of the stay is obviated in my construction by placing the cutting-edges oblique to the path of the wire, so that the ends are pointed by the oblique shear and will make a neat puncture in the pasteboard. The forked die in its downward movement cuts off the wire, bends the clinching ends, and retracts the shaping-block after the stay is formed on it. By adapting my machine so that these different functions are performed by the movement of one piece I avoid the necessity for separate cams and connecting mechanism for each function. The dies that form the stay are driven by cams supported by a latch, which is tripped off at the completion of the stroke, so that the cams drop and permit the immediate return of the dies and leave a free space, into which the wire may be feeding during the entire time occupied in the return of the other parts. On this account it becomes possible to operate this feed from the movement of the head on which it is mounted. The clinchers which turn down the ends of the stay on the inside of the angle have an independent lateral movement, whereby an equalizing of the pressure on either side is secured. A wedge in one of the slides prevents the return of the moving parts of the machine in event of the foot being removed from the treadle before the stroke is completed, and a latch holds the wedge from acting during the return after the completion of a full stroke. A sliding gage projects from the end of the horn, on which the box-corners are rested to be stayed, is adjustable in its position, and determines the distance from the bottom at which the stays may be inserted. In connection with this sliding gage a second novel feature is introduced in holding it outward by springs to the position to which it may be set, so that after the bottom of the box is brought lightly in contact with this gage and the first stay inserted a pressure against the box will push back the gage and bring the angle in position for the insertion of other stays.

The combinations of elements hereinafter described and claimed, whereby the above-mentioned novel results are attained, constitute the elements of invention in the within-described machine.

In the accompanying drawings, Figure 1 shows a side elevation of the machine, with the moving parts in their initial position. Fig. 2 is a top view, and Fig. 3 is a vertical section, showing the mechanism in the position reached when the staple is formed and is about to be inserted in the box-corner. Fig. 4 is drawn to a larger scale and shows the front of the machine with the cap removed. Fig. 5 is a central vertical section through the parts shown in the preceding figure. Fig. 6 is a view from beneath of the head in which the stay is formed. Fig. 7 shows the mechanism for feeding the wire. Fig. 8 is the cap removed from the head in Fig. 4, together with the guides for the clinching ends of the stay. Figs. 9 and 10 show, respectively, the forming-die and the forked die guided in the head. Fig. 11 shows the horn-plate, which is recessed for and guides the clincher-block and clinchers shown in Figs. 12 and 13, respectively. Fig. 14 gives three views of the sliding gage. Fig. 15 is the cam-carriage, together with the cams that

operate the forming and the forked dies. Figs. 16 and 17 are modifications of the wire-feed mechanism. The foregoing figures from Figs. 4 to 17 are drawn to a uniform scale. On a still larger scale Fig. 18 shows the position of the parts when the stay is formed, and Fig. 19 shows the same parts in the position occupied after the stay is inserted in the box-corner and while the ends are being clinched.

The main frame 1 of the machine comprises a horn 2, having two upper faces meeting at the center at a right angle for the support of the box-corner, fulcrums for the main lever 3 and for the head-carrying lever 4, a support for the wire-reel, and guides, as will hereinafter more fully appear. A link 5 has its upper end connected with the rear end of the head-carrying lever and at its lower end carries a cam-roll and is guided by a slot in the main frame. A cam 6 on the main lever, acting through the above mechanism, brings the head 7 down on the box-corner supported on the horn and holds it there during the latter portion of the forward movement of the main lever while the stay is driven and the ends are being clinched. Reference to Figs. 1 and 3 will show that this cam is of a form that will act as above indicated. In the first figure the lever is in the initial position, and the cam-roll will be seen to be on the inclined portion of the cam, and in the other, in which the lever is shown moved forward to the point of driving the stay, the roller will be seen to have reached the top of the incline on the cam.

Having introduced those elements which are concerned in a general way with the various operations, I shall arrange my further detailed description in the order with which these operations take place and describe in succession the mechanism that feeds the wire, shears off the sections, guides the points as they are pushed through the pasteboard, and clinches the ends of the stay.

Wire-feed mechanism.—The wire is flattened, so that it will bend more easily in the desired plane and will form into a stay that can be embedded even with the surface of the pasteboard. From the reel 8, Fig. 2, which is supported from the frame and carries this wire, it passes through a vertical slot in the guide 9, also supported from the frame, to the wire-feed mechanism, supported from the head 7. At the outer end of a guide projecting from this head, Fig. 4, is a pawl 10, between which and the vertically-adjustable block 11 the wire passes. This pawl under the action of the spring 12 serves as a detent, which, while permitting the wire to be drawn forward past it, prevents its return. On the guide, projecting from the head, is a slide 13, (shown separately in Fig. 7,) that carries a similar pawl 14 and adjustable block 15, by which the wire is gripped and drawn forward when the slide is moved toward the head, but which slips over the wire when the slide is moved in the other direction. A bent lever 16, fulcrumed to the head-carrying lever, has one arm engaging the slide 13 at the back and the other arm engaging between a pin 17 and spring 18 on the frame. As the head-carrying lever rises, carrying with it this bent lever and slide, the latter will be vibrated toward the head and feed in the length of wire required for a stay. When my machine is in practical use, the treadle is frequently liable to accidental movement, not sufficient to cut off and form a stay, but which, if the wire-feed mechanism were limited to the elements thus far described, would cause a short length of wire to be fed into the head where the stay is formed, and this, together with the full length fed when a full vibration is made, would cause more wire to be fed than the head would admit and produce kinks that would clog the machine. This objectionable action may be prevented by employing the mechanism shown either in Fig. 16 or in Fig. 17. In the former mechanism, when the slide is at the end of its guide, adjoining the head, a sufficient length of wire will be under the dies ready to be cut off and formed into a stay on the next stroke of the machine and the main lever with its treadle will be in its initial position. A stop, which I have shown projecting from the head, strikes the upper end of the pawl 14ª and loosens its grip on the wire. This pawl is held from again gripping the wire during the return of the slide by a latch 19, so that if the mechanism should be moved from the initial position less than a full stroke additional wire will not be fed. When, however, a full stroke is made and the slide vibrated to the end of its guide away from the head, the latch is cammed off from the corner on which it engages and the pawl is free to grip and feed the wire. By letting this latch strike the pawl 10 at this end of the stroke its hold on the wire is loosened before the feeding begins. The mechanism shown in Fig. 17 attains the same advantages by throwing in and out a clamp between the slide and its guide instead of between the slide and the wire, as in the above-described contrivance. A wedge 20 lies between the slide and guide, and a latch 21 serves to hold this wedge out of action during the forward movement of the slide in feeding the wire. On reaching the end of the forward movement this latch is lifted out through contact with a stop on the head and the wedge is freed, so that it will be driven by a spring 22. When thus released, the slide can return, as the traction of the guide against the side of the wedge tends to withdraw it; but movement in a contrary direction cannot take place, as the traction would then tighten the grip of the wedge. On the return of the slide to the end of its movement the wedge meets a stop, which drives it until it is again locked out of action by the latch and a forward movement can again take place. Both of the above constructions for preventing partial vibrations of the machine from feeding extra wire have

been introduced as modifications, because neither is required in connection with the brake which prevents partial vibrations of the whole machine, as described hereinafter, and thereby also prevents the feeding of extra wire. It is further to be noted that in their modification of the action of the wire-feed all three methods not only attain the same result, but employ elements either identical or equivalent and interchangeable between the several modifications by suitably changing the proportions. The pawl 14ª could therefore replace the wedge 20 as a clamp between the slide and its guide and be latched out of action in the same manner. Likewise the wedge could be used in place of the pawl to grip and carry the wire. When the equivalent character of these elements is noted, it will be seen that both modifications embody substantially the same invention. In either case a wedge or pawl is in action during the movement of the wire-feed slide in one direction and latched out of action during the movement in the contrary direction, the latching and unlatching being effected by stops against which the wedge or pawl is brought at one end of the vibration and against which the latch is released at the other end of the vibration. This feature I believe to be broadly new in combination with mechanism for cutting off and forming metallic stays, and therefore desire Letters Patent therefor, as hereinafter claimed.

Stay-forming mechanism.—The wire passes into the head through a groove in the side. At the inner end of this groove it passes over a knife-block 27 and under the dies, which shear it off, form it into a stay, and drive it through the box-corner. This knife-block is set in an oblique groove in the head and may be set up when the cutting-edge has been reground by the screw 28. The edge against which the shearing is done aligns obliquely across the path of the wire. The two dies above mentioned reciprocate in the same direction and perpendicularly across the direction in which the wire is fed. They are shown separately in Figs. 9 and 10. The former figure illustrates the forming-die 29. This die is notched to give the central bend to the stay. It is ribbed for strength, and provision is made at its upper end for the attachment of a link, through which it is driven. The forked die 30 is shown in Fig. 10. The outer edge of one of its prongs is beveled, so as to produce an oblique cutting-edge at its end, that will co-operate as a shear with the oblique cutting-edge of the knife-block and shear the ends of the stay at an angle, thus rendering them pointed and adapted to pierce the pasteboard. As the lower end of this prong requires grinding to renew the cutting-edge, a screw 31 is provided to adjust it downward and to take the thrust produced while the wire is being sheared. A shaping-block 32 underneath the wire and about which the stay is formed projects from a hole in the head, into which it can be retracted. The two dies move down in such relative time that the forked die first cuts off the wire for the stay. Next the forming-die presses this cut piece against the shaping-block and makes the central bend. These operations take place, as above described, when the two dies are driven down together. Having bent the wire over the shaping-block, the forming-die rests in its downward movement, clamping the bent wire on this block, while the forked die continues and bends the clinching ends parallel to each other. The central angle of the shaping-block is made obtuse instead of at a right angle, so that sharper angles may be given to the clinching ends when they are bent parallel past this block, as they must be bent sufficiently to insure their continuing to bend at the same point when they are clinched after passing through the box-corner. This shaping-block is attached to and held forward by a flat spring 33, which lies in a space between the head and head-carrying lever. A block rests against this spring and has a front beveled end in position to be cammed back by the forked die. As this die continues to descend after bending down the clinching ends of the stay, it cams back, this block pushing back the spring and retracting the shaping-block. The forming-die next resumes its motion downward and drives the stay past the end of the shaping-block into the box-corner. As the stay descends, guides 34 34 cam the clinching ends toward each other, so that they will enter the pasteboard at the proper distance from the angle. These guides are so mounted that they can yield laterally against springs 35 35 to permit the passage of the body of the stay, and these springs are sufficiently rigid to keep the guides from yielding while they are imparting additional bend to the clinching ends.

Mechanism for driving the dies.—Levers 36 and 37, fulcrumed in the head-carrying lever, are linked to the forming and forked dies. Cams 38 and 39, mounted in a carriage 24, impart the required motion to the dies through the levers. These cams are hinged to the carriage and supported in their operating position by a latch 40 during the forward motion of the carriage. As this carriage reaches the forward end of its stroke, the latch is tripped off by striking the end of one of the levers and the cams drop and permit the return of the dies to their upper position, so that wire may be fed in the head. The two cams are framed together in one casting, and this casting is extended past the hinge to support a third cam 41. As the carriage returns this cam passes under a roller 42, fixed to the head-carrying lever, and the cams 37 and 38 are thus lifted, so that the latch can again support them in their operative position. Fig. 3 shows these cams in their operative position occupied during the forward movement of the carriage, and Fig.

15 shows them as they are unlatched and dropped during the return movement.

Clinching mechanism.—When the upper end of the main lever has rocked forward sufficiently to form and insert the stay, as already described, a screw on it strikes the end of the rod 42*, by which motion is transmitted to the clinching mechanism. The forward end of this rod is connected to an angle-lever 43, engaging the clincher-block 44, sliding vertically in the horn-plate 45. The clinchers 46 46 are hinged to the clincher-block and guided by the sides of the recess in the horn-plate, against which they are held by spring-pressure. These clinchers as thus guided can yield independently toward the center to adapt to any inequality in the work such as would arise from an unequal thickness of pasteboard on the two sides of the angle.

Brake to prevent partial vibrations of the mechanism.—As the slide 13 derives its motion primarily from the main lever 3, it is obvious that a wedge and latch operating, as above described, in connection with Fig. 17 will attain the same end if arranged in combination with a slide coupled with this lever. A link 23 thus couples the sliding carriage 24 to this lever, and by reference to Figs. 2 and 15 the wedge 20^a between this carriage and its guide, its spring 22^a, and latch 21^a will be seen to control the motion of this carriage, as above described, in connection with the motion of the wire-feed slide. In adapting the wedge and latch to this carriage I use the pin 25, Fig. 3, to cam out the latch and a projection 26 on one of the cam-levers, which drops down in place at the completion of the stroke to drive back the wedge. By applying the above mechanism to the sliding carriage the feeding of unnecessary wire is equally well prevented as when applied to the wire-feed slide, and in addition the return of any and all of the moving parts is prevented after they have been started until a complete stroke has been made. This carriage and its guides are more substantial than those of the wire-feed mechanism, and the application of the wedge here is the construction which I prefer for my machines.

The sliding gage.—A plate 47, provided with guides that slide in parallel grooves in the horn, serves as an extension to it for supporting and guiding deep boxes. A yoke connected to the ends of the guides carries a rod which passes through an eye on the frame, and a collar 48 may be adjustably clamped on this rod to determine the forward position of the above-mentioned plate 47 when it is used as a gage for positioning the angles of the boxes on the horn. By holding the plate forward to its adjusted position by springs 49 it serves to determine the position of the stay which is to be inserted farthest from the bottom of the box, and at the same time will not be an obstacle to the insertion of additional stays along the corner, but will yield when pressed against and return by spring to its gage position when the pressure is removed.

I claim as new and desire to secure by Letter Patent—

1. The combination, with the cutting-off and stay-forming mechanism of a machine for staying the angles of paper boxes, of a detent constructed to prevent a return movement of the wire, a slide, mechanism on said slide, substantially as described, for gripping and feeding the wire, a wedge, means, substantially as described, for reciprocating said wedge in unison with said slide, a latch to restrain said wedge from action, and a frame-work supporting said detent, guiding said slide, and carrying stops to release said latch and to loosen said wedge, substantially as and for the purpose set forth.

2. The combination, with the cutting-off and stay-forming mechanism of a machine for staying the angles of paper boxes, of a detent constructed to prevent a return movement of the wire, a slide, mechanism on said slide, substantially as described, for gripping and feeding the wire, a wedge, a main lever connected with said wedge and slide, so as to vibrate them in unison, a latch constructed to restrain said wedge from action, and a frame-work supporting said detent, guiding said slide, supporting said lever, and carrying stops to release said latch and to loosen said wedge, substantially as and for the purpose set forth.

3. In a machine for forming and inserting metallic stays in the angles of paper boxes, wire-feed mechanism, substantially as specified, a knife-block having its cutting-edge aligned obliquely across the path of the wire, a shear having an oblique cutting-edge to cooperate with said knife-block, dies for forming and driving the stay, a shaping-block, a horn adapted to support a paper-box corner, actuating mechanism for said wire-feed mechanism, shear and dies, substantially as specified, and a supporting frame-work, combined substantially as and for the purpose set forth.

4. In a machine for forming and inserting metallic stays in the angles of paper boxes, a knife-block having its cutting-edge aligned across the path of the wire, a forming-die constructed to drive the stay, a retractible shaping-block, a forked die constructed to co-operate with said knife-block to bend the clinching ends and retract said shaping-block, a horn adapted to support a paper-box corner, actuating mechanism for said dies, substantially as specified, and a supporting frame-work, combined substantially as and for the purpose set forth.

5. The combination, with dies and a shaping-block adapted to form a metallic stay, of cams actuating said dies, a carriage carrying said cams, a latch for the support of said cams, means, substantially as specified, for unlatching and dropping said cams, mechanism, substantially as described, for moving said carriage and feeding wire under said

dies, and a frame-work for the support of these parts, substantially as and for the purpose set forth.

6. In a machine for staying the angles of paper boxes, a head guiding a metallic stay, a die guided in this head to drive said stay, a horn adapted to support a paper-box corner, clinchers guided from said horn, a spring pressing these clinchers against their guides, said guides and spring being so disposed relative to said clinchers that they can yield independently toward the center, mechanism, substantially as described, to drive said die and clinchers, and a supporting frame-work, combined substantially as and for the purpose set forth.

7. In a machine for staying the angles of paper boxes, a main lever, a carriage connected thereto, a wedge between said carriage and its guide, a latch in connection with said carriage, constructed to restrain said wedge from action, and a frame-work guiding said carriage and carrying stops to release said latch and to loosen said wedge, combined for the purpose specified.

8. The combination, with the cutting-off and stay-forming mechanism of a machine for staying the angles of paper boxes, of a horn adapted to support a paper-box corner, a plate provided with guides supported from said horn, and means, substantially as described, for adjusting this plate in front of the horn, for the purpose specified.

9. The combination, with the cutting-off and stay-forming mechanism of a machine for staying the angles of paper boxes, of a horn adapted to support a paper-box corner, a plate provided with guides supported from said horn, springs to draw said plate with its guides forward from said horn, and means, substantially as described, for limiting said forward movement, for the purpose specified.

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

DENIS A. FLAVELL.

Witnesses:
CHAS. L. CURTIS,
ROBT. O. KIRKWOOD.