(No Model.) 4 Sheets—Sheet 1.

D. A. FLAVELL.

PAMPHLET STAPLING MACHINE.

No. 516,156. Patented Mar. 6, 1894.

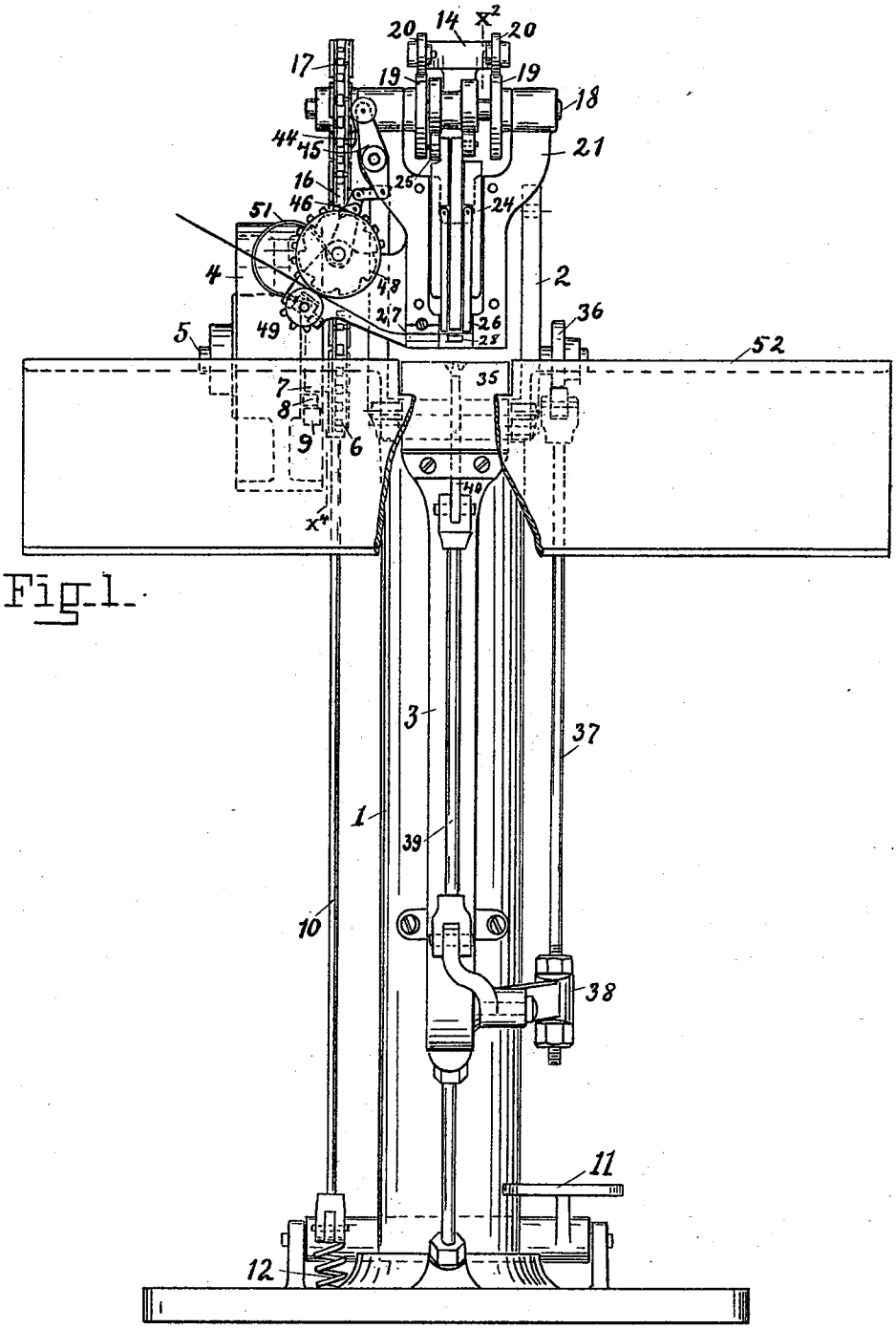

Fig. 1.

Witnesses=

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Ben L. Finkle

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Denis A. Flavell,

by S. W. Balch

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THE NATIONAL LITHOGRAPHING COMPANY,
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D. A. FLAVELL.

PAMPHLET STAPLING MACHINE.

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Fig. 2.

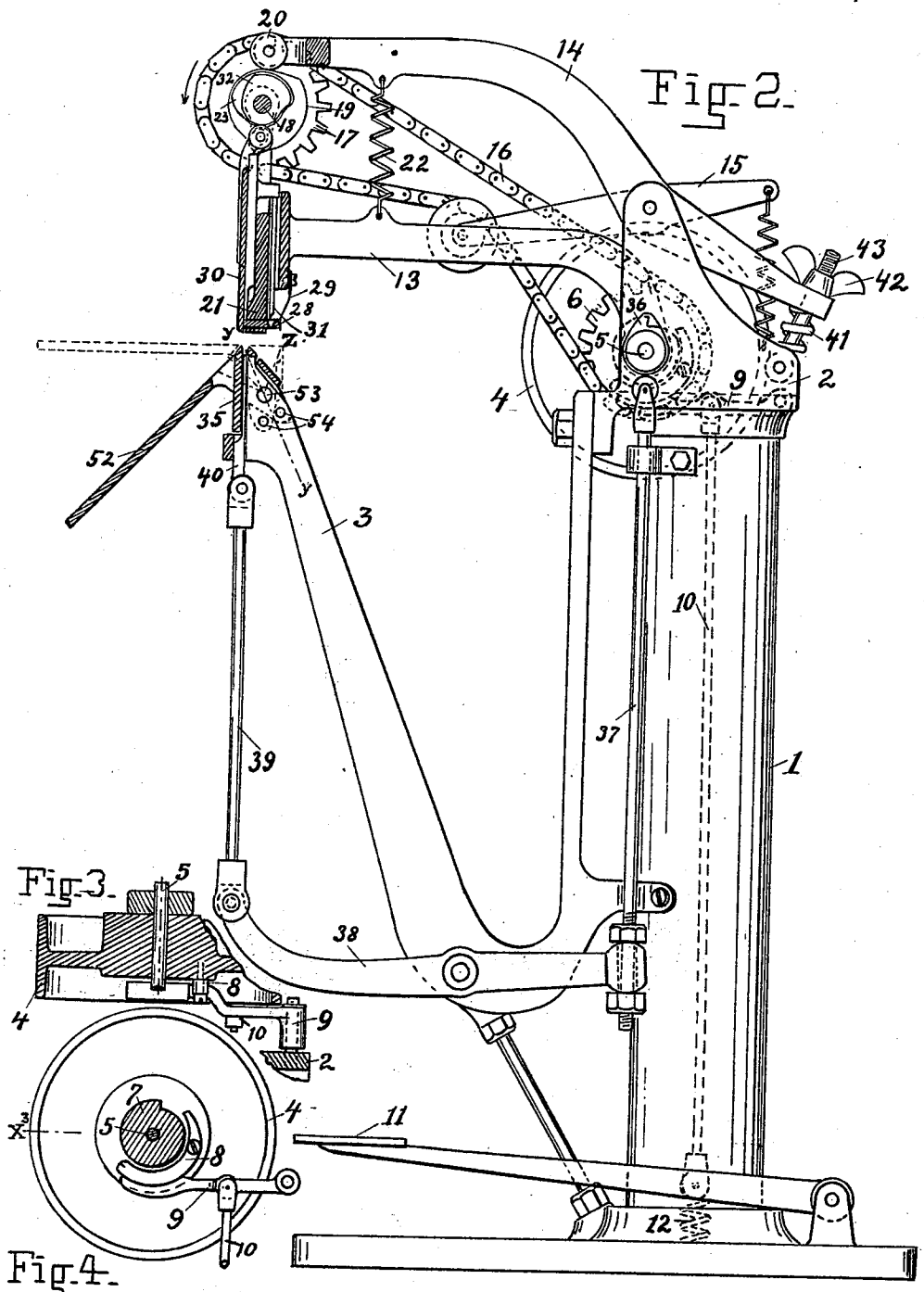

Fig. 3.

Fig. 4.

Witnesses:

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D. A. FLAVELL.

PAMPHLET STAPLING MACHINE.

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Fig. 5.

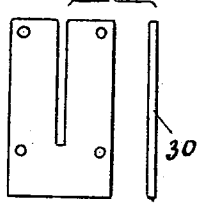


Fig. 6.

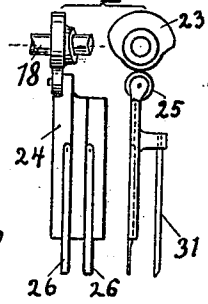


Fig. 7.

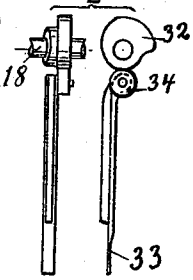


Fig. 8.

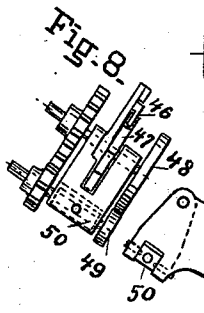


Fig. 9.

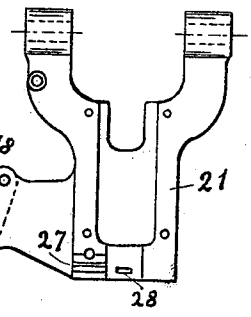


Fig. 10.

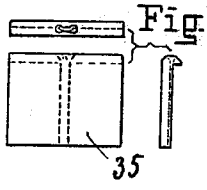


Fig. 11.

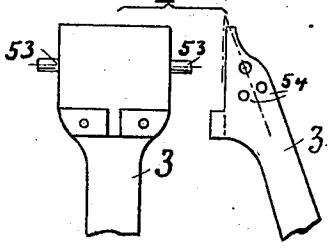


Fig. 12.

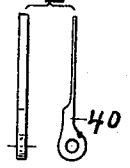


Fig. 13.

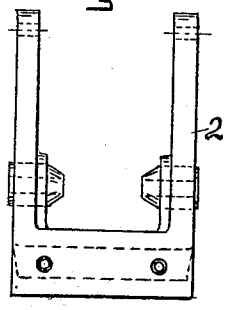


Fig. 14.

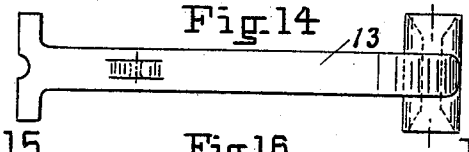


Fig. 15.

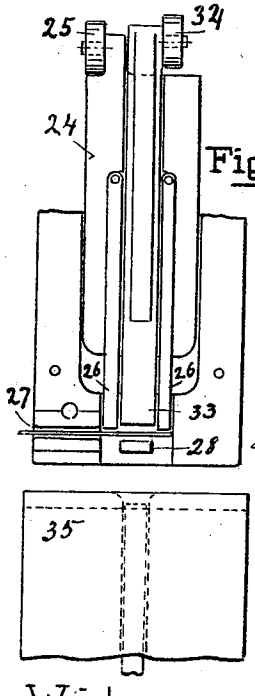


Fig. 16.

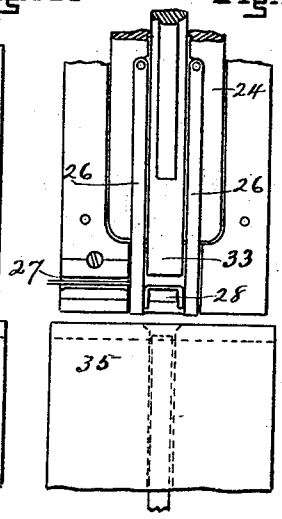


Fig. 17.

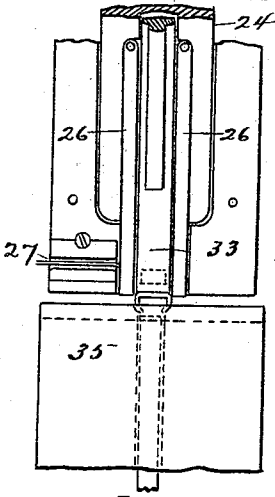
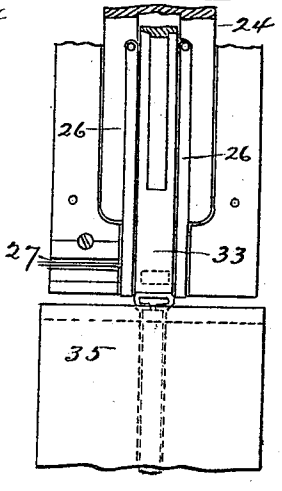


Fig. 18.



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D. A. FLAVELL.

PAMPHLET STAPLING MACHINE.

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Fig. 19.

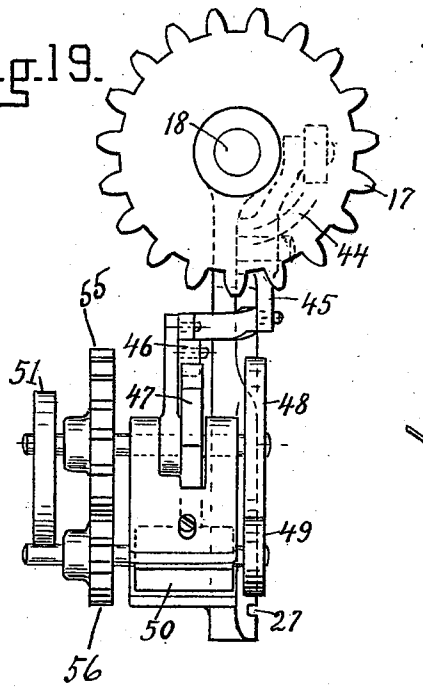
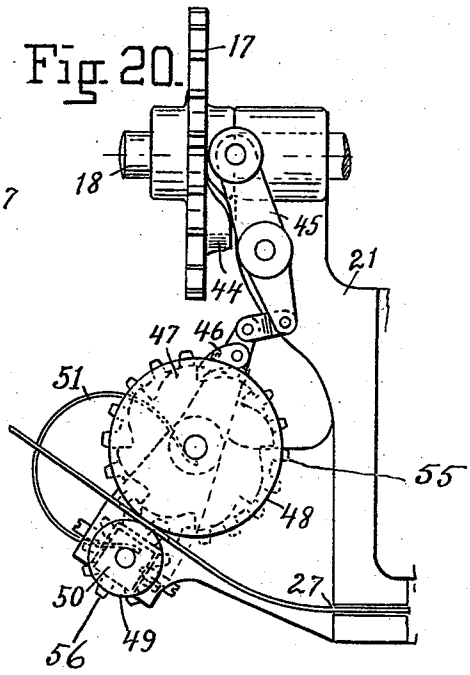


Fig. 20.



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THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

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PAMPHLET-STAPLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 516,156, dated March 6, 1894.

Application filed February 10, 1893. Serial No. 461,747. (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 in the city, county, and State of New York, have invented certain new and useful Improvements in Pamphlet-Stapling Machines, of which the following is a specification.

This machine forms and inserts wire stitches or staples through the leaves of pamphlets or books for the purpose of securing them together.

It consists of mechanism actuated by power applied to a pulley, by which wire, preferably flattened into a band, is fed into the machine, formed into a **U** shaped staple, inserted through the sheets to be fastened together and clinched.

My invention consists in various improvements in this class of mechanism, which contribute to the simplicity of construction, facility of operation, ease of adjustment to varying conditions, and to the quality of the work, as will be hereinafter specifically pointed out and claimed.

In the accompanying drawings, Figure 1 shows a front elevation of the machine, in which the cap is removed from the head so as to show the staple forming mechanism. Fig. 2 is a side elevation with certain parts in section along the line x^2. Figs. 3 and 4 show the clutch mechanism; the former being a horizontal section through the pulley along the line x^3, and the latter a vertical section along the line x^4 taken through the hub on the sprocket wheel. Fig. 5 shows a side and edge view of the cap removed from the head in Fig. 1. Fig. 6 shows a side and edge view of the forked die and its actuating cam by which the wire is cut off and the ends are bent down. Fig. 7 shows similar views of the punch together with its cam by which the staple is driven through the leaves which are to be connected. Fig. 8 shows a side view of the wire-feed mechanism. Fig. 9 is a front view of the head in which the staple forming and driving mechanism is supported and guided. Fig. 10 shows top, front and edge views of the horn-cap. This is attached to the horn of the machine and guides the clinching punch. Fig. 11 shows front and side views of the end of the horn. Fig. 12 shows front and side views of the clinching punch. Fig. 13 is a front view of the frame on top of the column of the machine. Fig. 14 is a top view of the arm carrying the head. Figs. 15 to 18, which are drawn to double the scale of the preceding figures, show the successive positions taken by the parts which form, drive, and clinch the staple. Fig. 19 is an enlarged side view of the wire-feed mechanism. Fig. 20 is a front view of the same.

The driving mechanism.—The main frame or stationary part of my machine consists of a column 1, to which are attached a frame 2 and a horn 3. The driving pulley 4 runs loose on the shaft 5 which is journaled in the frame. A sprocket wheel 6 is made fast to this shaft. This wheel has a hub 7 which is notched as shown in Fig. 4. A pawl 8 is pivoted to the hub of the pulley, and engages with the notch in the hub of the sprocket wheel. This pawl is so balanced that it will be thrown into engagement with the hub of the sprocket wheel by centrifugal force when the wheel is revolving at its full speed. The pawl is restrained from engaging with the notch in the sprocket wheel hub, except when the machine is to be operated, by a clutch arm 9. This is connected by a rod 10 with a treadle 11. These are held up by a spring 12. When the treadle is depressed, it pulls down the clutch arm and leaves the heavy end of the pawl free to be thrown out by centrifugal force when the notch is reached and effect the engagement of the clutch. If the power is not under full headway the centrifugal force will not be sufficient to throw the clutch, and the imperfect action of the staple forming and ejecting mechanism is thereby guarded against. To the frame 2, are hinged an arm 13, lever 14, and chain tightener 15. The sprocket wheel 6 drives, by means of a chain 16, a second sprocket wheel 17 which is mounted on the shaft 18 journaled in the head. These sprocket wheels have the same number of teeth in each, so that the shafts on which they are fastened and the cams thereon will revolve synchronously. Five independent movements are derived from the cams on these two shafts. I will describe them in the order in which they take place in the revolution of the shafts from the ini-

tial positions in which they are shown in Figs. 1, 2, 4, 6 and 7.

First, there is a pair of cams 19 19 which abut against rolls 20 20 on the lever 14. These serve to force down the head 21 with all its contained mechanism and to grip the work which is placed between it and the horn 3. The head it will be noticed is on the end of the arm 13, which is normally held up by the spring 22.

Second, a cam 23 imparts a vertical movement to the forked die. This die consists of a block 24 bearing a cam roll at its upper end and two hardened steel blades 26 26 which project downward from it. The head is recessed as a guide to this die. The lower end of this recess is of a depth equal to the width of the wire—that is, about one thirty-second of an inch, and the blades are thinned at their lower ends so as to lie flush in this section. The wire is led horizontally into this portion of the recess through a groove 27. Above the wire, the recess in the head is made deeper and wider to admit the block. The grooves in the block for the blades are made deeper than the recess in which the staple is formed so that the parts of the blades which lie in these can be thicker and stronger. A shaping block 28 projects through an opening in the head below the wire into the recess, and is pressed by a spring 29 against the cap 30 which is screwed to the head and incloses the mechanism. This shaping block is rectangular in form. As the forked die descends, the blade at the left first shears off the wire and then both blades contact with the ends of the wire and bend them over the shaping block as shown in Fig. 16. Just before the forked die reaches the bottom of its stroke, a rod 31, attached to a projection on the back of this die, and beveled at its lower end, engages the edge of an opening in the shaping block and retracts it from the recess where it serves as a former about which the wire is shaped.

Third, a cam 32 imparts a vertical movement to the punch 33. This punch lies between the blades of the forked die and carries a cam roll 34 at its upper end. I make the punch of one piece of metal. It is thinned at its lower end where it enters the narrow recess in which the staple is formed, but where it lies in the block 24 it is thicker and stronger, and is further strengthened by a rib on its front side. The cap 30 is notched as shown in order to clear this rib. The punch in descending ejects the staple from the head and forces its ends through the leaves of the pamphlet placed under it to be stitched. By organizing the head as above described, the power which forces it down is applied directly above it and not through the agency of a lever, and all the movements including its motion as a whole as well as the independent movements of its parts are derived from cams on a single shaft. On passing through the work, the ends of the staple enter two conical holes in the top of the horn-cap 35. The centers of these holes are nearer together than the ends of the staple, but they flare sufficiently to engage the ends. The holes are connected by a slot which is continued as a groove to the lower edge of the horn-plate. When the staple is driven down by the punch, its ends are deflected toward each other by the sides of the conical holes sufficiently to project them into this groove as shown in Fig. 17. The sides of these conical holes deflect the ends much better than simple inclined edges to the slot, for the flare in all directions enables the ends of the staple to enter with more certainty, and they are returned into the plane of the staple if they become shifted sidewise in passing through the work.

Fourth, a cam 36 on the shaft 5 acting through the rod 37, lever 38 and rod 39, lifts the clinching punch 40, and sets up the ends of the staple as shown in Fig. 18. The upper portion of the groove in which this is guided lies in the horn-cap, and the lower portion lies in the horn. The groove in the horn is deeper so that the lower end of the clinching punch, which is withdrawn from the groove and adjoining which the driving rod 39 is hinged, may be of sufficient strength. When the clinching punch is driven up, its blow is transmitted through the staple to the driving punch. It is of course possible to trace the stress of this blow through a chain of elements back to the clinching punch. As shown in my machine the driving punch reacts through its cam roll 34, against the cam 32, and from this the stress is transmitted to the cams 19 19, to the lever 14, to the framework, and from the framework back to the clinching punch through its actuating mechanism. In this chain of elements I have introduced a spring 41. It is in a measure immaterial which of these elements it lies between. I have shown it between the lever 14 and the frame 2. Normally it presses the end of the lever firmly against the nut 42 on the screw 43 secured to the frame, but when the staple and the work are compressed between the two punches it yields so that either thick or thin work may be operated upon without in any way changing the adjustment of the machine. A further advantage follows from the use of this spring in the more perfect clinching of the staple. Its sudden compression as the clinching punch drives up the ends of the staple causes one or more rebounds, the effect of which, I find, is to set them up much more closely than it is possible to do by simple pressure or by a single blow in a rigid machine. By placing parts of some weight, as for example the head of the machine, between the staple and the spring, a strong blow is struck by the parts on the rebound.

Fifth. After the foregoing movements have taken place and the forked die and the driving punch, at least, have returned, the feeding in of the wire takes place. On the side of the sprocket wheel 17 is a cam 44. This cam

contacts with the cam roll on the lever 45, and through the pawl 46 and ratchet wheel 47 turns the feed-rolls 48 and 49 and feeds the wire. Gears 55 and 56 are fastened on the shafts bearing the feed rolls, and transmit motion from the upper to the lower shaft so that the lower feed roll as well as the upper is positively driven. The shaft of the lower feed-roll 49 is journaled in a block 50 which is supported on pivots screwed in the head. A spring 51 lies between the rear ends of the shafts to which the feed-rolls are attached, and, by pressing them apart, forces the rolls together. The feeding in of the wire and the return of all the parts conclude the cycle of the movements.

The work table.—The table 52 on which the work is supported is hinged on pins 53 53. It can be fastened either in a horizontal position or at an angle of forty-five degrees by removable pins passing through the lugs on its under side at 54. When tipped at the angle its rear edge aligns as near as may be with the top of the horn-cap where the staple is clinched, and when brought to a horizontal position it must come to the height that the corner occupied when in the angular position. These conditions are attained by locating the holes for the hinge pins in the horn on a line *y* drawn through the point where the staple is formed and at one-fourth of a right angle from the line in which the staple is driven. On the table, the hinge pins are similarly located on a line *z* drawn through the edge of the table and at the same angle with one of its sides. By suitably shaping the parts, I am enabled to provide a rear as well as a front face to the table without its interfering with the horn when tilted to the inclined position.

Without limiting myself to the precise details of the construction shown, what I claim, and desire to secure by Letters Patent, is—

1. In a pamphlet stapling machine, the combination with a suitable supporting framework, of a reciprocating head containing mechanism for forming and inserting staples, a cam shaft journaled on said head, cams on said shaft for actuating said mechanism, mechanism for clinching the staples, a second cam shaft from which said clinching mechanism is actuated and means for synchronously actuating both shafts, substantially as described.

2. In a pamphlet stapling machine, the combination with a suitable supporting framework, of a reciprocating head, mechanism contained therein for forming and inserting staples, a cam shaft journaled on said head, cams on said shaft for actuating said mechanism, mechanism for clinching the staples, a second cam shaft from which said clinching mechanism is actuated, and positive flexible connections between the shafts, substantially as described.

3. In a pamphlet stapling machine, the combination of a reciprocating head, a cam situated directly over said head for effecting its reciprocation, mechanism in said head for forming and inserting staples, and a support for the work against which it is gripped by the head, substantially as described.

4. In a pamphlet stapling machine, the combination of a reciprocating head, mechanism in said head for forming and inserting staples, a cam shaft journaled in said head, cams on said shaft for effecting said reciprocation and actuating said mechanism, and a support for the work against which it is gripped by the head substantially as described.

5. In a pamphlet stapling machine, the combination with a punch for inserting staples, of a support for work containing two conical holes connected by a slot, a clinching punch guided in said slot, and actuating mechanism for said punches, substantially as described.

6. In a pamphlet stapling machine, the combination with a punch for inserting staples, of a clinching punch, actuating mechanism for both punches, and a spring independent of said actuating mechanism and in the line of stress disposed so as to yield under the thrust of the two punches against each other, substantially as described.

7. In a pamphlet stapling machine the combination with a supporting framework of a reciprocating head containing staple forming mechanism, a punch for inserting staples guided therefrom, a spring independent of said actuating mechanism and in the line of stress between said head and framework, a clinching punch, and mechanism for reciprocating said head and actuating said punches, substantially as described.

8. In a wire feed mechanism, a pair of feed roll shafts in combination with feed rolls thereon, a transversely pivoted journal block for one of the shafts and a spring between the ends of said shafts on the opposite side of the journal block from the feed rolls, substantially as described.

Signed by me, in New York city, this 4th day of February, 1893.

DENIS A. FLAVELL.

Witnesses:
SAMUEL W. BALCH,
BEN L. FAIRCHILD.