J. W. HYATT.

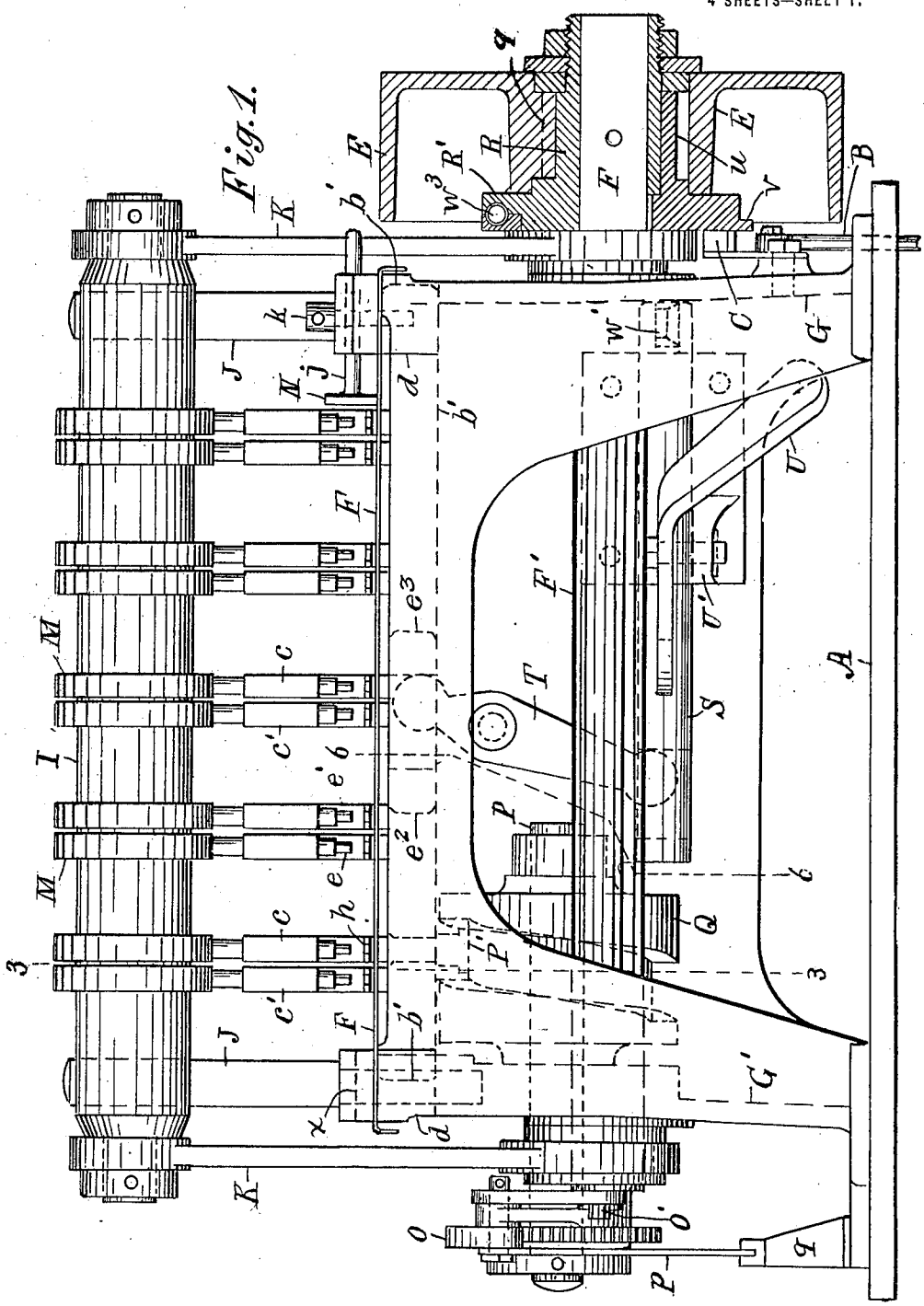
AUTOMATIC PUNCH.

APPLICATION FILED JAN. 4, 1918. RENEWED DEC. 12, 1918.

1,292,323. Patented Jan. 21, 1919.

4 SHEETS—SHEET 1.

Fig. 1.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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4 SHEETS—SHEET 2.

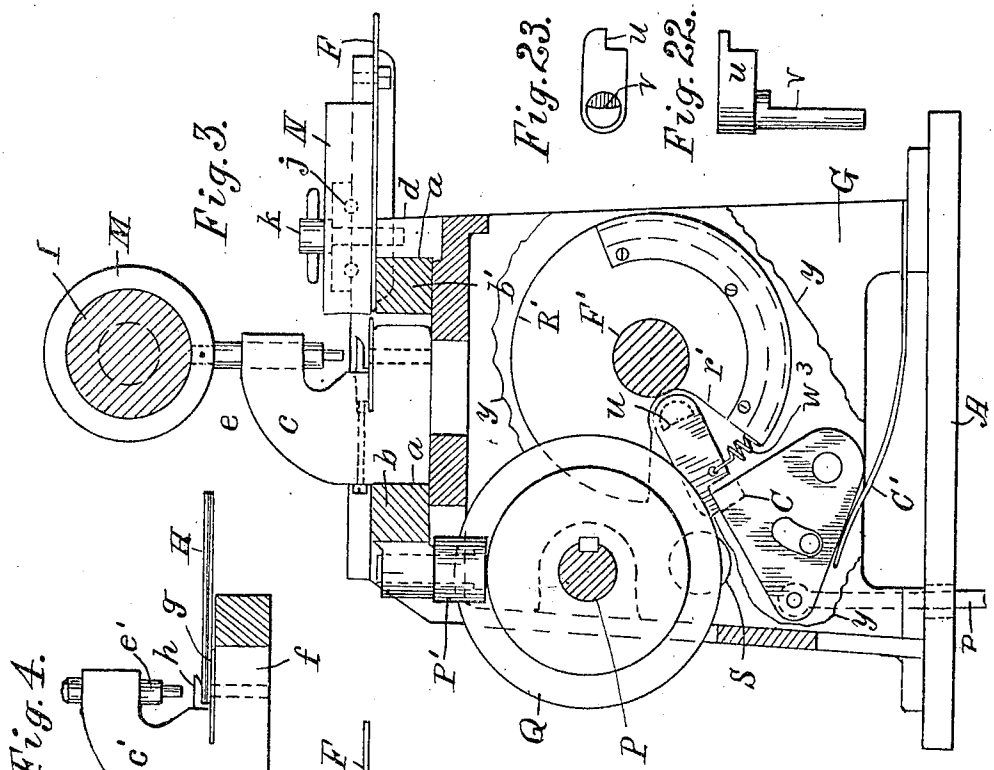


Fig. 3.

Fig. 23.

Fig. 22.

Fig. 4.

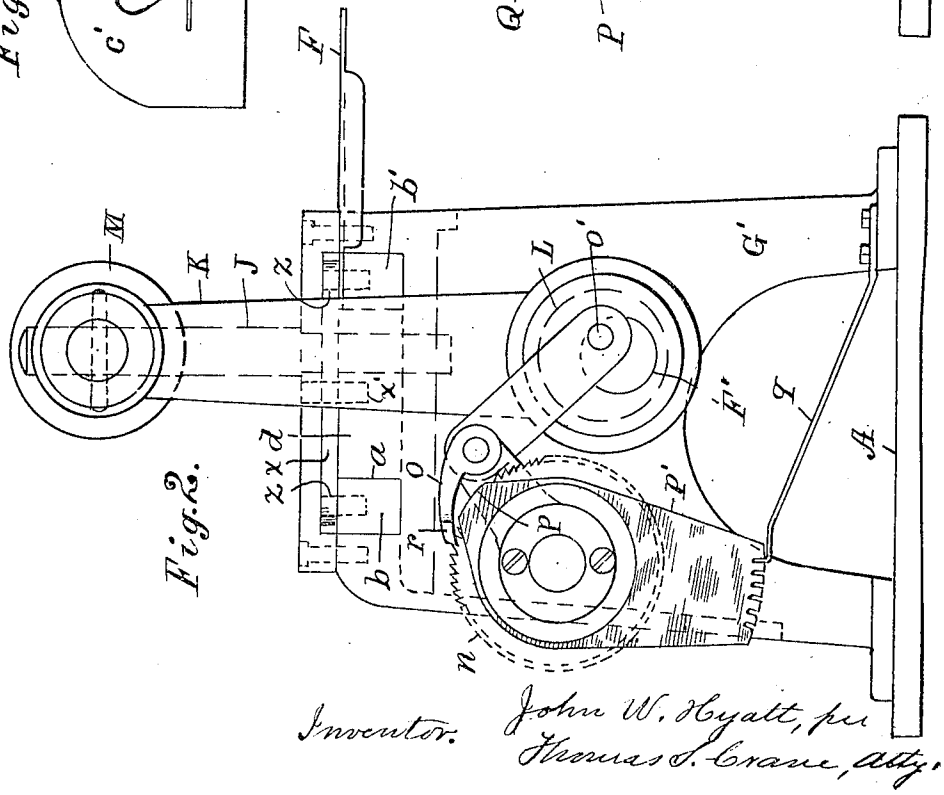


Fig. 2.

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4 SHEETS—SHEET 3.

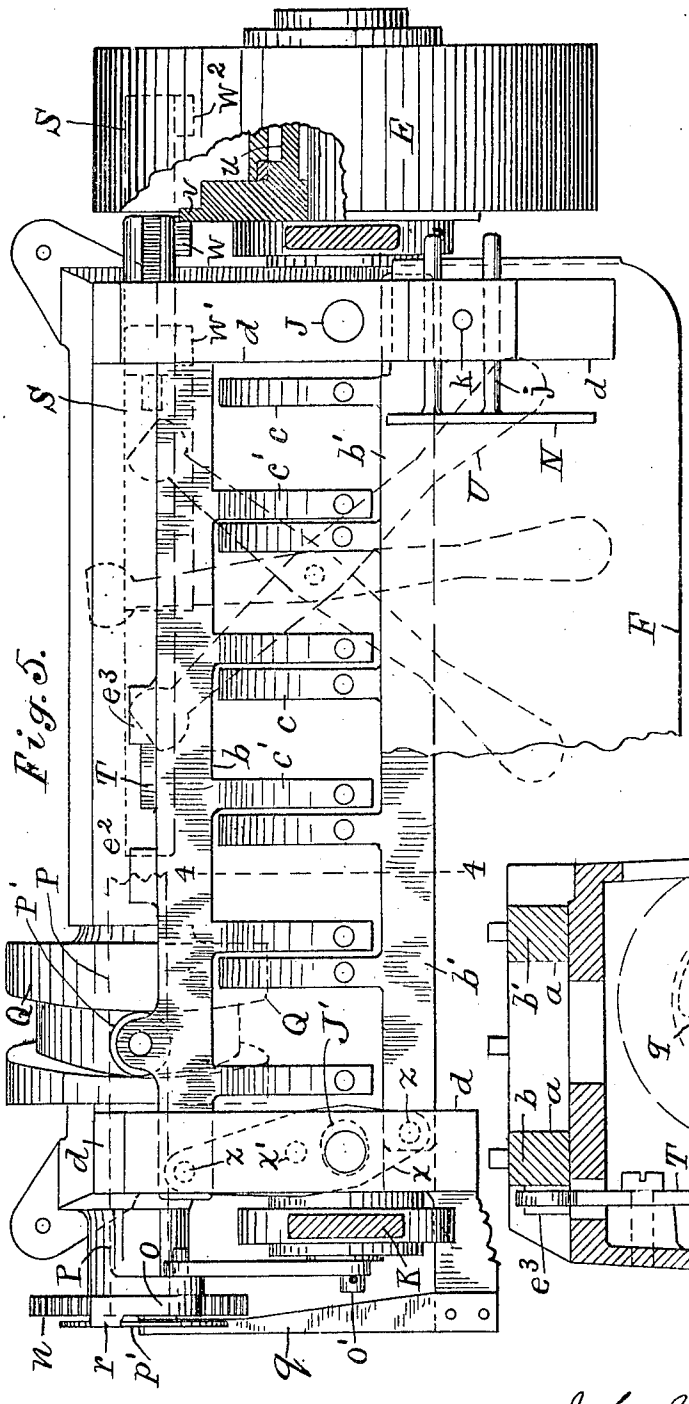


Fig. 5.

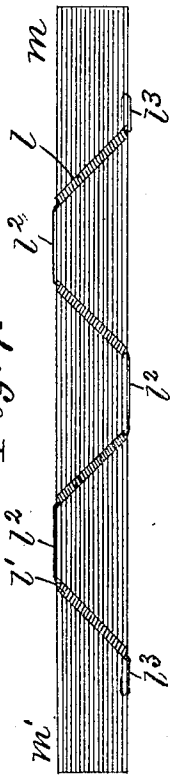


Fig. 7.

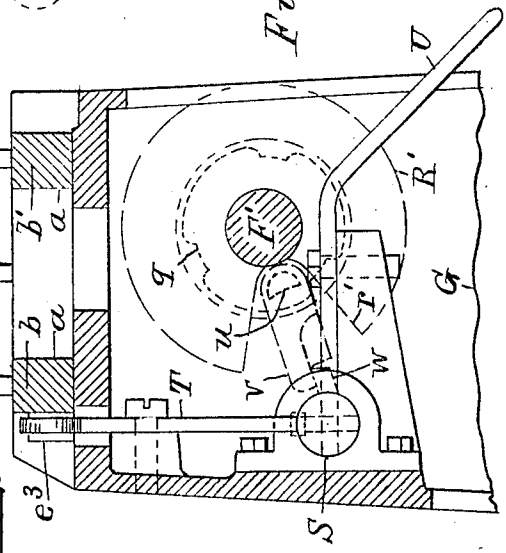


Fig. 6.

Inventors: John W. Hyatt, per Theo. S. Crane, Atty.

J. W. HYATT.

AUTOMATIC PUNCH

APPLICATION FILED JAN. 4, 1918. RENEWED DEC. 12, 1918.

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4 SHEETS—SHEET 4.

Fig. 8.

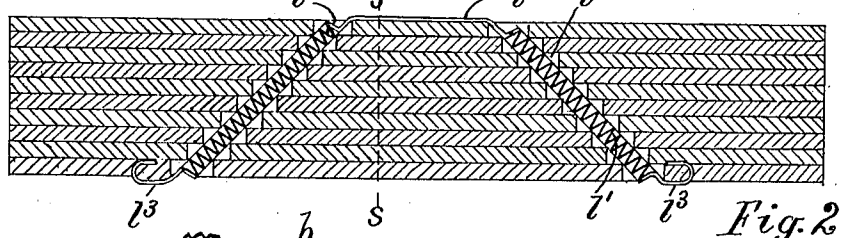


Fig. 19.

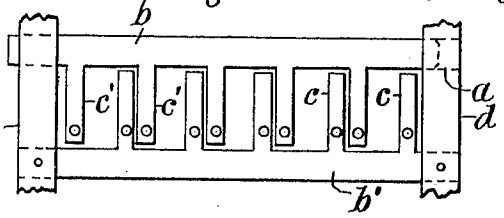


Fig. 20.

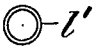


Fig. 21.

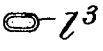


Fig. 9.

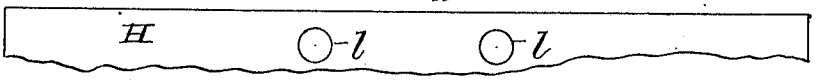


Fig. 10.

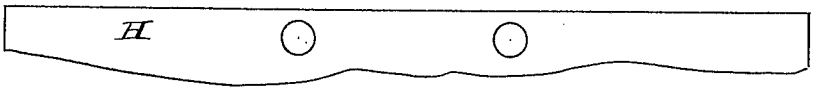


Fig. 11.



Fig. 12.

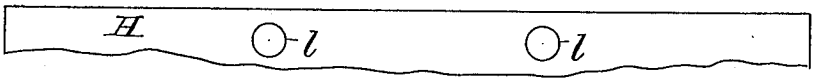


Fig. 13.

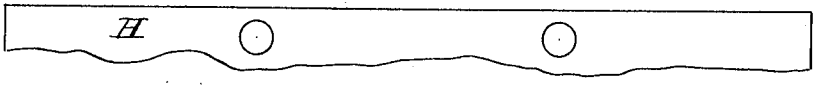


Fig. 14.



Fig. 15.

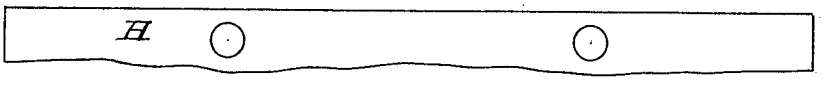


Fig. 16.

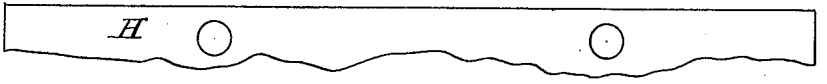


Fig. 17.

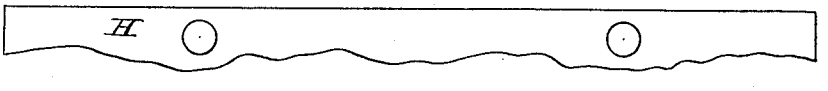
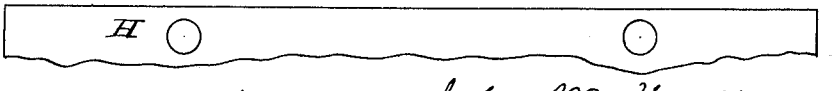


Fig. 18.



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UNITED STATES PATENT OFFICE.

JOHN W. HYATT, OF NEWARK, NEW JERSEY.

AUTOMATIC PUNCH.

1,292,323. Specification of Letters Patent. Patented Jan. 21, 1919.

Application filed January 4, 1918, Serial No. 210,248. Renewed December 12, 1918. Serial No. 266,495.

To all whom it may concern:

Be it known that I, JOHN W. HYATT, a citizen of the United States, of 141 Commerce street, Newark, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Automatic Punches, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to a machine for punching holes in pairs or rows progressively farther apart in the signatures of a book, to form inclined passages in which spiral springs can be inserted and secured to retain the leaves of the book elastically together.

Such a spring binding is designed to hold the book normally closed, but to permit its opening with ease at any point and to lie flat when opened.

I have found by experiment that the passage through the leaves for the spring must be inclined to the surface of the leaves, as shown in Figure 7 herein, so as to increase the length and extensibility of the spring; and the object of the present invention is to form the passage or channel for the spring by punching holes in the different signatures progressively nearer or farther apart so that when the signatures are superposed the holes will form a regularly inclined or sloping passage, as shown in Fig. 8 herein.

This object is attained by forming a punching machine with a sufficient number of punches to form holes and spring passages through the signatures for the desired number of springs (such punches being limited to ten in the present construction), and mounting the alternate punch-carriers upon slides by which the punches in each pair may be separated or moved progressively apart in punching the signatures which are placed successively in the machine.

The slides are movable parallel to one another and have carriers projected from each toward the opposite slide in the space between the slides, to support a punch and die.

The punches of each pair form passages in the leaves for two springs, and such punches may be gradually and intermittently separated, to punch the successive signatures, by making both the slides movable and moving them in opposite directions. In this case, the center of the space between two holes of any pair is unchanged, and a gage held fast at one end of the table serves to adjust all the signatures to the same position; but the alternate punches in the entire series may be held stationary, and the separation between them effected by the movement of a slide carrying the remainder of the punches. In this case, the center of the space between the successive pairs of holes advances one-half as much as each movement of the punches, and means would be required to advance the gage that amount before applying the successive signature.

The annexed drawing shows the punches attached to two slides which are movable in opposite directions.

The invention includes means for automatically stopping the punches after each actuation to remove the punched signature and insert another, and it also includes means for automatically stopping the machine when the punches have been separated to a predetermined degree, and for then reversing the movement of the slides so as to bring the punches step by step toward one another.

The invention will be understood by reference to the annexed drawing, in which Fig. 1 is a front elevation of the machine; Fig. 2 is an elevation of the left-hand end of the machine; and Fig. 3 is a cross section on line 3—3 in Fig. 1 with parts omitted which are shown in Fig. 6, and the rear end of the frame broken on the lines *y*, to fully expose the clutch mechanism which is shown only in dotted lines in Fig. 6. Fig. 4 is a section on line 4—4 in Fig. 5, showing the front slide-bar and the punch or goose-neck carried thereby. Fig. 5 is a plan of the parts below the level of the table F with a portion of the table at the right-hand end, and the rim of the clutch-pulley broken away to show the clutch-dog. Fig. 6 is a cross section on line 6—6 in Fig. 1; Fig. 7 is a longitudinal section of an assemblage of signatures or leaf-groups through the binding springs, four springs being shown in the binding.

Fig. 8 is a similar section with two springs shown in the binding and the leaves and springs enlarged to show the construction clearly. Fig. 9 shows the edge of the top signature in the book of Fig. 8 with the holes punched therein; and Figs. 10 to 18 inclusive show the edges of the successive signatures downward in the book with the holes punched progressively farther apart

in each signature to form the inclined passage for the spring which is shown in Figs. 7 and 8. Fig. 19 is a plan of the punch-carriers with one-half stationary and one-half movable. Fig. 20 is an end view of a cylindrical spring; and Fig. 21 an end view of a flattened spring. Fig. 22 is a side-view of the clutch-dog and its arm; and Fig. 23 shows the arm and the inner end of the dog.

The machine shown is built to set upon a bench-top A, and a treadle-rod B is shown in Fig. 3 extended downward through the bench-top from a spring-tripper C, which moves a clutch-dog u by which the driving-pulley E is connected to a driving-shaft F'. The frame of the machine is shown with end-plates G and G' at the right and left-hand ends respectively, and with guide-notches a in which horizontal slides b, b' are fitted to sustain and move the punch-carriers c and c'.

The notches are formed in cross-pieces d at opposite ends of the frame and the punch-carriers project toward one another between these cross-pieces, the alternate carriers being attached to the rear slide b and the front slide b'. The slides b, b' are connected by a lever x.

Each carrier is made in the form of a flat vertical plate so as to bring adjacent punches e and e' close to one another; and each carrier-plate is attached to its connected slide by a level foot f which forms a seat for a die g. A hole is formed through the foot below the perforation in the die to discharge the chips punched from the paper.

Each carrier is thus provided, not only with a movable punch but with a die which supports the paper during the punching operation, the die being held constantly in line with the punch by the connection of both to the slide.

The punches and dies are all arranged to form a single row or line parallel with the edge of the table, but the punches and dies are distinguished into two series, by their alternate connection to the slides which move in opposite directions.

In Fig. 3 the table F is shown supported level with the dies; and in Fig. 4 a signature H or group of leaves is shown with its rear edge resting upon the die and a stripper h extended over the die to clear the paper from the punch after each actuation. The punches are shown in Fig. 5 all arranged in a straight row, and a reciprocator-bar I is extended over the punches and fitted to move vertically upon posts J. The ends of this bar are connected by links K to eccentrics L, near the ends of the driving-shaft F, which move it vertically when the shaft is rotated.

A circular yoke M is attached to the head of each punch, and loosely embraces the reciprocator-bar so that the vertical movement of the bar reciprocates all the punches simultaneously. This bar does not rotate, nor move within the yoke when the links K are oscillated by the eccentrics.

A paper gage N is shown held adjustably by stems j and a clamp-screw k at one end of the table, such gage being adjusted, in practice, to guide the signature into the proper relation to the punches so that sloping passages l will be formed through the book, as shown in Fig. 7, at equal distances from the top m and bottom m' of the book.

Fig. 7 shows fifteen signatures secured together by four springs l', made in one piece with connections l^2 and end-locks l^3, which are bent and forced into the paper to hold the springs in place. The springs and their connections l^2 are formed in one piece, of suitable wire, by suitable mechanism; and the springs are threaded successively through the sloping passages in the signatures, and the ends of the wire locked fast, as shown.

Fig. 9 is a diagram of exaggerated proportions to show more clearly the formation of the passages by a series of holes overlapping upon one another and gradually extended farther from a given point upon the signature.

The holes punched in the ten signatures are illustrated in Figs. 9 to 18 inclusive, those in Fig. 9 corresponding with those in the upper signature in Fig. 8; and those in Fig. 18 corresponding with those in the lower signature; and the intermediate ones corresponding with the intermediate signatures.

The machine of the present invention operates to automatically punch the holes in the several signatures at progressively increasing distances apart, as shown in Figs. 9 to 18, or progressively nearer together; in which case the holes punched in the first signature would be represented by those in Fig. 18. This automatic operation is effected as follows:

A feed-spindle P is mounted beneath a roll P' upon the slide b, and a cam Q is rotatable with the spindle and has a groove fitted to the roll to reciprocate the slide back and forth longitudinally. The entire slope of this groove is shown in Fig. 1, determining the extreme movement of the slide in one direction in a half rotation of the cam, and such operation of the cam moves the punch-carriers, which are shown close together in Fig. 1, step by step into the separated positions shown in Fig. 5.

The outer end of the spindle is provided with a ratchet-wheel n, and a pawl o is reciprocated upon such ratchet-wheel by a crank-pin o' upon the outer end of the driving-shaft F'.

A shield p is mounted to turn adjustably upon the hub of the ratchet-wheel, and has a face concentric with the teeth of the wheel,

but projecting a little beyond the same which, when properly adjusted, engages an ear r upon the pawl and lifts the pawl during a part of its retracting movement from the ratchet-teeth. An arm p' is projected from the shield and notched to receive the end of a spring-catch q, which operates to hold the shield in various adjusted relations to the pawl-ear r; and the shield may thus be arranged to vary the actuation of the ratchet-wheel in any desired degree.

If sixteen signatures are to be punched between the limits of these two positions the shield is so adjusted that the pawl turns the ratchet-wheel one-thirty-second of a revolution at each actuation of the driving-shaft and punches, moving the punches step by step sixteen times during a half rotation of the cam.

Another book with a similar number of signatures can be then punched during the succeeding one-half rotation of the cam, the first signature having the holes punched far apart and the last with the holes near together.

During the punching of these signatures and of the others of similar character, the gage N remains adjusted in the same position, because the action of the slides moves the punches of each pair simultaneously in opposite directions so that the middle of the space between the two holes (indicated by the line s in Fig. 8) remains unchanged, and the ends of all the signatures can therefore be correctly set against the same gage.

Means is provided, as shown in Figs. 1 and 3, to disengage the shaft-clutch from the pulley after each actuation of the punches, so that one signature can be removed and another inserted.

The clutch is shown of ordinary construction in Figs. 1, 3 and 6 consisting of a hub R pinned to the driving-shaft F and having a clutch-plate R′ with a notch r' in one edge.

The center E′ of the pulley E is fitted to turn upon the hub R and formed, as shown in Fig. 6, with shoulders q to engage a dog u formed with a cylindrical body with a notch upon one side fitted to turn in a bore in the hub R, as shown in Figs. 1 and 6, and adapted, when rocked, to engage any of the shoulders. The dog has an arm v fitted to oscillate in the notch r' and projecting beyond the periphery of the clutch-plate R′.

A tension-spring w^3 holds the dog normally operative by engaging it with a shoulder q, and this causes the continuously rotating pulley E to operate the machine until the dog is disengaged.

A foot-tripper C is provided to engage the arm v automatically, being pressed thereto by a spring C′, such tripper resting upon the periphery of the clutch-plate R′ until the plate turns to the position shown in Fig. 3, when the clutch-arm v is arrested by the tripper and the dog is turned to an inoperative position, and the machine thus stopped.

The treadle-rod B when actuated by a treadle operates to draw the tripper clear from the arm v, permitting the spring w^3 to throw the dog into engagement with the first succeeding shoulder q, to restart the machine.

Such mechanism is used to stop the punches in their elevated position, as shown in Fig. 3, after each actuation, to change the signatures, and the movement is renewed by putting the foot upon the treadle. Means is further provided for stopping the machine automatically even if the treadle is depressed, when the punches have been separated to their maximum extent, thus warning the operator that the signatures for one volume have been completely punched, and that the machine requires the reversal of its automatic stopping mechanism, so as to be actuated again by the pressure upon the treadle and punch the next series of signatures in a reverse order.

The means for stopping the entire machine when the punches are separated or brought together to their maximum extent, consists of a trip-bar S movable beneath the roll P′ and provided with a tripping-lug w which, when the trip-bar is moved endwise, stands in the path of the arm v and thus disengages the dog from the pulley. This trip-bar is actuated by a shifter-lever T shown in Figs. 1, 5 and 6, which engages the trip-bar and has its upper end extended by the side of the slide b.

The slide is provided with two lugs e^2 and e^3, arranged to collide with the head of the lever T when the bar is moved respectively to its extreme right or left-hand position. A hand-lever U is pivoted upon a bracket U′ at one side of the trip-bar and its inner end engaged therewith to move the trip-bar by hand.

The lever T is pivoted intermediate to its ends, so that the left-hand movement of the slide b produces a reverse or right-hand movement of the trip-bar and moves its trip w into the path of the dog-arm v, as shown in Fig. 5, when the maximum movement of the slide is effected. This prevents any further actuation of the punches until the trip is moved by hand.

The trip is then cleared from the dog-arm v by moving it past the same into the inside of the pulley, as shown by dotted lines w^2 in Fig. 5, as the movement of the slide brings the lug e^2 against the head of the lever T upon one side and thus prevents any reversal of the lever.

The hand-lever U is shown in three positions in Fig. 5, in the right-hand position

which it would occupy when the punches are close together, as shown in Fig. 1, and the trip in the position shown at w' in Fig. 5 and Fig. 1.

It is shown in its mid-position corresponding with the separation of the punches represented in Fig. 5; and it is used, by movement to its left-hand position, to shift the trip inside the pulley as shown at w^2 in Fig. 5.

Such movement of the trip-bar brings the head of the lever against the lug e^2, which then, in the reverse movement of the slide, gradually moves the trip from the position indicated at w^2 into engagement with the dog-arm v.

This movement arrests the entire machine with the punches in the position shown in Fig. 1, and prevents the re-starting of the machine until the hand-lever U has moved the trip manually into the position shown at w'.

The lever x is required when the slides are designed to move simultaneously in opposite directions, and it is shown in Figs. 2 and 5 pivoted on the cross-bar d by a fulcrum-pin x', and its ends pivoted to the slide-bars b, b' by pivot-pin z. These pins x' and z are clearly shown in Fig. 5.

One of the posts J passes through the lever, and the lever is therefore formed with a slot J′ to clear the post.

The separation of the die-carriers may be effected, as shown in Fig. 19, by pinning to the cross-pieces d one of the bars, as for instance the bar b' to which the carriers c are attached, and reciprocating the slide-bar b step by step, as already described.

As above stated, such an arrangement would necessitate the moving of the gage automatically after punching each signature which would be a needless complication of the apparatus.

The springs may be made cylindrical, as shown at l' in Fig. 20, or flattened, as shown at l^3 in Fig. 21, in which latter case the holes would be punched of corresponding form instead of circular, as in Figs. 8 and 9.

The movement of the slide-bar is necessarily the same for each semi-rotation of the cam, and the cam is so proportioned as to separate the holes in a suitable degree, as shown in Figs. 8, and 9 to 18 inclusive, for use in books, magazines, and other articles where the inclination of the spring-hole l would be nearly the same.

The inclination of the holes can, however, be varied in a given assemblage of signatures or leaves, by varying the number of steps by which the slide-bar is moved from one extreme position to the opposite.

If the pawl be arranged to turn the ratchet wheel to a larger arc each time, the separation of the punches would be greater and the maximum separation reached with fewer actuations of the punches.

The inclination of the spring-holes may thus be varied, and also by varying the number of the leaves submitted to the punches at one operation, such number being the desired proportion of the total number in a book to produce the desired inclination of the spring-holes.

Having thus set forth the nature of the invention what is claimed herein is:

1. The combination, in an automatic punch, of two series of carriers having each a punch and die mounted thereon, and means operating automatically for moving the carriers progressively toward or from one another in uniform steps.

2. The combination, in an automatic punch, of two series of carriers having each a punch and die mounted thereon, means operating automatically for moving the carriers progressively toward or from one another in uniform steps through a predetermined space, and means operating automatically for arresting the movement of the carriers at the end of such space.

3. The combination, in an automatic punch, of two slides movable parallel with one another, punch-carriers in pairs projected respectively from the opposed sides of the slides in the space between the same, each carrier having a body extending upwardly from the slide and provided with a movable punch, and the foot of each carrier having a die arranged in line with the punch thereon, and means operating automatically for moving the slides respectively in opposite directions.

4. The combination, in an automatic punch, of two series of carriers having each a punch movable in its upper part and a die thereon below the punch, means operating automatically for moving the carriers progressively forward or from one another in uniform steps, a table F supported level with the dies, and a gage held adjustably at one end of the table to set the signatures of leaves into relation with the punches.

5. The combination, in an automatic punch, of two slides movable longitudinally and having punch-carriers thereon arranged in two series, the bodies of the carriers being flat to stand close together and having each an integral support for the die and the punch, the front and rear edges of the alternate carriers being attached respectively to the two slides, and means to move the slides automatically in opposite directions after each movement of the punches, to move the punches of each pair farther apart.

6. The combination in an automatic punch, of two slides movable longitudinally and having punch-carriers arranged in two series, the alternate carriers being attached respectively to the two slides, a rotating cam

operating one of the slides in a given direction to move it step by step, and a lever connecting such slide to the other slide to move it step by step in the opposite direction.

7. The combination in an automatic punch, of two slides movable longitudinally and having punch-carriers arranged in two series, the alternate carriers being attached respectively to the two slides, a rotating cam operating one of the slides in a given direction to move it step by step, a ratchet-wheel rotatable with the cam, a pawl reciprocated continuously to intermittently move the ratchet-wheel, an adjustable shield to vary the action of the pawl upon the teeth, and a lever connecting the two slides to move them in opposite directions.

8. The combination in an automatic punch, of a slide movable longitudinally and having punch-carriers arranged in two series all in a single row, one punch-carrier of each pair attached to one of the movable slides, means for moving the slide step by step longitudinally, and a reciprocator-bar extended over the row of punches each having a yoke fitted movably to the said bar, whereby the bar maintains connection with the punches in their step-by-step movements.

9. The combination in an automatic punch, of a frame having a table to support the sheets to be punched, a driving-shaft below the said table with pulley and clutch to drive the shaft, punch-carriers arranged in pairs at the edge of the table, means for progressively separating the punches, a reciprocating-bar with guides to hold it movably above the punches, eccentrics upon the driving-shaft with links connecting the same to the reciprocating-bar, and each punch having a yoke fitted movably to the said bar, whereby the bar operates the punches when they are progressively separated.

10. The combination in an automatic punch, of a frame having a table to support the sheets to be punched, two slides movable longitudinally on the said frame, a driving-shaft below the said table with pulley and clutch to drive the shaft, punch-carriers arranged in pairs at the edge of the table, the alternate carriers being connected respectively to the slides, means for moving the slides step by step in opposite directions, a trip to disengage the pulley-clutch, and a shifter for the said trip, with means upon one of the slides to actuate the shifter at a predetermined point and thus wholly arrest the machine at the maximum separation of the punches.

11. The combination in an automatic punch, of a frame having a table to support the sheets to be punched, two slides movable longitudinally upon the frame, a driving-shaft below the said table with pulley and clutch to drive the shaft, punch-carriers arranged in pairs at the edge of the table, the alternate carriers being connected respectively to the slides, a rotating cam moving the slides step by step from one another in opposite directions, a trip to disengage the pulley-clutch and a trip-shifter actuated by one of the slides when the cam has fully separated the punches from one another, and manually operated means for reversing the relation of the shifter and the slide and re-connecting the pulley with the clutch, whereby the cam then moves the punches step by step toward one another.

In testimony whereof I have hereunto set my hand.

JOHN W. HYATT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."