

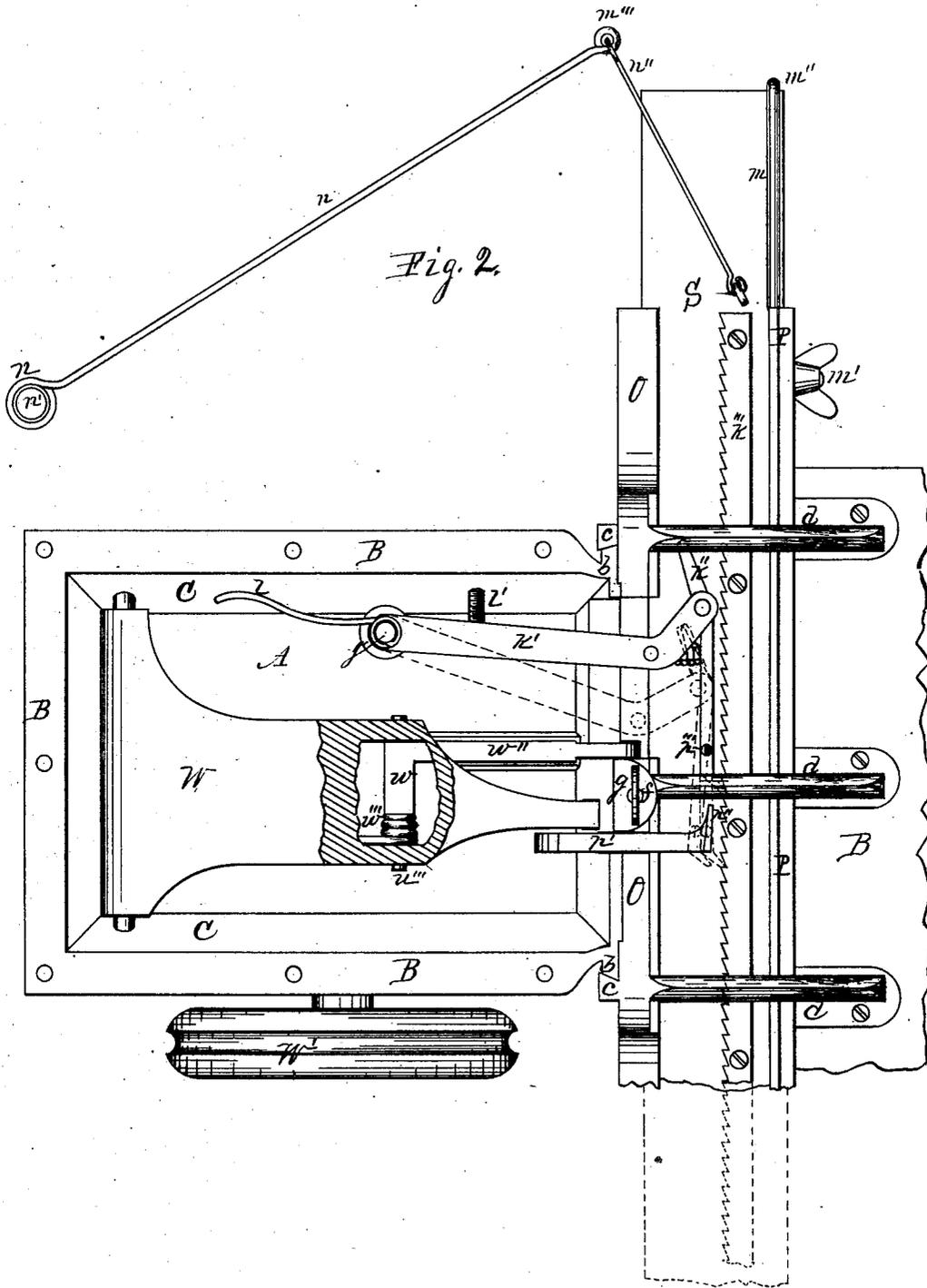
(Model.)

7 Sheets—Sheet 2.

W. F. & J. BARNES.
Book Stitching Machine.

No. 242,101.

Patented May 31, 1881.



Witnesses,
Samuel Sovereign
O. O. Behel.

Inventors,
William F. Barnes,
John Barnes,
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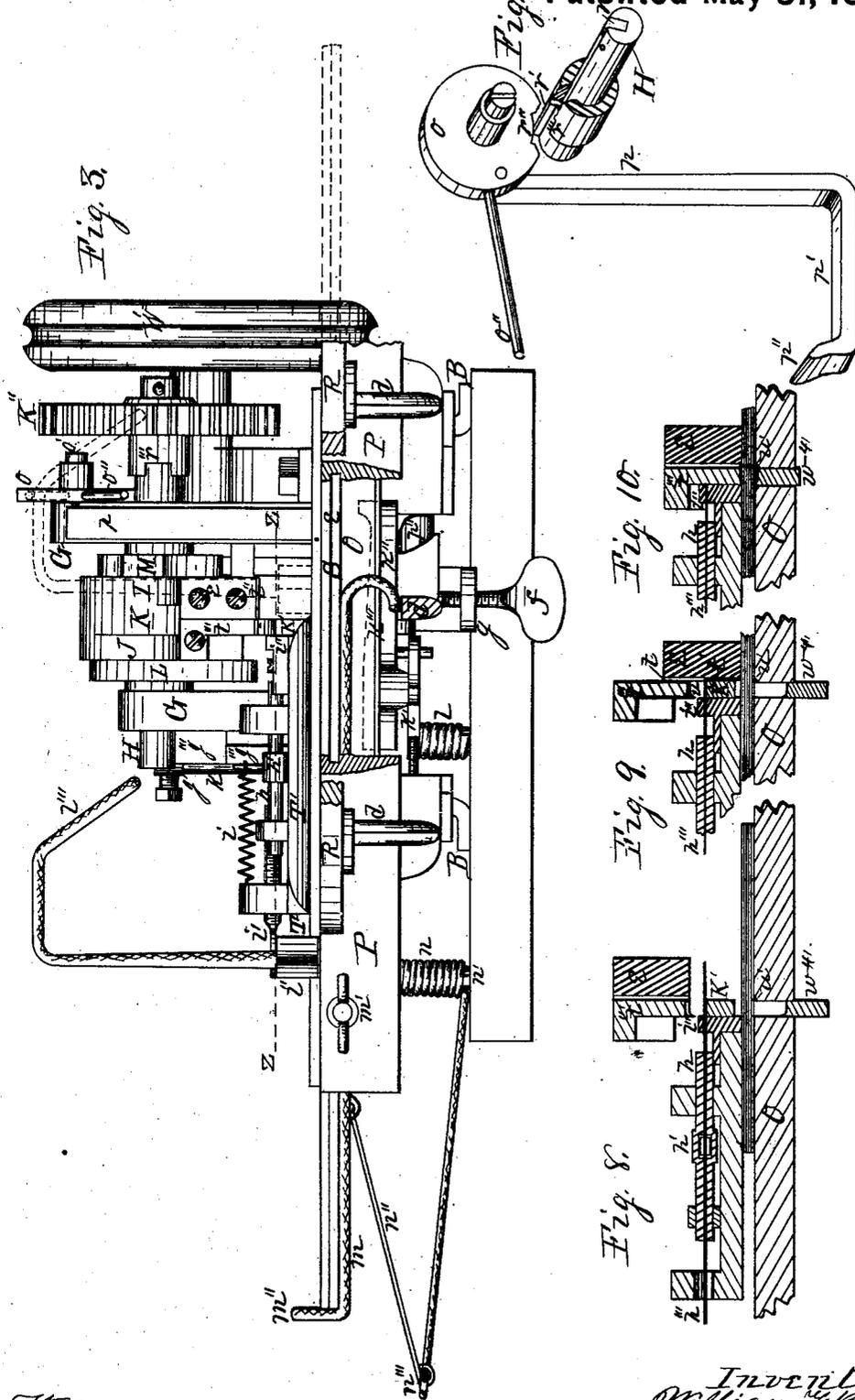
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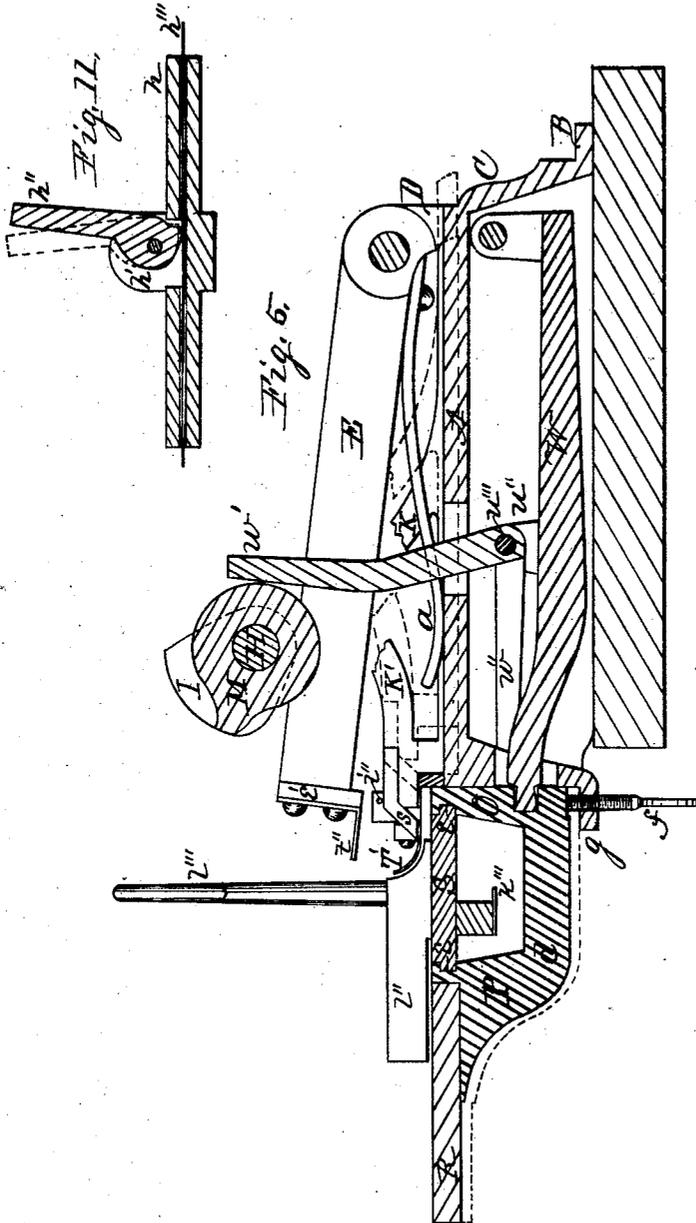
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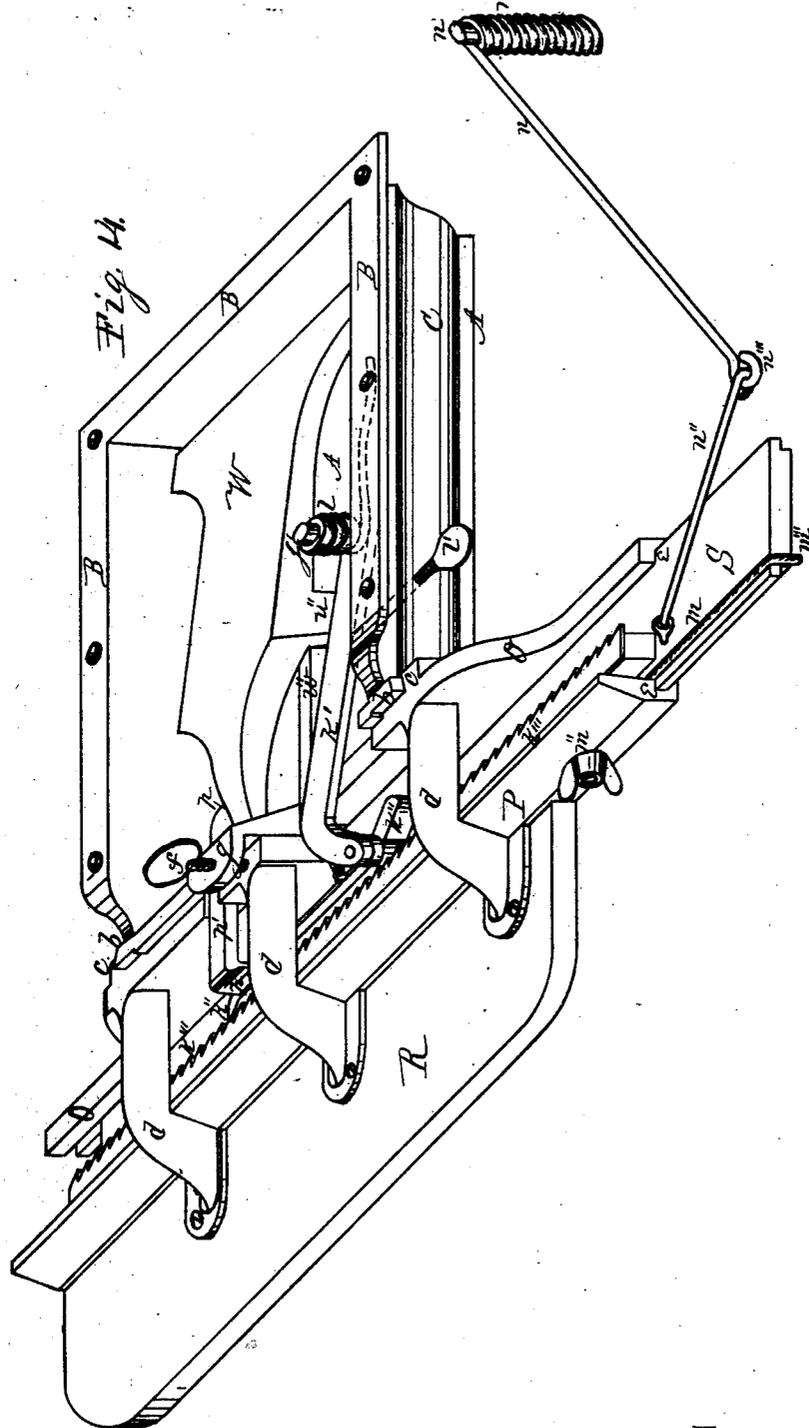
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(Model.)

7 Sheets—Sheet 7.

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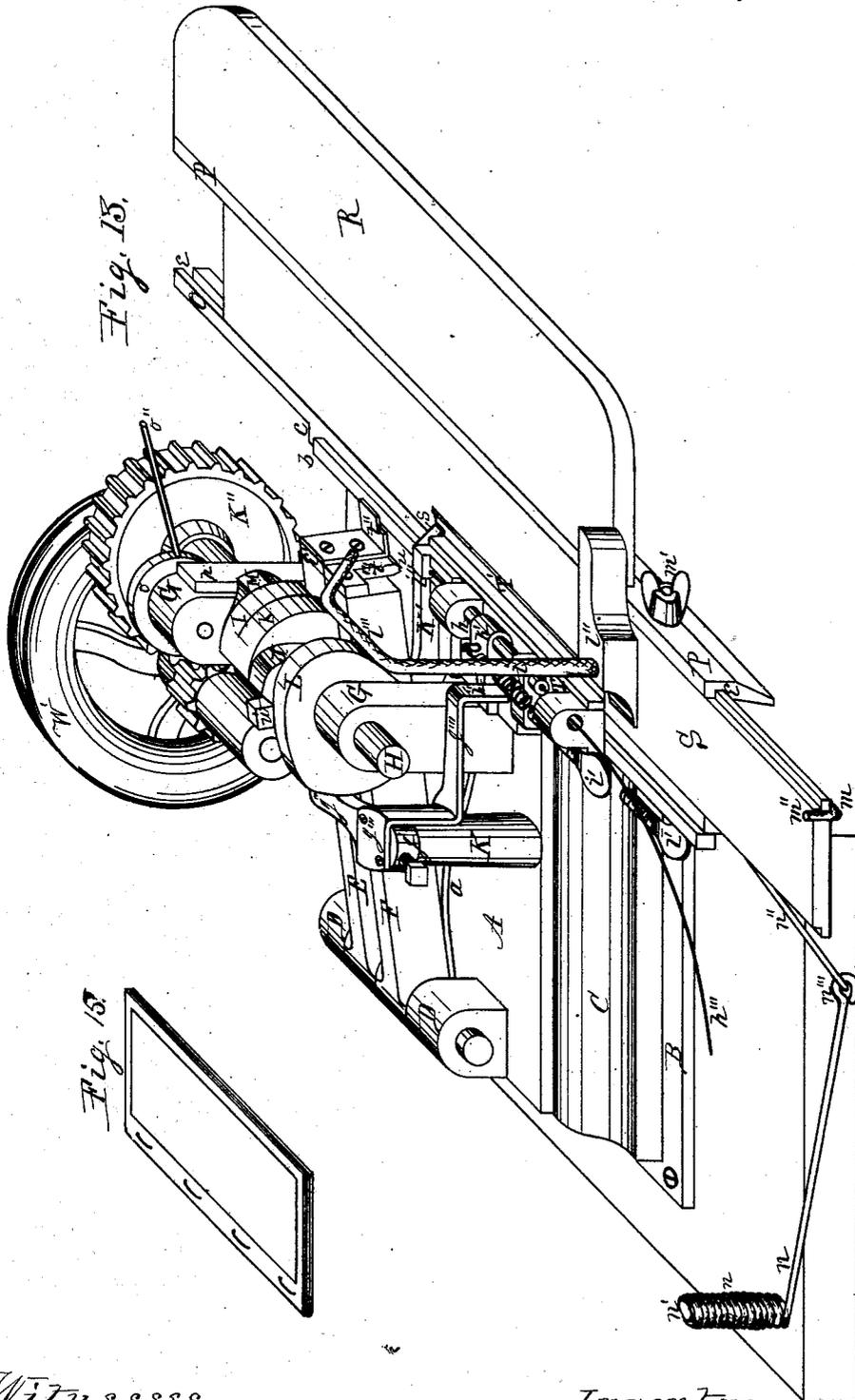


Fig. 13.

Fig. 13

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UNITED STATES PATENT OFFICE.

WILLIAM F. BARNES AND JOHN BARNES, OF ROCKFORD, ILLINOIS.

BOOK-STITCHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 242,101, dated May 31, 1881.

Application filed April 30, 1880. (Model.)

To all whom it may concern:

Be it known that we, WILLIAM F. BARNES and JOHN BARNES, of the city of Rockford, in the county of Winnebago and State of Illinois, have invented a new and useful Book-Stitching Machine, of which the following is a specification.

This invention relates to book or paper stitching machines in which wire is employed as a material of which to form the stitch; and the object of our invention is to produce a machine capable of taking the wire from the roll, spool, or other convenient package and cutting them from suitable lengths and inserting them in the folds of books or papers and bending them in such a manner as to securely fix the sheets in book form; and it consists in a carriage to receive the book or papers, capable of an automatic intermitting endwise movement to present the matter to be stitched in proper position to the stitching mechanism, and is made adjustable in its automatic movements to stitch at proper intervals books or papers varying in size, and is provided with an automatic disconnecting stop mechanism to permit the return movement of the carriage and stop the machine.

It consists, further, in a wire-carrying mechanism made adjustable to present the wire in proper lengths to the bending, cutting, and driving mechanism; in a bending mechanism to give form to the wire to be driven through the book or papers; in a cutting and driving mechanism to cut the wire from the continuous thread and drive it through the book or paper, and in a bending and clinching mechanism to bend and clinch the end of the wire driven through the book or paper.

These and other improvements to be herein after more fully explained constitute the subject of this specification.

In the accompanying drawings, Figure 1 is a plan view of a machine embodying our invention. Fig. 2 is an under-face or bottom-plan view, in which a portion of the center-hinged lever is broken away to show the parts hinged to its upper face. Fig. 3 is a front elevation, in which some of the front parts are broken away to reveal the parts back thereof. Fig. 4 is an elevation of the left-hand end of the machine, in which a portion of the front edge of the table is broken away. Fig. 5 is a

vertical section on dotted line x of Fig. 1. Fig. 6 is a side elevation of the wire cutter and driver. Fig. 7 is a side elevation of wire-bender. Fig. 8 is a vertical section on the dotted line y of Fig. 1, through the lengthwise center, of the wire-feeding device, in which the wire bender, cutter, and driver are in their elevated position. Fig. 9 is a like vertical section of a portion of the same device on dotted line y of Fig. 1, in which the wire-bender is in its lowest position and the cutter and driver is elevated. Fig. 10 is a like vertical section of the same portion as Fig. 9 on dotted line y of Fig. 1, in which both the bender and the cutter and driver are in their lowest positions. Fig. 11 is a horizontal section of the wire-feeding device on dotted line z of Fig. 3. Fig. 12 is an isometrical representation of the automatic stop-clutch mechanism. Fig. 13 is an isometrical representation of the machine as seen from the upper left-hand corner. Fig. 14 is an isometrical representation of the machine as seen from the under left-hand corner. Fig. 15 is an isometrical representation of a book stitched by our machine.

In the figures, A represents a bed-plate of suitable dimensions, rectangular in plan. B represents a foot-flange on its rear, right and left hand sides, fitted to receive screws or bolts by which to fix it in position to a suitable stand or table. From this foot-flange the bed-plate rises in box-like form, having edges C molded in ogee or cyma-recta form. Centrally from the rear portion of this bed-plate rise ears D, between which are pivoted the lever-arms E and F, of which E represents the bending-arm, and F the cutting and driving arm. These arms, toward their forward free ends, are guided in their vertical movements by means of standards G, which rise from the forward portion of the bed-plate. These lever-arms are each provided with a spring, a , fixed to their under face, operating to hold the free ends of the lever-arms elevated.

At H is represented a cam-shaft fitted to revolve in bearings in the upper portion of the standards G. On this shaft are mounted, to revolve therewith, the several cams I, J, K, L, and M, of which the cam I is employed to operate the bending-lever E, and the cam J to operate the driving-lever F, the cam K to operate beveled end sliding bar N, the cam L to

operate the wire-feeding mechanism, and the cam M to operate the bending and clinching mechanism.

The forward end of the bed is fitted with vertical guideways *b* on each front side corner, beveled from the front rearward inwardly. These guideways are received by like beveled guideways *c*, depending from the inner lengthwise bar, O, of a skeleton metallic table-frame, made vertically adjustable on the beveled vertical guideways *b* and *c*. In connection with the inner lengthwise bar, O, this metallic skeleton table-frame is composed of an outer lengthwise bar, P, placed parallel to the bar O, and connected on their under edges by bracket-arms *d*, which rise on the outside of the bar P, to receive the outer portion, R, of the table, to serve as a support for the outer portion of the matter to be stitched by the machine.

The upper inner edges of the lengthwise metallic bars of the skeleton table-frame are grooved, as at *e*, to receive a center portion, S, fitted to slide lengthwise therein freely, forming an endwise-movable carriage. This table is made vertically adjustable on its vertical beveled guideways by means of an adjusting-screw, *f*, threaded in a depending ear, *g*, in such a manner that its end operates against the under portion of the table to raise or lower it as the screw is turned to the right or left. This adjustment of the table is important, to adapt the machine to the varying thicknesses of work to be stitched.

At T is represented the base-plate of the wire-feeding device, which is fixed on the left-hand front corner of the main bed-plate, and overlapping the inner lengthwise bar, O, of the table in such a manner that the edge of the book or paper to be stitched may be placed between it and the table, and by means of the vertical adjustability of the table the space may be regulated to receive the book or papers snugly. The front edge of the base-plate T is fitted with an upward-curving guide, T', employed to give a free entrance of the matter to be stitched to the space between the table and the base-plate. On this base-plate T is mounted the wire-feeding device, of which *h* is a tubular shaft fitted to slide lengthwise in suitable bearings rising from the base-plate. One side of this shaft, near the center of its length, is cut away to its center, at which point it is provided with a clasp, *h'*, which embraces the shaft, having its end portions project therefrom, forming ears, between which is pivoted a lever-pawl, *h''*, in such a manner that when its free end is in the position represented in solid lines at Fig. 11 its inner end will cramp the wire *h'''*, passed through the shaft against the side thereof with sufficient force to cause it to move endwise with the shaft, and when the pawl is in the position represented in the dotted lines the shaft will be free to move in the opposite direction without moving the wire.

At *i* is represented a spiral spring, connected with the tubular shaft and with the base-plate

in such a manner that the contraction of the spring will produce the return movement of the shaft, which is adjustably limited by means of the adjusting-screw *i'*, located to receive the free end of the pawl on its return movement. The forward end of the base-plate is fitted with a perforated guide, *i''*, through which the forward end of the wire is passed to the bending, cutting, and driving devices.

At *j* is represented a collar, adjustably fixed to the upper end of a shaft, *j'*, by means of a suitable set-screw. This collar is provided with a lever-arm, *j''*, which extends to engage the face of the cam L. To this collar is fixed a lever-arm, *j'''*, having its free end extended and turned down to meet the free end of the lever-pawl *h''*. From this arrangement it will be seen that the revolutions of the cam L will impart an oscillatory movement to the lever-arm *j'''* through its connection with the lever-arm *j''*, which will cause the tubular shaft *h* to move forward and carry with it the wire *h'''*, from which to form the stitch, and the further movement of the cam will permit the lever-arm *j'''* to swing outward, which movement will permit the return movement of the tubular shaft by the action of the spiral spring, and during this return movement of the tubular shaft the wire will be held by the bending-lever E, and the return movement of the tubular shaft will pass over the wire, which will be again caught by the lever-pawl, to be carried forward with the succeeding forward movement of the shaft. The vertical shaft *j'* extends through its vertical support *k*, and to its lower end, under the bed-plate, is fitted with a lever-arm, *k'*, having its free end extending forward under the center endwise-moving carriage. To the free end of this lever-arm is pivoted a spring-actuated lever-pawl, *k''*, adapted to engage the saw-toothed ratchet *k'''*, fixed to the under face of a bar depending from the under face of the carriage.

At *l* is represented a spring, wound round the depending end of the vertical shaft *j'* in such a manner that its spring action will operate to retract the lever-pawl *k''*, which rearward movement is limited by an adjusting-screw, *l'*, to increase or lessen the movement thereof as the screw is turned farther in or out. This adjustment determines the distance of the intermitting movements of the carriage by means of its pawl-and-ratchet connection therewith, to regulate the distance between the stitches, to adapt the machine to stitch books or papers differing in length, and to insert more or less stitches in the article to be stitched.

At *l''* is represented a stop fixed transversely on the movable carriage of the table, to serve as a gage against which to place the end of the book when in position on the table to be stitched, to cause the book or papers to move with the carriage. A suitable automatic shipping-arm, *l'''*, rises from the transverse stop-gage to a proper height, having its upper portion bent to a plane parallel to the carriage,

extending lengthwise thereof, and having its free end inclined downward, producing an inclined plane to operate a stop mechanism.

At *m* is represented a gage-rod, made lengthwise adjustable on the inner face of the outer bar of the table, and when adjusted is fixed in position by means of a screw clamping-bolt, *m'*, fitted to embrace the rod, and with a thumb-nut, by which to clamp the rod to the table. The outer end of this rod is provided with an upturned hook end, *m''*, to receive the end of the table to limit its endwise movement.

At *n* is represented a spring coiled on a suitable stud, *n'*, fixed in any convenient position to the bed or frame. A suitable link, *n''*, connects the free end of the spring-arm *n'''* with the carriage in such a manner that the action of the spring will operate to produce the return movement of the carriage when the spring-actuated pawl *k''* is disengaged from the saw-toothed ratchet. By this arrangement it will be seen that the endwise movement of the carriage may be regulated to move endwise any distance within the limits of the devices, to adapt it to stitch books or other matter to be stitched of various lengths.

At *o* is represented a disk mounted to oscillate on a screw-stud support, *o'*, extending laterally from the upper end of the left-hand standard G. To this disk is pivoted a vertical moving arm, *p*, which extends down through the bed-plate, having its lower end provided with a right-angled arm, *p'*, fitted at its free end with an upturned wedge-formed arm, *p''*, which in its upward movement engages the beveled end stud, *p'''*, which projects from the under face of the pawl *k''* in such a manner as to disengage the pawl from the saw-toothed ratchet, as represented in dotted lines, to permit the return movement of the carriage by the action of the spring *n*, connected therewith. The vertical movement of this disconnecting device is made automatic by means of the lever-arm *o''*, projecting from the front edge of the disk *o*, which, in the forward intermitting movements of the carriage, is raised by means of the shipping-arm *l'''*, the inclined portion of which passes under the arm *o''* and causes it to ascend the inclination to its summit, as represented in dotted lines, Fig. 4, to disengage the pawl from the saw-toothed ratchet, as hereinbefore stated.

That portion of the cam-shaft H extending through its standard-support on the right-hand side of the machine is slotted lengthwise on one side, as at *r*, which is fitted with a clutch-bar, *r'*, pivoted at its outer end in such a manner that its inner enlarged end will be free to rise beyond the periphery of the shaft by the action of a suitable spring placed between its inner edge and the bottom of the slot. The inner end of this clutch-bar extends under the oscillating cam-disk *o* and enters a recess or sink, *r''*, formed in its periphery, to permit the bar to rise when the lever-arm *o''* is in its lowest position. On the outer portion of this slot-

ted shaft is loosely mounted a toothed gear-wheel, *K''*, having its hub notched in clutch form, as at *r'''*, to receive the uprising portion of the clutch-bar, to cause the shaft to revolve with the wheel to impart motion to the different parts of the machine. When the lever-arm *o''* is elevated, as represented in dotted lines, Fig. 4, the disk will be moved to bring its periphery in position to depress the clutch-bar to disconnect it from the clutch-hub, to permit the wheel to revolve on its shaft-bearing without imparting motion to the machine.

At *K'* is represented a sliding bar fitted to move endwise in a central groove in the upper face of the bed-plate and between the bending, cutting, and driving arms. This slide-bar at its forward end is of such height as to pass snugly under the wire from which the stitch is formed as it passes from the perforated guide *i''*. Immediately in front of the wire the forward end, *s*, of this slide-bar is beveled forward and downward at a suitable angle, so that in its rearward movement the driver will descend its inclined face. This slide is also provided with an upward-rising arm, *s'*, adapted to meet the rear face of the cam *K*, employed to govern its endwise movements.

At *s''* is represented a spring coiled on the stud *s'''*, fixed to the bed-plate, and its free end connects with the slide-bar in such a manner that its spring action operates to hold it in its forward position with its vertical arm in contact with the face of the cam.

The head *e'* of the bending-lever arm E is provided on its inner face or side next to the cutting and driving head, and directly opposite the perforation in the wire-guide *i''*, with a vertical groove, *t*, fitted to receive the wire, when bent to a vertical position over the beveled end center slide, as at *t'*, by the downward movement of the head, and serves as a guide to direct and hold the wire in a vertical position, and prevent bending thereof when being driven through the parcel to be stitched. This bending-head is also provided with a presser-foot, *t''*, extending from its lower face forward, to overlap the book or parcel to be stitched, and when in its lowest position its pressure on the book serves to hold the carriage during the return movement of the spring-pawl *k''* over the saw-toothed ratchet, and at the same time permits the return movement of the wire-feeding device over the wire while it is held by the bending-head.

The cutting and driving lever F is fitted with a driving and cutting head, *t'''*, having its under rear face beveled at an angle to correspond to the inclined forward portion of the sliding former or bar *K'*, over which it is placed, and is provided on its cutting-edge with a depending lip, which produces a slightly-curved driving-face provided with a transverse groove, *u*, adapted to receive the horizontal portion of the bent wire which overlaps the sliding bar, and in its downward movement between the

bending-head and perforated wire-guide cuts the portion to form the stitch from the main thread as it passes the perforation, and in its onward movement over the receding beveled end of the former or bar K' drives the vertical arm through the book or parcel, and in the passage of the vertical arm through the parcel its end comes in contact with the inclined corner surface w' of the opening in the inner bar of the table, which serves to give it an inclined curving form.

At W is represented a lever-arm, hinged at its rear end to the rear end of the bed on its under side, and its forward end is pivoted to the rear bar of the table in such a manner that it will move with the vertical movements thereof. This lever-arm is provided with ears w'' , rising from its sides, and receiving a transverse shaft, w''' , on which is pivoted a clincher consisting of a transverse bar, w , fitted to oscillate on the pivot-shaft, and from this transverse bar rises a vertical arm, w' , Fig. 5, to meet the rear face of the cam M.

At w'' is represented a clinching-arm, which extends horizontally from the front face of the transverse bar w , having its free end turned upward to freely enter an opening in the rear bar of the table, immediately under the driver. The upturned end of this clinching-arm is formed into a head, w' , fitted to receive the driven end of the stitch in such a manner that in connection with the driver the stitch will be snugly clinched, having its free ends turned inward and embedded in the book or parcel stitched. This clincher being mounted on the hinged lever pivoted to the table, its relative movements therewith will remain unchanged in the vertical adjustments of the table.

At w''' is represented a spring coiled on the transverse bar w , the action of which operates to hold the vertical arm of the clincher in contact with the cam and the clinching-head in its lowest position.

At W' is represented a band-wheel, to the hub of which is fixed a pinion, W'', both of which are mounted to revolve on a suitable bearing in such relative position to the toothed gear-wheel K'' on the cam-shaft that the teeth of the pinion shall engage the teeth of the wheel on the cam-shaft. This band-wheel is designed to be put in connection with a prime mover by a suitable belt-connection to impart motion to the machine.

From the foregoing it will be seen that with a book or other parcel placed in position on the carriage, and a suitable wire threaded in the machine, the several parts properly adjusted, and motion imparted to the machine through the band-wheel connection therewith, the wire will be carried forward a proper distance, bent at right angles, cut from the thread, driven through the parcel, and properly clinched, and the parcel moved to a second proper position and again stitched in the same manner, which operation will be repeated automatically until the stitching of the parcel is completed, when

the machine will be stopped and the carriage returned in position to receive another book or parcel, ready for a repetition of the above operation, which will be produced on putting the machine in connection with the moving power by depressing the free end of the lever w'' of the disk-cam.

We do not desire to confine ourselves in every particular to the construction herein described, as these may be varied to meet the views of the designer or the convenience of the mechanic in constructing the machine. As an instance, the beveled guideways, on which the table is made vertically adjustable, may be dispensed with, and the table may be provided with rigid arms extending to the rearward portion of the frame and pivoted thereto, to permit of a sufficient vertical movement, and in this construction the clincher may be mounted on a rearward extension of the table. These and many other mechanical changes may be employed without departing from the main features of our invention.

We claim as our invention—

1. In a book-sewing machine, wire-feeding mechanism consisting in the combination, with a tubular shaft provided with a lateral opening, and a pawl having its toe working in the latter, of a rock-shaft, and an arm extending from the latter and engaging with said pawl, substantially as set forth.

2. In a book-sewing machine, wire-feeding mechanism consisting in the combination, with a tubular shaft provided with a lateral opening, a pawl having its toe working in the latter, and a spring which retracts the tubular shaft, of a rock-shaft, an arm extending from the latter and engaging with the pawl, and an adjusting device adapted to arrest the retracting movement of the tubular shaft at a predetermined point, said adjusting device being independent of the means which actuate the tubular shaft in its forward movement, substantially as set forth.

3. In a book-sewing machine, the combination, with a main frame provided with mechanism which intermittently feeds the wire, mechanism which severs the wire, and mechanism which inserts the wire in the paper, of a vertically-adjustable table, a carriage sliding on the latter and provided with a rack, and a pawl, said pawl being pivoted on an arm secured to a vertical rock-shaft, substantially as set forth.

4. The combination, with the oscillating shaft fitted with lever-arms to impart movement to the carriage and feeding mechanism, of a lateral projecting arm adjustably fixed thereto, having its free end engage the face of a suitable actuating rotary cam, and held in contact therewith by spring action operating to impart an oscillatory movement to the shaft, substantially as and for the purpose hereinbefore set forth.

5. In a book-sewing machine, the combination, with a main frame provided with mech-

anism which feeds the wire, mechanism which severs the wire, and mechanism which fastens the wire in the paper, of a vertically-adjustable table supporting a carriage provided with a rack, a pawl pivoted to an arm, which latter extends from a vertical rock-shaft, and a second arm projecting from the shaft to actuate the wire-feeding mechanism, substantially as set forth.

6. In a book-sewing machine, the combination, with a tubular shaft having a side opening in which the toe of a pawl-lever works, a vertical rock-shaft having an arm which engages the long arm of the pawl, and a revolving cam which engages with a second arm of the vertical shaft, of a third arm extending from the vertical shaft and carrying a pawl, a carriage provided with a rack adapted to engage with this latter pawl, and a spring tending to draw the carriage backward, substantially as set forth.

7. In a book-sewing machine, the combination, with a former adapted to be automatically moved in and out of operative position, a bending-head which bends the wire over said former, and a presser-foot secured to the bending-head, of a combined cutting and driving head formed independent of the bending-head and adapted to operate on the wire immediately upon the withdrawal of said former from its operative position, substantially as set forth.

8. In a book-sewing machine, the combination, with a former adapted to be automatically moved in and out of operative position, a bending-head provided with a vertical groove, and a presser-foot, of a combined cutting and driving head and mechanism, substantially as described, for causing said head to operate upon that portion of the wire which rested upon the former immediately upon the withdrawal of said former from its operative position, substantially as set forth.

9. In a book-sewing machine, the combination, with a former provided with a vertically-inclined forward extremity, and mechanism which automatically moves said former in and out of operative position, of a bending-head provided with a vertical groove in its side next to the former, and also provided with a presser-foot, and a combined cutting and driving head adapted to have bearing upon the inclined extremity of the former as said former is withdrawn from operative position, substantially as set forth.

10. In a book-sewing machine, the combination, with wire-feeding mechanism, a former adapted to be alternately moved in and out of operative position, and a bending-head which bends the wire over the former, said bending-head being provided with a vertical side groove and with a presser-foot, of a combined cutting and driving head which has a downward stroke simultaneously with the withdrawal of the former from operative position, and a clincher adapted to fasten the lower horizontal arm

of the wire staple in the paper simultaneously with the fastening of the upper horizontal arm by the driving-head, substantially as set forth.

11. In a book-sewing machine, the combination, with a former alternately moved in and out of operative position, and a head which bends the wire over said former, of a downwardly-moving head adapted upon withdrawal of the former to operate upon that portion of the wire which rested upon the former, and an upwardly-moving clincher which fastens the lower horizontal arm of the staple into the paper simultaneously with fastening the upper horizontal arm of the staple by said downwardly-moving head, substantially as set forth.

12. In a book-sewing machine, the combination, with a former adapted to be alternately moved in and out of operative position, of a driving-head adapted to have a downward stroke as the former is moved out of operative position, said driving-head being formed with a downwardly-projecting point at one side adapted to press the free end of the upper horizontal arm of the wire staple into the paper, substantially as set forth.

13. In a book-sewing machine, the combination, with a longitudinal arm having its rear extremity hinged in vertical movement to the main frame and its forward extremity pivoted to the vertically-adjustable table, of a clincher pivoted on said longitudinal arm, and provided with an arm adapted to engage with a revolving cam, substantially as set forth.

14. In a book-sewing machine, the combination, with a longitudinal lever-arm located beneath the bed-plate, and a horizontal clinching-arm pivoted thereto, the forward extremity of the clinching-arm being provided with an upwardly-projecting clinching-head, of an upright arm rigidly secured to the clinching-arm and extending up through an opening in the bed-plate, a transverse revolving shaft provided with a cam, and a spring which is adapted to maintain said upright arm in contact with the cam, substantially as set forth.

15. In a book-sewing machine, the combination, with a longitudinal arm, having its rear extremity hinged to the main frame and its forward extremity pivoted to the vertically-adjustable table, of a transverse bar pivoted on the longitudinal arm, and provided with a clincher, and a spring wound on said bar and tending to withdraw the clincher from the wire staple, substantially as set forth.

16. In a book-sewing machine, the combination, with a driving-shaft provided with a slot, a spring-pressed clutch fitted in the latter, and a driving-wheel mounted on the shaft, and provided with a hub which engages with the clutch, of a carriage, mechanism, substantially as described, for connecting the carriage and driving-shaft, and a device, substantially as described, adapted to engage with the carriage at a predetermined point in its travel, and thereby cause the clutch to free the wheel from the shaft, substantially as set forth.

17. In a book-sewing machine, the combination, with a driving-shaft and a driving-wheel connected therewith by clutch mechanism, of a device, constructed substantially as described, for shifting the clutch, and a carriage provided with an arm which engages with said shifting device and automatically disengages the wheel from the shaft at a predetermined point in the travel of the carriage, substantially as set forth.

18. In a book-sewing machine, the combination, with a driving-shaft provided with a slot, a spring-pressed clutch fitted in the latter, and a driving-wheel whose hub engages with the clutch, of a carriage connected by mechanism, substantially as described, with said shaft, a vertical pivotal cam adapted to be engaged or disengaged with the clutch, and an arm projecting from the cam and adapted to engage with the carriage at a predetermined point in the travel of said carriage, substantially as set forth.

19. In a book-sewing machine, the combination, with a driving-shaft provided with a slot, a spring-pressed clutch working in the latter, and a vertical pivotal disk provided with a peripheral recess, of a carriage provided with an arm adapted to engage with an arm of the disk, and thereby rotate the latter so that the clutch is thrown out of the peripheral recess and depressed so as to disconnect the shaft from the wheel, substantially as set forth.

20. In a book-sewing machine, the combination, with a clutch which connects the driving-wheel to the driving-shaft, and mechanism, substantially as described, adapted to shift the clutch at a predetermined point in the travel of the carriage, of a device, substantially as described, connected to the clutch-shifter and adapted to disengage the carriage-actuating pawl from the carriage-rack simultaneously with the disconnection of the wheel and shaft, substantially as set forth.

21. In a book-sewing machine, the combination, with a clutch which connects the driving-wheel to the driving-shaft, a vertical pivotal cam adapted to shift the clutch, and a cam-arm adapted to be engaged with an arm of the carriage at a predetermined point in the latter's travel, of a depending arm pivoted to the cam, and provided with a disconnecting-arm adapted to disengage the carriage-actuating pawl from the carriage-rack simultaneously with the shifting of the clutch to disconnect the driving-shaft and wheel, substantially as set forth.

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