

(Model.)

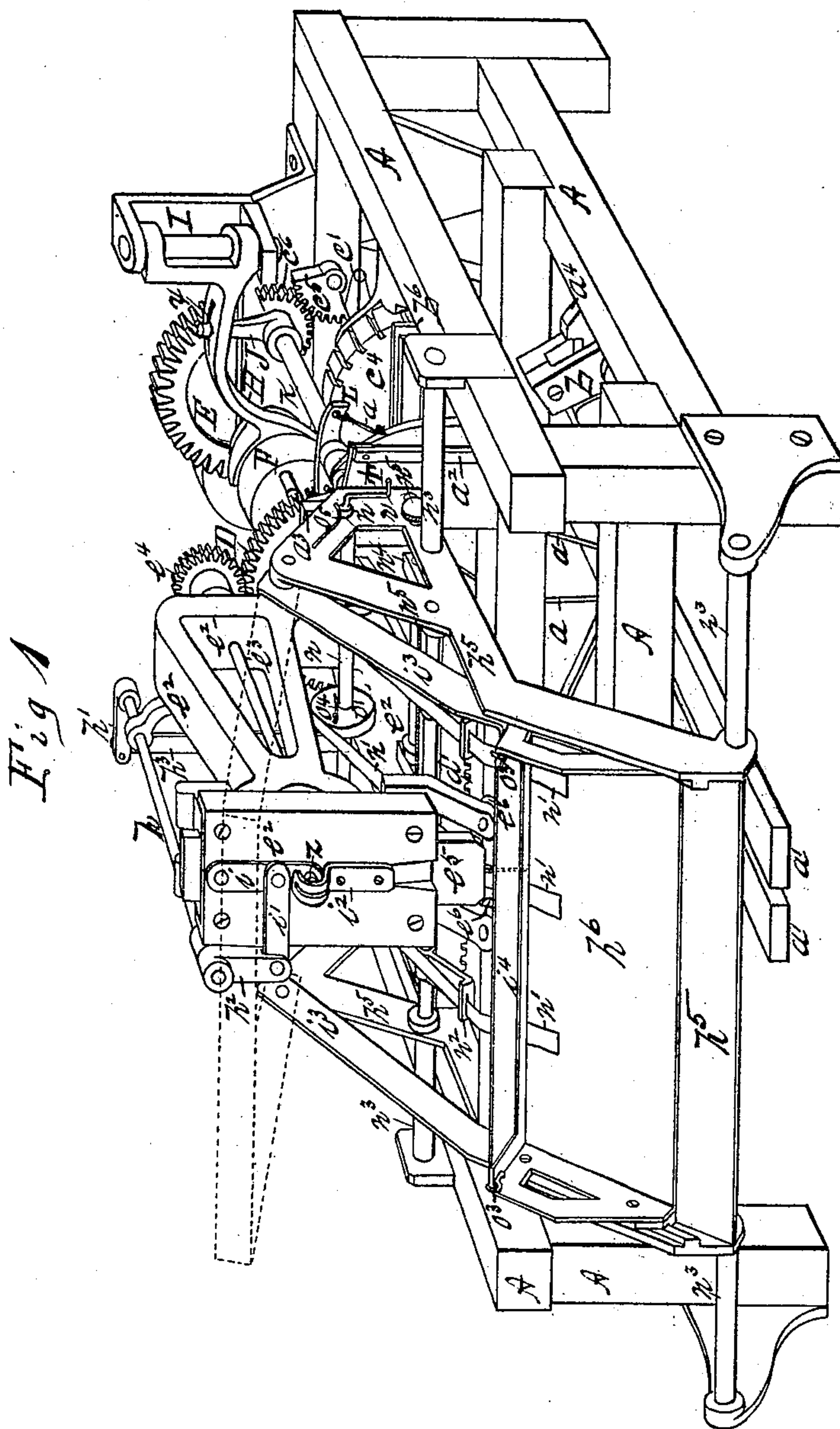
6 Sheets—Sheet 1.

J. F. TAPLEY & G. B. KILBON.

BOOK SEWING MACHINE.

No. 265,463.

Patented Oct. 3, 1882.



Witnesses
J. D. Garfield
G. W. Brainerd

Inventors
Jesse F. Tapley
George B. Kilbon
by Henry A. Chapin

(Model.)

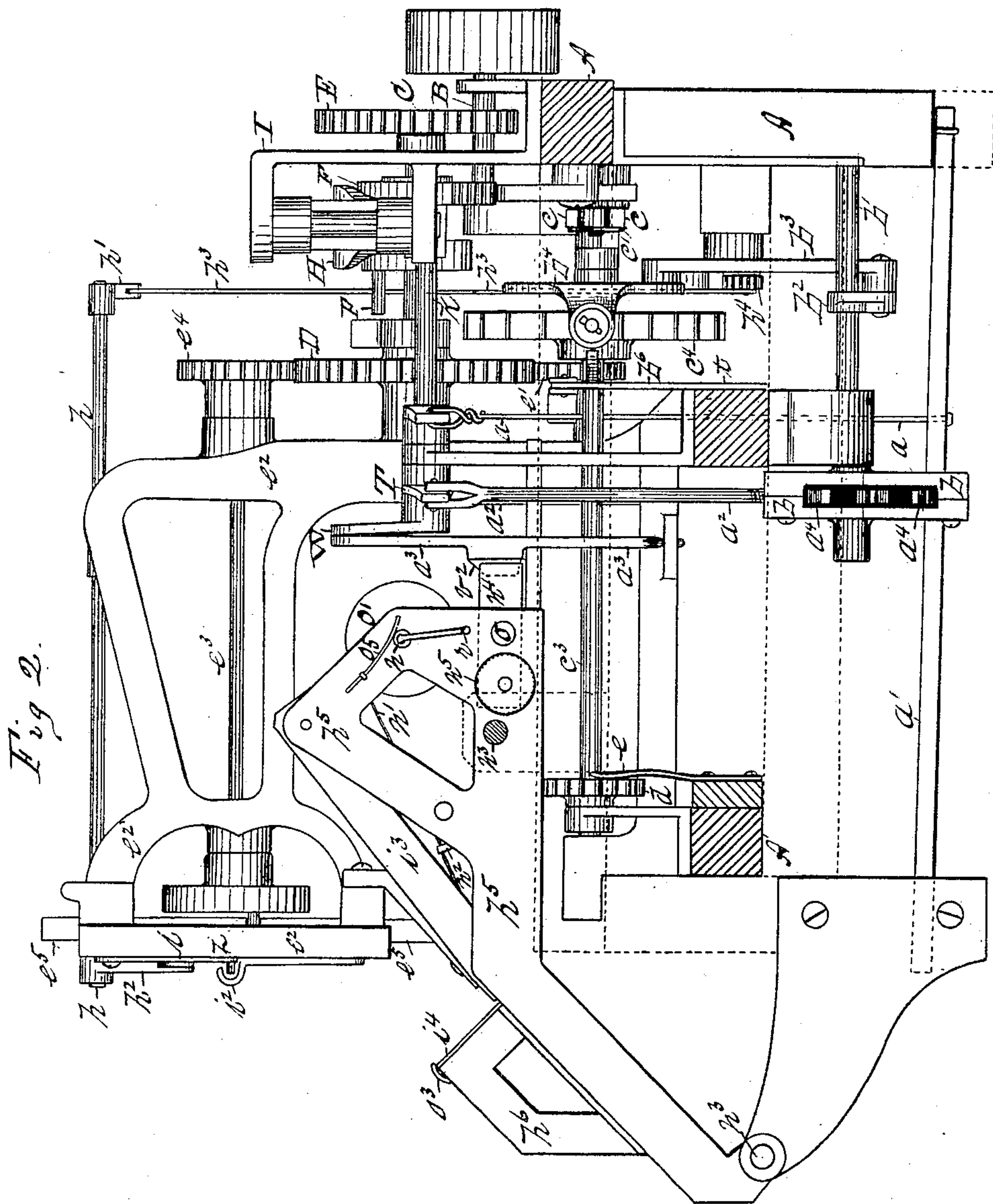
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(Model.)

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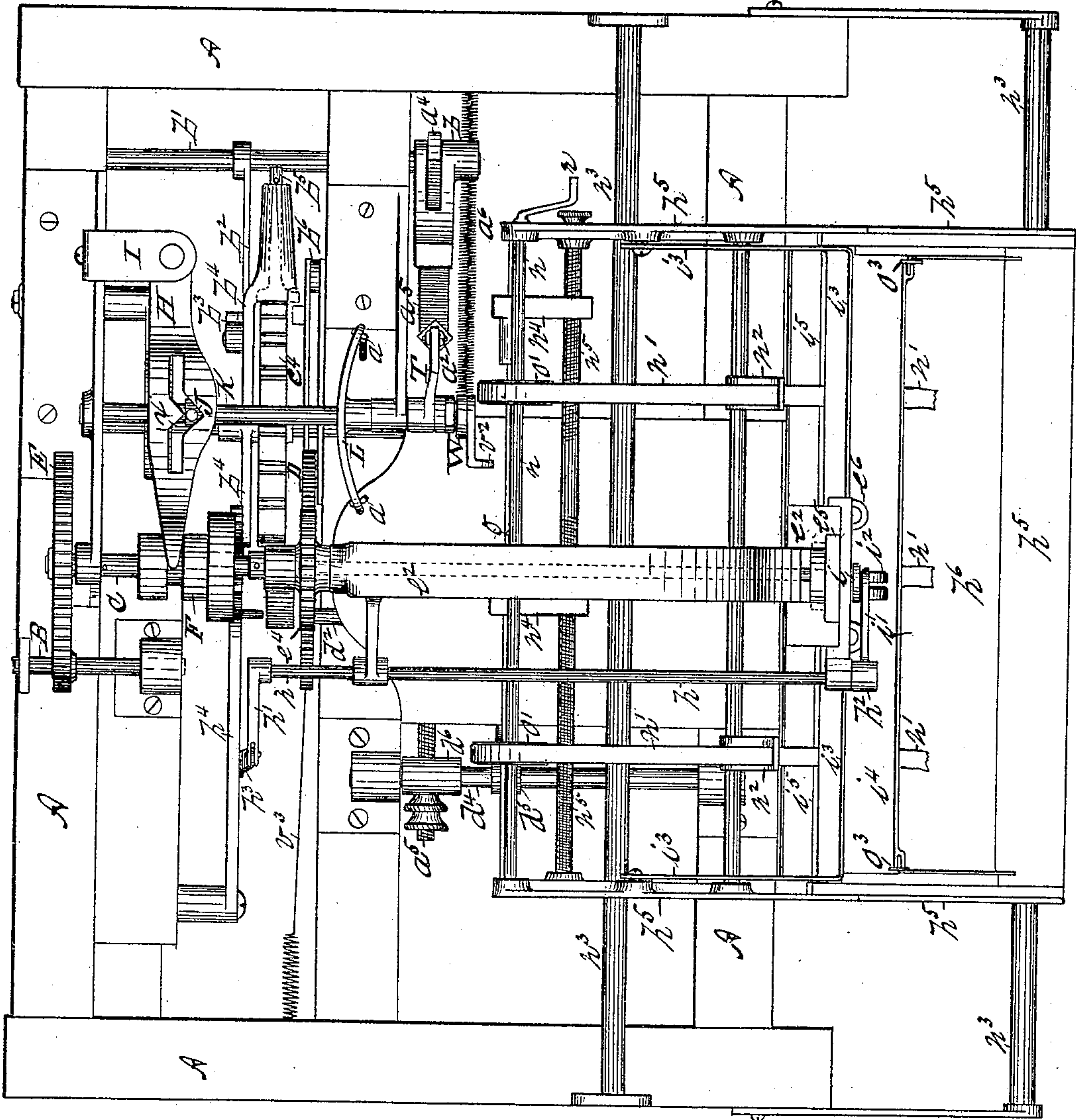


Fig. 3

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(Model.)

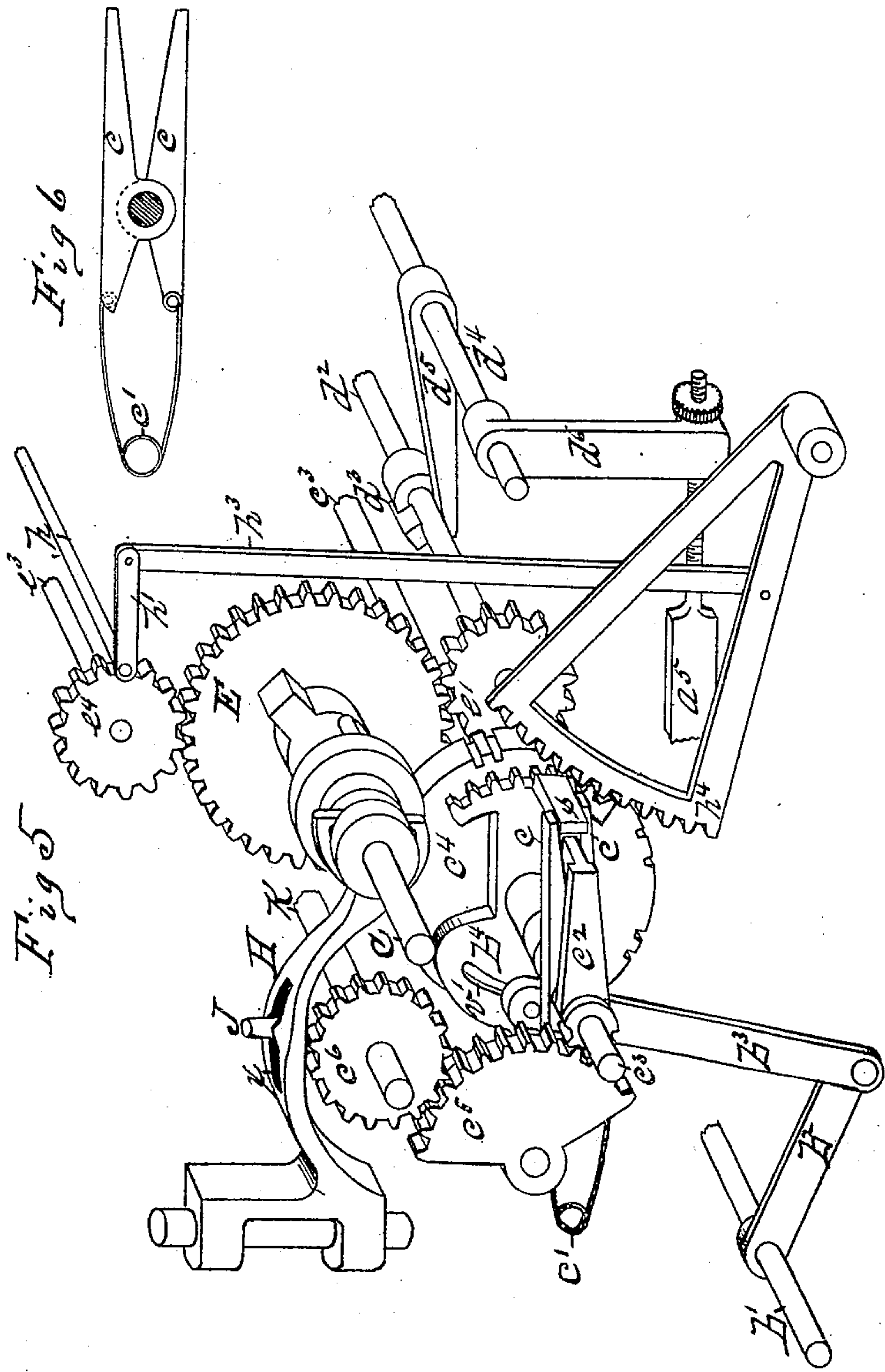
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Patented Oct. 3, 1882.



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J. D. Garfield
G. N. Brown

Inventors
Jesse F. Tapley
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(Model.)

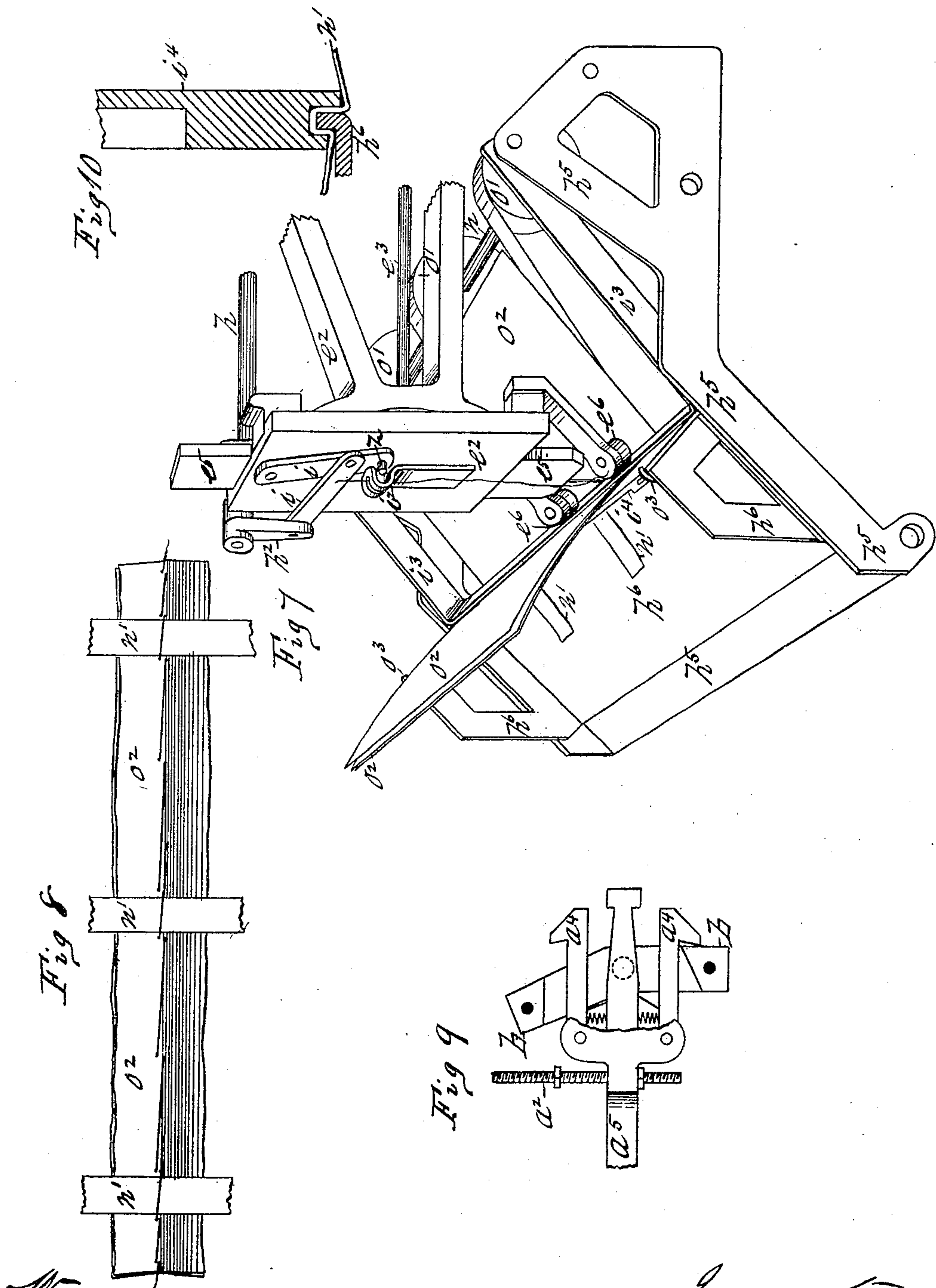
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UNITED STATES PATENT OFFICE.

JESSE F. TAPLEY AND GEORGE B. KILBON, OF SPRINGFIELD, MASS.

BOOK-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 265,463, dated October 3, 1882.

Application filed October 15, 1881. (Model.)

To all whom it may concern:

Be it known that we, JESSE F. TAPLEY and GEORGE B. KILBON, citizens of the United States, residing at Springfield, in the county of Hampden and State of Massachusetts, have jointly invented new and useful Improvements in Book-Sewing Machines, of which the following is a specification.

This invention relates to certain improvements in book-sewing machines by which the "signatures," as they are termed, or folded leaves of a book, are successively sewed through and through, having stitches of varying length made therein, as required for such work, and at the same time certain of said stitches are caused to be looped over or sewed through suitable binding-tapes running transversely across the united back edges of the signatures, the object being to provide a machine which will sew books more rapidly and with greater uniformity than can be done by hand, and which will insure a close and accurate arrangement of the book-leaves.

The sewing devices proper of this machine are those of the well-known Singer shuttle-machine, or a similar one, which it is not deemed necessary to describe or illustrate herein, except in so far as regards certain prominent features thereof, for the purpose of showing the operative relation of the novel mechanism which co-operates with said sewing-machine to accomplish the book-sewing.

In the drawings forming part of this specification, Figure 1 is a perspective view of a book-sewing machine embodying the improvements herein described and claimed. Fig. 2 is a side elevation, partly in section, and having a part of the frame shown in dotted lines. Fig. 3 is a plan view. Figs. 4 and 5 are perspective views of detail parts occupying relative operative positions, shown apart from the frame of the machine. Fig. 6 is a side elevation of detail parts. Fig. 7 is a perspective view of a portion of the work-table, showing the position of the work when being sewed and the needle-bar head of the sewing-machine. Fig. 8 shows the stitches and binding-tapes on the outside of the book-signature. Fig. 9 illustrates detail parts of feed-reversing mechanism. Fig. 10 shows parts (enlarged) of the work-table and the end of one of the tapes.

One feature of this invention consists in the employment of a signature-table carrying binding-tapes with winding and tension mechanism, and adapted to have a reciprocating motion horizontally from right to left, and vice versa, between the lower end of the needle-bar and the bed of the sewing-machine. It is obvious that any suitable cords may be used instead of tapes.

Other features of this invention consist in the combination, with said table, of feed devices to move the table and its work under the needle, so as to cause both short and long stitches, or stitches of uniform length, to be formed during the movement of said table the length of the signature in either direction; of devices for reversing the said horizontal movement of the table after one signature has been sewed and another one has been added; and of take-up devices to draw from the spool only such length of thread as each short and each long stitch requires.

Other minor features of invention will be understood from the following detailed description of the parts, the particular subject-matter claimed being hereinafter definitely specified.

In the drawings, A denotes the frame of the machine, adapted to support the sewing-machine and other operative mechanism. B is the driving-shaft. C is the main shaft. D and E are gears on the main shaft. F is a clutch on shaft C. H is a clutch-lever. I is the clutch-lever standard. J is the clutch-lever shipper-arm. K is the shipper-arm shaft. L is the treadle-yoke on shaft K. T is a hook-lifting arm. W is a stop-lever arm. *a* are treadle-connecting rods. *a'* are shipping-treadles. *a²* is a hook-connecting rod. *a³* is a stop-lever. *a⁴* are reversing-hooks. *a⁵* is the reversing-hook arm. *a⁶* is the reversing-arm spring. *b* is the reversing-link. *b'* is the reversing-link shaft. *b²* is an arm on shaft *b'*. *b³* is a feed-bar on arm *b²*. *b⁴* is a segmental feed-pawl carrier. *b⁵* is the pawl. *b⁶* is the pawl-lifter. *c* are spring-arms acting on the pawl-carrier. *c'* is a spring on arms *c*. *c²* is a stop-arm for the pawl-carrier. *c³* is the feed-shaft. *c⁴* is the feed-wheel. *c⁵* is an intermediate geared segment. *c⁶* is a gear on the shipper-arm shaft. *d* is a gear on the feed-shaft. *d'* is the feed-rack. *d²* is the shuttle and feed-motion shaft.

\bar{d}^3 is a cam on shaft \bar{d}^2 . \bar{d}^4 is the reversing-hook shaft. \bar{d}^5 is a cam-arm on shaft \bar{d}^4 . \bar{d}^6 is a vertical arm on said shaft. e is a spring bearing against feed-shaft gear. e' is a gear on the shaft \bar{d}^2 . e^2 is the sewing-machine frame. e^3 is the needle-bar shaft. e^4 is a gear on shaft e^3 . e^5 is the needle-bar. e^6 are pressure-rollers on frame e^2 . h is the take-up rock shaft. h' is a horizontal arm on said shaft. h^2 is a vertical arm on the same. h^3 is the take-up connecting-rod. h^4 is the take-up segment. h^5 is the work-table. h^6 is an adjustable work-support on said table. i is a vibrating take-up bar. i' is a connecting-rod to said bar. i^2 is the take-up hook. i^3 is a pivoted signature-holder. i^4 is a removable side to support h^6 . i^5 is a slot through table h^5 . n is the tape-roller shaft. n' are binding-tapes. n^2 are tape-guides. n^3 are guide-rods on which the work-table slides. n^4 are stop-blocks. n^5 is a stop-block screw. o is a stop-block rod. o' are tape-rollers. o^2 are signatures or book-leaves.

Like letters refer to like parts in the several figures.

The sewing-machine frame e^2 is properly secured on frame A, and two horizontal guide-rods, n^3 , are secured to said frame by proper supports.

A work-table, h^5 , consisting of two end frames and an inclined front side, is carried upon the said guide-rods, the latter passing transversely through said end frames, one at their lower front ends and the other near their rear ends, in such a way that said table may slide freely from right to left thereon.

Upon said inclined front side of table h^5 is fitted to slide in grooves on the inner sides of said frame-pieces a work-support, h^6 , having a removable upper side, i^4 , whose ends are grooved to receive the bent-around ends of said support, or other equivalent devices thereon, so that said side i^4 may be slid up and down thereon, and a longitudinal rib runs along under said side on support h^6 , which enters a groove in the lower edge of said side i^4 when the latter is pushed quite down, as seen in Fig. 10, and two hooks, o^3 , hook over and hold said side in place.

A signature holder, i^3 , (shown raised up by dotted lines in Fig. 1,) is pivoted by its ends to the inner side of said frame-pieces of table h^5 , and is adjusted to have its edge lie against said table just below the slot i^5 through the latter, which slot is clearly shown in Fig. 3.

A tape-roller shaft, n , is hung in said frame-pieces to table h^5 , carrying on it a series of tape-rollers, o' , having friction-springs o^4 thereon, whose ends bear on said shaft to cause said rollers to so resist rotation by pulling the tapes n' as to cause the latter to be drawn straight, and said shaft itself is held against too free rotation, when said tapes are so pulled, by a spring, o^5 , which bears upon it where it projects through said frame-piece at one end, and a crank, r , is provided by which said shaft may be rotated to wind the tapes on said rollers.

Tape-guides n^2 are placed on a rod running across said table in front of said tape-rollers, through which the tapes n' pass on their way to the table. The ends of said tapes are carried under the signature-holder i^3 and over the slot i^5 in the table h^5 , and are secured between lower grooved edge of the side i^4 of support h^6 and the aforesaid rib on the latter, which enters the groove in said side, as shown in Fig. 10, and are there firmly held, hooks o^3 preventing said side from sliding upward.

A rod, o , is fixed in the aforesaid frame-pieces of table h^5 , quite to the rear side thereof, running parallel to the guide-rods n^3 , and on said rod o are fitted two stop-blocks, n^4 , which slide thereon, actuated by a screw-rod, n^5 , which passes through one end thereof, and which is provided with a right and left hand thread, so that by turning rod n^5 said blocks are moved in opposite directions. The rear ends of blocks n^4 project beyond the rear side of table h^5 , for the purpose hereinafter stated.

A feed-rack, d' , is secured to table h^5 , with which a gear-wheel, d , engages to give said table the aforesaid motion back and forth upon said guide-rods and under the needle-bar.

Two pressure-rollers, e^6 , are hung on arms secured to the lower end of the head of the sewing-machine frame e^2 , (shown in Fig. 7,) and are adapted to roll against the rear face of the signature-holder i^3 to press it closely against the work.

The mechanism for imparting the aforesaid feed motions to table h^5 and for reversing its movements and for operating the sewing-machine in conjunction therewith is as follows: A driving-shaft, B, adapted to be run by any suitable means, is geared to the main shaft C, on which is a loose gear, D, having a hub which adapts it for engagement with a clutch, F, which is splined to shaft C, and is moved thereon by the clutch-lever H in the usual manner. Gear D engages with gear e^4 on shaft e^3 , and thus gives the requisite reciprocating motion to the needle-bar e^5 , and also engages with gear e' on shaft \bar{d}^2 , whereby the requisite shuttle motion is obtained, and the necessary intermittent feed motion is imparted to the reversing-hook shaft \bar{d}^4 by the action of cam \bar{d}^3 upon arm \bar{d}^5 . Shaft C and clutch F having been set in motion, the intermediate mechanism by which table h^5 is acted upon as aforesaid is put in connection with said shaft by pressing down either of the treadles a' , both of which are by rods a connected to the opposite arms of the treadle-yoke L on shaft K, whereby said shaft is rocked in two directions. One of the effects of rocking shaft K, as just stated, is to throw the upper end of the shipper-arm thereon to one end of the irregular-shaped slot x in the clutch-lever H, thereby swinging said arm and sliding-clutch F into engagement with the hub of gear D, and at the same time gear e^6 on shaft K (through the intermediate segment, e^5) swings the stop-arm e^2 either up or down, causing its end to carry with it one of the spring-arms e

and cause the other of said arms c to bear with the force of spring c' against the short arm s on the pawl-carrier b^4 . (See Fig. 5.) Therefore if the pawl b^5 (which is a piston-pawl operating in a cylindrical case by a spiral spring coiled around it to throw its thin end into the grooves across the edge of wheel c^4) be now drawn back away from said wheel, the pawl-carrier, which swings freely on shaft c^3 , will be by one of said arms c thrown around until the arm s on the pawl-carrier strikes the opposite arm c , where it will stop at a position coincident with arm c^2 , as shown in Fig. 5. Said pawl-carrier in swinging, as above described, carries the pawl toward the upper or the lower side of the grooved feed-wheel c^4 , which is fixed on the feed-shaft c^3 , and lets said pawl drop into one of the grooves in said feed-wheel. Pawl-carrier b^4 has a circular slot, v' , in it, in which the end of a pin fixed transversely in a bar, b^3 , enters. Said bar b^3 is given a vertical reciprocating motion by the rocking of shaft b' , with which it is connected by arm b^2 on said shaft. Shaft b' is given a rocking motion by the horizontal reciprocating motion of the reversing-hook arm a^5 , which is connected with said shaft by means of the link b , connected to the end thereof, and the hooks a^4 . The end of said arm a^5 to which the hooks a^4 are pivoted, as seen in Fig. 9, is adapted to be carried up and down in said link b , so that one of said hooks may engage alternately with first one and then the other end of said link, and so rock shaft b' as to give arm b^2 thereon a reciprocating motion from its highest point down or from its lowest point upward, carrying bar b^3 with it. The aforesaid horizontal reciprocating motion is given to arm a^5 jointly by the spring a^6 and the arm a^6 on shaft d^4 , the latter being actuated by the action of cam d^3 on shaft d^2 , as aforesaid. Said hook-carrying end of arm a^5 is moved up and down in the link b , for the purpose above stated, by the movement of arm T on the rock-shaft K , with which arm a^5 is connected by the rod a^2 . After the pawl b^5 has swung around with wheel c^4 from below up, or vice versa, it comes to a rest about opposite to the axis of shaft c^3 , on which said wheel is fixed, and at this point it is necessary that the pawl be carried out of engagement with said wheel, so that it may be carried back for another stroke. To effect this result, a pawl-lifter, b^6 , is provided, consisting of a vertical arm, t , pivoted by its lower end to the frame of the machine, and a horizontal arm pivoted to arm t , whose free end is supported near to and made to engage with a pin, o^4 , or some suitable projection on the hub of gear c' or the shaft that carries it, so that at each revolution of the latter a block, x , (shown in Fig. 4,) will be pushed against the thin end of pawl b^5 and disengage it from wheel c^4 , letting pawl-carrier b^4 swing around, as aforesaid. A spring, v^3 , Fig. 3, draws said pawl-lifter against or toward said hub of gear c' . A vertical stop-lever, a^3 , is pivoted one end to an arm, W , on the rock-shaft K , and its

lower end hangs loosely in a hole in part of the machine. Said lever a^3 is provided with a hook-arm, v^2 , and said hook-arm stands in such a position in the rear of table h^5 that when the latter has moved as far as it should to the right or to the left one of the stop-blocks n^4 is carried against said hook-arm, and pushing lever a^3 causes the end of arm W to swing over and shaft K to be rocked, thereby operating the above-described devices, whereby the machine is stopped by throwing arm J on shaft K to a vertical position and disengaging clutch F from gear E .

In work for which this machine is constructed it is generally required that there shall be both long and short stitches sewed through the signature o^2 , Fig. 8, the short stitches being made near each end and reaching over or through the tapes n' and over or through the middle tape, as shown, and the long stitches intermediate between the tapes. To this end the feed-wheel c^4 has the grooves in its periphery in which pawl b^5 engages cut at irregular intervals. Also, provision is made whereby the requisite length of thread for short and long stitches is taken up from the thread-spool automatically as follows:

The end of the pawl-carrier b^4 opposite to that in which the pawl is set is made in the form of a gear-segment, (see Fig. 5,) and a take-up gear-segment, h^4 , is so hung as to engage with the toothed end of said pawl-carrier. To said segment h^4 is pivoted a connecting-rod, h^3 , which in turn is pivoted to an arm, h' , on a rock-shaft, h . This latter shaft is hung so as to reach forward by the side of and beyond the face of the needle-bar head of the sewing-machine, and has a downhanging arm, h^2 , thereon, to the end of which is pivoted a connecting-rod, i' , which in turn is pivoted to a vibrating take-up bar, i , in the lower end of which is a stud, z , having a vertical thread-hole through it. (See Fig. 7.) A slotted hook, i^2 , is bent over the lower end of said vibrating bar i and said stud z . The thread from its spool passes down through the upper part of the slot in said hook i^2 , thence through the said hole in stud z , and thence through the lower part of said slot down to the needle, as shown in Fig. 7. Thus it will be seen that the extent of the vibrations of bar i by which the thread will be drawn from its spool for a stitch next to be made will be exactly in accordance with the oscillatory movements of the pawl-carrier b^4 , whose movements determine the extent of the feed motion given to the table h^5 as it carries the work along under the needle.

A spring, e , Fig. 2, is adapted to bear frictionally against the face of the feed-gear d to insure steadiness of motion in the latter.

The operation of this machine is as follows: The table h^5 is moved to one side, the tapes n' are drawn from their rollers, and their ends are secured between the lower grooved edge of the side i^4 of the work-support h^6 , and said side is there fastened by the hooks o^3 , so that

said parts will be in the position shown in Fig. 1. The signature-holder i^3 is now lifted up, as shown in dotted lines, and a signature, o^2 , is placed upon the table in the position shown in Fig. 7, and the signature-holder is dropped down upon it, crowding its outwardly-placed leaves between it and said side i^4 and holding the signature down upon the table beneath, while the rest of its leaves lie upon that portion of the tapes n' between the table and shaft n . Care is taken that support h^6 be moved sufficiently toward the pressure-rolls e^6 before placing the work as above described, to make sure that said signature-holder will be so pressed upon by said rollers as to hold the signature immovable while being sewed. If in arranging the machine as above stated for sewing, said table is moved quite to the left for starting the stitching, the left-hand treadle is pressed down, rocking shaft K, so as to throw the end of arm J toward clutch F, engaging the latter with the hub of gear D and causing arm c^2 to be swung downward against the lower one of the spring-arms c , carrying it away from the other one and making the upper one of said arms, through the action of spring c' , bear down upon the arm s on the pawl-carrier b^4 . Pawl b^5 is now drawn away from engagement with wheel c^4 , letting the pawl-carrier swing on shaft c^3 and carry the pawl toward the upper side of said wheel to there engage in one of the grooves therein. The sewing devices are now operating, and by the aforesaid rocking of shaft K arm T thereon is thrown up, lifting the reversing-hook arm a^5 up, so that one of hooks a^4 engages with the upper end of the link b , to which is given a vibratory movement by arm a^5 , causing pawl-carrier b^4 , through the above-described connections with shaft b' and the action of spring c' , to have an oscillatory movement, which causes it to turn wheel c^4 in one direction and to give to shaft c^3 and to gear d the requisite feed motion for moving table h^5 , as above described, the pawl-lifter b^6 lifting the pawl away from wheel c^4 when said pawl has swung down opposite said lifter. When the table h^5 has been fed along the length of the signature it carries, one of the stop-blocks n^4 will be carried by said table against the arm v^2 on the stop-lever a^3 , and said lever will thus be made to swing over and rock shaft K, causing arm J thereon to be swung to a perpendicular position, whereby clutch F will be drawn back and the machine stopped. After the above-named signature has been sewed the holder i^3 is lifted up, the leaves of said signature which rested upon the tapes are turned forward against those lying against the side i^4 , and another signature is placed on the table against the first one, the holder i^3 being let down upon it as before, and in so pressing said holder against the signature the support h^6 is caused to slide slightly down the inclined side of the table, drawing the tapes with it, and is so moved as each successive signature is added, until all of the latter which go to make up a book shall

have been sewed, and sewed to said tapes. As the sewing devices are operated the needle passes through said signatures, and down through the slot i^5 in table h^5 , its lower end passing beneath the bed proper of the sewing-machine, where a shuttle operates with it in the ordinary way to complete the stitch. If it be desirable to sew stitches of an even length, the feed-wheel c^4 may have its periphery grooved accordingly.

What we claim as our invention is—

1. The combination, in a book-sewing machine, of the needle-bar c^5 , and needle and operating mechanism of the work-table h^5 , the work-support h^6 , to slide on said table, the signature-holder i^3 , pivoted to table h^5 , and of mechanism, substantially as described, for feeding said work-table from right to left and from left to right with an intermittent motion, all as set forth.

2. In combination, the work-table h^5 , the work-support h^6 , adjustable on said table, and the signature-holder i^3 , pivoted to said table, substantially as set forth.

3. The support h^6 , adjustable on table h^5 , and having a turned-up rib along its rear edge, in combination with the side i^4 , movable vertically, and having its lower edge grooved to fit over said rib, and with the tapes n' and the tape-roller shaft n , having the spring-held rollers o' thereon, substantially as set forth.

4. In combination with the shaft c^3 , geared to table h^5 , the feed-wheel c^4 , transversely grooved around its periphery, the oscillating pawl-carrier b^4 , having the slot v' therein and carrying the pawl b^5 , the feed-bar b^3 , engaging with said pawl-carrier, and appliances, substantially as described, for imparting a reciprocating vertical motion to said feed-bar, substantially as set forth.

5. In combination, shaft b' , the link b , the reversing-hook arm a^5 , having the hooks a^4 pivoted thereto, and appliances, substantially as described, for imparting to said arm a^5 a horizontal reciprocating motion, and for raising and lowering said arm to cause hooks a^4 to engage alternately with either end of said link, all as set forth.

6. In combination, the pawl b^5 , the pawl-lifter b^6 , and the rotating pin o^4 on gear c' , substantially as set forth.

7. The combination, with the pawl-carrier b^4 , having the arm s thereon, of the arm c^2 , turning on shaft c^3 , the arms c , hung loosely on said shaft, and spring c' , substantially as set forth.

8. In combination, the treadles a' , shaft K, having thereon the treadle-yoke L, gear c^6 , segment c^5 , and the arm c^2 , substantially as set forth.

9. In combination, the feed-wheel c^4 , the pawl-carrier b^4 , pawl b^5 , arms c , spring c' , arm c^2 , segment c^5 , gear c^6 , shaft K, and the treadle-yoke L, connected by its two arms to the treadles a' , substantially as set forth.

10. In combination, clutch F, the clutch-le-

ver H, having the irregular slot x therein, arm J, shaft K, having arm W thereon, stop-lever a^3 , and the table h^5 , having the adjustable stop-blocks n^4 thereon, substantially as set forth.

5 11. The combination, with the pawl-carrier b^4 and with the vibrating take-up bar i , of appliances, substantially as described, to cause the thread-carrying end of said bar i to vibrate
10 in accordance with the oscillations of said pawl-carrier, substantially as set forth.

12. In combination, the table h^5 , the work-support h^6 , and the pressure-rollers e^6 , supported on frame e^2 , substantially as set forth.

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