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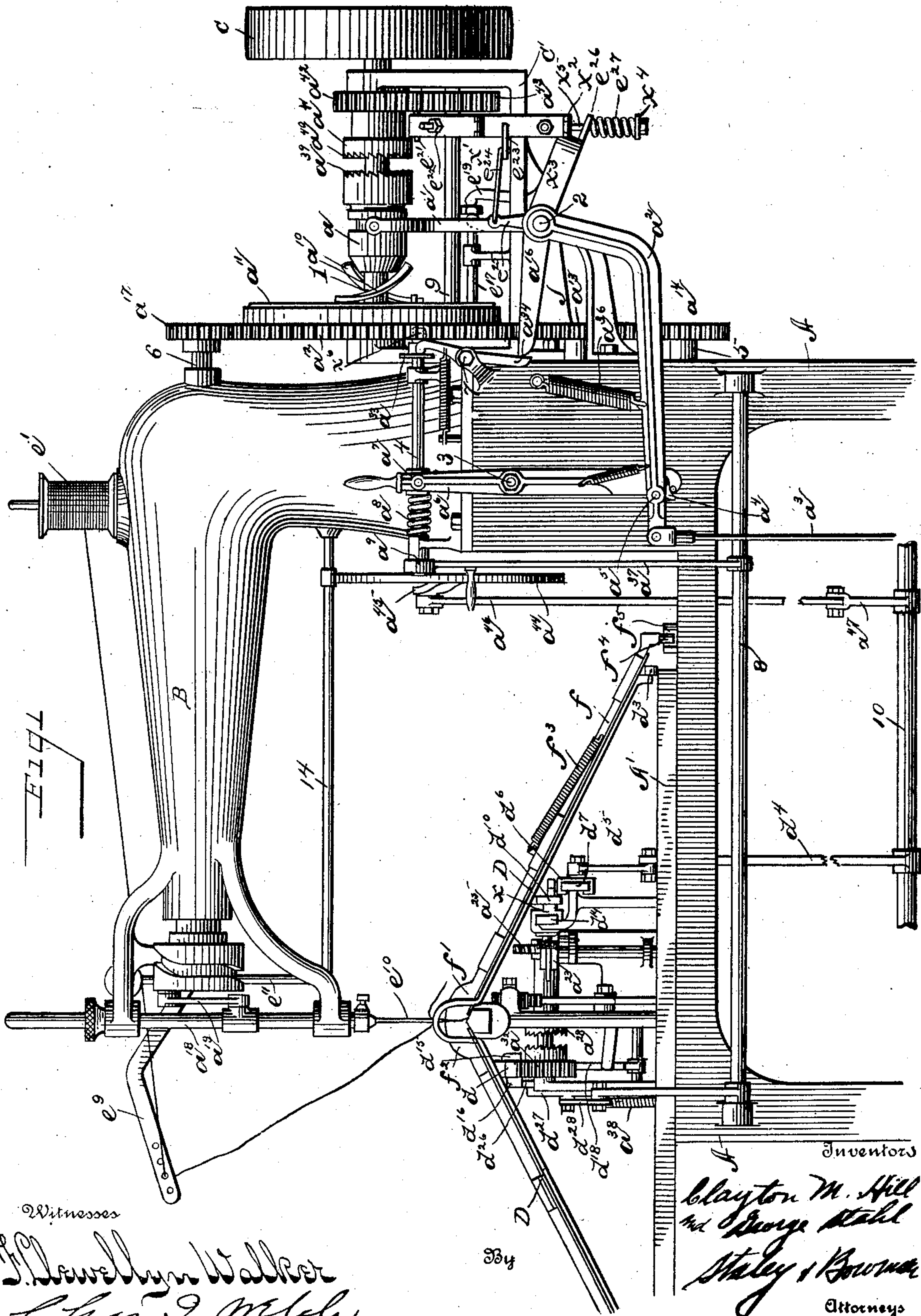
PATENTED JUNE 21, 1904.

C. M. HILL & G. STAHL.
FEEDING DEVICE FOR BOOK SEWING MACHINES.

APPLICATION FILED AUG. 1, 1903.

NO MODEL.

6 SHEETS—SHEET 1.



Witnesses
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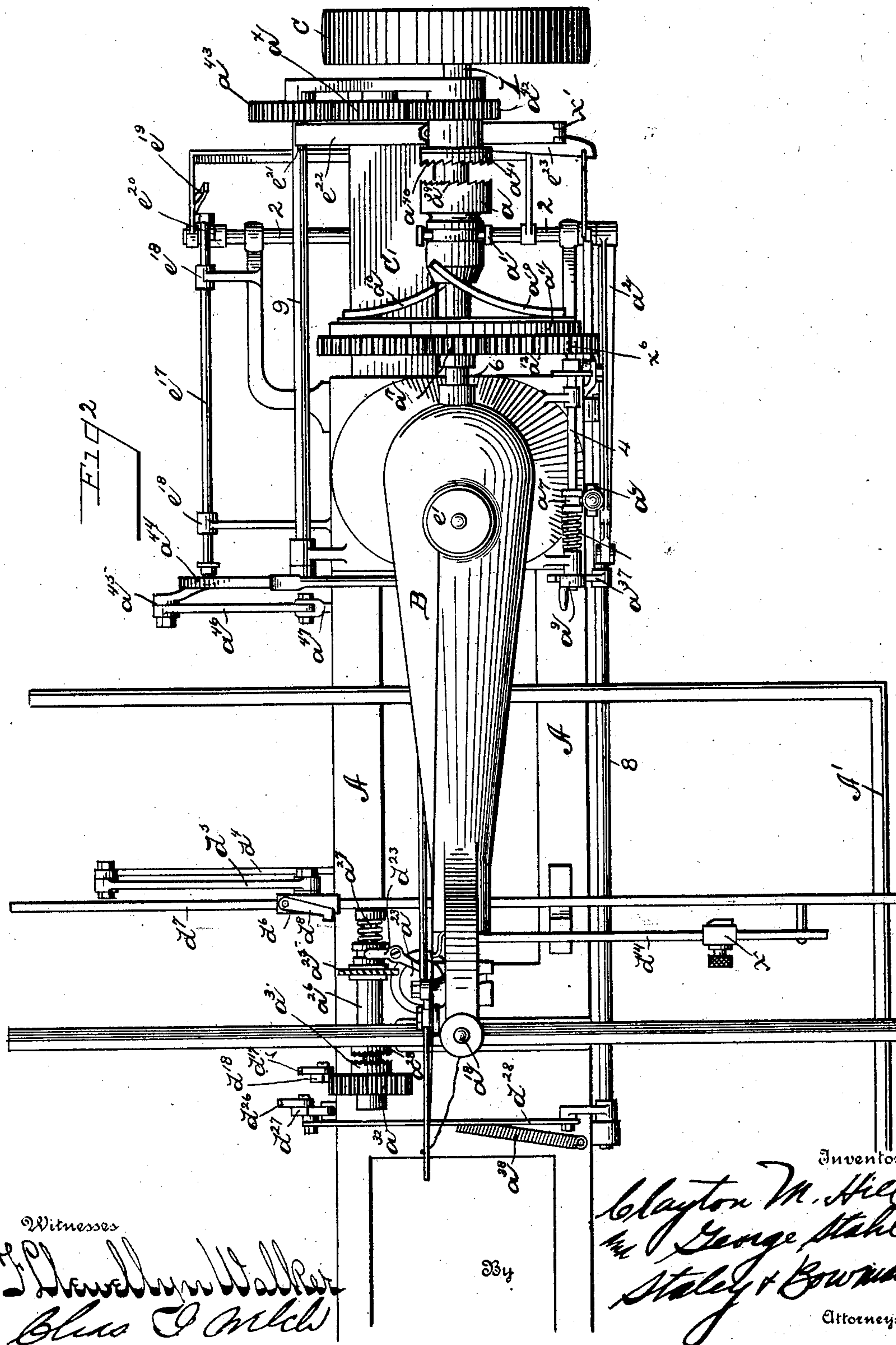
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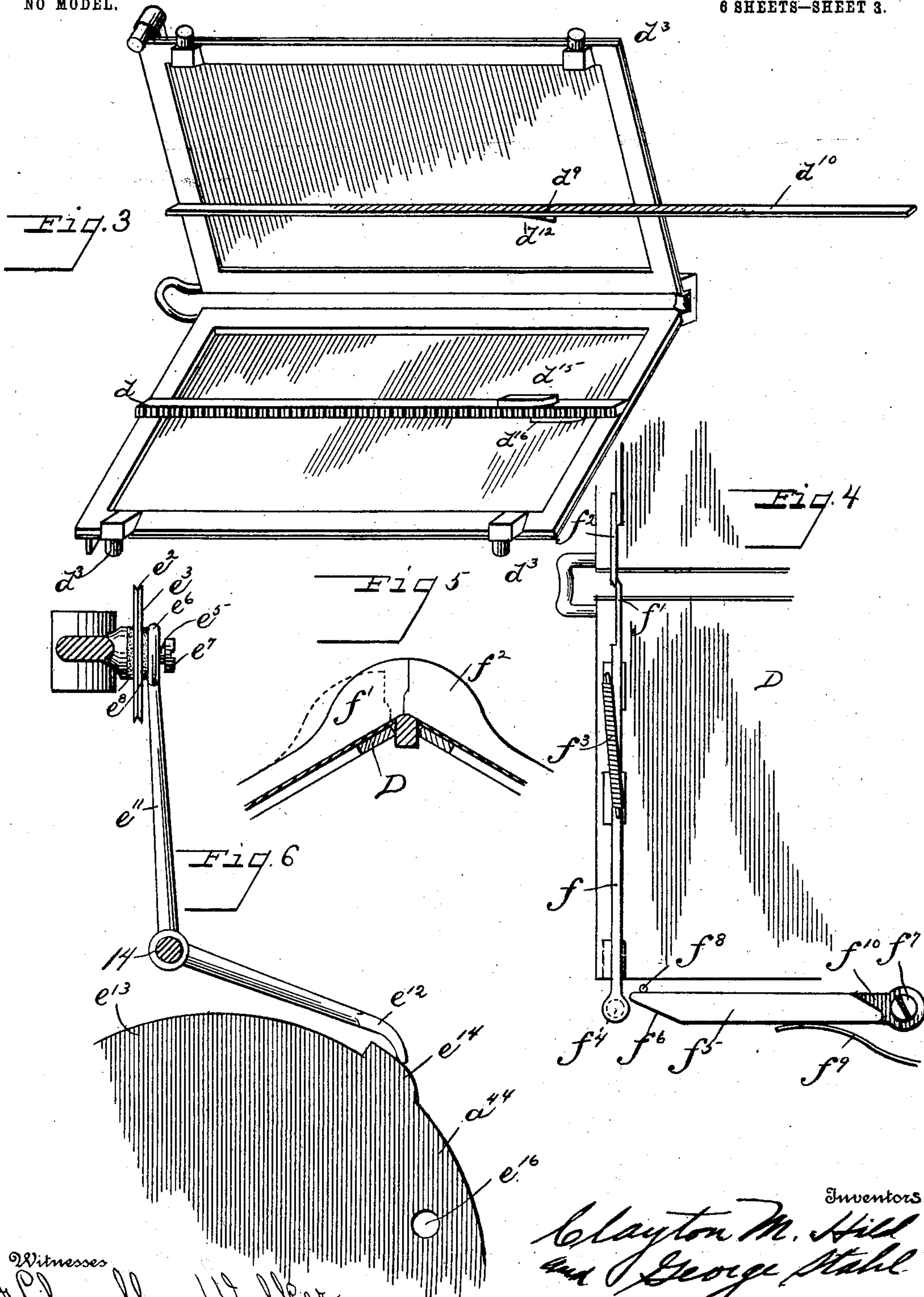
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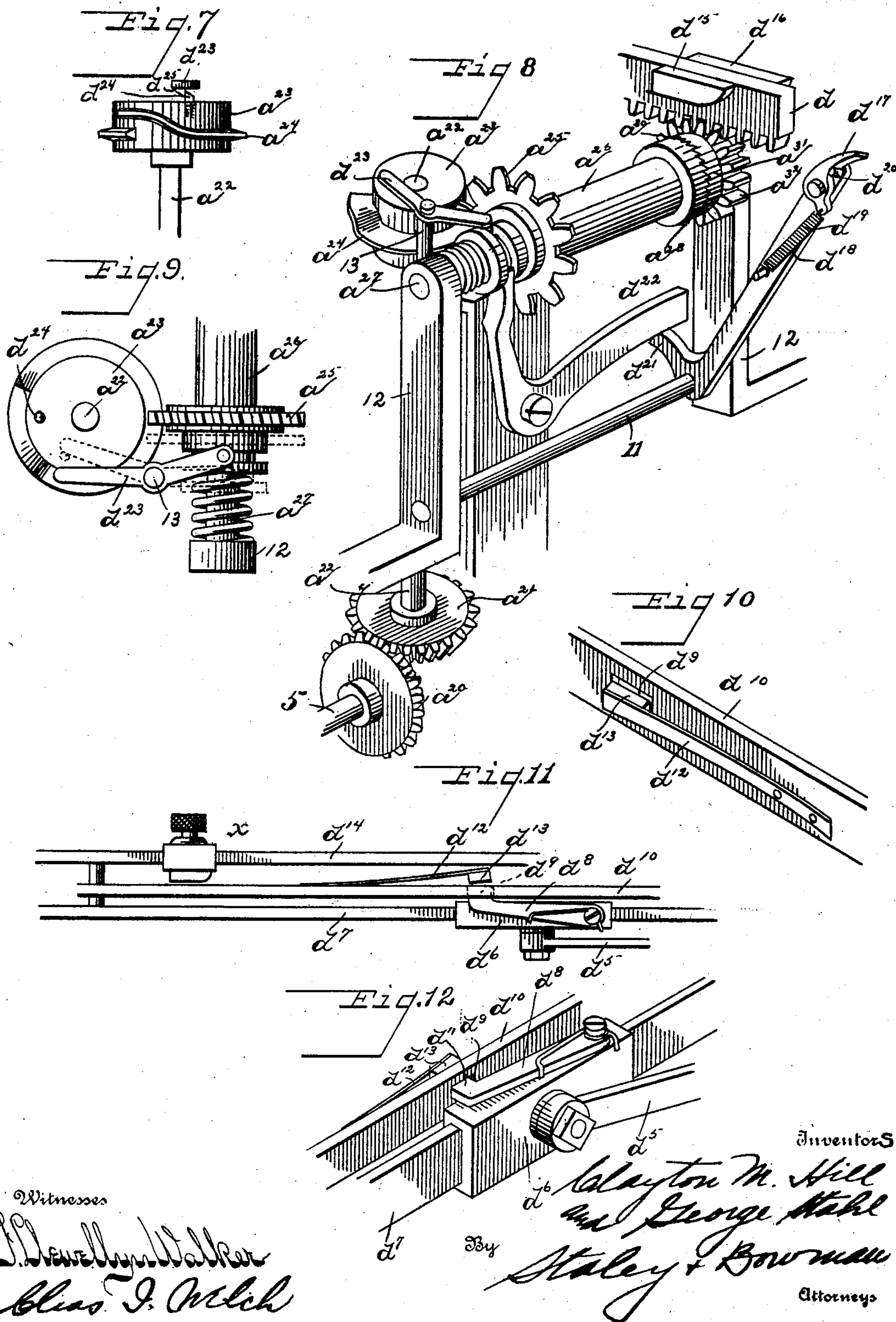
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6 SHEETS—SHEET 4.



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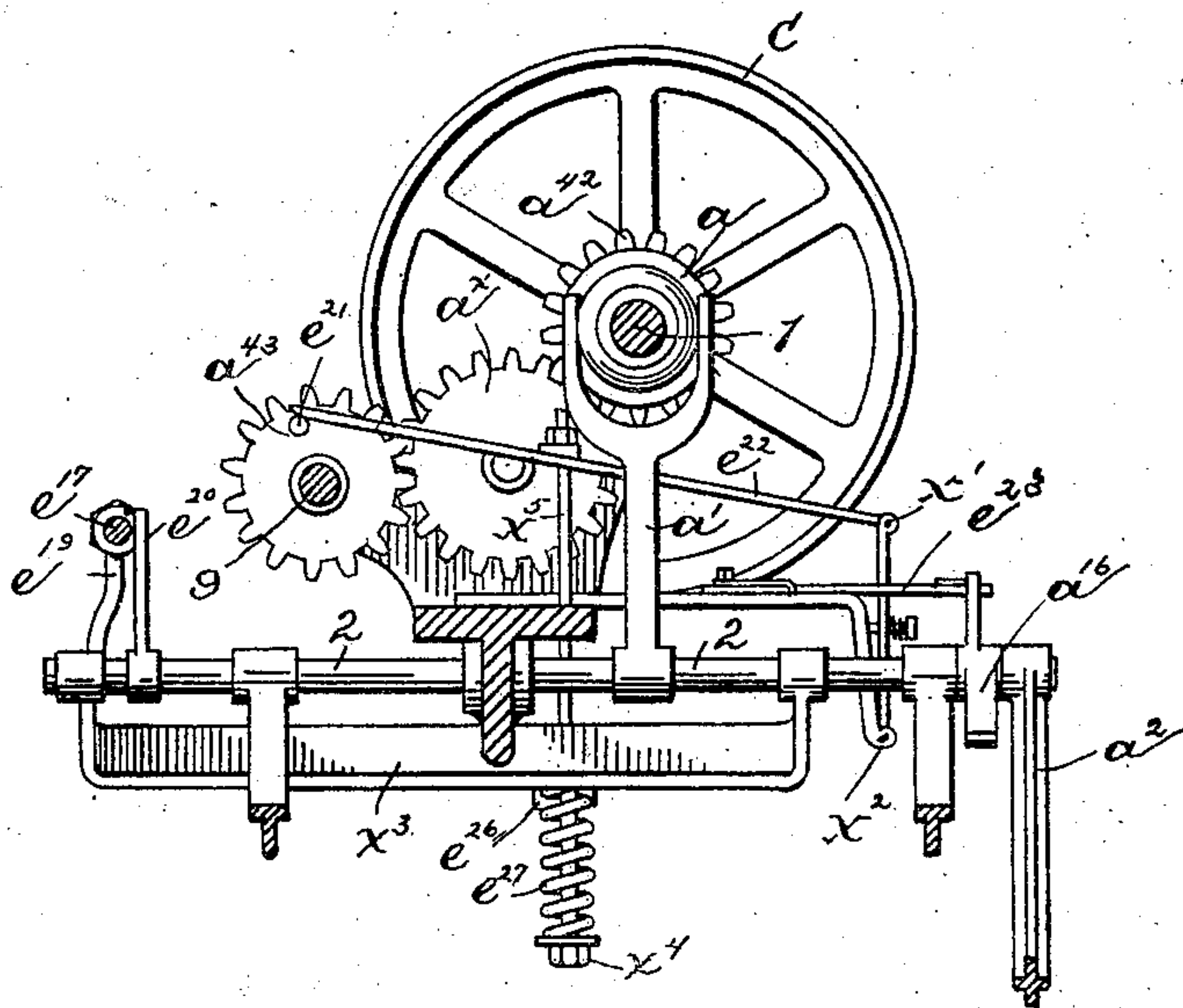
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6 SHEETS—SHEET 5.

Fig 13



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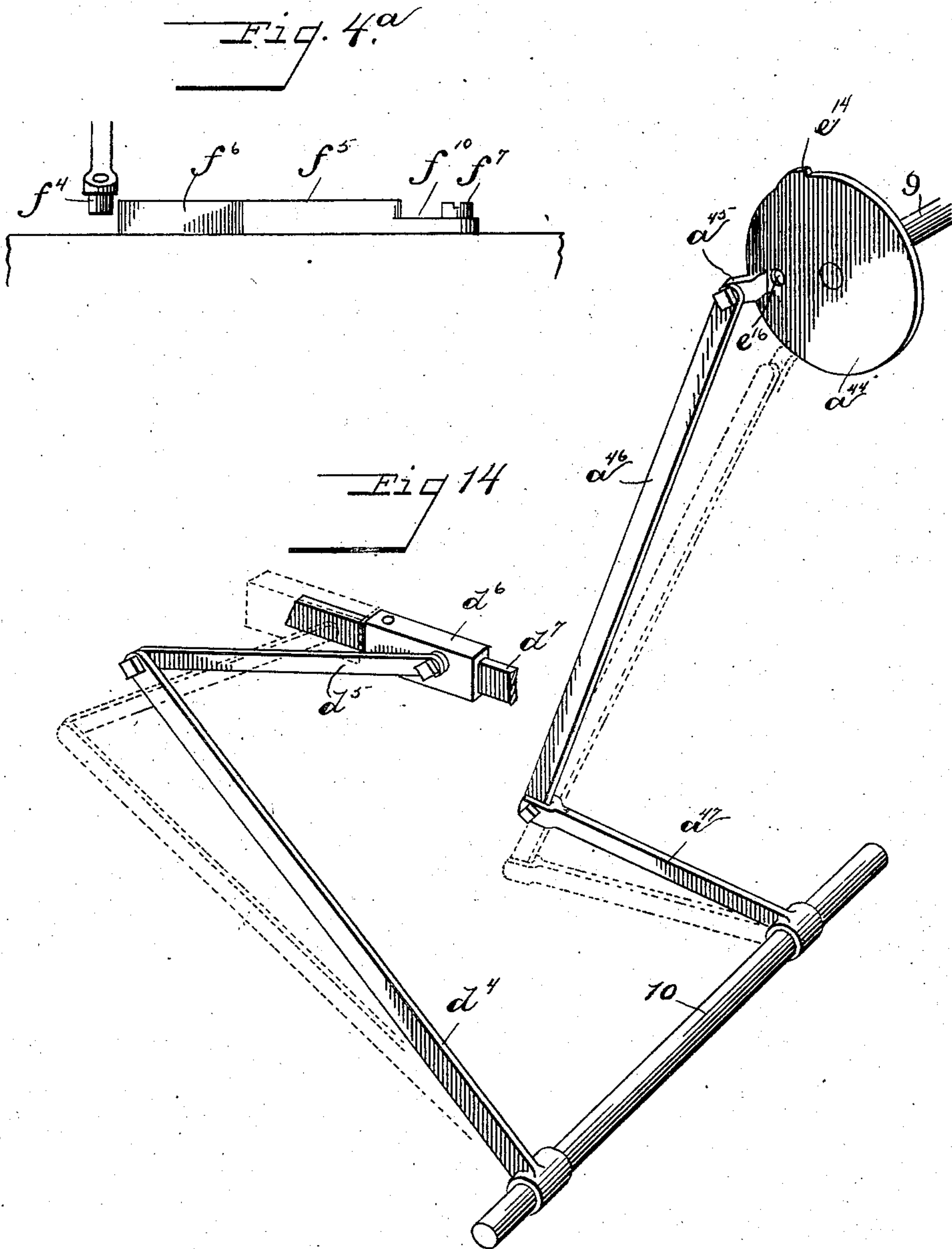
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NO MODEL.

6 SHEETS—SHEET 6.



Witnesses

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UNITED STATES PATENT OFFICE.

CLAYTON M. HILL AND GEORGE STAHL, OF DAYTON, OHIO.

FEEDING DEVICE FOR BOOK-SEWING MACHINES.

SPECIFICATION forming part of Letters Patent No. 762,999, dated June 21, 1904.

Application filed August 1, 1903. Serial No. 167,874. (No model.)

To all whom it may concern:

Be it known that we, CLAYTON M. HILL and GEORGE STAHL, citizens of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Feeding Devices for Book-Sewing Machines, of which the following is a specification.

Our invention relates to improvements in machines for stitching sheets of paper for forming what are called "flat-opening books," "composition-books," or books in which the paper is stitched through the center and in which the cover is adapted to open flat.

The devices of our machine are so arranged that sheets of paper are stitched together on the guard or back ready for binding. The sheets of paper are stitched in series and by a series of operations leaving the paper stitched to the guard or back, so that the binding can be readily accomplished.

Our improvements consist in the arrangements and constructions hereinafter described, such that the machine is adapted to stitch continuously in one direction, and when the stitching is completed the thread is cut and the table returned automatically to normal position, and at the end of the return movement all the parts are automatically thrown out of gear.

In the drawings, Figure 1 is a front elevation of our machine. Fig. 2 is a plan view thereof. Figs. 3, 4, and 5 are detail views of the holder for the paper. Fig. 4^a is a detail of the cutting device for the thread. Fig. 6 is a detail view of the tension device for the thread. Figs. 7, 8, and 9 are detail views of the devices for operating the table in the forward direction. Figs. 10, 11, and 12 are detail views of the operating devices for returning the table to its normal position. Fig. 13 is a detail view of a part of the operating devices for returning the table. Fig. 14 is a detail in perspective of the parts of the operating mechanism for the table, showing in part a diagrammatic view.

Like parts are indicated by similar characters of reference in the several views.

Our machine is adapted to be used in connection with a standard sewing-machine, and

we have shown in part a standard sewing-machine of what is known as the "Singer" make.

A A indicate the frame of the machine.

B indicates the arm, as shown in Fig. 1. 55

The driving-wheel C is mounted on a shaft 1, as shown in Figs. 1 and 2. This shaft is supported by a yoke C', which is in turn supported by the frame of the machine. The table D is of curved or V shape and is especially adapted for flat-opening books. 60

Our machine is so arranged that the driving-wheel C may be continuously driven by power or by hand. At the beginning of the operation of stitching a clutch, which is splined on the power-shaft supporting the driving-wheel C, is thrown to the left and engages a friction-clutch, which causes the table to be pushed forward by a step-by-step movement, so that the stitching can be done during this forward movement of the table. Near the 70

end of the forward movement of the table the clutch is thrown in the opposite direction by an automatic connection, and the holder or table is connected with the operating devices, which first move the table forward an additional distance and then return the table to normal position. The clutch referred to is marked a, Fig. 1, and is splined on the 80

shaft 1. A clutch-arm a' is rigidly connected to a shaft or stud 2, which is loosely journaled in the frame A of the machine. Said shaft 2 has an arm a² projecting therefrom and rigidly connected therewith, which is connected to a link a³, extending downwardly and connected to a treadle or any form of device adapted to be operated by the foot of the operator. The arm a², Fig. 1, has a roller a⁵, which is adapted to contact against a pawl a⁴ on the lower end of an arm a⁶, pivoted on a stud 3, projecting from the frame of the machine. This arm a⁶ at its upper end has a head a⁷, which fits loosely over a pin or rod 4. A spring a⁸ contacts at one end against the head a⁷ and at the other against one of the bearings for the rod 4. There is a head a⁹ on said rod. Consequently whenever the lower end of the arm a⁶ is moved to the right (looking at the front of the machine, as in Fig. 1) the upper end or head a⁷ of the arm a⁶, which 100

is rigid with the rod 4, will be moved to the left against the tension of the spring a^8 , which forces the rod 4 to the left for the purpose hereinafter explained. During the downward movement of the link a^3 , connected with the treadle, the shaft 2 is rotated by its connection with the arm a^2 , and the clutch a is thrown to the left by means of the clutch-arm a' against arms a^{10} , which extend from an ordinary friction-clutch a^{11} . By forcing this friction-clutch a^{11} to the left by means of the contact of the clutch a against the arms a^{10} the driving-wheel C transmits motion to a gear-wheel a^{12} and through an intermediate gear-wheel a^{13} to a gear-wheel a^{14} , which is formed on a shaft 5, journaled loosely on the frame A A of the machine, said gear-wheels constituting the auxiliary operating-gears for the step-by-step movement of the table. Motion is also transmitted to a gear-wheel a^{17} , which is formed rigid on a shaft 6, which shaft extends through the arm B of the machine and operates a needle-bar a^{18} by means of a link a^{19} , as shown in Fig. 1. The shaft 5 extends below the arm B and below the holder for the paper (marked D, see Fig. 1) and has a bevel-gear a^{20} , rigid with said shaft. (See Fig. 8.) This bevel-gear a^{20} engages with a gear a^{21} , formed at the lower end of a shaft a^{22} , said gears being additional gears for operating the table by a step-by-step movement, and at the upper end of said shaft a^{22} there is formed rigidly therewith a pulley a^{23} , having a cam or run way a^{24} . This cam or run way is adapted to engage with a pinion or spur-wheel a^{25} , which is formed rigid with a sleeve a^{26} , which in turn is splined on a shaft a^{27} . The sleeve a^{26} has the pinion or spur-wheel a^{25} at one end thereof, and at the opposite end there is a clutch a^{28} , with ratchet-teeth a^{30} formed thereon. These ratchet-teeth engage with the ratchet-teeth on a corresponding clutch member a^{31} , which clutch member a^{31} is formed with a spur-wheel a^{32} , adapted to engage a projecting rack-bar d . This projecting bar d is a part of the holder or table D, (see Fig. 3,) and consequently whenever the clutch members a^{28} and a^{31} are connected the table or holder D is moved forwardly by reason of the engagement of the teeth of the spur-wheel a^{32} with the teeth of the rack-bar d . The cam or run way a^{24} , as shown in Fig. 7, is formed so that during the complete revolution of the pulley a^{23} the pinion or spur-wheel a^{25} will move the distance of one tooth, and consequently the spur-wheel or pinion a^{32} , formed on the clutch member a^{31} , will be moved a distance of one tooth of the pinion a^{25} , when said clutch members are held connected, and the table D will thereby be moved one tooth or step, as shown in Fig. 7.

The table D is shown adapted to be slid along the frame, and the rollers a^3 revolve on the base A', which is supported on the frame A, as shown in Figs. 1 and 3. When the link a^3 , connected with the treadle, (not shown in

the drawings,) is moved downwardly and the lower member of the arm a^6 , Fig. 1, moved to the right, as heretofore explained, the treadle and the parts connected therewith are locked in the following manner: At the right end of the rod 4 there is a plate a^{33} , which is adapted to contact against the upper end of a crank-arm a^{34} , which is journaled on a stud 7. (See Fig. 1.) When the rod 4 is forced to its extreme position at the right by the spring a^8 , the lower end of the crank-arm a^{34} is in its extreme left-hand position, and the parts are unlocked, as shown in Fig. 1; but when the lower end of the arm a^6 is pressed to the right, as is the case when the link a^3 is pushed down, the upper end of the arm a^6 will move to the left, and the crank-arm a^{34} will be free to move so soon as the crank-arm a^{16} is moved sufficiently for the lower end of the crank-arm a^{34} to move free of the end of the arm a^{16} . The spring connected to the crank-arm a^{34} will thereupon cause the lower arm to be forced over the crank-arm a^{16} , so as to lock the shaft 2, which is rigidly connected with the arm a^{16} , so that whenever the treadle of the machine is moved by the operator the shaft 2 is rotated and held against return rotation so long as the crank-arm a^{34} rests above the arm a^{16} and prevents said arm from moving upwardly. A spring a^{36} will return the arm a^{16} to its normal upper position so soon as the crank-arm a^{34} is moved to the left by the tension of the spring a^8 . A lever a^{37} , projecting from the shaft 8, is adapted to be spring-pressed upwardly by a spring a^{38} , and the upper end of said lever engages between the head a^9 and the bearing for the rod 4 and prevents the spring a^8 from returning the rod 4 to the right until the shaft 8 is rotated. Consequently the clutch a is held in its extreme position at the left, and the gear a^{17} is held connected with the gear a^{12} and the gear a^{14} held connected through the intermediate gear a^{13} , so as to operate continuously the needle-bar for stitching and to move forwardly the holder or table by a continuous step-by-step movement during the stitching operation. Near the end of the forward movement of the table D we have so arranged the mechanism that the shaft 8 will be partially rotated, so as to move the lever a^{37} and force it out of engagement with the head a^9 of the rod 4, thereby permitting said rod 4 to be moved to the right by the tension of the spring a^8 (see Fig. 1) and release the lock for the shaft 2, so that the clutch a will be thrown to the right by the clutch-arm a' , and the tension of the spring a^{36} is such that the clutch-arm a' will be moved until the ratchet-teeth a^{39} , formed on the clutch a , are thrown into engagement with the ratchet-teeth a^{40} , formed on the corresponding clutch member a^{41} . This clutch member a^{41} has formed integrally therewith a pinion a^{42} . This clutch a^{41} is journaled loosely on the shaft, and the pinion a^{42} , formed

integral therewith, is in mesh with an intermediate gear a^{43} , which is journaled rigidly on a shaft 9. This shaft 9 is journaled loosely in brackets connected with the frame A, (see Fig. 2,) and at the opposite end of the shaft 9 there is journaled rigidly on said shaft a wheel a^{44} . A crank, Figs. 1 and 2, (marked a^{45}) is connected with said wheel, and a pitman a^{46} is connected with a rocker-arm a^{47} , extending from a shaft 10 and rigid therewith. (See Fig. 1.) The shaft 10 is journaled loosely in the frame A A. (The shaft is shown broken in Fig. 1.) There is also shown a rocker-arm d^1 , extending from said shaft 10, so that whenever said shaft 10 is rotated by the pitman a^{46} through its connections with the driving-wheel C the connecting-rod d^1 will operate a link d^5 , (see Fig. 1,) which link is pivotally connected with the head d^6 . (Shown in Fig. 12.) This head d^6 is slidingly mounted on a bed-rail d^7 , which is supported by the frame of the machine. (See Fig. 2.) The head d^6 is formed with a spring-pressed pawl d^8 , and the end of said pawl normally is spring-pressed to the left, (looking at the head from the front of the machine, as in Fig. 1,) and the end of said pawl is adapted at certain times to enter within a slot or opening d^9 in a rail or rod d^{10} , (see Fig. 3,) and while the pawl is in engagement with the slot or opening d^9 , formed in the rail or rod d^{10} , which is rigid with the holder or table D, the table or holder D will be moved by the head d^6 until the end d^{11} of said pawl d^8 is thrown out of engagement with said slot or opening by a spring d^{12} , (see Fig. 11,) which is formed with a head d^{13} , which is adapted also to enter the aperture d^9 and when forced therein to contact against the end d^{11} of the pawl d^8 . This spring d^{12} forces the pin or pawl d^8 out of engagement with the slot when the stud d^{13} is forced by the spring within said opening. A stud x is slidingly mounted on a rail d^{14} and can be adjusted so as to cause the spring d^{12} , with its stud d^{13} , to disengage the pin d^8 at any predetermined time. This is for the purpose of adjusting the machine for different-sized books; but the operation of our machine demands that the table or holder D be operated by the head d^6 a space or distance equal to about four inches in a forward direction and then be returned to its normal position before the table is again operated with a step-by-step movement, and the head d^6 is returned to normal position free of the table D. The rack bar or rail d of the table or holder D is formed with two stop-plates d^{15} and d^{16} , (see Fig. 8,) the stop-plate d^{15} being adapted near the end of the forward movement of the table or holder D to contact against a spring-pressed pawl d^{17} , pivoted at the upper end of a crank-arm d^{18} . This pawl is connected at its lower end with a spring d^{19} and at its upper end normally contacts against a pin d^{20} , fixed on said arm d^{18} . When the stop-plate d^{15} contacts

against the upper end of the pawl d^{17} , the upper end of the crank-arm d^{18} will be moved downwardly and the other end, d^{21} , of said crank-arm will be moved upwardly, said crank-arm being pivoted on the stud 11, which is supported by brackets 12, extending from the frame of the machine. The upper end d^{21} will contact against the pivoted clutch-arm d^{22} , and said arm d^{22} will force the sleeve a^{26} to the left and disengage the ratchet-teeth of the clutch members a^{28} and a^{31} . In Fig. 14 we have shown the head b^6 in full lines and also in dotted lines. In the position shown in dotted lines it has moved the additional forward distance of four inches, heretofore referred to. Upon the return movement of the table or holder D the stop-plate d^{15} will contact against the upper end of the pawl d^{17} , and said stop-plate will move the pawl against the tension of its spring d^{19} until the upper end of said pawl d^{17} slides over the plate d^{15} . Near the end of the forward movement of the table or holder D the stop-plate d^{16} causes a partial rotation of the shaft 8 for unlocking the head a^9 , heretofore referred to. This stop-plate contacts against a pawl d^{26} on an arm d^{27} , similar to the pivoted arm d^{18} . When this arm d^{27} is moved, the shaft 8 is rotated by the rocker-arm d^{28} , Fig. 2.

We have shown in Fig. 9 a small arm d^{23} , pivoted on a pin 13, which extends upwardly from the frame of the machine. This small pivoted arm d^{23} connects at its inner end with the sleeve a^{26} , and when the sleeve a^{26} is moved to the left by the contact of the arm d^{21} of the crank-arm d^{18} with the clutch-arm d^{22} the opposite end of said small arm d^{23} is moved to the right or toward the shaft a^{22} , and this small arm is adapted to be held against movement, so that the sleeve a^{26} cannot be moved to the right until the treadle is again moved by the operator at the beginning of a new operation of the machine. This is effected by a pin d^{24} , which is spring-pressed upwardly, (see Figs. 7 to 9,) which pin d^{24} is adapted to contact against the pin d^{25} on the outer end of the small arm d^{23} and rigidly hold same. This pin is spring-pressed, so that it will not interfere with the movement of the sleeve to the left. The mechanism of our machine is so adjusted or arranged that the pin d^{24} is brought opposite the pin d^{25} as the sleeve a^{26} is moved to the left, and consequently the end of the arm d^{23} passes freely over the spring-pressed pin d^{24} to locking position and is immediately locked by said pin d^{24} , and same remains locked until the next succeeding operation. The movement of the pulley a^{23} is so arranged or timed that when the shaft 5 ceases to rotate the pin d^{24} will be in position to prevent the movement of the arm d^{23} ; but as soon as a new operation is begun and the shaft 5 begins to rotate the pin d^{24} will pass out of the path of movement of the pin d^{25} , formed on the outer end of the small

arm d^{23} , and the sleeve a^{26} will at once be moved to the right by the spring, (shown in Fig. 8.) and the ratchet-teeth formed on the clutch members will be thrown into engagement, and the table will again be moved forwardly by a step-by-step movement. It should be further explained that the parts are so arranged that the pawl d^8 engages in the opening d^9 of the rail or rod d^{10} at or about the time the stop-plate d^{15} contacts against the pawl d^{17} , thereby causing the clutch members a^{28} and a^{31} to become disengaged.

We have shown in Fig. 6 the tension device for the thread. The thread e is fed from a spool e' , supported on the arm B in the usual way. The thread e passes within a groove e^2 , Fig. 6, formed in a wheel e^3 and once around the wheel. The wheel is pivoted on a stud e^5 , which extends from the arm B. We have shown flexible material e^8 , such as felt washers, placed between the wheel e^3 and the side of the supporting-arm and also flexible material e^8 between the wheel e^3 and the head or cap e^6 . The thread after passing around the groove formed on the wheels e^3 passes through openings in the take-up arm e^9 and through the needle e^{10} , which is supported by the needle-bar a^{18} . The arm e^{11} , Fig. 6, is journaled rigidly on the shaft 14, and on the upper end of said arm there is formed a head or cap e^6 . Said cap is held on the stud e^5 by the nut e^7 . There is journaled rigidly on said shaft 14 a projecting plate e^{12} , the lower end of which rests upon the periphery of a disk e^{13} , formed integrally with the wheel a^{44} . There is formed on the periphery of the disk a cam-surface e^{14} , and when the lower end of the plate e^{12} rests upon the cam-surface e^{14} the upper end of the arm e^{11} forces the head or cap e^6 to the left against the washers and retards the movement of the tension-wheel e^3 . This occurs at the end of the return movement of the head-block d^6 during the time when the head-block moves freely independent of its connection with the table D. By retarding the movement of the tension-wheel e^3 the thread e is put under tension; but when the end of the arm e^{12} drops off the surface e^{14} the tension is taken off the thread, and this occurs almost immediately after the head d^6 begins to move forward, and the tension remains off until near the end of the return movement of the head for the reason that the end of the plate e^{12} slides over the periphery-disk e^{13} and does not touch the cam-surface e^{14} until the table has been returned to its normal position by the head-block d^6 , disconnected from the head-block, and the head-block returned to its normal position. By this construction the tension is put on the thread during the stitching operation, which insures steady and accurate stitching; but when the stitching is completed the tension is automatically removed so that the thread can be cut (which occurs almost at the end of the forward movement of the head-block or at the end of

the additional four inches of forward movement of the table) without endangering the breaking of the thread or the needle and without causing the thread to drop off the needle before the stitching operation. It will be understood that the movement of the table forward an additional distance of about four inches after the stitching operating ceases is for the purpose of feeding sufficient thread to the needle for the beginning of the next operation of stitching, and consequently the thread is shown in Fig. 1 with a sufficient length extending through the needle to insure the stitching being properly begun.

The cutting device for the thread is shown in Figs. 1 and 4. Slidingly mounted on the upper side of the table or holder D we have shown a plate f , formed at its upper end with a knife-bar f' , which coöperates with a stationary knife-blade f^2 , resting upon the upper end of the opposite side of the table or holder D. The bar f is connected to one end of a spring f^3 , and the other end of said spring is connected with the table or holder D. The lower end of said bar f is formed with a roller f^4 . This roller is adapted to contact against the plate f^5 , having an incline at one end at f^6 . This plate is pivoted at f^7 and is spring-pressed against a pin f^8 by a spring f^9 . Near its pivotal point the plate f^5 is formed with a groove f^{10} . Near the end of the extreme forward movement of the table or holder D the roller f^4 mounts the incline f^6 of the plate f^5 , and the bar f is gradually moved downwardly against the tension of the spring f^3 until the roller passes the incline f^6 , moving along the side of the arm f^5 until it reaches the groove f^{10} . At this point the roller passes within the groove, and the bar f immediately slides to its normal position by the force of the tension of the spring f^3 , and the thread is cut by the coöperation of the knives f' and f^2 , and this cutting occurs when the tension is off the thread, as already explained.

We have shown an opening in the wheel a^{44} , (marked e^{16} , Figs. 6 and 2.) The rod e^{17} is adapted to be forced to the left (standing at the front, Fig. 1) and the left end of same to enter said opening for the purpose of locking the wheel a^{44} . This rod is slidingly mounted in brackets e^{18} , supported by the machine-frame, Fig. 2. The right end of said rod is formed with a head, Fig. 1, and this head contacts against fingers e^{20} , rigid on the shaft 2, so that when the shaft 2 is rotated by the spring a^{36} , which occurs after the stitching is completed, the rod e^{17} is moved to the right and the wheel a^{44} unlocked.

We have shown an intermediate wheel a^x , Fig. 2, which gears with wheel a^{43} , and this wheel a^{43} is formed with a pin e^{21} , and this pin is adapted to contact against the end of a hinged arm e^{22} for the purpose of raising said arm for operating a lock hereinafter described. The hinged arm e^{22} is composed of two pieces hinged together at the point x' , and these

hinged pieces, constituting the hinged arm e^{22} , are hinged to the frame of the machine at the point x^2 . A catch-plate e^{23} is pivoted to the frame, as shown in Fig. 13, and same is spring-pressed into its normal position, as shown in Fig. 13. There is loosely mounted on the shaft 2 a rocker-plate x^3 , and this rocker-plate has a projecting pin e^{26} , which pin contacts against one end of a spring e^{27} , and the other end of the spring e^{27} contacts against a head x^4 , formed on a stem x^5 . The spring is around said stem x^5 , and therefore bears at one end against the head of said stem and at the other end against the pin projecting from the rock-plate x^3 . The stem x^5 projects upwardly and is connected at its upper end to the upper piece of the hinged arm e^{22} . When the spring e^{27} is under tension and the lower piece of the hinged arm e^{22} held by the engagement of the pivoted catch e^{23} therewith, the spring tends to move the rocker-plate x^3 upwardly; but when the pivoted catch-plate e^{23} is thrown out of engagement with the hinged arm e^{22} the pieces of said arm move about the hinge x^1 , and the rocker-plate x^3 drops. To the catch-plate e^{23} there is fastened a link e^{24} , and at the opposite end this link connects with a stud e^{25} , which is rigidly connected with the shaft 2. Consequently when the shaft 2 rotates at the initial operation of the machine by the depression of the link a^3 and the treadle connected therewith the stud e^{25} moves to the left and withdraws the catch-plate e^{23} from engagement with the hinged arm e^{22} , and the upper piece of said hinged arm e^{22} , normally contacting at its outer end against the pin e^{21} , is withdrawn from contact with said pin and same drops and the stem x^5 moves downwardly therewith, and thereby permits the rock-plate x^3 to drop. A projecting finger-piece e^{19} is formed on said rock-plate x^3 , (see Fig. 13,) and when said rock-plate drops downward the upper end of said finger-piece e^{19} moves to the right. The finger-piece e^{20} , rigid with the shaft 2, will move to the left when the rod e^{17} moves to the left, and this rod cannot move to the left until the end of the rod enters the opening e^{16} by the rotation of the shaft 2 during the depression of the link a^3 . Consequently the rod e^{17} can be moved to the right when the clutch a is thrown to the right. After the stitching has been completed and the table has caused the rod 4 to be unlocked and the clutch a thrown to the right, so that the ratchet-teeth a^{39} and a^{40} are in engagement, and through the intermediate pinion a^x and the pinion a^{43} , which are operated by the power-wheel C, the table is moved by the head d^6 . Near the end of the return movement of the head d^6 the pin e^{21} , formed on the pinion a^{43} , will contact against the end of the hinged arm e^{22} near the end of the revolution of said pinion and the upper piece of said hinged arm e^{22} will be raised, together with the stem x^5 , and tension will be put upon the spring e^{27} sufficient to raise the rock-plate x^3 and cause the finger-piece e^{19} to

move the rod e^{17} to the left, and the end of said rod will slide against the face of the wheel a^{44} until the end of said rod e^{17} passes within the opening e^{16} and locks the wheel a^{44} . When the rod moves to the left, the finger-piece e^{20} oscillates and causes the clutch a to move to normal position. The wheel will remain locked until the shaft 2 is rotated and the finger-piece e^{20} moved to the right after the stitching has been done and the lock for the head a^9 released, when the shaft 2 is then rotated, causing the finger-piece e^{20} to move to the right. The rod e^{17} will also be moved to the right and the end of said rod will be withdrawn out of engagement with said opening e^{16} and the wheel a^{44} unlocked. The rod 4 also forms a lock for the shafts 5 and 6. Our present machine shows the pinion a^{12} formed with teeth in number four times as many as those on the pinion a^{17} , and accordingly we have formed in the side of the pinion a^{12} four openings, one of which is shown in Fig. 2, (marked x^6 .) When the rod 4 is moved to the right by the spring a^8 , the end of said rod will slide against the face of the pinion a^{12} until one of said openings x^6 comes opposite the end of said rod, when said rod will enter the opening and lock said pinion, and thereby stop the pinion a^{17} and the pinion a^{14} , which will cause the shafts 5 and 6 to be locked. The construction is such that this locking occurs when the needle e^{10} is in its extreme upward position. The machine is so adjusted that the sleeve a^{26} , Fig. 8, is moved to the left, and the clutch members a^{28} and a^{31} are also disengaged when the needle is in its extreme upward position. Thereby all danger of breaking the needle or disarranging the machine by reason of the table D beginning to return to normal position with the needle in its lowermost position will be avoided.

It will be seen that by these constructions we have formed positive locks for all the different parts of our mechanism, which insures the accurate working of the machine without endangering any breakage thereof.

In general the operation of our machine is as follows: The machine normally is disconnected, so that the driving-wheel C moves without effecting any operation of the parts of the machine until the treadle is worked by the operator, which by its said connection causes the shaft 2 to rotate and throw the clutch a to the left and connecting the friction-clutch a^{11} with the pinion formed on the shaft 6 and the pinion formed on the shaft 5, one being directly connected and the other connected through an intermediate gear. The shaft 6 is thereupon rotated and the needle-bar operated for stitching the paper. Simultaneously the table D is moved forward by a step-by-step movement, such that when the needle e^{10} is in its raised position the table moves one step and remains motionless until a stitch is made and then moves the next step, when the needle

is again raised to its normal position. The table operates in a forward direction by a step-by-step movement through its connection with the shaft 5, as shown in Fig. 8. The stitching continues and the parts remain connected until the table reaches nearly its extreme forward position. Before reaching its extreme forward position the table almost simultaneously causes the arms d^{18} and d^{27} to be depressed for the purpose of disconnecting the clutch members a^{28} and a^{31} , Fig. 8, and for releasing almost simultaneously the head a^9 , Fig. 1, so that the clutch a can be thrown to the right, thereby throwing into engagement the ratchet-teeth a^{39} and a^{41} . At this point the table has been advanced to a point where the pawl d^8 , Figs. 11 and 12, has entered the aperture or opening d^9 , formed in the bar d^{10} , connected to the table D, so that the head-block d^6 is connected directly with the table D, and when the head-block moves the table will move with it. The pitman connected with the wheel a^{44} will now cause the head-block d^6 to move forward a distance equal to about four inches, and at the end of this additional forward movement the thread is cut and the table is then returned to its normal position, and then the head-block is returned to its normal position free from the table, and then the connecting devices are thrown out of operative position and the machine remains at rest until the treadle is again depressed.

Having thus described our invention, we claim—

1. In a sewing-machine, the combination of a supporting-table and a main operating-shaft, a main clutch connected to said shaft normally inoperative but adapted to be thrown in two directions, a treadle for throwing said clutch, means connected with said clutch for moving said table by a step-by-step movement when said clutch is thrown in one direction, and means also connected with said clutch for returning said table to normal position when said clutch is moved in the opposite direction, and means independent of said treadle for automatically throwing said clutch to normal and inoperative position at the end of the complete operation of the machine.
2. In a sewing-machine, the combination of a supporting-table and a main operating-shaft, a main clutch connected to said shaft normally inoperative but adapted to be thrown in two directions, means for throwing said clutch, operating devices connected with said clutch and main shaft when said clutch is moved in one direction for causing said table to advance by a step-by-step movement, means also connected with said clutch and main shaft when said clutch is thrown in the opposite direction for causing said table to advance an additional forward distance and adapted automatically to return said table to normal position after it has moved an additional forward distance, and means for automatically throwing said clutch

to normal inoperative position at the end of the complete operation of the machine.

3. In a sewing-machine, the combination of a supporting-table and a main operating-shaft, a main clutch connected to said shaft and adapted to be thrown in two directions, means for throwing said clutch and means connected with said clutch for moving the table forward by a step-by-step movement when said clutch is thrown in one direction, and means connected with said clutch for moving said table an additional forward distance and for returning said table to normal position when said clutch is thrown in the opposite direction, for the purpose specified.

4. In a sewing-machine the combination of a main operating-shaft, a main clutch normally inoperative but adapted to be thrown in two directions, means connecting said shaft and clutch, a table, and a needle for sewing articles placed on said table, means for causing the main clutch to operate said needle and simultaneously to move said table by a step-by-step movement when thrown in one direction, and means for stopping the step-by-step movement of said table and for causing said clutch to move said table continuously forward an additional distance and for returning said table to normal position when said clutch is thrown in the opposite direction, for the purpose specified.

5. In a sewing-machine, the combination of a main operating-shaft, a main clutch connected to said shaft, a table for supporting the articles to be stitched, means for throwing said main clutch in one direction and means operated by said main shaft for causing said table to move forward by a step-by-step movement, and automatic reversing devices operated by said table near the end of its forward movement for moving said main clutch in the opposite direction, for the purpose of causing an additional forward movement and thereafter the return of the table, substantially as described.

6. In a sewing-machine, the combination of a main operating-shaft, a main clutch connected to said shaft, a table for supporting the articles to be stitched, means for moving said table by a step-by-step movement when said main clutch is thrown in one direction, including an auxiliary clutch, means connected with said table for automatically throwing the auxiliary clutch for the purpose of stopping said step-by-step movement, and devices also connected with said table for simultaneously shifting the main clutch to the opposite position, and means also operated by said main clutch for moving said table continuously upon the reversing of said clutch, for the purpose specified.

7. In a sewing-machine, a main operating-shaft, auxiliary operating-gears connected to said shaft, a table, additional gears operated by said auxiliary gears, a spiral device con-

connected to said additional gears, means operated by said spiral device for giving a step-by-step movement to said table, and locking means operated by said spiral device for disconnecting and holding disconnected said table and said auxiliary operating-gears.

8. In a sewing-machine, the combination of a main operating-shaft, a clutch connected to said main shaft, means for shifting said clutch, two sets of auxiliary operating-gears adapted to be operatively connected with said main shaft by the movement of said clutch, a table for supporting the article to be stitched adapted to be moved by a step-by-step movement in a forward direction by one set of auxiliary operating-gears after the main clutch has been moved in one direction, and means for causing the table to be moved an additional distance in a forward direction by the other set of said gears and thereafter returned to normal position when the main clutch is moved in the opposite direction, and means for varying the amount of return movement of the table, for the purpose specified.

9. In a sewing-machine, the combination of a main operating-shaft, two sets of gears connected to said shaft, a main clutch also connected to said shaft, a table and means for connecting said clutch with each set of gears, clutch members operated by one set of said gears connected with said table and normally connected together, additional auxiliary gears operated by the clutch members for moving said table by a step-by-step movement, means for disconnecting said clutch members near the end of the forward movement of said table, means for holding said clutch members disconnected when the main clutch is shifted in the opposite direction, means also connected with said gears on the main shaft for moving said table an additional forward distance after the main clutch has been shifted and for returning said table to its normal position during the further movement of the main operating-shaft, and means for varying the return movement, for the purpose specified.

10. In a sewing-machine, the combination of a main operating-shaft, two sets of gears connected with said shaft, a main clutch connected also to said shaft, a supporting-table and means for connecting said clutch with each set of said gears when moved to operative positions, clutch members connected with said table and normally connected together, and means for causing said clutch members to move said table by a step-by-step movement, means for disconnecting said clutch members near the end of the forward movement of said table, means for holding said clutch members disconnected when the main clutch is shifted to opposite position, a sliding block operated by one set of said gears, a pawl upon said block, means for throwing said pawl into engagement with said table for moving said table, and an adjustable block for causing the disen-

gagement of said pawl from said table, for the purpose specified.

11. In a sewing-machine, the combination of a table and a main operating-shaft, a movable clutch connected to said shaft, gears and devices operated thereby for moving said table in a forward direction, and additional gear-wheels for moving said table back to normal position, means for throwing said clutch in two directions and means for connecting it with one of said gears, means for locking said devices in engagement, a trip device connected with said table adapted to be operated by the same near the end of the forward movement for releasing said locking device while automatically causing said main clutch to be thrown to position for causing the engagement of the main operating-shaft with the second-mentioned gears, for the purpose specified.

12. In a sewing-machine, the combination of a table and a main operating-shaft, a movable clutch connected to said shaft, gear-wheels and devices operated thereby for moving said table in a forward direction, and gear-wheels and devices operated thereby for returning said table to normal position, means for moving said clutch and connecting the first-mentioned gear-wheels with said main operating-shaft, and means for locking said devices in engagement, a trip device connected with said table adapted to be operated by the same near the end of the forward movement for releasing said locking device for the purpose of permitting said main clutch to be thrown to position for causing the engagement of the main operating-shaft with the second-mentioned gear-wheels, means for throwing said clutch to said position, and means put under tension by the main operating-shaft for returning the main clutch to its normal position after a complete operation of the table, for the purpose specified.

13. In a sewing-machine, the combination of the main operating-shaft, a main clutch connected to said shaft normally in inoperative position, a table for supporting the articles to be stitched, an auxiliary operating-shaft, means for moving said main clutch in one direction for causing the auxiliary shaft to be operated by the main shaft and for thereafter throwing same in the opposite direction and thereafter automatically returning same to inoperative position, means connected with said auxiliary shaft for advancing said table by a step-by-step movement, and devices connected with said table for automatically disconnecting said main shaft and said auxiliary shaft at a predetermined time, locking devices for holding same disconnected operated simultaneously with the disconnecting of the auxiliary and operating shafts, means for retaining said locking device in locking position until said main clutch is thrown in the opposite direction, returned to its normal or inoperative position and thrown again into

its original operative position, and means for releasing said locking devices simultaneously with the beginning of the next operation of the machine.

5 14. In a sewing-machine, the combination of the main operating-shaft, a main clutch connected to said shaft normally in inoperative position, means for moving said clutch in two directions, gears operated by said main shaft
10 when said clutch is thrown in one direction, a needle operated by said gears, a thread-tension device, means for controlling said tension device automatically by the throwing of said clutch, and means for holding said tension de-
15 vice in operative position until said clutch is thrown in the direction opposite from that of the first movement, for the purpose specified.

15 15. In a sewing-machine, a table, operating devices for giving said table a step-by-step forward movement, and means for giving said
20 table an additional continuous forward movement and for returning said table to normal position by its continuous movement, a thread-tension device, means for applying tension
25 during the step-by-step forward movement and for automatically releasing the thread from tension during the additional continuous forward movement and for holding said
30 thread released from said tension device during the return movement of said table, for the purpose specified.

35 16. In a sewing-machine, the combination of a main operating-shaft, a supporting-table, devices for moving said table forward, and independent devices for returning same, a ten-
40 sion-wheel and flexible material around same, means for increasing the pressure against said flexible material for retarding said wheel at the beginning of the forward movement of
45 said table, and means for decreasing the pressure against said flexible material during the returning of said table by said independent de-
50 vices, for the purpose specified.

50 17. In a sewing-machine, the combination of a main operating-shaft, a supporting-table, gears for moving said table forward and ad-
55 ditional gears for returning same, a thread-tension device operated by said main shaft, means for applying tension during the move-
60 ment of said table forward, a needle-bar operated by said first-mentioned gears, a clutch connected to said main shaft and means for throwing same into engagement with both sets
55 of said gears, a spring for throwing said clutch to inoperative position after a complete operation of the machine, a lock for holding said clutch in both operative positions, said locks being adapted to be released automatically by
60 said table during its movement, for the purpose specified.

65 18. In a sewing-machine, the combination of a main operating-shaft and supporting-table, devices for moving said table by a step-by-step movement and additional devices for giving said table an additional continuous for-

ward movement and thereafter returning same, a thread-tension device and means for regulating the tension device for applying tension during the step-by-step movement of said table and for removing said tension at the be-
70 ginning of the additional forward movement of same and for holding said tension released during the return movement of said table.

75 19. In a sewing-machine, the combination of a main operating-shaft and supporting-table, means operated by said shaft for moving said table by a step-by-step movement in a forward direction, and means for giving said table an additional continuous forward move-
80 ment and for returning same by a continuous movement to normal position, a thread-tension device operated by said main shaft and regulated by the movement of the table, means for applying tension by said tension device at the beginning of the step-by-step movement
85 of the table and for releasing same at the beginning of the additional forward movement of said table, means for holding said tension released during the return movement of said table but adapted automatically to apply said
90 tension at the end of the return movement of said table.

95 20. In a sewing-machine, the combination of a main operating-shaft, a supporting-table, gears for causing said table to move forward by a step-by-step movement and operated by
100 said operating-shaft, independent gears also operated by said main shaft, a sliding block operated by said last-mentioned gears and means for connecting said sliding block with
105 said table, a thread-tension device normally adapted to apply tension, means for releasing the tension when said sliding block is connected with said table and for holding said
110 tension released until after said sliding block is returned to normal position, and means for returning said sliding block to its normal position independent of the movement of said table, for the purpose specified.

115 21. In a sewing-machine, the combination of a table, operating devices for giving to said table a forward step-by-step movement and an additional continuous forward movement, means for returning said table to normal po-
120 sition by a continuous movement, a thread-tension device, means for applying tension during the step-by-step movement of said table, means for locking said tension device during said step-by-step forward movement, and means for automatically releasing said thread
125 from tension device during the balance of the forward movement and the return movement of said table, for the purpose specified.

In testimony whereof we have hereunto set our hands this 29th day of July, A. D. 1903.

CLAYTON M. HILL.
GEORGE STAHL.

Witnesses:

CHAS. I. WELCH,
CLIFTON P. GRANT.