

No. 689,738.

Patented Dec. 24, 1901.

E. MORIARTY.
COUNTING OR ADDING APPARATUS.

(Application filed Oct. 2, 1899.)

(No Model.)

7 Sheets—Sheet 1.

Fig. 1.

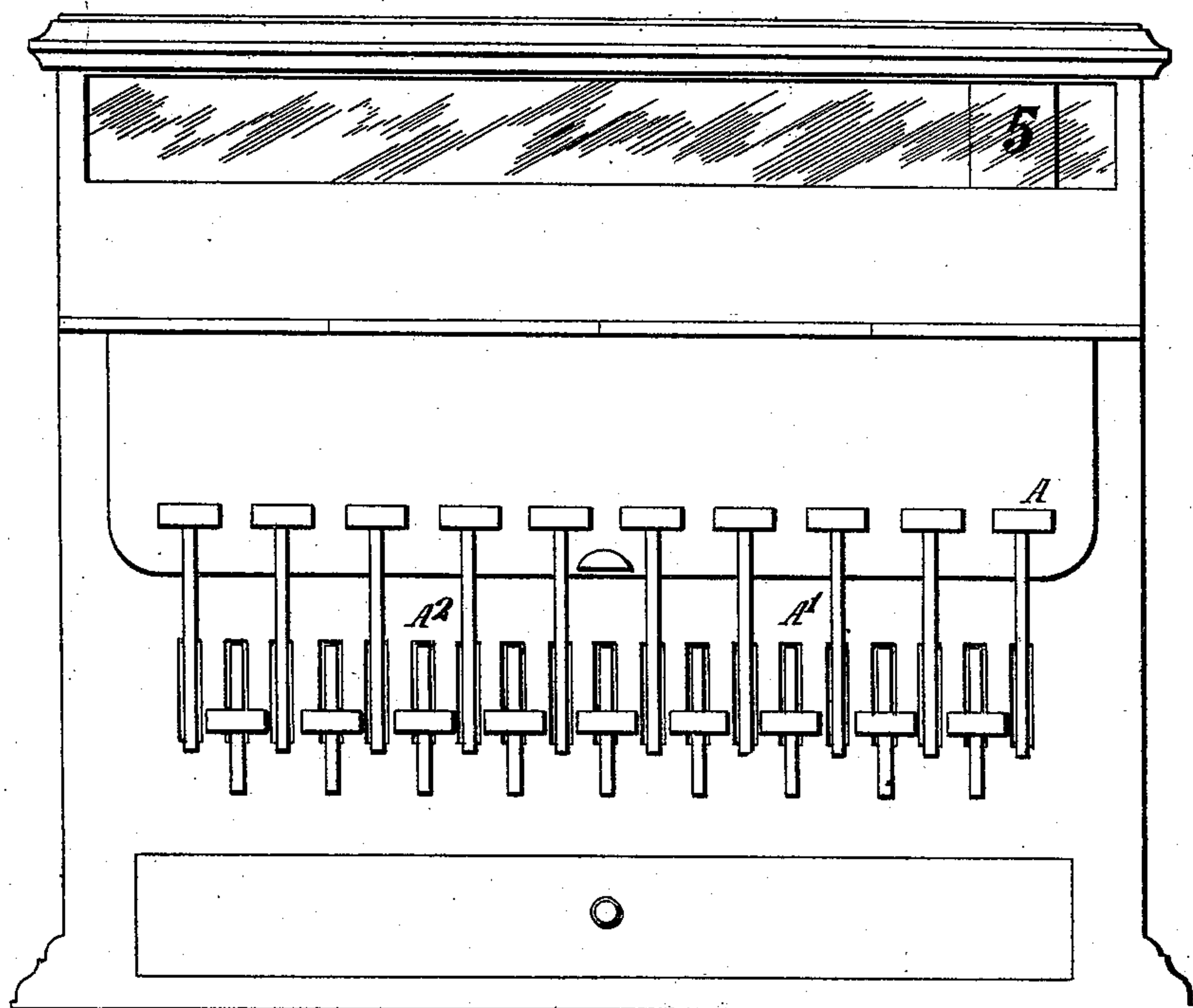
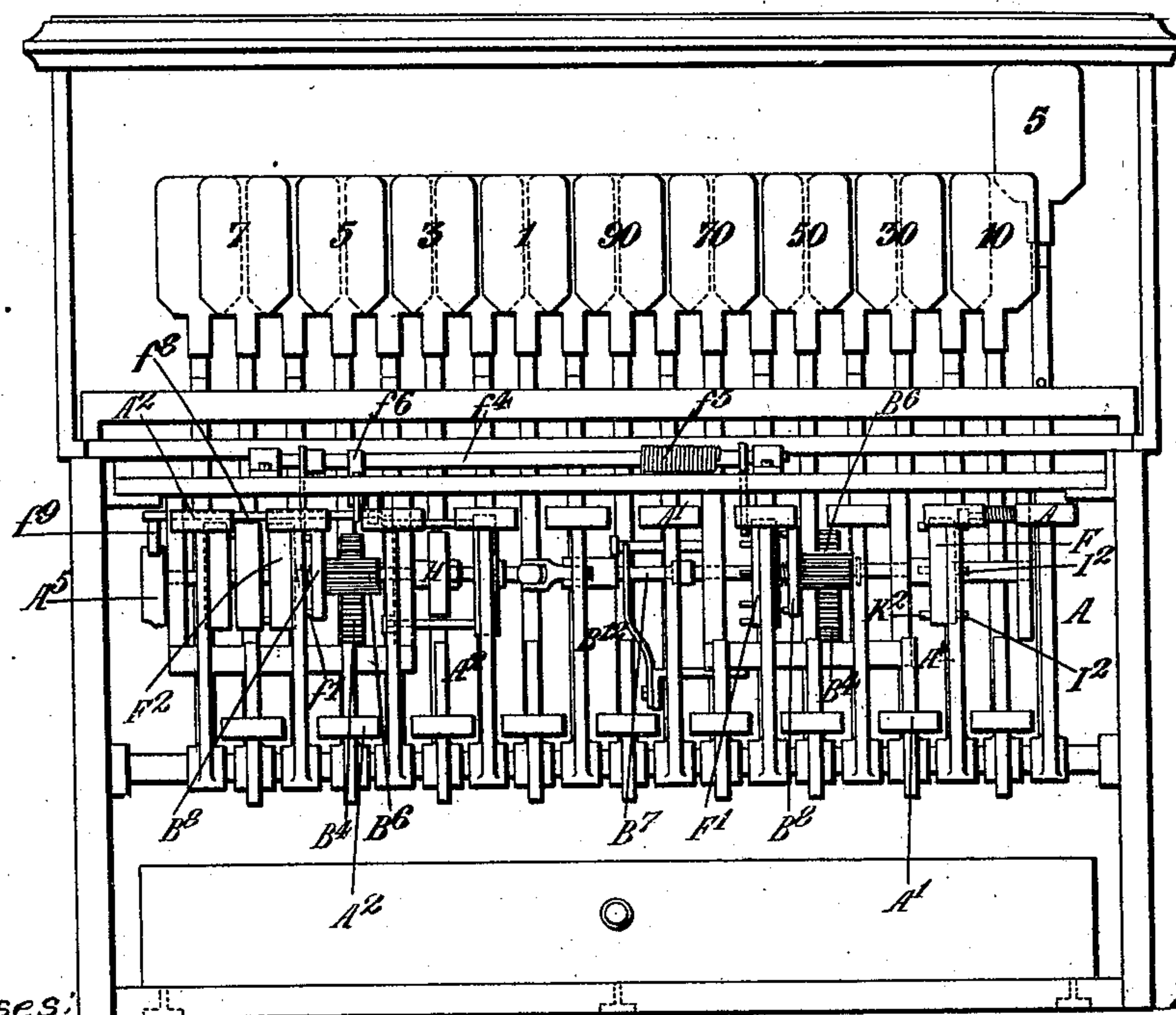


Fig. 2.



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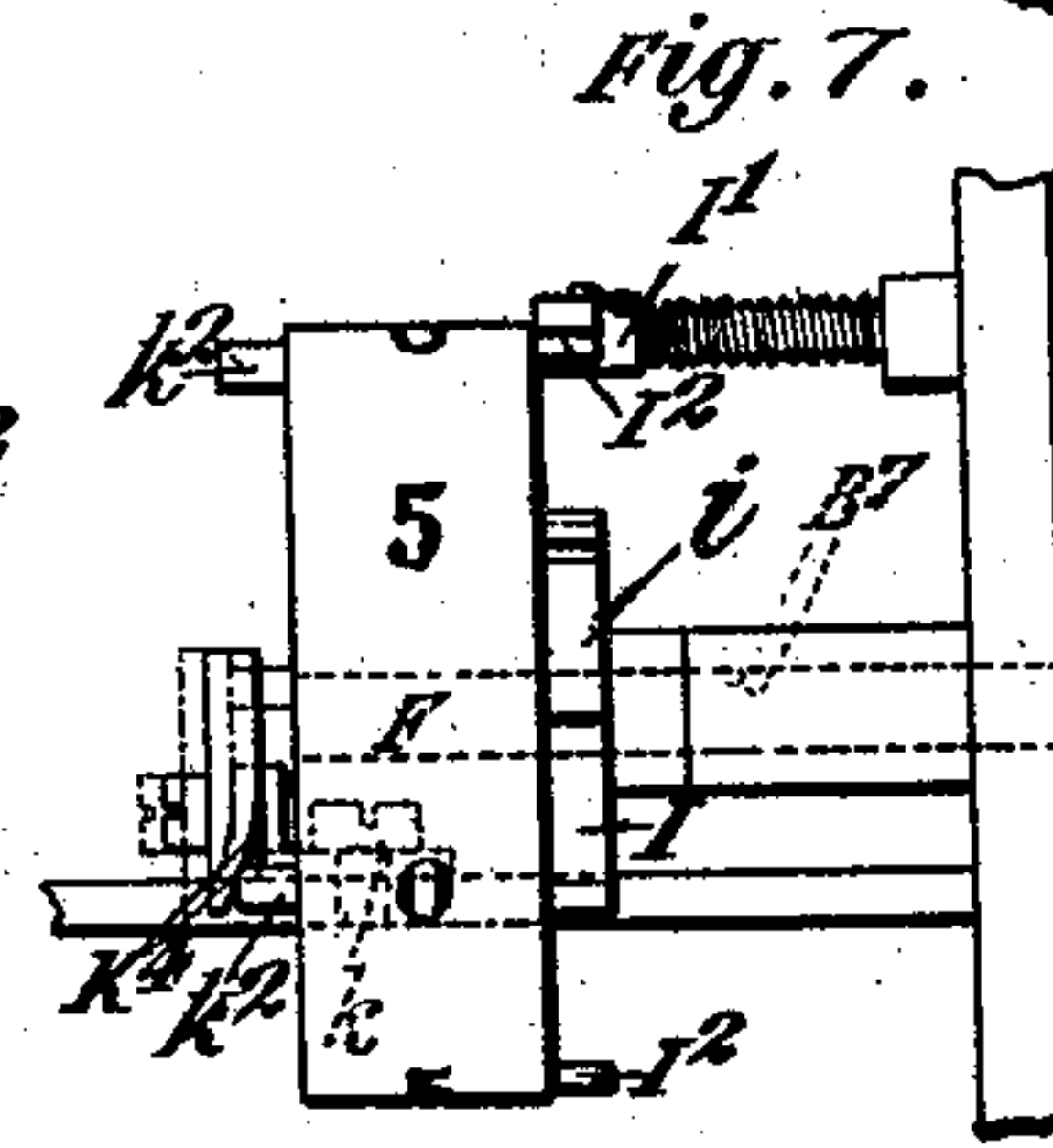
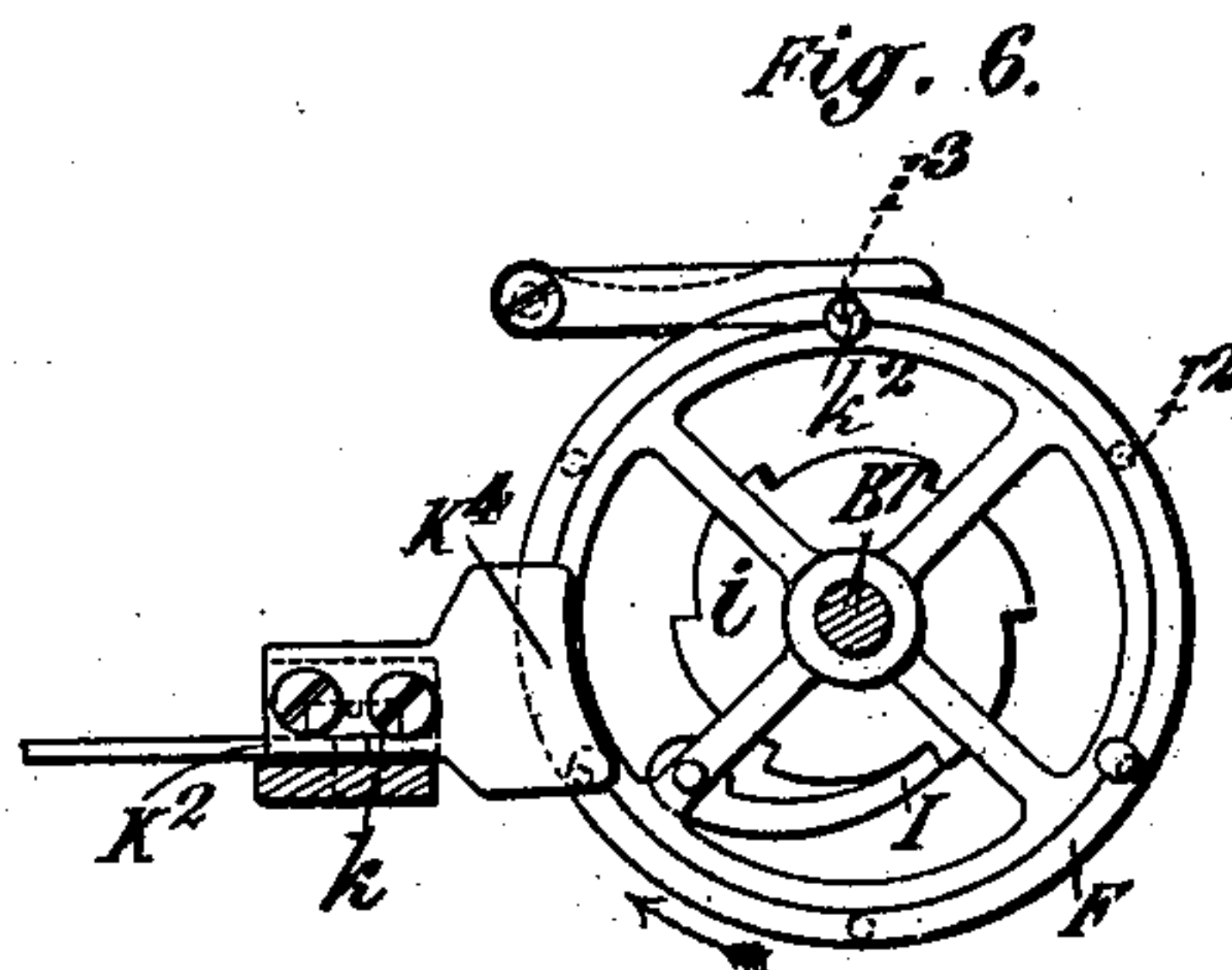
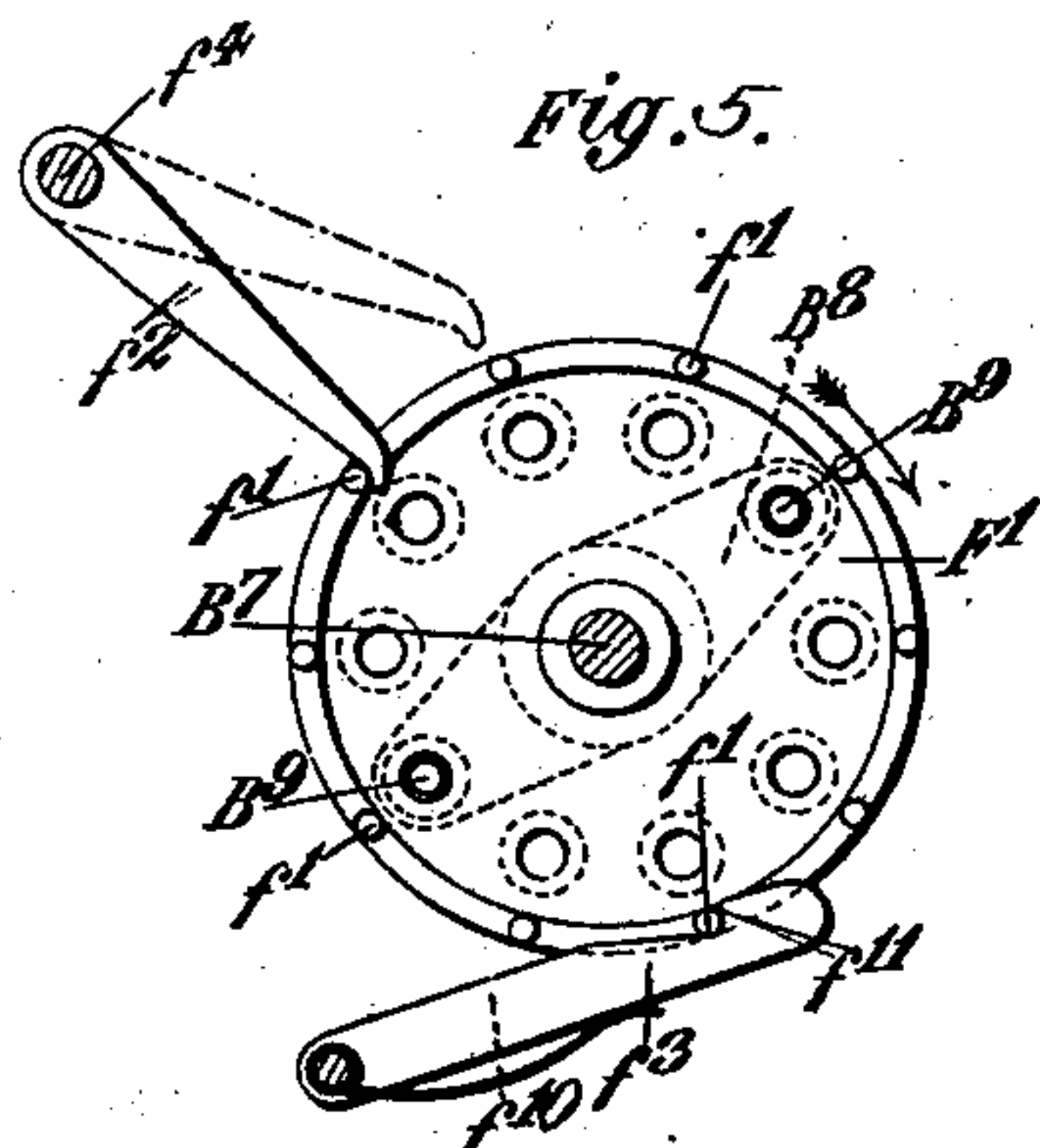
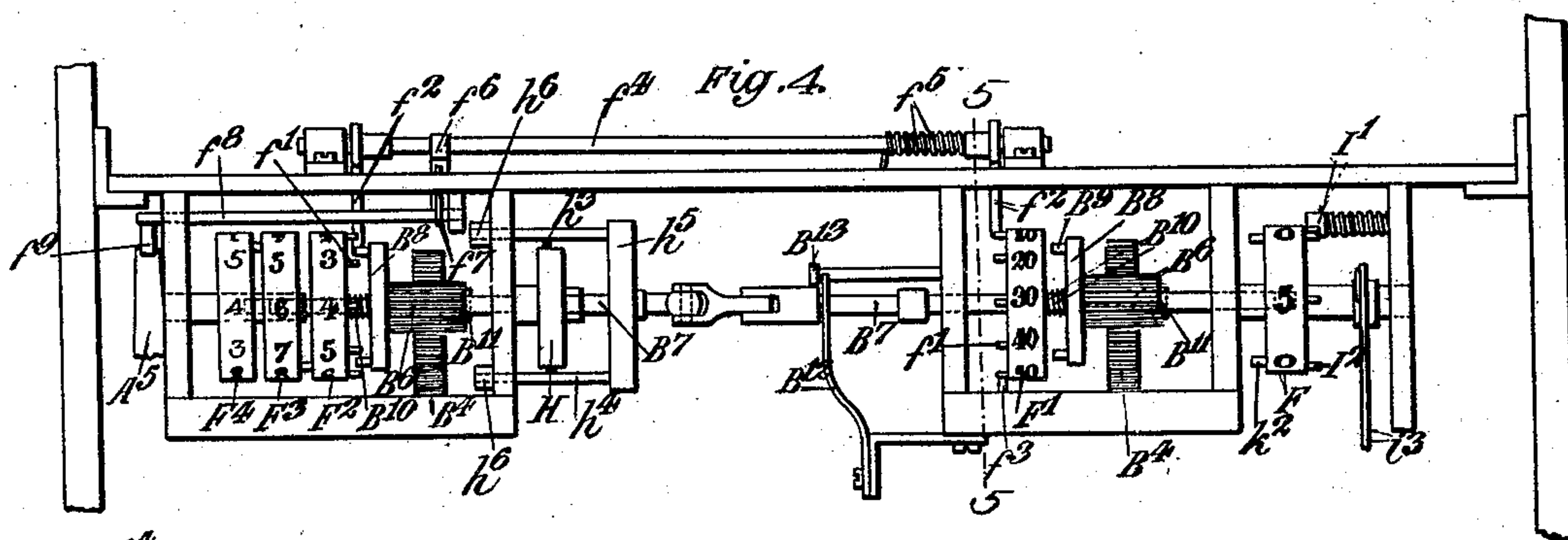
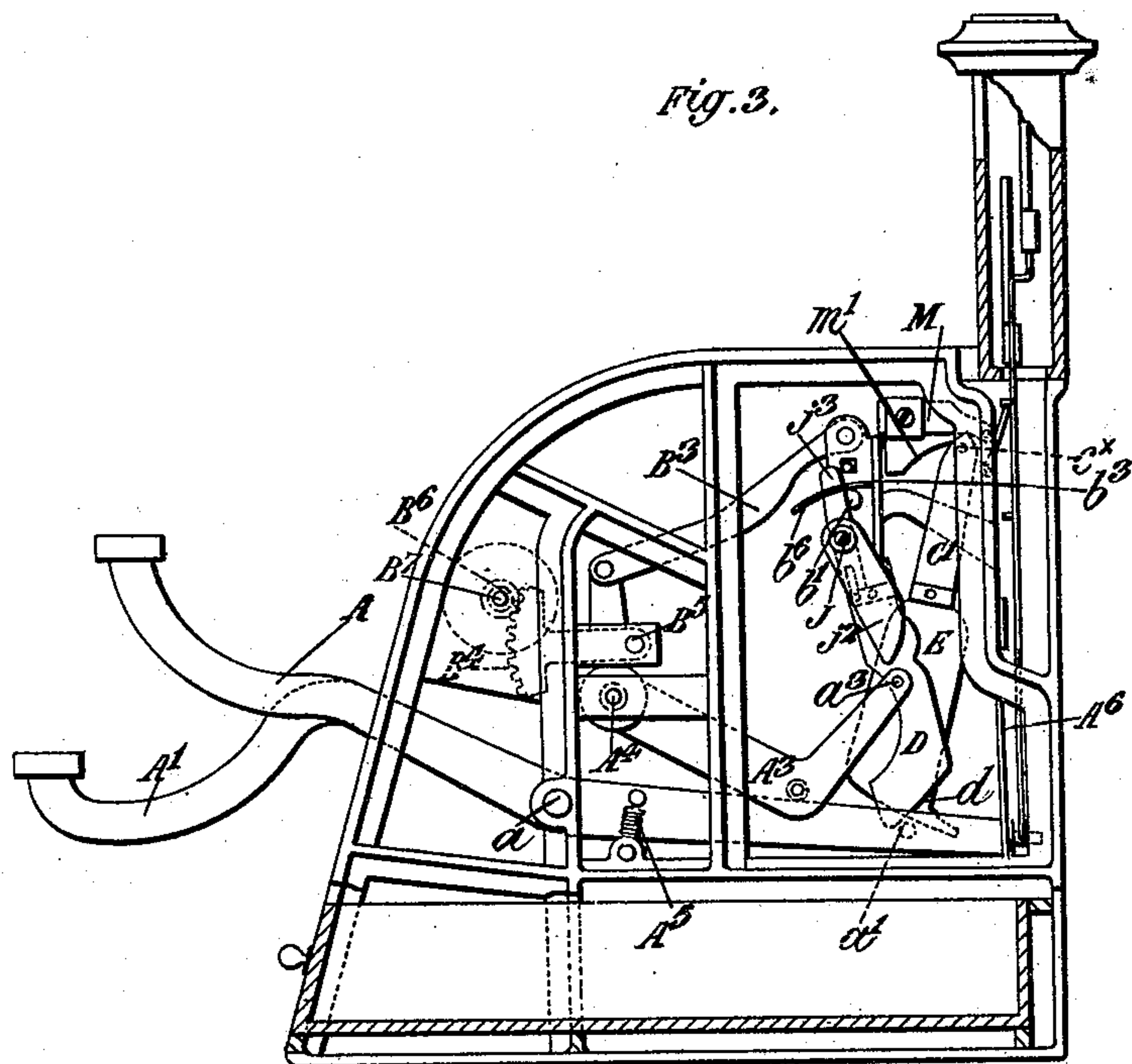
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7 Sheets—Sheet 2.



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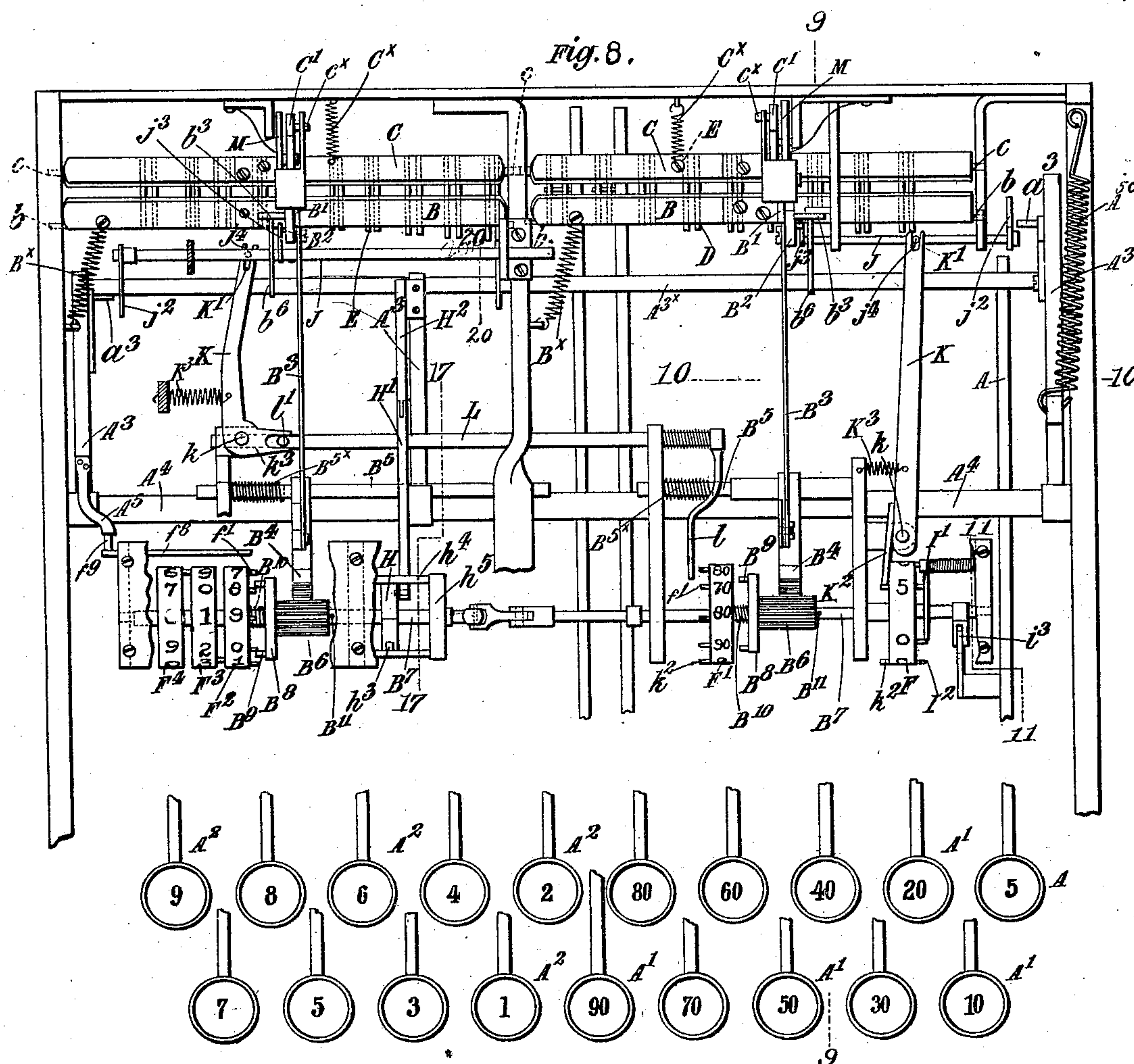
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7 Sheets—Sheet 3.



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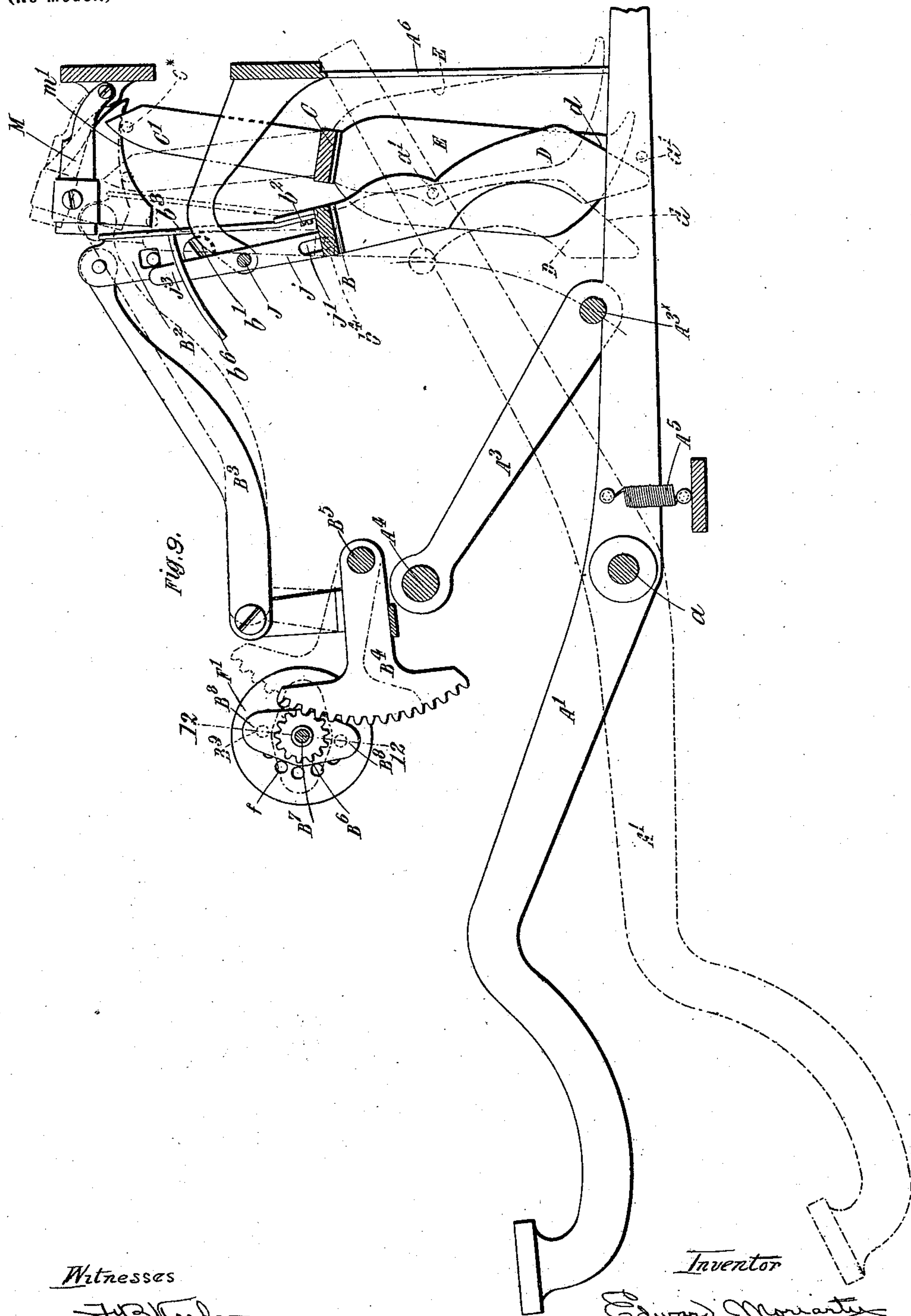
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COUNTING OR ADDING APPARATUS:

(Application filed Oct. 2, 1899.)

(No Model.)

7 Sheets—Sheet 4.



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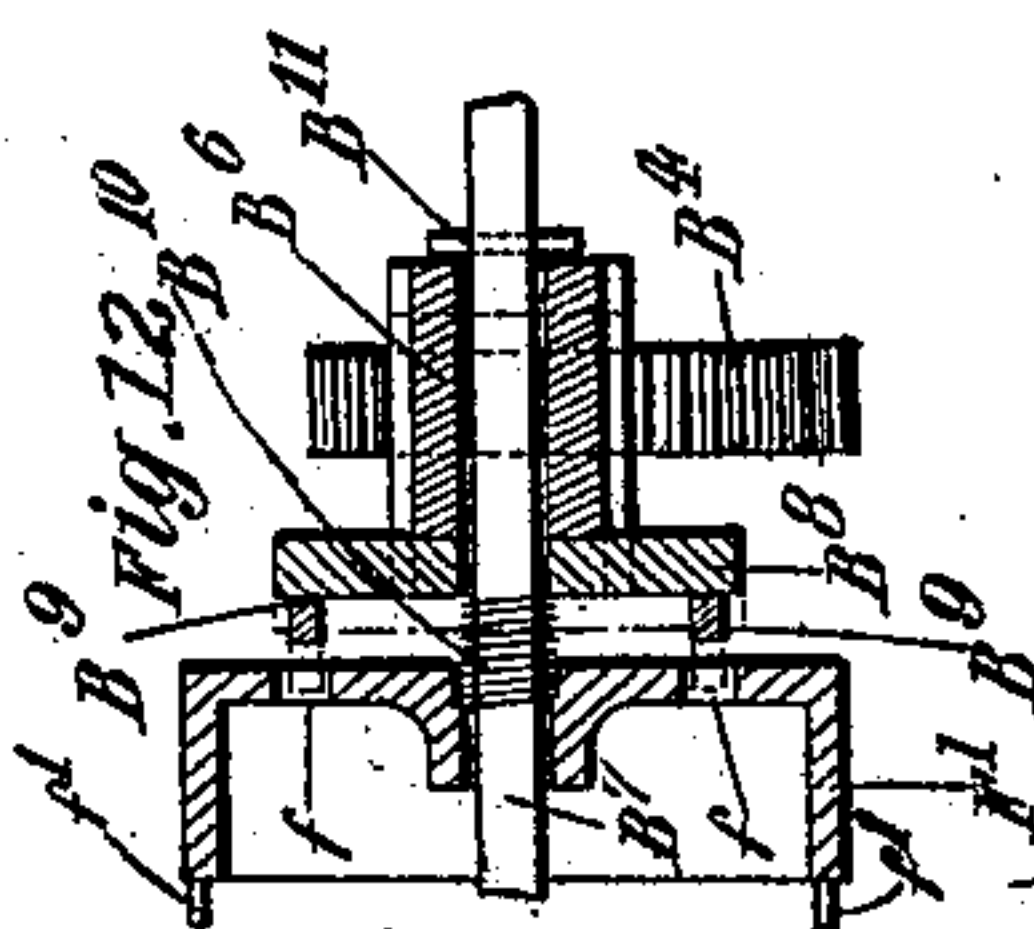
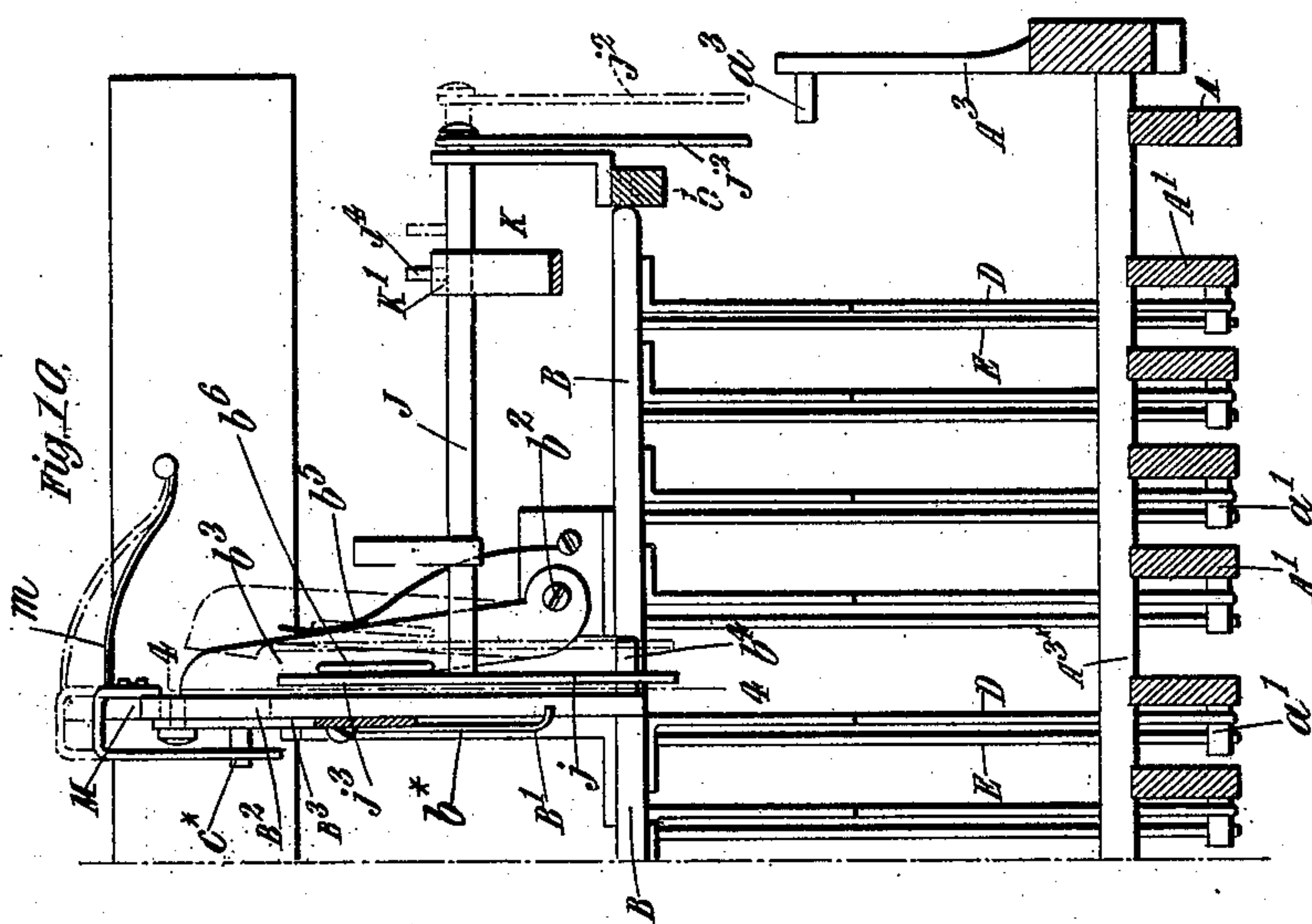
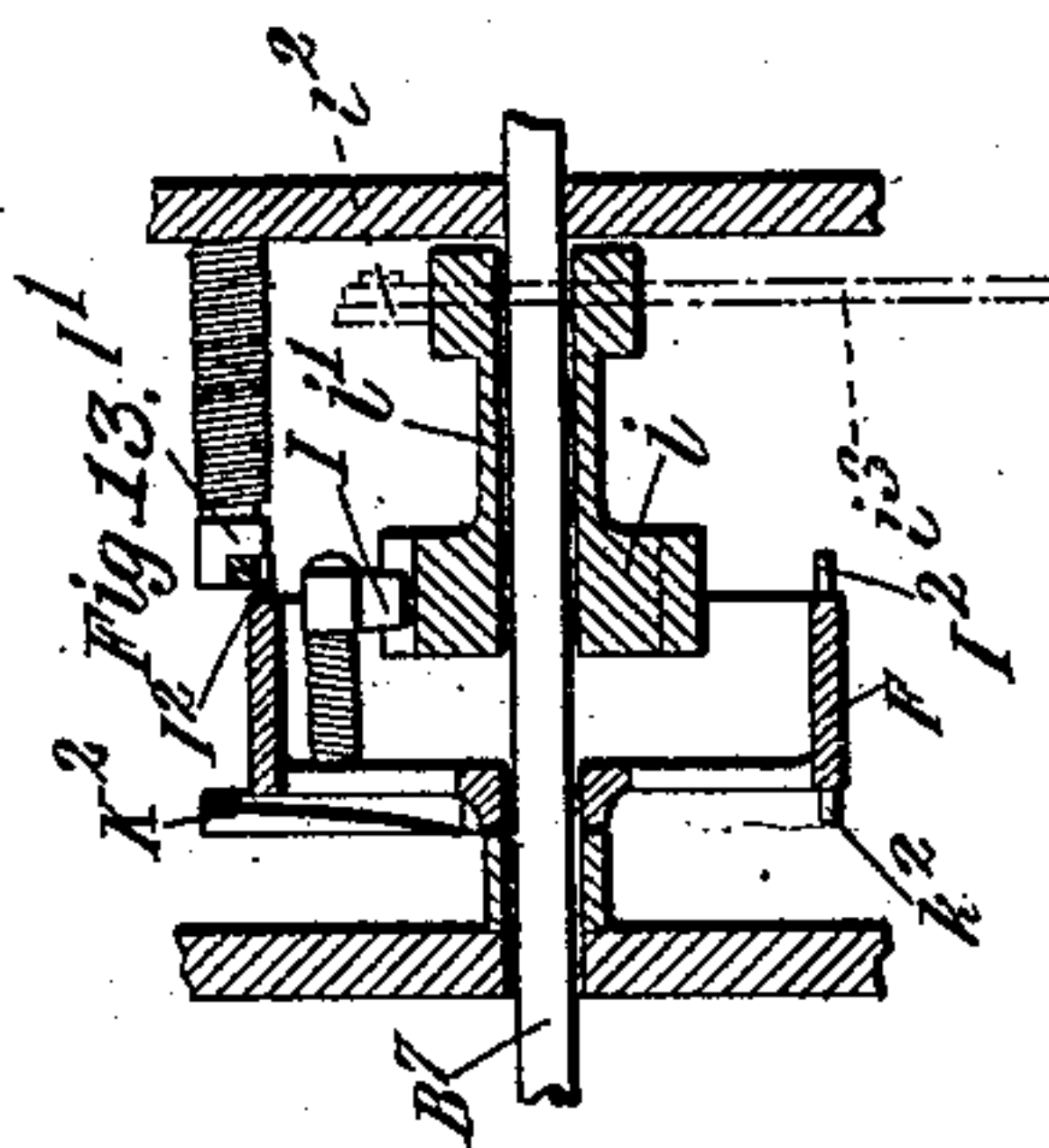
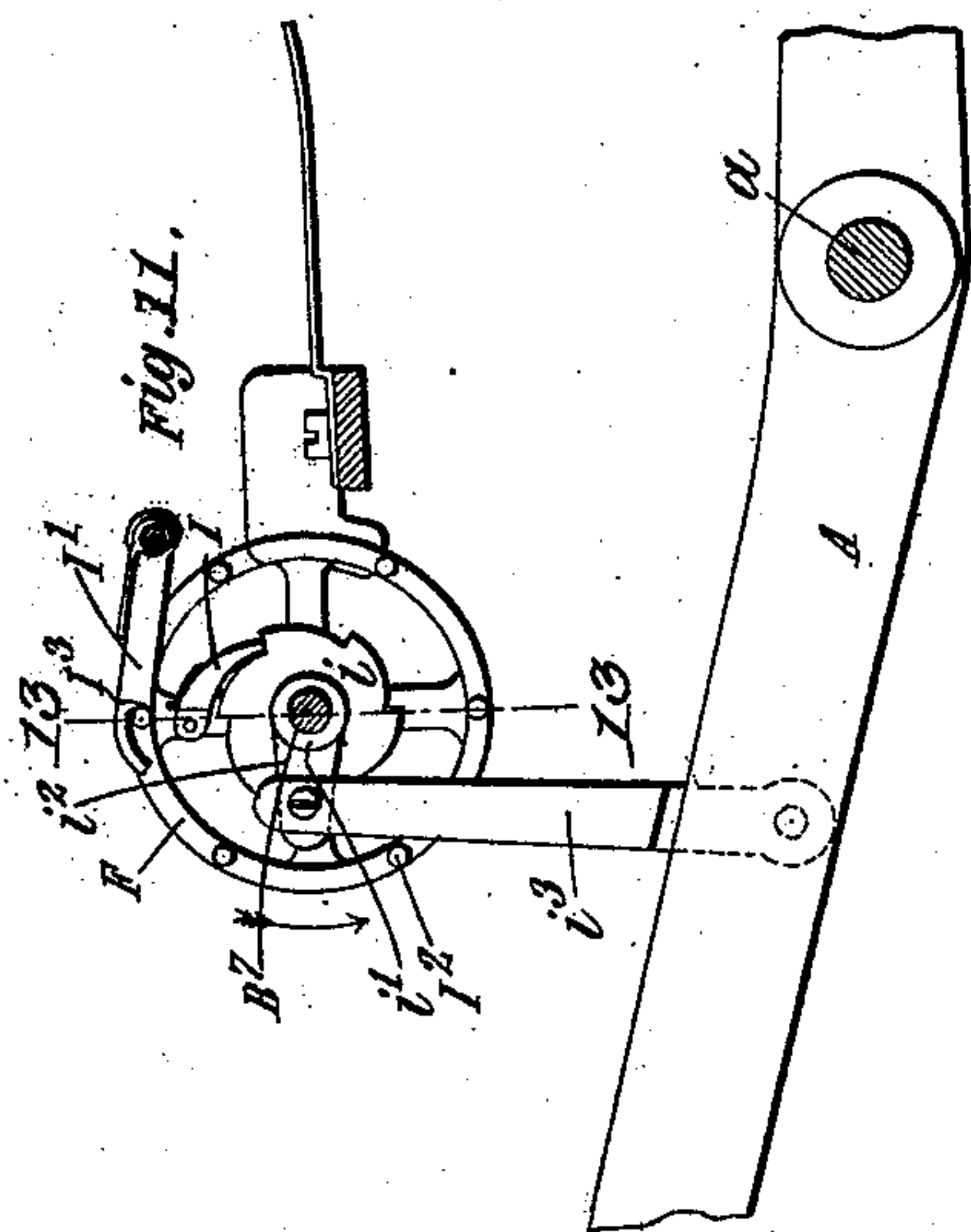
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E. MORIARTY.
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7 Sheets—Sheet 5..



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UNITED STATES PATENT OFFICE.

EDWARD MORIARTY, OF FULHAM, ENGLAND.

COUNTING OR ADDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 689,738, dated December 24, 1901.

Application filed October 2, 1899. Serial No. 732,392. (No model.)

To all whom it may concern:

Be it known that I, EDWARD MORIARTY, beer retailer, a subject of the Queen of Great Britain, residing at 180 North End road, Fulham, in the county of Middlesex, England, have invented certain new and useful Improvements in Counting or Adding Apparatus, of which the following is a specification.

This invention relates to counting or adding apparatus which is specially intended for use with money-tills of the kind in which there are employed a series of key-levers bearing numerals or other signs to correspond with the various amounts of money the till is intended to deal with, such key-levers working in conjunction with counting or registering mechanism, whereby the various amounts of money dealt with are added together and recorded by registering-drums, so that the total amount of money which should be found in the till is represented by the said drums.

According to my invention I provide in proximity to the inner ends of the aforesaid key-levers and in a position to be operated thereby a number of plates formed with inclined or cam-shaped edges or portions and hereinafter referred to as "cam-plates," a separate cam-plate being provided for each of the aforesaid key-levers. These cam-plates are arranged in series, each series being preferably carried by a rocking bar or shaft. The cam-plates of each series are of different contour—that is to say, their shape is such that when the key-levers are actuated the extent of rocking movement imparted to the said rocking bar will be greater or less, according as a key-lever representing a higher or a lower denomination is actuated.

Means are provided for transmitting the movement of the cam-plates to the registering-drums, which are caused to move angularly to an extent equivalent to the amount of movement which the said rocking bars receive from their cam-plates when the latter are actuated by the key-levers. Means are also provided for transferring from one registering-drum to the next of higher denomination the amount beyond that which can be registered on the drum of the lower denomination, such means comprising a movable arm carried by each of the rocking bars, which arm is released and permitted to move independ-

ently of the rocking bar when a transfer is to be made, means being also provided whereby the extent of movement of said movable arm is controlled. Means are also provided whereby the extent of movement of the aforesaid rocking bars cannot exceed that which is necessary for effecting any particular recording stroke, no matter how sharply or suddenly the key-levers may be struck in actuating them. For this purpose I employ stop-pieces carried by additional rocking bars, having cam-plates which are in form duplicates of the cam-plates on the main rocking bars with the exception that they are arranged in reverse order. Both of these sets of cam-plates and their rocking bars are adapted to move simultaneously, but in opposite directions.

In order that my invention may be clearly understood, I will proceed to describe the same more fully with reference to the accompanying drawings, which illustrate a money-till of the kind hereinbefore referred to provided with my improved counting or adding apparatus.

Figure 1 is a front elevation of the complete money-till. Fig. 2 is a similar view with the front part of the casing removed. Fig. 3 is an end view of the money-till with the end part of the casing removed. Fig. 4 is a front elevation showing the various registering-drums and parts immediately in connection therewith comprising the registering device. Fig. 5 is a transverse section in the line 5 5, Fig. 4, looking toward the right. Figs. 6 and 7 are respectively an end view looking toward the right and a front elevation showing, on a larger scale, the five-cents drum and the adjacent end of the transferring-lever which the drum operates. Fig. 8 is a plan view of the internal mechanism. Fig. 9 is a transverse section in the line 9 9, Fig. 8, drawn on a larger scale. Fig. 10 is a longitudinal section in the line 10 10, Fig. 8, also drawn on a larger scale, showing the transferring mechanism hereinafter described. Fig. 11 is a detail sectional view taken approximately in the line 11 11, Fig. 8, and drawn on an enlarged scale. Fig. 12 is a vertical section in the line 12 12, Fig. 9. Fig. 13 is a transverse section taken approximately in the line 13 13 of Fig. 11. Fig. 14

is a view similar to Fig. 10, but showing simply the upper part of said last-mentioned figure and on a larger scale. Fig. 15 is a vertical section taken approximately in the line 15 15 of Fig. 14 and looking toward the left. Fig. 16 is a front elevation of certain of the parts illustrated in Fig. 14 and hereinafter more fully described. Fig. 17 is a detail sectional view taken approximately in the line 17 17 of Fig. 8 and drawn on an enlarged scale. Fig. 18 is a plan view of a cam hereinafter more fully referred to. Fig. 19 is a perspective view of the main and additional rocking bars and their cam-plates. Fig. 20 is a transverse section taken in the line 20 20 of Fig. 8.

Like letters of reference indicate similar parts in all the figures.

A A' A² are the key-levers, which are of the ordinary construction usual in this class of apparatus—that is to say, they consist of bars pivoted at *a* to the framing of the apparatus and maintained with their outer ends elevated by a rocking frame A³, hinged to a transverse rod A⁴ and normally kept in its depressed position by a spring A⁵⁰, (see Fig. 8,) connected, respectively, to the rocking frame and the framework. Other springs, as A⁵¹, Fig. 3, may bear against pins, as A⁵², on the key-levers. The said outer ends of the key-levers bear figures or other signs designating the amounts of money which the various key-levers represent. In the example illustrated the key-levers are arranged in three series or divisions—viz., the key-lever A, representing five cents, the key-levers A', representing, respectively, ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, and ninety cents, and the key-levers A², representing, respectively, one, two, three, four, five, six, seven, eight, and nine dollars. It will therefore be seen that this arrangement comprises three divisions of the key-levers—one key-lever A, a series of nine key-levers A', and another series of nine key-levers A². Obviously, however, this arrangement may be varied in any desired manner to accord with the requirements of the apparatus. The inner ends of the key-levers work in vertical slots A⁶, Fig. 9, at the back of the machine, which slots serve the double purpose of guiding said key-levers and of limiting the extent of their vertical movement.

B B are the main rocking bars, of which there are two in the present example, one for the series of key-levers A' and the other for the series of key-levers A².

C C are the additional rocking bars, arranged adjacent to and parallel with the aforesaid bars B. These bars B and C are each provided with pivots *b* and *c*, respectively, at their ends, which pivots are mounted in suitable bearings forming part of the framing of the apparatus.

D D are the cam-plates carried by the main rocking bars B, and E E are the cam-plates carried by the additional rocking bars C.

F F' F² F³ F⁴ are the registering-drums, the drum F bearing alternately the figures "0" and "5" and the drum F' bearing the figures "0, 10, 20, 30, 40, 50, 60, 70, 80, 90." The drums F², F³, and F⁴ bear figures to represent units, tens, and hundreds, respectively.

The series of cam-plates D depend from the rocking bar B and are connected thereto, so that they all move simultaneously therewith. Each cam-plate is formed with a differently-shaped cam-surface *d*, so that the extent of rocking movement imparted to the rocking bar B when one or other of the cam-plates is actuated by a key-lever will vary to a predetermined extent, according as one or other of the cam-plates is actuated—that is to say, if a key-lever representing the lowest denomination of the series of key-levers A' be operated the said rocking bar B will be rocked to a definite predetermined extent; but if another key-lever of the same series be operated representing a denomination, say, twice or thrice as much as the key-lever of lowest denomination then the extent of rocking movement of the said bar will be correspondingly twice or thrice as great. The two series of cam-plates carried by the two bars B C are so arranged that they lie side by side (see Fig. 19) with their cam-surfaces facing in opposite directions, so as to form pairs of cam-plates. Each of the key-levers is provided with a lateral pin *a'*, Fig. 9, which lies immediately below the various pairs of cam-plates, and when the outer ends of the key-levers are depressed these pins rise and enter between the pairs of cam-plates, thereby causing them to be shifted in opposite directions and the rocking bars to likewise be rocked in opposite directions, as shown by the dotted lines in Fig. 9.

Each of the rocking bars B is provided with an arm or bracket B', to which is pivotally connected at *b'* a movable arm B², which is normally prevented from turning about its pivot by a locking device, hereinafter described. The said arm B² is connected at its outer end by a connecting-rod B³ to a segmental rack B⁴, mounted on a transverse rod B⁵. This rack gears with an elongated pinion B⁶, loosely mounted on a transverse shaft B⁷. The said elongated pinion forms part of a clutch device B⁸, which in the example illustrated comprises a pair of arms having at their extremities lateral pins B⁹, lying adjacent to the face of a registering-drum. The registering-drum is formed with a concentric series of holes *f*, corresponding in number to that of the divisions or denominations which the drum bears, and with these holes the pins B⁹ are adapted to engage by a lateral movement of the clutch device.

B¹⁰ is a spring interposed between each of the registering-drums and the said clutch devices, such spring normally tending to keep the clutch device pressed away from its adjacent drum against a stop-piece B¹¹ on the shaft B⁷. The pins B⁹ of the clutch device

are thus kept out of contact with the drum, although they lie sufficiently close thereto to insure their quickly engaging with the holes f in the drum when the clutch device is laterally shifted by the stop-piece B^{11} on the shaft as the latter is moved longitudinally by the action of a cam H . This cam is concentrically arranged with respect to the aforesaid shaft B^7 and is connected, by means of a rod H' , Fig. 17, to an arm H^2 , forming part of the rocking frame A^3 , so that each time a key-lever is operated and the said frame caused to swing about its bar A^4 the cam will be thereby oscillated. The said cam is formed with radial portions h , arranged diametrically opposite to one another, and each portion is formed with two cam-surfaces h' h^2 , Fig. 18. These cam-surfaces coöperate with pins h^3 h^3 , carried by rods h^4 , extending from arms h^5 , that are fixed radially to the said shaft B^7 . The aforesaid rods h^4 are adapted to slide in guide-pieces h^6 , which serve to steady the pins h^3 h^3 while they are being acted upon by the said cam. When one or other of the key-levers is depressed, its initial movement lifts the aforesaid swinging frame A^3 , which in turn imparts angular movement to the cam in the direction represented by the arrow in Fig. 17. This movement of the cam causes its cam-surfaces h' , Fig. 18, to act upon the pins h^3 , which consequently slide the shaft B^7 longitudinally from right to left of the machine and bring the clutch devices into engagement with their adjacent drums. By the continued downward movement of the key-lever the said rocking bars are actuated and cause the segmental rack B^4 to turn angularly to an extent depending on the denomination of the key-lever operated. This angular movement of the segmental rack turns the elongated pinion and clutch device to a corresponding extent, whereby the registering-drum belonging to the series of cam-plates under operation is caused to turn a sufficient distance to effect its registering movement. By the time the key-lever has been fully depressed and the cam H has completed its movement in the direction of the said arrow the aforesaid pins h^3 arrive in the spaces h^7 of the cam H , whereby they escape from the cam-surfaces h' and permit the springs B^{10} of the clutch devices to shift the said shaft B^7 from left to right of the machine and return it to its original position, thus carrying the pins B^9 out of engagement with the holes in the registering-drums. Then when the key-lever is liberated and allowed to return to its original position under the action of the spring-controlled rocking frame A^3 the cam H is by the latter shifted in the reverse direction, whereby the other cam-surfaces h^2 of said cam operate on the aforesaid pins h^3 . By so doing they cause the shaft B^7 to move longitudinally still farther in the direction of left to right of the machine against the resistance of a spring B^{12} , whereby the pins h^3 are positively carried completely away from the registering-drums.

I thus avoid any liability of the pins engaging with the drums during the time that the elongated pinions are being revolved in the reverse direction by their segmental racks as the latter return to their normal position under the influence of springs $B^{\times} C^{\times}$ on the rocking bars $B C$ and springs $B^{5\times}$ on the transverse rods B^5 . As soon as the said pins escape from the cam-surfaces h^2 and arrive opposite the space h^8 of the cam the reaction of the aforesaid spring B^{12} shifts the shaft B^7 longitudinally in the reverse direction—i. e., from right to left—so as to bring the pins h^3 into their normal position, ready to be again acted upon by the cam-surfaces h' when a key-lever is next depressed. At the same time the pins of the clutch devices are brought into the aforesaid position of close proximity to the registering-drums, ready to immediately reengage with the holes in said drums when a next recording operation is to be performed. In order to prevent the aforesaid spring B^{12} from carrying the shaft B^7 too far toward the left, the end of said spring is adapted to strike against a stop B^{13} .

The aforesaid registering-drums are provided with appropriate means for retaining them in any of the angular positions to which they are set by the apparatus. In the drawings I have shown the drums F' and F^2 provided with lateral pins f' , whose number corresponds with the number of steps which the said drums perform in completing a single revolution. Engaging with these pins are two pawls f^2 f^3 , arranged contiguous to each of the drums, the pawl f^2 serving to prevent the drum from moving in a forward direction and the pawl f^3 to prevent it from moving in a rearward direction. The pawls f^2 are carried by a spindle f^4 , which is furnished with a spring f^5 for causing the pawls to engage with the pins. Near one end of said spindle is a finger f^6 , which lies contiguous to a finger f^7 , carried by another spindle f^8 . This last-mentioned spindle has a lug or projection f^9 , which lies in the path of an arm A^5 , carried by the rocking frame A^3 , so that each time the said rocking frame is elevated when a key-lever is depressed the arm A^5 acts upon the aforesaid lug or projection f^9 and so turns the spindles f^8 and f^4 in a direction to remove the pawls from engagement with the pins on the drums. This movement takes place immediately a key-lever commences to descend and before the aforesaid clutch devices B^8 have had time to engage with the drums. The pawl f^3 is maintained in engagement with the pins f' by a spring f^{10} , which permits said pawl f^3 to give way to the pins f' as the drum moves in a forward direction—i. e., in the direction of the arrow in Fig. 5—but does not allow said pawl to give way to the pins if the drum tends to move in the opposite direction, the shoulder f^{11} then acting as a stop.

As the drum F (which registers alternately five cents and zero) does not require to be

turned more than one step at a time, I do not employ a cam-plate and rocking bar for operating it, but employ means for actuating it directly from its key-lever A. For this purpose I provide said drum with a spring-pawl I, Figs. 11 and 13, to engage with a ratchet i , forming part of a sleeve i' . This sleeve is provided with a radial arm i^2 , which is connected by a link i^3 to the key-lever A. The drum and the aforesaid sleeve are both loosely mounted on their shaft, and therefore each time the key-lever A is depressed the said drum is caused to travel a distance of one step through the intervention of the pawl and ratchet, as is well understood. In order to prevent said drum from being unintentionally turned in either direction, I provide a spring-pawl I', which is adapted to engage with lateral pins I² on the drum. The formation of this pawl is such that the tendency of the drum to turn forwardly when the key-lever A is depressed causes the pins to raise said pawl; but any tendency for the drum to turn in the reverse direction is overcome by a shoulder I³ on said pawl.

The aforesaid movable arm B² is, as already stated, capable of receiving movement about its pivot b' independently of the movement it receives from the main rocking bar B. Normally, however, the said arm B² is prevented from turning about its pivot by a locking device. When it is necessary for the machine to transfer the amount recorded by one registering-drum to another of higher denomination, the said locking device is thrown out of action and the independent movement of the arm B² is effected by a contrivance which is actuated by the registering-drum of lower denomination. The contrivance illustrated in the drawings for releasing the said arm B² and for effecting the independent movement thereof comprises a shaft J, Figs. 9 and 10, which is capable of sliding longitudinally and of oscillating. It is mounted in bearings that are independent of the aforesaid main rocking bar, and at its inner end it is provided with a crank or arm j , having an elongated slot j' therein to engage with a pin b^4 on the inner end of the movable arm B². The outer end of the said shaft J is provided with a finger or cam piece j^2 , which so long as the said shaft occupies its inward position (represented by the full lines in Fig. 10) lies out of the path of a pin or projection a^3 on the rocking frame A³. The aforesaid locking device comprises a plate or finger b^3 , which is pivotally connected at b^2 to a bracket on the rocking bar B and by a spring b^5 is normally maintained in a position transverse of the plane of movement of the movable arm B², so that the latter cannot at such time be shifted in the direction of said locking device or, in other words, cannot perform its aforesaid independent movement. The said locking device is provided with an elongated pin b^6 , which is adapted to be acted upon by an arm j^3 on the aforesaid shaft J when the latter is caused to

slide longitudinally into its outward position. By the outward sliding movement of the said shaft J the locking device is by means of the said elongated pin b^6 and the arm j^3 withdrawn from its restraining position, so that the arm B² is free to turn about its pivot and to perform its independent movement. For the purpose of imparting the sliding movement to the said shaft J at the proper times, a lever K, pivoted at k , is provided, the end K' of such lever engaging with a pin j^4 on the said shaft J and the other end K² lying in a position to be acted upon by pins k^2 on the registering-drum or by a device (hereinafter described) which is under the control of said pins. The aforesaid movable arm B² is provided with a curved slot b^7 , into which projects a pin b^8 on the arm or bracket B'. This pin serves as a stop for limiting the extent of the independent movement which the said arm B² can perform. In the case of the five-cents drum F, which alternately registers five cents and zero, as already explained, a transfer from this drum to the next drum of higher denomination—viz., to the drum F'—would be necessary at each alternate step of the drum F. In the drawings the five-cents drum F illustrated performs six steps at each complete revolution, and therefore it is provided with three lateral pins k^2 at a distance apart of two steps. At each alternate operation of the five-cents key-lever A one of the pins k^2 acts upon the inner end K² of the aforesaid lever K, which thus shifts the sliding shaft J outwardly into a position to bring its cam-piece j^2 in the path of the aforesaid pin a^3 on the rocking frame A³. Then at the next succeeding operation of the five-cents key-lever A the said shaft J will be rocked by the said pin a^3 striking the cam-piece j^2 , and will thereby shift the movable arm B² (through the intervention of the crank j and the pin b^4) a sufficient distance to cause the drum F' of higher denomination to turn one step and add to its record ten cents transferred from the drum F.

K³ is a spring which acts to return the aforesaid lever K and the shaft J to their normal position after each displacement by the pins k^2 , and b^x is a spring for returning the arm B² to its normal position. The end K² of lever K is provided with a cam-piece or incline K⁴, (represented best in Fig. 15,) which lies in the path of the pins k^2 , so that as the drum F moves in the direction of the arrow shown in Fig. 16 they one by one come against the inclined portion K⁴ of the lever and shift the end adjacent to the drum outwardly, the said lever K at this time turning on the pivot k .

In the case of transferring the records of the drum F' to the drum F² the lever K for sliding the shaft J on the main rocking bar of the dollars series of key-levers A² is for sake of convenience in construction situated at some distance from the drum F'. Therefore it has been necessary to provide a device between said drum and said lever K for

enabling the latter to be operated by the pin k^2 on the drum F' . For this purpose I have indicated a spindle L , having at its end adjacent to the drum F' a finger l , which lies in the path of the said pin k^2 of this drum. At the opposite end of said spindle L is a pin l' , engaging with the slotted end k^3 of the aforesaid lever K , so that each time said bar L is actuated it imparts movement to the lever K , which in turn imparts sliding movement to the shaft J , and thereby brings its cam-piece j^2 into position to be acted upon by the projection a^3 of the rocking frame A^3 .

The aforesaid additional rocking bars C are each provided with a stop-piece C' , which lies directly behind the arm B^2 of the rocking bar B , so that when any of the key-levers of the series A' A^2 are depressed the said arms on the additional rocking bars will be caused to approach the arms B^2 on the main rocking bars.

As already stated, the rocking bars C are provided with cam-plates which are arranged in the reverse order of that in which those on the bars B are arranged, so that although both the bars B and C rock simultaneously in opposite directions the extent of movement of the bars C is greatest when that of the bars B is least, and vice versa. By these means I am able to vary the position of the stop-piece C relatively to the arms B^2 , so that said stop-pieces will assume a position each time a key-lever of the series A' or A^2 is actuated to insure that the arms B^2 cannot shift beyond the distance necessary to cause the drums F' F^2 to correctly register the amount represented by the key-lever depressed. This prevents any liability of the registering-drums from being turned beyond their proper distance no matter how suddenly or forcibly a key-lever is depressed.

To prevent the arms B^2 from shifting beyond their proper ambit of movement when they are operated independently of the main rocking bar, as aforesaid, I arrange immediately at the rear of the upper ends of said arms B^2 a hinged stop-piece M , which is maintained in this position by a spring m , the distance between said hinged stop-piece and the said arm B^2 being only sufficient to enable the latter to perform its proper transfer-stroke. The said hinged stop-piece is provided with an inclined or cam surface m' for a pin c^x on the stop-piece C' of the additional rocking bar C to act upon as said stop-piece C' advances toward the arms B^2 . The hinged stop-piece M is thus raised into a position out of reach of the arm B^2 when the latter is moved with the main rocking bar B , and it therefore does not impede this movement.

In some cases a transfer from one drum to another has to be effected by the machine simultaneously with its ordinary recording operation—as, for instance, when a record from the five-cents drum F has to be transferred to the drum F' at the same time as, say, twenty cents has to be recorded by this drum. This

would require the latter drum not only to be turned two steps for registering the twenty cents, but also another step to register the ten cents transferred from the drum F . In this case the bars B and C would be rocked by their cam-plates, as already stated, and impart to the drum F' the necessary movement for registering twenty cents. At the same time the arm B^2 would be rocked independently by the shaft J as the latter was actuated by the pin a^3 operating on the cam-piece j^2 . An augmented movement would therefore be given to the said drum F' for adding to its record the extra ten cents transferred from the drum F . The removal of the plate b^3 from between the arms B^2 and C' permits of the extra amount of movement of the arm B^2 , the thickness of said plate being just sufficient to leave a space between said arms B^2 and C' wide enough for this movement, and no more. The said arm C' thus still serves as a stop-piece (even when the transferring is being effected) to prevent movement beyond that which is necessary for effecting the proper record.

In view of the fact that the shaft J of the series of key-levers A^2 is in the example illustrated situated in an elevated position and that therefore the pin a^3 on the rocking frame A^3 cannot actuate the finger or cam piece j^2 thereon until the said frame A^3 reaches its uppermost position it is necessary to provide means whereby the return of this shaft J to its original position by the action of the spring will not take place immediately the lever L has been actuated by the pin k^2 , but will be retarded until after the said shaft has been rocked by the said pin a^3 and cam-piece j^2 to effect the transferring operation. For this purpose I provide the said shaft with a notch J^2 , Fig. 20, with which a spring-controlled arm J^3 engages each time the said sliding rod is shifted into its outward position. This spring-controlled arm is provided with a tail-piece J^4 , against which the transverse bar A^{3x} of the aforesaid frame A^3 strikes when it assumes its lowermost position, and the eby causes the arm J^3 to become disengaged from the notch in the shaft J . The said shaft being thus released returns to its normal position after having been actuated by the said pin a^3 and cam-piece j^2 . It will be obvious, however, that no such device for retarding the return movement of the sliding shaft will be necessary when the construction of the machine permits the cam-piece j^2 to be arranged in a position relatively to the pin a^3 similar to that occupied by the cam-piece j^2 and pin a^3 of the device for transferring the records from the drum F to the drum F' .

The drums F^3 and F^4 may be operated from the drum F^2 in any convenient and ordinary manner, such means forming no part of my present invention.

What I claim is—

1. In adding apparatus, the combination with the series of key-levers and the series of

cam-plates adapted to be actuated thereby, of a registering-drum, of a longitudinally-movable shaft upon which said registering-drum is loosely mounted, a device capable of engaging with said drum when the shaft is shifted longitudinally in the proper direction, of means for longitudinally shifting said shaft and of means for transmitting to said engaging device the varying movements of the aforesaid cam-plates for the purposes specified.

2. In adding apparatus, the combination with the series of key-levers and the series of cam-plates adapted to be actuated thereby, of a registering-drum, a longitudinally-movable shaft upon which said registering-drum is loosely mounted, of a clutch device for engaging with said drum and loosely mounted on said shaft but adapted to move longitudinally therewith, of means for longitudinally shifting said shaft, of an elongated toothed pinion forming part of and moving with said clutch device, of a rack in constant gear with said pinion, and of means for transmitting to said rack the varying movements of the aforesaid cam-plates, for the purpose specified.

3. In adding apparatus, the combination with the series of key-levers and the series of cam-plates adapted to be actuated thereby, of a registering-drum, a longitudinally-movable shaft upon which said registering-drum is loosely mounted and formed with a circular series of apertures in one of its faces, of a clutch device consisting of arms having pins at their extremities for engagement with said apertures in the registering-drum, the said clutch device being loosely mounted on said shaft but capable of longitudinal movement therewith, of means for longitudinally shifting said shaft, of an elongated toothed pinion forming part of and moving with said arms, of a segmental rack in constant gear with said pinion, a bar which is common to the series of cam-plates, and of a connecting-rod coupled respectively to the said segmental rack and to said bar for the purpose specified.

4. In adding apparatus, the combination with the registering-drum, a longitudinally-movable shaft loosely carrying said drum, and with the means for transmitting to said drum the varying movements of the cam-plates when the key-levers are actuated; of retaining-pawls for normally retaining the said drum in a fixed position, and of means for releasing one of said pawls to permit of the drum's rotary movement by the aforesaid motion-transmitting means substantially as described.

5. In adding apparatus, the combination with the registering-drum, a longitudinally-movable shaft loosely carrying said drum, and with cam-plates, key-levers, and the means for transmitting to said drum the varying movements of the cam-plates when the key-levers are actuated; lateral pins on said drum, of two retaining-pawls adapted to engage said lateral pins, one of the pawls acting to prevent movement of the drum in a forward di-

rection and the other acting to prevent movement of the drum in a backward direction, whereby such pawls normally retain the said drum in a fixed position, of a spindle to which the pawl preventing forward movement of the drum is connected, and of means for actuating said spindle to release the pawl it carries each time a key-lever is operated substantially as described.

6. In adding apparatus the combination with the longitudinally-movable shaft and the registering-drum having lateral pins mounted loosely on the longitudinally-movable shaft and with cam-plates, key-levers and the means for transmitting to said drum the varying movements of the cam-plates when the key-levers are actuated, of two retaining-pawls adapted to engage with the lateral pins on said drum, one of said pawls acting to prevent movement of the drum in a forward direction and the other acting to prevent movement of the drum in the reverse direction, whereby such drum is normally retained in a fixed position, of a spring-controlled spindle to which the pawl preventing forward movement of the drum is connected, of a finger on said spindle, of a rocking frame which latter receives motion each time one or other of the key-levers is actuated and of means for actuating said spindle each time the said rocking frame is operated substantially as and for the purpose specified.

7. In adding apparatus, the combination with the longitudinally-movable shaft and the registering-drum having lateral pins mounted loosely on the longitudinally-movable shaft and with cam-plates, key-levers and the means for transmitting to said drum the varying movements of the cam-plates when the key-levers are actuated, of two retaining-pawls adapted to engage with the lateral pins on said drum, one of said pawls acting to prevent movement of the drum in a forward direction and the other acting to prevent movement of the drum in the reverse direction, whereby such drum is normally retained in a fixed position, of a spring-controlled spindle to which the pawl preventing forward movement of the drum is connected, of a finger on said spindle, of a rocking frame which latter receives motion each time one or other of the key-levers is actuated, of a second spindle provided with a finger adjacent to the finger on the first spindle, of an arm on said second spindle and of a projection on the rocking frame for actuating said arm, substantially as and for the purpose specified.

8. In adding apparatus, the combination with the longitudinally-movable shaft and the registering-drum and the clutch device both mounted loosely on the longitudinally-movable shaft, and with a key-lever and the means for imparting rotary movement to said clutch device; of a cam adapted to be actuated each time a key-lever is operated, and of projections on the aforesaid longitudinally-movable shaft upon which projections said cam oper-

ates when actuated and thereby imparts the said longitudinal movement to the shaft and the said clutch device thereon, for the purpose specified.

5 9. In adding apparatus, the combination with the longitudinally-movable spring-actuated shaft and the registering-drum and the clutch device both mounted loosely on the longitudinally-movable shaft, and with a key-
10 lever and the means for imparting rotary movement to said clutch device; of a cam located concentrically with respect to the longitudinally-movable shaft, of means for imparting to said cam an oscillatory movement
15 each time a key-lever is operated, and of projections on said shaft with which the cam engages to impart a longitudinal movement to said shaft first in one direction and then in the opposite direction, thereby alternately
20 causing the said clutch to engage and disengage the said registering-drum for the purpose specified.

10. In adding apparatus, the combination with the longitudinally-movable shaft and the
25 registering-drum and the clutch device both loosely mounted on the longitudinally-movable shaft and key-lever and with the means for imparting rotary movement to said clutch device; of a cam located concentrically with
30 respect to the longitudinally-movable shaft and having a double cam-surface, one portion of which operates to impart to the said shaft longitudinal movement in one direction and the other portion of which operates to
35 impart to the said shaft longitudinal movement in the opposite direction, of means for imparting to said cam an oscillatory movement each time a key-lever is operated, of
40 projections on said shaft for the said double cam-surface to act upon, and of springs for operating to return said shaft to its normal position for the purpose specified.

11. In adding apparatus, the combination with the longitudinally-movable shaft and the
45 registering-drum and the clutch device both loosely mounted on the longitudinally-movable shaft and having a pair of double cam-surfaces disposed diametrically opposite each other, a rocking frame, of a connecting-rod
50 coupling the said cam to a rocking frame, said rocking frame being lifted each time a key-lever is depressed, thereby imparting an oscillatory movement to said cam, arms on said
55 longitudinally-movable shaft, of a pair of lateral projections extending from said arms and bearing pins at their extremities, which pins are acted upon by said cam-surfaces to impart the longitudinal movement to the said
60 movable shaft, and of springs acting in opposite directions upon said shaft substantially as and for the purpose specified.

12. In adding apparatus, the combination with the series of key-levers, the series of cam-plates and the registering device, of an additional
65 series of cam-plates adapted to be operated simultaneously with the main series of cam-plates to prevent the latter from ex-

ceeding their proper ambit of movement when a key-lever is actuated.

13. In adding apparatus, the combination 70 with the series of key-levers, the main series of cam-plates, the rocking bar carrying them, and the registering device, of an additional series of cam-plates carried by a rocking bar and adapted to be operated by the said key-
75 levers simultaneously with the operation of the main series of cam-plates to an extent depending on that to which the main cam-plates are operated, and of stop-pieces on the rocking bars of the said additional and main cam-
80 plates respectively, for the purpose specified.

14. In adding apparatus, the combination with the series of key-levers, the main cam-plates, the rocking bar carrying them and the registering device, of an additional series of
85 cam-plates carried by a rocking bar and adapted to be operated by the said key-levers simultaneously with the operation of the main series of cam-plates to an extent depending on that to which the main cam-plates are op-
90 erated, and of stop-pieces on the rocking bars, one of such stop-pieces being in the form of a movable arm carried by the main rocking bar and the other in the form of a fixed arm carried by the additional rocking bar sub-
95 stantially as and for the purpose specified.

15. In adding apparatus, the combination with the series of key-levers, the series of main cam-plates, the rocking bar carrying them, and the registering device, of an additional
100 series of cam-plates carried by a rocking bar, the cam-surfaces of the latter series of cam-plates being situated in close proximity to the cam-surfaces of the main series of cam-plates and facing in an opposite direction
105 thereto, and of projections on the aforesaid key-levers adapted to enter between the proximate cam-surfaces of the two series of cam-plates each time the key-levers are actuated, whereby the said two series of cam-
110 plates are shifted in opposite directions for the purpose specified.

16. In adding apparatus, the combination with main rocking bars and a plurality of the series of key-levers, a plurality of the series
115 of cam-plates carried by a plurality of the main rocking bars and means for transmitting the movement of said main rocking bars to a plurality of registering-drums, including a pivoted arm mounted on each of the afore-
120 said main rocking bars, of means for keeping said pivoted arm normally incapable of independent movement, of means for releasing said pivoted arm and of means for moving it independently of the motion it receives from
125 the said rocking bars substantially as and for the purpose specified.

17. In adding apparatus, the combination with main rocking bars and a plurality of the series of key-levers, a plurality of the series
130 of cam-plates carried by a plurality of the main rocking bars and means for transmitting the movement of said main rocking bars to a plurality of registering-drums, including

a pivoted arm mounted on each of the aforesaid main rocking bars, of a locking device which by the action of a spring normally lies transversely of said pivoted arm, of a sliding oscillatory shaft of means for sliding said shaft to displace the locking device and so release the pivoted arm and of means for oscillating said shaft to cause the independent movement of the said pivoted arm substantially as and for the purpose specified.

18. In adding apparatus, the combination with main rocking bars and a plurality of the series of key-levers, a plurality of the series of cam-plates, a plurality of the main rocking bars carrying said cam-plates, a plurality of drums and means for transmitting the movement of said rocking bars to a plurality of registering-drums, including an arm pivotally mounted on each of the aforesaid main rocking bars, of a locking device comprising, a spring normally maintaining said hinged plate in a position transverse of the said pivoted arm, of a sliding oscillatory shaft connected to the pivoted arm and to the locking device by a contrivance which permits the said shaft to shift longitudinally without becoming operatively disconnected from the said pivoted arm and the said locking device, of means for sliding the said shaft and of means for oscillating it, all substantially as and for the purpose specified.

19. In adding apparatus, the combination with main rocking bars and a plurality of the series of key-levers, a plurality of the series of cam-plates carried by a plurality of the main rocking bars, a plurality of registering-drums and means for transmitting the movement of the said rocking bars to said plurality of registering-drums, including an arm pivotally mounted on each of the main rocking bars, of a locking device comprising a spring-controlled hinged plate normally maintained transverse of said pivoted arm by its spring, of a sliding oscillatory shaft connected to the said pivoted arm by a crank, of lever mechanism adapted to be actuated by the registering-drums for causing said shaft to slide each time the record of one drum is to be transferred to another of higher denomination, of a projection on said sliding oscillatory shaft, of a long pin on said hinged plate against which said projection strikes and so displaces the hinged plate when the sliding oscillatory shaft is moved outward by the said lever mechanism, of a finger on said sliding oscillatory shaft, and of a projection adapted to be moved each time a key-lever is operated and to actuate said finger when the latter is caused to slide into the path of said projection, whereby said shaft is oscillated, and, through the intervention of said crank, imparts the independent movement to the hinged arm substantially as and for the purpose specified.

20. In adding apparatus, the combination with the main rocking bar and the series of key-levers, a registering device, the series of

cam-plates carried by the main rocking bar, and means for transmitting the movement of said main rocking bar to a registering device, including a movable arm mounted on the aforesaid main rocking bar, of means for moving said arm independently of the movement it receives from its rocking bar and of means for limiting the extent of such independent movement substantially as and for the purpose specified.

21. In adding apparatus, the combination with the main rocking bar and the series of key-levers, a registering device, the series of cam-plates carried by the main rocking bar and means for transmitting the movement of the main rocking bar to a registering device, including a movable arm mounted on the aforesaid main rocking bar, of means for moving said arm independently of the movement it receives from its rocking bar and of a hinged stop-piece which normally occupies a position to limit the extent of independent movement of the said pivoted arm when the latter is shifted about its pivot, substantially as described.

22. In adding apparatus, the combination with the main rocking bar and the series of key-levers, a registering device, the series of cam-plates carried by the main rocking bar and means for transmitting the movement of the main rocking bar to a registering device, including a movable arm mounted on the aforesaid main rocking bar, of means for moving said arm independently of the movement it receives from its rocking bar, of a hinged stop-piece which normally occupies a position to limit the extent of independent movement of the said movable arm, and of means for displacing said stop-piece when the said arm is to be moved with the rocking bar substantially as described.

23. In adding apparatus, the combination with main and additional rocking bars and the movable arm carried by the main rocking bar, the arm carried by the additional rocking bar, and the hinged stop-piece, of means whereby said hinged stop-piece is shifted from its stopping position whenever the additional rocking bar is actuated substantially as described.

24. In adding apparatus, the combination with main and additional rocking bars and the movable arm carried by the main rocking bar, the arm carried by the additional rocking bar, and the hinged stop-piece; of an incline on said hinged stop-piece and of a pin on said arm of the additional rocking bar, whereby said hinged stop-piece is shifted out of the path of the movable arm of the main rocking bar by said pin, each time the additional rocking bar is actuated, substantially as and for the purpose specified.

25. In adding apparatus, the combination with main and additional rocking bars and the series of key-levers, a registering device, the series of cam-plates carried by the main and additional rocking bars and means for

transmitting the movement of the main rocking bar to a registering device, including a movable arm mounted on the main rocking bar, of an arm carried by the additional rocking bar and adapted to act as a stop-piece for limiting the movement of the main rocking bar, of means for moving said movable arm independently of the movement it receives from its rocking bar, of a hinged stop-piece for limiting the extent of such independent movement, of a locking-plate normally occupying a position transverse of and between the said movable and fixed arms, of means for displacing said hinged stop-piece when the additional rocking bar is actuated and of means for withdrawing said locking-plate from its position between the fixed and movable arms, so that sufficient space will be left between these arms to permit of the independent movement of the movable arm when such independent movement has to be performed in addition to the movement due to the rocking of the main rocking bar.

26. In adding apparatus, the combination with main rocking bar and the pivoted arm carried by the main rocking bar, the locking device therefor and the sliding oscillatory shaft for actuating said pivoted arm and locking device, of a spring for returning said shaft to its normal position and of means for retarding said return of the shaft substantially as and for the purpose specified.

27. In adding apparatus, the combination

with the pivoted arm, the locking device and the sliding oscillatory shaft, of a spring for returning said shaft longitudinally to its normal position, of a pivoted finger adapted to engage with and hold the said shaft when the latter slides into a position to be oscillated and of means for releasing said finger and liberating the shaft substantially as and for the purpose specified.

28. In adding apparatus, the combination with the pivoted arm, the locking device and the sliding oscillatory shaft, of a spring for returning said shaft longitudinally to its normal position, of a pivoted finger adapted to engage with a notch in said shaft when the latter slides into a position to be oscillated, of a spring normally tending to keep said finger in engagement with said notch and of a rocking frame having a transverse bar extending above all the key-levers and adapted to normally keep said finger out of engagement with the notch in the shaft and to permit such engagement to take place each time a key-lever is operated and the frame raised, substantially as and for the purpose specified.

In testimony whereof I have hereunto set my hand, in presence of two subscribing witnesses, this 15th day of September, 1899.

EDWARD MORIARTY.

Witnesses:

J. COLLINS,

FRED C. HARRIS.