

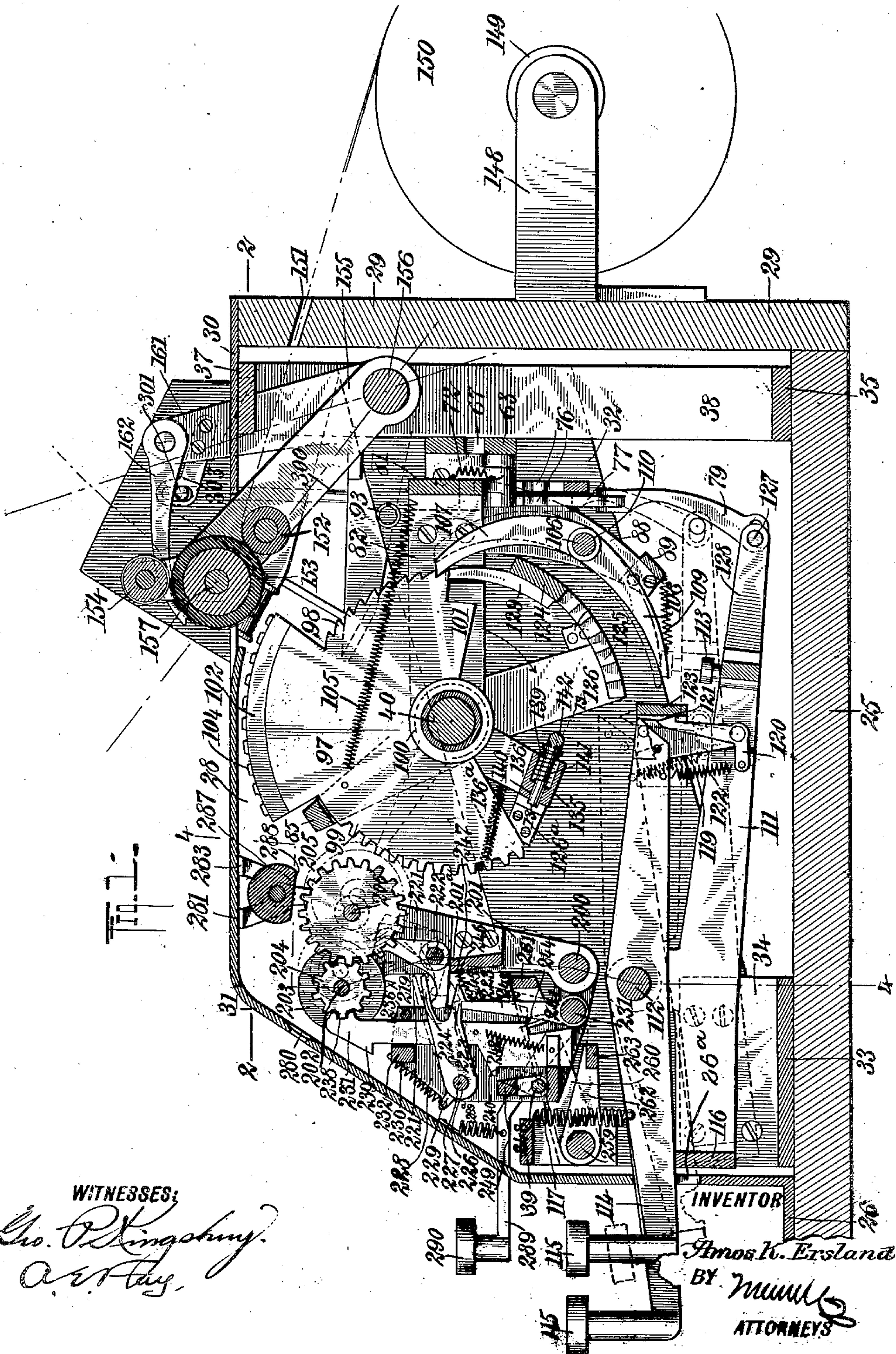
No. 829,769.

PATENTED AUG. 28, 1906.

A. K. ERSLAND.
ADDING AND RECORDING MACHINE.

APPLICATION FILED APR. 26, 1905.

10 SHEETS—SHEET 1.



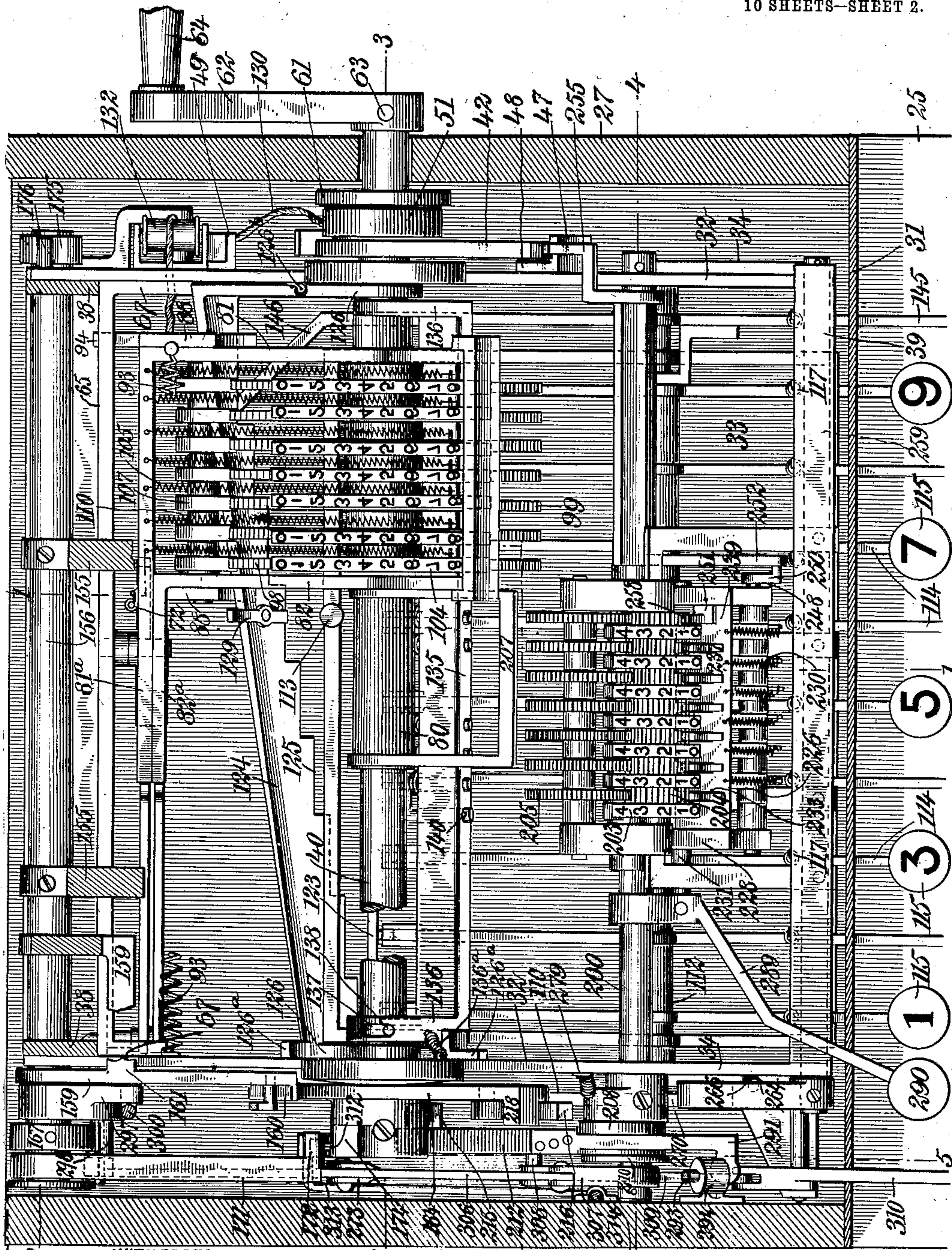
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10 SHEETS—SHEET 2.



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Fig. 2

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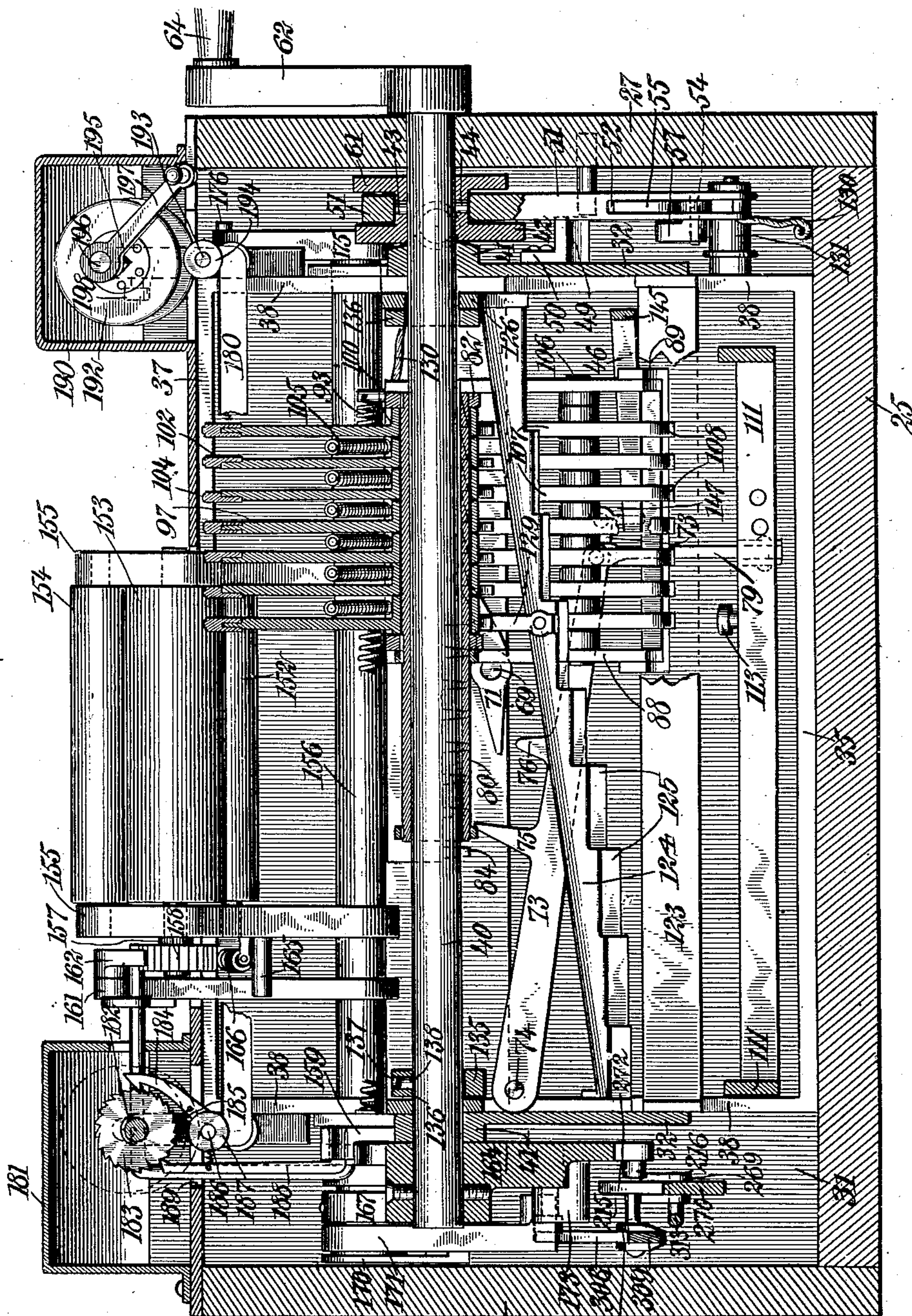
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10 SHEETS—SHEET 3.



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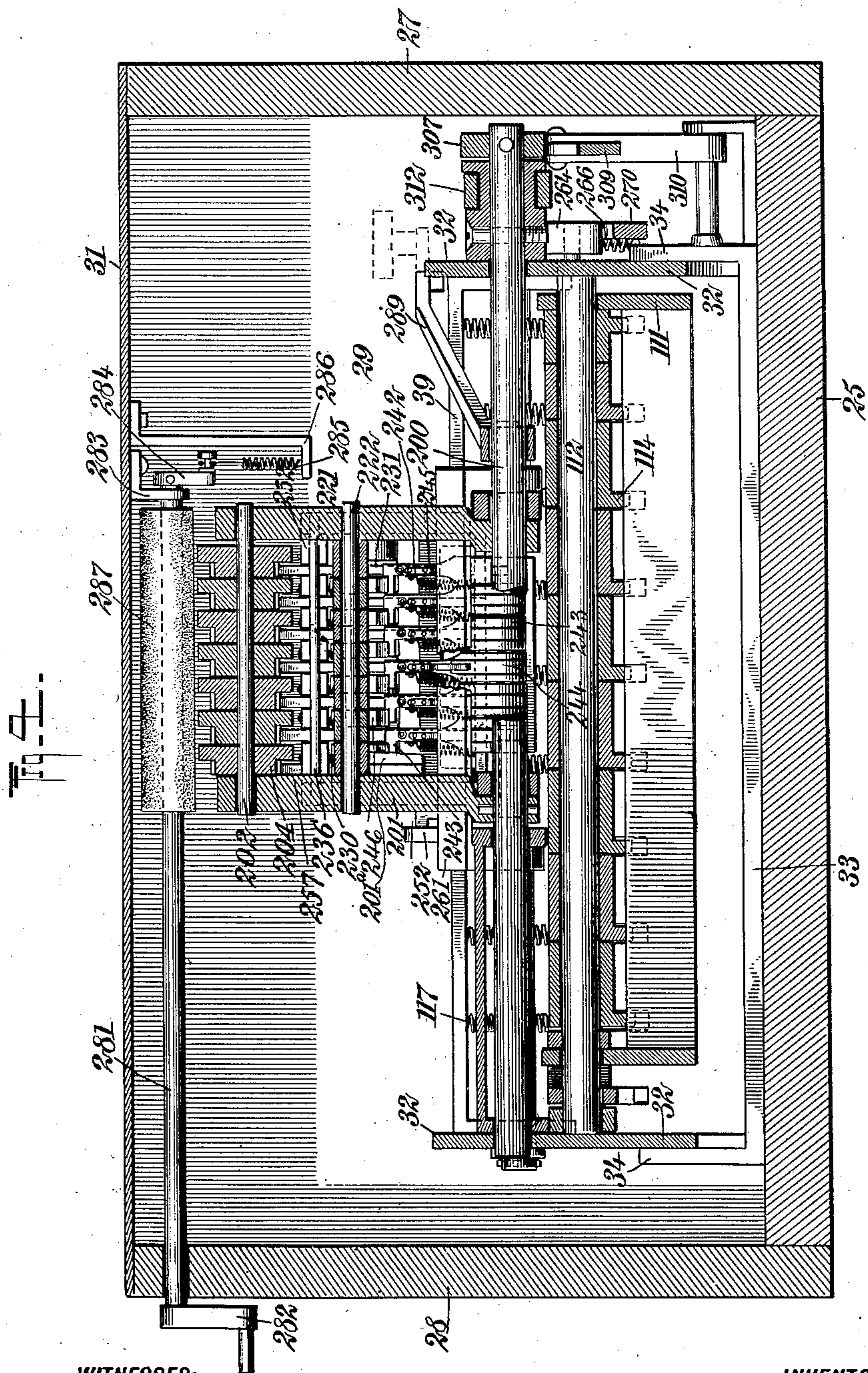
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10 SHEETS—SHEET 4.



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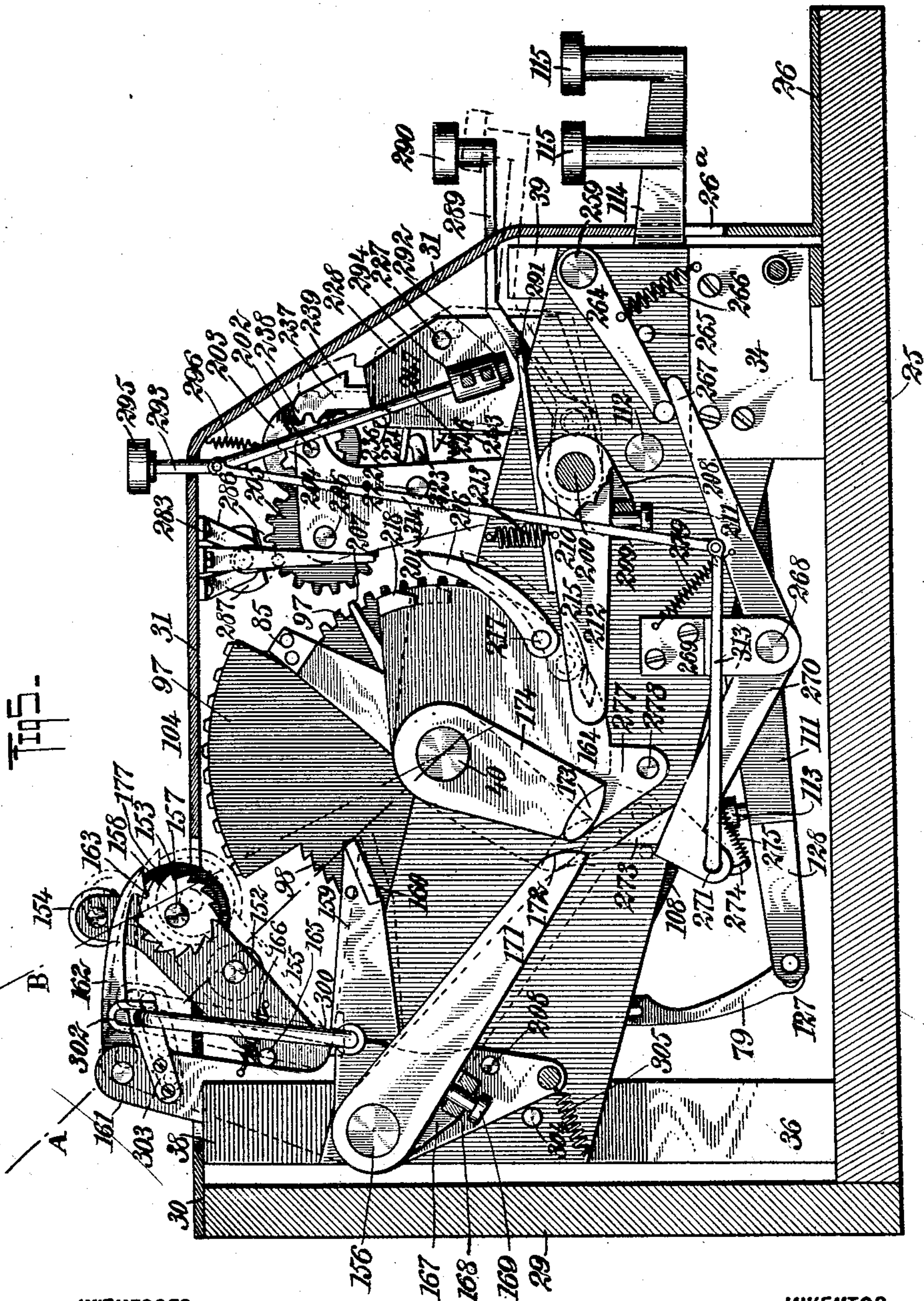
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10 SHEETS—SHEET 5.



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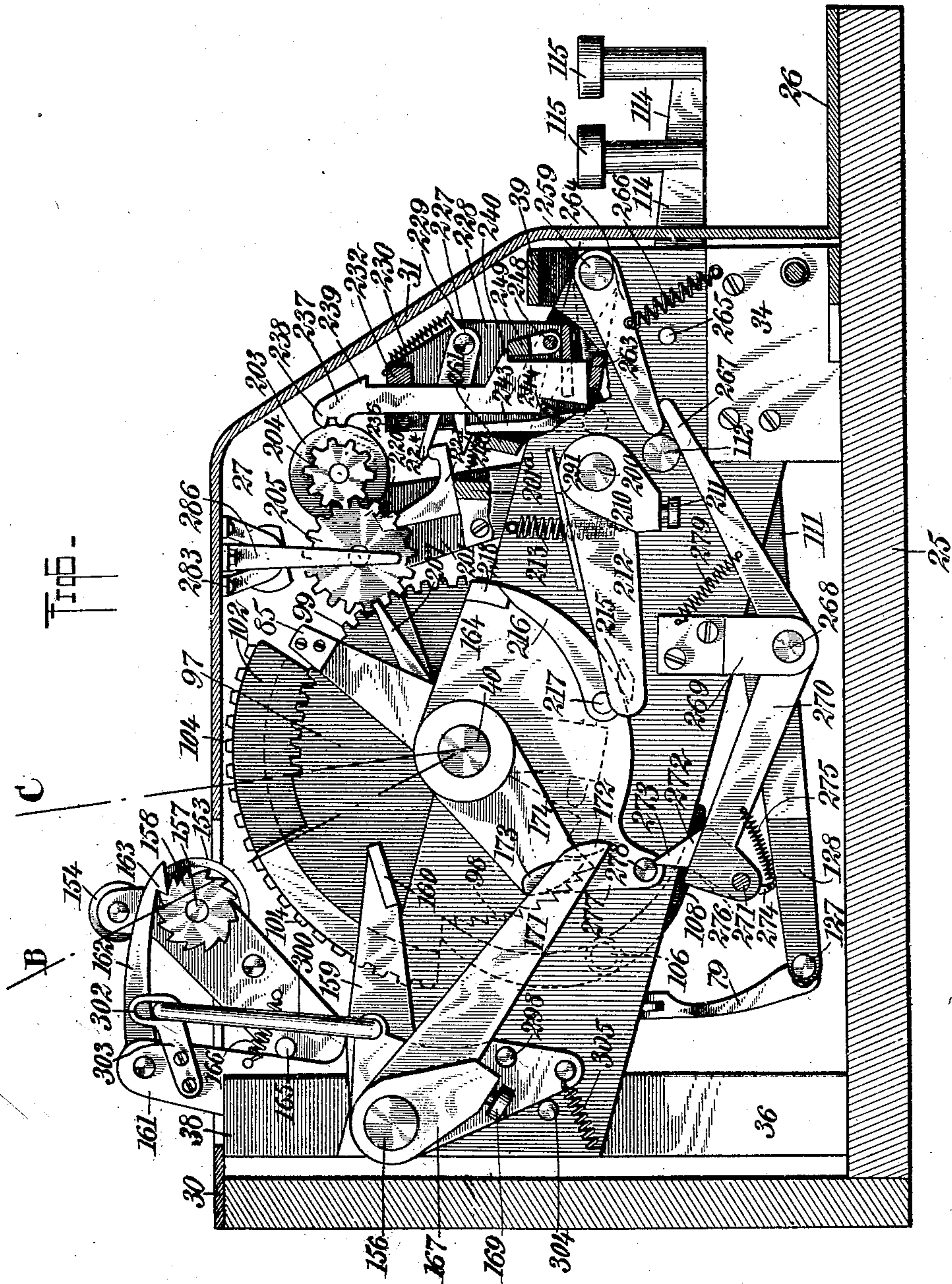
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10 SHEETS—SHEET 6.



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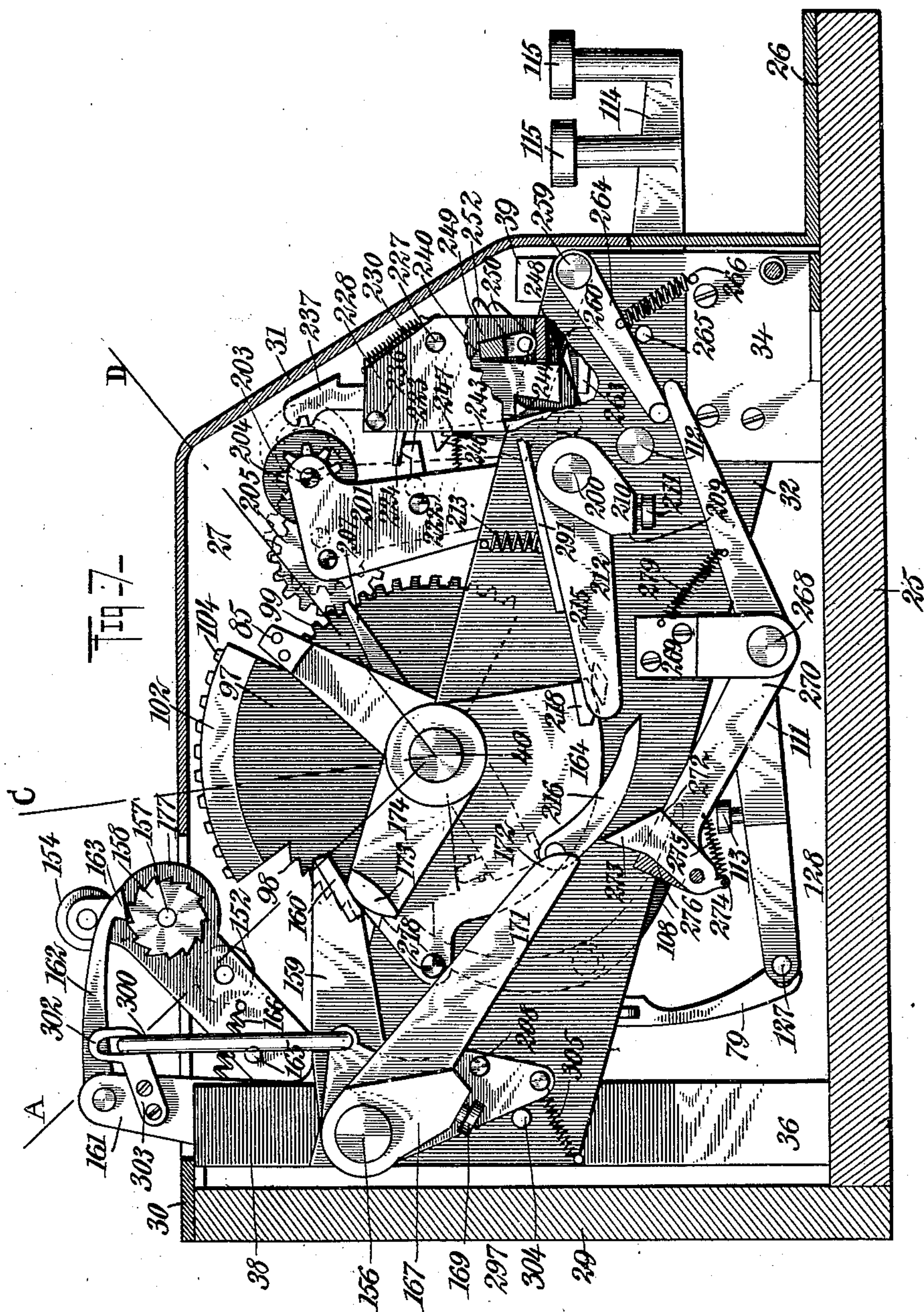
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APPLICATION FILED APR. 26, 1906.

10 SHEETS—SHEET 7.



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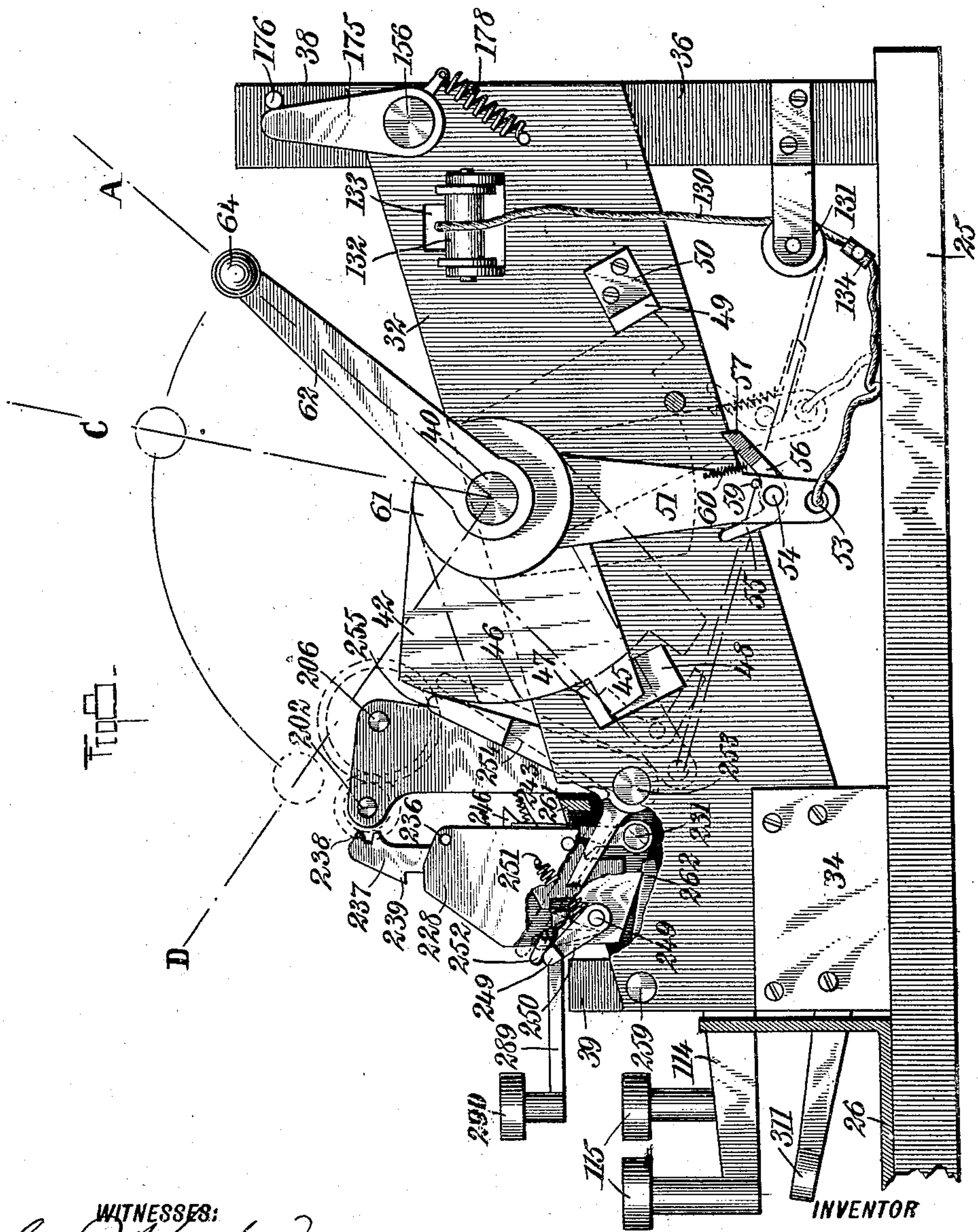
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PATENTED AUG. 28, 1906.

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10 SHEETS—SHEET 8.



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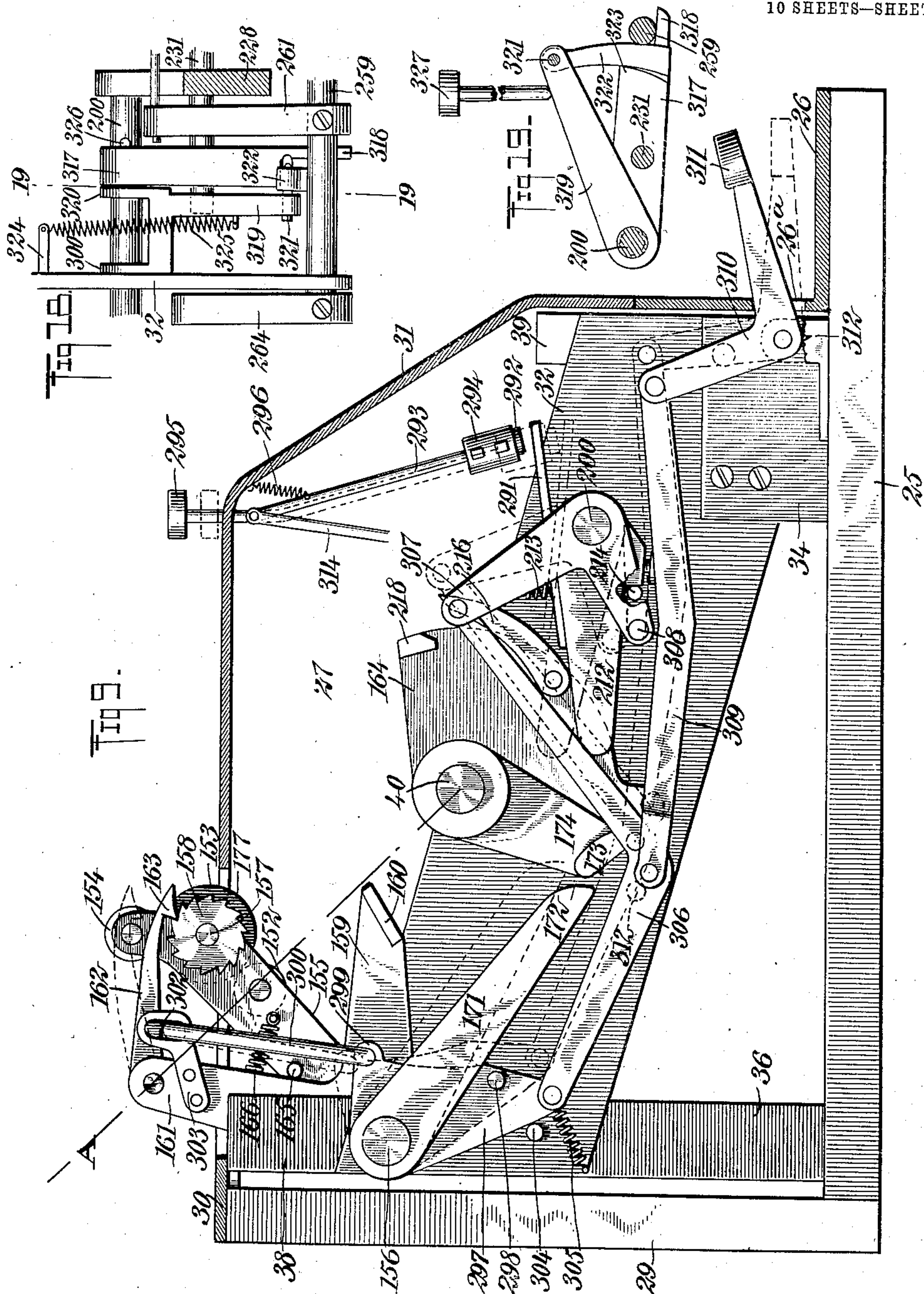
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A. K. ERSLAND.
ADDING AND RECORDING MACHINE.

APPLICATION FILED APR. 26, 1905.

10 SHEETS—SHEET 9.



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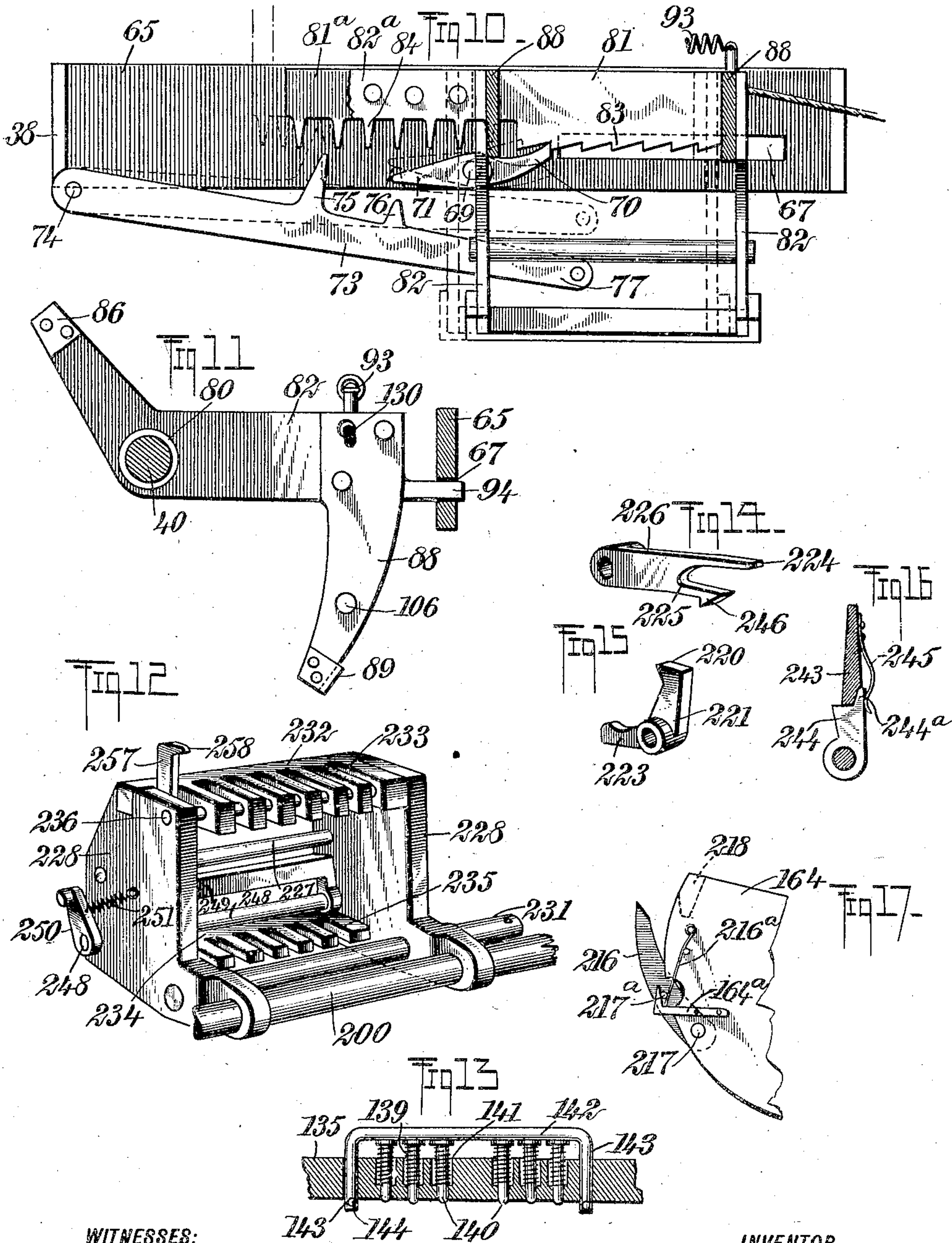
PATENTED AUG. 28, 1906.

A. K. ERSLAND.

ADDING AND RECORDING MACHINE.

APPLICATION FILED APR. 26, 1905.

10 SHEETS--SHEET 10.



WITNESSES:

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UNITED STATES PATENT OFFICE.

AMOS K. ERSLAND, OF FRUITHURST, ALABAMA.

ADDING AND RECORDING MACHINE.

No. 829,769.

Specification of Letters Patent.

Patented Aug. 28, 1906.

Application filed April 26, 1906. Serial No. 257,443.

To all whom it may concern:

Be it known that I, AMOS K. ERSLAND, a citizen of the United States, and a resident of Fruithurst, in the county of Cleburne and State of Alabama, have invented a new and Improved Adding and Recording Machine, of which the following is a full, clear, and exact description.

My invention relates to that class of adding-machines in which a carriage or traveling member moves automatically from order to order as the registering-keys are operated.

Machines of this class may be conveniently divided into two subclasses. In the first the carriage moves from right to left from order to order as the registering-keys are operated. The lowest figure of any sum is necessarily added first in this class of machines and each successive figure to the highest is added subsequently. Consequently the carriage moves automatically from the initial point. In the second class the carriage moves in the opposite direction or from left to right as the registering-keys are operated. Heretofore this has generally necessitated that the carriage be previously set by an extra set of keys or levers at the highest order corresponding to the first figure in the sum added.

The objection to the first class is that the figures are struck off in the wrong order on the keys—that is, contrary to the usual method of writing and reading. This leads to confusion and leaves the way open for many errors.

The second class of machines referred to does away with this objection; but on account of the necessity of striking an extra key for each sum added to set the carriage it calls for an addition to the physical exertion of the operator and is especially objectionable on account of the additional possibility of error and the necessity of causing the operator to use additional thought in operating the machine.

One of the principal objects of my invention is to construct an adding and recording machine that will do away with the objections of both of the classes of machines above referred to and at the same time retain the merits of both. In carrying out this object I construct a machine in such a manner that the carriage moves automatically in adding and returns to the initial position without necessitating any setting of the carriage for the order of the left-hand figure, and yet at the same time it provides that the highest

figure of any sum shall be struck off first on the registering-keys, each successive figure being struck off in the natural order.

My invention also comprises means for locking the key-levers in such a way as to secure the desired rotation of the type-wheels, also novel means for carrying from a lower to a higher order, means for correcting errors before the sum is added, and additional features which will appear in the course of the subjoined description.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a longitudinal vertical sectional view of a machine constructed in accordance with the principle of my invention, taken on the line 1 1 of Fig. 2. Fig. 2 is a sectional view of the same on the line 2 2 of Fig. 1. Fig. 3 is a sectional view on the line 3 3 of Fig. 2. Fig. 4 is a sectional view on the line 4 4 of Figs. 1 and 2. Fig. 5 is a sectional view on the line 5 5 of Fig. 2. Fig. 6 is an elevation of the left side of the machine with the outer casing removed and showing parts in section. Fig. 7 is an elevation similar to Fig. 6, showing parts in a different position and certain additional features. Fig. 8 is an elevation of the right end of the machine, showing a part of the casing in section, part of the casing being removed. Fig. 9 is an elevation of the left end of the machine with part of the casing in section and part of it removed. Fig. 10 is an elevation of a detail, showing parts in section. Fig. 11 is a sectional view of a detail. Fig. 12 is a perspective view of a detail. Fig. 13 is a sectional view on the line 13 13 of Fig. 1. Figs. 14 and 15 are perspective views of details. Fig. 16 is a side view, partly in section, of a detail. Fig. 17 is a rear elevation of a certain portion of the machine. Fig. 18 is a plan of a detail, and Fig. 19 is a sectional view on the line 19 19 of Fig. 18.

Outside casing and frame.—Referring first to Figs. 1 and 2, the machine is preferably mounted upon a base 25 and has a front casing 26, resting upon the base and provided with a vertical section covering the lower portion of the front of the machine and provided with slots 26^a for keys. On the right side of the machine is a casing 27 and on the left a casing 28. A rear end wall 29 is provided and a top 30. An additional

removable section 31, covering part of the top and front, is also provided. This section rests above the slots 26^a and affords a limit for the upward motion of the keys.

At each side of the machine at a distance from the casings are two side plates 32, which are joined at the front by a transverse horizontal plate 33. Secured to the base 25 are upwardly-extending arms 34, which are also secured to the side plates 32. A transverse bar 35 extends across the rear of the base of the machine and is provided with up-turned arms 36, upon which rest the rear ends of the side plates 32, so as to support the same in elevated position at this point. A transverse bar 37 also extends across the machine, and this is provided with standards 38, secured to the arms 36 and to the rear ends of the side plates 32. The side plates are also joined together at the front by a transverse bar 39.

Main shaft and carriage connections.—A main shaft 40 is mounted in journals 41 upon the side plates 32. A plate 42, having a hub 43, is mounted upon the main shaft 40 next to the outside of the right journal 41 and secured thereto by a pin or rivet 44. The plate 42 is provided with an extended point 45 and with a circular segment 46.

An outwardly-extending stop 47 is mounted upon a bracket 48 in front of the main shaft, and a similar stop 49 is mounted upon a bracket 50, at the rear of the shaft on the right-hand side plate 32. These stops are adapted to limit the oscillation of the main shaft in either direction by being in the direct path of the extension 45. In initial position the extension 45 rests against the stop 47, as indicated in Fig. 8. Mounted loosely upon the hub 43 is a carriage-return lever 51, which has a slot 52 and an aperture 53. Loosely mounted upon a pivot 54, located in the slot 52, is a bell-crank comprising a stop-pawl 55, adapted to engage the rear surface of the extension 45 and having a connecting section 56, upon which it is pivoted. It is also provided with a lever 57. The lever is adapted to unlock the stop-pawl 55 by coming in contact with the stop 47 as the extension 45 is coming into initial position. A stop-pin 59 is mounted upon the arm 51 for the purpose of limiting the motion of the bell-crank 56, and a spring 60 is employed for normally holding the bell-crank in contact with the stop-pin. A collar 61 is mounted upon the shaft 40 to keep the lever 51 in proper position. The main shaft passes through the right-hand casing 27 and is provided with a crank 62, secured to the shaft by a pin 63, and having an operating-handle 64.

It will be understood that the oscillation of the shaft 40 through the operation of the crank 62 will cause the oscillation of the re- turn-lever 51. The extension 45, which is

rigidly connected with the shaft, turns with it, and from the initial position shown in full lines in Fig. 8 will pass to the position shown in dotted lines when the extension is in contact with the stop 49. On the way to this position the rear of this extension will come in contact with the stop-pawl 55, so as to swing the lever 51 with it to the position indicated in dotted lines. Upon its return stroke it will also pick up the lever by engaging the arm 57 and carry it back until the arm 55 engages the stop 47, which will disengage the arm 57 from the extension 45. The purpose of moving this element will be referred to below.

Carriage escapement.—I have provided means whereby the carriage mounted on the shaft 40 is provided with an escapement, so as to insure its feeding forward one step at a time when any key is struck, Figs. 2, 3, and 10. A transverse vertical bar 65 is mounted upon the rear of the machine and is provided with arms 66, by which it is secured to the side plates 32. The bar is provided with a longitudinal slot 67, to the rear of which is a plate 68, fixed to the bar or rail 65 as an extra support for a stud or pivot 69. This stud or pivot is mounted to the left of the slot and near the middle of the rail. Mounted upon it is a lever which has a pawl 70, extending to the right, adapted to engage a rack, to be described. Extending to the left from the pawl is a lever 71, rigidly connected with it. A spring 72 presses the pawl against the rack. A lever 73 is mounted upon a stud 74, fixed to the left standard 38. This lever is provided with a tooth and with a lug 76, both extending upwardly from the lever. The lever terminates in an extension 77, which is connected, by a pivot 78, to downwardly-extending operating-rod 79. The carriage consists chiefly of a hollow tube 80, which is loosely mounted on the main shaft 40 and is adapted to freely slide there-upon between the two side plates 32. At the rear of the carriage is a vertical transverse bar 81, connected with a frame 82. The lower edge of the bar 81 is provided with two kinds of teeth, one set 83 constituting a rack for engagement with the pawl 70 and the other set 84 constituting a series of stops for engagement with the projection 75. The operating-rod 79, as will be obvious, constitutes means for feeding this bar, and consequently the carriage, forward a step at a time. When the rod 79 is raised, the projection 75 will pass between two of the teeth 84 and constitute a stop for preventing the carriage from moving beyond that point. The projection 76 also engages the lever 71 and disengages the pawl 70 from one of the teeth 83. This permits the carriage to be moved forward by a means to be described until the next tooth 84 engages the projection 75. When the rod 79 is drawn downwardly again, the pawl 70 is free to be forced by the spring 72 against the rack and into

such a position that when the next tooth 83 is forced against the end of the pawl it will be held in that position, the projection 75 being simultaneously withdrawn from engagement with a tooth 84. The bar 79 is connected up in a manner which will be referred to later, so as to cause this operation every time a key is struck to register a number. The frame 82 is provided with a transverse bar 85, having right-angled arms 86, secured to the rear of the frame, Fig. 11. The tube 80 is secured to the frame 82 by pins 87, and journals 88, extending downwardly and supporting a transverse bar 89 with right-angled arms 90, are secured to the outside of the frame 82. The parts 81 and 82 are preferably formed in two pieces, having projections 81^a and 82^a parallel with each other and secured together in any desired manner. The teeth 84 are preferably cut upon the lower side of both of these projections, the projection 81^a also being provided with teeth 83, but the projection 82^a is preferably made without these teeth. This gives room for a pair of escapement-levers 73, the lever 71 being wide enough for two projections 76 to engage with it. Through the right journal 88 of the frame 82 passes a perforation 91, above which is a stud 92, having an aperture for receiving a spring 93. The opposite end of the spring is secured to the left side plate 32, and it constitutes the motive power for moving the carriage from right to left. Extending from the rear of the journal 88 is a finger 94, which is adapted to slide in the slot 67 when the carriage moves for the purpose of guiding the carriage and preventing vibration.

It will be seen from the construction so far described that a carriage is provided upon the shaft 40, and this carriage has means for giving it intermittent motion from right to left. This carriage is designed for the purpose of supporting and moving the type-wheels, which will now be described.

Type-wheels.—Loosely mounted upon the right end of the tube 80 are a series of type-supports 97, which I shall designate as "type-wheels," Fig. 1. Each of these is provided with a series of ratchet-teeth 98, preferably nine in number, and with a series of gear-teeth 99 upon the opposite side. Attached to the right side of each wheel 97 is a hub 100 for giving the correct spacing on the carriage-tube 40. These hubs come in contact with each other or with the adjacent faces of the other wheels. Extending downwardly from the lower end of each series of ratchet-teeth is a shoulder 101, formed by cutting out a portion of the wheel below the teeth. Between the two sets of teeth on each wheel is a type-segment 102, which has a cut-off portion 103 to correspond with the circle of the face of the wheel 97. This segment carries a series of types 104 on its face, these

types representing the ten numerals. A motor-spring 105 is secured to each type-wheel and to the transverse bar 81 for the purpose of normally urging the wheels in a certain direction. Mounted upon a carriage-shaft 106, which extends across the frame 82, are a series of stop-pawls 107. These stop-pawls engage with the ratchet-teeth 98 and hold the wheels against rotation under the impulse of the springs 105. The opposite end of each pawl has a lever 108, which extends rearwardly from the shaft. Each lever is also provided with a spring 109, which is secured to the transverse bar 89, so as to constantly urge the lever in such direction that the pawl 107 will engage the teeth 98. These stop-pawls are separated from each other by collars 110 on the shaft 106. In order to provide for operating this part of the device, a frame 111 is pivotally mounted upon a shaft 112, extending across the machine. This frame is provided with a screw 113, adapted to engage the lower end of any of the levers 108, according to the position of the carriage. When this frame is swung upon its pivot to raise the screw or stud 113, it will be obvious that the lever 108 will be so moved as to swing the stop-pawl out of engagement with the teeth 98. The shaft 112 is also used for the pivoting of a series of key-levers 114. Each of these levers is provided with a key 115, and the bar 111 is provided with a cross-piece 116, adapted to engage with the lower edges of the key-levers, so that when any key is depressed it will swing the frame 111 about the shaft 112 and cause the stud 113 to operate the stop-pawl and disengage it from the rack. A spring 117 is employed to normally keep each key in elevated position and the weight of the outer end of the frame 111 keeps it in normal position. On the outer end of each key-lever is a projection 119, to the lower end of which is pivoted a bell-crank 120, having a catch 121. A spring 122 normally operates to keep the catch in operative position, and when the keys are depressed these catches engage a stationary transverse bar 123. This locks the key in its lowered position.

I provide means for accomplishing the proper rotation of the type-wheel corresponding to the key depressed, in order to cause the number on the type-face 104, which corresponds to the key to be rotated to the proper position for registration. In order that this may be done, I provide a graduated bar 124, having a series of steps or teeth 125. The tooth at the left is designed to operate in conjunction with key No. 1, which indicates the numeral 1, the second key with the key numbered 2, &c. Each successive step after the first is depressed a constant distance back of the one at its left, so that, for example, the step No. 5 is four steps to the rear of step No. 1 and corresponds with key No. 5.

This graduated bar is pivoted by means of a frame 126 upon the shaft 40, and is designed to swing with the type-wheels when a key is operated. By the depression of a key the catch 121 is locked in position and the device is set. No operation of the type-wheel except to release it from the stop-pawl is accomplished by this mechanism; but as soon as this release takes place the type-wheel rotates and with it the frame 126 and graduated bar 124. This motion is limited by stops 126^a, Figs. 1 and 2. A spring 126^b is provided for returning the frame 126 to place. The carriage, as has been described, is at this point situated in such a position that the type-wheel which corresponds with the particular column of figures in which the one being registered is located is ready to move into units' place, and when this rotation of the type-wheel and the frame 126 takes place the graduated bar 124 swings over the transverse bar 123, and that step of the bar which corresponds with the particular key depressed will strike the latch 121 and permit the latter to be disengaged from the bar 123, so that the key will resume its normal position. This operation swings the stud 113 away from the lever connected with the stop-pawl, so as to permit the latter to be swung by the spring attached thereto into engagement with the tooth 98, which happens to be in proper position for engagement at that time. The parts are obviously so arranged and timed that that tooth which engages with the stop-pawl corresponds with the step which disengages the latch 121. For example, if No. 5 key has been depressed No. 5 step will disengage the latch 121 connected with that key, and by the time this step reaches such a position as to cause this disengagement the fifth tooth of the rack 98 will be in position ready to be caught by the stop-pawl. The parts having operated in this manner the type-wheel will of course be left in a stationary position with the numeral 5 in printing or registering position.

It was stated above that the operation of the arm 79 caused the carriage to move upward one step. As this arm is mounted by means of a pivot 127 upon a projection 128 on the frame 111, it will be obvious that the operation of this frame through the depression of any one of the keys will place the projections 75 and 76 in such position as to provide for the feeding forward of the carriage one step when the key is again released, so that the arm 79 can descend into normal position. It has been stated above that the graduated bar 124 is freely pivoted upon the shaft 40. It is provided, however, with a projection 129, which engages with the rear face of the units type-wheel, so that the rotation of the type-wheel will cause the rotation of the graduated bar. This projection 129 is mounted so as to always be oppo-

site the type-wheel which is in operative or units position as the type-wheels pass it in the travel of the carriage. The carriage cannot be returned to initial position until all of the type-wheels have been returned to their initial positions, because they would engage the projection 129.

Carriage-returning mechanism.—The lever 51, which has been described, together with the bell-crank and other features mounted thereon, constitute a portion of a means which I employ for returning the carriage to initial position after it has been moved as far as may be desired to the left by the operation of the spring 93. The operation of this lever has been described and need not be repeated. In the perforation 53, with which it is provided, is secured a flexible member 130 (Fig. 8) in the form of a belt or ribbon. This member passes over two idler-pulleys 131 and 132, through an opening 133 in one of the side plates 32 and is connected with the carriage in any desired manner, so that the swinging of the lever 51 in the manner described above will cause the flexible member to pull the carriage back to initial position in an obvious manner when the crank is swung through a complete oscillation. The flexible member is preferably formed of some pliable material and provided with a swivel 134, having a take-up screw to provide for the stretching thereof.

Restoring mechanism.—For the purpose of restoring the type-wheels to initial position and stopping them uniformly in that position a bar 135, Figs. 1, 2, and 3, is mounted parallel with the shaft 40 upon arms 136, these arms being pivotally mounted upon the main shaft and having a motor-spring 136^a. One of the arms is provided with an elongated slot 137, through which a stud 138 on the shaft projects. This bar is located between the rear of the gear-toothed segments 99 and the shoulders 101. The bar 135 is provided with passages 139, Fig. 13, in which are located bolts 140, provided with springs 141 for normally forcing them outwardly. These bolts bear upon a rod 142, extending along the bar 135, which is provided with end extensions 143, passing through the bar and secured on the opposite side by pins 144. This constitutes a resilient buffer for the oscillating frame on the carriage. By the provision of the slot 137 it will be seen that upon the oscillation of the frame the bar 135 is not moved until the first part of the stroke is commenced. When the carriage is in such a position that any of the shoulders 101 of the type-wheels are opposite the bar 135, the rotation of the crank to return the type-wheels to original position will cause such shoulders to be engaged by the bar and stop them in that position. This is timed to occur on the finish of the first stroke of the operating-crank when the stud 138 engages the end of the slot 137, and it is provided for

the purpose of turning the type-wheels back to zero and taking away the jar on the type-wheels when they come to a dead stop against the bar 85 on the carriage. The parts are

5 adjusted so that the spring-pressure on the resiliently-mounted bar 142 is sufficient to force all the type-wheels against the stop-bar and allow the pawl 107 to drop behind the last of the ratchet-teeth 98.

10 *Zero-key.*—I prefer to have a zero-key connected with a lever 145, provided with an independent escapement and connected with the frame 111, so that the action of the motor-spring on the main frame will pull this

15 escapement out of the escapement-teeth, making the action positive and quick. As the zero-key has no other office to perform than that of feeding the carriage forward one space for every depression of the key it is not

20 desirable to have it connected with the mechanism for operating the graduated bar 125. Accordingly the lever 145 is loosely pivoted upon the shaft 112 in a similar manner to the levers 114. The lever extends to the rear to

25 a point even with the end of the projection 128, and it is provided with an offset 146 and with a bar 147 similar to the bar 79. The bar 147 is connected with one of the levers 73, described above, it being understood that

30 this lever is similar to the other one, which is connected to the bar 79 and is provided with projections 75 and 76 in the same manner. The operation of this device will be obvious, and it affords means to effectively feed

35 the carriage forward without disturbing any of the other mechanism.

Printing mechanism.—In order that the operations of the calculating-machine may be effectively recorded, a pair of brackets 148

40 are provided, having a roller 149 journaled thereon for carrying a roll of paper 150. This paper is fed through an opening 151 in the rear wall 29 of the machine to a small rubber roller 152, thence between this and an impression-roller 153, and finally out of the machine between the impression-roller and a

45 second small rubber roller 154. These rollers are journaled upon a frame 155, which in turn is pivotally mounted by means of a shaft 156, passing through the bars 38. The roller 153 is mounted upon a shaft 157, which is provided with a ratchet-wheel 158. For the

50 purpose of operating this ratchet-wheel in order to rotate the impression-roller and feed the paper forward a step at a time, according to the operations of the crank 62 and main shaft, the transverse shaft 156 is provided with a pivoted frame 159, having a cam-surface 160, Figs. 5 and 7. Upon this frame is

55 mounted an arm 161, Fig. 1, normally projecting upwardly from the transverse shaft, and upon this arm is pivotally mounted a pawl 162, having a tooth 163, adapted to engage the teeth of the ratchet-wheel 158. It

60 will be readily obvious that the oscillation of

the frame 159 about the shaft 156 will move the pawl 162, and consequently turn the shaft 157. The operation of the frame in this manner is brought about by the provision of means connected with the shaft 40 for

70 engaging the cam-surface 160. This means is represented by a segment 164, the rear surface of which is adapted to engage the cam-surface 160. The arm 161 is normally held against a stud 165 by a spring 166, connect-

75 ing the arm with the frame 155.

In order to provide for swinging the frame 155 about the shaft 156 as a center, so as to present the impression-wheel with the paper thereon to the type-surface 104, the shaft

80 156 is provided on its left end with a rigidly-mounted lever 167. This lever has a lateral extension 168, carrying a set-screw 169 for adjusting purposes. Projecting from the shaft 156 and located in parallelism with the

85 lever 167 is a thin disk 170, Figs. 2 and 3. Loosely mounted on the shaft 156 between the parts 167 and 170 and resting on the set-screw 169 is a forwardly-extending lever 171, Fig. 9, provided with a cam-surface 172.

90 This cam-surface is in the direct path of a cam 173, mounted on an arm 174 on the shaft 40. The oscillation of the shaft 40, as will be obvious, will cause the cam-surfaces 173 and 172 to engage with each other, so as

95 to rock the shaft 156 and force the impression-roller against the type-surfaces on the wheels 97. It will be seen, therefore, that the oscillation of the shaft 40 through the operation of the crank will not only cause

100 the paper to be forced against the printing-types, so as to record the number which has been set up in the machine, but will upon its return stroke feed the paper forward one step

105 through the operation of the pawl 162 and leave the paper in position for the next impression. On the right-hand end of the shaft 156 is rigidly mounted an arm 175, Fig. 8, designed to come in contact with a stop 176 on the plate 32, so as to provide for limiting the

110 motion of the frame 155 in one direction. The shaft 157 is provided with a finger-wheel 177, by which the impression-roller may be operated in an obvious manner. A spring 178 is also mounted between the frame 155

115 and the bar 37, so as to press the arm 175 against the stop 176.

Inking device.—For the purpose of supplying ink to the printing device I prefer to employ an inking-ribbon 180. The means

120 which I prefer to employ for feeding this ribbon between the impression-roller and the printing-surface 104 will now be described. Mounted upon the upper end of the left-hand standard 38 is a casing 181 for supporting a

125 shaft 182, Fig. 3. This shaft carries a roller for receiving and winding up the printing-ribbon. Connected with the roller and mounted upon the shaft is a ratchet-wheel 183. A pawl 184 is mounted to engage the

130

ratchet-wheel and is held against the teeth thereof by a spring 185, being pivoted on a shaft or stud 186, which also carries a guide-spool 187 for the inking-ribbon. Connected with the lever 159 is an upwardly-extending push-pawl 188, the upper end of which passes through a slot 189 in the cover 37 of the machine and is adapted to engage the teeth of the ratchet-wheel so as to give it a forward motion every time the lever 159 is operated. The pawl 184 prevents the rotation of the shaft 182 in the wrong direction, while the pawl 188 positively rotates it to wind up the inking-roller. The winding up of the ribbon is therefore effected in such a manner that the same surface will not be presented to the type-surface on two successive operations. For the purpose of providing a let-off roller to contain the ribbon when it is first placed on the machine and to wind it up again, so as to be used successively, the right-hand standard 38 is provided with a casing 190. This casing supports a shaft 191 for containing a ribbon-holding roller or spool 192. Mounted upon a shaft 193 is a guide-wheel 194, similar to the wheel 187 and in line both with the latter and with the spool 192. The end of the spool 192 is provided with a square opening 195, into which a shaft 196, having a square end, is designed to be placed. This shaft is provided with a crank 197 for operating the spool to wind the ribbon upon it from the spool at the other end of the machine. For the purpose of regulating the tension on the shaft 191 I have provided a thumb-screw 198, bearing upon that shaft. It will be obvious that the operation of the main crank 62 will, through the instrumentality of the lever 159, cause the ribbon to be gradually wound up upon the left-hand side of the machine, being let off from the spool 192 as fast as desired, the ribbon passing directly above the line of travel of the type-wheels when they are in initial or printing position and under the impression-roller.

Adding-wheels.—The mechanism so far described is provided for the purpose of registering numbers as they are struck on the keys and for accurately feeding the carriage so as to provide for presenting the numbers in a regular way without reversing the order and also without necessitating the setting of the carriage to provide for the proper placing for the first figure at the left. It also provides for the printing of numbers after they have been registered on the type-wheels. My invention also comprises means for adding the numbers together, and I will now proceed to describe the adding mechanism shown in the drawings. Journaled through the side plates 22, between the main shaft and the casing 26 at the front, is a transverse shaft 200. Fixed to this shaft in any desired manner are two standards 201, carrying a transverse shaft 202. Mounted upon the

latter shaft are a series of adding-wheels 203. These wheels each consist of a disk carrying on the face thereof the ten numerals. Rigidly connected with each of the adding-wheels is a spur-wheel 204, by means of which power is designed to be transmitted to the adding-wheels in order to rotate them a proper number of steps, and I preferably also provide a series of idler spur-wheels 205, mounted on a shaft 206 on the standards 201 for the purpose of transmitting power to the spur-wheels 204 from the gear-segment 99, although it will be readily understood that the particular method of transmitting motion from the teeth 99 to the wheels 204 is a matter that can be accomplished in many ways. The standards 201 being pivotally mounted by means of the shaft 200, it will be readily understood that if they are oscillated so that the teeth of the wheels 205 will engage with the teeth 99 that are placed opposite them by the registration on the type-wheels of the number to be added the rotation of the type-wheels will cause a rotation of the adding-wheels. Before describing how this is accomplished I will state that the operation is intended to take place not when the type-wheels are first rotated to their positions for registering, but when they are returned to initial position by the operation of the crank 62.

As has been set forth above, the type-wheels are operated in such a manner that the left-hand one represents the first numeral of the number to be added irrespective of the order which it may occupy. Furthermore, the registering of additional numerals is accomplished with the movement of the carriage one space to the left for each one. Consequently the type-wheels being placed in initial position with the left one immediately to the right of the right-hand adding-wheel, the feeding of the carriage one step to the left by the operation of registering one figure places the left-hand segment 97 exactly opposite the right-hand wheel 205. If, then, other figures are included in the number, the type-wheel carriage moves to the left one space for each additional figure, and the segments 99 consequently are placed opposite a sufficient number of the adding-wheels to provide for the number of figures in the number to be added. For example, if the number contains three figures the third type-wheel from the left will be opposite the right-hand adding-wheel, or, rather, the right-hand spur-wheel 205, and the left segment 99 will be opposite the third spur-wheel from the right. It will be seen, therefore, that upon the oscillation of the frame 201 about its pivot in the position shown in dotted lines in Fig. 1 the respective teeth of the segments 99 and the spur-wheels 205 will engage with each other, but that the type-wheels having already been operated to register the re-

quired figures no operation of the adding-wheels will take place until the crank 62 is turned so as to restore the type-wheels to original position. This will accomplish the rotation of each adding-wheel as many spaces as the type-wheel which is connected therewith at the time has been rotated out of initial position previous to the enmeshing of the teeth 99 and 205. This provides for the accurate adding of the numbers, which may be registered upon the type-wheels and printed therefrom, the printing, as will be understood, taking place before the adding operation is started.

Lock for adding-wheels.—In order to lock the adding-wheels which may not be in engagement with any of the segments 99, a bar 207 is mounted upon the carriage 80 in such a manner that its outer end constitutes a lock in alinement with the tooth of the type-wheels which is adapted to engage with the adjacent teeth of the wheels 205. This bar being rigidly fixed with respect to the carriage, it will engage with all of the wheels 205 if the frame 201 is oscillated into proper position. Therefore before any of the type-wheels are fed forward by the escapement device and after any of them are fed forward those wheels 205 which do not engage with the type-wheel segments will engage with the locking-bar 207, and therefore the turning of the crank 62 will be positively prevented from operating any adding-wheels except those which are connected with the proper type-wheel segments. For the purpose of accomplishing the oscillation of the frame 201 a lever 208 is rigidly mounted upon the shaft 200, Figs. 2 and 5. Connected with this lever by a bar 209 is a thin member 210, spaced from the lever 208. The bar is provided with a set-screw 211, on which rests a lever 212. A spring 213 normally urges the bar 209 in an upward direction against a stop 214. This consequently is designed to normally push the lever 212 in an upward direction and force a cam-surface 215 thereon into the path of a movable member 216, mounted upon the segment 164, which, as has been seen, is connected with the main shaft 40, Fig. 17. The member 216 is pivotally mounted by means of a stud 217, so that it can swing into the positions shown, respectively, in Figs 5 and 6. The member 216 is provided with a stud 217^a, engaging a stop 164^a when the member is in its outer position, and a spring 216^a is provided for engaging the stud and normally forcing it against the stop, as is shown in Fig. 17. The spring 216^a merely forces the member 216 into such a position that the cam 215 can pass behind it on the return stroke. When the crank on the main shaft is operated, the member 216 engages the cam-surface 215, causing the lever 212 to press down on the set-screw 211, thus causing the shaft 200 to

turn slightly and swing the idler-wheels of the adding mechanism to the rear and into mesh with the type-wheels and locking-bar. The proper amount of oscillating motion to be imparted to the frame 201 in this manner can be adjusted to any desired degree of accuracy by means of the set-screw 211. The member 216 slides on the cam-surface 215, and at the end of the stroke a stationary cam-surface 218 on the segment 164, which has acted as a stop for the member 216 during the above-described operation, engages with the cam 215. The member 216 then drops back to initial position, as indicated in Fig. 5. On the return stroke of the crank the cam 215 slides back on the cam 218, between the latter and the member 216; and then engages with the opposite or inner surface of the member 216, freeing the lever 212 and allowing the spring 213 to pull it back to initial position as it leaves the cam-surface 218. As the lever 212 is free to move in an upward direction the cam 215 will pass over the member 216, as indicated, until it reaches its initial position.

Carrying mechanism.—So much of this mechanism as has been described provides for the transfer of a number from the type-wheels to the adding-wheels, and it will be obvious that the repeated transfers of the numbers in this manner will provide for accurate adding of the same. A device has to be provided, however, for carrying a figure from one column to the next higher when the sum of the figures added amounts to "10" or more. For this purpose the adding-wheels are each provided with a projection 219, located at the proper distance from the zero or tenth numeral thereon. When an adding-disk completes a revolution, this projection is adapted to come into contact with a tooth 220 upon a bell-crank 221, Fig. 15. This bell-crank is pivotally mounted upon a shaft 222 upon the standards 201 and is provided with a forwardly-extending projection 223. This projection passes between a pair of extensions 224 and 225 upon a lever 226, Fig. 14. The bell-cranks and levers are in number preferably equal to one less than the number of adding-disks, and the levers are mounted upon a shaft 227, journaled in plates 228. Each of the last-mentioned levers is provided with a projection 229, by means of which it is connected with a spring 230 for normally forcing it into its lowest position with the upper extension 224 against the forward extension 223 of the bell-crank.

Directly in front and parallel with the shaft 200 is a shaft 231, Fig. 12. This is journaled through the plates 228. These plates are connected at their upper ends by a transverse guide-rack 232, having a series of teeth or slots 233 and are connected at the bottom by a guide-rack 234, having a similar series of slots 235. The number of slots in

each guide-rack is equal to the number of bell-cranks 221. The upper guide-bar is preferably provided with a cross-bar 236, passing through the ends of the teeth between the slots and serving to guide a series of slides 237. These slides pass through both series of slots and are vertically movable therein. These slides are each provided with one or more gear-teeth 238, adapted to mesh with the teeth of the gear-wheels 204 and constituting a rack therefor. Each one is also provided with a forwardly-extending tooth 239, adapted to rest upon a guide-rack 232 when the slide is in the lowest position. Each slide is also provided with two additional teeth 240 and 241 on opposite sides thereof. A spring 242 normally forces each slide downward, so that the tooth 239 will engage upon the upper surface of the bar 232.

Mounted loosely upon the shaft 231 are a series of triggers 243, Fig. 16. Each is bifurcated and provided with a pivoted tooth 244 for engaging the tooth 241 and with a spring 245 for engaging a nib 244^a on the tooth and yieldingly holding the tooth and trigger in fixed position with relation to each other. As the triggers and slides are restored to initial position simultaneously, the tooth 241 might strike the tooth 244 on the back stroke if the latter were rigidly mounted. The projection 222 has a catch 246 for holding the end of the trigger.

When the parts are held in the position shown by Fig. 1 by the engagement of the end of the trigger with the catch 246, the slide is held in such position that its teeth will engage with the teeth of the gear-wheel 204. When the carrying-point 219 swings to the right from the position shown in Fig. 1, so as to engage the under surface of the tooth 220 and swing the bell-crank upon its pivot, the lever 226 will be oscillated in an upward direction, so as to disengage the catch 246 from the lever 245 and permit the latter to swing to the rear by the operation of a swing 247. This unlocks the slide 237 and permits its spring 242 to move it into a lower position, in which the tooth 239 will engage with the bar 232. As the space between the tooth 239 and bar 232 in the highest position of the slide is equal to the pitch of the gear-wheel 204, this will cause the rotation of the corresponding adding-wheel one step. The slide 237 is obviously so placed with relation to the carrying point or projection 219, which operated upon the bell-crank 221, that it operates the next column of figures.

When the adding-wheels are in gear with the type-wheels, they are out of gear with the slides 237. If the adding-wheels were rotated sufficiently to carry one from one column to the next, the slides would fall without performing the carrying operation. I

therefore provide means for holding up such slides as are released by the projection 219, until the adding-wheels are thrown into gear with the slides. This means is then moved on the return stroke of the crank to release such slides as have been set free, and they will then fall and perform their function.

A shaft 248 is journaled upon the plates 228 and carries a bar 249, which is adapted to engage under the teeth 240 and hold the slides in elevated position, Fig. 12. This bar is oscillatable with the shaft 248, and the shaft is provided with a lever 250, which extends from the outer surface of one of the plates 228 and is normally urged in one direction by a spring 251, Fig. 8. This lever is adapted to be operated by a lever 252, mounted to oscillate upon a shaft 253 and rigidly connected with a lever 254. The levers 252 and 254 therefore constitute a bell-crank for operating the lever 250. The shaft 253 extends to a position near the right-hand side plate 32, and the lever 254 is provided with a projection 255, extending to the right of this side plate and in the path of the segment 42. Normally this projection is held by the segment in a position shown in Fig. 8, such that the lever 252 will bear upon the lever 250 and hold the bar 249 in such position that it will not engage the teeth 240; but when the lever 62 is oscillated and the type-wheels are moved out of engagement with the slides the segment is turned so that the projection 255 slides off the edge of the segment, as indicated in dotted lines in Fig. 8. The lever 250 is thereby relieved from the above-mentioned position, and the spring 251 pulls it into the position indicated in dotted lines in Fig. 1, so that the bar 249 is ready to engage the teeth 240 and lock the slides in elevated position. This prevents the operation of the slides until the adding-wheels are brought back into engagement with the slides. The engagement of the teeth 240 by the bar 249 is timed to occur before motion is imparted to the adding-wheels. To resist the action of the slides which may rest on the bar 249, I prefer to lock the frame 228 by means of a catch 228^a.

It will be obvious that the carrying device need not be applied to the units-adding wheel except so much of it as is designed to carry from that wheel to the next one. Consequently in place of the slide 237 on the units-adding wheel I have provided an upwardly-extending blade 257, Fig. 12, and this blade is provided with a tooth 258, extending to the rear and adapted to engage between the teeth of the units-adding-wheel pinion. As the units-wheel is not acted upon in carrying, this tooth is designed to act with the slides which are mounted adjacent to the other type-wheels for locking the units-wheel.

Fig. 18 shows a modified form of trigger 243^a, having a yielding tooth 244^a and pro-

vided with a spring 244^b for operating the tooth. This prevents the tooth from being stopped if it strikes the tooth 241.

Restoring device for the carrying mechanism.—In order to provide for restoring the parts to normal position, so that they can be operated to add the numbers when it is time for this operation to take place, a transverse shaft 259 is mounted upon the side plates. This shaft carries a pair of levers 260, Fig. 7, which are connected by a cross-bar 261, Figs. 1 and 4. This cross-bar is designed to engage the rear surface of the trigger 243 and restore it to normal position when the shaft 259 is oscillated. This is accomplished by forcing the upper end of the trigger to slide along the lower inclined surface of the catch 246, so as to engage the forward surface thereof when the lever 226 is moved to normal position. Another pair of levers 262 is mounted upon the shaft 259 and provided with a cross-bar 263. This cross-bar is adapted when pushed upwardly to engage the lower ends of the slides 237 and restore them to their normal elevated position. For the purpose of operating the shaft 259 it is provided with an arm 264 outside one of the casings 32, Figs. 5, 6, and 7. This arm is normally urged against a stud 265 by a spring 266; but to force it into an operating position an arm 267 is provided adapted to engage with it. This arm is pivoted upon a shaft 268, mounted in journals 269 upon the side plates 32. It is provided with a rearwardly-extending arm 270, constituting, with the arm 267, a bell-crank. This bell-crank is provided with a stud or shaft 271, on which is pivotally mounted a lever 272, having a tooth 273. On a projection 274 below the shaft 271 the lever is connected by a spring 275 with the bell-crank. This spring obviously operates to normally force the lever into the position shown in Fig. 6, in which the left-hand side of the lever engages a shoulder 276 on the inner side of the arm 270.

Upon the segment 264 is a projection 277, having a stud 278 which engages the tooth 273. This construction provides for a positive operation of the bell-crank 267 to 270 in one direction when the stud 278 engages with the tooth 273 and permits the stud to pass over the tooth 273 when the segment moves in the other direction. A spring 279 yieldingly resists the action of the stud 278 in an obvious manner. When the operating-crank is pulled, the stud 278 forces the lever into such position that the bar 263 engages the bottom of the slides and forces them upward, the tooth 241 moving above the position of the tooth 244 on the trigger and the bar 261 engaging the rear surface of all the triggers, so as to force them inward and causing the teeth 244 to engage the teeth 241. Simultaneously the ends of the triggers will engage the catches 246 and lock them in position, as

shown in Fig. 1. At the same time a locking-bar 249 drops in front of the teeth 240 on the slides, and when released by the stud 278, passing beyond the tooth 273, the parts will assume the position shown in Fig. 1 except for the fact that the bar 249 will engage the under surfaces of the teeth 240. This is all timed to occur before the adding-wheels are acted upon by the action of the operating-crank.

It will be seen from the description so far given that in addition to the registering device described above the automatic adding of the numbers is effectively provided for in this construction and that no additional manipulations are required on the part of the operator than the mere operation of the keys and the crank 62 to secure the printing of the numbers to be registered, as well as their addition upon the adding-wheels. The sum of the numbers added can at all times be seen through an opening 280 in the casing 31.

Zero-setting device.—In order to provide for resetting the adding-wheels to zero position after the sum is completed, I provide certain mechanism which is illustrated in Fig. 4, reference also being had to Fig. 1. Mounted in the upper part of the casing is a shaft 281, having a crank 282, by means of which it can be rotated. This shaft is journaled in a hanger 283 upon the inside of the casing, and has a crank 284 connected by a spring 285 with a frame 286. As will be readily understood, this spring normally holds the shaft in a certain position. Upon the shaft is mounted a rubber roller 287, having a portion 288 of its surface cut away upon a chord of its circumference. Mounted on and fixed to the shaft 231 is a lever 289, having a spring 289^a and a key 290. By pressing the key 290 with the left hand the frame 228 is swung forward and the teeth 238 are swung out of engagement with the adding-wheel gears. By holding the key down the adding-wheels can be turned by the operation of the crank 282, the flexible rubber roller 287 engaging the teeth of the gears 205, so as to rotate them in the opposite direction to that in which they are rotated in the operation of adding. This can be carried on until each carrying-tooth 219 is in engagement with the top of the corresponding tooth 220 on the bell-crank 221. This places all the adding-wheels in the zero position, and, if necessary in order to accomplish this result, the rubber roller can be rotated more than once. The spring 285 normally keeps the roller in the position shown in Fig. 1, so that it will be out of engagement with the teeth of the wheels 205.

Adding-wheel-shifting device.—It is sometimes desirable to throw out the adding mechanism, so that the registration of numbers can be accomplished, together with the printing thereof, without disturbing the sum

registered on the adding-wheels. This is desirable, for example, in setting down the results obtained by adding either part or all of a column of figures. As the sum can be read at any time through the opening 280 it is a convenience to have means for throwing the adding-wheels out of operation, so that this sum can be registered on the keys and printed. For accomplishing this result the lever 212 is provided with a forward extension 291, Fig. 9, against which a head 292 upon a rod 293 is adapted to move. This rod is guided in a bearing 294, secured to one of the side casings, and is provided with a key 295 and a spring 296 for normally holding it in elevated position. When the key is depressed, the head 292 engages with the projection 291 and elevates the lever 212, so that its cam-surface 215 will be out of the path of the member 216, thus disconnecting the adding-wheels from the type-wheels and preventing their being shifted into engagement therewith. When the key is held down in this manner, any desired sums can be struck off on the registering-keys and printed by operating the main crank without disturbing the adding-wheels.

Error-correcting device.—If in the operation of the machine the wrong key is struck, it is desirable to have means provided so that the error can be corrected before the number is added. I prefer to accomplish this by means of the mechanism illustrated principally in Fig. 9. Loosely mounted upon the shaft 156 between the levers 159 and 171 and extending downwardly is a lever 297, Fig. 9. This lever has a stud 298, which is directly below the lever 171. The lever 297 is provided with a projection 299, to which is connected a rod 300, which is provided with a horizontal portion 301, passing through an elongated slot 302 in a bracket 303 on the lever 161. The horizontal portion 301 of this rod engages under the pawl 162, and when it is raised it disengages the tooth 163 of the pawl from the ratchet-wheel 158. In normal position the rod 300 is lowered on account of the fact that the lever 297 is pulled into contact with a stud 304 by means of a spring 305. The lever 297 is pivotally connected with a bell-crank 306, the other end of which is connected with a bell-crank 307, mounted on the shaft 200. The latter bell-crank is provided with a stud 308, which projects under the lever 212 and is adapted to lift the same from the stud 214 when the bell-crank 307 is swung about the shaft 200. The central portion of the bell-crank 306 is pivotally connected with a link 309, which in turn is connected with a bell-crank 310, having a key 311. The latter bell-crank is pivoted on a bracket 312. By depressing the key 311 the link 309 is drawn forward to the position shown in dotted lines in Fig. 9, and the lever 297 and bell-crank 307 are also swung to the positions

shown in dotted lines, which operate the rod 300 and the lever 212, so as to throw the printing mechanism and the adding mechanism out of operative connection with the elements directly operated by the main shaft. If an error in adding the sum is discovered before the operating-crank is pulled, the key 311 is pressed down and held with the left hand while the main crank is operated by the right hand in the same manner as in adding. This restores the type-wheels and carriage to the initial position without disturbing the adding and printing mechanism. The sum can then be started over again and the error can be corrected.

The bell-crank 267 to 270 should not be operated upon in correcting errors, as this would cause any slide which had been set free after the former operation to rotate the corresponding adding-wheel one point back as the turning of the crank restores the adding-wheels. This is due to the fact that the adding-wheels not being in gear with the type-wheels are by this operation brought into gear with the slides. I therefore provide means for throwing the lever 272 forward, so that the stud 278 will clear it when the crank is pulled. The means which I have illustrated for accomplishing this purpose comprises a stud 312 on the bell-crank 306. The stud is so placed as to engage the lever 272 near the point 273. The adding-wheel-shifting device is also affected in the same manner, and to obviate this I have provided the pivot 271 with an extension 313. This is connected by means of a rod 314 with the key-stem 293. (See Fig. 5.) This rod is guided in a bracket 315, (shown on Fig. 2,) secured to the casing in such a way as to place the parts in the necessary position. It will be seen that pressing down the key 295 throws the point 273 forward and out of the path of the stud 278 simultaneously with the operation of the lever 212.

Lock for the adding-wheel frame and carrying device.—In Figs. 18 and 19 I have shown a device for locking the adding-wheel frame which is desirable because under certain conditions the force required to throw the detent lever 172 out from the slides 156 might be sufficient to throw the frame backward and the slide-teeth out from engagement with the adding-wheel pinions. If these parts were held in that position, the act of carrying might be prevented and the adding-wheels left without support. A strong spring could be used for accomplishing this result; but I prefer to loosely mount an arm 317, Figs. 18 and 19, on the shaft 200 near to the left side of the frame 261. It is also mounted on the shaft 231 and is provided with a finger 318, which projects under the shaft 259 and limits the motion of the adding-wheel frame. Loosely pivoted also upon the shaft 200 is another arm 319, which has journals 320 oc-

cupying the space between the arm 317 and the plate 32. Near its end this arm is provided with a stud 321, which supports a pendent wedge 322. The arm 317 is provided with a shoulder 323, between which and the shaft 259 the wedge is adapted to hang. Between a stud 324 on the plate 32 and the arm 319 is a spring 325, which normally holds the arm in the position indicated in Fig. 19, in which the wedge is forced into a binding position between the shoulder 323 and the shaft 259, to hold these parts against relative movement with respect to each other. The shaft 200 is provided with a pin 326 to hold the arm 317. This construction partially takes the place of the arm 289, a key 327 being provided to engage the arm 319 and operate it.

The operation of this mechanism is as follows: When the parts are in the normal position, (shown in Fig. 19,) the projection 318 acts as a positive stop for the adding-wheel frame and limits its rearward motion. The wedge also locks the frame from moving in the other direction, as it is forced between the shoulder and the shaft. If now the key 327 is pressed, it will drive the wedge from its position between the shaft and shoulder and free the arm 317, so that it can move. When the arm 319 is forced down far enough to engage the shaft 231, the frame is moved forward and the adding-wheels disengaged from the type-wheels, leaving the device free to turn the adding-wheels to zero. The location of the keys 295 and 327 is a matter of convenience, and they may be placed in any convenient part of the machine.

Operation of the machine.—The machine is operated for adding and printing a sum in the following manner: The registering-key corresponding to the figure in the highest-order column is first struck and then a key is struck corresponding to each successive figure in the other columns to the right. The handle is then pulled forward to the full limit and back to its former position, when it is ready for the next sum. The amount is printed, the paper fed through the roller and the amount set up on the adding-wheels, and finally the type-wheels are restored to initial position, so that the next sum can be registered. The operation of the keys sets up the desired number on the type-wheels in the manner which has been previously described. Each key that is struck is left locked in registering position by means of the latch 121 until released by the notched bar. By this action the carriage stop-pawl 107 is released, so that it automatically moves into the path of the rack 98 and stops the latter in desired position. By the same operation the bar 79 operates the carriage-escapement and moves it forward one step. Simultaneously with the release of the carriage or in advance of this operation the end of the key-lever is

withdrawn from the graduated bar. The first type-wheel on the carriage is now under the impression-roller and in the units-printing line, and as the type-wheel is also the means for actuating the adding-wheel it is directly to the rear of the units-adding wheel. It will be seen that if now the handle is pulled the figure set up will be printed and added in the units-column; but if another registering-key is operated before the handle is pulled the first type-wheel is advanced to the second order or the tens-column, while the second wheel is brought into the units-column with the number registered in printing position. If the handle is now pulled, the figure on the first wheel is printed in the tens-column and the figure on the second wheel in the units-column, and so on. The first figure struck on a key will always be printed in the highest order and the last figure in the units-column when the handle is pulled independently of the number of figures registered. This does away with setting the carriage at the highest order of the sum to be added. The first action of the crank—namely, pulling it forward—in addition to the effects above mentioned also provides for the printing of the number to be registered, the feeding of the paper forward, the feeding of the printing-ribbon forward, and the removal of the printing mechanism from the surface of the type-wheels. Before the handle is operated to bring the type-wheels back to original position the shaft 200 is operated by the mechanism described so as to bring the adding-wheel-operating mechanism into engagement with the gear-segment 99. Then as the motion of the crank progresses and the type-wheels are restored to their initial position the corresponding adding-wheels are operated and the sum set up upon the adding device.

It is to be understood that the drawings which have been described are presented for the purpose of illustrating the principles involved in my invention and that the invention itself is capable of embodiment in other forms than that shown within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of a plurality of movable members, a series of type characters upon each of said members, a series of depressible keys corresponding to the characters on the members, means connected with the keys for limiting the motion of the members to present to printing position the character of one member which corresponds with the key operated, said means comprising locking devices for holding each key in depressed position, and means connected with said members for releasing the locking devices.

2. The combination of a plurality of movable type-supporting members, a series of depressible keys, and means connected with each key for limiting the motion of all of the supporting members, said means comprising locking devices for holding each key in depressed position, and means connected with said members for releasing the locking devices.
3. The combination of a plurality of movable type-supporting members, a series of depressible keys, and means connected with each key for limiting the motion of all of the supporting members to present the character corresponding to the key into printing position, said means comprising locking devices for holding each key in depressed position, and means connected with said members for releasing the locking devices.
4. The combination of a plurality of movable type members, a plurality of depressible keys, a stationary bar, a device for engaging said bar and locking the keys in a depressed position, and means for unlocking the keys comprising a bar movable with said type members, and having a series of steps for engaging the several locking devices and disengaging them from said stationary bar.
5. The combination of a plurality of type members, a plurality of keys, a locking device for each key, a movable bar having means for unlocking the keys, a stud connected with the keys and adapted to be operated by any one of them, a locking device for the type members, and means connected with said locking device for engaging the stud.
6. The combination of a plurality of movable type members capable of being locked in stationary position, a plurality of depressible keys, a stationary bar, a device on each key for engaging said bar and holding the keys in depressed position, and means adapted to be moved by said keys for unlocking the type members.
7. The combination of a plurality of movable type members, means for locking said members, a set of depressible keys, a bar, a locking device on each key for engaging said bar and holding the keys, a movable frame adapted to be moved by said keys, said frame being provided with a stud, and a lever connected with each type member for unlocking it, said lever being located in the path of said stud.
8. The combination of a plurality of movable type members, a plurality of depressible keys, a latch movably mounted on each key for locking the key in depressed position, and means for unlocking the latches, said means being movable with said type members.
9. The combination of a plurality of movable type-wheels, a plurality of keys, a locking device connected with each key for locking it in depressed position, and means for automatically unlocking the key; said means comprising a movable bar having surfaces in different planes for engaging the locking means on the several keys, a locking device for each type-wheel, and means connected with the keys for disengaging the locking device of one type-wheel.
10. The combination of a plurality of oscillatable type-wheels, a plurality of keys, a locking device for fixing each key in depressed position, an oscillatable bar having means for unlocking the keys, a stud connected with the keys and adapted to be operated by any one of them, a locking device for the type-wheels, and means connected with said locking device for engaging said stud to move it into operative position.
11. The combination of a plurality of oscillatable type-wheels, a plurality of movable keys, a stationary bar, a locking device on each key for engaging said bar and holding the keys in depressed position, a movable frame adapted to be moved by said keys, said frame being provided with a stud, a lever connected with each type-wheel for unlocking it, said lever being in the path of said stud, and resilient means for holding the lever in locking position.
12. The combination of a plurality of movable type-supporting members, a series of keys, a locking device on each key, a movable frame adapted to be operated by each key, means for moving said supporting members, and means connected with the frame for limiting the motion of said supporting members to an intermittent one.
13. The combination of a plurality of movable type-supporting members, a series of keys, a locking device on each key, a movable frame adapted to be operated by each key, means for moving said supporting members, and means connected with the frame for limiting the motion of said supporting members to an intermittent one, said means comprising a bar having ratchet-teeth, a lever for engaging said ratchet-teeth, and an arm connected with said frame and said lever.
14. The combination of a plurality of movable type-supporting members, a set of keys, means for moving the type members, said means comprising a bar having ratchet-teeth, a lever for engaging said ratchet-teeth and an arm connected with said lever, a second lever similar to the first and adapted to operate in the same way, a zero-key, and means for connecting the zero-key with the second lever.
15. The combination of a main shaft, a carriage mounted thereon, a series of oscillatable type-wheels mounted upon the carriage, means for oscillating the shaft, said means comprising a crank, a spring for normally moving the carriage in one direction, and means connected with the shaft for moving the carriage in the other direction; said last-named means comprising a flexible member connected with the carriage, and a

lever pivotally mounted upon the main shaft and connected with said flexible member.

16. The combination of a main shaft, a carriage mounted thereon, a series of oscillatable type-wheels mounted upon the carriage, a series of keys, means for oscillating said type-wheels one at a time, means for oscillating the shaft, said last-named means comprising a crank having a handle, a spring for normally moving the carriage in one direction, and means connected with the shaft for moving the carriage in the other direction, said means comprising a flexible member connected with the carriage, guides for the flexible member, a lever connected with the flexible member, a segment movable with the shaft and means for transmitting motion from the segment to the lever in one direction.

17. The combination of a main shaft, a carriage mounted thereon, a series of oscillatable type-wheels mounted upon the carriage, a series of keys, means for oscillating said type-wheels one at a time, means for oscillating the shaft, said last-named means comprising a crank having a handle, a spring for normally moving the carriage in one direction, and means connected with the shaft for moving the carriage in the other direction, said means comprising a flexible member connected with the carriage, guides for the flexible member, a lever connected with the flexible member, a segment movable with the shaft and means for transmitting motion from the segment to the lever in one direction; said last-named means comprising a bell-crank mounted on the lever, means for limiting the motion of the bell-crank, means for yieldingly holding the bell-crank against said limiting means, and a projection on the segment adapted to engage the bell-crank.

18. The combination of a main shaft, a carriage mounted thereon, a series of oscillatable type-wheels mounted upon the carriage, a series of keys, means for oscillating said type-wheels one at a time, means for oscillating the shaft, said last-named means comprising a crank having a handle, a spring for normally moving the carriage in one direction, means connected with the shaft for moving the carriage in the other direction; said means comprising a flexible member connected with the carriage, guides for the flexible member, a lever connected with the flexible member, a segment movable with the shaft and means for transmitting motion from the segment to the lever in one direction; and a printing device operatively connected with said shaft.

19. The combination of a main shaft, a carriage mounted thereon, a series of oscillatable type-wheels mounted upon the carriage, a series of keys, means for oscillating said type-wheels one at a time, means for oscillating the shaft, said last-named means

comprising a crank having a handle, a spring for normally moving the carriage in one direction, means connected with the shaft for moving the carriage in the other direction; said means comprising a flexible member connected with the carriage and a lever pivotally mounted upon the main shaft and connected with said flexible member; a printing device operatively connected with said shaft, the printing device comprising an impression-roller, and means for intermittently rotating the roller and feeding paper thereupon.

20. The combination of a main shaft, a carriage mounted thereon, a series of type members mounted on the carriage, a lever pivotally connected with the main shaft and connected with said carriage, a printing device comprising an impression-roller, and means for intermittently rotating the impression-roller and feeding paper thereon.

21. The combination of a main shaft, a carriage mounted thereon, a series of type members mounted on the carriage, a flexible member connected with the carriage, a lever connected with the flexible member, a movable segment, means for transmitting motion from the segment to the lever in one direction, and a printing device operatively connected with said segment.

22. The combination of a main shaft, a carriage mounted thereon, a series of type members mounted on the carriage, a lever connected with the carriage, a movable segment, and means for transmitting motion from the segment to the lever in one direction; said last-named means comprising a bell-crank mounted on the lever, and means for limiting the motion of the bell-crank.

23. The combination of a main shaft, a carriage mounted thereon, a series of type members mounted on the carriage, a lever connected with the carriage, a movable segment, means for transmitting motion from the segment to the lever in one direction, said last-named means comprising a bell-crank mounted on the lever and means for limiting the motion of the bell-crank, means for yieldingly holding the bell-crank against said limiting means, and a projection on the segment adapted to engage the bell-crank.

24. The combination of a main shaft, a carriage mounted thereon, a series of movable type members on the carriage, and means connected with the shaft for moving the carriage; said means comprising a flexible member connected with the carriage, a lever connected with the flexible member, a segment movable with the shaft, and means for transmitting motion from the segment to the lever in one direction.

25. The combination of a main shaft, a carriage mounted thereon, a series of movable type members mounted upon the carriage, means for oscillating the shaft, and

means connected with the shaft for moving the carriage; said last-named means comprising a flexible member connected with the carriage, and a lever pivotally mounted upon the main shaft and connected with the flexible member.

26. The combination of a main shaft, a carriage mounted thereon, a series of movable type-wheels mounted upon the carriage, and means connected with the shaft for moving the carriage; said means comprising a flexible member connected with the carriage, and a lever pivotally mounted upon the main shaft and connected with said flexible member.

27. The combination of a main shaft, a carriage mounted thereon, a series of movable type members mounted upon the carriage, a printing device operatively connected with the shaft, a printing device comprising a compression-roller, means for intermittently rotating the roller and feeding paper thereupon, and an adding mechanism adapted to be connected with the type members.

28. The combination of a main shaft, a carriage movably mounted thereon, a series of type members movably mounted on the carriage, each type member being provided with a set of ratchet-teeth, a series of keys, means for moving the type members, said means being adapted to operate upon the ratchet-teeth, means for moving the carriage forward intermittently, a second shaft located adjacent to the main shaft, an impression-roller mounted to oscillate about the second shaft, and means connected with the main shaft for rotating the impression-roller and for oscillating it about the second shaft.

29. The combination of a main shaft, a carriage movably mounted thereon, a series of type members movably mounted on the carriage, each type member being provided with a set of ratchet-teeth, means for moving the type members, said means operating upon the ratchet-teeth, a second shaft located adjacent to the main shaft, an impression-roller mounted to oscillate about said second shaft, and means connected with the main shaft for rotating the impression-roller and for oscillating it about the second shaft.

30. The combination of a main shaft, a carriage movably mounted thereon, a series of type members located upon the carriage, a printing device mounted adjacent to the faces of the type members, said printing device comprising an impression-roller, means for rotating the impression-roller, means connected with the main shaft for moving the printing device toward the type-wheels, an inking-ribbon, and means for moving the inking-ribbon between the impression-roller and the type-wheels.

31. The combination of a main shaft, a carriage movably mounted thereon, a series of type members located upon the carriage,

a printing device mounted adjacent to the faces of the type members, said printing device comprising an impression-roller, means for rotating the impression-roller, means connected with the main shaft for moving the printing device toward the type-wheels, an inking-ribbon, means for moving the inking-ribbon between the impression-roller and the type-wheels, said means comprising a pawl, and means connected with the main shaft for moving said pawl.

32. The combination of a main shaft, a carriage mounted thereon, a series of movable type members connected with the carriage, a printing device operatively connected with said shaft and comprising an impression-roller, means for intermittently rotating the roller and feeding paper thereupon, and means for feeding an inking-ribbon across the face of the impression-roller, said last-named means comprising a spool or roller for receiving the inking-ribbon, a ratchet and pawl for rotating said spool or roller, and means connected with the main shaft for operating said ratchet and pawl.

33. The combination of a main shaft, a carriage connected therewith, an impression-roller, means for intermittently rotating said roller, said means comprising a ratchet-wheel connected with the roller, a pawl for engaging the ratchet-wheel, means connected with the main shaft for operating the pawl, a second shaft, a lever connected with the second shaft and with the pawl, a second lever connected with the second shaft, and an operating-arm connected with the main shaft and adapted to engage the second lever.

34. The combination of a main shaft, means for oscillating it, a carriage loosely mounted upon said main shaft, a set of keys, means for moving the carriage along the shaft, means connected with the keys for limiting the motion to an intermittent one, means for moving the carriage in another direction, an impression-roller, means for intermittently rotating said roller, said last-named means comprising a ratchet-wheel connected with the roller, a pawl for engaging the ratchet-wheel, and means connected with the main shaft for operating said pawl.

35. The combination of a main shaft, means for oscillating it, a carriage loosely mounted upon said main shaft, a set of keys, means for moving the carriage along the shaft, means connected with the keys for limiting the motion to an intermittent one, means for moving the carriage in another direction, an impression-roller, means for intermittently rotating said roller, said last-named means comprising a ratchet-wheel connected with the roller, a pawl for engaging the ratchet-wheel, means connected with the main shaft for operating said pawl, a second shaft, a lever on said shaft connected with the pawl, a second lever rigidly con-

nected with the second shaft, and an operating-arm mounted on the main shaft adapted to engage said second lever.

36. The combination of a main shaft, 5 means for oscillating it, a carriage loosely mounted upon said main shaft, a set of keys, means for moving the carriage along the shaft, means connected with the keys for limiting the motion to an intermittent one, 10 means for moving the carriage in another direction, an impression-roller, means for intermittently rotating said roller, said last-named means comprising a ratchet-wheel connected with the roller, a pawl for engaging the ratchet-wheel, means connected with 15 the main shaft for operating said pawl, an inking-ribbon, and means for feeding said ribbon across the face of the impression-roller.

37. The combination of a main shaft, a 20 carriage mounted thereon, a series of oscillatable type-wheels mounted upon the carriage, a series of keys, means for oscillating said type-wheels one at a time, means for 25 oscillating the shaft, said means comprising a crank having a handle, a spring for normally moving the carriage in one direction, means connected with the shaft for moving the carriage in the other direction; said 30 means comprising a flexible member connected with the carriage and a lever pivotally mounted upon the main shaft and connected with said flexible member, a printing device operatively connected with said shaft, 35 the printing device comprising an impression-roller, means for intermittently rotating the roller and feeding paper thereupon, an inking-ribbon, and means for feeding the inking-ribbon across the face of the impression- 40 roller, said last-named means comprising a spool or roller for receiving the inking-ribbon, a ratchet and pawl for rotating said spool or roller, and means connected with the main shaft for operating said ratchet and pawl.

38. The combination of a main shaft, a 45 carriage longitudinally movable thereon, a series of type-wheels oscillatably mounted upon the carriage, a series of keys, means for oscillating a type-wheel and feeding the carriage 50 forward one step, a printing device mounted adjacent to the faces of the type-wheels, said printing device comprising an impression-roller, means connected with the main shaft for rotating said impression-roller, means 55 connected with the main shaft for moving the printing device toward the type-wheels, an inking-ribbon, and means for moving the ribbon between the impression-roller and the type-wheels; said means comprising a ratchet- 60 wheel, a movable pawl for rotating said ratchet-wheel, and means connected with the main shaft for moving said pawl.

39. The combination of a main shaft, a 65 carriage movably mounted thereon, a series of type-wheels oscillatably mounted on the car-

riage, each type-wheel being provided with a set of ratchet-teeth, a series of keys, means for rotating the type-wheels, said means operating upon said ratchet-teeth, means for moving the carriage forward intermittently, 70 a second shaft located adjacent to the main shaft, an impression-roller mounted to oscillate about said second shaft, means connected with the main shaft for rotating the impression-roller and for oscillating it about the 75 second shaft, and means for moving a printing-ribbon between the type-wheels and the impression-roller, said means comprising a lever connected with the second shaft and oscillatable therewith. 80

40. The combination of a main shaft, a carriage movably mounted thereon, a series of type-wheels oscillatably mounted on the carriage, each type-wheel being provided with a set of ratchet-teeth, a series of keys, for 85 rotating the type-wheels, said means operating upon said ratchet-teeth, means for moving the carriage forward intermittently, a second shaft located adjacent to the main shaft, an impression-roller mounted to oscillate about 90 said second shaft, means connected with the main shaft for rotating the impression-roller and for oscillating it about the second shaft, means for moving a printing-ribbon between the type-wheels and the impression-roller, 95 said means comprising a lever connected with the second shaft and oscillatable therewith, and means for winding up the inking-ribbon, said means comprising a spool, a crank for the spool removably connected therewith, 100 and a tension device.

41. The combination of a main shaft, a carriage mounted thereon, a series of oscillatable type-wheels mounted upon the carriage, a series of keys, for oscillating said type- 105 wheels one at a time, means for oscillating the shaft, said means comprising a crank having a handle, a spring for normally moving the carriage in one direction, means connected with the shaft for moving the carriage in 110 the other direction, said means comprising a flexible member connected with the carriage and a lever pivotally mounted upon the main shaft and connected with said flexible member, a printing device operatively connected 115 with said shaft, the printing device comprising an impression-roller, means for intermittently rotating the roller and feeding paper thereupon, and an adding mechanism adapted to be connected with type-supporting de- 120 vices.

42. A calculating-machine comprising a series of adding-disks, said disks being provided with carrying-points, a bell-crank with which said carrying-points are adapted to 125 engage, a lever adapted to be operated by the bell-crank, a vertically-movable slide for holding each disk in fixed position, said slides being adapted to rotate the disks by gravity when released, means for locking said slide, 130

and means connected with said lever for unlocking the slide of the next disk.

43. A calculating-machine, comprising a series of adding-disks, a series of vertically-movable slides having means for locking said disks against rotation, a carrying-point connected with each disk, a bell-crank located in the path of each carrying-point, a lever adapted to be operated by each bell-crank, a locking-trigger for holding each slide in fixed position, and means on the bell-crank for releasing the trigger to permit the slide to drop and rotate a disk one step.

44. A calculating-machine, comprising a series of adding-disks, a series of slides having means for locking said disks against rotation, means connected with each disk for transmitting motion to another disk, a locking-trigger having a yielding tooth for holding each slide in fixed position, means connected with said transmitting means for releasing the trigger to permit the slide to move and rotate a disk one step, a shaft, a frame journaled upon the shaft, said frame having means for locking the slide in stationary position, and means for turning the shaft to unlock the slide.

45. A calculating-machine, comprising a series of adding-disks, a series of slides having means for locking said disks against rotation, a carrying-point connected with each disk, a bell-crank located in the path of each carrying-point, a lever adapted to be operated by each bell-crank, a locking-trigger for holding each slide in fixed position, means on the bell-crank for releasing the trigger to permit the slide to move and rotate a disk one step, an oscillatable shaft, and means thereon for moving the trigger into operative position to engage and lock said lever.

46. A calculating-machine, comprising a series of adding-disks, a series of slides having means for locking said disks against rotation, a carrying-point connected with each disk, a bell-crank located in the path of each carrying-point, a lever adapted to be operated by each bell-crank, a locking-trigger for holding each slide in fixed position, means on the bell-crank for releasing the trigger to permit the slide to move and rotate a disk one step, an oscillatable shaft, means thereon for moving the trigger into operative position to engage and lock said lever, and means for restoring the slide to initial position.

47. A calculating-machine, comprising a series of adding-disks, a series of slides having means for locking said disks against rotation, a carrying-point connected with each disk, a bell-crank located in the path of each carrying-point, a lever adapted to be operated by each bell-crank, a locking-trigger for holding each slide in fixed position, means on the bell-crank for releasing the trigger to permit the slide to move and rotate a disk one

step, means for restoring the slide to initial position, and means for setting the bell-crank in initial position ready to be again operated upon by the carrying-point.

48. A calculating-machine, comprising a series of adding-disks, a series of slides having means for locking said disks against rotation, a carrying-point connected with each disk, a bell-crank located in the path of each carrying-point, a lever adapted to be operated by each bell-crank, a locking-trigger for holding each slide in fixed position, means on the bell-crank for releasing the trigger to permit the slide to move and rotate a disk one step, and means for restoring the slide to initial position; said last-named means comprising an oscillatable shaft, and a frame mounted on said shaft and adapted to engage the end of the slide, said slide being provided with resilient means for restoring the operation of said frame.

49. A calculating-machine, comprising a series of adding-disks, a series of slides having means for locking said disks against rotation, a carrying-point connected with each disk, a bell-crank located in the path of each carrying-point, a lever adapted to be operated by each bell-crank, a locking-trigger for holding each slide in fixed position, means on the bell-crank for releasing the trigger to permit the slide to move and rotate a disk one step, a shaft, a frame journaled upon the shaft, said frame having means for locking the slide in stationary position, means for turning the shaft to unlock the slide, a main shaft having type-wheels thereon, and means connected with said main shaft for operating said last-mentioned operating means.

50. A calculating-machine, comprising a series of adding-disks, a series of slides having means for locking said disks against rotation, each disk being provided with a carrying-point, a locking-trigger for holding each slide in fixed position, means for releasing the trigger to permit the slide to move and rotate a disk one step, a shaft, a frame journaled upon the shaft, said frame having means for locking the slide in stationary position, means for turning the shaft to unlock the slide, a main shaft having type-wheels, and means connected with the main shaft for operating said last-mentioned operating means.

51. A calculating-machine, comprising a series of adding-disks, a series of slides having means for locking said disks against rotation, each disk being provided with a carrying-point, a locking-trigger for holding each slide in fixed position, means for releasing the trigger to permit the slide to move and rotate a disk one step, and means for restoring the slide to initial position; said last-named means comprising an oscillatable shaft, and a frame mounted on said shaft and adapted to engage the slide, said slide being provided

with resilient means for restoring the operation of said frame.

52. The combination of a series of adding-disks, a series of slides having means for locking said disks against rotation, each disk being provided with a carrying-point, a locking device for holding each slide in fixed position, means for releasing the locking device to permit the slide to move and rotate a disk one step, means for restoring the slide to initial position, and means for setting the locking device in initial position ready to be engaged by said carrying-point.

53. A calculating-machine comprising a series of adding-disks each having a carrying-point, a series of slides having means for locking said disks against rotation, a locking-trigger for holding each slide in fixed position, means controlled by the carrying-point for releasing the trigger to permit the slide to move and rotate a disk one step, an oscillatable shaft, and means thereon for moving the trigger into operative position for locking the slide.

54. A calculating-machine, comprising a series of adding-disks, a series of slides having means for locking said disks, means connected with each disk for transmitting motion to another disk, and a locking-trigger having a yielding tooth for holding a slide in fixed position.

55. A calculating-machine, comprising a series of adding-disks, a series of slides having means for locking said disks against rotation, means connected with each disk for transmitting motion to another disk, a locking-trigger having means for holding each slide in fixed position, means connected with said transmitting means for releasing the trigger to permit the slide to move and rotate a disk one step, and means for locking the slide in stationary position.

56. A calculating-machine, comprising a series of adding-disks, a series of vertically-movable slides having means for locking said disks against rotation, means for holding each slide in fixed position, and means for releasing the slides to allow them to drop and rotate the disks.

57. A calculating-machine, comprising a main shaft, a series of registering devices, an adding device, means for connecting the adding device with the registering devices, a printing mechanism, means for disconnecting the printing mechanism, and means for disconnecting the adding device from the registering devices, whereby the registering devices can be operated independently of the adding device and the printing mechanism.

58. A calculating-machine, comprising a series of registering devices, an adding device, a zero-setting device for the adding device, means for connecting the adding device with the registering devices, a printing mechanism, means for disconnecting the printing

mechanism, and means for disconnecting the adding device from the registering devices.

59. A calculating-machine, comprising a main shaft, a series of registering devices thereon, an adding device, means for connecting the adding device with the registering devices, a printing mechanism, means for connecting the printing mechanism with the main shaft, means for disconnecting the printing mechanism from the main shaft, and means for disconnecting the adding device from the registering devices, whereby the registering devices can be operated independently of the adding device and printing mechanism.

60. In an adding and recording machine, the combination of adding-wheels, an impression-roller, registering-keys, a carriage movable successively step by step into the printing-line and the adding-line, a series of type-wheels mounted on the carriage outside the adding and printing line, which are advanced into the printing and adding lines by motion of the carriage, means for actuating the type-wheels whereby the type corresponding to the key operated is advanced under the impression-roller, a manually-operated handle, means for pressing the impression-roller against the type-wheels which have been advanced into the printing-line, and means connected with said handle for connecting the adding-wheels with the type-wheels.

61. In an adding and recording machine, the combination of adding-wheels, an impression-roller, registering-keys, a carriage movable successively into printing-line and the adding-line, a series of type-wheels mounted on the carriage outside the adding and printing line, means for successively advancing the type-wheels into the printing and adding lines by motion of the carriage, means for actuating the type-wheels whereby the type corresponding to the key operated is advanced under the impression-roller, a manually-operated handle, means for pressing the impression-roller against the type-wheel which has been advanced into the printing-line, means for connecting the adding-wheels with the type-wheels which have been advanced into the printing-line and adding-line by operation of the handle, and means for restoring the type-wheels which have been brought under the impression-roller to their former position.

62. The combination of a main shaft, a tube thereon, a carriage movable successively from order to order and mounted on the tube, a wheel mounted on the tube and having types corresponding to the ten numerals, a spur-gear section, a ratchet-section, a cut-off portion, and a shoulder in the cut-off portion.

63. The combination of a main shaft, a tubular support thereon, a carriage movable

successively from order to order and mounted on said support and having a slot, a guide fixed to the carriage and mounted in said slot, a motor-spring for actuating the carriage, an escapement, registering-keys for controlling the motion of the carriage, a series of type-wheels mounted on the carriage-tube, a motor-spring for actuating each type-wheel, and stop-pawls for engaging the type-wheels and holding them against the impulse of the motor-springs.

64. The combination of a main shaft, a tubular support thereon, a series of registering-keys, a carriage mounted by the support on the main shaft and movable step by step into the printing-line, a series of type-wheels mounted on the carriage-tube, stop-pawls for the type-wheels, motor-springs for actuating the type-wheels, an escapement for controlling the motion of the carriage, a universal lever adapted to be operated by the registering-keys, and an adjustable stud fixed to the universal lever for engaging the stop-pawls for the type-wheels as they move into the units printing and adding line.

65. The combination of an impression-roller, registering-keys, a carriage movable successively step by step into the printing-line, type-wheels mounted on the carriage, motor-springs for actuating the type-wheels, an escapement for controlling the motion of the carriage, a universal lever adapted to be operated by the registering-keys, an arm connected with the universal lever and with the escapement, an adjustable stud for releasing the type-wheels as they move into the units-printing column, an oscillatable graduated bar, and an arm fixed to the graduated bar, which the type-wheels engage as they are released on moving into the printing-line, causing the graduated bar to swing into the type-wheels.

66. The combination of an impression-roller, type-wheels, registering-keys, key-levers, a movable graduated bar, locking-levers for the key-levers, a bar which the locking-levers are adapted to engage for locking them in the path of the graduated bar, and graduated steps on the bar for determining the rotation of the type-wheels as they are advanced into the units-printing line, corresponding to the key operated.

67. The combination of a rocking shaft, a frame fixed to the shaft, a printing impression-roller mounted in the frame, a lever fixed to the shaft, journals in the lever, a movable printing-lever mounted in the journals, and an adjustable screw located under the printing-lever.

68. The combination of a rocking shaft, a frame fixed to the shaft, an impression-roller mounted in the frame, a fixed lever on the shaft, a movable printing-lever mounted in the fixed lever, an adjustable screw under

the printing-lever, a cam on the printing-lever, a main shaft, a lever fixed to the main shaft, and a cam on the last-named lever for actuating the printing-lever and impression-roller.

69. The combination of a series of adding-wheels, idle wheels, a shaft, a frame on the shaft, bell-cranks mounted in the frame, a lever fixed to the shaft, a cross-bar journaled on the shaft, an adjustable screw in the cross-bar, said screw being a part of the lever fixed to the shaft, a movable adding-wheel-shifting lever resting on the adjustable screw, and a cam on the shifting-lever.

70. The combination of a series of adding-wheels, idle wheels, a shaft, a frame on the shaft, bell-cranks mounted in the frame, a lever fixed to the shaft, a cross-bar journaled on the shaft, an adjustable screw in the cross-bar, said screw being a part of the lever fixed to the shaft, a movable adding-wheel-shifting lever resting on the adjustable screw, a cam on the shifting-lever, a main shaft, a handle on the main shaft, type-wheels on the main shaft, adding-wheels, a segmental disk fixed to the main shaft, a movable curved lever mounted on the disk, and means whereby the curved lever is adapted to swing the adding-wheels in gear with the type-wheels and hold them in that position during the remainder of the forward stroke of the handle.

71. The combination of a series of adding-wheels, a shaft, a lever connected with the shaft, an adjustable screw connected with the shaft, said screw constituting a part of said lever, a movable adding-wheel-shifting lever resting on the adjustable screw, a main shaft, type-wheels on the main shaft, adding-wheels, a segmental disk connected with the main shaft, a movable curved lever mounted on the disk, and means whereby the curved lever is adapted to swing the adding-wheels in gear with the type-wheels and hold them in that position during the remainder of the forward stroke of the main shaft.

72. The combination of a series of adding-wheels, a shaft, an adjustable screw connected with the shaft, a movable adding-wheel-shifting lever resting on the adjustable screw, a main shaft, type-wheels on the main shaft, adding-wheels, a disk connected with the main shaft, a movable lever mounted on the disk, and means whereby the latter lever is adapted to swing the adding-wheels in gear with the type-wheels and hold them in that position during a portion of the movement of the main shaft.

73. The combination of a series of adding-wheels, a shaft, a lever fixed to the shaft, an adjustable screw connected with the lever, and a movable adding-wheel-shifting lever resting on the adjustable screw.

74. The combination of a rocking shaft, an

impression-roller, a movable printing-lever, a cam on the printing-lever, a main shaft, a lever fixed to the main shaft, and means on the last-named lever for actuating the printing-lever and impression-roller.

75. The combination of an impression-roller, type-wheels, registering-keys, key-levers, a movable graduated bar, locking-levers for the key-levers, and means for locking the locking-levers in the path of the graduated bar, said bar having graduated steps for determining the motion of the type-wheels.

76. The combination of an impression-roller, registering-keys, a movable carriage, type-wheels mounted on the carriage, means for actuating the type-wheels, means for controlling the motion of the carriage, a universal lever adapted to be operated by the registering-keys, an arm connected with the universal lever and with said means for controlling the motion of the carriage, a stud for releasing the type-wheels, a graduated bar, and an arm on the graduated bar for engaging the type-wheels.

77. The combination of an impression-roller, type-wheels, registering-keys, key-levers, a movable graduated bar, locking-levers for the key-levers, and means for locking the locking-levers in the path of the graduated bar, said bar having graduated steps for determining the motion of the type-wheels as they are released on moving into the printing-line for causing the graduated bar to move into engagement with the type-wheels.

78. The combination of a main shaft, a movable support thereon, a series of registering-keys, a carriage mounted on the support, a series of type-wheels mounted on the carriage, means for actuating the type-wheels, means for controlling the motion of the carriage, a universal lever adapted to be operated by the registering-keys, and an adjustable stud connected with the universal lever and adapted to release the type-wheels.

79. The combination of a main shaft, a support movably mounted thereon, a carriage on the support, said carriage having a slot, a guide fixed in the carriage and mounted in said slot, means for actuating the carriage, an escapement, and a series of type-wheels mounted on the carriage.

80. The combination of a main shaft, a support movably mounted thereon, a carriage on the support, said carriage having a slot, a guide fixed in the carriage and mounted in said slot, means for actuating the carriage, an escapement, a series of type-wheels mounted on the carriage, means for actuating each type-wheel, and stop-pawls for engaging the

type-wheels and holding them against the operation of said last-named means.

81. The combination with a carriage, of means for actuating the carriage, a main shaft, a segmental disk, an extension fixed to the main shaft, a stop, an oscillating lever, a dog mounted on the oscillating lever, and a flexible connection from the oscillating lever to the carriage.

82. The combination with a carriage movable from order to order, of a motor-spring for actuating the carriage, a main shaft, a handle for the main shaft, a segmental disk, an extension fixed to the main shaft, a stop, a hub fixed to the disk, an oscillating lever, a dog mounted in the oscillating lever, and a cord connecting the oscillating lever with the carriage.

83. The combination with a set of adding-wheels and pinions therefor, of an oscillatable shaft, a frame fixed to the shaft, guide-racks on the frame, a series of carrying and locking slides mounted in the guide-racks, said slides having teeth for engaging the adding-wheel pinions in normal position and locking the adding-wheels, a stop-shoulder on each slide, a detent tooth for engaging said shoulder, and motor-springs for actuating the slides.

84. The combination with a set of adding-wheels and pinions therefor, of an oscillatable shaft, a frame fixed to the shaft, guide-racks on the frame, a series of carrying and locking slides mounted in the guide-racks, said slides having teeth for engaging the adding-wheel pinions in normal position and locking the adding-wheels, a series of triggers mounted on the shaft, a shoulder on each trigger for engaging the slide, and motor-springs impelling the shoulder away from the slides.

85. The combination with a set of adding-wheels and pinions therefor, of an oscillatable shaft, a frame fixed to the shaft, guide-racks on the frame, a series of carrying and locking slides mounted in the guide-racks, said slides having teeth for engaging the adding-wheel pinions in normal position and locking the adding-wheels, a series of compound levers, an arm on each of said compound levers, an upper member on each compound lever, and a spring for holding the compound lever in extreme position.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

AMOS K. ERSLAND.

Witnesses:

HENRY HORR,
E. R. CARLSON.