

No. 813,281.

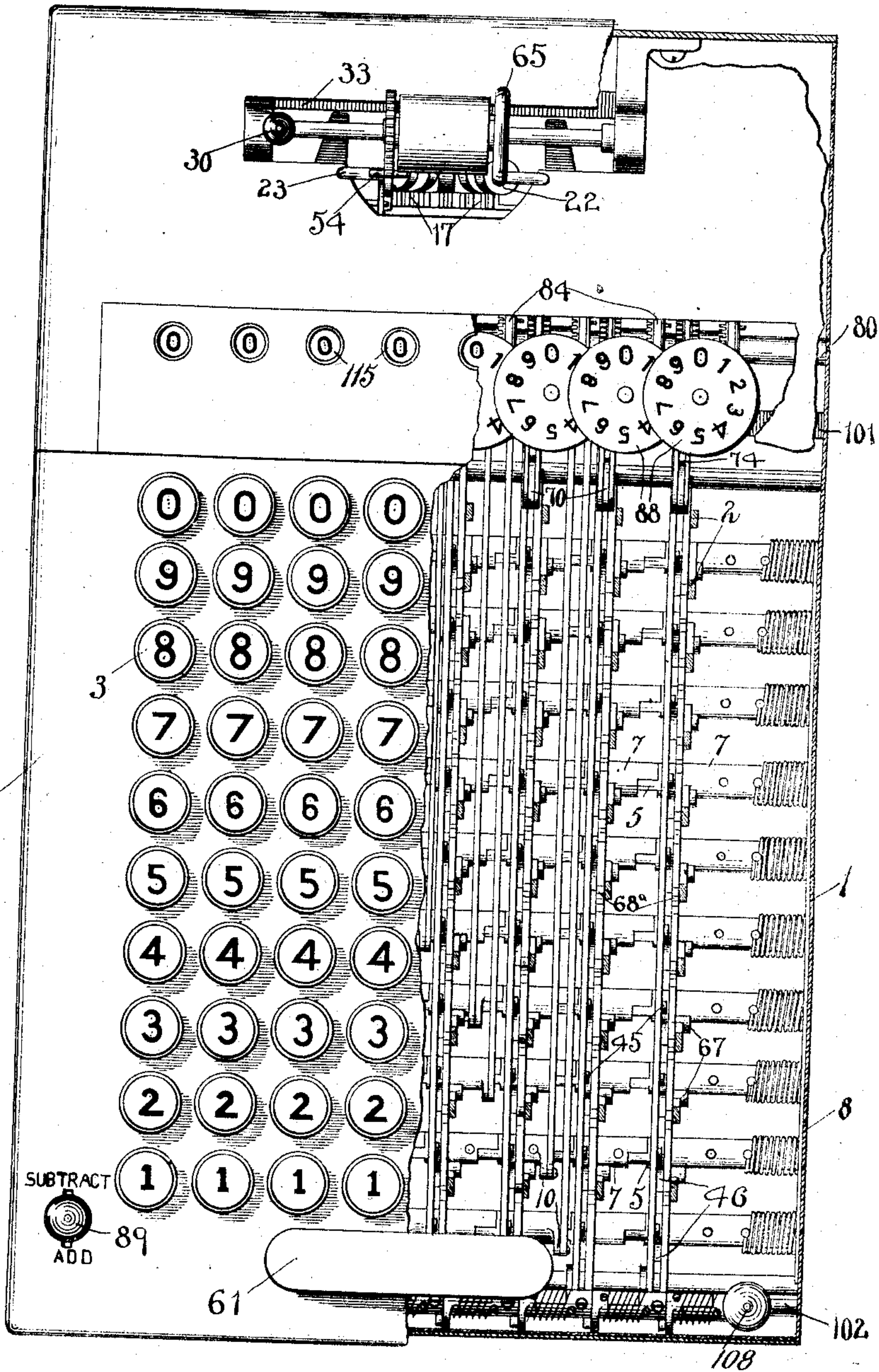
PATENTED FEB. 20, 1906.

L. S. CRANDALL.
MECHANICAL CALCULATOR AND RECORDER.

APPLICATION FILED FEB. 10, 1904.

5 SHEETS—SHEET 1.

Fig. 1.



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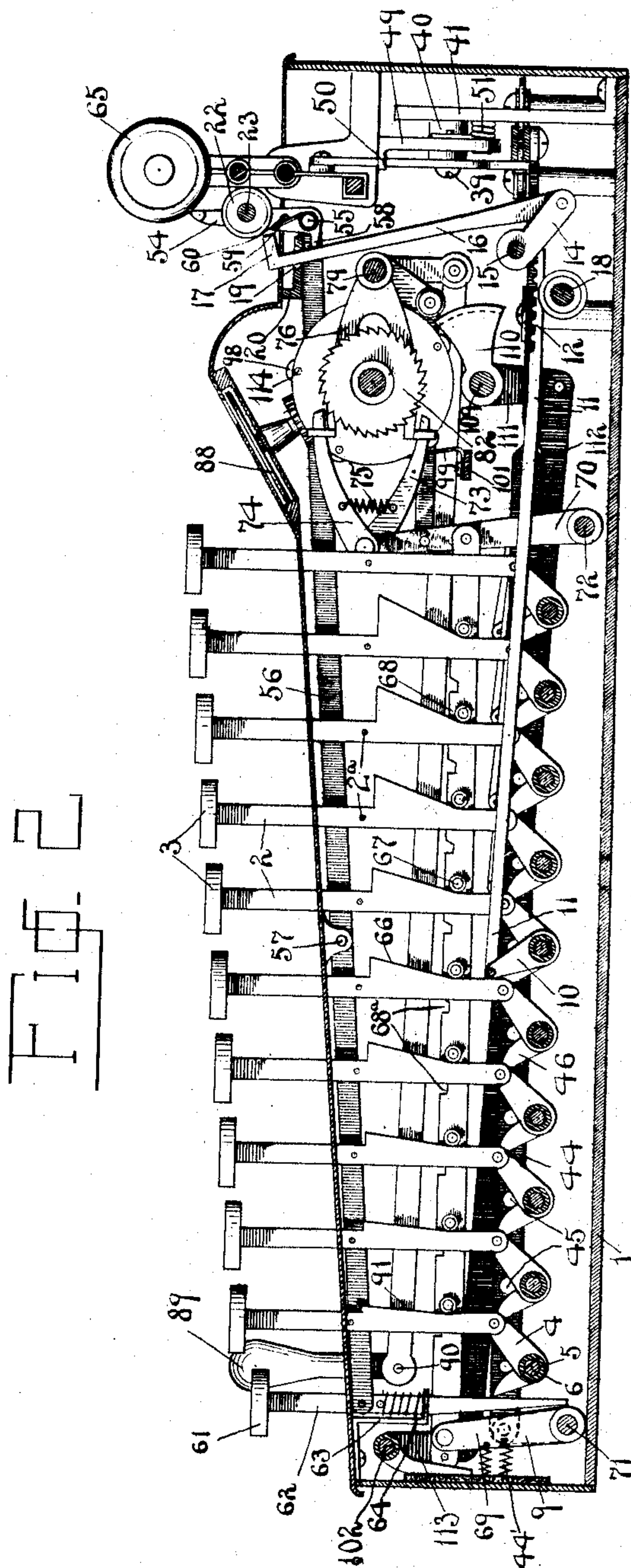
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5 SHEETS—SHEET 2.



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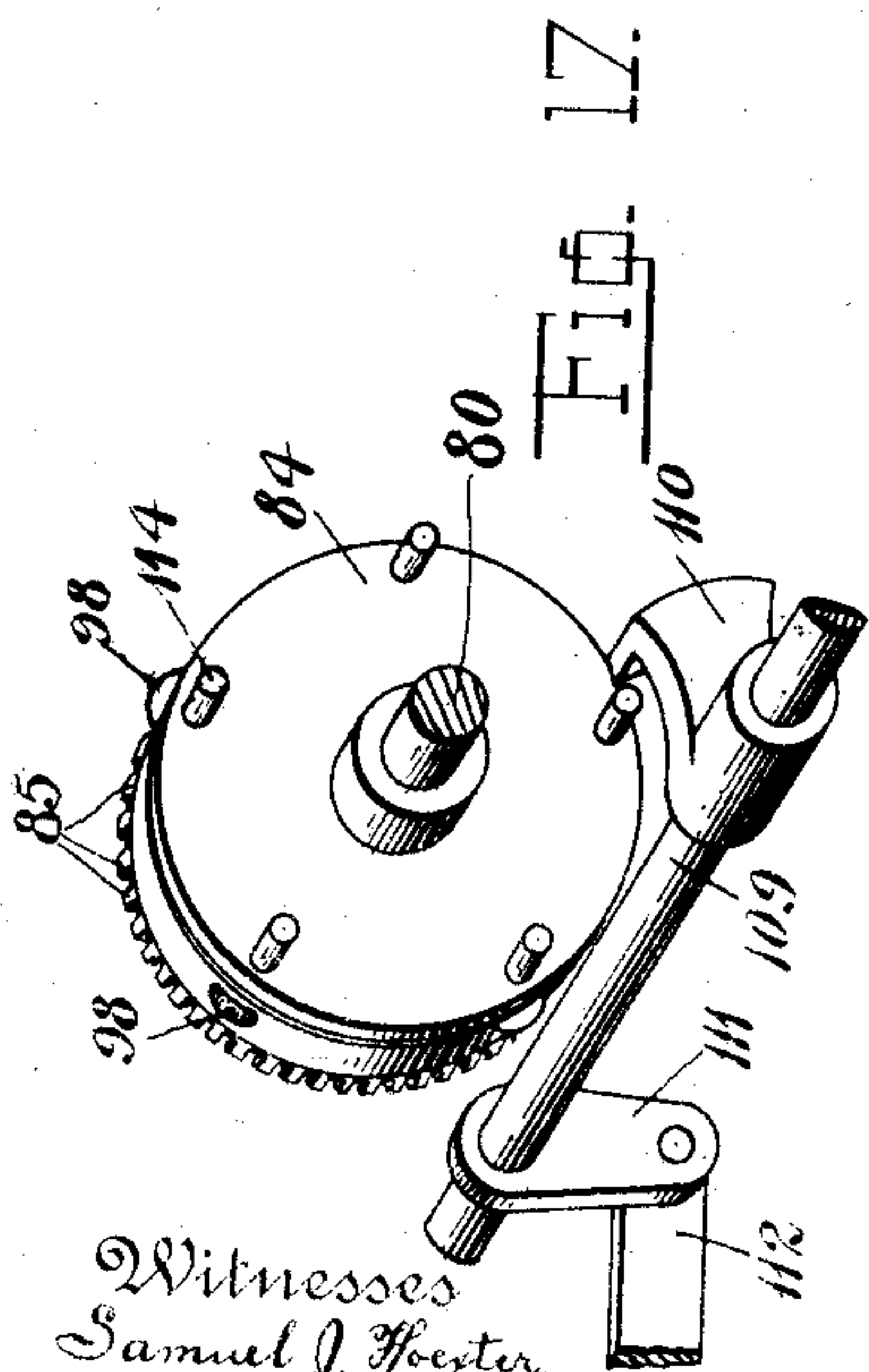
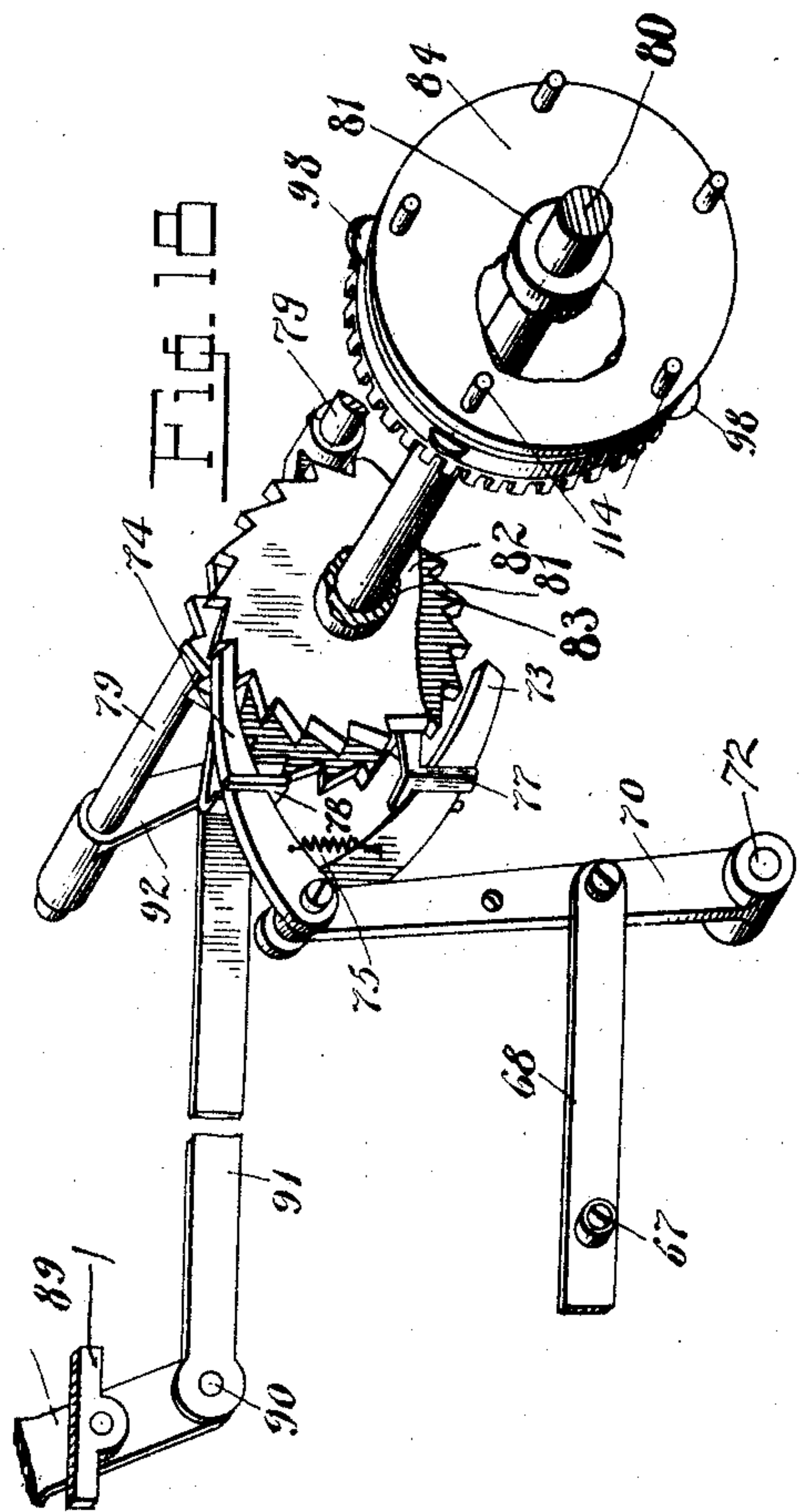
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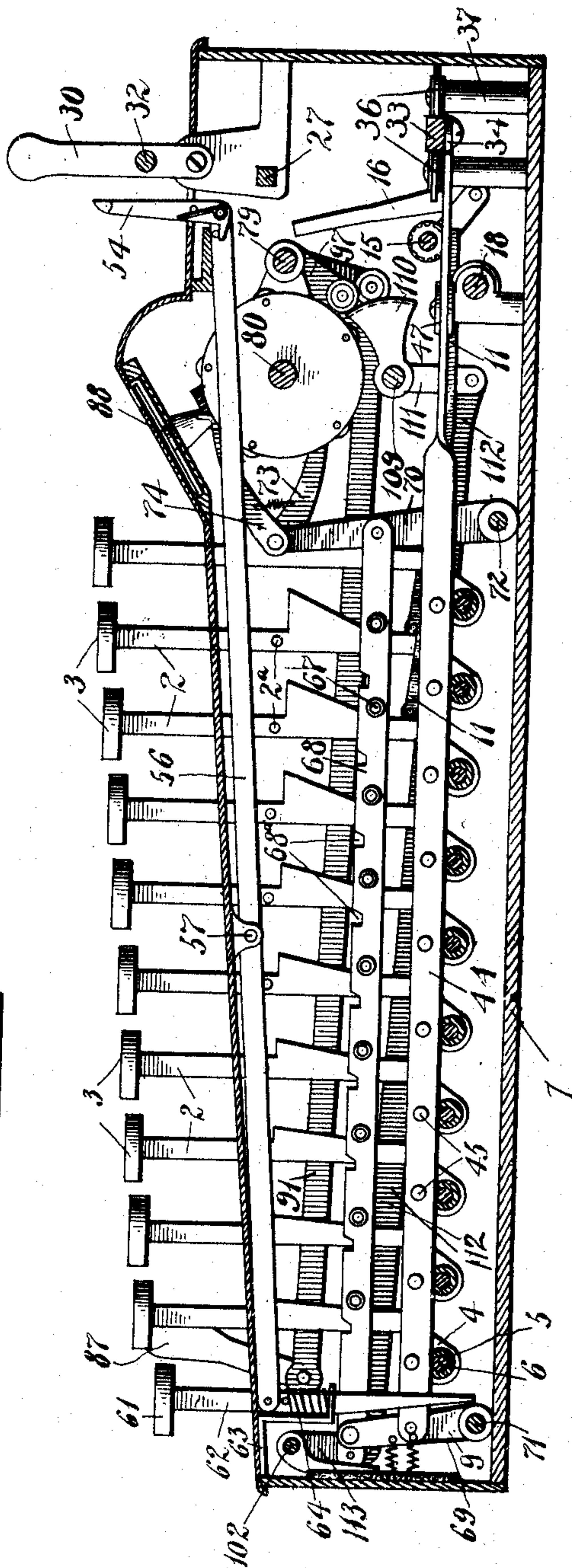
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6 SHEETS—SHEET 3.



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Fig. 24.



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5 SHEETS—SHEET 4.

Fig. 3.

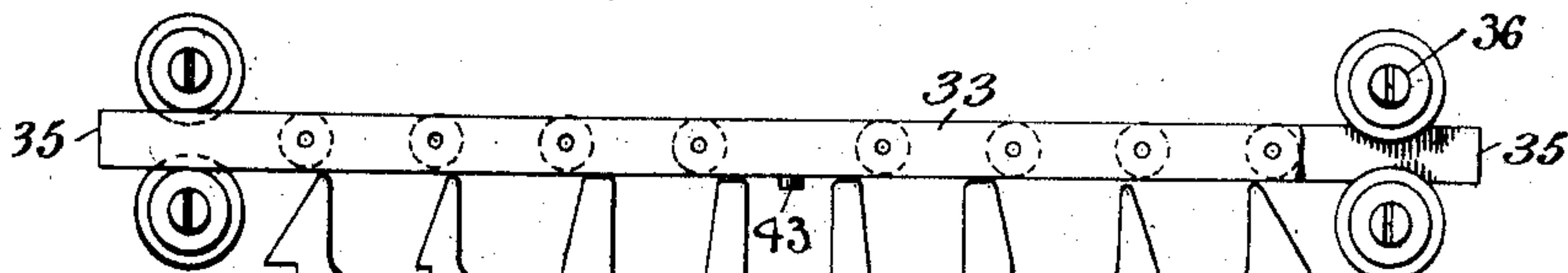
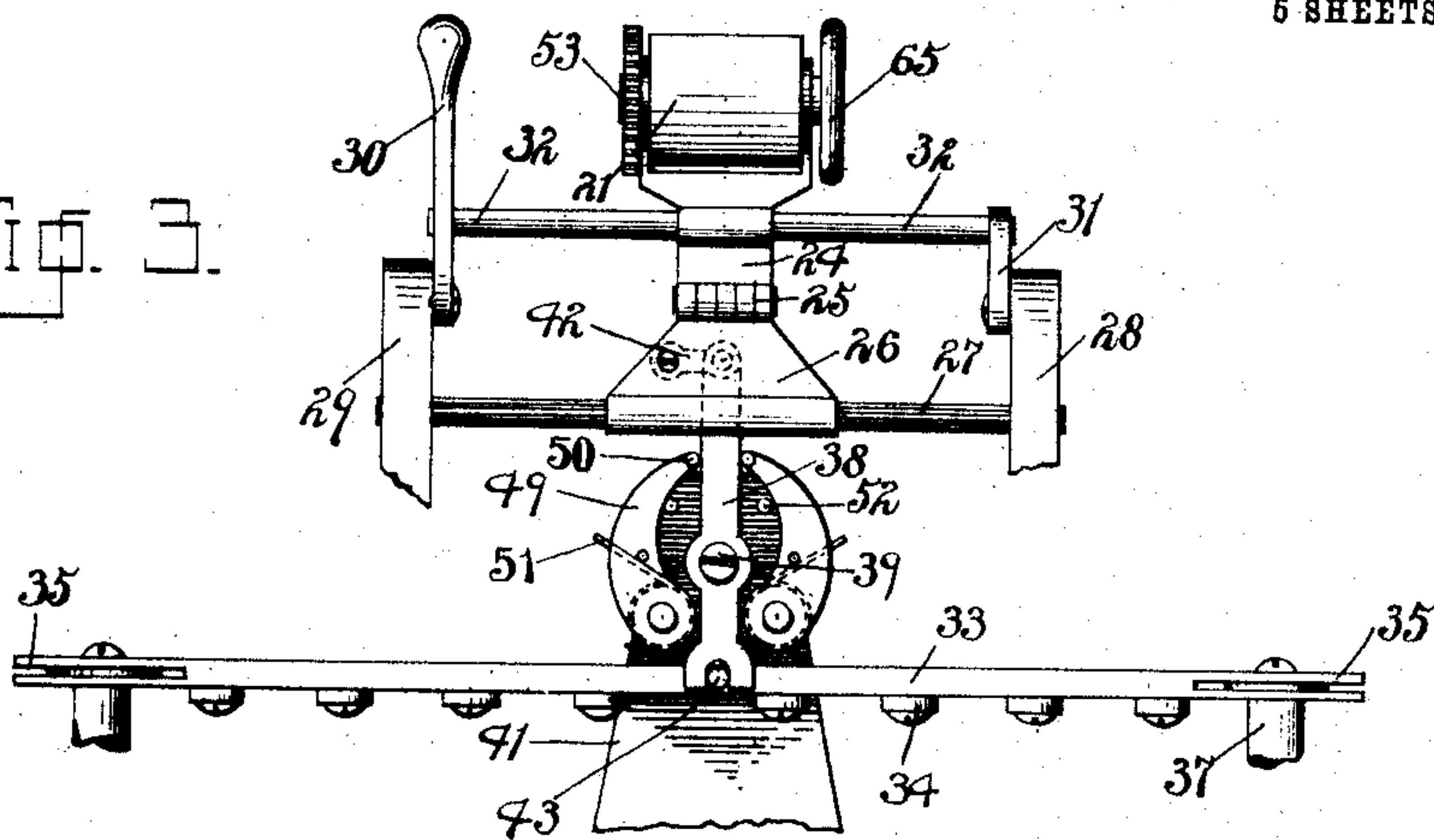


Fig. 4.

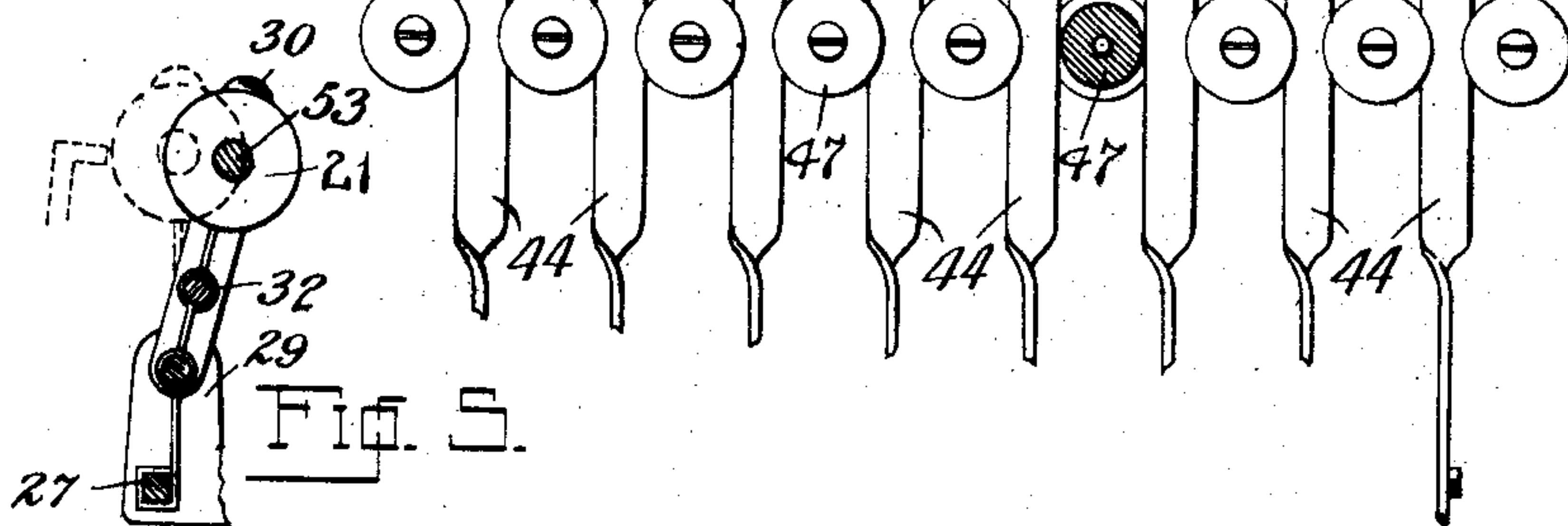


Fig. 5.

Fig. 6.

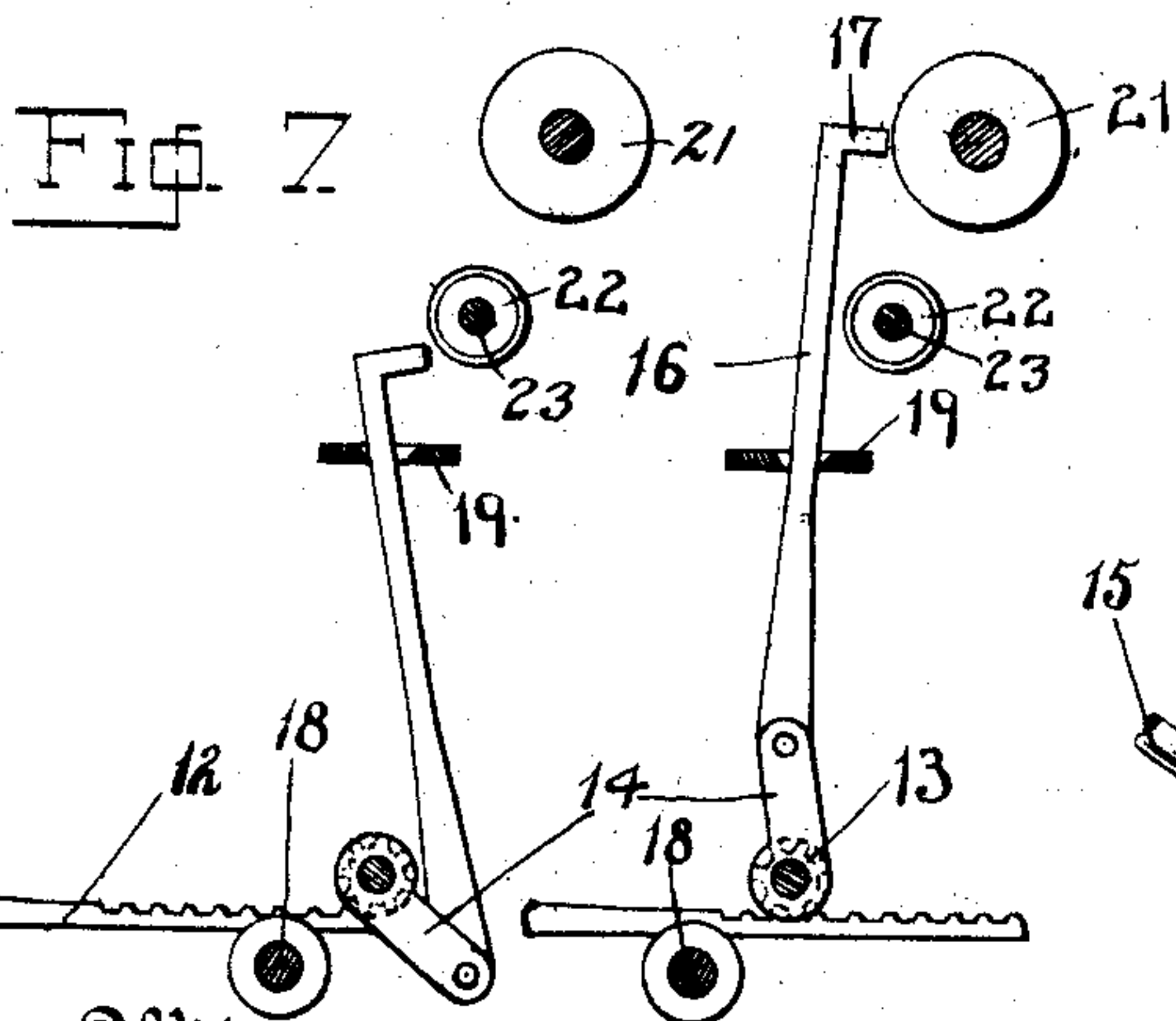


Fig. 7.

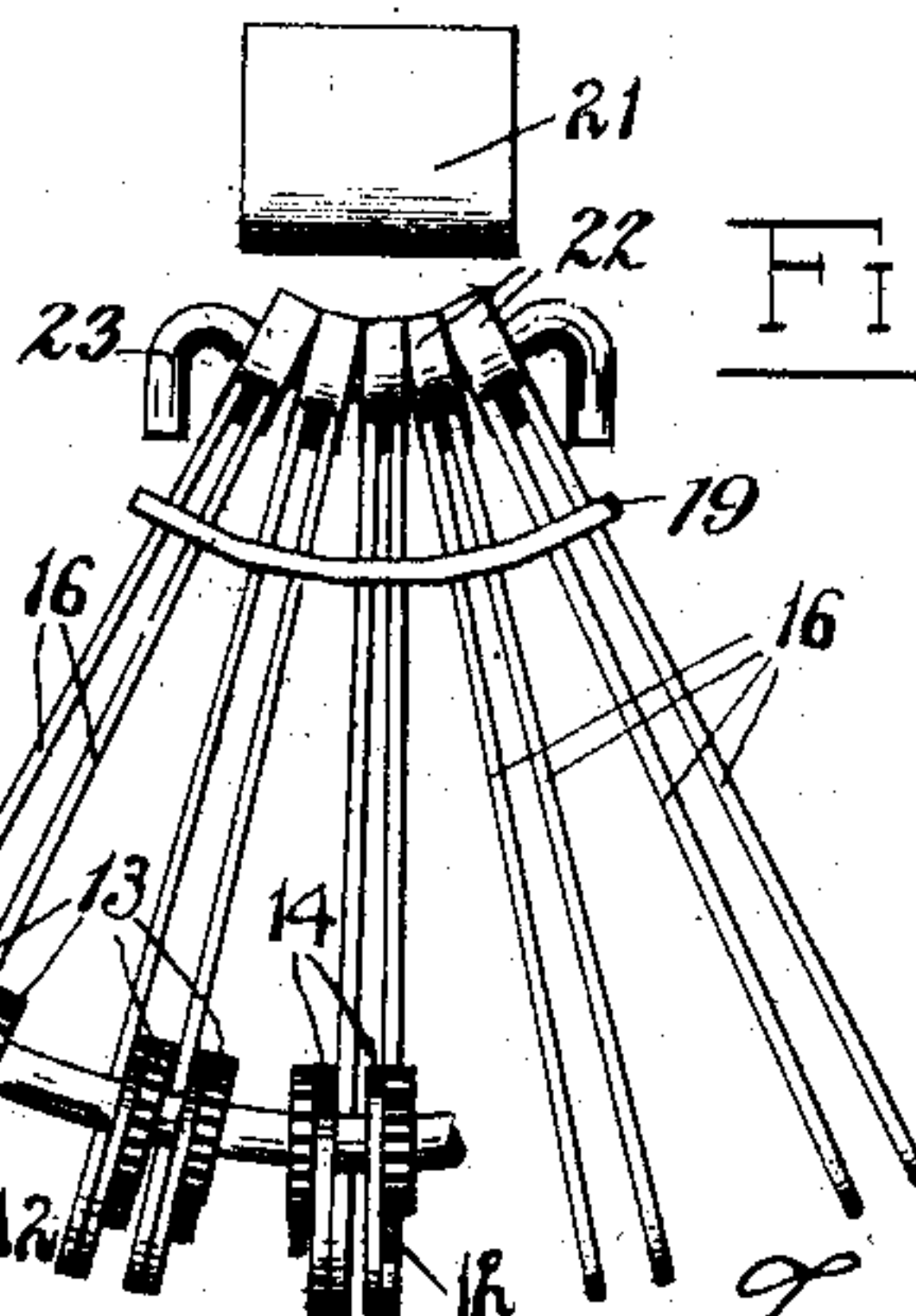


Fig. 8.

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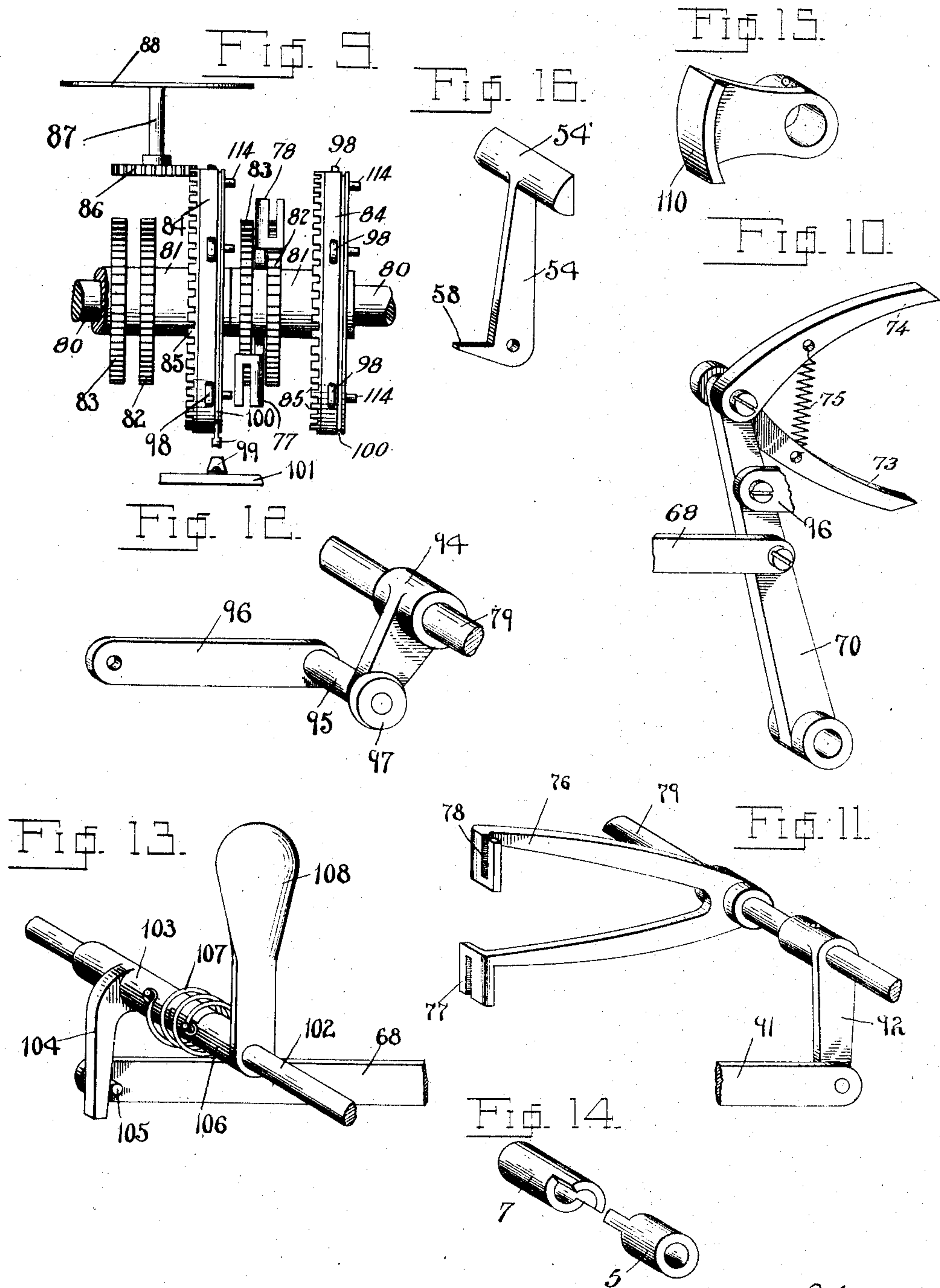
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MECHANICAL CALCULATOR AND RECORDER.

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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

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MECHANICAL CALCULATOR AND RECORDER.

No. 813,281.

Specification of Letters Patent.

Patented Feb. 20, 1906.

Application filed February 10, 1904. Serial No. 192,961.

To all whom it may concern:

Be it known that I, LUCIEN S. CRANDALL, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Mechanical Calculators and Recorders, of which the following is a specification.

My present invention relates to mechanical calculators and recorders and to that class of calculators and recorders in which the numbers to be recorded and totalized or subtracted are determined by depression of selected keys of a series of keys arranged in a suitable number of rows of ten keys, each row representing the denominational value of the figures to be printed or recorded by the depression of any of its ten keys—i. e., hundredths, tenths, units, tens, and so on.

In the present invention it is my object to provide mechanism whereby the registering or recording operation, or both, are completed simultaneously with and solely by the depression of a key.

In machines of this character it has been proposed also when it is desired to subtract one number from another to progress a registering or recording dial or dials or other medium of register or record until the same indicates the digit or digits of lesser unitary value desired, at the same time dogging or throwing out of operation the carrying mechanism to prevent the feed or progress of the indicating dial or dials or other instrument of next higher value. This unnecessarily complicates the mechanism. In the machine constructed in accordance with my invention subtraction is accomplished by a simple device or devices for reversing the register mechanism.

Further features of my invention are improved means whereby the recording device may be thrown out of operation, so that the register may be used alone, and means whereby the register may be thrown out of operation and the recording device used alone and means preventing the actuation of the register by the adding devices and the subtracting devices at one and the same time.

With a machine constructed in accordance with my invention it is possible to record a series of numbers on the recorder which may be added and from which other numbers may

be subtracted, the result, whether sum or remainder, being indicated on the register, to suspend actuation of the register so that such result may be transferred to the recorder, to return the register-dials to their zero positions to begin a new operation, or to continue the old calculation by allowing the result obtained to remain on the register-dials.

My invention further consists in many improved details of construction hereinafter described, and shown in the accompanying drawings, in which like reference-numerals refer to like parts, and in which—

Figure 1 is a top plan view, partly in section, of a mechanical calculator and recorder constructed in accordance with my invention. Fig. 2 is a central longitudinal sectional view of the same. Fig. 2^a is a like view on a different sectional line. Fig. 3 is a detail front elevation of the recorder-platen and the platen-shift bar. Fig. 4 is a top plan view, partly in section, showing the cam means for shifting the platen. Fig. 5 is a side elevation of the recorder-platen carriage, showing the same out of operative position. Fig. 6 is a detail front elevation showing the arrangement of the recorder type-bars. Fig. 7 is a detail sectional side elevation of one of the type-bars, illustrating the means for throwing the same into printing position. Fig. 8 is a similar view showing the type-bar in printing position. Fig. 9 is a detail front elevation, partly in section, showing one of the register-dial feed-gears and parts adjacent thereto. Fig. 10 is a detail perspective view showing the adding and subtracting pawls forming part of the register mechanism. Fig. 11 is a detail perspective view of the register-governor. Fig. 12 is a detail perspective view, partly in section, showing one of the series of carrying devices. Fig. 13 is a side elevation of the mechanism for returning the register-dials to their "0" position. Fig. 14 is a detail perspective view of an interlocking collar and sleeve used in the recording and "0" return devices. Fig. 15 is a detail perspective view of the dog for preventing the overmotion of the "0" return mechanism. Fig. 16 is a detail perspective view of the platen-spacing pawl. Fig. 17 is a detail perspective view of a portion of the "0" return mechanism, showing one of the transmitting-wheels, the stop-pins thereon, and

the relative positions of the stop-pins and one of the dog-plates; and Fig. 18 is a detail perspective view of a portion of the adding and subtracting mechanism.

5 *The key system.*—Referring now in detail to the drawings, 1 represents the casing of my improved calculating and recording machine, having mounted thereon a series of key-bars 2, having at their upper ends keys
10 3 and arranged, preferably, in eight longitudinal rows of ten keys each, although any number of such rows may be employed, each row representing the denominational value of a number registered or recorded by the
15 depression of any one of its ten keys—that is, tens, hundreds, thousands, or other denomination—and each of the said keys being numbered and representing a numerical value ranging from “1” to “9” and “0”—i. e.,
20 there being a lateral row of keys for each number from “1” to “9” and “0.” The key-bars 2 are mounted vertically in the machine-casing 1, sliding in suitable perforations in the top thereof and supported at their
25 lower ends on upwardly-projecting rock-arms 4, integral with key-faced sleeves 5, mounted on a rock-shaft 6, extending transverse the machine, for purposes fully hereinafter described. The keys 3 may be of any
30 suitable color or may be provided with any suitable indicia thereon.

Each of the sleeves 5 is loosely mounted on the rock-shaft 6 and, as stated, is provided with a finger or projection articulating with a
35 key or notched-faced collar 7, rigidly mounted upon the rock-shaft 6. Rock-shafts 6, of which there are ten in number, one for each lateral row of keys, are controlled by any suitable form of spring, such as springs 8,
40 mounted on the end of said shafts and secured at one end to said shaft and at the other end to the side of the casing 1. A depression of any key will rotate its key-faced sleeve 5 on the shaft 6 beneath said key.
45 Such rotation of the sleeve will through engagement with the collar 7 described rotate the shaft in the direction of the arrow, Fig. 1.

The printing or recording system.—One of the collars 7 on each of the ten shafts 6 is provided with an upwardly-projecting arm 10,
50 which is connected, through means of a sliding bar or pitman 11, having a rack 12 on its forward end, with pinion-teeth 13 on a crank-arm 14, pivotally mounted on a curved rod or
55 shaft 15, suitably seated or mounted in the rear part of the machine. There are ten crank-arms 14, each of which is connected in the manner described to one of the shafts 6, so that each is controlled by a lateral row of
60 keys. Each crank-arm 14 has pivotally mounted thereon a type-bar 16, at the upper end of which is a type-head 17 with a character thereon. The teeth 12 on bars 11 are held in engagement with the pinion-teeth 13
65 on the crank-arms 14 by a guide-wheel 18,

suitably positioned beneath the bars or pitmen 11, and upon which said bars 11 are supported at their forward ends. In this manner each shaft 6 is connected to a particular type-bar, the shaft 6 at the extreme front of
70 the machine being connected to the first type-bar on the right, (shown in Fig. 6,) the second shaft being connected to the second type-bar, the third shaft being connected to the third type-bar from the right, and so on. 75
Each of the type-bars 16 carries on its type-head a number-type, said numbers being “1, 2, 3, 4, 5, 6, 7, 8, 9, 0” and running in consecutive order from right to left of the machine. Near their upper ends each of the
80 type-bars 16 passes through a guide hole or perforation 19 in a plate 20, suitably mounted in the machine-casing. The object of these perforations or holes 19 will be described later. 85

21 is the printing-platen, mounted as hereinafter described.

22 represents a series of inking-rolls of any suitable number, but numbering five, as shown in the drawings, one for each two or
90 more or less type-bars rotatably mounted on a bar 23, shown in the drawings curved to conform to the arrangement of the type-bars. Inking-rolls 22 are arranged immediately above and out of contact with the type-heads
95 17, so that when the said type-heads are projected into printing position they will pass over the surface of said rolls, thereby inking the type on said heads. Any other suitable means may be employed for inking the said
100 type, or direct inking means may be done away with entirely and suitable ribbon mechanism substituted. As the pitmen 11 are shoved forward the teeth 12, engaging the
105 teeth 13 on the crank-arms 14, rotate said crank-arms, forcing the type-bar 16 upwardly through perforation 19, the type-head 17 passing over inking-rolls 22. As the crank-arm 14 reaches a vertical position the type-bar 16, which rests normally in a slanting position, will be vibrated and thrown toward
110 the platen, striking the same, and thereby making the impression. Such movement of the type-bar being caused by the rotation of the shaft 6 in opposition to its spring 8, the
115 type-bar is returned to its normal position by the return of the said shaft to its normal position by the said spring.

The platen-shifting mechanism.—In order to determine the denominational value of a
120 number printed in the manner already described, it is desirable to shift the position of the recorder-platen 21. This I accomplish in the following manner: The frame of the platen-carriage comprises a plate 24, hinged
125 at 25 to a sliding plate 26, mounted on a guide-bar 27, seated in standards 28 29 on the machine-casing 1. Pivoted to standard 29 is a shift lever or handle 30, connected to a rock-arm 31, pivoted to the standard 28 by a
130

bar 32. Bar 32 passes through the plate 24, which is slidable thereon. Such arrangement is provided for the purpose of throwing out the recorder-platen when it is desired to suspend record temporarily or to use the register alone. It will be readily seen that the throw of the lever or handle 30 to the rear will carry the platen 21 away from the printing-point. Extending transverse the machine-casing beneath the platen 21 and its frame is a slide or shuttle bar 33, carrying antifriction-rollers 34. Slide-bar 33 may be mounted in any suitable manner to slide in either direction transverse the casing 1, and, as shown in the drawings, the same is mounted through slots 35 on the flanged guide-rollers 36, mounted on posts 37 on the bottom of the machine-casing. Plate 26 of the recorder-platen frame or carriage is connected to bar 33 through means of a lever 38, pivoted at 39 to a post 40 on a frame 41, mounted at the rear of the machine-casing. Lever 38 is connected at its upper end to the sliding plate 26 by a pivoted link 42 and is forked at its lower end to straddle a pin 43 on slide-bar 33.

Each of the eight longitudinal rows of keys 3 has mounted beneath it above the rock-shafts 6 a shuttle-bar 44, extending longitudinally in the casing and provided with a series of pins 45, adapted to engage cams or projections 46 on sleeves 5, there being one pin 45 for each sleeve 5. At their rear ends bars 44 are twisted, so that their faces are parallel with the bottom of the machine-casing and slide between and are supported by guide-rollers 47, being supported at their forward ends by rock-arms 9, loosely mounted on a shaft 71. Shuttle-bars 44 are, furthermore, formed with cam-surfaces 48 at their rear ends, each of said bars through its cam-surface being in a path to engage one of the antifriction-rollers 34 upon the movement of the said bar. Cam-surfaces 48 face four to the right-hand side of the machine and four to the left-hand side of the machine. Cam-surfaces 48 vary in extent, shape, or size, so that upon actuation of their respective shuttle-bars 44 they will move the slide-bar 33 a distance sufficient to move the platen-carriage to the proper printing position to give the number printed the denominational value determined by the column in which the depressed key is located.

From the foregoing it will be seen that at the same time that the key is depressed, throwing the proper type-bar into printing position through mechanism already described, the cam or projection 46 on the sleeve 5, partially rotated by the key depressed through engagement with one of the pins or projections 45 on its shuttle-bar 44, will force the said shuttle-bar forward, throwing the cam-face 48 of said shuttle-bar into engagement with its antifriction-roller 34 on

the bar 33, so that the said bar 33 is moved a distance sufficient to move the platen frame or carriage through the lever 38 to a position to print the number in a position on the platen which will give it the denominational value represented or determined by the position of the column of keys in which the depressed key is located.

In view of the foregoing mechanism it is necessary that the platen-carriage rest normally in a central position. For this purpose I have provided a pair of pivoted arms 49, mounted on the frame 41 and having bearing lugs or projections 50 held normally against the lever 38 by the action of springs 51, holding arms 49 normally against stop-pins 52 on the frame 41. By this means each movement of the lever 38, whether to right or left, will be in opposition to one or the other of the arms 49, which will through springs 51 return the said lever to its central or vertical position. The platen carriage or frame being connected through link 42 to the lever 38 is therefore held normally in a central position on the bar 27. It is obvious that any movement of the lever 38 will communicate a proportionate movement to the bar 33, so that if the bar 33 has been moved to one side or the other of its normal position to bring the carriage to the desired printing position the said bar will, with the other parts described, be returned to its normal position. The shuttle-bars 44 are returned to their normal positions by springs 44', secured at one end to the machine-casing and at their other ends in eyes in the said shuttle-bars.

For the purpose of line-spacing on the platen 21 I have provided a suitable ratchet-wheel 53 and beneath the ratchet 53 a pawl 54, having an elongated tooth 54' and pivoted at 55 to the end of a bar 56, pivoted at 57 to ears on the machine-casing 1. The forward movement of the pawl 54 is limited by a finger 58 on the heel of the said pawl, engaging a pin or projection on the bar 56. Pawl 54 is held normally in vertical position by a spring 59, mounted on its pivotal pin 55 and secured to a pin or projection 60 on the said pawl.

61 is a space-key having a stem 62 pivotally connected to the bar 56 and sliding through a guide-bracket 63.

64 is a coil-spring mounted on the stem 62, adapted to hold key 61 normally in its forward position.

Stem 62 extends downwardly in the casing to a point just above the bottom of the casing, the downward movement of the said stem being limited by the end thereof contacting with the bottom of the casing.

A downward depression of the key 61 raises the rear end of the bar 56, throwing the pawl 54 upwardly into engagement with the teeth of the ratchet-wheel 53 to rotate the platen 21 a distance equal to one line-space.

The elongated tooth 54' of the pawl 54 is provided to allow for slight irregularities in the position of the recorder-platen. The flexible connection between the pawl 54 and the bar 56 described is provided to allow the said pawl to ride over the teeth of the said ratchet upon the return movement of the key 61 under the influence of its spring 64. A hand-wheel 65 is also mounted on the platen 21, so that the same may be turned forward or backward, as desired, for the purpose of spacing, making corrections, or any other reasons. Any other suitable devices may be used in connection with the recorder-platen carriage, such as paper guides, rollers, and other attachments common to the ordinary type-writing construction. Other means may be used for line-spacing and for shifting the platen, if desired.

The totaling or registering system.—Each of the key-bars 2 excepting the zero-key bar is provided with a cam-surface 66, facing toward the rear of the machine and each engaging an antifriction-roller 67 on shuttle-bars 68. Shuttle-bars 68 are commensurate in number with the longitudinal rows of keys—that is, one shuttle-bar 68 for the hundreds-column, one for the tens-column, one for the units-column, and so on. Each shuttle-bar 68 is supported by a pair of rock-arms 69 70, the rock-arm 69 being loosely mounted on a shaft 71 at the front of the machine, the rock-arm 70 being mounted on a shaft 72 in the rear portion of the casing. Mounted at the upper end of each rock-arm 70 is a subtracting-pawl 73 and an adding-pawl 74, connected by a spring 75 and sliding in a bifurcated rock-arm 76, having a notch 78 in one fork thereof to receive the adding-pawl 74 and a notch 77 in the other fork thereof to receive the subtracting-pawl 73. Rock-arm 76 is rigidly mounted upon a shaft 79, suitably mounted in and extending transverse the casing. Mounted on a shaft 80, extending transverse the machine, are a series of collars 81 equal in number to the number of longitudinal rows of keys employed. Rigidly mounted on or integral with each collar are a pair of ratchet-wheels 82 83. The teeth of the ratchet-wheels 82 83 project in opposite directions. The teeth of the ratchet-wheel 82 are adapted to be engaged by the adding-pawl 74, and the teeth of the ratchet-wheel 83 are adapted to be engaged by the subtracting-pawl 73 in a manner hereinafter described. Each collar 81 has also mounted rigidly thereon a transmitting-wheel 84, having a crown-gear 85 meshing with a pinion 86 on a shaft 87 of a register-dial 88. The number of register-dials 88 also corresponds with the number of longitudinal rows of keys.

89 is a shift handle or lever suitably pivoted to the machine-casing and pivotally connected at 90 at its lower end to a bar 91, ex-

tending rearwardly in the casing, and a rock-arm 92, rigidly mounted on the rock-shaft 79. The thrust of the handle or lever 89 in the direction of the arrow, Fig. 2, through the bar 91 and rock-arm 92, rocks the rock-shaft 79, elevating the bifurcated rock-arm 76 and raising the pawls 73 74, which are held toward each other by the springs 75, and throwing the subtracting-pawl 73 into the path of engagement with the teeth on the ratchet-wheel 83. The movement of the handle or lever 89 to the limit of its throw in the opposite direction will lower the bifurcated rock-arm 76 to bring the adding-pawl into engagement with the teeth of the ratchet-wheel 82. The movement of the handle or lever 89 to the central or vertical position holds both of the pawls out of the path of engagement with their respective ratchet-wheels. The bifurcated rock-arm 76 therefore operates as a governor to the register mechanism.

Upon the depression of a key 3 the shuttle-bar 68 will be forced toward the rear of the machine a distance depending upon the value of the key depressed, forcing the rock-arm 70 to the rear and carrying the pawls 73 74 rearward through guide-notches 77 78 respectively.

For preventing overmotion of the shuttle-bars 68 I provide stop pins or projections 2^a on each of the key-bars 2, which are in line with and are adapted to engage a series of notches 68^a in shuttle-bars 68 upon the key-bars reaching the limit of their depression.

The register indicates the result after a series of operations, whether of addition or subtraction, of all or certain of the numbers recorded on the recorder; but as a general rule in the use of the machine the register will show the sum of all the numbers recorded. If it is desired to transfer this result, whether it be the sum or the remainder of an addition or subtraction, to the bottom of the column of figures recorded on the recorder without adding or subtracting this result to or from itself on the register, the handle 89 is moved to its central or vertical position, as shown in Fig. 2, in which case both pawls 73 and 74 are held out of the path of engagement with their respective ratchet-wheels, so that by the depression of a key, although displacing the shuttle-bar 68 and moving its rock-arm 70, no motion will be communicated to the total-dial 88, controlled by the operation of the key depressed, owing to the fact that the actuating-pawls fail to engage the teeth of their respective ratchet-wheels. Such arrangement therefore makes it possible to record a series of numbers on the platen and then record the result without altering or changing the statement on the total-dials.

The carrying mechanism.—In order to perform the adding or subtracting operation necessary in machines of this character, I

have provided a very simple mechanism consisting in a rock-arm 94, loosely mounted on the shaft 79, carrying at its outer end a pin 95, upon which is pivotally mounted a link 96, connected directly to one of the rock-arms 70. Each of the rock-arms 70 is thus connected to the shaft 79. On the pin 95 is an antifriction-roller 97, adapted to engage any one of the five cam projections 98 on the next adjacent transmitting-wheel 84 of lower denomination. For the purpose of clearness the transmitting-wheel 84 may be described as being divided into five segments, each segment including a sufficient number of teeth of the crown-gear 85 to rotate the pinion 86 one revolution, each of such segments being provided with one of the cam projections 98.

From the foregoing it will be seen that upon a complete revolution of one of the register-dials of lower denomination the antifriction-roller 97 in line with the transmitting-wheel 84, connected to such dial, will be displaced by engagement with one of the five projections 98 on such transmitting-wheel, drawing the link 96, by means of the pin 95, to the rear, pulling the rock-arm 70 of the next higher denomination to the rear a distance sufficient to move the adding-pin or the subtracting-pin, depending upon which pawl is in the path of engagement with its pinion, a distance equal to one tooth, thereby increasing or decreasing, such as the case may be, the value of the number on the register-dial of such higher denomination.

The movement of each of the transmitting-wheels 84 is governed or controlled by a spring 99, engaging a groove 100 in the periphery of the wheel. Springs 99 may be mounted in any suitable manner—such, for instance, as on the bar 101, suitably supported in the machine.

The zero-return mechanism.—For the purpose of returning the dials to their zero positions the following mechanism is provided: A shaft 102, extending transversely in the machine-casing, at the forward end thereof, has loosely mounted thereon a series of sleeves 103, provided with downwardly-projecting fingers 104, engaging pins 105 on the shuttle-bars 68. The number of sleeves 103 is equal to the number of longitudinal rows of keys and to the number of shuttle-bars 68, there being one sleeve 103 for each shuttle-bar 68. Mounted rigidly on the shaft 102, adjacent each sleeve 103, is a collar 106, having a finger or projection held normally in engagement with the notched end of the sleeve 103 by a spring 107, secured at one end to the said sleeve and at the other end to the said collar.

108 is an operating-handle mounted rigidly on the shaft 102 and adapted to rock said shaft when actuated. A forward pull of the operating-handle 108 will partially rotate each of the collars 106, which through

springs 107 will communicate motion to the sleeves 103, forcing the shuttle-bars 68 to the rear until further movement of the said shuttle-bars is obstructed. Springs 107 are of sufficient strength, therefore, to move shuttle-bars 68 until the latter are obstructed. Inasmuch as the shuttle-bars 68 will not all be obstructed at one and the same time, it becomes necessary to provide the flexible connection between each of the sleeves 103 and the shaft 102. Upon obstruction of a shuttle-bar 68 rotation of the sleeve 103, connected to such shuttle-bar, will be stopped and further movement of the handle or lever 108 will then be in opposition to the spring 107, connected to the particular sleeve 103 dogged. As has already been described, the rearward movement of any one of the shuttle-bars 68 forces the rock-arm 70 to the rear, feeding either the adding or subtracting gear-wheel or neither, depending upon whether the adding or subtracting pawl is in the path of engagement with its gear-wheel or whether both are held out of the path of engagement. When it is desired to return all of the register-dials to their zero positions, the adding-pawls 74, through operation of the lever 89, are lowered into the path of engagement with their respective gear-wheels 83. The handle 108 is then drawn forward, throwing all of the shuttle-bars 68 to the rear and feeding each of the dials 88 around until they are stopped at their zero positions, as hereinafter described. For stopping the dials 88 in their zero positions or for preventing overmotion of the same a dog-plate 110 for each of the transmitting-wheels 84 is rigidly mounted upon a shaft 109, extending transverse the machine beneath the said transmitting-wheels. Dog-plates 110 will normally be in inoperative position beneath the transmitting-wheel 84 and are adapted to be thrown into operative position through partial rotation of the shaft 109 by a link 111, connected by a bar 112 and a link 113 to the shaft 102. Projecting from the side of each of the transmitting-wheels 84 are five stop-pins 114, corresponding in positions to the cam projections 98 on the periphery of the said wheels. When the handle 108 is pulled forward and the shaft 102 partially rotated to throw back all of the shuttle-bars 68, the link 113, communicating motion to the bar 112 and the link 111, partially rotates the shaft 109, throwing the stop-plates 110 upward into the path of rotation of the stop-pins 114. The transmitting-wheels 84 and dials 88 are so geared and arranged when the parts of the machine are assembled that when the stop-plates 110 are projected into their operative positions and any one of the five pins 114 on each of the transmitting-wheels 84 rests against its stop-plate 110 the dial of the particular denomination to which the transmit-

ting-wheel upon which the said stop-pin is located will rest in its zero position. It will therefore be obvious that the bringing of each of the transmitting-wheels to a position wherein one of its stop-pins 114 rests against a stop-plate 110 will bring all of the dials to register zero.

As shown in Fig. 2, the dials 88 are arranged on an angle facing the operator, being covered by a raised portion of the casing 1, provided with sight-openings 115. In order to make the dials 88 of suitable size, the same may be shingled or overlapped, as shown in Fig. 1.

I do not wish to be understood as limiting myself to the exact details of structure herein shown and described, inasmuch as the same may be varied without departing from the spirit of my invention.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a machine of the character described, the combination with a record - printing platen, of means for moving said platen variable longitudinal distances to right or left of a constant normal position to predetermined positions.

2. In a machine of the character described, the combination with a movable record-printing platen, of means for moving said platen variable longitudinal distances to predetermined positions, and means for automatically returning the platen to its initial position.

3. In a machine of the character described, the combination with the key mechanism, the register mechanism actuated thereby, and a series of type-carriers actuated by said key mechanism, of a record-printing platen adjustable on either side of a central normal position, and cam means for throwing said platen to its adjusted position.

4. In a machine of the character described, the combination with the key mechanism, the register mechanism actuated thereby and the type-carriers actuated thereby, of an adjustable platen resting normally in a central position, cam means for adjusting said platen to either the right or left of said normal position, and means for returning said platen to its normal position.

5. In a machine of the character described, the combination with the key mechanism, the register mechanism actuated thereby and the type-carriers actuated thereby, of an adjustable platen resting normally in a central position, an adjustable shuttle-bar, suitable lever connection between the shuttle-bar and the platen, and cam means actuated by the key mechanism for adjusting said shuttle-bar.

6. In a machine of the character described, the combination with the key mechanism and the register mechanism actuated thereby, of a platen - carriage frame, the platen-

carriage slidably mounted thereon, a lever connected to said carriage, an adjustable shuttle-bar connected to said lever, means actuated by the key mechanism for adjusting said shuttle-bar to selected positions, and spring-pressed arms bearing against said lever and adapted to hold the same normally in central position.

7. In a machine of the character described, the combination with the key mechanism and the register mechanism actuated thereby, of a jointed platen - carriage frame, a hinged platen - carriage slidably mounted thereon, means for holding said carriage in a central normal position, and means actuated by said key mechanism for adjusting said carriage to either right or left of said central normal position to determine the denominational value of characters printed thereon.

8. In a machine of the character described, the combination with the key mechanism, the register mechanism actuated thereby, an adjustable platen, means for holding said platen normally in central position, a shuttle-bar, lever means connecting said platen and shuttle-bar, a series of shuttle-bars operatively connected to the key mechanism having cam-faces adapted to engage the first-mentioned shuttle-bar to force the platen to either right or left of its central position.

9. In a machine of the character described, the combination with longitudinal rows of keys, the register mechanism actuated thereby, and a platen adjustable to either right or left of a central normal position, of a shuttle-bar for each longitudinal row of keys, suitable cam connection between the longitudinal rows of keys and their respective shuttle-bars, and suitable connection between the shuttle-bars and the platen to adjust the latter to a position either right or left of its central normal position depending upon the shuttle-bar actuated.

10. In a machine of the character described, the combination with a series of longitudinal rows of keys having different denominational values, an adjustable platen held normally in a central position, of a series of shuttle-bars of different denominational values one for each longitudinal row of keys, suitable cam connection between the rows of keys and their respective shuttle-bars, a laterally-adjustable shuttle-bar having projections thereon mounted in the path of the cam-faces of the said series of shuttle-bars, and suitable connection between the said lateral shuttle-bar and the said platen to communicate motion to the latter, upon actuation of the former by any one of the series of denominational shuttle-bars.

11. In a machine of the character described, the combination with the key mechanism, of a register-dial, a transmitting-wheel geared to said dial, reversed ratchet-wheels operatively connected to said transmitting-

wheel, an adding-pawl adapted to engage one of said ratchet-wheels, a subtracting-pawl adapted to engage the other of said ratchet-wheels, shuttle-bars actuated by the key mechanism for actuating said pawls upon actuation of the key mechanism, and a governor adapted to guide either one or the other of said pawls into engagement with its respective ratchet-wheel.

10 12. In a machine of the character described, the combination with the key mechanism, of a register-dial, a transmitting-wheel geared to said dial and suitably mounted in the machine-casing, an adding ratchet-wheel connected to said transmitting-wheel, 15 a subtracting ratchet-wheel also connected to said transmitting-wheel, pawls for engaging the respective ratchet-wheels, suitable connection between the key mechanism and said pawls to actuate the latter simultaneously with the former, and a governor adapted to guide either of the pawls into engagement or hold both out of the path of engagement.

25 13. In a machine of the character described, the combination with the key mechanism, of the register-dials, the transmitting-wheels geared thereto and having cam projections, the ratchet-wheels operatively connected to each of the transmitting-wheels, 30 the pawls adapted to be projected into the path of their respective ratchet-wheels, the connection between the key mechanism and the said pawls, the antifriction-wheel in the path of and adapted to engage, the cam projections on a transmitting-wheel of lower denomination, the connection between the antifriction-wheel and the pawls of the transmitting-wheel of next higher denomination, and 40 the means for throwing either of the said pawls into the path of engagement with their respective ratchet-wheels.

14. In a machine of the character described, the combination with the dial, the 45 transmitting-wheel geared thereto, the shuttle-bar adapted to be actuated by depression of the keys, pawl-and-ratchet connection between said transmitting-wheel and said shuttle-bar, the projections on the transmitting-wheel, the stop-plate adapted to be thrown 50 into the path of said projections, and the means independent of the keys for throwing said stop-plates into the path of the projections and actuating said shuttle-bar.

55 15. In a machine of the character described, the combination with the dial, the transmitting-wheel geared thereto and having projections thereon, the longitudinal row of keys having graduated cam-faces, the 60 shuttle-bar engaging and adapted to be actuated by said cam-faces, pawl-and-ratchet mechanism adapted to actuate the transmitting-wheel and connected to said shuttle-bar, the stop-plate adapted to be thrown into 65 the path of the projections on the transmit-

ting-wheel, means independent of the keys for actuating said shuttle-bar, and a flexible connection between said independent actuating means and said stop-plate and shuttle-bar.

70 16. In a machine of the character described, the combination with the key mechanism, the register mechanism actuated thereby, of a record-printing platen adjustable to either side of a normal central position, means for adjusting said platen by direct action of said key mechanism, and means for printing a record upon said platen.

17. In a machine of the character described, the combination with the key mechanism, the register mechanism, the record-printing mechanism comprising the record-printing platen, and the platen-shift mechanism, of intermediate mechanism actuated directly by the action of the key mechanism 85 to actuate said register, printing and platen shift mechanisms simultaneously with the actuation of said key mechanism.

18. In a machine of the character described, the combination with the key mechanism, the register mechanism, the record-printing mechanism comprising the record-printing platen, and the platen-shift mechanism, of intermediate mechanism actuated directly by the action of the key mechanism 95 to actuate said register, printing and platen shift mechanisms actuated simultaneously, and at one operation with the actuation of said key mechanism.

19. In a machine of the character described, the combination with the key mechanism and the indicators, of a pair of pawls for each of said indicators operated by said key mechanism to operate said indicators in either direction and means for moving either 105 of said pawls into operative engagement, or for holding both of said pawls out of operative engagement.

20. In a machine of the character described, the combination with the key mechanism and the indicators, of a pair of pawls for each of said indicators operated by said key mechanism to operate said indicators in either direction, shuttle-bars actuated by said key mechanism for operating said pawls 115 and means for moving either of said pawls into operative engagement.

21. In a machine of the character described, the combination with the key mechanism and the indicators, of a rock-arm for 120 each of said indicators, duplicate pawls mounted on each of said rock-arms, shuttle-bars actuated by said key mechanism for operating said rock-arms and means for moving either of said duplicate pawls into operative 125 engagement to determine the direction of movement of an indicator.

22. In a machine of the character described, the combination with the key mechanism and the indicators, of addition and 130

subtraction pawls for operating said indicators, shuttle-bars for operating said pawls and operated by said key mechanism and means for moving either the addition or the subtraction pawl into or out of operative engagement.

23. In a machine of the character described, the combination with the key mechanism and the indicators, of addition and subtraction pawls for operating each of said indicators, shuttle-bars for operating said pawls and operated by said key mechanism, means for moving either the addition or the subtraction pawl into or out of operative engagement, and carrying mechanism for transferring items from one indicator to the indicator of next higher denomination.

24. In a machine of the character described, the combination with the key mechanism and the indicators, of transmitting-wheels for operating said indicators, a pair of pawls for each of said wheels for operating each of said wheels in either direction and operated by said key mechanism, and a series of devices independent of said key mechanism operated by transmitting-wheels of lower denomination for operating the pawls of transmitting-wheels of next higher denomination.

25. In a machine of the character described, the combination with the key mechanism and the indicators, of transmitting-wheels for operating said indicators, a pair of pawls for each of said indicators for operating each of said indicators in either of two directions and operated by said key mechanism, a series of devices independent of said key mechanism operated by transmitting-wheels of lower denomination for operating pawls of next higher denomination, and means for moving either pawl of the respective pairs of pawls into or out of operative engagement.

26. In a machine of the character described, the combination with indicators and transmitting-wheels for driving said indicators, of pawls for driving said transmitting-wheels and key mechanism for operating said pawls, and means independent of said key mechanism operated periodically by transmitting-wheels of lower denomination for operating the key-actuated pawls of indicators of the next higher denomination.

27. In a machine of the character described, the combination with the key mechanism and the indicators, of key-operated pawls for driving said indicators and means independent of said key mechanism for operating key-actuated pawl of higher denomination at definite periods in the movement of indicators of lower denomination.

28. In a machine of the character described, the combination with the key mechanism and the indicators, of key-operated pawls for driving said indicators, means in-

dependent of said key mechanism for operating a pawl of higher denomination at definite periods in the movement of an indicator of next lower denomination, and means for moving said pawls into or out of operative engagement.

29. In a machine of the character described, the combination with the key mechanism and the indicators, of transmitting-wheels for driving said indicators, of addition and subtraction pawls for driving each of said transmitting-wheels and operated by said key mechanism, and means for moving either of said pawls into or out of operative engagement or holding both of said pawls out of operative engagement.

30. In a machine of the character described, the combination with an adjustable record-printing platen and record-printing devices, of means for moving said platen from a normal position for a printing impression, means for automatically returning said platen to normal position after said impression, a ratchet-wheel on said platen, a pawl for actuating said ratchet and a key-actuated lever for actuating said pawl.

31. In a machine of the character described, the combination with an adjustable record-printing platen and record-printing devices, of means for moving said platen longitudinally from a normal position for a printing impression, means for automatically returning said platen to normal position after said impression and key-actuated line-spacing mechanism.

32. In a machine of the character described, the combination with a record-printing platen, of means for moving said platen variable longitudinal distances to right or left of a constant normal position for a printing impression, means for printing a record upon said platen and means for automatically returning said platen to normal position after the printing impression.

33. In a machine of the character described, the combination with the key and register mechanism, of a platen, means for variably adjusting the platen to predetermined printing positions and means for automatically returning said platen to normal position after each printing impression.

34. In a machine of the character described, the combination with the key mechanism and the indicators, of transmitting-wheels for actuating said indicators, a pawl for each of said wheels for actuating the same, means operated by the key mechanism for operating said pawls, projections in zero positions on said wheels, stop devices adapted to be thrown into the path of said projections, flexible means for operating said pawls simultaneously to variable extents to throw the projections against the stop devices and means for throwing the stop devices into the paths of the projections.

35. In a machine of the character described, the combination with the key mechanism and an indicator, a pair of ratchet-wheels for operating said indicator, a pair of
5 pawls operated by said key mechanism one for actuating each ratchet-wheel and engaging diametrically opposite points of said wheels, flexible means for drawing said pawls toward each other and a forked rocking gov-

ernor adapted when in central position to hold both of the pawls out of operative engagement and when in either of its extreme positions to hold but one of said pawls out of operative position.

LUCIEN S. CRANDALL.

Witnesses:

HENRY E. MÄTJEN,
MABEL F. GLADDING.