1,167,332.

W. H. BROWN.

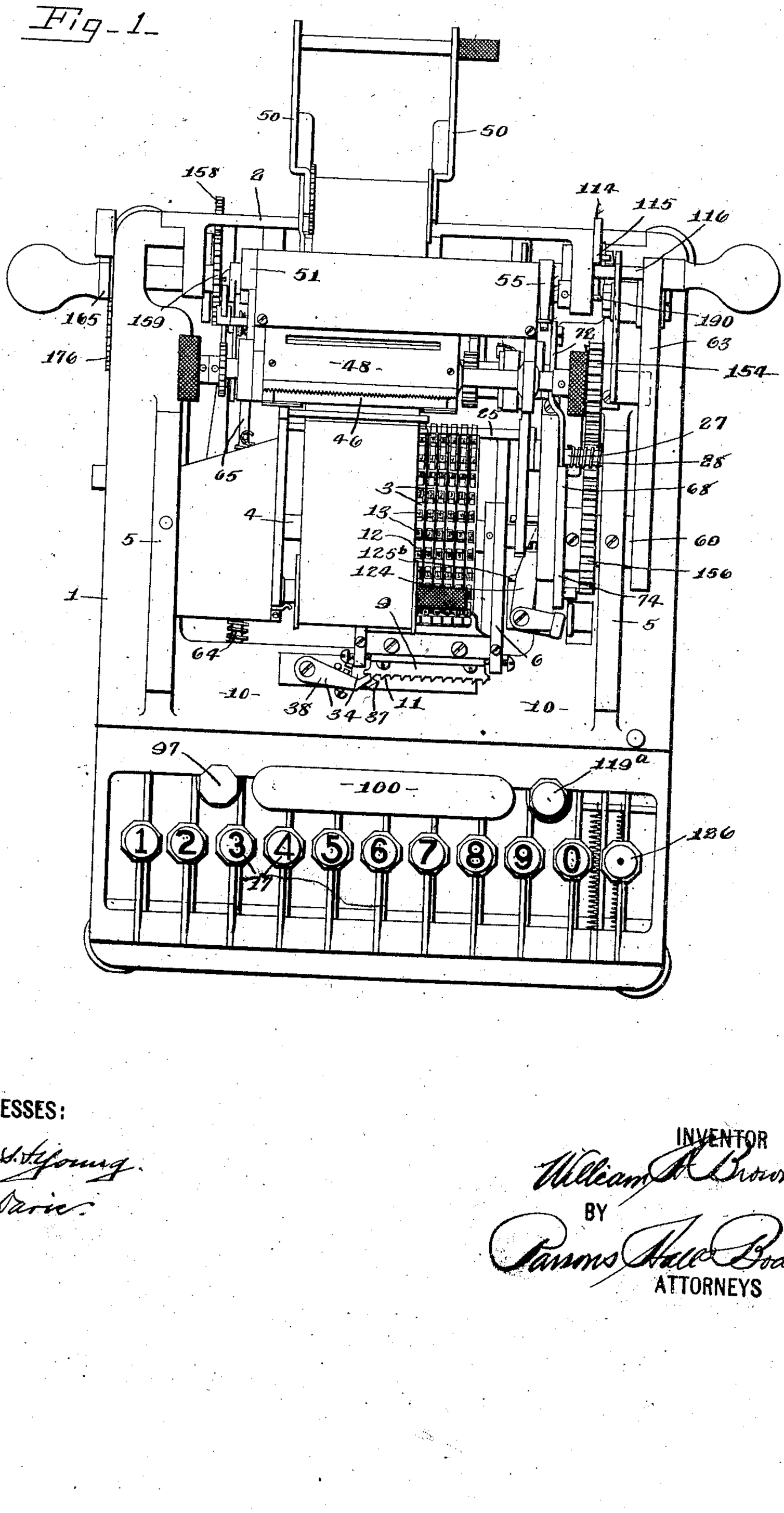
CALCULATING MACHINE.

APPLICATION FILED JAN. 13, 1913.

Patented Jan. 4, 1916.

12 SHEETS—SHEET 1.

Fig. 1.



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12 SHEETS—SHEET 2.

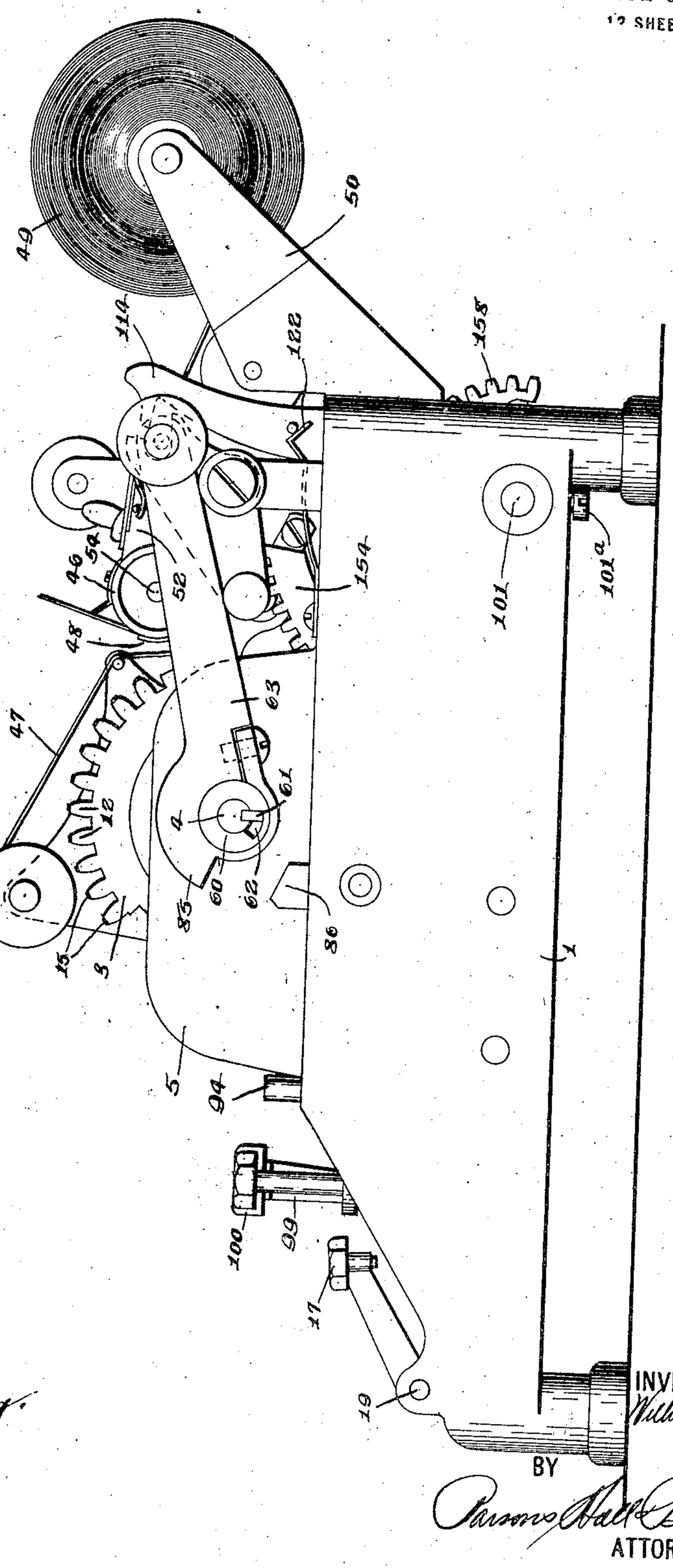

Fig-2

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12 SHEETS—SHEET 3.

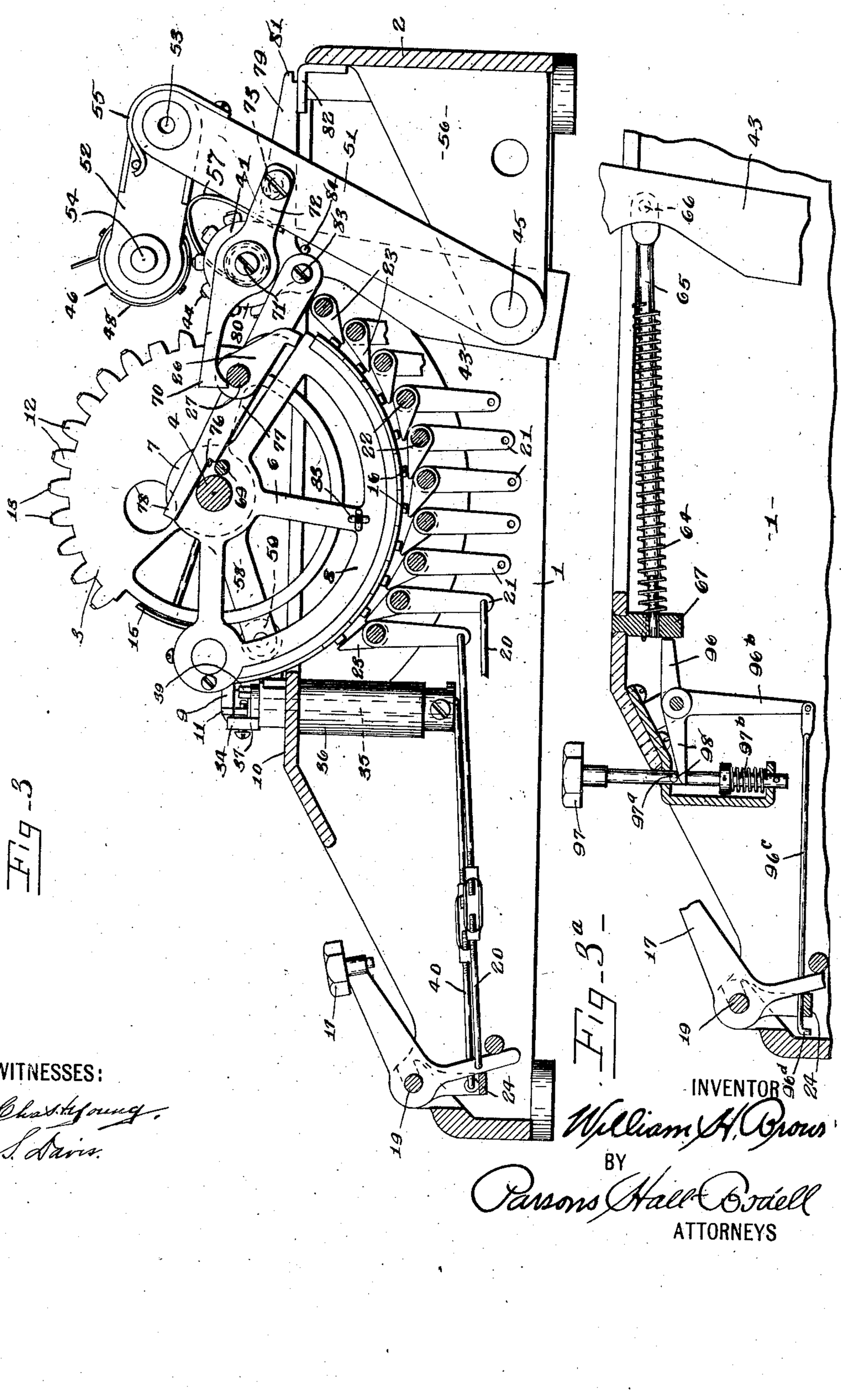

Fig. 3.

Fig. 3a.

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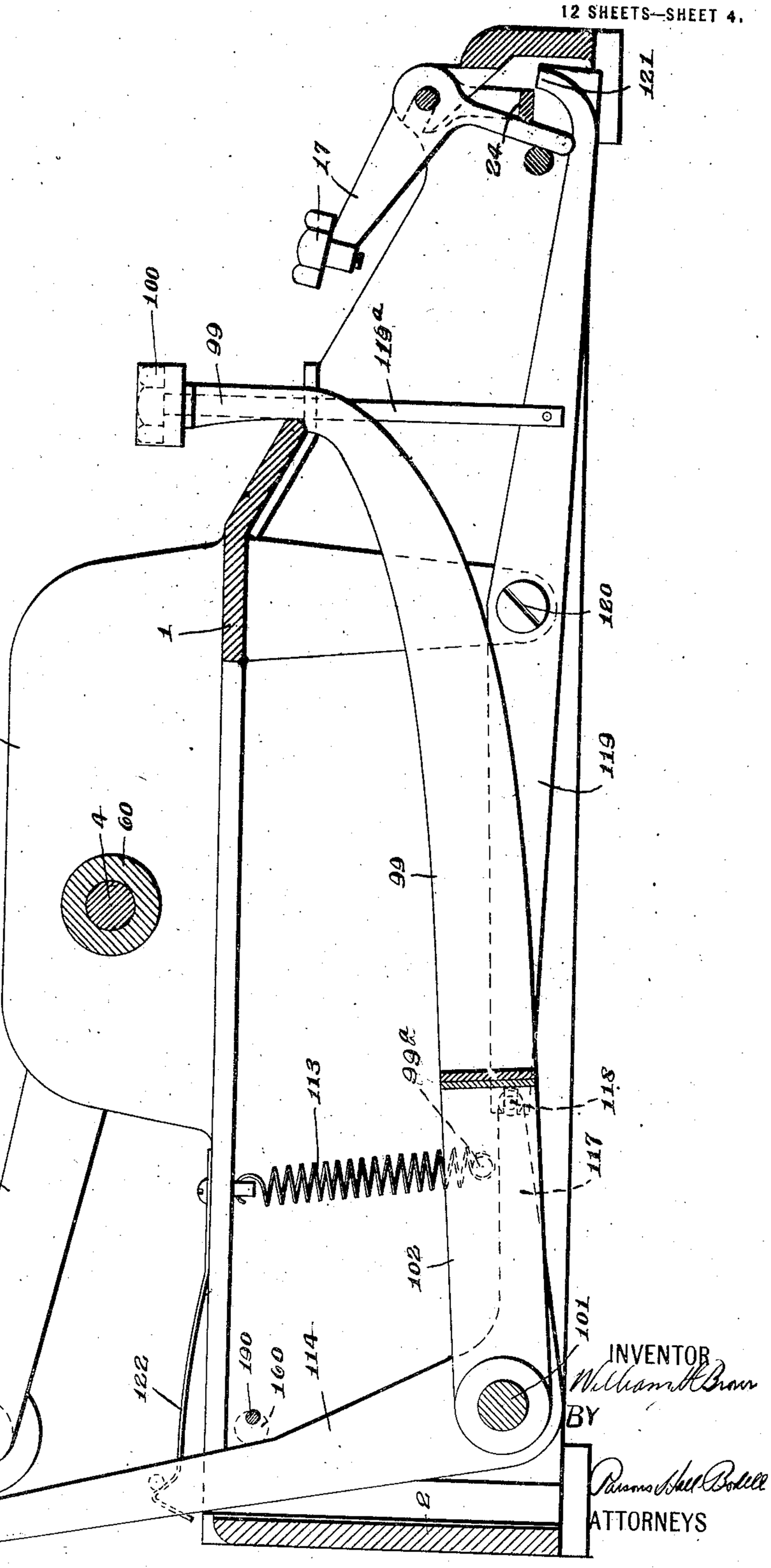
12 SHEETS—SHEET 4.

Fig-4-



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APPLICATION FILED JAN. 13, 1913.

Patented Jan. 4, 1916.
12 SHEETS—SHEET 5.

Fig. 5

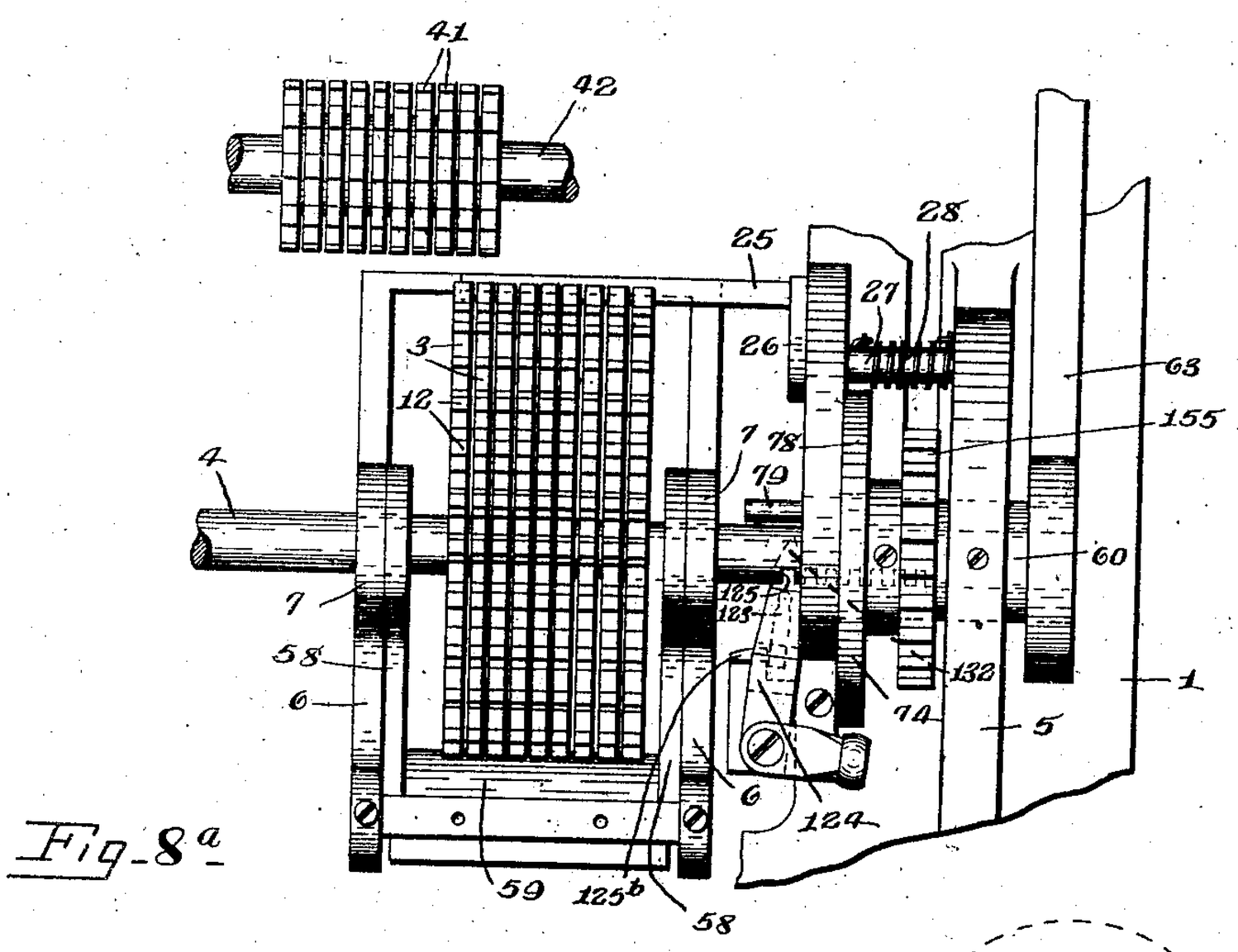


Fig. 8a

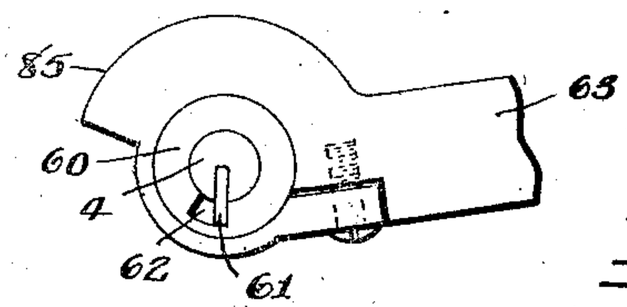
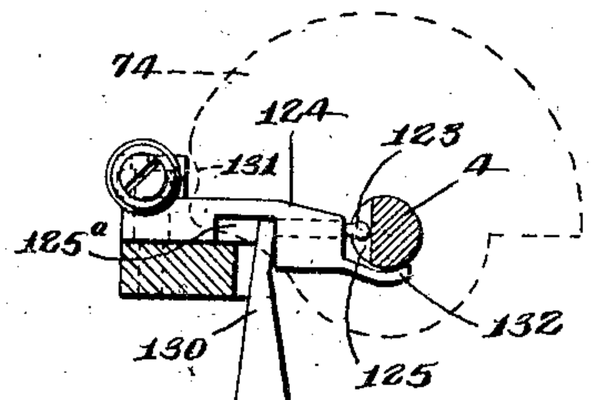


Fig. 13.



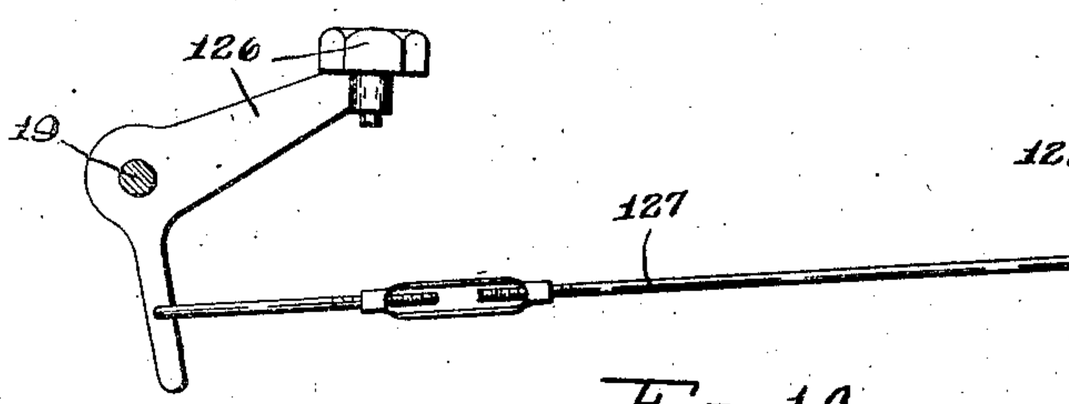
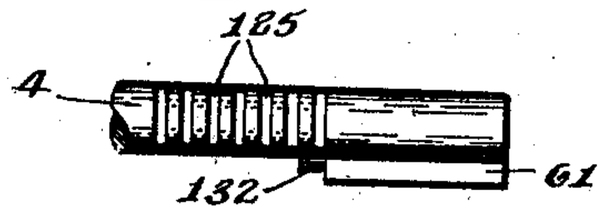


Fig. 14.



Witnesses.
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CALCULATING MACHINE.

APPLICATION FILED JAN. 13, 1913.

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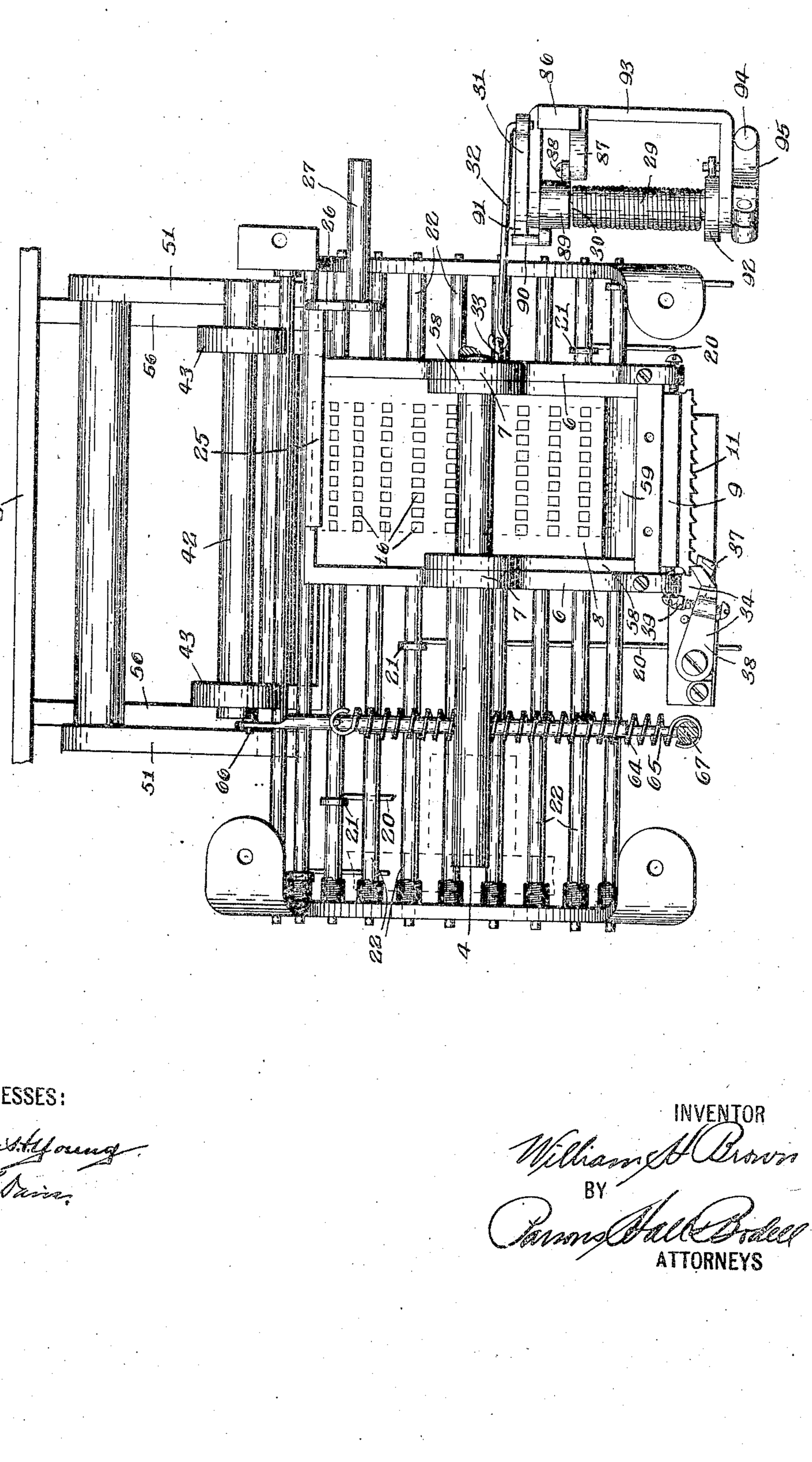
12 SHEETS—SHEET 6.

Fig. 6.



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12 SHEETS—SHEET 7.

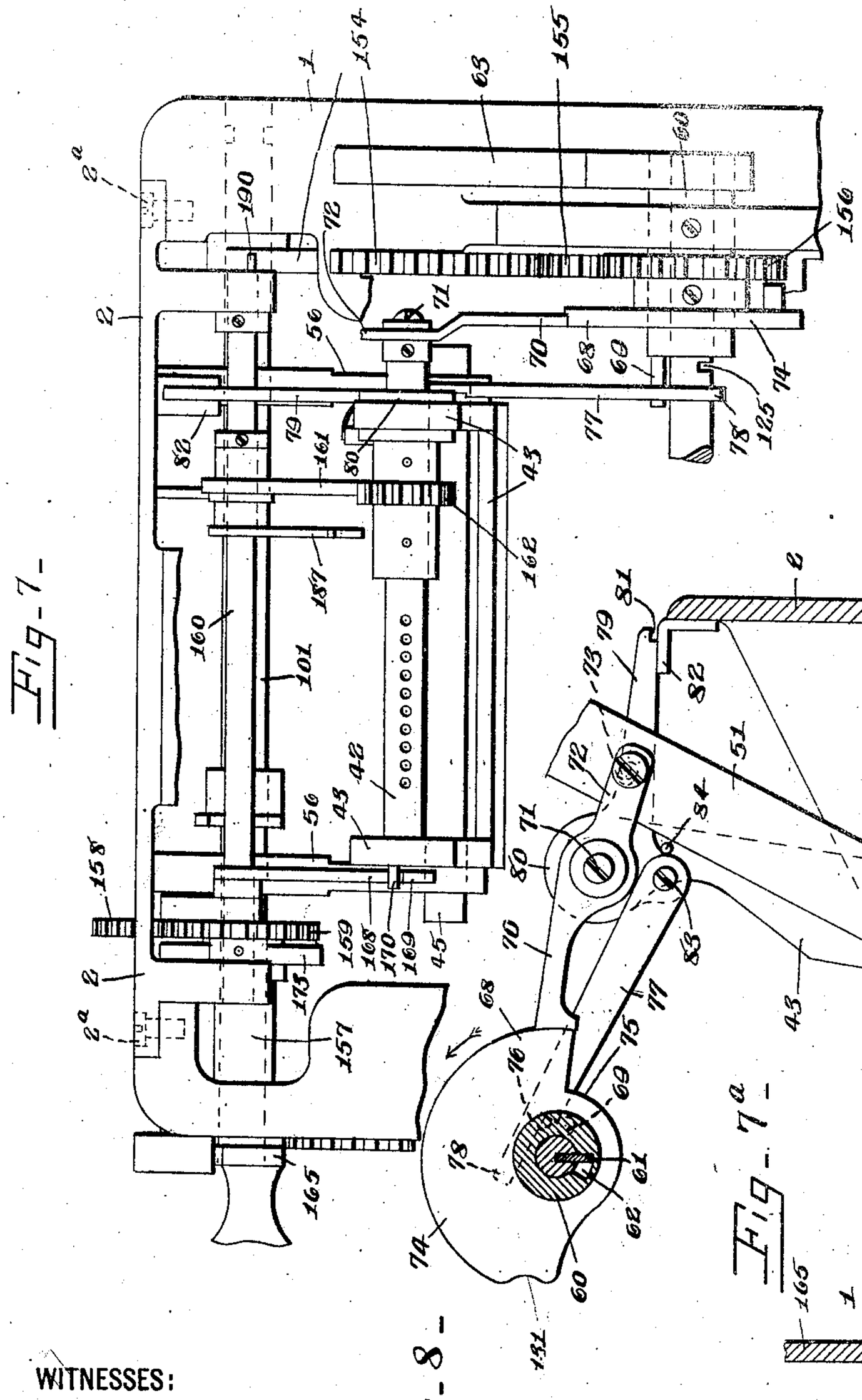

Fig. 7.

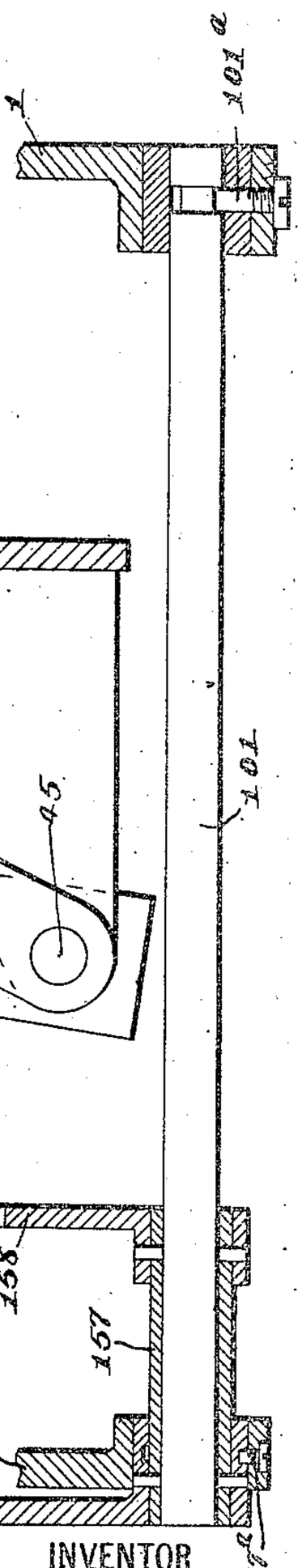

Fig. 7a.

Fig. 8.

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1,167,332.

Patented Jan. 4, 1916.

12 SHEETS—SHEET 8.

Fig. 9.

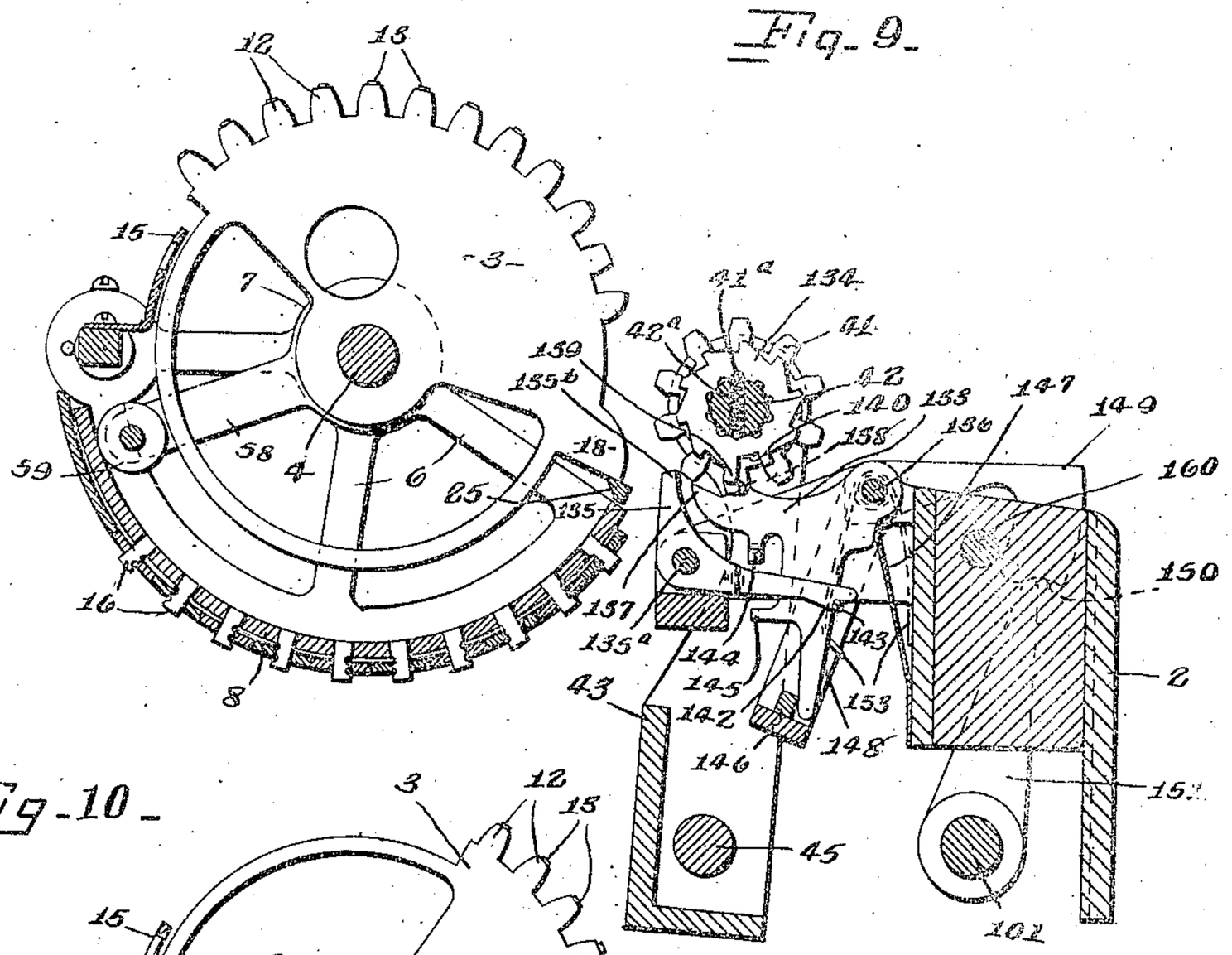
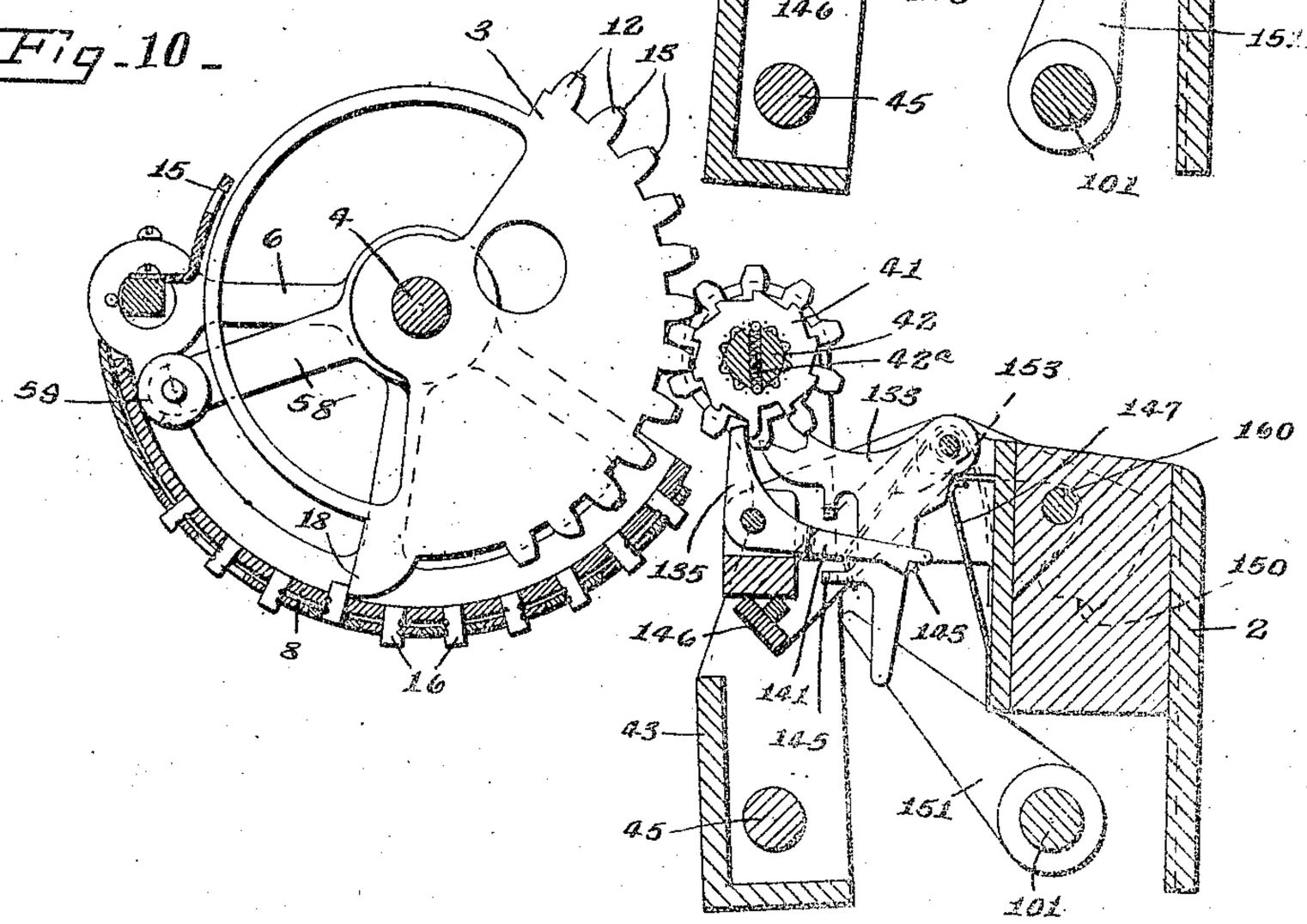


Fig. 10.



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1,167,332.

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CALCULATING MACHINE.
APPLICATION FILED JAN. 13, 1913.

Patented Jan. 4, 1916.
12 SHEETS—SHEET 9.

Fig. 11.

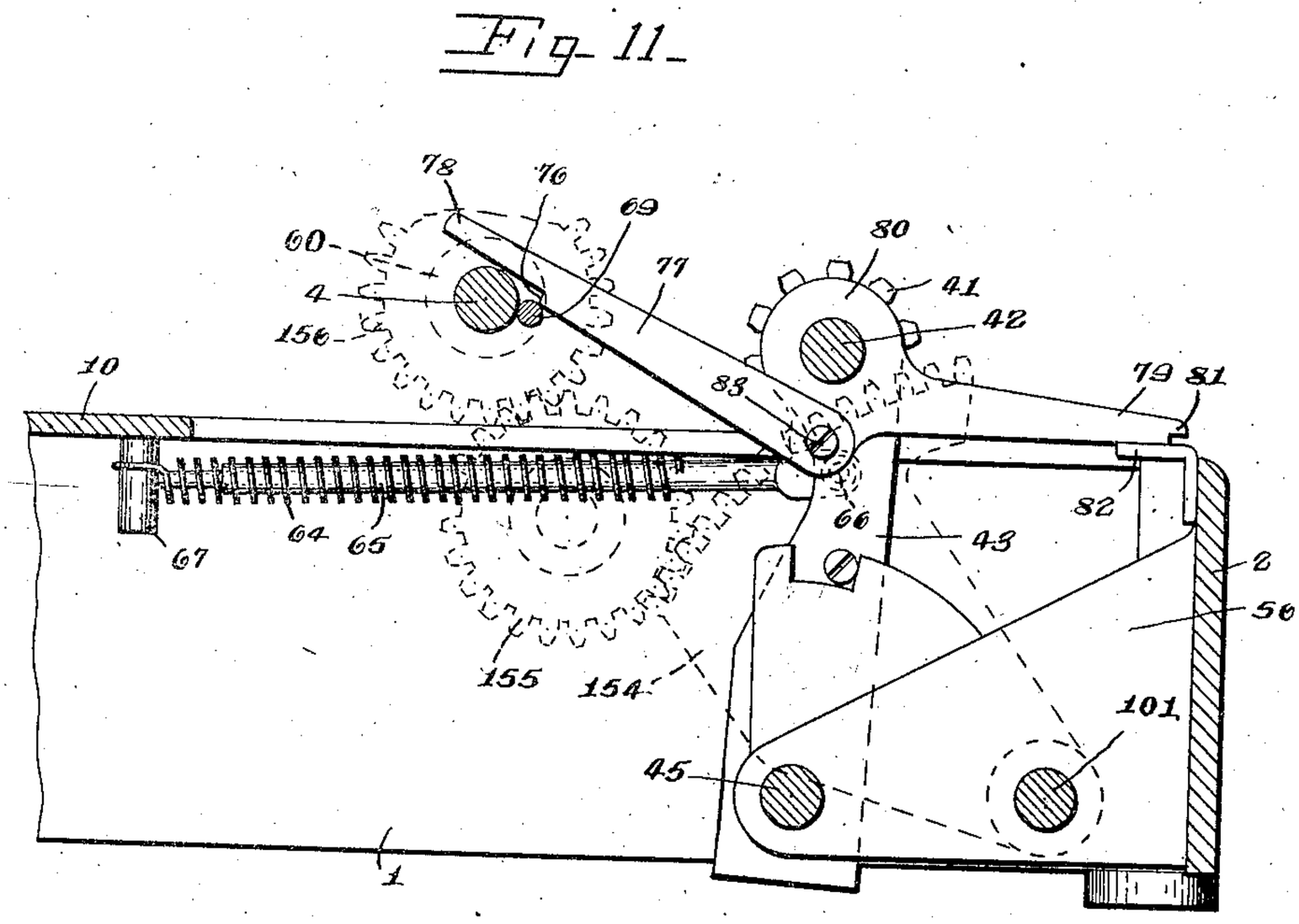
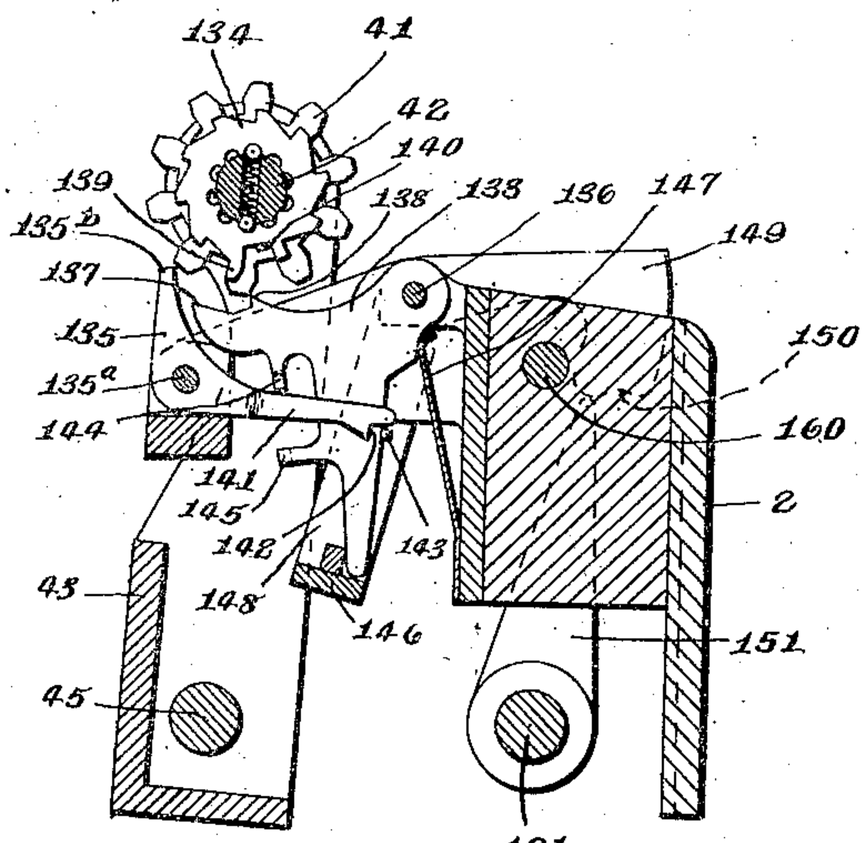


Fig. 12.



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APPLICATION FILED JAN. 13, 1913.

Patented Jan. 4, 1916.
12 SHEETS—SHEET 10.

Fig. 15.

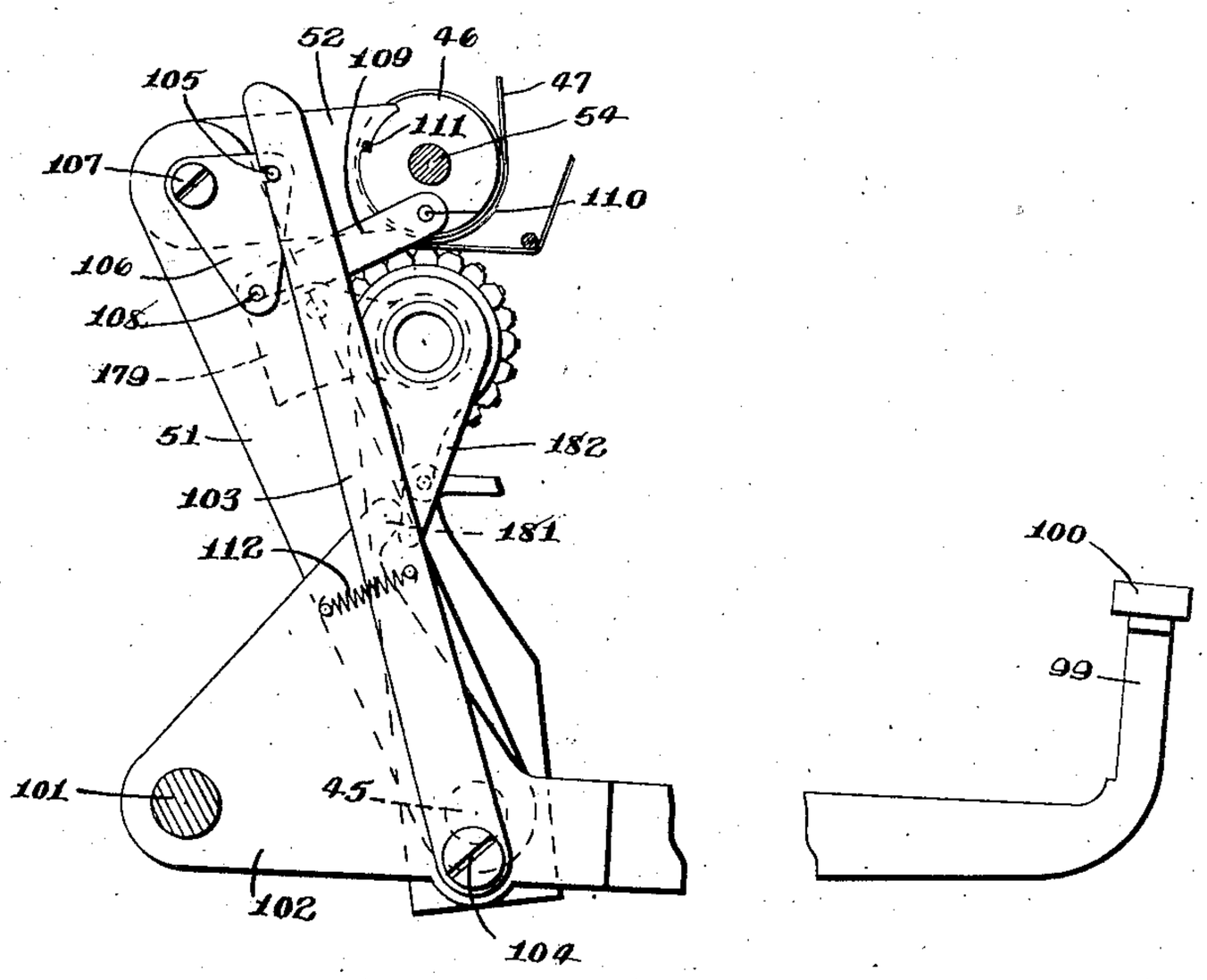
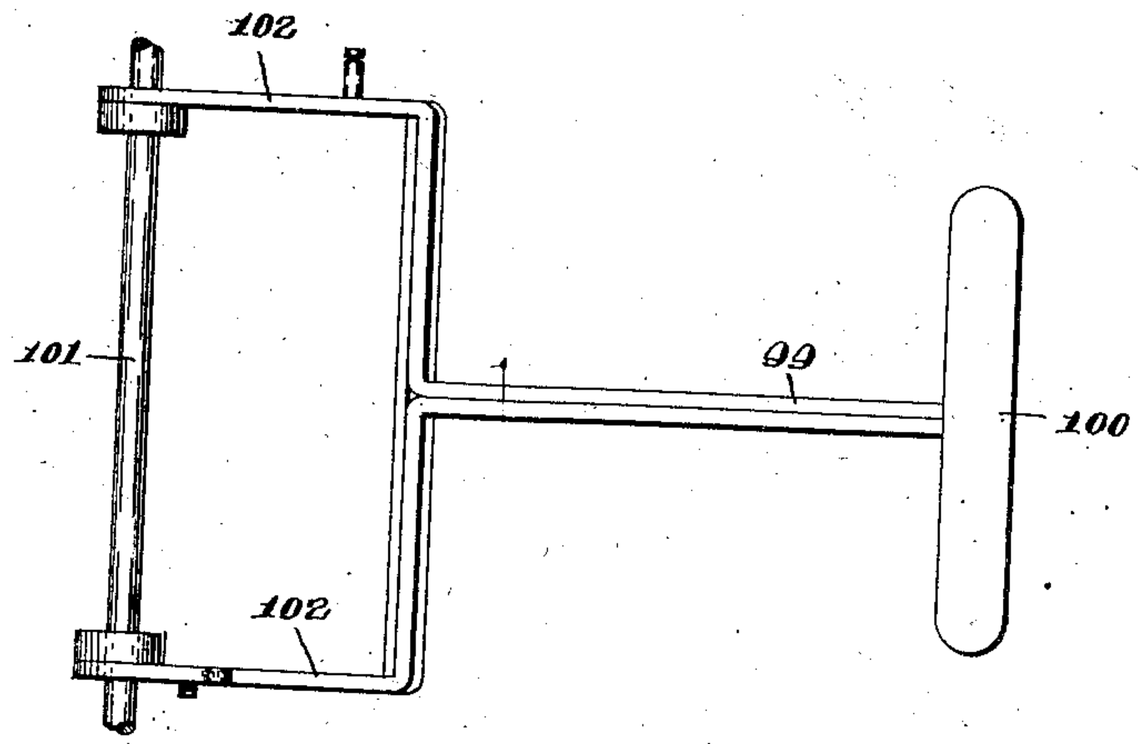


Fig. 16.



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APPLICATION FILED JAN. 13, 1913.

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Patented Jan. 4, 1916.

12 SHEETS—SHEET 11.

Fig. 17.

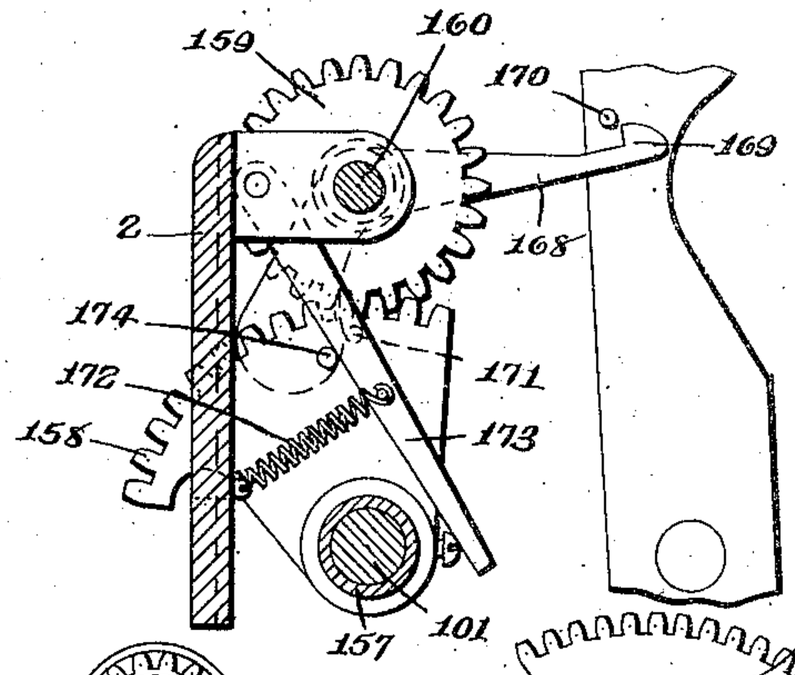


Fig. 18.

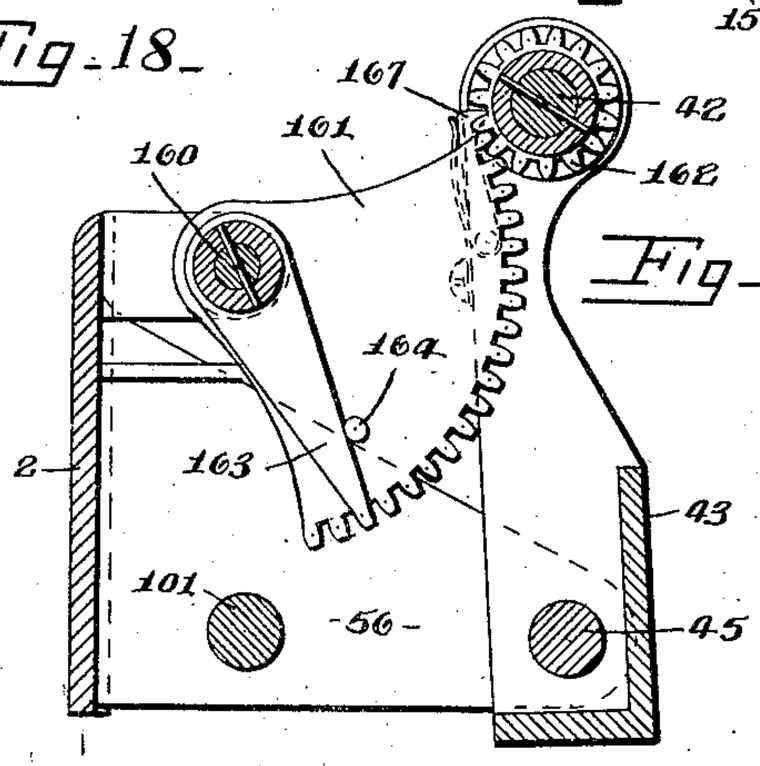


Fig. 19.

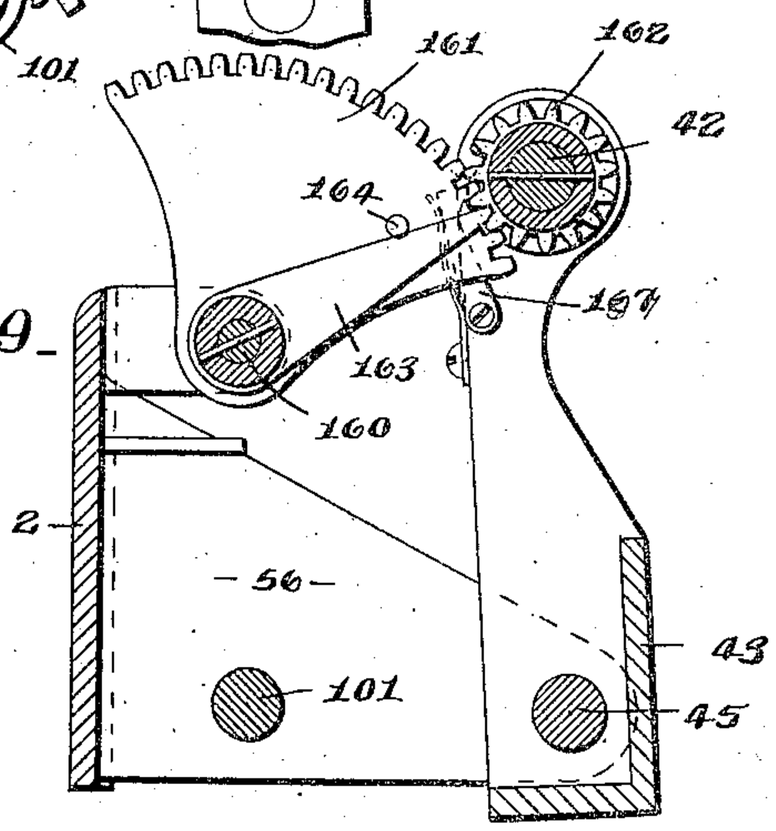
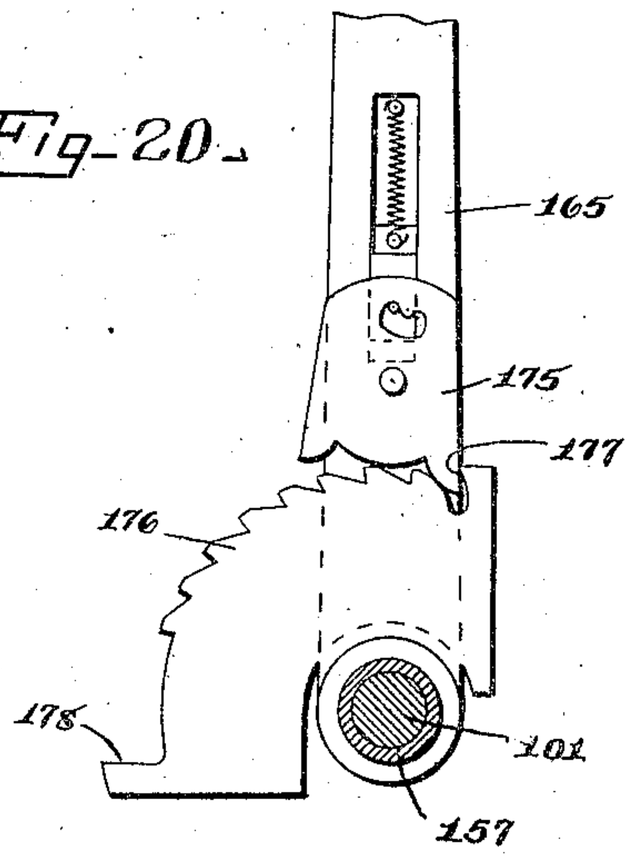


Fig. 20.



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CALCULATING MACHINE.

APPLICATION FILED JAN. 13, 1913.

1,167,332.

Patented Jan. 4, 1916.

12 SHEETS—SHEET 12.

Fig. 21.

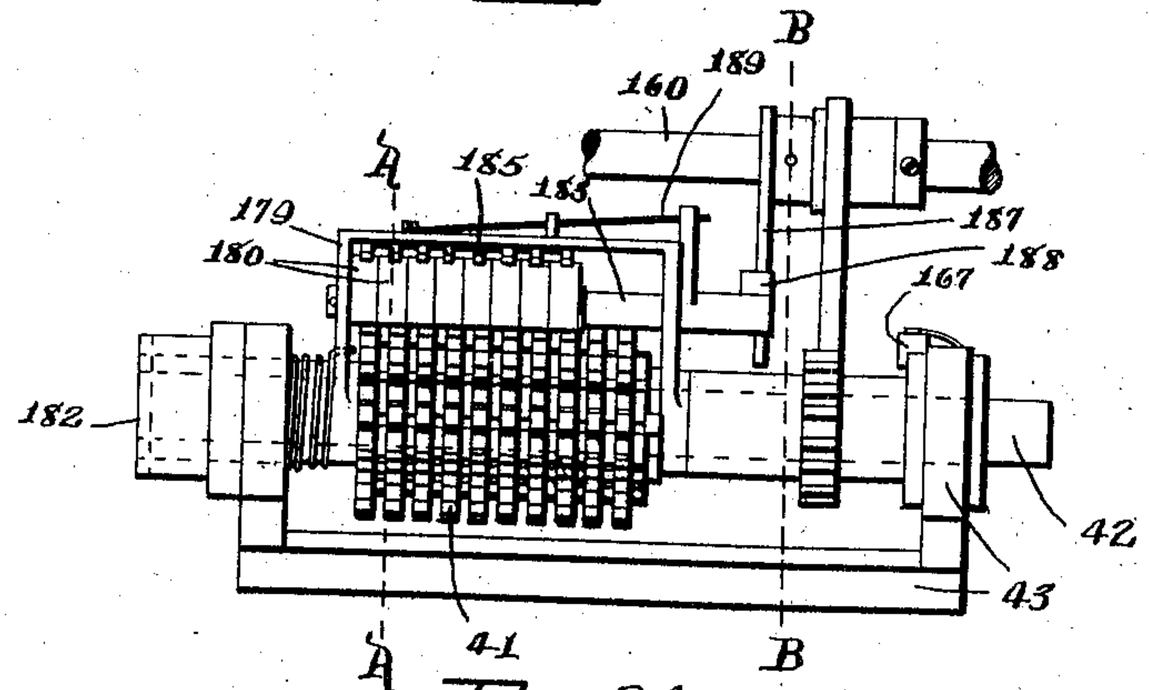


Fig. 24.

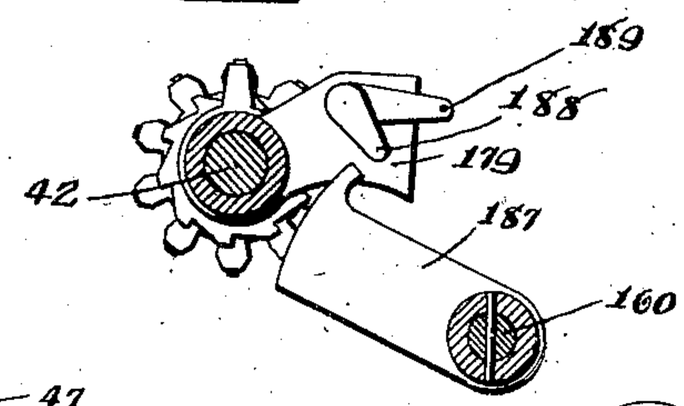


Fig. 22.

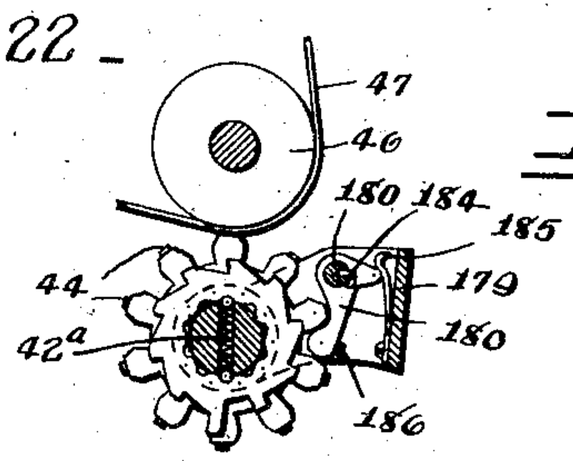


Fig. 23.

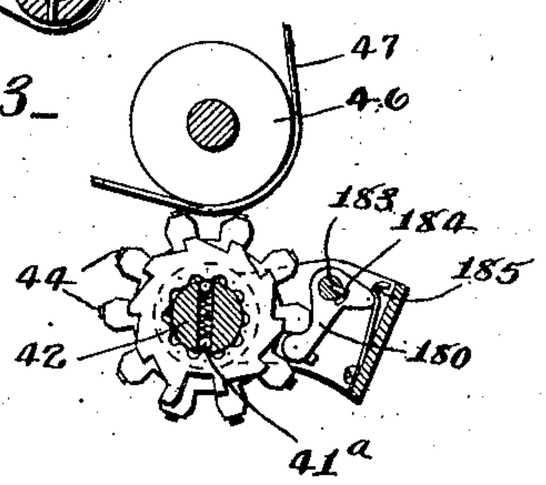
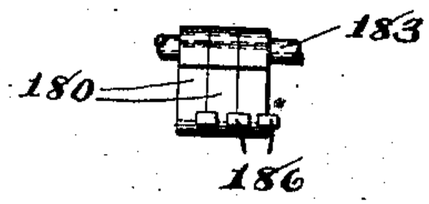


Fig. 25.



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UNITED STATES PATENT OFFICE.

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CALCULATING-MACHINE.

1,167,332. Specification of Letters Patent. Patented Jan. 4, 1916.

Application filed January 13, 1913. Serial No. 741,786.

To all whom it may concern:

Be it known that I, WILLIAM H. BROWN, of Syracuse, in the county of Onondaga and State of New York, have invented a new and useful Calculating-Machine, of which the following is a specification.

This invention has for its object the production of a calculating machine, which is particularly simple in construction and compact in the organization of its parts; and it consists in the combinations and constructions hereinafter set forth and claimed.

In describing this invention reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a plan of my calculating machine. Fig. 2 is a side elevation thereof. Fig. 3 is a longitudinal sectional view, the carrying over and clearing mechanisms and other parts being removed. Fig. 3ª is a fragmentary longitudinal sectional view, parts being removed, showing particularly the eliminator key and mechanism. Fig. 4 is a longitudinal sectional view through the machine, the calculating mechanism being removed, showing the total key and parts operated thereby. Fig. 5 is a fragmentary view, showing particularly the controlling elements and carriage therefor, and the operating member and contiguous parts, and a portion of the decimal mechanism in top plan, the calculating wheels being also shown. Fig. 6 is a plan of detached parts of the calculating mechanism illustrating the carriages for the controlling elements, the calculating elements and the platen, the key operated rock shafts which control the setting of the controlling elements, the spring motor for feeding the controlling elements to the left, and the escapement for controlling such feeding movement. Fig. 7 is a plan view of the rear portion of the frame of the machine showing the relative positions of the clearing mechanism and carrying over mechanism and carriage for calculating wheels carried by the detachable supplemental frame, and also the connections between the main operating element and said mechanisms. Fig. 7ª is a detail view of the alined shafts of the carrying over and clearing mechanisms and contiguous parts of the frame. Fig. 8 is an elevation of parts seen in Fig. 3, showing particularly the cam or eccentric means associated with the operating member and not shown in Fig. 3. Fig. 8ª is a fragmentary view of the operating member and contiguous parts. Figs. 9 and 10 are longitudinal sectional views through the controlling elements, calculating elements and associated parts, other parts being omitted, illustrating the setting of the controlling elements, the movement of the calculating wheel carriage, and the operation of the carrying over mechanism. Fig. 11 is a fragmentary sectional view illustrating a portion of the mechanism for returning the calculating wheel and platen carriages, and parts movable therewith, to their rear or normal position and for holding the same in such position. Fig. 12 is a view similar to Fig. 9, the controlling means being omitted, illustrating the first step in the operation of the resetting means for the carrying over mechanism. Fig. 13 is a detail view illustrating the operation of the decimal mechanism, shown in plan in Fig. 5. Fig. 14 is a detail view of the shaft of the controlling wheel carriage, illustrating the teeth therein forming part of the decimal mechanism. Fig. 15 is a fragmentary view illustrating in side elevation, the operation of the total key and the elimination of the zeros of the inactive elements. Fig. 16 is a plan view of the total key. Figs. 17, 18 and 19 are longitudinal sectional views illustrating the clearing mechanism located in the rear portion of the frame of the machine and carried by the supplemental frame, Fig. 17, showing a portion of the calculating carriage, Figs. 18 and 19, showing said carriage in section. Fig. 20 is an inner face view of the clearing lever and contiguous parts. Fig. 21 is a plan of the calculating wheel carriage, showing the zero eliminating pawls. Figs. 22 and 23 are detail views taken on the plane of line "A—A", Fig. 21, illustrating steps in the operation of the zero eliminating pawls. Fig. 24 is a sectional view of the plane of line "B—B", Fig. 21, showing means for resetting the zero eliminating pawls. Fig. 25 is a fragmentary view illustrating said pawls in rear elevation.

This calculating machine comprises, generally, a series of controlling elements, a series of calculating elements, the controlling elements being movable into numeral

positions, one series of elements being movable into and out of connection with the other series of elements, means for controlling the setting of the controlling elements in numerical positions, carrying over mechanism, clearing mechanism, recording mechanism, and an actuating member operable to actuate the controlling elements and effect the movement of, or control the operations of, the carrying over mechanism, the recording mechanism, and the movement of one series of elements into and out of connection with the other series of elements.

1 is the main frame of the machine, and 2, Figs. 3 and 7, is a supplemental frame detachably mounted in the main frame and carrying mechanisms to be hereinafter described. The frame 2 closes the rear side of the frame 1 and is detachable by a rearward movement after unloosening fastening members as screws 2^a, Fig. 7.

3 are the controlling elements here shown as oscillatory and movable from a starting position in one direction about their axis into numerical positions and movable axially step by step into denominational positions.

In the illustrated form of my invention, the controlling elements are mounted in any suitable manner on the shaft 4, Figs. 2, 5 and 6, extending transversely of the case and journaled in bearings formed in uprights 5, Figs. 1 and 2, projecting from the top plate of the frame, the shaft 4 being here shown as shiftable axially in its bearings for the purpose of carrying the elements 3 into and out of denominational positions. Said shaft constitutes part of a carriage which also includes a depending frame 6, Figs. 3, 5 and 6, having hubs 7 on the shaft at opposite ends of the series of controlling elements 3, the frame 6 also having an arc shape supporting plate 8, Figs. 3, 9 and 10, concentric with the axis of the shaft 4 and elements 3, and carrying means for limiting the movement of the elements 3 in numerical positions. The frame 6 is also formed at its front side with a flange 9, Figs. 1 and 6, running upon the top plate 10 of the frame 1, and supporting a rack 11 coöperating with escapement pawls which control the movement of the shaft 4, and frame 6 to the left to carry the elements 3 into denominational positions.

Each controlling element 3 is here shown as toothed, the teeth 12 thereof being shown as extending but part way around the same and as provided with type 13 at their ends, and each element 3 is weighted so as to move about its axis into numeral positions, see Fig. 10, when relieved of means tending to normally restrain it from such movement. Some of the teeth 4 are unprovided with type and these teeth are normally arranged at the printing line of the machine, so that when the elements 3 remaining in their starting position when a number is set in other elements, will not make a record.

The diametrically opposite side of each element 3 from that side on which the gear teeth 12 are located, is formed with peripheral indicating numerals corresponding to the type of the gear teeth, and these numerals are visible through a sight opening in a plate 15 on the front side of the frame 1, Fig. 3.

The means for determining the numerical positions of the elements 3 comprises a plurality of series of stops or abutments 16, Figs. 3, 9 and 10, located in holes extending radially through the arc shaped plate 8 of the frame 6, there being one series of stops for each element 3, Fig. 6, and each stop corresponding to a number or value from 0 to 9 inclusive and being adapted to be operated by one of the series of keys 17 on the key board of the machine. There are ten numeral keys, Fig. 1, representing values from 0 to 9 inclusive.

Upon the operation of each stop 16 by its corresponding key 17, it is moved into the path of a radially extending shoulder 18, Figs. 9 and 10, on the corresponding controlling element 3 and hence limits the movement of said controlling element 3 about its axis under the influence of its weighted portion, when said element is relieved of its restraining means to be presently described.

The keys 17 are here shown as including angle levers, Fig. 3, mounted at their angles on a shaft 19 located at the front end of the frame, corresponding arms of the levers 17 having key heads, and the other arms thereof being connected by links 20 to arms 21 on rock shafts 22, Figs. 3 and 6, having other arms 23 coacting with the stops 16 respectively of one series, to press the same above the surface of the plate 8 into the path of the radially extending shoulder 18. The levers 17 also coact with a universal bar 24 which works the escapement. There are ten rock shafts 22, Figs. 3 and 5, corresponding to the number of abutments or stops 16 in each series, and there are a plurality of series of abutments or stops 16 arranged side by side transversely of the machine, there being one series for each of the elements 3, see Fig. 6.

The restraining means for the controlling elements 3 comprises a detent in the form of a bar 25, Figs. 5, 6 and 9, extending parallel to the shaft 4 and normally engaging with the shoulders 18 of the elements 3, this bar 25 being carried by a rock arm 26, Fig. 3, on a rock shaft 27, Figs. 4 and 5, which is journaled in one of the uprights 5 of the frame and which is encircled by a spring 28 normally restraining rocking of the shaft 27.

All of the controlling elements 3 are normally arranged in their starting position

with the shoulders 18, Figs. 3 and 9, resting on the bar or detent 25, and during the shifting of the elements 3 and associated parts to the left into denominational positions, the shoulders 18 are carried one by one, off the end of the bar 25, so that each element 3 turns by gravity until its shoulder 18 engages the stop of its companion series of abutments 16, which stop has been previously set by the operation of the proper numeral key 17.

The carriage composed of the shaft 4 and frame 6 is moved to the left by means of a spring 29, Fig. 6, tensioned by the main operating member, this spring 29 being mounted on a rock shaft 30 which is provided with a rock arm 31 connected to a rod 32 to one side of the frame 6 as at 33, Figs. 3 and 6. The spring 29 tends to move the controlling elements and the carriage including the shaft 4 and frame 6 to the left, and such movement is controlled by an escapement 34, Figs. 1 and 6, comprising a rock shaft 35 journaled in a vertical bearing 36, Fig. 3, and operating to move a pawl 37 into the path of one tooth of the rack 11, while another tooth thereof is being relieved of the spring pressed pawl 38 pivoted to the frame 1 and coacting with a knock-off device 39 on the tail of the pawl 37. As the tooth of the pawl 37 moves toward the rack 11, the tail thereof is moving in the opposite direction causing the knock-off device 39 to push the pawl 38 out of engagement with the rack. The rock shaft 35 is connected to the universal bar 24 operated by links 40. Any form of escapement may be used for controlling the feeding of the carriage to the left.

41 are the calculating elements, and in this embodiment of my invention, said elements are shown as movable into and out of connection with the controlling elements 3. These elements 41 are gear wheels mounted upon a shaft 42, Figs. 7, 9 and 10, supported at its opposite ends in side pieces of the carriage 43, the carriage 43 being movable for carrying the wheels into and out of mesh with the teeth 12 of the controlling elements 3 in which a number has been set. The wheels 41 are mounted on the shaft to rotate about the same independently of each other. As here-shown the wheels 41 are connected to the shaft 42 by spring pressed ratchets consisting of balls 41^a at opposite ends of transverse passages 42^a in the shaft 42 and coacting with internal rounding ratchet teeth on the wheels 41. The controlling elements are driving wheels and the calculating elements driven wheels and said driving wheels are actuated as hereinafter described. The teeth of the calculating wheels 41 are also provided with type 44 at their ends for the purpose of printing the total. As here shown, the carriage 43 is pivoted to the supplemental frame 2 and is mounted on a shaft 45 supported at its opposite ends in the sides of the supplemental frame 2.

46 is a platen movable in one direction into and out of coöperation with the type 13 of the elements 3 and in another direction into and out of coöperation with the type 44 of the gear teeth of the calculating wheels 41, a suitable ribbon 47, Fig. 2, being interposed between the platen 46 and the elements 3 and 41, and the platen being provided with suitable means as a shield 48 for guiding the paper from a reel 49 supported by brackets 50 projecting from the rear end of the supplemental frame 2. The ribbon is operated by suitable mechanism. As here shown the platen 46 is mounted on a carriage 51 including side arms pivoted at their lower ends on the shaft 45 of the side arms of the carriage 43, and forwardly extending brackets 52 pivoted at 53 at the upper ends of the side arms and carrying at their front ends a shaft 54 on which the platen is mounted. Pivotal movement of the arms 52 is resisted by a spring 55, Fig. 3.

Both the carriages 43 and 51 are pivoted to forwardly extending side pieces 56 on the supplemental frame 2 and are hence removable with said frame. The carriages 43 and 51 move as a unit toward and from the controlling elements 3, and a spring 57, Fig. 3, is interposed between said carriages to permit overthrow of the platen 46. The wheels 41 and platen 46 are arranged so that when the wheels 41 are in mesh with the teeth 12 of the elements 3, the platen 46 does not cooperate with the type of the wheels 3 but is brought into and out of coöperation with the elements 3 by the overthrow or hammer effect of said platen and its carriage.

The means operable to actuate the controlling elements 3 from their numerical positions and for effecting the movement of the calculating wheel carriage 43 and platen carriage 51, will now be described.

The means for actuating the controlling elements 3 from the numerical positions, comprises rock arms 58, Figs. 3, 5, 9 and 10, mounted on the shaft 4 to move therewith, said arms 58 carrying a roller 59 at their ends which is movable over the inner face of the arc shape plate 8 for the abutments or stops 16, for depressing such stops, and into engagement with the shoulders 18 of the elements 3 in which a number has been set, for carrying said elements in a retrograde direction about their axes to their starting position; and during this operation, the elements 3 in which an example or item is set, are in mesh with the calculating wheels 41 and actuate the same an amount equal to the actuation of the elements 3.

The means for operating the arms 58 also controls the movement of the calculating wheel carriage 43 and the platen carriage

51, and comprises a member, here shown as a sleeve 60, Figs. 2, 5, 7 and 8, journaled in one of the uprights 5 of the frame and mounted on one end of the shaft 4 and connected thereto by a key 61 associated with the shaft 4, the key extending into a keyway 62 of greater width than the key so that the sleeve 60 is connected to the shaft 4 by lost motion for the purpose hereinafter explained. The sleeve 60 is operated by a suitable handle 63, Figs. 2, 5 and 7, which is here shown as mounted directly thereon but obviously may be mounted in any other location and connected to the sleeve in any other suitable manner.

The calculating wheel carriage 43 and the platen carriage 51 are moved forwardly to carry the calculating wheels 41 and platen 46 into coöperation with the controlling elements 3, by a spring 64, Figs. 6 and 11, which is tensioned by the operation of the sleeve 60, as hereinafter described, so that the sleeve 60 is the prime mover. This spring 64 encircles a rod 65 pivoted at its rear end at 66, to one of the side arms of the calculating wheel carriage, the rod extending at its other end through a stud 67, Fig. 11, depending from the top plate of the frame 1, the spring being connected at one end to the stud and at its other end to the rod.

The movement of the calculating wheel carriage 43 and the platen carriage 51 by the spring 64, is controlled by eccentric or cam means provided on the sleeve 60; this cam means having high and low points arranged so that the carriages will have a sudden movement forwardly on the initial movement of the sleeve. This cam means consists of an arm 68, Fig. 8, normally projecting rearwardly from the sleeve and another arm or shoulder 69, Figs. 1 and 8, projecting from the inner end of the sleeve 60, the arm 68 coacting with a holding arm 70 secured at 71 to one side arm of the calculating wheel carriage 43 and having a rearwardly extending arm 72 connected to one side arm of the platen carriage 51 by a pin-and-slot 73 for the purpose of permitting the overthrow of the carriage 51 relatively to the calculating wheel carriage 43, when the carriages are pulled forwardly by the spring 64. The arm 68 is formed integral with a cam 74 forming part of the decimal mechanism to be hereinafter described, and the arm 68 is arranged so that the arm 70 will move off the end thereof to the base or low point of the cam during the initial part of the rotation of the sleeve 60.

During the initial movement of the sleeve 60 by the hand lever, the arm 68 and cam 74 are moved in the direction indicated by the arrow, Fig. 8, so that the arm 68 moves clear of the holding arm 70, permitting the holding arm to jump to the low point 75 of the cam as the spring 64 reacts and pulls the calculating wheel carriage and platen roll carriage forwardly. During the movement of the sleeve 60 in a retrograde direction, the cam or eccentric pin 69 engages a shoulder 76 on a push rod or arm 77 connected to the calculating wheel carriage 43 causing the carriages 43 and 51 to be moved rearwardly until the arm 70 can again engage the end of the arm 68. Said arm 77 has an extension 78 at its front end which rides on the shaft 4 and prevents the arm 77 from falling downwardly out of position when the calculating wheel carriage 43 is in its rearmost position.

A suitable lock is provided for holding the calculating wheel carriage 43 in its forward position while the calculating wheels 41 are in mesh with the controlling elements 3, this lock being here shown as a lever 79, Figs. 3, 8, and 11, having a hub 80 concentric with the axis of the calculating wheels 41 and having a latch arm 81 which coacts with a fixed shoulder 82 on the detachable frame member 2. The lock 79 is operated by the push arm 77 which is pivoted eccentrically at 83 thereto, so that the preliminary movement of the push arm 70 rocks the latch arm 81 out of engagement with the shoulder 82 before the rearward movement of the calculating wheel carriage and platen carriage begins. The pivotal movement of the latch 79 is limited by a stop 84 on the corresponding side arm of the calculating wheel carriage 43. As here illustrated the latch 79 is mounted on the calculating wheel shaft 42.

The operation of the machine as thus far described is as follows: Upon the depressing of any key 17, the corresponding rock shaft 22 will be operated and the corresponding abutment 16 moved into operative position, and the escapement operated permitting the controlling elements 3, shaft 4 and frame 6 to feed one step to the left, carrying the first element 3 to the left off the end of the rod 25, so that said element will move by gravity about its axis until its shoulder 18 engages its abutment or stop 16 set by the key operated. The operation of additional keys 17 will cause this operation to be repeated moving the elements 3 successively step by step into denominational positions and permitting the same to move into numerical positions. It will be understood that when a number is set up in the machine the key levers 17 must be struck in order, for instance, if 129 is to be added, the key 17 representing the number 1 must be first struck, then the key representing the number 2 and lastly the key representing the number 9. The handle 63 is then pulled forwardly, actuating the sleeve 60 to permit the arm or cam 68 thereon to move clear of the holding arm 70 of the calculating wheel

carriage 43 and the platen carriage 51, thus permitting the carriages 43 and 51 to move forwardly and bring the calculating wheels 41 in mesh with the controlling elements in which the number has been set, and the platen 46 into and out of coöperation with said controlling elements 3. At this period of the operation, the lost motion caused by the keyway 62 is taken up and the shaft 4 rotated causing the rock arms 58 to carry the roller 59 over the inner face of the curved plate 8, depressing the abutments 16 previously set by the key levers 17, and returning the controlling wheels 3 in which the number is set, about their axis to their starting position. The handle 63 is then swung to the limit of its forward movement effecting the return of the controlling elements 3, shaft 4 and frame 6 to the right. During the reverse movement of the handle 63, the pin or cam 69 on the sleeve 60 engages the shoulder 76 on the push arm 77 and returns the calculating wheel carriage and the platen carriage to their rear position and reëngages the cam or arm 68 with the holding arm 70.

As before stated the controlling elements 3 are shifted to the right by means of a spring 29, Fig. 6, and are controlled in such shifting movement by an escapement operated by the keys. The carriage is returned to the right and the spring tensioned by means of a cam 85 mounted on the sleeve 60 on the outside of the upright 5 of the frame; the cam 85 is here shown, Fig. 8ª, as formed integral with the handle 63. Said cam cooperates with the upper end of a plunger 86, Figs. 2 and 6, carrying at its lower end an arm 87 which is pivoted at 88 to a lug on a collar 89 loosely mounted on the rock shaft 30, the collar having a shoulder 90 which moves into and out of engagement with the shoulder 91 on the rock arm 31, the latter being connected by the link 32 to the carriage for the controlling elements 3.

During the latter part of the movement of the lever 63 forwardly, the cam 85 engages the plunger 86 which in turn actuates the collar 89 about the shaft 30, thus tensioning the spring 29, one end of which is connected to said collar and the other end of which is connected to the collar 92 fixed to a yoke 93 in which the rock shaft is journaled, this yoke 93 being secured to the inner face of one of the sides of the frame 1. While the spring 29 is being tensioned by the rock shaft 30 the arm 31 remains in the position to which it has been shifted. Subsequently a portion of the lever 63 engages a second plunger 94, Figs. 2 and 6, which coacts with a rock arm 95 fixed to the shaft 30 so that at the extreme end of the forward movement of the lever 63, the plunger 94 will be depressed, the shaft 30 rotated in the reverse direction until the shoulder 91 of the rock arm 31 is again in engagement with the shoulder 90 on the collar 89. This arrangement of parts causes the spring to be tensioned and the carriage for the controlling elements 3 to be returned to the right successively.

The shoulder 90 of the collar 89 is normally engaged with the shoulder 91 of the rock arm 31 so that upon the first depression of a key 17, and the operation of the escapement, the arm 31 will be rocked to push the carriage for the elements 3 one step to the left.

If a wrong number should be set in the controlling elements, the same may be eliminated by operating the handle 63; and in order that the number eliminated may not be transferred to the calculating wheels and a record thereof made on the paper on the platen, means is provided for preventing the forward movement of the calculating wheel carriage and the platen carriage. Said means comprises a lock 96 movable into the path of the front end of the rod 65, Fig. 3ª in order to prevent movement of said rod by the spring 64, this lock 96 being operated by an eliminator key 97, Figs. 1 and 3ª which is connected thereto by suitable means 98.

The lock 96 is here shown as a horizontal lever pivoted between its ends to the frame, and having one end arranged to move into the path of the rod 65 and its other end arranged under a shoulder 97ª on the eliminator key 97. The lever 96 is also formed with a vertically extending arm 96ᵇ which is connected to one end of a link 96ᶜ which extends forwardly and has its front end downturned forming a shoulder 96ᵈ arranged in the path of the universal bar 24 so that upon the operation of any numerical key, the lock 96 is reset in its starting or ineffective position. The downward movement of the key 97 is against the action of a returning spring 97ᵇ.

A record of the total in the calculating wheels 41 is made by moving the arms or brackets 52 of the platen carriage 51 downwardly on their pivot 53 against the action of the spring 55, Fig. 3. In this form of my invention, this movement of the platen 46 is effected by a total lever 99, Figs. 4, 15 and 16, the lever extending from front to rear of the machine and having an elongated key head 100 at its front end exposed on the key board, see Fig. 1, and being mounted on a shaft 101 at its rear end, the shaft 101 being located at the rear of the frame 1 and mounted in the side arms 56 of the supplemental frame 2. The rear portion of this lever is bifurcated and the bifurcations 102 are loosely mounted on the shaft 101. The shaft 101 forms part of the carrying over and clearing mechanism to be described.

One of the bifurcations 102 is connected by a link 103 to one of the arms or brackets 52 of the platen carriage 51, so that upon the depression of the lever 99, said arm 52 will also be depressed carrying the platen downwardly into and out of coöperation with the type at the printing line of the calculating wheels 41, Fig. 15. In this form of my invention, the link 103 is pivoted at its lower end at 104 to one of the bifurcations of the lever 99, and is pivoted at 105 at its upper end to one arm of an angle or bell crank lever 106 which is pivoted at its angle at 107 to the platen carriage on an axis coincident with that of the arm 52 of the carriage and the other arm of said angle lever is pivoted at 108 to one end of a link 109, the other end of which link 109 is pivoted at 110 to one end of the platen eccentric to the axis thereof. Hence upon the depression of the lever 99, the platen 46 will be rotated slightly preliminary to the depression of the arms 52 in order that a too wide space will not intervene between the item and total records.

The movement of the platen about its axis is limited by a stop 111 on the adjacent bracket or arm 52 of the platen carriage, which stop 111 coöperates with the opposite end walls of a recess in one end of the platen, as clearly seen in Fig. 15. The link 103 is here shown as formed with an open ended slot for engaging the pivot 105 and as held from disengagement by reason of the open ended slot by a spring 112 connected at one end to the link 103 and at its other end to the lever 99.

The movement of the lever 99 is against the action of a returning spring 113, Fig. 4. Said lever 99 also actuates means for eliminating the zeros at the printing line of the inactive wheels 41, as hereinafter described.

In order that when the total is being taken, the operating lever 63 and the key levers 17 will be locked from movement, suitable locking means for this purpose is provided which is actuated by the total lever 99. Said means comprises a locking detent or pawl 114, Fig. 4, located at one side of the machine as seen in Fig. 1, and mounted on the shaft 101 and connected to the lever 99 to work therewith, the detent having a hook 115 at its upper end which coacts with a shoulder 116 projecting inwardly from the handle 63.

The locking detent 114 is formed with a forwardly extending arm 117 which is suitably connected at 118 by a pin-and-slot to a lever 119 pivoted between its ends at 120 to one of the sides of the frame 1, the forward arm of the lever having an upwardly extending portion 121 which is shifted in front of the universal bar 24, and hence prevents the actuation of the bar and the movement of the key levers. The slot of the pin-and-slot connection 118 is open at its rear end to permit the detachment of the lock 114 during the removal of the supplemental frame 2 and parts carried thereby. The forwardly extending arm 117 of the detent 114 is arranged in the path of a laterally extending pin or shoulder 99^a on one of the bifurcations of said lever 99 so that the downward movement of the lever 99 will move the lock 114 into operative position. The spring 113 is here shown as connected to said shoulder. A spring pressed detent 122 impositively holds the locking pawl 114 in either of its positions.

The lock 114 is moved out of operative position by means to be described forming part of the clearing mechanism but in case a total is taken and the machine not cleared, the lock 114 may be moved to its inoperative position against the holding force of the detent 122 by depressing a key 119^a, Fig. 4, connected to the lever 119 in front of its pivot 120.

The first two wheels at the right of the calculating wheels 41 are reserved for decimals or cents, and the decimal mechanism comprises means by which after a number including the decimal has been set in the machine, the carriage for the controlling wheels 3 is moved to the right two steps, preliminary to the actuation of said elements by the roller 59, that is preliminary to the rotation of the shaft 4. This decimal means comprises means operated by a decimal key for clutching the shaft 4 to the mechanism operating to return the shaft 4 and the controlling wheels 3 and frame 6 to the right two steps preliminary to the rotation of the shaft 4. As here shown, Figs. 5 and 13, the clutch consists of a sliding pin 123 carried by a lever 124 and slidable relatively thereto into and out of notches or teeth 125, Fig. 14, in the shaft 4 and said pin is operated by means of decimal lever key 126 connected by a link 127 to an arm 128 mounted on a rock shaft 129 which is provided with a shifting arm 130 coacting with the rear end of the pin 123. The lever 124 is one arm of an angle lever, the other arm of which is provided with a roller coacting with the cam 74, previously referred to, on the sleeve 60. The rear end of the clutch pin 123 normally extends into a recess 125^a in the underside of the lever 125, and abuts against a stationary shoulder 125^b which normally prevents pivotal movement of the lever 125 to the left. Upon the operation of the decimal key, the clutch pin 123 is thrown into one of the notches of the shaft 4 and out of the path of the shoulder 125^b and there is sufficient space between the roller on the lever 124 and the bottom of a notch 131 in the periphery of the cam 74 to permit the shaft 4 and controlling elements 3 to shift two steps of the escapement

to the left before the roller engages the bottom of the notch 131 in the cam 74. Upon the initial part of the forward movement of the lever 63, the cam 74 engaging the roller on the lever 124 will move the angle lever on its pivot, and, as the pin 123 is clutched into one of the notches of the shaft 4, will cause the shaft to be shifted to the right two steps whereupon the cylindrical peripheral surface of the shaft will have come into engagement with the pin 123 and return the same to its normal position. The lever 124 is also provided with an extension 132 extending under the shaft 4 into the path of a peripheral shoulder thereon as the inner end of the key 61. This shoulder engages the extension 132 when the shaft is shifted to the limit of its movement to the left except two steps, and as the clutch pin 123 is engaged with the shoulder 125^b, further movement of the shaft 4 to the left is prevented until the decimal key is operated.

During the retrograde movement of the shaft 4, frame 6 and elements 3 by the decimal mechanism, the two controlling elements 3 at the right are moved under the locking bar 25 so that during the rotation of the elements 3 by the shaft 4 and roller 59, the shoulders 18 of these two elements will engage the bar 25. The advance edges of these shoulders 18 are formed rounding or inclined, Figs. 9 and 10, in order to act as cams and rock the bar 25 about the axis of its supporting shaft 27 and against the influence of its spring 28, out of the path of said shoulders 18.

The carrying over mechanism for the calculating wheels 41, comprises a plurality of sets of members as pawls 133, Figs. 9, 10 and 12, coacting with ratchet wheels 134 on the wheels 41, there being one pawl 133 for each wheel 41, except the first wheel to the right, and latches 135 for coacting with the pawls respectively to normally hold the pawls out of position to engage the ratchet wheels 134 of the companion calculating wheels 41. Said latches are arranged to be operated by the wheels 41 of lower denomination than the wheels with which their companion latches coact, and the latches are operated by the wheels 41 when the wheels make complete revolutions, and each pawl is provided with means for coacting with the latch of the wheel of next higher denomination, in order to cause the latch of higher denomination to release its pawl and permit it to move into position to coact with the ratchet teeth of the wheel of higher denomination after the wheel of lower denomination has made a complete revolution.

Each pawl 133 is angular in form and is pivoted at its angle on a shaft 136 common to all of the pawls, the shaft being carried by the supplemental frame 2 so that the pawls are fixed from movement with the calculating wheel carriage 43 and coöperate with said wheels during the rearward movement of the carriage 43 upon each operation of the machine. One arm of each pawl 133 is formed with advance and rear teeth 137 and 138 for coöperating with the ratchet wheel 134 of the companion calculating wheel 41, and the other arm extends downwardly and coacts with means for resetting the pawls. Each latch is also angular and is pivoted at its angle on a rod 135^a common to all of the latches, and is formed with upwardly extending arm having a tooth 135^b at its upper end which coacts with a long tooth 139 projecting radially from the ratchet wheel 134. Each ratchet wheel is formed with a deep notch 140 in the rear of the long tooth 139. The horizontal arm 141 of each latch is formed with a notch or shoulder 142 which coacts with a laterally extending shoulder 143 on the tail of its companion pawl and holds the pawl out of operative position. The pivot rod 135^a is supported on a cross bar 135^c carried at its ends by forwardly extending arms 135^d associated with the supplemental frame 2. Each pawl 133 is formed with a shoulder 144 depending from its horizontal arm for the purpose of cocking its companion latch during the resetting of the parts, and each pawl is also formed with a laterally extending shoulder 145 projecting from its tail or vertical arm for tripping the latch of the pawl of next higher denomination when the tooth 137 of the pawl of lower denomination enters the deep notch 140 of the corresponding calculating wheel 41.

As thus far described the parts are in such position that the long teeth are in front of the teeth 135^b of the latches 135. As nine is being accumulated in the first wheel which is the decimal wheel but for convenience will be considered the units wheel, the wheel makes a complete revolution bringing the long tooth 139 in the rear of the tooth 135^b, Figs. 9 and 10, of the latch, coacting with the tens wheel pawl 133 so that upon the next rotative step of the units wheel by a controlling element 3, said latch is released and the pawl 133 held thereby is likewise released and coacts with the ratchet teeth of the tens wheel during the retrograde movement of the carriage 43. If 99 is accumulated in the units and the tens wheels and one is added or if any number is accumulated therein and a number is added to carry the total to 100 the deep notch 140 of the tens wheel is positioned to receive the tens wheel pawl which enters said deep notch 140 and in so doing, trips by means of its shoulder 145 the latch holding pawl 133 of the wheel of next higher denomination, that is the hundreds wheel, permitting the hundreds wheel pawl to coöperate with the ratchet teeth of the said wheel during the

next rearward movement of the calculating wheel carriage 43. Thus any addition made in the unit is carried over to the tens wheel and from the tens to the hundreds wheel, etc. During the rearward movement of the carriage 43, the advance tooth 137 of any pawl that has been tripped, first engages a tooth of the companion ratchet wheel 134 and advances the wheel part of the step, the advance tooth then moves out of engagement with said tooth of the ratchet wheel and the rear tooth 138 of the pawl engages the next tooth of the ratchet wheel and completes the step.

The pawls 133 and latches 135 are reset during each operation of the handle 63 and therefore are reset during each forward and rearward movement of the calculating wheel carriage 43. Such resetting movement is effected by means of a swinging bar or yoke 146, Figs. 9, 10 and 12, which engages the tails or vertical arms of the pawls 133 and moves the same until the shoulders 143 thereof are engaged by the latches 135 or the shoulders 142 thereof. The resetting movement of the pawls is against the action of the springs 147.

The bar or yoke 146 is actuated from the operating member or sleeve 60, and is here shown as carried by swinging arms 148 mounted on the shaft 136, one of said arms being provided with an arm 149 having a cam 150 which coacts with a rock arm 151 mounted on the rock shaft 101 journaled in the supplemental frame 2 and connected to the operating sleeve or member 60 to be operated thereby.

The arrangement of the arms 148 and 149 and the shape of the cam 150 are such that when the rock arm 151 is moved from its normal or upright position, Fig. 9, it engages the cam 150 and moves the bar 146 to first swing the tails of the pawls 133 to their fullest extent, Fig. 12, thereby carrying the shoulders 143 into engagement with the shoulders 142 of the latches 135 and moving the latches into operative position by reason of the fact that the shoulders 144 on the pawls engage the horizontal arms 141 of the latches. The rock arm 151 next swings forwardly out of engagement with the cam 150, Fig. 10, permitting the bar 146 to be swung slightly in the reverse direction and withdraw the shoulders 144 out of engagement with the latches, and then said rock arm swings to its starting position. The spring 153 resists the movement of the bar 146 by the arm 149 and normally holds said bar 156 out of the way of the tails of the pawls.

The rock shaft 101 is connected to the sleeve 60 by means of a toothed segment 154, Fig. 11, mounted on the shaft 101 and meshing with an idler 155 meshing with a gear 156 mounted on the sleeve 60.

The clearing mechanism carried by the supplemental frame 2 comprises means for rotating the shaft 42 and calculating wheels 41 until the long teeth 139 of said wheels are limited by the rear teeth 138 of the pawls 133 and then turning said wheels slightly forwardly until the long teeth are in their normal position, that is, in front of the teeth 135[a] of the latch 135.

The clearing mechanism, Figs. 7, 17, 18, 19 and 20 as here shown, comprises a shaft arranged in axial alinement with the shaft 101 and being here shown as a sleeve 157 mounted on the shaft 101 on the side of the machine opposite to that on which the segment 154 is located, a segment 158 mounted to rock with said sleeve and meshing with a gear wheel 159 mounted on a shaft 160 arranged above the shafts 155 and 157, and a segment 161 loosely mounted on the shaft 160 and meshing with a gear wheel 162 on the shaft 42 carrying the calculating wheels. Said mechanism also includes means for clutching the segment 161 to the shaft 160 during the movement of the segment in one direction, and as here shown this means comprises a rock arm 163 mounted on the shaft 160 contiguous to the segment 161 and coacting with a shoulder or pin 164 projecting from one side of the segment 161, this rock arm 163 having a single tooth at its end which is alined with one of the teeth of the segment.

The shaft or sleeve 157 is provided with a handle lever 165 on the outside of the case and during the movement of said lever forwardly, the shaft 157 and power-transmitting parts 158, 159 and 163 carry the segment 167 upwardly rotating the gear 162 and the shaft 42 to carry the calculating wheels 41 in a retrograde direction to their full extent. During the movement of the lever rearwardly, the arm 163 does not transfer movement to the segment 161, but the tooth at the end of said arm engages the wheel 162 and rotates the same one step in a forward direction, carrying the long teeth 139 of the calculating wheels 41 in front of the teeth 135[a] of the latches. The segment 161 falls to its starting position during the first forward movement of the calculating wheel carriage 43 after the clearing operation.

The shafts 101 and 157 are journaled in suitable bearings in the frame 1 and sides 56 of the frame 2 and are held in the bearings by keys 101[a] and 157[a], Figs. 2, 7, and 7[a], as screws extending upwardly from the lower sides of the machine through said bearings and into circumferential grooves 101[b] and 157[b] in said shafts. Upon the withdrawing of the screws 101[a] and 157[a], the shafts 101 and 157 can be withdrawn axially and the frame 2 removed rearwardly upon the removing the screws 2[a].

A trailing pawl 167 carried by the calculating wheel carriage and entering the notch in the periphery of the shaft 42 holds the shaft in its starting position from further rotation in a retrograde direction.

The calculating wheel carriage 43 is held from forward movement when the segment 161 is meshing with the gear 162 by suitable means, as a latch 168, pivotally mounted between its ends on the shaft 160, one arm thereof having a hook 169 which engages a shoulder 170 on one of the side arms of the calculating wheel carriage, and the other arm of which is weighted in order to tilt the latch on its pivot and move the hook 169 into engagement with the shoulder 170. The latch is moved on its pivot to disengage the hook 169 from the shoulder 170, and is held in this position by an eccentric pin 171 projecting from the side of the segment 158 and acting on the weighted arm of the latch 168.

The operating lever 165 and sleeve or shaft 157 to which it is attached, and moved forwardly against the action of a returning spring 172 which is here shown as connected at one end to the frame 2 and at its other end to a lever 173 pivoted to the frame 2 and engaging the eccentric pin 174 projecting from the other side of the segment 158 from that from which the pin 171 projects. Obviously the spring 172 connected as described will tend to move the segment 158 and hence return the parts to their starting position.

Suitable means is provided for preventing the return of the lever 165 to its starting position before the same has been pulled forwardly to its full extent, said means comprising an automatically reversible pawl 175 on the lever 165 and coacting with a rack 176 fixed to the frame 2, the pawl coacting with shoulders 177 and 178 at opposite ends of the rack for shifting the same into and out of position to engage the teeth of the rack.

In order that the zero type of the inactive elements at the left of the elements or wheels 41 in which a number is set will be eliminated during the printing of the total, means is provided for turning the inactive elements about the shaft 42 during the operation of the total lever 99. Said means comprises a frame 179, Figs. 21, 22, 23, 24 and 25, mounted on the shaft 42 and carrying a series of pawls 180 coacting with the gear teeth of the wheels 41 and mounted to be moved out of operative position during any movement of the gear wheels 41 by the controlling elements 3. As previously referred to, one of the bifurcations of the lever 99, Fig. 15, is formed with a shoulder 181 which engages a depending arm 182 or the pawl frame 179, and hence rocks the frame during the depression of said lever. These pawls 180 are mounted on a shaft 183 and are connected thereto by a key 184 which extends lengthwise of the shaft and which enters wide recesses or keyways in the pawls in order to permit the pawls to move sufficiently, relatively to the shaft 183 to be disengaged from the gear teeth of the wheels 41 when said wheels are operated by the controlling elements 3, and each pawl is held in either of its positions it is capable of assuming relatively to the shaft 183, by impositive locking means as a spring pressed detent 185. Each pawl is also formed with a laterally extending shoulder 186, Fig. 25, arranged to press the next pawl to the right out of operative position so that if the total contains any zeros, as for instance, the number 10,036, the zeros in the number will not be eliminated.

The shaft 183 is rocked by means of an arm 187, Figs. 7 and 24, mounted on the rock shaft 160 of the clearing mechanism. The arm 187 is normally in its position shown in Fig. 24 and during its upward movement with the shaft 160, engages a rock arm 188 on the shaft 183 rocking the shaft in a retrograde direction, and moving all pawls 180 out of operative position. During the movement of the arm 187 with the shaft 160 in the reverse direction, it resets the pawls 180. A spring 189 holds the shaft from turning more than it is intended to turn, that is, holds the shaft from displacement. The shaft 160 of the clearing mechanism is also formed with an eccentric pin 190, Figs. 1, 4 and 7, for coacting with the locking lever 114 for the hand lever 63 and positively moving said lock out of operative position when the machine is cleared, so that all parts are returned to their starting position during the clearing operation.

The construction of the means for controlling the operation of the controlling elements 3 including the keys 17 and parts operated thereby and the movements of the carriage for the controlling elements 3 and specific constructions thereof constitute the subject matter of my pending application Sr. No. 565,197, filed June 6, 1910. The carrying over and clearing mechanism *per se* constitutes the subject matter of my pending application Sr. No. 592,227, filed Nov. 14, 1910. The decimal mechanism constitutes the subject matter of my application, Sr. No. 705,639, filed June 24, 1912, renewal of application Sr. No. 585,746, filed Oct. 7, 1910. The zero eliminating mechanism constitutes the subject matter of my pending application Sr. No. 584,100, filed Sept. 29, 1910, and the subject matter of the controlling elements *per se* forms the subject matter of my pending application, Sr. No. 467,472, filed Dec. 14, 1908. The subject matter of this application is the combination of operating means, the interconnections be-

tween the various mechanisms of the machine, and the means for controlling the operations of the various mechanisms by which combination the mechanisms are brought together in a unitary structure.

What I claim is:

1. In a calculating machine, a series of controlling wheels movable laterally to the left into denominational positions and about their axes into numerical positions, calculating wheels movable into and out of connection with the controlling wheels, a carriage for the calculating wheels, an actuating member arranged coaxially with the controlling wheels, connections between said member and the controlling wheels operating to return the wheels about their axes to their starting positions, and to the left out of their denominational positions, and connections between said member and the carriage to control the movement thereof, substantially as and for the purpose described.

2. In a calculating machine, a series of controlling wheels movable laterally to the left into denominational positions and about their axes into numerical positions, calculating wheels movable into and out of connection with the controlling wheels, a shaft on which the controlling wheels are loosely mounted, a carriage for the calculating wheels, an actuating member including a sleeve mounted on the shaft and connected thereto to rock the same, the shaft having means thereon connected to the controlling wheels to return the same about their axes to their starting positions, and means operated by the sleeve for moving the controlling wheels to the right out of their denominational positions and also means for controlling the movement of the carriage, substantially as and for the purpose specified.

3. In a calculating machine, a series of controlling wheels movable laterally to the left into denominational positions and about their axes into numerical positions, calculating wheels movable into and out of connection with the controlling wheels, a platen movable toward and from the controlling wheels, carriages for the calculating wheels and the platen, an actuating member arranged coaxially with the controlling wheels and connected to said controlling wheels to return the same about their axes to their starting positions and to the right out of their denominational positions, and connections between said member and the carriages to control the movements thereof, substantially as and for the purpose set forth.

4. In a calculating machine, a series of controlling wheels movable laterally to the left into denominational positions and about their axes into numerical positions, calculating wheels movable into and out of connection with the controlling wheels, a platen movable toward and from the controlling wheels, carriages for the calculating wheels and the platen, an actuating member arranged coaxially with the controlling wheels and connected to said wheels to move the same about their axes to their initial position, and said member having cams thereon operating to move the controlling wheels to the right out of their denominational positions and coacting with power transmitting means actuating said carriages, substantially as and for the purpose described.

5. In a calculating machine, a series of controlling wheels movable laterally to the left into denominational positions and about their axes into numerical positions, calculating wheels movable into and out of connection with the controlling wheels, a platen movable toward and from the controlling wheels, a shaft on which the controlling wheels are loosely mounted, carriages for the calculating wheels and the platen, an actuating member including a sleeve mounted on the shaft and connected thereto to rock the shaft, power transmitting connections between the shaft and the controlling wheels, connections operated by the sleeve to move the controlling elements to the right out of their denominational positions, and other connections operated by said sleeve for controlling the operation of the carriages, substantially as and for the purpose specified.

6. In a calculating machine, a series of controlling wheels movable laterally to the left into denominational positions and about their axes into numerical positions, calculating wheels movable into and out of connection with the controlling wheels, a platen movable toward and from the controlling wheels, carriages for the calculating wheels and the platen, an actuating member arranged coaxially with the controlling wheels and connected to said controlling wheels to return the same about their axes to their starting positions and to the right out of their denominational positions, and connections between said member and the carriages to control the movement thereof, and decimal setting mechanism operating to return the controlling wheels to the right preliminary to the movement thereof about their axes out of their numerical positions, said mechanism including means for connecting the same with the actuating member, substantially as and for the purpose set forth.

7. In a calculating machine, a series of controlling wheels movable laterally to the left into denominational positions and about their axes into numerical positions, calculating wheels movable into and out of connection with the controlling wheels, a platen movable toward and from the controlling wheels, a shaft on which the controlling wheels are loosely mounted, carriages for

the calculating wheels and the platen, an actuating member including a sleeve mounted on the shaft and connected thereto to rock the shaft, and power transmitting connections between the shaft and the controlling wheels and connections operated by the sleeve to move the controlling elements to the right out of their denominational positions, and other connections operated by said sleeve for controlling the operation of the carriages, and decimal setting mechanism operating to return the controlling wheels to the right preliminary to the movement thereof about their axes out of their numerical positions, said mechanism including means for connecting the same with the actuating member, substantially as and for the purpose described.

8. In a calculating machine, a frame, a shaft journaled in the frame, a series of controlling elements mounted on the shaft and movable about the same in one direction, a series of calculating elements movable into and out of connection with the controlling elements to be actuated thereby, means for controlling the movement of the controlling elements about the shaft in one direction, means on the shaft for moving the controlling elements about the shaft in the opposite direction, and operating means including a sleeve mounted on the shaft and connected thereto to rotate the shaft to move the controlling elements in the opposite direction, and power-transmitting connections operated by the sleeve to control the movements of the series of calculating elements into and out of connection with the controlling elements, substantially as and for the purpose specified.

9. In a calculating machine, a frame, a shaft journaled in the frame, a series of controlling elements mounted on the shaft and movable about the same in one direction, a series of calculating elements movable into and out of connection with the controlling elements to be actuated thereby, means for controlling the movement of the controlling elements about the shaft in one direction, means on the shaft for moving the controlling elements about the shaft in the opposite direction, and operating means including a sleeve mounted on the shaft and connected thereto to rotate the shaft, power-transmitting connections operated by the sleeve to control the movements of the series of calculating elements into and out of connection with the controlling elements, and a hand lever connected to the sleeve, substantially as and for the purpose set forth.

10. In a calculating machine, a frame, an axially movable shaft journaled in the frame, a series of controlling elements mounted on the shaft and movable about the same in one direction, a series of calculating elements, a carriage therefor movable for carrying the calculating elements into and out of connection with the controlling elements to be actuated thereby, means for controlling the movement of the controlling elements about the shaft in one direction and also the axially shifting of the shaft in one direction, operating means comprising a sleeve journaled in the frame and mounted on said shaft, power-transmitting connections operated by the shaft to actuate the controlling elements about the shaft in the opposite direction, and means operated by the sleeve to control the movements of the carriage, and the axial movement of the shaft in the opposite direction, substantially as and for the purpose described.

11. In a calculating machine, a frame, a shaft journaled in the frame, toothed controlling elements mounted on the shaft and movable lengthwise of the axis of the shaft, and also about the shaft in one direction, the controlling elements being provided with type, a carriage supported by the frame, a series of toothed calculating wheels supported by the carriage and having type, the carriage being movable for carrying the wheels into and out of mesh with the controlling elements, a platen arranged to coact with the controlling elements and the calculating wheels, a carriage for the platen movable together with the calculating wheel carriage when the wheels are being moved into and out of mesh with the controlling elements, keys for controlling the movement of the controlling elements about the shaft, an escapement operated by the keys for controlling the movement of the controlling elements laterally in one direction, connections between the shaft and the controlling elements for moving the same about the shaft in the opposite direction, a sleeve mounted on the shaft and keyed to the shaft by a lost motion, a spring for moving the carriages in one direction, eccentric means on the sleeve, and means connected to said carriages and coacting with the eccentric means whereby the carriages are returned against the influence of the spring to their starting position and are held in such position, and are relieved of holding means during the initial movement of the sleeve, substantially as and for the purpose specified.

12. A calculating machine comprising a frame, and a movable carriage supported by the frame, a series of elements carried by the carriage, a spring normally tending to move the carriage in one direction, operating means including a member movable about an axis and having cam means having high and low points, means associated with the carriage and normally engaged with the high point of the cam means, and said means being movable to carry the high point out of engagement with the means on the car-1

riage during the starting movement of said member and thereby permitting the spring to actuate the carriage, substantially as and for the purpose set forth.

13. In a calculating machine, a movable platen, a carriage for the platen, a spring connected to the carriage for moving the carriage to carry the platen into operative position, a member movable about an axis and having eccentric means having high and low points, and a pair of arms associated with the carriage, one coacting with the high point of the means and preventing movement of the carriage by the spring, and being movable to the low point of said means and the other arm coacting with the eccentric cam means to be actuated thereby and return the carriage against the action of the spring, substantially as and for the purpose described.

14. In a calculating machine, a series of driving elements having type, a series of driven elements and a platen movable into and out of coöperation with the driving elements and the type thereof respectively, and carriages for the driven elements and the platen, substantially as and for the purpose specified.

15. In a calculating machine, a series of driving elements having type, a series of driven elements and a platen movable into and out of coöperation with the driving elements and the type thereof respectively, and carriages for the driven elements and the platen, the carriages being pivoted, substantially as and for the purpose set forth.

16. In a calculating machine, a series of driving elements having type, a series of driven elements and a platen movable into and out of coöperation with the driving elements and the type thereof respectively, and carriages for the driven elements and the platen, the carriages being pivoted on a common axis, substantially as and for the purpose described.

17. In a calculating machine, a series of driving elements having type, a series of driven elements and a platen movable into and out of coöperation with the driving elements and the type thereof respectively, and carriages for the driven elements and the platen, a spring connected to said carriages to move the same, spring means interposed between the carriages whereby the platen has an overthrow movement, and means for controlling the operations of the carriages by the spring, substantially as and for the purpose specified.

18. In a calculating machine, a series of driving elements having type, a series of driven elements and a platen movable into and out of coöperation with the driving elements and the type thereof respectively, carriages for the driven elements and the platen, a spring connected to said carriages to move the same, spring means interposed between the carriages whereby the platen has a slight overthrow movement, and means for controlling the operations of the carriages by the spring, said means comprising a member movable about an axis and having cam means formed with high and low points and an arm connected to the carriage and normally coacting with high point to hold the carriage from movement by the spring, and movable to the low point upon the starting movement of said member, substantially as and for the purpose set forth.

19. In a calculating machine, a series of driving elements having type, a series of driven elements and a platen movable into and out of coöperation with the driving elements and the type thereof respectively, carriages for the driven elements and the platen, a spring connected to said carriages to move the same, spring means interposed between the carriages whereby the platen has a slight overthrow movement, and means for controlling the operations of the carriages by the spring, said means comprising a rotatable member having a cam thereon, a push arm connected to said carriages and coacting with the cam, the push arm being rigidly connected to the carriage for the calculating elements and being connected to the platen carriage by lost motion, substantially as and for the purpose described.

20. In a calculating machine, a series of toothed driving elements, a series of toothed driven elements movable into and out of mesh with the driving elements, a carriage for the driven elements, means for moving the carriage to carry the driven elements into and out of mesh with the driving elements, a lock for holding the carriage when said series of elements are in mesh and means for controlling the operation of the series of elements and the carriage, said means being connected to the lock to operate the same, substantially as and for the purpose specified.

21. In a calculating machine, a frame having a fixed shoulder, a series of toothed driving elements having type, a series of toothed driven elements movable into and out of mesh with the driving elements, a movable carriage for the driven elements, means for moving the carriage to carry the driven elements into and out of mesh with the driving elements, a lock associated with the carriage and coöperating with the fixed shoulder on the frame, to hold the driven elements in mesh with the driving elements, the lock being normally out of engagement with the shoulder, operating means for controlling the movement of the driving elements and the carriage and a part connected to the lock to move the same, said part coacting with said means, substantially as and for the purpose set forth.

22. In a calculating machine, a frame having a fixed shoulder, a series of toothed driving elements having type, a series of toothed driven elements movable into and out of mesh with the driving elements, a movable carriage for the driven elements, means for moving the carriage to carry the driven elements into and out of mesh with the driving elements, a pivoted lock associated with the carriage and coöperating with the fixed shoulder on the frame, to hold the driven elements in mesh with the driving elements, the lock being normally out of engagement with the shoulder, operating means for controlling the movement of the driving elements and the carriage, a part connected to the lock eccentric of its pivot and coacting with said means, and a stop on the carriage for limiting the pivotal movement of the lock after the same has been disengaged from the shoulder whereby the carriage is moved to carry the driven elements out of mesh with the driving elements after the lock has been disengaged, substantially as and for the purpose described.

23. In a calculating machine, a series of toothed driving elements having type, a series of toothed driven elements movable into and out of mesh with the driving elements, a platen for coacting with the type, a carriage for the driven elements, and a carriage for the platen, a spring for moving the carriages as a unit, operating means for actuating the driving elements and controlling the movements of the carriages, the operating means including a cam, a spring interposed between the carriages to permit overthrow of the platen carriage, an arm rigidly connected to the carriage for the driven elements and connected by a pin-and-slot to the platen carriage, the arm coacting with the cam, substantially as and for the purpose specified.

24. In a calculating machine, a frame formed with a shoulder, a series of toothed driving elements having type, a series of toothed driven elements movable into and out of mesh with the driving elements, a platen for coacting with the type, a carriage for the driven elements, and a carriage for the platen, a spring for moving the carriages as a unit, operating means for actuating the driving elements and controlling the movements of the carriages, the operating means including a cam, a spring interposed between the carriages to permit overthrow of the platen carriage, an arm rigidly connected to the carriage for the driven elements and connected by a pin-and-slot to the platen carriage, the arm coacting with the cam, a lock pivoted to the carriage for the calculating elements and coacting with the shoulder on the frame when said elements are in mesh with the driving elements, a second arm pivoted to the lock and coacting with said cam, and means for limiting the pivotal movement of the lock after the same has been disengaged from the shoulder whereby the carriages are moved to their starting position by the last-mentioned arm, and the first-mentioned arm is engaged by the cam, substantially as and for the purpose set forth.

25. In a calculating machine, a series of controlling elements, a series of calculating elements, the controlling elements being movable into numerical positions and one series of elements being movable into and out of connection with the other series, a spring for moving one series into and out of connection with the other series, keys for controlling the setting of the controlling elements, an actuating member operable to actuate the controlling elements and having means for normally preventing movement of one series of elements into and out of connection with the other series by the spring, and means operable to prevent movement of said series of elements into connection with the other series of elements by the spring when said actuating member is operated, substantially as and for the purpose described.

26. In a calculating machine, a series of driving elements, a series of driven elements movable into and out of connection with the driving elements, a carriage for the driven elements, carrying over mechanism including a series of parts for the calculating elements, and operable by the movement of said elements, and means for operating the driving elements to actuate the calculating elements, and for controlling the movement of the carriage to carry the calculating elements into and out of connection with the driving elements, and also relatively to the carrying over mechanism, and connections between the operating means for resetting the carrying over mechanism during each operation of the machine, substantially as and for the purpose specified.

27. In a calculating machine, a main frame, controlling elements, and means for controlling the movement thereof and for actuating the same, said means being supported by the main frame, a supplemental frame detachably secured to the main frame, calculating mechanism, recording mechanism, carrying-over mechanism, and clearing mechanism carried by the supplemental frame, and operating means for the mechanisms carried by the main frame and the mechanisms carried by the supplemental frame, the operating mechanism being carried by the main frame and connected to the mechanisms on the supplemental frame, substantially as and for the purpose set forth.

28. In a calculating machine, a main frame, controlling elements, and means for

controlling the movement thereof and for actuating the same, said means being supported by the main frame, a supplemental frame detachably secured to the main frame, calculating mechanism, recording mechanism, carrying over mechanism, and clearing mechanism carried by the supplemental frame, and operating means for the mechanisms carried by the main frame and mechanisms carried by the supplemental frame, the operating mechanism being carried by the main frame and connected to the mechanisms on the supplemental frame, by intermeshing gears movable into and out of engagement during the movement of the supplemental frame, substantially as and for the purpose described.

29. A calculating machine, calculating mechanism comprising recording means which includes a printing couple comprising two members, one being movable toward and from the other to effect the making of a record of the total and of the items or examples, keys for setting the items or examples in said mechanism, a universal bar operated by the keys, a total lever connected to the movable member of the printing couple, a main operating member for effecting the operating of the calculating mechanism to calculate the items set in said mechanism by the keys, a lock operated by the total lever and coöperating with the main operating member to prevent operation of the main operating lever when the total is being taken, and an additional lock operated by the total lever into position to prevent operation of the universal bar while the total is being taken, substantially as and for the purpose set forth.

30. In a calculating machine, calculating elements, clearing mechanism, and means for eliminating the zeros in the inactive elements including parts operated out of operative position by the calculating elements during the calculating operations, and means actuated by the clearing mechanism for returning said parts into operative relation with the calculating elements, substantially as and for the purpose described.

31. In a calculating machine, calculating elements, clearing mechanism and means for eliminating the zeros in the inactive elements, said means comprising a series of pawls coacting with the elements respectively, and arranged to be moved out of engagement with said elements during the calculating operations, a shaft on which the pawls are mounted, the pawls being independently movable on the shaft a limited amount and being connected to the shaft by lost motion, a rock shaft having an arm thereon, and means operated by the clearing mechanism for coacting with said rock arm to reset the pawls, substantially as and for the purpose specified.

32. In a calculating machine, calculating elements having type, a platen coacting with the type at the printing line, means for operating the platen, mechanism for eliminating the zeros of the inactive elements comprising a movable frame and parts individual to the elements carried by the frame and normally engaged with said elements and movable out of engagement therewith during the calculating operations of said elements, means for operating the platen and said frame including interengaging parts whereby upon the initial operation of the platen actuating means, the frame is moved to cause the parts carried thereby engaged with the inactive elements to move said inactive elements, sustantially as and for the purpose set forth.

33. In a calculating machine, calculating elements having type, a platen coacting with the type at the printing line, means for operating the platen, mechanism for eliminating the zeros of the inactive elements comprising a movable frame and parts individual to the elements carried by the frame and normally engaged with said elements and movable out of engagement therewith during the calculating operations of said elements, means for operating the platen and said frame including interengaging parts whereby upon the initial operation of the platen actuating means, the frame is moved to cause the parts carried thereby engaged with the inactive elements to move said inactive elements, clearing mechanism, and means operated thereby for resetting said parts, substantially as and for the purpose described.

34. In a calculating machine, a series of calculating elements having type, a platen movable toward and from said elements to print the total, means including a lever connected to the platen to move the same, means for eliminating the zeros in the inactive elements comprising a rocking frame, a rock shaft carried by the frame and extending parallel to said series of elements, pawls mounted on the rock shaft and movable independently of each other about said shaft a limited distance and being connected thereto by a lost motion, the pawls being arranged to be moved about the shaft an amount equal to the lost motion by the calculating elements during the calculating operations thereof, the frame and the total lever having interengaging means whereby the frame is rocked during the initial movement of the total lever, clearing mechanism including means for coacting with the rock shaft to reset the pawls, substantially as and for the purpose specified.

35. In a calculating machine, a main frame, a supplemental frame, detachably secured to the main frame, controlling and calculating elements, and means for control-

ling the operation of said elements, said means being mounted on the main frame, carrying over and clearing mechanism mounted on the supplemental frame, and movable therewith, the carrying over and clearing mechanism including a shaft extending transversely of the supplemental frame and through the contiguous portions of the main frame, means for normally holding the shaft from axial displacement, and means for securing the supplemental frame to the main frame, substantially as and for the purpose set forth.

36. In a calculating machine, a main frame, a supplemental frame detachably secured to the main frame, controlling and calculating elements, and means for controlling the operation of said elements including an operating element mounted on the main frame, carrying over and clearing mechanism mounted on the supplemental frame, and movable therewith, the carrying over and clearing mechanism including a shaft extending transversely of the supplemental frame and through the contiguous portions of the main frame, means for normally holding the shaft from axial displacement, means for securing the supplemental frame to the main frame, and power-transmitting means between the operating element and said shaft, substantially as and for the purpose described.

In testimony whereof, I have hereunto signed my name in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 10th day of January, 1913.

WILLIAM H. BROWN.

Witnesses:
S. DAVIS,
L. M. BURTON.