No. 706,375. Patented Aug. 5, 1902.

F. S. BALDWIN.

CALCULATING MACHINE.

(Application filed Nov. 26, 1901.)

(No Model.) 8 Sheets—Sheet 1.

Fig. 1.

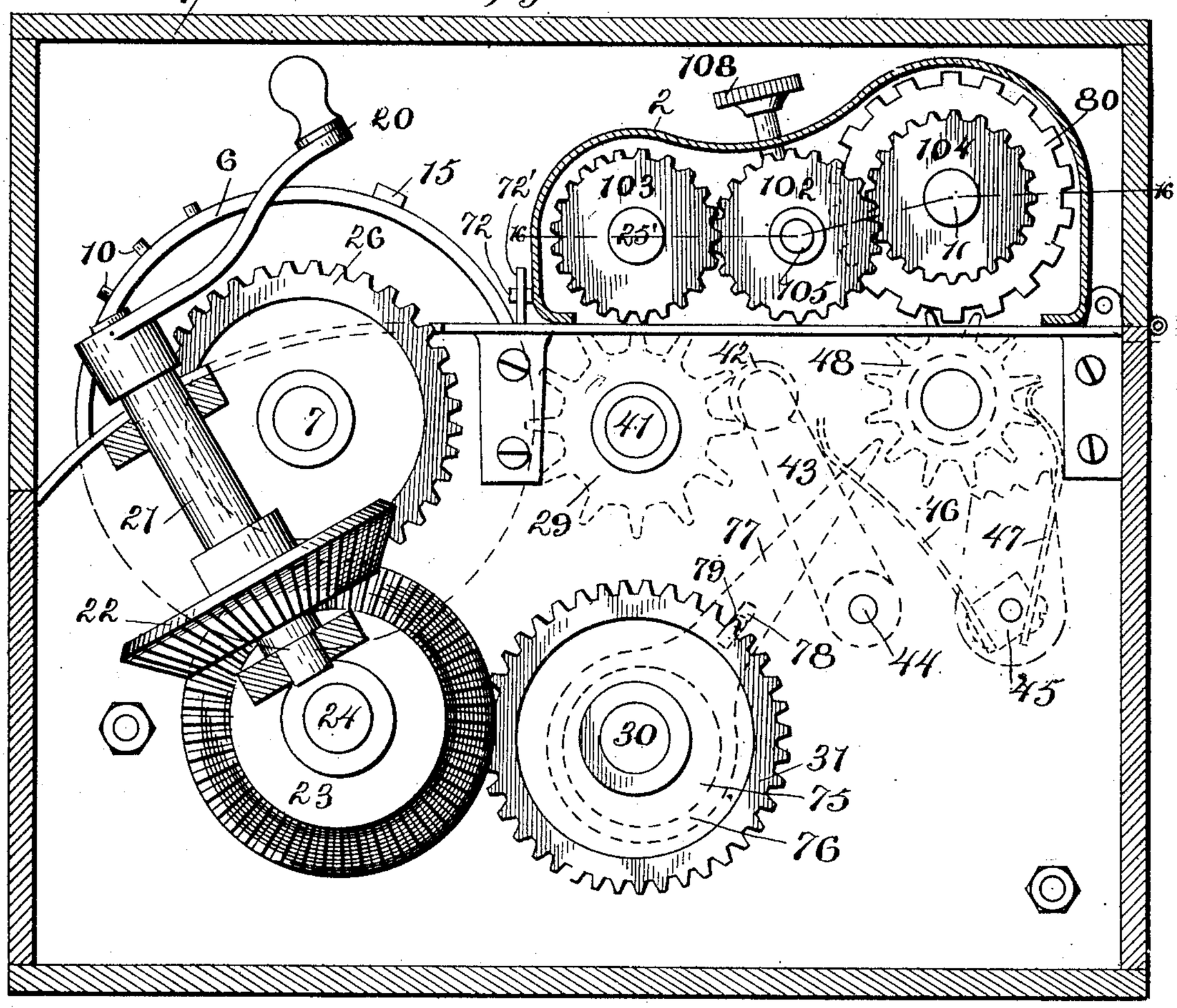
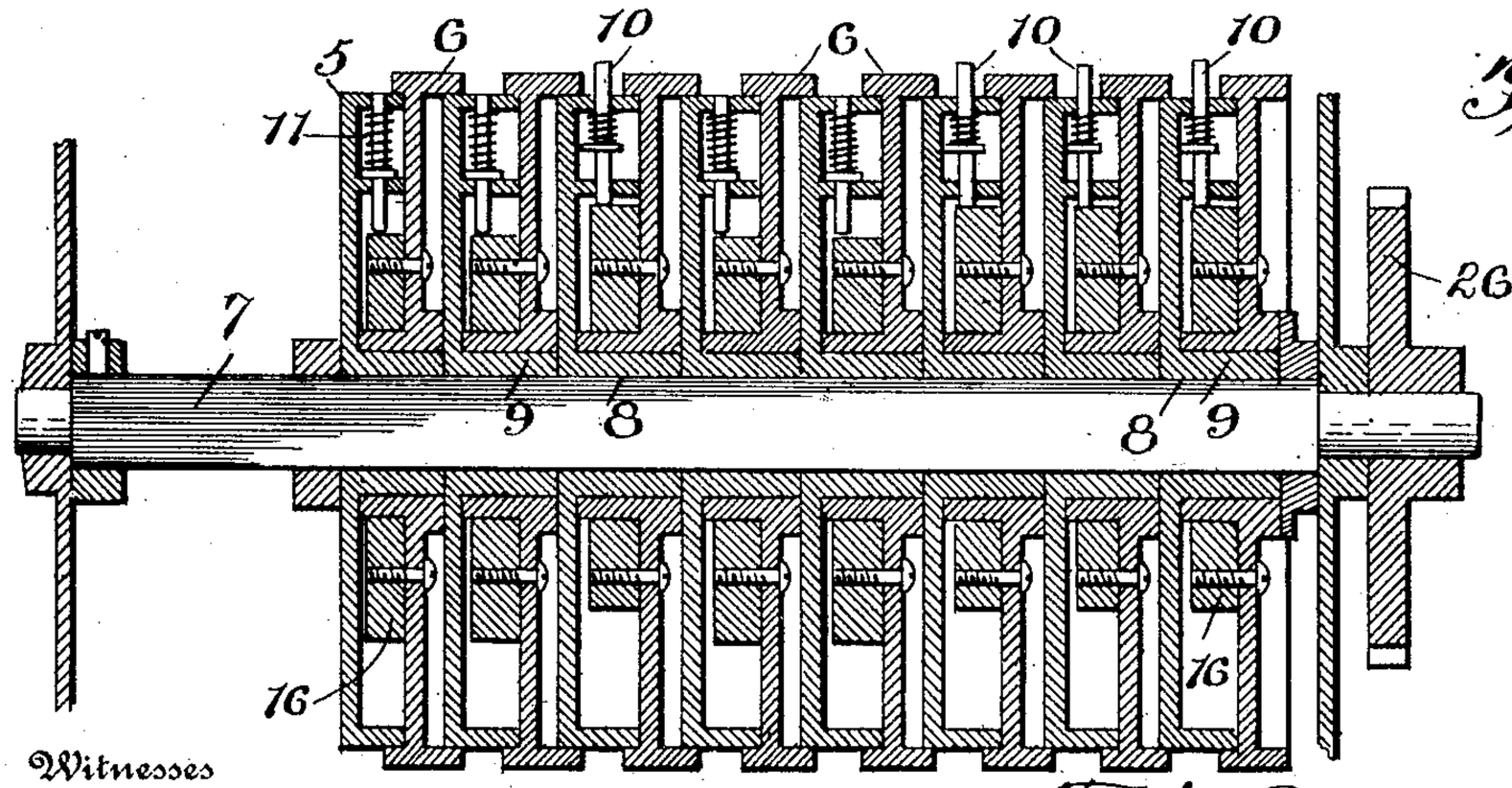


Fig. 6.



Witnesses

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No. 706,375. Patented Aug. 5, 1902.

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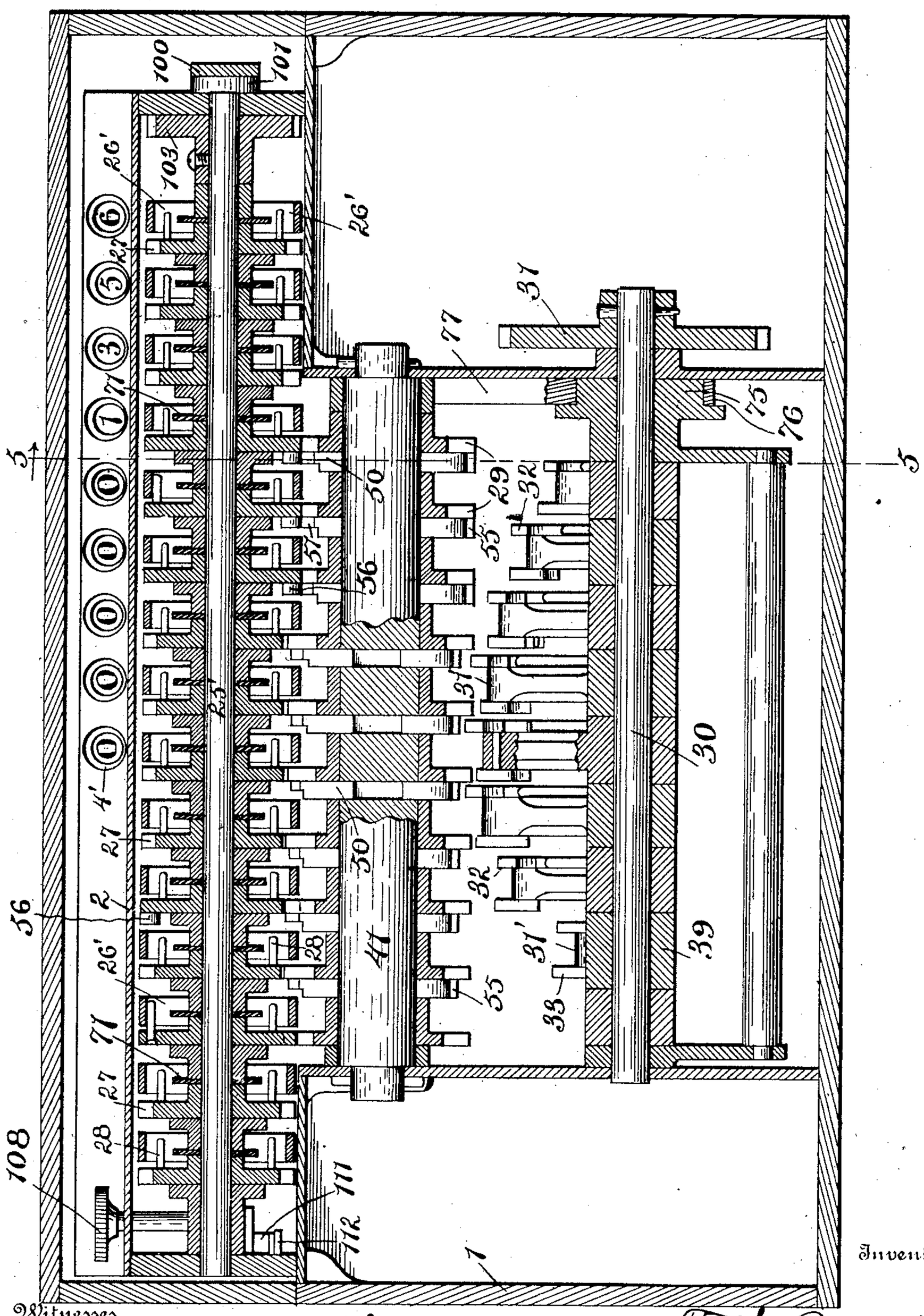
(No Model.) 2 Sheets—Sheet 2.



Witnesses
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(No Model.) 8 Sheets—Sheet 3.

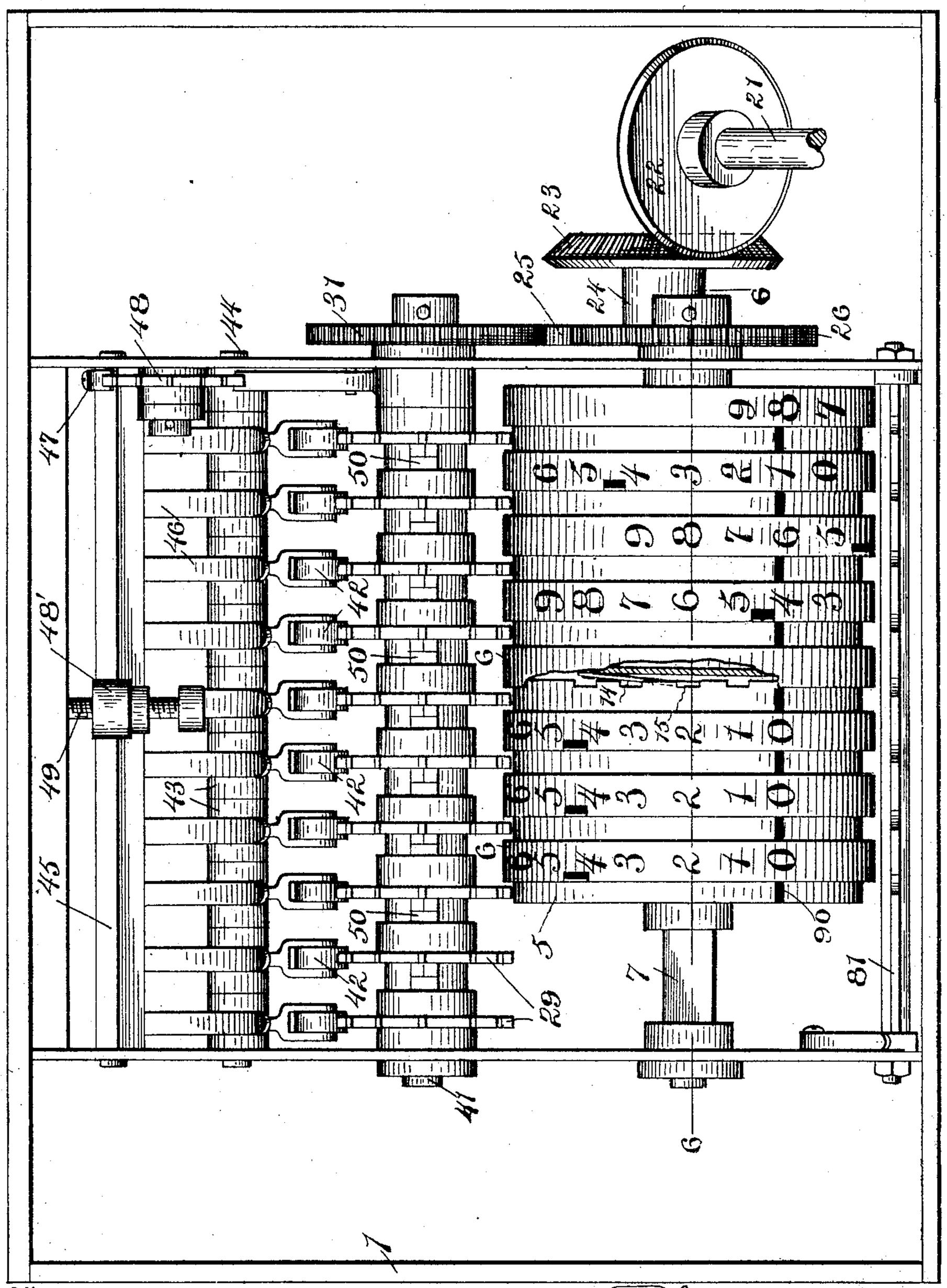

Fig. 3.

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(No Model.) 8 Sheets—Sheet 4.

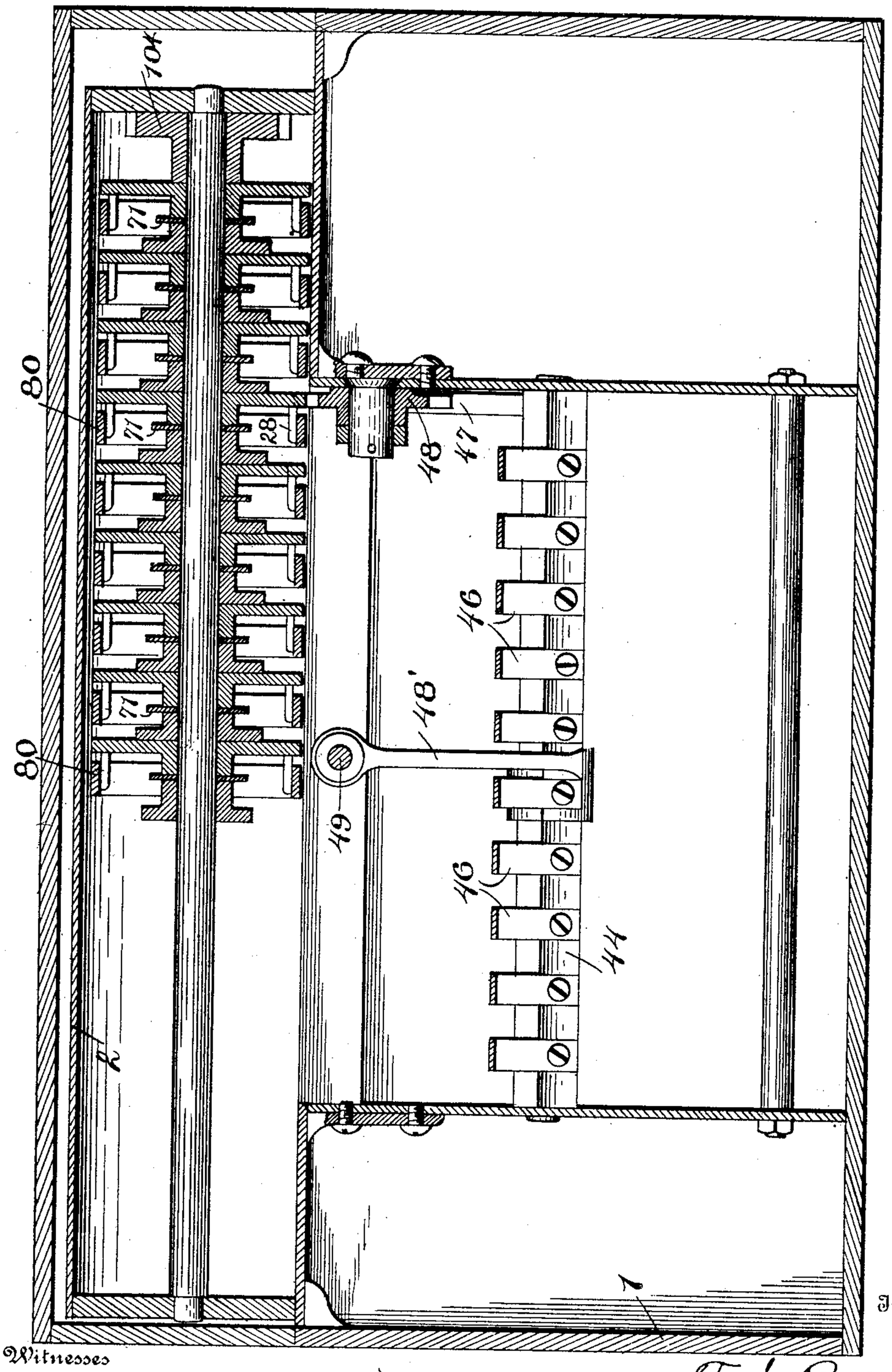

Fig. 4.

Witnesses

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(No Model.) 8 Sheets—Sheet 5.

Fig. 5.

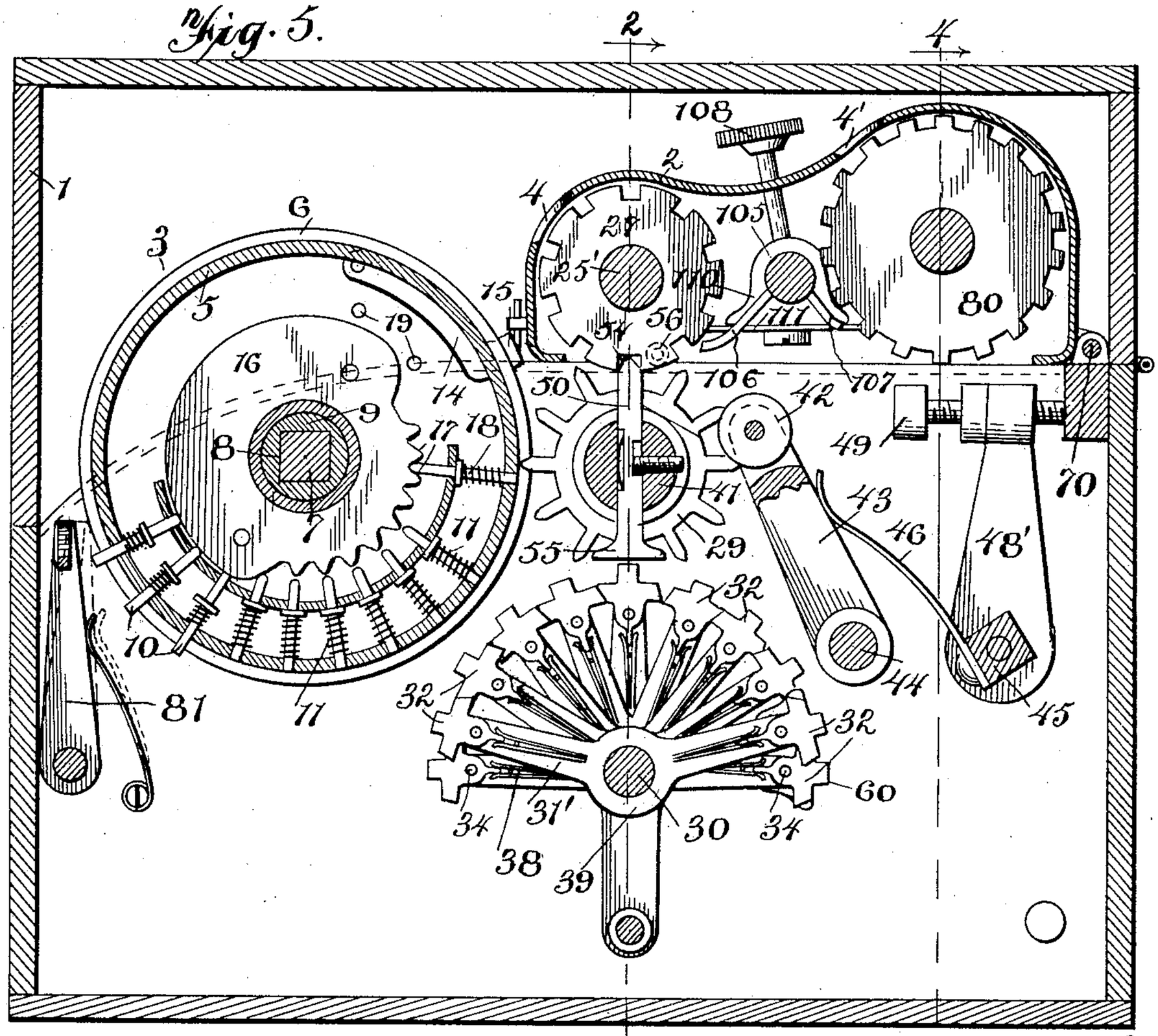


Fig. 12.

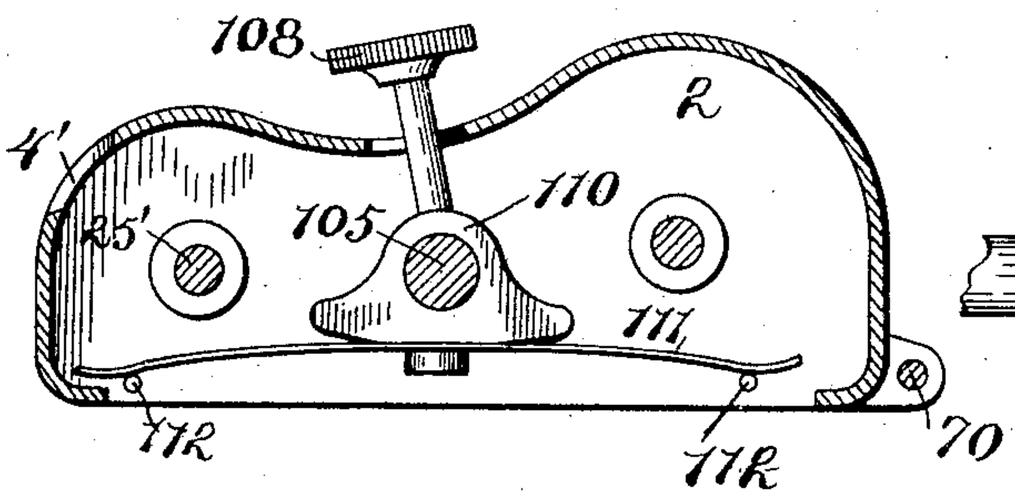
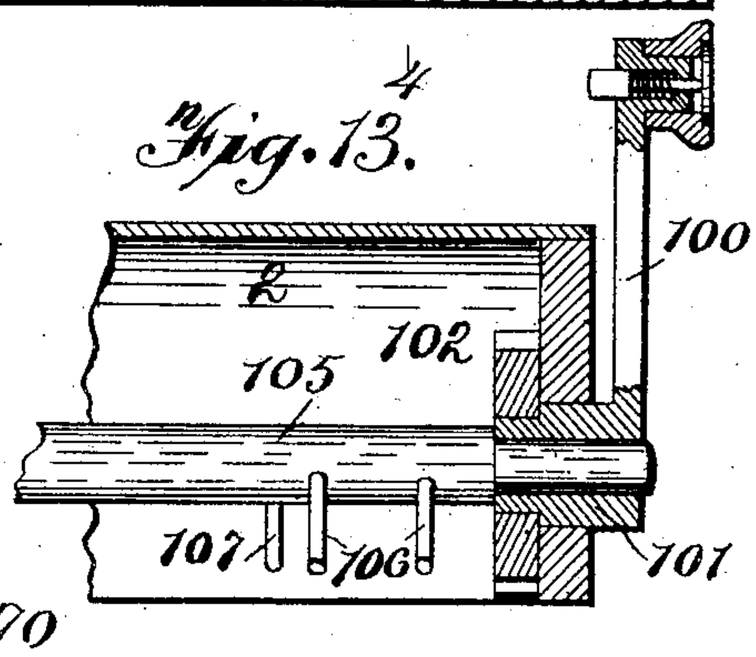


Fig. 13.



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(No Model.) 8 Sheets—Sheet 6.

Fig. 7.

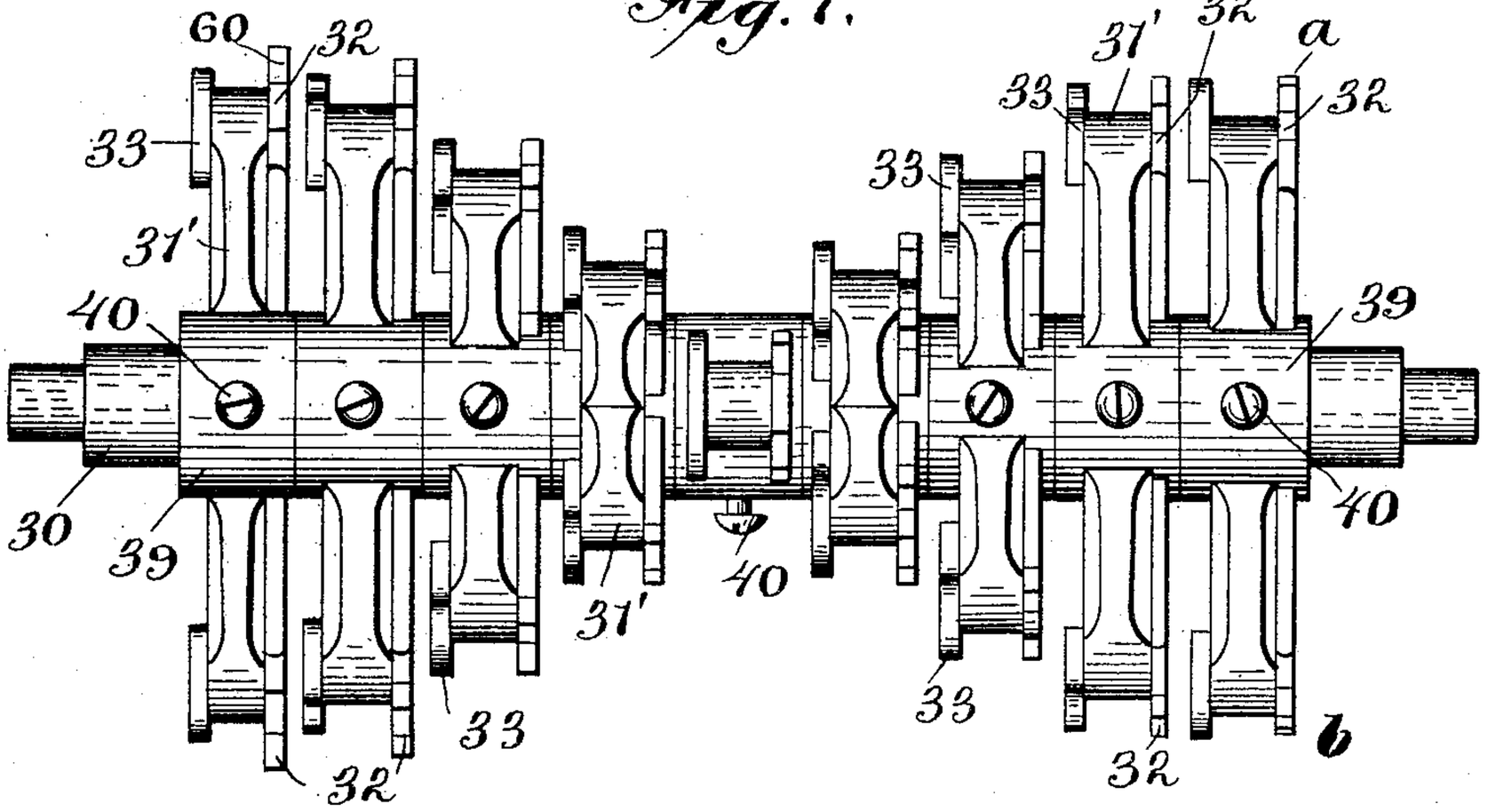


Fig. 14.

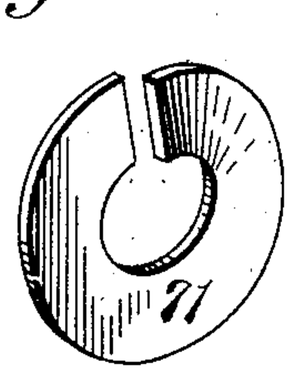


Fig. 15

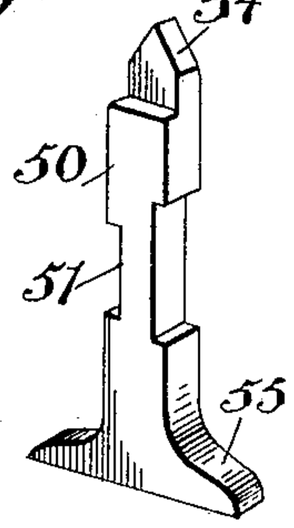


Fig. 16.

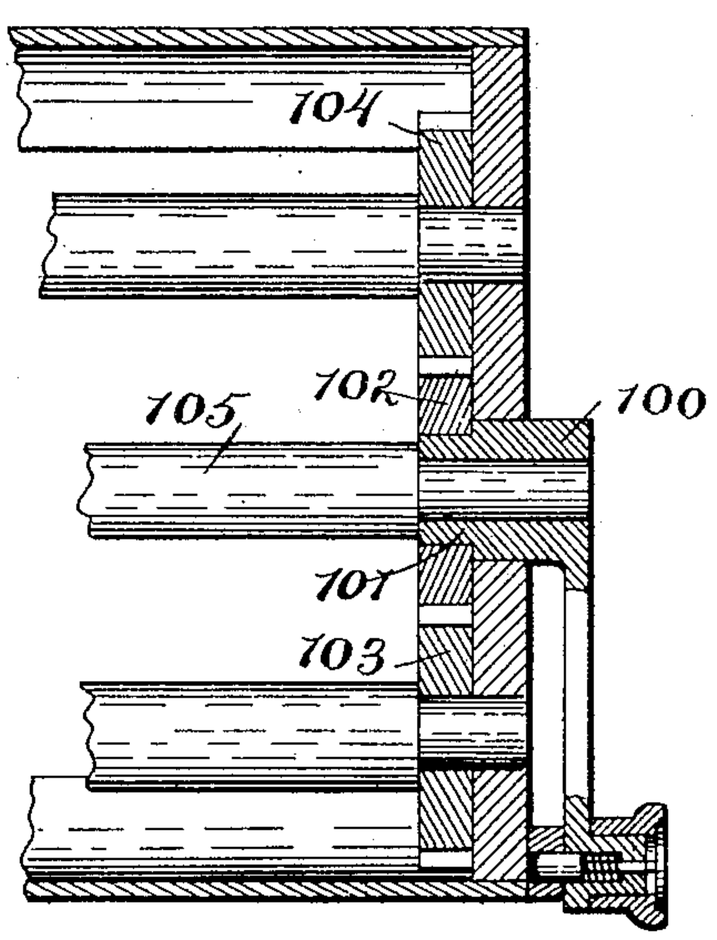
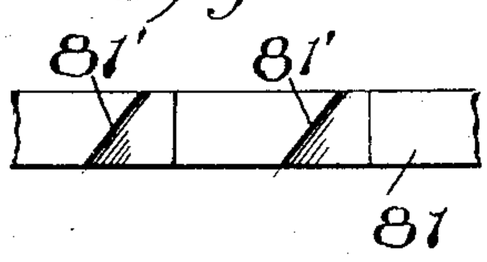


Fig. 18.



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(No Model.) 8 Sheets—Sheet 7.

Fig. 8.

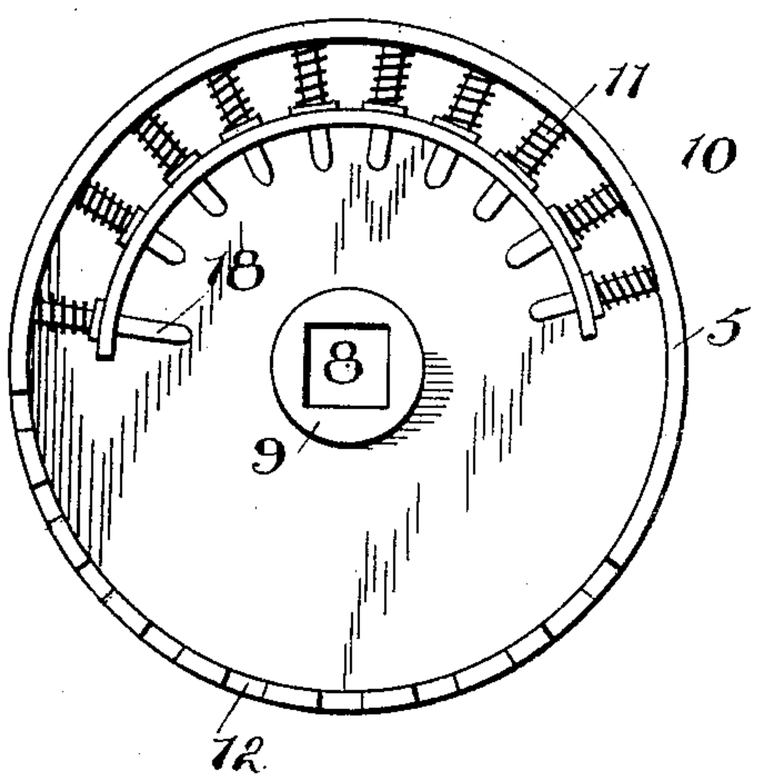


Fig. 9.

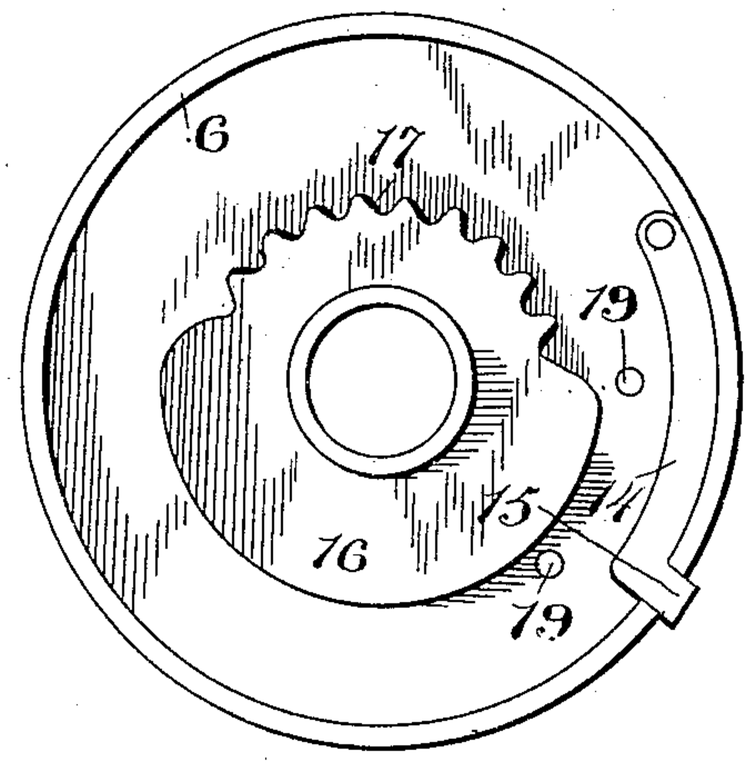


Fig. 10.

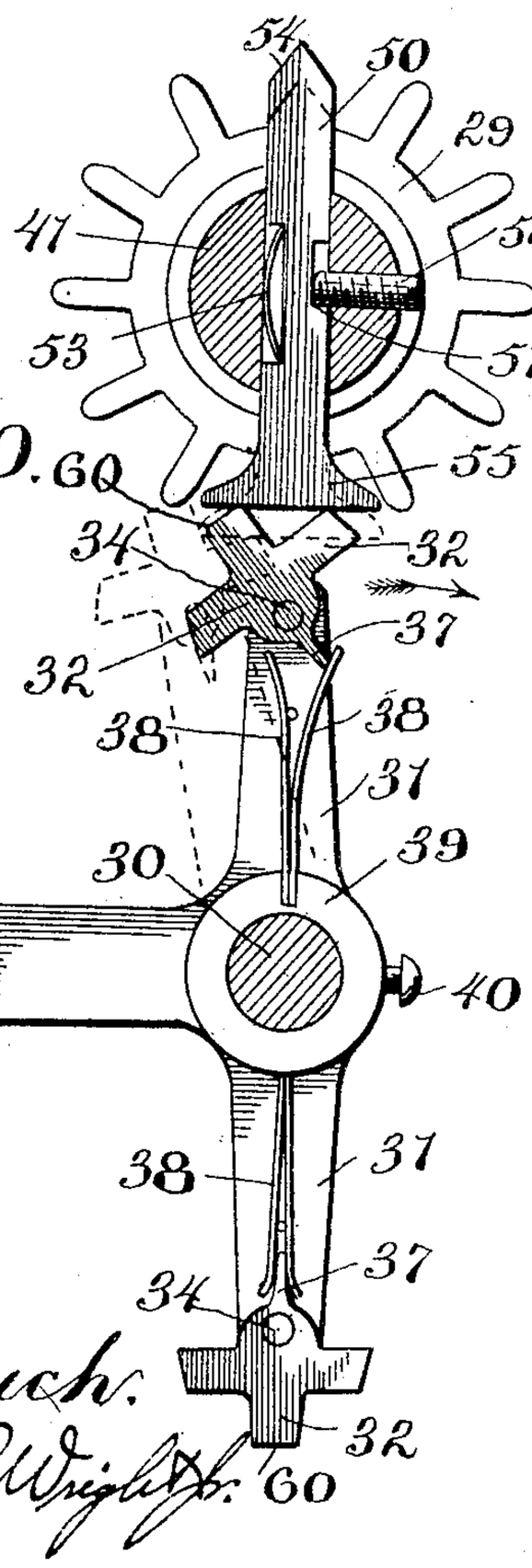
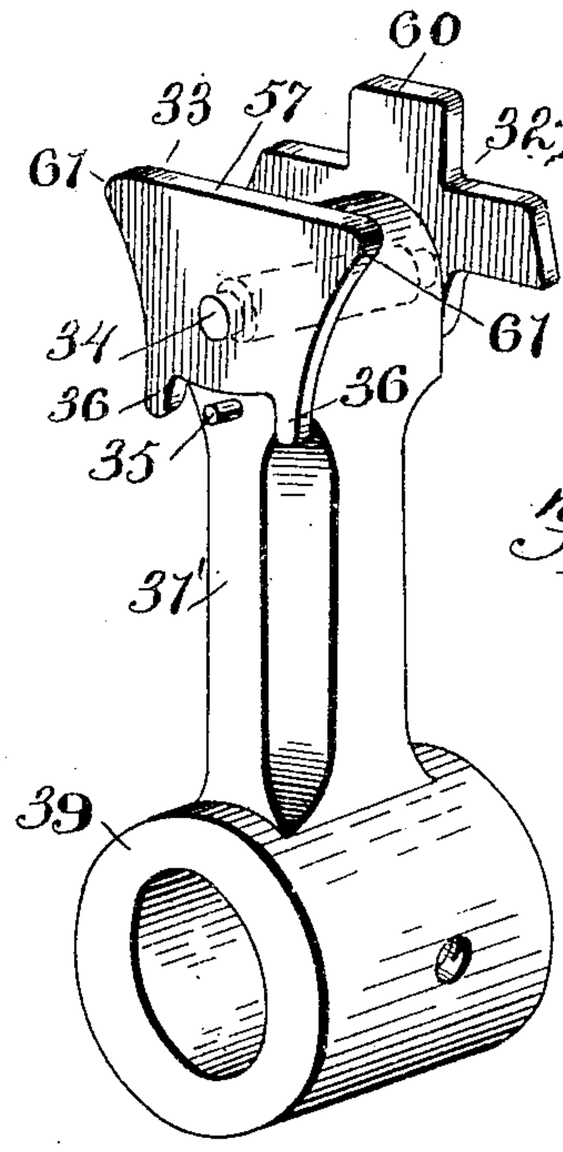


Fig. 11.



Witnesses

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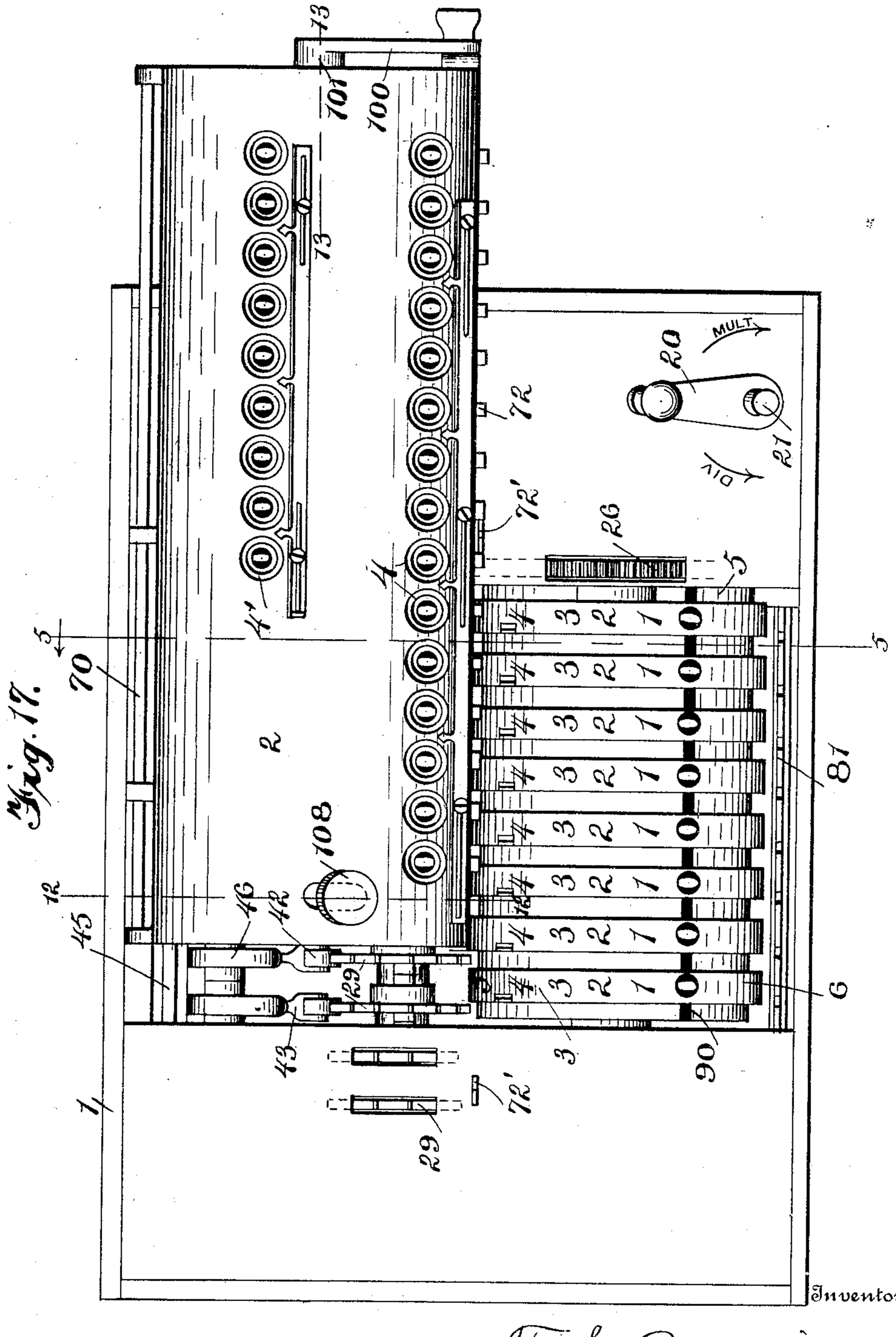

Fig. 17.

Witnesses

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UNITED STATES PATENT OFFICE.

FRANK S. BALDWIN, OF NEWARK, NEW JERSEY.

CALCULATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 706,375, dated August 5, 1902.

Application filed November 26, 1901. Serial No. 83,741. (No model.)

To all whom it may concern:

Be it known that I, FRANK S. BALDWIN, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented new and useful Improvements in Calculating-Machines, of which the following is a specification.

My invention relates to improvements in calculating-machines, of which the following is a full description.

The object of my invention is to provide an improved calculating-machine by which multiplication and division can be accurately and quickly computed.

In the accompanying drawings, Figure 1 is an end elevation of a machine embodying my invention, part of the mechanism being shown in dotted lines. Fig. 2 is a vertical sectional view on the line 2 2 of Fig. 5 looking in the direction indicated by arrow. Fig. 3 is a top plan view with the carriage and its mechanism removed, the same being partly in section. Fig. 4 is a vertical sectional view on the line 4 4 of Fig. 5 looking in the direction indicated by arrow. Fig. 5 is a vertical transverse sectional view with the carriage in position and taken on the line 5 5 of Fig. 2 and also on the line 5 5 of Fig. 17. Fig. 6 is a vertical longitudinal view on the line 6 6 of Fig. 3, the said section being taken through the actuating-cylinder. Fig. 7 is a detached top plan view of the carrying members or elements and the revolving shaft to which they are attached. Fig. 8 is a detached side elevation of one of the tooth-carrying members of the actuating-cylinders. Fig. 9 is a detached side elevation of one of the tooth-setting members of the actuating-cylinders. Fig. 10 is an enlarged detached view of one of the intermediate wheels and the carrying mechanism adapted to coact therewith. Fig. 11 is an enlarged detached perspective view of one of the arms with its oscillating carrying members. Fig. 12 is a transverse sectional view through the carriage on the line 12 12 of Fig. 17. Fig. 13 is a longitudinal sectional view of one end of the carriage, taken on the line 13 13 of Fig. 17. Fig. 14 is a detached enlarged perspective view of one of the friction-rings used between the recording-wheels of the carriage. Fig. 15 is a detached perspective view of the sliding-bar element or member of the carrying mechanism. Fig. 16 is a horizontal sectional view of one end of the carriage, taken on the line 16 16 of Fig. 1. Fig. 17 is a top plan view of a machine embodying my invention complete. Fig. 18 is an enlarged detached view of a portion of the bail 81.

Referring now to the accompanying drawings, 1 is a case constructed of any desired material, and in which a portion of the mechanism is suitably supported and journaled, and 2 a transversely-movable carriage in which the recording mechanism is suitably supported and journaled in a manner to be fully explained hereinafter.

An actuating-cylinder 3 is supported in the case 1, and upon this actuating-cylinder is set up (in the manner to be particularly described hereinafter) a multiplicand in multiplying and the divisor in division. The carriage 2 contains a plurality of openings 4, arranged in a longitudinal line and through which is exposed the product in multiplication and the dividend in division. This carriage also contains a second row of openings 4′, through which is exposed the multiplier in multiplication and the quotient in division. With this general but brief explanation the operation of the several parts of the invention, it is thought, will be more readily understood, and they will be described in the same sequence in which they are stated in this general description.

Actuating-cylinder.—The actuating-cylinder 3 consists of a plurality of tooth-carrying ring wheels or disks 5 and a plurality of tooth-setting members 6. The tooth-carrying members 5 are situated upon the shaft 7 and are held against independent movement thereof in any desired manner. As shown in Figs. 6 and 8, I show an angular opening 8 in the tooth-carrying members, and the shaft 7 is correspondingly shaped. Each of the tooth-carrying members 5 is provided with a circular hub 9, upon which are journaled the tooth-setting members 6. From this it will be noted that the tooth-carrying members 5 cannot have any movement independent of the shaft 7, while tooth-setting members 6 are permitted an independent movement.

The tooth-carrying members 5 are provided with a plurality of teeth 10, which are nor-

mally held inward in the position shown in Fig. 8 by suitable light springs 11. As shown in Fig. 8, the teeth 10 are located at one side of the tooth-carrying members 5 only, and for a purpose to be explained hereinafter. At the opposite side the edges of the tooth-carrying members 5 are provided with a plurality of recesses or notches 12, corresponding in the distances or spaces between them to the distances or spaces between the teeth 10. By reference to Fig. 3 it will be noted that the tooth-setting members 6 are larger in diameter and overlap the adjacent edges of the tooth-carrying members 5. Each of the tooth-setting members 6 is provided with a combined locking and setting member 14, the projecting end 15 thereof serving as a means to oscillate the tooth-setting member and by engagement with the notches 12 of the tooth-carrying members adapted to lock the two members against accidental displacement after they have been once set. The projecting end 15 of the locking member 14 is forced into the notches 12 by any desired form of spring, as shown in Fig. 3, and is adapted to be pressed laterally to the right (in Fig. 3) for the purpose of disengaging the projecting end 15 from the notches of the adjacent tooth-carrying members 5. Each of the tooth-setting members 6 is provided with a cam 16, the said cam adapted to force one or more of the teeth outward by engagement therewith, as shown in Fig. 5, according to the distance the tooth-setting member 6 is revolved or oscillated. The tooth-setting members are also provided, preferably, (though not necessarily when a locking member is used,) with a plurality of notches or shoulders 17, with which the inner elongated end of the tooth 18 engages, so that the operator in setting the teeth of the actuating-cylinder will feel the tooth 18 slip by the notches and will serve as a sort of an indicator or guide in the properly positioning of the parts, as will more fully appear hereinafter. Projecting from the tooth-setting members are the stop-pins 19, adapted to engage with either end of the case supporting the inner end of the teeth 10, for the purpose of limiting the movement of the tooth-setting member and also for the purpose of "wiping out," which will be fully explained hereinafter and which is well understood by those skilled in this art.

The edges of the tooth-setting members are provided with numerals, as clearly shown in Fig. 2, and by means of the projecting end 15 the actuating member of the actuating-cylinder can be set to throw out one or more of the teeth 10, according to the movement of the tooth-setting member 6, and the number of teeth thrown out corresponds with the numeral opposite which the setting member is placed and locked by engagement with the notches 12, as before explained. Generically speaking, the actuating-cylinder consists of a plurality of actuating members, each of the actuating members consisting of the tooth-carrying members 5 and the tooth-setting members 6. These actuating members represent, respectively, units, tens, hundreds, &c., as is well understood.

The actuating-cylinder and consequently the actuating-tooth members carried thereby are revolved through the medium of an operating-handle 20, which is suitably attached to an inclined shaft 21, carrying upon its lower end a bevel-gear 22. This bevel-gear 22 is in engagement with the bevel-gear 23, carried by a counter or short shaft 24, and the opposite end of this shaft 24 carries a gear 25, the latter gear 25 being in mesh with a gear 26, attached to the shaft 7 of the actuating-cylinder 3.

By means of the handle 20 the actuating-cylinder carrying the tooth-actuating members may be revolved in one direction for the purpose of multiplying and in the opposite direction for dividing, which will be explained more fully hereinafter.

Passing longitudinally through the carriage 2 is a registering-wheel shaft 25′, carrying a plurality of registering-wheels 26′, the registering-wheels being provided with numerals from "1" to "0," as usual in calculating-machines and as is well understood. These registering-wheels are independent of each other and consist of a gear-wheel 27, to which is attached a ring or band 26′, the latter carrying the numerals, the numerals adapted to be exposed through the series of openings 4. The gear-wheels 27 are attached to the rings 26′ through the medium of projecting pins 28, which are soldered or otherwise suitably connected to the band or ring 26′.

By reference to Fig. 5 it will be noted that the actuating-cylinder and its actuating members do not directly engage or operate the registering-wheels 26′, and hence a plurality of intermediate gears 29 are provided, there being an intermediate gear for each registering-wheel. The teeth 10 of the actuating-cylinder when projected engage the intermediate gear-wheels 29 and cause the intermediate gear-wheels to revolve a number of teeth corresponding to the number of projecting teeth 10 upon its corresponding actuating member. These intermediate gears 29 in turn mesh or gear into the gear-wheel 26 of the registering-wheels, and hence the registering-wheels are turned a number of teeth corresponding to the number of teeth actuated upon by the actuating members of the actuating-cylinder with which it is adapted to mesh when the cylinder is revolved. From this description it will be noted that the number to be multiplied is set up on the actuating-cylinder and a number of teeth 10 of each actuating member of the actuating-cylinder will be projected corresponding to the number set up, and when the actuating-cylinder is revolved through the mechanism before described the intermediate wheels 29

will be revolved a number of teeth corresponding to the number of teeth projecting upon its coacting actuating member.

Carrying elements.—The carrying mechanism here shown is considered by me one of the important features of my improved calculating-machine, and I will now proceed to describe it. A revolving shaft 30 is suitably journaled and extends parallel with the actuating-cylinder shaft 7, and this shaft 30 is provided with a gear-wheel 31, which meshes with the gear 25. The gears 25, 26, and 31 are of the same size, and hence the shafts 30 and 7 revolve in unison. Secured to the shaft 30 are a plurality of arms 31′, which carry at their outer ends oscillating carrying members 32 and 33. These members are rigidly attached to opposite ends of a shaft 34, which is journaled in the end of the arms 31, and a pin 35 serves to limit the movement, oscillation, or vibration of the carrying members by engagement with the shoulders or projections 36, extending from the inner side of the member 33. By reference to Fig. 10 it will be seen that the oscillating carrying member 32 is provided with an inwardly-extending arm 37, which normally rests between the springs 38, which extend radially from a hub 39, formed as a part of or attached to the arms 31. This hub 39 is firmly attached to the shaft 30 through the medium of a screw or other suitable device 40. The springs 38 serve to hold the oscillating carrying members 32 and 33 normally into position shown in Figs. 5 and 11, permitting them to vibrate an equal distance in two directions, as will be readily understood from the illustration, or (as will appear more fully hereinafter) these carrying members are adapted to act when the shaft 30 is revolved in either direction, and hence perform their function of carrying whether the machine is being used for multiplication or division.

The intermediate wheels or gears 29 are placed loosely upon a shaft 41, but are held in their rotated position through the medium of rollers 42, (see Figs. 5 and 3,) attached to the free end of an arm 43, loosely pivoted upon a rod 44. There is an arm 43 and a roller 42 journaled upon its free end for each of the intermediate wheels 29 and acting independently. An oscillating rod 45 has attached to it a plurality of springs 46, which engage the arms 43, (see Fig. 5,) and also spring 47, engaging the intermediate wheel 48. (See Fig. 1, dotted lines.) Connected to the rod 45 is a laterally-extending crank or arm 48′, through the upper free end of which passes an adjusting-screw 49, by means of which the tension of the springs 46 and 47 upon their respective intermediate wheels is regulated.

For each of the intermediate gears 29 a sliding rod 50 (see Figs. 5 and 10) is provided and passes transversely through the shaft or rod 41, adjacent to the intermediate gears or wheels. These sliding bars 50 are provided on one side with an elongated recess 51, with which the inner end of a screw 52 engages, and at its opposite side with an elongated recess, in which is placed a spring 53. This spring serves to cause a tension on the bar to hold it in its moved position for the carrying operation, which will be presently explained. This arrangement prevents any loosening of the screw 51 affecting the tension of the spring 53, thus causing the sliding rods or bars 50 to always have a uniform tension irrespective of any adjustment, which is an important feature. One end of the sliding bars or rods 50 is pointed, as shown at 54, and the opposite end is provided with a head 55, the head 55 adapted to coact with the oscillating member 32, and the pointed end 54 adapted to be engaged by a roller or projection 56, carried by the coacting recording-wheel 27.

By reference to Figs. 5, 10, and 11 it will be noted that the carrying member 32 is approximately cross-shaped, while the carrying member 33 has an upper straight surface 57.

The carrying mechanism in operation (referring to them now individually) operates as follows: When one of the registering-wheels 26′ has the "0" or "9" exposed through its corresponding opening of the carriage and is moved one tooth more by the mechanism hereinbefore explained, the roller or projection 56 engages one of the pointed or inclined sides 54 of the sliding bar 50 and moves it downward to the position shown in dotted lines, Fig. 10. This movement of the sliding bar 50 carries its head in a position to engage the arm 60 of the carrying member 32 and to cause it to oscillate to its limit of movement in one direction, the movement being limited, as before stated, through the medium of the pin 35 and the arm 36. As the shaft 30 continues to revolve, and hence continues to carry the arm 31, with the carrying elements 32 and 33, around with it, the carrying member 33 being tilted so that one of its corners 61 (according to the direction the shaft 30 is being revolved, whether a multiplication or a division calculation is being made) engages the next succeeding intermediate wheel 29 between its teeth and by the continued rotation of the shaft 30 moves the said succeeding intermediate wheel one tooth, thus carrying to the succeeding intermediate wheel and in turn carrying to the succeeding registering-wheel, in engagement with the succeeding intermediate wheel, one number. At the same time as the carrying element 32 is passing by the end 55 of the sliding bar the sliding bar is moved upward or, in other words, returned to its normal position ready to be again actuated for carrying at the proper time in the operation of the mechanism. It will thus be seen that this carrying mechanism simultaneously carries to the succeeding registering-wheel and sets the carrying mechanism for the next succeeding carrying operation. As soon as the carrying member 32 has passed

by the head 55 of the sliding bar 50 one or the other of the springs 58 will return the oscillating carrying members to their normal positions (shown in Figs. 5 and 11) ready to be again actuated, whether the shaft 30 be moved in one or the other direction for multiplication or division. When the oscillating carrying members 32 and 33 have been tilted by engagement with the head 55 of the bar 50, the end or corner 61 of the member 33 is thrown in engagement between the teeth of the next succeeding intermediate wheel 29, and the movement of the parts holds the carrying member in its engagement with the succeeding wheel and insures a positive carrying operation. It will be noted that the operation of these carrying elements is in a direct line of rotation, which is of great utility in the positive and sure action of the parts.

Having now explained the individual or separate action of the carrying elements, a general description of the sequence action of these carrying elements upon the series of intermediate wheels and in turn through the intermediate wheels upon the registering-wheels will now be explained. By reference to Fig. 7, which is a plan view of the shaft 30 with the arms 31 and their carrying elements attached thereto, it will be noted that these arms are so arranged that they extend in a spiral around the shaft in two directions and that they are all placed at one side of the shaft. When the machine is used for multiplication, the carrying elements act in the sequence of one of these spirals, as indicated by arrow *a*—as, for instance, when multiplying—and operate in sequence around the other spiral, as indicated by arrow *b*, when revolved in the other direction—as, for instance, when dividing—the central carrying element 65 acting in each spiral arrangement, and hence forming a part of each spiral or diagonal arrangement of the carrying members. Attention is called at this point to the fact that the actuating members of the actuating-cylinder 3 have their teeth 10 on one side only, and that the carrying members of the shaft 30 are on one side of the center of that shaft only. The object of this arrangement is that the actuating-cylinder performs its function during half a revolution of the handle 20 and the carrying members perform their carrying operation during the other half of the revolution of the said handle, that the actuating-cylinder and the carrying members act one after the other has completed its operation. Again, attention is called to the fact that the intermediate wheels 29 have twelve teeth, the registering-wheels 26′ ten teeth, and that the teeth 10 are arranged in the actuating-cylinder at a distance equal to twenty-four teeth, while the arms 31, with the carrying elements 32 and 33, are arranged upon their shaft at a pitch of twenty teeth for the full circle. From this it will be noted that the teeth of the intermediate gears 29 and the teeth of the actuating-cylinder are arranged at a less pitch than the pitch of the carrying members on the shaft 30, which gives the intermediate wheels 29 a slight lead over the carrying members on the shaft 30—that is to say, the teeth of the intermediate wheels 29 are revolving slightly in lead of the carrying members on the shaft 30, which insures the actuating of the sliding bars 50 slightly in advance of the engagement therewith of the carrying member 32. This arrangement is of great practical value in preventing any jamming of the carrying elements where they are supposed to theoretically operate simultaneously—as, for instance, in deducting one from a thousand.

The carriage.—The carriage 2, as before explained, carries the registering-wheels 26′, and these registering-wheels are in constant gear with the intermediate wheels 29, which will serve to prevent the registering-wheels from throwing over or past, since the intermediate gears are held from throwing over by the rollers 42, before explained. In order to hold the registering-wheels 26′ in their proper position, however, when the carriage is turned upward on its pivotal rod 70, I place between these registering-wheels a suitable friction-ring 71, Fig. 14. The arrangement of the registering-wheels and the said friction-rings is clearly shown in Fig. 2 and need not be more specifically described. These friction-rings serve to hold the registering-wheels in their moved positions.

The carriage 2 has a movement transverse the machine for the purpose of bringing the proper calculating mechanism in gear with the actuating members of the actuating-cylinder, according whether the calculating is in units, tens, hundreds, thousands, &c. This is well understood by those skilled in the art and need not be further explained, with the exception that the carriage has a sliding and a hinge movement upon the pivotal rod 70, whereby the carriage can be raised and moved to the desired point, according to the calculation to be made, and lowered in operative position. The carriage will be properly positioned and held in an adjusted position through the medium of a series of projections 72 upon the front edge of the carriage, which are adapted to engage suitable arms 72′, extending from the frame of the machine.

As indicated by arrows in Fig. 17, when the handle 20 is moved in one direction a multiplying calculation is the result, while when moved in the other direction division is effected. When the handle is in the position shown in Fig. 17, it is at a neutral point. It takes a complete revolution of the handle 20 to make a calculation, in that, as before explained, the actuating-cylinder is thrown into operation during a half-revolution of the handle and the carrying mechanism thrown into operation during the other half-revolution of the handle 20.

The desired number to be multiplied being set up on the actuating-cylinder, the handle is turned once for each time that number is to be multiplied. For instance, if it is to be multiplied by two the handle will be turned twice, and the product will appear through the openings 4. At the same time the multiplier will appear through the openings 4′, and when division is being calculated the quotient will appear through the opening 4′. The operation of this part of my invention will now be explained.

Referring particularly to Fig. 1, it will be noted that the shaft 30 has an eccentric 75 (shown in dotted lines) and that an eccentric-strap 76 passes around this eccentric and is, in fact, a part of a lever 77. This lever 77 is provided with a slot 78, through which a fulcrum-pin 79 projects. The free end of the lever 77 is adapted to engage an intermediate wheel 48, the intermediate wheel 48 in turn meshing with a registering-wheel 80. The registering-wheels 80 are arranged the same as the registering-wheels 26′, excepting that there are not so many of them. From this description it will be noted that for each revolution of the shaft 30, which revolves in unison with the shaft 7, and hence for each revolution of the shaft 7 by the handle 20, the intermediate wheel 48 is moved one tooth and in turn will move the engaging registering-wheel 80 one tooth. The registering-wheels 80 simply register or record the number of revolutions given to the handle 20, and hence indicate in multiplication the multiplier and in division the divisor.

When a calculation has been completed and it is desired to wipe out the numbers on the actuating-cylinder, a bail 81 is moved inward to the position shown in dotted lines, which will bring it in the line of travel of the projecting combined setting and locking members, and a single revolution of the handle 20 in the direction to revolve the actuating-cylinder, as shown by arrow, Fig. 3, will bring all of these actuating members 15 in engagement with the bail, and the pins 19 serve as a stop. This operation will bring all of the actuating members of the actuating-cylinder to zero. When the positive locking members 15 are used, one wall 81′ of each notch in the bail 81 will be beveled, as shown in Fig. 18, whereby the locking members will be moved laterally by engagement therewith and the members 5 released. By reference to Fig. 3 it will be noted that the tooth-carrying members 5 are provided with a colored line 90, forming, in effect, a straight line across the actuating-cylinder and which is a guide in the setting of the members—that is to say, the number to be set is brought in a line with this indicating-mark 90. For instance, if "123" is to be multiplied the "1," "2," and "3" of the first three actuating members of the cylinder will be brought in line with this indicating-mark, and if the "123" is to be multiplied five times five revolutions are given to the handle 20, when the product will appear through the opening 4 of the carriage. It is also desirable to wipe out the numbers appearing through the openings in the carriage, and this is effected in the following manner: A handle 100 is journaled in one end of the carriage, the hub 101 of the handle passing through the end of the carriage and carrying a gear 102. This gear 102 is in mesh, respectively, with the gears 103 and 104, which are respectively attached to the shafts of the registering-wheels of the carriage, and hence when the handle is rotated the registering-wheels are correspondingly rotated when the carriage is raised. They cannot of course be rotated when the carriage is lowered, since the registering-wheels are in engagement with their respective intermediate wheels or gears, and hence the carriage should be raised before the handle 100 is rotated. The hub 101 of the handle is journaled upon the reduced end of a rod 105, the said rod 105 having oppositely-projecting arms 106 and 107. At the opposite end of the carriage from the handle 100 is arranged a handle 108, and this handle is rigidly connected to the rod or shaft 105. When the handle 108 is moved in one direction, the rods 106 will be forced inward between the registering-wheels 26′ and adapted to engage the shoulders or projections 56. When so moved, a rotation of the handle 100 in one direction will wipe out the calculation on the registering-wheels 26′ and expose through the openings 4 zero or "0" of each registering-wheel. When the handle 108 is turned in the other direction and the handle 100 given a revolution in the other direction, the same result in respect to the registering-wheels 80 is effected, while the wheels 26′ revolve with their shaft, being held in position by frictional contact with the shaft, as before explained. By this mechanism the calculation upon the registering-wheels 26′ and 80 can be independently wiped out, which is of great advantage, for in some instances it is desired to let the calculation on the registering-wheels 80, which represent the multiplier in one instance and the quotient in another instance, remain, while the product or dividend on the registering-wheels is wiped out, and vice versa.

By reference to Fig. 12 it will be seen that a head or rocker 110 is rigidly attached to the rod or shaft 105, and connected with this head is a spring 111. The outer free ends of this spring 111 is in engagement with the pin 112, the said arrangement serving to hold the rock-shaft or rod 105 normally in the position shown in Fig. 5 and normally with the arms 106 and 107 out of the line of travel of the projections on the registering-wheels 80 and 26′.

I produce a fast and accurate construction by providing a series of twelve-toothed intermediate wheels between the registering-wheels and the driving mechanism, the left side of the wheels engaging with the cylinders

containing the operating-numbers, the lower portion with the carrying movement, the right side with a series of check-rollers, and the upper portion with the registering-wheels. The object of this arrangement is to reduce the diameter of the driving parts to their lowest terms, so that the machine can be run at a higher rate of speed without danger of overriding by the momentum of the revolving wheels.

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

1. A calculating mechanism including twelve-toothed intermediate wheels, registering-wheels and carrying members adapted to engage respectively the upper and lower sides of said intermediate wheels, an actuating mechanism adapted to engage one side and check members engaging the opposite sides of said intermediate wheels, for the purpose described.

2. A calculating mechanism including registering-wheels, actuating members, a plurality of independent intermediate wheels engaging respectively the registering-wheels and the actuating members, a shaft adapted to rotate in the opposite direction, the said shaft provided with a plurality of carrying members constructed and arranged to engage an actuating intermediate gear when the shaft is moved in either direction, substantially as described.

3. A calculating mechanism including registering-wheels, actuating members, a plurality of independent intermediate wheels engaging in operation respectively the registering-wheels and the actuating members, the actuating members adapted to be moved in two directions, a member adapted to move in two directions and carrying a plurality of actuating members arranged in spiral relation, the carrying members constructed and arranged to engage and actuate the intermediate wheels when the carrying members are moved in either direction, substantially as described.

4. A calculating mechanism including registering-wheels, intermediate wheels in engagement therewith, toothed actuating members, and a plurality of carrying members arranged around a common center and actuated independently of the actuating members and said intermediate wheels, the pitch of the teeth of the intermediate wheels and the actuating member being less than the pitch of the arrangement of the carrying members, whereby the teeth of the intermediate wheels revolve slightly in lead of the carrying members, substantially as and for the purpose described.

5. A calculating mechanism including a plurality of registering-wheels, a plurality of independent intermediate wheels in engagement therewith, a plurality of toothed actuating members adapted to engage the intermediate wheels, a plurality of carrying members each carrying member adapted to act in two directions, sliding members between the intermediate wheels and adapted to be actuated by the registering-wheels, and moved in the path of travel of the carrying members and to throw them into engagement with the succeeding intermediate wheel when they are moved in either direction, substantially as described.

6. A calculating mechanism including registering-wheels, a plurality of intermediate wheels in engagement therewith, a plurality of toothed actuating members adapted to engage the intermediate wheels, a plurality of sliding bars adapted to slide transverse the intermediate wheels and actuated by the movement of the registering-wheels, and a plurality of oscillating carrying members adapted to be thrown into action through the medium of the said sliding bars substantially as described.

7. A calculating mechanism including registering-wheels, a plurality of intermediate wheels in engagement therewith, a plurality of toothed actuating members adapted to engage the intermediate wheels, and a revolving member carrying a plurality of oscillating carrying members, and means controlled by the registering-wheels adapted to throw the carrying members into action, substantially as described.

8. A calculating mechanism including a plurality of registering-wheels, a plurality of intermediate wheels in engagement therewith, a plurality of toothed actuating members adapted to engage the intermediate wheels, a revolving member carrying a plurality of oscillating carrying members adapted to engage the intermediate wheels when the revolving member is moved in either direction, and means controlled by the registering-wheels adapted to throw the carrying members into action in either direction, substantially as described.

9. A calculating mechanism including registering-wheels, intermediate wheels, in engagement therewith, toothed actuating members adapted to engage the intermediate wheels, and a revolving member carrying a plurality of independently-acting carrying members, the said carrying members arranged thereon in double oppositely-spiral arrangement, substantially as and for the purpose described.

10. A calculating mechanism including registering-wheels, actuating mechanism and intermediate connections between the actuating mechanism and the registering-wheels, and carrying elements adapted to engage the intermediate mechanism, the carrying elements including a transversely-movable bar, two connected oscillating members one adapted to be engaged by the bar, and the other adapted to engage the succeeding intermediate wheel, substantially as described.

11. A calculating mechanism including registering-wheels, actuating mechanism, inter-

mediate mechanism between the actuating mechanism and the registering-wheels, and a carrying mechanism including a revolving member carrying a plurality of carrying members, a plurality of sliding bars, the carrying members adapted to be oscillated in opposite directions by the sliding bars and consisting each of an approximately cross-shaped member for engagement with the sliding bar, and a shouldered member for engagement with the intermediate mechanism, substantially as described.

12. A calculating mechanism including registering-wheels, actuating mechanism, intermediate mechanism between the actuating mechanism and the registering-wheels, and a carrying mechanism including transversely-movable bars, a revolving member carrying a plurality of oscillating carrying members, each oscillating carrying member having a limited oscillating movement and provided with means to hold it normally in the position to operate in two directions, through engagement with the sliding bars, substantially as described.

13. A calculating-machine including two series of registering-wheels, and a wiping-out mechanism consisting of an intermediately-arranged oscillating member provided with oppositely-projecting arms adapted to engage projections respectively upon said series of wheels according to the direction in which the oscillating member is moved, and a handle adapted to rotate the series of wheels, whereby the calculation upon either of the series can be independently wiped out, substantially as described.

14. A calculating mechanism including registering-wheels, actuating mechanism, intermediate mechanism, a carrying mechanism, operatively connected with the actuating mechanism, a lever, an eccentric operated by the carrying mechanism, the free end of the eccentric-lever adapted to engage intermediate gears, and a second series of registering-wheels adapted to be actuated by said intermediate gears, substantially as described.

15. A calculating mechanism including a plurality of registering-wheels, a plurality of intermediate wheels, an actuating mechanism, a carrying mechanism, a plurality of independent levers forming checks respectively for the intermediate wheels, an oscillating member carrying a plurality of independent springs adapted to engage the said independent levers, and means for adjusting the oscillating member and thus controlling the tension of the spring and consequently the tension of the checks, substantially as described.

16. In a calculating-machine, a series of registering-wheels alined loosely upon a shaft, and non-shouldered friction devices frictionally connecting said wheels with said shaft.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRANK S. BALDWIN.

Witnesses:

CHAS. E. WEEKS,

WM. A. DRABBLE.