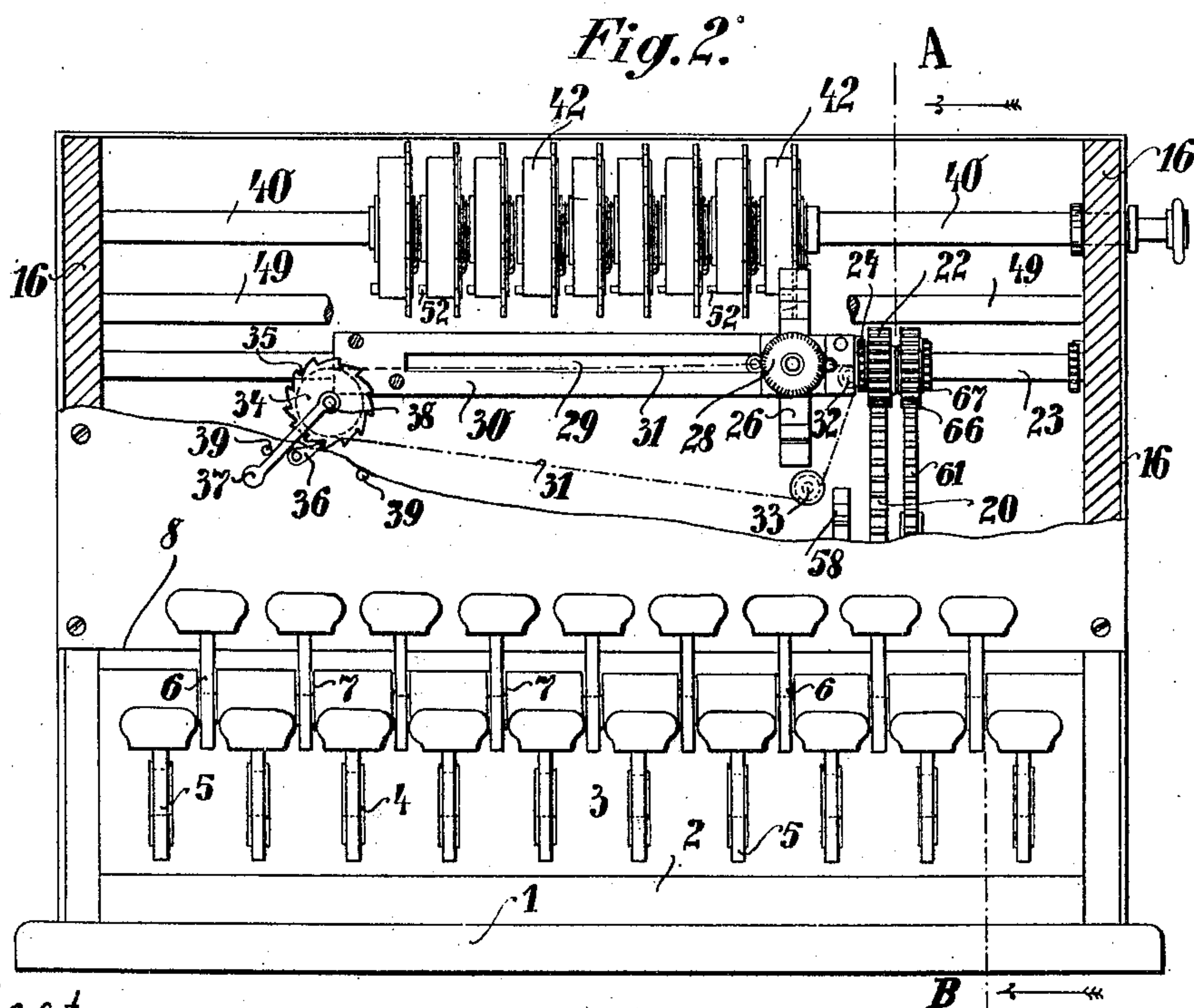
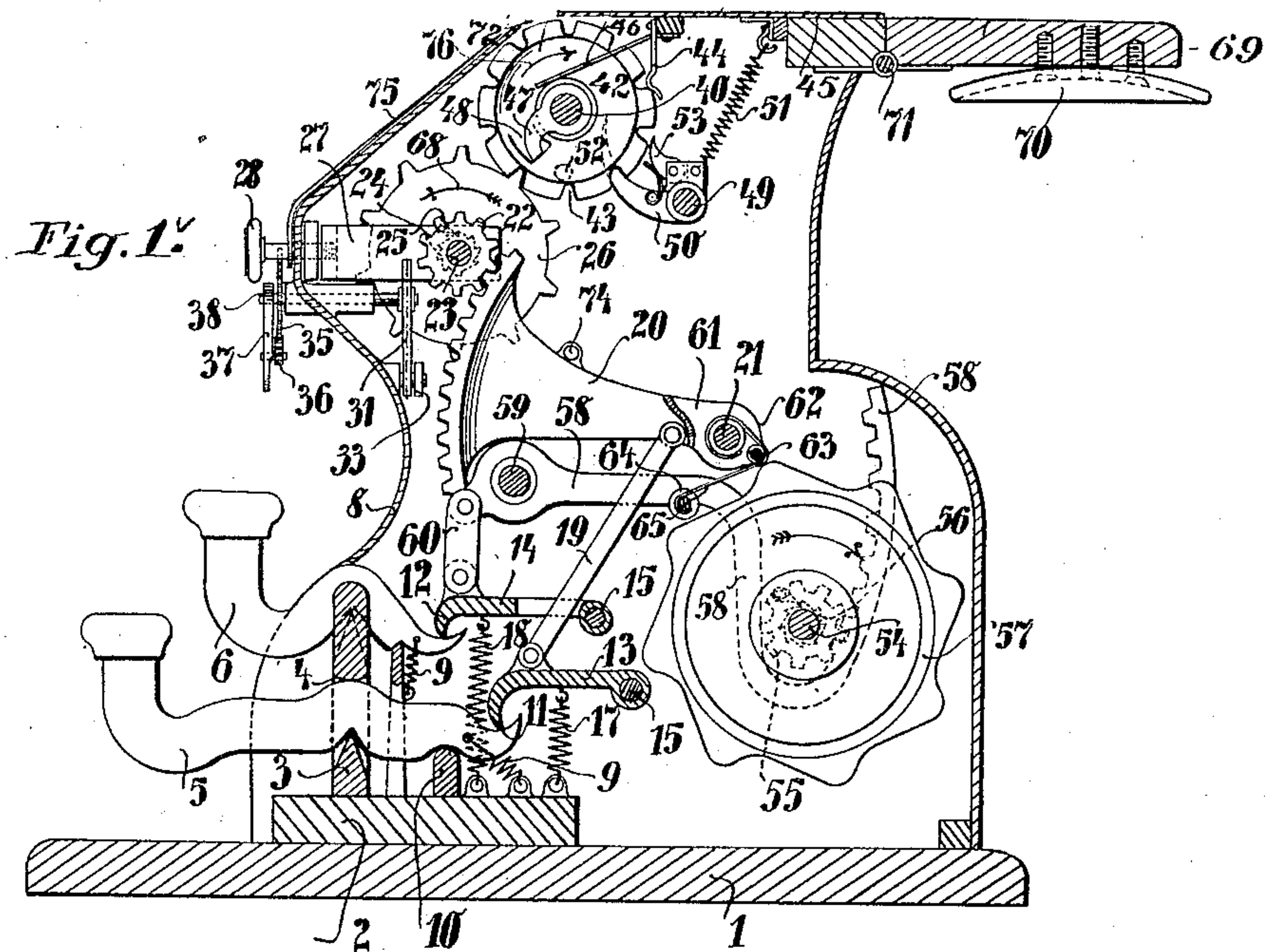


S. DE GOMILA.

## ADDING AND MULTIPLYING MACHINE.

APPLICATION FILED MAY 9, 1905.

3 SHEETS—SHEET 1.



Attest  
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M. H. Bates

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No. 833,960.

PATENTED OCT. 23, 1906.

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ADDING AND MULTIPLICATING MACHINE.

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3 SHEETS—SHEET 2.

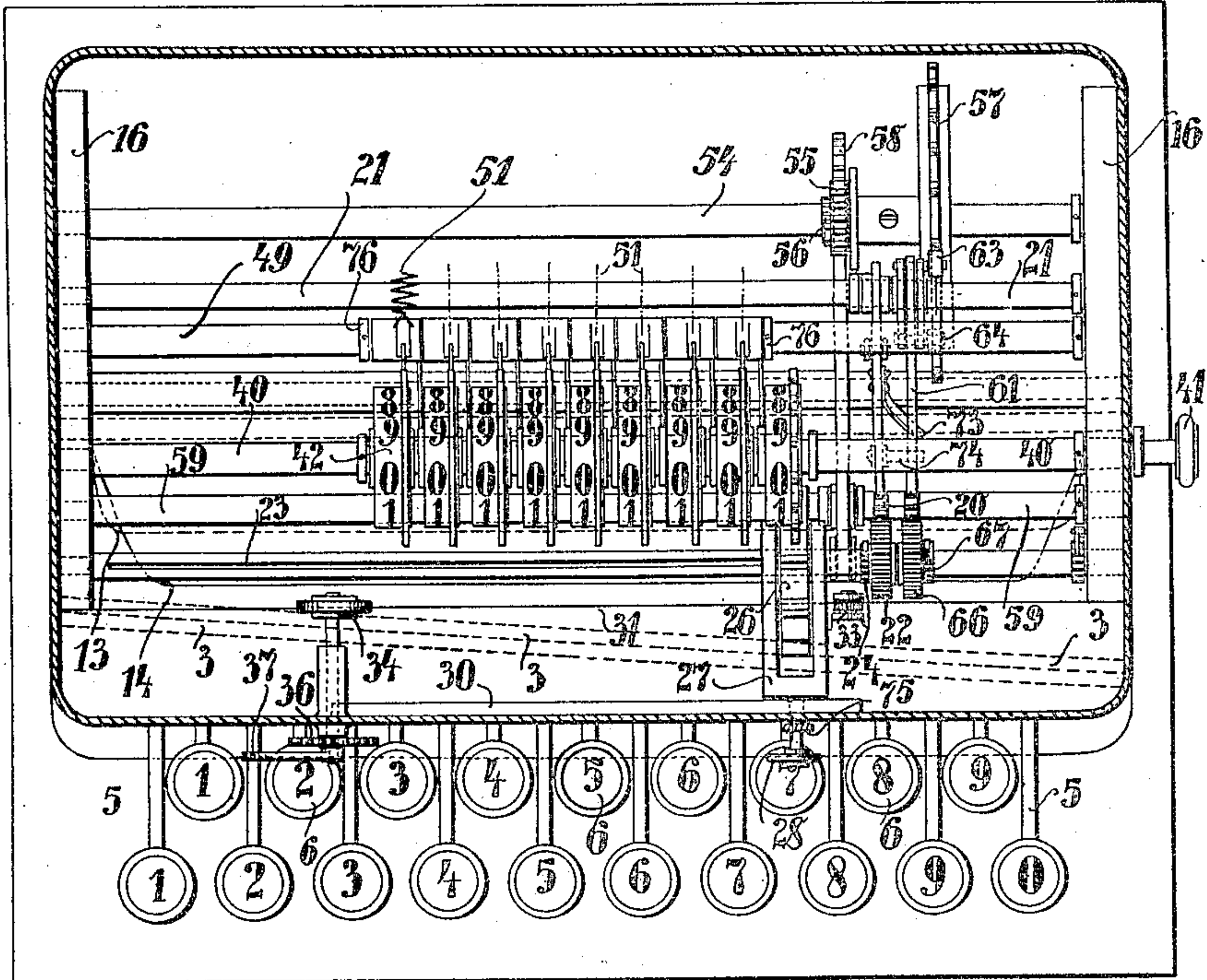


Fig. 3.

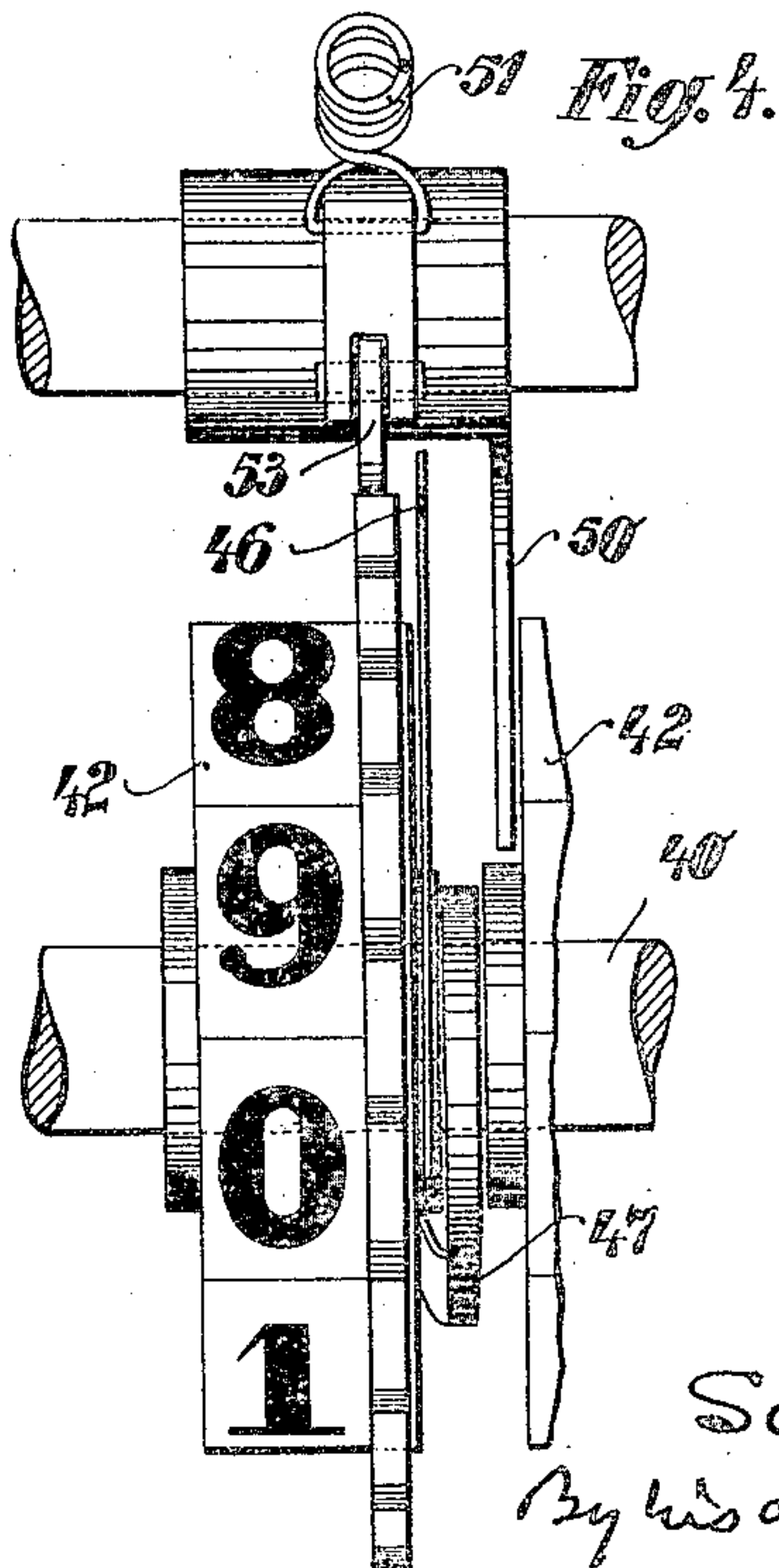


Fig. 4.

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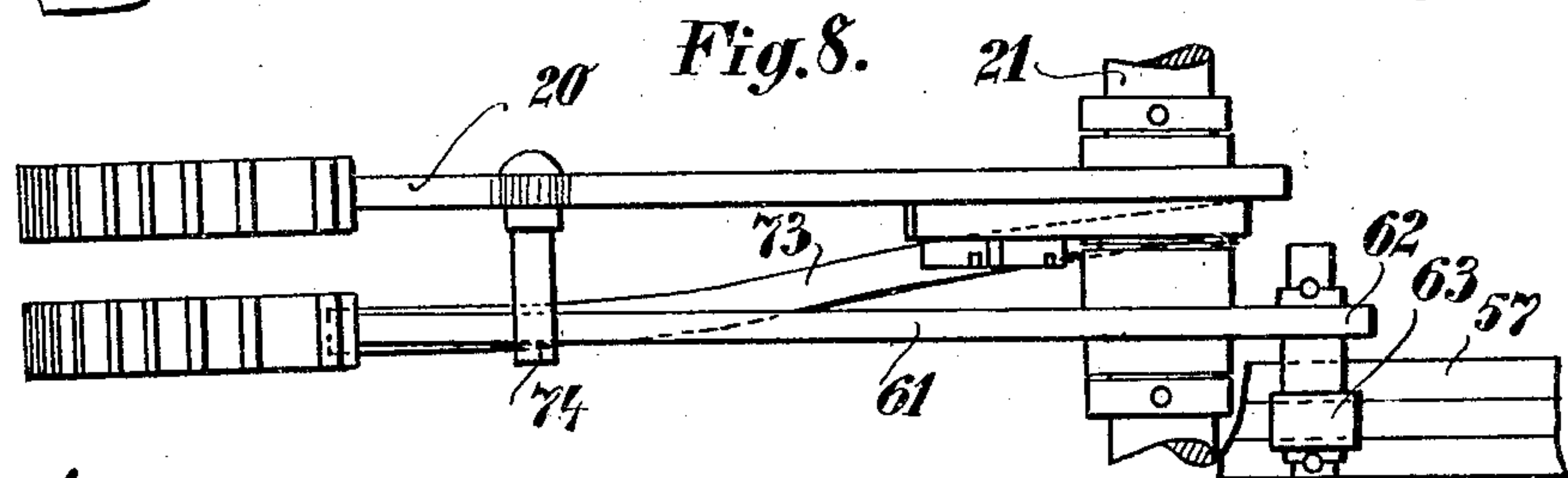
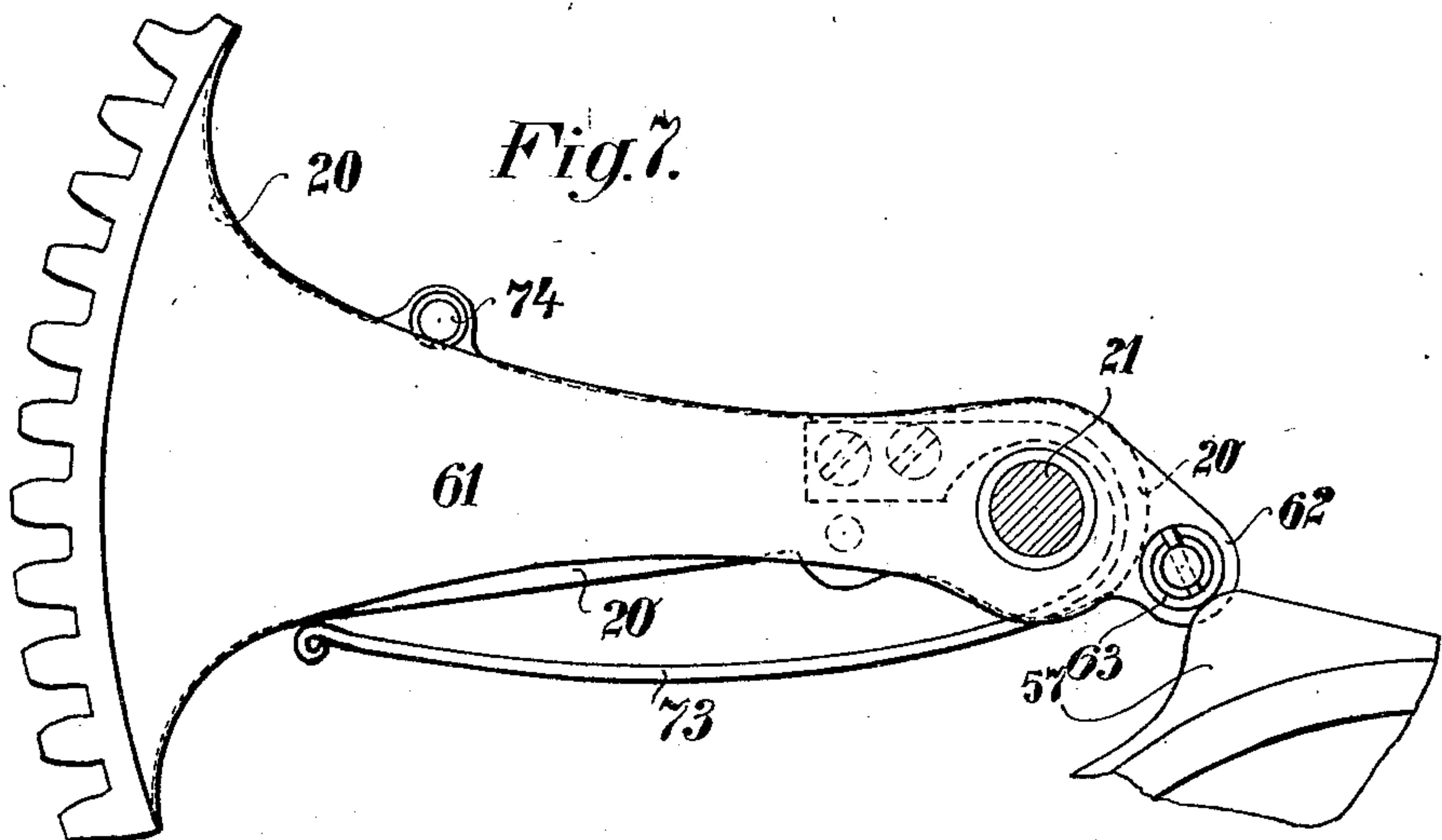
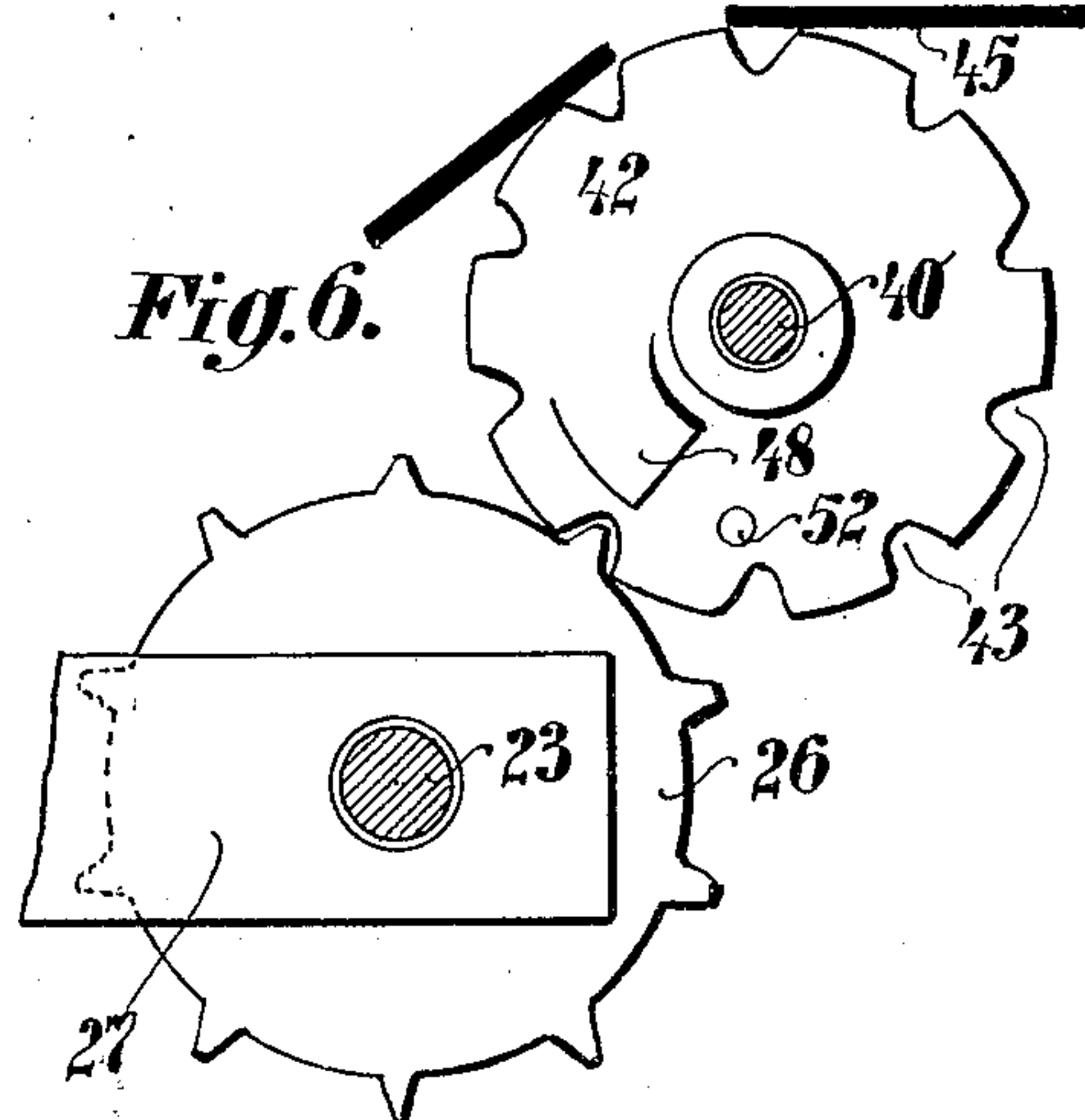
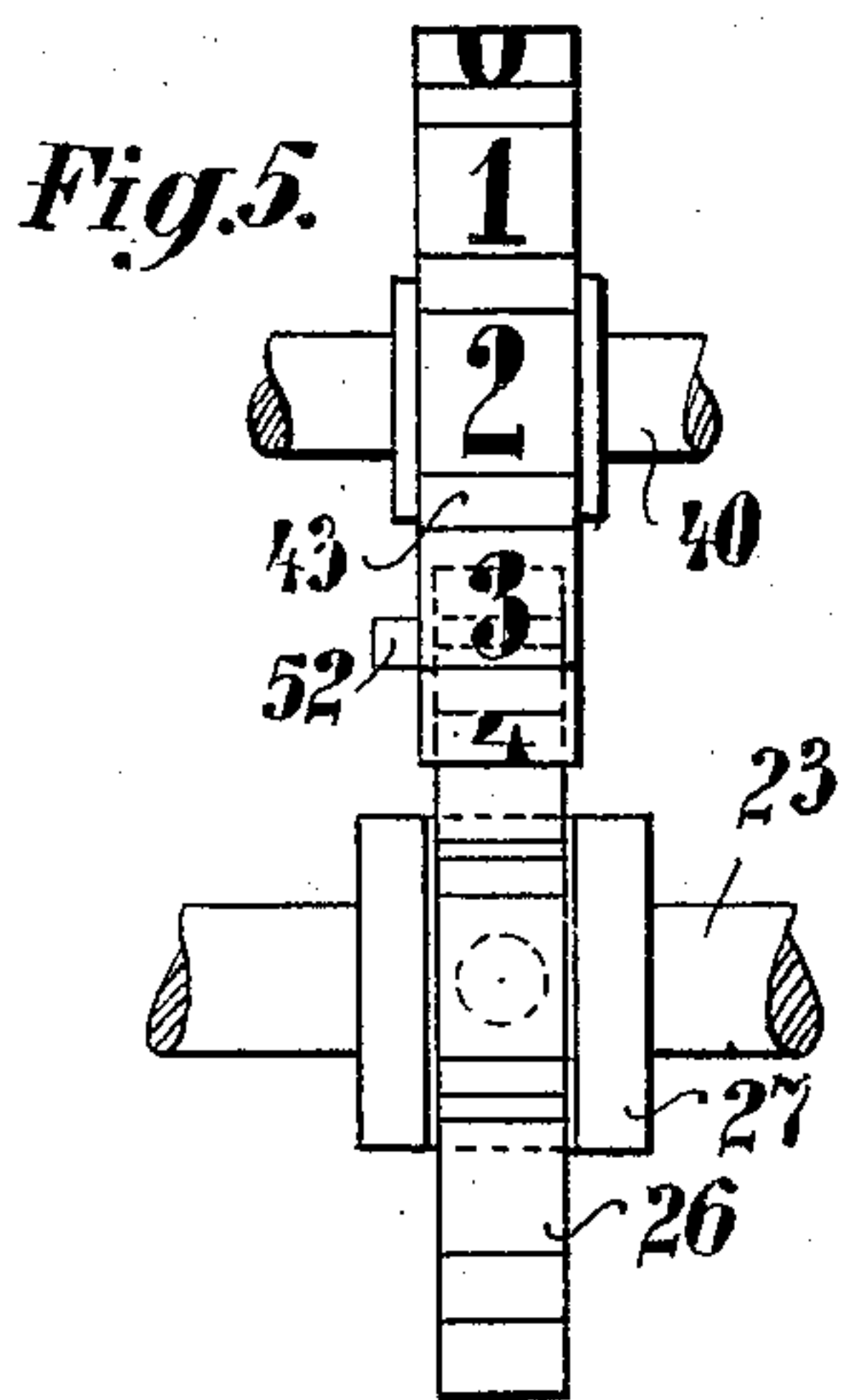
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3 SHEETS—SHEET 3.



Attest  
R. M. Kelly  
M. H. Bates

Inventor  
Salvador de Gomila  
By his atty *[Signature]*



# UNITED STATES PATENT OFFICE.

SALVADOR DE GOMILA, OF MALAGA, SPAIN.

## ADDING AND MULTIPLICATING MACHINE.

No. 833,960.

Specification of Letters Patent.

Patented Oct. 23, 1906.

Application filed May 9, 1905. Serial No. 259,623.

*To all whom it may concern:*

Be it known that I, SALVADOR DE GOMILA, a subject of the King of Spain, residing at Malaga, Kingdom of Spain, have invented certain new and useful Improvements in an Adding and Multiplicating Machine, of which the following is a full, clear, and exact description.

My invention relates to a machine by which adding and multiplying of numbers may be performed.

My improved machine is shown in the annexed drawings, in which—

Figure 1 is the vertical cross-section through the machine on the line A B of Fig. 2. Fig. 2 is a front elevation of the machine, the upper part of which is partly broken away. Fig. 3 is a plain view of the machine, the cover of the casing including the mechanism of the machine being broken away. Fig. 4 shows a detail of the machine on enlarged scale. Fig. 5 is a front view of a modified form of the number-wheels and the wheel coacting with said number-wheels. Fig. 6 is a side view of same. Fig. 7 is an elevation of the segments 20 and 61, to be described, arranged one behind the other and on a large scale; and Fig. 8 is a plan view of the same.

On the bottom plate 1 of the machine and securely fastened thereto rests a smaller plate 2, on which is securely arranged a bearing-plate 3. This plate 3 is provided with rectangular openings 4 for the reception of keys 5 and is also provided with recesses 7 for the reception of keys 6.

The keys 5 serve only for the manipulation of adding, whereas keys 5 and 6 together are used in the performance of multiplying. The lower edges of the openings 4 and recesses 7 are knife-shaped, as shown partly in full and partly in dotted lines in Fig. 1. The keys 5 and 6 rest upon these knife-shaped edges.

Springs 9 are provided to draw all the keys down upon arresting-rails 10. It is to be remarked that the key 5 the knob of which carries the number "0" and the key 6 carrying number "1" are shorter than all other keys, so that only the springs 9 can be hooked into them—that is to say, these two keys cannot come into engagement with the downwardly-curved longitudinal edges of plates 13 and 14, which are rotatable on axles 15, supported by the right and left side walls 16 of the machine. Springs 17 and 18 are

provided to draw plates 13 and 14 down upon the inner ends of the keys 5 and 6, as shown in Fig. 1.

With the exception of the key 5 carrying the "0" and key 6, carrying the number "1," as mentioned, all the keys 5 are of exactly the same length. Keys 6 are also of the same length. The bearing-plate 3, however, is arranged obliquely, as shown in Fig. 3, so that the inner effective arms of the successive keys 5 and 6 are made gradually longer, proceeding from the left to the right side of the machine—that is to say, the downward movement of the knobs of keys 5 and also the keys 6 is throughout alike, but the upward movements of the inner ends of keys 5 and 6 are different in such a manner that if key 5 carrying the number "1" is pressed down the free effective end of its inner arm makes an upward movement of the measure "1," while, for instance, the inner arm of the key carrying number "5" makes an upward movement of the measure "5," and, for a further instance, the arm of key 9 rises to the measure of "9." In accordance with these different upward movements of the inner effective arms of the keys 5 and 6 the plates 13 and 14 are differently rotated on their axles 15. Plate 13 is by means of a link 19 connected to a toothed segment which is loosely rotatable on a shaft 21, securely journaled in the side walls 16 of the machine. The segment 20 is in engagement with the toothed wheel 22, loosely rotatable on a shaft 23, also with its ends journaled in the walls 16. At the left side of wheel 22 there is provided a ratchet-wheel 24, securely connected to shaft 32. A pawl 25 upon rotatably-connected wheel 22 is in engagement with said ratchet-wheel 24. The shaft 23 carries another toothed wheel 26, slidable in a longitudinal direction on shaft 23. This shaft can rotate in bearings provided in the walls 16, (but not shown,) and wheel 26 follows every rotating movement of said shaft.

Wheel 26 is located between the two tongues of a fork 27, carried by a pin passing through the slot 29 of a guide-piece 30 and having at the outer side of the machine a knob 28. By means of this knob the fork 27 and wheel 26 can be moved in both directions. To both sides of the fork 27 are connected the ends of a chain 31, passing over rollers 32, 33, and 34, the axles of which are supported by the front portion 8 of the casing. The pin carrying the fork 27 can be



provided with an indicator 75, showing exactly the position of wheel 26. The rollers 32 and 33 are loosely rotatable on their axles. Wheel 34, however, is rigidly connected to its axle 38, which itself is loosely rotatable in a bearing connected to front portion 8 of the casing. Axle 38 carries rigidly thereon a ratchet-wheel 35, with which a pawl 36, connected to a lever 37, is in engagement. Said lever is loosely carried by shaft 38, and its swinging movement is limited by pins 39, fastened to front portion 8 of the casing.

The number 40 denotes a shaft rotatably resting in the side walls 16 of the machine. This shaft 40 carries a series of number-wheels 42, loosely rotatable upon it. By means of suitable collars 76 (indicated in Fig. 2 at both sides of the series of number-wheels) these latter are prevented from axial movement along shaft 40.

Each number-wheel carries at its circumference the ten numbers "0" to "9," as shown in Fig. 3. Each number-wheel carries, further, a radial flange which is provided with ten recesses 43, which, one after the other, come into engagement with the teeth of the wheel 26, as will clearly be seen from Fig. 1.

At the right side of each number-wheel there is provided a flat spring 47, Fig. 1, said spring being rigidly secured to shaft 40, which latter can be rotated by means of a knob 41, Fig. 2. The direction of all springs is exactly the same. When shaft 40 is rotated contrary to the direction of the arrow 76, all springs 47 come into engagement with the recess 48, provided at the right side face of each number-wheel. This recess 48 of each wheel is wedge-shaped in circumferential direction, so that the springs 47 can rotate the wheels contrary to arrow 76, but slide ineffectively out of the recesses 48 if shaft 40 is rotated in direction of the arrow 76.

By means of the spring 48 and rotation of shaft 40 contrary to direction of arrow 76 all number-wheels can be rotated simultaneously until all numbers appear at the openings 72, Fig. 1. As soon as this result is obtained shaft 40, and with it the springs 47, is rotated in the direction of arrows 76 until the springs 47 arrive at wires 46, which are securely attached to the cover portion 45 of the casing of the machine. These wires 46 are arranged in a less space than the body of the springs 47, so that the wires can enter into the space remaining between springs 47 and the number-wheel to which the springs belong. When the springs have arrived at the wire 46 and are then rotated somewhat farther, they are pushed off, so that their effective ends are moved out of engagement with the recesses 48. Springs 44 are provided to prevent the wheels 42 from being rotated in the direction of arrow 76 by the

friction produced by the pressure action of the springs 47. As shown in Fig. 1, the springs 44 are in engagement with the one recess 43 of each wheel 42.

Behind the number-wheel there is provided a shaft 49, immovably rotating in and connected to the side walls 16 of the machine. On this shaft 49 are rotatably arranged loosely-mounted levers 50 by springs 51, which are kept in the position shown in Fig. 1. To each lever 50 is connected a pawl 53, which by a spring secured to lever 50 is normally held in the position shown in Fig. 1, out of which it cannot be rotated to the right.

Each lever 50 is arranged between two wheels 42. The pawl 53, however, is arranged opposite to the flange of the left adjacent wheel, if looking at the machine from the standpoint of the operator. At the left side of every wheel 42 is provided a pin 52, and during the rotation of every wheel 42 as soon as its number "9" passes the openings 72 in the direction of arrow 76 the pin 52 of such wheel moves the lever 50 at its left side downward, so that the pawl 53 of such lever 50 can push the left adjacent wheel forward by one step or number—that is to say, when one wheel 42 is rotated in such a manner that its number "9" passes openings 72, so that number "0" appears within that opening, the left adjacent wheel is rotated by one step, so that if its number "0" had before appeared within opening 72 its number "1" will now appear therein. Had any other number appeared within opening 72 the next higher number would now appear.

Within the lower part of the machine is a shaft 54, carrying rotatably thereon a toothed wheel 55, Figs. 1 and 3. At the left side of this wheel 55 is a ratchet-wheel 56, which is rigidly secured to shaft 54. With this ratchet-wheel a pawl, Fig. 1, is in engagement, which by means of a pin is connected to the toothed wheel 55. At the right side of this toothed wheel 55 the shaft 54 carries a thumb-wheel 57, which is also rigidly secured to it. Toothed wheel 55 is in engagement with a toothed sector 58, loosely rotatable on a shaft 59, which is securely attached to the side wall 16 of the machine. A short arm of the toothed sector 58 is connected to plate 14 by means of a link 60.

On the shaft 21, which loosely carries the sector 20, already mentioned, there is provided another sector 61, the general shape of which and the number of its teeth exactly correspond with shape and teeth of sector 20.

Adjacent to wheel 22 of shaft 23 is provided another toothed wheel 66 of exactly the same dimensions as wheel 22 and also loosely rotatable on shaft 23. At the right side of wheel 66, Fig. 3, shaft 23 carries a ratchet-wheel 67, which is in engagement with the pawl attached to wheel 66.



Ratchet-wheel 67 is also immovable on shaft 23. The arrangement of the ratchet-wheels 24 and 67, Figs. 1 and 3, is such that shaft 23 by the movement of the segments 20 and 61 is rotated in the same direction as section 68.

The sectors 20 and 68 are different in two particulars—namely, sector 20 carries a pin 75, rigidly attached thereto, as shown in Figs. 1 and 3, which pin rests on the upper edge of segment 61, so that if segment 20 is moved downward sector 61 is also forced to follow. Further, in distinction to segment 20, the segment 61 has a short lever extending behind and carrying a roller 63, normally in contact with the thumb of wheel 57. The lever 62 of the segment 61 carries a flat spring 65, bent around the boss of segment 61 and secured thereto. This spring 65 is passed around the pin on which the roller 63 rotates; is then bent to the left, and carries at its free end a roller 64, which is in contact with an adjacent thumb of the disk 57.

To the segment 20 is connected a flat spring 73, Fig. 3, which is all the time in contact with the lower edge of segment 61, to push it against pin 64. In consequence of the arrangement of spring 73 segment 61 follows every upward movement of segment 20.

The action of the machine is as follows: The numbers "4583," "395," and "5476" are to be added, giving the sum "10454," as an example. First of all, wheels 42 are rotated by means of knob 41 until all numbers "0" appear at opening 72. Then lever 3 of the lower series 5 of the keys is pushed down, thereby lifting plate 13 by three units, which movement is exactly in the same degree transmitted to the first number-wheel 42 by means of segment 20, wheel 22, pawl 25, ratchet-wheel 24, shaft 23, and wheel 26. In the opening 72 appears number 3 at the units-wheel 45, which is the one farthest to the right in Fig. 2. Then the key 5 of the lower row of keys is pushed down, which thereby lifts the plate 13 by five units, in consequence of which the units-wheel 45 is turned farther by five numbers, so that now number "8" appears within opening 72. Now key 6 of the lower row 5 of keys is pushed down, thereby in the same manner rotating the units-wheel 45 farther by six steps or numbers. As the result is "14," and therefore surpasses the value "9," pin 52 of the units-wheel has actuated its lever 50, so that the pawl 53 of this latter rotates the second wheel 42 farther by one step, so that at this second wheel the number "1" appears in opening 72. As the sum of eight and six is fourteen, the units-wheel 45 shows the number "4," and the sum obtained is "14." Now lever 37 is pushed to the right, thereby moving wheel 26 to the left, so that wheel 26 comes into engagement with the flange of the second wheel 42. Now in just the same manner one after the other the keys

8, 9, and 7 of the lower row 5 are pushed down. As the sum of these numbers is twenty-four, and as the second wheel 24 already shows number "1," it follows that the second wheel 45 will be turned until the number "5" appears. In the mean time, however, pin 52 of the second wheel 42 has a second time actuated the second lever 50, and consequently the third wheel 42 has rotated forward by two steps and number "2" appears at the opening 72 on the third wheel 42.

For the purpose of adding the third vertical row 5, 3, and 4, wheel 26 is again moved one step to the left by means of lever 37. Having thereupon added the last three mentioned numbers, the wheel 26 is again moved forward so that it comes in engagement with the fourth-wheel 45, and after numbers "4" and "5" have been added by actuating the corresponding levers of the lower lever-row 5 the sum of "10454" will appear within the opening 72.

As an example in regards the process of the multiplication, assume, for instance, eighty-three is to be multiplied by ninety-five. This takes place in the following manner: The example is to multiply eighty-three by ninety-five, wherein "95" may be written below "83." At first five of ninety-five is multiplied by three of eighty-three, giving the result "15." Then five of ninety-five is multiplied by eighty of eighty-three, giving the result "400." Then ninety of ninety-five is multiplied by three of eighty-three, giving "270," and, finally, ninety of ninety-five is multiplied by eighty of eighty-three, giving "7200." All these single products are automatically added by the machine, giving "7885."

In this machine the process of multiplying is accomplished by repeated addition. To multiply, for instance, eighty-three by ninety-five the machine is manipulated as follows: The number-wheels are first rotated by means of knob 41 until the numbers "0" appear at opening 72. Wheel 26 is then adjusted so that it meshes with the units-wheel 42. Then key 5 of the lower row of keys is pushed down, rotating the units-wheel 42 by five steps, but at the same time, by means of the spring 73, lifting the segment 61 by exactly the same amount. While the writer lifts his finger on key 5 of the lower row he presses down with the finger of his other hand the key 3 of the upper row 6 of keys. In consequence thereof the plate 14 is lifted by two (not three) steps, at same time rotating thumb-wheel 57 by means of the segment 58, wheels 55 and 56, and shaft 45 by two steps. As the segment 61 is lifted by the spring of segment 20 by five steps, it could only oscillate in both directions by five steps during the time both said thumb-wheels 57 run past the roller 63 of lever 62 of segment 61. As the units-wheel 42 was at first ro-



tated by five steps by actuating-key 5 of the lower key-row and thereafter again two times by each five steps by pressing down lever 3 of the upper key-row, the units-wheel was rotated seventy-five steps, and shows, therefore, number "5" in the opening 72, and at the same time the tens-wheel shows the number "1"—that is to say, both wheels together show the number "15." As only the units-wheel has been rotated more than one time, its lever 50 has actuated and rotated the second number-wheel 42 one step forward, and the obtained result must be "15." Now, wheel 26 is to be moved farther until it comes in engagement with the toothed flange of the second number-wheel—that is, the tens-wheel. Again, key 5 of the lower key-row 5 is pressed down. Then, while this key 5 remains in down position key 8 of the upper row 6 is pressed down, causing thereby seven oscillations of segment 61, so that the second wheel 42 is rotated seven times by five steps—that is to say, the second wheel 42 was one time rotated by five steps by means of key 5 of the lower row, and then seven times by five steps by means of key 8 of the upper row, and that amounts to eight times five steps altogether. As the second wheel 42 now shows the number "1" and its lever 50 was afterward operated four times, the result "415" must appear in the opening 72, because five multiplied by eight are forty, and as the second number-wheel 42 represents the value ten the effect is the same as if five is multiplied by eight, equal to four hundred. Adding to these four numbers the value seventy-five, already obtained by the first wheel 42, it is evident that the sum "415" must appear. Now, the number eighty-three is to be multiplied by number nine of number ninety-five. As the number nine stands in the second row, taken in vertical direction, because nine represents ninety, wheel 26 must be in engagement with the second wheel 42 but as it already stands in this position no manipulation of it is required in the selected example. Again, first of all, lever 9 of the lower row 5 of keys is pressed down, and while still being in this position lever 3 of the upper row 6 of keys is pressed down, causing the second wheel 42, which was already turned by nine steps, to be again rotated by nine steps. The result is twenty-seven, or, more exactly, two hundred and seventy, which the machine immediately adds to the sum of four hundred and fifteen, so that the result of "685" appears in the opening 72. Now the number "8", representing "80," is finally multiplied by number "9," which represents "90," as mentioned, whereby the definitive final result is obtained. For this purpose wheel 26 is to be moved into engagement with the third wheel 49, because the result of eighty multiplied by ninety lies within the thou-

sands. Again, key 9 of the lower key-row 5 is pressed down, rotating the third wheel 42 by nine steps. Then key 8 of the upper row 6 of keys is pressed down, causing seven rotations of the third wheel 42 by nine steps. As the result, seven thousand and two hundred is obtained by this multiplying nine by eight and is added to at the third and fourth vertical number row, because lever 50 of the third wheel was seven times actuated, and the final sum of "7885" automatically appears within slot 72 of the machine.

Instead of that construction of the number-wheels shown by Figs. 1 to 4, in which the same are provided with a radial flange, the modified construction shown in Figs. 5 and 6 may be employed. With this modified construction the wheels 26 are of the diameter of the flange of the number-wheels shown in Figs. 1 to 4, and by this advantage is obtained that the numbers when passing the slot 72 or appearing in it lie immediately below said slot and are thereby easier to read.

As the number-wheels in Figs. 5 and 6 form themselves a toothed wheel, a separate flange cut out for the teeth in wheel 26 is not necessary, and consequently wheels 26 may be adjusted directly or centrally in front of the respective number-wheels, as shown in Fig. 5.

The machine can be employed while standing on any usual desk as used in merchant-offices, but more preferably it is arranged before the table and so low that its cover may project slightly beyond the upper surface of the table, allowing the writer having the books in convenient position for or from which he performs any calculation required. For this purpose a plate 69 may be provided by means of a hinge 71, connected to the casing of the machine—and, for instance, being provided with flat india-rubber bells 70 by vacuum to be pressed down onto the surface of the table and securing thereby the whole machine to the table.

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

1. In an adding-machine, a set of keys arranged at an angle to the axis of a series of number-wheels, the inner ends of said keys being of gradually-increased length according to the stroke prescribed for each of them, combined with a plate supported rotatably and having a straight longitudinal edge resting on said inner ends of the keys, a loosely-rotatable toothed segment, a link connecting the segment to said plate, a shaft, a toothed wheel on the shaft engaging said segment, a pawl on the toothed wheel engaging a serrated wheel fixed to said shaft, a toothed wheel arranged to slide upon said shaft, means for moving such last-mentioned toothed wheel along its shaft, a series of toothed number-wheels loosely rotatable on



a shaft such number-wheels being arranged to come one after the other in engagement with the said slidable toothed wheel, means for simultaneously turning the entire series of number-wheels to their zero position, and means for rotating each following wheel at the completion of the rotation of the preceding wheel, substantially as described.

2. In an adding-machine, a set of keys arranged at an angle at the axis of a series of number-wheels, the inner ends of said keys being of gradually-increased length according to the stroke prescribed for each of them, combined with a plate supported rotatably and having a straight longitudinal edge resting on said inner ends of the keys, a loosely-rotatable toothed segment, link connecting the segment to said plate, a shaft, a toothed wheel on the shaft engaging said segment, a pawl carried by the toothed wheel engaging a serrated wheel fixed to said shaft, a toothed wheel arranged to slide upon said shaft, a fork having such last-mentioned toothed wheel between its prongs, a guide carrying the fork, an endless chain, pulleys supporting said chain, a shaft resting rotatably in a bearing and fixedly carrying at its end one of the said pulleys, a serrated wheel secured to the outer end of the shaft, a lever rotatably mounted on the pulleys-shaft and in engagement with the serrated wheel, a series of toothed number-wheels loosely rotatable on a shaft such number-wheels being arranged to come one after the other in engagement with the said slidable toothed wheel, means for simultaneously turning the entire series of number-wheels into their zero position, and means for rotating each following wheel at the completion of the rotation of the preceding wheel, substantially as described.

3. In an adding-machine, a set of keys arranged at an angle to the axis of a series of number-wheels the inner ends of said keys being of gradually-increased length according to the stroke prescribed for each of them, combined with a plate supported rotatably and provided with a straight longitudinal edge resting on said inner ends of the keys, a loosely-rotatable tooth-segment, a link connecting the segment to said plate, a shaft, a toothed wheel on said shaft engaging said segment, a pawl carried by its toothed wheel engaging a serrated wheel fixed to said shaft, a toothed wheel arranged to slide upon said shaft, means for moving such toothed wheel along its shaft, a series of loose rotatable toothed number-wheels such number-wheels being arranged to come one after the other in engagement with the said slidable toothed wheel, means for simultaneously turning the entire series of number-wheels into their zero position, means for rotating each following wheel at the completion of the rotation of the preceding wheel, a second set of keys supported at an angle to the axis of the said

number-wheels the inner ends of the said keys being of successive variable length according to a prescribed stroke, a second plate supported rotatably and having a straight longitudinal edge resting on the inner ends of the said second series of keys, a second toothed segment, a link connecting the second plate with the second toothed sector, a shaft, carrying loosely rotatable thereon a toothed wheel, a pawl on the last-mentioned toothed wheel adapted to engage a serrated wheel fixed to said shaft, a thumb-wheel rigidly connected to the same shaft, a third toothed sector rotatably mounted on a shaft and having a rear arm, a roller for said arm adapted to come in engagement with the thumbs of the said thumb-wheel, a toothed wheel in engagement with the third toothed sector and carrying a pawl adapted to engage a serrated wheel, a serrated wheel secured to the shaft carrying slidably thereon the toothed driving-wheel for the series of toothed number-wheels, and a pin and a spring both secured to the first toothed segment such spring being adapted to push the third segment against the said pin, substantially as described.

4. In an adding-machine, a set of keys arranged at an angle to the axis of a series of number-wheels the inner ends of the successive keys being of gradually-increased length according to the stroke prescribed for each of them, combined with a plate supported rotatably and having a straight longitudinal edge resting on said inner ends of the keys, a loosely-rotatable toothed segment, a link connecting the said segment to said plate, a shaft, a toothed wheel on the shaft engaging said segment, a pawl on the toothed wheel engaging a serrated wheel fixed to said shaft, a toothed wheel arranged to slide upon said shaft, a fork to move such toothed wheel, a guide carrying the fork, an endless chain to move the fork, pulleys supporting said chain, a shaft resting rotatably in a bearing and carrying at its inner end fixed thereto one of the said pulleys, a serrated wheel fixed to the other end of the shaft, a lever rotatably mounted on the pulley-shaft and in engagement with the serrated wheel, a series of toothed number-wheels loosely-rotatable on a shaft such number-wheels being arranged to come one after the other in engagement with the said slidable toothed wheel, means for simultaneously turning the entire series of number-wheels into their zero position, means for rotating each following wheel at the completion of the rotation of the preceding wheel, a second set of keys arranged at an angle to the axis of the said number-wheels and having their inner ends of gradually-increasing length according to a prescribed stroke, a second plate supported rotatably and provided with a straight longitudinal edge resting on the inner ends of the said



second series of keys, a second toothed sector,  
a link connecting the second plate with the  
second toothed sector, a shaft, carrying  
loosely rotatable thereon a toothed wheel  
5 having a pawl, a serrated wheel fixed to said  
shaft and with which the pawl engages, a  
thumb-wheel rigidly connected to the same  
shaft, a third toothed sector rotatably mount-  
ed and having a rear arm provided with a  
10 roller adapted to come in engagement with  
the thumbs of the said thumb-wheel, a  
toothed wheel in engagement with the third  
toothed sector and carrying a pawl, a ser-

rated wheel secured to the shaft which carries  
slidably thereon the toothed driving-wheel 15  
for the series of toothed number-wheels, and  
a pin and a spring both secured to the first  
toothed segment such spring being adapted  
to push the third segment against the said  
pin, substantially as described. 20

In witness whereof I subscribe my signa-  
ture in presence of two witnesses.

SALVADOR DE GOMILA.

Witnesses:

JULIO WELTER,  
D. R. BIRCH.