No. 791,849. PATENTED JUNE 6, 1905.

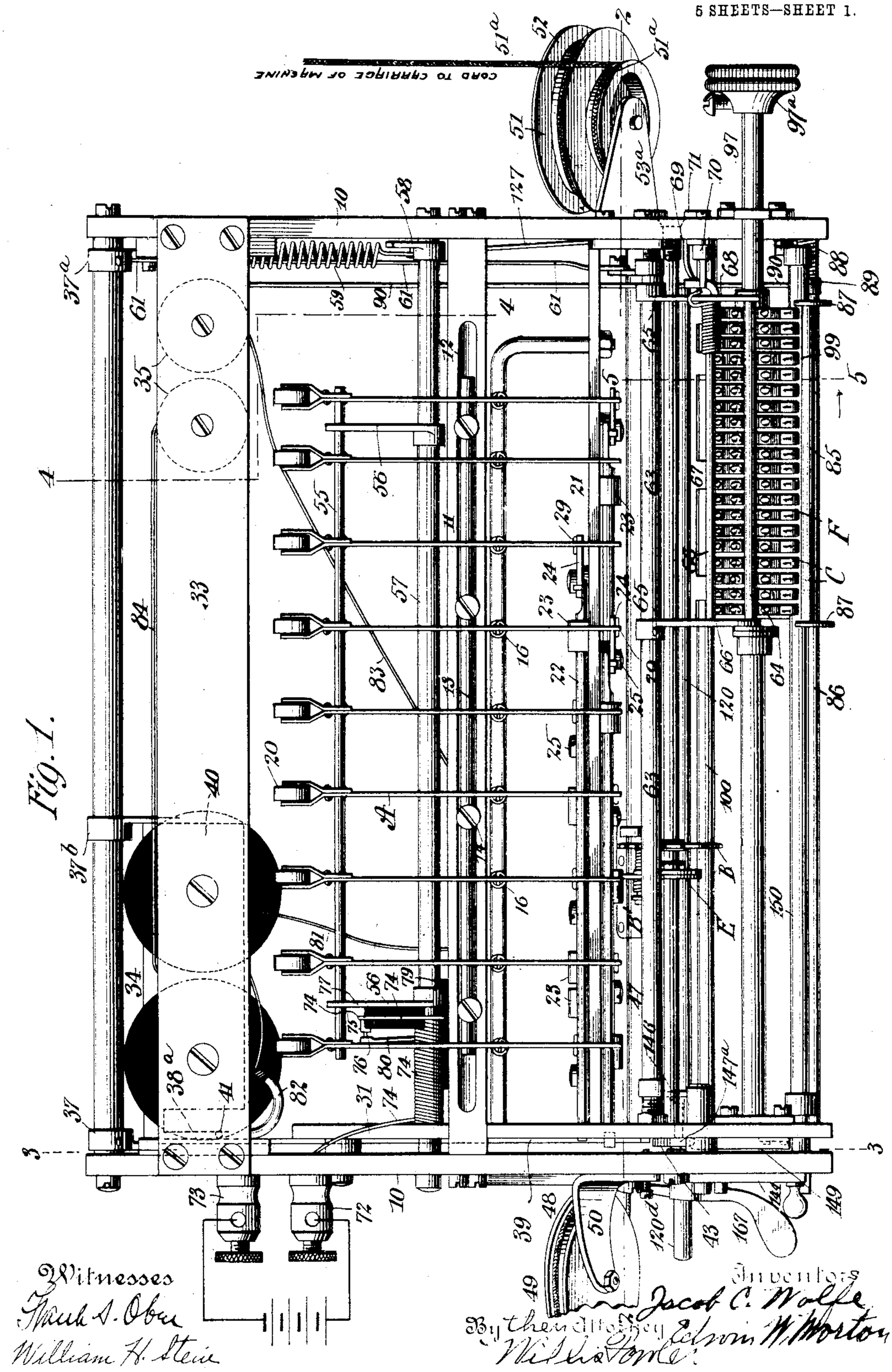
J. C. WOLFE & E. W. MORTON.

ADDING MACHINE.

APPLICATION FILED OCT. 9, 1903.

5 SHEETS—SHEET 1.

FIG. 1.



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5 SHEETS—SHEET 2.

FIG. 2.

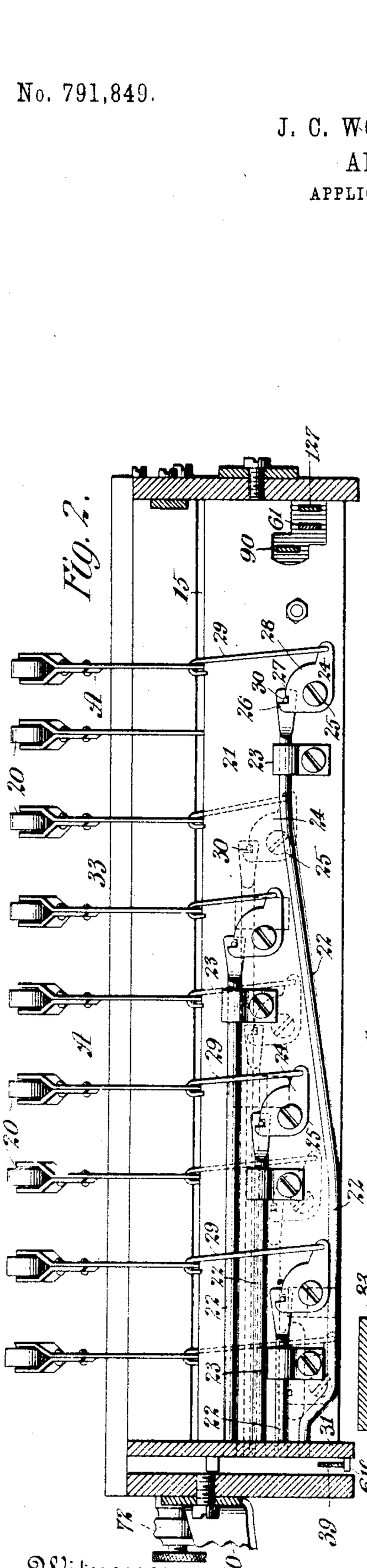

FIG. 3.

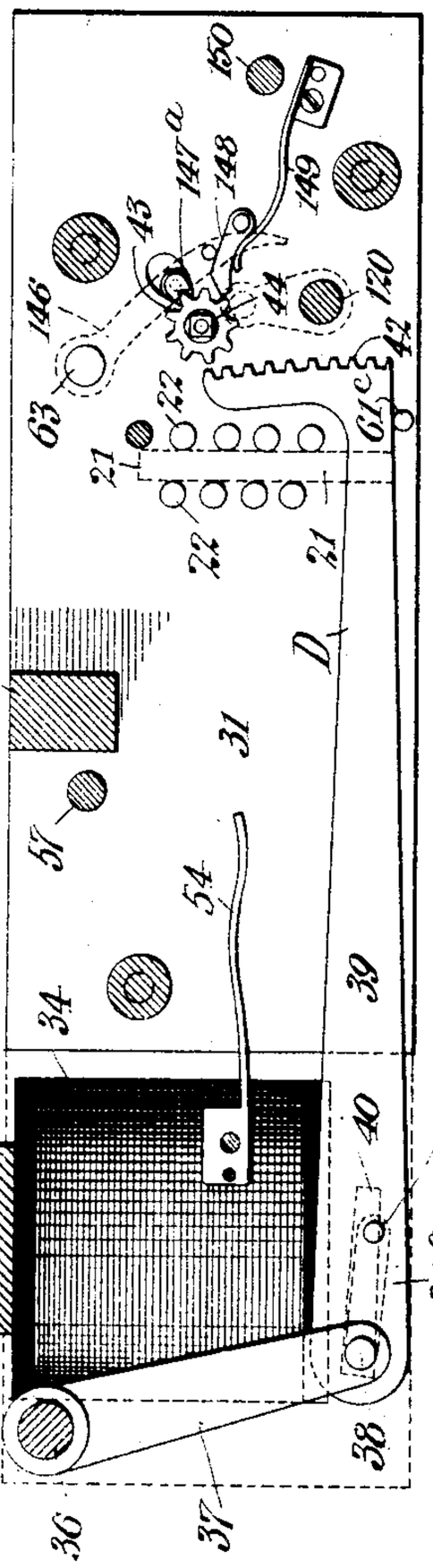

FIG. 4.

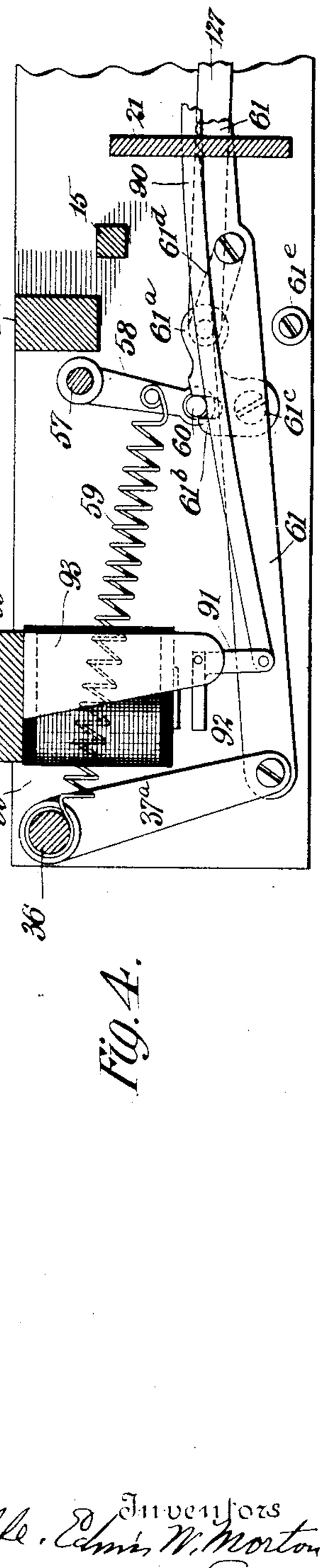

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PHOTO LITHOGRAPHED BY SACKETT & WILHELMS LITHO. CO. NEW YORK

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5 SHEETS—SHEET 3.

Fig. 7.

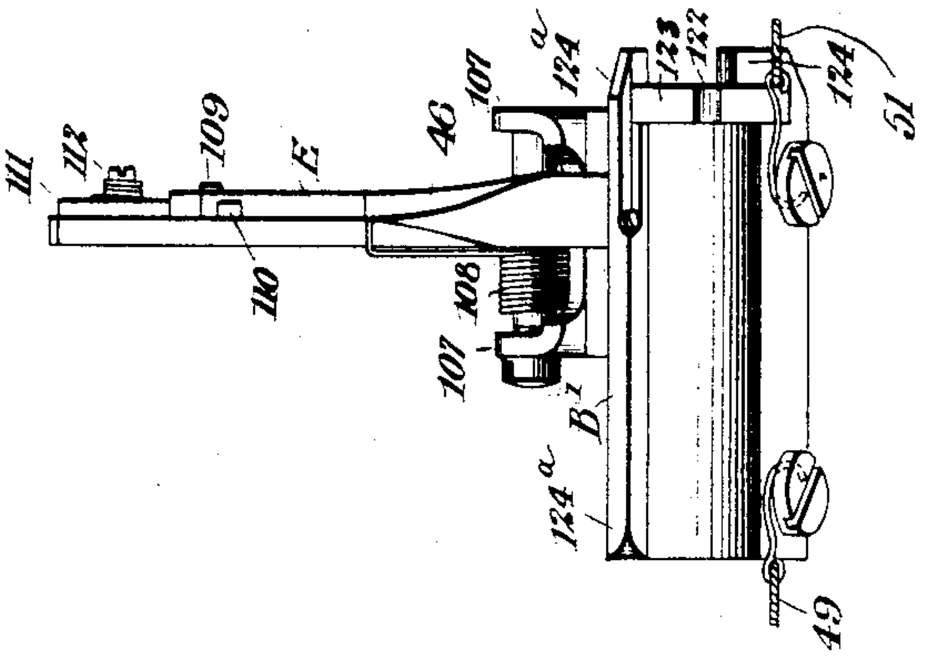


Fig. 6.

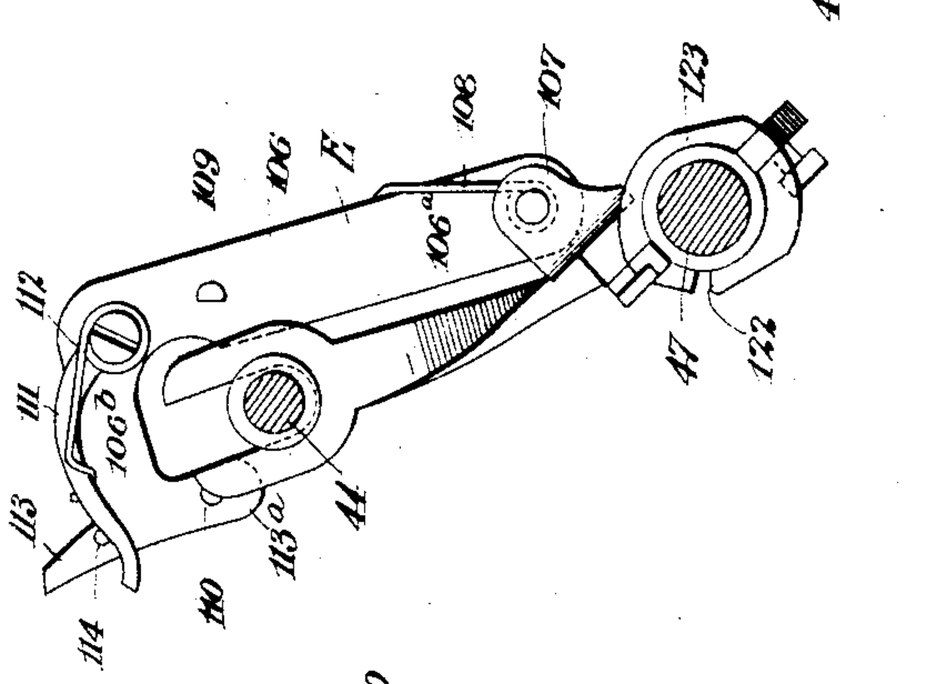
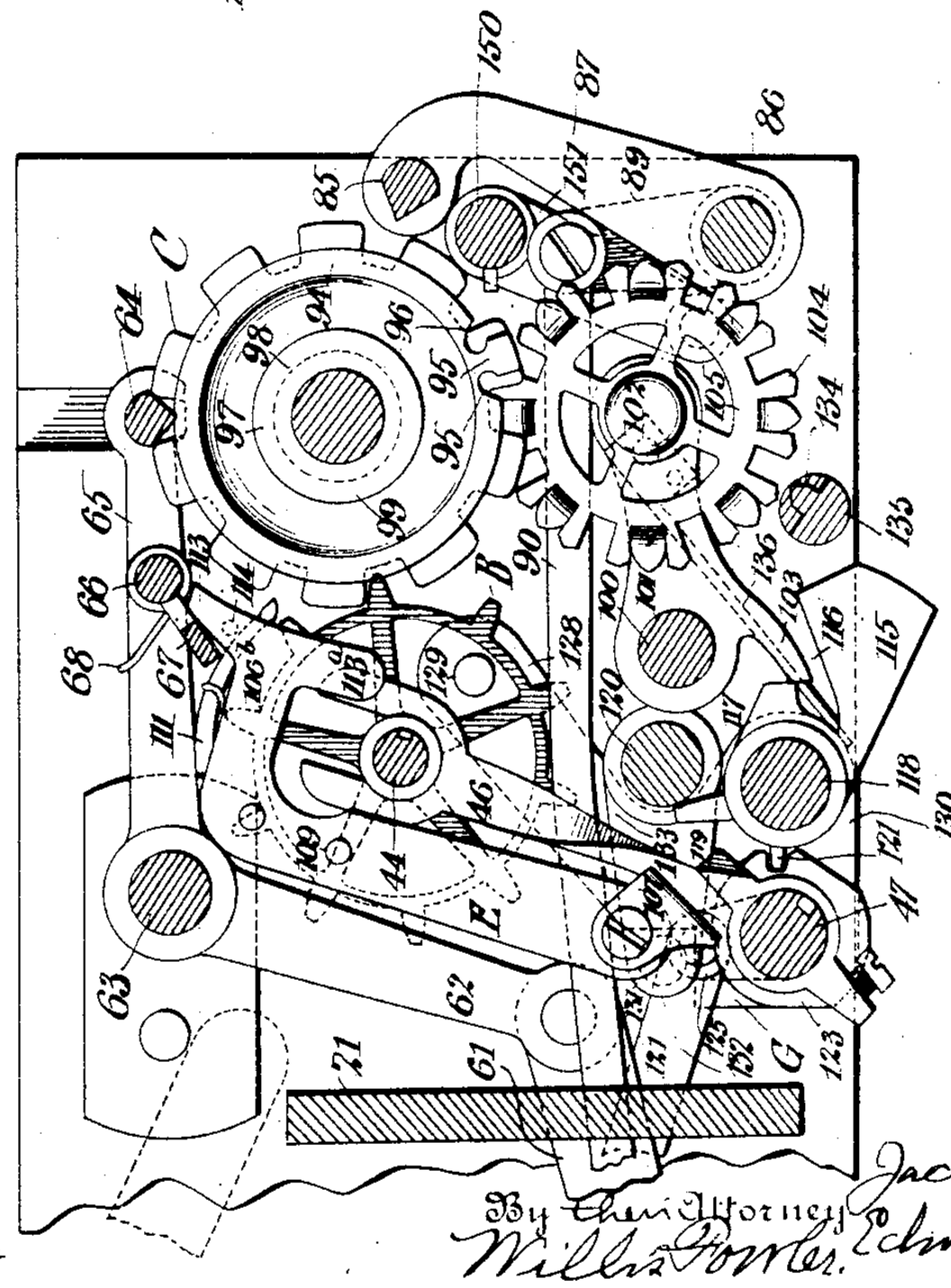


Fig. 5.



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ADDING MACHINE.

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5 SHEETS—SHEET 4.

Fig. 9.

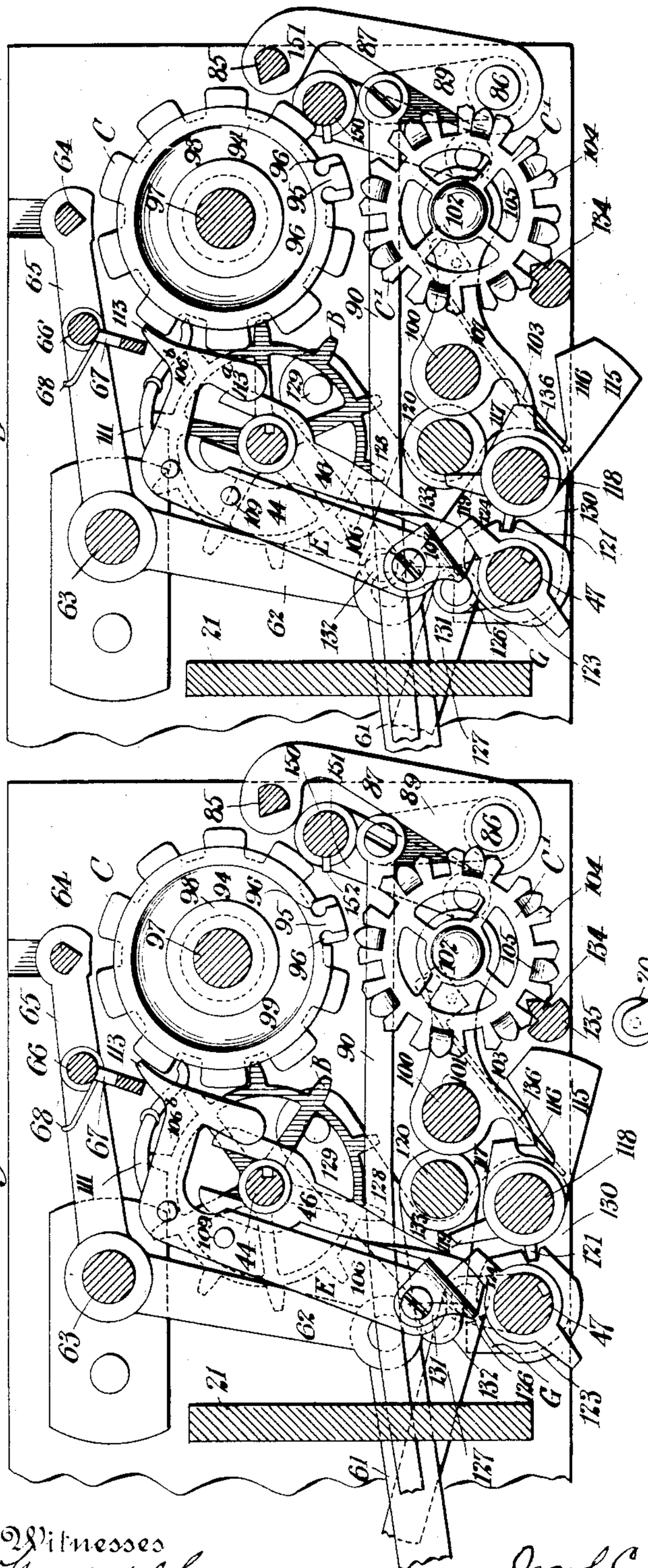

Fig. 10.

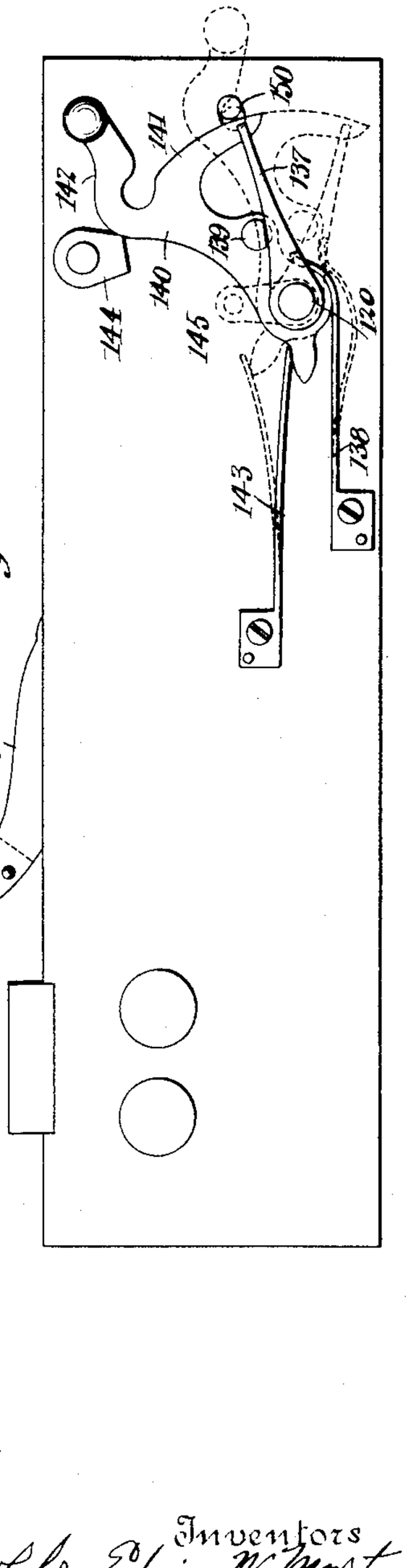

Fig. 8.

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No. 791,840. PATENTED JUNE 6, 1905.

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ADDING MACHINE.

APPLICATION FILED OCT. 9, 1903.

5 SHEETS—SHEET 5.

Fig. 11.

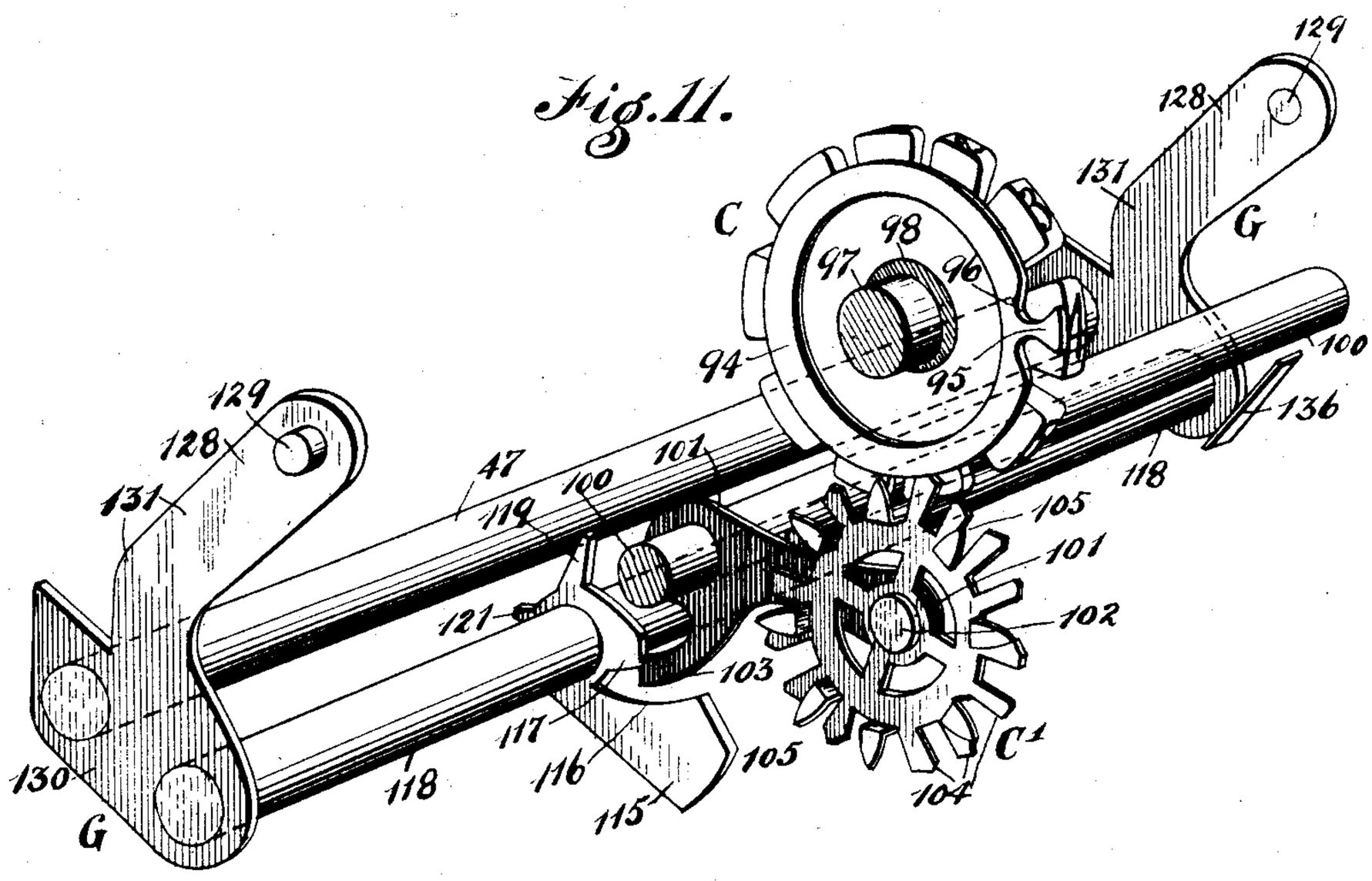
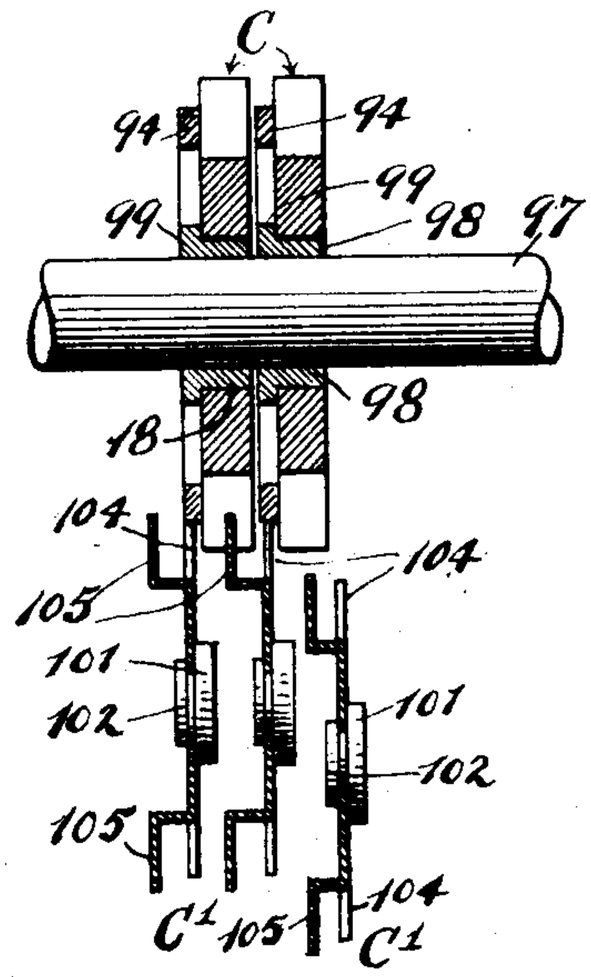


Fig. 12.



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UNITED STATES PATENT OFFICE.

JACOB C. WOLFE, OF NEW YORK, AND EDWIN W. MORTON, OF WHITE-PLAINS, NEW YORK.

ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 791,849, dated June 6, 1905.

Original application filed October 24, 1899, Serial No. 734,618. Divided and this application filed October 9, 1903. Serial No. 176,413.

To all whom it may concern.

Be it known that we, JACOB C. WOLFE, residing at New York city, county of New York, and EDWIN W. MORTON, residing at White-plains, Westchester county, State of New York, citizens of the United States, have invented certain new and useful Improvements in Adding-Machines, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, and the same being a divisional application of our original application for Letters Patent for adding attachments for type-writers, filed October 24, 1899, Serial No. 734,618.

The present invention relates more especially to adding mechanism or machines, and it is particularly well adapted for use with an adding attachment for type-writing machines, in which form we have herewith illustrated it.

The invention consists in the novel constructions and combinations of the several parts, as will be hereinafter fully set forth and then pointed out in the claims.

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

Figure 1 is a plan view of our improved adding-machine. Fig. 2 is a longitudinal section taken substantially on the line 2 2, Fig. 1. Fig. 3 is a section taken substantially on the line 3 3, Fig. 1. Fig. 4 is a section taken substantially on the line 4 4, Fig. 1. Fig. 5 is an enlarged transverse vertical section taken on the line 5 5, Fig. 1, the drive-wheel, index or adding wheels, the carrying-wheels, aligning-bars, and check mechanism being in their normal positions. Fig. 6 is an enlarged side elevation of the check mechanism, the carriage for the said mechanism and the carriage-shaft and drive-shaft being in transverse section. Fig. 7 is an enlarged side elevation of the carriage shown in Fig. 6 and an edge view of the check mechanism. Fig. 8 is an enlarged section taken on the same line as is Fig. 5, showing the positions occupied by the parts in said Fig. 5 just prior to the time the electric contact is made that actuates the drive-wheel. Fig. 9 is an enlarged section taken on the same line as Figs. 5 and 8 and illustrates the positions occupied by the parts shown in said figures when the index-wheels or adding-wheels are to be reset to "0." Fig. 10 is a view of the left-hand side of the machine. Fig. 11 is a perspective view of the swinging frame G, together with one of the index-wheels and a carrying-wheel which carries the tens therefrom, as will be hereinafter fully set forth. Fig. 12 is a vertical sectional view taken through two adjacent index-wheels with which coöperate three tens-carrying wheels, one of which is shown as dropped out of engagement with the index-wheel to which it carries the tens.

The frame of the machine consists, usually, of two side bars 10, connected at or near their centers by a longitudinal bar 11, in the top of which bar a longitudinal groove 12 is made, arranged to receive a rod 13, held in position by set-screws 14 or their equivalents, and the said rod 13 is utilized to pivct the key-levers A, which are nine in number. The right-hand lever is adapted to be brought beneath the letter "I," which usually represents the numeral "1" on a type-writing machine, and the other levers are brought, respectively, under the numeral-keys, reading from "2" to "9," inclusive. Each key-lever A is carried across a fixed bar 15, which is in front of the cross-bar 11. This fixed bar 15 is shown in Figs. 1 and 3, and between the fulcrum-bar 11 for the key-levers and the front bar 15 a support 16^a is provided, usually in the nature of a bar, and on this support springs 16 are located, which bear against the under surfaces of the key-levers in advance of their fulcrum, the springs serving to assist the key-levers in assuming a normal position after they have been depressed.

A forward partition 21 extends from side to side of the frame, as is shown in Figs. 1 and 2, and this partition 21 carries a series of bolts 22, mounted to slide in suitable bearings 23. Some of these bolts are arranged at the front of the partition 21 and others at the

rear, and a bolt is connected with each key-lever, with the exception of the key-lever adapted to be depressed by the numeral-key 9 of the type-writing machine. These bolts are so arranged that the bolt connected with the numeral-key lever 1 is the lowermost bolt, while the other bolts are arranged one above the other in proper order. The bolt corresponding to the key-lever to be depressed by the numeral-key 9 is the uppermost bolt, and this bolt is stationary and is distinguished from the others by the reference-numeral 32 and is best shown in Fig. 2. Each key is connected with a lever 24, and these levers are fulcrumed, by means of suitable pins 25, some at the front side of the front partition 21 and the others at the rear side of the said partition, as shown in Figs. 1 and 2. The levers 24 are in the form of angle or elbow levers; but each lever 24 is provided at its left-hand end with a spur 26 and a recess 27 next the said spur, the recesses 27 of the said levers being produced in their upper edges, and each lever 24 is further provided with a cylindrical or segmental section 28, extending from the right hand of a recess 27 which is lower than the left-hand wall to a point near the right-hand end of the lever, as is best shown in Fig. 2, and the lower or right-hand end of each lever 24 is connected by a link 29 or its equivalent with the forward end of a key-lever A. Each movable bolt 22 is provided at its right-hand or inner end preferably with a flattened surface and with a pin 30, which projects from the said flattened surface and is adapted to enter and normally remain in a recess 27 of one of the bolt-actuating levers 24 controlled by the key-levers. Each time a key-lever is depressed the bolt-actuating lever 24 connected therewith is operated in a manner to throw the bolt in communication therewith in direction of the left-hand side of the frame and through an opening provided for the outer end of the bolt in a short transverse partition 31 adjacent to the left-hand side of the frame, as is indicated in Fig. 2; but the uppermost or stationary bolt 32 extends at all times beyond this inner transverse partition 31 and into the space between said partition and the said right-hand side of the frame, as is clearly shown in Fig. 2. The cylindrical surfaces 28 of the bolt-levers 24 serve to hold the bolts in their thrown position, as when the bolts are thrown the pins 30 leave the recesses 27 and ride upon the cylindrical surfaces 28. The bolts 22 and 32 are adapted to limit the movement of the electrically-operated segment D, to be hereinafter described, which segment controls the movement of a drive-wheel B, which drive-wheel is adapted to act upon any one of a series of index-wheels C, also to be hereinafter particularly mentioned.

A bar 33 extends from one side of the frame to the other at the rear, and this bar 33 constitutes the yoke of a main set of magnets 34 and an auxiliary set of magnets 35. (Shown in Figs. 1, 3, and 4.) A shaft 36 is mounted to rock in the upper rear portion of the frame of the machine, and this shaft carries a downwardly-extending crank-arm 37 at or near its left-hand end, a similar arm 37^a at or near its right-hand end, and an intermediate crank-arm 37^b. A pivot-pin 38 is passed through the lower end of the left-hand crank-arm 37, as shown in Fig. 3, and this pivot-pin 38 is likewise placed through a crank-arm 38^a from the armature 40 of the main magnet, the other end of the said armature being pivoted to the intermediate crank-arm 37^b on said shaft 36, as is shown in Fig. 1. The crank-arm 38^a of the armature is rigidly secured to the shank 39 of a segment D by a pin 41 or a like device. Thus when the magnets 34 are energized and the armature 40 attracted the free end of the shank 39 of the segment D will be raised as far as the projected bolt 22, operated by a key-lever, will admit, as these bolts are intended to regulate the upward throw of the segment. (See Fig. 3.) The segment is provided with a vertical head 42, toothed upon its forward or outer edge, and the teeth of the segment are adapted to engage with the teeth of a pinion 43 on a shaft 44, located in the space between the left-hand side of the frame and the parallel partition 31, as shown in Figs. 1 and 3. A drive-wheel B is mounted to slide on the shaft 44 and to turn with said shaft, (see Fig. 1;) but while the drive-wheel moves upon its shaft relatively to the movement of the carriage of the type-writer to which the attachment is made it is not brought into action relative to an index-wheel until one of the key-levers has been pressed and the magnets 34 energized in a manner which will be hereinafter set forth.

The drive-wheel B is acted upon by a carriage B′, and this carriage is mounted to slide on a shaft 47, (shown in Figs. 1, 5, 6, 7, and 8,) and the said carriage is provided with a fork 46, which enters a circumferential groove 45 in the hub of the drive-wheel B, as indicated in Figs. 6 and 8. The carriage B′ is actuated by the movement of the carriage of the type-writer to which the machine is applied preferably in the following manner: A cord 48, made of metal or other material, is secured to the left-hand portion of the carriage B′ and is connected to the left-hand side of the attachment and is passed around and secured to a spring-drum 49, mounted to turn in brackets 50 at the left-hand side of the attachment, as shown in Fig. 1, while a similar cord 51 is attached to the right-hand end of the carriage B′ and is connected at the other end with one step of a differential pulley mounted to turn in brackets 53^a, and a second cord 51^a, connected with the other step of the pulley, is carried to an engagement with the carriage of the type-writing machine and over

any necessary guide-pulleys. Thus it will be observed that the carriage of the attachment travels with the carriage of the typewriting machine. A spring 54 is projected from the left-hand side of the frame or from a near-by support over the shank 39 of the segment D employed to actuate the drive-wheel B. This spring 54 is used to assist the segment in returning to its normal position.

A bar 55, which we denominate a "universal bar," is depressed each time that a key-lever is forced downward at its rear end. In fact, the bar 55 extends beneath and in the downward path of each of the key-levers, as shown in Fig. 1. This universal bar 55 is connected by arms 56 with a rock-shaft 37, and said shaft may be denominated a "universal rock-shaft." The universal bar, through the medium of this rock-shaft 57 and connections, controls or regulates the movement of the major portion of the operative mechanism of the attachment. This universal rock-shaft 57 is provided at its right-hand end with a crank-arm 58, and this arm is usually connected by a spring 59 with the segment-shaft 36, or shaft that brings the segment in position for engagement with the pinion 43 on the drive-shaft 44. The spring 59 serves to return the universal bar 55 to its upper or normal position after a key-lever has been removed from the influence of a numeral-key of a type-writer. The crank-arm 58 of the universal rock-shaft 57 is provided at its lower end with a pin 60, as shown in Fig. 4. The mechanism controlled by this crank-arm 58 is shown in Figs. 4, 5, 8, and 9 and is as follows: A link 61 is pivoted to the right-hand crank-arm 37^a on the segment rock-shaft 36, (shown in Fig. 4,) and this link 61, as shown in Fig. 5, has a bell-crank connection 62 with an alining-shaft 63, which shaft controls the mechanism for alining the index-wheels C. This alining is accomplished through the medium of a bar 64, whose lower edge is usually made V-shaped, and this bar is adapted to enter longitudinally-alining spaces between the teeth of the aforesaid index-wheels C, as illustrated in Figs. 1 and 5. This alining-bar 64 is located across the upper central portion of the index-wheels and is connected with the alining rock-shaft 63 by means of arms 65 or their equivalents, and a mechanism E, adapted to serve as a check to prevent too great a throw of the index-wheels, is controlled from the carrying-frame of the alining-bar. This check mechanism E is in its turn attached to the carriage B′, as shown in Figs. 5, 8, and 9.

The controlling device for the check mechanism E consists of a bar 66, pivoted in the arm 65 parallel with the alining-bar 64 and alining-shaft 63, and the said bar is provided with a longitudinal apron 67, which normally extends downwardly and rearwardly therefrom throughout practically the full length of the bar 66, as illustrated in Fig. 1, and this apron is held in the aforesaid rearward and downward inclination through the medium of a spring 68, having one end attached to the bar 66 and the other end in engagement with one of the arms 65, as shown in Figs. 1 and 5.

The controlling device for the check mechanism E is brought into action when the frame carrying the alining-bar is raised by forming a crank-arm 69 at the right-hand end of the apron-carrying bar 66, which as the frame of the alining-bar 64 is raised engages with a pin 70 at the right-hand side of the frame, causing the apron 67 to be depressed at that time. The downward movement of the crank-arm 69 is limited by contact with a lower pin 71, also attached to the frame, as shown in Fig. 1.

When the universal bar 55 is depressed by any one of the key-levers A, motion is communicated to the segment rock-shaft 36, and consequently to the segment D, by imparting to the link 61 a forward throw, and this is accomplished by causing the pin 60 on the arm 58 of the universal rock-shaft 57 to enter a depression 61^b in the upper edge of an angle-lever 61^a, which angle is fulcrumed by a suitable pivot-pin 61^c to the inner face of the right-hand side of the frame of the attachment, as shown in Fig. 4, and the forward end of this lever 61^a is connected by a short link 61^d to the main link 61, and the downward movement of the main link 61 is limited by being brought in engagement with an eccentric stop 61^e, pivoted to the side of the frame below the said link 61, as shown in Figs. 3 and 4. When a numeral-key—for example, the key indicating the numeral "1"—on the type-writer is depressed, the first half of the movement of the key-lever A depressed by said key causes a bolt 22 to be thrown outward and limit the upward movement of the electrically-controlled segment D, raising the alining-bar 64 and bringing the head 42 of the segment in mesh with the pinion 43, so that when the segment is raised by the movement of the armature 40 toward the magnet 34 the segment will immediately revolve the pinion 43, and consequently the drive-shaft 44 and the drive-wheel B. The initial movement of the segment is accomplished by the movement of the segment-shaft 36, as has been stated, and which is rocked by the depression of the universal bar 55 and consequent movement of the universal rock-shaft 57, its arm 58, and the connection between said arm and the link 61, as is shown in Fig. 4, which latter movement likewise serves to impart motion to the alining-bar, as shown in Fig. 5. The last half of the movement of the key-lever provides time for the armature 40 to work.

The electrical devices employed, as heretofore stated, consist of main magnets 34 and their armature and auxiliary magnets 35 and accompanying armature. Two binding-posts 72 and 73 are located at the left-hand side of

the frame, being wired in suitable manner to a battery or other medium for generating electricity. The wiring consists of a wire 74, carried from the binding-post 72 and wound around the universal shaft 57. This wire 74 is the main wire and is carried to a connection with a contact 75, which contact is in the nature of a spring and has a return-section at one side having a point 76 formed thereon, and the contact 75 is secured upon an insulating-block 77, in turn secured to an arm 56 of the universal bar 55, as illustrated in Fig. 1. The contact 75 is therefore a movable contact and is adapted to be brought in engagement with another contact 78, which is in the form of a spring, and this spring is attached to an insulating-block 79, secured to the bottom portion of the bar 11, which receives in the groove 12 the bar 13, upon which the key-levers A are fulcrumed. A second contact-point 60 is likewise attached to the insulating-block 79, and as the universal shaft and its bar 55 are depressed by a key A′ of the type-writing machine the contact 80 engages with the point 76 of the movable contact 75 once at the downward stroke of a key-lever and again at the upward stroke of the key-lever. When such a contact is made, the auxiliary magnets 35 are energized and an auxiliary alining-bar is brought into action, as will be hereinafter described. The connections which occur between the contacts 75 and 78 serve to energize the main magnets 34, and thus actuate the segment D and the shaft 44, on which the drive-wheel B is mounted to turn and slide.

A wire 81 is carried from the contact 78 to the magnets 34 and through the magnets, from which the current is conducted to the binding-post 73 through another wire 62. (Shown in Fig. 1.) A wire 63, leading from the contact 80, is carried to the auxiliary magnets 35, and the current passes through these magnets and along a wire 84, which is connected with the wire 82, and consequently to the binding-post 73; but we desire it to be understood that the wiring may be differently accomplished and that, if desired, instead of the drive-wheel being electrically operated it may be manually controlled.

An auxiliary alining-bar 85 is located at the front of the machine and is adapted to correct the alining of the index-wheels C in the event they should become disarranged before the main alining-bar 64 descends. This auxiliary alining-bar 85 is given a taper at its contact-face greater on one side than the other, so that in the event the spaces between the teeth of the index-wheels are not in alinement the said engaging point may readily enter the said spaces and true them. This auxiliary alining-bar is secured upon a shaft 86, mounted to rock in the frame of the attachment at the front, the bar being secured to the shaft 86 through the medium of arms 87, as shown in Figs. 1, 8, and 9. A spring 88 normally holds the said auxiliary alining-bar out of engagement with the index-wheels, as is shown in Fig. 1, and this auxiliary alining-bar is not brought into action until the contact-points 75 and 80 engage, and thus energize the auxiliary magnets 35. The auxiliary alining-bar is moved by providing a crank-arm 89 at the right-hand end of the shaft 86 and pivoting one end of a connecting-bar 90 to the said crank-arm, which connecting-bar 90 is carried rearward and is pivoted to a crank-arm 91, projected downwardly from the armature 92 of the auxiliary magnets 35, as illustrated in Fig. 4, the said armature being pivoted in suitable brackets 93, projected downwardly from the yoke 33.

The adding-head F of the machine consists of a series of index-wheels C, made from any suitable material and in any desired number. Each index-wheel is provided with ten teeth, and upon each tooth a numeral is produced, the numerals reading from "0" to "9," inclusive, and the teeth of the drive-wheel B are arranged to enter the spaces between the teeth on the index-wheels. Each index-wheel moves independently, and each index-wheel is provided upon one of its side faces with an annular flange 94, and a tooth 95 is projected from this flange, having its sides recessed where a tooth connects with the flange, as shown in Fig. 5, and the flange 94 is likewise provided with a recess 96 at its outer peripheral portion at each side of the tooth 95, as is illustrated also in Figs. 5, 8, and 9. The index-wheels are mounted to turn freely on a shaft 97, the ends whereof may turn in the frame of the attachment, and the said shaft is provided at its right-hand end with a knob 97^a. Each index-wheel turns on a sleeve 98, the sleeves being loosely mounted on the shaft 97, and, furthermore, the index-wheels are properly spaced by washers 99, which are likewise loosely mounted on the shaft 97. A stationary shaft 100 is located below and slightly in advance of the drive-shaft 44, as is also shown in Figs. 5, 8, and 9, and a series of bell-crank levers 101 is loosely mounted on the shaft 100. One member of these bell-crank levers is longer than the other, and the longer member extends upwardly and beneath the series of index-wheels, being pivoted at its forward end with a suitable stud 102, while the shorter member, 103, of each bell-crank lever is in the nature of a finger and extends downward and rearward, its rear end being flat or straight.

A carrying-wheel C′ is mounted upon the stud 102 of each bell-crank lever 101, and a carrying-wheel C′ is located immediately below each of the index-wheels C. Each carrying-wheel is provided with teeth 104 at its periphery in the same vertical plane with the wheels, and the outer ends of these teeth are concaved, so that they may be brought in frictional engagement with the outer peripheries

of the flanges 94, secured to the index-wheels; and in the normal position of the carrying-wheels such a contact occurs. The index-wheels are prevented from turning to carry over except at that time when said teeth 104 again enter the recesses 96 in the index-wheels, thus permitting the teeth 95, projected from the index-wheels, to turn the carrying-wheels with which said teeth 95 engage the distance of one tooth, and thus communicate motion to the next index-wheel to indicate a sum greater than nine. This communication between two adjoining index-wheels is brought about by producing lateral teeth 105 at one side of each carrying-wheel at or about the central portion of said binding-teeth 104 by punching out the metal and bending the punched portions or otherwise, which teeth 105 act as the teeth of a cog and enter the spaces between the teeth of the adjoining index-wheel. The contact between the teeth 104 and the flange 94 of an index-wheel is very slight, and at times they do not touch. The index-wheels are, in fact, prevented from turning by engagement with the lateral or cog teeth 105 of the tens-carrying wheels, which latter wheels are prevented from turning by one pair of the curved teeth 104 engaging the flange of the next index-wheel to the right.

The straight teeth 104 act in pairs in conjunction with the flange 94 of the index-wheel of lower order, and each pair of teeth have the ends made concave alike, but in an opposite direction, so as to constitute a surface of sufficient length to cause such carrying-wheel to be held from rotation when it is up. It will thus be seen that each pair of the concave teeth are virtually one tooth, the space between them being in the present instance the result of displacing the metal laterally in order to provide the bent carrying-tooth 105. The carrying-wheel is turned the distance of one tooth, or rather one pair of teeth 104, at each complete revolution of the index-wheel of lower order whose flange it engages and at the time when such wheel is passing from "9" to "0" by virtue of the tooth 95 on the flange 94 engaging with the space between a pair of the straight teeth 104 on the carrying-wheel. This construction is substantially what is known as the "Geneva movement," it being a modification of the well-known Geneva stop for watches.

When the parts are in normal positions with the tens-carrying wheels C′ all up, an index-wheel C of lower order has the concave ends of a pair of teeth 104 of a carrying-wheel lying sufficiently close to the flange 94 of the index-wheel to lock the carrying-wheel, and at the same time the lateral carrying-teeth 105 lie in the path of the teeth on the periphery of the index-wheel of next higher order. Considering the relation between the straight teeth 104 and the flange 94 of a low-order index-wheel, the relative shape of the parts is such that while the index-wheel may be turned on its axis the carrying-wheel cannot be turned. This carrying-wheel is thus locked by its straight teeth lying close to the flange 94 of the index-wheel of lower order, and the index-wheel of higher order is locked by reason of a lateral tooth 105 of such carrying-wheel taking in between the teeth of said index-wheel of higher order. In order, therefore, to actuate a certain index-wheel by the drive-wheel B, the tens-carrying wheel must be dropped or lowered, so that its lateral tooth 105 is out of engagement and out of the path of the peripheral teeth of the said index-wheel, which may then be freely turned, as its flange 34 is then only in sliding engagement with a pair of straight teeth 104 on the adjacent carrying-wheel, which does not prevent the turning of such index-wheel. This dropping of the carrying-wheel, by a lateral tooth 105, locks a certain index-wheel which it is desired to operate, in which it may be supposed that the right-hand index-wheel C is to be actuated by the drive-wheel B, when moved into engagement with it for the purpose. This index-wheel is free to turn because its peripheral teeth are free from a carrying-tooth 105 of the dropped carrying-wheel C′. Assuming now that the operation of the right-hand index-wheel C is such as necessitates carrying over the tens to the index-wheel of next higher order at its left-hand side, this operation is effected by the single tooth 95, projecting from the flange 94 of the index-wheel of lower order which is being actuated, entering between two pairs of the straight teeth 104 of the carrying-wheel C′, which is next to be dropped one, and giving such next carrying-wheel a turn, and this serves to turn the index-wheel of next higher order one tooth through means of the carrying-tooth 105 of such carrying-wheel to which the carrying is done.

The check mechanism E is illustrated in detail in Figs. 5, 8, and 9, and consists of a crank or L-shaped arm 106. The vertical member 106^a thereof is pivoted in a yoke 107, attached to the carriage, and the upper member 106^b faces the index or adding wheels and has an upper projection 113 and a lower projection 113^a. A spring 108 is coiled around the pivot-pin of the arm 106, having bearing against the yoke and against the rear edge of the vertical or body member 106^a of said arm 106, and said spring serves to hold the arm 106 in the inclined position shown in Figs. 5, 6, 8, and 9 and likewise assists in returning the arm to its normal position when operated by the apron 67 of the depressing device carried by the upper-alining-bar frame. The vertical member of the said arm 106 is provided with a stop 109, and the downwardly-extending section 113^a of the upper member is provided with a stop 110, and these two stops 109 and 110 serve to

limit the movement of the fork 46. A check-finger 111 is pivoted on the arm 106 where its two members connect, and said finger 111 extends beyond the forward edge of the arm 106 and is normally held in an upward position (shown in Figs. 5, 6, 8, and 9) by a spring 112; but the forward movement of the said check-finger is limited by a stop-pin 114, located upon the upper extension 113 of the arm 106, while the downward movement of said finger 111 is limited by engagement with the stop 110.

The carrying-wheels C′ are held in their upper position or in engagement with the index-wheels C or are dropped out of engagement with said index-wheels by means of the cams 115, one of said cams being provided for each bell-crank lever 101 supporting a carrying-wheel C′. It is necessary that a carrying-wheel shall be dropped before the index-wheel C with which it mates can be operated, and at this point it may be stated that when the frame of the upper alining-bar 64 is raised and the apron 67 carried by said frame is depressed in a forwardly direction, as has been described, the said apron will come in contact with the projecting portion 113 of the arm 106 of the check mechanism, as shown in Fig. 5, and will carry said arm forward and bring the finger 111 in the space between two teeth of the index-wheel of next higher order to which the tens is to be carried and which is adjacent to the index-wheel then engaged by the drive-wheel B, and as the said index-wheel is turned by the drive-wheel B through the medium of the carrying-wheel C′, actuated through the segment D, the finger 111 will be carried downward until it reaches the stop 110, thus permitting the index-wheel of higher order to move the distance of one tooth only, and when the arm 106 is moved rearward from the index-wheel, owing to the upward movement of the key-lever that brought the arm into action, the check mechanism will likewise move rearward and the spring-controlled finger 111 will disengage from the index-wheel and return to its normal position, ready to again be brought into action with reference to any one of the other index-wheels.

The cams 115 are provided with cam-slots 116 in their upper edges, adapted to receive the fingers or shorter members 103 of the bell-crank levers 101, and each cam 115 is also provided with a straight edge 117 above the recess 116 produced therein. The cams are loosely mounted upon a shaft 118, and this shaft is carried by a pivoted frame G, to be hereinafter described. When the cams 115 are in their normal positions, they incline downwardly and forwardly, as shown in Fig. 5, and the shorter members 103 of the bell-crank levers engage with the straight edges 117 of the said cams, thus holding the carrying-wheels C′ in their upper or normal position; but when a cam is rocked in an upward direction the shorter member 103 of the bell-crank lever which the cam controls enters the slot 116 of the cam, and consequently the carrying-wheel C′ mounted on that particular bell-crank lever may drop downward out of engagement with its mating index or adding wheel. The downward movement of the cams 115 is limited by projections 119 from their upper rear edges above the shaft 118, and when the cams are in their normal position these projections engage with the rear side of a setting rock-shaft 120, whose functions will be hereinafter set forth. The cams are actuated by a nut 123, mounted to revolve between projections 124 at one end of the carriage B′, as shown in Figs. 5 and 8 and in Fig. 9, and this nut is mounted to slide on the carriage-shaft 47 and to turn with said shaft, while the carriage simply slides on the shaft. The nut 123 is provided with a peripheral recess 122, which is adapted to receive a pin 121, projected rearwardly from the pivot portion of the cam to be acted upon. The carriage-shaft 47 is mounted to rock in the above-mentioned frame G, and the carriage-shaft 47 is actuated when the universal bar 55 is depressed through the medium of a connecting-rod 127, which is pivoted to an upwardly-extending crank-arm 126, located at one end of the carriage-shaft 47, and the other end of the connecting-bar 127 is pivoted to the lever 61ª, actuated by the pendent arm 58 of the universal shaft 57, as shown in Fig. 4. Thus it will be observed that each time the key-lever is depressed the shaft 47 will be rocked in a manner to cause the cam 115 with which the nut 123 engages to be carried forward, permitting the carrying-wheel located on the said cam to drop. The carriage B′ is provided with inclined surfaces 124ª at each end in order that as the carriage slides upon its shaft 47 the said inclined surfaces 124ª will carry the projections 119 of the cams 115 in engagement with the setting rock-shaft 120 should any of the cams 115 be out of normal position.

The swinging frame G consists of two side arms or plates 128, which are pivoted on pins 129 to the respective sides 10 of the frame. In the lower horizontally-extending part 130 of each side piece 128 is mounted the respective ends of the cam-shaft 118, which is fixed, and also the respective ends of the carriage-shaft 47, which rocks in its bearings. Thus the swinging frame G comprises the two side plates 128, the cam-shaft 118, and the carriage-shaft 47, and these two shafts are always maintained in the same fixed relation to each other, at the same time the two shafts are bodily moved laterally by the swinging of the frame, which is normally under spring tension by the acting of the spring 136, bearing upon one of the said plates, and the spring serves to force the frame rearwardly whenever the frame is free from the restraint of the cam-rollers 132, which are carried by the

crank-arms 133, fixed upon the setting rock-shaft 120, and which cam-rollers ride over the rear edges of the respective side plates 128 of the frame G. The rear edge of each plate 128 is formed with a cam-recess 131, from which arises and forwardly and upwardly an inclined surface. Normally the cam-rollers 132 stand in recesses 131 and hold the frame G at its forward limit of movement and against the action of its spring 136. When the setting rock-shaft 120 is rocked, so as to carry its crank-arms 133 upwardly, the cam-rollers 132 thereof leaving the recesses 131 of the frame G move upwardly over the forwardly-inclined part thereof, thus freeing the frame, so that its spring can force it backwardly, and thereby carry backwardly both the cam-shaft 118 and the carriage-shaft 47. Thus while the bell-crank shaft 100 and the setting rock-shaft 120 remain in fixed position relatively to each other the cam-shaft 118 varies its distance from each by reason of the swinging of the frame G, of which it forms part. In the normal positions of these parts the frame G is swung forwardly and held in such position by reason of the cam-rollers 132 on the arms 133 of the shaft 120 locking in the cam-recesses 131 of the frame G, and under this condition the upward projections 119 on the cam 115 are each pressed against the rear side of the shaft 120, thereby raising each cam to what may be termed its "intermediate" position, as shown in Fig. 5, and in which the straight part 117 of each cam engages the end of the finger 103 of each bell-crank lever 101 in such a manner as to hold up each carrying-wheel into engagement with the index-wheels.

When a carrying-wheel C′ is to be dropped in order to actuate the index-wheel C, which is normally locked thereby, the carriage-shaft 47 is rocked thereby, causing the notch 122 in the nut 123 to bear downwardly against the pin 121 on the rear of the cam 115, so as to raise the forward end of the cam to its highest position, thereby raising the straight-edge 117 above the finger 103 of the engaging bell-crank lever 101 and permitting the same to drop into the notch 116, which movement lowers the forward end of the lever and drops the carrying-wheel thereof out of reach of the index-wheels, as will be particularly understood from Fig. 8.

When it is desired to drop or disengage all of carrying-wheels C′ from the index-wheels C for resetting to "0," this is done by rocking the setting-shaft 120, in a manner hereinafter described, so as to raise its crank-arms 133 and carry the cam-rollers 135 upwardly to free the frame G and permit its spring to force it backwardly, thereby moving the cam-shaft 118 and all of the cams 115 a sufficient distance backwardly and away from the fingers 103 of the bell-crank levers 101 to cause the outer ends of the latter to drop, and thus lower all of the carrying-wheels. From this position the parts are restored to their normal relations by the reverse movement of the setting rock-shaft 120, carrying downwardly and rearwardly its crank-arms 133, which move the cam-rollers 132 down the rear edge of the side plates 128 of the frame G and presses the same forwardly until the cam-rollers 132 enter the recesses 131 in said side plates, which movement restores the various parts to the positions shown in Fig. 5, and in this connection it will be noted that while in both Figs. 5 and 9 the straight part 117 is in engagement with the finger 103 of the bell-crank lever 101 nevertheless such part 117 is lower than and stands farther rearwardly in Fig. 9 than in Fig. 5, because the cam-shaft 118 has been swung downwardly and backwardly by the frame G, and hence is a greater distance from the bell-crank-lever shaft 100 in Fig. 9 than it is in Fig. 5. A guide-bar 135 is located below the carrying-wheels C′, and this guide-bar is provided with recesses 134, into which the teeth of the carrying-wheels C′ enter and are supported when said carrying-wheels are in their lower position, as illustrated in Fig. 8. When it is desired to set one or more of the index-wheels C, this is accomplished without manipulating the universal bar 55, since a lever 137 is secured to the left-hand end of the setting rock-shaft 120, as shown in Fig. 10, and this lever is pressed upward by a spring 138 and bears normally against a stud 139, which is secured to a second lever 140, the latter lever being pivoted to the left-hand end of the frame. This lever 140 is provided with an outwardly and forwardly projected cam-arm 141 and with a locking-recess 142 at the inner end of the arm. The upper lever 140 is held in an upper or normal position by a spring 143, having a bearing against its lower end, and when the said lever 140 is in its normal position it rests at its upper end against a stop 144. By pressing down the lever 137 the rollers 132 on the crank-arms 133 of the setting rock-shaft 120 are carried out of the recesses 131 in the pivoted frame G, and the said frame is immediately pressed upward and rearward by a suitable spring 136, attached to the frame at one end and having bearing against the bottom forward portion of the frame G at its lower end, as is shown in Figs. 5, 8, and 9. This movement of the setting rock-shaft will cause the frame G to swing so far rearward as to release the bell-crank levers and permit the carrying-wheels C′ to drop to their lower position, as shown in Fig. 9, whereupon any one of the index-wheels C may be turned by the finger or by a pencil.

When it is desired to reset all of the index-wheels—namely, bring all of the "0's" in line at the top, as shown in Fig. 1—this is accomplished in the following manner: A controlling-shaft 150 is located in front of and slightly

below the series of index-wheels C, and this shaft is provided with crank-arms 151 at its ends, pivoted to the sides of the frame, and the shaft 150 is further provided with rearwardly-extending pins 152, capable of entering the spaces between the index-wheels C and extending in the direction of the flanges 94 of said wheels. The controlling-shaft 150 extends at one end through a slot produced in the left-hand portion of the frame, as illustrated in Fig. 10, and the pins on the shaft 150 are normally held away from the index-wheels by the projecting end of the said shaft being in engagement with the lower end of the cam-arm 141 of the lever 140, as shown in Fig. 10; but when the pins 152 are to be carried into the spaces between the index-wheels C the lever 140 is pressed downward, thereby also pressing in the same direction the lever 137, connected with the setting rock-shaft 120, and the projecting end of the pin-shaft 150 will ride up the cam-surface of the cam-arm 141 and will enter the locking-recess 142 in the lever 140, bringing the pins 152 to the desired position, as illustrated in Fig. 9. Thus it will be observed that at this time the carrying-wheels C′ are all dropped and that by turning the knob 97ª, attached to the index-wheel shaft 97, the index-wheels will be turned, by reason of their frictional contact with the shaft, until the single teeth 95 on the flanges 94 of the index-wheels engage with the said pins, at which time the index-wheels C will cease to turn, and when all of the teeth 95 have engaged with the pins 152 "0" will appear on each index or adding wheel at the top and in front of the main alining-bar, as shown in Fig. 1, since the tooth carrying "0" is almost diametrically opposite to the single tooth 95 of an index-wheel.

It is necessary when the index-wheels are to be reset that the main alining-bar 64 should be simultaneously raised from the wheels, and this is effected by locating a downwardly and forwardly extending crank-arm 146 (see Fig. 1) on the alining-bar shaft 63, which crank-arm 146 is engaged by a pin 145ª on a crank-arm 145, attached to the setting rock-shaft 120, as shown in Fig. 10.

It is very necessary that the drive-wheel shaft shall not revolve until acted upon by the segment D. To that end a stop 147ª is connected with the crank-arm 146, as shown in Fig. 3, and this stop has movement to and from the pinion 43. When the crank-arm 146 is in its lower position, the stop 147ª locks the pinion 43; but when the crank-arm 146 is raised, which happens when the main alining-bar is elevated, the stop leaves the pinion, and the pinion is free to move. A detent 148 is likewise provided for the pinion 43, the detent being controlled by a spring 149, and said detent prevents the pinion 43 from turning in the wrong direction.

In the general operation of the machine let it be supposed a key-lever A has been depressed by a key A′ of a type-writing machine. The key-bolt 22, actuated by the said key-lever A, is moved into the path of the electrically-operated segment D, and at the same time the main alining-bar 64 is elevated and the carrying-wheel C′, belonging to the index or adding wheel C, which is to be turned, is lowered, and simultaneously the segment D is brought into mesh with the pinion on the drive-wheel shaft 44, and the check mechanism E is turned toward the index-wheel to be operated upon, a tooth on the drive-wheel B and the check-arm 111 of the said check mechanism E entering the spaces between the teeth of two adjacent index-wheels C. All of these movements are accomplished during the first half of the movement of the key-lever A. During the remaining half of the movement of key-lever A the circuit in which the main magnets 34 are located is closed by the union of the two contacts 75 and 78, whereupon the segment D is raised by the armature of the said magnets and the drive-shaft is revolved, turning the drive-wheel, and consequently the index-wheel, the distance of one or more teeth, according to which numeral-key is depressed. As soon as the key-lever A is relieved from pressure all the parts return to their normal positions. It will be remembered that the auxiliary alining-bar 85 is normally out of engagement with the index-wheels C; but during the first half of the movement of the key-lever A the circuit including the secondary or auxiliary magnets 35 is closed by reason of the contact 80 engaging with the moving contact 75, and the auxiliary alining-bar is carried against the front surfaces of the index or adding wheels C, insuring their alinement. The circuit is then broken, and the auxiliary alining-bar 85 is returned by its spring to its normal position. This operation is repeated as the key-lever A is returned to its normal position, thereby insuring the alinement of the index-wheels C, which will permit the main alining-bar 64 to also drop into alining position.

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

1. An adding device comprising a set of adding-wheels each provided with a wheel for carrying the tens value to the next adding-wheel of higher order, each of said carrying-wheels being adapted to engage simultaneously both an adding-wheel of lower and higher order to carry the tens value from the former to the latter and means for throwing said carrying-wheels into and out of engagement with the adding-wheels, the adding-wheel of lower order serving to lock the engaged carrying-wheel against rotation and cause it to lock the adding-wheel of higher order at the same time said adding-wheel of lower order being free to turn and at certain

times turning the engaged carry-wheel to effect the rotation of the said adding-wheel of higher order in carrying the tens value, and means for operating said adding-wheels, substantially as and for the purpose set forth.

2. An adding device comprising a set of adding-wheels each provided with a wheel for carrying the tens value to the next adding-wheel of higher order, each of said carrying-wheels being adapted to simultaneously engage both an adding-wheel of lower and higher order to carry the tens value from the former to the latter, means for keeping all of said carrying-wheels in engagement with the adding-wheels, the adding-wheel of lower order serving to lock the engaged carrying-wheel which carries the tens therefrom against rotation and to cause it to lock the adding-wheel of higher order at the same time said adding-wheel of lower order being free to turn and at certain times turning the engaged carrying-wheel to effect the rotation of the said adding-wheel of higher order in carrying the tens value, means for disengaging at will a carrying-wheel from the adding-wheel to which it carries the tens value when said adding-wheel is to be operated for adding, and means for operating said adding-wheels, substantially as and for the purpose set forth.

3. An adding device comprising a set of adding-wheels each provided with a wheel for carrying the tens value to the next adding-wheel of higher order, each of said carrying-wheels being adapted to simultaneously engage both an adding-wheel of lower and higher order to carry the tens value from the former to the latter, means for keeping all of said carrying-wheels in engagement with the adding-wheels, the adding-wheel of lower order serving to lock the engaged carrying-wheel which carries the tens therefrom against rotation at the same time said adding-wheel of lower order being free to turn and at certain times turning the engaged carrying-wheel to effect the rotation of the said adding-wheel of higher order in carrying the tens value, means for disengaging at will a carrying-wheel from the adding-wheel to which it carries the tens value when said adding-wheel is to be operated for adding, and a set of key-operated levers each of which when actuated serves to actuate the said adding-wheels and at the same time to disengage from the adding-wheel then actuated the carrying-wheel which carries the tens thereto, substantially as and for the purpose set forth.

4. An adding device comprising a set of adding wheels or members, a set of carrying-wheels adapted to be moved into and out of engagement with said adding-wheels and each adapted to simultaneously engage both an adding-wheel of lower and higher order for carrying the tens value from the former to the latter, the adding-wheel which carries therefrom and said carrying-wheel itself locking the adding-wheel of higher order to which it carries, means for moving a particular one or all of said carrying-wheels out of engagement with the adding-wheels and an alining device for engaging and alining the carrying wheel or wheels as they become disengaged from the adding-wheels and then holding them locked in alined position, the said carrying-wheels engaging with the said alining device before disengaging from the adding-wheels and vice versa, substantially as and for the purpose set forth.

5. An adding device comprising a set of adding-wheels each provided with a wheel for carrying the tens value to the next adding-wheel of higher order, each of said carrying-wheels being adapted to engage simultaneously both an adding-wheel of lower and higher order to carry the tens value from the former to the latter, and means for throwing said carrying-wheels into and out of engagement with the adding-wheels, and an alining device for said adding-wheels, the said carrying-wheels being in engagement with and serving to lock the adding-wheels when the alining device is out of engagement with the adding-wheels, substantially as and for the purpose set forth.

6. An adding device comprising a set of adding wheels or members, a set of carrying-wheels adapted to be moved into and out of engagement with said adding-wheels and each adapted to simultaneously engage both an adding-wheel of lower and higher order for carrying the tens value from the former to the latter, the adding-wheel of lower order locking the carrying-wheel which carries therefrom and said carrying-wheel itself locking the adding-wheel of higher order to which it carries, means for moving a particular one or all of said carrying-wheels out of engagement with the adding-wheel to which it carries when the latter is to be operated to add, at the same time leaving the remaining wheels in engagement with their particular adding-wheels, substantially as and for the purpose set forth.

7. An adding device comprising a set of adding-wheels each provided with an annular flange or surface and a tens-carrying tooth, a carrying-wheel for each adding-wheel adapted to be moved into and out of engagement with the same and each provided with a set of teeth adapted when engaging the adding-wheel to bear against said flange or surface and lock itself against rotation and also adapted to be tripped by the tens-carrying tooth of the adding-wheel thus engaged, each of said carrying-wheels being also provided with a second set of teeth for engaging the next adding-wheel of higher order and turning said adding-wheel of higher order when the tens-carrying teeth of the adding-wheel of lower order trips said carrying-wheel, means for disengaging from the adding-wheel which is to be operated for adding the carrying-wheel which car-

ries the tens to it and at the same time holding the other carrying-wheels in engagement with their respective adding-wheels, and means for operating said adding-wheels, substantially as and for the purpose set forth.

8. An adding device comprising a set of adding wheels or members and means for operating them to effect addition, two alining devices for engaging in succession the adding wheels or members to aline them, and means for throwing one of said alining devices in engagement with the wheels one in advance of the other and throwing them out again, substantially as and for the purpose set forth.

9. An adding device comprising a set of adding-wheels, a drive-wheel adapted to engage and actuate said adding-wheels, a pinion connected with and operating the said drive-wheel, a toothed segment adapted to be operated on a center through varying lengths of arcs and to be reciprocated in the plane of such arc to engage and disengage the said pinion, means for varying the range of oscillation of said segment in accordance with the ordinal value of the numeral to be added, and a set of key-levers connected with and operating said segment and said means for varying the oscillation of the segment, substantially as and for the purpose set forth.

10. An adding device comprising a set of adding-wheels, a drive-wheel adapted to engage and actuate said adding-wheels, a pinion connected with and operating said drive-wheel, a toothed segment adapted to be oscillated on a center through varying lengths of arcs and to be reciprocated in the plane of such arc to engage and disengage the said pinion, a set of sliding bolts or stops adapted to be projected into the path of oscillation of said segment to vary the lengths of the arcs through which it moves, a set of numeral key-levers each connected with and actuating said means for oscillating and reciprocating said segment, each one of said key-levers being connected with and actuating one of said sliding bolts or stops the projected position of which in the path of oscillation of said segment is determined by the ordinal value of the particular key-lever connected therewith so as to regulate the throw of the segment in accordance with such ordinal value, substantially as and for the purpose set forth.

11. An adding device comprising a set of adding-wheels each provided with a wheel for carrying the tens value to the next adding-wheel of higher order, each of said carrying-wheels being adapted to engage simultaneously both an adding-wheel of lower and higher order to carry the tens value from the former to the latter, and means for throwing said carrying-wheels into and out of engagement with the adding-wheels the said adding-wheel of lower order being free to turn and at certain times turning the engaged carrying-wheel to effect the rotation of the said adding-wheel of higher order in carrying the tens value, and means for operating said adding-wheels, substantially as and for the purpose set forth.

12. An adding device comprising a set of adding-wheels each provided with a wheel for carrying the tens value to the next adding-wheel of higher order, each of said carrying-wheels being adapted to simultaneously engage both an adding-wheel of lower and higher order to carry the tens value from the former to the latter, means for keeping all of said carrying-wheels in engagement with the adding-wheels, the said adding-wheel of lower order being free to turn and at certain times turning the engaged carrying-wheel to effect the rotation of the said adding-wheel of higher order in carrying the tens value, means for disengaging at will a carrying-wheel from the adding-wheel to which it carries the tens value when said adding-wheel is to be operated for adding, and means for operating said adding-wheels, substantially as and for the purpose set forth.

13. An adding device comprising a set of adding wheels or members and means for driving the same to effect the adding, the range of movement of said driving means being varied and regulated in accordance with the ordinal value to be added, a suitable support and a set of sliding bolts or stops mounted upon said support and adapted to be projected one at a time into the path over which said driving means moves to regulate the range of movement thereof, a set of numeral key-levers each connected with and actuating said driving means and each connected with one of said sliding bolts or stops to actuate the same, each of said stops or bolts permitting a range of movement of said driving means different from the other stops and in accordance with the ordinal value of the key-lever connected therewith, substantially as and for the purpose set forth.

14. An adding device comprising a set of adding wheels or members and means for driving the same to effect the adding, the range of movement of said driving means being varied and regulated in accordance with the ordinal value of the numeral to be added, the said driving means for the adding-wheels including a pinion and an oscillating toothed segment, a suitable support and a set of sliding bolts or stops mounted upon the said support and adapted to be projected one at a time into the path of oscillation of said segment to vary the range of movement thereof, a set of numeral key-levers each one of which is connected with one of said bolts or stops the relative position of each of which stops when projected in the path of the segment being determined by the ordinal value of the connected numeral key-lever, and connections be-

tween said key-levers and segment whereby each key-lever may operate the segment, substantially as and for the purpose set forth.

15. An adding device comprising a set of adding wheels or members and means for driving the same to effect the adding, the range of movement of said driving means being varied and regulated in accordance with the ordinal value of the numeral to be added, the said driving means for the adding-wheels including a pinion and a toothed segment adapted to oscillate about a center and to be reciprocated in the plane of its oscillation to engage and disengage said pinion, an electromagnet, having a vibrating armature connected with said segment, a movable frame or arm upon which said armature is mounted, a set of numeral key-levers connected with and controlling the means for regulating the range of oscillation of said segment in accordance with the numeral value of each key-lever, and connections between said key-levers and the movable frame or arm carrying said armature, an electric circuit including said magnet and a circuit-closer located in said circuit, each of said key-levers controlling said circuit-closer and operating the same to close the circuit when each key-lever is actuated, whereby upon the initial movement of each key-lever in its operation the said armature is shifted mechanically to throw the segment into gear with its pinion and is then closed on its magnet to oscillate the segment for actuating the adding-wheels, substantially as and for the purpose set forth.

16. An adding device comprising a set of adding wheels or members and means for driving the same to effect the adding, the range of movement of said driving means being varied and regulated in accordance with the numeral value of the numeral to be added, a set of sliding bolts or stops adapted to be projected one at a time into the path of the means for driving the adding-wheels to vary the range of movement of said driving means, each of said bolts or stops being provided with a pin and a pivoted member having a notch for engaging said pin for projecting the bolt when said pivoted member is rocked in one direction and having a projection at one side of said notch for engaging the pin of said bolt and retracting the same when said pivoted member is moved in the opposite direction, a set of numeral key-levers each connected by means of a link with one of said pivoted members for actuating the bolts or stops, substantially as and for the purpose set forth.

17. An adding device comprising a set of adding wheels or members and means for driving the same to effect the adding, the range of movement of said driving means being varied and regulated in accordance with the ordinal value of the numeral to be added, a set of sliding bolts or stops adapted to be projected one at a time into the path of the means for driving the adding-wheels to vary the range of movement of said driving means, each of said bolts or stops being provided with a pin and pivoted member having a notch for engaging said pin for projecting the bolt when said pivoted member is rocked in one direction, a finger or projection located to the side of said notch for engaging the pin of the bolt to retract the same, and a cam-surface located to the other side of the notch for engaging and sliding over said pin when the bolt is projected and serving to hold the bolt in projected position, a set of numeral key-levers each connected by means of a link with one of said pivoted members for actuating the bolts or stops, substantially as and for the purpose set forth.

18. An adding device comprising a set of adding-wheels, means for automatically carrying the tens for an adding-wheel of lower order to one of higher order, a rotating drive-wheel adapted to be placed in engagement with each and any one of said adding-wheels to actuate the same and means for operating said driving-wheel, a set of key-levers connected with and controlling said means for actuating the drive-wheel in accordance with the ordinal value of each of said key-levers, a check device moving in response to the movement of said drive-wheel when the same is shifted from one adding-wheel to another and adapted to engage the adding-wheel of next higher order to the adding-wheel acted upon by said drive-wheel to prevent the wheel of higher order from being operated beyond the point to carry the tens value thereto, substantially as and for the purpose set forth.

19. An adding device comprising a set of adding wheels or members, a drive-wheel provided with a rotary shaft upon which it slides laterally and by which it is rotated, a carrier mounted to slide back and forth upon a shaft, an arm projected from said carrier and engaging the said drive-wheel to shift the same back and forth in response to the movement of the carrier, means for moving the carrier in one direction or the other to bring the drive-wheel into proper position to drive a certain one of the adding-wheels, means for automatically carrying the tens value from the adding-wheel of lower order to one of higher order, a fixed member mounted upon said carrier and provided with a normally retracted spring-pawl having a limited range of movement and means for moving said pawl into position for engagement with the adding-wheel of next higher order when the drive-wheel is actuating one of lower order to prevent the said wheel of higher order from being rotated beyond the point to carry the tens thereto, substantially as and for the purpose set forth.

20. An adding device comprising a set of adding wheels or members, a set of carrying-wheels adapted to be moved into and out of engagement with said adding-wheels and each adapted to simultaneously engage both an adding-wheel of lower and higher order for carrying the tens value from the former to the latter, means for moving a particular one or all of said carrying-wheels out of engagement with the adding-wheel to which it carries when the latter is to be operated to add, substantially as and for the purpose set forth.

In testimony whereof we have hereunto set our hands in the presence of the two subscribing witnesses.

JACOB C. WOLFE.
EDWIN W. MORTON.

Witnesses:
WILLIS FOWLER,
WILLIAM H. STEIN.