(No Model.) 6 Sheets—Sheet 1.

W. K. NICHOLS.

ADDING MACHINE.

No. 517,291. Patented Mar. 27, 1894.

Fig 18

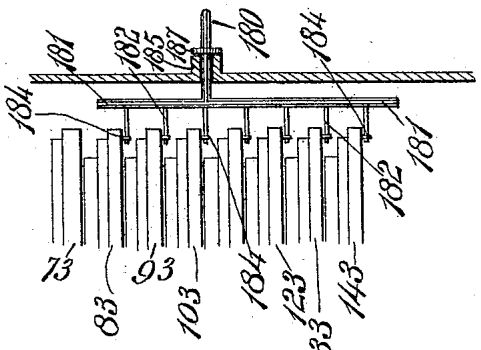

Fig 1.

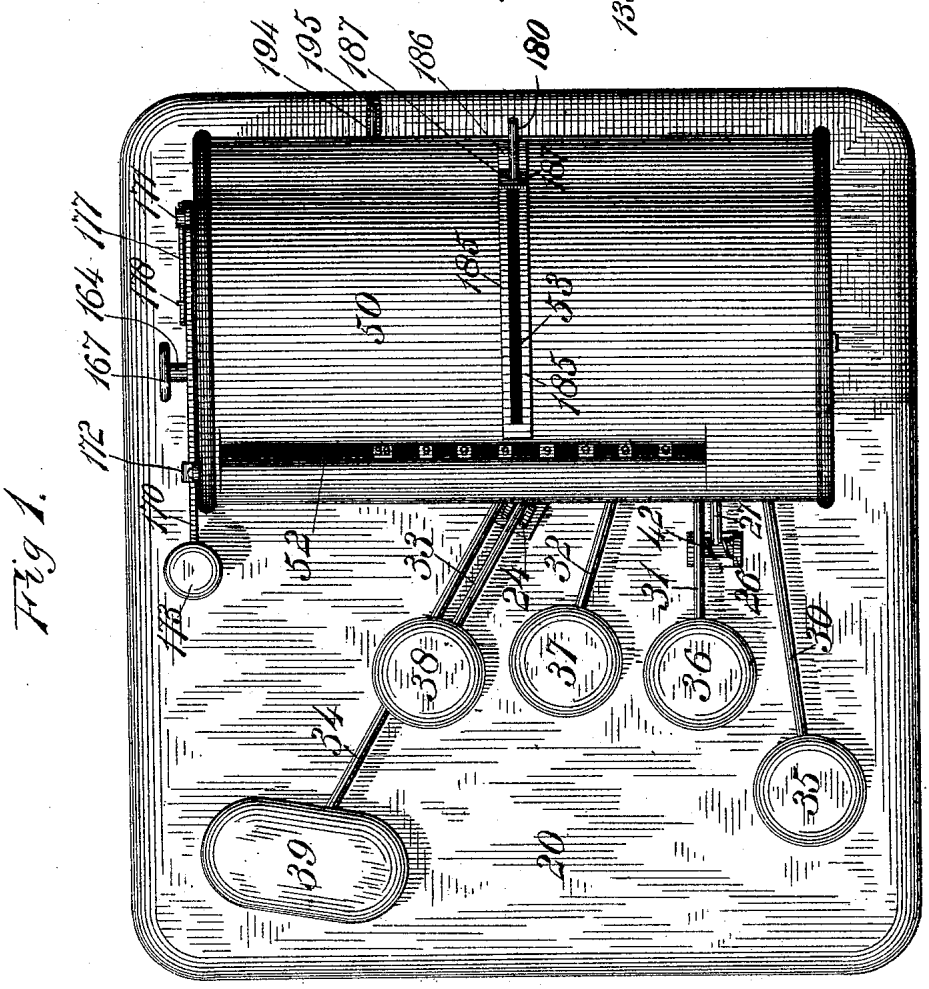

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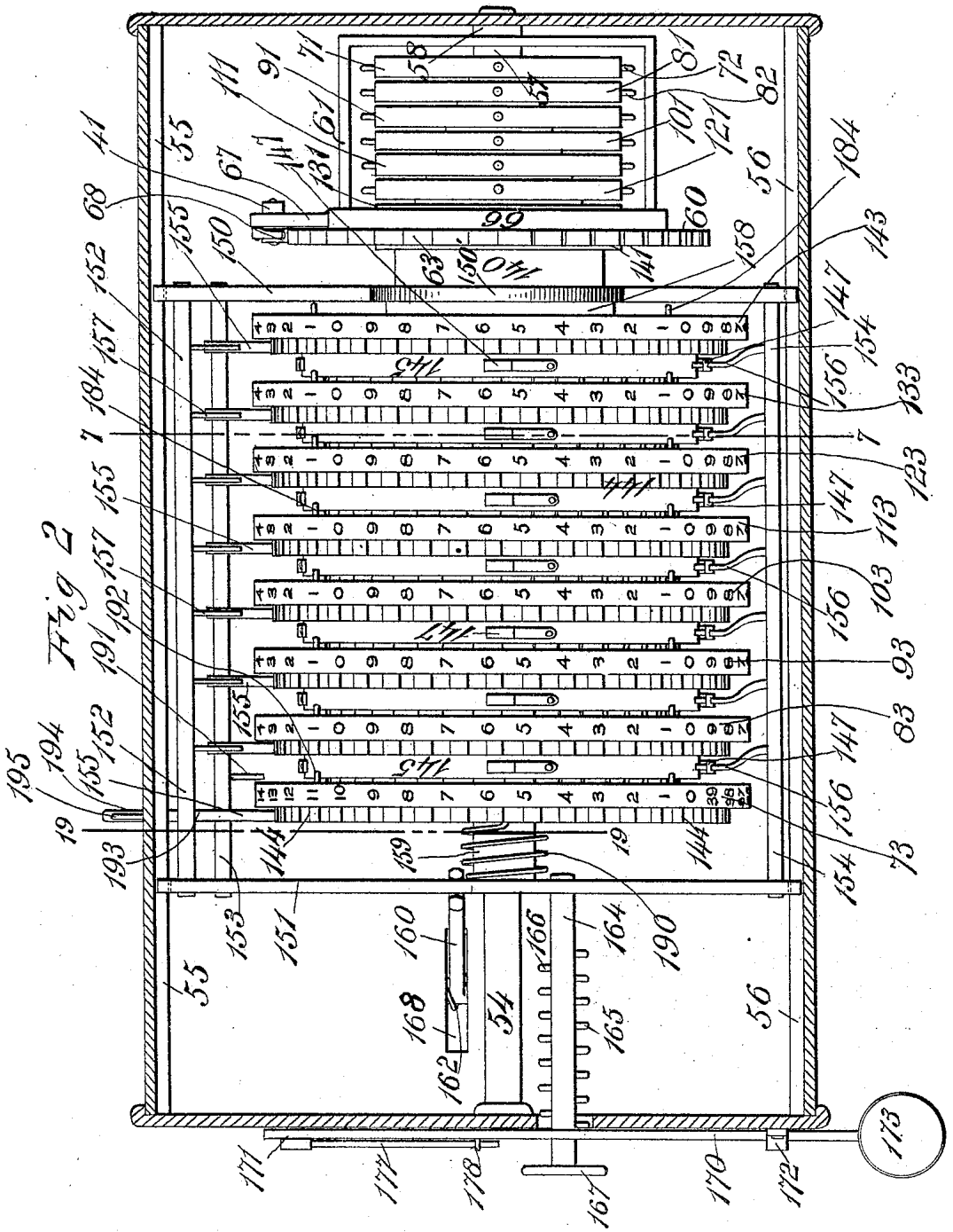
Fig 2



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ADDING MACHINE.

No. 517,291. Patented Mar. 27, 1894.

Fig 20.

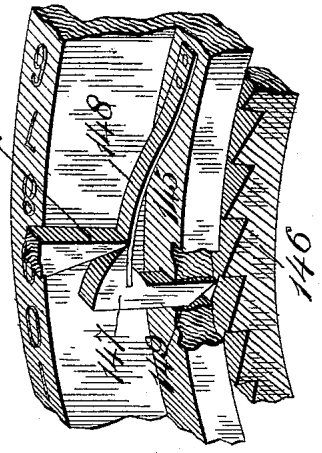

Fig 4.

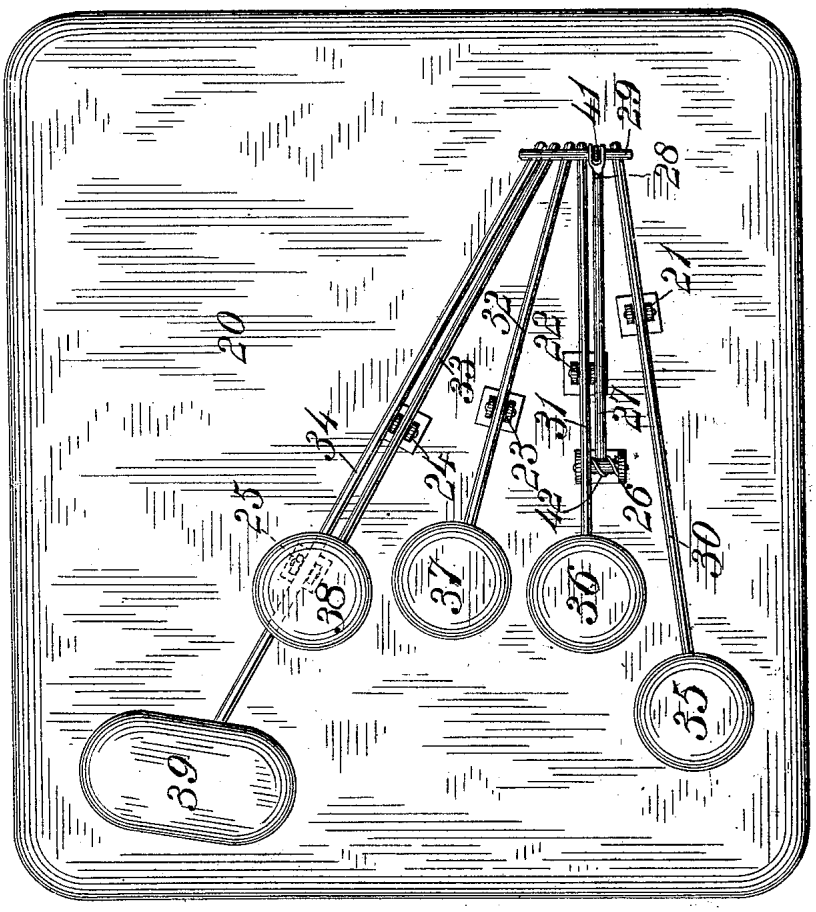

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Fig 5

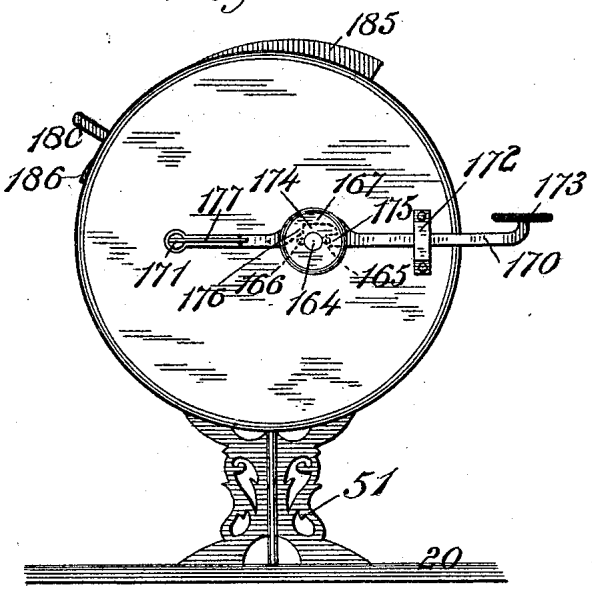
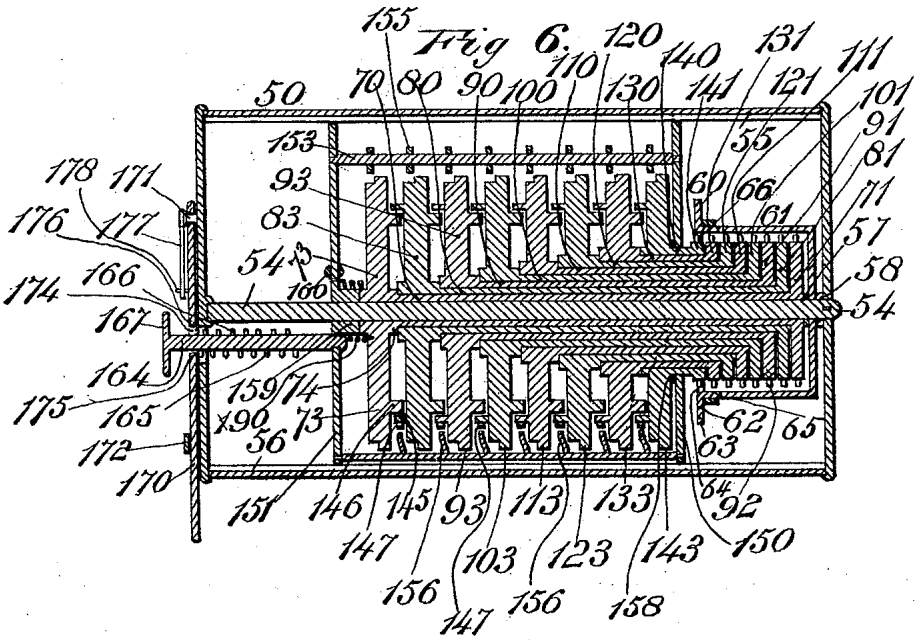


Fig 6.



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ADDING MACHINE.

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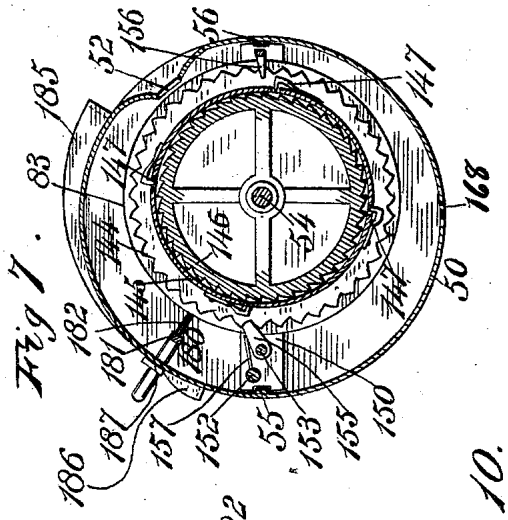

Fig 7.

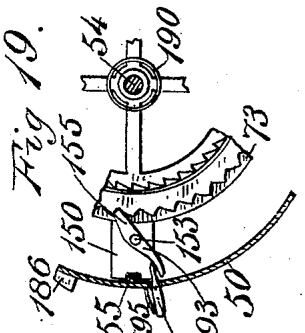

Fig 19.

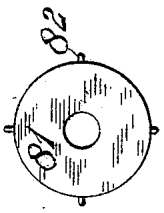

Fig 13.

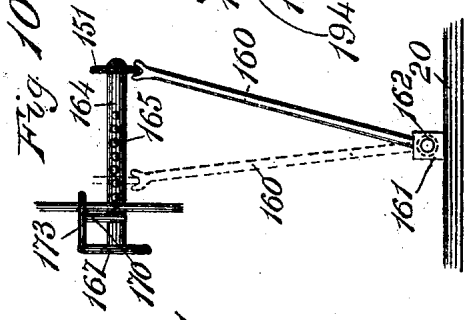

Fig 10.

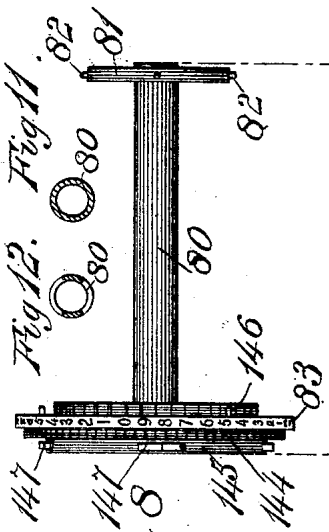

Fig 11.

Fig 12.

Fig 8

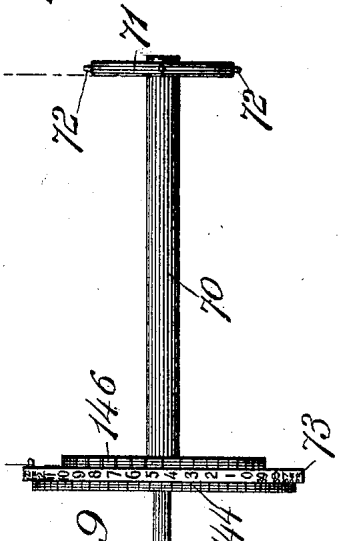

Fig 9

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ADDING MACHINE.

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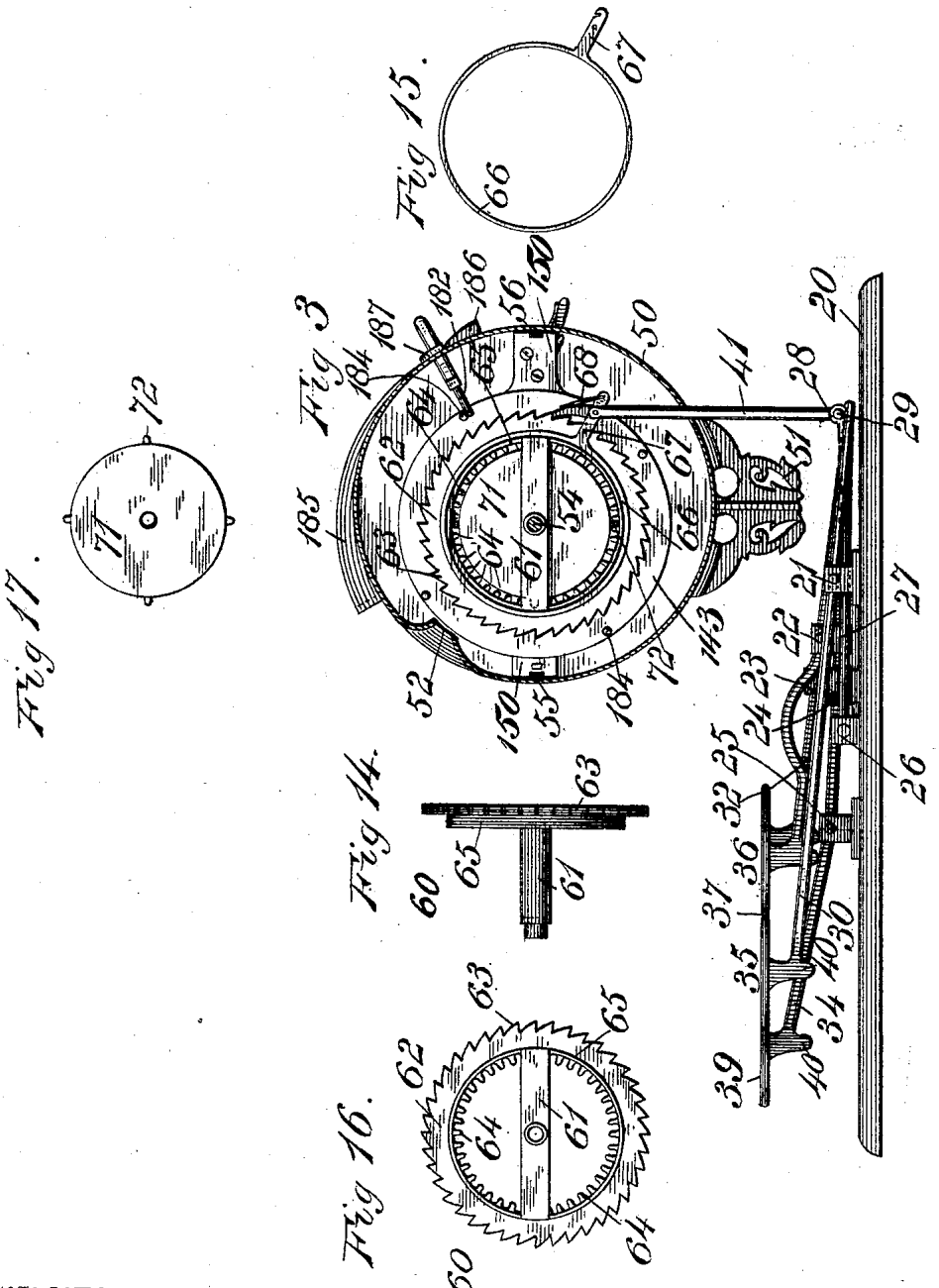

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UNITED STATES PATENT OFFICE.

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ADDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 517,291, dated March 27, 1894.

Application filed January 4, 1892. Serial No. 417,044. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM K. NICHOLS, a citizen of the United States of America, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Adding-Machines, of which the following is a specification.

The object of this invention is to provide an adding machine or other registering device, which is simple in construction, which may be operated rapidly and which will carry the tens of one column to another and register automatically the aggregate of successive columns of figures by the use of one set of keys.

Figure 1 of the accompanying drawings represents a plan of this improved adding machine. Fig. 2 represents a plan thereof with the upper half of the case removed. Fig. 3 represents an elevation of the right-hand end of this improved adding machine with the end of the casing removed. Fig. 4 represents a plan of the key-board, the registering mechanism being omitted. Fig. 5 represents an end elevation of the left-hand end of the machine, the key-board being omitted. Fig. 6 represents a horizontal longitudinal diametrical section of the casing and the registering mechanism therein. Fig. 7 represents a transverse section of the cylinder on line 7—7 of Fig. 2. Fig. 8 represents a side elevation of one of the shifting sleeves having a numeral wheel at one end and a disk at the other end provided with prongs engaged by the actuating wheel. Fig. 9 represents a side elevation of another of the shifting sleeves with its numeral wheel and disk disposed farther apart so as to receive between them the numeral wheel and disk represented in Fig. 8, the sleeve whereof slides over the sleeve shown in Fig. 9. Fig. 10 represents a side elevation of the mechanism for shifting the registering mechanism to bring different numeral wheels into operative connection with the actuating wheel for adding different denominations of figures. Fig. 11 represents a transverse section of one of the sliding sleeves. Fig. 12 represents a transverse section thereof in modified form. Fig. 13 represents an end view of the disk shown in Fig. 8. Fig. 14 represents a side elevation of the actuating wheel. Fig. 15 represents a ring encircling the flange of said actuating wheel and provided with an arm for carrying the pawl for actuating said wheel. Fig. 16 represents a front elevation of the actuating wheel of the registering mechanism. Fig. 17 represents an end view of the disk shown in Fig. 9. Fig. 18 represents the adjusting rake in connection with the numeral wheels for moving the latter to zero. Fig. 19 represents a partial transverse section on line 19—19 of Fig. 2, showing the left face of a segment of the final numeral wheel, the dog for holding said wheel, the lever for releasing said dog, and the spring for restoring said wheel to zero. Fig. 20 represents an enlarged segment of one of the numeral wheels, its spring dog, a segment of the toothed flange of the next numeral wheel and the pointed lug for depressing said dog.

The same numerals of reference indicate the same or corresponding parts in the different figures.

A base 20 is provided at different points with a number of upwardly projecting lugs forming fulcrums 21, 22, 23, 24, and 25 for the several actuating key-levers 30, 31, 32, 33 and 34 as fully shown in Figs. 3 and 4. The key lever 30 is provided with a key plate 35 which serves as a key for the digit 1. The key lever 31 is provided with a key plate 36 which serves as the key for the digit 2. The key lever 32 is provided with a key plate 37 which serves as a key for the digit 3. The key lever 33 is provided with a key plate 38 which serves as a key for the digit 4 and the key lever 34 is provided with a thumb plate 39 which serves as the key for the digit 5. These keys are so placed relative to each other as to receive the fingers and thumb of the right-hand. Each of the key levers is provided under the key plate with a downwardly projecting heel 40 shown in Fig. 3 which comes against the base and serves as a stop for its lever, determining the extent of the movement thereof. These heels are of different lengths on the different levers according to the extent of movement required of each lever. The levers are fulcrumed at different distances from their inner ends so that the keys will have substantially the

same length of stroke while their leverages vary according to the movements required of them respectively. The base 20 is also provided with studs 26 in which a short shaft 27 is pivoted; see Figs. 1, 2, 3 and 4. This shaft is provided with an arm 28 which terminates adjacent to the inner ends of the key levers. A bar 29 is attached to and carried by the inner end of the arm 28 and extends in a horizontal plane above the inner ends of the key levers. An upright push rod 41 is pivoted at its lower end to this bar 29 and constitutes a part of the mechanism for moving the actuating wheel 60 of the registering mechanism hereinafter described. This bar 29 is pushed up through different distances by the different key levers and a spring 42, shown in the form of a torsional spring on the shaft 27, serves to depress the arm 28 and under the action of the bar 29 to restore the keys and the actuating pawl to their normal positions.

The adding or registering mechanism which is fully illustrated in Figs. 2 and 6 is contained within a cylindrical case 50, which is mounted on the base 20 above the inner ends of the key levers, being supported by pedestal brackets as 51. This case is provided with a longitudinal reading slot 52 closed by a glass or other transparent pane through which the sum or result of the numbers added or registered may be read the casing adjacent to said slot being preferably bent inward as shown in Figs. 3 and 7. The case is also provided in its upper face with a transverse slot 53 (see Fig. 1) in which plays the handle of the rake 180 hereinafter described for setting the machine to zero.

A central fixed rod 54 extends from end to end of the case and serves as an arbor on which the registering mechanism turns. The case is also provided with internal longitudinal ribs 55 and 56 disposed at diametrically opposite points, upon which the shifter for the registering mechanism slides as hereinafter described.

An actuating wheel 60 which is shown in detail in Figs. 3, 14, and 16 is disposed within the case 50 near the right-hand end thereof on the arbor 54. This wheel consists of a yoke-shaped frame 61 disposed between the collars 57 and 58 on the arbor 54, and a rim 62 attached to or cast integral with the inner ends of said frame see Figs. 2 and 6. The rim 62 is provided on its outer circumference with ratchet teeth 63 and on its inner circumference with radial teeth 64. The number of ratchet teeth is a multiple of ten and corresponds with the divisions on the numeral wheels. The radial teeth are the same in number as the ratchet teeth. The rim 62 is also provided with a flange 65 as best seen in Fig. 14 on which rides a ring 66 having an arm 67 as shown in detail Fig. 15. This arm is pivoted to the upper end of the push rod 41, and carries a spring pawl 68 which engages the ratchet teeth of the actuating wheel 60. When a key is depressed the push rod 41 is lifted a distance corresponding with the value of or numeral on the key lever struck and the pawl 68 turns the actuating wheel of the registering machine one tooth or more as determined by the number on the key.

A sliding sleeve 70 shown in Figs. 6 and 9 is disposed on the arbor 54. This sleeve 70 is provided at its right-hand end with a disk 71 having one or more radial prongs 72 which are engaged by the radial teeth 64 of the actuating wheel 60 when said disk is concentric with the rim 62 of said wheel. The opposite end of this sleeve 70 is provided with a numeral wheel 73 having on its periphery a series of numerals corresponding to the number of teeth on the actuating wheel, and ranging from zero to one less than the highest number of teeth on said wheel from 0 to 39 in the machine shown. The disk 71 and numeral wheel 73 are fixed to or integral with the sleeve 70. A sleeve 80, shown in Figs. 6, 8, 11, and 12 the interior diameter of which corresponds with the exterior diameter of the sleeve 70 is disposed on said sleeve 70 and provided at its right hand end with a disk 81 rigidly fixed to said sleeve adjacent to the disk 71 and on the left side thereof, and at its opposite end, with a numeral wheel 83 also rigidly fixed to said sleeve and disposed a slight distance from the numeral wheel 73, the outer end of the hub of the wheel 83 abutting closely against a shoulder 74 at the inner end of the hub of the wheel 73. The sleeve 80 may be in the form of a complete cylinder, as shown in Fig. 11, or of a skeleton, as shown in Fig. 12. The disk 81 is provided with prongs 82 similar to those of the disk 71. The numeral wheel 83 is provided at its periphery with several sets of numerals each set ranging from 0 to 9, the aggregate number of numerals in the several sets corresponding to the total number of numerals on the final numeral wheel 73 and to the number of teeth on the actuating wheel 60. There are four sets of numerals on the wheel 83 and forty numbers or divisions on the final wheel 73, when the machine is constructed as shown in the drawings, but it is obvious that the size and capacity of the wheels may be varied. A sleeve 90 shown in Fig. 6 and having an interior diameter as large as the exterior diameter of the sleeve 80 is fitted over said sleeve 80 and adapted to turn thereon. This sleeve is provided at one end with a disk 91 fixed thereto and having prongs 92 and at its opposite end with a numeral wheel 93 also fixed to or integral with its sleeve. As shown in the drawings a succession of sleeves 100, 110, 120, 130, and 140 are disposed one over the other, each being shorter than the preceding. These sleeves are severally provided at their right-hand ends with pronged disks 101, 111, 121, 131, and 141 fixed to their respective sleeves and at their left hand ends with numeral wheels 103, 113, 123, 133, and 143, also fixed

to their respective sleeves each of said numeral wheels being provided with the same numeral as wheel 83 arranged in sets of ten. The number of these wheels will vary for different machines according to the capacity thereof. The several sleeves may be tubular, as indicated in Fig. 11, or in skeleton form, as indicated in Fig. 12. The numeral wheel 143 is designed for use in adding the first right-hand column of figures to be added and the next wheel 133 is used in adding the second column to the left and so on with each successive wheel. Each of the numeral wheels is provided with sunken peripheral teeth 144 corresponding to the number of numerals on the wheel. Each of said wheels except the final wheel 73 is provided on its left face with a flange 145 and each of said numeral wheels except the initial wheel 143, is provided on its right face with a toothed flange 146 having as many teeth as there are numerals on said wheel. The flanges 146 are of smaller diameter than the flanges 145 so that the right flange 146 of one wheel shuts concentrically into the left flange 145 of the adjacent wheel. A number of dogs 147 shown in Figs. 2, 7, 8, and 20 are supported on the left flanges of the several wheels; there being as many of these dogs as there are general divisions or naughts on each wheel. Each dog is supported on the free end of a spring 148 attached to the flange 145, and the tooth of the dog is made to project through a hole as 149 in the flange 145 when the dog is depressed by contact with a pointed prong 156 on the bar 154. One of the dogs on the left flange of the wheel 143, when so depressed passes through a hole in said flange and engages a tooth of the right flange of the wheel 133, whenever the wheel 143 passes from 9 to 0, said dog carrying the wheel 133 one tooth at each engagement. As soon as the dog has performed the function of moving the wheel of the next higher order one tooth its spring retracts it. The flanges of the wheels 123, 113, 103, 93, 83, and 73 interlap as shown in Fig. 6 in the manner described so that one wheel turns the succeeding wheel, one notch each time the preceding wheel passes from 9 to 0. The left hand wheel 73 has no flange on its left face as there is no adjacent wheel to be actuated thereby; and the right hand wheel 143, being the initial wheel has no flange on its right face.

A shifting device shown in Figs. 10 and 6 is employed to shift the sleeves so as to bring their pronged disks successively into engagement with the actuating wheel 60. The shifter when constructed as herein shown, comprises two cross bars 150 and 151 see Figs. 2, 3, and 6 provided with recesses at their opposite ends whereby they engage and slide upon the bars 55 and 56 on the inner face of the case. The bar 150 of the shifter has a ring 150′ Fig. 2 which encircles the sleeve 140 between its disk 141 and numeral wheel 143, a collar 158 being interposed between said bar and said wheel, and the bar 151 has a hole through which the arbor 54 extends, a collar, 159 being inserted between said bar and the hub of the final numeral wheel 73. Longitudinal bars 152, 153, and 154 connect the end cross bars 150 and 151. A number of dogs 155 equal to the number of numeral wheels are pivoted on the longitudinal rod 153 and serve to engage the teeth in the sunken portions of the peripheries of said numeral wheels. These dogs prevent accidental turning of the wheels and permit them to turn under the action of the keys or pawls. Springs 157 attached to the rod 152 bear against the dogs 155 and cause them to engage the peripheral teeth of the numeral wheels. Prongs 156 project inward from the longitudinal bar 154 at points opposite the left-hand flanges of the several numeral wheels, and engage the dogs 147 disposed on said flange and depress said dogs.

Any suitable means may be employed for sliding or shifting the shifter from right to left and returning it to its original position. When shifted to the left it carries the nest of sleeves and their several pronged disks and numeral wheels, a step sufficient to carry one of said disks out of engagement with the actuating wheel 60 and to bring the next adjacent disk into engagement with said wheel.

The mechanism for sliding the shifter consists, as herein shown in Figs. 2, 6, and 10, of a forked arm 160 pivoted in lugs 161 attached to the base 20. This arm plays in a longitudinal slot 168 shown in Figs. 2 and 7 in the bottom of the case 50 and engages the cross-bar 151 of the shifter. A torsional spring 162 (see Fig. 2) on the shaft to which the arm 160 is attached, tends to swing said arm toward the left, and hence to move the shifter and numeral wheels in that direction.

A device for regulating the movement of the shifter comprises a rod 164 see Figs. 1 and 21 extending from the cross bar 151 through the outer end of the case. This rod is provided with a number of prongs 165 on one side thereof, and with a number of similar prongs 166 on the opposite side of said rod, opposite the spaces between the prongs 165. The prongs 165 correspond in number to the numeral wheels and the prongs 166 are one less in number than the numeral wheels. The end of the casing is slotted to permit the prongs to pass through it. The outer end of the rod 164 is provided with a button 167. An escapement lever 170 is fulcrumed on the pivot 171 at the end of the casing, and plays in a loop 172 see Figs. 1, 5, 6, and 10. This lever is provided at its outer end with a key plate 173 and near its center with a slot 174 opposite the opening for the rod 164. This lever is also provided with teeth 175 and 176 disposed in different planes at opposite ends of the slot 174 as shown in dotted lines in Fig. 5 and in full lines in Fig. 6. When the shifting device is in its normal position one of the pins 165 rests against the tooth 175 of the lever 170 as shown in Fig. 6 and prevents

the slide rod 164 from moving outward under the action of the spring 162. When the lever 170 is depressed the tooth 175 releases one of the said prongs 165 and the slot 174 comes opposite said prong and permits said rod to move outward under the action of the spring 162 until one of the prongs 166 strikes against the tooth 176, which in the depressed position of the lever is in position to be engaged by said prong. When the lever 170 is released by the operator the spring 177 attached to the pivot 171 and engaging a pair of pins 178 lifts said lever into its former position, whereby a prong of the series 166 is released and escapes outward through the slot 174, and the next pin of the series 165 engages the tooth 175. On the down stroke of the lever 170, the slide rod 164 moves a distance sufficient to partially shift the disk of the numeral wheels and on the upstroke of said lever the slide rod moves outward sufficiently to complete the shifting of the numeral wheels one step to the left and bring another numeral wheel corresponding to the next column of figures to be added into action. When the operation of adding the several numbers is finished the lever 170 is lifted so as to bring its lower tooth 175 out of the path of the prongs 165 and by pressing upon the button 167, the registering mechanism is returned to its original position at the right of the case. When the shifter has shifted the numeral wheels to the right, all of said wheels excepting the final wheel 73 may be rotated to bring them to zero by means of a rake which consists of a head or bar 181 provided with a number of teeth 182 corresponding to the number of numeral wheels to be rotated. The handle 180 of this rate projects through the transverse slot 53 in the case and plays in said slot when actuated being provided with a lateral projection 187 on one or both sides. The teeth 182 engage lateral pins 184 on the right-hand sides of the numeral wheels. There are as many of these pins on each numeral wheel as there are series of numerals thereon, and the pins are so arranged that when the rake reaches the end of its stroke the naughts on said wheels will appear opposite the reading slot 52 of the case. The case is provided with a cam 185 adjacent to the slot 53, over which the lateral projection 187 rides, whereby the rake is kept at the same radius from the numeral wheel (see Figs. 1, 5, and 7). A cam 186 at the opposite end of the slot, up which the rake rides when retracted, causes the rake teeth to be lifted out of the path of the lateral pins on the numeral wheels, whereby said wheels are permitted to turn without obstruction. A spring 190 shown in Figs. 2 and 19 is connected at one end of the final wheel 73 and at its other end to the cross bar 151 and acts torsionally to turn said wheel backward to zero when the latter is released. A stop 191 projects inward from the bar 153, and a stud 192 on the right face of the final numeral wheel 73 engages said stop when the zero point of said wheel is opposite the reading slot. The dog 155 which serves as a check pawl for the wheel 73 is provided with a tail 193 and the lever 194 pivoted in a slot in the case engages said tail when the registering mechanism is in its normal position at the right of the case. A spring 195 tends to depress the outer end of said lever and hold it in its normal position. A lifting of the outer end of the lever 194 presses down the tail of the dog 155 and releases said dog from its engagement with the peripheral teeth 144 of the final numeral wheel 73 and the spring 190 then rotates said wheel until its stud 192 comes in contact with the stop 191 and said wheel is then at zero. The spring 190 is wound up more or less as the wheel is actuated to bring its numerals opposite the reading slot.

In the use of this improved adding machine, the fingers and thumb of the right hand are placed over the respective keys of the keyboard, each finger maintaining position over the same key. In adding a succession of columns of figures the first column to the right is first added by depressing the keys corresponding to the successive numbers in said column when less than six. When the digits exceed five two of said keys are struck in succession to represent the digits 6, 7, 8, or 9. This actuation of the keyboard moves the actuating wheel 60 through different degrees according to the different leverages of the key levers and the disk 141 of the sleeve 140, being in engagement with said wheel 60, is actuated thereby and causes the numeral wheel 143, which may represent the units column or first column to the right, to be rotated numbers of digits corresponding with the values of the keys struck. Whenever this numeral wheel 143 passes from 9 to 0, the dog 147 on the flange of said wheel comes in contact with the prong 156 on the bar 154 whereby it is depressed and the point of the prong engages the toothed flange on the next numeral wheel 133, which represents the second or tens column and moves it one notch. If the sum of the first column of figures equals or exceeds 100, the second numeral wheel 133 will actuate the third numeral wheel 123 in the same manner. When the adding of the first or units column has been completed, the key plate 173 on the lever 170 at the left hand end of the machine is struck and the shifter, being thereby released, shifts the disk 141 out of contact with the actuating wheel 60 and brings the next disk 131 into engagement therewith, whereby its numeral wheel 133 representing the second or tens column is in position to be actuated by the keys. The second or tens column is then added in the same manner as the first or units column and its sum included with the sum of the units column in the registration which appears through the reading slot of the machine. When the second or tens column is completed

the key plate 173 at the left end of the machine is again struck and the third disk 121 on the sleeve of the third numeral wheel 123 representing the third or hundreds column is brought into communication with the actuating wheel 60 and the keys are again manipulated in the same manner for adding the third or hundreds column, the total of all the columns appearing in the reading slot. If the figures to be added exceed three or more columns, the succeeding numeral wheels are brought into use successively by touching the key plate 173 at the end of each column and any number of columns may be added according to the number of numeral wheels and the capacity thereof, and the aggregate of all the columns will appear in the reading slot. The capacity of the machine illustrated with its eight wheels, having the divisions described, is 399, 999, 999.

In adding different pages of ledger accounts the sum of the first page will be noted by the operator, and the adding of the second page proceeded with by shifting the units disk back into connection with the actuating wheel and the adding of the second page can then be effected. The aggregate of both pages will appear in the reading slot, which will be noted by the operator, and the adding of the succeeding pages proceeded with in the same manner. In this way the footings to be placed at the bottoms and tops of the several pages are readily obtained, and the aggregate of all the pages appears on the reading slot. When the adding of a given problem is completed the lever 170 at the left end of the machine is lifted and the button 167 is pushed inward, whereby the mechanism is shifted to the right and the disk 141 of the units wheel 143 is again brought into connection with the actuating wheel 60. The rake 180 is then moved upward in the slot 53, whereby all the wheels except the final wheel 73 are turned back to zero, and said rake is then returned to its normal position, the lifting cam 186 serving to withdraw it out of the path of the numeral wheel. The lever 194 is then lifted and the dog 155 releases the wheel 73 and the spring 190 rotates said wheel to its normal position at zero.

The numeral wheels may be so divided and connected as to add and carry for different monetary systems as for instance the British monetary system in which case the numeral wheel to the right will represent pence, the second numeral wheel to the left will represent shillings, the third numeral wheel to the left will represent units of pounds, the fourth numeral wheel to the left will represent tens of pounds and so on. In such case the connecting mechanism between the first and second numeral wheels will be adjusted to actuate the second numeral wheel at every twelve steps of the first numeral wheel and the mechanism between the second and third numeral wheels, will be adjusted to actuate the third wheel at every twenty steps of the second wheel, the succeeding wheels being actuated under the decimal system at every ten steps of a preceding wheel.

It is obvious that the keyboard may have nine key levers instead of five, disposed on fulcrums affording gradually increasing leverages, the bar 29 being of sufficient length to extend over the inner end of all of said key levers. In that case the striking of two keys for the digits above 5 will be avoided.

I claim as my invention—

1. The combination of a series of numeral wheels and an actuating wheel, all of said wheels having a common axis of rotation, means for shifting one of said elements longitudinally of said axis to bring said numeral wheels successively into operative connection with said actuating wheel, and a key mechanism for driving said actuating wheel.

2. The combination of a series of numeral wheels and an actuating wheel, all of said wheels having a common axis of rotation, means for shifting one of said elements longitudinally of said axis to bring said numeral wheels successively into operative connection with said actuating wheel, a key mechanism for driving said actuating wheel, and an adjunctive mechanism for actuating one of said numeral wheels by its adjacent wheel at determined intervals.

3. The combination of a series of concentric sleeves of different lengths, each provided with a numeral wheel at one end and a pronged disk at the other end, an actuating mechanism for rotating one of said sleeves, a key mechanism for driving said actuating mechanism, a shifter for shifting said sleeves so as to bring said disks, connected with the numeral wheels of different denominations, into engagement successively with said actuating mechanism.

4. The combination of a series of concentric sleeves of different lengths, each provided with a numeral wheel at one end and a pronged disk at the other end, an actuating mechanism for rotating one of said sleeves, a key mechanism for driving said actuating mechanism, a shifter for shifting said sleeves so as to bring said disks connected with the numeral wheels of different denominations into engagement successively with said actuating mechanism, and an adjunctive mechanism for actuating one of said numeral wheels by its adjacent wheel at determined intervals.

5. The combination of a series of concentric sleeves of different lengths, each provided with a pronged disk at one end and with a numeral wheel at the other end, a supporting arbor for said sleeves, an actuating wheel comprising a yoke-shaped frame journaled on said arbor and a rim having exterior ratchet teeth and interior radial teeth, an arm carrying a pawl engaging said ratchet teeth, a key mechanism, a rod connecting said key mechanism with said pawl-carrying arm, and a

shifter for shifting said sleeves to bring said pronged disks successively into connection with the radial teeth of said actuating wheel.

6. The combination of a series of concentric sleeves of different lengths, each provided with a pronged disk at one end and with a numeral wheel at the other end, a supporting arbor for said sleeves, an actuating wheel comprising a yoke-shaped frame journaled on said arbor and a rim having exterior ratchet teeth and interior radial teeth, an arm carrying a pawl engaging said ratchet teeth, a key mechanism, a rod connecting said key mechanism with said pawl-carrying arm, a shifter for shifting said sleeves to bring said pronged disks successively into connection with the radial teeth of said actuating wheel, and adjunctive mechanism for actuating one of said numeral wheels by its adjacent numeral wheel at determined intervals.

7. The combination of a case, a rod supported therein, a nest of sleeves on said rod severally provided with pronged disks and numeral wheels, an actuating wheel provided with radial inwardly projecting teeth for engaging the pronged disks, means for rotating said actuating wheel, and means for shifting said sleeves.

8. The combination of a series of numeral wheels, an actuating mechanism for one of said wheels, a key mechanism for driving said actuating mechanism, a shifter for shifting said numeral wheels successively into operative connection with said actuating mechanism, a spring mechanism for automatically shifting said shifter, an independent releasing mechanism for permitting such spring mechanism to act on the shifter to bring another numeral wheel into engagement with the actuating mechanism, and regulating devices automatically controlling the movement of the shifter.

9. The combination of a series of numeral wheels, an actuating mechanism for one of said wheels, a key mechanism for driving said actuating mechanism, a shifter for shifting said numeral wheels successively into operative connection with said actuating mechanism, a spring mechanism for automatically shifting said shifter, a rod projecting from said shifter and provided with prongs on its opposite sides, and an escapement lever with which said prongs engage and by which the shifter is released for shifting the numeral wheels.

10. The combination of a case provided with a transverse slot, a number of numeral wheels within said case provided with lateral studs at determinate points, and a movable rake head disposed within said case and consisting of a horizontal bar provided with a series of teeth extending between said wheels for engaging said studs to return said wheels to zero, said rake head having a handle extending outward therefrom through said transverse slot for moving said rake head.

11. The combination of a case provided with a reading slot and with a transverse slot, a lifting cam on said case at the end of said slot, a number of numeral wheels journaled within said case and provided with lateral studs, means for actuating said numeral wheels, and a rake, the teeth of which engage said studs for turning back said wheel and bringing the zero points thereof opposite said reading slot, the handle of said rake extending through said slot and being provided with a lateral projection for engaging said lifting cam.

12. The combination with a case provided with an arbor and with longitudinal guide ways, a registering mechanism adapted to slide on said arbor, and a shifter consisting of longitudinal and transverse bars embracing said registering mechanism and engaging said guide ways, a spring-actuated forked lever engaging one of the cross bars of said frame for sliding said frame and registering mechanism, and means for regulating the shifting operations.

13. The combination of a series of concentric sleeves of different lengths provided with a series of pronged disks and with a series of numeral wheels, a supporting arbor for said sleeves, an actuating wheel comprising a rim and a frame journaled on said arbor and forming a socket in which said disks slide, said rim having exterior ratchet teeth and interior radial teeth, an arm carrying a pawl engaging said ratchet teeth, a key mechanism, a rod connecting said key mechanism with said pawl carrying arm, a shifter for shifting said sleeves to bring said pronged disks successively into connection with the radial teeth of said actuating wheel, and adjunctive mechanism for actuating one of said numeral wheels by its adjacent numeral wheel at determined intervals.

WILLIAM K. NICHOLS.

Witnesses:
F. C. SOMES,
C. A. WEED.