

W. W. HOPKINS.

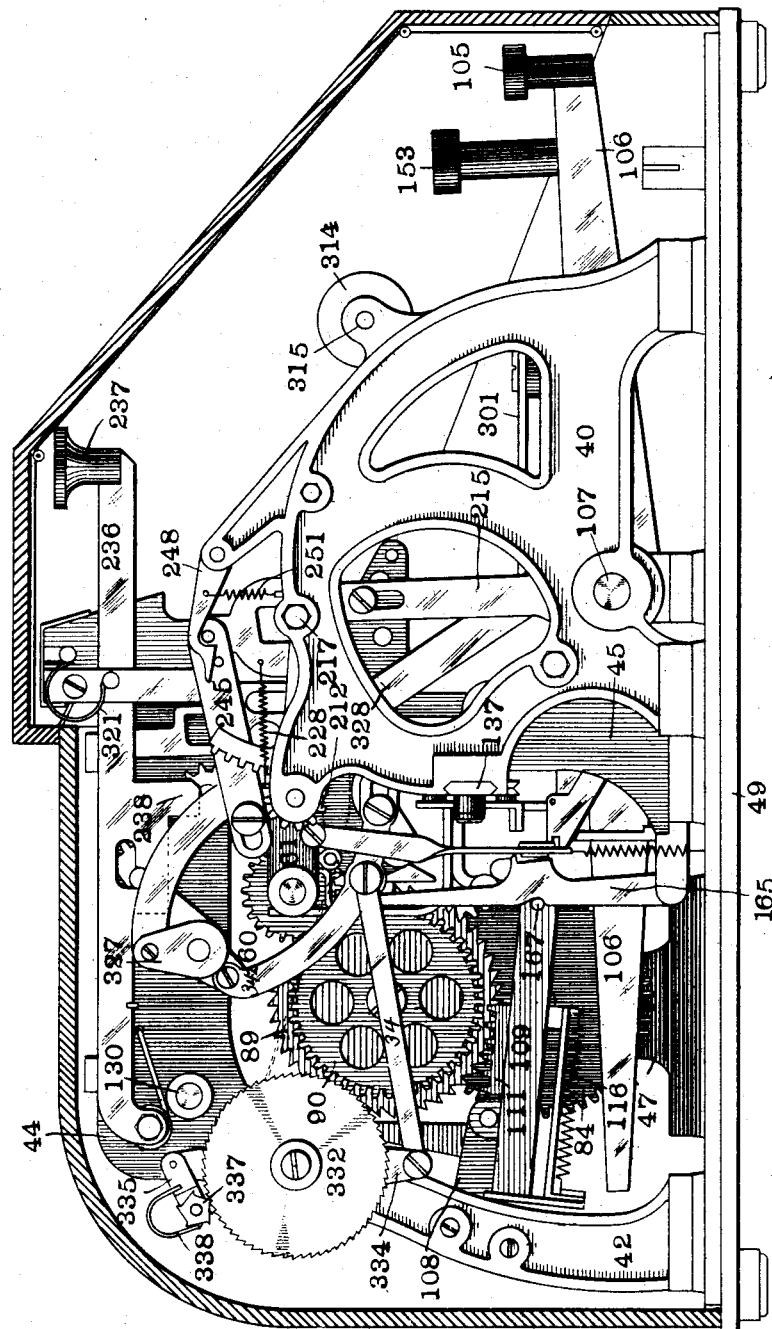
ADDING AND RECORDING MACHINE.

(Application filed May 2, 1898.)

(No Model.)

14 Sheets—Sheet 1.

Fi. 1.



Witnesses

W. A. Alexander.
N. W. Perkins.

Inventor

W. W. Hopkins
By Attorneys
Fowler & Fowler

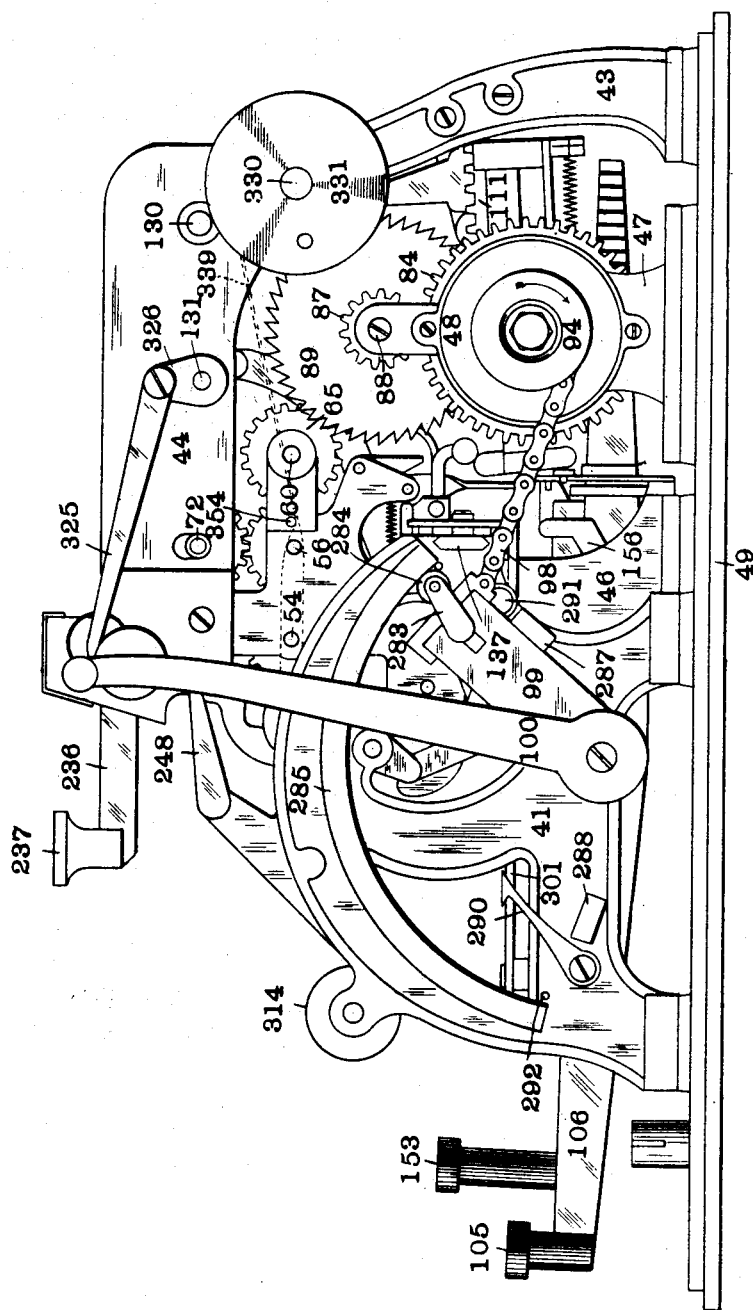
W. W. HOPKINS.
 ADDING AND RECORDING MACHINE.

(Application filed May 2, 1898.)

(No Model.)

14 Sheets—Sheet 2.

Fig. 2.



Witnesses

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 ADDING AND RECORDING MACHINE.

(Application filed May 2, 1898.)

14 Sheets—Sheet 3.

Fig. 3.

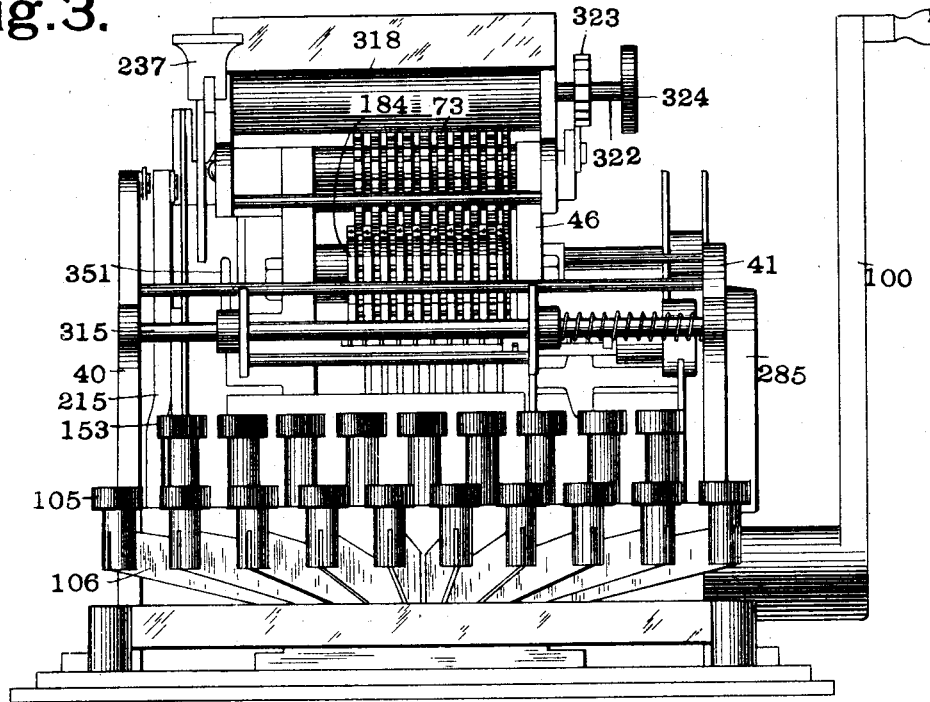


Fig. 4.

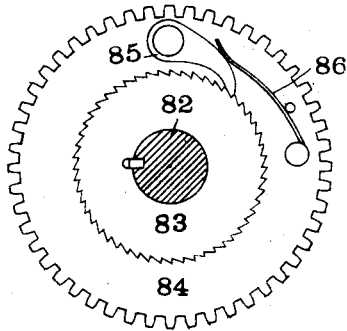
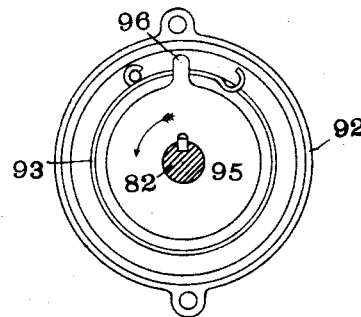


Fig. 5.



Witnesses

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 ADDING AND RECORDING MACHINE.

(No Model.)

(Application filed May 2, 1898.)

14 Sheets—Sheet 4.

Fig. 6.

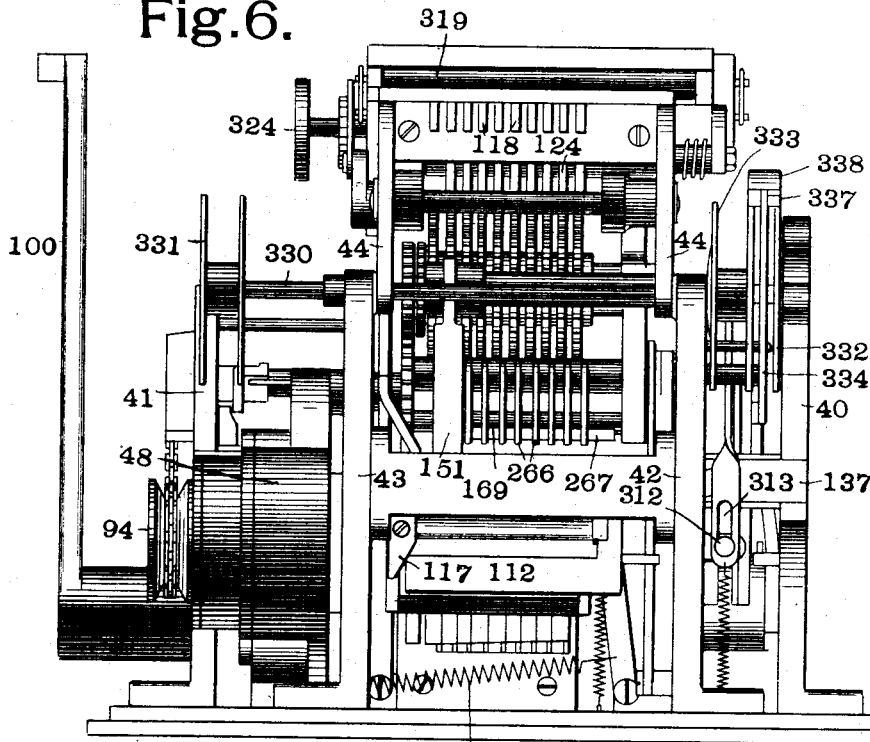


Fig. 7.

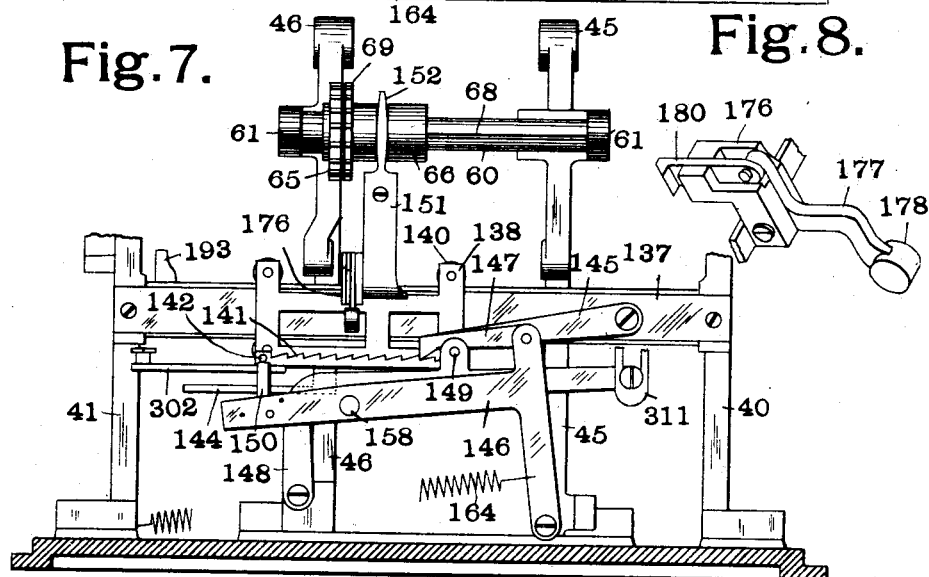


Fig. 8.

Witnesses

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 ADDING AND RECORDING MACHINE.

(Application filed May 2, 1898.)

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14 Sheets—Sheet 5.

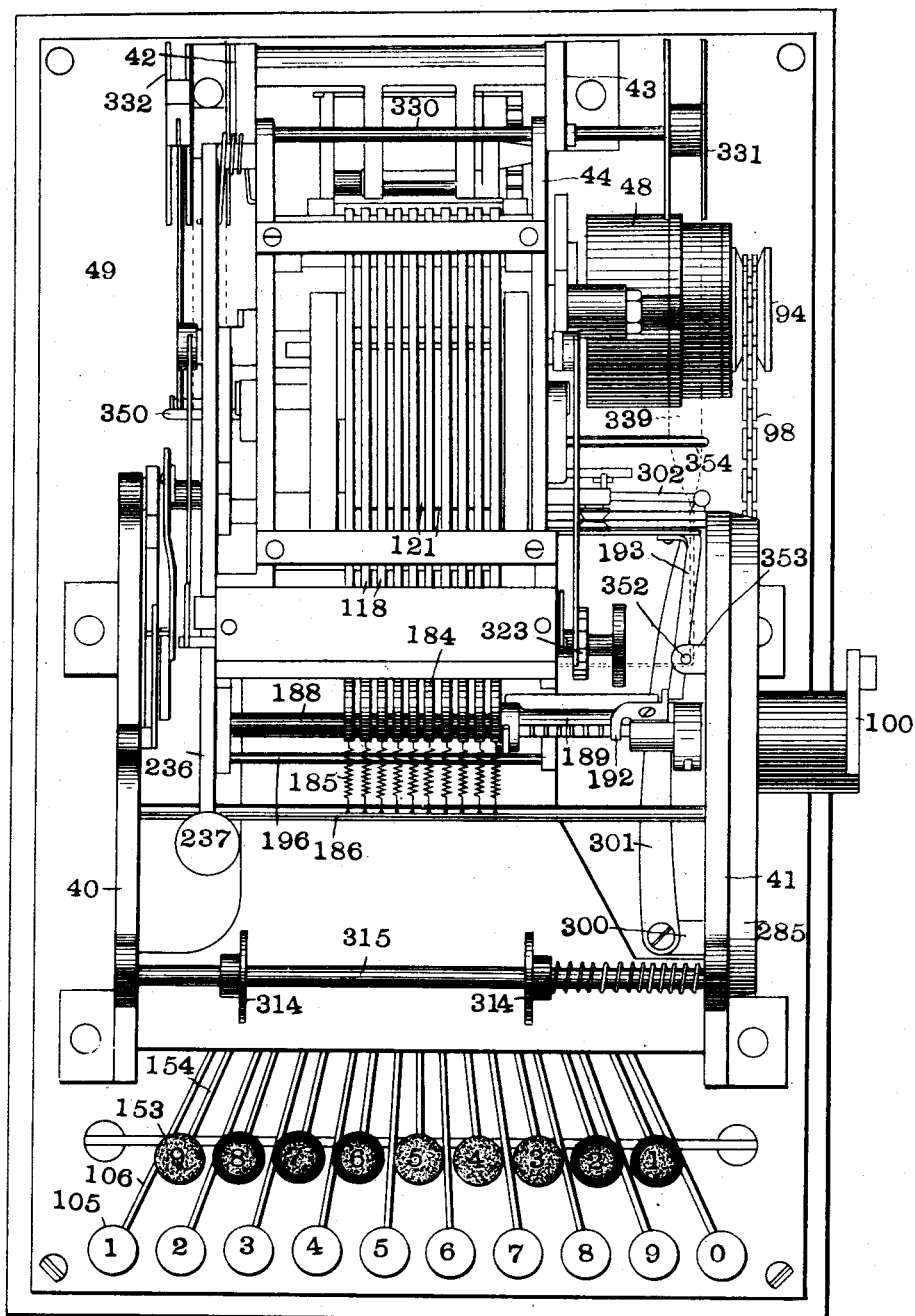


Fig. 9.

Witnesses

W. A. Alexander
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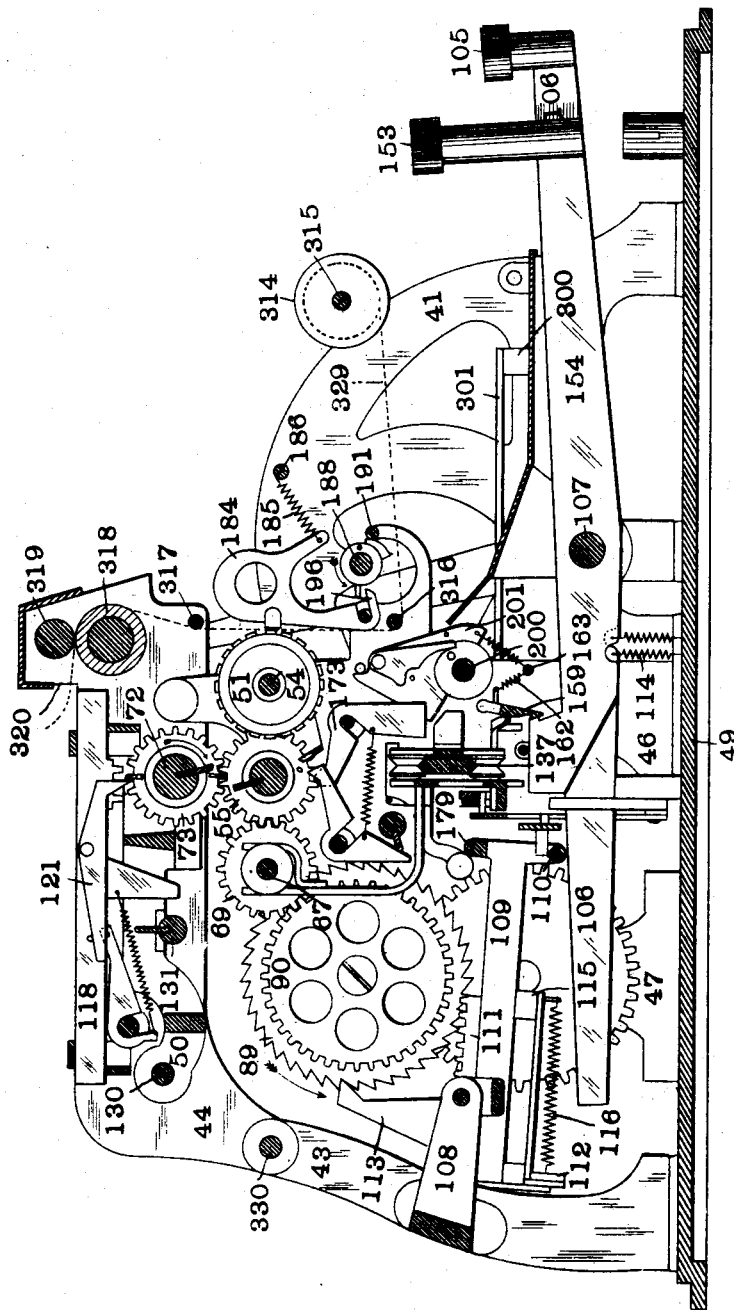
W. W. HOPKINS.
ADDING AND RECORDING MACHINE.

(No Model.)

(Application filed May 2, 1898.)

14 Sheets—Sheet 6.

Fig.10.



Witnesses

W. A. Allen & Co.
N. W. Perkins & Co.

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Howe & Howe

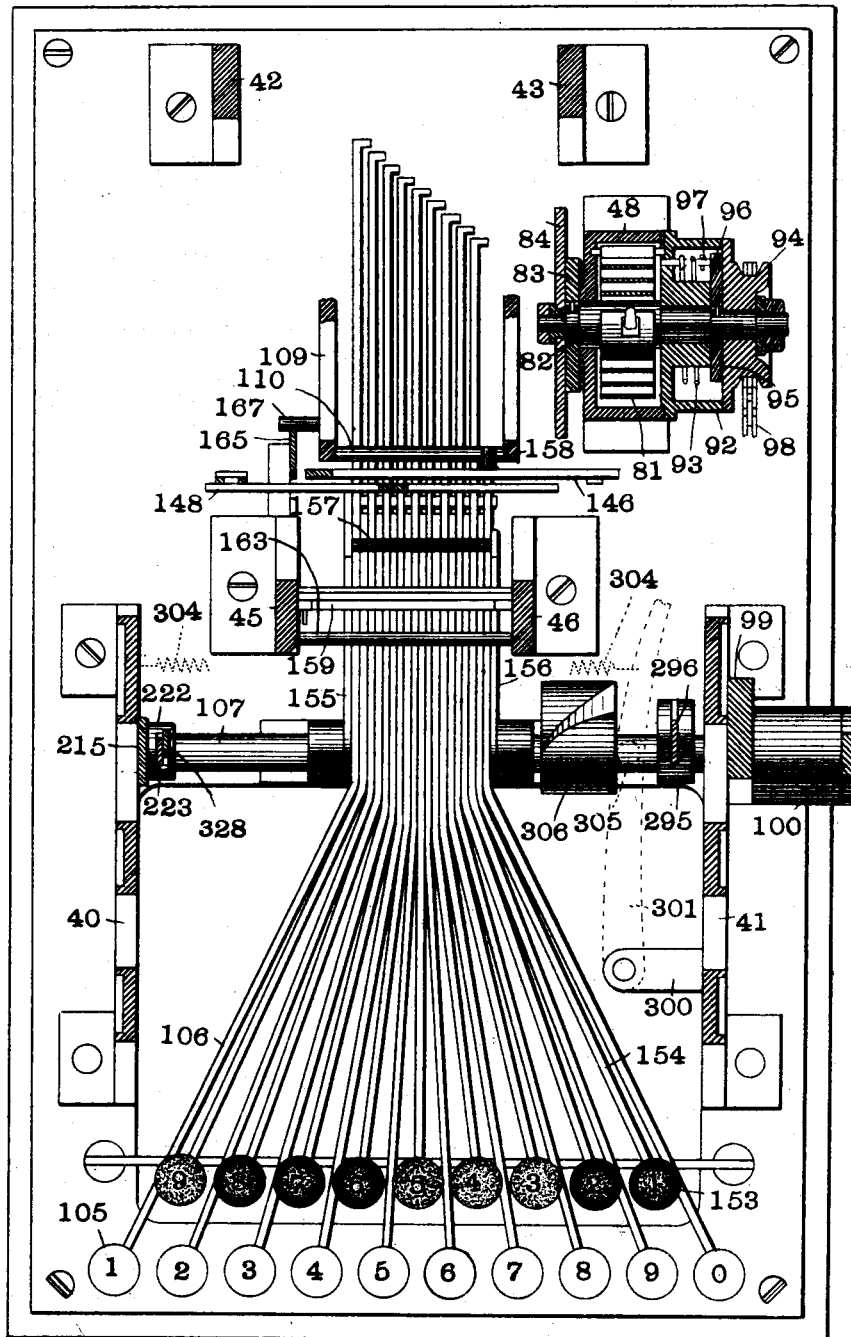
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 ADDING AND RECORDING MACHINE.

(Application filed May 2, 1898.)

(No Model.)

14 Sheets—Sheet 7.

Fig. 11.



Witnesses

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(Application filed May 2, 1898.)

14 Sheets—Sheet 8.

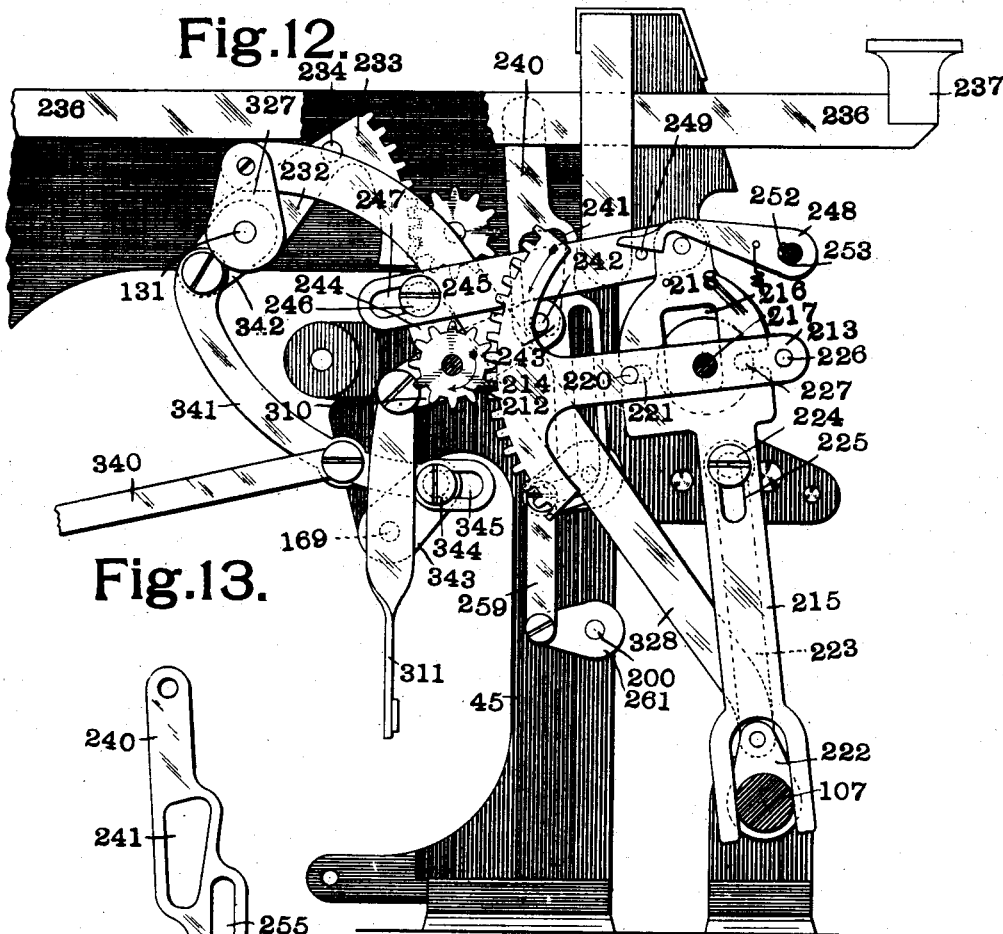


Fig. 13.

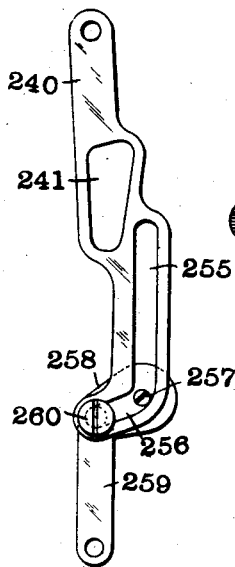
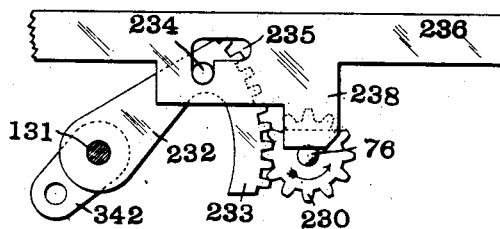


Fig. 14.



Witnesses

W. A. Alexander
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Howe & Clark

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ADDING AND RECORDING MACHINE.

(No Model.)

(Application filed May 2, 1898.)

14 Sheets—Sheet 9.

Fig.15.

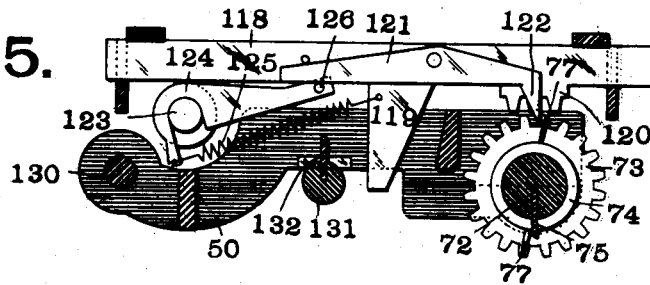


Fig.16.

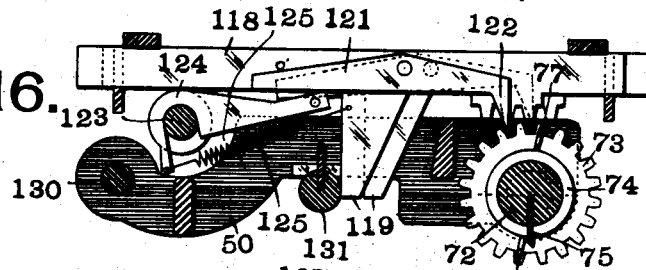


Fig.17.

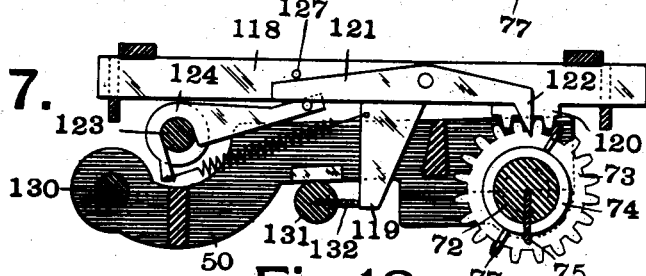


Fig.18.

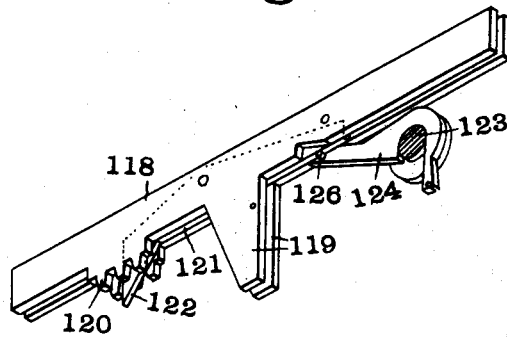
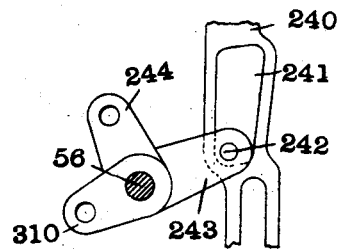


Fig.47.



Witnesses

W. A. Alexander,
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Forbes & Forbes

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ADDING AND RECORDING MACHINE.

(No Model.)

(Application filed May 2, 1898.)

14 Sheets—Sheet 10.

Fig.19.

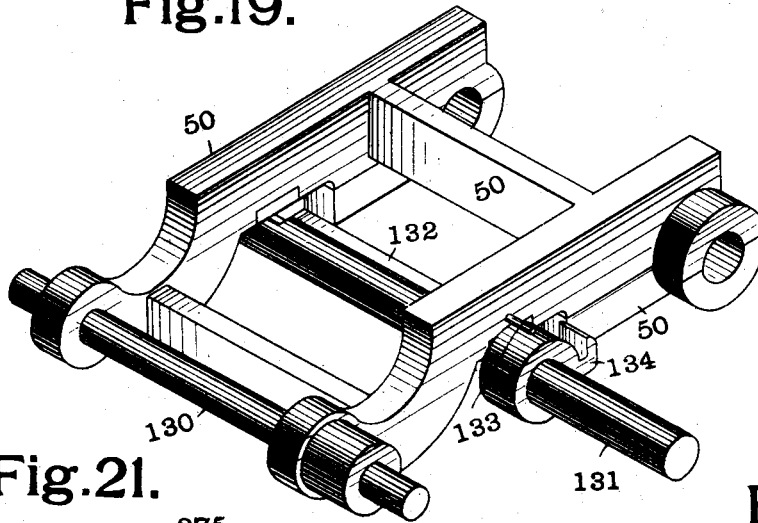


Fig.20.

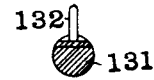


Fig.21.

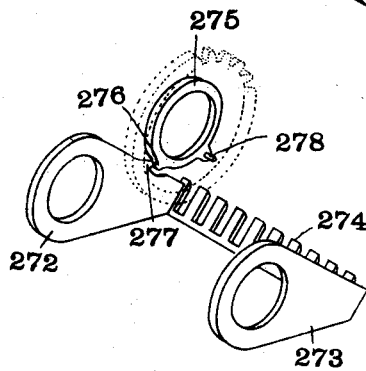


Fig.23.

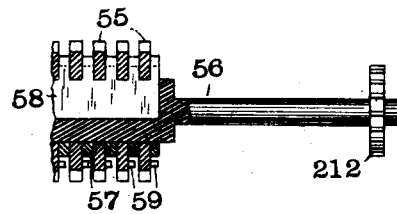


Fig.22.

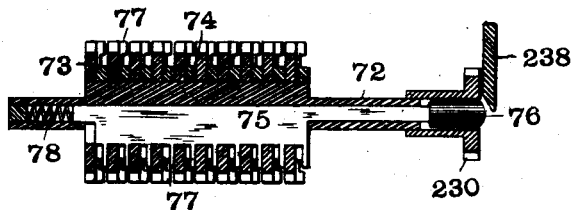


Fig.24.

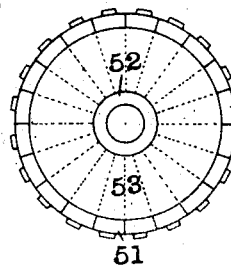
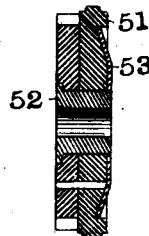


Fig.25.



Witnesses

W. A. Alexander
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W. W. Hopkins

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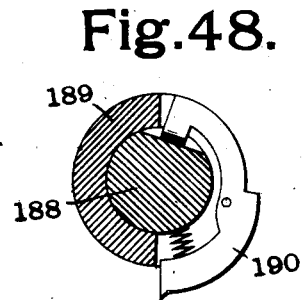
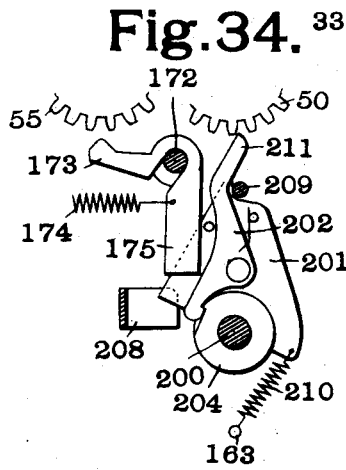
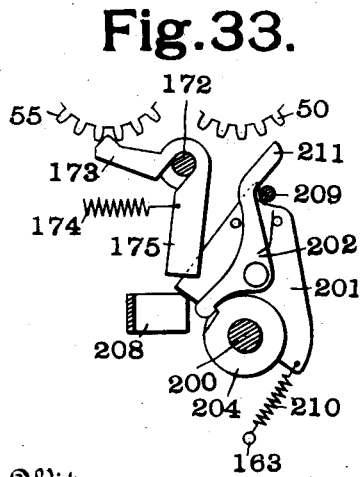
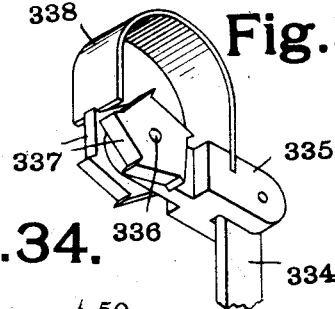
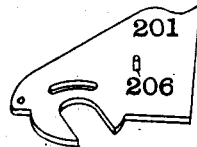
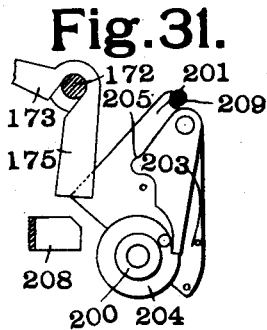
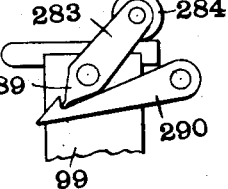
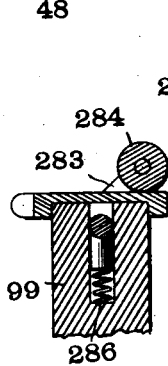
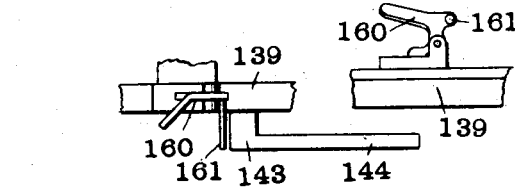
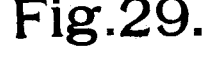
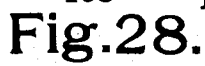
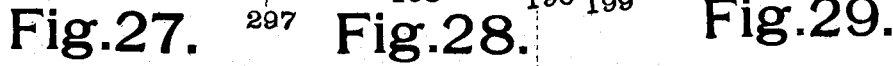
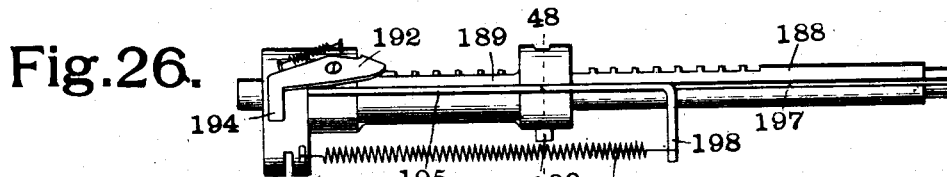
Lowell & Clark

W. W. HOPKINS.
ADDING AND RECORDING MACHINE.

(Application filed May 2, 1898.)

(No Model.)

14 Sheets—Sheet II.



Witnesses

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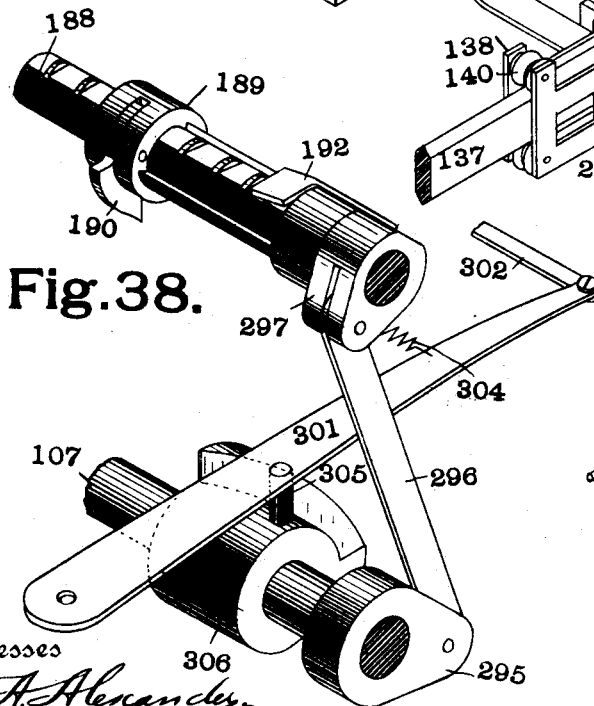
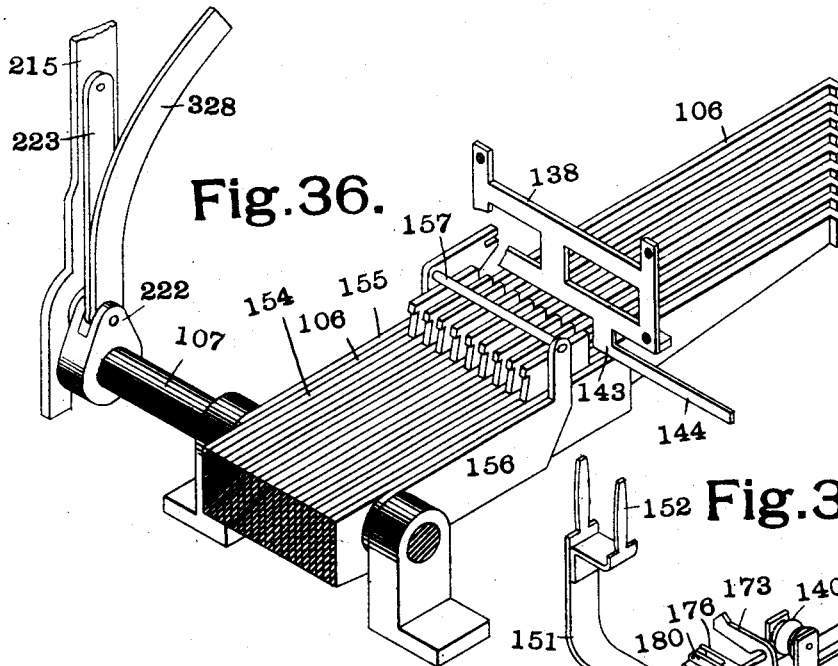
W. W. Hopkins
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Hawley & Hawley

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 ADDING AND RECORDING MACHINE.

(Application filed May 2, 1898.)

(No Model.)

14 Sheets—Sheet 12.



Witnesses

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 N. W. Perkins

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By Attorneys

Lowell & Lowell

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 ADDING AND RECORDING MACHINE.

(Application filed May 2, 1898.)

(No Model.)

14 Sheets—Sheet 13.

Fig. 40.

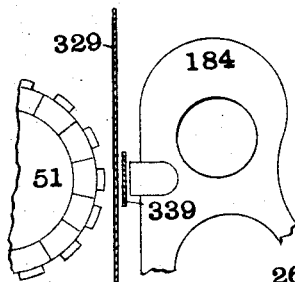


Fig. 41.

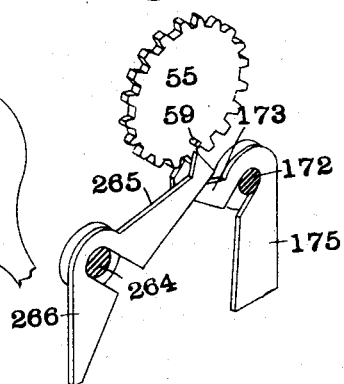


Fig. 42.

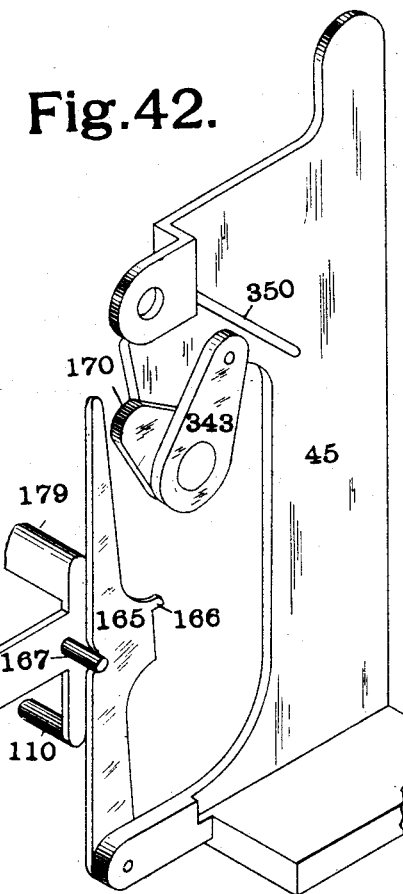


Fig. 43.

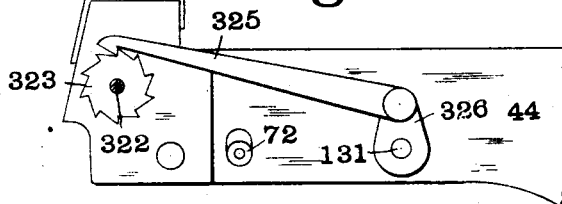


Fig. 44.

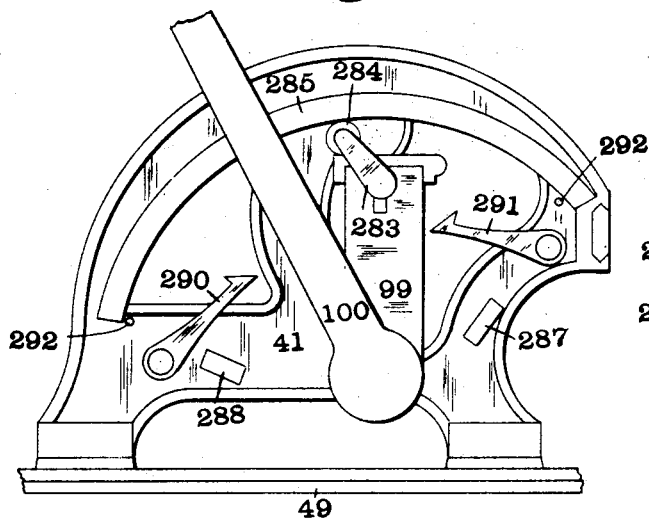
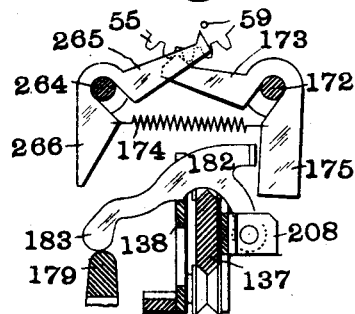


Fig. 45.



Witnesses

W. A. Alexander,
 W. W. Perkins

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W. W. Hopkins

By Attorneys

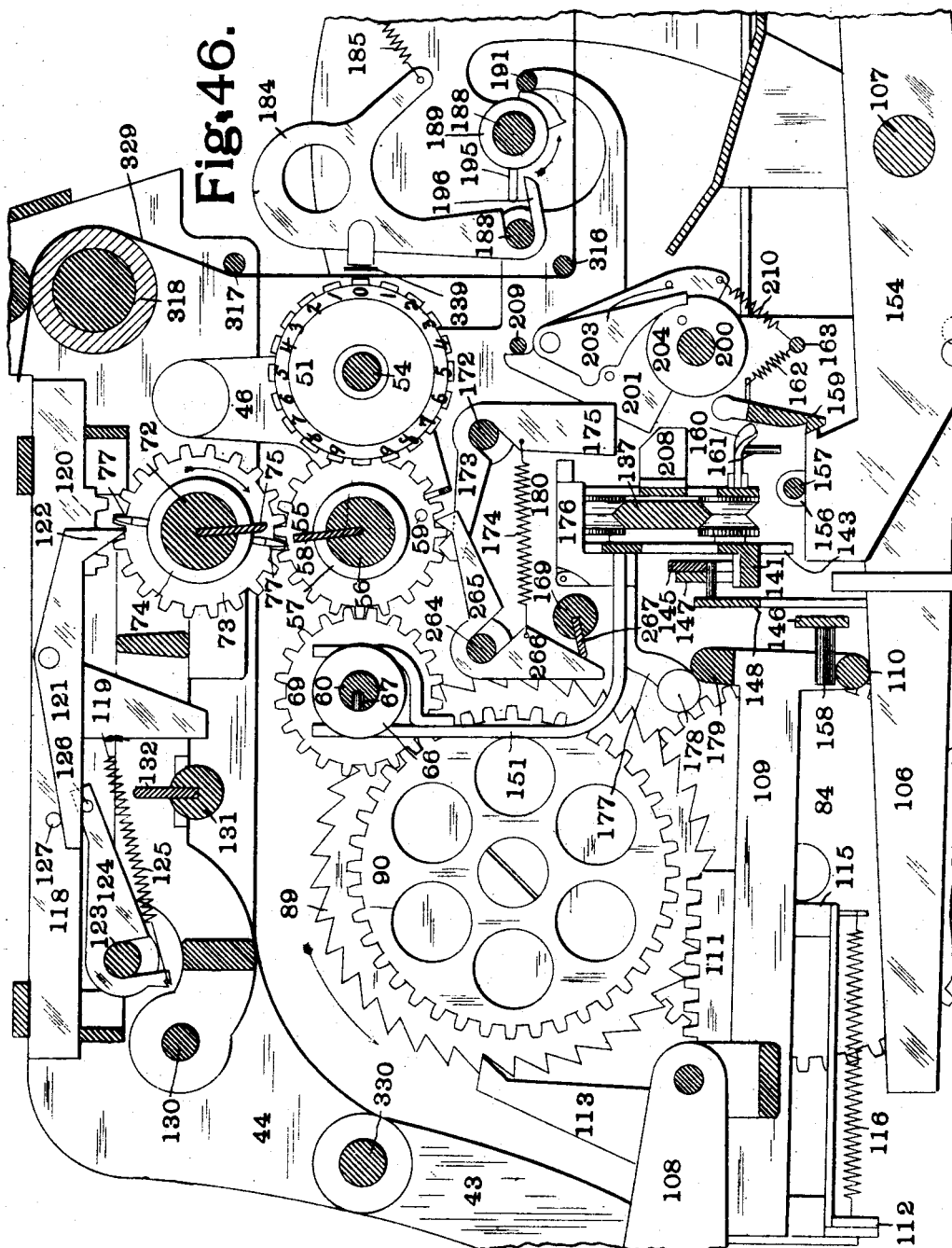
Charles & Charles

W. W. HOPKINS.
ADDING AND RECORDING MACHINE.

(Application filed May 2, 1898.)

(No Model.)

14 Sheets—Sheet 14.



Witnesses

W. A. Alexander,
N. W. Perkins.

Inventor

W. H. Hopkins
By Attorneys
Fowler & Fowler

UNITED STATES PATENT OFFICE.

WILLIAM W. HOPKINS, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE HOPKINS
ADDING MACHINE COMPANY, OF SAME PLACE.

ADDING AND RECORDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 693,939, dated October 8, 1901.

Application filed May 2, 1898. Serial No. 679,494. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. HOPKINS, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented a certain new and useful Adding and Recording Machine, 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.

My invention relates more especially to that class of adding-machines in which a carriage or traveling member moves automatically from order to order as the registering-keys are operated.

My invention is an improvement upon the adding-machine described in Letters Patent No. 517,383, granted to me March 27, 1894.

One object of my invention is to simplify the construction and reduce the number of parts of the adding-machine above referred to.

Another object of my invention is to provide means for positioning the carriage in the left-hand or highest order of the number to be registered preliminary to the registering of said number.

Another object of my invention is to print both the registered numbers and the sums from one set of printing-wheels, and thus dispense with the laterally-moving paper-carriage set forth in my aforesaid patent.

Another object of my invention is to provide means for transferring the sum from the adding-wheels to the printing-wheels.

Another object of my invention is to print all the digits of the number to be registered or of the sum at one time and also to print directly by the movement of the handle.

Another object of my invention is to provide against the overrotation of the adding and printing wheels.

Another object of my invention is to provide means whereby the operator is compelled to make a complete stroke of the handle, thus necessitating the complete performance of its work.

I will first set forth in a general way the plan of my machine and will then describe the details thereof in full.

The machine is provided with a set of ten

registering-keys corresponding to the digits "0" to "9," inclusive. These keys when depressed unlock a motor and so govern an escapement mechanism that the motor is permitted to rotate the registering-wheels exactly proportional to the key depressed. The machine is also provided with a set of order-keys which correspond in number to the number of orders in the registering capacity of the machine. When one of the order-keys is depressed, the carriage is moved into position to actuate the registering-wheel of the corresponding order. At the front of the machine is a series of type-wheels which I will term "printing-wheels." These wheels are loosely mounted or journaled on a shaft which is preferably horizontal. The number of these wheels determines the full capacity of the machine and is preferably one greater than the number of order-keys. To the rear of the adding-wheels are a set of idle wheels corresponding in number to the printing-wheels and also loosely journaled on a shaft which is parallel to the shaft on which the printing-wheels are journaled. Above the idle wheels are loosely journaled upon a shaft a corresponding number of adding-wheels. These latter-mentioned wheels work in conjunction with a carrying mechanism and are adapted to be swung either into engagement with the idle wheels or with the carrying mechanism. To the rear of the idle wheels is a shaft upon which is mounted a spur-wheel which is adapted to engage successively with the various idle wheels. This spur-wheel is so mounted upon the shaft as to move longitudinally of it, but to be incapable of independent rotation. The axial movement of this spur-wheel is governed by the carriage, which is controlled by the above-mentioned order and registering keys. The shaft upon which the said spur-wheel is mounted has rigidly secured to its end a second spur-wheel, which is rotated by a motor whose movement is controlled by the registering-keys. It will be seen from this that when one of the order-keys is depressed and the carriage brought into the desired order the laterally-moving spur-wheel will be brought in the same order and will actuate the idle-wheel in that order, and thereby both the printing and adding

wheels of said order, as the adding-wheels are normally in engagement with the idle wheels. As the registering-keys are depressed the carriage will move successively from order to order, thus bringing the spur-wheel successively in engagement with the idle wheels.

As the adding-wheels in the different orders are rotated they position the carrying mechanism for carrying in the various orders, as required. When the handle is pulled, a number of printing-hammers corresponding to the number of orders in the number registered are tripped to print the said number. Further movement of the handle brings the printed wheels to zero and at the same time returns the carriage to its normal position and also actuates the carrying mechanism to carry in any of the orders in which it may have been positioned for carrying by the adding-wheels, the adding-wheels being thrown out of engagement with the idle wheels and into engagement with the carrying mechanism during the first part of the motion of the handle. After each number is printed the paper is fed for the next number, this motion being also preferably imparted by the movement of the handle.

When it is desired to take the sum of the numbers registered, a key, which I term the "total-key," is depressed to transfer the sum from the adding-wheels to the printing-wheels. As this movement of the adding-wheels is in the opposite direction to their normal movement, it will be readily seen that the sum upon the adding-wheels will be transferred to the printing-wheels, as the said printing-wheels have the characters repeated upon them in ascending order from each side of the zero. When the sum is taken, the printing-hammer-tripping device is moved to actuate the desired number of printing-hammers by means which I will not now describe. The handle is pulled toward the operator as in printing the registered number, and the printing-wheels are brought to zero in the same manner, except that they are moved in the opposite direction.

I do not wish to be understood as limiting myself to the form and construction of machine shown and described, as many changes may be made therein without departing from the spirit of my invention.

In using the words "printing-wheels" and "adding-wheels" I do not wish to be understood as limiting myself to wheels, as any mechanism which will print, record, or indicate the numbers may be used in place of wheels. By the term "carriage" herein used I include any translating device which is capable of establishing operative connection successively between the keys and the recording or adding device.

My invention consists in the combination, with an adding-machine of the class referred to, of a set of keys for positioning the carriage

at the left or highest order of the number to be registered.

My invention also consists in the novel means for transferring the sum from the adding-wheels to the printing-wheels, whereby the necessity for two sets of type-wheels is dispensed with.

My invention also consists in the novel means for bringing the printing-hammer-tripping device into position to trip the desired number of hammers when the carriage is positioned to register a number and also in the means for positioning the said printing-hammer-tripping device when the total-key is depressed to print the sum of the numbers registered.

My invention also consists in the means for locking the order-keys in depressed condition until the carriage has reached its proper position and also in the means for locking all the order-keys against movement after one of the registering-keys has been struck until the handle is operated to print the number registered.

My invention also consists in the novel means for preventing the return of the handle until it has performed its complete movement.

My invention also consists in other novel features and details of construction, which are too numerous to be set forth fully here, but which will be fully described in the specification, and pointed out in the claims hereto affixed.

In the drawings, Figure 1 is a side elevation looking at the left-hand side of the machine, the case being shown in section. Fig. 2 is a side elevation looking at the right-hand side of the machine. Fig. 3 is a front elevation. Fig. 4 is a detailed view showing a part of the motor. Fig. 5 is a detailed view showing another portion of the motor. Fig. 6 is a rear elevation. Fig. 7 is a rear view of the carriage and a portion of the frame and also of some of the devices used to actuate the carriage. Fig. 8 is an isometric projection of the device for unlocking the idle wheels when the registering-keys are depressed. Fig. 9 is a top plan view. Fig. 10 is a vertical longitudinal section. Fig. 11 is a horizontal section. Fig. 12 is an elevation showing portions of the frame and the parts actuated by the movement of the total-key. Figs. 13 and 14 are detailed views of some of the parts shown in Fig. 12. Figs. 15, 16, and 17 are sectional views showing the carrying mechanism in different positions. Fig. 18 is an isometric projection showing a portion of the carrying mechanism. Fig. 19 is an isometric projection showing the frame which carries the adding-wheels. Fig. 20 is a section of the shaft which actuates the frame shown in Fig. 19. Fig. 21 is an isometric projection showing the comb for preventing the overrotation of the wheels when being brought to zero after the total is taken and the part actuating said comb. Fig. 22 is a

section through the total-wheels and the total-wheel shaft. Fig. 23 is a longitudinal section showing a portion of the idle wheels. Fig. 24 is an end view of one of the printing-wheels. Fig. 25 is a section of one of the printing-wheels. Fig. 26 is a rear view of the printing-hammer-tripping devices. Figs. 27 and 28 are side and bottom views, respectively, of details of the carriage. Figs. 29 and 30 are a side view and section, respectively, of the devices for preventing the premature return of the handle. Figs. 31 and 32 are a side view and isometric projection, respectively, of one of the order-stop pawls. Figs. 33 and 34 are views showing a modification of the order-stop pawls. Fig. 35 is an isometric projection of the device for automatically reversing the inking-ribbon. Fig. 36 is an isometric projection showing a portion of the order and registering key bars. Fig. 37 is an isometric projection showing the carriage. Fig. 38 is an isometric projection showing the printing-hammer-tripping device. Fig. 39 is an isometric projection of a detail. Fig. 40 is an enlarged view showing the relative position of the printing-wheels, printing-hammers, and the paper and inking-ribbon. Fig. 41 is an isometric projection showing the pawls for locking the idle wheels. Fig. 42 is an isometric projection showing details of construction of the devices for locking the order-keys. Fig. 43 is a side view showing the devices for actuating the paper-feeding rollers. Fig. 44 is a side elevation of a portion of the machine. Fig. 45 is a view showing a modification of the device for unlocking the idle wheels. Fig. 46 is an enlarged view of a portion of Fig. 10. Fig. 47, Sheet 9, is a view showing in detail some of the devices shown in Fig. 12; and Fig. 48, Sheet 11, is an enlarged cross-section on the line 48 48 of Fig. 26.

The frame of the machine.—At the forward end of the machine are two side frames 40 and 41, and at the rear are two standards 42 and 43, to which is attached one end of the frame 44, the other end of which is attached to two uprights 45 and 46. 47 is a standard to which is attached the motor-casing 48. The side frames 40 and 41 and the standards 42, 43, 45, 46, and 47 are secured to a base 49. Swung within the frame 44 is a frame 50. (Shown in detail in Fig. 19.) While I prefer to use the form of frame shown, I do not limit myself to the same, as many forms of frames may be designed which will answer the same purpose.

The printing and idle wheels.—The printing-wheels are preferably one more in number than the order-keys of the machine, so as to allow the printing of a sum which has one more order than any number which can be registered in the machine; but they may be any greater number. The printing-wheels 51 are composed of a spur-wheel and an attached printing-disk, Fig. 25. The said printing-disk may be composed of a number of

sectors, each of which carries one printing character. The separate parts of the wheel 51 are held in place by means of a hub 52 and washer 53. The said printing-wheels 51 are loosely journaled on a shaft 54. The printing characters of the wheel 51 are arranged in regular order from "1" to "9," inclusive, at each side of the "0." The "0" normally stands at the front of the wheel in such a position as to be struck by the printing-hammers. Meshing with the spur-wheels 51 are a series of idle wheels 55, Figs. 10 and 46, which are loosely mounted on a shaft 56. Between each two of the spur-wheels 55 is a split washer 57, Figs. 10 and 25. Secured in the shaft 56 is a comb 58, the teeth of which project between the spur-wheels 55 and are adapted to come in contact with pins 59, which project from the left side of each of the spur-wheels 55. When the shaft 56 is rotated the proper distance, the comb 58 by coming in contact with the pins 59 brings the wheels 55 into their normal position, thus positioning the printing-wheels 51 with which the said idle wheels 55 are in engagement. The shafts 54 and 56 are journaled in the uprights 45 and 46. At the rear of the shaft 56 is a shaft 60, Figs. 7, 10, and 46, which is journaled in rearwardly-extending arms 61, carried by the uprights 45 and 46. Rigidly secured to the shaft 60 is a spur-wheel 65, which is adapted to be actuated by the motor, to be hereinafter described. Mounted on the shaft 60 is a collar 66, which is provided with a spline or feather 67, which runs in a groove 68 in the said shaft 60. This allows the said collar 66 to move freely in the direction of the length of the shaft 60, but prevents it rotating independently of said shaft. Secured to the collar 66 is a spur-wheel 69, which is adapted to mesh successively with the various idle wheels 55 as it is moved along the shaft 60 by the carriage, which is to be hereinafter described.

Adding-wheels.—Journaled in the frame 50 is a shaft 72, Figs. 10, 15, 16, 17, and 46, upon which are loosely mounted a number of spur-wheels 73, which correspond in number to the idle wheels 55 and normally engaged therewith. Between each two wheels 73 and around the shaft 72 is a split washer 74. Carried in the shaft 72 is a movable comb 75, which is actuated by pressure upon the end of an extension 76. Upon each of the wheels 73 at diametrically opposite points are teeth 77, Figs. 22 and 46, which are cut away at their inner ends, so that the comb 75 does not normally strike them, said comb being normally kept in a right-hand position by a spring 78.

Motor and gearing.—81, Fig. 11, is the motor-spring, one end of which is attached to the motor-casing 48 and the other to the motor-shaft 82. Rigidly secured to the motor-shaft 82 is a ratchet-wheel 83. (Shown in detail in Fig. 4.) Loosely mounted on the motor-shaft 82 is a spur-wheel 84, on which is carried a dog 85, which is kept in engage-

ment with the ratchet-wheel 83 by means of a spring 86, carried by the said wheel 83. The spur-wheel 84 meshes with spur-wheel 87, Fig. 2, on a stud 88. The said spur-wheel 87 is rigidly connected to a ratchet-wheel 89, which is in turn rigidly connected with a spur-wheel 90, Figs. 1, 10, and 46. The said spur-wheel 90 meshes with the wheel 65, which is rigidly secured to the shaft 60. In the cover 92 of the motor-case 48 is a coil-spring 93, Figs. 5 and 11, one end of which is attached to the said cover 92 and the other to the flange of a pulley 94, which is loosely journaled on the motor-shaft 82. Rigidly secured to the motor-shaft 82 is a disk 95, (best shown in Fig. 5,) which is provided with a projection 96, which is adapted to strike against a pin 97, by which the spring 93 is secured to the pulley 94. Secured to the pulley 94 and passing around the same is one end of a chain 98, Fig. 2, the other end of which is secured to an arm 99, which is actuated by the handle 100.

The registering-keys and mechanism for controlling the motor-escapement.—105 represents the registering-keys, Figs. 9 and 11, which are numbered from "1" to "9," inclusive, beginning at the left. The zero-registering key for convenience is placed at the right. 106, Figs. 10 and 11, represents the registering-key bars, which are pivoted on a shaft 107. The registering-key bars vary in length, as best shown in Fig. 11. Secured to the rear uprights 42 and 43 are arms 108, Figs. 1 and 10, to which is pivoted a frame 109. Secured in the frame 109 is a rod 110, which passes over and rests upon all the registering-key bars except the zero-key bar. Sliding on the frame 109 is a rack 111, Figs. 1, 10, and 46, by which is carried a stop 112, which is adapted to come in contact with the ends of the bars 106. Carried on the frame 109 is a dog 113, which engages with the ratchet-wheel 89 and prevents the said ratchet-wheel, and thereby the motor, from rotating. The bars 106 are held in their normal position by springs 114. Carried by the rack 111 is a downward extension 115, to which is attached one end of a spring 116, Figs. 1, 2, 10, and 46, the other end of which is attached to a downward extension 117 of the frame 109. The object of this spring is to return the rack 111 to its normal position after it has become disengaged from the spur-wheel 90.

The carrying mechanism.—Secured in the frame 44 are a number of carrying-bars 118, Figs. 6, 9, 10, 15 to 18, and 46, corresponding to the number of adding-wheels 73 in the machine. Each of these bars except that at the right hand is adapted to slide longitudinally a short distance. Extending downwardly from each of the bars 118 except that at the right hand is an arm 119, and each of the bars is provided with teeth 120, preferably three in number, which are adapted to be engaged by the adding-wheels when the said wheels are raised. Pivoted to each of the bars 118

at its left-hand side is a pawl 121, having a downward projection 122 at its forward end. Pivoted on the shaft 123 in the frame 44 are pawls 124, corresponding in number to the bars 118 and engaging with them, as is best shown in Figs. 15 to 18. Between each of the pawls 124 and the arm 119 of the corresponding carrying-bar is stretched a coil-spring 125. In each of the pawls 124 is a pin 126, upon which rests the end of the pawl 121, which is pivoted to the next carrying-bar to the right, and in each of the carrying-bars is a pin 127, which limits the upward movement of the pawl 121, which is pivoted to it.

Means for raising the adding-wheels to put them in engagement with the carrying-bars.—The frame 50, (see also Fig. 19,) in which the shaft 72 of the adding-wheels 73 is journaled, is pivoted in the frame 44 at the point 130, Figs. 10, 15, and 46. Below the frame 50 and journaled in the frame 44 is a shaft 131, which is provided with a blade 132, which is adapted to come in contact with the arms 119 of the carrying-bar 118, and thus move the said carrying-bars to their normal position. The shaft 131 at the point at which the frame 50 rests upon it has a cross-section, as shown in Fig. 20, from which it will be obvious that when the shaft 131 is rotated the frame 50 will be swung upward on its pivot 130. In the frame 50 is a pin 133, which engages with a hook 134 on the shaft 131 when the said shaft is in its normal position, and thus prevents the frame 50 from being accidentally swung on its pivot.

The carriage and actuating mechanism.—In the rear of the frames 40 and 41 is secured a guide 137, Figs. 1, 7, 10, and 46, upon which the carriage runs. The carriage is composed of a rear plate 138 and a front plate 139, between which are secured grooved wheels 140, which run on said guide 137. To the rear plate 138 is secured a ratchet-bar 141, Fig. 7. At the right-hand end of the ratchet-bar 141 is a pin 142. Depending from the plate 138 is a stop 143, Fig. 36, having a lateral projection 144. The stop 143 is adapted to come in contact with the order-key bars, hereinafter to be described. Pivoted to the guide 137 is a dog 145, which engages with the ratchet-bar 141, as best shown in Fig. 7. Pivoted to the lower and rear part of the upright 45 is a T-shaped lever 146, to which is pivoted a dog 147, which also engages with the rack-bar 141. Pivoted to the lower and rear end of the upright 46 is an L-shaped lever 148, which carries a pin 149, extending under the dogs 145 and 147 and adapted to raise the said dogs. Carried by the T-shaped lever 146 is a stop 150, which is adapted to come in contact with the pin 142, carried by the rack-bar 141, and thus lock the said lever 146 against movement when the carriage is in its normal position. Extending upwardly from the rear plate 138 is an arm 151, having at its upper end a U-shaped portion 152, which takes into a groove upon the collar 66, and thus moves the said

collar 66 and attached wheel 69 longitudinally on the shaft 60.

153, Figs. 1, 9, and 11, represents the order-keys, which are numbered from one to nine, inclusive, from right to left; 154, the order-key bars, which pass between the registering-key bars and are pivoted on the same shaft 107. Pivoted on the shaft 107 at the sides of the registering and order key bars are arms 155 and 156. Carried by the arms 155 and 156 is a rod 157, which is adapted to be raised when the order-keys are struck by the movement of their bars. An extension of the arm 155, Figs. 1 and 11, engages with the L-shaped lever 148, Fig. 7, and thus raises the dogs 145 and 147. Extending rearwardly from the lever 146 is a pin or projection 158, which rests upon the rod 110 of the frame 109. Pivoted in the uprights 45 and 46 above the order-key bars 154 is a catch 159, Figs. 10, 11, 39, and 46, which is adapted to come into engagement with offsets in the rear of the upward extensions of the order-key bars 154. Secured to the rear plate 138 of the carriage is a projecting plate 160, Figs. 10, 25, 28, and 46, provided with a downwardly-extending pin 161, which is adapted to come in contact with the upward extensions of the order-key bars 154. The catch 159 is held in its normal position by a spring 162, which is secured to said catch and a rod 163, extending between the uprights 45 and 46. Secured to one arm of the T-shaped lever 146 is a spring 164, Fig. 7, the other end of which is secured at the right hand of the machine, either to the side frame 43 or to the base. The object of this spring 164 is to move the lever 146 to its normal position after it has been swung on its pivot by the movement of the bars 106, and thus feed the carriage one space toward the right.

Means for locking the order-keys.—Pivoted to the lower and rear end of the upright 45 is an arm 165, Figs. 1, 6, 11, and 12, having a projection 166, Fig. 42, adapted to take over the top of the lever 148. In the rear of the arm 165 is a depression adapted to receive a pin 167, carried by the frame 109. On the shaft 169, journaled in rearward extensions of the uprights 45 and 46, is a cam 170, Fig. 42, adapted to make contact with the upper end of the arm 165 when the said shaft 169 is rotated.

Means for unlocking the printing and adding wheels.—On a shaft 172, secured in the uprights 45 and 46, are pivoted a number of pawls 173, corresponding in number to the number of idle wheels 58. The pawls 173 are held in position to lock the idle wheels 58 by springs 174, one end of which is secured to the downward extensions 175 of said pawls 173 and at the other end to other pawls, which will be hereinafter described. Carried by the rear plate 138 of the carriage is a block 176, (shown in detail in Fig. 8,) in which is pivoted a bell-crank lever 177. To the lower end of the bell-crank lever 177 is secured a

cylindrical weight 178, which makes contact with the bar 179, carried by the frame 109. To the upper end of the bell-crank lever 177 is pivoted an arm 180, which is guided by the block 176 and the end of which is adapted to come in contact with the downward extensions 175 of the pawls 173 when the frame 109 is swung on its pivots, and thus disengage the said pawls 173 from the idle wheels 58. In Fig. 45 is shown a modification in which the block 176, the bell-crank lever 177, and arm 180 are replaced by a lever 182, which is pivoted to a stop to be hereinafter described, which is secured to the front plate 139 of the carriage. The lever 182 has an extension 183, which rests on a bar 179, hereinafter described.

The printing-hammers.—Carried in forwardly-extending brackets carried by the uprights 45 and 46 is a shaft 183, on which are pivoted the printing-hammers 184, Figs. 3, 10, and 46 which are adapted to come in contact with the printing-faces of the printing or type wheels 51. 185 represents springs, one end of which is attached to the said printing-hammers 184 and the other to a rod 186, secured in the frames 40 and 41. The point of attachment of the springs 185 to the hammers 184 is on line with the shaft 183 and the rod 186, so that any movement of the hammers in either direction is resisted by the springs.

The printing-hammer-tripping devices.—Pivoted at one end of the forward extension of the upright 45 and at the other to the frame 41 is a ratchet-bar 188, upon which slides a sleeve 189. (Shown in detail in Fig. 26.) In the left-hand end of the sleeve 189 is pivoted a dog 190, which is adapted to engage with the teeth on the rack-bar 188. The said dog 190 is constructed so as to allow the sleeve 189 to move freely toward the left, but to prevent its movement toward the right, except when the said dog is moved out of contact with the rack-bar by contact with a rod 191. At the right end of the sleeve is pivoted a dog 192, which is arranged so as not to interfere with the movement of the sleeve 189 toward the right, but to prevent its movement toward the left, except when the pressure of an arm 193, attached to the carriage, raises the said dog 192 out of contact with the rack-bar by pressure on a downward extension 194 of the said dog. Secured in the rear of the sleeve 189 is a blade 195, which is adapted to make contact with forwardly-projecting fingers 196 of the printing-hammers 184. The blade 195 projects through the sleeve 189 into a groove 197 in the bar 188, and thus prevents the said sleeve 189 from rotating independently of the said bar 188. 198 is an extension of the blade 195, to which is attached one end of a spring 199, the other end of which is attached to an arm on the bar 188.

Devices for positioning the printing-hammer-tripping device when taking the total.—Carried by the uprights 45 and 46 is a shaft 200, upon which are pivoted a number of

pawls, which I term "order-stop pawls," corresponding in number to the number of printing-wheels. To each of the order-stop pawls 201 is pivoted a dog 203, which prevents the rotation of the pawl 201 in a forward direction by contact with a notch in a flange 204 on the said shaft 200. Each of the dogs 203 is provided with a rearward extension 205, which is adapted to come in contact with the downward extensions 175 of the pawls 173. Extending from each of the pawls 201 at its right-hand side is a pin 206, which is adapted to make contact with the dog 203 of the pawl to the right when it is released. Extending from the front plate 138 of the carriage is a stop 208, which is adapted to make contact with the pawls 201 when they are thrown rearwardly by mechanism to be hereinafter described. Secured in the uprights 45 and 46 is a rod 209, which limits the forward movement of the pawls 201. The pawls 201 are held in their normal position by springs 210, which are attached at one end to the said pawls and at the other to the rod 163. In a modification shown in Figs. 33 and 34 the dog 203 is replaced by a dog 202, having an upward projection 211, which is adapted to come into contact with the teeth of the printing-wheels 51.

Mechanism for bringing the printing-wheels to zero.—In the left-hand end of the idle-wheel shaft 56 is a spur-wheel 212. (Best shown in Figs. 1 and 12.) Pivoted to the frame 40 is an arm 213, carrying a toothed segment 214, which engages with the spur-wheel 212. 215 is an arm which rides over the shaft 107, as best shown in Fig. 12, so as to allow both an upward-and-downward and lateral motion. In the upper end of the arm 215 is an opening 216, through which extends the pivot 217 of the arm 213, the said pivot 217 being provided with a head 218, which prevents the arm 215 from being displaced. To the rear of the pivot 217 is a pin 220, secured in the arm 213. This pin 220 is normally in engagement with a recess 221 in the upper end of the arm 215. Secured to the shaft 107 is an arm 222, to which is pivoted one end of a link 223, the other end of which is attached to the arm 215 by a screw 224, which passes through a slot 225 in the said arm 215. At the front of the pivot 217 is secured in the arm 213 a pin 226, adapted to be brought into engagement with a recess 227 in the upper part of the arm 215 when the said arm 215 is moved forward. The arm 215 is held in its normal position by a spring 228, Fig. 1, one end of which is attached to the upper end of said arm and the other to the frame 40.

Means for bringing the adding-wheels to zero.—On the left-hand end of the adding-wheel shaft 72 is secured a spur-wheel 230, Fig. 14, through which projects the rounded end of the projection 76, hereinbefore described. Journaled on the shaft 131 is an arm 232, provided with a toothed segment

233, which engages with the spur-wheel 230. On the arm 232 is a pin 234, which works in an L-shaped slot 235 in a lever 236, which I term the "total" lever or key. The lever 236 is pivoted at its rear end to the frame 44 and is provided at its front end with a key 237. On the lever 236 is a downward extension 238. (Best shown in Fig. 14.) The downward extension 238 has its lower end beveled, as shown in Fig. 22, and is adapted to force the projection 76 of the comb 75 inwardly.

Means for reversing the mechanism for bringing the printing-wheels to zero.—Pivoted to the arm 236 is a plate 240, Figs. 12 and 13, in which is an opening 241, through which extends a pin 242 in an arm 243, which is pivoted on the idle-wheel shaft 56. Formed integral with the arm 243 is an arm 244, which is connected to a link 245 by means of a screw 246, which passes through a slot 247 in the said link. Pivoted to an upward extension of the frame 45 is a hook 248, which is adapted to engage with a pin 249 on the link 245, and thus hold the arm 215 in its forward position. The hook 248 is pulled downwardly by a spring 251, Fig. 1, which is attached at one end to the said hook and at the other to the frame 40. The downward movement of the hook 248 is limited by means of a stop 252, which works in a curved slot 253 in the said hook.

Means for actuating the order-stop pawls.—In the plate 240 is a vertical slot 255, having a rearward and downward incline portion 256, which works on a pin 257. 259 is a link which is connected to the plate 240 by a pin 260 passing through the extension 256 of the slot 255 and into the arm 258, which is pivoted on the upright 45 by the pin 257, which also passes through the slot 255. The other end of the link 259 is pivoted to an arm 261, which is rigidly secured to the shaft 200 of the order-stop pawls.

Means for preventing overrotation of the idle wheels on resetting to zero.—Journaled in rearward extensions of the frames 45 and 46 is a shaft 264, Fig. 46, upon which are pivoted a number of pawls 265, equal in number to the idle wheels 58. The ends of the pawls 265 are slightly to the rear and below the pins 59 of the idle wheels 58 when the said idle wheels are in their normal position. On the pawls 265 are downward projections 266, to each of which is attached one end of one of the springs 174, the other end of which is attached to one of the pawls 173, as previously described. On the shaft 169 is a blade 267, which comes in contact with the inclined edges of the downward extensions 266 of the pawls 265, and thus holds the said pawls in their normal position.

Pivoted on the shaft 54 of the printing-wheels 51 are two arms 272 and 273, Fig. 21. Connecting the ends of the arms 272 and 273 is a comb 274, the teeth of which stand slightly to the front and below the pins 59 of the idle wheels 58. Pivoted on the left-hand end of

the shaft 56 of the idle wheels 58 is an annular member or ring 275. On the ring 275 is a projection 276, which engages with a projection 277 on the arm 272. Projecting from the ring 275 is a pin 278, which is adapted to engage with the left-hand tooth of the comb 58, and thus raise the comb 274 to prevent over-rotation of the wheels 55.

Means for preventing the return of the handle prematurely.—The handle 100 is secured to the right-hand end of the shaft 107. Rigidly secured to the shaft 107 is the arm 99, Figs. 2, 29, and 30, to which the chain 98 is attached. Carried by the arm 99 is a U-shaped part 283, between the arms of which is journaled a roller 284, which runs upon a track or guide 285, either secured to or formed integral with the frame 41. The part 283 is forced upwardly by spring 286. The motion of the arm 99 is limited by two stops 287 and 288, Fig. 2, upon the frame 41. At the right-hand side of the part 283 is an inwardly-projecting point 289, which is adapted to engage with hooks 290 and 291, also carried by the frame 41. At each end of the track 285 is a pin 292, which is adapted to strike against the roller 284 and prevent its becoming wedged while it is being reversed.

Means for actuating the printing-hammer-tripping devices.—On the shaft 107 is rigidly secured an arm 295, in which is pivoted one end of a link 296, the other end of which is secured to an arm 297 on the shaft 188. The arms 295 and 297 and the link 296 are so arranged that when the handle 100 is pulled forward to rotate the shaft 107 the arm 297 will be thrown upward, thus bringing the blade 195 against the fingers 196 of the printing-hammers 184.

Means for returning the carriage.—On the frame 41 is a lug 300, to which is pivoted an arm 301, the end of which is secured to an extension 302 of the carriage. The arm 301 is pulled toward the left by a spring 304, one end of which is secured to said arm and the other to the frame 40. Extending downwardly from the arm 301 is a pin 305. On the shaft 107 is a cam 306, which is adapted to engage with the pin 305, thus forcing the arm 301 to the right, which through the extension 302 draws the carriage to its extreme position at the right.

Formed integral with the arms 242 and 244 is an arm 310, Fig. 12, to which is pivoted a link 311, the opposite end of which is secured, by means of a screw 312, passing through slot 313, Fig. 6, in the said link, to the arm 148.

Paper-feeding mechanism.—In the frames 40 and 41 is journaled a shaft 315, upon which the paper is wound between two flanges 314, one of which should be made removable to allow the roll of paper to be slipped over the shaft. The paper passes from the shaft 315, Fig. 10, around a roller 316, journaled in forward extensions of the uprights 45 and 46. From the roller 316 (see also Fig. 46) it passes upwardly between the printing-wheels 56 and

the inking-ribbon to roller 317 and thence between the feed-rollers 318 and 319, from which it passes out through the opening 320 above the carrying-bars. The roller 319 is held down against the roller 318 by two springs 321, one end of each of said springs being secured to the shaft of said roller and the other ends to the frame of the machine. On the shaft 322 of the roller 319 is a ratchet-wheel 323, and at the end of the said shaft 322 is a milled head 324. Engaging with the ratchet-wheel 323 is a dog or pawl 325, Figs. 2 and 43, which is pivoted to an arm 326, secured on the end of the shaft 131. Secured to the opposite end of the shaft 131 is an arm 327, Fig. 12, to which is attached one end of a link 328, the other end of which is attached to the arm 222 on the shaft 107, operated by the handle 100, as before described. 329 represents the paper.

The inking-ribbon and means for actuating the same.—Passing through the uprights 42 and 43 and the frame 44 at the point where said frame is connected to said uprights is a shaft 330, Figs. 10 and 46. To the right end of the shaft 330 is rigidly secured an ink-ribbon spool 331, Figs. 2, 6, and 9, and to the left-hand end of said shaft is rigidly secured a ratchet wheel or disk 332, Fig. 1. Adjacent to the disk 332 an ink-ribbon spool 333 is loosely mounted upon the said shaft. The end of the ink-ribbon spool 333, Fig. 6, which is adjacent to the disk 332 has formed in it ratchet-teeth corresponding to those in the said disk 332, Fig. 1. Pivoted on the shaft 330, between the ink-ribbon spool 333 and the disk 332, is an arm 334, Figs. 1 and 6. Pivoted to the top of the arm 334 is a block 335, in the end of which is journaled a short shaft 336, Fig. 35, to which are rigidly secured two star-wheels 337. The star-wheels 337 are so arranged on the shaft 336 that their points are staggered—that is, each point is between two points upon the other wheel. The wheels 337 are normally held from rotation by means of a spring 338. 339 represents the ink-ribbon. To the lower end of the arm 334 is pivoted one end of a link 340, the other end of which is pivoted to a link 341. One end of the link 341 is pivoted to an arm 342, which is either secured to or formed integral with the arm 327. The other end of the link 341 is pivoted to an arm 343 by means of a screw 344, which passes through a slot 345 in the said link into the arm. The link 343 is rigidly secured to the shaft 169, hereinbefore described.

The inking-ribbon 339 passes from the spool 333 beneath a pin 350, Fig. 9, in the upright 45. It then passes around a pin 351, Fig. 3, and between the type-wheels and printing-wheels to a pin 352, carried on a lug 353, Fig. 9, on the frame 41. From pin 352 the ribbon passes under pin 354, Fig. 2, to the spool 331.

Operation of the machine.—To register a number in the machine, one of the order-keys 153, Figs. 9 and 11, is first struck, the

order-key to be struck depending upon the left-hand or highest order in the number desired to be registered. For example, if the number to be registered was in hundreds the third key would be struck. If the number was in tens of thousands, the fifth key would be struck, &c. The striking of this key will elevate the rear end of the lever corresponding to that key, thus raising the bar 157, and consequently swinging the rear ends of the arms 155 and 156 upwardly, Figs. 10, 11, 36, and 46. As the rear end of the arm 155 engages with the L-shaped lever 148 the said lever will be swung on its pivot and the dogs 145 and 147, Fig. 7, raised out of engagement with the rack-bar 141 by means of the pin 149. This will release the carriage, which, being under the influence of the spring 304, will move toward the left until it strikes the bar 154, that has been elevated by the depression of the order-key, which thus determines the position of the carriage. The carriage, being connected by the arm 151 to the collar 66, moves the said collar 66, Fig. 7, longitudinally on the shaft 60 and brings the spur-wheel 69 into engagement with the idle wheel 55 in the order corresponding to the order-key struck. For the purpose of preventing the premature return of the order-key bar 154 to its normal position, which would allow the carriage to move to its extreme position at the left, the catch 159, Figs. 10, 11, and 39, is provided. The catch 159, taking into the recess in the upward extension of the order-key bar, holds the said bar in its raised position until the pin 161, Figs. 10, 27, 28, 37, and 46, which is moving slightly in advance of the stop 143, strikes the order-key bar, thus through the plate 160 pressing the said catch 159 toward the front of the machine and releasing the bar. The spur-wheel 69 now being in engagement with the idle-wheel 55 of the desired order, the registering-key corresponding to the figure in the left-hand order of the number to be registered is depressed. The depressing of this key elevates the rear end of the registering-key bar 106, to which it is attached. As the rod 110, Figs. 10, 11, 42, and 46, rests upon the registering-bars, the elevation of the bar swings the front end of the frame 109 upwardly. This movement brings the rack 111, Figs. 1, 2, and 10, into engagement with the spur-wheel 90 and at the same time withdraws the dog 113 from the ratchet-wheel 89, and thus releases the motor. As the motor is now free to act, it revolves the ratchet-wheel 89 and spur-wheel 90 in the direction of the arrow in Figs. 10 and 46, thus driving the rack 111 and attached parts forward along the frame 109 until the stop 112 comes in contact with the end of the registering-key bar which has been elevated. The length of the registering-key bar thus determines the distance through which the rack 111 can move, and consequently the amount of revolution of the spur-wheel 90. The spur-wheel 90 being in engagement with the spur-wheel

65, Fig. 7, rotates it proportionally to the registering-key depressed. As the spur-wheel 69 cannot rotate independently of the shaft 70 60, to which the spur-wheel 65 is secured, it will also be rotated proportionally to the registering-key depressed. The spur-wheel 69 being in engagement with the idle wheel 55 in the left-hand order of the number to be registered will rotate the said idle wheel, and thus position the printing-wheel 51 in the same order, and also rotate the corresponding adding-wheel 73 proportionally to the recording-key depressed. As the pin 158, Figs. 7, 10, 11, and 46, rests upon the bar 110 the lever 146 is swung upwardly when the frame 109 is raised. This throws the dog 147 to the left sufficiently to take into the next notch to the left on the ratchet-bar 141. As the registering-key is released and the frame 109 lowered the lever 146 is drawn back to its normal position by the spring 164. This forces the dog 147 toward the right, and consequently moves the carriage one order, bringing the spur-wheel 69 into engagement with the next idle wheel 58 to the right. The above operation is repeated by depressing the desired registering-keys until all the numerals in the number to be registered are brought into their proper position on the adding-wheels. As the frame 109 is swung upon its pivot the bell-crank lever 177 is actuated by the bar 179 to throw the arm 180 forward against the downward extension 175 of the pawl 173, which locks the idle wheel 58 in the order in which the machine is operated. In the modification shown in Fig. 45 the part 182 performs the offices of the bell-crank lever 177 and arm 180, Fig. 8. As the arm 193 rests against the downward extension 194 of the dog 192 the said dog is raised out of contact with the teeth on the rack-bar 188, Figs. 9, 10, 26, 38, 46, and 48, and forces the sleeve 189 to the left the same distance that the carriage moves, for, as before described, the dog 190 is so arranged as to allow the sleeve to move toward the left. As soon as the carriage stops the pressure being relieved from the extension 193 the dog 192 drops into contact with the teeth 190, and thus prevents the sleeve from moving too far to the left. After the registering-keys have been depressed to register the number, as above described, the handle 100 is pulled forward and downward. During the first movement of the handle the rotation of the shaft 107, to which the said handle is rigidly secured, forces the link 296 upwardly, thus rotating the rack-bar 188 and sleeve 189 in the direction of the arrow in Figs. 10 and 46. As the sleeve 189 has been moved to the left the same distance as the carriage, the blade 195 will engage with the fingers 196 of as many of the printing-hammers 184 as there are orders in the number registered. The blade 195 by its action on the fingers 196 will force the hammer 184 away from the printing-wheels, and consequently bring the springs 185 un-

der tension. As soon as the blade 195 moves sufficiently to become disengaged from the fingers 196 the hammers will be released and thrown toward the printing-wheels by the spring 185, thus causing the number to be printed on the paper. At the same time the dog 190, Figs. 10, 26, 38, and 46, will be drawn out of engagement with the teeth on the rack 188 by contact with the bar 191. As the sleeve is now free to move toward the right, it will be drawn to its normal position by the spring 199, Fig. 26. As the shaft 107 is rotated by the movement of the handle 100 the link 223, Figs. 12 and 36, will be drawn downward by the arm 222. Owing to the slot 225 in the arm 215 the first part of the movement of the link 223 will not be communicated to the said arm, as is best seen in Fig. 12. This part of the movement takes place while the printing-hammers are being tripped, as above described. As soon as the screw 224 reaches the lower end of the slot 225, which is immediately after the tripping of the printing-hammers, the downward movement of the link 223 will be communicated to the arm 215. As the arm 215 moves downwardly it will swing the arm 213 on the pivot 217 and move the toothed segment 214 in the direction of the arrow in Fig. 12, as the pin 220 is in engagement with the recess 221. This rotates the spur-wheel 212 in the direction shown by the arrow in Fig. 12. The spur-wheel 212 being rigidly secured to the shaft 56 of the idle wheels 55 rotates the said shaft in the same direction. The idle wheels of all the orders in which significant numbers have been registered will be rotated by the contact with the pins 59, Figs. 23 and 46, of the teeth of the comb 58. As the shaft is rotated the teeth of the comb 58 will come in contact with the pins 59 and bring them to their normal position, thereby bringing the printing-wheels to zero—that is, bringing the printing-wheels in such position that if they were struck by the printing-hammers they would print "0." Just previous to the beginning of the rotation of the shaft 56 the end of the slot 345 comes in contact with the screw 344, and thus swings the arm 343 toward the rear. This movement is owing to the fact that the link 328 is pivoted to the arm 222, and the arms 327 and 342 are formed integral. This movement of the arm 343, Fig. 42, rotates the shaft 169, so as to move the blade 267 downwardly, and thus allows the ends of the pawls 264 to swing upwardly in the path of the pins 59, and thus prevent overrotation of the wheels 55. The motion of the link 328, which begins with the movement of the handle, is communicated through the arm 327 to the shaft 131. As the shaft 131 is rotated the frame 50, Figs. 15 to 20, is swung upwardly, so as to take the adding-wheels 73 out of engagement with the idle wheels 55 and put them into engagement with the teeth 120 on the carrying-bars 118. This prevents the adding-wheels from being disturbed when the idle

and printing wheels are brought to zero and also brings them into position to be acted on by the carrying-bars, as will be hereinafter described. As the numbers to be added are registered in the machine, the adding-wheels 73 will be continuously moved in the direction shown by the arrow in Fig. 10, as will be evident from the above description. Whenever one of the adding-wheels 73 has been moved more than nine places—that is, makes more than half a revolution—one of the teeth 77 on the said adding-wheel will come in contact with the incline portion of the downward projection 122 of the pawl 121 upon the corresponding carrying-bar. This will force the forward end of the said pawl upwardly and depress the rear end. As the rear end of the pawl 121 rests upon the pin 126 of the pawl 124, which locks the next carrying-bar to the left, the downward motion of the rear end of the pawl 121 will force the said pawl 124 downwardly and so unlock the carrying-bar of the next higher order, which will be thrown backward by the spring 125. The backward movement of the carrying-bar 118 will be limited by the contact of its downward extension 119 with the shaft 131. When the handle is pulled to print the number to be registered, the frame 50 will be thrown upwardly to bring the adding-wheels into engagement with the teeth 120 on the carrying-bars, as has been above described. If any of the bars have been released to carry, as above described, they will be in the position shown in Fig. 16. The further rotation of the shaft 131 brings the blade 132 in contact with the downward extensions 119 of any of the carrying-bars which have been released and forces the said carrying-bars forward, as shown in Fig. 17, thus moving the corresponding adding-wheel one space. The bars will be retained in their position by engagement with the pawls 124. In case a carrying-bar is released when its adding-wheel is at "9" the downward projection 122 of its pawl will strike upon the tooth 77 and be tripped in the same manner as if the adding-wheel were moved one space and so disengage the next pawl to the left from its carrying-bar and so position said carrying-bar for carrying. It will be seen from this that if all the adding-wheels were at "9" and one was added in the units order all the bars would be released for carrying. The object of the devices carried by the arm 99 is to prevent the premature return of the handle 100, Figs. 2, 29, 30, and 44. It will be seen that when the roller 284 is in the position shown in Fig. 2 the handle could not be pulled forward unless there was some means of reversing the position of the said roller 284, as the said roller would wedge between the rear end of the arm 99 and the guide 285. The hook 291 is in engagement with the projection 289 in the same manner as the hook 290 is shown in Fig. 29, and consequently as the handle is pulled the part

283 is swung on its pivot, bringing the roller 284 in its forward position. The handle can now be pulled forward, but cannot return, as the roller 284 would become wedged between the front end of the arm 99 and the guide 285. As soon as the handle has completed its movement the projection 289 will become engaged with the hook 290 at the front end of the guide, so that the position of the roller can be reversed to allow the return movement. Upon the beginning of the return movement of the handle the link 328, Fig. 12, will rotate the shaft 131, so as to allow the frame 50, carrying the adding-wheels, to be lowered into its normal position. At the same time the link 296 will rotate the rack-bar 188, so as to bring the printing-hammer-tripping devices into their normal position at the extreme right of the machine. At the same time if the carriage has not been completely returned to its position on the right, as is the case when one or more zeros are at the right-hand end of the number registered, the cam 306 will engage with the pin 305 upon the arm 301, and thus return the carriage to its normal position. As soon as the handle is moved the link 223, Figs. 12 and 36, will be forced upward; but it will not affect the link 215 until the screw 224 has reached the upper end of the slot 225, when the said arm 215 will be forced upwardly, thus rotating spur-wheel 212 in the opposite direction to the arrow in Fig. 12. This will rotate the shaft 56 and bring the comb 58 into its normal position. At the same time the shaft 169 will be rotated by the movement of the link 341, so as to force the pawls 265, Figs. 10, 41, and 46, to resume their normal position out of the path of the pins 59. During the operation of the registering-keys the motor will be more or less unwound owing to the number and value of the keys depressed. This will rotate the disk 95 in the direction of the arrow in Fig. 5, and thus move the projection 96 around toward the pin 97. As soon as the handle 100 is operated the pulley 94 (see also Figs. 2, 6, 9, and 11) will be rotated in the opposite direction to the unwinding of the motor. As soon as the pin 97 comes in contact with the projection 96 on the plate 95 the rotation of the pulley 94 will wind the motor. It will be seen from this that each time the handle is pulled the motor will be wound up just as much as it has run down during the registering of the number. The ratchet-wheel 83 and dog 85 allow the motor to be wound up without affecting the spur-wheel 84, which is locked against movement by the ratchet-wheel 89 and dog 113. When it is desired to take the total of the numbers registered in the machine, the total-key 237 is depressed to swing the bar 236 on its pivot. The first movement of the bar forces the extension 76, Figs. 14 and 22, of the comb 75 to the right by the action of the inclined end of the projection 238 of the said bar. This brings the teeth of the comb 75 in a position to engage with the inner ends of the teeth 77 on the adding-wheels. During the same time the downward movement of the plate 240, Fig. 12, through the link 259 and arm 261 rotates the shaft 200, so as to throw the pawls 201 to the rear in such position that the rear ends of said pawls will be in the path of the stop 208, Figs. 10 and 46, and the projections 205 of the dogs 203 will be in proximity to the downward extensions 175 of the pawls 173. During the first part of the movement of the lever 236, the arm 232, carrying the tooth-segment 233, will not be affected, owing to the downward extension of the slot 235; but as soon as the pin 234 has reached the upper end of the slot 235 the said arm and segment will be swung on the pivot, moving the spur-wheel 230 in the direction of the arrow in Fig. 14. This will rotate the shaft 72 and bring the teeth of the comb 75 into engagement with the teeth 77, thus bringing the adding-wheels 73 into their normal position, Figs. 10 and 46. This will transfer the amount on the adding-wheels to the printing-wheels; but the printing-wheels will be rotated in the opposite direction to that in which they are rotated when registering a number. As the printing-faces are arranged from "1" to "9" on each side of the "0" on the printing-wheels, it will be seen that this opposite movement will bring the printing-wheels into the proper position. It is to be remembered that the wheel 69 has moved to the right a sufficient distance to be out of engagement with the last idle wheel to the right, and hence does not interfere with the rotation of the said wheel while transferring the sum. As the shaft 72 is rotated and the numbers are being transferred from the adding-wheels through the idle wheels to the printing-wheels, whenever an idle wheel is rotated the rear end of its locking-pawl 173, Figs. 10, 31, and 46, will be forced downward, which will bring the downward extension 175 of said pawl against the projection 205 on the dog 203 of the corresponding order-stop pawl, and thus release said pawl, and, as has been previously described, all those to the right of it, so that they may be swung forward into their normal position by the springs 210. It will be seen from this that when the complete sum has been transferred from the adding to the printing wheels, all the order-stop pawls 201 to the right of the highest order in the sum will be in their forward position, while only those to the left will remain in their rear position. With the modification shown in Figs. 33 and 34 the order-stop pawls will be operated by the action of the wheels 51 on the dogs 202. As soon as the upper end of the slot 241, Fig. 12, in the plate 240 reaches the pin 242 the arm 243 will be swung downwardly, thus actuating the arms 244 and 310, Fig. 47. The movement of the arm 244 will force the link 245 toward the front of the machine, which will actuate the arm 215, so as to bring its depression 227 into engagement with the pin 226. The hook 248 will engage with the pin 249 and hold

the arm 215 in this position against the tension of the spring 228, Fig. 1. The movement of the arm 310 draws the link 311 upwardly, and thus raises the L-shaped lever 148, Fig. 7. This disengages the dogs 145 and 147 from the rack-bar 141 and allows the carriage to move toward the left of the machine. The carriage will be stopped in its proper position by the contact of the stop 208 with the order-stop pawls 201, which have been positioned in the manner above described. The only object in having the carriage positioned at this time is to position the printing-hammer-tripping devices. The movement of the carriage positions the printing-hammer-tripping devices in the same manner as when an order-key is struck, so that the description of this operation need not be repeated. On the upward movement of the lever 236 the shaft 72 and comb 75 are returned to their normal position, and the order-stop-pawl shaft is also returned to its normal position, taking with it any of the pawls which have not been tripped. The handle is now actuated in the same manner as when registering a number. The first movement of the handle trips the printing-hammers in the same manner as has been described in connection with the registering of a number. The further movement of the handle draws down the arm 215, Fig. 12, by means of the link 223. The arm 215 being now in engagement with the pin 226 instead of the pin 220 the spur-wheel 212 will be rotated in the opposite direction and the bringing of the wheels to zero thus effected. As the right-hand tooth of the comb 61 nears the end of its movement in bringing the wheels to zero it will strike the pin 278, Fig. 21, on the ring 275, and thus raise the comb 274 into the path of the pins 59, and thus prevent the overrotation of the wheels. When the handle returns, the shaft 59 and the comb 61 will be returned to their normal position, at the end of which movement the arm 215, Fig. 12, will be drawn into engagement with the pin 220 by the spring 228, as the hook 248 has been left behind in its downward motion. The return of the printing-hammer-tripping devices and the carriage to their normal position has been accomplished in the same manner as after printing a registered number. Each time the handle 100 is actuated the shaft 131, as has been above described, is rotated. This by means of the arm 326 (best shown in Figs. 2 and 43) actuates the dog 325 to rotate the ratchet-wheel 323 one notch, and thus feeds the paper, which passes between the roller 319 and 320. At the same time the link 341, which is rigidly secured to said shaft, is actuated. The link 340, which is secured to the link 341, actuates the inking-ribbon-feeding device, as is shown in Fig. 1. Whenever the inking-ribbon becomes wound entirely upon one spool the other spool is held against rotation and the star-wheel 337, Fig. 35, which is in engagement

with it, is compelled to rotate against the pressure of the spring 338, thus throwing itself out of engagement with the said wheel and the other said star-wheel into engagement with the other ratchet-wheel, so that the feeding of the ribbon is automatically reversed.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In an adding-machine, adding devices corresponding to the numerical orders, a carriage for moving successively from order to order and determining the adding device to be actuated, and an order-key for each order for bringing said carriage into engagement with the desired adding device to begin the registration of a number.

2. In an adding-machine, adding devices corresponding to the numerical orders, a carriage movable step by step to cause the orders successively to be in operative position, and an order-key for each order, all operatively connected to the carriage and independently movable to bring the carriage into position to secure the action of the adding-wheel of the order corresponding to that of the key actuated.

3. In an adding-machine, registering devices corresponding to the numerical orders, adding devices corresponding to said registering devices, a carriage for determining which of said registering and adding devices shall be actuated and moving successively from order to order, and an order-key for each order adapted to position said carriage in the desired order to begin the registration of a number.

4. In an adding-machine, registering devices corresponding to the numerical orders, adding devices corresponding to said registering devices, a carriage for determining which of said registering and adding devices shall be actuated and moving successively from order to order, a series of order-keys adapted to position said carriage in the desired order to begin the registration of a number, and means for locking the order-key actuated until said carriage has reached the desired position.

5. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, a carriage for determining which of said registering and adding wheels shall be actuated and moving successively from order to order, order-keys adapted to be thrown in the path of said carriage, and means for locking the order-key actuated until the said carriage has reached the order corresponding to said key.

6. In an adding-machine, a series of registering devices corresponding to the numerical orders, a series of adding devices corresponding to said registering devices, a carriage for determining which of said adding and registering devices shall be actuated and moving

successively from order to order, an order-key for each order adapted to position said carriage in the desired order to begin the registration of a number, and a series of registering-keys controlling the motion transmitted by way of said carriage to the registering and adding devices in each successive order.

7. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, a carriage moving successively from order to order and determining which of said registering and adding wheels shall be actuated, a set of order-keys for positioning said carriage in the desired order, a set of registering-keys for controlling the motion imparted by way of said carriage to said registering and adding wheels, and means actuated by the movement of said registering-keys for locking said order-keys.

8. In an adding-machine, a series of registering devices corresponding to the numerical orders, a series of adding devices corresponding to said registering devices, a carriage for determining which of said registering devices shall be actuated and moving successively from order to order, means for impelling said carriage toward the higher orders, devices for locking said carriage in its normal position, and a series of order-keys adapted to release said carriage and to be thrown in its path.

9. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to the registering-wheels, an axially-moving wheel for determining which of said registering and adding wheels shall be actuated, a carriage controlling the movement of said axially-moving wheel, and a series of order-keys for positioning said carriage to bring said axially-moving wheel into the desired order.

10. In an adding-machine, a series of adding devices corresponding to the numerical orders, a carriage moving successively from order to order and determining which of said adding devices shall be actuated, a set of order-keys for positioning said carriage in the desired order, a set of registering-keys controlling the motion imparted to said adding device and feeding said carriage toward its normal position, and means independent of said registering-keys for returning said carriage to normal position.

11. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, idle wheels connecting said registering and adding wheels, an axially-moving wheel adapted to engage with said idle wheels and to move successively from order to order, a carriage controlling the axial movement of said axially-moving wheel, a series of order-keys for positioning said carriage to bring said axially-moving wheel into the desired order, and means for rotating said axially-moving wheel.

12. In an adding-machine, a series of registering-wheels, a series of adding-wheels, an

axially-moving wheel for determining which of said registering and adding wheels shall be actuated, a series of order-keys for positioning said axially-moving wheel in the desired order to begin the registration of a number, and a series of registering-keys controlling the rotation of said axially-moving wheel and moving it successively from order to order.

13. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, an axially-moving wheel for determining which of said registering and adding wheels shall be actuated, a carriage controlling the axial movement of said axially-moving wheel and impelled toward the higher orders, a series of registering-keys for controlling the rotation of said axially-moving wheel, and a series of order-keys adapted to be thrown in the path of said carriage to stop it in the desired order to begin the registration of a number.

14. In an adding-machine, registering devices corresponding to the numerical orders, adding devices corresponding to said registering devices, a carriage for determining which of said registering and adding devices shall be actuated and moving successively from order to order, a motor for actuating said registering and adding devices, a sliding rack for controlling said motor, and a series of stops controlled by suitable finger-keys for limiting the movement of said sliding rack.

15. In an adding-machine, registering devices corresponding to the numerical orders, adding devices corresponding to said registering devices, a motor mechanism for actuating said registering and adding devices, a movable frame, a sliding rack carried by said frame and adapted to be thrown into engagement with said motor mechanism, and a series of registering-keys for actuating said frame to throw said rack into engagement with said motor mechanism to limit the movement of said sliding rack.

16. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, an axially-moving wheel for determining which of said registering and adding wheels shall be actuated, a carriage controlling the axial movement of said axially-moving wheel, a movable frame controlling the rotation of said axially-moving wheel, a series of registering-keys for controlling said movable frame, pawls or dogs for moving said carriage from order to order, and connections between said movable frame and said pawls or dogs, whereby the movement of said frame will feed said carriage from order to order.

17. In an adding-machine, a series of registering-wheels corresponding to the numerical orders, a series of adding-wheels corresponding to said registering-wheels, a carriage de-

termining which of said registering and adding wheels shall be actuated, a spring impelling said carriage in the direction of the higher orders, suitable pawls or dogs for locking said carriage against motion toward the higher orders and feeding it in the opposite direction, a set of order-keys for disengaging said pawls or dogs from said carriage and positioning a stop in the path of said carriage, and a series of registering-keys for actuating said pawls or dogs to feed said carriage toward the lower orders.

18. In an adding-machine, registering-wheels corresponding to the numerical orders, a series of adding-wheels corresponding to said registering-wheels, a shaft situated parallel to the axis of said registering and adding wheels, a spur-wheel mounted on said shaft to move longitudinally of it but not to rotate independently thereof, said latter-named wheel determining which of said registering and adding wheels shall be actuated, a motor rotating said shaft, a sliding rack governing said motor, a series of registering-keys, registering-key bars of varying lengths for said registering-keys, and a stop carried by said sliding rack and adapted to come into contact with the ends of said registering-key bars and thereby determine the amount of movement of said rack.

19. In an adding-machine, a series of registering devices corresponding to the numerical orders, adding devices, mechanism for actuating said registering devices to register the individual numbers, means for accumulating the sum of said registered numbers upon said adding devices, and means for transferring the sum from said adding devices to said registering devices when said adding devices are brought to zero, whereby the sum is indicated by said registering devices.

20. In an adding-machine, a series of registering devices corresponding to the numerical orders, adding devices, mechanism for actuating said registering and adding devices at one and the same time, appliances for bringing said registering devices to zero independently of said adding devices, and means for transferring the sum from said adding to said registering devices by resetting the said adding devices to zero.

21. In an adding-machine, registering devices corresponding to the numerical orders, adding devices corresponding to said registering devices, a carriage for determining which of said registering and adding devices shall be actuated and moving successively from order to order, devices for positioning said carriage in the desired order to begin the registration of a number, means for accumulating the sum of the registered numbers upon said adding devices and means for transferring the sum from said adding devices to said registering devices when said adding devices are brought to zero and said carriage is in its normal position out of engagement with said registering and adding devices.

22. In an adding-machine, registering devices corresponding to the numerical orders, adding devices corresponding to said registering devices, appliances for transferring the sum from said adding devices to said registering devices, mechanism for bringing said registering devices to zero, and means for reversing said latter mechanism by the movement of said transferring appliances whereby said registering devices may be brought to zero after the transfer of the sum.

23. In an adding-machine, a series of registering-wheels corresponding to the numeral orders, said registering-wheels being provided with two sets of digits arranged in reverse order, a set of adding-wheels corresponding to said registering-wheels, means for actuating said adding-wheels and said registering-wheels in one direction to position one set of digits, and means for transferring the sum from the adding-wheels to rotate said registering-wheels in the opposite direction to position the other set of digits.

24. In an adding-machine, registering-wheels corresponding to the numerical orders, suitable adding-wheels corresponding to said registering-wheels, idle wheels connecting said registering and adding wheels, mechanism for actuating said idle wheels to position said registering and adding wheels, connections for throwing said adding-wheels out of engagement with said idle wheels, means for bringing said idle and registering wheels to zero while said adding-wheels are out of engagement therewith, and appliances for bringing said adding-wheels to zero while in engagement with said idle wheels to transfer the sum to said registering-wheels.

25. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, mechanism for simultaneously actuating the registering and adding wheels of the same order, appliances for bringing said registering-wheels to zero independently of said adding-wheels, and means for bringing said adding-wheels to zero while in communication with said registering-wheels to transfer the sum to said registering-wheels.

26. In an adding-machine, registering devices corresponding to the numerical orders, adding devices corresponding to said registering devices, appliances for transferring the sum from said adding to said registering devices, mechanism for bringing said registering devices to zero, means for reversing said latter mechanism, whereby said registering devices may be brought to zero after the transfer of the sum, and means for preventing the overrotation of said registering devices when they are brought to zero from their reversed position.

27. In an adding-machine, a series of printing devices corresponding to the numerical orders, impression-taking means for said printing devices, a series of adding devices corresponding to said printing devices, means for

transferring the sum from said adding devices to said printing devices, actuating devices for said impression-taking means, and appliances for positioning said actuating devices, said appliances being controlled by the transfer of the sum from the adding to the printing devices.

28. In an adding-machine, registering-wheels corresponding to the numerical orders, a series of adding-wheels corresponding to said registering-wheels, mechanism for actuating said registering and adding wheels, mechanism for bringing said registering-wheels to zero, mechanism for bringing said adding-wheels to zero, a total-key for actuating said latter-named mechanism, and means controlled by the movement of said total-key for reversing the movement of the mechanism for bringing the registering-wheels to zero.

29. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, means for actuating said registering and adding wheels, mechanism for bringing said registering-wheels to zero, a handle for actuating said mechanism, mechanism for bringing said adding-wheels to zero, a total-key for actuating said latter-named mechanism, reversing devices for reversing the movement of the mechanism for bringing the registering-wheels to zero, and means for positioning said reversing devices by the movement of said total-key.

30. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, means for bringing said registering-wheels to zero, a shaft for said adding-wheels provided with a movable comb which is normally out of engagement with said adding-wheels, and a total-key for throwing said comb into engagement with said adding-wheels and rotating said shaft to bring said adding-wheels to zero and transfer the sum to said registering-wheels.

31. In an adding-machine, registering-wheels corresponding to the numerical orders, a series of adding-wheels corresponding to said registering-wheels, mechanism for bringing said registering-wheels to zero, a toothed member for actuating said mechanism, a handle normally moving said toothed member in one direction to actuate said mechanism, mechanism for bringing said adding-wheels to zero, a total-key for actuating said latter-named mechanism, and means controlled by the movement of said total-key for causing said handle to move said toothed member in the opposite direction.

32. In an adding-machine, printing-wheels corresponding to the numerical orders, a series of printing-hammers for said printing-wheels, a printing-hammer-tripping device adapted to actuate a variable number of said printing-hammers, a series of adding-wheels corresponding to said printing-wheels, mechanism for bringing said adding-wheels to zero, a total-key for actuating said latter-named mechanism, and means controlled by the movement of said total-key for causing said handle to move said toothed member in the opposite direction.

anism for bringing said adding-wheels to zero, means for positioning said printing-hammer-tripping device, and a total-key for actuating said mechanism for bringing the adding-wheels to zero and for positioning the printing-hammer-tripping device.

33. In an adding-machine, printing-wheels corresponding to the numerical orders, a series of printing-hammers for said printing-wheels, a printing-hammer-tripping device adapted to actuate a variable number of said printing-hammers, a series of adding-wheels corresponding to said printing-wheels, a carriage determining which of said printing and adding wheels shall be actuated and moving successively from order to order, connections between said carriage and said printing-hammer-tripping device, whereby said printing-hammer-tripping device will be positioned by the movement of said carriage, devices for bringing said adding-wheels to zero, a total-key for actuating said devices to transfer the sum to said printing-wheels, and devices actuated by the movement of said total-key for positioning said carriage and thereby said printing-hammer-tripping device.

34. In an adding-machine, a series of registering-wheels corresponding to the numerical orders, a series of adding-wheels corresponding to said registering-wheels, a carriage determining which of said registering and adding wheels shall be actuated and moving successively from order to order, mechanism for positioning said carriage in the desired order to begin the registration of a number, and means for transferring the sum from said adding-wheels to said registering-wheels.

35. In an adding-machine, a series of registering-wheels corresponding to the numerical orders, a series of adding-wheels corresponding to said registering-wheels, an axially-moving wheel determining which of said registering and adding wheels shall be actuated, a carriage controlling the axial movement of said axially-moving wheel, a series of order-keys for positioning said carriage in the desired order to begin the registration of a number, and means for transferring the sum from said adding-wheels to said registering-wheels.

36. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, mechanism for actuating said registering and adding wheels, means for bringing said adding-wheels to zero while in communication with said registering-wheels, whereby the sum will be transferred to said registering-wheels, appliances for bringing said registering-wheels to zero, said appliances being controlled by a pivotally-mounted member, devices normally actuating said pivotally-mounted member in one direction, and connections for causing said latter-named devices to actuate said pivot-

ally-mounted member in the other direction, whereby the appliances for bringing the registering-wheels to zero will be reversed.

37. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, mechanism for actuating said registering and adding wheels, appliances for bringing said adding-wheels to zero, 10 appliances for bringing said registering-wheels to zero, a pivotally-mounted toothed segment for operating said latter-named appliances, a laterally and longitudinally movable member for actuating said segment, 15 said laterally and longitudinally movable member being normally in engagement with said segment at one side of its pivot, and means for throwing said laterally and longitudinally moving member into engagement 20 with said segment at the other side of its pivot, whereby the devices for bringing the registering-wheels to zero will be positioned to clear out in a reverse direction.

38. In an adding-machine, printing devices corresponding to the numerical orders, a carriage determining which of said printing devices shall be actuated and moving successively from order to order, impression-taking means for said printing devices, said 30 impression-taking means being controlled by said carriage, and mechanism for operating said impression-taking means to print the number registered after all the corresponding printing devices have been positioned.

39. In an adding-machine, adding devices, printing devices, a carriage determining which of said adding and printing devices shall be actuated and moving successively from order to order, impression-taking means 40 for said printing devices, and actuating mechanism for the impression-taking means, said mechanism being controlled by said carriage.

40. In an adding-machine, printing devices corresponding to the numerical orders, a carriage determining which of said printing devices shall be actuated and moving successively from order to order, a series of impression-taking appliances for said printing devices, actuating mechanism adapted to operate a variable number of said impression-taking appliances, and means for positioning 50 said actuating mechanism by the movement of said carriage.

41. In an adding-machine, a series of printing devices corresponding to the numerical orders, a series of printing-hammers for said printing devices, a carriage for determining which of said printing devices shall be actuated and moving successively from order to order, a printing-hammer-actuating appliance for operating a variable number of said printing-hammers, and means for bringing 60 said carriage into position for actuating the desired printing devices to begin the registration of a number, said means also positioning said printing-hammer-actuating ap-

pliance to operate the desired number of printing-hammers.

42. In an adding-machine, printing-wheels corresponding to the numerical orders, printing-hammers for said wheels, adding-wheels 70 corresponding to said printing-wheels, mechanism for actuating said printing and adding wheels, a carriage determining the order in which said mechanism operates, a printing-hammer-tripping appliance, and connections 75 between said carriage and printing-hammer-tripping appliance, whereby said printing-hammer-tripping appliance is positioned to trip a greater or less number of hammers by 80 the movement of said carriage.

43. In an adding-machine, printing-wheels corresponding to the numerical orders, a series of printing-hammers for said printing-wheels, a sliding member adapted to trip a 85 variable number of said hammers, a series of adding-wheels corresponding to said printing-wheels, a carriage for determining which of said registering and adding wheels shall be actuated, a series of order-keys for positioning 90 said carriage in the desired order, and connections between said carriage and said sliding member by means of which said sliding member is positioned by the movement of said carriage in one direction, but is not affected 95 by its movement in the other direction.

44. In an adding-machine, printing-wheels corresponding to the numerical orders, a series of printing-hammers for said printing-wheels, a sliding member adapted to trip a 100 variable number of said hammers, a series of adding-wheels corresponding to said printing-wheels, a carriage for determining which of said printing and adding wheels shall be actuated, means for positioning said carriage 105 in the desired order, connections between said carriage and sliding member for positioning said sliding member by the movement of said carriage, mechanism for rotating said sliding member to trip said hammers, and means for returning said sliding member to its normal position. 110

45. In an adding-machine, printing-wheels corresponding to the numerical orders, a series of printing-hammers for said printing-wheels, a series of adding-wheels corresponding to said printing-wheels, a carriage for determining which of said printing and adding wheels shall be actuated, means for positioning 120 said carriage in the desired order, a sliding member for tripping a variable number of said printing-hammers, a suitable pawl for preventing the movement of said sliding member, connections between said carriage and said sliding member for releasing said 125 pawl to position said sliding member, a retaining-pawl for holding said sliding member in the position placed by the carriage, and means for releasing said retaining-pawl after said sliding member has been actuated to trip 130 the printing-hammers, so that said sliding member may return to its normal position.

46. In an adding-machine, registering devices corresponding to the numerical orders, adding devices corresponding to said registering devices, carrying devices for the latter, and means for raising and lowering said adding devices to put them in communication with either the registering or the carrying devices.

47. In an adding-machine, registering devices corresponding to the numerical orders, adding devices corresponding to said registering devices, said adding devices being carried in a swinging frame, carrying devices for said adding devices, and means for bringing said adding devices into communication with either said registering or said carrying devices by the movement of said frame.

48. In an adding-machine, adding devices, a series of sliding carry-bars, a pivotally-mounted frame carrying the adding devices, said adding devices being normally out of engagement with said carrying-bars, means for positioning said bars to carry, and mechanism for swinging said frame to throw said adding devices into engagement with said carrying-bars, said latter-named means also actuating said carrying-bars.

49. In an adding-machine, adding-wheels corresponding to the numerical orders, mechanism for actuating said adding-wheels, suitable carrying-bars slidably mounted in a stationary frame, appliances for positioning said carrying-bars to carry by the rotation of said adding-wheels, means putting said adding-wheels into engagement with said carrying-bars, and connections for actuating said carrying-bars to carry.

50. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, means for actuating said adding and registering wheels, a pivotally-mounted frame carrying said adding-wheels, carrying-bars for said adding-wheels, and means for swinging said frame to put said adding-wheels into engagement with said carrying-bars and also to actuate said carrying-bars to carry.

51. In an adding-machine, a handle required to be operated after the registering-keys are operated, an arm moved by said handle, a suitable path adjacent to said arm, a roller interposed between said path and said arm to allow the arm to move in but one direction, and means at each end of said path for reversing the position of said roller to allow said arm to move in the opposite direction.

52. In an adding-machine, printing-wheels corresponding to the numerical orders, series of printing-hammers for said printing-wheels, a series of adding-wheels corresponding to said printing-wheels, carrying devices for said adding-wheels, an axially-moving wheel determining which of said printing and adding wheels are to be actuated, appliances for positioning said axially-moving wheel in the desired order, a motor for rotating said axi-

ally-moving wheel, a series of registering-keys for controlling said motor and feeding said axially-moving wheel from order to order, and means for tripping a number of said printing-hammers corresponding to the number of orders in the number registered.

53. In an adding-machine, a series of printing-wheels corresponding to the numerical orders, a series of printing-hammers for said printing-wheels, a series of adding-wheels corresponding to said printing-wheels, an axially-moving wheel determining which of said printing and adding wheels shall be actuated, a carriage controlling the axial movement of said axially-moving wheel, a series of order-keys for positioning said carriage in the desired order, a printing-hammer-tripping device adapted to trip a variable number of said printing-hammers, connections between said carriage and said printing-hammer-tripping device, whereby said latter-named device is positioned by the movement of said carriage to trip the desired number of printing-hammers, a series of registering-keys for controlling the rotation of said axially-moving wheel, and means for actuating said printing-hammer-tripping device to trip the desired number of printing-hammers.

54. In an adding-machine, printing-wheels corresponding to the numerical orders, a series of printing-hammers for said printing-wheels, a series of adding-wheels corresponding to said printing-wheels, an axially-moving wheel determining which of said printing and adding wheels shall be actuated, a carriage governing the axial movement of said axially-moving wheel, a printing-hammer-tripping device adapted to trip a variable number of said printing-hammers, connections between said carriage and printing-hammer-tripping device, whereby the movement of said carriage will position the printing-hammer-tripping device to trip the desired number of hammers, appliances for rotating said adding-wheels to transfer the sum to said printing-wheels, and means for positioning said carriage and thereby said printing-hammer-tripping device by the transfer of the sum from the adding to the printing wheels.

55. In an adding-machine, printing-wheels corresponding to the numerical orders, a series of printing-hammers for said printing-wheels, a series of idle wheels corresponding to said printing-wheels, a series of adding-wheels meshing with said idle wheels, an axially-moving wheel determining which of said idle wheels shall be actuated, a carriage controlling the axial movement of said axially-moving wheel, a series of order-keys for positioning said carriage in the desired order, a printing-hammer-tripping device for tripping a variable number of said printing-hammers, connections between said carriage and printing-hammer-tripping device, whereby both will be positioned at once, a motor for rotating said axially-moving wheel, a series

of registering-keys for controlling the movement of said motor, and a suitable handle for winding said motor actuating said printing-hammer-tripping device and returning said carriage to its normal position.

56. In an adding-machine, a series of printing devices corresponding to the numerical orders, a series of printing-hammers for said printing devices, a series of adding devices corresponding to said printing devices, a carriage determining which of said printing and adding devices shall be actuated and moving successively from order to order, a printing-hammer-tripping appliance adapted to trip a variable number of said printing-hammers, connections between said carriage and printing-hammer-tripping device, whereby said printing-hammer-tripping device will be positioned by the movement of said carriage, a series of pawls adapted to be thrown in the path of said carriage, mechanism for transferring the sum from said adding devices to said printing devices, means for releasing said pawls by transferring the sum, and connections for releasing said carriage to allow it to position said printing-hammer-tripping device.

57. In an adding-machine, printing devices corresponding to the numerical orders, a series of printing-hammers for said printing devices, a printing-hammer-tripping device adapted to actuate a variable number of said printing-hammers, a series of adding devices corresponding to said printing devices, mechanism for transferring the sum from said adding devices to said printing devices, a series of pawls adapted to control the movement of said printing-hammer-tripping device, means for simultaneously throwing said pawls into position to control said printing-hammer-tripping device and transferring the sum from said adding devices to said printing devices, and appliances controlled by the transfer of the sum for releasing a suitable number of said pawls to allow them to return to their normal position and thereby determine the position of said printing-hammer-tripping device in taking the sum.

58. In an adding-machine, a series of printing-wheels corresponding to the numerical orders, a series of printing-hammers for said printing-wheels, a series of adding-wheels corresponding to said printing-wheels, an axially-moving wheel determining which of said printing and adding wheels shall be actuated, a carriage controlling the axial movement of said axially-moving wheel, a printing-hammer-tripping device for actuating a variable number of said printing-hammers, connections between said carriage and said printing-hammer-tripping device, whereby said printing-hammer-tripping device will be positioned

by the movement of said carriage, a series of pawls adapted to be thrown in the path of said carriage, a releasing device carried by each of said pawls for releasing the pawl next to it, means for rotating said adding-wheels to transfer the sum to said printing-wheels, and appliances for releasing said pawls by the transfer of the sum.

59. In an adding-machine, registering-wheels corresponding to the numerical orders, a series of adding-wheels corresponding to said registering-wheels, an axially-moving wheel determining which of said registering and adding wheels shall be actuated, a motor for rotating said axially-moving wheel, a sliding rack, a swinging frame carrying said sliding rack, a series of registering-keys adapted to swing said frame to bring said sliding rack into engagement with said motor, and means controlled by the movement of said registering-keys for determining the movement of said sliding rack.

60. In an adding-machine, registering-wheels corresponding to the numerical orders, a series of adding-wheels corresponding to said registering-wheels, a series of pawls for locking said registering and adding wheels, a carriage determining which of said registering and adding wheels shall be actuated, a motor, a sliding rack controlling said motor, a swinging frame carrying said sliding rack, means for moving said swinging frame to throw said rack into engagement with said motor, a releasing device carried by said carriage for actuating one of said pawls to release the registering and adding wheels of its order, and means for actuating said releasing device by the movement of said swinging frame.

61. In an adding-machine, registering-wheels corresponding to the numerical orders, adding-wheels corresponding to said registering-wheels, an axially-moving wheel determining which of said registering and adding wheels shall be actuated, a carriage controlling the axial movement of said axially-moving wheel, a motor mechanism for rotating said axially-moving wheel, a sliding rack for controlling said motor, a swinging frame carrying said sliding rack, a series of registering key-bars upon which rests one end of said swinging frame for throwing said rack into engagement with the motor mechanism, and means controlled by said registering key-bars for limiting the movement of said sliding rack.

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

WILLIAM W. HOPKINS. [L. S.]

Witnesses:

J. CLARENCE TAUSSIG,
A. C. FOWLER.