

(No Model.)

3 Sheets—Sheet 1.

C. S. LABOFISH.
CALCULATING MACHINE.

No. 544,360.

Patented Aug. 13, 1895.

Fig. 1.

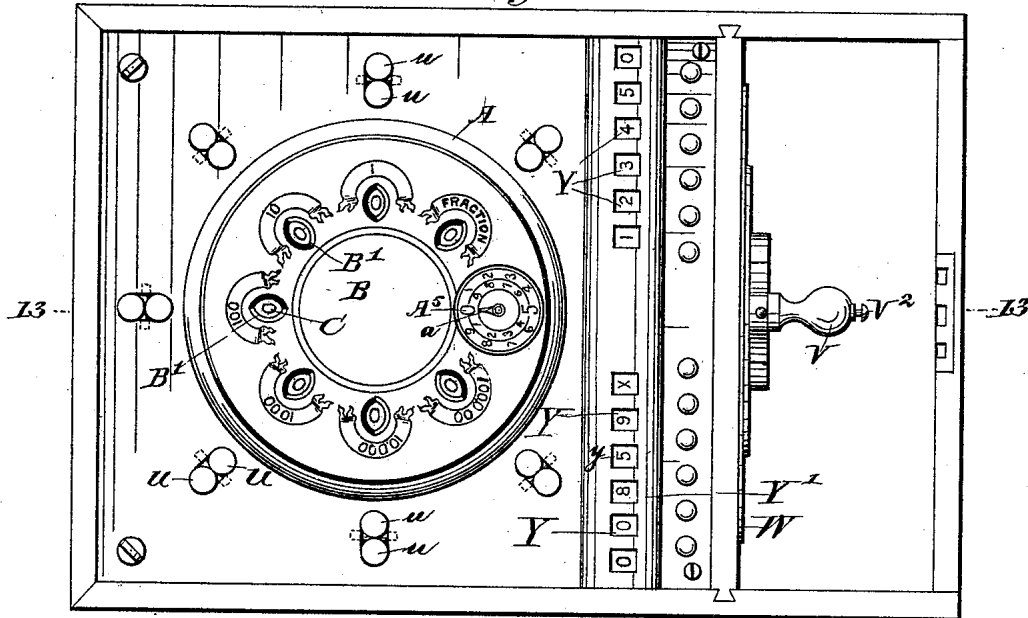
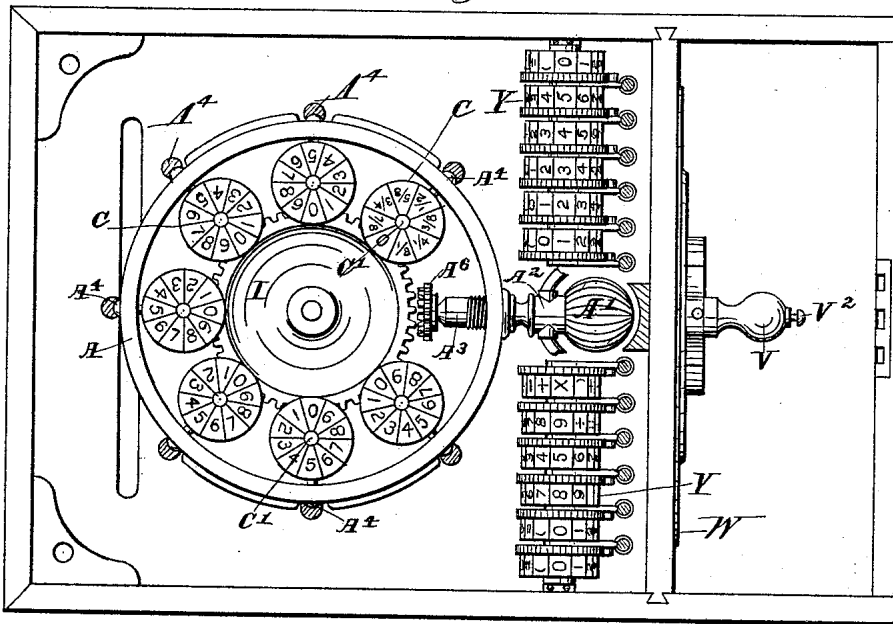


Fig. 2.



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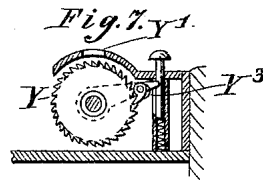
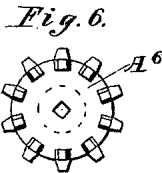
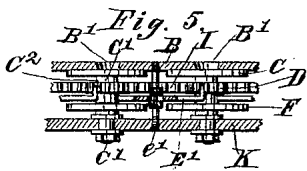
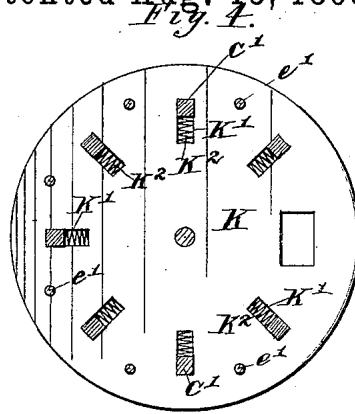
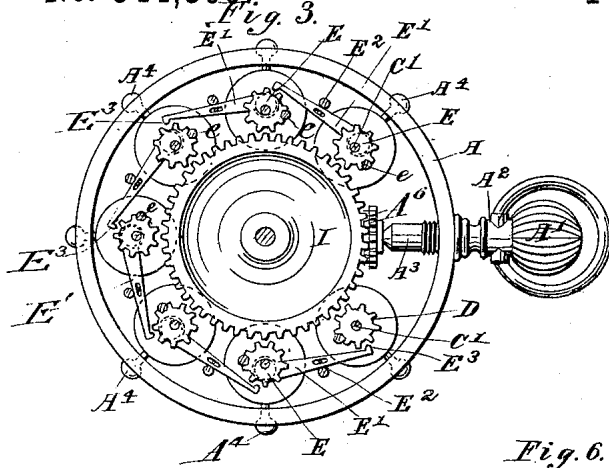


Fig. 1 R.

Fig. 10.

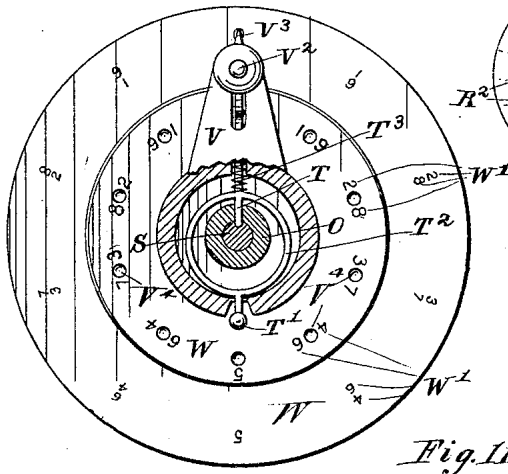
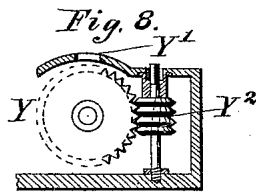
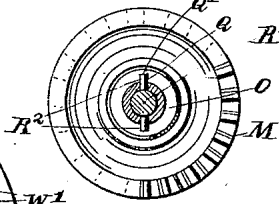
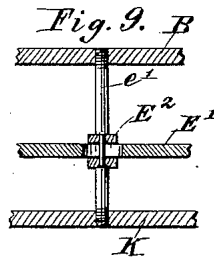
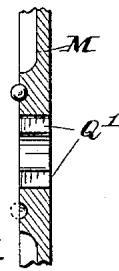


Fig. 11.



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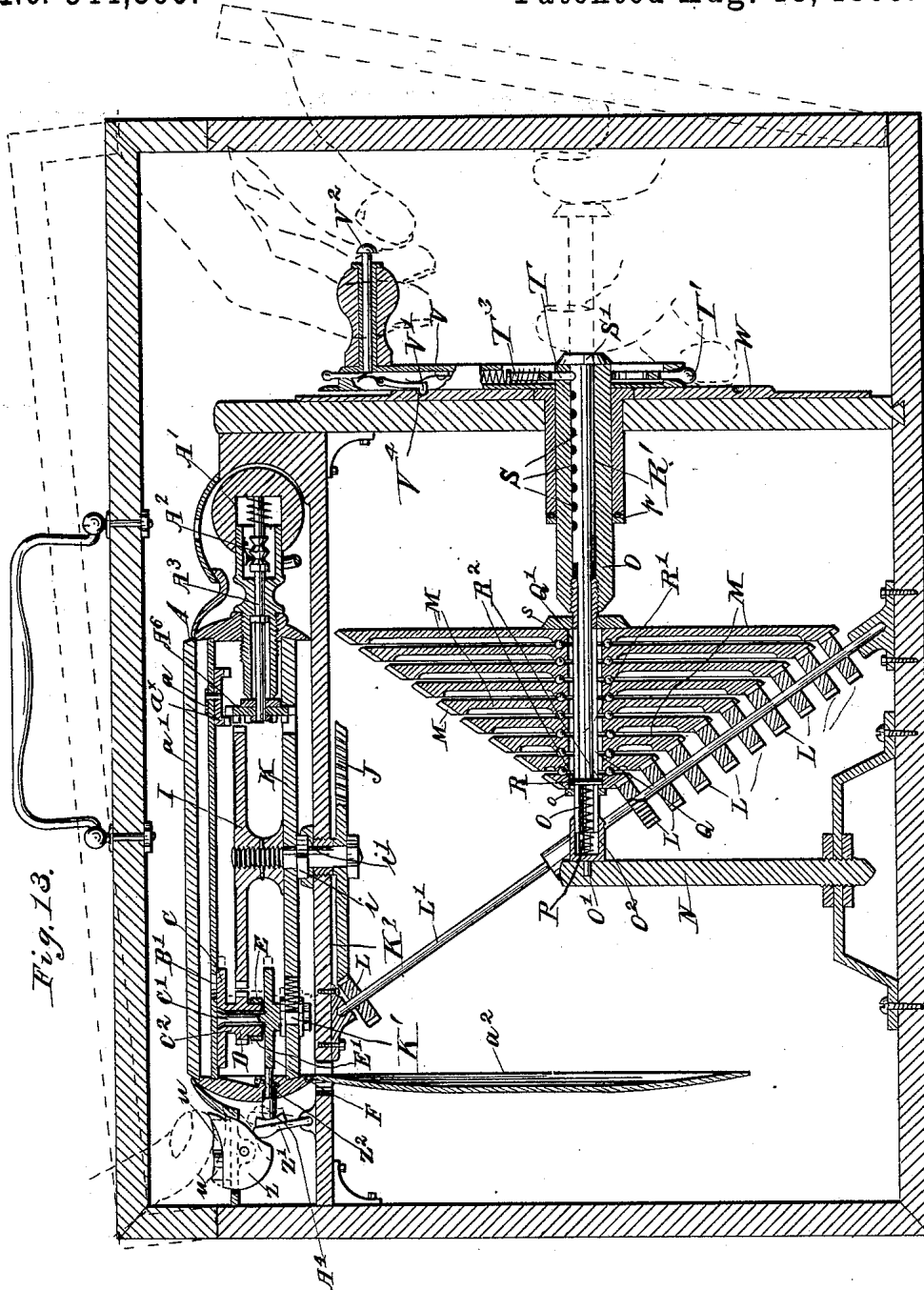


Fig. 13.

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UNITED STATES PATENT OFFICE.

CHARLES S. LABOFISH, OF TROY, NEW YORK.

CALCULATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 544,360, dated August 13, 1895.

Application filed May 14, 1894. Serial No. 511,074. (No model.)

To all whom it may concern:

Be it known that I, CHARLES S. LABOFISH, a citizen of the United States, residing in the city of Troy, State of New York, have invented a new and useful Improvement in Calculating-Machines, of which the following is a full and clear specification, enabling others skilled in the art to which it pertains to make the same.

My invention relates to calculating-machines such as are used to perform automatically arithmetical problems. Its object is to simplify the means used for such purposes and provide a sure means of extending the usefulness of such machines by so constructing the device that a portion may be used for problems in addition and subtraction and the complete device be extended in its usefulness so as to embrace the four primary principles in mathematics—addition, subtraction, multiplication, and division.

It consists in the device and parts illustrated in the accompanying drawings, in which like letters refer to like parts in each.

Figure 1 is a top view of the machine, showing dial-plate, guide-dial, and sight-holes. Fig. 2 is a section view of same with the dial-plate removed. Here the number-disks, problem-board, wheels, and push-buttons are seen. Fig. 3 is a top view in section of the case with dial and number-disks removed. This shows the actuating-wheels of the number-dials, the levers, eccentrics, and push-buttons. Fig. 4 is a bottom view of the bottom frame-plate, showing slots, square end of sliding-journals, and springs. Fig. 5 is a detail of part of the mechanism of the case. Fig. 6 is an enlarged view of the crown-pin and guide-dial wheel. Fig. 7 is an enlarged view of the operating mechanism of the problem-wheels. Fig. 8 is a modification of the same. Fig. 9 is an enlarged view of one of the posts which hold the case together, showing the means by which the lever is supported. Fig. 10 is a bottom view of one of the multiplying-wheels, showing the keyway and key and key-rod in section. Fig. 11 is a section of one of the multiplying-wheels, showing the ball-bearing. Fig. 12 is a face view of the crank-dial and spring-pin of notch-rod, notch-rod, and hollow spindle in section. Fig. 13 is a section

through 13 13 of Fig. 1, showing in section the entire mechanism of the machine.

The application herewith presented is intended as an improvement on my application, Serial No. 494,526, filed December 23, 1893, for calculating-machines.

In constructing my device a metal case, preferably resembling a watchcase, is provided for one part, and a box, preferably square, is provided for both parts combined. In this square box compartments are provided for the metal case containing the first part of my invention and for the mechanism of the second and the third part of this invention. The square case, in which the entire combination is placed, is shown in section in Fig. 13 and in top plan view in Fig. 1.

In Fig. 13 the dotted lines show the movement of parts of this invention to enable the operator to more easily operate the device. These parts (shown in dotted lines) are preferably hinged where the joints show. When closed and in position shown by square section lines, they are locked or otherwise properly secured. The square case may have a handle to admit of being carried about, as shown in Fig. 13.

The metal case A, containing the first part of my invention, is provided with a hinged face a^2 . In a bezel on this case is lodged a glass a' , such as is usual in watchcases, to enable the operator to have a clear view of the face of the device. It has also a stem A^2 with a spring-crown A' . The spring-crown has a pin A^3 running through it which rotates with the crown A' . Around the perimeter of the case are located a number of push-buttons A^4 . These push-buttons operate through the case upon the mechanism within, as will be explained farther on. Upon the face of the dial is located a guide-dial A^5 , with a pointer a fixed over it. This pointer identifies the number desired when the device is operated, as will be shown further on. The numbers on the guide-dial are arranged in two circles in reverse order, so that they may be applied to use in addition or subtraction without resetting the machine. Upon the dial B are circumferentially arranged the elliptical-shaped sight-holes B' . To each one of these holes is assigned a different numerical quantity or

value—as, for instance, in the drawings, Fig. 1, one of the holes is identified by the word “Fraction.” This is the lowest denomination. The next is marked 1. The next is marked 10, the next 100, and in this manner they are sequentially numbered up to 100,000, and may be carried up further by increasing the number of the dials and holes.

The sight-holes B' are made preferably elliptical, so that a full-sized number may be seen at each one of them. They are for the purpose of readily observing the numbers or aggregate of numbers wanted, all other numbers on the number-dials being occluded.

I have, by preference, adopted in the drawings the decimal system of enumeration as most convenient; but it is obvious that this is mere selection.

Directly under the sight-holes, circumferentially arranged around the main driving-wheel, are the number-disks C, as shown in Fig. 2. These disks are all of the same size and have each a zero-mark, and from one to nine marked upon them. They are adapted to rotate under the dial-plate, each one directly under a different hole B' appropriated to that special dial, and they have also a radial movement, which will be spoken of farther on. In their normal condition they do not form a contact with the central wheel. These number-disks C have a shaft C' passing loosely through them centrally, so that they may rotate around it. They have also fixed to them, on their under side, a hollow shaft C². This shaft sleeves over C' and is adapted to rotate about it. Fixed to the same hollow shaft C² as the number-disks C, and just under them, is a toothed or gear wheel D. One of these is associated with each of the number-disks C. Each wheel has the same number of teeth on it as there are numbers on the disk. These toothed wheels are the means by which the number-disks are rotated, as they gear in the teeth of the central driving-wheel I and are impelled by it. Directly under the gear-wheel D that actuates the number-disks, and upon the same pinion as both number-disks and cog-wheel, is fixed an eccentric E, (see Fig. 3,) and upon this eccentric is journaled the lever E'. This lever is loosely hinged centrally in a notch in the plate-post E² for the purpose of support, and at the same time allowing it to have a free movement. Upon the end of the lever is a pawl E³, which is adapted to engage in the cogs of the next adjacent actuating-wheel. A detent e (see Fig. 3) holds the actuating-wheel in position to be rotated. The operation of this lever is so arranged that upon one complete rotation of the number-dial, to the shaft of which the eccentric E is journaled, the pawl E³ is raised by the movement of the lever E', carried forward (or backward) one tooth, and falls into the next tooth. In this manner one complete rotation of one of the dials with numbers on it effects one unit of rotation in the dial actuated by the lever and pawl. Thus it will be

seen that if the cog-wheels, fixed on the same shafts as the eccentrics, have ten cogs each, one rotation of one of these wheels will, through the lever E', cause the wheel next adjoining of higher order in whose cogs the pawl operates to make one-tenth of a rotation. In this manner the addition of numbers is carried over and maintained automatically. If the rotation of the number-dials be reversed, subtraction of numbers is the result.

The hollow shaft C², upon which the number-disks C, the actuating-wheels D, and the eccentrics E are fixed, are arbored over the shaft C'. This shaft passes through the number-disk loosely and through the hollow shaft C², and has its end, which is square, lodged in the slots K' of the bottom frame-plate K. (See Figs. 4 and 13.) Fixed on the shaft C' is the disk F, on the edge of which the push-button A⁴ acts. The series of slots K' on the bottom plate are radially arranged, and into these slots the square end of the shaft C' lodges. A washer on the outside and one on the inside of bottom plate K, fixed on the shaft C', holds it in position, and as these washers are larger than the slots and adjusted loosely to the same they permit the shaft to slide radially in the slot under pressure induced by the push-button. In these same slots K' the spring K² is lodged. The posts e' are for the purpose of holding the dial-plate B and bottom plate K in position.

The central driving-wheel I is journaled in the bottom frame-plate centrally. The shaft of this wheel I has upon it a projecting head *z*, preferably square in shape. (See Fig. 13.) This head *z* is very pronounced and is the means of connection between the two main parts of the device.

The central wheel I is toothed, its teeth corresponding with the cogs on the actuating-wheels D of the number-disks C in pitch, so that when the central wheel impulses these number-disk wheels the same number of cogs on the central wheel actuates a like number of cogs on the number-disk wheels, and thus the number of cogs on the number-disk wheels being ten that number of cogs on the central wheel causes the number-disk to make a complete rotation.

The impulse to the central wheel is transmitted to it by a pin A³ located in the crown of the case A. This pin rotates in the crown A'. It has formed on its end a wheel A⁶, having two gears—one a face-gearing to gear with and turn the driving-wheel I, the other an edge gear to gear with and operate the wheel a^x, that moves the guide-dial hand a. The crown-pin is arranged with a series of notches a³, into which a spring a⁴ operates. By means of this spring the pin is held in position when the wheel A⁶ is thrown into or out of gear with the power-wheel I.

The pins of the push-buttons A⁴ on the outside of the case are adapted to come in contact with the disks F. When any one of them is pressed it exerts a pressure on the rim of

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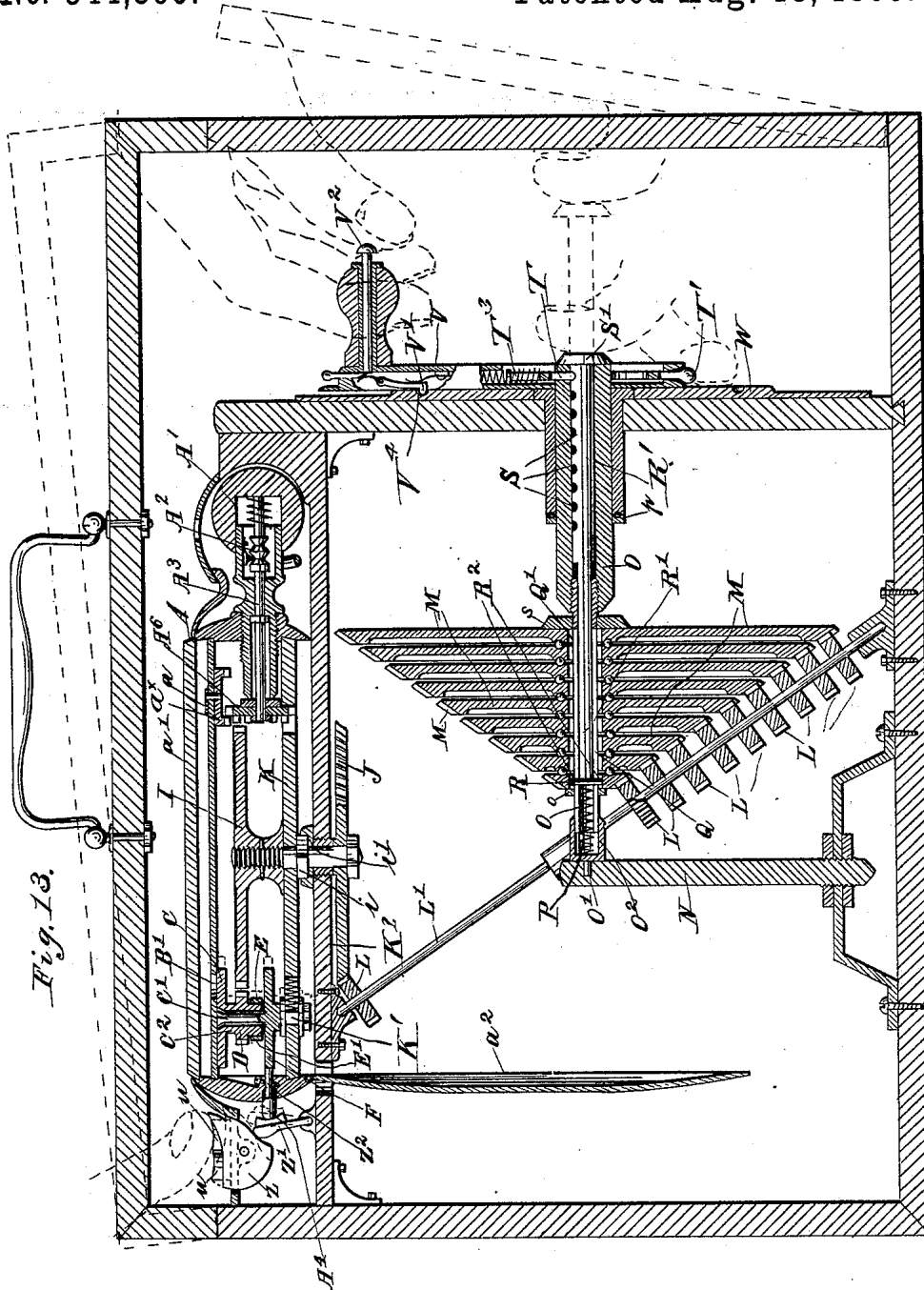


Fig. 13.

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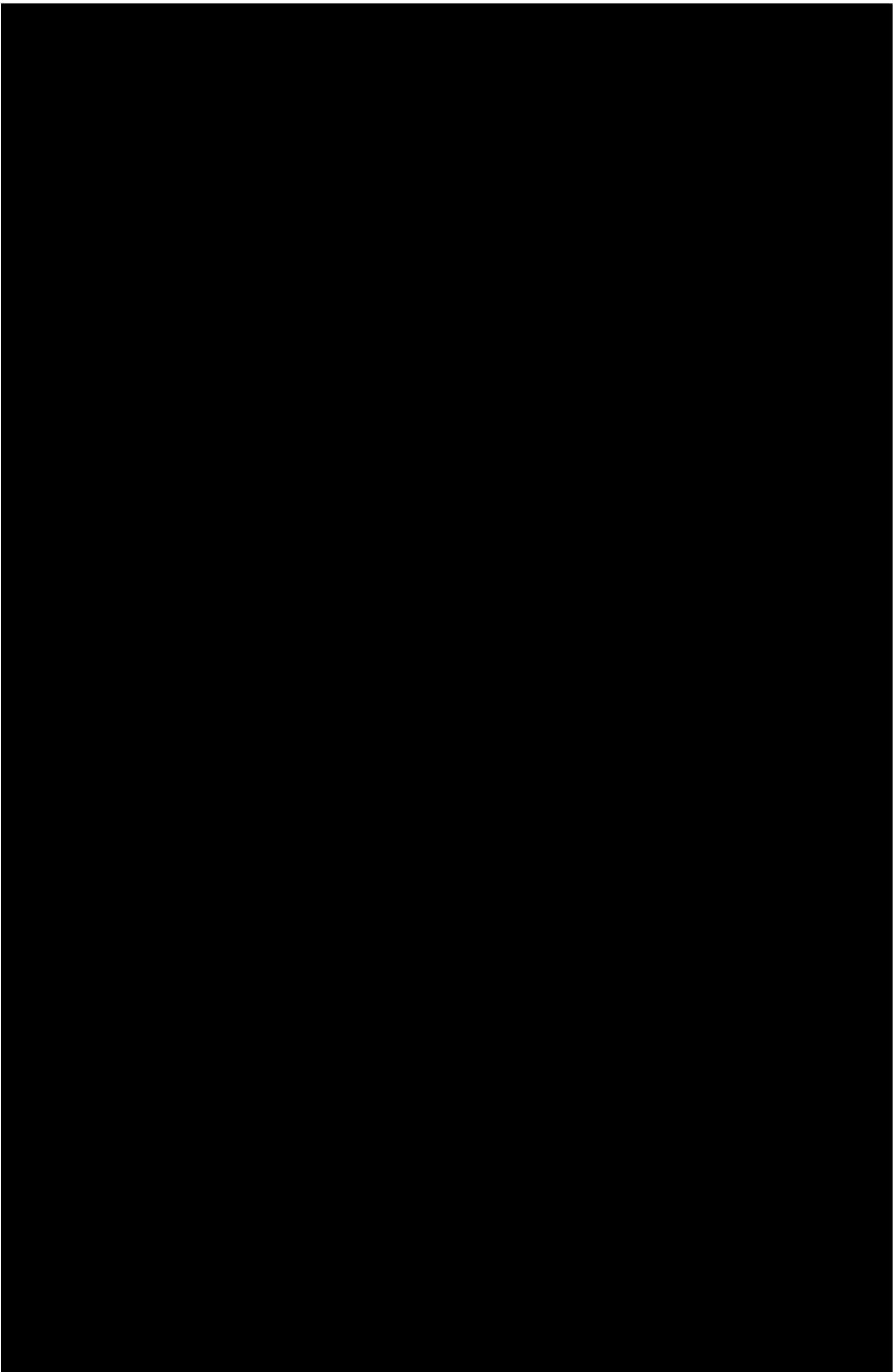
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the disk F, which causes the square end of the shaft C', lodged in the slot K', to slide radially and collapse the spring K². The number-disk, cog-wheel, and eccentric, which are arbored on the hollow shaft C², which sleeves over C', are thus moved radially at the same time and by the same means. This causes the cog-wheel D, which actuates the number-disk C, to be thrown in gear with the driving-wheel I. Here it is held by continuing the pressure on the push-button A⁴. While holding it in this manner, the crown-pin A³ is turned until the number desired is pointed to by the pointer *a* on the guide-dial A⁵. This movement of the crown-pin also rotates the central wheel I and the number-dial hand *a* with the actuating-wheel A⁶, of which it is in gear, and the same number will now appear at the sight-hole over the number-disk, which is being held in gear by the pressure on the push-button, as is pointed to by the hand on the dial. The push-button now being released and the dial-hand returned to zero, the desired number will remain in sight at the sight-hole to be added to or subtracted from, as may be required. This constitutes the first part of my invention.

The head *z*, formed outside of the lower frame-plate on the shaft of the driving-wheel, is very pronounced and preferably square. This head *z* is one part of the coupling that unites the two most essential parts of the device. The other part of the coupling is a socket *z'* formed on the end of the shaft of the bevel gear-wheel J, which gears into the bevel gear-wheel L, axled on the transversely-placed shaft L'. This shaft is fixed in one of the compartments of the machine-box with its terminals journaled preferably in jeweled bearings upon the sides of the box. It has axled upon it a number of gear-wheels L, all of which correspond in the number of cogs with one another and with the number of cogs on the actuating-wheels on the number-dial shaft, as they bear a direct relation to each other. These wheels L gear with a series of multiplying-wheels M, the movement of the two being coincident. These wheels M are adapted to be both multipliers and dividers. They are arranged in such a manner that the smallest one corresponds in size and number of cogs with the wheels L on the shaft L'. The next has twice the number of cogs, the third three times, and in this ratio they increase in diameter and cogs up to the last or largest. The object in thus increasing number of cogs in exact ratio is to admit of any one of the cone-shaped set of wheels M rotating the shaft-wheels L a greater or less number of times. For instance, if it is required to rotate the shaft-wheels L five times, the fifth wheel from the bottom of the cone is actuated, and this having five times as many cogs as the wheels on the shaft L', that shaft is caused to rotate five times with one rotation of the larger wheel. Both the multipliers M and the wheels L are adapted

to rotate from left to right or from right to left, as required in the solution of problems in multiplication or division.

A bracket N is secured to the side of the case in any desirable manner as a means to help sustain the hollow spindle O. This bracket has a socket in it adapted for this purpose. In this is journaled the pin O', upon which the spindle O rotates. One end of this spindle is fitted with a screw-tapped cap O², within which is lodged one end of a spring P. The other part of the spring passes up the center of the spindle and abuts against the key R. This key is fixed on a rod R', which has a diameter smaller than the interior of the spindle O. It has two radial arms R². (See Figs. 13 and 10.) These arms project through a keyway or slot Q in the walls of the spindle O and are adapted to slide in the same. The key R is attached to the end of the rod R', which rests loosely in the center of the spindle O. The spring P is adapted to actuate this rod R' when so desired. Upon the other end of this rod are the notches S'. A keyway Q' is also formed in the wheels M, and in this keyway the key R, after it has passed through the walls of the spindle O, engages and moves the different wheels of the cone-shaped set.

The wheels M are held in position upon the spindle O, upon which they are strung through a central perforation by the disks *s* so loosely to admit of their being individually turned by the key R when said key is in position. These wheels M are always in gear with the wheels L, which they actuate. At points where friction is greatest ball-bearings are provided.

Within an enlargement of one end of the hollow spindle O is lodged the notched part of the rod R', which is an enlargement of the rod R'. It has a bolt-shaped head S', and on one side a series of notches S corresponding in number with the number of wheels strung upon the rod R'. A spring-pin T is arranged to lodge in these notches and securely hold the pin T while the device is operated. This spring-pin is best shown in Figs. 12 and 13. A button T' on one side is attached to a ring T². On the opposite side of the ring is a lug T³, upon which a helical spring is strung, which holds the pin T in place. When the button T' is pressed the spring T³ is collapsed, the pin T comes out of the notch in which it was lodged, and the spring P causes the rod R' to fly up out of the hollow spindle O. The particular notch S desired is selected, the rod R' pressed down into the spindle O as far as this notch, and the button T' released. The catch-pin T by the resiliency of the spring is forced at once to engage in the notch firmly, and the key R on the other end of rod, which has been seated in the corresponding keyway in one of the wheels is also by this movement placed in a position to rotate that particular wheel.

The crank V, by which motion is imparted

value—as, for instance, in the drawings, Fig. 1, one of the holes is identified by the word “Fraction.” This is the lowest denomination. The next is marked 1. The next is marked 10, the next 100, and in this manner they are sequentially numbered up to 100,000, and may be carried up further by increasing the number of the dials and holes.

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The central driving-wheel I is journaled in the bottom frame-plate centrally. The shaft of this wheel I has upon it a projecting head *i*, preferably square in shape. (See Fig. 13.) This head *i* is very pronounced and is the means of connection between the two main parts of the device.

The central wheel I is toothed, its teeth corresponding with the cogs on the actuating-wheels D of the number-disks C in pitch, so that when the central wheel impulses these number-disk wheels the same number of cogs on the central wheel actuates a like number of cogs on the number-disk wheels, and thus the number of cogs on the number-disk wheels being ten that number of cogs on the central wheel causes the number-disk to make a complete rotation.

The impulse to the central wheel is transmitted to it by a pin A³ located in the crown of the case A. This pin rotates in the crown A'. It has formed on its end a wheel A⁶, having two gears—one a face-gearing to gear with and turn the driving-wheel I, the other an edge gear to gear with and operate the wheel a^x, that moves the guide-dial hand a. The crown-pin is arranged with a series of notches a³, into which a spring a⁴ operates. By means of this spring the pin is held in position when the wheel A⁶ is thrown into or out of gear with the power-wheel I.

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