No. 663,890. Patented Dec. 18, 1900.

H. J. HANSON.

CALCULATING MACHINE.

(Application filed June 4, 1900.)

(No Model.) 4 Sheets—Sheet 1.

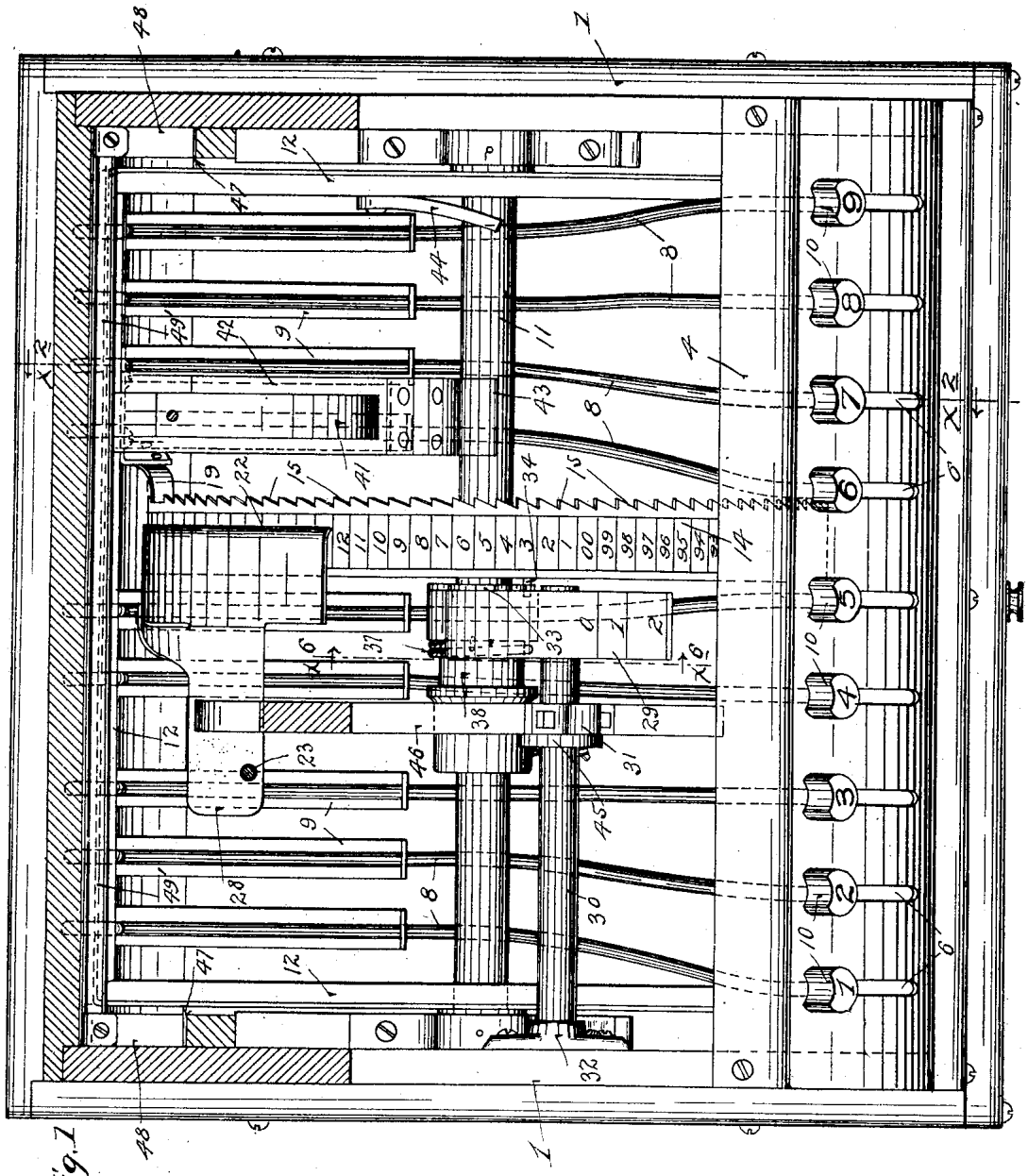

Fig. 1.

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Fig. 2.

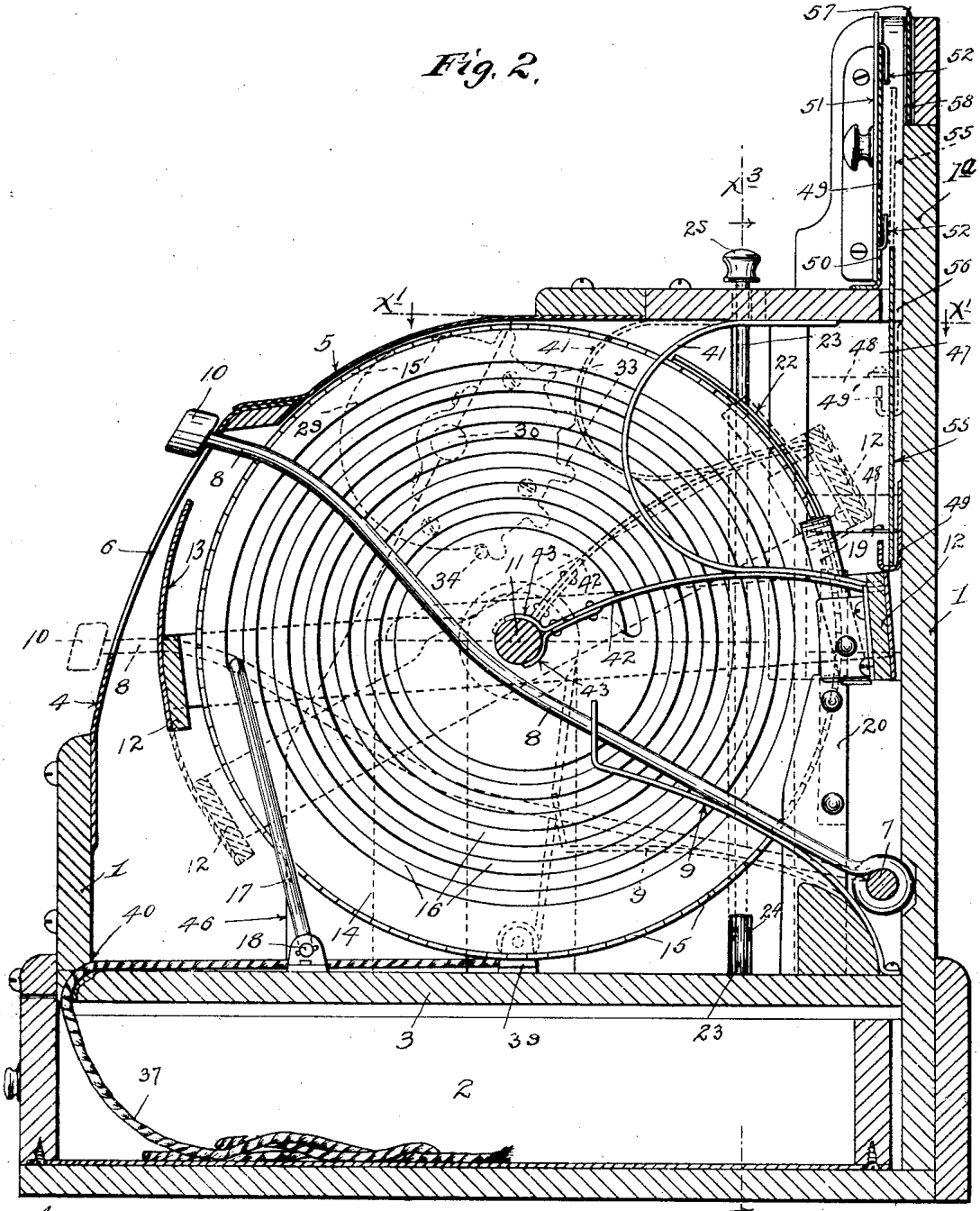

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Fig. 3.

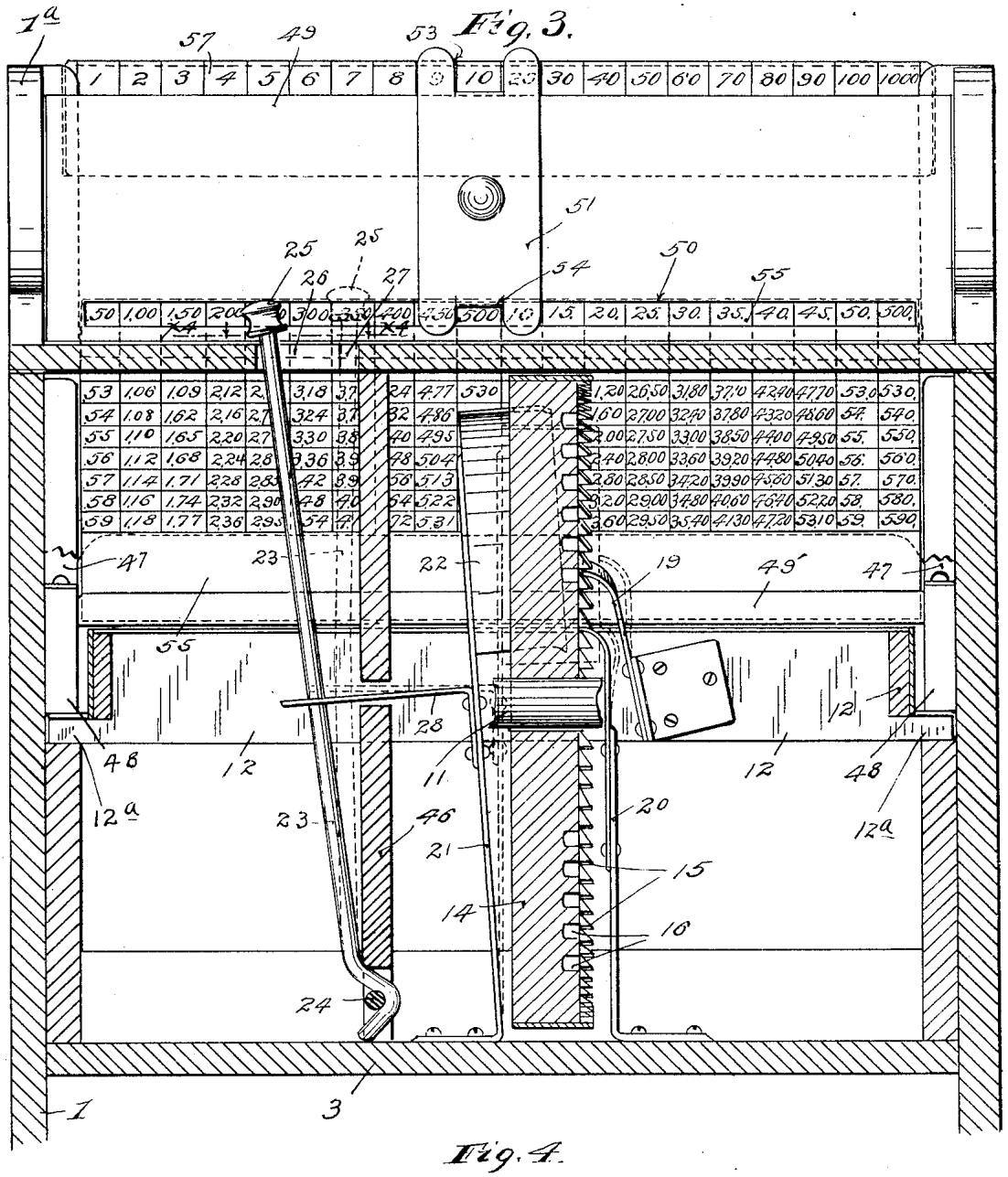
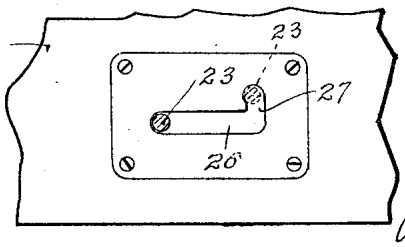


Fig. 4.



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(No Model.) 4 Sheets—Sheet 4.

Fig. 5.

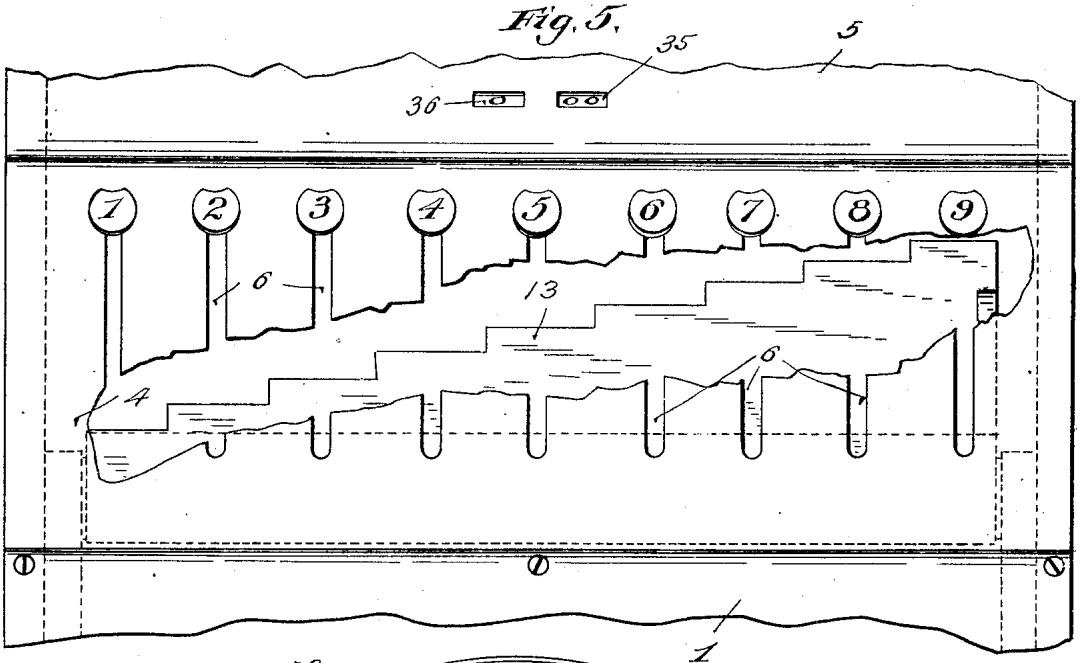


Fig. 6.

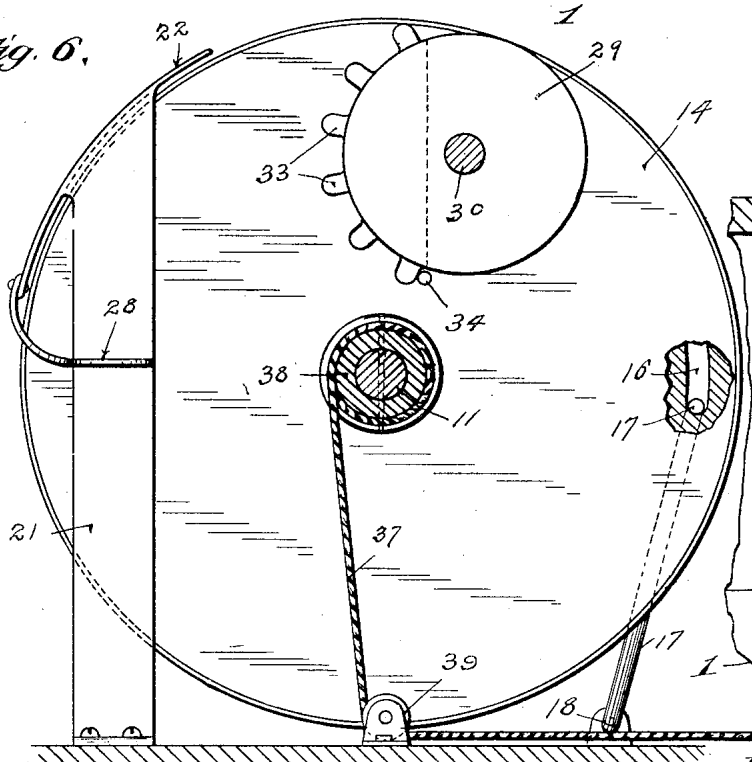
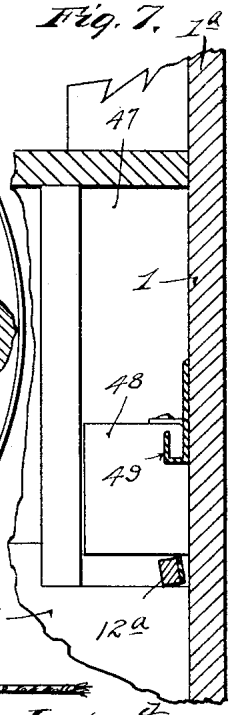


Fig. 7.



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UNITED STATES PATENT OFFICE.

HANS J. HANSON, OF HANSONVILLE, MINNESOTA.

CALCULATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 663,890, dated December 18, 1900.

Application filed June 4, 1900. Serial No. 18,979. (No model.)

To all whom it may concern:

Be it known that I, HANS J. HANSON, a citizen of the United States, residing at Hansonville, in the county of Lincoln and State of Minnesota, have invented certain new and useful Improvements in Calculating-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to calculating-machines, and has for its especial object to provide such a machine of simple construction and small cost and by the use of which long columns of figures may be accurately added and other computations made.

To the above ends the invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a view, partly in plan and partly in horizontal section, on the line $x' x'$ of Fig. 2, showing my improved calculating-machine in its preferred form. Fig. 2 is a vertical section approximately on the line $x^2 x^2$ of Fig. 1. Fig. 3 is a vertical section taken principally on the line $x^3 x^3$ of Fig. 2, but with some parts shown as cut by an offset plane. Fig. 4 is a detail in section approximately on the line $x^4 x^4$ of Fig. 3. Fig. 5 is a front elevation of the keyboard portion of the machine, some parts being broken away. Fig. 6 is a vertical section approximately on the line $x^6 x^6$ of Fig. 1 looking toward the right, some parts being broken away and others removed; and Fig. 7 is a detail view of a portion of one side of the case.

The numeral 1 indicates the case of the machine, the same, as shown, having a lower compartment in which a drawer 2 is mounted to work below the false bottom 3 of the said case. The upper and outer portion of the case is preferably formed by sheet-metal sections 4 and 5, the latter of which is preferably detachable for a purpose which will hereinafter appear. The section 4 is provided with a series of slots 6, spaced apart laterally, as best shown in Figs. 2 and 5. There are nine of these slots 6 and the purpose of the same will hereinafter appear.

Suitably mounted at their inner ends on a transverse pivot-rod 7 is a series of key-rods 8, nine in number, the free outer ends of which work one in each of the slots 6 of the plate 4. These key-rods 8 are subject to springs 9, which yieldingly hold the same upward, and at their outer ends they are provided with finger-pieces or heads 10, marked consecutively from the left to the right with the numerals or digits "1" to "9," inclusive.

Mounted for pivotal or oscillatory movement within the case 1 and on a horizontally-extended shaft 11 is a lever 12, preferably of the rectangular form shown. The lever or frame 12 is adapted to be moved from the position indicated by full lines into the position indicated by dotted lines in Fig. 2, and at its forward edge it is provided with a stepped plate 13, preferably bent to form the segment of a cylinder. Said plate 13 has nine steps, varying in height from the left toward the right and standing one under each of the key-rods 8, as best shown in Fig. 5.

Secured on the intermediate portion of the rotary shaft 11 is a large "units-wheel" 14, the periphery of which is subdivided into one hundred equal parts and marked consecutively with the numerals "1" to "100." It also has preferably at its periphery a ratchet-flange 15, with one hundred teeth. Furthermore, in one face the wheel 14 is provided with a spiral profile groove or channel 16, in which the laterally-turned free end of a stop-rod 17, pivoted at its lower end at 18, is mounted to work. This profile groove 16 permits several complete rotations—as illustrated about five and a half rotations of the said wheel 14.

The oscillating lever or frame 12 has a spring-pawl 19, the free end of which normally engages with the teeth of the ratchet-flange 15. A spring retaining-pawl 20, shown as supported at its lower end by the false bottom 3, also engages the said ratchet-teeth. Both pawls 19 and 20 are adapted to be thrown and held in inoperative positions, so as permit the return movement of the wheel 14 by

means of a trip, preferably constructed as follows:

21 indicates a spring-arm secured at its lower end to the false bottom 3 and provided at its free upper end with a segmental flange or head 22, which by movement toward the right is adapted to engage the free ends of the pawls 19 and 20 and to hold the same in inoperative positions.

23 indicates an operating-rod which is pivoted at its lower end, as shown, on a rod 24 and is provided at its upper end with a finger-piece or head 25. The upper end of said rod 23 works through a slot 26, cut in the case 1 and provided at one end with an offset notch 27. The rod 23 is connected to the spring-arm 21 by a connecting link or strap 28. The spring tension of the arm 21 tends to hold the parts in their normal positions, (indicated by full lines in Fig. 3.) However, by moving the rod and the parts operated thereby into the dotted-line positions indicated in Fig. 3 and then moving the free end of said rod 23 into the notch or extremity 27 of the slot 26 the pawls 19 and 20 are locked in released or inoperative positions.

For coöperation with the so-called "units-wheel" 14 is a carrying-wheel 29, which, as shown, is mounted in close proximity to the said wheel 14 by means of a shaft 30, journaled in suitable bearings 31 32 on the case 1. On its face or periphery the carrying-wheel 29 is marked with the digits "0, 1, 2, 3, 4, 5," and it is provided with several teeth—as shown six teeth 33. The units-wheel 14 is provided with a pin or projection 34, which at each complete rotation of said wheel engages one of the teeth of the wheel 29 and moves said latter wheel one step in advance. Hence it will be understood that the hundreds are carried from the units-wheel 14 onto the carrying-wheel 29. The return movement of the units-wheel 14 will return the carrying-wheel to its normal position. In the normal positions of the two wheels 14 and 29 the zero-marks of the said two wheels register, respectively, with alined perforations or slots 35 and 36 cut in the detachable case-section 5, as best shown in Fig. 5.

To readily return the wheels 14 and 29 to their normal positions after a column of figures has been added, a flexible cord 37 is applied to a hub or drum portion 38 of said units-wheel 14 and is extended over a guide-sheave 39, suitably mounted on the false bottom 3 of the case 1. Preferably the cord 37 is then passed through a suitable perforation 40 in the false bottom 3 and is dropped into the drawer 2, so that access thereto is easily afforded by drawing out the said drawer.

The oscillating lever or frame 12 is normally yieldingly held, as indicated by full lines in Fig. 2, by means of a leaf-spring 41, one end of which is applied to the top of the case 1 and the other end of which, as shown, is applied to the rear or inner end of the said frame 12. The spring 41 is provided with a branch spring portion 42, the free end of which is pronged at 43 and embraces the shaft 11 of the units-wheel 14. With this construction the upward movement of the inner end of the frame or lever 12 compresses the spring 41, and the downward depression of the said spring tends to straighten out the spring-section 42, and thus to force the pronged end 43 more tightly against the shaft 11. This puts the said shaft under frictional tension to stop when the said frame or lever 12 is brought to a stop, and thus tends to prevent the units-wheel from being thrown too far under the action of momentum. Other friction devices may also be provided—such, for instance, as the leather clip 44, which is secured on the frame or lever 12 and engages the shaft 11. A friction-washer 45 is also shown as applied to the shaft 30 of the carrying-wheel 29 for frictional engagement with a partition 46 within the case 1.

The operation of the mechanism so far described is substantially as follows, and it may be here stated that this device is especially adapted for adding very long columns of quite small sums—such, for instance, as would usually be found in credit-books: In adding the first column of figures the keys corresponding to the successive numerals are depressed and the total amount is registered on the units-wheel, or if the sum of the column exceed one hundred it will appear recorded on the two wheels 14 and 29. To illustrate, suppose the first column of figures amounts to "255." The numeral "2," indicating hundreds, will appear through the slot or sight-opening 36, while "55," in line therewith, will appear through the slot or sight-opening 35. Hence the numeral "5" would be put down in the units-column and "25" would be carried or added into the "tens" column, and so on until the whole sum is secured. Thus it will be seen that if the proper keys are depressed the addition of a column must be correctly made and indicated. By successively adding the units, tens, and hundreds columns, and so on, in the manner above indicated columns of figures consisting of sums of any length may be easily and correctly added even by a person having but a very slight mathematical training. It will of course be understood that the units-wheel 14 should be returned to normal position and started anew for the addition of each successive column. The spiral groove or channel 16 limits the number of possible rotations of the units-wheel to approximately five and a half; but this slot may be varied within any practical limits desired. The engagement of the extremities of the said channel with the stop-arm 17 limits in the one case the normal position of the units-wheel and in the other its extreme position away from normal. The normal position of the said units-wheel is indicated in Fig. 2.

By means of part of the mechanism already described and additional devices immediately to be described various other computations than the additions above indicated may be performed on this machine. To this end the sides of the case 1 are provided with vertical channels or guides 47, in which vertically-movable blocks 48 are mounted to move. The blocks 48 are connected to the ends of a transversely-extended channel-bar 49′, and the oscillating lever or frame 12 is provided at its inner end with oppositely-projected lugs or fingers 12^a, which underlie the said blocks 48 and control the vertical movements of said blocks 48 and channel 49′. The back of the case 1 is extended upward, as shown at 1^a, and spaced apart from but just forward of this portion 1^a is a thin guide plate or rail 49, provided, preferably, with a slot 50. An indicator-head 51 is mounted to slide transversely over the guide-plate 49, being shown as provided with overturned lips 52, which hold it in place on the said plate 49. At its upper and lower ends said head 51 is provided, respectively, with notches 53 and 54 for a purpose which will presently appear.

The numeral 55 indicates a card or chart which is graduated or marked on its face, as presently noted, and when in operative position is supported by the channel bar or piece 49′, which receives vertical movement with the sliding heads 48. The card or chart 55 is adapted to be dropped into working position, as just indicated, by passing it between the section 1^a of the case 1 and the guide-plate 49 and through a suitable slot 56 in the top of the case.

The numeral 57 indicates a so-called "quantity-strip," which is subdivided and marked lengthwise and transversely of the machine with numerals indicating certain numbers of pounds, bushels, yards, or other quantities of measure. This quantity-strip is preferably loosely supported in a suitable seat 58, formed in the upper portion of the case extension 1^a, as best shown in Figs. 2 and 3.

The chart or card 55 is lined longitudinally to correspond to the number of different positions which the lifting lever or frame 12 may be given under the actions of the various actuating-keys 8, which in the machine described are nine in number. We will assume that the particular chart 55 is graduated or marked to indicate the selling price or sum which should be received for wheat or other produce in quantities corresponding to the numbers on the quantity-strip 57 at a selling price varying from fifty to fifty-nine cents per bushel. More specifically stated, the top line of the chart, which is normally clearly seen through the slot 50 of the guide-plate 49, is marked just below the numerals on the quantity-strip 57 to indicate the values of the different quantities or numbers of bushels of grain or produce at fifty cents per bushel. Hence by moving the indicator-head 51 so that its upper notch 53 displays the figure "10" of the quantity-strip its lower notch 54 displays the "$5" mark on the chart 55. This of course indicates that ten bushels of grain at fifty cents per bushel are worth five dollars.

It is not of course necessary to operate the keys 8 in calculating the value of any amount of grain or produce at fifty cents per bushel; but for any other price varying from fifty-one to fifty-nine, inclusive, cents per bushel the said keys must be depressed, so as to raise the chart 55 as an entirety. For instance, to determine the value of seventy bushels of wheat at fifty-nine cents per bushel the head 51 should be moved so that its upper notch 53 displays the figure "70" on the quantity-strip 57 and then the actuating-key marked with the numeral "9" should be depressed to its limit. This will raise the chart 55 upward to its limit, so that the amount "$41.30" is displayed in the notch 54 of the head 51.

From the above statements the principle of graduation or arrangement of the markings of the chart 55 will be understood.

In practice I propose to provide a series or plurality of quantity-strips and charts marked in various denominations for performing various calculations. For instance, I may provide interest tables, subtraction and multiplication tables, tables for determining prices or values of lumber, &c.; but the principle of construction and operation will be the same throughout all of such devices, and hence I do not deem it necessary for the purposes of this case to carry out specific illustrations thereof further than as above given.

The machine above described is of course capable of many modifications within the scope of my invention.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with a units-registering wheel marked from "1" to "100" and capable of several rotations, of a spiral guide carried by said wheel, a stop coöperating with said spiral guide and a differential feed device for said recording-wheel, substantially as described.

2. The combination with a units-registering wheel marked from "1" to "100" and provided with a spiral profile groove, of a pivoted stop working in said spiral groove to limit the movements of said wheel, and a differential feed device for the said wheel, substantially as described.

3. The combination with a registering-wheel, of a friction device for preventing over-movements of said registering-wheel, of a differential feed device for said registering-wheel, and a device whereby the movement of said feed device increases the friction of said friction device, substantially as described.

4. The combination with the units-registering wheel 14 having the ratchet-teeth 15, of the oscillating frame 12 with spring-pawl 19,

the retaining-pawl 20, a differential feed device operating said lever 12, and a releasing device comprising the arm 21 with segmental flange 22, the slot 26, 27, in the machine-case, and the rod 23 working through said slot 26, 27, and connected to said arm 21, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HANS J. HANSON.

Witnesses:
J. G. LUND,
GUSTAV ERICKSON.