

S. R. STALLARD.
CALCULATING MACHINE.

No. 518,284.

Patented Apr. 17, 1894.

FIG. 1.

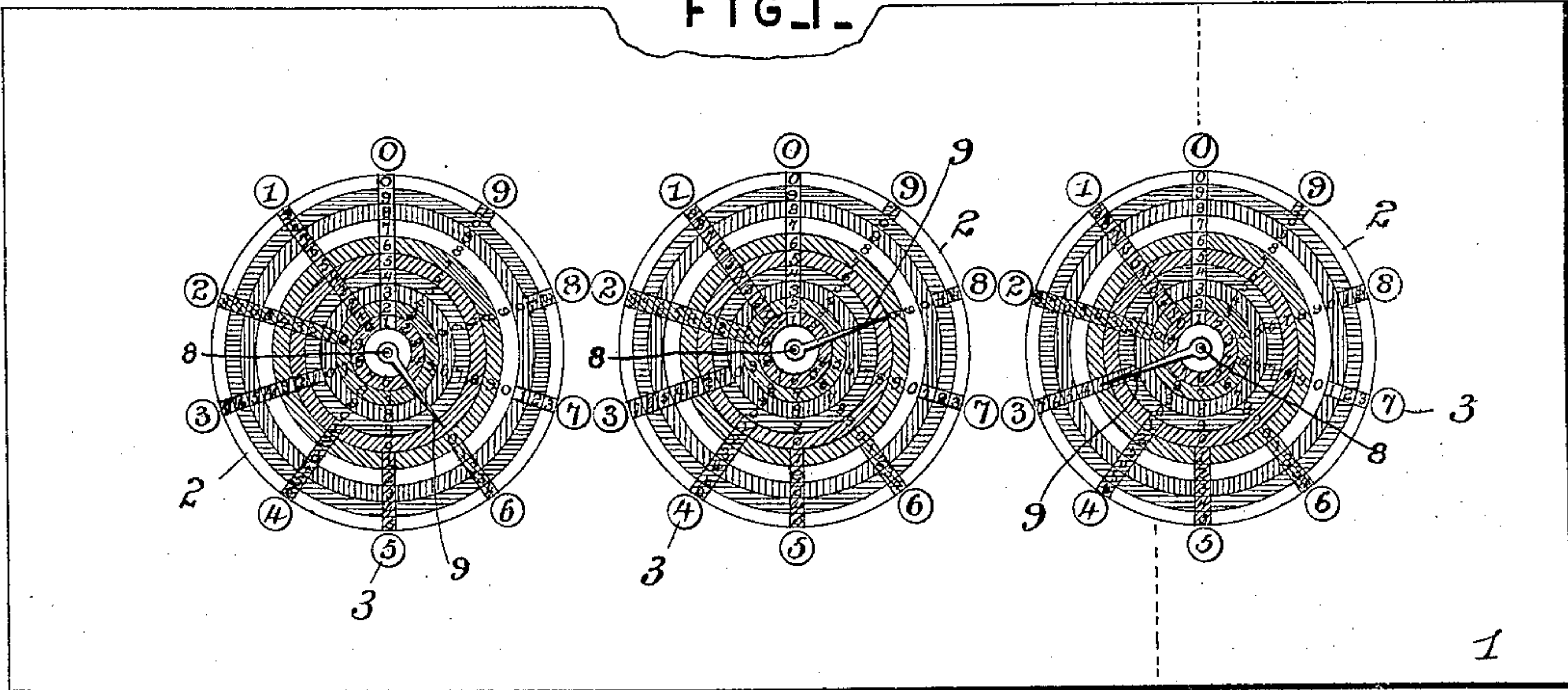


FIG. 2.

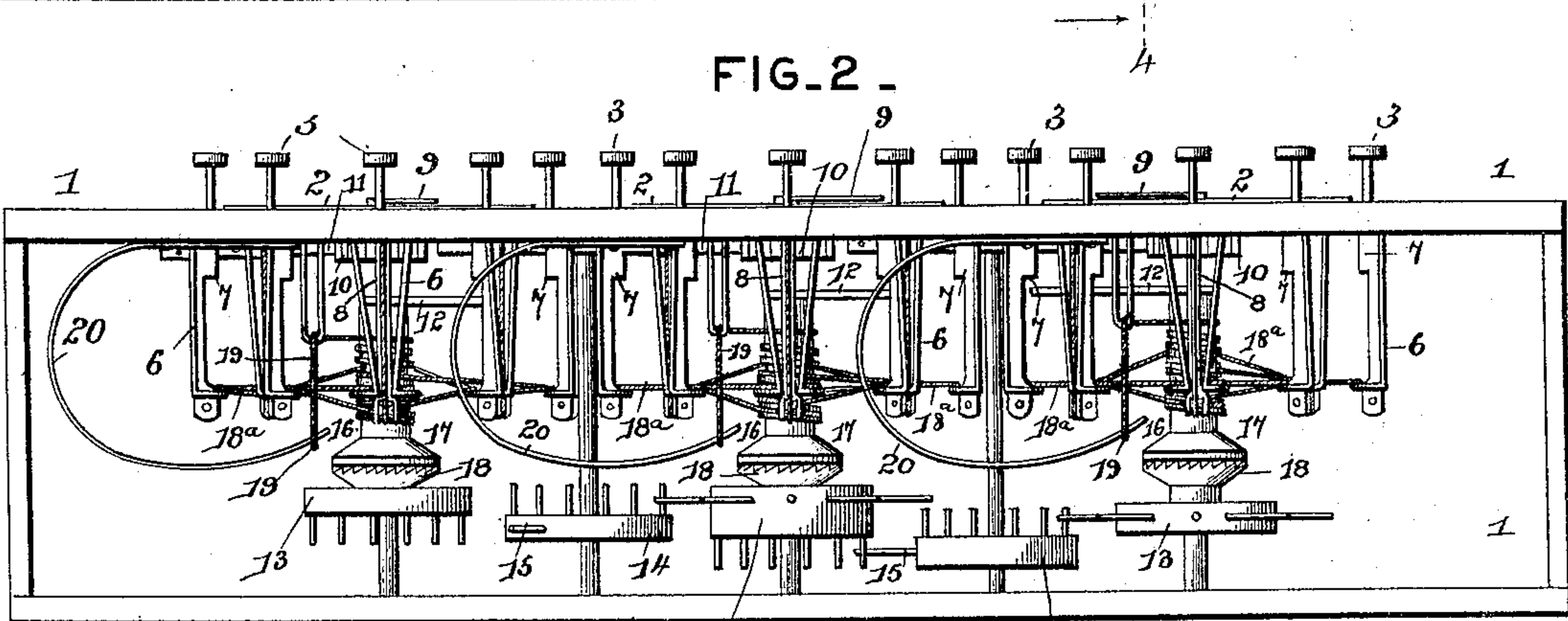


FIG. 3.

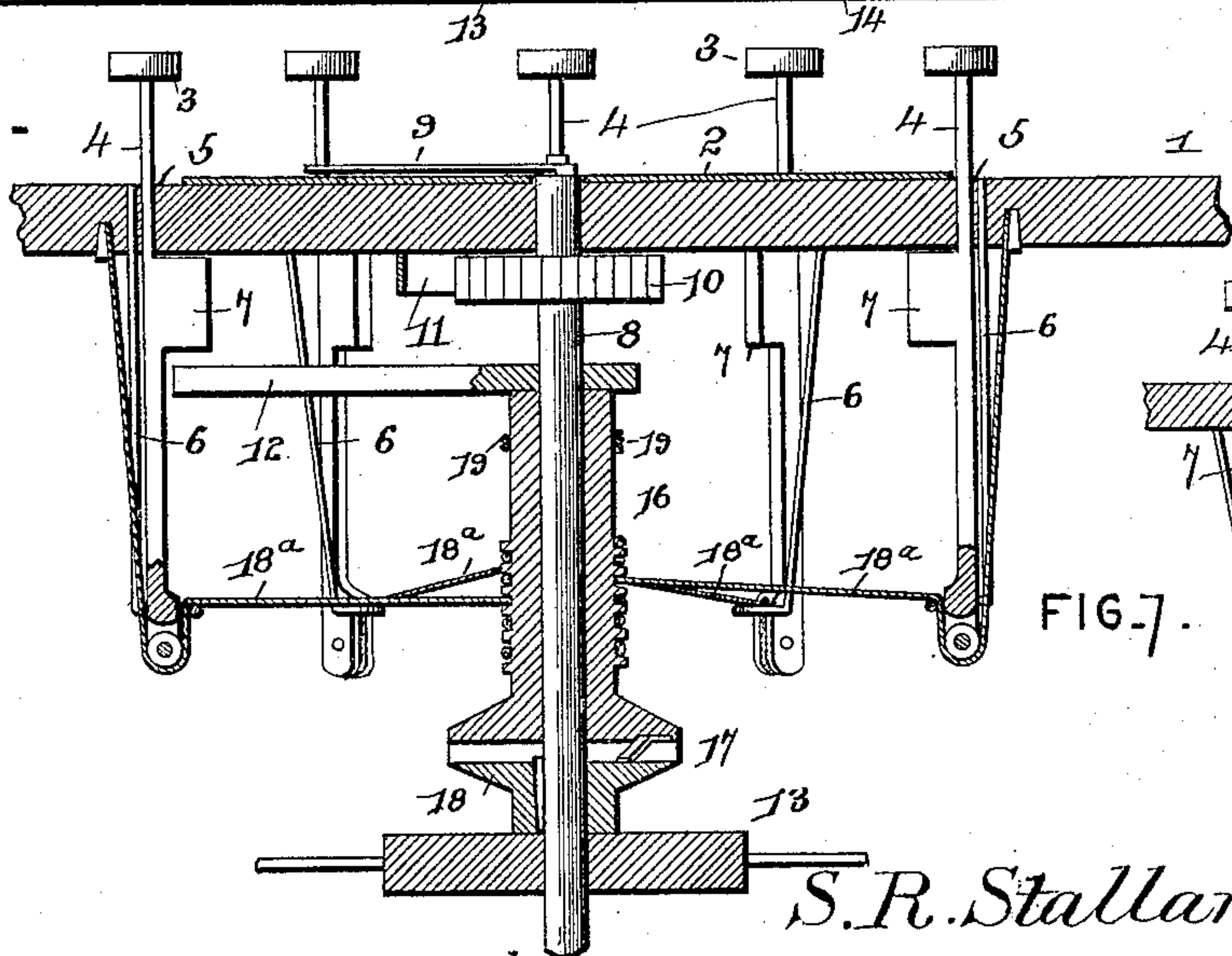


FIG. 5.

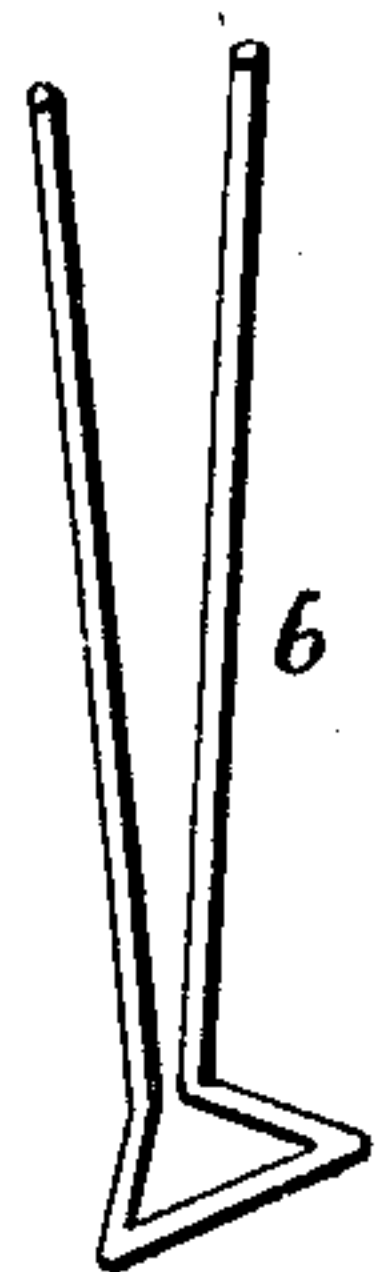
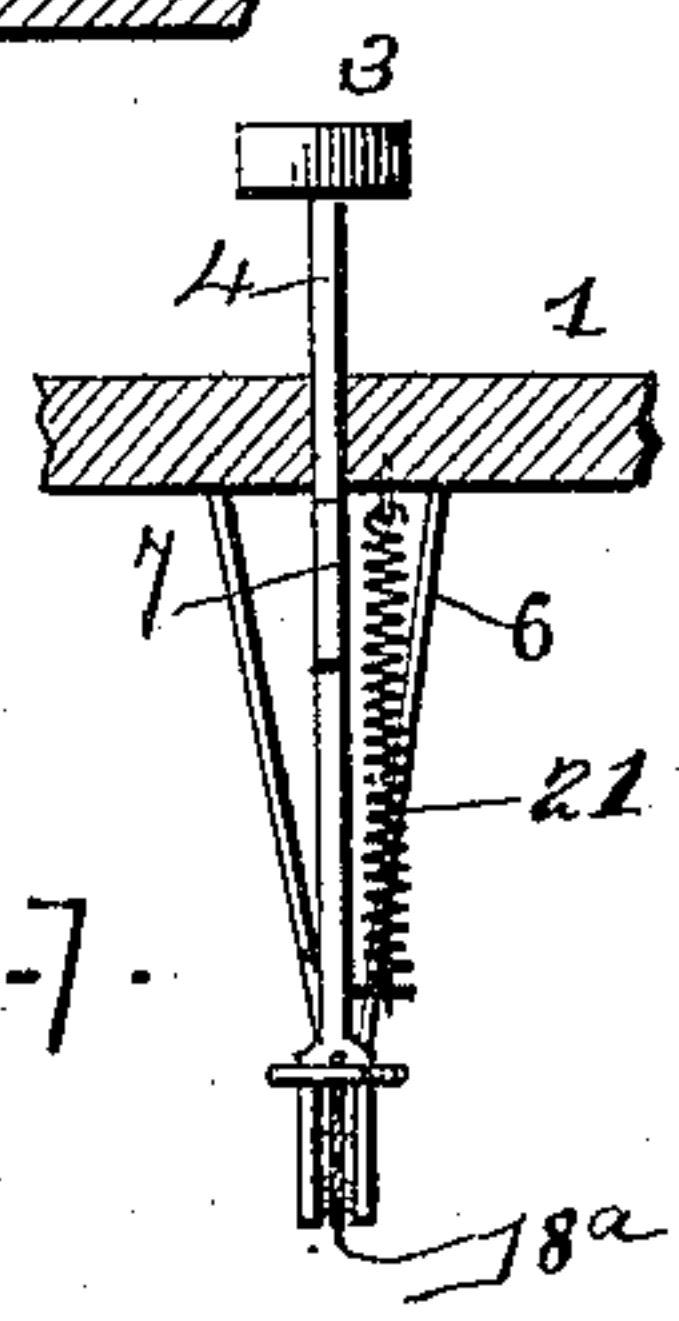


FIG. 7.



Witnesses

Jas. H. McArthur

[Signature]

By his Attorneys,

S. R. Stallard

[Signature]

(No Model.)

2 Sheets—Sheet 2.

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FIG. 4.

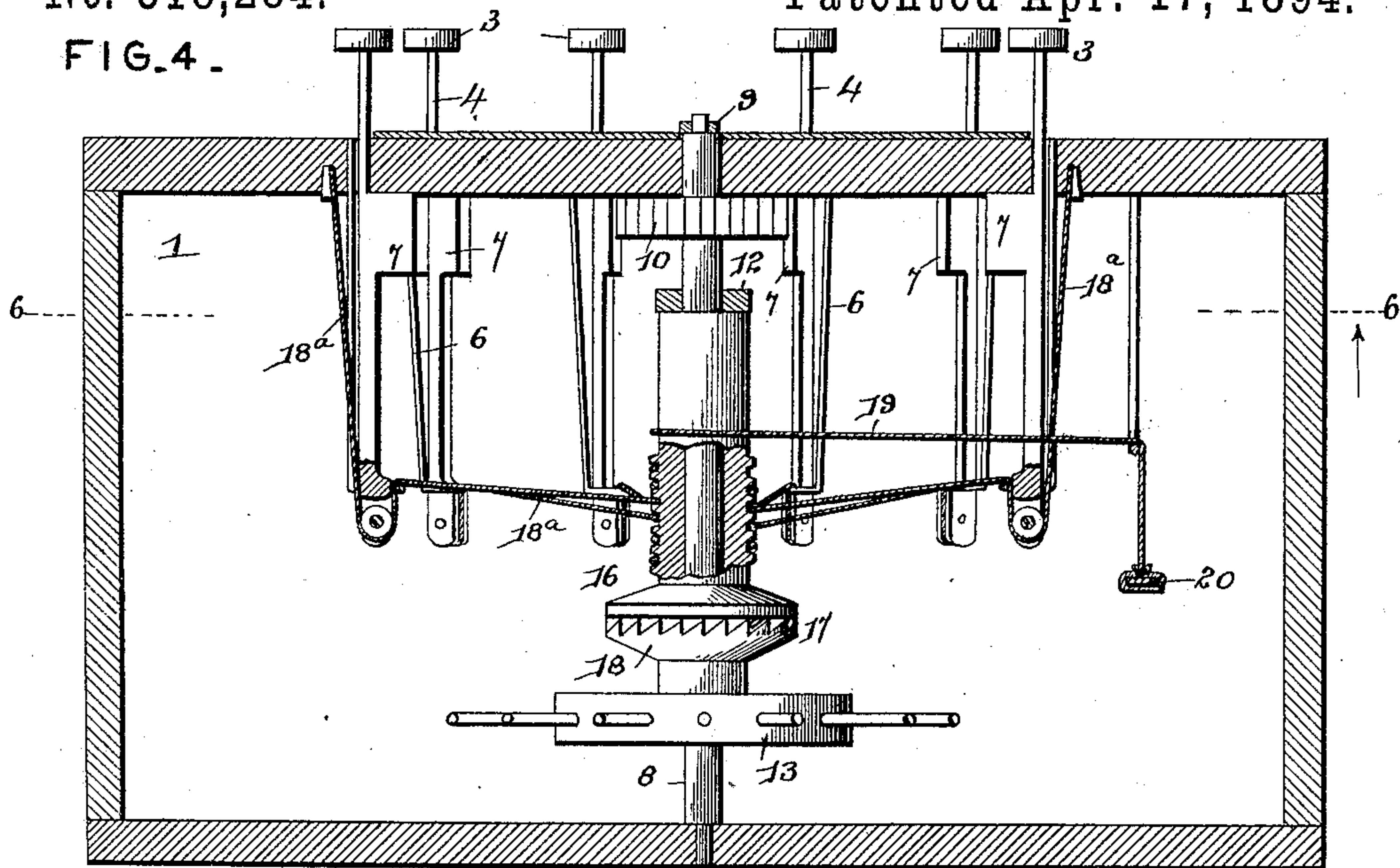
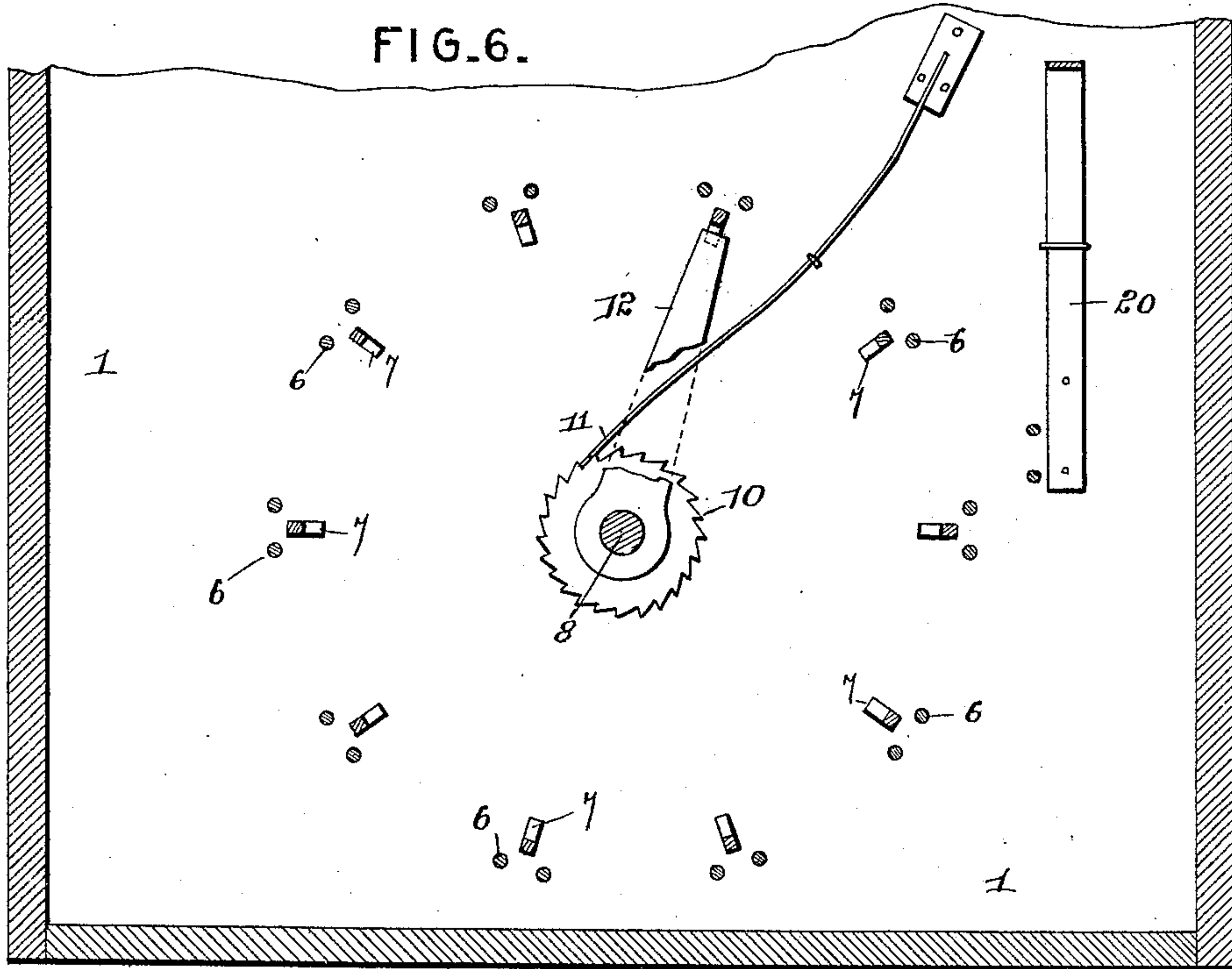


FIG. 6.



Inventor

S. R. Stallard

Witnesses

Jas. K. McCathran

[Signature]

By His Attorneys.

[Signature]

UNITED STATES PATENT OFFICE.

SHERMAN R. STALLARD, OF MERIT, TEXAS.

CALCULATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 518,284, dated April 17, 1894.

Application filed June 21, 1893. Serial No. 478,373. (No model.)

To all whom it may concern:

Be it known that I, SHERMAN R. STALLARD, a citizen of the United States, residing at Merit, in the county of Hunt and State of Texas, have invented a new and useful Calculating-Machine, of which the following is a specification.

My invention relates to improvements in mechanical calculators, and it has for its object to provide means for facilitating the addition of successive numbers of the same or different denominations, and also for subtracting and multiplying the same by substantially the means employed in adding.

Further objects and advantages of the invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings: Figure 1 is a plan view of an apparatus embodying my invention. Fig. 2 is a side view with the casing broken away. Fig. 3 is a central longitudinal section. Fig. 4 is a transverse section on the line 4—4 of Fig. 1. Fig. 5 is a detail view of one of the guides. Fig. 6 is an inverted sectional plan view upon the line 6—6 of Fig. 4. Fig. 7 is a detail sectional view.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

1 designates the casing, the top plate of which is provided with a series of dials 2, which represent respectively the orders or columns of numbers; the dial at the extreme right representing units and the remaining dials representing successively tens, hundreds, &c. These dials are provided with radiating columns of figures, ten in number, extending from the center to the periphery of each dial, and the corresponding figures of these radial series are arranged in circular columns, which are concentric with the dials. The numerals in each circular column increase regularly from zero to nine, but the zeros of the several circular columns, of which there are ten, are arranged respectively in different radial series. By this arrangement all of the numerals from zero to nine will be found in each radial series. The circular columns are preferably distinguished by different colors of the ground, as indicated by the shading upon the drawings, and each radial series

is provided with a band of color extending from the zero in that series to the periphery of the disk, the color in the several series corresponding, respectively, with that of the circular column in which the zero from which the band extends is found.

Concentric with each disk is a series of depressible numbered keys 3, the numbers on which increase in the opposite direction to the numerals in the circular series of the disks. The numerals in the circular series of the disks increase toward the right, while those upon the keys increase toward the left. The key-shanks 4 are mounted in perforations 5 in the top plate of the casing and operate at their lower ends in guides 6, which depend from said plate. These key-shanks are provided with shoulders 7 which form stops to limit the depression of each key, the location of the stop shoulders upon the different keys varying according to the numeral carried by such keys in order that the amount of depression may be proportioned to such numeral.

8 represents a spindle, which is employed in connection with each dial and projects at its upper end through the center of the same to carry the pointer or index 9, adapted to travel over the face of the dial. This spindle carries a fixed ratchet 10, engaged by a pawl 11 to prevent backward rotation thereof, and it furthermore carries a fixed lateral arm 12, which swings around within the space which is circumscribed by the pendent guides 6 and terminates short of the key-shanks so as to pass the latter freely except when a key is depressed to bring its shoulder into the path of the free end thereof. Each spindle carries a spur-wheel 13, except that for the highest order of dials is provided with a peripheral series of spurs which are arranged to engage the teeth of an idle gear 14. Furthermore, each spur-wheel, with the exception of the one which is connected with the units dial, is fitted with depending spurs which are adapted to be engaged by a peripheral pin 15, carried by the idle gear 14 which is continuously rotated by the spur-wheel 13 of the next lower denomination.

The mechanism comprising the spur-wheels and idle gears above described constitute the means for communicating motion from an indicating device of one denomination to that

of the next higher denomination, and it will be understood that as the idle gear which is operatively connected to the spur-wheel of a particular spindle rotates continuously with
 5 that spindle, and as such idle gear carries a single pin, which is arranged to engage a spur of the wheel of next higher denomination, the latter will be turned through a tenth of a rotation for each complete rotation of the first-
 10 named spindle.

Loosely mounted upon each spindle is a drum or spool 16, which is provided at its lower end with a clutch 17, of which the lower member, 18, is fixed to the spindle. Cords or flexible connections 18^a are attached at one end
 15 to a fixed object, such as the top plate of the casing, are passed downwardly and around anti-friction pulleys carried by the lower ends of the key-shanks, thence upwardly and over
 20 the looped ends of the guides in which such key-shanks operate, and are attached to the drum in positions to be reeled thereon. Also connected to the drum, and reeled thereon in an opposite direction from the cords or con-
 25 nections 18^a, is a tension cord 19, connected to a tension spring 20.

From the above description it will be understood that when a key is depressed the flexible connection 18^a, which is operatively
 30 connected to its lower end, will be strained, thus unwinding the cord and causing the rotation of the drum, which is communicated through the clutch 17 to the spindle 8, thus producing a rotary motion of the latter, which
 35 is checked by the contact of the lateral arm 12 of such spindle with the stop-shoulder of the particular key depressed. When the key is released the spool is returned to its normal position thus rewinding the cord by the ac-
 40 tion of the tension spring 20, and elevating the key by the pull on said cord.

This being the construction of my improved apparatus, the operation thereof is as follows: Place all of the pointers upon the radial se-
 45 ries having zero in the outer circular column by turning the pointers backward, and assuming that it is required to add the following numbers, viz., 3, 8, 7, and 5, follow the outer circular column to the right until the
 50 numeral 3 is reached, depress the key contiguous to such numeral, thereby turning the spindle and causing it to be checked at the radial series bearing the numeral 3 in the outer column; then follow the radial series
 55 indicated by the pointer until the zero in such series is found, and follow the circular column containing such zero to the right until the numeral 8 in that column is reached, and depress the key contiguous to the radial series
 60 containing the 8 just found. The index having now passed the starting point and registered more than 10, the motion of the units spindle will have been communicated through the mechanism provided for that purpose to the
 65 tens dial, thus causing the latter to register 1. The operator must now follow the radial series indicated by the pointer of the units dial

until zero is found, and again follow the cir-
 cular column containing such zero until the
 next numeral to be added is discovered, and
 then operate as above described. The result
 of the addition will be found in the outer cir-
 cular columns of the several dials in those ra-
 dial series which are indicated by the point-
 ers of the respective dials. That is, taking
 the four numerals above indicated, when the
 addition is finished the pointer of the tens
 dial will indicate the radial series having 2
 in the outer circular column, and the pointer
 of the units dial will indicate the radial se-
 ries having 3 in its outer circular column,
 thus showing that the sum of the numbers
 added is twenty-three. To subtract, use for
 the remainder the figures on the keys instead
 of the figures in the outside circles of the
 dials, and assuming that the problem is to
 subtract eighteen from twenty-five, registers
 the minuend on the machine by turning the
 units pointer to the 5 key, and the tens
 pointer to the key marked 2, and then pro-
 ceed by using the figures on the dials as in
 addition, except when a pointer is opposite a
 zero representing the minuend, in which case
 such pointer must be turned once around
 before subtracting. The result, or remainder,
 will be represented by the figures carried by
 those keys indicated by the pointers. Again,
 if it is required to subtract six hundred and
 ninety-eight from nine hundred and eighty-
 seven, turn the pointers backward until they
 occupy positions opposite the keys marked
 "9," "8," and "7," then following the radial
 column indicated by the pointer of the hun-
 dreds dial, find the circular column whose
 zero appears in said radial column, and turn
 the pointer forward to the numeral "6" of
 said circular column. Proceed in the same way,
 successively, with the tens and units dials,
 when it will be found that the pointer in the
 hundreds dial is opposite the key marked
 "2," the pointer in the tens dial is opposite
 the key marked "8," and that in the units
 dial is opposite the key marked "9." It will
 be understood that when the pointer of the
 hundreds dial is turned to indicate the first
 step of the subtraction it does not indicate
 the key bearing the first numeral of the re-
 sult, necessarily, for the reason that said
 pointer may be moved by the subsequent ma-
 nipulation of the pointers of the other dials.
 To multiply with my improved apparatus,
 register the successive partial products on
 the proper dials and proceed as in addition.
 For instance, if it is required to multiply
 twenty-five by eighteen, the first partial re-
 sult attained by multiplying twenty-five by
 eight is indicated by turning the pointer of
 the hundreds dial to "2," thus showing that
 the first partial result is two hundred. The
 second partial result is then added to the first
 partial result by turning the pointer of the
 hundreds dial to indicate the addition of two,
 and by turning the tens dial to indicate an ad-
 dition of five. The result is indicated in the

outer concentric columns by the positions of the pointers, that of the hundreds dial being opposite "4," that of the tens dial being opposite "5," and that of the units dial being opposite "0," thus showing a complete product of four hundred and fifty.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Fig. 7 shows a return spring 21, which is connected with each of the key-shanks and is designed to hold the same in operative position when the cords 18^a are slackened by the depression of an adjacent key, and also to return the keys promptly to position.

What I claim as new is—

1. In a calculating machine, the combination of fixed dials provided with ten radial series of consecutively-arranged digits disposed in concentric circular columns, each of which contains the ten digits pointers traversing said dials, keys, operating connections between the keys and pointers, and means for communicating motion from each pointer to the pointer of next higher denomination, substantially as specified.

2. The combination with dials having radial series of digits which are disposed in concentric circular columns, the numerals in each column being arranged consecutively and contiguous columns being distinguished from each other, of pointers traversing the dials, keys, operating connections between the keys and pointers, and means for communicating motion from one pointer to that of the next higher denomination, substantially as specified.

3. The combination of a dial provided with radial series of consecutively-arranged numerals disposed in concentric circular columns, the numerals in each column being arranged consecutively and the initial numbers of the several columns being disposed in different radial series, contiguous columns being distinguished from each other, as by color, to facilitate tracing a particular column; a pointer traversing said dial, and means for operating the pointer substantially as specified.

4. The combination with fixed dials provided with radial series of digits disposed in concentric circular columns, of a series of numbered keys arranged contiguous to the outermost circular column with its initial number opposite that of the outermost column and with its numbers increasing in a direction opposite to that of the said column, pointers traversing said dials, operating connections between the keys and pointers, and means for communicating motion from each pointer to that of the next higher denomination, substantially as specified.

5. The combination with fixed dials provided with radial series of consecutively-ar-

anged numerals disposed in concentric columns, of numbered keys arranged respectively in operative relation to the radial series of numerals, the numerals of said keys being arranged consecutively and increasing in a direction opposite to the direction of increase in the concentric columns, pointers traversing said dials, operating connections between the keys and the pointers, and means for communicating motion from each pointer to that of the next higher denomination, substantially as specified.

6. The combination with dials having radial series of numerals, of numbered keys arranged, respectively, contiguous to the outer terminals of said series, pointers having spindles disposed centrally of the dials and arranged to traverse the dials, drums loosely mounted upon the spindles, flexible connections between the keys and the drum, stops carried by the keys, and arms fixed to the spindles and adapted to engage the stop of a depressed key, substantially as specified.

7. The combination with dials, depressible keys, and pointers having spindles concentric respectively with the dials, of means for communicating motion to the spindles, and stop-shoulders carried by the keys and adapted when the latter are depressed to lie in the paths of stop-arms carried by the spindles, substantially as specified.

8. The combination with dials, depressible keys, and pointers arranged to traverse said dials, and having spindles of drums loosely mounted upon said spindles, clutch connections between the drums and the spindles, flexible connections between the keys and the drums, a tension device consisting of a tension spring and a flexible connection reeled upon each drum to return the latter to its normal position, and means for communicating motion from one spindle to the next of higher denomination, substantially as specified.

9. The combination with fixed dials, of depressible numbered keys disposed in circular series around the dials, spindles arranged respectively concentric with the dials and carrying pointers to traverse the same, means to prevent the backward rotation of the spindles, lateral arms carried by the spindles and adapted to engage stop-shoulders fixed to the keys when such shoulders are arranged in the path thereof by the depression of a key, connections between the keys and the spindles, and means for communicating motion from each spindle to that of the next higher denomination, substantially as specified.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

SHERMAN R. STALLARD.

Witnesses:

ALLEN R. CALDWELL,
MACK WATSON.