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Patented Jan. 10, 1899.

J. E. DUNCAN.
COMPUTING MACHINE.

(Application filed Feb. 8, 1898.)

(No Model.)

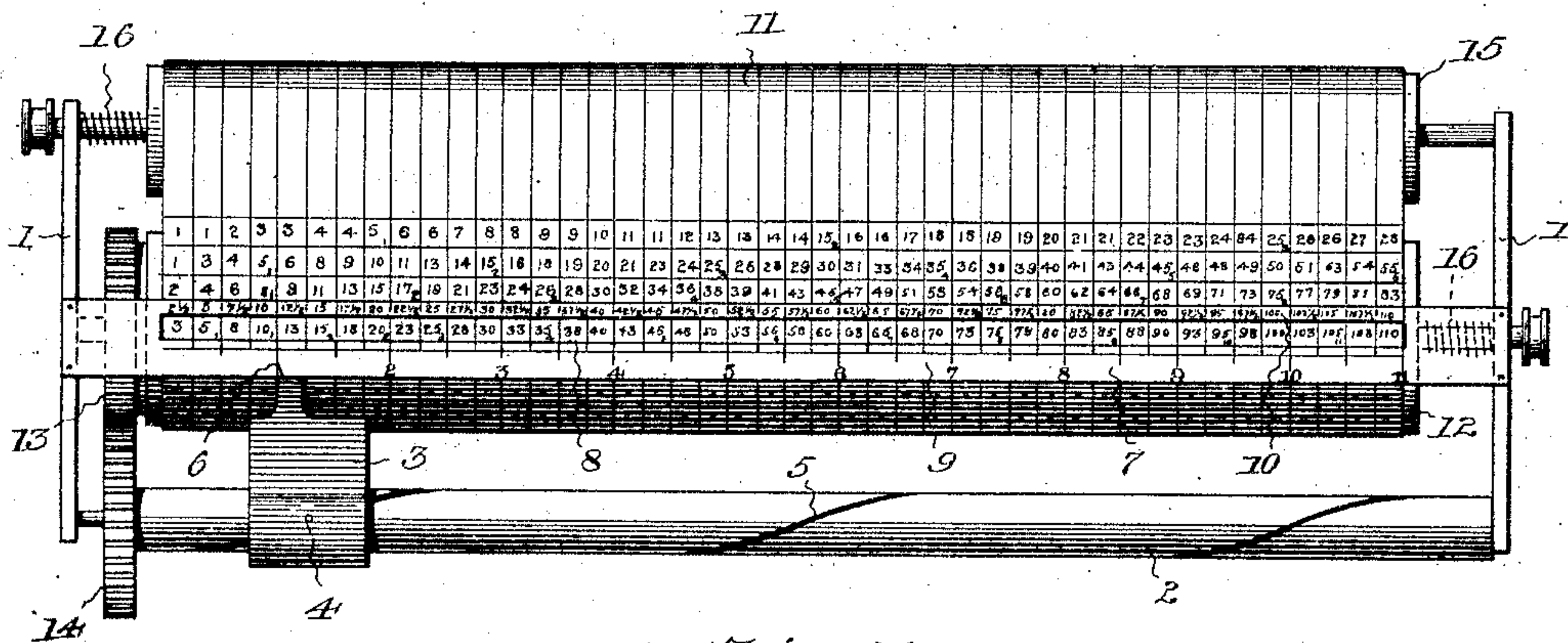


Fig. 1.

1	1	2	3	3	4	4	5	6	6	7
1	3	4	5	6	8	9	10	11	13	14
2	4	6	8	9	11	13	15	17	19	21
3	5	8	10	13	15	18	20	23	25	28
3	6	9	13	16	19	22	25	28	31	34
4	8	11	15	19	23	26	30	34	38	41
4	9	13	18	22	26	31	35	39	44	47
5	10	15	20	25	30	35	40	45	50	55
6	11	17	23	28	34	39	45	51	56	62
6	13	19	25	31	38	44	50	56	63	69
7	14	21	28	34	41	48	55	62	69	76

Fig. 4.

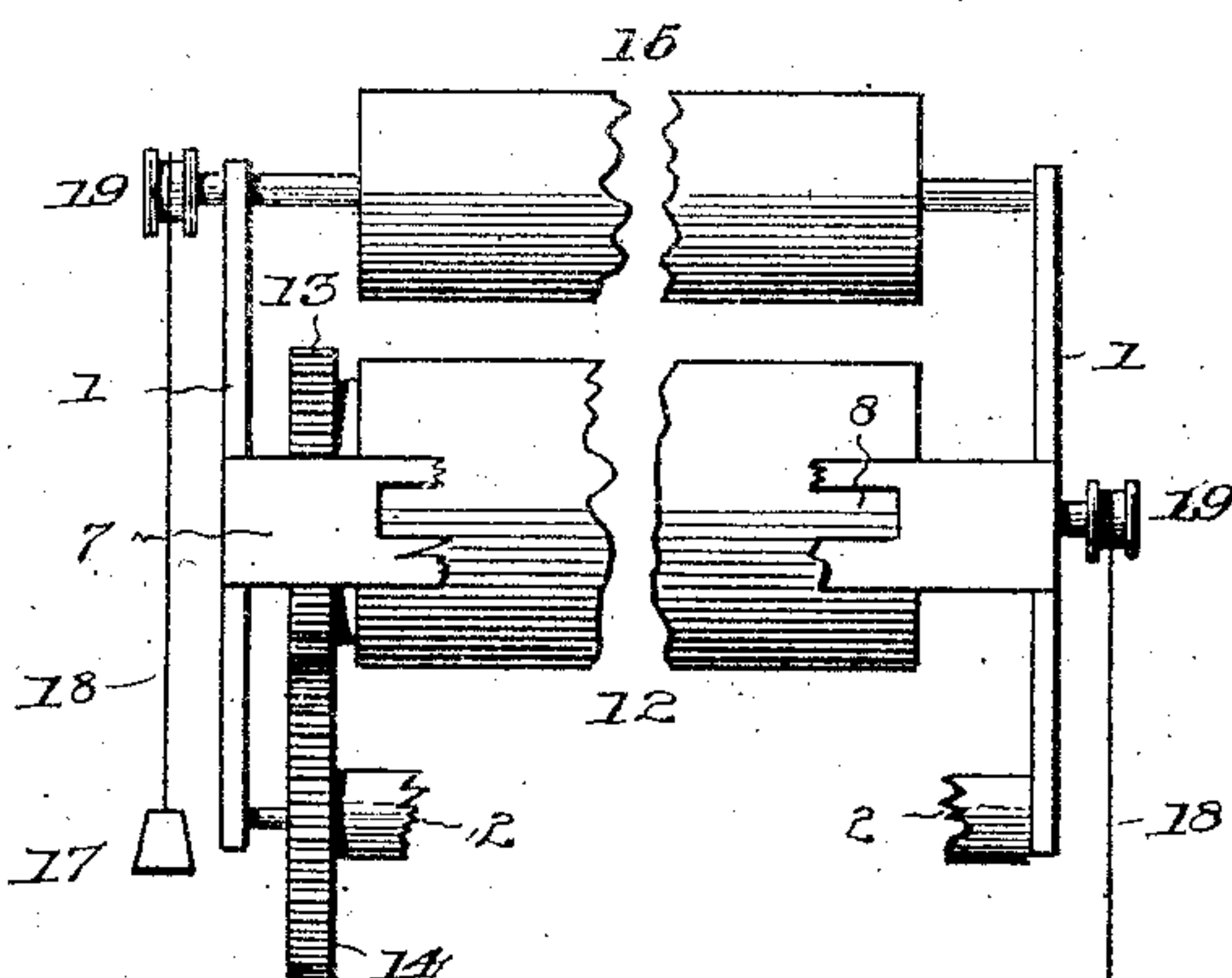


Fig. 3.

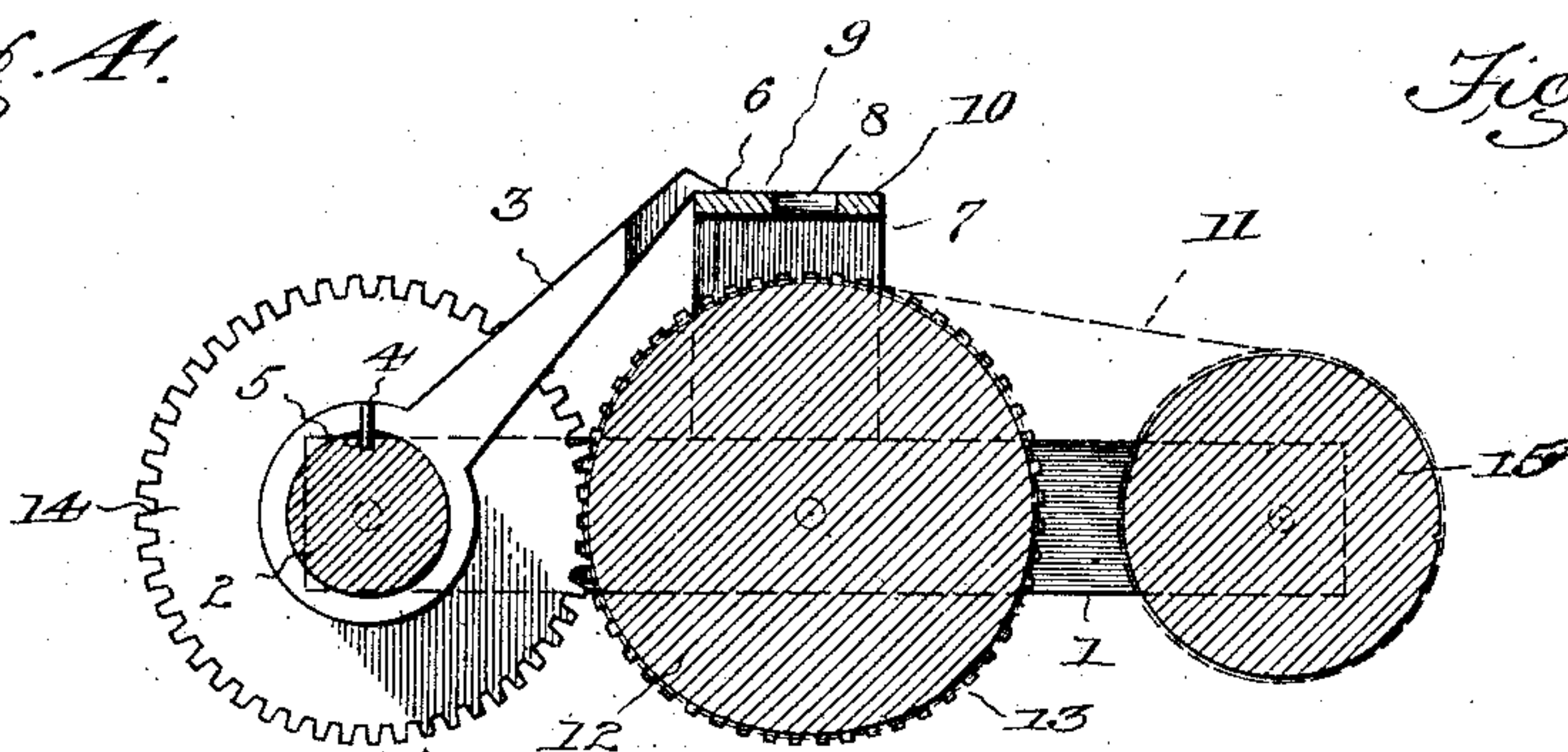


Fig. 2.

Witnesses

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UNITED STATES PATENT OFFICE.

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COMPUTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 617,323, dated January 10, 1899.

Application filed February 8, 1898. Serial No. 669,522. (No model.)

To all whom it may concern:

Be it known that I, JAMES EUGENE DUNCAN, a citizen of the United States, residing at Centralia, in the county of Wood and State of Wisconsin, have invented a new and useful Computing-Machine, of which the following is a specification.

My invention relates to computing-machines particularly designed for computing wages, interest, &c., and has for its object to provide a simple, compact, and efficient device whereby mental calculation in ascertaining wages due at a given rate for a length of time which is the fraction of a week, day, or other unit of time may be avoided.

Further objects and advantages of this 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 front view of a machine constructed in accordance with my invention. Fig. 2 is a vertical sectional view of the same. Fig. 3 is a partial front view showing a modified construction of counterbalancing devices consisting of a weight. Fig. 4 is a plan view of a portion of the result-sheet.

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

Mounted in a suitable frame having end plates 1 is a feed roll or screw 2, upon which is mounted for axial movement a slide 3, having a guide-pin 4 to traverse a spiral groove 5 or otherwise connected with the feed-roll, whereby rotary motion is communicated to the latter during the reciprocator or axial movement of the slide. The slide carries a pointer 6, which traverses a rate-bar 7, preferably having an elongated slot 8 and graduated to form a time-scale 9 and a rate-scale 10. This bar is terminally affixed to the end plates 1, and also mounted in the frame to pass under the bar is a result-sheet 11, having longitudinal and transverse intersecting columns of characters, of which the transverse columns register with the time and rate graduations of the bar 7, while the longitudinal columns are located parallel with said bar and are adapted to be exposed successively between the time and rate scales in

the slot 8. Said result-sheet traverses an operating-roller 12, which is connected by intermeshing gears 13 and 14 (carried, respectively, by said operating-roll and with the feed-roll) with the feed-roll, whereby as the slide is moved axially the operating-roll is actuated to bring different longitudinal columns of its characters into registration with the slot 8. One end of the result-sheet 11 is attached to the operating-roll 12 and the other end to a carrier-roll 15, whereby as the slide is moved longitudinally upon the feed-roll the result-sheet is reeled from one roller to the other to bring the desired graduations contiguous to the rate-bar. Also the operating and carrier rolls are provided with yielding tension devices, which in the construction illustrated in Fig. 1 consist of coiled springs 16, said springs being arranged to strain the result-sheet in opposite directions, whereby one is tightened as the other is loosened to maintain a constant tension upon the result-sheet, and thus insure the holding of the same taut during the operation of the mechanism.

In the modified construction (illustrated in Fig. 3) the tension devices consist of weights 17, connected by cords 18 with spools or drums 19, affixed, respectively, to the spindles of the operating and carrier rolls.

In the construction illustrated the result-sheet is graduated to indicate the wages per hour and day for given rates per day, based on the scale of ten hours per day, and when this sheet, of which only a portion is illustrated in Fig. 4, is used in connection with the cooperating devices shown in Fig. 1 the movement of the slide along the feed-roll to arrange the pointer opposite the numeral "1" of the time-scale will advance the result-sheet to bring the fourth horizontal column of graduations into registration with the slot 8, and thus, contiguous to the numeral "1" of the time-scale, will expose the numerals "10" and "1" of the result-sheet, said numerals "10" and "1" being arranged in the same block. The numeral of the rate-scale registering with the numeral "1" of the time-scale is "10," and indicates a rate of ten cents per day, for instance, and hence the graduation "10" on the result-sheet indicates that one day's wages at the rate of ten cents per

day is ten cents, while the numeral "1" in the same block indicates that the wages at ten cents per day for one hour is one cent. In other words, the numerals of the time-scale represent both days and hours and the numerals in the blocks of the result-sheet respectively indicate wages per day and hour or per fraction of a day and per fraction of an hour. Therefore when the pointer is in the position shown in Fig. 1, opposite the numeral "1" of the time-scale, the wages due for either one hour or one day and calculated upon the basis of any rate per day comprehended by the machine will be exposed in the slot 8. For instance, if the rate per day is twenty cents the wages for the length of time indicated by the pointer will be shown on the result-sheet opposite the numeral "20" of the rate-scale 10, said block containing the numerals "20" and "2" to show that the wages per day is twenty cents and for one hour is two cents. If the slide is moved to arrange the pointer opposite the numeral "2" of the time-scale, the result-sheet will be advanced a corresponding distance, and hence that longitudinal column thereof having the numerals "5" and "1" in the first transverse column will be exposed through the slot 8. Then in the block of the result-sheet contiguous to the pointer will be found the results "40" and "4," thus indicating that at the rate of twenty cents per day (the "20" being found in the rate-scale opposite the pointer) the wages for two days will be forty cents, while for two hours it will be four cents. With the parts in this position the longitudinal column of the result-scale will show the wages at all the different rates per day for two hours and two days. Thus in the block of the result-sheet under the rate-numeral "10" of the rate-scale will be found the numerals "20" and "2," thus indicating that the wages for two days at ten cents per day is twenty cents and for two hours is two cents.

It will be understood that the rate-scale can be extended to indicate any desired amount per day up to, say, three dollars and sixty cents or four dollars, or as high as may be required by the conditions under which the apparatus is used.

The relative movements of the slide and the operating-roll depend upon the gearing by which the feed roll or screw 2 and the operating-roll 12 are connected. It is my object to cause the advance of the result-sheet through a distance equal to the interval between two horizontal columns of numerals, while the slide advances through the distance between two contiguous graduations of the time-scale. Therefore if the slide is moved from its initial point or zero of the time-scale to the graduation "1" the result-sheet will be advanced a corresponding distance; but this distance on the result-sheet, as on the rate-scale, which is parallel with the time-scale, is divided into four parts for convenience in calculation. It is unnecessary to subdivide the

time-scale, as it is usual to estimate time by either days or hours in calculating wages; but the rates may have a fractional range. The graduations on the several parts of the apparatus above described are arranged according to the decimal system, and starting with a rate of ten cents per day I place the numeral "10" of the rate-scale opposite the numeral "1" of the time-scale; but, for example, it may be desirable to calculate upon the basis of five cents per day, and therefore I divide the space between "0" and "10" of the rate-scale to indicate the rate five. So the rate may be either two and one-half or seven and one-half cents per day, and therefore I find it convenient to still further subdivide the interval between "0" and "10" of the rate-scale to indicate the rates two and one-half and seven and one-half. It will be understood that this subdivision may be still further extended; but it will be sufficient for the purposes of illustration to indicate those shown in the drawings. Therefore when the slide moves from "0" to "1" of the time-scale the result-sheet is advanced from "0" to "10," or through four subdivisions corresponding with the subdivisions of the interval between "0" and "10" of the rate-scale. It is obvious that the movement of the result-sheet to bring different horizontal columns into operative or indicating position must be equal to the advance of the slide with relation to the rate-scale. If, therefore, the slide advances to the numeral "1" of the time-scale, it is opposite the numeral "10" of the rate-scale, or has passed four subdivisions of the rate-scale, and hence the result-sheet must advance through four horizontal columns in order to correspond. If the slide is advanced to the numeral "5" of the time-scale, whereby it is disposed opposite the numeral "50" of the rate-scale, the result-sheet must advance in a direction perpendicular to that of the slide through a distance equal to twenty horizontal columns, or if, as above indicated, the slide is advanced to the numeral "2" of the time-scale, where it is opposite the numeral "20" of the rate-scale, the result-sheet must correspondingly advance in a perpendicular direction to bring the eighth horizontal column into view through the inspection-slot 8.

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

Having described my invention, what I claim is—

1. A computing-machine having parallel operating and carrier rolls, a continuous result-sheet terminally attached respectively to said rolls and reeled thereon for movement from one roll to the other, yielding tension devices connected with said rolls for maintaining the sheet under tension, said sheet being provided with intersecting longitudinal and transverse columns of result-indicating char-

acters, a fixed rate-bar arranged contiguous to the operating-roll and adjacent to the surface of the result-sheet traversing the same, said bar being provided with parallel time and rate scales of which the graduations register respectively with the transverse columns of characters on the result-sheet, a feed-roll connected by intermeshing gears with the operating-roll, and a slide mounted upon the feed-roll, having a pin-and-groove connection with the same to impart rotary motion to the feed-roll, and hence to the operating-roll as the slide is moved axially, and also provided with a pointer traversing the rate-bar, substantially as specified.

2. A computing-machine having parallel operating and carrier rolls, a continuous result-sheet terminally attached respectively to said rolls and provided with intersecting longitudinal and transverse columns of characters, yielding tension devices connected with said rolls for maintaining the result-sheet

under tension, a fixed rate-bar arranged contiguous to the surface of the result-sheet and having time and rate scales and an intermediate inspection-slot, a slide having a pointer to traverse the rate-bar and mounted for movement parallel therewith, and operating connections between the slide and the operating-roll, whereby rotary motion is communicated to the latter when the former is moved parallel with the rate-bar, the result-sheet being provided in the blocks of its longitudinal columns with a plurality of numerals respectively representing wages per day and hour, 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.

JAMES EUGENE DUNCAN.

Witnesses:

ORRIN GRAY,
NASH MITCHELL.