

No. 751,706.

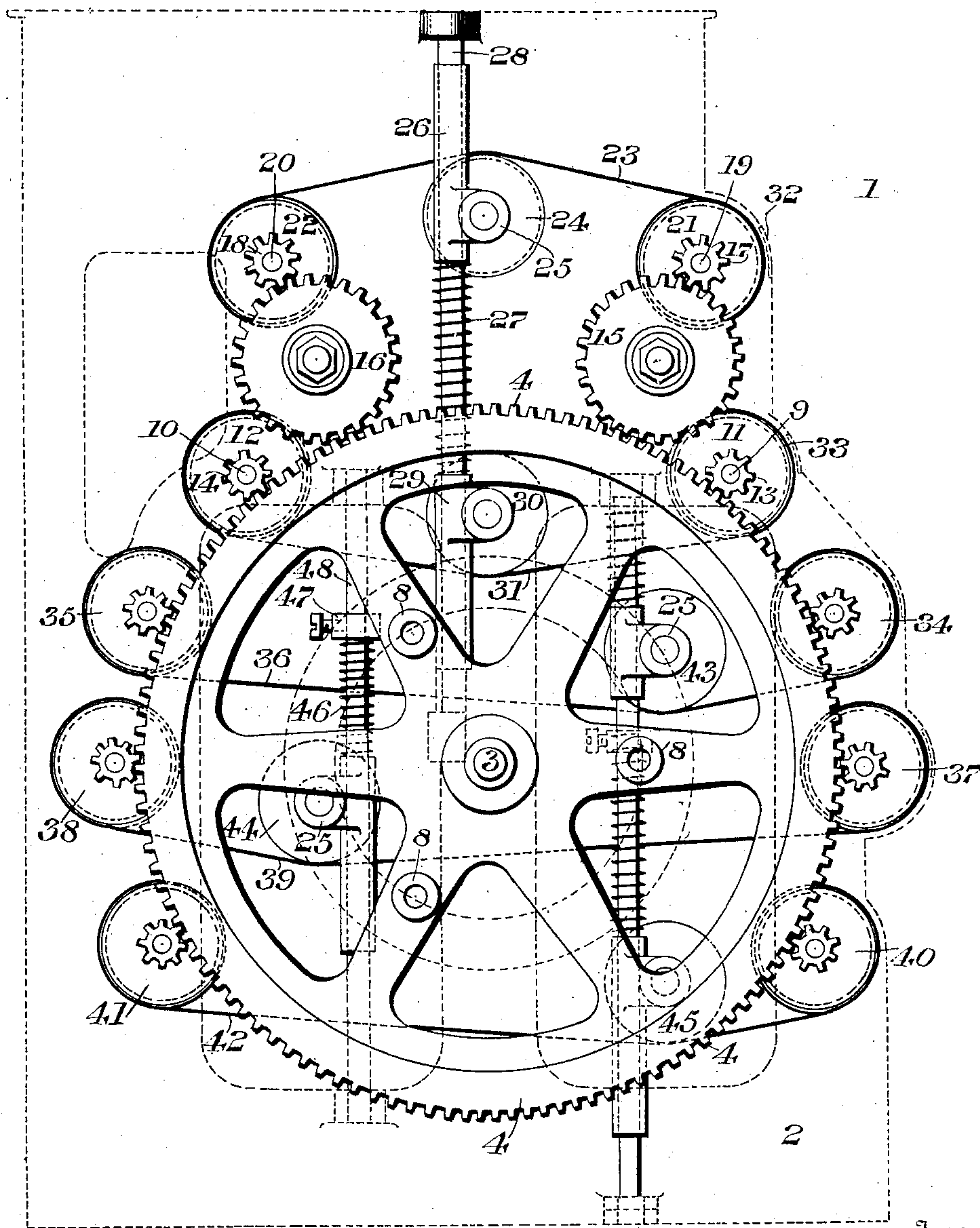
PATENTED FEB. 9, 1904.

F. S. WEYRS.  
COMPUTING MACHINE.  
APPLICATION FILED MAR. 18, 1903.

NO MODEL.

5 SHEETS—SHEET 1.

*Fig. 1.*



Witnesses

P. J. Bayle  
L. Houville

Inventor

Frank D. Weyers  
By Wiedersheim & Laidman  
Attorneys

No. 751,706.

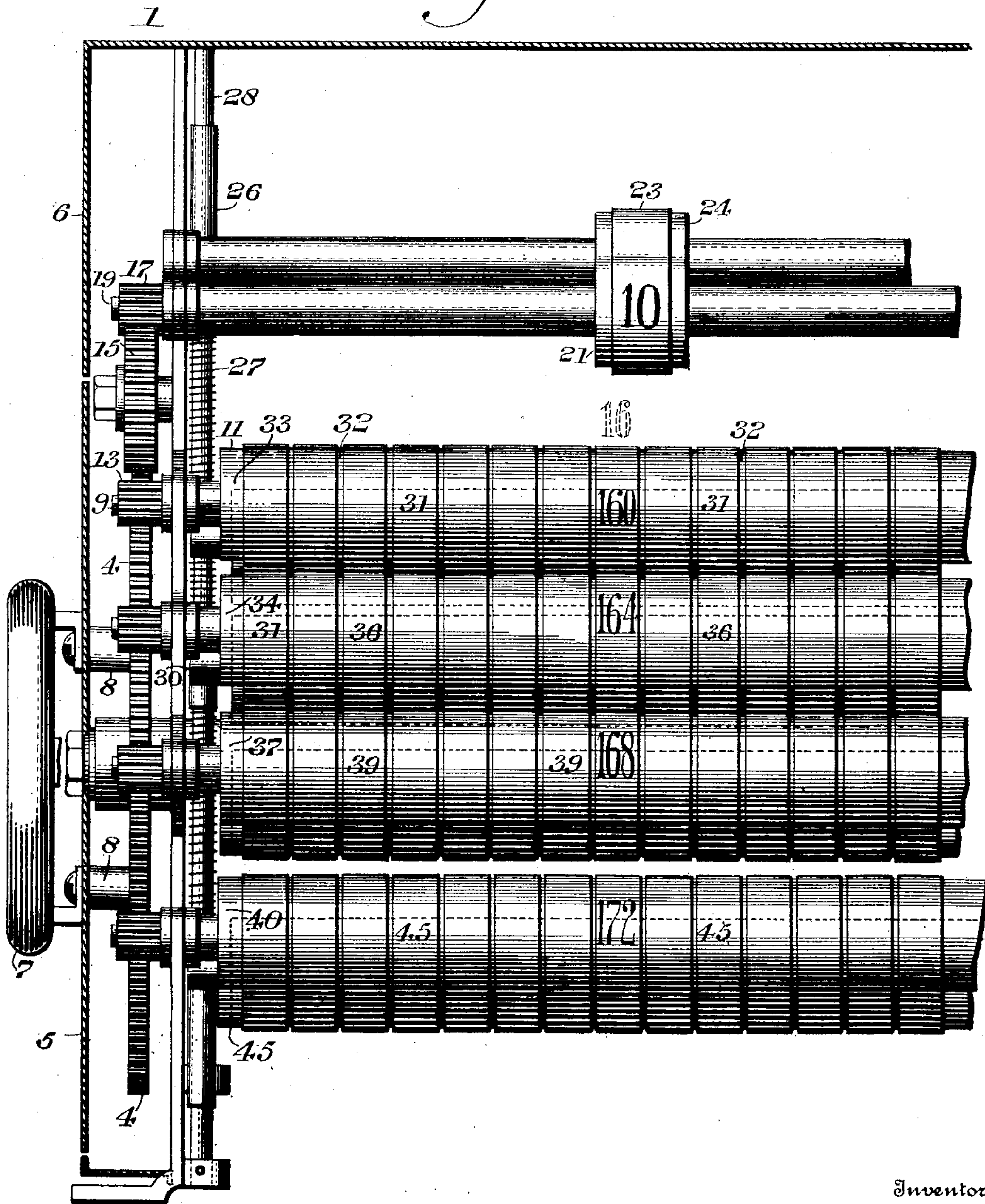
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5 SHEETS—SHEET 2.

*Fig. 2.*



Witnesses  
*P. J. Doyle*  
*L. Douville.*

By

Inventor  
*Frank S. Weyrs.*  
*Wiedersheim & Fairbank.*  
*Attorneys*



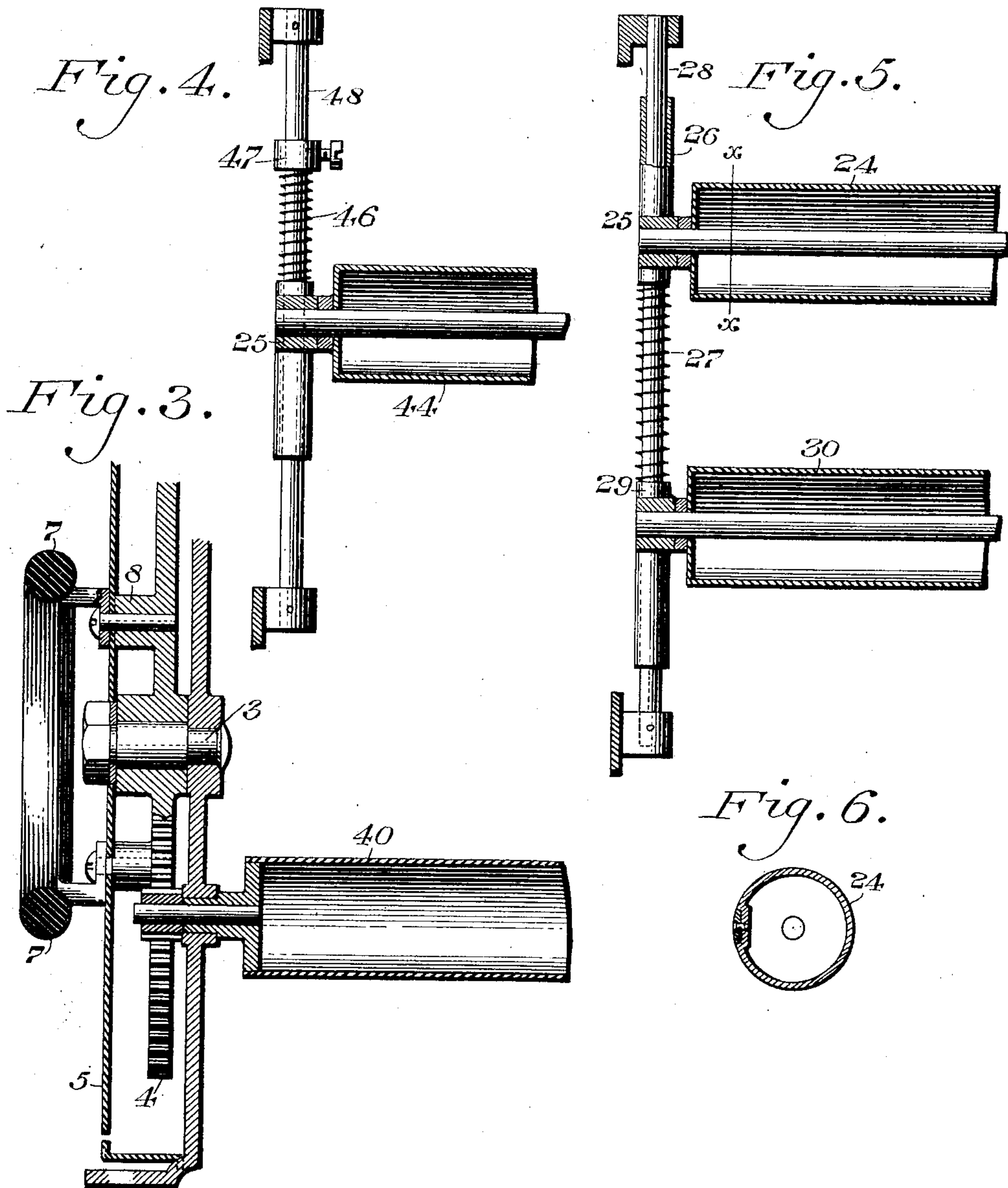
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5 SHEETS—SHEET 3.



Witnesses  
P. H. Hagler.  
L. Douville.

By

Inventor  
Frank S. Weyrs.  
Niedersheim & Fairbanks,  
Attorneys

No. 751,706.

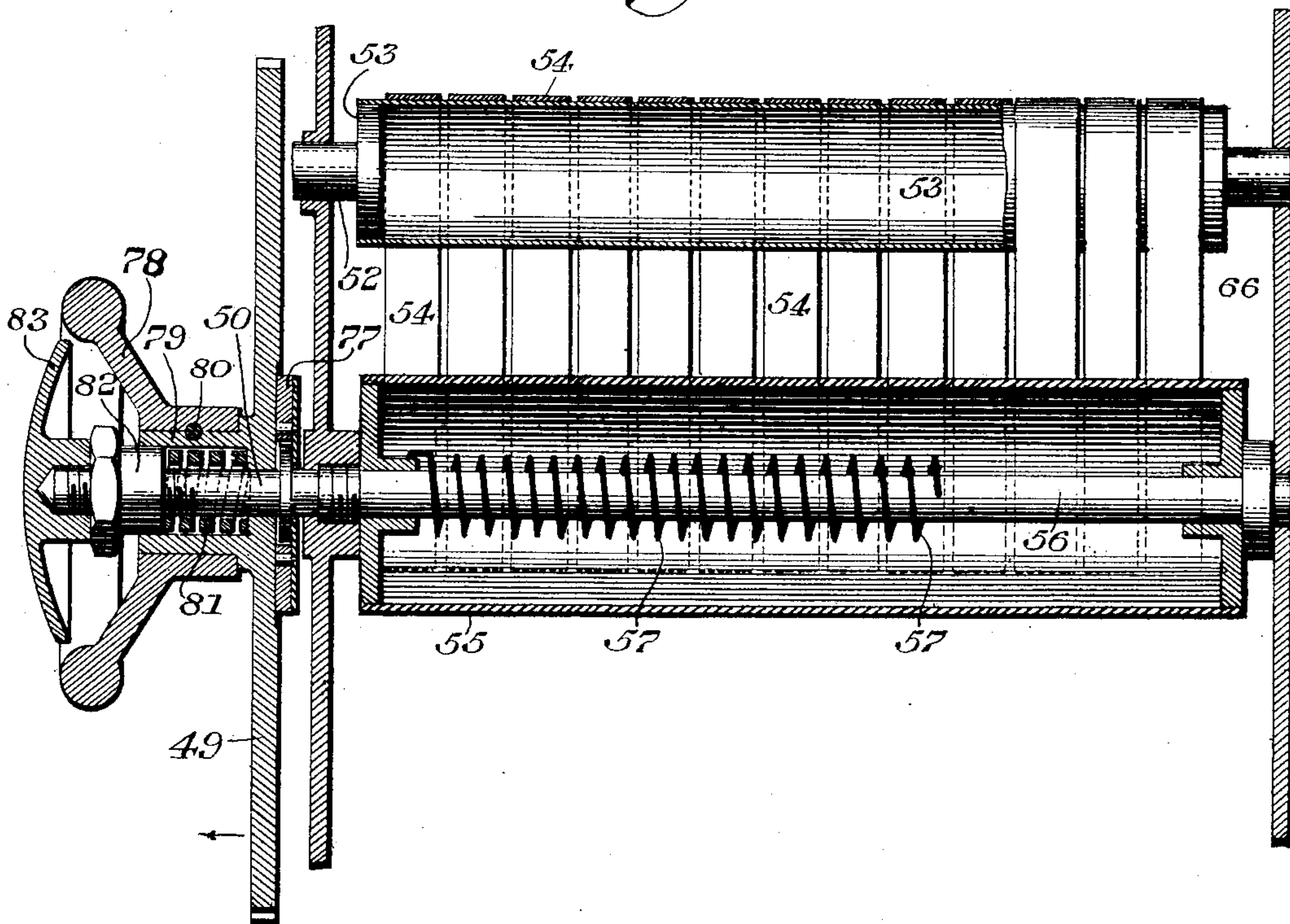
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5 SHEETS—SHEET 4.

*Fig. 7.*



Witnesses  
P. J. Ingle.  
L. Bouville.

By

Inventor  
Frank S. Weyrs.  
Biedersheim & Leibau.  
Attorneys

No. 751,706.

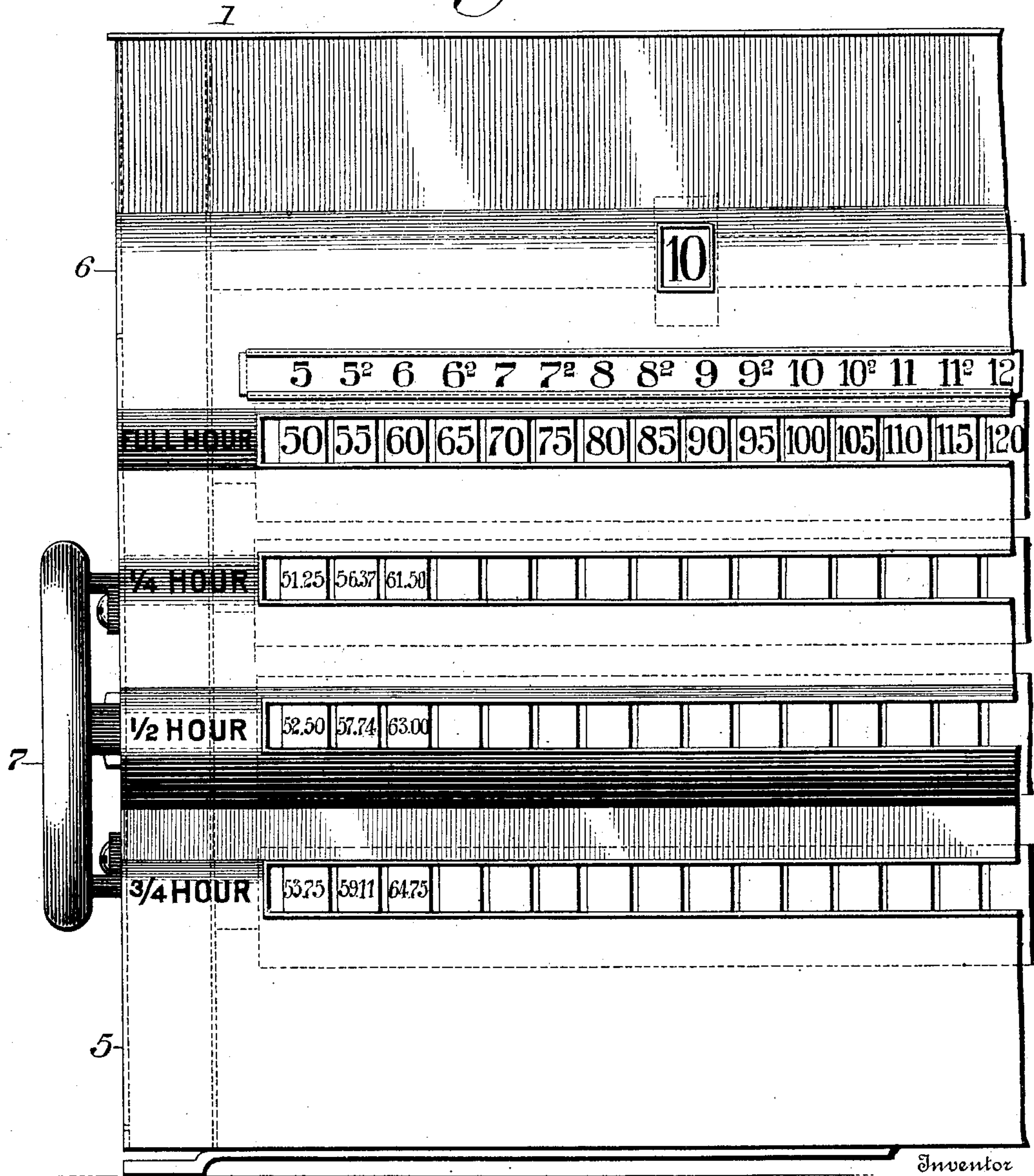
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COMPUTING MACHINE.  
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5 SHEETS—SHEET 5.

*Fig. 8.*



Witnesses

*P. F. Eagle.*  
*L. Douville.*

*Frank S. Weyrs.*  
By *Wiederheim & Leibman*  
*Attorneys*



# UNITED STATES PATENT OFFICE.

FRANK S. WEYRS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF  
ONE-HALF TO JAMES B. FLESHMAN AND WARNER J. DUHRING, OF  
PHILADELPHIA, PENNSYLVANIA.

## COMPUTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 751,706, dated February 9, 1904.

Application filed March 18, 1903. Serial No. 148,460. (No model.)

*To all whom it may concern:*

Be it known that I, FRANK S. WEYRS, a citizen of the United States, residing at the city of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Computing-Machines, of which the following is a specification.

My invention has relation to a computing-machine in which a series of bands or tapes are employed having characters thereon bearing a fixed relation to each other, and in such connection it relates to such a machine provided with suitable mechanism adapted to operate said bands or tapes in unison.

The nature and scope of my present invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which a computing-machine is illustrated having a time-unit-of-value member consisting of a flexible band or tape employed to represent the total number of complete or entire hours, a scale-value member setting forth the rate of wage per hour, and also having a denominational time-value member consisting of a series of superposed flexible bands or tapes upon which are represented sum-totals for time or wage, the first of the series of tapes or bands representing the sum for the integral or entire hour, the second series of tapes or bands representing the sum for the integral or entire number of hours plus a quarter-hour, the third series of tapes or bands representing the sum for the integral or entire number of hours plus one-half an hour, and the fourth series of tapes or bands representing the sum for the integral or entire number of hours plus three-quarters of an hour.

Of course it is to be understood that my invention is not to be confined to such a computing-machine as particularly defined, for the machine of my said invention is adapted for other uses—for example, computing interest on principal sums or other complex problems or calculations.

With reference to the drawings, Figure 1 is a side elevational view of a computing-ma-

chine embodying main features of my invention. Fig. 2 is a view, partly in section and partly in front elevation, of the left-hand end portion of the machine. Fig. 3 is a detail view illustrating, partly in section and partly in elevation, mechanism for actuating the means adapted to shift the flexible bands. Figs. 4 and 5 are detail views illustrating, partly in elevation and partly in section, means for holding certain of the flexible bands or tapes under tension. Fig. 6 is a sectional view taken on the line *xx* of Fig. 5. Fig. 7 is a detail view illustrating, partly in section and partly in elevation, drums adapted to receive and support a series of flexible bands or tapes and means for holding one of the drums under spring tension. Fig. 8 is a front elevational view of the left-hand end portion of the computing-machine.

Referring to the drawings, 1 represents a computing-machine provided with a housing or casing 6 of any suitable form and inclosing the mechanism of the machine carried by a framework 2, as illustrated in Figs. 1, 2, 7, and 8.

With reference to Figs. 1 to 6, inclusive, in the framework 2 of the machine is suitably journaled a series of shafts and pivotally connected with the same a certain number of gear-wheels for a purpose to be hereinafter more fully explained. To a shaft 3 of the framework 2 is rigidly secured a gear-wheel 4, and to the end of said shaft and preferably also to projections 8 of the gear-wheel 4 is secured a disk or plate 5, arranged in alinement with the casing or housing 6 and adapted to close an opening in said casing. The projections 8 of the gear-wheel are also adapted to support a hand-wheel 7, as illustrated in Figs. 2 and 3, by means of which the gear-wheel 4 and mechanism controlled by the same may be manually actuated. As shown in Figs. 1 and 2, to the shafts 9 and 10 are secured drums 11 and 12, which receive their rotary movement from the gear-wheel 4 by means of pinions 13 and 14, meshing with the same and which are secured to the shafts 9 and 10. Above the shafts 9 and 10 and in the frame-



work 2 are arranged shafts 19 and 20, which receive their rotary movement through the intervention of idler-gears 15 and 16, meshing with the driving gear-wheel 4 and with pinions 17 and 18, secured to the shafts 19 and 20. To the shafts 19 and 20 and 9 and 10 are rigidly secured drums 21 and 22 and 11 and 12 and to each of which one end of a flexible band or tape 23 and 31 is secured. These drums 11 and 12 and 21 and 22, by the intervention of the pinions 13 and 14 and 17 and 18, and in one instance by the intermediary of the idler gear-wheels 15 and 16, are rotated and shift the tapes 23 and 31 in unison in either direction by actuating the driving gear-wheel 4. The flexible bands or tapes 23 and 31 will in this instance be wound upon the drums 11 and 21 and at the same time be unwound from the drums 12 and 22, or vice versa, as will be readily understood from Fig. 1 of the drawings. In order to hold the flexible bands or tapes 23 and 31 under proper tension, the same are guided over rollers 24 and 30, carried by the ears 25 of the sleeves 26 and 29, slidably arranged on a rod 28, supported by the framework 2, which sleeves 26 and 29 under the influence of a spring 27 will hold the rollers 24 and 30 under a certain amount of tension against the flexible bands or tapes 23 and 31, as will be readily understood from Figs. 1 and 5 of the drawings. The tapes 23 and 31 in the present instance carry numerals which are arranged on the same an equal distance apart. In the computing-machine shown the drums 21 and 22 carry a single flexible band or tape 23, while the drums 11 and 12 carry a plurality of flexible bands or tapes 31, as illustrated in Fig. 2. For this purpose the housing 6, as shown in Fig. 8, is provided with a single opening 32, through which may be observed a numeral occupying a position preferably in alinement with the horizontal central axis of the drum 21, while certain of the numerals on the tapes or bands 31, occupying a similar position as the numerals on the tape 23, will appear through an oblong slit in the casing or housing 6, which may be partitioned as shown in Fig. 8. As the numerals are arranged a defined or equal distance apart from each other on the tapes or bands 23 and 31, it follows that when the same are shifted in unison numerals having a certain relationship to each other will appear through the openings arranged in the casing or housing 6, as will be presently more fully explained.

In addition to the drums 11 and 12 and 21 and 22, hereinbefore described, there are arranged in the computing-machine shown three sets of drums 34 and 35, 37 and 38, and 40 and 41, which, as shown in Fig. 1, are located a certain distance from the perimeter of the driving gear-wheel 4 and receive their rotary movement from the same by means of pinions in a similar manner as the drums 11 and 12 and 21

and 22 receive their motion. Each set or pair of drums 34 and 35, 37 and 38, and 40 and 41 carry a plurality of flexible bands or tapes 36, 39, and 42, held under tension by rollers 43, 45, and 44 and actuated by springs 46, which, as shown in connection with the rods 48, bear with one end against a collar 47, adjustably arranged on the rods 48, to permit of a ready regulation of the tension derived from the springs 46. These bands or tapes 36, 39, and 42 are arranged with numerals equally spaced thereon in the same general manner to conform to the arrangement of numerals on the tapes 23 and 31, and certain of said numerals occupying a position at or in alinement with the horizontal central axis of the drums 34, 37, and 40 will appear through openings arranged in the casing or housing 6. These tapes being actuated in unison with the tapes 23 and 31 by the driving gear-wheel 4 will expose through the openings in the casing or housing 6 numerals which will have a defined relationship to each other.

If the machine is to be employed as a computing device of wage, the numerals on the tape 23 will represent the total number of hours of work performed. Below the opening exposing one of the numerals of the tape 23, as shown in Fig. 8, is removably arranged a card or indicator containing the rate of wage per hour or fraction thereof. Below the indicator are arranged tapes 31, 36, 39, and 42, which will indicate in succession, first, the sum of the integral or entire hours of work; second, the integral or entire hours of work plus one-quarter of an hour; third, the said hours plus one-half of an hour, and, fourth, the same plus three-quarters of an hour. If, therefore, the rate of wage is six cents per hour, the sum-total due for ten hours of work will be sixty cents, for ten hours and a quarter of an hour sixty-two cents, for ten hours and one-half hour sixty-five cents, and for ten hours and three-quarters of an hour sixty-seven cents. These numerals, indicating the total amount due for work performed for the total number of integral or entire hours and fractions thereof, will when said number of hours or fractions thereof are known and the driving gear-wheel is turned until the numeral corresponding with the number of hours carried by the tape 23 appears through the opening in the casing or housing 6, the vertical column of numerals of the tapes 31, 36, and 39, appearing below the numeral indicating the rate of wage, indicate the total sum due for work performed in full hours and fractions thereof, as hereinbefore fully described. This will also be the case when the rate of wage paid per hour is sixteen cents, in which instance, as shown in Fig. 2, the total amount due for ten hours work performed will be one hundred and sixty cents; for ten and one-fourth hours, one hundred and sixty-four cents; for ten and one-half hours, one



hundred and sixty-eight cents, and for ten and three-fourths hours, one hundred and seventy-two cents. By arranging the tapes or bands in the manner hereinbefore described the length of the tape employed is one-quarter of the length that would otherwise be necessary if a tape were used which had incorporated thereon the fractional parts of an hour. It follows, therefore, that this feature permits of a much quicker manipulation of the machine, because it is only necessary to turn the operating means one-quarter of the distance or space that otherwise would be required to accomplish the same result. Furthermore, the use of separate tapes or bands is preferable in that the machine can be made to suit differing requirements where differing rates of wage exist without the necessity of substituting entire aprons or tapes, as occasion may require, to adapt the machine to the varying conditions. It is, however, obvious that more than a single row of numerals or characters may be placed on the tapes or bands and that for a better distinction between such rows different colors may be employed. These rows would of course comply, for instance, with varying conditions of the rate of wage and the varying denominations of coin, as one row and color would indicate a dollar and the other rows and colors a fraction of such values or denominations in dollars, cents, or the like. Also the arrangement of the rows of numerals or characters may vary in their position on said tapes or bands to facilitate the proper computations under varying conditions.

After having positively actuated the drums 61, 53, 74, 75, and 76 by the driving gear-wheel 49 the same may be held in their respective positions by the following preferred mechanism.

As shown in Fig. 7, the shaft 56 of the drum 55 passes loosely through the driving gear-wheel 49 and an extending sleeve 79 thereof and is provided at its end with a collar 82 and a disk 83, arranged within the rim of a hand-wheel 78, secured to the sleeve 79 by means of a pin or bolt 80.

Within the extending sleeve 79 is mounted on the shaft 56 a strong spring 81, bearing with one of its ends against the collar 82 and with its other end against the gear-wheel 49 and forcing the same against a collar integral with the shaft 56, surrounded by a housing 77, which is secured to the driving gear-wheel 49. The frictional contact between the gear-wheel 49 and the collar in the housing 77 is sufficiently strong to hold the gear-wheel 49 in each position given. In order to turn the gear-wheel 49, the hand-wheel 78 is first moved toward the disk 83, which acts as a hand-rest for the operator, and by this movement the gear-wheel 49 is brought out of engagement with the collar of the shaft 56, arranged in the housing 77, and thus is free to be actuated.

Having thus described the nature and ob-

jects of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A computing-machine comprising means for exhibiting a constant, a plurality of devices in parallel relation with each other each bearing series of characters and means for moving said devices synchronously to present to view certain of said series, said constant representing a fixed relation between the characters exhibited on two of said devices.

2. A computing-machine comprising means for exhibiting a constant, a plurality of devices in parallel relation with each other each bearing series of characters and unitary rotary means for moving said devices to synchronously present to view certain of said series, said constant representing a fixed relation between the characters exhibited on two of said devices.

3. A computing-machine comprising means for exhibiting changeable characters, means for exhibiting a constant and additional means geared to move synchronously with said first-named means in parallel relation with each other and with said first-named exhibiting means for exhibiting additional changeable characters whose relation to the first-named changeable characters is expressed by the constant.

4. A computing-machine comprising means for exhibiting a constant, a plurality of pairs of rollers bearing flexible bands and means for synchronously rotating said rollers to present to view portions of such bands, said constant representing a fixed relation between the characters exhibited on two of said bands.

5. A computing-machine comprising a wall, a plurality of apertures in said wall, a character on said wall adjacent said apertures, a flexible band and means for synchronously presenting at each of said apertures a portion of said flexible band bearing a character, said constant representing a fixed relation between the characters exhibited on two of said devices.

6. A computing-machine comprising means for exhibiting changeable characters, means for exhibiting a constant, and a plurality of additional means movable in parallel relation with each other and synchronously with said first-named means for exhibiting a plurality of additional sets of changeable characters whose relation to the first-named changeable characters is expressed by the constant.

7. A computing-machine comprising a case, a plurality of apertures in said case, a plurality of flexible bands bearing characters visible through said apertures, pairs of rollers in said case on which said bands are wound, unitary means for rotating said rollers and stationary characters adjacent said apertures expressing a relation between the characters on two of said bands.

8. A computing-machine comprising a case, a plurality of apertures in said case, a figure on said case representing a wage-rate, a flexible



band bearing a plurality of figures representing units of time or the like, a flexible band bearing a plurality of figures representing the products of said constant and said units, a  
5 third flexible band bearing a plurality of figures representing such products plus a definite fraction of said constant and unitary means for presenting at such apertures definitely-related portions of such bands.

10 9. A computing-machine, comprising a case, a character constantly exhibited on said case, apertures in said case adjacent said character, a plurality of devices in parallel relation to each other on said case each bearing series of  
15 characters and means for moving said devices synchronously to present at said apertures certain of said series, said constantly-exhibited character representing a fixed relation between the characters exhibited at two of said  
20 apertures.

10. A computing-machine, comprising a case, a numeral constantly exhibited on said case, apertures in said case adjacent said numeral, a plurality of rotary devices in parallel  
25 relation with each other, each bearing series of numerals and unitary means extending

out of said case for synchronously rotating said devices to present at each of said apertures a certain numeral of said series, said constantly-exhibited numeral representing a fixed  
30 relation between the numerals exhibited at two of said apertures.

11. A computing-machine comprising a case, a numeral constantly exhibited on said case, apertures in said case adjacent said numeral, a movable device bearing a progressive series of numerals, a plurality of other movable devices in parallel relation with each other and with said first-named movable device, one  
35 bearing a series of numerals representing the product of the numerals of said first-named series by said constantly-exhibited numeral, and another bearing a series of numerals representing the integral sum of such product and a portion of said constantly-exhibited numeral and means for synchronously moving all  
40 said devices.

FRANK S. WEYRS.

Witnesses:

JOHN A. WIEDERSHEIM,  
WM. CANER WIEDERSEIM.