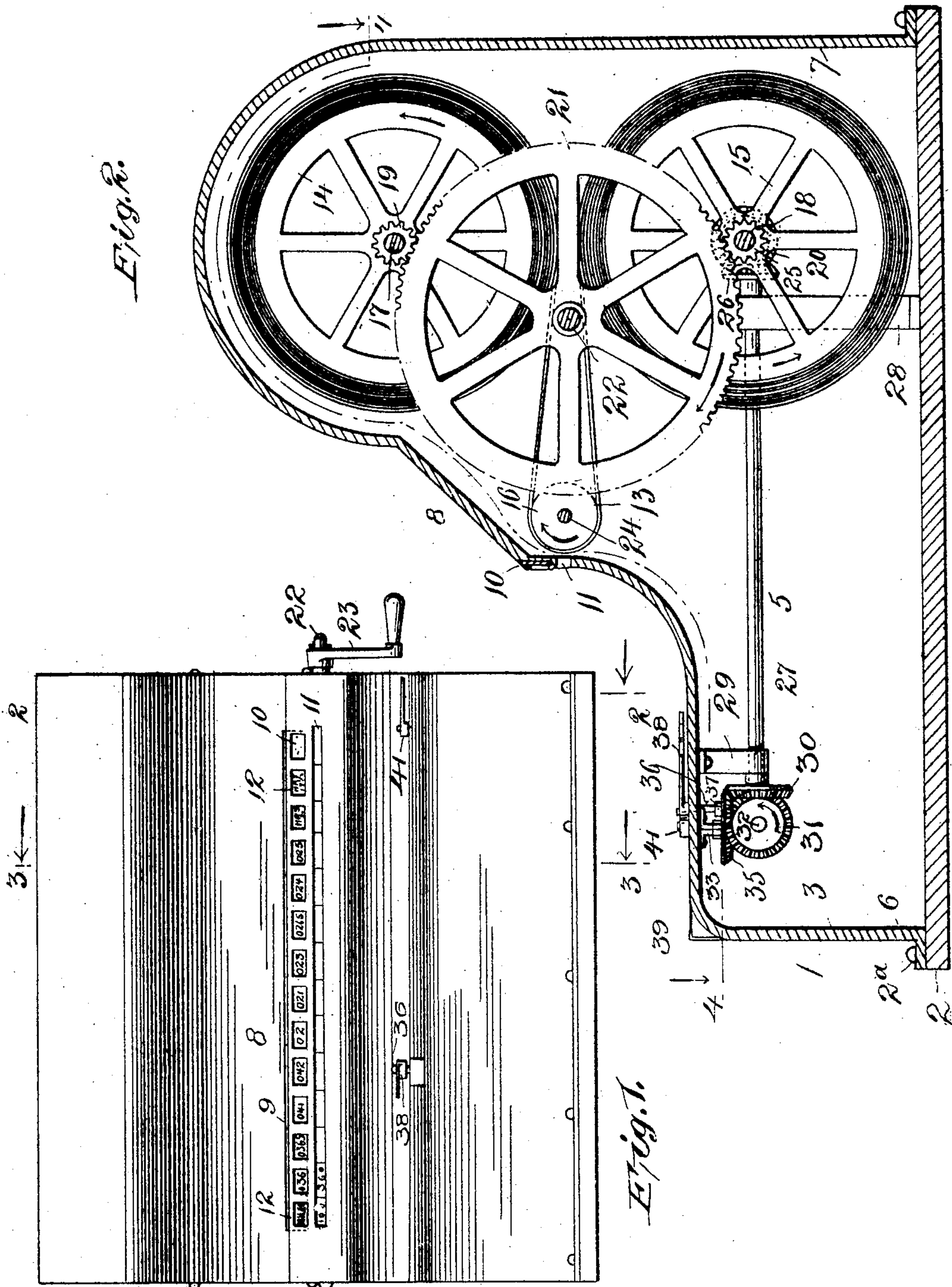


No. 799,031.

PATENTED SEPT. 12, 1905.

C. CAMPBELL, JR.
CALCULATING MACHINE.
APPLICATION FILED SEPT. 8, 1904.

4 SHEETS—SHEET 1.



Witnesses
C. W. Benjamin
Phas. G. Munsley.

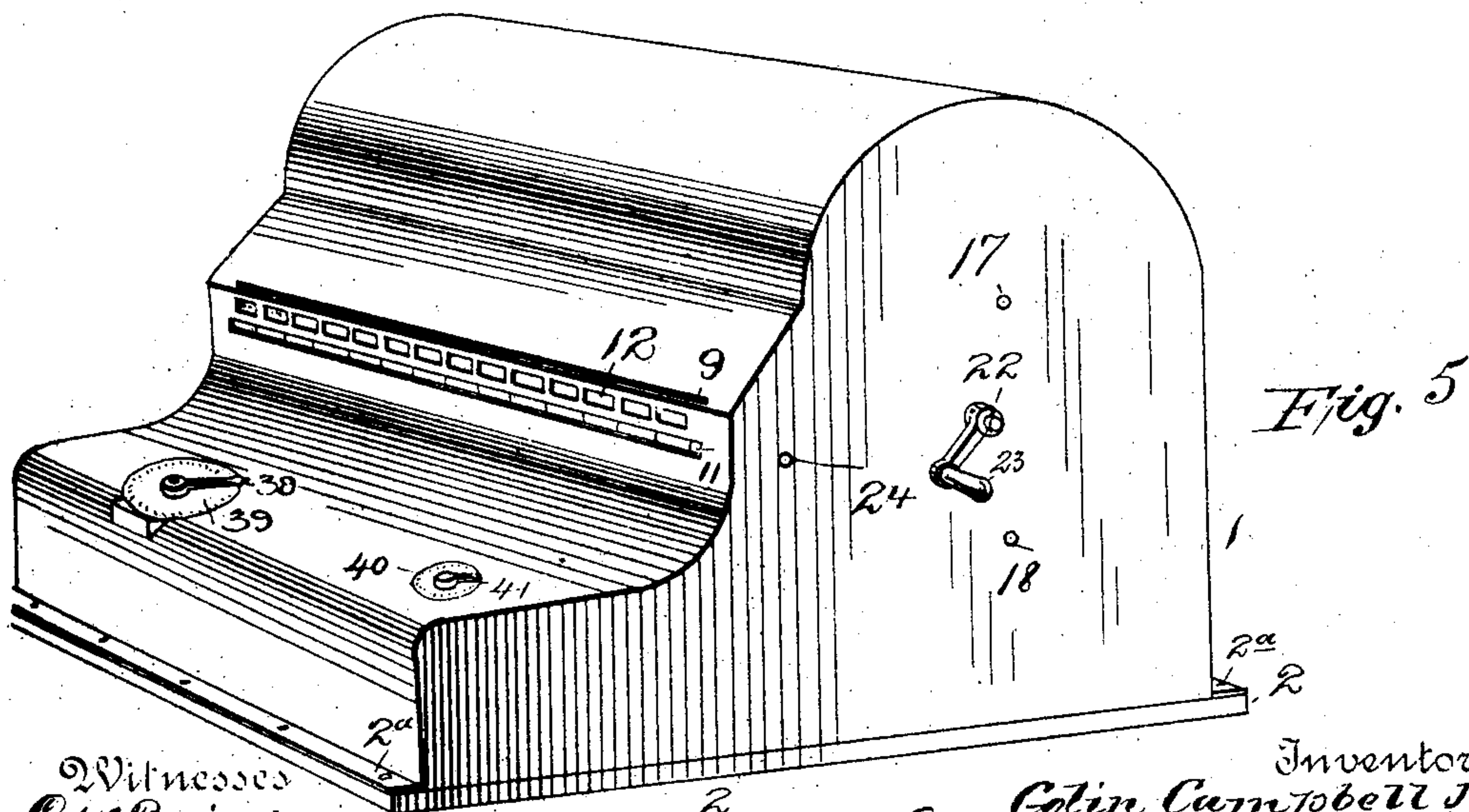
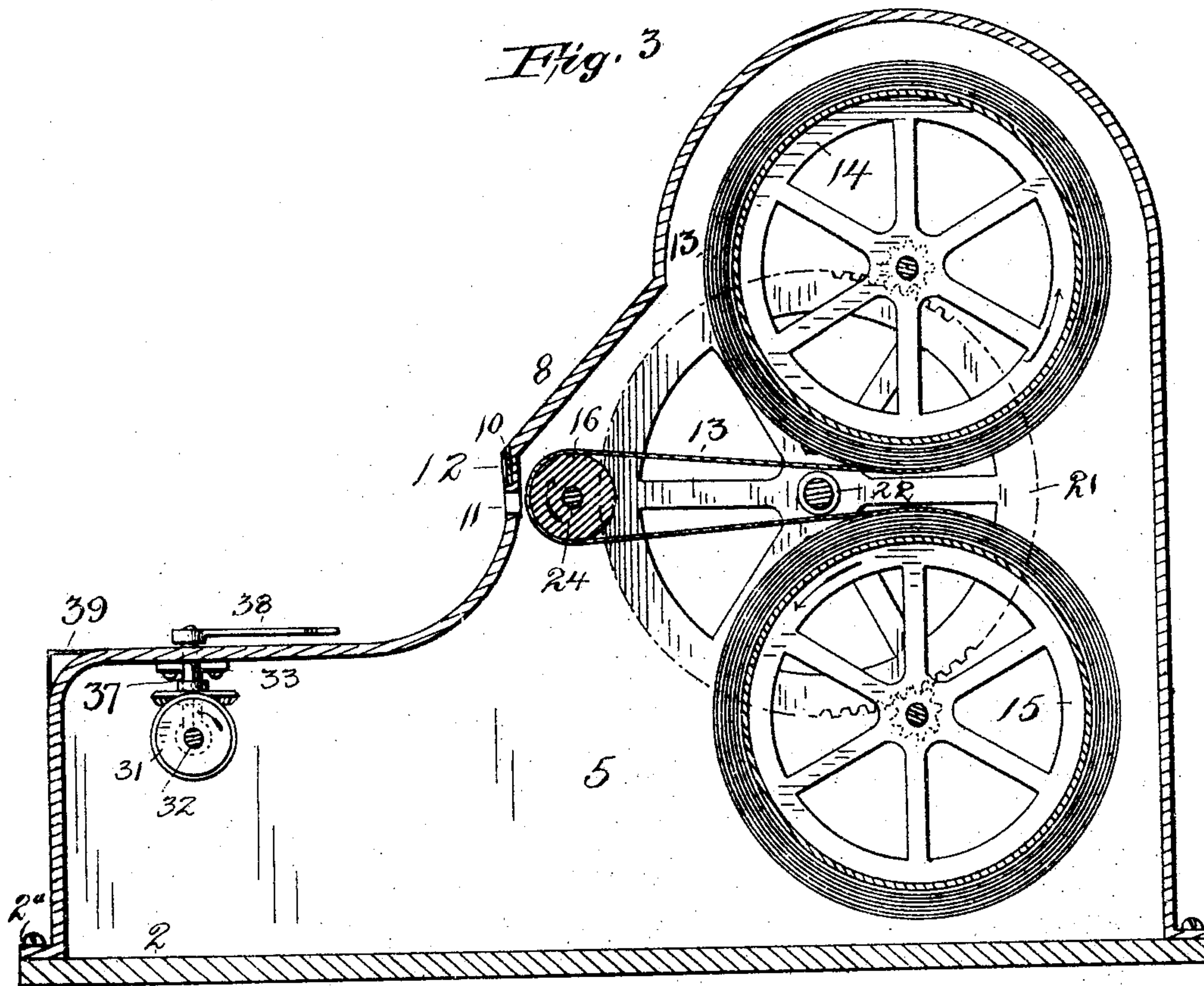
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4 SHEETS—SHEET 3.

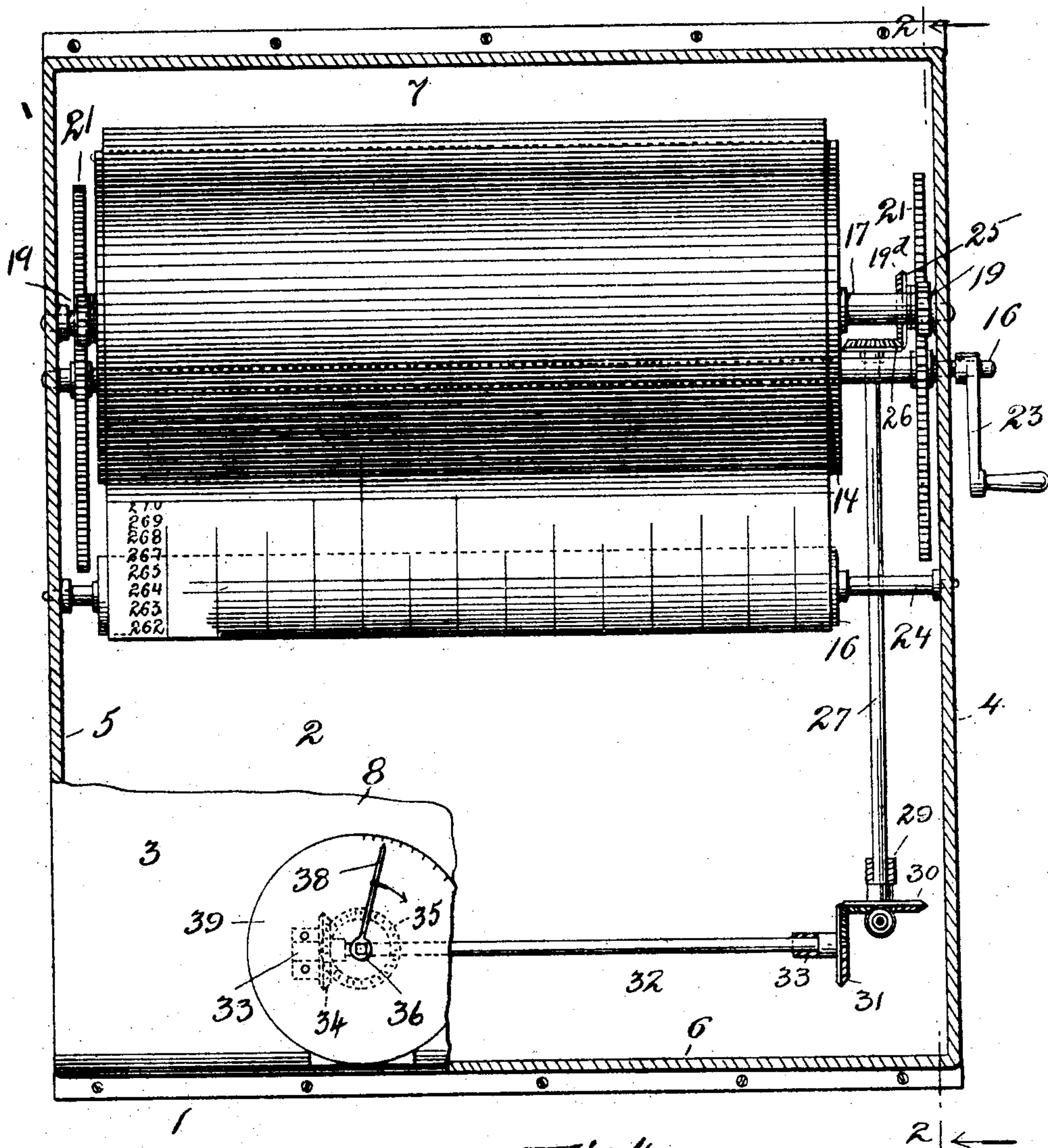
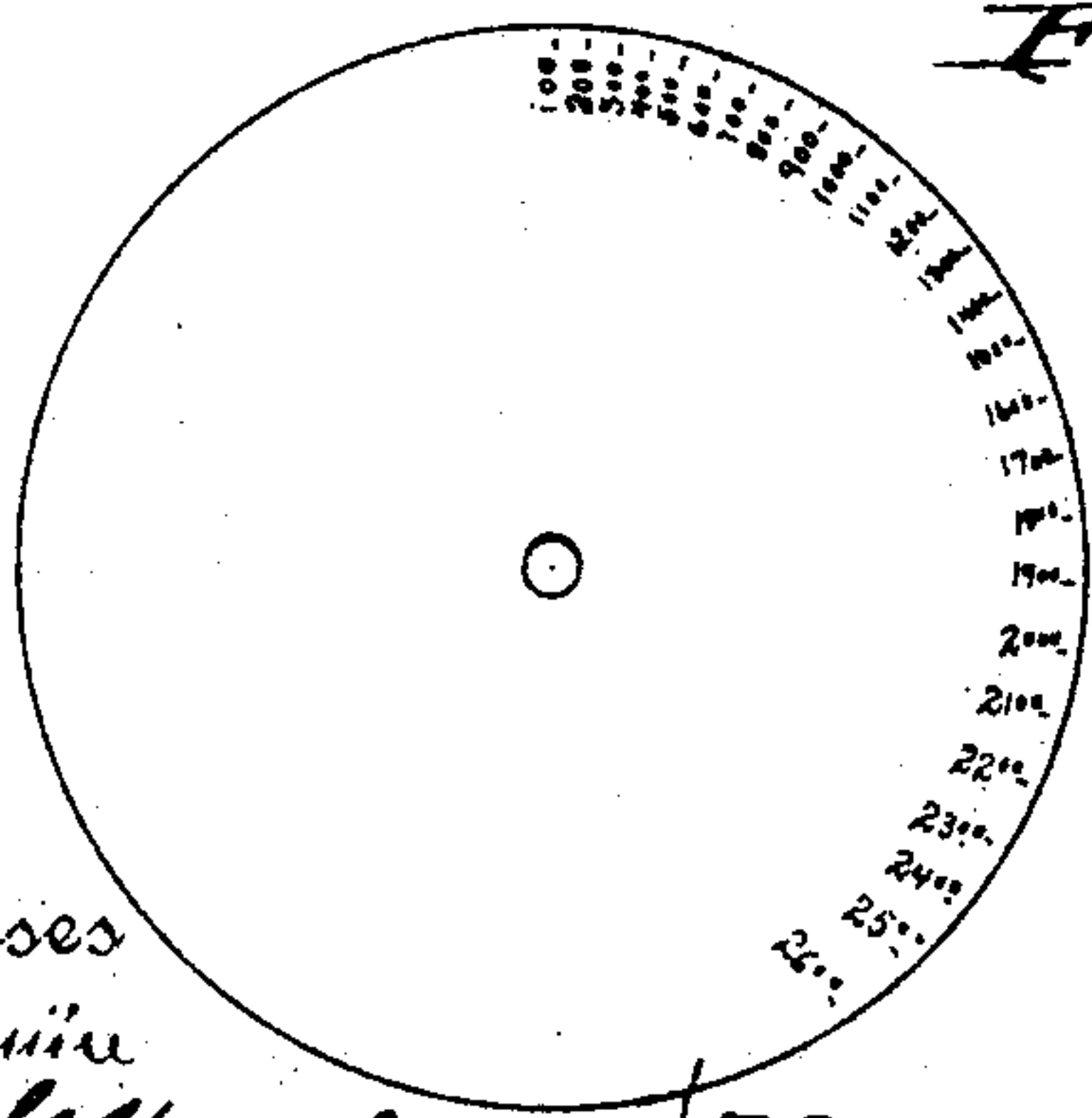


Fig. 4.

Fig. 6.

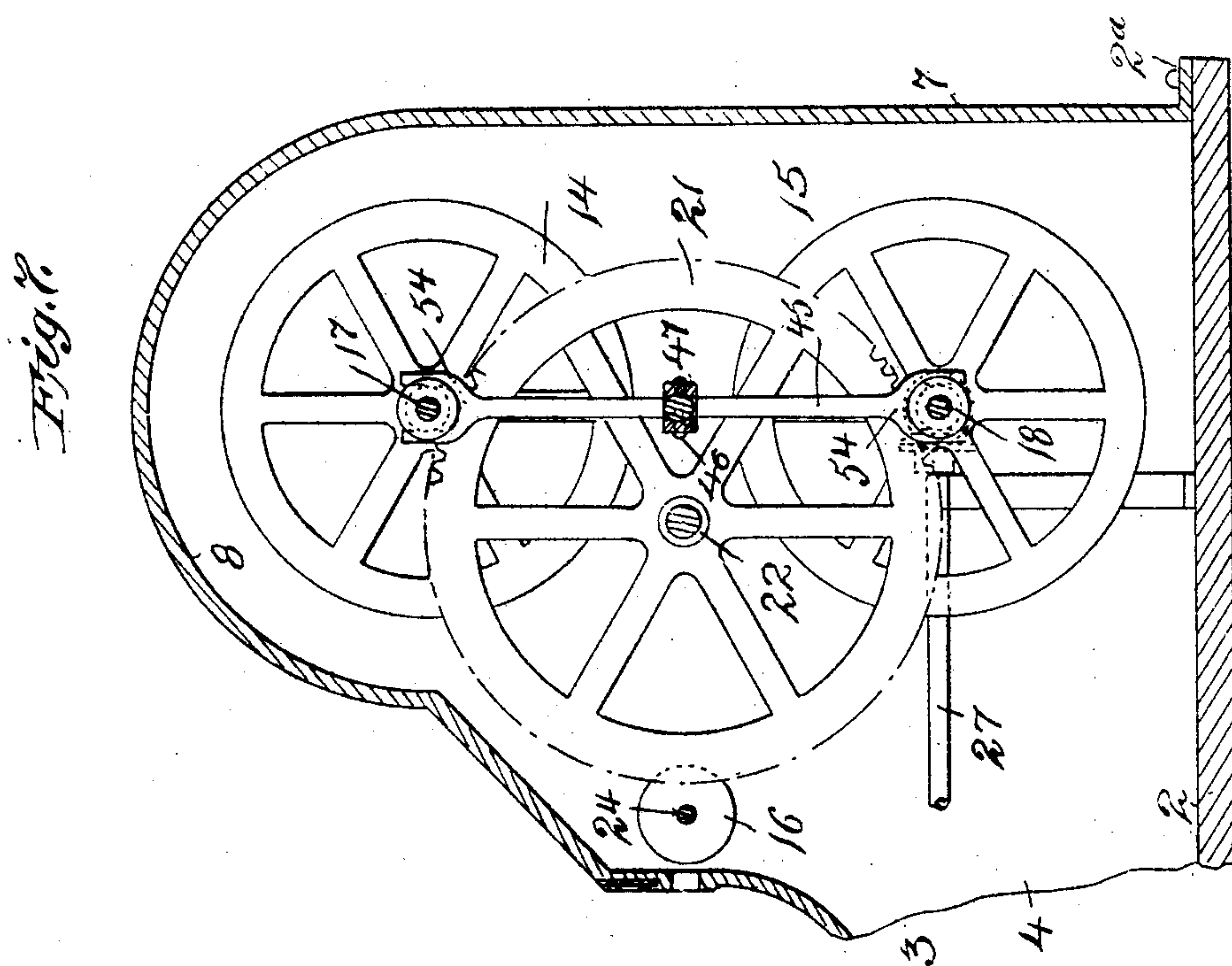
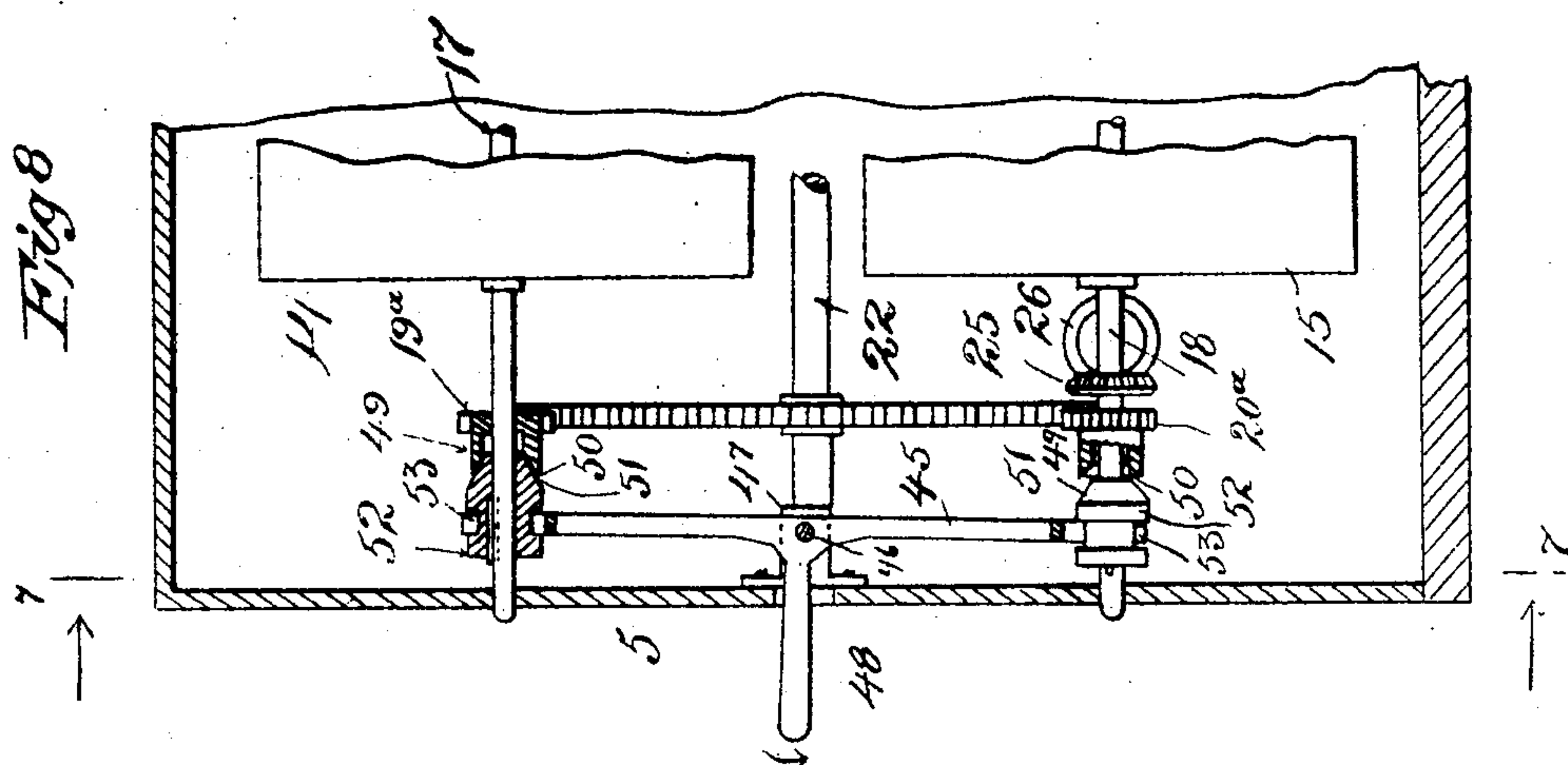


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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

COLIN CAMPBELL, JR., OF UNION HILL, NEW JERSEY.

CALCULATING-MACHINE.

No. 799,031.

Specification of Letters Patent.

Patented Sept. 12, 1905.

Application filed September 8, 1904. Serial No. 223,683.

To all whom it may concern:

Be it known that I, COLIN CAMPBELL, Jr., a citizen of the United States, and a resident of Union Hill, county of Hudson, State of New Jersey, have invented a new and useful Improvement in Calculating-Machines, of which the following is a specification.

The object of my invention is to provide a machine of this class which will readily indicate the amounts required without the vexatious additions and multiplications incident to the methods of calculating-machines heretofore in use.

More particularly, the object of my invention is to shift accurately and rapidly a long sheet, ribbon, or tape which is provided with a number of tabulated characters so that the desired reading may be had instantly and without delay.

These objects are accomplished by providing a machine with a casing in which are mounted rolls. A tape is mounted on two of said rollers so as to be wound from one to the other and pass over a third roll which is so disposed with regard to the casing that the characters on the tape may be readily read through the casing. Means are also provided for accurately and rapidly shifting the tape and for indicating just what characters are passing under the openings in the casing at all times while the machine is in operation.

For a more particular description of certain embodiments of my invention reference is to be had to the accompanying drawings, forming a part hereof, in which—

Figure 1 is a front elevation of my improved machine. Fig. 2 is a sectional view taken on the line 2 2 of Fig. 1 looking in the direction of the arrows. Fig. 3 is a similar section taken on the line 3 3 of Fig. 1. Fig. 4 is a section taken on the line 4 4 of Fig. 2 looking in the direction of the arrows. Fig. 5 is a perspective view of my improved machine. Fig. 6 shows one of the dials. Figs. 7 and 8 show certain details of a modified structure for changing the feed of the tape or ribbon, Fig. 7 being taken on the line 7 7 of Fig. 8 looking in the direction of the arrows.

Throughout the various views similar reference characters designate similar parts.

The machine 1 rests on a base 2, which supports the casing 3, which incloses and sustains the mechanism of the machine. Screws 2^a secure these parts together. This casing is

provided with two vertical walls 4 and 5, in which the rollers are journaled, as will appear below, and two transverse vertical walls 6 and 7. The vertical walls 4, 5, 6, and 7 are united by a curved and irregular top 8, which preferably has the outline indicated in Fig. 2. The top 8 is provided with a slot 9, in which may be inserted an index-card 10, which designates the characters or the nature of the characters which may be read through the slot 11 immediately below the card 10. The marks of the card 10 are read through openings 12 immediately above the slot 11. The portion of the cover 8 adjacent to the wall 6 is made horizontal and provided with dials, the purpose of which will appear below.

A tape 13 passes from the lower part of a roller 14 to and over a roller 16 to the upper part of a roller 15. The tape and rollers are so arranged that the tape 13 may be wound on or off the roller 14 from or on the roller 15 and always over the roller 16, one end being secured to the roller 14, the other to the roller 15. The roller 16 is so placed that its circumference is parallel to the openings 11, so that any characters on the tape 13 which pass under the openings 11 may be read there-through. It is also obvious that when the tape 13 is wound on either of the rollers 14 or 15 it is wound with its face inward, so that its outer or back surface is exposed on the rollers 14 and 15. This protects the face of the ribbon or tape 13 while it is stored in the machine. The rollers 14 and 15 are each mounted on shafts 17 and 18, respectively, and are provided with pinions 19 and 20, respectively, which pinions are not fixed or keyed to their respective shafts, but have an adjustable or frictional connection, as will appear below. The pinions 19 and 20 are driven by a large gear 21, which is fixed to and mounted on a shaft 22, which, like the shafts 17 and 18, is journaled in the walls 4 and 5, respectively. The end of the shaft 22 is provided with a crank 23 or other actuating mechanism, so that the machine may be either manually or otherwise operated, as desired. The shaft 24 of the roller 16 runs parallel to the shafts 17, 18, and 22 and is journaled in the casing 3 in a similar manner. The gears 19 and 20 rest against collars 19^a, fixed to the shafts 17 and 18, thereby having a frictional connection with said collars, which permits said gears to slip on their respective shafts when necessary to compensate for the tape on

the rollers. The shafts 17, 18, and 22 may be provided with one or more intermeshing gears, as desired; but as all are practically identical it is unnecessary to describe them further.

The shaft 18 is provided near the wall 4 of the casing 3 with a beveled gear 25, which is free from the pinion 20 and fixed to the shaft 18. The particular location of this beveled gear 25 is immaterial, provided it is conveniently located where it will mesh with the gear 26, which is mounted on a shaft 27, journaled in suitable bearings 28 and 29. The bearing 28 is preferably attached to the base 2, and the bearing 29 is preferably suspended from the horizontal portion of the cover 8. The other end of the shaft 27 from the beveled gear 26 is provided with a beveled gear 30, which meshes with another beveled gear 31, which is mounted on a shaft 32, which shaft is journaled in suitable bearings 33.

At a suitable point on the shaft 32 is fixed a beveled gear 34, which meshes with a beveled gear 35 on a vertical shaft 36, held in any suitable bearings 37, and a pointer 38 is fixed to the upper end of the shaft 36. This pointer 38 passes over a dial 39, which is marked and graduated so as to correspond with the paper on the roller 15, as will appear below. The graduations are preferably in units of one hundred each. If desired, a second or auxiliary scale 40, with its pointer 41, may be placed as shown in Fig. 5. The dial 40 is graduated from "1" to "100," and the pointer 41 is connected with the shaft 32 by suitable gearings, so as to make a complete revolution while the other pointer moves a distance represented by adjacent marks. As the amount of paper on the roll 15 which is wound on by one revolution of this roll varies with the amount of paper already on the roll and as the shaft 32 rotates with an angular velocity which is in a fixed and definite ratio to the angular velocity of the shaft 18, it is obvious that the graduations on the dial 40, unlike the graduations on the dial 39, can only be approximate. For example, if the graduations on the dial 40 are correct when the ribbon is in the condition indicated in Fig. 2 they will be slightly incorrect after the shaft 18 has made a few revolutions, because then one revolution of the shaft 18 would wind more or less of the ribbon or tape onto the roller 15, so that one revolution of the pointer 41 would at one time indicate that more characters had passed the openings 11 than at another. For this reason it might be well to omit all characters from the dial 40 as misleading, and this pointer 41 might be used on a plain dial to indicate only approximately. In Figs. 4 and 6 only a part of the marks or graduations are shown.

If the tape or ribbon 13 is of great length, so that the diameter of the winding-surface of the roller 14 or the roller 15 is greatly

changed during the operation of the machine, it may be that the means for letting the pinions 19 and 20 slip on their respective shafts may be insufficient to enable the mechanism to work properly. If this is so, means should be provided whereby the gear 21 will drive either the shaft 17 or the shaft 18, whichever one contains the roller upon which the ribbon or tape is being wound, but not both at once.

In Figs. 7 and 8 is shown a simple mechanism for effecting this change, although it is obvious that any other suitable mechanism may be employed. The means set forth in these figures comprise a rocker-arm 45, which is pivoted at 46 by means of a pin mounted on lugs 47. The rocker-arm 45 has a handle 48, which projects through the casing and preferably through the wall 5. The pinion 19^a is loose to the shaft 17, and the pinion 20^a is loose to the shaft 18. These pinions are provided with collars 49, which are chamfered out at 50 to receive and fit the conical ends 51 of plugs 52, which are keyed to and revolve with the shafts 17 and 18, respectively, but have a slight longitudinal movement thereon, which permits these plugs 52 to either engage or disengage these collars 49, as may be desired. Each of the plugs 52 is provided with an angular groove 53, which engages the forked end 54 of the rocker 45. When the mechanism is in the position shown in Fig. 8, the plug 52 engages the collar 49 of the pinion 19^a. It may be made to disengage the collar 49 on the pinion 19^a and through plug 52 engage its corresponding collar by merely giving the handle 48 a slight angular movement in the direction of the arrow, as shown in Fig. 8.

It is obvious that instead of providing a frictional clutch, as shown, a similar result might be obtained by merely shifting the pinions 19 and 20 on the shafts so that either one, but not both at once, would engage the gear 21. This, however, would be objectionable, as there are times when the teeth would not be in a position to intermesh and might refuse to engage, so as to cause annoyance and trouble. For these reasons it is thought that the frictional clutch is better, and is also better for the additional reason that it permits the pinion to slip on the shaft if such slipping is necessary to prevent the machine or ribbon from being injured.

The machine as above described may be used for an indefinite number of purposes and will be of value wherever a large list of tabulated statements is to be rapidly shifted and readily read. Of course it may be used by brokers, factors, insurance companies, banks, commission merchants, bookkeepers, and all offices where a large number of definite and tabulated tables are used in calculation. However, without limiting myself in any way for clearness and conciseness I will describe one

particular manner in which my improved calculating-machine may be used with great advantage.

Referring to the openings 12, (shown in Fig.

5 1) appear various characters. Beginning with the "1," at the extreme left, appears the term "Miles." The others, reading from left to right, are as follows: ".036," ".0365,"
10 ".041," ".042," ".02," ".021," ".023," ".0265," ".024," ".025," "Hrs. 3," "Hrs. 17½."

The tape or ribbon is printed so as to correspond to the use in an office where the pay of trainmen is calculated. Under the head of
15 "Miles" appear figures which run from "1" to "6000" and show through the slot 11. The pay of trainmen various according to their work and the mileage which they run. For each mile one class of engineers receive
20 .036, another class receive .0365, another class receive .041, and another class .042, depending on the nature of the service rendered. It often happens that the same engineer will run several kinds of engines, and so be en-
25 titled to pay in several classes of work, each of which is calculated on a separate basis—that is, he might draw pay for two hundred miles at .036 and for four hundred miles at .042, all within the same month and for which
30 he would get paid the same pay-day. On the tape or ribbon 13 is set down opposite each mile the pay which corresponds to the mileage. For example, for one hundred miles the tape or ribbon would show under ".036"
35 "3.60," under ".042" "4.20," and so on throughout the list. Each mileage-mark which appears under the head of "Miles" has its corresponding figures to indicate the compensation due for the mileage traveled in
40 the various classes, so that the operator by merely turning the crank 23 until the desired number of miles appears at its proper place under the index is enabled to read the pay earned for the mileage and reads it off di-
45 rectly under the rate per mile in the index. As indicated in Fig. 1, if the mileage is one hundred the pay at the rate of .036 is 3.60 or at .042 per mile is 4.20, which of course represents the pay earned. As the tape 13
50 passes the slot 11 very rapidly, it is impossible to read the figures while the machine is in operation. To avoid the incessant stopping and starting of the machine or slow running, the dials are provided, and the pointers on the
55 dials indicate the position of the mileage passing before the opening 11, so that the operator at all times knows by glancing at the dials the characters passing the opening 11 and he is enabled to accurately and rapidly
60 bring the proper mileage before the opening 11.

From the foregoing the operation of the mechanism can be readily understood, and it is obvious that if the characters on the ribbon
65 13 are changed, as well as the index which

shows through the opening 12, this machine may be used with great advantage for all purposes wherein tabulated sheets may be employed.

My invention is not to be construed as limited to the precise construction shown and described, as it is obvious that many others may be made, all of which come within the scope of my invention as pointed out in the annexed claims.

Having thus described my invention, what I claim is—

1. In a calculating-machine, a casing, a tape or ribbon, and rollers for supporting or moving said tape or ribbon, so that a portion
80 of it passes adjacent to a predetermined part of said casing, dials and pointers indicating what portion of the tape is passing the predetermined part of the casing when the machine is in use, one of said dials being so
85 marked as to correspond with the amount of tape on a roller.

2. In a calculating-machine, a tape or ribbon, rollers which are so arranged and disposed that the tape is wound from one onto
90 another, means for causing said rollers to wind and unwind said tape or ribbon, and means for permitting an irregular angular movement between the said rollers and their actuating mechanism.

3. In a calculating-machine, a casing with an index, rollers mounted therein, a ribbon with characters mounted on said rollers, shafts supporting said rollers, gears having a slipping and frictional connection with said shafts
100 and means for driving said gears.

4. In a calculating-machine, the combination of a casing provided with an aperture, rollers within said casing to support and guide
105 a tape or ribbon so that characters thereon can be seen through said aperture, dials in said casing, pointers to cooperate with said dials and connected to said tape supporting and guiding means so as to move in a certain definite ratio to the movement of said tape or ribbon, one of said dials being graduated with
110 marks indicating single revolutions of said rollers.

5. In a machine of the class described, the combination with a pair of rollers, a gear and
115 means to operatively connect it with either of said rollers to wind a tape bearing a series of characters from either roller onto the other, a dial graduated in accordance with the characters on said tape and a pointer operatively
120 connected to said gear to indicate on said dial the approximate position of certain characters on said tape.

Signed at the city, county, and State of New York this 22d day of June, 1904.

COLIN CAMPBELL, JR.

Witnesses:

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WENONA MARLIN.