No. 768,089. PATENTED AUG. 23, 1904.

I. N. SWEET.

INTEREST COMPUTING MACHINE.

APPLICATION FILED AUG. 4, 1902.

NO MODEL. 6 SHEETS—SHEET 1.

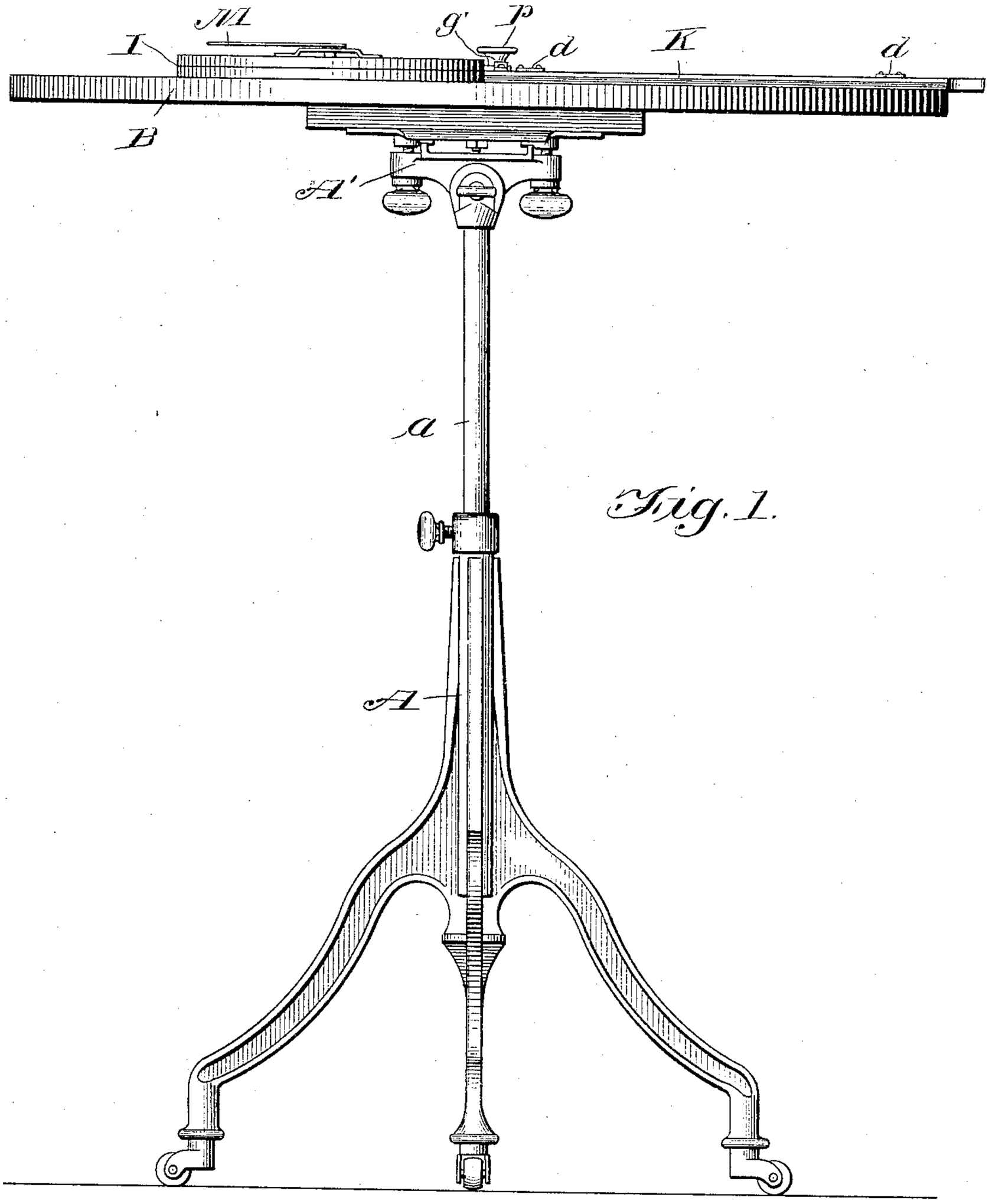

Fig. 1.

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K. K. Lindy

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by Frank D. Thomason
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NO MODEL. 6 SHEETS—SHEET 2.

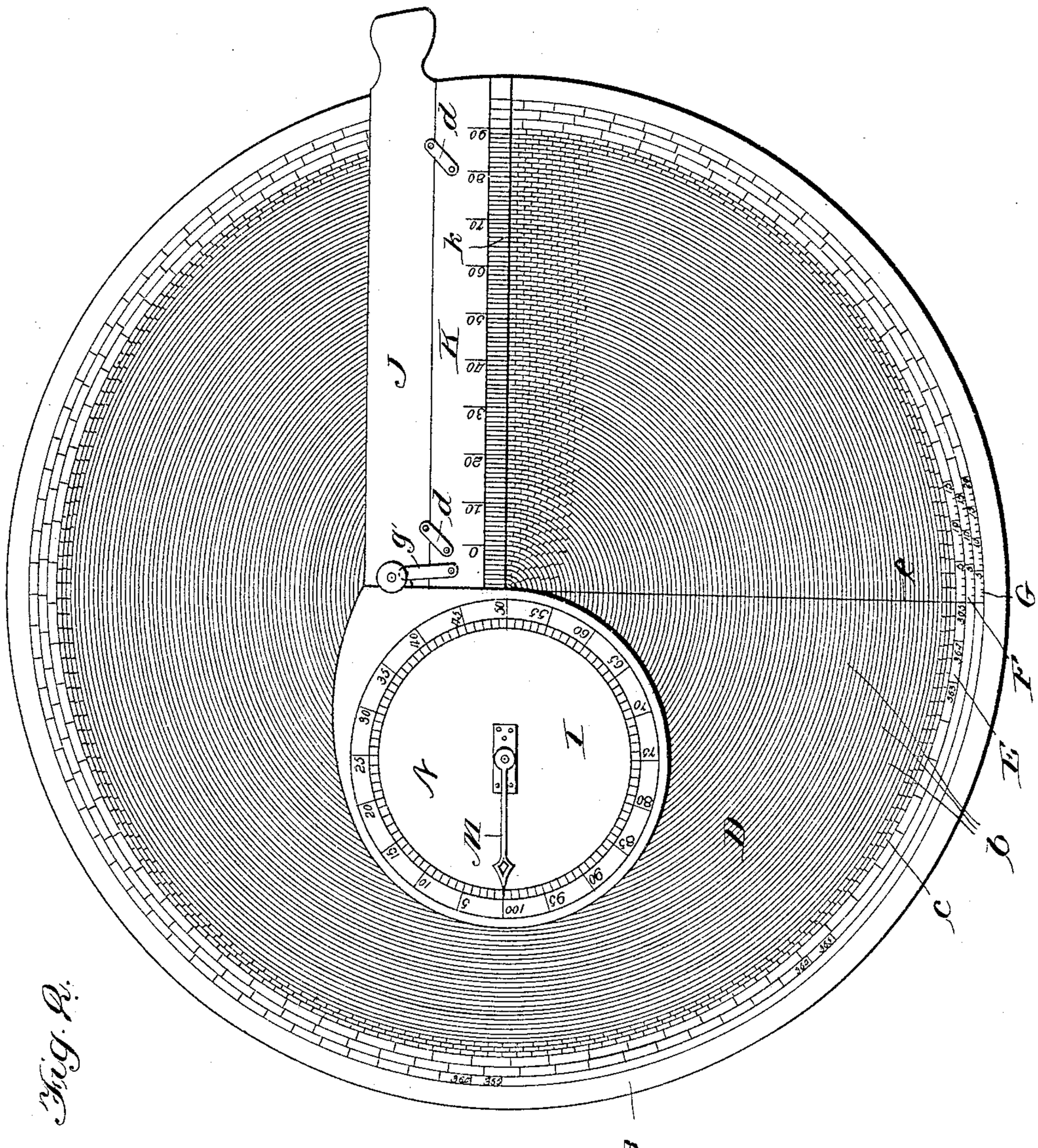

Fig. 1.

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Fig. 3.

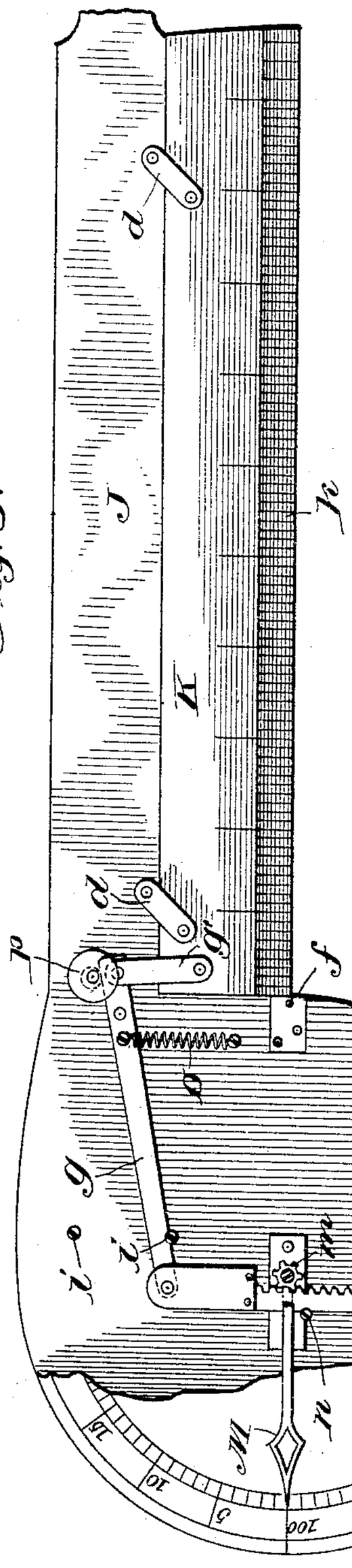
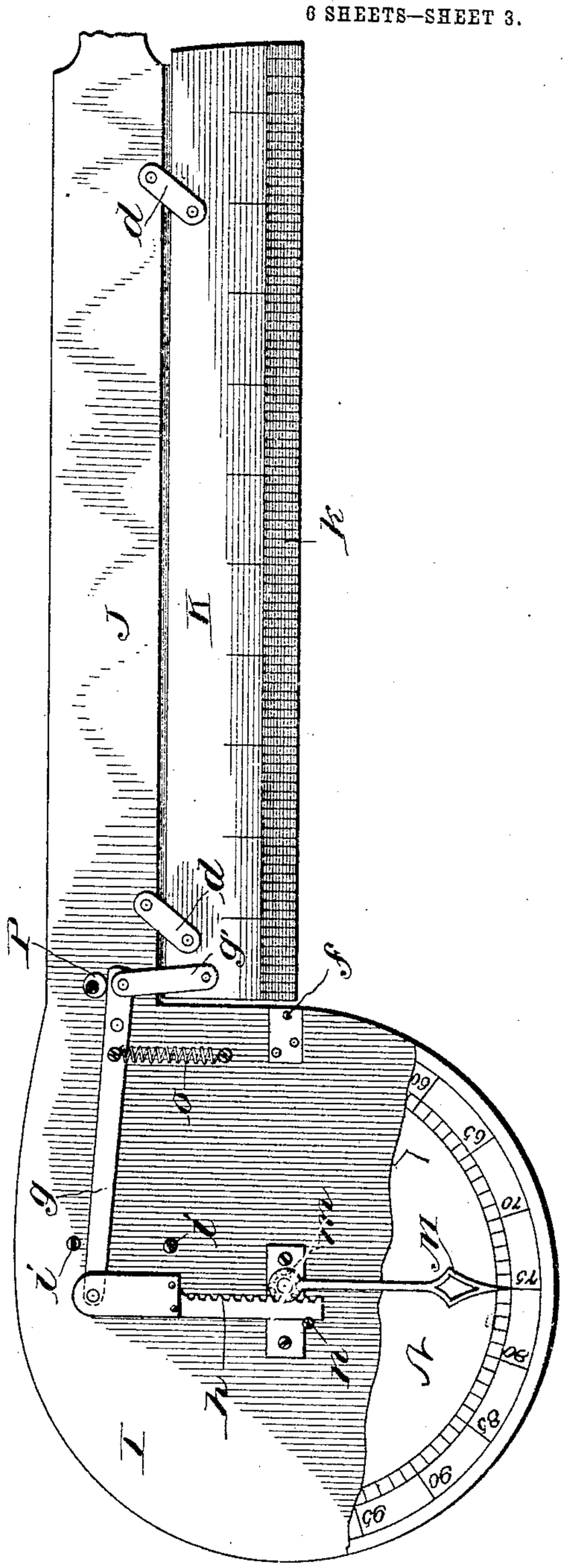


Fig. 4.



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NO MODEL. 6 SHEETS—SHEET 4.

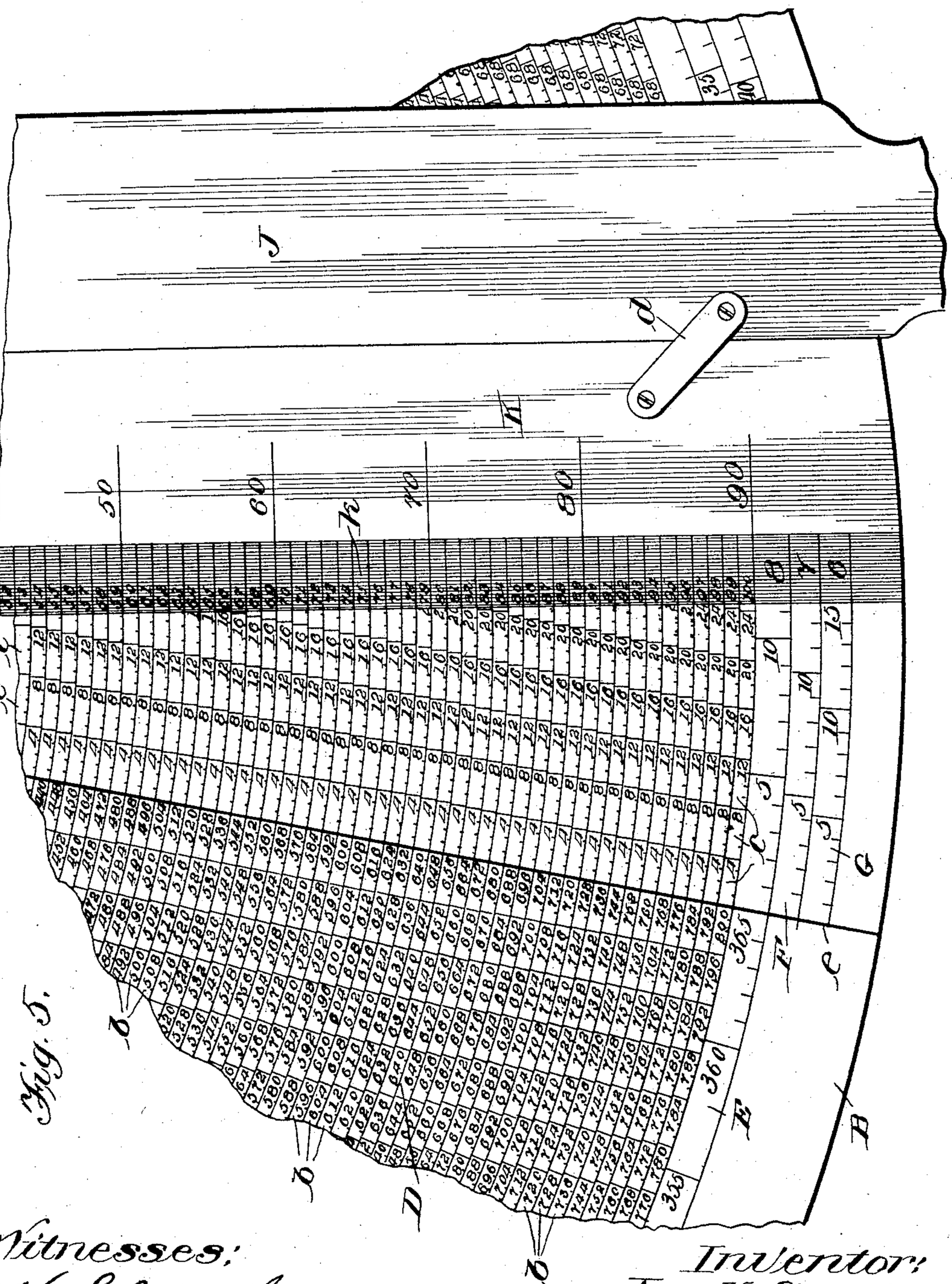

Fig. 5.

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NO MODEL. 6 SHEETS—SHEET 5.

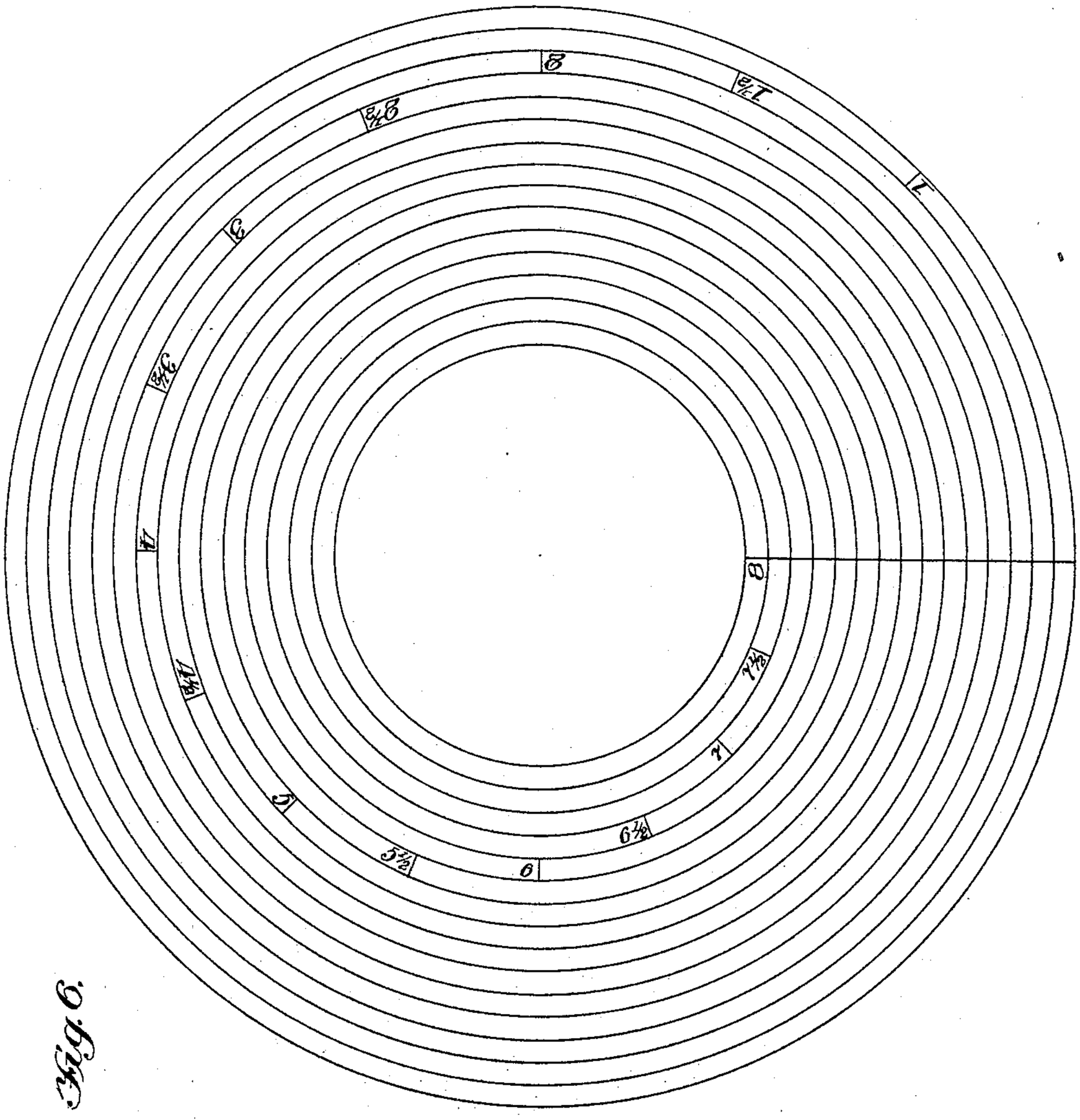

Fig. 6.

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INTEREST COMPUTING MACHINE.

APPLICATION FILED AUG. 4, 1902.

NO MODEL.

6 SHEETS—SHEET 6.

Fig. 7.

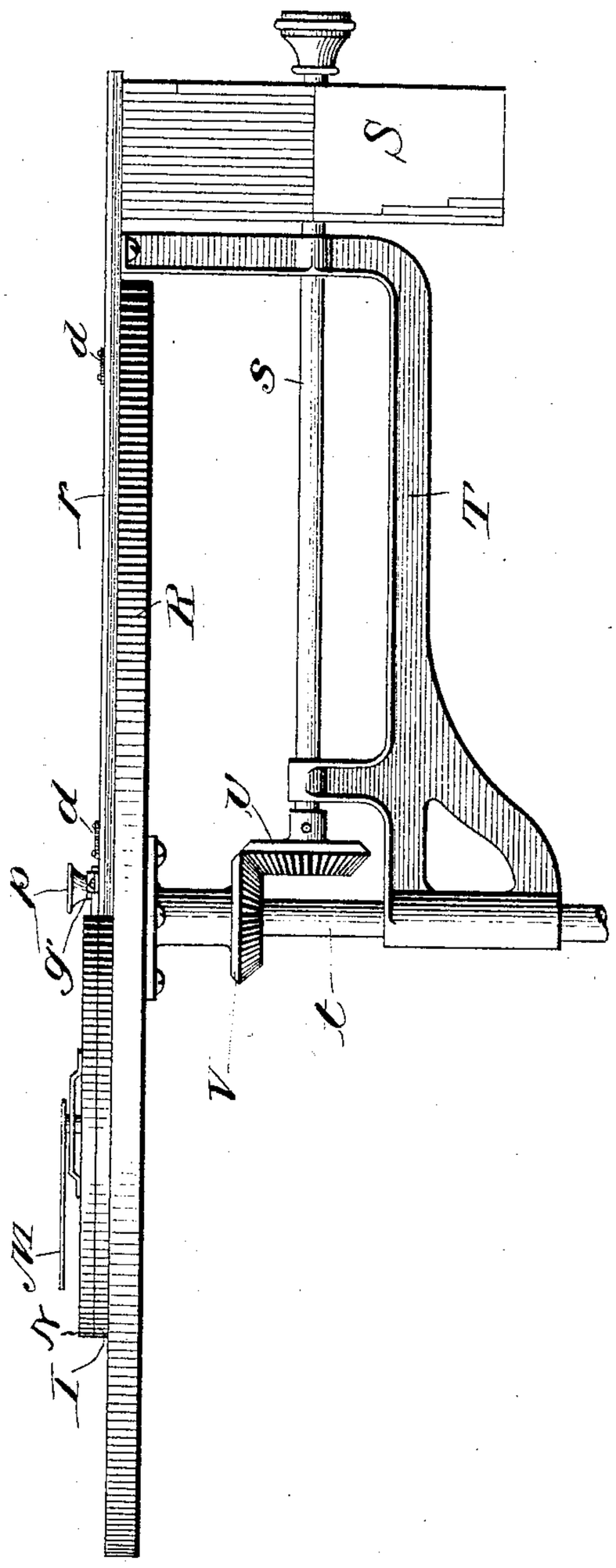
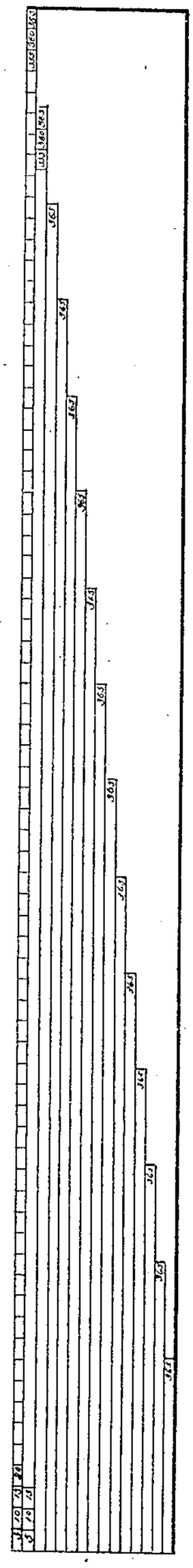


Fig. 8



Witnesses:
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E. L. Lundy

Inventor:
Ira N. Sweet.
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Attorney.

No. 768,089. Patented August 23, 1904.

UNITED STATES PATENT OFFICE.

IRA N. SWEET, OF AURORA, ILLINOIS.

INTEREST-COMPUTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 768,089, dated August 23, 1904.

Application filed August 4, 1902. Serial No. 118,284. (No model.)

To all whom it may concern:

Be it known that I, IRA N. SWEET, a citizen of the United States, and a resident of Aurora, in the county of Kane and State of Illinois, have invented a certain new and useful Improvement in Interest-Computing Machines, of which the following is a full, clear, and exact description.

The object of my invention is to provide a device for ascertaining the amount of interest due on any given principal for any given length of time quickly and easily by a purely mechanical operation.

Heretofore the most expeditious way of computing interest, particularly in large financial and commercial institutions, has been by book. This I accomplish by the means hereinafter fully described and as particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a side view of my invention, showing the chart and interest-computing devices mounted upon a suitable stand. Fig. 2 is a plan view thereof. Figs. 3 and 4 are plan views of the graduated principal straight edge and fraction-indicator used in conjunction therewith, having portions of the dial of said indicator removed so as to expose to view the actuating mechanism for the index-hand of the same. Fig. 5 is a plan view, drawn to full size, of a broken-away section of the interest-indicating chart and straight edge. Fig. 6 is a diagrammatic view of said table, illustrative of the chronological zone of said chart. Fig. 7 is a side elevation of the upper portion of the supporting-stand and computing devices of a modified construction of my invention. Fig. 8 is a diagrammatical view of the date-tables for the different per cents of interest which appear on the circumference of the date-chart of said modification.

In the drawings, A represents a suitable stand having a vertically-adjustable post *a*, that has a head A′ securely fastened to its upper end, so constructed as to permit of the circular chart B, supported thereby, to have a rotary and a tilting movement, as desired. The upper face of the chart B is provided with a series of one hundred concentric spaces *b*, which are separated by concentric lines, preferably black in color and of equal width, and each of these spaces *b* is divided into sections *c*, which are equal in length in all of said circular spaces, as near as practicable, and at the same time permit said circular spaces to be divided a given number of times without leaving a fraction. Each of these sections *c* is provided with four slight graduations located at equal distances apart. The innermost circular space is divided into four of these sections, the next to the inner circular space into six of said sections, and the third circular space from the center into eight of said sections, and the sections in each successive circular space from the center increases in the same ratio until the outer or one hundredth circular space is reached, which contains two hundred of said sections. A heavy radiating line is drawn extending from the center of the chart to its circumference, which intersects the point in all of said circular spaces, from which the division of each of said spaces into sections commences, and the section to the right of this zone or starting-line *e* in each circular space contains the numeral "4," which indicates the number of divisions marked by the graduation into which said first section is divided. The second section to the right of the line *e* contains the numeral "8" and the next "12," the next "16," and so on, and indicate the total number of divisions marked by the graduations in the sections extending from left to right in each circular space entirely around the chart. Thus the section of the innermost circular space next the left-hand side of the zero-line *e* contains the numeral "16," indicating the total number of divisions into which the sections contained in said circular space is divided, and the corresponding or last section of the second circular space from the center of the chart contains the numeral "24," indicating the total number of divisions in which said second space is divided, and the last section of the third space contains the numeral "32," indicating the number of divisions in said space, and so on in the same mathematical progression to the outer or one-hundredth circular space from the center, which contains the numeral "800." Outside of this circular

field of the chart B, which for convenience of description will hereinafter be termed the "interest-indicating" field D, is a circumferential marginal calendar zone, which is devoted to concentric calendar-spaces E F G, in each of which the number of the days of the year is recorded. Taking the calendar year to contain three hundred and sixty-five days, the innermost of these calendar-spaces E is divided into seventy-one equal sections, which are subdivided by suitable graduations into five equal divisions, each of which represent one day, thus dividing the entire calendar-space E into three hundred and sixty-five divisions. This innermost circle is utilized during the operation of the apparatus when it is desired to compute interest at eight per cent., as will hereinafter more fully appear, and the starting-point of the section and the divisions of said sections into which said calendar-space E is divided is indicated by the zero-line *e* of the chart or in the same radial line as that bounding the left of the first section of the one-hundredth circular space of the interest-field C, which contains the numeral "800." The next calendar-space bounding the eight-per-cent. calendar-space, as well as all other of said concentric calendar-spaces beyond the same, start from the zero-line; but the next or seven-per-cent. calendar-space F ends at the point intersected by a radial line bounding the right of the section of the outer circular space of the field C containing the numeral "700," and the next outer calendar-space G, or six-per-cent. calendar-space, ends at a point intersected by a radial line bounding the right of the section of the outermost or one-hundredth circular space of field D containing the numeral "600," and so on. In Fig. 6 of the drawings is a diagrammatic view illustrating the concentric arrangement of these calendar-spaces, by referring to which it will be observed that my invention contemplates the computation of interest on any given amount from one per cent. up to eight per cent. The length of the calendar-space used in the computation of interest at one per cent. corresponds to one-eighth of the circumference of the circle struck from the center of the chart. The length of the calendar-space devoted to the calculation of interest at two per cent. corresponds to one-quarter of the circumference of the circle, the length of the three-per-cent. calendar-space to three-eighths of the circumference, the length of the four-per-cent. calendar-space to one-half of the circumference, and so on, and each of these spaces is divided up into three hundred and sixty-five divisions, which are suitably marked by graduations for the convenience of locating the number of the days of the year for which interest is due. If desired, the chart might be provided with calendar-spaces indicating a fractional amount of interest, substantially as shown in Fig. 6, and which shows spaces for one and one-half per cent., two and one-half per cent., three and one-half per cent., and so on up to eight per cent.

In order to compute interest through the medium of the interest-field D and any given one of the calendar-spaces, a principal ruler K is employed, which is of a length sufficient to extend from the center of the chart to and beyond the circumference of the same and is provided with a straight edge that is divided by a series of graduations *k*, corresponding to the number of circular spaces in the interest-indicating field D and located a distance apart corresponding to the width of said spaces. These graduations are numbered commencing with "1" at the inner end, which registers with the innermost circular space of the interest-field D in numerical order to "100" at its outer end, where the outermost of said graduations registers with the outermost of said circular spaces of said field D. If desired, every tenth graduation can be extended and indicated by a decimal. These figures, indicating the graduations on the ruler K, indicate the amount of principal on which it is desired to compute interest. Beyond the outermost graduations indicated by the number "100" said ruler is provided with several graduations which respectively register with the circular calendar-spaces of the calendar zone D of the chart, and in the space between the innermost of these "calendar-graduations" (as we shall hereinafter call them) is the figure "8" and in the next of said calendar-spaces "7," and the next "6," and so on out to the figure "1."

Now when it is desired to ascertain what the interest is upon a given amount the ruler K is placed in a radial position upon the chart, with the innermost and outermost principal graduations registering or alining with the innermost and outermost circular space of the interest-field D, and still maintaining its radial position it is moved in a circular path until the straight edge alines with the graduations indicating the number of days interest is to run in the calendar-space representing the rate of interest it is desired to compute. The figure representing the amount of principal appearing next the straight edge of the ruler is then located, and then the nearest number in the circular space of the interest-field D alining with the space marked by said number is ascertained. If the straight edge alines with the radial cross-bar bounding the right-hand end of the section, the number appearing in said section will represent the amount of interest. If said straight edge should cut through one of said sections between the ends thereof, then the nearest figure plus a unit for each of the divisions between said number and said straight edge will represent the amount of interest upon said principal. For instance, referring to Fig. 5, suppose it is desired to ascertain the amount of interest

on eighty-nine dollars at six per cent. for fifteen days. By following the foregoing directions and bringing the straight edge to aline with the graduation in the six-per-cent. calendar-space indicating fifteen days and then allowing the eye to locate the graduation marked "89" on the ruler it will be found that the nearest number to the right of the straight edge is "20" and there are exactly two divisions between said straight edge and the section numbered "20," or twenty-two cents, (22¢.) If the amount of principal was eight hundred and ninety dollars instead of eighty-nine dollars, a cipher would be added to both the "89" and the "22," thus showing the interest to be two dollars and twenty cents for fifteen days, and if the amount of principal was eight thousand nine hundred dollars two ciphers would be added to the "22," making the total interest twenty-two dollars. The same rule applies to any of the numbers representing the amount of principal upon which it is desired to compute the interest.

Sometimes the straight edge of the rule will strike through one of the divisions of the sections of the field G, and if the principal is a large amount the fraction would make it desirable to ascertain and have the exact amount. This can be done by eye measurement and in some instances satisfactorily; but in the majority of cases it would be preferable to do this in such manner as to obtain a mathematically correct result. I accomplish this by an indicator which when the straight edge is moved forward from its normal position a distance corresponding to the length of one of the divisions of a section will cause an index-hand to make a complete revolution of the circular dial divided into one hundred equal spaces suitably graduated, but when said straight edge moves but a portion of said division will cause said index-hand to register a proportionate part of a revolution only. The means for accomplishing this result are fully illustrated in Figs. 2, 3, and 4 of the drawings and comprise a circular plate I of suitable material, having a straight arm J projecting tangentially therefrom. This arm J extends beyond the circumference of chart B and has its outer extremity preferably shaped to form a convenient hand-grasp with which to move said plate I and the straight edge K when the same are properly pivoted, as will hereinafter be more fully described. The width of the arm J is preferably less than one-quarter the diameter of plate I, and it has secured to the straight side thereof nearest the imaginary line radiating from the center of said plate I, which the length of said arm parallels by means of corresponding links *d d*, located near each end, said ruler K. The width of the ruler K is such that when it is held close against arm J its graduated straight edge will aline with a radial line drawn from the center of plate I and with the opening *f* of the plate I, up through which a pivotal pin projecting from the center of chart B passes.

When in its normal position against arm J, the end of the ruler nearest plate I bears against and fits snug in the crotch of arm J, as shown in Fig. 3 of the drawings, and when it is moved laterally away from said arm said ruler assumes the position shown in Fig. 4 of said drawings. The extent of the movement of ruler K from arm J corresponds to the length of one of the divisions of one of the sections *c* of the chart, and by registering the extent of its movement the exact fraction of said division remaining uncovered thereby is easily ascertained. This I accomplish by pivoting the end of ruler K nearest plate I to the short arm of a lever *g* (of the first class) by means of a link *g'* and by means of a rack *h*, pivotally connected to the extremity of the longer arm of said lever, the movement of which is limited by the stop-pins *i i*, substantially as shown in Figs. 2 and 3 of the drawings. This rack *h* engages a suitable pinion *m*, fast on the spindle of an index M, which is journaled in the center of plate I and a dial N, which latter is so secured concentric to said plate as to form a housing for said lever, rack, and spindle, as shown. Rack *h* is held in engagement with pinion *m* by the guide-pin *n*, and the long arm of lever *g* has a coil contraction-spring *o*, secured thereto, which normally retains the ruler and the index M in the position shown in Fig. 3, and any movement of the ruler is indicated by said index. The ruler may be moved laterally by hand. I prefer, however, to use an eccentric cam P, which engages the short arm of lever *g* and is secured on a spindle that has a milled knob *p* on its outer end for convenience of manipulation. The advantage of this cam is that it locks the ruler, and consequently the index, in any position it may within the limits of its movement be moved to and only permits those parts to automatically resume their original position when it is desired to be restored to its first position.

In Figs. 7 and 8 I show a modified construction of my invention in which a circular interest chart or table R and a ruler *r* are used that are similar to those hereinbefore described, but in which the concentric calendar zone is omitted, and instead a calendar-cylinder S substituted. The calendar-cylinder is movable independently of the chart R and revolves in a plane at right angles to the plane of the chart. This is accomplished by securing said cylinder on the outer end of a horizontal shaft *s*, which extends radially to the central post *t*, supporting said chart, and is journaled in suitable bearings forming part of a stationary bracket T. The outer upturned end of the arm of this bracket, in which the outer end of the shaft *s* is journaled, is extended and is suitably secured to the under side of the tangentially-extended end of arm

J of the circular plate I. The inner end of the shaft *s* has a bevel-gear *v*, which meshes with gear V, integral with the lower edges of a cylindrical socket secured to and depending from the under side of the chart and concentric therewith, which fits loosely on the upper end of post *t*, so that when the chart is rotated said shaft is correspondingly moved and will revolve one complete revolution or a part of a revolution, according as the chart is made to move a complete circle or part of a circle. The circumference of the cylinder S is provided with a series of equidistant circumferential lines, whereby it is divided into a series of, say, fifteen spaces of different lengths, the longest of which located at the end nearest the chart completely encircles the cylinder. The next is one-sixteenth of the circumference of said cylinder less in length, and so on, each succeeding space being one-sixteenth of the circumference of the cylinder less in length than the preceding one until the last space at the end of the cylinder farthest from said chart is reached, which is just one-eighth of the circumference of the cylinder in length. Each of the circumferentially-disposed spaces are divided into three hundred and sixty-five divisions, each of which represent in numerical order from left to right a given day of the year, and all of them commence in the same longitudinal plane as the commencement of the first longitudinal space, which completely encircles the cylinder. The longest of said calendar-spaces is used when it is desired to compute interest at eight per cent., the next at seven and one-half per cent., the next at seven per cent., and so on until the shortest calendar-space is reached, which is used when it is desired to compute interest at one per cent. Now when it is desired to compute interest by this modified construction of my invention the chart is rotated and the cylinder thereby revolved until the straight edge of the ruler alines with the number of the day of the year when the principal is to be paid in the calendar-space used for the particular rate of interest to be charged on said principal. The amount of principal is then located on the ruler, whereupon the amount of interest is computed in the manner hereinbefore fully explained in connection with the preferred form of my invention.

What I claim as new is—

1. An interest-computing machine comprising an interest-field consisting of parallel rows of numbers representing interest products at different rates per cent. placed in arithmetical progression in series arranged in spaces formed by concentric circles intersected by radial lines, a graduated rule having amounts indicating principal marked thereon, and a series of date-spaces concentric with the rows containing the interest products, the said date-spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends designating spaces being in stepped relation.

2. An interest-computing machine comprising an interest-field consisting of concentric rows of numbers representing interest products at different rates per cent. placed in arithmetical progression in series arranged in spaces formed by concentric circles intersected by radial lines, a graduated rule having amounts indicating principal thereon, and a series of date-spaces concentric with the rows containing the interest products, the said date-spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends designating spaces being in stepped relation.

3. An interest-computing machine comprising an interest-indicating field consisting of parallel rows of equidistant numbers representing interest products at different rates per cent. placed in arithmetical progression in series arranged in spaces formed by concentric circles intersected by radial lines, a rule having a straight edge with graduations located the same distance apart as said rows of numbers, consecutively designated by numbers arranged in numerical order from top to bottom, and a series of date-spaces concentric with the rows containing the interest products, the said date-spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends designating the spaces being in stepped relation.

4. An interest-computing machine comprising an indicating-field consisting of concentric rows of equidistant numbers placed in arithmetical progression in series arranged in spaces formed by concentric circles intersected by radial lines, a rule having a straight edge with graduations located the same distance apart as said rows of numbers consecutively designated by numbers arranged in numerical order from top to bottom, and a series of date-spaces concentric with the rows containing the interest products, the said date-spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends designating the spaces being in stepped relation.

5. An interest-computing machine comprising an interest-indicating field consisting of concentric rows of numbers representing interest products at different rates per cent. placed in arithmetical progression in series arranged in spaces formed of concentric circles intersected by radial lines, a graduated rule having amounts indicating principal marked thereon, and a series of date-spaces concentric with the rows containing the interest products, the said date-spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends designating the spaces being in stepped relation.

6. An interest-computing machine compris-

ing an interest-field consisting of concentric rows of numbers representing interest products at different rates per cent. placed in arithmetical progression in series arranged in spaces formed by concentric circles intersected by radial lines, a graduated rule having amounts indicating principal marked thereon, and a series of date-spaces concentric with the rows containing the interest products, the said date-spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends designating spaces being in stepped relation.

7. An interest-computing machine comprising an interest-indicating field consisting of parallel rows of equidistant numbers representing interest products at different rates per cent. placed in arithmetical progression in series arranged in spaces formed by concentric circles intersected by radial lines, of a rule having a straight edge with graduations located the same distance apart as said rows of numbers consecutively designated by numbers arranged in numerical order from top to bottom, and a series of date-spaces concentric with the rows containing the interest products, the said date-spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends designating spaces being in stepped relation.

8. An interest-computing machine comprising an interest-indicating field consisting of concentric rows of equidistant numbers representing interest products at different rates per cent. placed in arithmetical progression in series arranged in spaces formed by concentric circles intersected by radial lines, of a rule having a straight edge with graduations located the same distance apart as said rows of numbers, consecutively designated by numbers arranged in numerical order from top to bottom, and a series of date-spaces concentric with the rows containing the interest products, the said date-spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends designating spaces being in stepped relation.

9. An interest-computing machine comprising an interest-indicating field having divided spaces containing numeral, and dates indicating spaces having positive relation to the numeral data on said field, the said date-spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends designating spaces terminating in stepped relation and a ruler having graduations indicated by numbers representing principal extending diagonally through the interest and date spaces.

10. An interest-computing machine comprising a circular interest-indicating field divided into concentric graduated spaces—containing numbers—a date-indicating zone containing date-spaces surrounding and concentric to the same, the said date-spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends of the date-designating spaces terminating in stepped relation, and a ruler having graduations indicated by numbers representing principal, which is placed radially to said field and is adjustable in a circular path struck from the center thereof.

11. An interest-computing machine comprising a circular indicating-field, a date-indicating zone surrounding the same having concentric calendar-spaces, the said spaces being divided by approximately equidistantly-spaced lines indicating the days of the year, the ends designating spaces terminating in stepped relation.

12. An interest-computing machine comprising an interest-field, containing numerical data, and date-indicating spaces having positive relation to the numerical data on said field, the said date-spaces being divided by approximately equidistantly-spaced line indicating the days of the year, the ends designating spaces terminating in stepped relation and a ruler having graduations indicated by numbers representing principal which is adjustable radially with relation to said interest-field and date-indicating spaces.

13. In an interest-computing machine, a circular interest-indicating field and concentric calendar zone, a ruler having a straight edge normally in a line intersecting the center of said field and a carrier to which said rule is movably attached, and means supported by said carrier for indicating the extent of the independent movement of the ruler.

14. In an interest-computing machine, a circular interest-indicating field, and concentric calendar zone surrounding the same, of a circular plate having a tangentially-extending arm rotatably secured to the center of said field, a ruler having a straight edge normally intersecting the center of said field, said straight edge being movably attached to the arm of said carrier, a dial supported by said plate, having an index-hand and means operatively connecting said ruler and hand whereby the latter indicates the extent of the independent movement of the ruler.

15. In an interest-computing machine, a circular interest-indicating field, and concentric calendar zone surrounding the same, a circular plate having an integral tangentially-extending arm, rotatably secured to the center of said field, a ruler having a straight edge normally in a line intersecting the center of said field, said ruler being movably attached to the arm of said carrier, a dial supported by said plate, an index-hand, spindle therefor provided with a pinion, a reciprocal rack, a spring-returnable lever to the longer arm of which said rack is pivotally connected and link uniting the shorter arm of the same to said ruler.

16. In an interest-computing machine, a circular interest-indicating field, and concentric

calendar zone surrounding the same, a circular plate having an integral tangentially-extending arm, rotatably secured to the center of said field, a ruler having a straight edge normally in a line intersecting the center of the field, corresponding links secured to and connecting each end of the ruler to the arm of said carrier, a dial supported by said plate, an index-hand, spindle therefor provided with a pinion, a reciprocal rack, a spring-returnable lever to the longer arm of which said rack is pivotally connected and link uniting the shorter arm of the same to said ruler.

In testimony whereof I have hereunto set my hand at Chicago, Illinois, this 25th day of July, 1902.

IRA N. SWEET.

Witnesses:
H. S. GAITHER,
E. K. LUNDY.