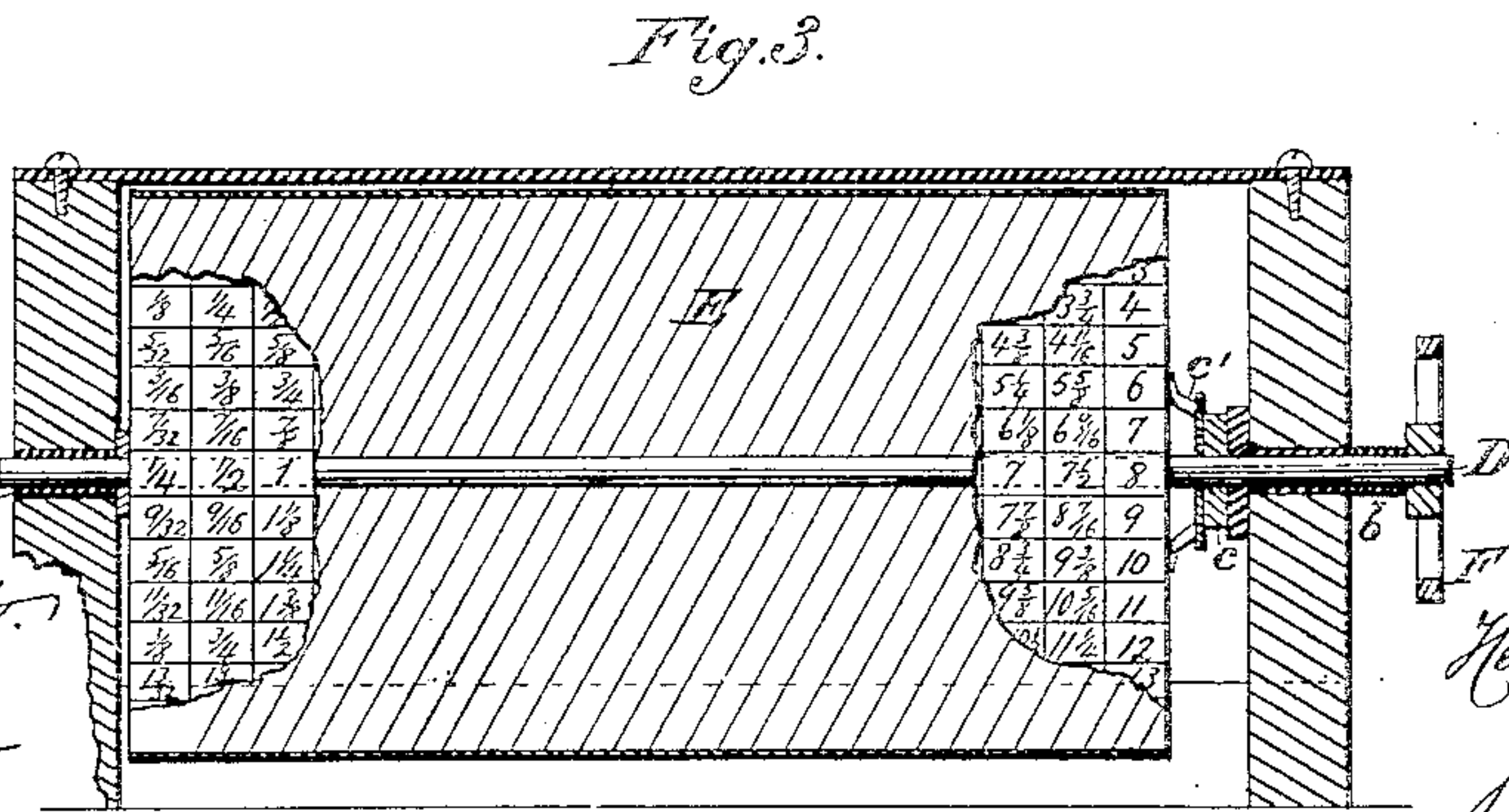
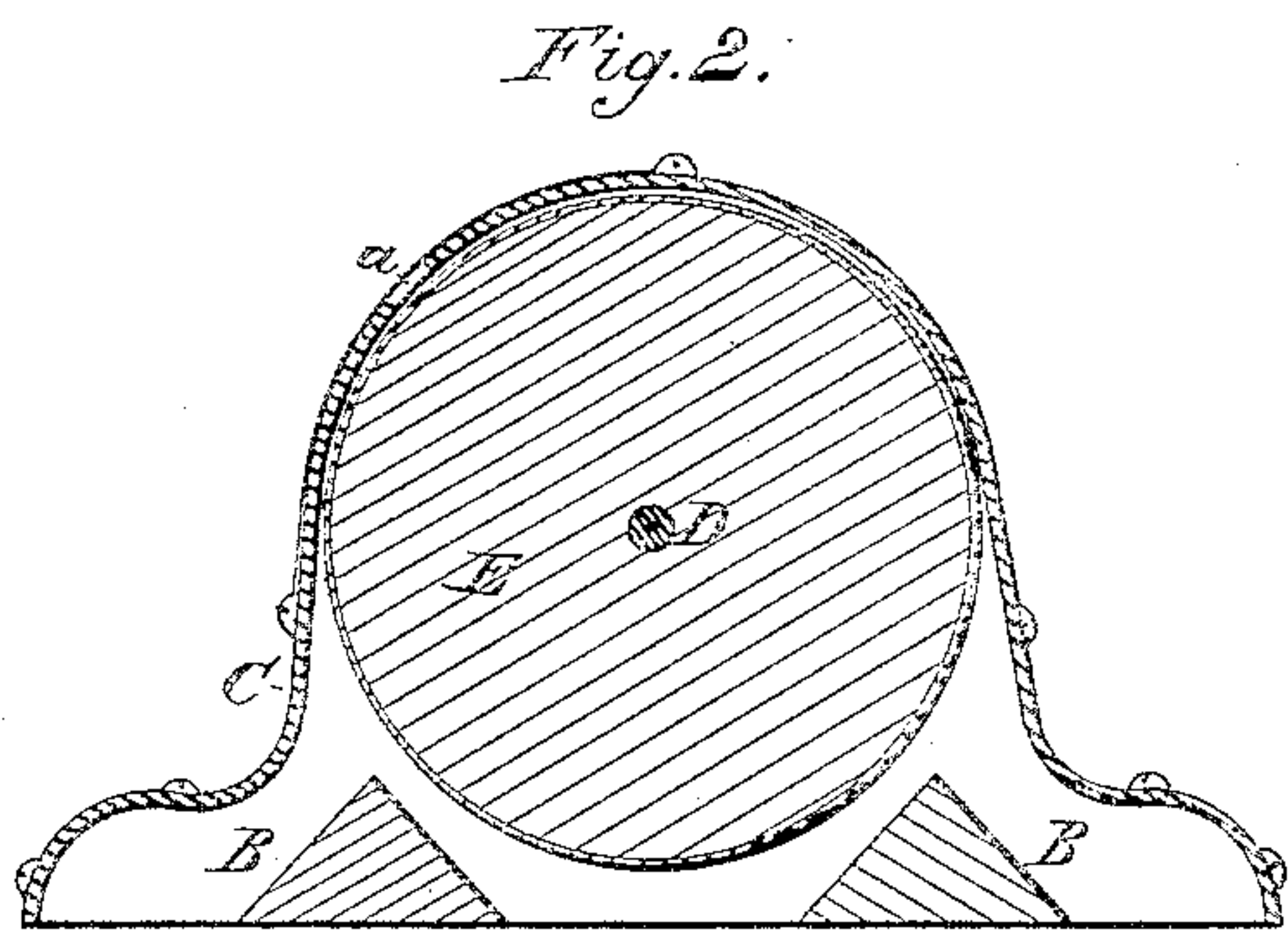
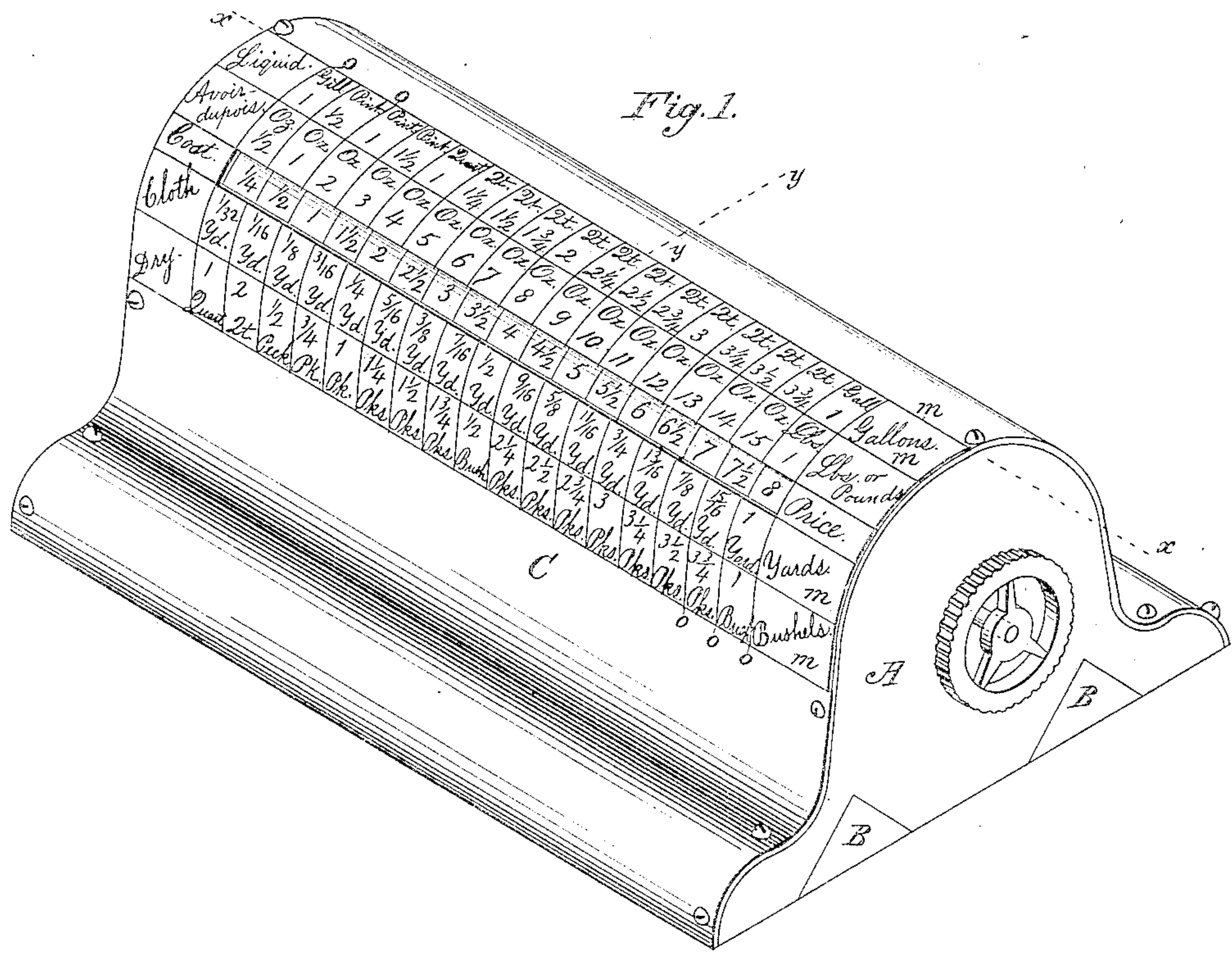


H. H. HAM, Jr.
Mechanical Calculator.
No. 214,128. Patented April 8, 1879.



Attest:
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Fig. 4.

	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{9}{16}$	$\frac{5}{8}$	$\frac{11}{16}$	$\frac{3}{4}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{15}{16}$	1
	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{3}{2}$	2
	$\frac{3}{32}$	$\frac{3}{16}$	$\frac{3}{8}$	$\frac{9}{16}$	$\frac{3}{4}$	$\frac{15}{16}$	$\frac{1}{8}$	$\frac{15}{8}$	$\frac{1}{2}$	$\frac{17}{16}$	$\frac{17}{8}$	$\frac{2}{16}$	$\frac{2}{4}$	$\frac{2}{8}$	$\frac{2}{5}$	$\frac{2}{12}$	3
	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$	2	$\frac{2}{4}$	$\frac{2}{12}$	$\frac{2}{4}$	3	$\frac{3}{4}$	$\frac{3}{2}$	$\frac{3}{4}$	4
e	$\frac{5}{32}$	$\frac{5}{16}$	$\frac{5}{8}$	$\frac{15}{16}$	$\frac{1}{4}$	$\frac{19}{16}$	$\frac{1}{8}$	$\frac{2}{8}$	$\frac{2}{12}$	$\frac{2}{16}$	$\frac{3}{8}$	$\frac{3}{16}$	$\frac{3}{4}$	$\frac{4}{16}$	$\frac{4}{8}$	$\frac{4}{16}$	5
e	$\frac{3}{16}$	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{1}{8}$	$\frac{1}{2}$	$\frac{1}{8}$	$\frac{2}{4}$	$\frac{2}{5}$	3	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{4}{8}$	$\frac{4}{12}$	$\frac{4}{8}$	$\frac{5}{4}$	$\frac{5}{8}$	6
e	$\frac{7}{32}$	$\frac{7}{16}$	$\frac{7}{8}$	$\frac{15}{16}$	$\frac{1}{4}$	$\frac{2}{16}$	$\frac{2}{5}$	$\frac{3}{16}$	$\frac{3}{12}$	$\frac{3}{16}$	$\frac{4}{8}$	$\frac{4}{16}$	$\frac{5}{4}$	$\frac{5}{16}$	$\frac{6}{8}$	$\frac{6}{16}$	7
e	$\frac{1}{4}$	$\frac{1}{2}$	1	$\frac{1}{2}$	2	$\frac{2}{12}$	3	$\frac{3}{12}$	4	$\frac{4}{12}$	5	$\frac{5}{12}$	6	$\frac{6}{12}$	7	$\frac{7}{12}$	8
e	$\frac{9}{32}$	$\frac{9}{16}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{2}{4}$	$\frac{2}{16}$	$\frac{3}{8}$	$\frac{3}{16}$	$\frac{4}{12}$	$\frac{5}{16}$	$\frac{5}{8}$	$\frac{6}{16}$	$\frac{6}{12}$	$\frac{7}{16}$	$\frac{7}{8}$	$\frac{8}{16}$	9
	$\frac{5}{16}$	$\frac{5}{8}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{2}{12}$	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{4}{8}$	5	$\frac{5}{8}$	$\frac{6}{4}$	$\frac{6}{8}$	$\frac{7}{12}$	$\frac{8}{8}$	$\frac{8}{4}$	$\frac{9}{8}$	10
	$\frac{11}{32}$	$\frac{11}{16}$	$\frac{1}{8}$	$\frac{2}{16}$	$\frac{2}{4}$	$\frac{3}{16}$	$\frac{4}{8}$	$\frac{4}{16}$	$\frac{5}{12}$	$\frac{6}{16}$	$\frac{6}{8}$	$\frac{7}{16}$	$\frac{8}{4}$	$\frac{8}{16}$	$\frac{9}{8}$	$\frac{10}{16}$	11
	$\frac{3}{8}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{2}{4}$	3	$\frac{3}{4}$	$\frac{4}{12}$	$\frac{5}{4}$	6	$\frac{6}{12}$	$\frac{7}{12}$	$\frac{8}{4}$	9	$\frac{9}{4}$	$\frac{10}{12}$	$\frac{11}{4}$	12
	$\frac{13}{32}$	$\frac{13}{16}$	$\frac{1}{8}$	$\frac{2}{16}$	$\frac{3}{4}$	$\frac{4}{16}$	$\frac{4}{8}$	$\frac{5}{16}$	$\frac{6}{12}$	$\frac{7}{16}$	$\frac{8}{8}$	$\frac{8}{16}$	$\frac{9}{4}$	$\frac{10}{16}$	$\frac{11}{8}$	$\frac{12}{16}$	13
	$\frac{7}{16}$	$\frac{7}{8}$	$\frac{1}{4}$	$\frac{2}{8}$	$\frac{3}{12}$	$\frac{4}{8}$	$\frac{5}{4}$	$\frac{6}{8}$	7	$\frac{7}{8}$	$\frac{8}{4}$	$\frac{9}{8}$	$\frac{10}{12}$	$\frac{11}{8}$	$\frac{12}{4}$	$\frac{13}{8}$	14
	$\frac{15}{32}$	$\frac{15}{16}$	$\frac{1}{8}$	$\frac{2}{16}$	$\frac{3}{4}$	$\frac{4}{16}$	$\frac{5}{8}$	$\frac{6}{16}$	$\frac{7}{12}$	$\frac{8}{16}$	$\frac{9}{8}$	$\frac{10}{16}$	$\frac{11}{4}$	$\frac{12}{16}$	$\frac{13}{8}$	$\frac{14}{16}$	15
	$\frac{1}{2}$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	$\frac{17}{32}$	$\frac{17}{16}$	$\frac{2}{8}$	$\frac{3}{16}$	$\frac{4}{4}$	$\frac{5}{16}$	$\frac{6}{8}$	$\frac{7}{16}$	$\frac{8}{12}$	$\frac{9}{16}$	$\frac{10}{8}$	$\frac{11}{16}$	$\frac{12}{4}$	$\frac{13}{16}$	$\frac{14}{8}$	$\frac{15}{16}$	17
	$\frac{9}{16}$	$\frac{1}{8}$	$\frac{2}{4}$	$\frac{3}{8}$	$\frac{4}{12}$	$\frac{5}{8}$	$\frac{6}{4}$	$\frac{7}{8}$	9	$\frac{10}{8}$	$\frac{11}{4}$	$\frac{12}{8}$	$\frac{13}{12}$	$\frac{14}{8}$	$\frac{15}{4}$	$\frac{16}{8}$	18
	$\frac{19}{32}$	$\frac{19}{16}$	$\frac{2}{8}$	$\frac{3}{16}$	$\frac{4}{4}$	$\frac{5}{16}$	$\frac{6}{8}$	$\frac{7}{16}$	$\frac{8}{12}$	$\frac{9}{16}$	$\frac{10}{8}$	$\frac{11}{16}$	$\frac{12}{4}$	$\frac{13}{16}$	$\frac{14}{8}$	$\frac{15}{16}$	19
	$\frac{5}{8}$	$\frac{1}{4}$	$\frac{2}{12}$	$\frac{3}{4}$	5	$\frac{6}{4}$	$\frac{7}{12}$	$\frac{8}{4}$	10	$\frac{11}{4}$	$\frac{12}{12}$	$\frac{13}{4}$	15	$\frac{16}{4}$	$\frac{17}{12}$	$\frac{18}{4}$	20
	$\frac{21}{32}$	$\frac{21}{16}$	$\frac{2}{8}$	$\frac{3}{16}$	$\frac{5}{4}$	$\frac{6}{16}$	$\frac{7}{8}$	$\frac{8}{16}$	$\frac{10}{12}$	$\frac{11}{16}$	$\frac{12}{8}$	$\frac{13}{16}$	$\frac{14}{4}$	$\frac{15}{16}$	$\frac{17}{8}$	$\frac{18}{16}$	21
	$\frac{11}{16}$	$\frac{1}{8}$	$\frac{2}{4}$	$\frac{4}{8}$	$\frac{5}{12}$	$\frac{6}{16}$	$\frac{8}{4}$	$\frac{9}{8}$	11	$\frac{12}{16}$	$\frac{13}{8}$	$\frac{14}{16}$	$\frac{15}{4}$	$\frac{16}{16}$	$\frac{17}{4}$	$\frac{18}{8}$	22
	$\frac{23}{32}$	$\frac{23}{16}$	$\frac{2}{8}$	$\frac{4}{16}$	$\frac{5}{4}$	$\frac{7}{16}$	$\frac{8}{8}$	$\frac{10}{16}$	$\frac{11}{12}$	$\frac{12}{16}$	$\frac{14}{8}$	$\frac{15}{16}$	$\frac{17}{4}$	$\frac{18}{16}$	$\frac{20}{8}$	$\frac{21}{16}$	23
	$\frac{3}{4}$	$\frac{1}{2}$	3	$\frac{4}{12}$	6	$\frac{7}{12}$	9	$\frac{10}{12}$	12	$\frac{13}{12}$	15	$\frac{16}{12}$	18	$\frac{19}{12}$	21	$\frac{22}{12}$	24
	$\frac{25}{32}$	$\frac{25}{16}$	$\frac{3}{8}$	$\frac{4}{16}$	$\frac{6}{4}$	$\frac{7}{16}$	$\frac{9}{8}$	$\frac{10}{16}$	$\frac{12}{12}$	$\frac{14}{16}$	$\frac{15}{8}$	$\frac{17}{16}$	$\frac{18}{4}$	$\frac{20}{16}$	$\frac{21}{8}$	$\frac{23}{16}$	25
	$\frac{13}{16}$	$\frac{1}{8}$	$\frac{3}{4}$	$\frac{4}{16}$	$\frac{6}{12}$	$\frac{8}{8}$	$\frac{9}{4}$	$\frac{11}{8}$	13	$\frac{14}{8}$	$\frac{16}{4}$	$\frac{17}{8}$	$\frac{19}{12}$	$\frac{21}{8}$	$\frac{22}{4}$	$\frac{24}{8}$	26
	$\frac{27}{32}$	$\frac{27}{16}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{6}{4}$	$\frac{8}{16}$	$\frac{10}{8}$	$\frac{11}{16}$	$\frac{13}{12}$	$\frac{15}{16}$	$\frac{16}{8}$	$\frac{18}{16}$	$\frac{20}{4}$	$\frac{21}{16}$	$\frac{23}{8}$	$\frac{25}{16}$	27
	$\frac{7}{8}$	$\frac{1}{4}$	$\frac{3}{12}$	$\frac{5}{4}$	7	$\frac{8}{4}$	$\frac{10}{12}$	$\frac{12}{4}$	14	$\frac{15}{4}$	$\frac{17}{12}$	$\frac{19}{4}$	21	$\frac{22}{4}$	$\frac{24}{12}$	$\frac{26}{4}$	28
	$\frac{29}{32}$	$\frac{29}{16}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{7}{4}$	$\frac{9}{16}$	$\frac{10}{8}$	$\frac{12}{16}$	$\frac{14}{12}$	$\frac{16}{16}$	$\frac{18}{8}$	$\frac{19}{16}$	$\frac{21}{4}$	$\frac{23}{16}$	$\frac{25}{8}$	$\frac{27}{16}$	29
	$\frac{15}{16}$	$\frac{1}{8}$	$\frac{3}{4}$	$\frac{5}{8}$	$\frac{7}{12}$	$\frac{9}{8}$	$\frac{11}{4}$	$\frac{13}{8}$	15	$\frac{16}{8}$	$\frac{18}{4}$	$\frac{20}{8}$	$\frac{22}{12}$	$\frac{24}{8}$	$\frac{26}{4}$	$\frac{28}{8}$	30
	$\frac{31}{32}$	$\frac{1}{16}$	$\frac{3}{8}$	$\frac{5}{16}$	$\frac{7}{4}$	$\frac{9}{16}$	$\frac{11}{8}$	$\frac{13}{16}$	$\frac{15}{12}$	$\frac{17}{16}$	$\frac{19}{8}$	$\frac{21}{16}$	$\frac{23}{4}$	$\frac{25}{16}$	$\frac{27}{8}$	$\frac{29}{16}$	31
	1	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32
	$\frac{1}{32}$	$\frac{2}{16}$	$\frac{4}{8}$	$\frac{6}{16}$	$\frac{8}{4}$	$\frac{10}{16}$	$\frac{12}{8}$	$\frac{14}{16}$	$\frac{16}{12}$	$\frac{18}{16}$	$\frac{20}{8}$	$\frac{22}{16}$	$\frac{24}{4}$	$\frac{26}{16}$	$\frac{28}{8}$	$\frac{30}{16}$	33
	$\frac{1}{256}$	$\frac{1}{128}$	$\frac{1}{64}$	$\frac{3}{128}$	$\frac{1}{32}$	$\frac{5}{128}$	$\frac{3}{64}$	$\frac{7}{128}$	$\frac{1}{16}$	$\frac{9}{128}$	$\frac{5}{64}$	$\frac{11}{128}$	$\frac{3}{32}$	$\frac{13}{128}$	$\frac{7}{64}$	$\frac{15}{128}$	$\frac{1}{8}$
	$\frac{1}{128}$	$\frac{1}{64}$	$\frac{1}{32}$	$\frac{3}{64}$	$\frac{1}{16}$	$\frac{5}{64}$	$\frac{3}{32}$	$\frac{7}{64}$	$\frac{1}{8}$	$\frac{9}{64}$	$\frac{5}{32}$	$\frac{11}{64}$	$\frac{3}{16}$	$\frac{13}{64}$	$\frac{7}{32}$	$\frac{15}{64}$	$\frac{1}{4}$
	$\frac{3}{256}$	$\frac{3}{128}$	$\frac{3}{64}$	$\frac{9}{128}$	$\frac{3}{32}$	$\frac{15}{128}$	$\frac{9}{64}$	$\frac{21}{128}$	$\frac{3}{16}$	$\frac{27}{128}$	$\frac{15}{64}$	$\frac{33}{128}$	$\frac{9}{32}$	$\frac{39}{128}$	$\frac{21}{64}$	$\frac{45}{128}$	$\frac{3}{8}$
	$\frac{1}{64}$	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{5}{32}$	$\frac{3}{16}$	$\frac{7}{32}$	$\frac{1}{4}$	$\frac{9}{32}$	$\frac{5}{16}$	$\frac{11}{32}$	$\frac{3}{8}$	$\frac{13}{32}$	$\frac{7}{16}$	$\frac{15}{32}$	$\frac{1}{2}$
	$\frac{5}{256}$	$\frac{5}{128}$	$\frac{5}{64}$	$\frac{15}{128}$	$\frac{5}{32}$	$\frac{25}{128}$	$\frac{15}{64}$	$\frac{35}{128}$	$\frac{5}{16}$	$\frac{45}{128}$	$\frac{25}{64}$	$\frac{55}{128}$	$\frac{15}{32}$	$\frac{65}{128}$	$\frac{35}{64}$	$\frac{75}{128}$	$\frac{5}{8}$
	$\frac{3}{128}$	$\frac{3}{64}$	$\frac{3}{32}$	$\frac{9}{64}$	$\frac{3}{16}$	$\frac{15}{64}$	$\frac{9}{32}$	$\frac{21}{64}$	$\frac{3}{8}$	$\frac{27}{64}$	$\frac{15}{32}$	$\frac{33}{64}$	$\frac{9}{16}$	$\frac{39}{64}$	$\frac{21}{32}$	$\frac{45}{64}$	$\frac{3}{4}$
	$\frac{7}{256}$	$\frac{7}{128}$	$\frac{7}{64}$	$\frac{21}{128}$	$\frac{7}{32}$	$\frac{35}{128}$	$\frac{21}{64}$	$\frac{49}{128}$	$\frac{7}{16}$	$\frac{63}{128}$	$\frac{35}{64}$	$\frac{77}{128}$	$\frac{21}{32}$	$\frac{91}{128}$	$\frac{49}{64}$	$\frac{105}{128}$	$\frac{7}{8}$

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UNITED STATES PATENT OFFICE.

HENRY H. HAM, JR., OF PORTSMOUTH, NEW HAMPSHIRE.

IMPROVEMENT IN MECHANICAL CALCULATORS.

Specification forming part of Letters Patent No. 214,128, dated April 8, 1879; application filed October 25, 1878.

To all whom it may concern:

Be it known that I, HENRY H. HAM, Jr., of Portsmouth, in the county of Rockingham and State of New Hampshire, have invented certain new and useful Improvements in Calculating-Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to that class of devices commonly called "calculating-machines," and used for performing certain mathematical operations mechanically, the object in the present instance being to provide a machine which shall give, simply by an inspection of the tables of figures, the cost of any ordinary fractional parts of a pound, yard, bushel, or gallon at any price in common use without any mental calculation or arithmetical process whatever; and the invention consists in the combination of a rotating cylinder, having upon its surface a table of costs, with a longitudinally-slotted inclosing-case, provided at each side of the slot with a table of fractional parts, and in certain details of construction, which will be fully described, and then specifically designated in the claims.

In the accompanying drawings, Figure 1 is a perspective view of the apparatus complete, showing the slotted inclosing-case with one series of the fractional price-list, which forms the outer surface of the cylinder, appearing in the slot. Fig. 2 is a transverse vertical section through the case and cylinder on the line *y y* of Fig. 1, and shows the relative positions of the case and cylinder. Fig. 3 shows a vertical longitudinal section of the machine on the line *x x* of Fig. 1, parts of the cylinder being shown complete with its lines of figures. Fig. 4 illustrates the arrangement of the table of prices on the outside of the cylinder reduced to a plane surface.

The construction of the apparatus is as follows: Two end pieces, A and A', of the form shown in Fig. 1, or of any other suitable for furnishing a substantial base for sustaining the other parts of the machine, are connected

by the longitudinal ties B B. These ties are preferably of triangular shape, and are secured in recesses or gains cut in the end pieces, so as to hold them firmly in place. Over these end pieces, and secured to them by screws or other means, is placed the outside case, C, preferably of metal, and having the slot *a* cut through it for nearly its whole length.

In the end pieces are placed the journal-bearings *b* and *b'*, the bearing *b* being provided with a broad collar upon the inside of the end pieces. A shaft, D, passes through these bearings and carries the cylinder E, a milled wheel, F, or other suitable device being attached to one end of the shaft for the purpose of rotation. In order to prevent the cylinder from being too easily turned a washer, *c*, is interposed between the collar of the bearing *b* and a spring, *c'*, which presses against the end of the cylinder, the pressure of the spring upon the washer producing sufficient friction between it and the collar to prevent unnecessary movement of the cylinder. The outer surface of this cylinder is divided into rectangular spaces by the lines *d*, which encircle it, and the lines *e*, running longitudinally from end to end.

Within the right-hand series of rectangular spaces encircling the cylinder are placed the figures representing the full cost of one pound, one yard, one bushel, or one gallon of the article the cost of fractions of which it is desired to determine. In the present instance this scale runs from one-eighth, by eighths, to a whole number, and from that to thirty-three; but it is evident these numbers may be changed to suit the prices of whatever material the machine is to be used for calculating. Lengthwise of the cylinder the lines *d* give seventeen spaces, thus giving the cost of the fractions of an article by sixteenths and multiples thereof, although this arrangement may be readily changed to suit the divisions of the metrical or any other system it may be determined to use. These lines and figures are stamped or engraved upon the surface of the cylinder; or they may be printed or written upon some flexible material, which is afterward wrapped around the cylinder and secured thereto.

The outer case, C, is also provided with four longitudinal rows of rectangular spaces, two

above and two below the slot *a*, formed by the lines *m*, which run from end to end of the case, and the transverse lines *o*, running circumferentially around the circular part of the case. Each of these rows represents a system of measurement—as, in liquid measure, the first space represents one gallon, and the others fractions thereof down to one gill. Avoirdupois weight is represented by one pound and fractions thereof to a half-ounce, and so on with cloth-measure and dry measure, which are represented by one yard and one bushel, with the fractions thereof in common use.

To operate the machine, turn the cylinder until the figures representing the cost of a pound, gallon, bushel, or whatever weight or measure is used appear at the right-hand end of the slot in the case; then run the eye along the scale representing the weight or measure used until the fraction representing the weight or measure of the article is reached, when, by referring to the figures in the corresponding space upon the cylinder, as seen through the slot in the case, the price of the article is found inscribed upon that space.

Should it be desired to ascertain the quantity to be given for a certain sum of money, we proceed as follows: Turn the cylinder until the price of a gallon, bushel, yard, or a full number of whatever system is used appears in the slot of the case at the right hand of the machine; then look along the line until a figure is found corresponding with the sum of money to be invested, when the figures in the

corresponding space of the row representing fractions of the weight or measure wanted will represent the quantity of the article required to equal in value the money presented.

Where the scales upon the machine are many, thus causing the figures to be very small, a magnifying-glass, to serve the double purpose of keeping dust out of the machine and magnifying the figures so that they may be easily read, is placed over the slot in the case, if desired.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. In a calculating-machine, the combination of the rotating cylinder *E*, having upon its surface the table of costs, with the longitudinally-slotted inclosing-case *C*, provided at each side of the slot with the table or tables of fractional parts of weights and measures, all arranged for use substantially in the manner shown and described.

2. The rotating cylinder, in combination with the spring at its end, the washer *c*, and broad-collared journal-bearing *b*, for the purpose of producing friction to prevent a too-easy rotation of the cylinder, as set forth.

In testimony that I claim the foregoing as my own I hereunto affix my signature in presence of two witnesses.

HENRY H. HAM, JR.

Witnesses:

E. A. DICK,
F. H. SCHOTT.