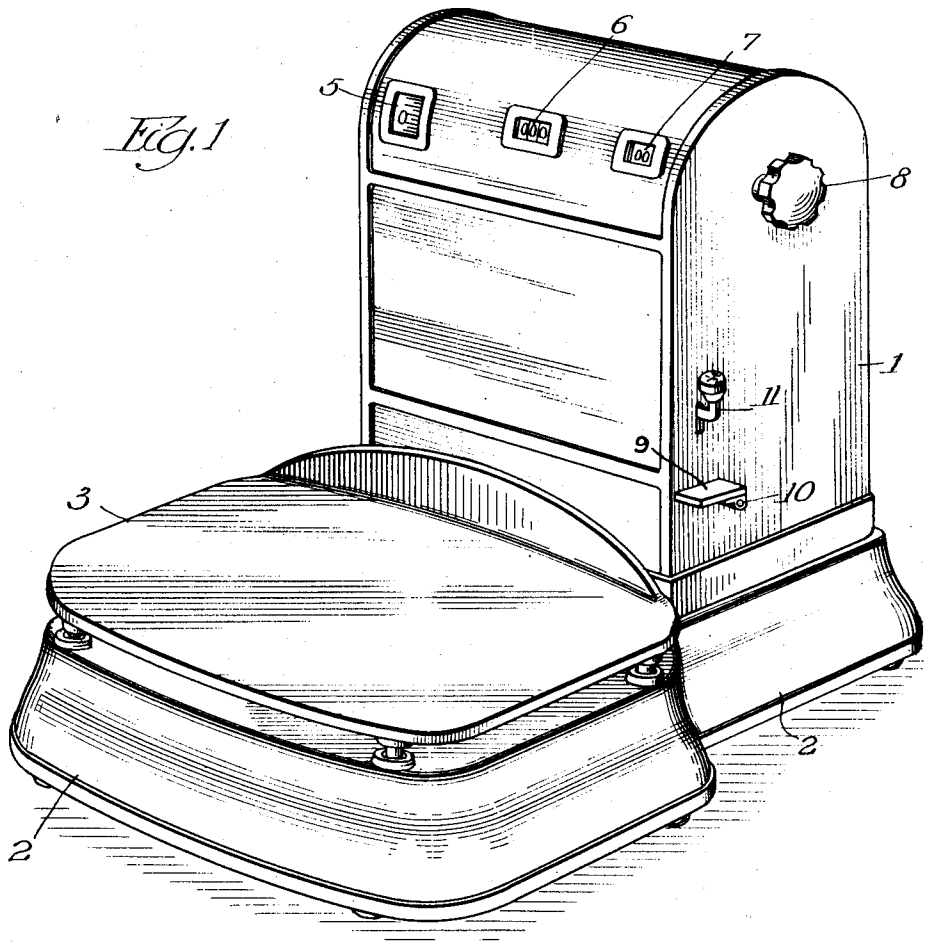
April 9, 1946. O. MALCHER 2,397,970

COMPUTING SCALE

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Fig. 1



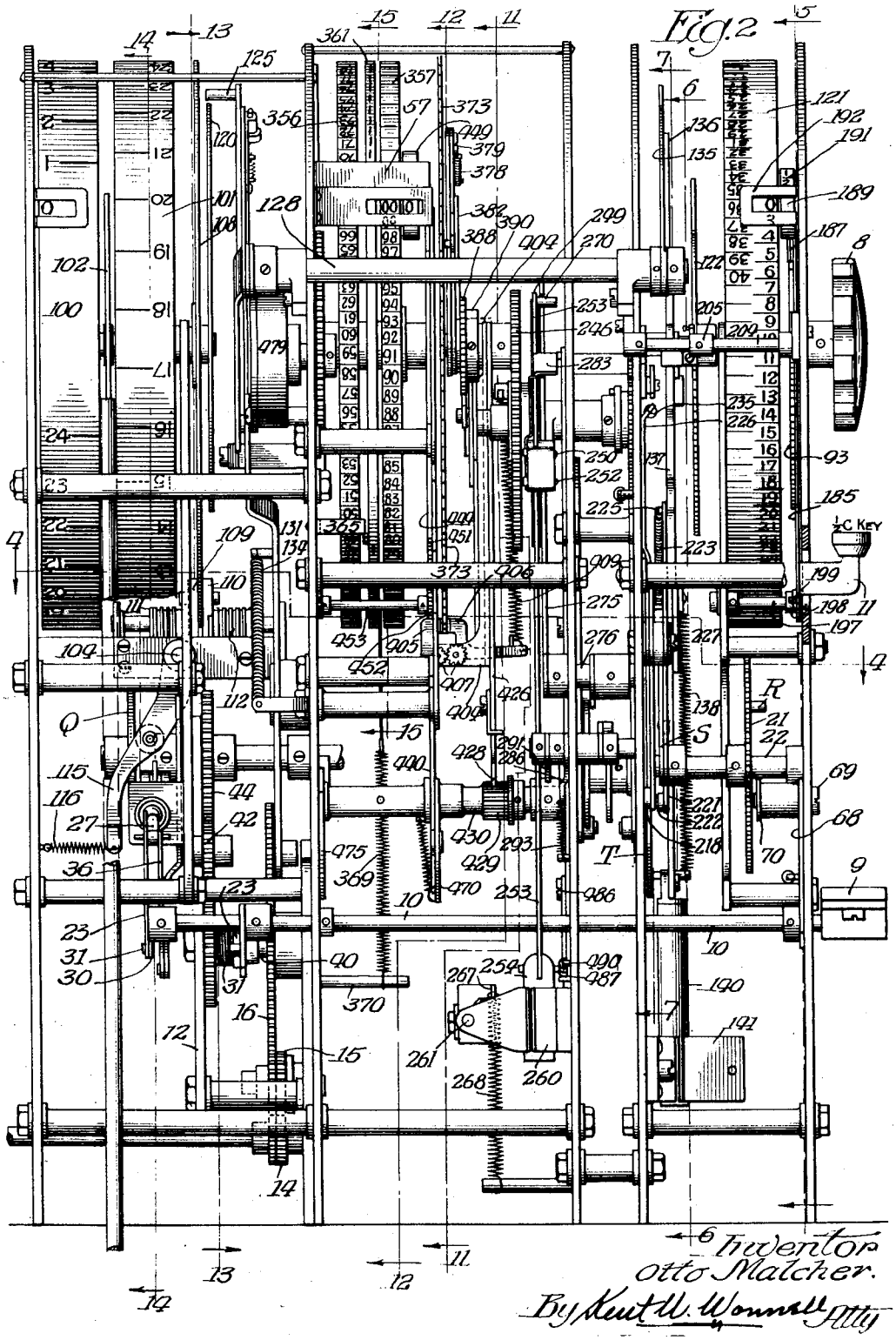
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COMPUTING SCALE

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Fig. 2



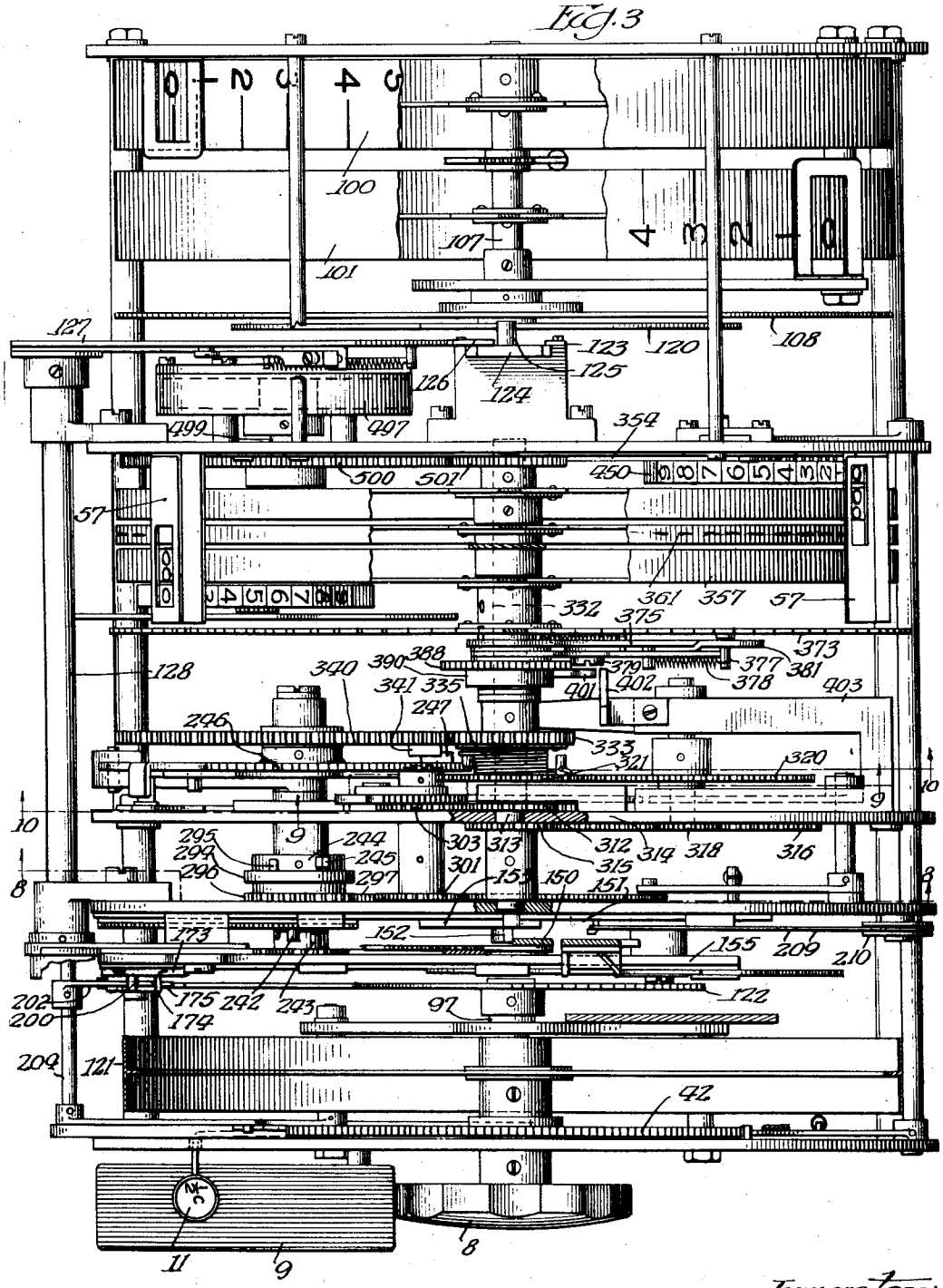
Inventor
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Fig. 3



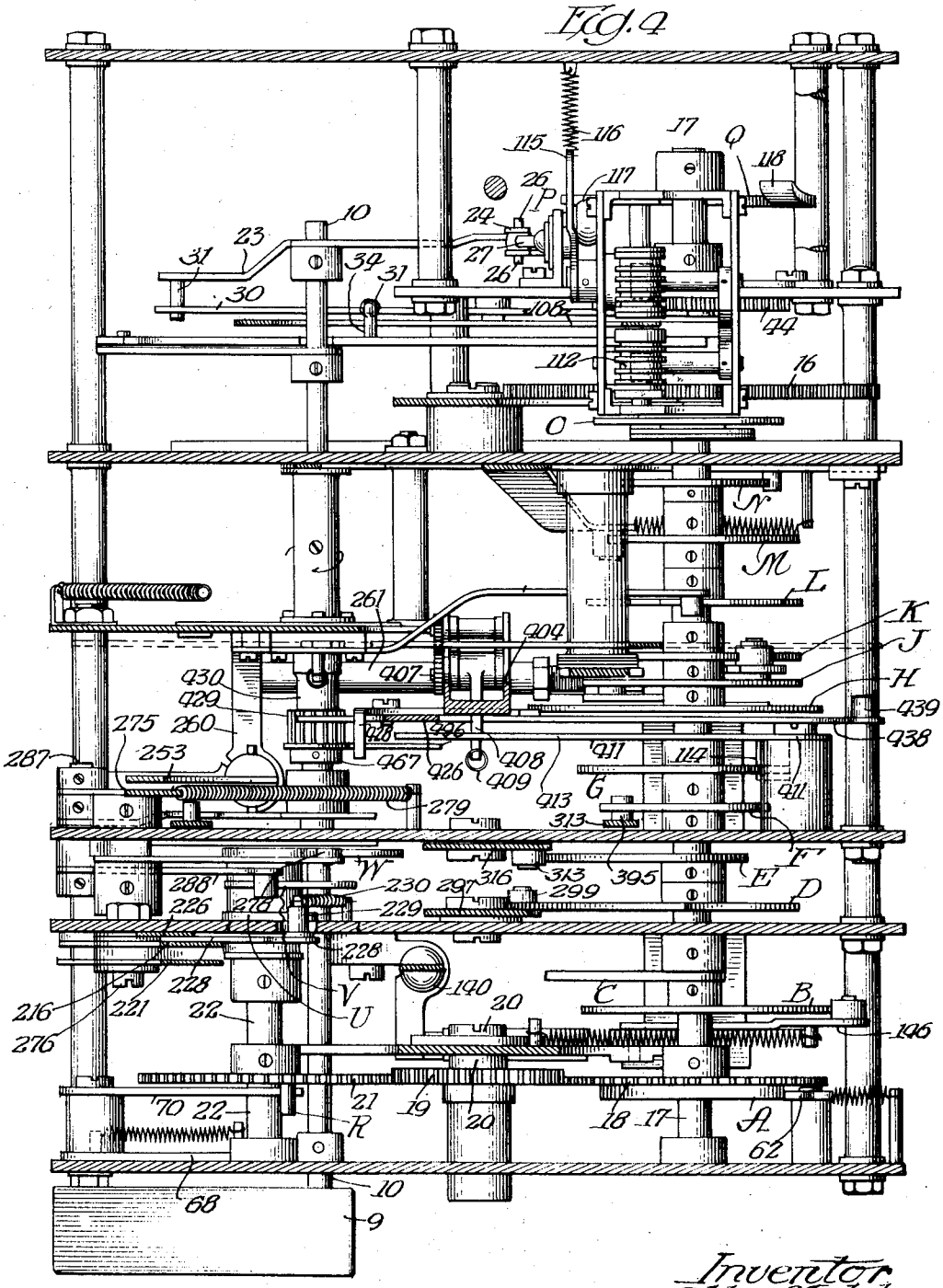
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FIG. 4



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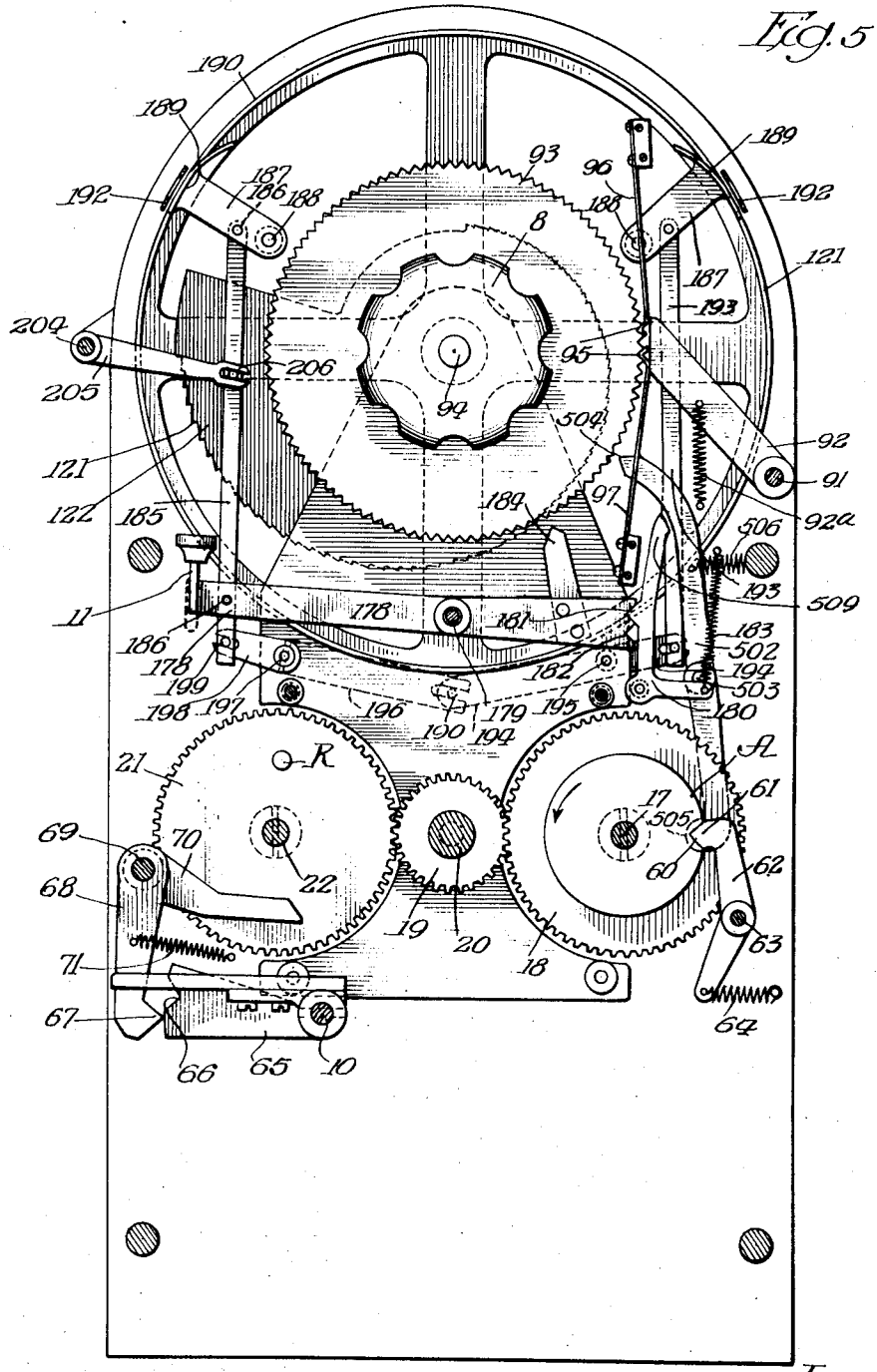
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Fig. 5



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Fig. 6

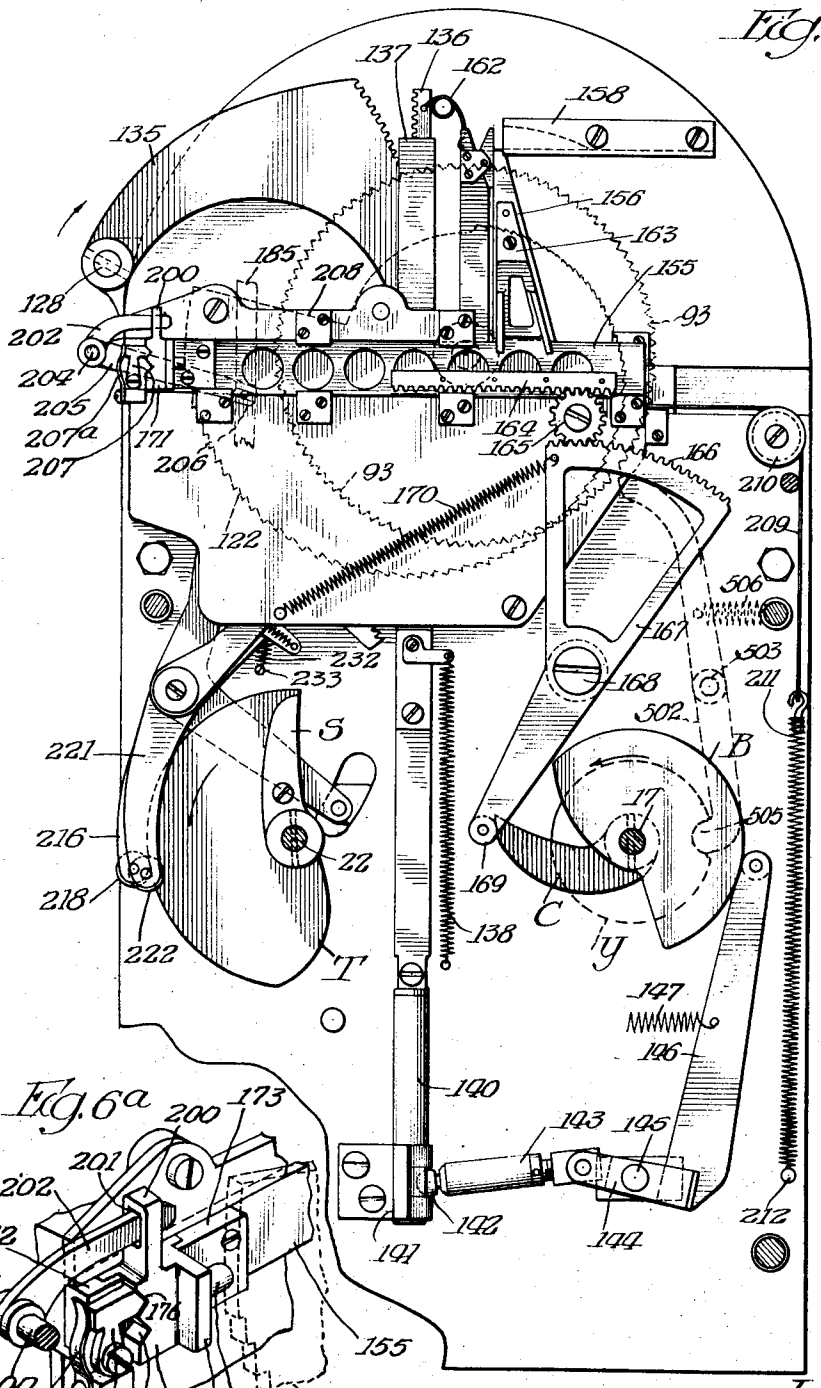


Fig. 6a

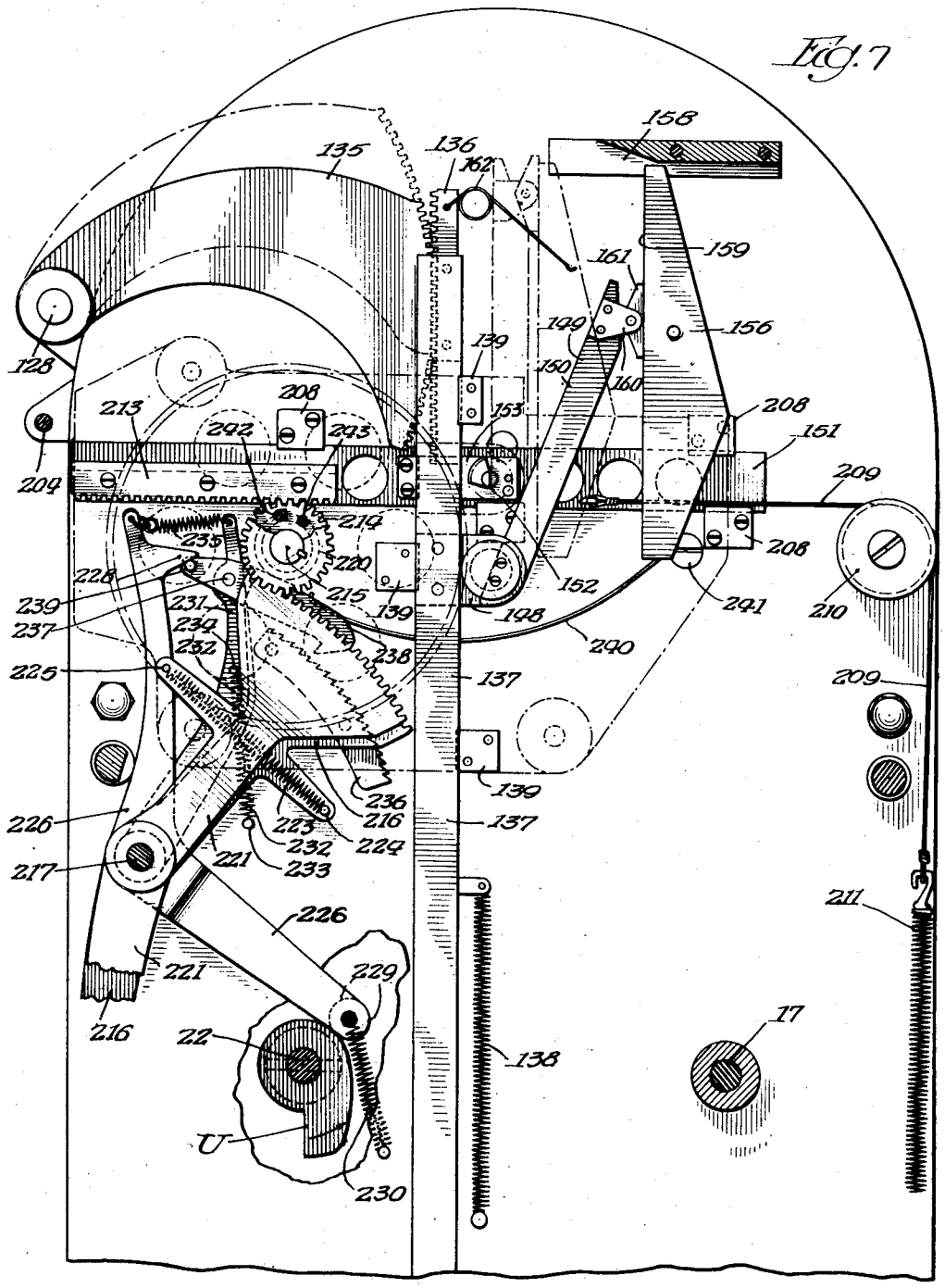
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Fig. 7



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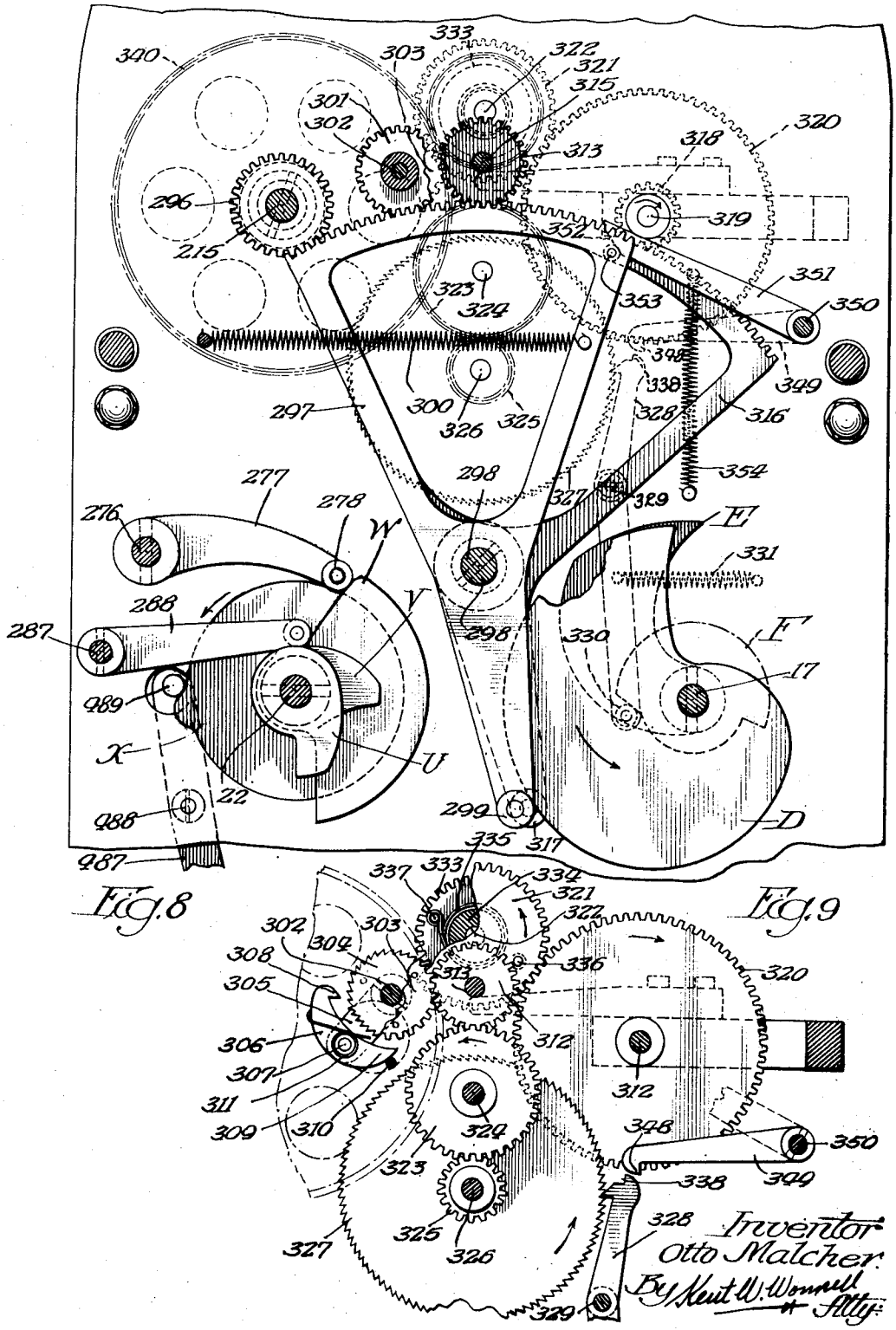


Fig. 8

Fig. 9

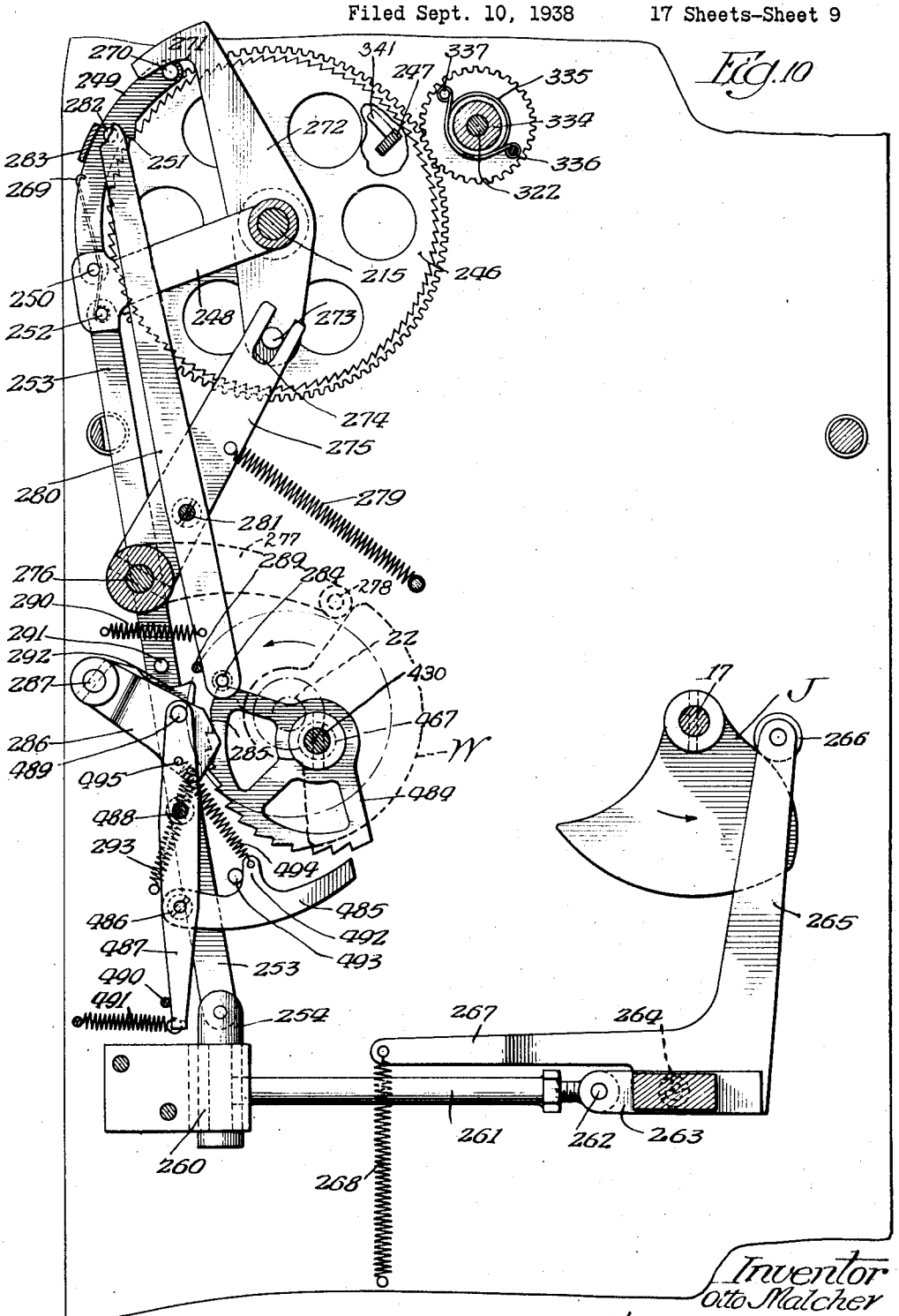
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Fig. 10



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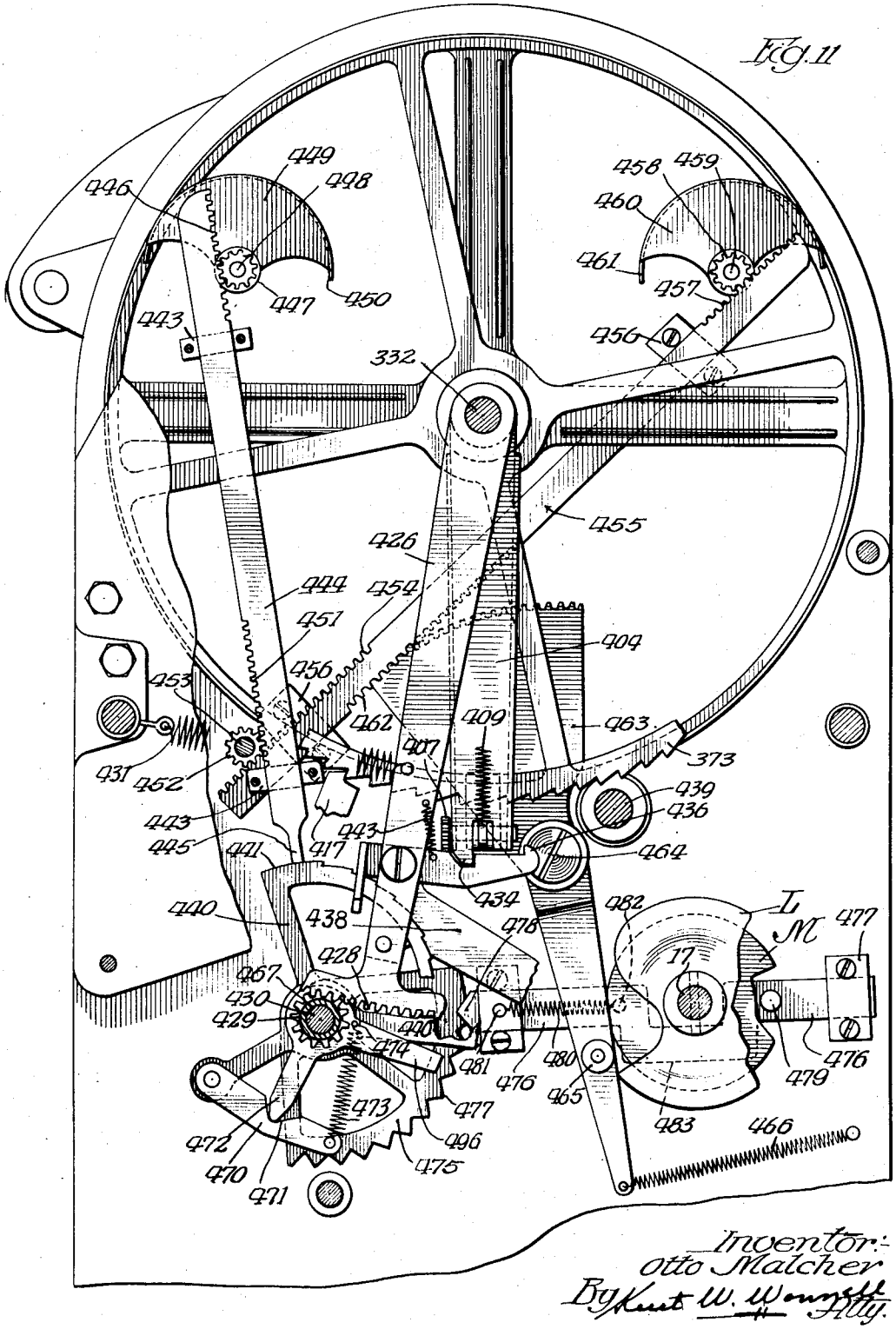
By Kent W. Wormell Atty.

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Fig. 11



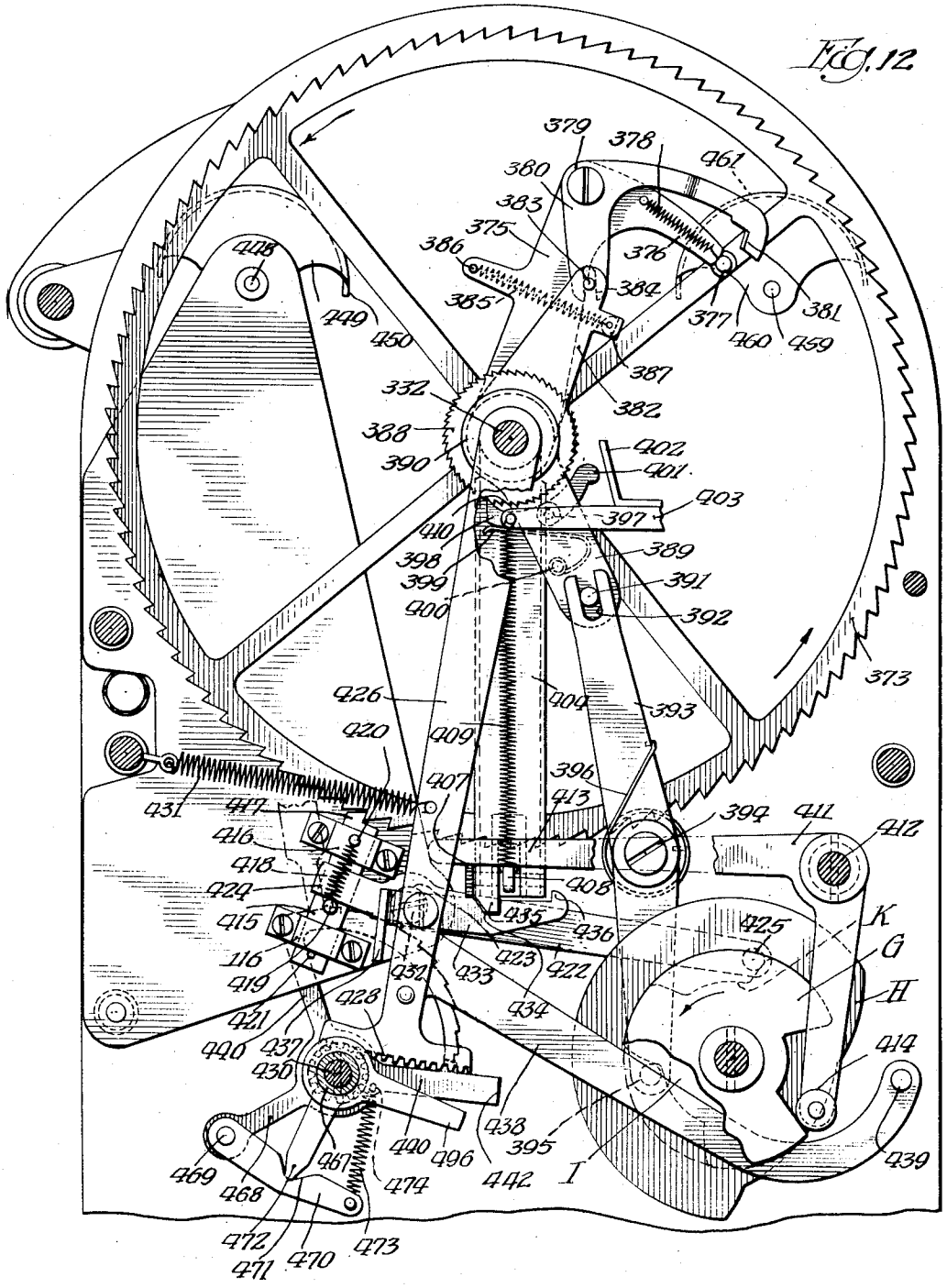
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Fig. 12.



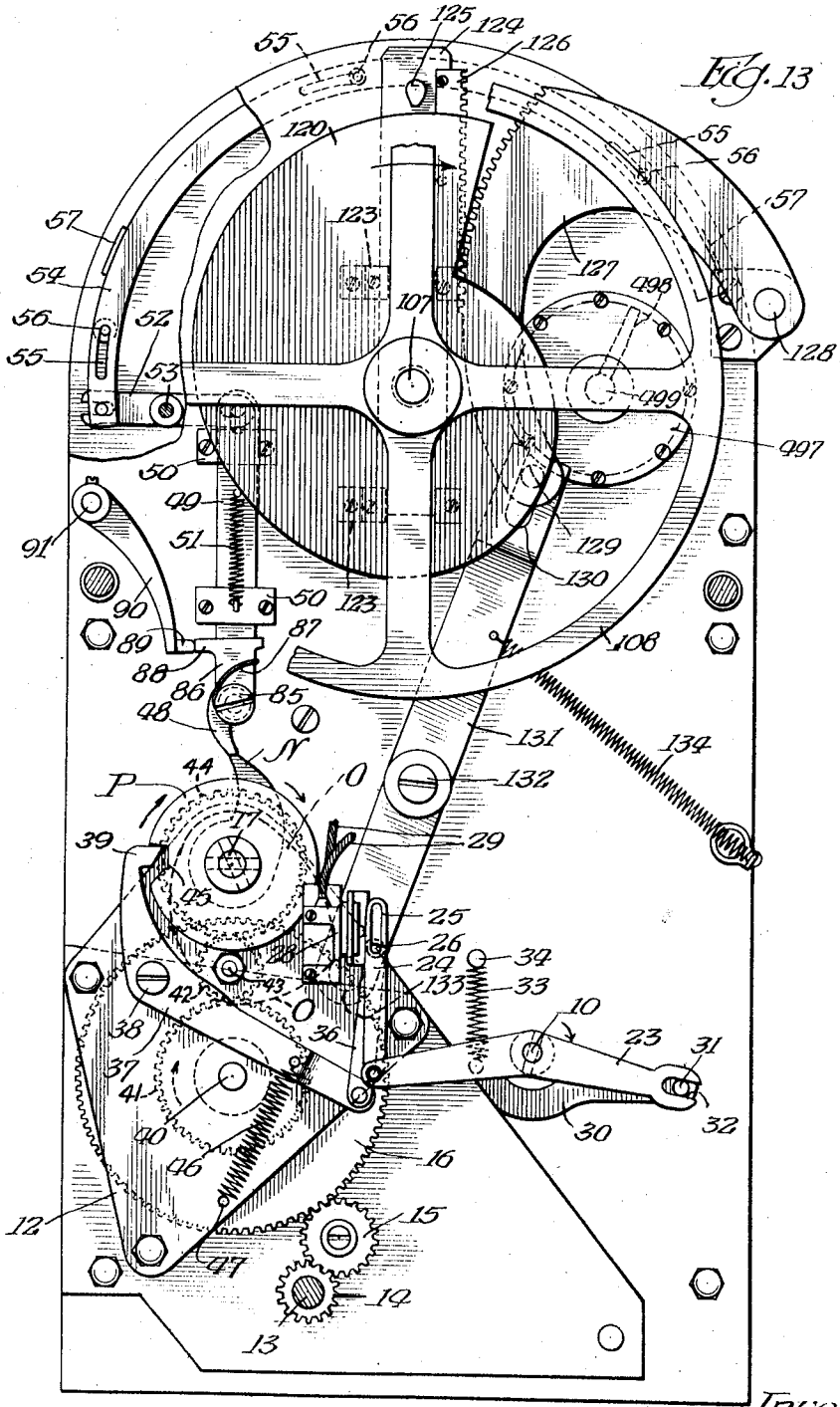
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Fig. 13



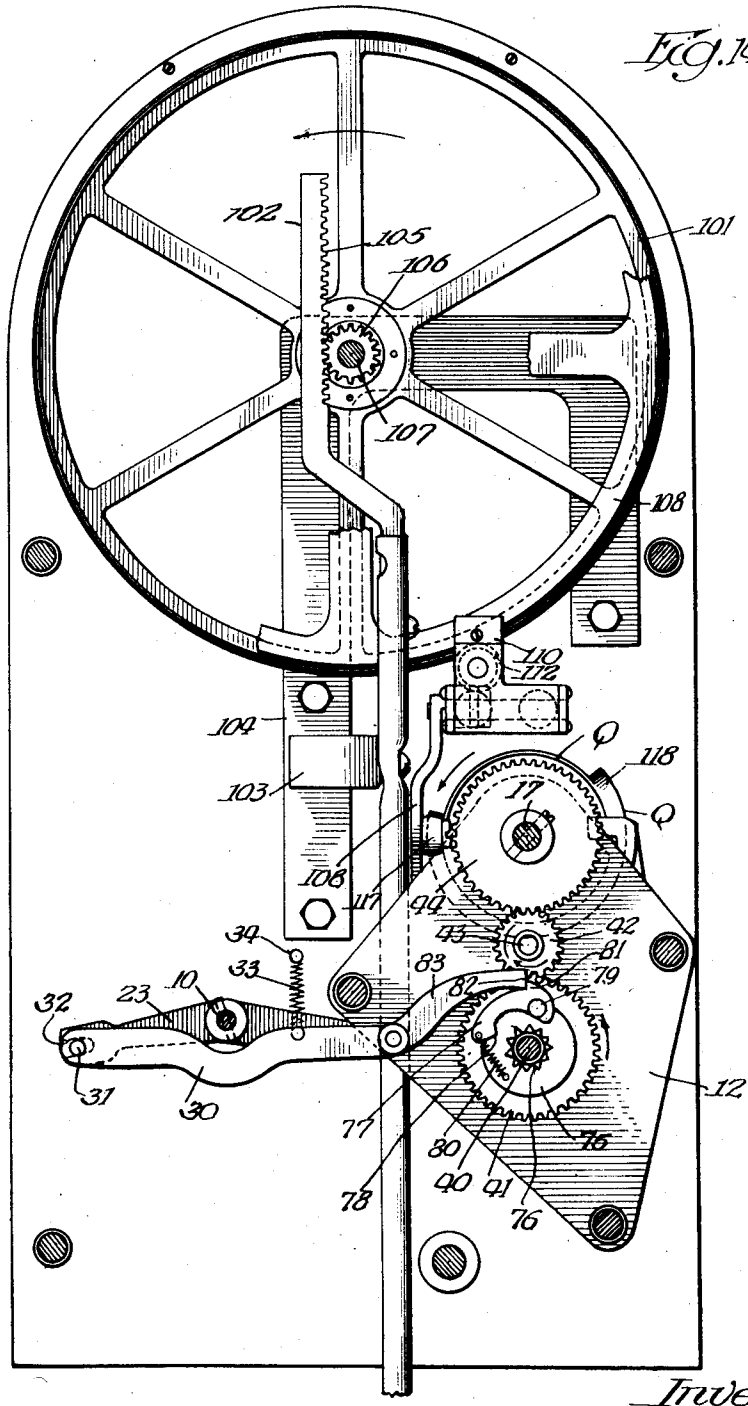
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Fig. 14



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Fig. 15

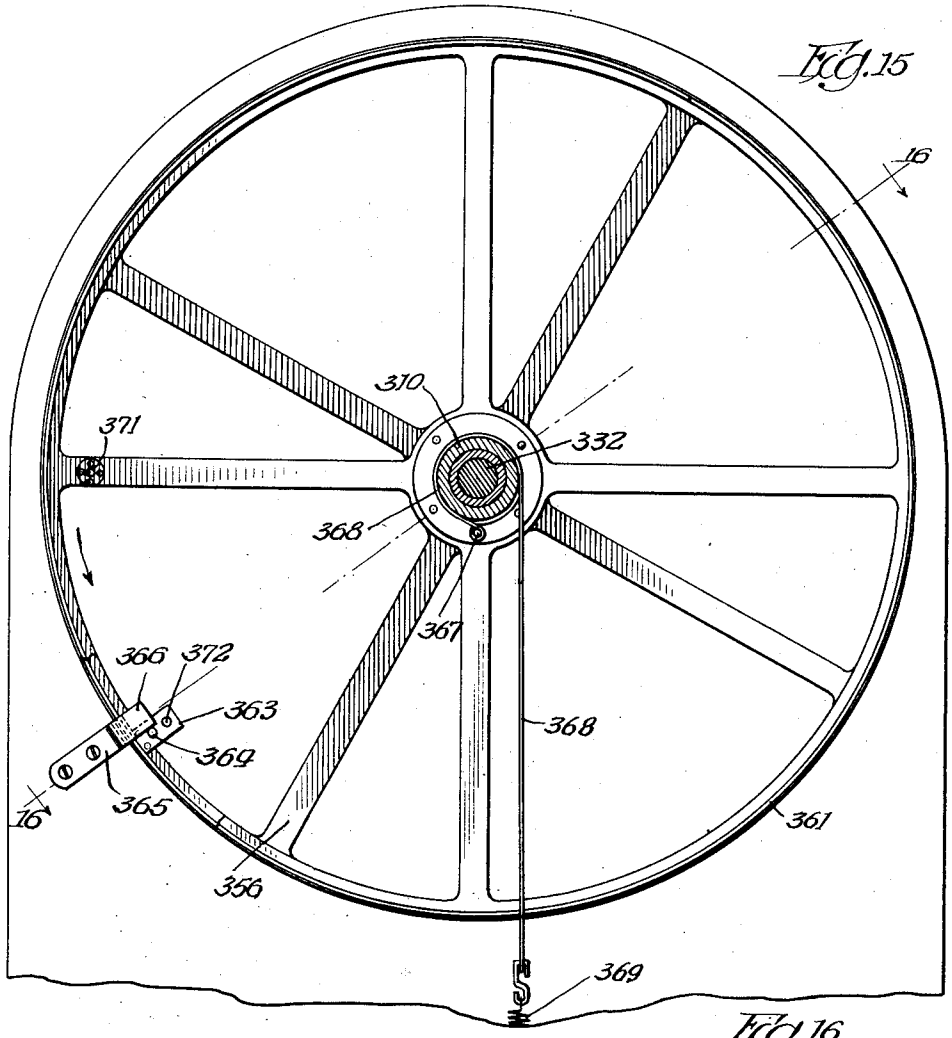
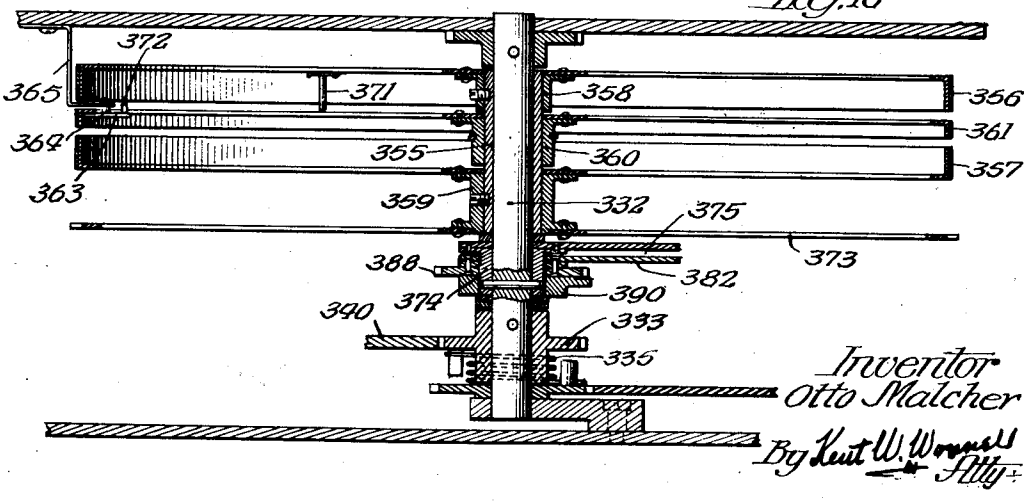


Fig. 16



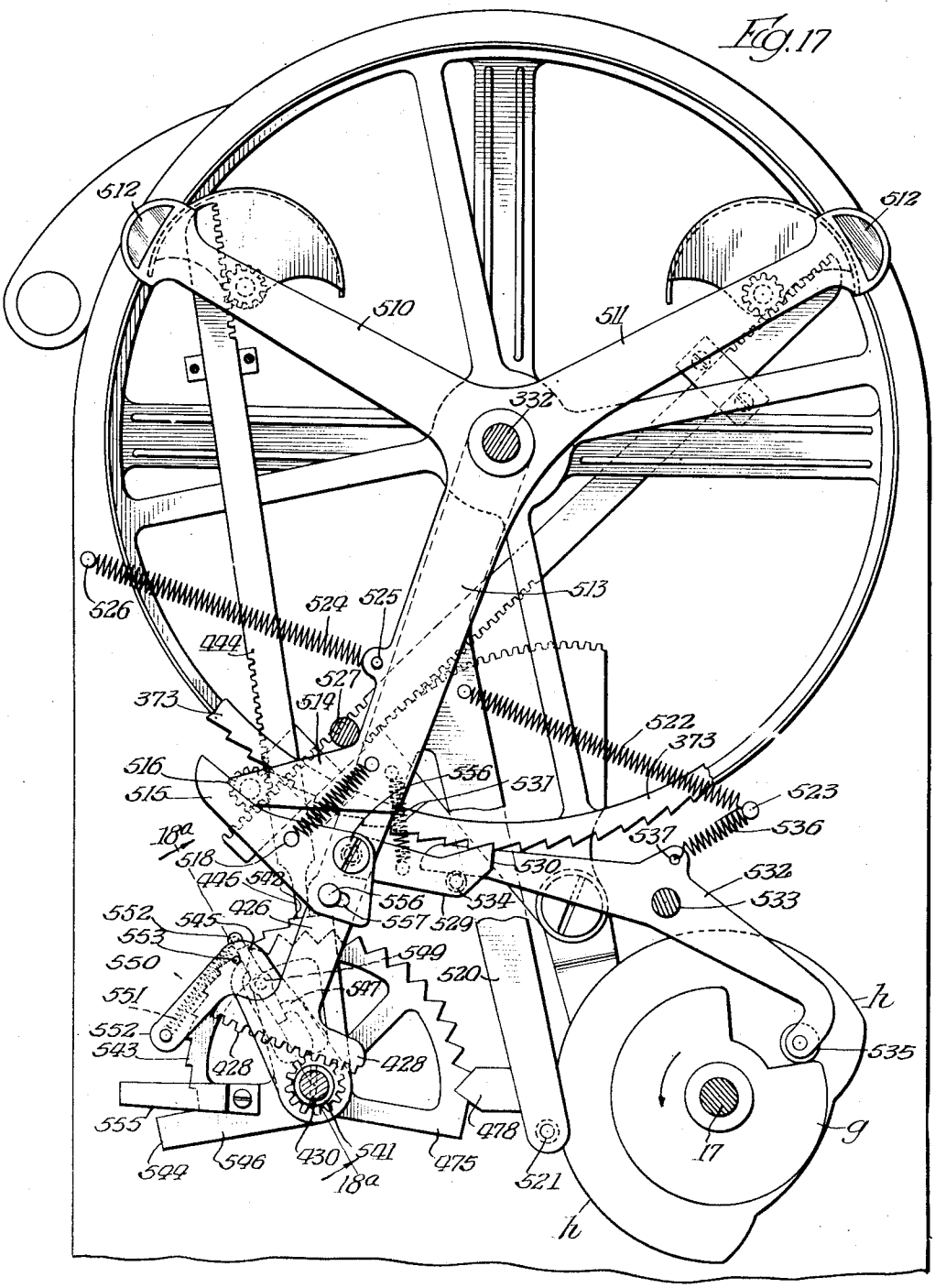
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Fig. 17



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Fig. 18

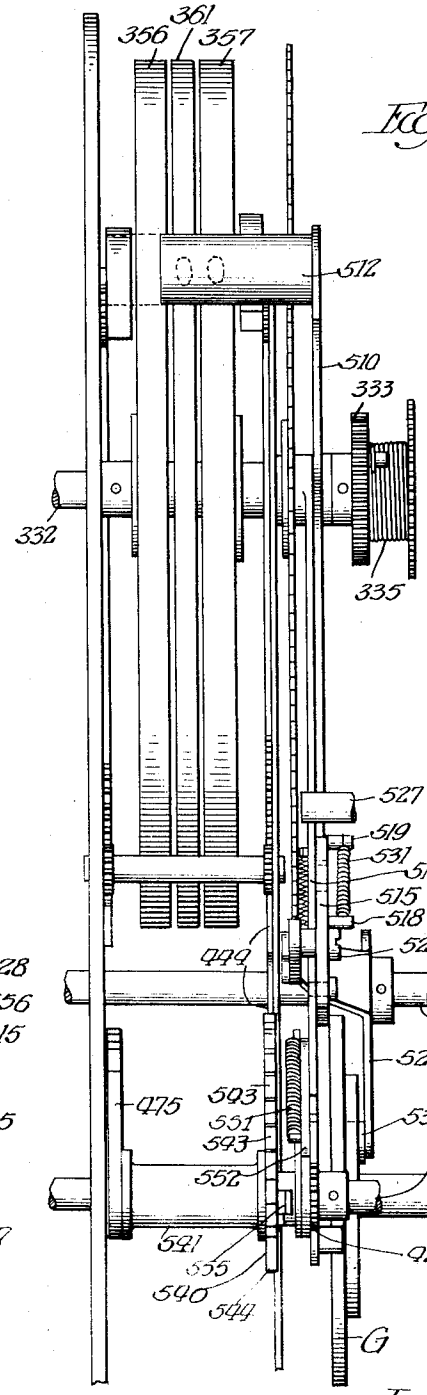
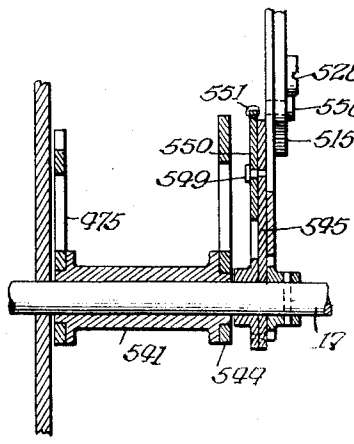


Fig. 18a



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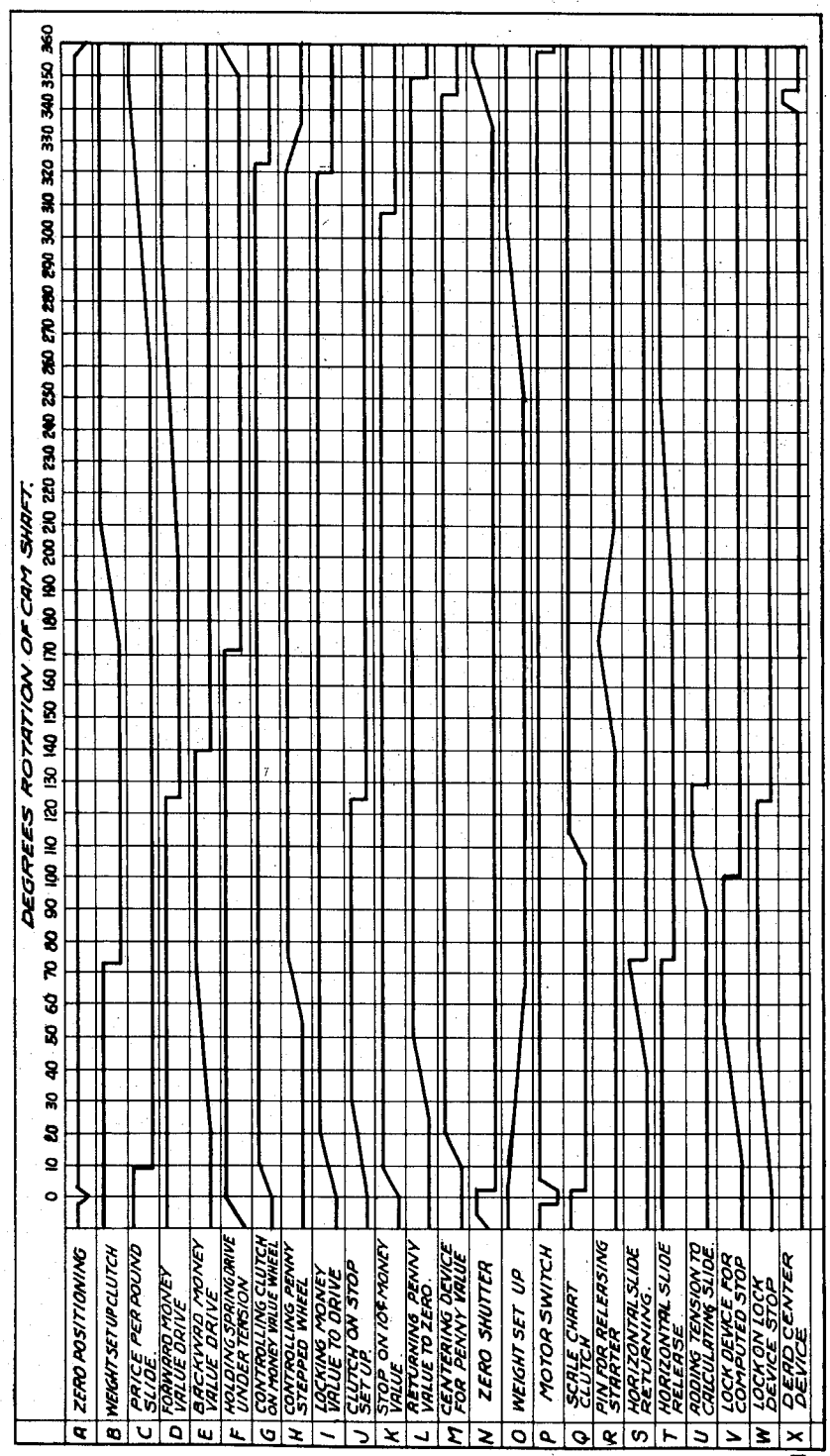


Fig. 19

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Patented Apr. 9, 1946 2,397,970

UNITED STATES PATENT OFFICE

2,397,970

COMPUTING SCALE

Otto Malcher, Chicago, Ill.

Application September 10, 1938, Serial No. 229,263

16 Claims. (Cl. 235—61)

This invention relates in general to a computing scale used in connection with a weight machine and has more particular reference to an indicator to designate the computed value of a weighted article for which the price per pound is set and indicated.

An important object of the invention is in simplifying the mechanism for more accurately recording the money value when the price per pound is given and the weight determined by a suitable weighing mechanism.

Other objects of the invention are to simplify the construction of the money value charts so that the computed values may be shown in easily read figures of large size; to simplify the setting of a units column indicator as determined by a proportion of the ten cent value; to accurately position the operating parts and cams for moving the parts positively, accurately and without lost motion; to provide means for adding a one-half cent value to any of the price per pound units; to provide means for eliminating any dead-center in the calculating mechanism; to provide covers for the sight openings which shield the movement of the indicating wheels until the computed values are set; and in general to provide the mechanism herein shown and described.

For accomplishing these results and others which will appear hereinafter, the accompanying drawings illustrate a preferred embodiment of the invention. In the drawings,

Fig. 1 is a perspective of a computing scale and weight mechanism enclosed in a suitable casing, in accordance with the invention;

Fig. 2 is a front elevation with some parts broken away and some parts omitted, of a mechanism enclosed by the upright casing of Fig. 1 in accordance with the invention;

Fig. 3 is a top elevation of the mechanism with some parts broken away and some shown in section;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2 showing the ½¢ mechanism;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 2 showing the weight control mechanism;

Fig. 6a is an enlarged perspective of the stop slide for one-half cent variations;

Fig. 7 is a section taken on the line 7—7 of Fig. 2 showing the vertical and horizontal components of the computed value mechanism;

Fig. 8 is a section taken on the line 8—8 of Fig. 3 showing the drive mechanism for the ten cent chart;

Fig. 9 is a section taken on the line 9—9 of Fig. 3 showing the spring tensioning mechanism for the ten cent chart;

Fig. 10 is a section taken on the line 10—10 of Fig. 3 showing the computed stop set up and locked and the dead center relief mechanism;

Fig. 11 is a section taken on the line 11—11 of Fig. 2 showing the one cent positioning mechanism;

Fig. 12 is a section taken on the line 12—12 of Fig. 2 showing the safety drive, stop and lock mechanism for the ten cent wheel;

Fig. 13 is a section taken on the line 13—13 of Fig. 2 showing the zero shutter, weight set-up, and the motor switch mechanism;

Fig. 14 is a section taken on the line 14—14 of Fig. 2 showing the weight chart, positioning rack and clutch for the chart;

Fig. 15 is a section taken on the line 15—15 of Fig. 2 showing the ten dollar wheel;

Fig. 16 is a section taken on the line 16—16 of Fig. 15 showing the operation and relation of the ten dollar wheel;

Fig. 17 illustrates a modification of the one cent mechanism similar to a portion of that shown in Fig. 11;

Fig. 18 is an elevation of the modification illustrated in Fig. 17;

Fig. 18a is a section taken on the line 18a—18a of Fig. 17; and

Fig. 19 is a diagrammatic timing chart illustrating the operation of the various cams and the parts which they operate as related to one complete operation of the machine and therefore one complete rotation of the cam operating shaft.

In a computing machine of this kind accuracy of measurement of values is highly desirable and is difficult to obtain. In a machine comprising so many mechanisms in which the measurements are referred to a surface of comparatively short length, a slight looseness or variation of pressure may make such a difference in the ultimate calculation that the result is not accurate or may produce a slight variation which is just as objectionable. For example, in weighing and calculating a certain weight at a certain price per pound the computed result may be the same for fifty or any number of times, but if the next computation of the same variables produces a variation, even of one cent in value, the mechanism may be objected to as not sufficiently accurate.

In the present invention this objection is overcome by moving the calculating or computing members for any weight and any price to a positive stop and then adding a tension to these mov-

able members against the stop so that there can be no variation due to looseness or variation in pressure.

In a calculating machine for values even up to twenty dollars, a one cent graduation will require two thousand values and to produce numerals which are of sufficient size to be readily seen both by the customer and by the dealer requires either charts of large size or a particular arrangement of charts and values thereon such as the applicant has provided. Charts of large size are objectionable because they require a larger enclosing casing, more material, more weight, and therefore are more expensive. The present construction is therefore designed with the view of economizing in weight, space, cost and size, all of which are highly desirable.

It is frequently necessary to make calculations for one-half cent additions in the price per pound values. In an ordinary dial scale this can only be accomplished by inserting the one-half cent value after each other valuation, thereby doubling the number of figures and greatly increasing the size of the drums, the weight, number of parts, and other undesirable features. The present invention overcomes this by providing a one-half cent key, the calculation value of which is simply added to any previously selected price per pound so that the computed value is for the addition of the one-half cent value to any price per pound.

In any computing device of this kind occasions frequently arise where the opposite teeth or points of the computing mechanism are engaged and as this is at the critical point for an added one cent valuation, the storekeeper is losing practically a full cent in valuation each time that the computing mechanism moves back instead of forward. To overcome this objection a positive means is provided eliminating the dead-center position and insuring the proper one cent value.

Some calculating machines are operated continuously by an electric motor and are connected for operation only when certain keys are pressed. The present machine has operating means which sets a motor in operation for a particular cycle each time the calculating mechanism is operated. The movement of the various mechanisms through the cycle causes the operation to produce a computed money value depending upon the weight and the price per pound, and after the movement is complete the motor is stopped and ready for another operation. While the charts for the computed money values are in movement a shield is moved across the sight openings at the front and rear but when the computed value is reached these shields move out of the way, disclosing the true computed money value.

For satisfactory operation it is necessary that the computation of the money value to be effected in a few seconds, which means that the cycle of operation as described must all take place within that time, that is, approximately three or four seconds, in order that the machine may be considered successful in operation.

The operation of this machine is effected through the operation of a number of cams designated by capital letters A to X inclusive, the timed operation of which and the specific name of the cam is set up on the chart constituting Figure 19, as well as in the description in the specification relating thereto.

In general an article or goods to be sold is placed upon the weighing machine, the price per pound is set by means of a knob at the end of the casing and a lever projecting from the casing is engaged which sets the mechanism in operation to produce the computed money value. The result is read from the computed value opening at both sides of the casing where it is visible both by the customer and by the dealer. If the price per pound includes a one-half cent valuation, a key bearing the one-half cent designation is pressed after the operation of the price per pound knob and before the operating lever is engaged.

Referring now more particularly to the drawings, the operation of the various mechanisms are produced by their corresponding cams A to X in proper timed relation, which is indicated upon the timing chart, but the operation will be best understood by describing the complete action produced by each cam and its associated parts. Unless otherwise stated, the parts are in the initial or zero positions, and a complete cycle is one turn of the cam for any part, represented as 360° on the timing chart.

General structure.—The computing mechanism is housed in a suitable casing 1 (Fig. 1) mounted upon a base 2 which also supports a weighing scale comprising a platform 3 which communicates its movement produced by a weight to an operating beam 4 movable vertically in casing 1 and constituting one of the computing factors of which the price per pound is the other.

At opposite sides of the upper portion of the casing 1 are sight openings 5, 6 and 7 to show numerals indicating the weight, computed value, and price per pound, visible both to the purchaser and the seller. At one end of the casing is a knob 8 for setting the price per pound values, below it is an operating arm 9 mounted upon a shaft 10, and above it is a one-half cent key 11 extending through a slot in the casing.

To operate the mechanism it is necessary only to place an article upon the platform 3, to turn the price per pound mechanism by the knob 8 to the proper value as shown in openings 7, and to press the arm 9 rocking the shaft 10. If an additional ½-cent valuation is to be added to any price per pound, the ½-cent key 11 is also depressed. This will start a motor for the mechanism, mask the openings 6 during the calculating movement, and then set up the computed value in the openings 6, all in the space of two or three seconds; then complete the cycle, stopping the motor.

The various mechanisms are mounted in a skeleton frame consisting of a number of thin metal plates connected through their marginal edges by rods and spacing sleeves on the rods between the plates, the various shafts and mechanisms being connected to and extending through and between the plates as described. This frame is light, strong, and permits the necessary access to the parts mounted therein.

Starting the motor.—Within the casing an electric motor 12 (Figs. 3 and 13) having a driving shaft 13 is connected by gears 14, 15 and 16 to a countershaft 40. This countershaft has a driving gear 41 which meshes with an idler gear 42 mounted upon a stub shaft 43 connected to a driving gear 44 fixed to a cam shaft 17 which carries many of the operating cams. At the operating end (Figs. 4 and 5) a gear 18 secured to the cam shaft is connected by an idler gear 19 mounted on a stub shaft 20 with a gear 21 of the same size attached to a second cam shaft 22 which also rotates one complete turn for each cycle of operations.

When the operating arm 9 is depressed its shaft 10 is rocked, moving with it a lever 23 attached intermediate its ends (Figs. 4, 13, 14) to the other end of the shaft. Pivoted at one end of lever 23 is a link 24 having a slot 25 at its upper end engaging a cross-pin 26 of a switch arm 27 for a switch 28 to close an electric circuit through conductors 29 to the driving motor. As soon as this actuated lever 23 is returned by a spring pressed lever 30 attached by a pin 31 and slot 32 connection to the other end of lever 23, leaving the switch arm 27 in circuit closing position due to the slot 25, a spring 33 attached at one end to the lever 30 and at the other end to a fixed pin 34 tends to move it about its pivot 35 in a direction to return the other lever 23, the rock shaft 10 and the arm 9 to their original positions as soon as finger pressure is lifted from the latter.

Upon the movement of the switch arm to switch closing position by the slotted link 24, a link 36 (Fig. 13) attached to the switch arm 27 by the cross-pin 26 is also raised. The lower end of this link 36 is pivoted to one end of a lever 37 pivoted intermediate its ends on a pivot stud 38 attached to a fixed plate. At its other end is a pointed extremity 39 to engage a notch 45 in a motor switch cam P secured to cam shaft 17. A spring 46 attached at one end to the lever 37 near the switch end, and at the other end of the spring to a fixed pin 47 tends to hold the pointed extremity in the cam notch and to open the motor switch 28.

Closing of the switch 28 starts the motor, pulls the extremity 39 out of its notch 45, and during a complete rotation of the motor timing cam P, the pointed extremity rides on the outer circular surface of the cam, against which it is pressed by its spring 46, until the extremity drops in the cam notch, the spring operating the link 36 to open the motor switch 28, ready for the next actuation of the motor.

Motor drive clutch.—Instead of the driving gear 41 (Fig. 14) being attached to the countershaft 40 it is loosely mounted thereon but secured to a disc 75 which is also freely rotatable on shaft 40. A star gear wheel 76 is keyed to the shaft and has teeth engaged by a tooth 77 at one end of an arm 78 mounted at its other end on a pivot 79 carried by disc 75 and the tooth pulled into engagement with the teeth of gear wheel 76 by a spring 80.

Near the pivot the arm 78 has a projection 81 adapted to be engaged by a tooth 82 at the end of an arm 83 of lever 30, and to hold tooth 78 away from gear wheel 76.

When lever 30 is depressed in starting the motor, arm 83 is raised, immediately releasing arm 78 which is moved by its spring 80 to engage its tooth 77 with star wheel 76, thereby completing a clutch connection between shaft 40 and wheel 76 attached thereto, arm 78 and its tooth 77 which engages wheel 76, and disc 75 and driving gear 41 attached thereto. Arm 83 is held out of position to re-engage the arm for the first portion of movement of gear 41, but its spring 33 tends to move it for re-engagement, and a complete rotation of gear 41 brings the projection 81 against tooth 82 on the lever arm 83 which overcomes the spring 80 and raises the tooth 77 out of engagement with the star gear wheel 76.

Insuring motor operation.—Any movement of operating arm 10 which is sufficient to start the motor must also continue its operation through a complete cycle, and means is provided to retain the arm in operating position during a portion of the cycle, then to release and return it for the next actuation.

Secured on the cam shaft 17 near the operating end of the machine (Fig. 5) is a zero positioning cam A having an angular notch 60 engaged by a pointed end 61 of a lever 62 mounted on a pivot 63 between its ends and having a spring 64 connected to its other end and tending to hold the opposite pointed end in the notch for accurately positioning the cam A and shaft 17 in rest position to which it is returned upon completion of a cycle.

Actuation of arm 9 and its shaft 10 also moves an arm 65 attached to the shaft (Fig. 5) and having a notch 66 in its outer edge adapted to be engaged by the pointed extremity 67 of an arm 68 fixed to a stub shaft 69 which also carries an arm 70 adjacent the gear 21 on second cam shaft 22. Projecting from the gear is a starter release pin R to engage the arm 70 after a predetermined movement of gear 21 rocking it and the other arm 68 out of engagement with the notch 66 against the action of a spring 71 attached at one end to the arm 68 and to a fixed part at the other end.

In operating arm 9 and 65, spring 71 pulls arm 68 in engagement with notch 66, raising arm 70 into the path of pin R and holding shaft 10, and consequently motor switch 28 in closed position. Engagement of the pin R moves the pointed extremity 67 out of notch 66, allowing arm 65, shaft 10, and operating arm 10 to return to normal or initial position under the action of lever 30 and its spring 33, before the motor cycle is complete. Completion of the motor cycle causes the arm 83 to open the star wheel 76, clutch, and the zero positioning cam A is then in position to be engaged by its pointed lever 62 which positions all parts accurately for the next motor operation.

Operation of money value shield.—As soon as the motor starts it rotates shaft 17 to the right (Fig. 13) carrying with it the zero shutter cam N of which the tip engages a corresponding but pivoted tip 48 at the end of a slide 49 mounted for sliding movement in guides 50. The cam and tip have opposite abrupt and slightly undercut shoulders which allow the slide to drop suddenly under the action of a spring 51 attached at one end to the slide and at the other to the lower guide 50, as soon as the motor rotates the cam N a slight distance.

A lever 52 mounted on a pivot 53 between its ends is connected at one end to the upper end of slide 49 and at the other end to a curved carrier 54 having slots 55 at intervals for mounting it to slide upon headed studs 56 secured in one of the frame plates. Extending from the carrier 54 are shields 57 which underlie the sight openings 6 for the money value, at opposite sides of the casing, and overlie the mechanism for determining the money values until the computation is complete, the slide 49 and the carrier 54 being abruptly moved by the cam N just before the motor comes to rest. This prevents the customer from seeing the movement of the money value wheels until the computed value is obtained. On their outer faces the shields 57 have zero designations and are therefore called the zero shutters.

Zero shutter operation by price per pound knob.—As the last calculated money value appears in the openings 6 it is desirable to operate the zero shutter as soon as the price per pound is changed. For this reason the tip 48 (Figs. 5 and 13) is mounted on a pivot 85 at the end of the slide 49 and has an extension 86 pressed

against the slide by a spring 87 which also tends to hold the tip 48 in position to engage the tip end of cam N. At the side opposite its engagement with the slide is a projection 88 from tip extension 86 which is engaged by the extremity 89 of an arm 90 secured to a shaft 91 which also carries an arm 92 opposite a toothed wheel 93 secured to a shaft 94 upon which the money value knob 8 is also fixed.

The end of the arm 92 engages toothed extremities 95 of upper and lower spring blades 96 and 97 attached at their other ends to fixed supports, and the extremities riding in the teeth of the wheel 93. A spring 92a holds the arm against the blades.

Any movement of the wheel 93, as setting it for a new price per pound value, causes the extremities 95 to ride outwardly on the teeth, moving the arm 92, and through shaft 91 and the other arm 90, rocking the extension 86 and its tip 48 upon pivot 85 sufficiently to disengage the tip from the tip of cam N, thereby allowing spring 51 to actuate the carrier 54 and the zero shutters as before explained.

Setting the price per pound.—At the operating end of the casing the knob 8 is turned, rotating its shaft 94 and the money value wheel 121 secured thereto until the desired value appears in sight openings 7 on opposite sides of the casing. This operation also sets the toothed money value disc 122 with its spiral stepped graduations in any desired position where it is releasably held by the toothed wheel 93 engaged by spring fingers 96. This wheel 121 and disc 122 are usually positioned before or when the material to be weighed is placed upon the scale.

If the setting of the price per pound remains unchanged for a succeeding calculation the first movement of the cam shaft 17 actuates the zero shutter cam N, as explained above, operating the zero shutter, and if the knob 8 is turned the teeth of the wheel 93 act as knock-outs moving the arm 93 and actuating the zero shutter as explained above.

Locking the weight chart.—At one end of the mechanism are weight charts 100 and 101 (Figs. 2 and 14) having oppositely disposed numerals indicating weights visible through sight openings 5. Between these charts is sufficient space to admit a weight bar 102 which is the only operating connection from the weighing scale, and its movement is dependent upon the weight applied to the scale platform 3.

This weight bar has a saddle 103 for slidably engaging an upright supporting frame part 104, and at its upper end is a rack 105 engaging a pinion 106 fixed upon a shaft 107 which is also attached to the weight chart wheels for moving them in accordance with the weight upon the scale.

Also attached to the chart wheel shaft 107 is a locking disc 108 which extends at the bottom between clutch arms 109 and 110 actuated by rack clutch members 111 and 112 mounted upon a shaft 113 and actuated by connected gear members (not shown) one of which is fixed upon a shaft 114 to which one end of a lever 115 is connected so that the movement of the lever actuates the clutch. This lever has a spring 116 at its free end connecting it to the frame and tending to operate it to clutch the disc 108. Intermediate its ends it has a contact roller or projection 117 adapted to engage a scale chart clutch cam Q attached to cam shaft 17, which has an open space with an outwardly flared pickup 118 to allow the clutch to engage the disc 108 and the pickup to release it.

By reference to Fig. 14 and the timing chart (Fig. 19) it will be seen that a slight movement of cam shaft 17 releases roller 117 allowing spring 116 to operate the lever 115 actuating the clutch members 111 and 112 to grip disc 108 therebetween until the flared pickup 118 of the clutch cam Q engages the roller 117 and releases the clutch.

Weight set-up.—Attached to the shaft 107 is also a spiral weight set-up disc 120 (Figs. 2, 3, 13) which is rotated and locked with the locking disc 108. At one side mounted for vertical movement in guides 123 is a weight slide 124 having a top projection 125 overlying the disc 120.

Secured to one side of the slide 124 is a rack 126 meshing with a segmental gear 127 secured to a shaft 128 at the outside of the money value charts. This gear has a tail piece with a projection 129 engaged in a slot 130 at the end of a lever 131 mounted between its ends on a fixed pivot 132 and having a projection 133 at its other end engaging a weight set-up cam O mounted on cam shaft 17.

A spring 134 secured at one end to a fixed portion of the frame and at the other to the upper end of lever 13 tends to move it and the gear 127 in a direction to contact projection 125 with the disc 120, the amount of movement depending upon the position of the disc. Operation of the gear 127 is timed by cam O and after the calculation is complete, the cam again returns the projection 125 and its slide 124 to the position shown in Fig. 13, ready for the next operation.

Connected to the other end of shaft 128 (Figs. 6 and 7) is a gear segment 135 meshing with a rack 136 carried by a vertically movable weight set-up bar 137 which is moved in accordance with the movement of weight slide 124 by means of a spring 138 attached at one end to the bar and at the other to a fixed frame part.

This bar 137 is slidable in fixed guides 139 and must be rigidly held in fixed position for accurate calculations. At its lower end is a round clutch bar 140 slidable in a clutch sleeve 141 of the wrapping grip type having one end fixed and the other loosely embracing the bar 140 and actuated by a toggle clutch having a ball tip 142 engaging the loose end of the sleeve and moved to tightly grip the bar 140 when an adjustable toggle member 143 pivoted to another toggle member 144 mounted on a fixed pivot 145 is actuated by its attached arm 146. An actuating spring 147 attached to the arm and to a fixed frame part tends to move the toggle to clutching position, but is controlled by the weight set-up clutch cam B attached to cam shaft 17 and timed to release the lever for operation by the spring about 70° after the starting position and to engage the lever, releasing the clutch after about 200° movement of the cam shaft.

Money value calculations.—Carried by the weight set-up bar 137 is a pivoting support 148 for a weight calculating arm 149 inclinable at different angles, its inner surface 150 being the contact edge for the money value calculations. By inclining the arm more or less to the bar the price per pound factor is combined with the weight variation produced by lowering the bar 137 more or less, and the point at which a transversely movable slide 151 engages the edge 150 accurately determines and sets up the calculated money value.

The inner edge of the arm 149 in upright posi-

tion determines the zero point of calculations, and instead of a sharp contact projection on the slide 151 a half cylindrical projection 152 is rotatable in a plate 153 attached to the slide and backed by a quartered abutment 154, so that it turns in its mounting as it engages the contact edge of arm 149. Thus the axis of the projection is the zero point of the slide, the contact is of a surface, not a line or point, and the abutment prevents bending or damage to the projection 152.

Price per pound slide connections.—Mounted for horizontally transverse-sliding movement at one side of the bar 137 is a price per pound slide 155 which carries an upright head 156 (Figs. 6 and 7) with a tip engaging in a slotted guide 158 for steadying and holding it in place, and with a straight contact inner edge 159. Carried at the outer end of arm 149 is a pivotal mounting 160 for a flat contact foot 161, the flat surface engaging the straight edge 159, to avoid undue wear and to slide easily thereon.

A spring 162 is attached at one end to the upper end of rack 136 and has a bent extremity adapted to engage the upper end of the arm 149 and tends to press the upper end of the arm away from the rack, and also from its bar 137. In its vertical or nearly vertical position, the arm has only a slight tendency to move outwardly for low prices per pound and for low weights, so that the spring is provided to improve calculations for such values.

In Fig. 6 the head 156 is shown with an attached brace 163 secured by ribs at the bottom to the slide 155, for holding the head rigidly in upright position and its contact edge 159 in vertical relation to engage the contact foot 161 for accurate calculations. The effect is the same as if the axis of the foot 161 is the contact point for the arm 149.

At one side of the slide 155 is secured a rack 164 meshing with a pinion 165 pivoted on a frame plate and meshing with a gear segment 166 at one end of a lever 167 having a median pivot 168 and a projection 169 at the other end. This projection engages a price per pound slide cam C fixed on cam shaft 17, and very soon after the motor is started the projection is released by the cam allowing the lever 167 to be moved by a spring 170 attached at one end to the upper end of the lever and at the other to a fixed frame part. Movement of the lever to the left (Fig. 6) moves the slide to the right an amount determined by the setting of the price per pound toothed disc 122.

At the left end of the slide 155 is a stop slide 171 mounted in guides 172 and having a ledge 174 at one side projecting beyond the guide 173 and supporting an abutment projection 175 carried by the slide. The projection 175 engages any of the teeth of price per pound disc 122 set in its path by adjustment of the knob 8, which therefore determines the amount the price per pound slide is moved to the right by the spring pressed lever 167, and thus sets the vertical head 156 in its proper location.

Half-cent price variations.—The half-cent key 11 has finger piece at its outer end but extends through an opening to the inside of the casing in the form of a lever 178 (Figs. 2, 5 and 6) medially pivoted on a shaft 179 below the toothed holding wheel 93 for the price per pound disc 122.

At that end of the lever opposite the key are notches 181 and 182 either one engaged by a toothed holding pawl 180 pressed by a spring 183 into such engagement. Rigidly secured to and extending from this end of the lever is a pointed knock-out arm 184 adapted to be moved when the key is depressed so that its pointed extremity engages the teeth of the price per pound holding wheel 93.

In order to give visible notice that the one-half cent value has been added and to show this added value in the sight openings 7, an operating bar 185 is connected by a pivot 186 to the key of lever 178 and the upper end of the lever is pivotally attached to an arm 187 having a fixed pivot 188 at its inner end and a plate 189 at its outer end conforming to the curvature of a price per pound wheel 121 so that the one-half cent designation 191 on the plate 189 will appear through a perforated plate 192 which forms the price per pound sight opening.

At the other side of the casing is a similar arm 187 and its plate 189 connected at the upper end of an operating bar 193. The lower ends of the bars 185 and 193 are connected for joint operation by a lever 194 having a pin and slot connection with the lower end of the bar 193 and mounted intermediate its ends upon a pivot 195, the other end having a pin and slot connection 190 with an arm 196 secured to a shaft 197 mounted in the machine frame and having an arm 198 secured thereto and having a pin and slot connection 199 with the lower end of the bar 185. Thus when the key lever 178 is depressed the bar 185 is directly pulled downward and through the arms 198, 196 and lever 194, the bar 193 is correspondingly pulled downwardly thereby drawing the plates 189 on opposite sides of the casing so that the one-half cent graduations carried thereby are moved in line with the sight openings 7.

The holding pawl 180 retains the half-cent key and its lever 178 either in a position so that the half-cent valuation is shown through the sight openings, in which case the knock-out arm 184 is in engagement with the wheel 93, or when the pawl 180 engages the notch 181 the half-cent valuation is withdrawn from the sight opening and the knock-out arm 184 is at a distance from the wheel.

When the price per pound valuation is changed by rotating the knob 8 and the toothed holding wheel 93, if the knock-out arm 184 happens to be in engagement with the toothed wheel 93, the teeth of the wheel engaging knock-out arm 184 will cause the lever 178 to be moved to the units valuation, omitting the half-cent addition, and to be held in such position by the pawl 180 engaging the notch 181 as shown in Fig. 5.

The result of this is that each time the price per pound mechanism is set for a new value the half-cent addition is removed and the price per pound setting is only for units variations. In order to add the half-cent valuation the key 11 must be depressed for each calculating operation. This prevents accidental carrying of the half-cent valuation for new price per pound settings.

Half-cent slide variations.—When the price per pound slide 155 is moved to the right in accordance with the price per pound setting of the disc 122 it is obvious that a movement of one-half the distance between the spirally arranged teeth of the disc 122 will cause a corresponding setting of the head 156.

For half-cent valuations and calculations the price per pound disc 122 has ½ cent teeth spaced equally between the full cent teeth, but for the higher price per pound values, usually above

thirty-five cents, no half cent teeth or steps are usually needed.

To produce a half-cent variation the projection 175 is moved downwardly the proper amount by its slide 171. This is effected by providing an extension 200 at one end of the slide with an eye 201 engaged by the free end of an arm 202 secured to a shaft 204. This shaft extends along the side of the machine and has another arm 205 secured to it, the outer end of the arm having a pin and slot connection 206 with the upright bar 185 moved by the half-cent lever 178. When the slide 155 is moved to the right the eye 201 is disengaged from the arm 202, but re-engages the arm when it is returned.

At one side of the slide 171 are notches 176 and 177 engaged by the pointed end of a holding pawl 207 pivoted on the guide 172 and having a spring 207a tending to hold the stop slide in either position, the upper notch being for the one-half value.

When the half-cent key is depressed the arm 205 is rocked downwardly carrying with it the arm 202, through their connection with the shaft 204, and the stop slide 171 is moved downwardly until the pawl 207 engages the notch 176. This sets the abutment projection 175 downwardly a one-half step or an amount equal to the necessary half-cent positioning of the projection so that when the slide 155 is moved forwardly by the lever 167 it must be moved this additional amount before the projection engages the proper tooth of the price per pound disc 122.

In order to return the stop slide and its projection 175 to the normal full cent position, omitting the half-cent setting, the slide 155 must first return the stop slide 171 so that the eye 201 is engaged by its arm 202 so that as soon as the half-cent key and its lever 178 is no longer depressed, the arm 202 will again be moved up by arm 205 raising the stop slide until its penny notch 177 is engaged by pawl 207 holding it in position for the units engagement of its projection 175.

Setting the money value slide.—After the head 156 with its straight edge 159 is set up by the price per pound slide 155 and the weight arm 149 has been positioned against the head at the proper inclination determined by the vertical movement of the set-up bar 137 it is necessary to bring the money value slide 151 so that its projection 152 engages the contact edge 150 for accurately setting up money value determined by these factors. The money value slide is therefore mounted for horizontal movement in guides 208 and is drawn to the right (Figs. 6 and 7) by a flexible cord 209 secured at one end to the slide 151 passing over a pulley 210 and secured at its other end to one end of a spring 211, the other end of which is attached to a projection 212 fixed to the machine frame. Secured to the other end of the slide 151 is a rack 213 meshing with a pinion 214 loosely mounted on a shaft 215 and this pinion in turn meshing with the teeth at one end of a tensioning lever 216 mounted intermediate the ends upon a shaft 217 secured in the frame and having an anti-friction roller 218 at its other end riding on the surface of the horizontal slide release cam T which is mounted upon the cam shaft 22.

Also secured to the shaft 215 is a pinion 220 meshing with the teeth at one end of a lever 221, the lever being mounted intermediate its ends upon the shaft 217 and having a contact roller 222 at its other end for engaging a horizontal slide returning cam S which is mounted upon the cam shaft 22 and secured to the adjacent slide releasing cam T so that their releasing surfaces coincide.

These two levers 216 and 221 are somewhat similar in shape and are oppositely pressed by a spring 223 located between the levers and one end of the spring attached to a projection 224 at one side of the lever 216 and the other end of the spring attached to a projection 225 at the opposite side of the lever 221. Thus the tendency of the spring is to pull the toothed ends of the levers apart oppositely rotating their respective pinions.

Adding tension to the calculated slide.—If the contacting projection 152 abuts the calculation surface 150 only lightly, or very tightly, it may produce a variation of the calculated result and it is therefore one of the features of the present invention to provide means for moving the calculating slide against the calculation surface 150 and then to add tension to the slide so it will always be pressed tightly against the calculation surface.

For accomplishing this result a lever 226 is mounted intermediate its ends upon the shaft 217 having a pointed projection 228 at its upper end and having a contact projection 229 at its lower end to engage a tension adding cam U which is mounted on the second cam shaft 22 for operating the lever. The end of the lever is held in contact with the cam by a spring 230 attached at one end to the lower end of the lever 226 and at the other end to a fixed portion of the frame.

Also mounted on shaft 217 is an arm 231 having a spring 232 which may be of the spring coil type attached at one end to a screw or projection 233 secured to the machine frame and having its other end attached to a projection 234 on the arm 231 tending to draw the arm away from the upper end of lever 226. At their upper ends the lever 226 and the arm 231 are connected by a spring 235 which tends to hold them together or from separating too far from each other, the coil spring 232 being more for returning the arm to its normal position as shown.

Secured to the upper end of lever 216 is a toothed ratchet segment 236 and mounted near the upper end of the arm 231 on a pivot 237 is a pawl 238 having one end adapted to engage the teeth of the segment 236 and having a projection 239 at the other end adapted to engage the pointed projection 228 of the tension adding lever 226. A flat spring 240 secured to the frame at one end by a screw 241 bears at its free end upon the pawl 238 tending to press it into engagement with the ratchet segment 236 but the engagement of the projection 239 with the projection 228 of the lever 226 is such that the pawl 238 is held from engagement with the ratchet segment 236 until lower end of the lever 226 is actuated by its driving cam U.

The operation of the tensioning lever 226 by its cam U moves the upper end of the lever to the left or free from engagement with the projection 239 of the ratchet pawl 238 allowing the spring 240 to press the pawl into engagement with the segment 236 and the continued movement of the upper end of the lever resiliently pulls the arm 231 by means of its spring 235 carrying with it the lever 216 which is then engaged by the pawl 238 thereby adding tension to the pinion 214 which meshes with the teeth of the lever 216.

Extending from one side of pinion 214 is a projection 242 adapted to engage a projection 243

on the pinion 220, thereby moving the projection 152 of the calculating slide tightly against the calculating surface 150 of the arm 149 and at the same time rotating the shaft 215 and seting it in the correct calculated stop position.

Lock device for computed stop.—Secured to the shaft 215, which may be called the stop set-up shaft, is a collar 244 having a projection 245 and a computed money value stop ratchet 246 (Figs. 3 and 10). It is important that this ratchet wheel 246 be accurately locked for holding it in the calculated position set up by the shaft because it carries a stop 247 which is engaged by a spring drive mechanism for setting up the computed money value and the mechanism as shown in Fig. 10 is in locked position, which is first released as soon as the driving motor is started in operation so that the shaft 215 may be turned for any new value and as soon as the calculated money value is obtained the mechanism is returned to the locking position as shown in Fig. 10.

To hold the ratchet wheel 246 securely in any adjusted position, an arm 248 is pivoted at one end to swing about shaft 215 and at the other end, a shoe 249 is connected by a pivot 250, the shoe extending partially over the ratchet wheel 246 and having a tooth 251 to engage the teeth thereof, extending opposite the shoe from the same end of arm 248 and connected to it by a pivot 252 is an operating bar 253 having a cylindrical clutch member 254 pivotally connected at its lower end and movable vertically in a clutch sleeve 260 of the embracing grip type. The free edge of the sleeve is operated by a toggle bar 261 having a pivot 262 connecting it with a toggle arm 263 mounted on a fixed pivot 264 of the frame and comprising a lever arm 265 having a contact roller 266 at its outer end engaging a clutch set up cam J mounted on the cam shaft 17. Another arm 267 of the toggle lever is connected to one end of a spring 268, the other end of which is connected to a fixed portion of the frame so that the action of the spring holds the roller 266 against the cam J and the high portion of the cam releases the clutch sleeve, allowing a movement of the gripped clutch member 254 and the bar 253. A spring 269 extending about the pivot 252 under the pivot 250 and over the outer edge of the shoe 249 tends to hold the latter in the direction of the ratchet wheel 246 and at the upper end of the shoe is a projection 270 engaged by a hooked extremity 271 of a lever 272 pivoted intermediate its ends on shaft 215, and actuated by a projection 273 at its lower end engaged by a slot 274 at the end of an arm 275 secured to an operating shaft 276 mounted in the machine frame. This shaft 276 has an arm 277 secured to it with a projection 278 at its outer end engaging a cam W mounted on the cam shaft 22 so that the movement of the arm 277 to the high portion of the cam rocks the shaft 276 upwardly, throwing the hooked extremity 271 of the lever 272 out of engagement with the projection 270 so that the shoe 249 can be disengaged from the ratchet wheel 246. This movement is opposed by a spring 279 connected at one end to the arm 275 and at the other end to a fixed portion of the machine frame.

In order positively to disengage the ratchet wheel from the locking shoe, a knock-out bar 280 in the form of a lever is mounted intermediate its ends upon a pivot 281 and at the upper end it has a projection 282 for engaging an extension 283 at the outer edge of the shoe 249. At the lower end of this lever is a projection 284 engaged by an inclined portion 285 at the outer end of an arm 286 secured to a shaft 287 mounted in the machine frame and also having an arm 288 (Fig. 8) secured to it for engagement by a lock device cam V on the second cam shaft 22.

This lever or knock-out bar 280 is held normally against a stop 289 near its lower end by means of a spring 290 attached at one end to the lever and at the other end to a fixed portion of the machine frame. The arm 286 also operates the bar 253 by means of a projection 291 intermediate the ends of the bar and a cam surface 292 at the upper side of the arm so that as the arm 286 is raised by its cam V, the shoe 249 is first raised from engagement with the teeth of the ratchet 246, after the hook 271 is disengaged, and then the continued movement of the arm 286 moves the knock-out bar so that its projection 282 engages the projection 283 of the shoe 249 insuring that it is raised and positively disengaged from the teeth of the wheel 246.

The arm 286 is drawn downwardly and the arm 288 is held against its cam V by means of a spring 293 attached at one end to the outer end of the arm 286 and at the other end to a fixed portion of the machine frame.

As soon as the high points of the cams W and V have been passed, and after the shaft 215 has been rotated to set up the ratchet wheel 246 for another computed value position, the bars 253 and 280 are drawn downwardly to the position shown in Fig. 10 by their springs and the hook extremity 271 is engaged over the projection 270 locking the shoe 249 in place and holding the money value stop 247 carried by the disc 246 in position for engagement by the spring drive for the computing wheels.

Spring drive for money value wheels.—Mounted loosely upon shaft 215 is a collar 294 (Figs. 3, 8 and 9) having a projection 295 in the path of the projection 245 on the collar 244 secured to the shaft 215. To this collar 294 is secured a gear 296 also loose on the shaft and rotatable to engage the projection 295 with the value setting projection 245.

This projection 245 is located at such a position upon its collar 244 that in order to engage it the projection 295 must be moved an additional distance beyond the regular setting position to add pressure to the spring drive for bringing it against the money value stop 247 on the money value ratchet wheel 246, as heretofore explained.

This gear 296 is actuated by a forward money value drive lever 297 having a segmental rack with teeth engaging those of the gear at its outer end carrying a projection 299 at its other end for engaging a forward money value driving cam D mounted upon the cam shaft 17.

This lever is actuated by a spring 300 attached at one end to the upper end of the lever and at the other end to a fixed projection of the frame and holding the lower end of the lever in engagement with the cam D. When the contact projection 299 rides off of the high point of the cam D the lever 297 is actuated by its spring 300 to rotate the gear 296 until the projection 295 engages with the stop projection 245.

Also meshing with the teeth of the lever 297 is a gear 301 secured to a shaft 302 mounted in the frame and carrying a gear 303 loose on the shaft but secured to a ratchet pinion 304 which is also loose on the shaft. Secured to the shaft adjacent the pinion 304 is an arm 305 having a pawl 306 mounted on a pivot 307 at the end of the arm, the pawl having a tooth 308 at one end

to engage the teeth of the ratchet **304**, the other end of the pawl having a tail piece **309** for engaging a projection **310** set in the machine frame so that when the arm is in its rest position as shown in Fig. 9 the tooth of the pawl will be held out of engagement with ratchet pinion **304** against the tension of a spring **311** surrounding the pivot of the pawl and extending over the toothed end of the pawl. As soon as the arm is moved by shaft **302** so that the tail piece **309** no longer engages the fixed projection **310**, the tooth **308** of the pawl rides over the pinion **304** and picks up the pinion for a reversing movement upon the return of the arm.

Meshing with gear **303** is a gear **312** mounted on a shaft **313** supported in the machine frame at one side of a machine frame plate **314**. At the other side of the plate and also mounted upon the shaft **313** is a gear **315** which meshes with the teeth at the end of a money value backward drive lever **316** also pivoted on shaft **298** intermediate its ends and having a projection **317** for engaging a backward drive cam E secured to the cam shaft **17**.

Also meshing with the teeth of the backward drive lever **316** is a pinion **318** mounted on a shaft **319** and secured to the shaft is a gear **320** which meshes with a gear **321** freely mounted on a shaft **322** to which a gear **333** is secured, the gears **321** and **333** being spaced apart by a drum or hub portion **334** upon which a spring **335** is wound, one end of the spring being secured to a pin **336** projecting from the gear **321**, and the other end of the spring secured to a pin **337** projecting from the gear **333**.

Connected to the spring gear **333** is a larger gear **340** mounted on the money value stop shaft **215** and having a stop projection **341** located in the path of the stop **247** on the money value drive ratchet **246** so that as this gear wheel **340** is driven by the spring drive mechanism it comes in contact with the fixed money value stop **247** and additional pressure is given to the stop **341** to press it tightly against the stop **247** so that there can be no looseness between them and to eliminate any chattering. The accurate locating of the position of the gear **333** which is attached to the shaft **322** and carries the money value wheels and the associated mechanism.

At this point it may be observed that the spring **335** is always under slight tension, the pins **336** and **337** projecting inwardly from their respective gears a sufficient distance so that when the spring is released the two pins will be drawn together and remain in that position until the next money value is set up by the mechanism.

It is also pointed out that although the money value mechanism is shown in the zero position, the money value charts would ordinarily be in a position to show the last calculated money value so that the first operation of the money value charts is to return them to a zero position or approximately thereto. As a matter of fact the present mechanism provides for a slight tension upon the money value charts and when they are returned they would ordinarily register a value other than zero, which is another reason for covering the money value openings during the calculation period. If a customer should see a certain value set up at the initial operation of the machine which is subsequently changed in the final result he might question the accuracy of the calculation but by masking the money value during the whole operation only the completed result is shown near the very end of the cycle.

Tensioning the spring drive.—From the above description it will be apparent that the forward money value drive lever **297** actuates the shaft **302**, the arm **305** attached to it, and the pawl **306** about the ratchet wheel **304** in one direction, and the backward drive lever **316** through the gears **315**, shaft **313**, and gear **312** meshing with the gear **303** rotates the arm **305** and the ratchet holding pawl **306** in the reverse direction.

The movement of the arm **305** about its shaft **302** is at most only slightly more than half a rotation of the shaft. It is this rotation of the arm which tensions the spring **335** for pressing the stop **341** against the set up money value stop **247** as above explained.

It is necessary to retain a spring tension on these stops as long as a money value is set up and for this purpose a gear **323** meshing with the gear **312** is mounted upon a shaft **324** mounted in the machine frame, and this gear meshes with a pinion **325** secured to a shaft **326** also mounted in the machine frame below the gear **323** and having a large toothed ratchet disc **327** also secured to the shaft **326** and to the pinion **325**.

A holding pawl **328** has a toothed extremity for engaging the teeth of the ratchet disc **327** in one direction and holding it against reverse movement. This pawl is mounted intermediate its ends upon a shaft **329** carried by the machine frame and at its other end is a contact roller **330** to engage a spring tension holding cam F secured to the cam shaft **17**. A spring **331** connected at one end to this lower end of the pawl and at the other end to a fixed portion of the machine frame tends to hold the contact roller **330** in engagement with the cam F.

At the upper end of the holding pawl is a notch **338** for engagement by a holding tooth or projection **348** at the end of an arm **349** secured to a shaft **350** mounted in the machine frame and having another arm **351** spaced along the shaft and having a contact portion **352** at its outer end adapted to engage a projection **353** at the adjacent end of the forward driving lever **297**. The arms **349** and **351** are pressed downwardly by a spring **354** attached at one end to the arm **351** and at the other end to a fixed projection of the machine frame.

In the returning direction of movement of the ratchet disc **327** upon the release of the spring **335** it rides against the spring pressed pawl **328** and makes a sharp ringing noise which may be objectionable. The first movement of its cam F disengages the tooth end of the pawl from the disc **327** and as soon as the driving lever **297** is moved to the left (Fig. 8) in its driving direction, the contact portion **352** of the arm **351** rides off of the projection **353** and engages the tooth **348** in the notch **338** so that there will be no reengagement of the pawl **328** until the driving lever **297** has returned almost to its starting point which will engage the arm **351** raising the arm **349** through the shaft **50** and disengaging the toothed end of the pawl **328** so that it will re-engage the spring holding disc **327** holding the disc **327** for the return driving movement.

Operation of the money value spring drive.—Assuming that the money value mechanism connected to the shaft **322** is at zero or some previously set up value, the pawl **328** will be in engagement with the spring tensioning disc **327**, the contact pins **336** and **337** at the ends of the spring **35** will be spaced apart and a tension will be applied by the spring to gear **333** which is in turn

imparted to the large gear 340 holding its money value positioning stop 341 against the value set-up stop 247.

In the positions shown in Fig. 8 the backward drive lever 316 is actually in position for a zero money value set-up but for a set-up value the lower end of this lever and its contact 317 would be nearer its cam E.

As soon as the motor is started the money value mechanism is released from its set-up position, as hereafter described, releasing the shaft 322 and the gear 340 to separate its stop 341 from the fixed stop 247 and at the same time moving the ends of the spring 335 together so that the end pins 336 and 337 engage each other, releasing the set-up tension of the spring 335.

Soon after the motor is started for any operation of the mechanism the contact 317 of the backward drive lever 316 is engaged by its cam E which drives the upper end of the lever 316 to the right (Fig. 8) and through the engagement of its teeth with pinion 318 and shaft 319 it rotates the attached gear 320 and the meshing gear 321 in a direction to set up a slight tension on the spring 335 and actually to move the gear 333 and its shaft 322 which has now been released, a little below the zero position of the shaft. This movement of the lever 316 has no effect upon the forward moving lever 297 because the gear 312 which is driven by the shaft 313 and the gear 315 which meshes with the teeth of the lever 316, simply drives the gear 303 and the ratchet 304 loosely upon the shaft 302; but the movement of the gear 315, also 312, causes a movement of the meshing gear 323 and the pinion 325 meshing with it and the ratchet disc 327 connected to the pinion in a direction to click over the holding tooth of the pawl 328 which is therefore removed out of engagement with the ratchet 327.

The parts are now approximately in the position shown in Fig. 8 with both the levers 297 and 316 riding on the high points of their respective cams D and E just prior to the operative movement of the levers for setting up a new calculated value upon the money value wheels, depending upon the position of the stop shaft 215.

Continued movement of the cam shaft 17 brings the engaged ends of the forward and backward drive levers 297 and 316 substantially together until the drop-off points of their respective cams D and E are reached, the former being reached a short distance before the latter.

Release of the forward drive lever 297 from the high point of its cam D causes the spring 300 to move the upper end of this lever to the left in engagement with gear 296 which is loose upon the value set-up shaft 215 until the stop 295 carried by it comes in contact with the fixed stop 245 carried by the collar 244 secured to the shaft 215. The value set-up and the position of the stop 245 determines the amount that the lever 297 is moved to the left by its spring. As before described this fixed stop 245 is positioned a little bit beyond the actual stop position so that the stop 295 is moved a few degrees, or a few teeth, further than necessary. This movement of the forward drive lever 297 causes a corresponding movement of the shaft 302 because of the engagement of gear 301 which is secured to the shaft and is in engagement in the teeth of the lever 297. Rotation of the shaft 302 rotates the arm 305, disengaging the pawl 306 from its knock-out pin 310, allowing the arm and pawl 306 to rotate with the shaft and causing the pawl to walk around the ratchet pinion 304 until the drive lever 297, through its connection with gear 296 and projection 295, is engaged against stop 245 on shaft 215, the shaft 302 being rotated an amount which is determined by the degree of rotation of the set-up shaft 215.

For the brief period before the projection 317 of the backward drive lever 316 is released from the high portion of its cam E the gear 312 is held against rotation because the lever 316 is held against rotation by its cam E, but as soon as the projection 317 drops from the high portion of the cam E the backward drive lever 316 is free to move to the left at its upper end, thereby actuating pinion 318 on shaft 319 and gear 320 to rotate the gear 321 for winding up and placing a tension upon the spring 335. At the same time the gear 312 also engaged by the backward drive lever 316 communicates this returning movement through shaft 313 and gear 312 to the spring set-up gear 303 to which the ratchet 304 is attached, and as the pawl 306 is now in engagement with the ratchet, the arm 305 and the shaft 302 to which it is attached are rotated in a counter-clockwise direction until the tail piece 209 engages the knock-out stop 310.

This returning movement of the arm 305 by means of the gear 312 also drives gear 323, pinion 325 with which it meshes, and the ratchet disc 327, the latter in a clockwise direction, depending upon the original movement of the shaft 302 and the attached arm 305.

At this time the forward drive lever 297 is actuated in the opposite direction and later is picked up by its cam D until it is returned to the position shown in Fig. 8.

While the forward drive lever 297 is moved from its initial position, the first movement to the left drops the arms 351 and 349 to engage the tooth 348 in the notch 338 of the holding pawl 328 and although the pawl 328 is released by its cam F after about one-half of the movement of the cam, the pawl is not released by the holding arm 349 until the forward drive lever returns to the position where its projection 353 engages the inclined end 352 of the arm 351 which thereupon allows the pawl 328 to re-engage the spring tension ratchet wheel 327.

Thus a tension is placed upon the spring 335 in accordance with the positioning of the stop 245 by the shaft 215, the gear 340 is moved resiliently and tightly to engage its stop 341 with the value set-up stop 247, and the spring 335 is sufficiently tensioned and held by the tensioning disc 327 to retain the wheel 340 in this position.

Money value chart.—Loosely mounted upon the shaft 332 is a sleeve 355 (Figs. 2, 3, 15 and 16) to which money value charts 356 and 357 are secured at the ends of the sleeve by hubs 358 and 359 respectively, leaving a space between them for a hub 360 to which is secured a ten-dollar wheel 361. Although this wheel 361 is loosely mounted on the sleeve it carries a small plate 363 at the inner side of its outer rim having a projection 364 adapted to engage a stop member 365 secured to an adjacent portion of the frame and having an extension 366 which projects between the chart wheel 361 and one of the chart wheels 356 in the path of the projections 364.

Secured to the hub of the ten-dollar wheel by means of a projection 367 is one end of a flexible band or cord 368 which is wrapped partially about the hub 360 and extends downwardly between the adjacent wheels where the free end

of the cord is attached to one end of a spring **369**, the other end of which is secured to a fixed frame projection **370**. This spring and cord tend to hold the ten-dollar wheel with its projection **364** against the fixed stop extension **366**.

In order to move the ten-dollar wheel so that a ten dollar digit will be visible through the opposite sight openings **6**, one of the chart wheels **356** carries a lateral projection **371** in the path of the projection **372** on the plate **363** of the ten-dollar wheel so that as the chart wheels are moved to a position for registering over a ten-dollar value the projection **371** engages the projection **372** and carries the wheel **361** forwardly exhibiting a ten-dollar digit through each of the opposite money value sight openings.

Also attached to the hub **359** of the ten-cent chart **357** is a ten-cent ratchet disc **373** having teeth corresponding to the ten-cent valuations and graduation of the ten-cent wheels **356** and **357**. The positioning and accurate locking of this disc **373** therefore determines and positions the ten-cent wheels.

The advantage of graduating the periphery of these wheels **356** and **357** in ten-cent valuations is apparent from the fact that the periphery of a wheel of this size may be divided into a hundred graduations having indicating numbers of a size easily read and distinguished through the sight openings. A computing scale for twenty-four pounds at seventy-five cents a pound would require eighteen hundred graduations which obviously would be quite impractical upon a money value wheel of ordinary size to make the designating numerals visible. By providing a separate ten-dollar value wheel and by setting the units wheel in accordance with the movement of the tens wheel between ten-cent valuations, money value numerals of sufficient size are presented so that they are clearly visible through the sight openings without magnification.

Locking the money value wheels.—Secured to the money value shaft **332** is a hub **374** located adjacent the ratchet disc **373** and secured to the hub is an arm **375** having an angular projection **376** at its outer end adapted to abut a projection **377** on one of the arms of the ratchet disc **373**. Connected at one end to the projection **377** is a spring **378**, the other end of which is connected to a fixed point on the arm extension **376** tending to hold the arm **375** against the projection but permitting a movement therebetween.

Mounted on a pivot **379** at the outer end of arm **375** is a lever **380** having a hooked projection **381** at one end adapted to overlap and engage on the far side of the projection **377** opposite the contacting end of arm extension **376**. The object of this lever is to lock the arm **375** tightly in connection with the disc **373** in positioning the ten-cent ratchet disc **373**, and to unlock them for trueing the disc for units values.

To operate lever **380**, an arm **382** is freely rotatable on the hub **374** which is secured to the shaft **332** and the outer end of this arm carries a projection **383** engaging in a slot **384** at the inner end of the lever **380**. A spring **385** adjacent this end of arm **382** is connected at one end to a projection **386** at one side of the arm **375** and at the other end to a projection **387** at the other side of the arm **382**. The tendency of this spring is to move the lever **380** and the arm **382** so that the hook extremity **381** engages over the projection **377** holding the end of the arm **375** against the projection.

Secured to the arm **382** and therefore rotatable with it, is a ratchet **388** by means of which the lever **380** may be actuated for unlocking movement as it is normally held in locked position by the spring **385**. An arm **389** has a hub portion **390** freely rotatable upon the hub **374** adjacent the ratchet **388** and this arm carries a projection **391** at its outer end engaging in a slot **392** at one end of a lever **393** mounted between its ends upon a fixed pivot **394** secured to the machine frame and having a projection **395** at its other end engaging a cam I on the cam shaft **17**. Surrounding the pivot and bearing on the lever **393** to press it against the same is a spring **396** to take up lost motion between the parts and to hold the lever **393** in engagement with its cam I.

Mounted on a pivot **397** carried by the arm **389** is a pawl **398** having a pointed extremity to engage the ratchet **388** with a spring **399** attached to a projection **400** on the arm and bearing against the pointed end of the pawl tending to press it into engagement with the ratchet. At the other end of the pawl is a tail piece **401** adapted to engage a projection **402** carried by a fixed frame extension **403** underlying the ratchet.

When the money value ratchet disc **373** is being rotated by the money value shaft **332** the arm **375** is freely rotated with it for at this time the operating lever **393** is moved by its cam I to rock arm **389** toward the projection **402** which engages the tail piece **401** of the pawl **389** moving it out of engagement with the ratchet **388**. By locking the money value disc **373** to the hub **374** in this manner through the arm **375** the money value wheels are in effect locked to the shaft **322** but with the difference that after the shaft has been accurately positioned by the spring drive the ratchet disc **373** may be released by unlocking the hook **381** for trueing back the ratchet disc **373** to the last full ten-cent value when necessary. A spring, as **378**, is not suitable for this connection between the shaft and the disc **375** which includes the spring **378** and it requires too much time to take up the vibration of the spring. A positive driving connection is therefore provided as described and the lock hook **381** is released near the end of a value set-up cycle so that the disc **373** may be trued back as subsequently explained.

Operating clutch for money value disc.—In order to lock the money value charts or wheels in their money value indicating positions the ratchet disc **373** has a locking clutch for tightly gripping the disc therebetween which is mounted at the end of a bar **404** (Figs. 2, 4, 11 and 12) pivoted at its upper end on shaft **332**, extending below the periphery of the disc and carrying at its lower end jaws **405** and **406** at opposite sides of the disc which are operated toward and from engaging position by meshing gears **407**, one of which is actuated by an attached projecting lever arm **408** normally drawn into clutching position by a spring **409** attached at one end to the arm **408** and the other end attached to a fixed projection **410** on the frame extension **403**.

This lever arm **408** is controlled by an actuating lever **411** in the form of a bell crank mounted at its angle upon a shaft **412** in the machine frame and having an arm **413** extending over the lever arm **408**, and its other arm having a projection **414** engaging a clutch controlling cam G on cam shaft **17**.

The timing of this cam is such that as soon as the machine is started for a new value the projection **414** of the operating lever **411** is operated by the cam to move the other arm **413** and press

the clutch arm 408 in a direction to release the clutch jaws from engagement with the disc 373. The clutch is not released to allow its application by the spring 409 until the cycle of operations is nearly complete.

Operating stop for ten-cent wheel.—As the money value disc 373 is conveniently graduated in ten-cent teeth or steps, a positive stop is provided comprising a stop bar 415 (Fig. 12) mounted in suitable guides 416. At its end is a tooth 417 for engaging any of the ten-cent teeth of the disc 373 and urging the stop bar into such engagement is a spring 418 attached at one end to a projection 419 on the bar and at the other end to a fixed projection 420 on one of the guides 417. At the other end of the bar is a pin or projection 421 for engaging one of the guides 416 to limit the movement of the stop bar in tooth engaging position.

To control the stop bar a lever 422 is mounted intermediate its ends upon a fixed pivot 423 and has the side of one extremity 424 in engagement with the projection 419 on the stop bar and at the other end of the lever is a contact member 425 for engaging the ten-cent money value cam K secured to the cam shaft 17. The surface of the cam has a notch which actuates the lever 422 to withdraw the stop bar from its engaging position as soon as the motor is started for a money value calculation and to hold the stop bar out of such engagement until just before the ten-cent disc 373 is disengaged by the locking hook 381 from its positive connection with the money value shaft 332 by the operation of the money value lock cam I.

Controlling the penny value stepped wheel.—It may happen that the calculated money value is an exact multiple of ten cents, the tooth 417 of the stop bar 415 will exactly engage behind one of the teeth of the ten-cent disc 373, but if there are variations of the units values, the truing back of the ten-cent wheel until the stop 417 engages the next lower tooth causes a proportional movement which sets up the proper unit on the penny value wheels.

This penny value movement is effected by an arm 426 pivoted at its upper end on shaft 332 and having a rack 428 at its lower end in engagement with a pinion 429 secured to a shaft 430 suitably mounted in the machine frame. A spring 431 is connected at one end to the arm 426 and at the other end to a fixed bar of the machine frame which tends to move the arm about the shaft in a direction opposed to the value setting up directional movement of the ten-cent disc 373, which happens to be a clockwise direction as viewed in Fig. 12.

Attached near the lower end of the arm 426 upon a pivot 432 is a lever 433 having a notch 434 engaged by a projection 435 at the bottom of the clutch supporting bar 404, and the lever having a toothed extremity 436 for engaging the projection 435 if it is released from the notch 434. At the other end of the lever 433 is a knock-out projection 437 which is engaged as hereinafter set forth, for disengaging the arm 426 from the clutch bar 404 with which it moves as a unit under ordinary conditions. A spring 443 attached at one end to the holding lever 433 and at the other to the penny movement arm tends to hold the lever with its notch 434 in engagement with the clutch bar projection 435.

Also attached to and projecting from the lower end of the arm 426 is a cam operating bar 438 having a projection 439 at its outer or free end adapted to engage the surface of a controlling cam H secured to the cam shaft 17 for operating the arm 426.

Secured to a sleeve 467 rotatable on the shaft 430 is a penny value stepped wheel 440, the shaft being rotated by the rack 428 and pinion 429 in accordance with the backward movement of the arm 426 as determined by the engagement of the stop tooth 417 between the ten-cent positions on the ten-cent disc 373.

On this penny stepped wheel 440 there are high points 441 and 442 at the extremities thereof for indicating zero values, and graduated steps therebetween for indicating penny values from one to nine.

For the present the sleeve 467 may be regarded as rotatable with the shaft 430 but there is a flexible connection between them consisting of an arm 468 extending from the penny wheel 440 having a pivot 469 at its outer end to which one end of a link 470 is pivoted, this link having a broad but somewhat pointed extremity of an arm 472 rigidly secured to the shaft 430. A spring 473 connecting one end to the outer end of the link 470 and at the other end to a fixed point 474 on the penny wheel 440 tends to hold the projection 472 centered in the notch 471.

When the latch 381 is lifted allowing the ten-cent disc 373 to be varied slightly in position with respect to the shaft 332, the lower end of the arm 426 is moved until the stop 417 engages the next tooth in its trueing back direction which moves the shaft 430 and the penny value wheel in accordance with the trueing back movement of the disc. For example, if the stop tooth 417 exactly engages behind one of the teeth an even multiple of ten will be observed through the sight openings 6 and no trueing back movement of the disc 373 will be required; but if some intermediate penny value is set up as $4.27, the disc 373 will be moved past ten-cent tooth indicating $4.20 and $\frac{7}{10}$ths of the amount for the next tooth. This backward movement sets up the penny value wheel 440 for the seventh graduation which operates the penny value wheels as hereinafter described.

After the penny value is set up by the operation of the arm 426 and the penny wheel 440 the arm 426 is retained in the set up position and a short time after the motor is started for the next calculation it is returned by the engagement of its arm 438 with the penny wheel cam H which also returns the penny wheel 440 to its zero position as shown in Fig. 12.

Penny wheel operation.—Suitably mounted in guides 443 attached to a fixed frame plate is a penny wheel operating bar 444 having a reduced extremity 445 at its lower end for engaging the zero high points 441 and 442 and the intermediate penny value stops of the penny wheel 440.

At the upper end of this bar 444 is a rack 446 engaging a pinion 447 secured to a shaft 448 which carries a penny value wheel 449 having an outer marginal rim 450 upon which penny values appear of the same size and in alignment with the ten-cent values on the adjacent ten-cent wheel 357.

At the lower edge of the bar 444 is a rack 451 meshing with a pinion 452 freely mounted on a shaft 453 secured in the machine frame and this pinion is of sufficient width so that it also meshes with a rack 454 at the edge of an operating bar 455 suitably mounted for sliding movement in guides 456 attached to the machine frame. At its upper end this bar has a rack 457 meshing with a pinion 458 mounted on a shaft 459 which

also carries an opposite penny value wheel 460 having a marginal flange 461 for exhibiting the penny values similar to the opposite penny wheel 449. This penny wheel 460 is moved in relation to the other ten-cent wheel 356 and is moved in a direction reverse to that of the penny value wheel 449 to set up its values.

For actuating the penny value wheels the bar 455 has a rack 462 at one edge engaging with a segmental rack at the end of an operating lever 463 mounted intermediate its ends upon a fixed pivot 464 and having a projection 465 near the other end for engaging the surface of a penny value cam L secured to cam shaft 17. Attached to the lower end of the lever 463 is a spring 466 which is also attached to a fixed portion of the frame and tends to hold the lower end of the lever against the cam L.

In the cam surface is a short notch or recess which is timed to appear just before the machine cycle is complete and after the position of the penny wheel 440 has been determined. The spring 466 then actuates the lever 463 moving the bars 455 and 444 downwardly until the extremity 455 of the bar 444 engages that stop of the wheel 440 which is opposite the extremity. The downward movement of the bar 444 determines the extent to which the penny value wheels 440 and 460 are moved, thereby setting up the proper penny or units values.

Soon after the motor is started for any new calculation of the machine the cam L actuates the lever 463 to raise the bars 455 and 444 so that the penny value wheel 440 may be returned to its zero position and the penny value exhibiting wheels 449 and 460 may be placed in their zero positions for the next operations.

Penny value centering device.—Secured to the same sleeve 467 to which the penny wheel 440 is attached is a toothed segment 475 (Figs. 11 and 12) which is therefore subject to the same flexible centering movement as the penny wheel 440. This segment has eleven teeth corresponding to the zero surfaces 441 and 442.

The object of this centering device is to accurately position the penny value wheel for any calculated penny value and the teeth of the segment 475 are set so that the penny value wheel 440 will be adjusted to provide an accurate abutment for the reduced end 445 of the penny value bar 444.

A reciprocating bar 476 is mounted for sliding movement in guides 477 secured to the machine frame and at one extremity is a pointed tooth 478 adapted to engage any one of the teeth of the segment 475 which is moved opposite the end of the bar by the penny set up arm 426. If the tooth of the segment 475 does not register with the tooth 478 at the end of the centering bar the movement of the bar into engagement with the tooth will accurately position and center the segment 475 and with it the penny wheel 440 so that the reduced end of the bar 444 will engage the steps of the penny wheel 440. This centering movement is permitted by the flexible connection between the link 470 and the arm 472 secured to the shaft 430 without varying the position of the shaft.

Movement of the centering bar is effected by a centering device cam M secured to the cam shaft 17 and having a notch to engage a projection 479 on the bar near the very end of the value set-up cycle just before the operating lever 463 for the money value set-up wheels 449 and 460 is actuated to set up the predetermined units values.

This bar 476 is pressed into tooth engaging position by a spring 480 connected at one end to a projection 481 on one of the guides 477 and at the other to a fixed projection 482 on the bar 476. As this bar is approximately in line with the cam shaft 17 it is formed with an offset 483 which clears the shaft but allows the full reciprocating movement of the bar. During most of the cycle the bar is held out of engaging position against its spring 480 by its cam M.

Dead center relief.—It may happen that the pointed extremity of the centering bar 476 may strike upon the extremity of one of the positioning teeth of the toothed segment 475 in which case it would move to one side or the other to take the higher or lower figure, and so provision is made for advancing the toothed segment 475 to the next higher one-cent valuation. In other words if the toothed extremity 478 engages the point of a tooth on the segment 475 between any two one-cent valuations it would record a one-half cent valuation, but as there are no one-half cent valuations on the money value wheels and as the prices of any commodity are always in penny valuations, the segment 475 is simply advanced to the next higher one-cent valuation, which is the common business practice.

Movement of the positioning toothed segment is effected by a ratchet segment 484 (Figs. 8, 10, 11 and 12) secured to sleeve 467 which may be moved on its shaft 430 against the centering arm 472. This segment 484 is actuated only near the end of the cycle of movement by a pawl 485 mounted at one end of a pivot 486 carried by a lever 487. The lever is mounted intermediate its ends upon a pivot 488 secured to a fixed portion of the frame and has a projection 489 at the end of the arm opposite the connection of the pawl 485 and this projection extends through a perforation in one of the frame plates (Fig. 8) to engage the surface of a dead center cam X mounted on the second cam shaft 22.

The lever 487 is actuated only near the end of the cycle of any calculating operation and the lower end is normally held against a stop 490 by a spring 491 attached to the lower end of the lever and to a fixed point of the machine frame, and the lever being actuated by a single projection on its cam X before the centering device for the penny value mechanism has been operated. The extremity of the pawl 485 is held out of engagement with the ratchet segment 484 by a projection 492 at one side of and intermediate the ends of the pawl which engages a fixed projection 493 carried by the machine frame against which it is held yieldingly by a spring 494 connected at one end to the projection 492 and connected at the other end to a projection 495 on the lever 487.

When the lever 487 is held against its stop 490 by its spring 491 the projection 492 of the pawl is held against its projection 493 and out of contact with the teeth of the segment 484, but when the penny wheel 440 and its tooth segment 475 have been set in position near the end of the cycle for any calculation, the lever 487 is actuated by the high point of its cam X moving the pointed end of the pawl toward the segment 484 and as it moves away from the fixed projection 493 its spring 494 engages it with one of the ratchet teeth of the segment 484 so that the segment is moved slightly in a counter-clockwise direction, thereby moving the toothed wheel 475 past the dead-center position and allowing the pointed

extremity 478 to accurately register with the next digit tooth of the segment 475.

Nine and one-half cent knock-out.—A condition arises where the calculated money value is more than 9½ cents for restoring the ten-cent ratchet disc 373 to its previously set-up position. In other words if the calculated value is an even multiple of ten cents the stop tooth 417 engages exactly behind one of the teeth of the ratchet disc 373; if the calculated value is some penny value digit between one and nine, the clutch projection 381 is raised from engagement with the projection 377 of the ratchet disc and the disc may be trued back against the tension of spring 378 for setting up the operation of the penny value wheels 449 and 460 as above explained but if the calculated value is a multiple of ten plus a 9½ cent valuation, the tens wheels and consequently the controlling ratchet disc 373 for the tens wheels must again resume the position to which they were originally turned before the setting back operation.

This returning movement is effected by the spring 378 which pulls back the ratchet disc 373 until its projection 377 again abuts the end of the projection 376 and the value set-up by returning the tens wheels to the next higher graduation than the calculated 9½ cent value will be visible through the sight opening 6 for the proper ten-cent amount.

The knock-out mechanism comprises a knock-out arm 496 secured to the penny value sleeve 467 so that it is operated by the penny value arm 426. When the calculated value is more than 9½ cents the penny value segment 440 is rotated by the shaft 430 until the second zero high point 442 of the segment is directly below the reduced extremity 445 of the penny wheel operating bar 444. At this time the penny value arm 426 and the clutch supporting bar 404 have been moved together by spring 431 almost the distance of one tooth of the ratchet disc 373 until the stop tooth 417 engages the next lower ten-cent tooth on the disc. As the 9½ cent value cannot be registered the knock-out projection 496 engages the knock-out projection 437 on the lever 433 and rotates the lever about its pivot disengaging the projection 435 of the clutch bar from the notch 434 of the lever 433.

The clutch supporting bar 404 and the arm 425 being thus released from movement together under the action of spring 431, allows the arm 426 to be held in its proper place and also allows the clutch supporting bar 404 to be actuated by the spring 378 which returns the ten-cent ratchet disc 373 to the original position to which it was moved in the setting up direction with the next ten-cent value tooth on the disc 373. Thus the 9½ cent valuation is changed to the next ten-cent value which will be clearly visible in the money value sight openings with a very slight change of alignment which would hardly be perceptible even for the greatest possible variation.

Money value shaft damper.—In order to prevent free or undue vibration of the money value shaft 332, a damper is provided comprising a casing 497 (Figs. 3 and 13) which is sealed and contains a liquid for retarding the movement of a vane 498 secured to a shaft 499 extending from the casing and having a gear 500 also attached to the shaft and meshing with a gear 501 attached to the shaft 332.

When the money value shaft is rotated by its spring 335 or released, the damper retards a quick or sharp movement thereof and cushions and smooths the operation of the shaft and also the movement of the money value wheels which are attached to the shaft for rotation.

Anti-interference device.—Provision is made for insuring that the motor switch be sufficiently actuated to continue the operation of the machine for a complete cycle but provision must also be made to prevent the operator of the scale from attempting to change the price per pound setting after the machine has been started in operation for any particular calculation.

To accomplish this result a lever 502 (Figs. 5 and 6) is mounted intermediate its ends upon a pivot 503 fixed to the machine frame and at its outer end is a pointed projection 504 adapted to engage any one of the teeth of the wheel 93 which holds the price per pound setting mechanism in any adjusted position. At the other end of the lever 502 is a projection 505 to engage an anti-interference cam Y mounted on cam shaft 17 and having a continuous outer surface except at the zero position of the cam so that as soon as the machine is started the projection 505 rides out of the zero recess on the cam and the toothed extremity 504 is retained in engagement with the toothed wheel 93 until the zero point of the cam Y is again reached. This prevents any turning of the price per pound knob or the toothed wheel 93 until the cycle of operations is complete. A spring 506 is connected at one end to a fixed projection of the machine for holding the lower end of the lever normally against the surface of its cam Y. As the operation of this cam is similar to the operation of the zero positioning cam A no separate diagram is made for it. This locking lever 502 is also in the path of an extension 509 of the half-cent holding pawl 180 so that as soon as the lever is actuated to locking position it also locks the half-cent key and lever against change.

Modification of the penny value mechanism.—Instead of the penny set-up mechanism shown more particularly in Figs. 17 and 18 utilizing the same or similar parts as shown. In this modified structure the sight openings for the calculated money values are varied to set up the proper calculated amounts under certain conditions. Mounted on the money value shaft 332 adjacent the penny operating arm 426 is a three-armed member having two arms 510 and 511 extending upwardly toward the opposite money value sight opening 6, and each carrying a magnifying glass bar 512 movable with the arm over the penny and ten-cent money value wheels.

Extending parallel with the arm 426 is an arm 513 having an integral toothed projection 514 extending at its lower end laterally of the arm 426 by a pawl 515 mounted on a pivot 528 carried by the arm 426 and having a tooth 516 at its outer end to engage the toothed end of the projection 514 and the pawl being held in this engagement by a spring 517 attached at one end to a projection 518 on the pawl and to a projection 519 on the arm 513.

An actuating arm 520 for actuating the penny value arm 426 is formed integral with the arm and carries the projection 521 which engages a cam *h* secured to cam shaft 17. The actuating arm 520 is held against its cam and the arm 426 is moved in its operative direction by a spring 522 connected at one end to the arm 520 and at the other end to a fixed stop 523.

The arm 513 is drawn in an opposite direction by a spring 524 attached at one end to an eyelet 525 at the side of the arm and at the other end to a projection 526 on the machine frame.

This spring 524 tends to hold the arm 513 against a stop 527 fixed to the machine frame and as the arm 426 is normally held in contact with the arm 513 by the pawl 515, the arm 426 is likewise limited in one direction by the stop 527.

Also mounted on the pivot 528 carried by the arm 426 is a stop pawl 529 having a tooth 530 for engaging the teeth of the ten-cent ratchet disc 373 and this pawl is normally drawn in position to engage the teeth by a spring 531 attached at one end to the pawl and at the other end to a projection on the arm 426.

In order to disengage and time the engagement of the pawl 529 with the ratchet disc, a lever 532 is mounted intermediate its ends upon a pivot 533 and one extremity is adapted to engage a projection 534 carried by the pawl 529, the other end of the lever having a projection 535 in engagement with an operating cam *g* mounted on the cam shaft 17 and corresponding in timing to the cam G.

This lever 532 is held in engagement with its cam by a spring 536 connected at one end to a perforated projection 537 at one side of the lever and to a fixed machine projection 523 at the other end of the lever. The holding pawl 529 is thus allowed to engage and is disengaged from the toothed disc 373 by the operation of the lever 532.

The rack 428 at the end of the penny operating arm 426 engages the pinion 429 secured to shaft 430 and a penny value stepped segment 540 is secured to a sleeve 541 on the shaft 430, this segment having an end zero contact space 544. Also connected to the sleeve 541 is the toothed truing segment 475 which is engaged by the toothed extremity 478 of the truing bar 476.

The sleeve 541 is flexibly connected to the shaft 430 to permit a truing movement of the segments 475 and 540 by an arm 545 secured to the shaft 430 and by a yoke member 546 secured to the sleeve and having two arms 547 and 548 extending outwardly at different distances substantially parallel with the edges of the arm 545 and the extremities of both arms turned inwardly. Mounted on a pivot 549 carried by the arm 545 between the bent extremities of the arm 547 and 548 is a lever 550 which has a spring 551 connected at one end to the outer end of lever 550 and the other end of the spring connected to the outer end of a lateral extension 552 of the arm 545. This spring 551 holds the lever normally against a stop pin 553 carried at the outer end of the arm 545 and engages the bent extremities of the arms 547 and 548 on opposite sides of its pivot 549 so that the same spring 551 tends to center the sleeve 541 with respect to the shaft 430 but allows a truing variation of the segments 475 and 540 for the purpose of setting the penny value segment for engagement by the reduced extremity 445 of the penny wheel operating bar 444.

A knock-out bar 555 is attached to the penny value segment 540 in a position to engage a projection 556 carried by the tail piece of the holding pawl 515 and projecting through a slot 557 of the arm 426 on which it is mounted, so that the projection limits the movement of the holding pawl when engaged by the knock-out bar 555. The knock-out action occurs only at the time when more than 9½ cents value is set up by the penny value arm 426 and the separation of the arm 426 and the arm 513 by disengaging the pawl 515 allows the arm 513 to be carried back against its stop 527 by its spring 524 and thus to move the glass bars 512 backwardly with respect to the forward value set-up movement of the ratchet disc 373 approximately one tooth or to the next ten-cent value.

In operation this modification eliminates the clutch between the money value set-up shaft and the ten-cent ratchet disc 373, the disc is driven with the shaft 332 to a positive stop as determined by the spring drive mechanism and after the disc 373 reaches its fixed position the stop pawl 529 engages the disc either directly behind one of the teeth if the calculated value is an even multiple of ten cents or if it is some intermediate value the arm 426 is then moved up a proportionate amount of the distance of one tooth until the pawl 529 engages the next tooth of the disc 373. This proportionate movement sets up the penny value stepped segment 540 and trues the position for the correct value as previously explained, setting up the penny value wheels in their correct positions in accordance therewith. This forward movement of the arm 426 is effected by the spring 522 which swings the lower end of the operating arm 520 inwardly of the cam *h* at the proper time, the stop pawl 529 permitting a movement slightly less than the extent on one tooth of the disc 373 and correspondingly moving the arm 510 and 511 to exhibit the proper units values together with the set-up value of the tens wheels.

When the movement of the penny wheel is for more than 9½ cents the knock-out bar 555 engages the projection 556 releasing pawl 515 so that the extremity 514 of arm 513 is released from its movement with the arm 526 and the arm 513 is drawn against the stop 527 by its spring 524, thus placing the magnifying glasses 512 carries by the arms 510 and 511 over the money value wheels 356 and 357 and the penny value wheels 449 and 460 in substantial alignment with the next value on the ten-cent wheels which will be the correct valuation for the money value set up.

Reference to the cam chart.—Although the construction and operation of all the parts has thus been described the sequence of their operations is more easily understood from a reference to the cam timing chart, Fig. 19.

As the cam shafts 17 and 22 are rotated one complete rotation for each operative movement of the machine or for each separate money value calculation, the chart is divided into 360 degrees and the line opposite each of the cams diagrammatically illustrates its operation in relation to the cycle of each calculated value movement. In general the high point of the line for each cam represents the high point of the cam, an abrupt shoulder indicates an abrupt drop in the cam, and an inclined portion of the line indicates a gradual setting up or release of the mechanism actuated by the cam.

As previously explained, when this computing scale is in operation it will not ordinarily be found with the value indicating wheels and parts, and the price per pound mechanism in zero position, as they will designate the calculated value previously set up as well as the previous price per pound. These variations however are taken care of and explained in the description of the structure and operation of the several parts wherever necessary.

Summary of operation.—As soon as the price per pound dial has been set by its knob 8 in accordance with an article weighed by the scale, and the operating arm 9 has been depressed, the

scale chart clutch and the zero positioning cams Q and A are released and the zero shutter is dropped over the money value sight openings 6; the price per pound slide is then released by cam C, the controlling clutch for the money value wheel operated by the cam G is released, together with the release of the stop for the ten-cent wheel operated by the cam O and the lock devices for the computed stops operated by the cams V and W are gradually operated; the centering device for the penny value is withdrawn by its cam M and the penny value mechanism is returned to zero by its cam L; the said set-up mechanism is gradually released by its cam O and the penny value stepped wheel is returned by its cam H; the horizontal price per pound slide is actuated by its cam S and released by the horizontal slide cam T and the weight set-up clutch is actuated by its cam B; the backward money value drive mechanism is gradually released by its cam E and during this time the calculated money value is being set up and tension is then added to the calculating slide by the cam U; the lock device for the computed stop is released by the cam V, the scale chart clutch mechanism is operated by the cam Q; the forward money value drive mechanism is operated by the cam D and the clutch on the stop set-up is released by the cam J and the lock on the lock stop device is released by the cam W; the tension is then released from the calculating slide by the cam U as the money value has now been set up, and the backward driving mechanism for the money value is released for operation by the cam E; the starter release is actuated by its cam R, and the tensioning mechanism for the spring drives is operated by the cam F; the weight set-up clutch is now gradually applied by its cam B, the stop is set for the ten-cent money value wheel by its cam K and the money value mechanism is locked to the drive mechanism by the cam I; the controlling clutch on the money value wheel is released by the cam G, the operation of the penny wheel is effected by the cam H, the penny value centering device is operated by the cam M and if necessary the dead center device is operated by its cam X; the penny value may now be returned to zero by its cam L and the spring drive tensioning device is operated by its cam F.

At this time all of the necessary movements for setting up the money value have been completed, the zero shutter is operated by its cam N to uncover the money value sight openings, the zero positioning cam A is operated and the anti-interference cam Y is released, and the motor switch cam F is returned for the next operation.

I claim:

1. In a computing device, a stop shaft rotatably positioned in accordance with the product of any two variables, means for accurately holding the shaft in any product set up position, a product indicating wheel having connected gears with a projection on one of the gears, means forming a projection carried by the shaft for engaging the gear projection in connection with the wheel, a spring drive mechanism for moving the wheel and its gears to press the said projections tightly together, and spring means in connection with the shaft and determined by the positioning thereof for adding tension to the spring drive in moving the said stops together.

2. In a computing device, a stop shaft positioned in accordance with the product of any two values, means for accurately holding the shaft in any product set up position, a plurality of stops carried by the shaft, a product indicating wheel including a connected gearing of which one gear has a stop adapted to be moved in engagement with one of the fixed stops of the shaft, spring drive mechanism for moving the gearing and the wheel until the stop of the gear engages the said stop of the shaft, the spring drive mechanism including a gear having a stop to engage another stop carried by the shaft for insuring an additional operation of the spring drive mechanism sufficient to add pressure to the wheel stop contacts for pressing them tightly together and thereby to insure an accurate positioning of the wheel.

3. In a computing device, a stop shaft positioned in accordance with the product of any two values, means for accurately holding the shaft in any product set up position, a fixed stop carried by the shaft, a product indicating wheel having a connected gear with a stop thereon for engaging the said stop of the shaft, and spring drive mechanism for moving the gear to add pressure to the said stop connection, the spring drive mechanism comprising gears and toothed levers for operating the gears in opposite directions in applying and releasing the spring drive, a ratchet wheel and a holding pawl therefore, and means for controlling the holding pawl and holding it out of engagement with the ratchet wheel until the amount of spring pressure is determined.

4. In a computing device, a stop shaft positioned in accordance with the product of any two values, means for accurately holding the shaft in any product set up position, a fixed stop carried by the shaft, a product indicating wheel having a connected gear with a stop thereon for engaging that of the stop shaft, a spring drive for the wheel comprising a gear in connection with the wheel and a coaxial gear in connection with the spring drive mechanism, a spring attached at its ends to the said gears and rotatable on a drum between them, the gears having inward projections to which the ends of the spring are attached, and the gears being moved oppositely to separate the projections in tightening the spring and movable together so that the projections engage in releasing the spring, and stop means in connection with the shaft for predetermining the amount of tension applied by the spring drive mechanism in moving the stop of the wheel in engagement with the fixed stop of the stop shaft.

5. In a computing device, a shaft, means for locking the shaft in value set up position, a plurality of value wheels rotatable on the shaft and including a ratchet disc in connection therewith, means including a releasable latch for locking the ratchet disc in fixed connection with the shaft, and an arm having a clutch operable after the disc has been set for locking it in fixed position with respect to the disc, and means controlled by the arm and the ratchet disc when released by the latch for actuating the value wheels therewith.

6. In a computing device, a shaft, a plurality of value wheels rotatable on the shaft including a disc having peripheral teeth representing tens values, a stop movable to engage the teeth of the disc, a units value arm rotatable on the shaft, the arm being movable relative to the disc for a portion of the distance between two adjacent teeth, a units wheel located adjacent the periphery of the value wheels, and a units set up mechanism actuated by the movement of the units arm for moving the units wheel to set up

an aligned numeral reading line in accordance with the movement of the arm.

7. In a computing device, a value indicator, means for driving the indicator against a stop positioned in accordance with values including units and tens, said indicator being composed of a tens dial and a units dial, means forming a shifting sight opening, and means whereby the shifting of the sight opening to the last full amount of the ten cent dial controls the numeral of the units dial.

8. In a computing device for registering the value represented by digits of different decimal orders, movable means for exhibiting the values composed of more than one order, comprising at least two graduated members for exhibiting values in terms of major and minor units, means for operating the value member in major units in accordance with the value to be exhibited, means forming a shifting sight opening for aligning the numerals and through which the values of the digits may be seen, and means whereby the shifting of the sight opening to be the last full amount of the major unit controls the numeral of the minor unit.

9. In a computing device for exhibiting values composed of more than one decimal order, and comprising a tens indicator and a units indicator, means depending upon the movement of the tens indicator between its full ten cent valuations for controlling the movement of the units indicator, said means including a stepped wheel and an operating bar engaging the stepped wheel at different heights for moving the units indicator in the same direction of rotation as the tens indicator.

10. In a computing device, a value exhibiting indicator composed of separate members for different decimal orders, means positioned in accordance with the product of any two values for operating the indicator, mechanism for positioning the member of the lower decimal order in accordance with the calculated value between the graduations of the member of the higher decimal order, and controlling means for positioning the member of the lower decimal order comprising a member with graduated steps thereon and with end portions each at the same level for setting the member at a zero value.

11. In a device for exhibiting values comprising separate indicator members for tens and units, means dependent upon the movement of the tens member between successive graduations for controlling the movement of the units member, said means comprising a disc member with graduated steps thereon and the steps designating different units, and end portions of the same height representing zero valuations, and an operating bar for the units member engageable with the zero and units graduations.

12. In a computing device for exhibiting values comprising separate units and tens indicators, means dependent upon the movement of the tens indicator for moving the units indicator, said means comprising a disc member with graduated projections indicating the different units of the indicator, a toothed wheel in connection with the graduated wheel, and means to insure the positioning of the graduated step wheel with one step for each unit and not between two of them.

13. In a computing device, means for exhibiting values comprising an indicator member adjustable for indicating different units values, a toothed wheel having a holding pawl for engaging between the teeth to hold it in the different units indicating positions, and means for moving the wheel in a direction such that the pawl will engage between the teeth for the higher value when it strikes the point of the tooth between any two values.

14. In a computing device for registering a computed value, a value indicator comprising a units wheel and a wheel for values above units, means comprising a stepped member for positioning and controlling the units wheel according to the value set upon the other wheel having means for centering it with respect to any of its units graduations, and flexible means for permitting a movement of the centering means with respect to the stepped member without varying the positioning means between the wheels.

15. In a computing device for registering values, a device comprising parts having tens graduations and units graduations, numerals designating said graduations, means depending upon the movement of the tens graduations between its full tens movement for controlling the units graduations, operating means moving the tens and units graduations in the same direction of rotation, and means for shifting the reading line depending upon which units graduations are brought into alignment with the tens graduations.

16. In a computing device for registering values, a device comprising parts having tens graduations and units graduations, numerals designating said graduations, means depending upon the movement of the tens graduations between its full tens movement for controlling the units graduations, operating means moving the tens and units graduations in the same direction of rotation, and means for shifting the reading line the number of units the tens has passed the last full tens reading.

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