E. E. L. AND F. G. L. BOYER.

VALUE PRINTING AND INDICATING DEVICE FOR SCALES.

APPLICATION FILED JULY 24, 1915.

1,338,282. **Patented Apr. 27, 1920.**

9 SHEETS—SHEET 1.

FIG. 2.

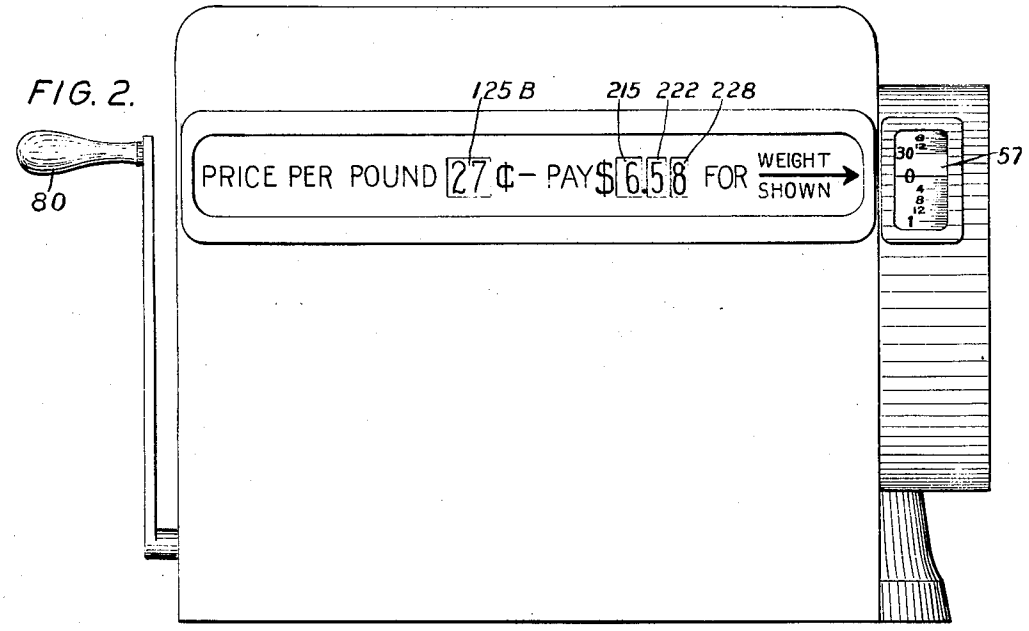
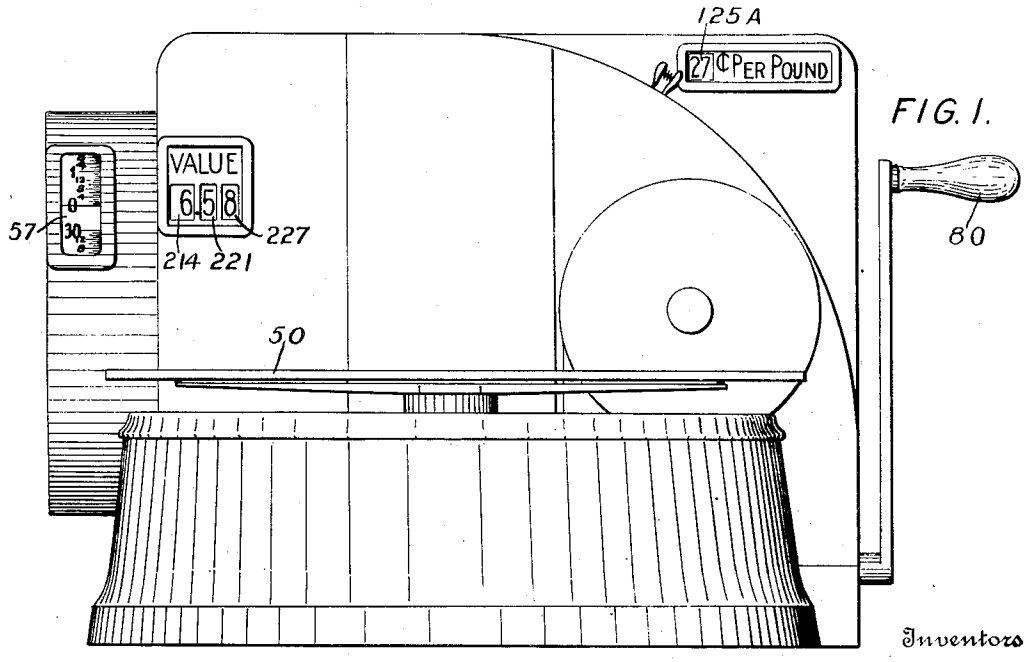


FIG. 1.



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FIG. 4

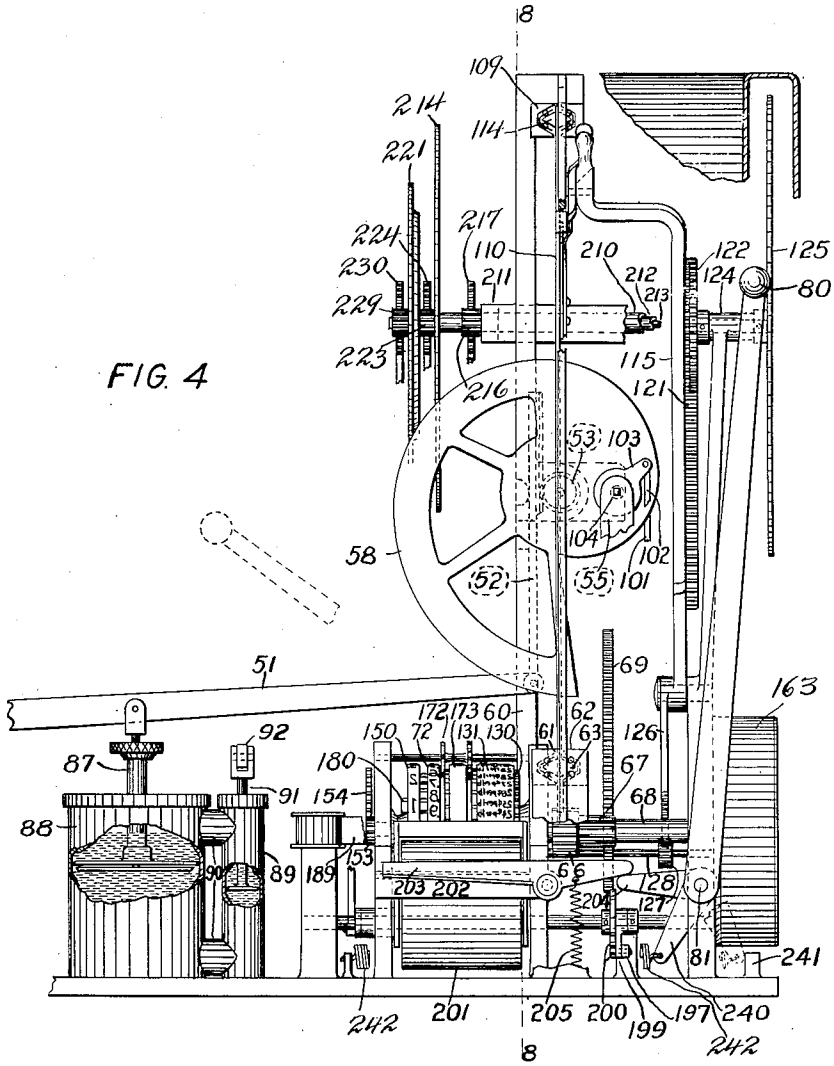
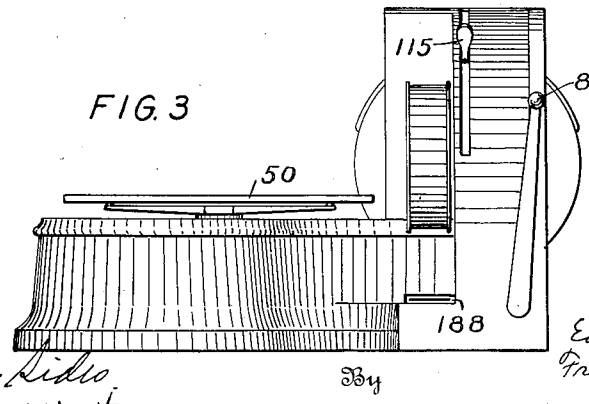


FIG. 3



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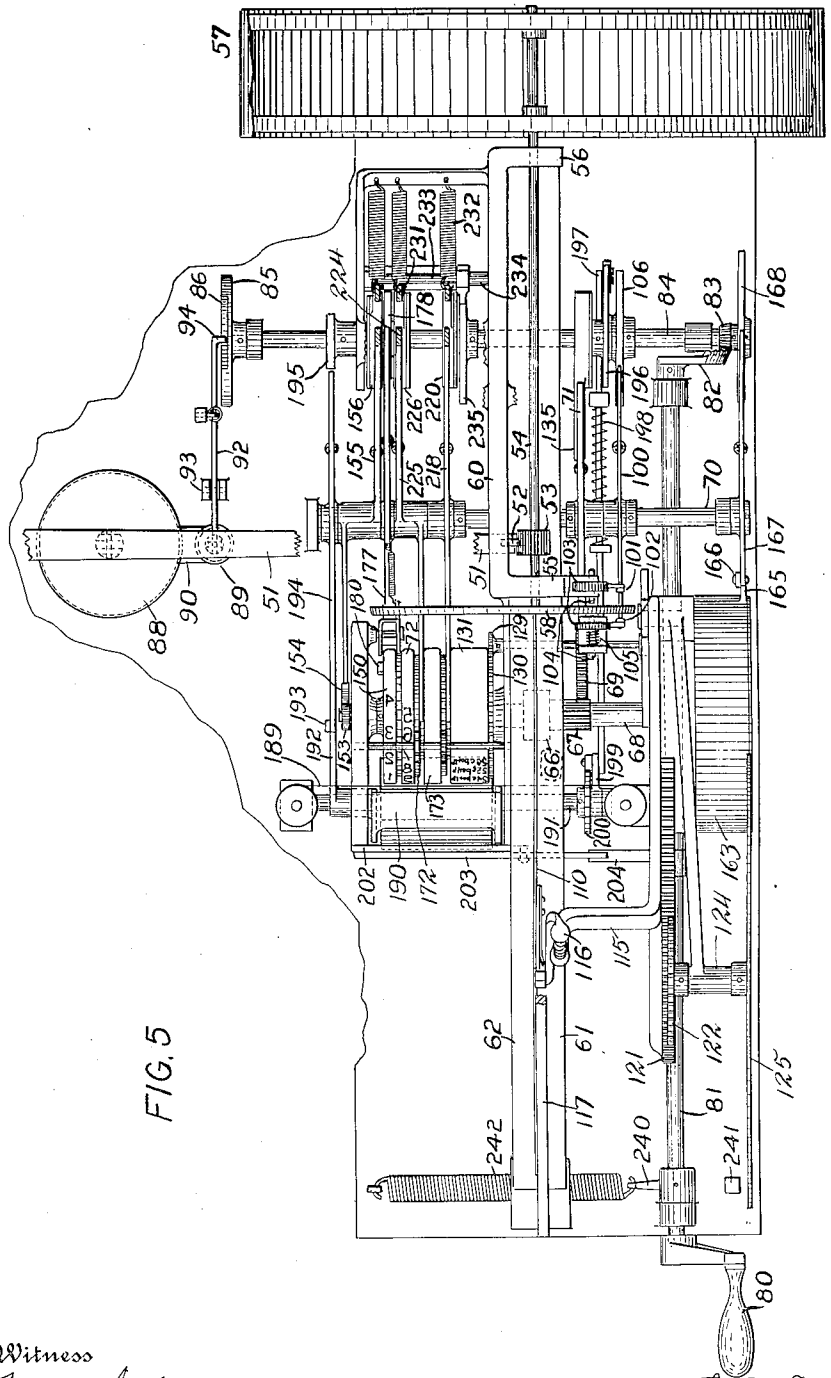


FIG. 5

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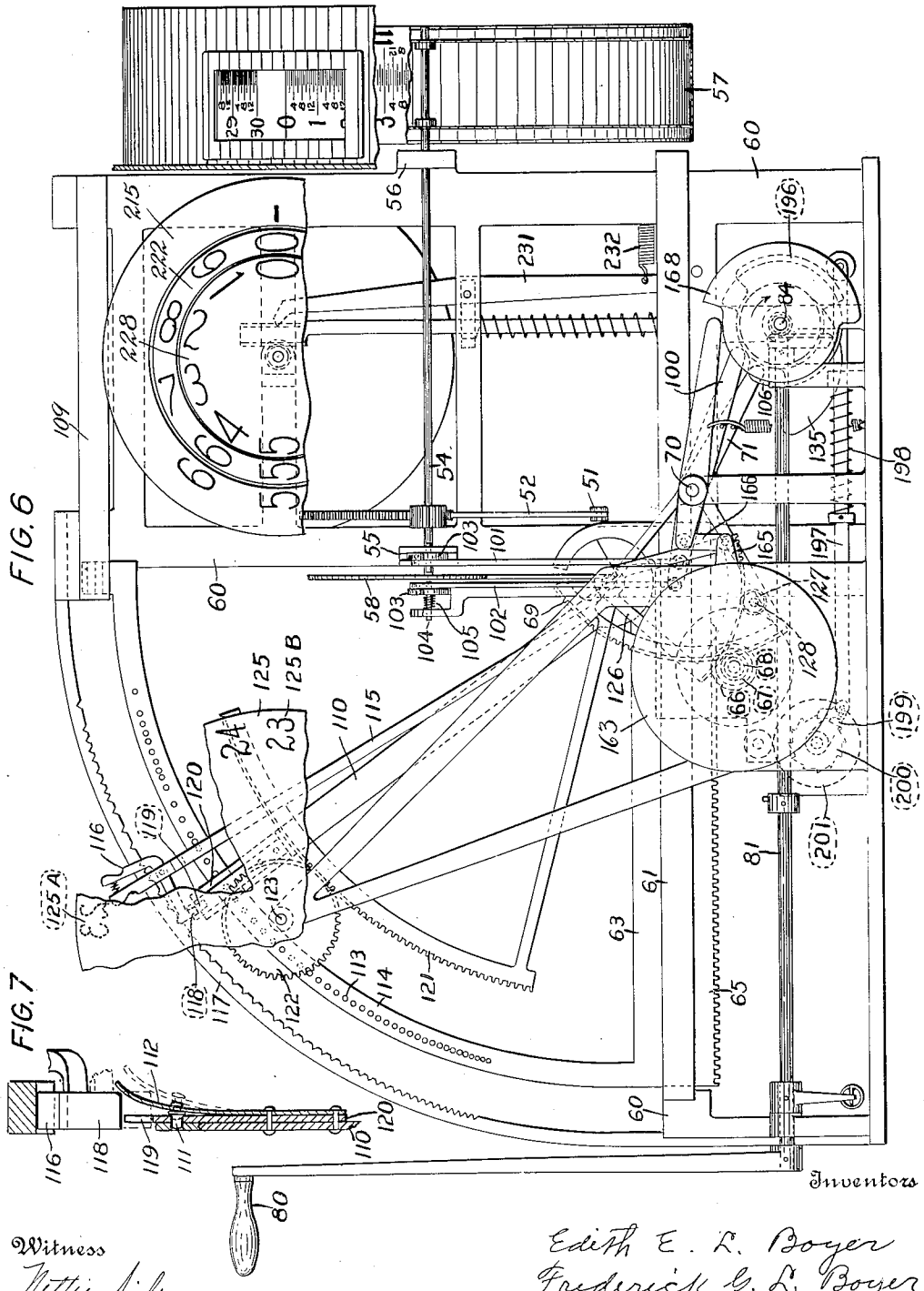


FIG. 6

FIG. 7

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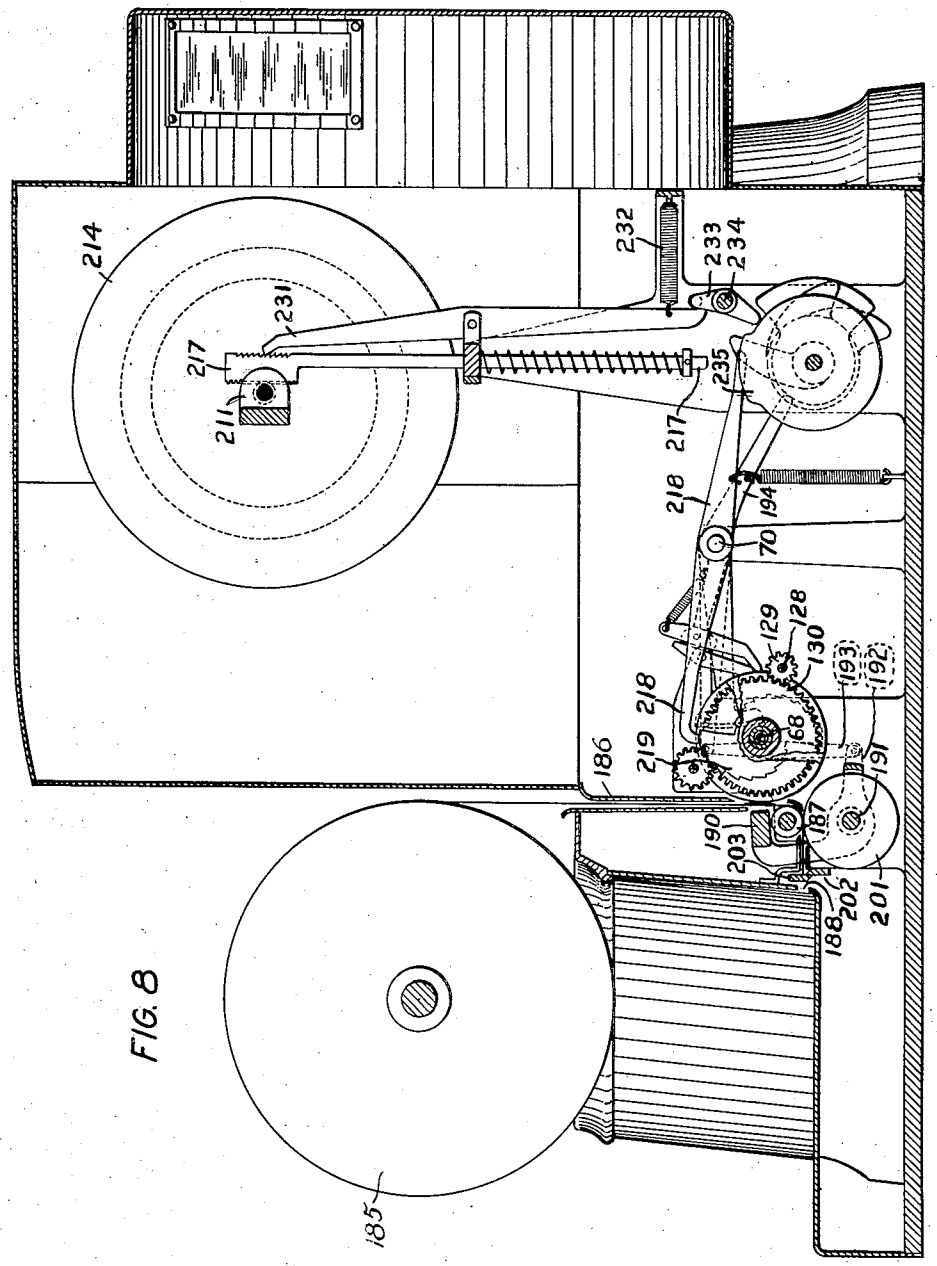


FIG. 8

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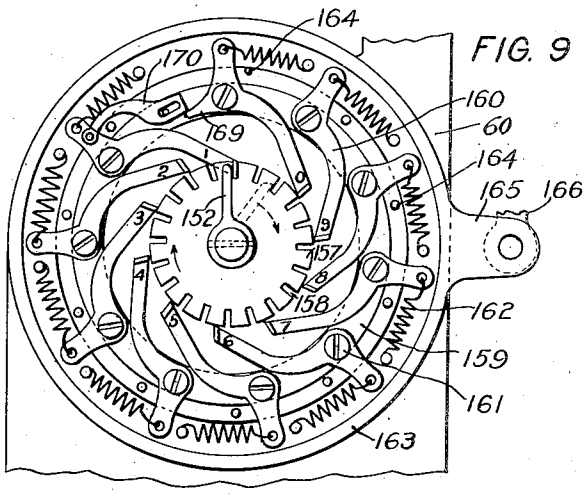


FIG. 9

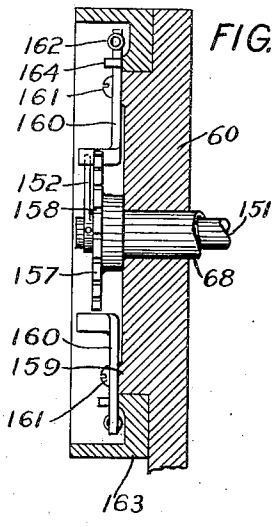


FIG. 10

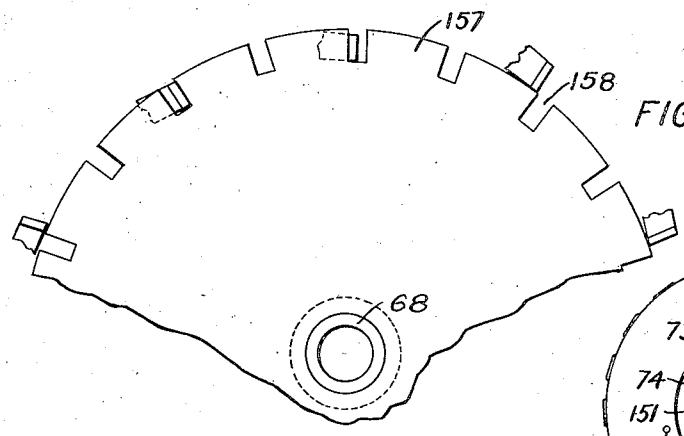


FIG. 11

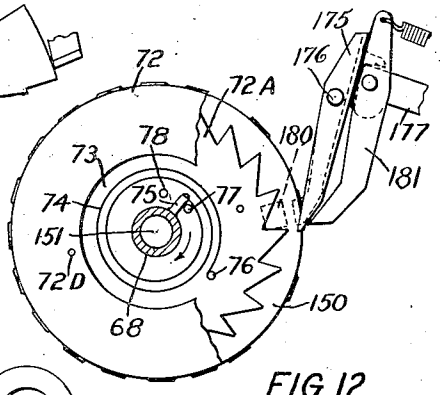


FIG. 12

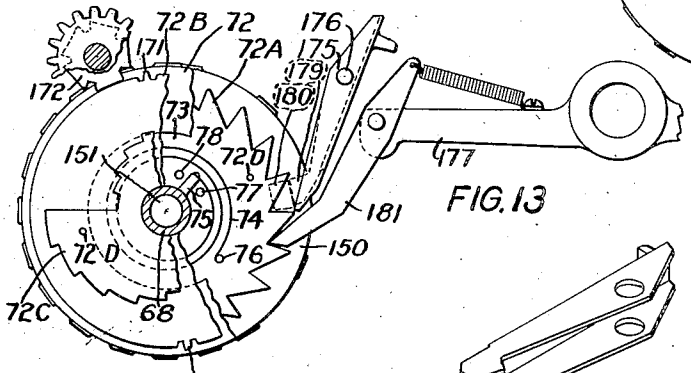


FIG. 13

FIG. 14

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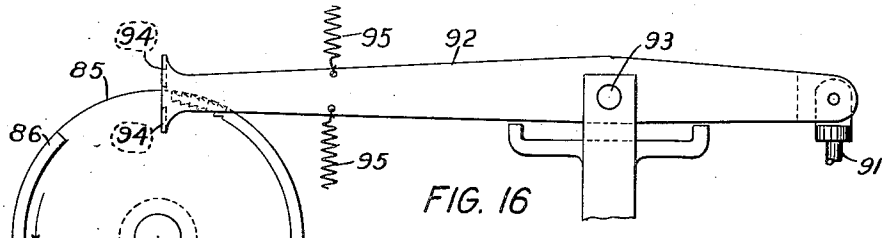


FIG. 16

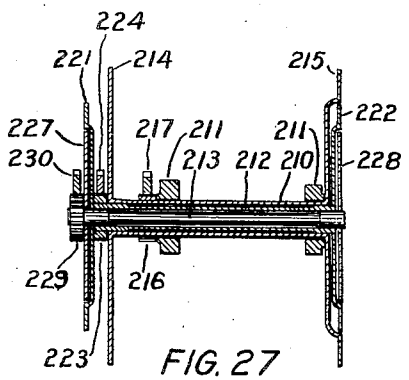


FIG. 27

FIG. 19

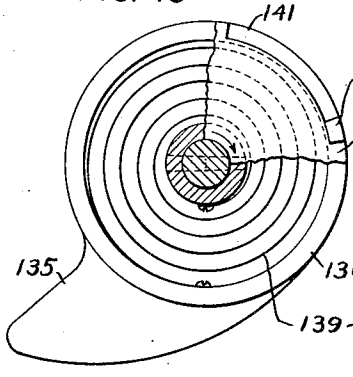
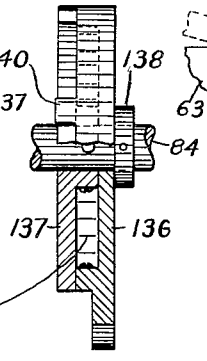


FIG. 20



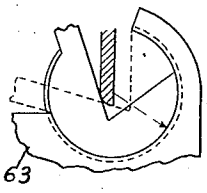


FIG. 18

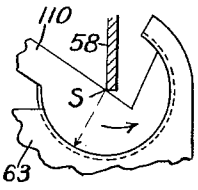
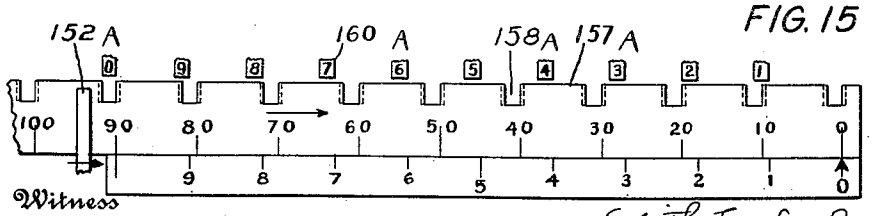


FIG. 17

FIG. 15



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9 SHEETS—SHEET 8.

FIG. 22

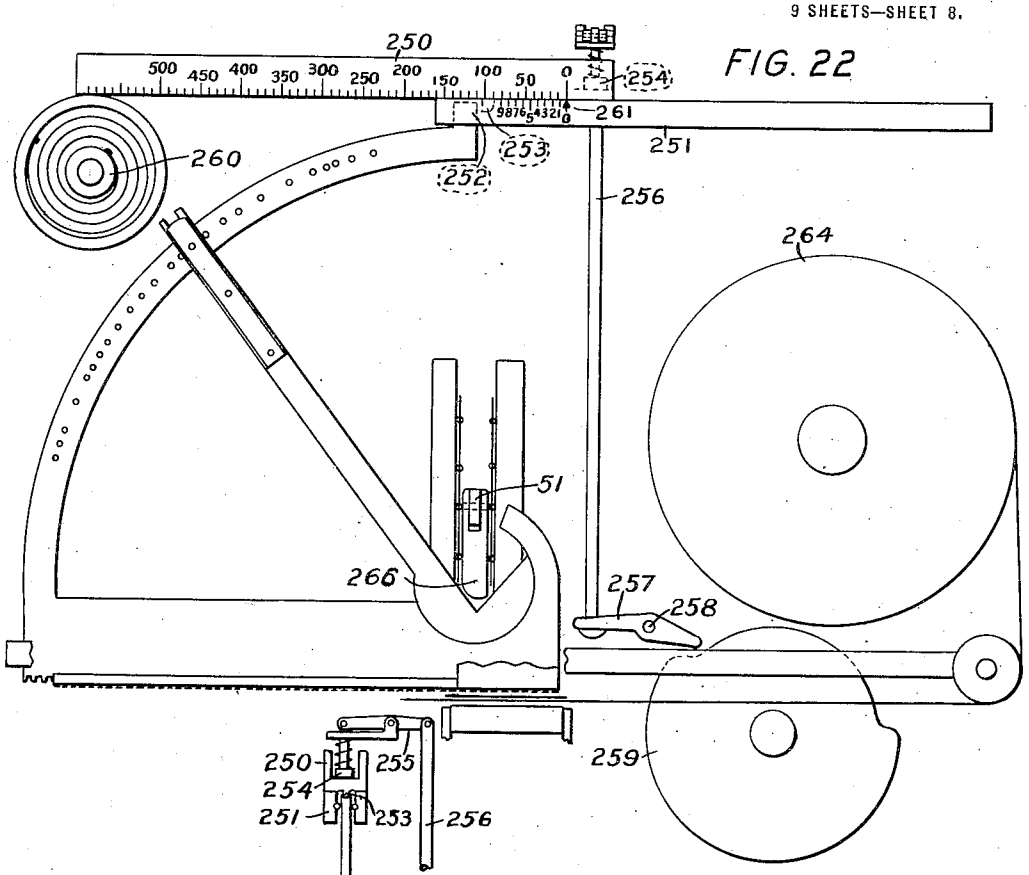


FIG. 23

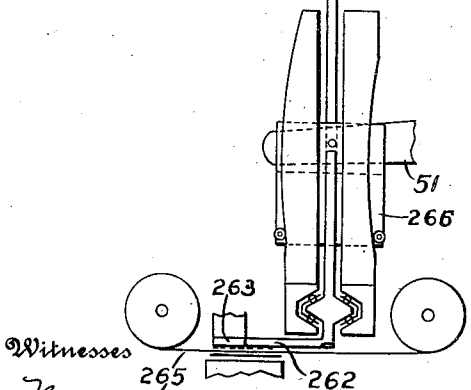
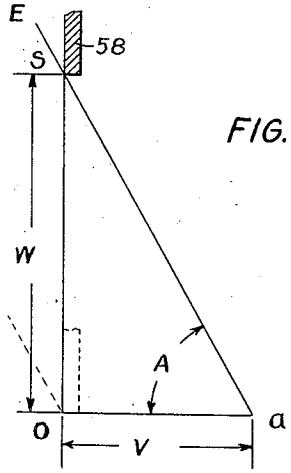


FIG. 21



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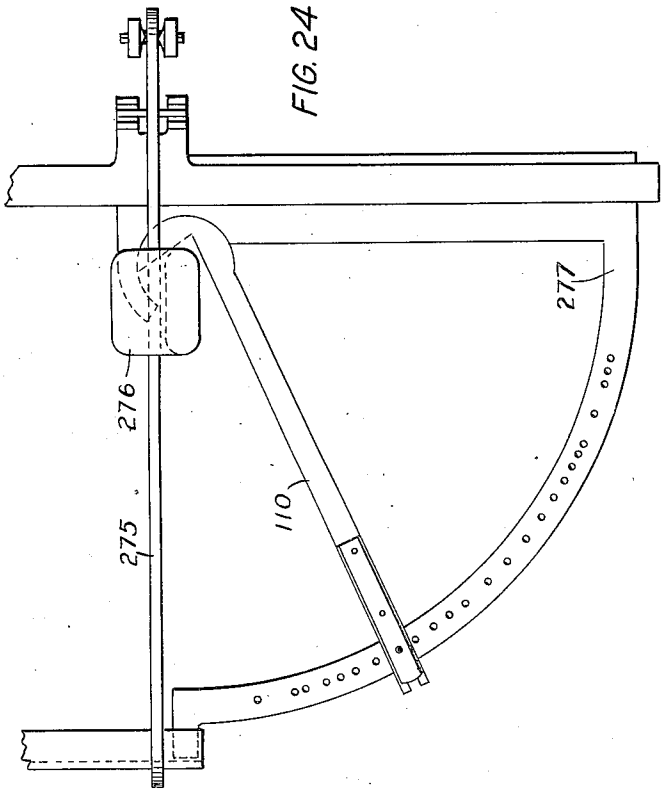
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FIG. 24



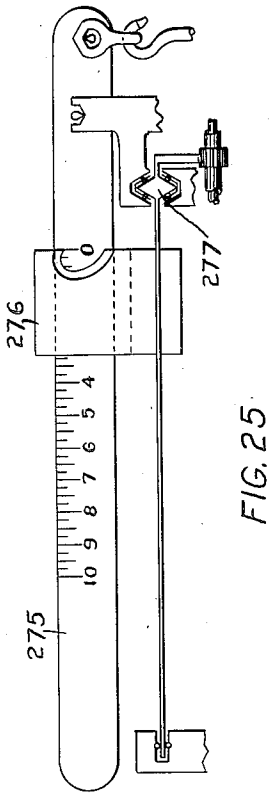


FIG. 25

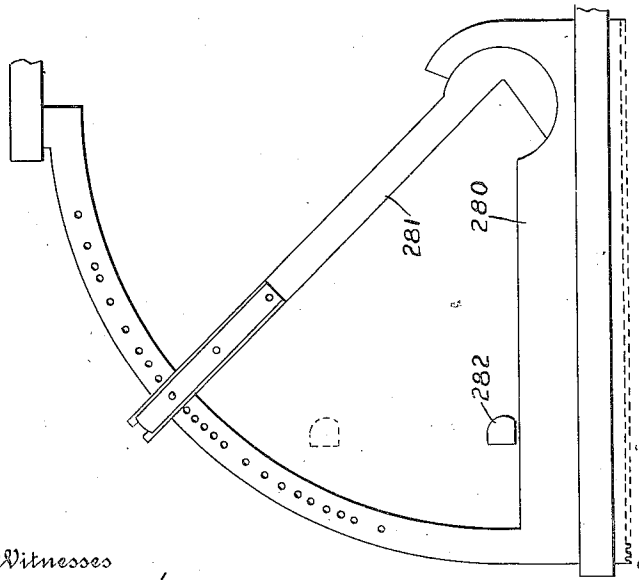


FIG. 26

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UNITED STATES PATENT OFFICE.

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VALUE PRINTING AND INDICATING DEVICE FOR SCALES.

1,338,282. Specification of Letters Patent. Patented Apr. 27, 1920.

Application filed July 24, 1915. Serial No. 41,667.

To all whom it may concern:

Be it known that we, EDITH E. L. BOYER and FREDERICK G. L. BOYER, citizens of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented a new Value Printing and Indicating Device for Scales, of which the following is a specification.

The prime object of our invention is to combine with a scale a device for printing on a ticket or strip of paper the price at which a commodity is sold and the cost of an article weighed on the scale, which ticket may be handed to a customer to show how much is to be paid for the article; also to provide an indicator to show the computed value of the article in figures, the indicator showing no other figures, thus eliminating the danger of error in reading. Another object is to provide that the indicator will continue to show the value of the last article weighed until the operation of printing a new amount begins, this indication being visible on two sides of the machine so both clerk and customer can see it. Another object is to provide for variations in the basic value of commodities. By means of a convenient lever the device may be set to multiply the weight of an article by any price per pound, indicators visible to both clerk and customer showing the price for which it is set, and the amounts printed and indicated will be the product of the weight and price. In addition to this the usual indication of weight is visible to the clerk and customer.

In operating the device the clerk lays the article on the scale and when the scale comes to rest he moves an operating handle to and fro, thus completing the operation. The price lever may be adjusted either before or after the article is placed upon the scale, but it must be done before the operating handle is moved. Provision is made for preventing movement of the handle until the scale comes to rest, and the first thing accomplished by moving the handle is to lock the scale so it cannot move while the printing device is in operation.

Our invention includes numerous novel devices and structures whose purposes and advantages will be evident when they are described. Among these is the arrangement for controlling the computing, indicating and printing mechanism by the scale without imposing any work on the scale that is not necessary in its operation as a scale *per se*.

Figure 1 is a front elevation of a scale equipped with our device. By front is meant the portion which faces the clerk.

Fig. 2 is a rear elevation.

Fig. 3 is a side elevation.

Fig. 4 is an elevation of the mechanism seen from the right with the scale and cabinet removed.

Fig. 5 is a plan with the cabinet removed, the scale also being removed.

Fig. 6 is a rear elevation with the cabinet removed.

Fig. 7 is a detail of parts whereby the price mechanism is controlled.

Fig. 8 is a sectional elevation on line 8—8 Fig. 4, looking toward the front of the machine.

Fig. 9 is a view of the device for arresting the unit wheel. This device is practically a mechanical vernier.

Fig. 10 is a transverse section through Fig. 9.

Fig. 11 is an enlarged view of the disk 157 in Fig. 9.

Fig. 12 shows the justifying mechanism in normal position.

Fig. 13 shows the justifying mechanism in operated position.

Fig. 14 is the pilot pawl.

Fig. 15 is a diagrammatic view of the mechanical vernier, with modifications adapting it to measure rectilinear instead of rotary motion.

Fig. 16 is part of the mechanism for preventing premature operation of the handle.

Fig. 17 is a detail showing the manner of pivoting the multiplier bar and its relation to the stop cam.

Fig. 18 is a modified form of the structure shown in Fig. 17.

Figs. 19 and 20 are front and side views respectively of the yielding cam.

Fig. 21 is a diagram showing the principle on which variations in price are effected.

Fig. 22 is a front elevation of a modified construction for printing and indicating the value,

Fig. 23 is a side elevation of the construction shown in Fig. 22.

Fig. 24 is a plan view showing the manner of applying our device to a balancing scale.

Fig. 25 is an elevation of the structure shown in Fig. 24.

Fig. 26 is a diagrammatic view showing a different method of computing the value.

Fig. 27 is a horizontal sectional view of the indicators.

Similar numerals refer to like parts in all the views.

The scale comprises a platform 50 upon which commodities to be weighed are laid and the scale is of the well known type in which the platform is depressed to a greater or less extent according to the weight upon it. As scales of this type are well known in the art it is unnecessary to describe the present scale in further detail than to say that the platform 50 is connected to a lever 51 which is depressed to a variable position of equilibrium when an article is laid upon the platform. This lever is connected through a rack 52 and pinion 53 to a shaft 54, (see Figs. 4, 5 and 6) which is mounted in bearings 55 and 56 and carries a wheel 57, graduated in pounds and ounces. By these connections the wheel is rotated proportionally to the weight placed upon the scale. A spiral cam 58 is secured to the shaft 54. As is usual in such devices all of these parts are made as light as possible and every precaution is taken to eliminate friction. Any suitable means may be employed to balance the cam 58 so that its presence on the shaft will not affect the accuracy of the scale.

The bearings 55 and 56 are carried by the main frame 60 which also carries a pair of rectilineal guides, 61 and 62. A carriage 63 is mounted to slide between these guides on ball bearings (see Fig. 4). A horizontal rack 65 depending from the carriage meshes with a pinion 66, this pinion and another, 67, being rigidly secured to a sleeve 68, the sleeve being journaled in the frame 60. A sector 69 loosely mounted on a shaft 70 is enmeshed with pinion 67. (See Figs. 4 and 6.) This sector has an arm 71 of which more will presently be said. A type wheel 72 is loosely mounted on the sleeve 68. (See also Figs. 12 and 13.) This wheel will hereinafter be referred to as the dimes wheel. For convenience in construction this wheel is composed of the type carrying portion 72 secured between disks 72^A and 72^B, with a stepped cam 72^C placed outside of the latter, the four parts being secured together by rivets 72^D. The central portion of the wheel is removed, forming a recess 73, to receive a spiral spring 74, one end of this spring being attached to a pin 75 fixed in the sleeve 68, the other end being attached to a pin 76 projecting from the disk 72^A. The spring tends to rotate the wheel on the sleeve and normally holds a pin 77 carried by the disk 72^A against the pin 75. A pin 78 limits the movement of the wheel on the sleeve. The disk 72^A is provided with ratchet teeth. This wheel and its operation will be further described presently and it need only be said at this time that it rotates when the carriage moves, and that it carries equally spaced numerals 1, 2, 3, etc, representing dimes.

When an article has been laid on the scale platform the operating handle is moved for the purpose of computing the value, and printing and indicating the value and price per pound. To prevent premature movement of the handle; that is, before the scale mechanism has come to rest in a position of equilibrium, the following mechanism is provided. The operating handle 80 is carried by a shaft 81 and connected by bevel gears 82 and 83 to the cam shaft 84. (See Fig. 5.) This shaft carries a wheel 85 having a cylindrical flange 86. A portion of this flange is cut away and both edges of one end of the remainder are serrated for a short distance. (See also Fig. 16.) The lever 51 is attached to the piston 87 of a dash pot 88 by which the movements of the scale are retarded in the usual way. (See Fig. 4.) The cylinder of the dash pot is connected to a secondary cylinder 89 by tubes 90, through which the fluid is free to flow to and fro, and the piston 91 of the cylinder 89 is connected to a lever 92 which is arranged to rock on a pivot 93 (see Figs. 5 and 16). The free end of the lever lies close to the flange 86 and carries locking lugs 94 projecting laterally, one outside and one inside of the flange, the distance between the lugs being but little greater than the thickness of the flange. By means of springs 95 the lever is balanced so the flange can normally enter the space between the lugs, as in Fig. 16. Being thus poised a very slight pressure will rock the lever. The piston 91 fits loosely in its cylinder so as to offer no resistance to the springs 95 centering the lever. But when the scale platform moves, the piston 87, whose area is quite large compared to that of piston 91, moves the fluid rapidly up or down in the secondary cylinder, which raises or lowers the piston 91 and moves one or the other of the lugs 94 into the path of the flange 86. As soon as the piston 87 comes to rest the lever is centered by the spring. By means of this device the operator is prevented from operating the handle 80 until the scale comes to rest, and if the scale should move during the initial part of the handle operation the lever 92 will move and engage a lug 94 in the serrations on the flange. Dash pots such as 88 are in common use on scales and are not found to impair their sensitive-

ness or accuracy. It is quite evident that adding the secondary cylinder does not affect the operation of the dash pot. By this means the delicate movement of the scale is employed to control a relatively ponderous mechanism without imposing any strain upon or impeding the movement of the scale.

In order to lock the scale set part, which in the present case is cam 58, during the computing operation, the following mechanism is provided: A lever 100 loosely mounted on shaft 70 carries two pitmen, 101 and 102 respectively. (See Figs. 5 and 6.) The former is connected to an arm (Fig. 4) projecting from a nut 103 which is mounted on a screw 104 carried by the bearing 55, the nut being confined in a slot formed in said bearing. One end of the screw is normally close to the cam 58, and the other end and the hole it lies in are square to prevent the screw rotating. The pitman 102 is connected to another nut 103 mounted on a screw 104, etc., the only difference being that the confining slot is broad enough to receive a compressing spring 105, whereby the nut and screw are yieldingly pressed toward the cam. This screw has a right hand thread while the opposite screw has a left hand thread. A cam 106 on shaft 84 rocks lever 100 upward soon after the handle 80 starts to move, which rotates the nuts 103 and moves the screws toward the cam 58, thereby clamping it and rendering it immovable. This occurs just before the serrated portion of the flange 86 has passed the lugs 94.

It occasionally happens that the momentum of the scale parts carries them too far, in which case they have to return to their position of equilibrium. This retrograde movement will react on the dash pot and tend to move the lever toward and possibly past its normal position. Should this occur and should the operator, by a remote chance, move the handle just as the lever 92 is passing its normal position, the flange 86 might enter the space between the lugs 94 and allow the handle to turn. But the continued movement of lever 92 will bring one or the other of lugs 94 into engagement with the serrations on the flange 86 and arrest the handle before the clamping mechanism just described is actuated. By backing the handle slightly the wheel 85 can be disengaged from the lug 94 and if the scale parts have come to rest the handle can be operated in the usual way. It is seen, therefore, that premature operation of the handle is impossible.

In order to ascertain the value of a commodity placed upon the scale I provide a mechanical computing device operated by power independent of the scale. This device multiplies one factor, namely, weight, as represented by the position of the cam 58, by another factor, namely, price per unit of weight, the product being the value of the commodity on the scale. The mechanical representative of the price factor is the bar 110 mounted on the carriage 63 (see Figs. 4, 5 and 6). By means of mechanism to be described later the carriage is moved by the operating handle 80 until stopped by the bar 110 impinging on the cam 58, the distance traveled by the carriage representing the value of the commodity. Two conditions govern the travel of the carriage; (1) the position of the cam 58, fixed by the weight of the commodity, and (2) the angularity of the bar 110 with reference to the line of travel of the carriage. As shown in Fig. 4 one side of the bar 110 (shown by a dotted line) lies in the plane of the axis of the shaft 54. In Fig. 17 the relation of the cam to the bar, when both are in normal, or what will hereinafter be referred to as 0 position, is illustrated. The bar is pivotally mounted on the carriage, having a circular terminal which rotates in a circular recess formed in the carriage 63, the circular terminal having an annular tongue which lies in a groove in the recess to keep the bar from slipping out of the recess.

The active edge of the bar 110; *i. e.*, the edge which impinges on the cam 58, is rectilineal and radial to the axis on which it rocks. The cam 58 is set on the shaft 54 in such a position that, when there is nothing on the scale; *i. e.*, when the wheel 57 shows 0 weight, if the carriage be moved until the bar 110 impinges on the cam, the point of contact will coincide with the pivotal axis of the bar. This is the condition shown in Fig. 17. The movement of the carriage in the direction indicated by the arrow has been stopped by the active edge of the bar coming in contact with the corner of the cam, the cam being in the position it occupies when the scale is at 0 weight; the point of contact coincides with the axis of the bar. The carriage is then also in 0 position, and while in this position the bar can be rocked on its axis without disturbing either the cam or the carriage, from which it follows that with the scale at 0 the carriage will be arrested at 0 regardless of the angular position of the bar with reference to the line of travel of the carriage. When an article is placed on the scale the cam rotates a distance proportional to the weight of the article. This brings a new point on the came into the plane of the active edge of the bar and since the cam is spiral its radius at this new point is shorter than at the point which lies in the plane of the bar when there is no weight on the scale. If the handle 80 is now operated the carriage will move beyond the 0 position, the dimes printing wheel 72 moving in unison with it, until it is stopped by the cam. For this reason we hereinafter refer to the cam as

a stop, symbolized in Fig. 17 by S, and since the position of the stop is variable we refer to it as a movable stop.

To illustrate the process of multiplication, suppose a commodity sells for thirty cents per pound, and that the angularity of the bar is such that when one pound of the commodity is on the scale the carriage will move just far enough to turn the dimes wheel three spaces, a distance representing thirty cents. If the quantity of commodity weighs $2\frac{1}{2}$ lbs. the carriage will travel far enough to move the dimes wheel $2\frac{1}{2}$ times three spaces or a distance equal to $7\frac{1}{2}$ dimes. If the quantity of commodity weighs $\frac{2}{3}$ of a pound the carriage will move $\frac{2}{3}$ of three spaces, or a distance representing twenty cents. Means is provided for printing fractions of dimes; *i. e.*, cents. This will be described later. Changes in the price factor are effected by changing the angularity of the bar 110. Increasing its angularity diminishes its value and decreasing its angularity increases its value as a factor. The bar is maintained at any desired angularity by the quadrant 114 to which it is secured by a latching pin 111, the quadrant forming part of the carriage 63, its upper end having ball bearing guide 109 in the upper part of the frame 60 (see Figs. 4 and 6.) The quadrant and bar are in the same plane (see Fig. 7) and the end of the bar, which is V shaped, runs in a V shaped groove in the quadrant. The quadrant is provided with recesses 113 into which the latching pin 111 is adapted to drop and whereby the bar is locked to the quadrant. The latching pin is carried by a flat spring 112, riveted to the bar 110.

A modified construction, designed to obviate the sharp edge of bar 110 coming in contact with the sharp edge of cam 58, is illustrated in Fig. 18. In this construction the edge of the cam 58 is rounded, the rounding being on a given radius. The active edge of the bar is removed from the axis on which it rocks by a distance equal to this radius.

For adjusting the position of the bar in accordance with the desired price per pound, a lever 115 is provided, this lever rocking on an axis coincident with the axis of the bar 110. The lever carries a latch 116 which normally rests in one of a plurality of notches in a stationary quadrant 117 carried by the frame 60, and this latch has a lug 118 adapted to enter a notch 119 in an extension 120 secured to the end of the bar 110. Simultaneously with entering this notch the lug cams the spring 112 outwardly, as in Fig. 7, and releases the bar from the quadrant 114. The lever being thus coupled to the bar the latter is moved to any desired position, and as the operator releases the latch the bar becomes locked to quadrant 114 and the lever to quadrant 117. The lever carries a toothed sector 121 which meshes with a gear 122 secured to a short shaft 123 journaled in a bearing 124 carried by frame 60. Said shaft also carries a disk 125 bearing numerals indicating the price at which the value of the article on the scale is being computed. This indication is visible at 125^A to the clerk and at 125^B to the customer. Another sector, 126, (see Figs. 4, 5 and 6) carried by the lever 115 meshes with a pinion 127 on a shaft 128, said shaft also carrying a gear 129 (see Fig. 5) which meshes with a gear 130 secured to a printing wheel 131, this wheel being loosely mounted upon sleeve 68. The printing wheel bears characters corresponding to those on indicator 125 and a numeral corresponding to the one exhibited at 125^A and 125^B is brought by the gearing mentioned to a point opposite the printing platen.

The mechanism by which the carriage 63 is moved into contact with the stop cam 58 and held stationary in this position while the value represented in the length of its travel is being determined and printed, will now be described. A cam 135 is mounted on shaft 84, the construction of the cam being shown in detail in Figs. 19 and 20. The cam is carried by a drum 136, which is loosely mounted on the shaft contiguous to a disk 137 rigidly secured to the shaft, a collar 138 holding the drum in place against the disk. The movement of the drum is limited by a lug 140 carried thereby which plays in a recess 141, and a spiral spring 139 in the drum tends to keep the cam in its forward position, as shown in Fig. 19. When the handle 80 is pulled forward the cam 135 lifts the lever 71, and through the sector 69, pinion 67, sleeve 68, pinion 66 and rack 65 moves the carriage from its normal position until it is arrested by the edge of bar 110 engaging the spiral cam 58. This arrests the entire train, including cam 135, the spring 139 then yielding and allowing the shaft 84 and disk 137 to move on. From the foregoing it will be seen that the process of multiplication is carried out with power derived from another source than the scale, while the movement of the cam 58 to position preparatory to computing a value imposes no restraint whatever on the scale mechanism.

The distance traveled by the carriage represents value, which for the present will be considered monetary. The printing wheel 72 moves in unison with the carriage and the periphery of the wheel is divided into twenty equal spaces representing dimes. A given movement of the carriage therefore represents so many dimes and fractions thereof. The travel of the carriage depends upon two factors; namely, the weight of the article or commodity on the scale and the distance the carriage would travel were the

weight factor unity. This may be called the price or base factor. The price factor may be varied by varying the angle formed by the rectilineal edge with the line of motion of the carriage. This is illustrated diagrammatically in Fig. 21 in which the distance OS=weight (W) and represents the change in the active radius of stop cam 58 as it is rotated from zero position by the scale Oa=value (V) of the commodity whose weight is W, and represents the travel of the carriage from its zero position. The line Ea represents the active edge of bar 110 and A the angle formed by this edge with the line of motion of the carriage, which is parallel to Oa. V=W cotangent A, and if P=the price or value of a quantity whose weight is unity then W cotangent A=WP and cotangent A=P.

When the scale and carriage are at zero, S and *a*, (*a* representing the axis on which the bar 110 rocks and S the stop on which the bar impinges to arrest the carriage) are at 0. This will be understood by reference to Fig. 21, where the stop 58, when in zero position, is represented by a dotted rectangle at the lower left hand corner of the figure, and the active edge of the bar 110, when the carriage is at zero, is represented by an oblique dotted line. In practice the axis *a* is maintained slightly removed from its zero position *i. e.* on the minus side of 0 in order to give the cam 59 unimpaired freedom of movement, but as this does not affect the result it will be disregarded and *a* will be assumed to coincide with 0. The carriage with its associated mechanism is in fact a computing device, the result of its computation being the product of weight and price (WP). We therefore call it a multiplier, and within the term include the carriage 63, bar 110, rack 65, pinion 66 and sleeve 68. The dimes wheel 72 which is loosely mounted on the sleeve 68 carries two sets of type from 0 to 9, which are used to print the dimes contained in the product. As the product may and usually will include fractions of dimes (cents) it is necessary to provide a wheel 150 beside the dimes wheel with which to print cents. This wheel is carried by a shaft 151 journaled in sleeve 68. An arm 152 is secured to one end of the shaft (see Figs. 9 and 10) while the wheel is secured to the shaft at the other end of the sleeve, the shaft continuing through a journal in frame 60 and having a pinion 153 secured to its end. (See Figs. 4 and 5.) A sector 154 journaled on shaft 70 meshes with the pinion. An arm 155 carried by the sector is adapted to be lifted by a cam 156 carried by shaft 84, this cam being similar in construction to cam 135 which is shown in detail in Figs. 19 and 20. Contiguous to arm 152 a disk 157 is secured to sleeve 68 (see Fig. 10), the periphery of this disk having 20 equally spaced notches 158, each space representing ten units (cents) of movement of the multiplier. This disk is part of the multiplier, and is related to the mechanism for printing cents, which will now be described.

On a circular boss 159, formed on the frame 60, ten unit pawls 160 are mounted to rock on screw studs 161 and are urged by springs 162 to press against the periphery of disk 157, or drop into its notches (see Fig. 9). A ring 163 is arranged to rock on the boss 159 and carries pins 164 adapted to engage the pawls and lift them from the disk. To assist in describing the operation of the pawls they are numbered from 0 to 9 and as a further assistance they are illustrated diagrammatically in Fig. 15, in which figure 157^A represents the notched disk, while the pawls are indicated at 160^A. The diagram differs from Fig. 9 in that there are the same number of notches as there are pawls, while in Fig. 9 there are twice as many notches as pawls. This difference, which is a minor one, will be explained later. When the axis *a* of the bar 110 is at 0 the 0 pawl is opposite a notch. Since the distance between the notches represents ten units (cents) of multiplier travel it follows that a movement of one, two, or any integral number of dimes will bring a notch opposite the 0 pawl. The distance between the pawls in Fig. 15 is nine-tenths of the distance between the notches. A movement of one cent, eleven cents, twenty-one cents, etc., will therefore bring a notch opposite the 1 pawl. In like manner a movement of two, twelve, twenty-two, etc., cents will bring a notch opposite the 2 pawl; three, thirteen, twenty-three, etc., cents bringing a notch opposite the three pawl, etc. In Fig. 9 the distance between the pawls is one and nine-tenths of the distance between the notches, which makes them nineteen-twentieths of the distance between alternate notches. The 0 pawl being opposite a notch when the multiplier is at zero, it follows as before that when the multiplier travel equals any integral number of dimes a notch will be opposite the 0 pawl. And as before a movement of one, eleven, twenty-one, etc., cents will bring a notch opposite the 1 pawl, a movement of two, twelve, twenty-two, etc., cents bringing a notch opposite the two pawl, etc.

A lug 165 projecting from ring 163 is connected by a link 166 to a lever 167 mounted on shaft 70, the lever being operated by a cam 168 carried by shaft 84. (See Figs. 5 and 6.) When said shaft is rotated by the handle 80 and after movement of the multiplier is arrested by the cam 58, the ring 163 is rocked and the pins 164 (Fig. 9) removed from contact with the unit pawls, allowing them to rest on the disk, one of

them dropping into a notch. The cam 168 is timed to release the pawls before the cam 156 starts to rotate the wheel 150 which is rigidly attached to shaft 151. The wheel rotates until the arm 152 is arrested by the pawl which has dropped into a notch, the type being so arranged on the periphery of the wheel that when it is arrested the desired type will be opposite the printing platen. The function of this mechanism is similar to that of a vernier; in fact it is a mechanical vernier. Controlled by the comparatively slight movement of the multiplier it moves the printing and indicating wheels large distances, performing its work with great accuracy.

From the above description it is evident that the wheel 150 will be arrested by the pawl whose number corresponds to the odd units of travel of the carriage. For example: if the travel be three, thirteen, twenty-three, etc. units, the 3 pawl will have dropped into a notch and will arrest the wheel. If the travel be seven, seventeen, twenty-seven, etc., units the 7 pawl will therefore be the one to arrest it. If the travel includes a fraction of a unit it is desirable to count the fraction as one or cancel it, according to whether it is half or more than half of a unit, or is less than half. To accomplish this the relative width of the pawls and notches is made such that if the travel includes just half of a unit two pawls may simultaneously drop into notches. This is illustrated in Fig. 11, but will be more easily understood by reference to Fig. 15, where the notches 158^A are just the width of the pawls. Were the member 157^A, which may be assumed to represent disk 157 moved to the right just half of a unit, the 0 pawl would be unable to drop into the notch which it faces in the figure, but were the left side of the notch cut away a distance equal to half of a unit of travel the pawl could then drop into the notch. Moreover, it could drop into the notch were the travel anything less than half of a unit. Now were the right side of the next notch; *i. e.*, the notch nearest to the 1 pawl in Fig. 15 cut away an amount equal to half of a unit of travel the 1 pawl would be able to drop into it when the travel is half of a unit or more, but it could not drop into the notch were the travel less than half of a unit. Cutting away both sides of all notches an amount equal to half of a unit of travel will therefore enable two pawls to simultaneously occupy notches when the travel terminates in half of a unit. When two pawls simultaneously occupy notches, the one of higher denomination should arrest the wheel 150. The wheel is therefore made to rotate in the same direction as the disk 157. The arm 152 normally lies between the 0 and 1 pawl, it being shown in this position by dotted lines in Fig. 9, and because of its direction of movement, it passes the pawls in descending sequence, as is indicated by an arrow in Fig. 9. Therefore, if two pawls have dropped, the one of higher denomination will arrest the arm. Theoretically the arm 152 is in a position where it cannot move after the 0 pawl has dropped in a notch; in other words, the 0 on the wheel 150 is supposed to be normally in printing position. But in practice the arm is kept back from the 0 pawl so as not to interfere with the pawl dropping into a notch, and provision is made for moving the shaft 151 far enough to allow this initial idle movement. Theoretically, however, the arrest of wheel 150, if the 0 pawl has dropped into a notch, is immediate. Should the travel be one-half of a unit (cent), or ten and one-half, twenty and one-half, etc., units, the 0 and 1 pawls would simultaneously drop into notches, and since the arm 152 is to pass the 0 before the 1 pawl the former would arrest the arm and the unit wheel would print 0 where it should print 1. This is a very small matter, for it would occur only where the travel terminated at just the half unit, but to prevent it the 0 pawl may be provided with an arm 169 adapted to coöperate with a link 170. One end of this link is pivoted to the 1 pawl (see Fig. 9), the other end of the link being connected by a slot and pin to the boss 159. The pin 164 belonging to the 1 pawl is placed where it will release the pawl before the 0 pawl is released by its pin, and the link is so positioned that in case the 1 pawl drops into a notch the link will be projected into the path of the arm 169 on the 0 pawl and prevent the 0 pawl dropping into a notch. The link does not move far enough to arrest the arm unless the 1 pawl drops into a notch. It is not essential that this mechanism be applied to the 0 and 1 pawls; it may be applied to any two. It is only necessary that the arm 152 normally lies between the two pawls which are thus associated, the position of the arm with reference to the type on wheel 150 being adjusted accordingly. The object of providing the wheel 72 with twenty instead of ten numerals is to reduce the number of revolutions it will be required to make for large values. The disk 72^B carries two teeth 171 which engage a transfer pinion 172 through which amounts are transferred from the dimes type wheel 72 to the dollar type wheel 173. (See Figs. 4 and 5) Obviously the dimes type wheel 72 might be provided with only one set of figures, or it might have three or more sets. Whatever the number of sets of numerals it has the disk 72^B will have an equal number of teeth 171, and disk 157 will have ten times that number of notches 158.

Since the wheel 72 moves in unison with

the multiplier it is obvious that the movement of the wheel, like that of the multiplier, will represent not only the dimes but fractions of dimes. But as the wheel is to print the dimes it is necessary to correct the position of the wheel so the character which represents the whole dimes in the product shall be opposite the printing platen. To permit this correction it will be recalled that the dimes type wheel 72 is loosely mounted on the sleeve 68 (see Figs. 12 and 13) and carries pins 77 and 78, movement of the wheel on the sleeve being limited by one or the other of said pins impinging on pin 75 which projects from the sleeve, and that the spring 74 normally holds the wheel in the position where pin 77 rests against pin 75. As the multiplier moves from zero position, and until arrested by the cam 58, the wheel 72 moves in unison with the sleeve, the pin 77 remaining in contact with pin 75, the numerals on the wheel passing the printing platen in ascending sequence. The numerals on the dimes wheel 72 are so located that when the multiplier is in zero position the 9 type is opposite the printing platen, and when the multiplier has moved an amount representing ten cents it brings the 0 type on the dimes wheel opposite the platen. If the multiplier is moved a distance representing nineteen cents it will bring the 1 type almost to the platen; that is, the 1 type will lack one tenth of a space of being in printing position. To print the correct result it is then necessary to move the wheel 72 forward against the tension of spring 74 a fraction of a dime, and the mechanism now to be described is for that purpose.

A pawl 175 (see Figs. 12, 13 and 14) is mounted on a stationary stud 176 and adapted to engage the teeth of the ratchet 72^A. The pawl is normally held out of engagement with the ratchet by a lever 177 mounted to rock on shaft 70 (see Figs. 5 and 12) and after rotation of the wheel 150 is completed this lever is rocked downward by a cam 178 on shaft 84, and the pawl 175 allowed to engage the ratchet (see Fig. 13). Provision is made whereby if the travel of the carriage has terminated in a fraction of $9\frac{1}{2}$ units (cents) or over; *i. e.*, if the product is $9\frac{1}{2}$ or over, $19\frac{1}{2}$ or over, $29\frac{1}{2}$ or over, etc., the pawl will be permitted to drop into a notch in the ratchet 72^A when it is released from the lever 177. Otherwise it will rest upon the point of a tooth. The mechanism for accomplishing this will now be described. Integral with the pawl 175 is a lug 179. A block 180 is secured to the unit wheel in such a position that when it is arrested by the pawl 160 representing 9 units the block will be under the lug 179 (see Fig. 14). The object of this is to remove what would otherwise be a close point. That is, since the pawl 175 is required to remain on top of the tooth if the travel terminates in 9 units and a fraction less than one half, and drop behind the tooth if said fraction equals one-half, it would require exceedingly accurate workmanship to insure this operation. Because of the presence of the lug 179 and block 180 the parts may easily be so adjusted that dropping of the pawl 175 is assured when the fraction equals just one-half, while leaving ample margin to prevent its dropping when the units wheel is arrested by the pawl 160 representing 8 units. The arm 177 carries a spring pressed pawl 181 which, as the arm is rocked to the position shown in Fig. 13, moves the wheel 72 in the same direction in which it has been moved by the multiplier to a point where a type is opposite the platen, the spring 74 yielding and allowing the wheel to rotate on the sleeve 68. In order to permit this additional movement the wheel normally stands with the numeral 9 opposite the platen. This pawl 181 normally lies on pawl 175, which we call the pilot, and when the pilot drops into a notch it allows the pawl 181, which we call the justifying pawl, to engage the tooth behind which the pilot has fallen, in which case it will move the wheel one step. If the pilot remains on the point of a tooth or is held out by block 180 as in Fig. 13 it does not allow the justifying pawl to engage said tooth, but pilots it into the next space, in which case it will have nearly completed its movement before engaging a tooth and therefore will move the wheel but slightly. The term "justifying" is used because its function is somewhat analogous to what printers call "justifying."

The value and price are printed on a strip of paper taken from a roll 185, Fig. 8, the paper passing down through a chute 186, around a roller 187 and through a slot 188. An inked ribbon 189, seen to best advantage in Fig. 5, passes between the type wheels and the paper. The platen 190 is mounted to rock on a shaft 191, and is connected through an arm 192 and link 193 to a lever 194 mounted to rock on shaft 70. (See Fig. 5.) At a certain time a cam 195 on shaft 84 rocks the lever and presses the platen against the paper. After the printing is done a cam 196 on shaft 84 engages a roller on the end of a pull rod 197 (see Figs. 5 and 6) and moves it longitudinally in opposition to a compression spring 198 coiled on the rod. The rod is connected to an arm 199 arranged to rock on shaft 191, and carrying a pawl which operates a ratchet wheel 200 driving a feeding drum 201. The paper is clamped between this drum and roller 187 and movement of the rod 197 rotates the drum and feeds the paper out through slot 188. A shear consisting of a stationary blade 202 and movable blade 203 is situated

just inside of the casing, and with the first movement of shaft 87 an arm 204 moves from beneath the outer end of the movable shear blade and allows the spring 205 to open the shear. (See Fig. 4.) At the end of the return movement of handle the shear is closed, cutting off the paper which has just been printed and fed out. The mechanism for indicating the product obtained by the mechanical multiplication; *i. e.*, the value of the commodity on the scale, will now be described.

A sleeve 210 is journaled in bearings 211 supported by frame 60, a sleeve 212 is journaled within the first and a shaft 213 is journaled in the latter sleeve. (See Figs. 4 and 27.) Sleeve 210 carries an indicator disk 214 at one end and a disk 215 at the other end, and between the disks carries a pinion 216 meshing with a rack 217. The lower end of the rack is adapted to rest on one end of a lever 218 mounted to rock on shaft 70, the other end of the lever being bent down and adapted to engage the steps of a cam 219 (see Fig. 8). This cam is rigidly attached to wheel 173 and after the wheel is in position for printing a cam 220, similar in construction to cam 135, (see Figs. 19 and 20) carried by shaft 84 rocks the lever until its bent end engages a step on the cam 219. The steps are graded distances from the axis of the cam and when the lever is arrested by a step the rack 217, which then rests upon the lever, will have been lifted a distance corresponding to the distance the wheel 173 has moved. The disks 214 and 215 carry numerals corresponding to those on the wheel 173 and when the lever 218 is arrested the rack will have rotated the disks far enough to expose at sight openings in the cabinet numerals corresponding to that printed by the wheel 173.

Sleeve 212 carries disks 221 and 222 and a pinion 223 operated by a rack 224. This rack is lifted by a lever 225 operated by a cam (see Fig. 5) 226 and controlled by the stepped cam 72^c on wheel 72, in the same manner as rack 217 is lifted, and the disks carry numerals which are exposed at the sight opening according to the numeral printed by the wheel 72. The cam 226 does not act until after the justifying pawl 175 has brought the wheel 72 into printing position. Disks 227 and 228 are mounted on shaft 213 which shaft also carries a pinion 229 meshing with a rack 230. The lower end of this rack rests upon lever 155 and is lifted a distance proportional to the movement of the unit wheel 150, numerals on disks 227 and 228 corresponding to the numeral printed by the unit wheel being thereby brought opposite the sight opening. Each of the racks is provided with ratchet teeth which are engaged by retaining pawls 231 (see Fig. 8). Springs 232 normally press the pawls into the ratchets and the indicator disks are thereby retained in the position to which they are moved by the above described mechanism after said mechanism is returned to normal condition. By this means the indicator continues to show the last value computed. A releasing pawl 233 mounted to rock on a shaft 234 is engaged in the early part of the handle operation by a cam 235 and rocked toward the lower ends of retaining pawls 231 and rocks said pawls sufficiently to allow the racks to drop down on their respective levers, thus destroying the indication for the last value computed. The cam passes out of engagement with the releasing pawl so as not to interfere with the action of the retaining pawls which are again allowed to engage and hold the racks in elevated positions.

An arm 240 carried by shaft 81 engages a lug 241 and limits the forward stroke of the handle 80, and a spring 242 returns the handle to its normal position. (See Figs. 4 and 6.)

A simplified arrangement for indicating and printing the value is shown in Figs. 22 and 23 in which a graduated scale 250 mounted on suitable guides 251 moves in unison with the multiplier, a lug 252 on the multiplier engaging a lug 253 on the scale and pushing it along. The multiplier then returns to normal position while the scale is held in the position to which it has been moved by a brake 254. This brake is carried on the end of a lever 255 the other end of which is connected through a pull rod 256 to a pawl 257 arranged to rock on a fixed center 258. When the handle starts to move a cam 259 rocks the lever and lifts the brake, allowing a spring 260 to return the scale to normal position. The cam does not disturb the brake on the return of the handle. The graduations on the scale represent dimes and are read at 0 index 261. A vernier scale is placed on the guide 251, the graduations thereon representing cents. The value is read as follows: suppose the index points between 50 and 60 on the scale 250 and the 4 graduation on the vernier just coincides with a graduation on the scale; the value will then be 54 cents. Were it the 7 graduation which coincides with a line on the scale the reading would be 57 cents. At the bottom of the multiplier a scale 262 is mounted to move in unison both ways with the multiplier, the graduations being raised so they can be used to print. The stationary vernier 263 also has raised graduations and by means of a platen the value is printed on a strip of paper taken from a supply roll 264, a ribbon 265 supplying the ink.

Another variation in Figs. 22 and 23 is the substitution of a vertically movable stop 266 for the spiral cam 58. This stop

is moved a distance proportional to the weight on the scale by the arm 51.

Other modifications in structure are possible. Fig. 15, for example, suggests a straight line arrangement of the mechanical vernier, with sliding instead of rocking pawls. Although the values have heretofore been considered as monetary it is obvious that other values may be substituted. Instead of dividing the travel of the multiplier into units of value it may represent pieces. If it takes a given number, say 23, bolts to make a pound and the price lever is set at 23, the product printed will show the number of bolts on the scale. It is not essential that the divisions on wheel 72 represent ten units, as by slight modifications in the parts it may represent any desired multiple of units.

The scale so far considered is one in which a member is moved a distance proportional to the weight laid upon it. Figs. 24 and 25 show our improvement applied to a scale having a beam 275 and movable counter-weight 276. In scales of this type the position of the counterweight on the beam is proportional to the weight on the scale, so the counterweight may be employed in the same manner as the cam 58 or stop 266 is employed. A carriage 277 is mounted to slide on a line perpendicular to the beam 275, and carries the bar 110. With the carriage and counterweight at 0 the rectilineal edge of the bar just touches the counterweight. The counterweight having rounded corners the bar is cut away as in Fig. 18. It is evident that all of the elements for multiplying weight by price are found in this structure.

Fig. 26 shows diagrammatically a different method of arriving at the value. A carriage 280 is mounted to slide as before and carries a bar 281 having a rectilineal edge adopted to engage a movable stop 282, this stop, as before, being moved from 0 a distance proportional to the weight. As before the travel of the carriage represents value. When the stop is at 0 as in the figure, and when the rectilineal edge is in contact with it, the indicators and printing wheels will stand at 0. Moving the carriage to the position shown in the figure, which is its normal position, sets the indicators and printing wheels to their highest reading. As the carriage approaches 0 the reading on the indicators and printing wheels diminishes, leaving a balance representing the distance the carriage lacks of reaching 0.

What we claim is as follows:

1. In a computing device, a member arranged to move various distances, a given distance of movement thereof representing a unit of weight, and apparatus normally dissociated from said member, thereby eliminating all tendency to retard or otherwise affect the movement of said member, said apparatus comprising: a movable element adapted to associate with and have the extent of its movement controlled by said member, a given extent of movement thereof representing the price of a quantity whose weight is unity, its total movement representing the product of said price and the weight represented by the controlling member; means for printing the product and means for preventing association of the apparatus with the controlling member while the latter is in motion.

2. In a computing device, a member arranged to move various distances, a given distance of movement thereof representing a unit of weight; means controlled by said member for multiplying the weight represented by the movement of the member by a factor representing the price of a quantity whose weight is unity; and means for preventing operation of the aforesaid means while said member is in motion.

3. In a computing device, a member arranged to move various distances, a given distance of movement thereof representing a unit of weight; means controlled by said member for multiplying the weight represented by the movement of the member by a factor representing the price of a quantity whose weight is unity; means designed to prevent operation of the aforesaid means while said member is in motion, and means for stopping its operation should said member move while it is in operation.

4. In a computing device, a computing element arranged to move various distances and stop in any of various positions, a second computing element adapted to be moved toward said element until it impinges thereon, thereby effecting a computation, and means controlled by the movement of the first element for preventing the second element from impinging on the first while the first is in motion, said means being powerless to affect the position in which the first element stops.

5. In a computing device, a computing element arranged to move various distances and stop in any of various positions, a second computing element normally dissociated from but adapted to move toward and impinge on the first, thereby effecting a computation, and means controlled by the force which moves the first element for preventing said impingement while the first element is in motion.

6. In a computing device, a computing element arranged to move various distances, a second computing element arranged to move various distances and finally impinge on the first, thereby effecting a computation, means adapted to prevent movement of the second element while the first is in

motion and means for arresting the second element should the first move while the second is in motion.

7. In a computing device, a computing element arranged to move various distances, a second computing element arranged to move until arrested by impinging upon the first element, thereby effecting a computation, means for locking the first element before the impingement takes place, and means for preventing operation of the lock while said element is in motion.

8. In a computing device, a movable computing element adapted to come to rest in any position, means for locking it in any position in which it comes to rest, and means for preventing operation of the locking means while said element is in motion.

9. In combination, a spiral cam adapted to be rotated a distance proportional to the weight of a quantity, and a multiplier comprising a bar with a rectilineal edge lying in a plane radial to the axis of the cam at an angle to said axis, said multiplier being mounted to move parallel to said axis from its zero position until arrested by its edge engaging the cam.

10. In combination, a spiral cam adapted to be rotated a distance proportional to the weight of a quantity, a multiplier comprising a bar with a rectilineal edge lying in a plane radial to the axis of the cam at an angle to said axis, said multiplier being mounted to move parallel to said axis from zero position until arrested by its edge engaging the cam, and means for varying the angularity of the edge with reference to the axis of the cam.

11. In combination, a spiral cam adapted to be rotated a distance proportional to the weight of a quantity, a multiplier comprising a bar with a rectilineal edge lying in a plane radial to the axis of the cam at an angle to said axis, said multiplier being mounted to move parallel to said axis from zero position until arrested by its edge engaging the cam, and a pivot whereon the bar rocks to vary the angularity of its rectilineal edge with reference to the axis of the cam, the axis of the pivot passing perpendicularly through said radial plane at a point where it will just touch the cam when it is in a position representing no weight and the bar is in zero position.

12. In combination, a stop movable from zero a distance proportional to the weight of a quantity; a multiplier comprising a movable bar with a rectilineal edge which impinges on the stop, said edge lying at an angle with reference to the direction of movement of the bar, said bar being carried by a pivot whereon it may be rocked to vary said angle so that with a given weight represented by the movement of the stop the bar will move a greater or less distance before it is arrested by the stop, thereby increasing or diminishing its value as a factor, an indicator showing the value for which the bar is set, and means for printing the product.

13. In combination, a stop movable a distance proportional to the weight of a quantity; a multiplier movable from zero until arrested by the stop, a given extent of movement thereof representing a unit of value; a numeral bearing member whose numerals represent one or more units of value; means for moving said member, and means controlled by the multiplier for arresting said numeral bearing member in a position in which the units figure of the number represented by the movement of the multiplier is in printing or indicating position.

14. In combination, a stop movable various distances; a multiplier movable from zero until arrested by the stop, a given travel representing a unit of value, its total travel representing an arithmetical progression of multiples of said unit; a wheel divided into a number of parts corresponding to said units, means for moving the wheel, and means for arresting it when it has rotated as many divisions as the multiplier lacks of completing a multiple of travel.

15. In combination, a stop movable various distances; a multiplier movable from zero until arrested by the stop, a given travel representing a unit of value, its total travel being divided into equal multiples of said unit; a wheel divided into a number of parts corresponding to said multiple, means for moving the wheel, means for arresting it when it has rotated as many divisions as the multiplier lacks of completing a multiple of travel, and means whereby travel of the multiplier equal to one half or any larger fraction of a unit will procure the arrest of the wheel after it has moved a number of spaces one less than the number contained in the multiple, while movement of less than half of a unit will procure its immediate arrest.

16. In combination, a stop movable various distances; a multiplier adapted to start at zero and move until arrested by the stop, each unit of travel representing a unit of value, said multiplier comprising a member having a series of equally spaced notches, the distance from center to center thereof being equal to a multiple of the unit of travel; pawls equally spaced, equal in number to said multiple and so located that when the multiplier is at zero one of the notches is opposite the first pawl, another notch one unit of movement removed from the second pawl, another two units removed from the third pawl, etc.; and means for registering the units of travel of the multiplier, com-

prising a movable member adapted to be arrested by a pawl which has dropped into a notch.

17. In combination, a stop movable various distances; a multiplier adapted to start at zero and move until arrested by the stop, each unit of travel representing a unit of value, said multiplier comprising a member having a series of equally spaced notches, the distance from center to center thereof being equal to a multiple of the unit of travel; pawls equally spaced, equal in number to said multiple and so located that when the multiplier is at zero one of the notches is opposite the first pawl, another notch one unit of movement removed from the second pawl, another two units removed from the third pawl, etc.; the notches being of such width that when the multiplier is midway a unit of movement two pawls may simultaneously occupy notches; and means for registering the units of movement, comprising a movable member adapted to be arrested by the pawl of higher denomination.

18. In combination, a stop movable various distances; a multiplier adapted to start at zero and move until arrested by the stop, each unit of travel representing a unit of value, said multiplier comprising a member having a series of equally spaced notches, the distance from center to center thereof equaling a multiple of the unit of travel; pawls equally spaced, equal in number to said multiple and so located that when the multiplier is at zero one of the notches is opposite the first pawl, another notch one unit of movement removed from the second pawl, another notch two units of movement removed from the third pawl, etc.; means for registering said multiples of travel, and means for registering units fewer than a multiple, the latter means comprising a movable member adapted to be arrested by a pawl which has dropped into a notch.

19. In combination, a stop movable various distances; a multiplier adapted to start at zero and move until arrested by the stop, each unit of travel representing a unit of value, said multiplier comprising a member having a series of equally spaced notches, the distance from center to center thereof equaling a multiple of the unit of travel; pawls equally spaced, equal in number to said multiple and so located that when the multiplier is at zero one of the notches is opposite the first pawl, another notch is one unit of travel removed from the second pawl, another notch two units of travel removed from the third pawl, etc.; a type carrier moved by the multiplier, bearing characters representing multiples of the unit of value, and means for supplementing the movement imparted by the multiplier whereby to bring to printing position the character which represents the number of whole multiples of travel.

20. In combination, a stop movable various distances; a multiplier adapted to start at zero and move until arrested by the stop, each unit of travel representing a unit of value, said multiplier comprising a member having a series of equally spaced notches, the distance from center to center thereof equaling a multiple of the unit of travel; pawls equally spaced, equal in number to said multiple and so located that when the multiplier is at zero one of the notches is opposite the first pawl, another notch is one unit of travel removed from the second pawl, another notch two units of travel removed from the third pawl, etc.; a type carrier moved by the multiplier, bearing characters representing multiples of the unit of travel, means for supplementing the movement imparted by the multiplier whereby to bring to printing position the character which represents the whole multiples of travel; a second type carrier bearing characters representing units of value, and means for moving it until arrested by a pawl which has fallen into a notch, thereby bringing a type into position to print the units of value in excess of those printed by the multiple printer.

21. In combination, a stop moved various distances; a multiplier arranged to start at zero and travel until arrested by the stop, said multiplier comprising a rotary disk with notches in its periphery separated by distances representing ten units of travel, said units also representing cents; ten pawls representing 0 to 9 cents respectively, mounted contiguous to the disk and so positioned that when the multiplier is at zero the 0 pawl is opposite and adapted to drop into a notch, while one unit of movement will bring a notch opposite the 1 pawl, two units bringing a notch opposite the 2 pawl etc.; a wheel bearing numerals from 0 to 9, and means for rotating it, said wheel being controlled by a member adapted to engage whatever pawl has dropped into a notch and arrest the wheel, the numerals being so arranged that the one corresponding to the value of the arresting pawl will be brought to a given fixed point.

22. In combination, a stop moved various distances; a multiplier arranged to start at zero and move until arrested by the stop, said multiplier comprising a rotary disk with notches in its periphery separated by distances representing ten units of travel, said units also representing cents; ten pawls representing 0 to 9 cents respectively, mounted contiguous to the disk and so positioned that when the multiplier is at zero the 0 pawl is opposite and adapted to drop into a notch, while one unit of movement will

bring a notch opposite the 1 pawl, two units bringing a notch opposite the 2 pawl etc.; a wheel bearing numerals from 0 to 9, and means for rotating it so the numerals pass a fixed point in descending sequence, said wheel being controlled by a member adapted to engage a stop which has dropped into a notch and arrest the wheel with the numeral corresponding to the arresting pawl opposite said fixed point.

23. In combination, a stop moved various distances; a multiplier arranged to start at zero and move until arrested by the stop, said multiplier comprising a rotary disk with notches in its periphery separated by distances representing ten units of travel, said units also representing cents; ten pawls representing 0 to 9 cents respectively, mounted contiguous to the disk and so positioned that when the multiplier is at zero the 0 pawl is opposite and adapted to drop into a notch, while one unit of movement will bring a notch opposite the 1 pawl, two units will bring a notch opposite the 2 pawl etc., the pawls and notches being of such relative width that two pawls can simultaneously occupy notches when the disk has moved just half of a unit; a wheel bearing numerals from 0 to 9, and means for rotating it so the numerals pass a fixed point in descending sequence, said wheel being controlled by a member adapted to engage a stop which has dropped into a notch and arrest the wheel with the numeral corresponding to the arresting pawl opposite said fixed point.

24. In combination, a stop moved various distances; a multiplier arranged to start at zero and move until arrested by the stop, said multiplier comprising a rotary disk with notches in its periphery separated by distances representing ten units of travel, said units also representing cents; ten pawls representing 0 to 9 cents respectively, mounted contiguous to the disk and so positioned that when the multiplier is at zero the 0 pawl is opposite and adapted to drop into a notch, while one unit of movement will bring a notch opposite the 1 pawl, two units bringing a notch opposite the 2 pawl etc.; a wheel bearing numerals from 0 to 9, and means for rotating it, said wheel being controlled by a member adapted to engage whatever pawl has dropped into a notch and arrest the wheel, the numerals being so arranged that the one corresponding to the value of the arresting pawl will be brought to a given fixed point; a wheel rotating in unison with the disk, bearing numerals representing tens of cents, and a justifying device to move the wheel independently of the multiplier after it has finished, and bring the numeral representing the tens of units the multiplier has moved to the aforesaid given point.

25. In combination, a stop moved various distances; a multiplier arranged to start at zero and move until arrested by the stop, said multiplier comprising a rotary disk with notches in its periphery separated by distances representing ten units of travel, said units also representing cents; ten pawls representing 0 to 9 cents respectively, mounted contiguous to the disk and so positioned that when the multiplier is at zero the 0 pawl is opposite and adapted to drop into a notch, while one unit of movement will bring a notch opposite the 1 pawl, two units bringing a notch opposite the 2 pawl, etc.; means for holding the pawls away from the disk while it is moving and means for pressing them against the disk after it comes to rest whereby to cause them to enter notches with which they register; a wheel bearing numerals from 0 to 9 and means for rotating it, said wheel being controlled by a member adapted to engage whatever pawl has dropped into a notch and arrest the wheel, the numerals being so arranged that the one corresponding to the value of the arresting pawl will be brought to a given fixed point.

26. In combination, a stop movable various distances; a multiplier adapted to move until arrested by the stop, comprising a member having notches separated by distances representing ten units of travel, said units also representing cents; ten pawls representing 0 to 9 cents respectively, mounted contiguous to the notched member and so positioned that when the multiplier is at zero the 0 pawl is opposite a notch, while one unit of movement will bring a notch opposite the 1 pawl, two units bringing a notch opposite the 2 pawl etc.; the notches and pawls being of such relative size that two pawls can simultaneously occupy notches when the multiplier is midway a unit of movement, and means for preventing the 0 and 1 pawls simultaneously occupying notches.

27. In combination, an element which is adjustable to represent the various weights, means controlled by said element for multiplying the weight it represents by another factor, means for printing the product, and means for continuously indicating the product last printed until operation for printing a new product is begun.

28. In combination, a multiplier, an indicator controlled thereby which indicates values proportional to the travel of the multiplier, a movable element representing by its position the weight of a quantity of commodity, a frictional lock whereby said element may be locked in any position without disturbance, and means controlled by said element for moving the multiplier a distance proportional to the weight represented by the position of the element.

29. In a computing device, a member arranged to move various distances, a given distance of movement thereof representing a unit of weight, means adapted to associate with and be controlled by said member for multiplying the weight represented by the distance said member has moved by a factor representing the price of a quantity whose weight is unity, said means being normally disassociated from said member; means for associating them, thereby performing the multiplication, and means for preventing their association before said member comes to rest.

30. In a computing device, a member arranged to move various distances, a given distance of movement thereof representing a unit of weight, means adapted to associate with and be controlled by said member for multiplying the weight represented by the distance said member has moved by a factor representing the price of a quantity whose weight is unity, said means being normally dissociated from said member; means for associating them, thereby performing the multiplication, and means for preventing their association before said member comes to rest, but permitting it when said member comes to rest, regardless of the position it then occupies.

31. In a combination, a computing device which effects computations by moving various distances according to the weight of quantities of commodity, an indicator controlled thereby to indicate the value of various quantities of commodity according to the weight thereof when a given extent of movement of the computing device causes the indicator to indicate the value of a quantity of commodity whose weight is unity; and means for preserving each indication until another computation is begun.

32. In a combination, a computing device which effects computations by moving various distances according to the weight of quantities of commodity, an indicator controlled thereby to indicate the value of various quantities of comodity acording to the weight thereof when a given extent of movement of the computing device causes the indicator to indicate the value of a quantity of commodity whose weight is unity; means for preserving each indication until another computation is begun, and means for printing the value of the commodity.

33. In combination, a computing device which effects computations by moving various distances according to the weight of quantities of commodity, an indicator controlled thereby to indicate the value of various quantities of commodity according to the weight thereof when a given extent of movement of the computing device causes the indicator to indicate the value of a quantity of commodity whose weight is unity; means for preserving each indication until another computation is begun, and means for printing the price per unit of weight and the value of the commodity.

34. In a combination, an element adapted by virtue of variations in its position to represent any weight, means controlled by said element for multiplying the weight it represents by another factor, and means for preventing operation of the multiplier while the controlling element is in motion.

35. In combination, an element adapted to represent the weight of any quantity, means controlled by said element for multiplying the weight it represents by another factor, means for preventing operation of the multiplier while the status of said element is unsettled, and means for stopping its operation should said status change while it is operating.

36. In combination, an element adapted to represent the weight of any quantity, means controlled by said element for multiplying the weight it represents by another factor, means for preventing operation of the multiplier while the status of said element is unsettled, and means for preventing any change in the status of said element while the multiplier is in operation.

37. In combination, a stop movable from zero a distance proportional to the weight of a quantity when a given distance of movement represents a unit of weight; a multiplier comprising a rectilineally movable carriage having a bar with a rectilineal edge placed at an angle with reference to the movement of the carriage, said edge just touching the stop when the multiplier and stop are at zero; and means for moving the carriage from its zero position until it engages the stop, and means for preventing movement of the multiplier while the stop is in motion.

38. In combination, a stop movable from zero a distance proportional to the weight of any quantity when a given distance of movement represents a unit of weight; a multiplier comprising a rectilineally movable carriage having a bar with a rectilineal edge placed at an angle with reference to the movement of the carriage, said edge just touching the stop when the multiplier and stop are at zero; means for moving the carriage, a given travel representing a unit of value, so that with a given angularity of the bar and with the stop removed from zero a distance representing one unit of weight the carriage, starting at zero, will have traveled a distance representing a given value when the bar engages the stop, means for preventing movement of the multiplier while the stop is in motion, and means for disclosing the value the travel of the multiplier will represent when the weight represented by the stop is unity.

39. In combination, a stop movable from zero a distance proportional to the weight of any quantity when a given distance of movement represents a unit of weight; a multiplier comprising a rectilineally movable carriage having a bar with a rectilineal edge placed at an angle with reference to the movement of the carriage, said edge just touching the stop when the multiplier and stop are at zero; means for moving the carriage, a given travel representing a unit of value, so that with a given angularity of the bar and with the stop removed from zero by a distance representing one unit of weight, the carriage, starting at zero, will have traveled a distance representing a given value when the bar engages the stop, means for preventing movement of the multiplier while the stop is in motion, means for disclosing the value the travel of the multiplier will represent when the weight represented by the stop is unity, means for varying the angularity so that for a unit of weight any desired travel of the multiplier may be obtained, and means for disclosing the value of the actual travel of the multiplier.

40. In combination, a stop movable from zero a distance proportional to the weight of any quantity when a given distance of movement represents a unit of weight; a multiplier comprising a rectilineally movable carriage having a bar with a rectilineal edge placed at an angle with reference to the movement of the carriage, said edge just touching the stop when the multiplier and stop are at zero, the bar being arranged to rock on an axis which touches said edge and the stop when at zero; means for moving the carriage, a given travel representing a unit of value, so that with a given angularity of the bar and with the stop removed from zero by one unit of weight, the carriage, starting at zero, will have traveled a distance representing a given value when the bar engages the stop; and means for printing the value represented by the travel of the multiplier.

41. In combination, a stop movable from zero a distance proportional to the weight of any quantity, moving a given distance for a unit of weight; a multiplier comprising a rack, a pinion enmeshed therewith and secured to a sleeve, and a bar having a rectilineal edge forming an angle with the rack, said edge just touching the stop when the multiplier and stop are at zero; a ratchet wheel revoluble on the sleeve but normally held by a spring against a stop, each tooth thereof representing a multiple of units of travel of the multiplier; a pilot pawl pivoted on a stationary stud and arranged to drop behind a tooth if the multiplier lacks no more than half of a unit of completing its last multiple of travel, a justifying pawl, and means for causing it to engage and move a ratchet tooth to a particular position, thereby rotating the ratchet wheel on the sleeve, which of two teeth shall be thus engaged depending upon whether the pilot remains on or drops behind a tooth.

42. In combination, a stop movable from zero a distance proportional to the weight of any quantity, moving a given distance for a unit of weight; a multiplier comprising a rack, a sleeve carrying a rigidly attached pinion enmeshed with the rack, and a bar having a rectilineal edge forming an angle with the rack, said edge just touching the stop when the multiplier and stop are at zero; a ratchet wheel revoluble on but normally held by a spring in a given position with reference to the sleeve, each tooth thereon representing a multiple of units of movement of the multiplier; a pilot pawl pivoted on a fixed stud and arranged to drop behind a tooth if the multiplier lacks no more than half of a unit of completing its last multiple of travel; a justifying pawl and means for causing it to engage and move a tooth of the ratchet to a particular position, thereby rotating the wheel on the sleeve, which of two teeth shall be thus engaged depending upon whether the pilot remains on or drops behind a tooth; a wheel bearing numerals representing units, means for rotating it, and means, depending upon the distance the multiplier has moved in excess of a multiple, for arresting the wheel with the numeral in a given position which represents said excess.

43. In combination, a wheel whose movement is divided into units and bearing numerals representing a multiple of said units and means for rotating it variable amounts; a ratchet secured to the wheel whose teeth correspond to said multiples, a pilot pawl pivoted on a fixed stud and arranged to drop behind a tooth if the movement of the wheel lacks not to exceed half of a unit of completing a multiple; a justifying pawl and means for causing it to engage a tooth of the ratchet and move the wheel independently of the aforesaid wheel-moving-means, whereby to bring a numeral thereon to a given point, which of two numerals shall be brought to said point depending upon whether the pilot remains on or drops behind a tooth.

44. In combination, a wheel whose movement is divided into units and bearing numerals 1, 2, 3, etc., representing multiples of said unit, a notched disk and means for moving it and the wheel variable amounts in unison; a ratchet secured to the wheel whose teeth correspond to said numerals; a pilot pawl pivoted on a fixed stud and arranged to drop behind a tooth if the movement of the wheel lacks not to exceed half

of a unit of completing a multiple of movement; a justifying pawl and means for causing it to engage a tooth of the ratchet and move the wheel independently of the aforesaid wheel-moving means, whereby to bring a numeral thereon to a given point, which of two numerals shall be brought to said point depending upon whether the pilot remains on or drops behind a tooth; pawls equally spaced, equal in number to said multiple and so arranged around the notched disk that before the wheel has moved, or when it has moved a number of units corresponding to said multiple, the first or 0 pawl is opposite and adapted to drop into a notch, the next or 1 pawl being then where one unit of movement will bring a notch opposite it, while two units of movement will bring a notch opposite the 2 pawl; a wheel bearing numerals 1, 2, 3, etc., and means for rotating it until arrested by a projection secured to it engaging a pawl which has dropped into a notch, thus bringing the numeral corresponding to that of the arresting pawl into juxtaposition to the selected multiple numeral.

45. In combination, a member having a series of equally spaced notches, means for moving said member, the travel thereof being divided into units, the distance from center to center of the notches being equal to a multiple of the unit of travel; pawls equally spaced, equal in number to said multiple and so located that when the notched member is in certain positions one of the notches is opposite the first pawl, another notch being one unit of travel removed from the second pawl, another notch then being two units of travel removed from the third pawl, etc., means for registering units of travel less than a multiple, comprising a movable member having a projection adapted to engage the pawl which has dropped into a notch.

46. In combination, a revoluble disk having notches in its periphery separated by distances representing ten units of movement thereof; ten pawls representing respectively 0 to 9 units of movement of the disk, mounted contiguous to the disk and so positioned that when the disk is in a certain position the 0 pawl is opposite and adapted to drop into a notch, while one unit of movement will bring a notch opposite the 1 pawl, two units of movement bringing a notch opposite the 2 pawl, etc., means for rotating the disk variable distances, means for indicating the integral multiples of movement thereof, a wheel for indicating the units of movement of the disk less than a multiple, means for rotating the unit wheel and a member connected to the wheel adapted to engage a pawl which has fallen into a notch, thereby arresting the wheel, a numeral thereon indicating the value of the pawl whereby it was arrested.

47. In combination, a member movable a variable degree, its movement being measured in units and multiples thereof, means for disclosing the number of whole multiples it has moved and means for disclosing the units less than a multiple, comprising: a member having divisions numbered respectively 0, 1, 2, 3, etc., and means controlled by the movement of the first member for moving the second member, whereby is brought to a given position the numeral which most nearly represents the units not included in whole multiples moved by the first member, one-half unit being considered nearer to a whole than to no unit.

48. In combination, a member movable a variable degree, its movement being measured in units and multiples thereof, means for disclosing the number of whole multiples it has moved and means for disclosing the units less than a multiple, comprising: a member having divisions equal in number to the units in a multiple, and means controlled by the movement of the first member, for moving the second member as many divisions as the first member lacks of completing a multiple.

49. In combination, a member movable various degrees, its movement being measured in units and multiples thereof, said member bearing numerals representing said multiples; means for moving it, and means operative after the aforesaid means ceases to operate, for moving the member and bringing one of the numerals opposite a given fixed point.

50. In a computing device, a stop arranged to move various distances from a zero position, a given extent of movement thereof representing a unit of weight, means for locking said stop in a position representing the exact weight of any quantity, an indicator showing said weight; a multiplier arranged to move until arrested by said stop, a given extent of movement thereof representing the value or price of a quantity whose weight is unity, and means for indicating the product of said price and the weight shown by the indicator, computed to the nearest amount for which a medium of exchange is available.

51. In a computing device, a stop arranged to move various distances from a zero position, a given extent of movement thereof representing a unit of weight, means for locking said stop in a position representing the exact weight of any quantity, an indicator showing said weight; a multiplier arranged to move until arrested by said stop, a given extent of movement thereof representing the value or price of a quantity whose weight is unity, and means for print-

ing the product of said price and the weight shown by the indicator in figures representing the nearest amount which can be equaled with a given medium of exchange.

52. In a computing device, a stop arranged to move various distances from a zero position, a given extent of movement thereof representing a unit of weight, means for locking said stop in a position representing the exact weight of any quantity, an indicator showing said weight, a multiplier arranged to move until arrested by said stop, a given extent of movement thereof representing the value or price of a quantity whose weight is unity; means for indicating the product of said price and the weight shown by the indicator in figures representing the nearest amount which can be equaled with a given medium of exchange, and means for printing said amount.

53. In a computing device, a stop arranged to move various distances from a zero position, a given extent of movement thereof representing a unit of weight, a means for locking said stop in a position representing the exact weight of any quantity, an indicator showing said weight, a multiplier arranged to move until arrested by said stop, a given extent of movement thereof representing the value or price of a quantity whose weight is unity; means for indicating the product of said price and the weight shown by the indicator in figures representing the nearest amount which can be equaled with a given medium of exchange, means for maintaining said product indication, and means for printing the product.

54. In a computing device, an element arranged to move various distances, a given distance of movement representing a unit of weight; an element controlled by the first element for multiplying the weight, represented by the movement of the first element, by a factor representing the price of a quantity whose weight is unity; indicating mechanism controlled by one of said elements, and means for maintaining the indication until the next computation is begun.

55. In a computing device, an element arranged to move various distances, a given distance of movement representing a unit of weight; an element controlled by the first element for multiplying the weight, represented by the movement of the first element, by a factor representing the price of a quantity whose weight is unity; indicating mechanism controlled by one of said elements, printing mechanism controlled by one of said elements and adapted to be restored to an initial position after each computing operation, and means for maintaining the indication after the printing mechanism has been restored to its initial position.

56. In a computing device, an element arranged to move various distances, a given distance of movement representing a unit of weight; an element controlled by the first element for multiplying the weight, represented by the movement of the first element, by a factor representing the price of a quantity whose weight is unity; indicating mechanism controlled by one of said elements, means for maintaining the indication until the next computation is begun, and means for varying the value of the second element as a factor.

57. In a computing device, an element arranged to move various distances, a given distance of movement representing a unit of weight; an element controlled by the first element for multiplying the weight, represented by the movement of the first element, by a factor representing the price of a quantity whose weight is unity; product indicating mechanism controlled by movement of the second element, and means for maintaining the indication until the next computation is begun.

58. In a computing device, an element arranged to move various distances, a given distance of movement representing a unit of weight; an element controlled by the first element for multiplying the weight, represented by the movement of the first element, by a factor representing the price of a quantity whose weight is unity; indicating mechanism controlled by one of said elements, printing mechanism controlled by the second element and adapted to be restored to an initial position after each computing operation, and means for maintaining the indications after the printing mechanism has been restored to its initial position.

59. In a computing device, an element arranged to move various distances, a given distance of movement representing a unit of weight; an element controlled by the first element for multiplying the weight, represented by the movement of the first element, by a factor representing the price of a quantity whose weight is unity; product printing mechanism controlled by movement of the second element and adapted to be restored to an initial position after each computation, product indicating mechanism controlled by the second element, and means for maintaining the indications after the printing mechanism has been restored to initial position.

60. In a computing device, means for indicating the exact weight of quantities, means for indicating the price per unit of weight, means for exactly multiplying said weight and price, and numeral bearing wheels operated under the control of said multiplying means for showing the exact product to the nearest unit, the wheel of lower order being adapted to show quantities represented by such portion of the

movement of the wheel of higher order as is too small to be expressed by the numerals on said wheel of higher order.

61. In a computing device, means for indicating the exact weight of quantities, means for indicating the price per unit of weight, means for exactly multiplying said weight and price, means for adjusting the product to a given medium of exchainge, means for indicating the adjusted product and means for maintaining the indication until another multiplication has begun.

62. In a computing device, a member movable indeterminate distances, a type carrier arranged to move in unison therewith, the type therefore occupying indeterminate positions with reference to a given printing position when said member comes to rest, said type being required to print the number of multiples of a unit of import which is contained in the travel of said member; means for bringing the required type to the printing position, without altering the position of said member; a second type carrier, and means for moving it and bringing to said printing position the numeral which most nearly equals the units in the remainder of the travel.

63. In a computing device, a member movable indeterminate distances, and means operative when said member is in any position in which it may come to rest, for showing the distance thereby traveled, comprising: means for disclosing a numeral showing the multiples of a unit of import contained in said travel, and means for disclosing beside and in alinement with said numeral a numeral which most nearly equals the units in the remainder of the travel.

64. In combination, a stop movable from a zero position a distance proportional to the weight of any quantity which does not exceed a given weight, a multiplier, means for moving the multiplier until arrested by said stop, with the stop in the position representing the weight in question, a type carrier, means controlled by the movement of the multiplier for moving said carrier to bring the required type within a given distance of the printing position, the position of said type with reference to the printing position, to which it is brought by said means being variable and depending upon the weight that the position of the stop represents; and means whereby the carrier is subsequently moved to bring said type to the printing position.

65. In a device of the character described, a computing member whose movement is proportional to the result of a computation; a member bearing numerals to represent the figure in the units place in said result; means for moving said units member and means controlled by said computing member for arresting the units member at the required figure while it is traversing a single series of units, whether the movement of the computing member represents a quantity greater or less than the units.

66. In a computing device, a wheel adapted to rotate a distance proportional to the result of a computation; a wheel bearing numerals from 0 to 9 to represent the figure in the units place in said result, means for rotating said units wheel and means controlled by the first wheel for arresting the units wheel when the required numeral first reaches the proper position, regardless of whether the movement of the first wheel represents more or less than ten units.

67. In a computing machine, a stop which is free to assume any one of an infinite number of positions within the limits of its motion, prior to each computing operation; a rectilineally movable multiplier adapted to perform computations by moving from zero position until arrested by said stop; means for locking the stop in the exact position which it has assumed, during the time of contact with said multiplier, and means for disclosing the result to the nearest unit; comprising two wheels bearing numerals to represent, respectively, the units and tens place in the result, and means controlled by the movement of said multiplier for moving said wheel and compelling the required numeral on each wheel to appear in the center of the sight opening.

68. In a computing device, an element arranged to move various distances, a given distance of movement representing a unit of weight; an element controlled thereby for multiplying the weight represented by the movement of the aforesaid element by a factor representing the price per unit of weight, said second element being normally dissociated from the first, thereby eliminating all tendency to retard or otherwise affect the movement of the first element; an indicator showing said product expressed in figures to the nearest unit and means for maintaining the indication after the second element has become dissociated from the first.

69. In a computing device, an element arranged to move various distances, a given distance of movement representing a unit of weight; an element controlled thereby for multiplying the weight represented by the movement of the aforesaid element by a factor representing the price per unit of weight, said second element being normally dissociated from the first, thereby eliminating all tendency to retard or otherwise affect the movement of the first element; an indicator showing said product expressed in figures to the nearest unit and means for preventing association of said elements while the first element is in motion.

70. In a device of the character described,

a computing member whose movement is proportional to the result of a computation; a member bearing numerals to represent the figure in the units place in said result; and means controlled by said computing member for moving said numeral bearing member and bringing the required figure to the required position while said numeral bearing member is traversing a single series of units, whether the movement of the computing member represents a quantity greater or less than ten cents.

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