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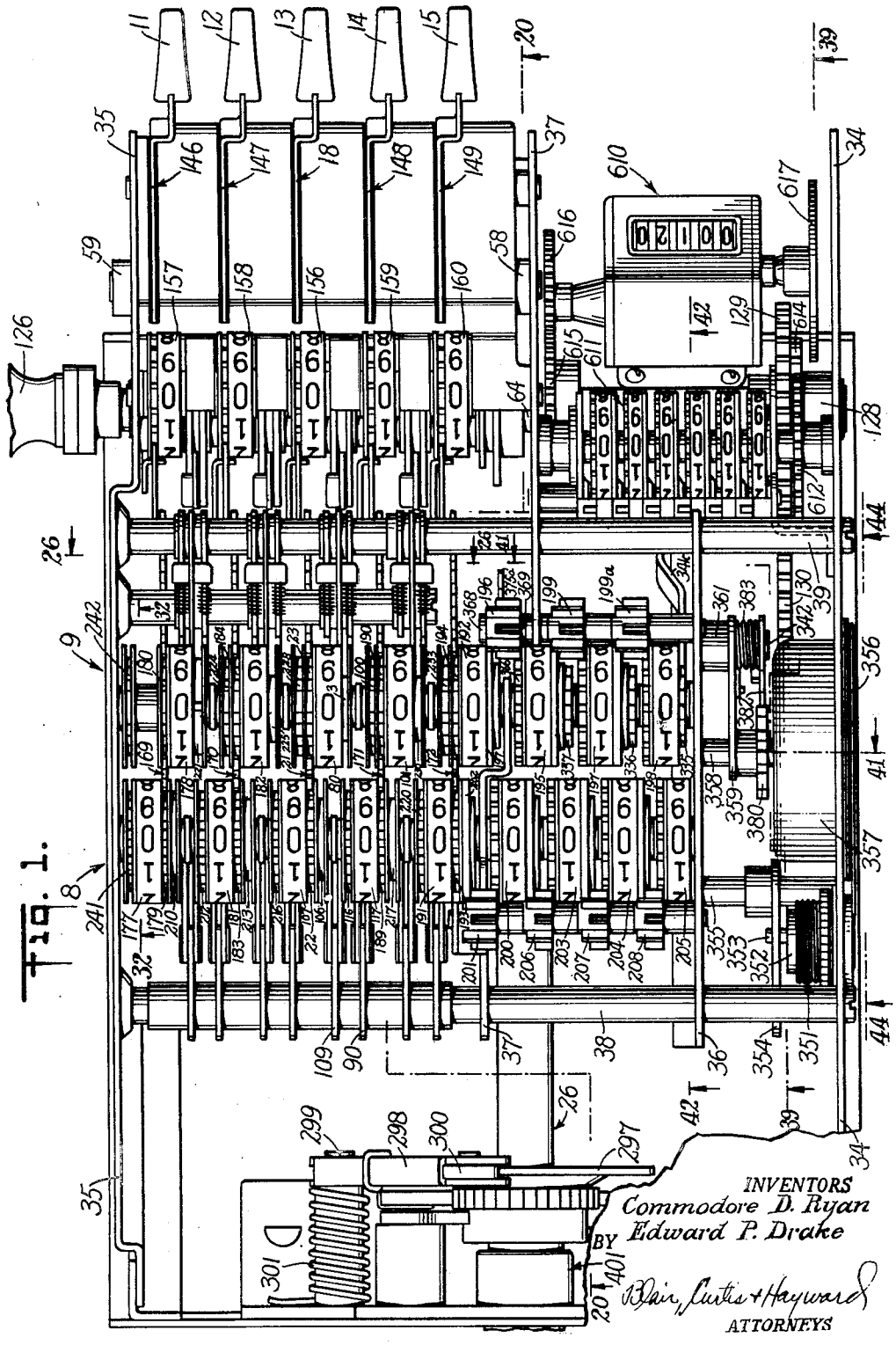

Fig. 1.

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Fig. 2.

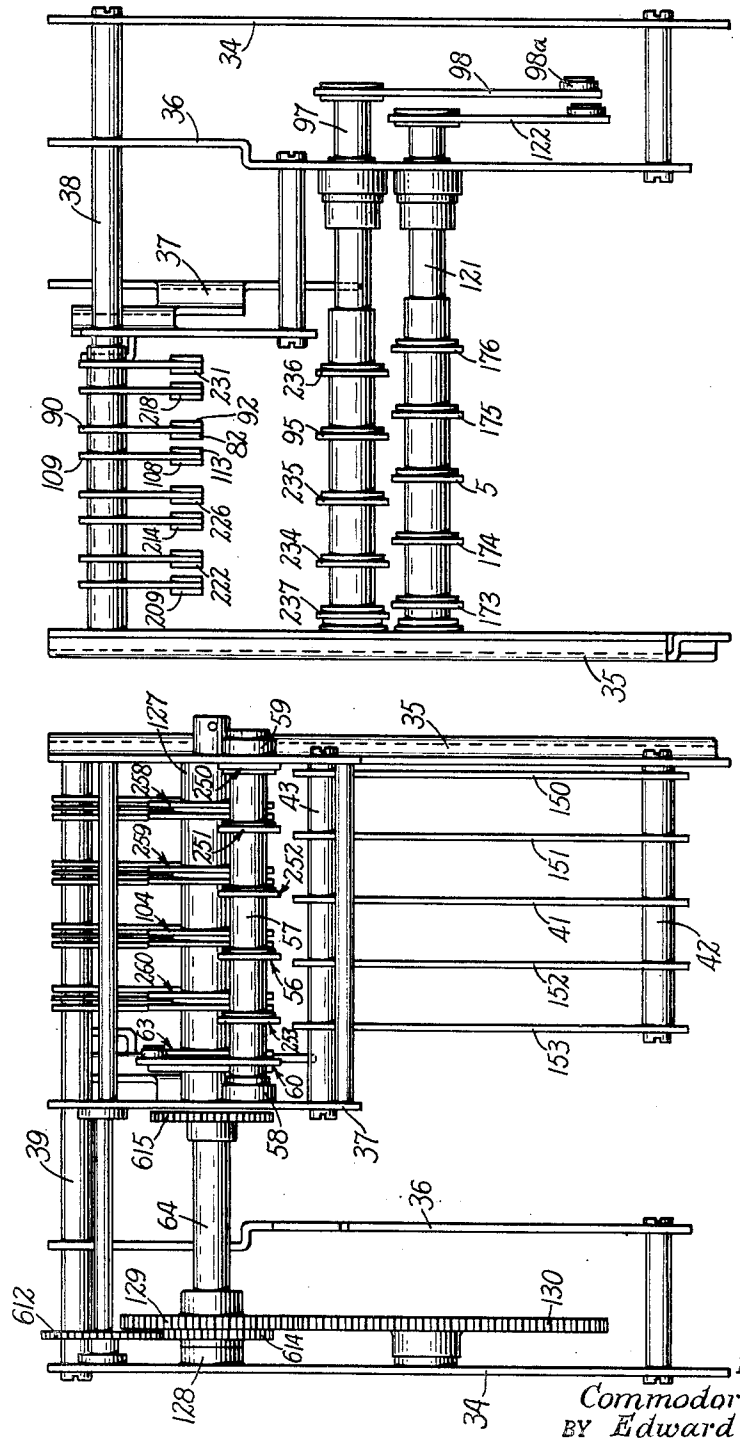

Fig. 3.

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VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 3

Fig. 4.

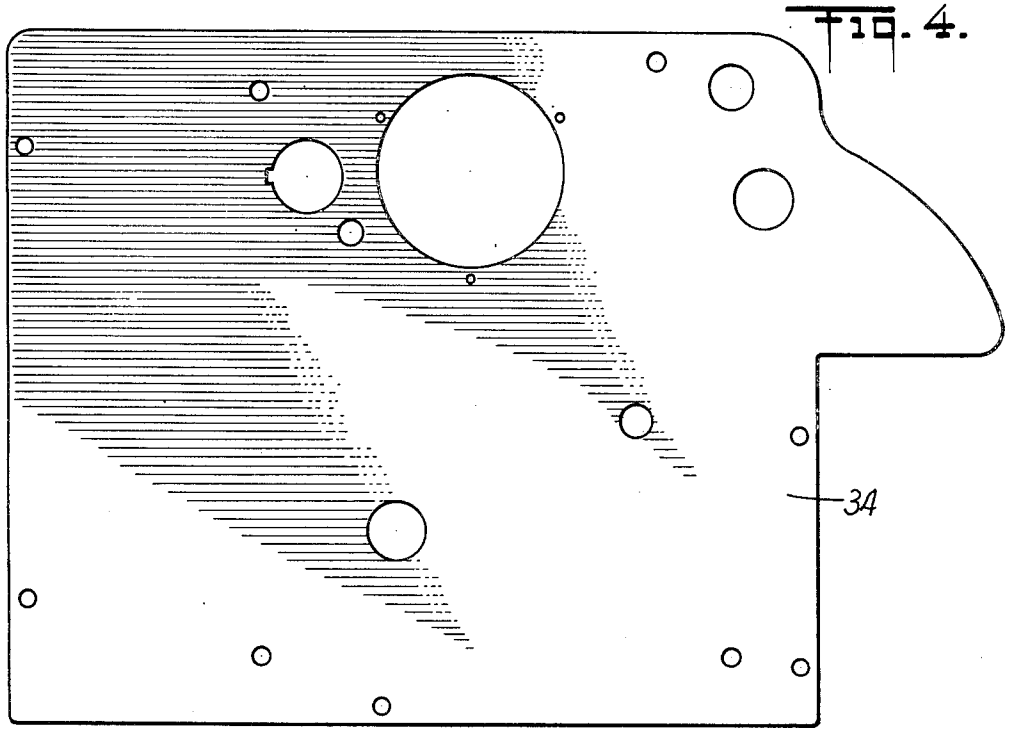
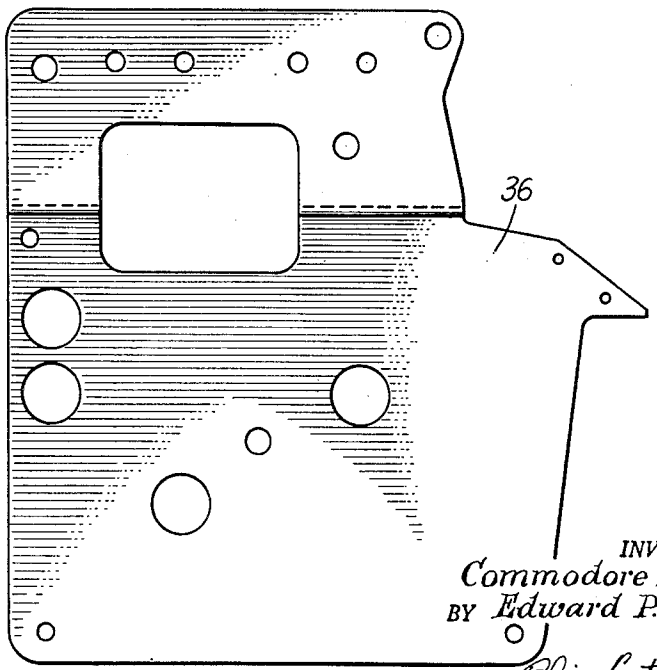


Fig. 5.

Fig. 6.



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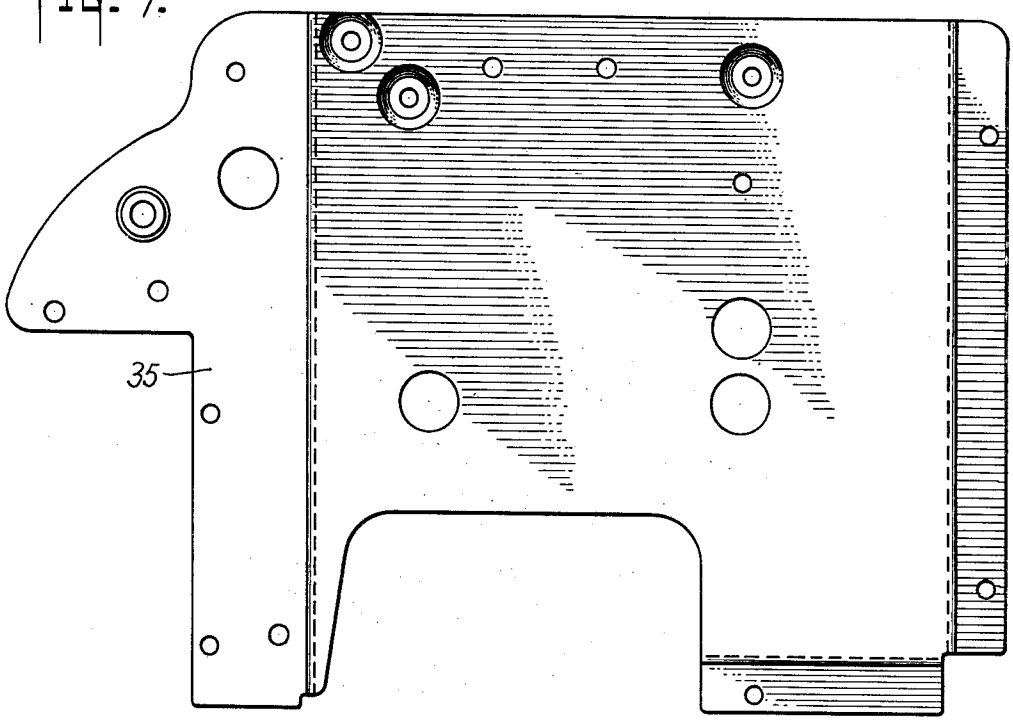
VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 4

Fig. 7.



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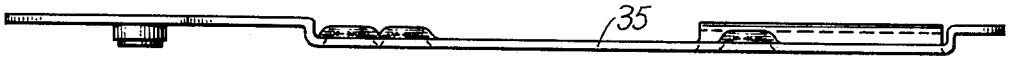

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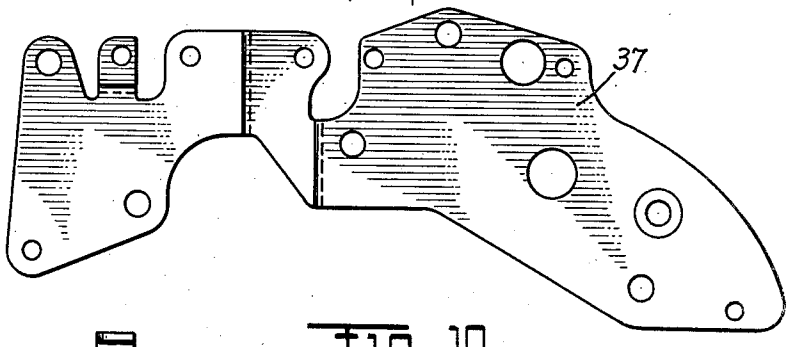

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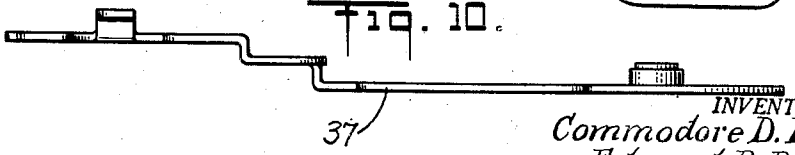

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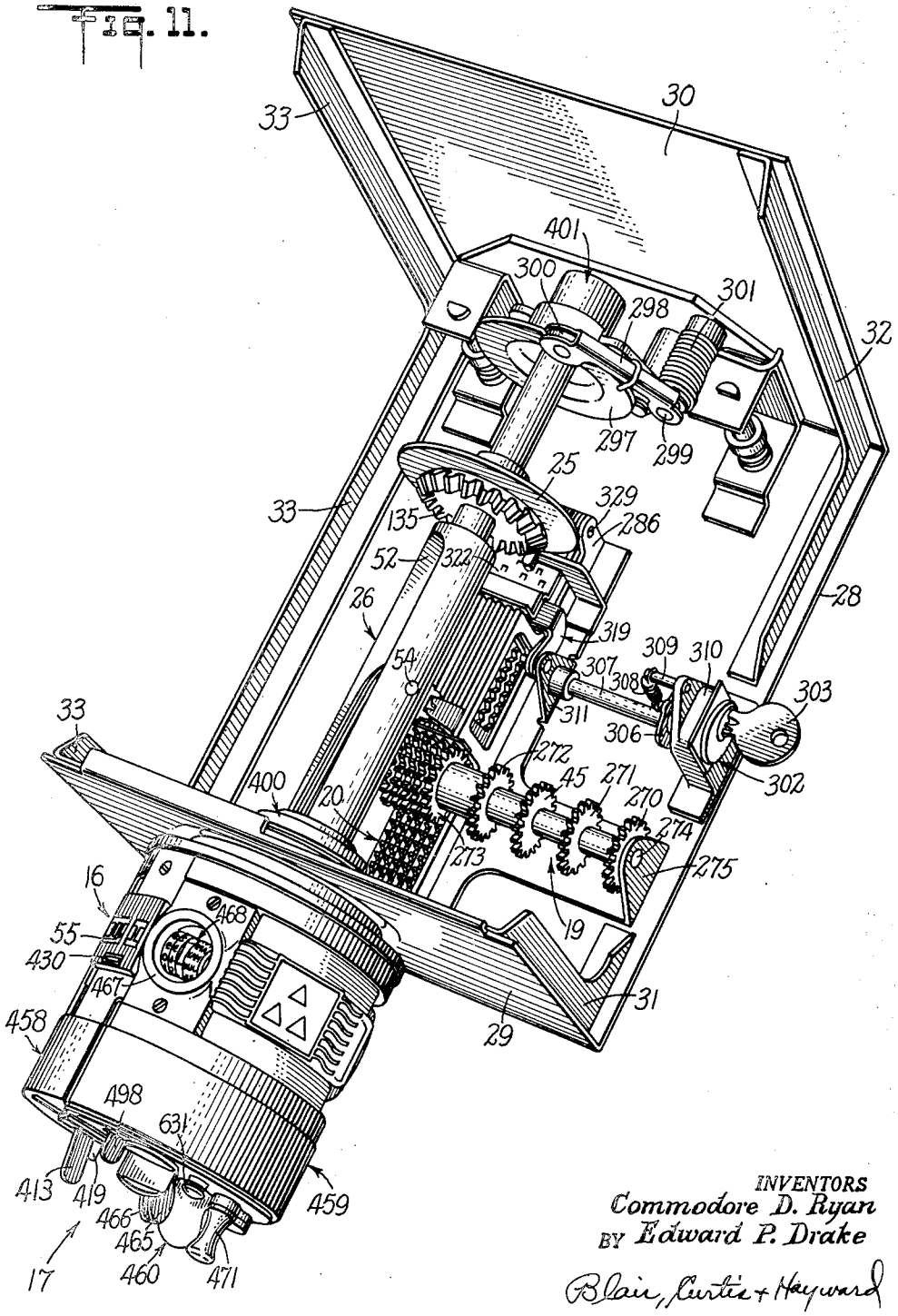
VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 5

Fig. 11.



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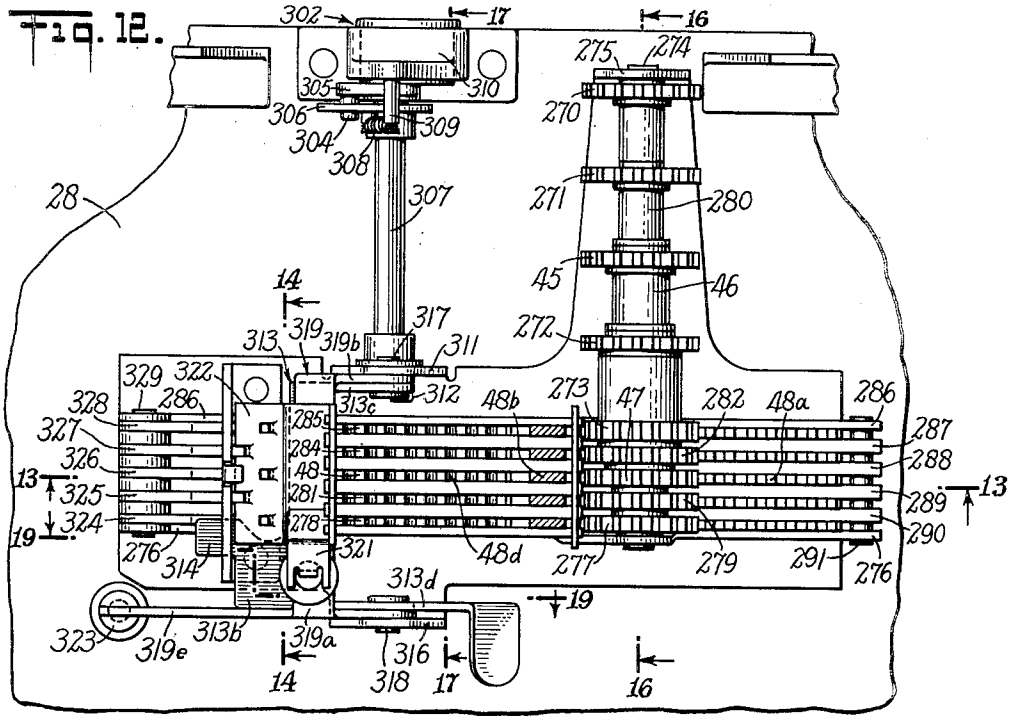
Filed June 16, 1944 30 Sheets-Sheet 6

Fig. 12.



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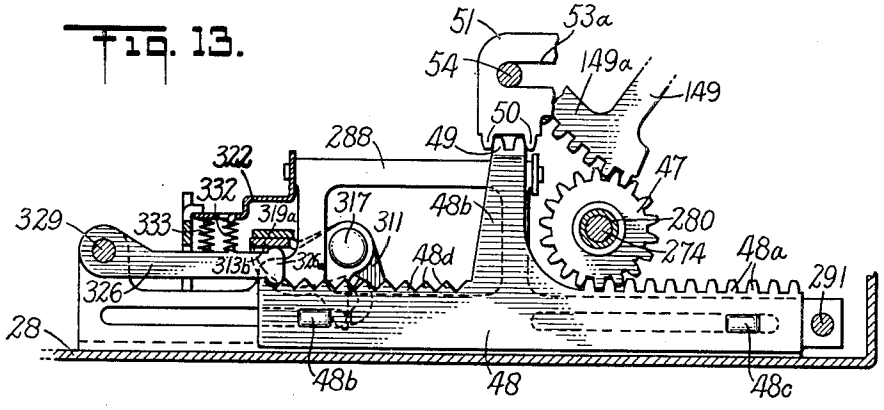

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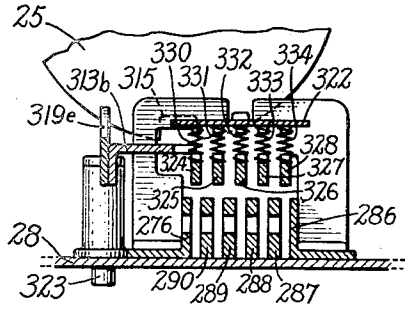

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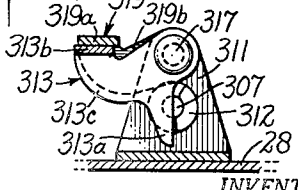

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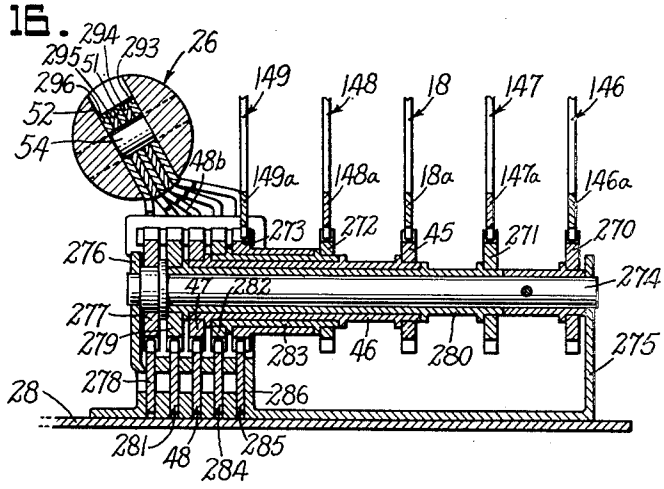
VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 7

Fig. 16.



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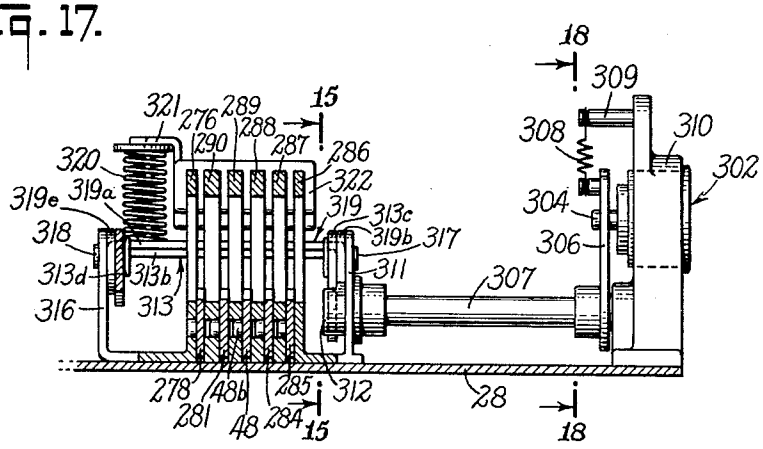

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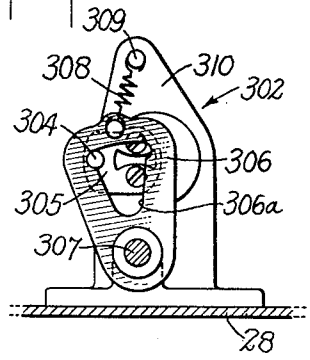

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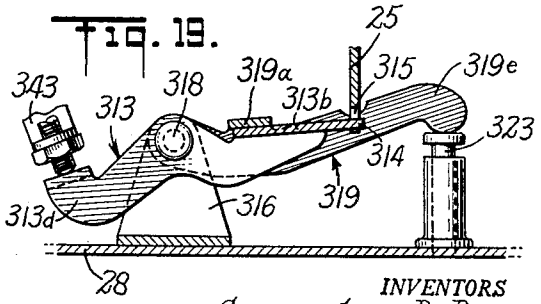

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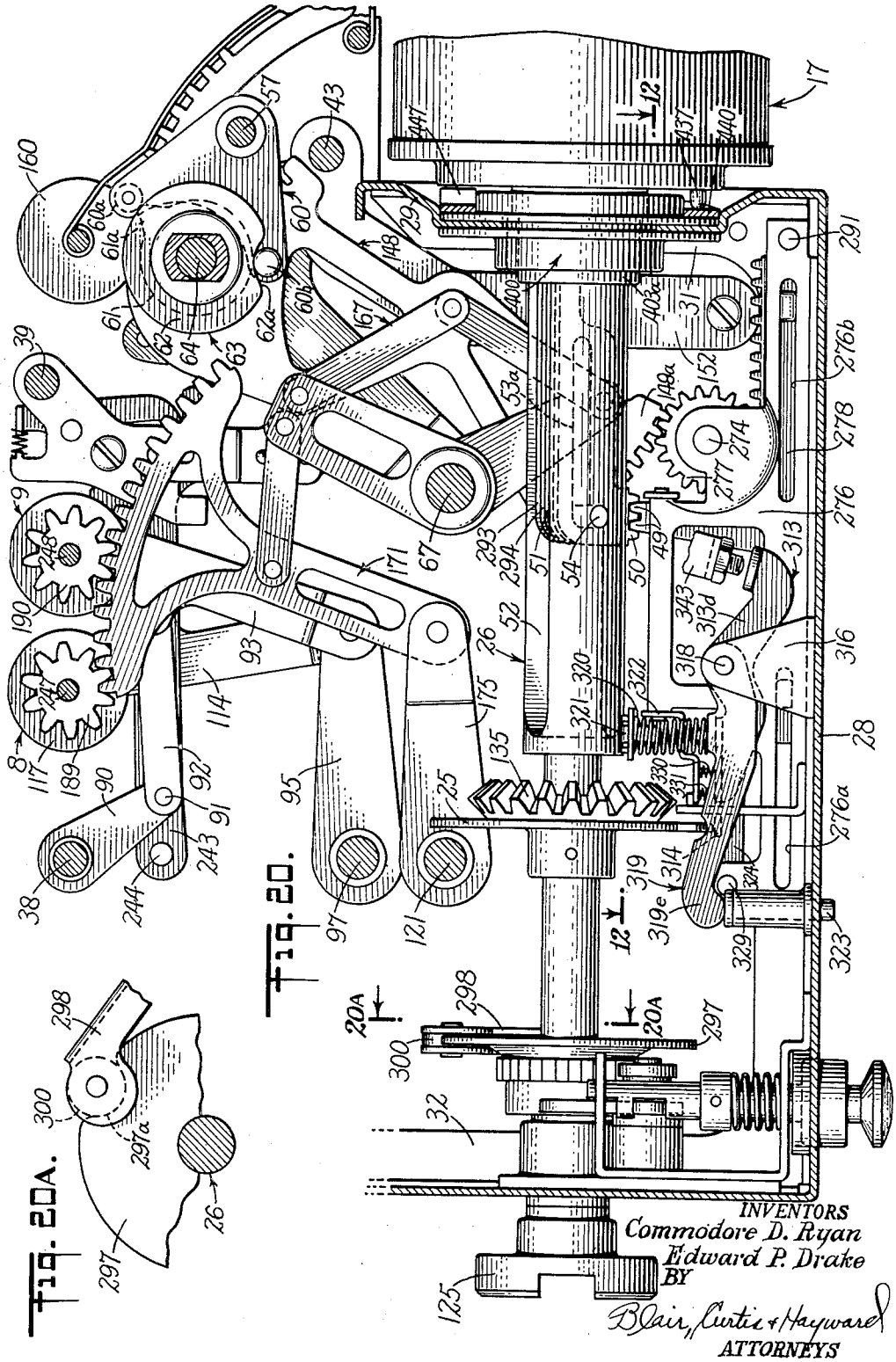

Fig. 20.

Fig. 20A.

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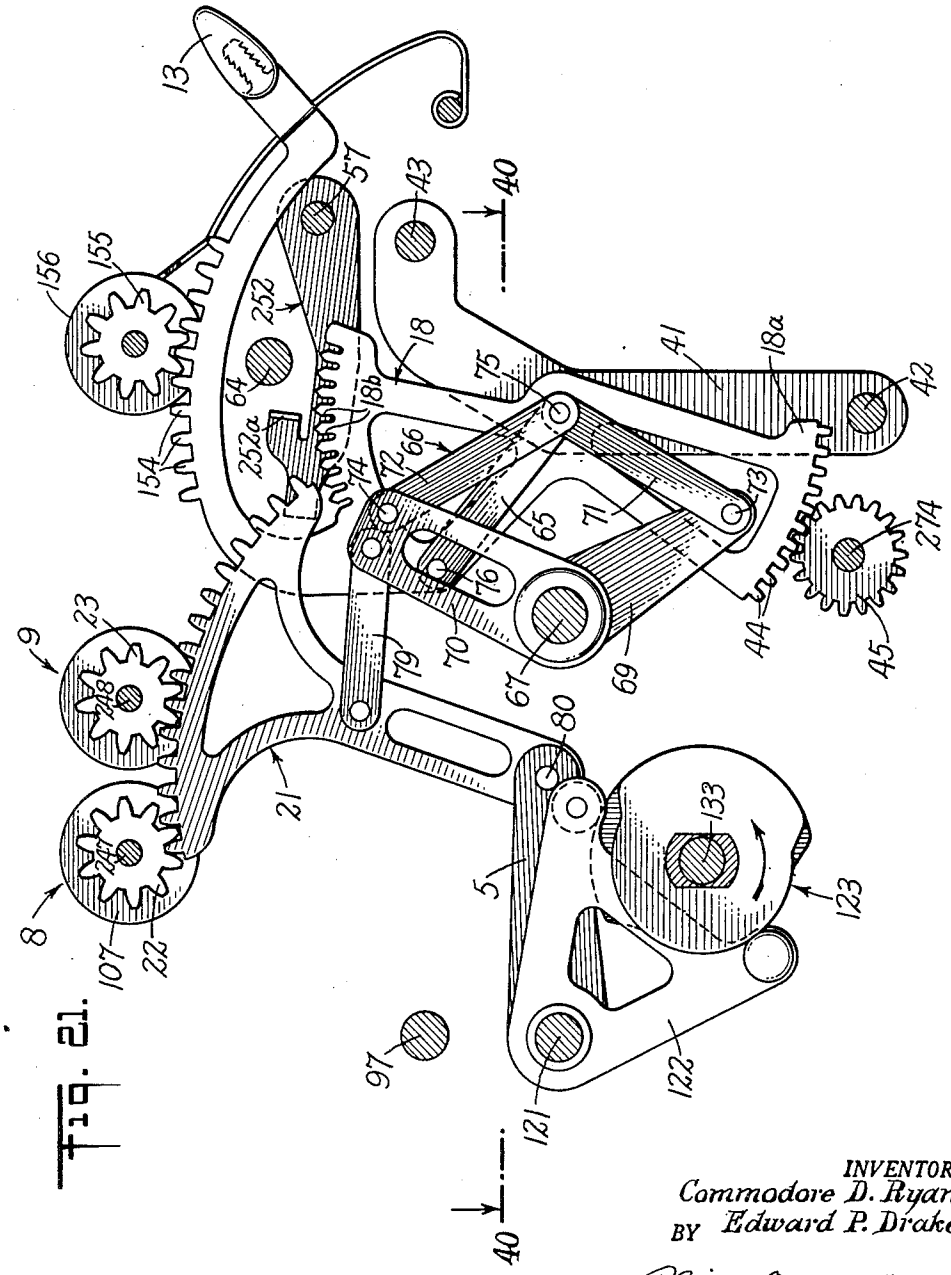

Fig. 21.

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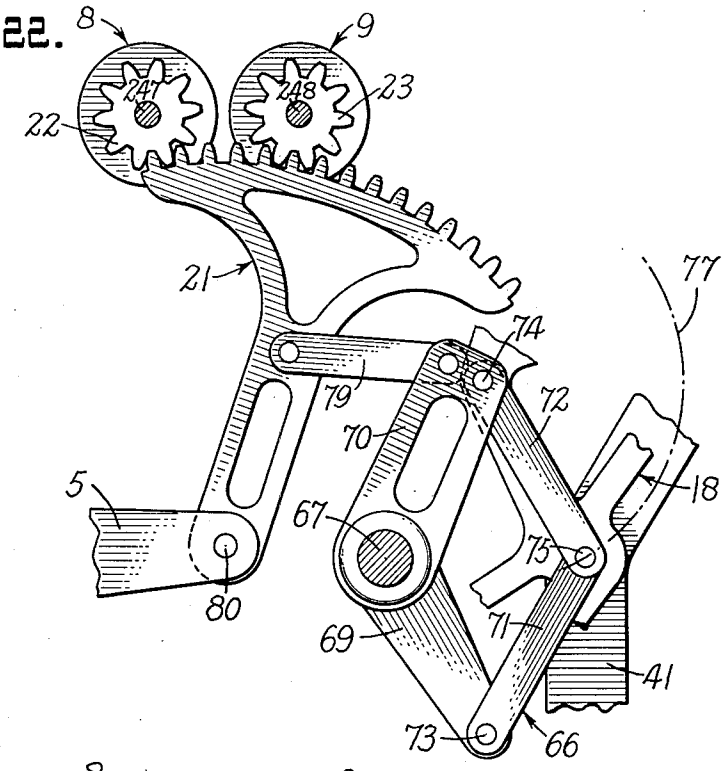
Filed June 16, 1944 30 Sheets-Sheet 10

Fig. 22.



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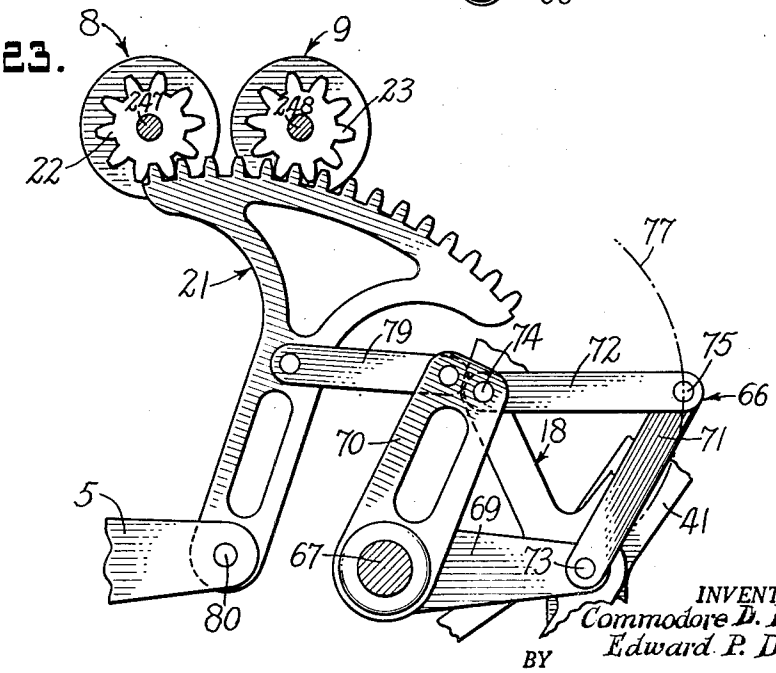

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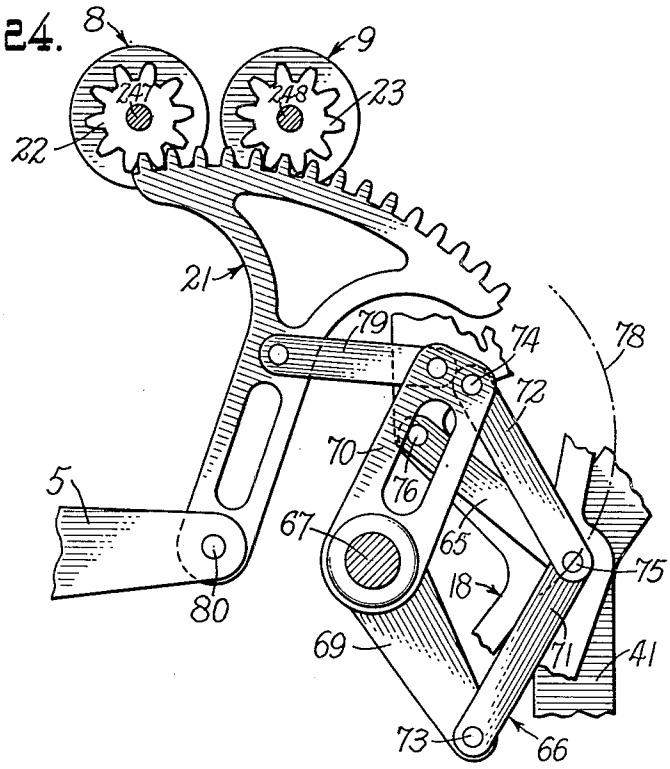
Filed June 16, 1944 30 Sheets-Sheet 11

Fig. 24.



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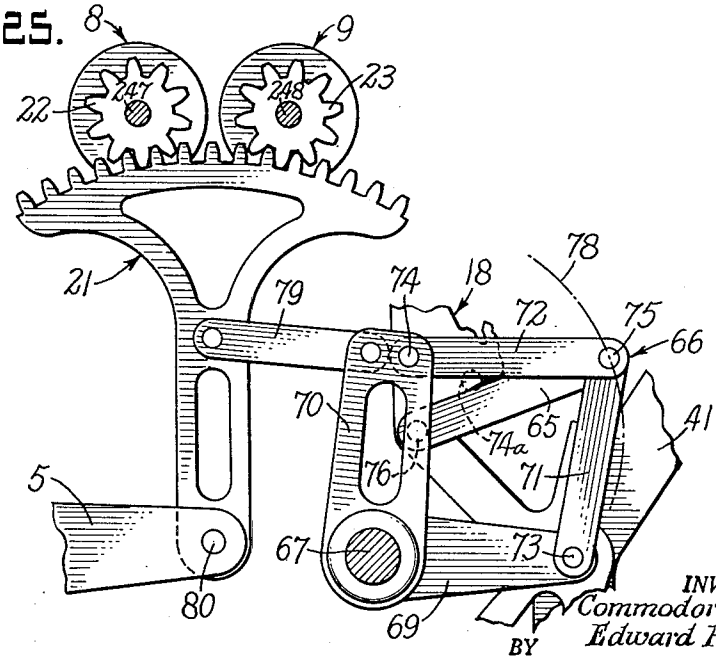

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VALUE PRINTING AND REGISTERING MECHANISM

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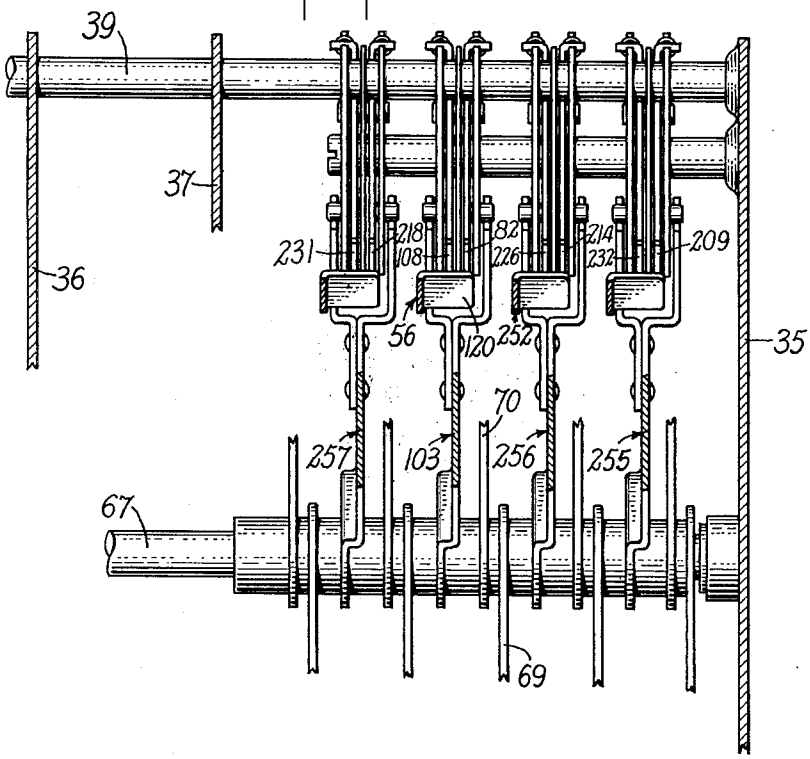
Fig. 26.



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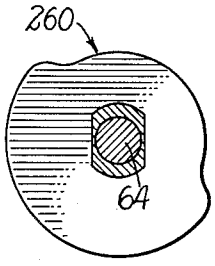

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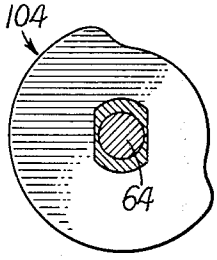

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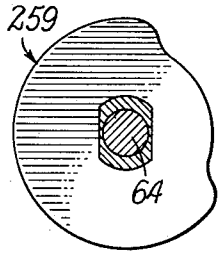

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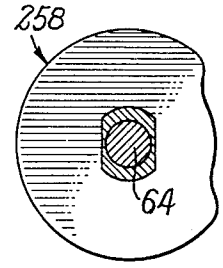

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VALUE PRINTING AND REGISTERING MECHANISM

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Fig. 31.

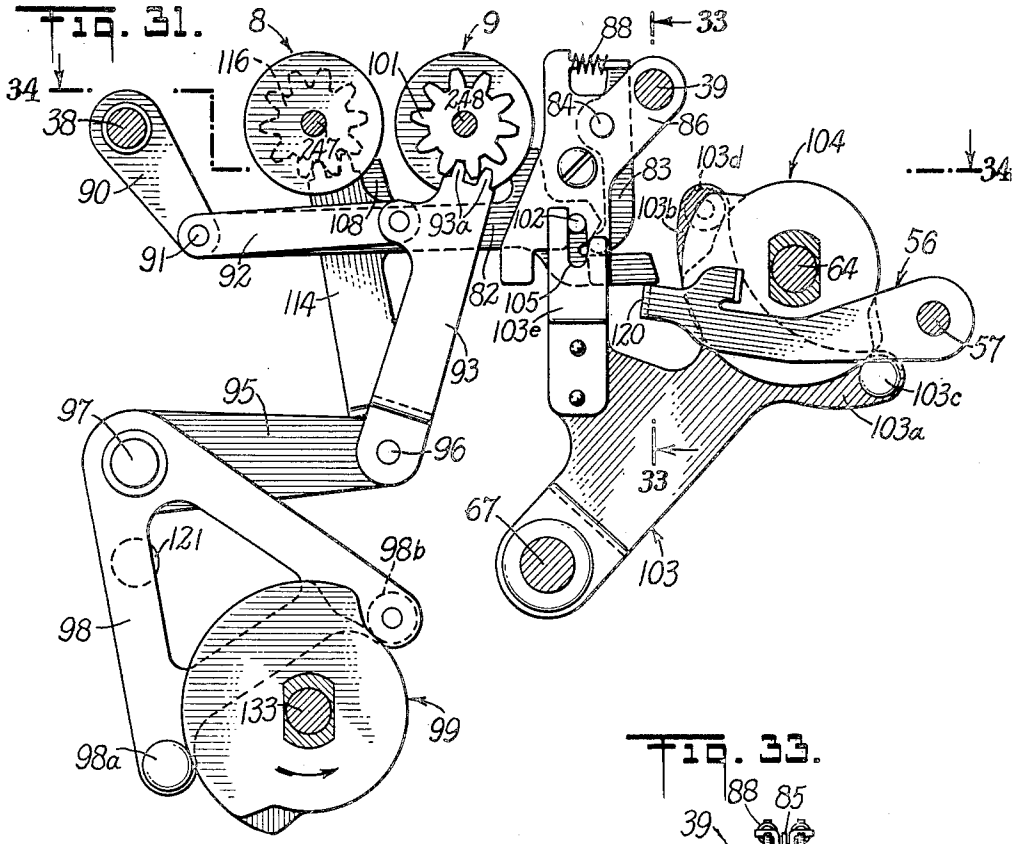
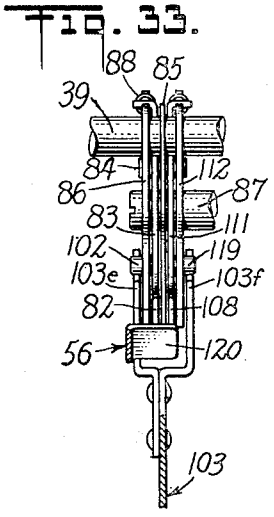


Fig. 33.



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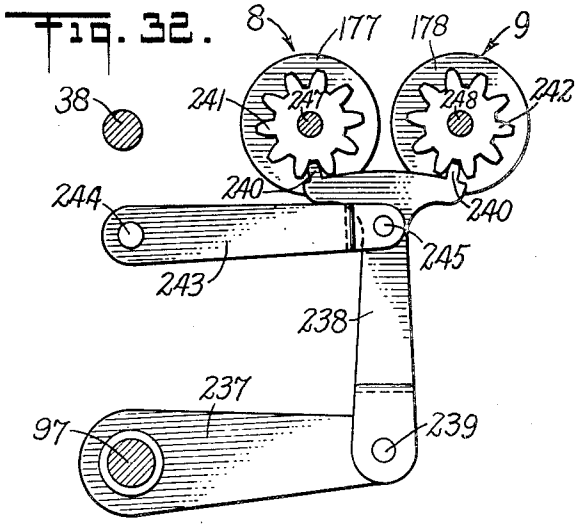

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VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 14

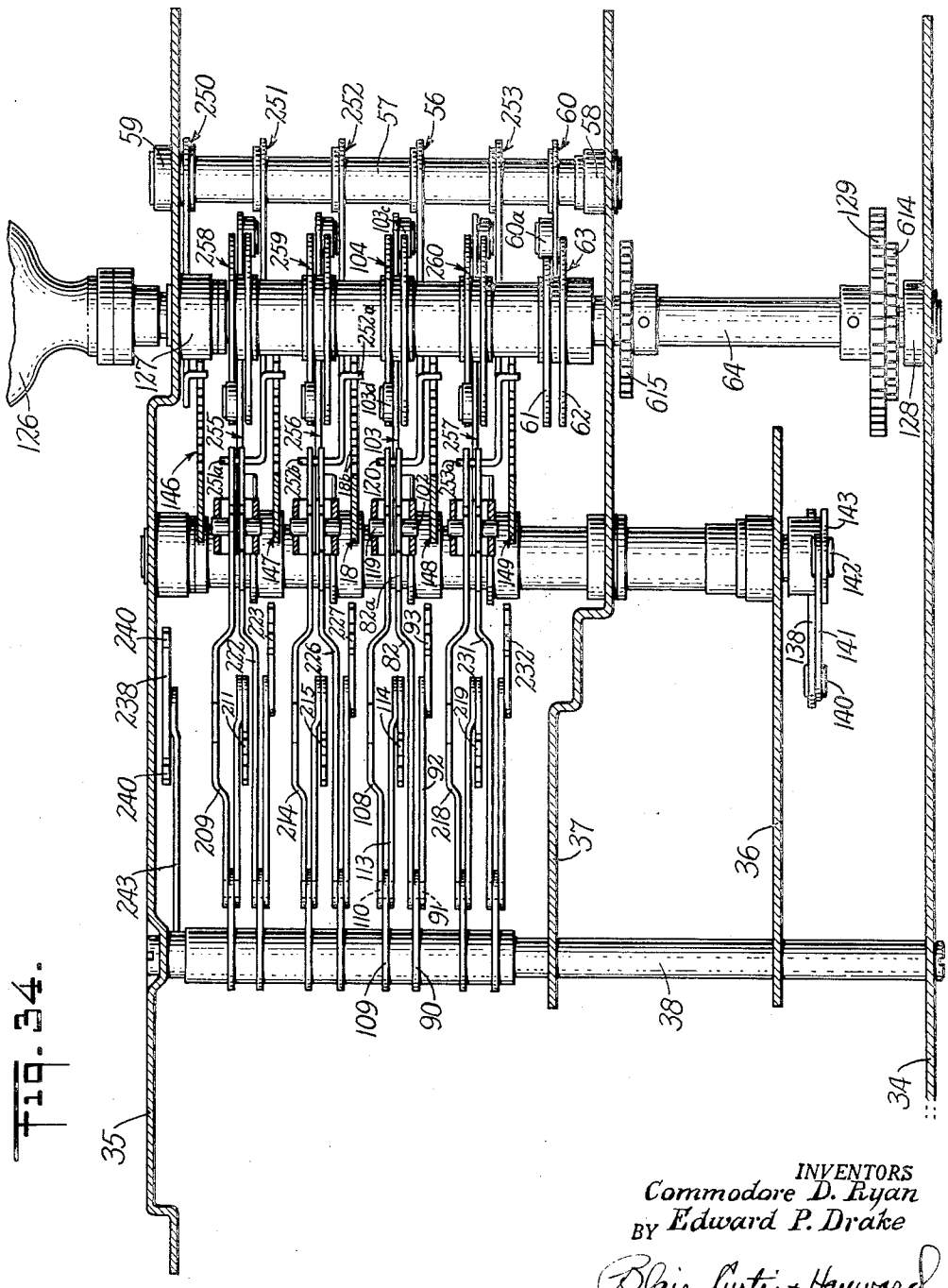

Fig. 34.

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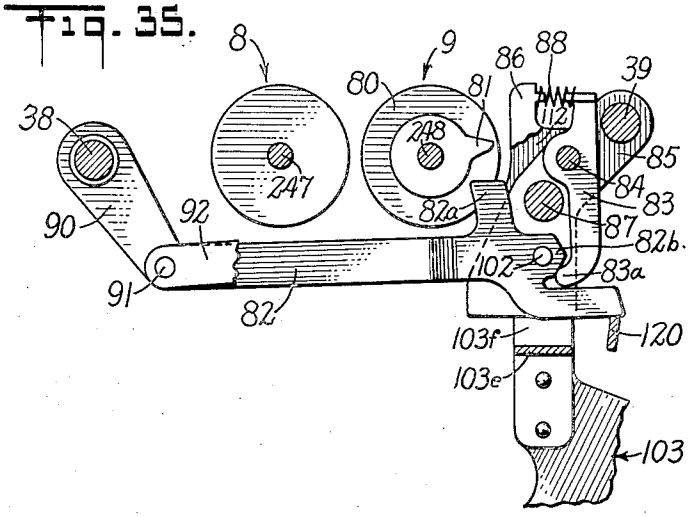
Fig. 35.



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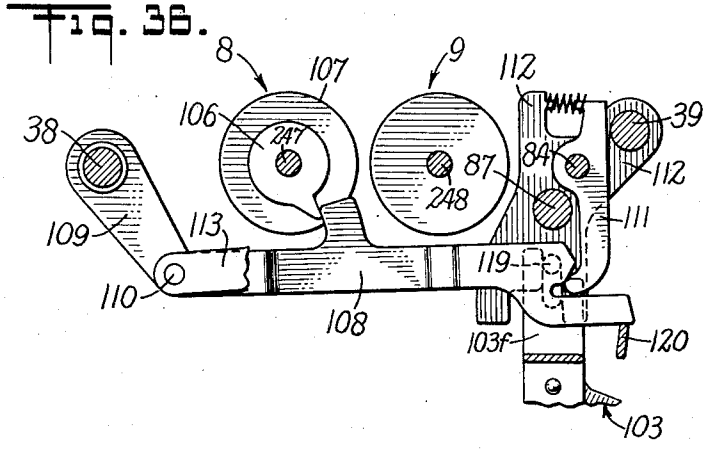

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VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 16

Fig. 35A.

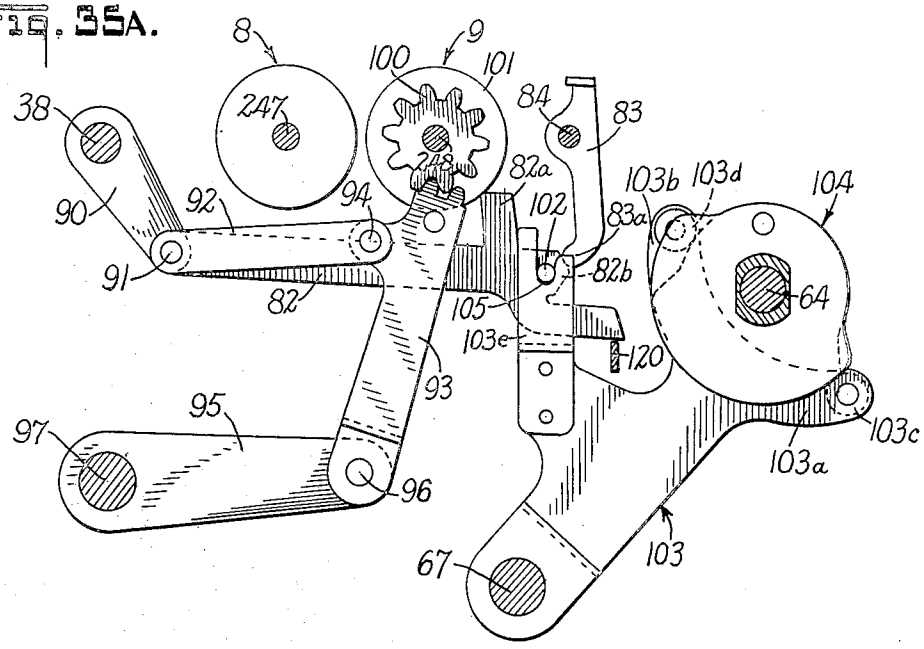
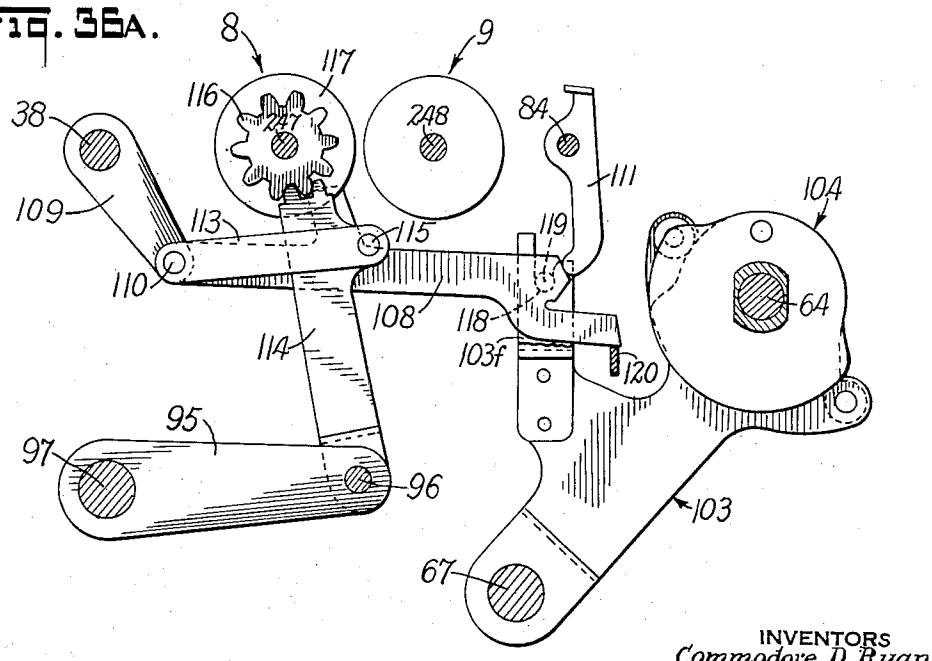


Fig. 36A.



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Filed June 16, 1944 30 Sheets-Sheet 17

Fig. 37.

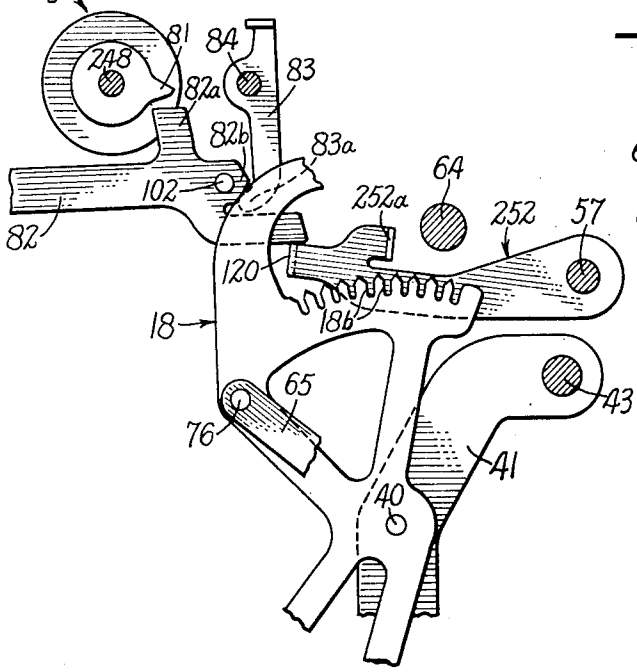
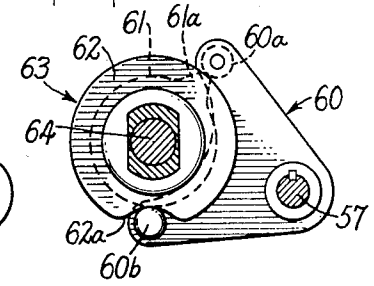


Fig. 37A.



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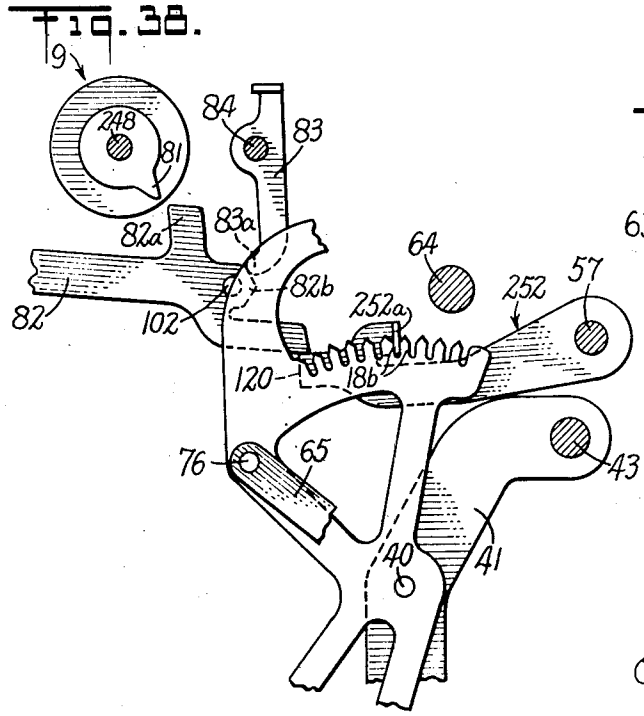
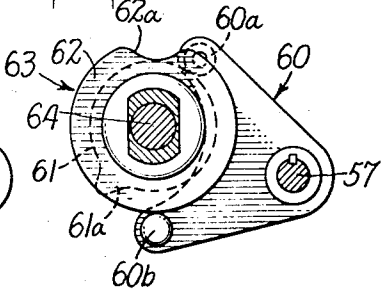


Fig. 38A.



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VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 18

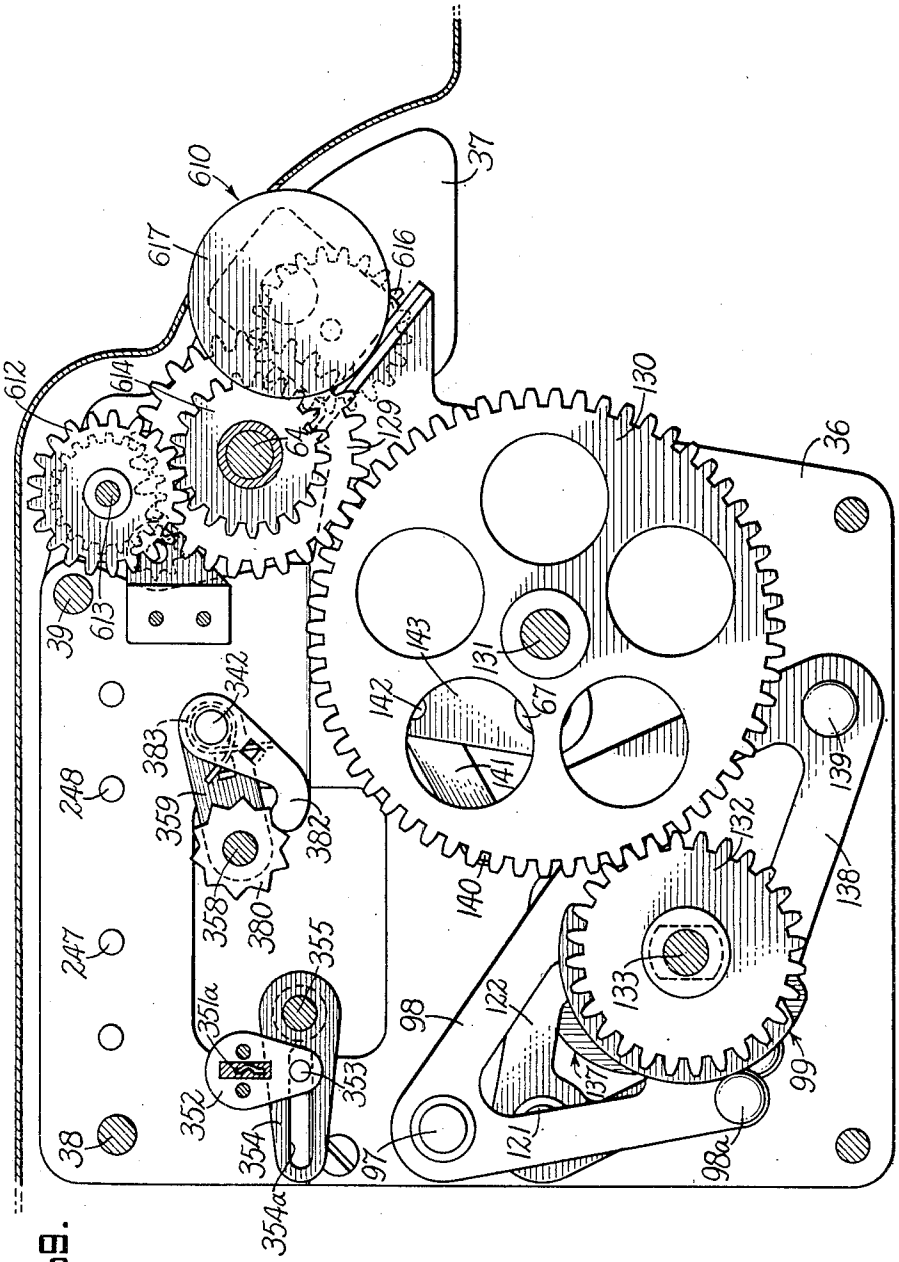

Fig. 39.

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VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 19

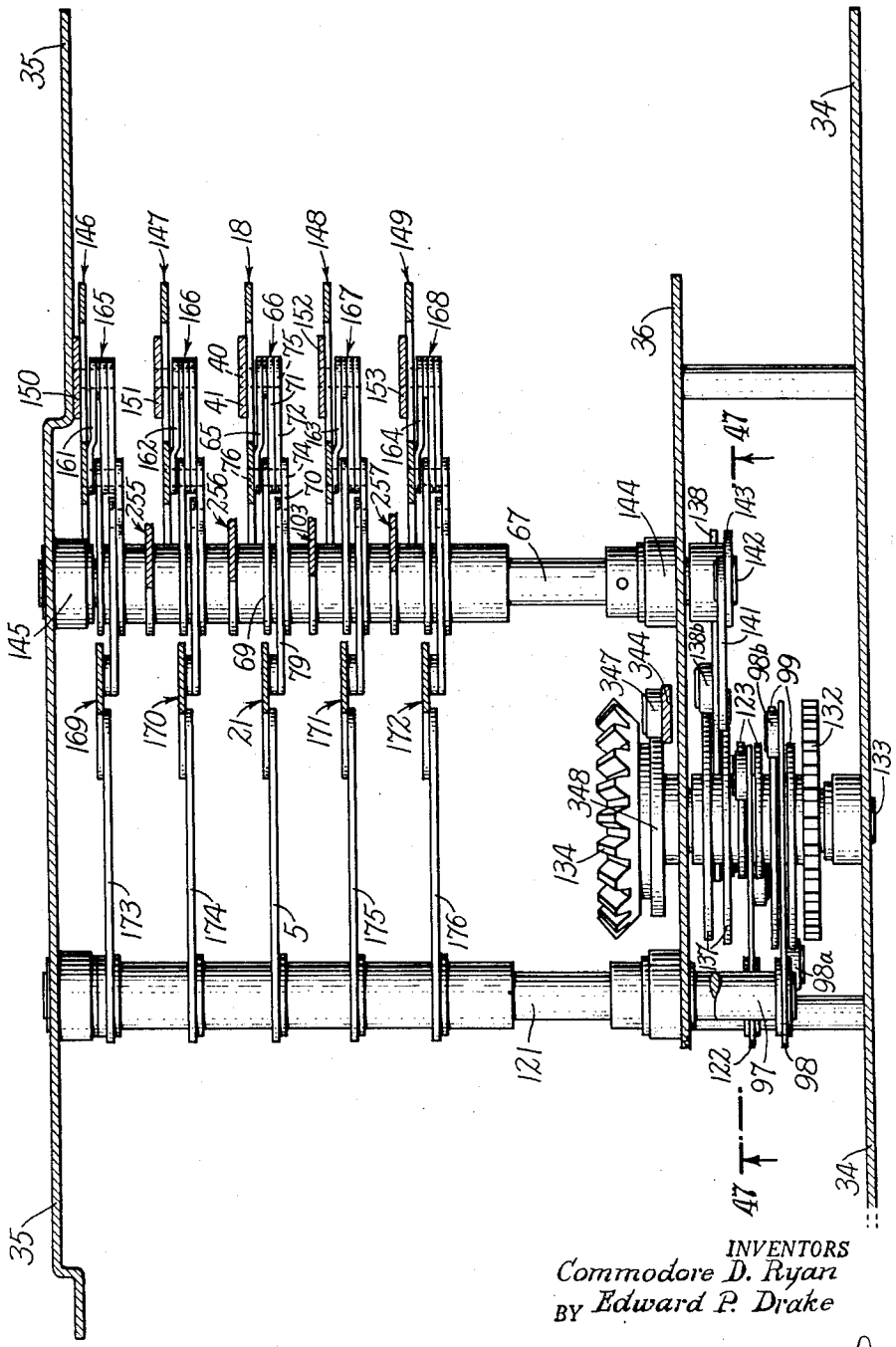

Fig. 40.

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VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 20

FIG. 42.

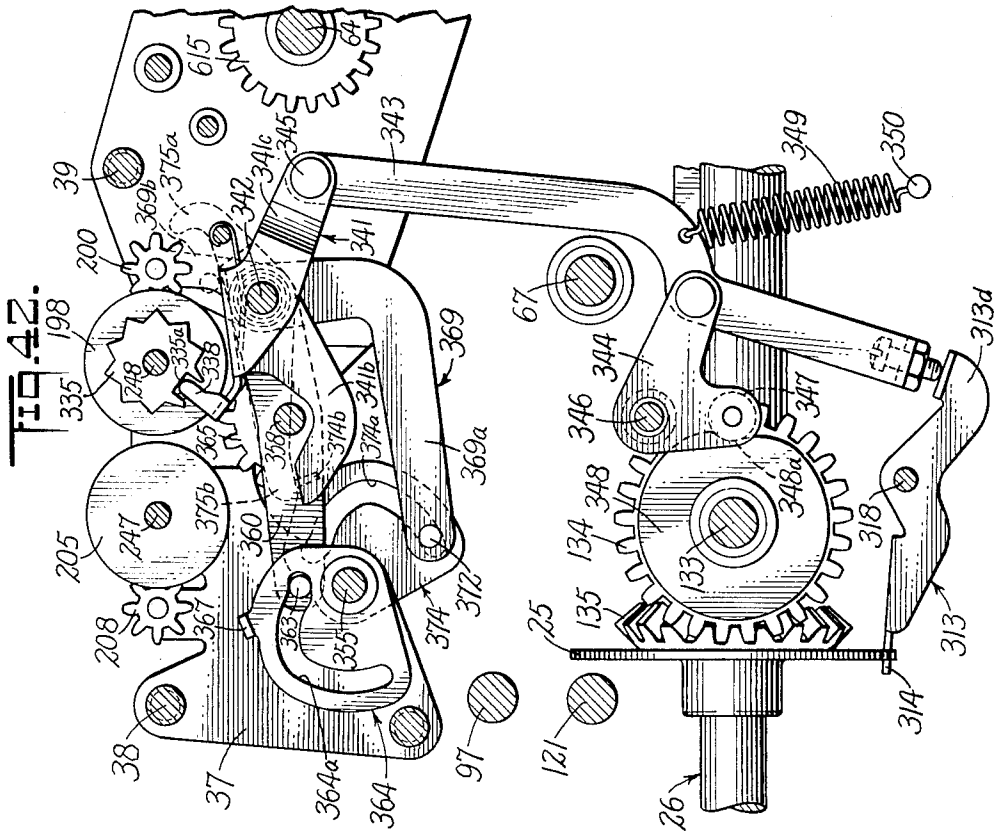

FIG. 41.

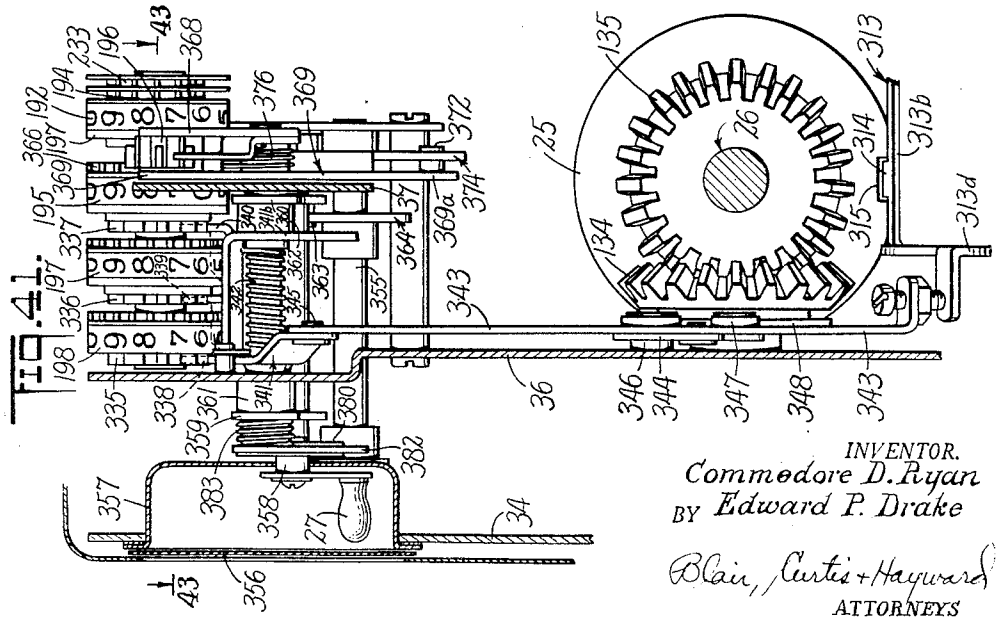

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Fig. 43.

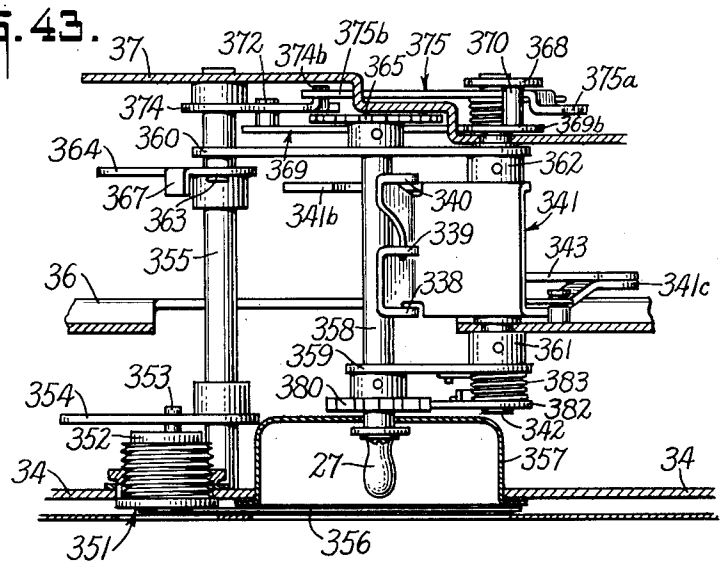

Fig. 44.

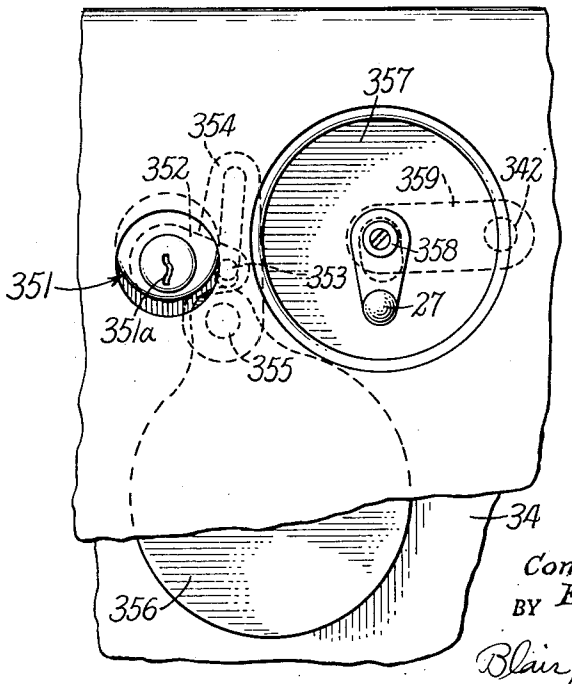

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Fig. 45.

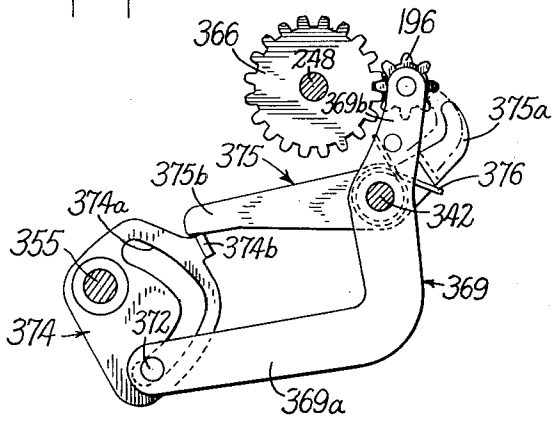


Fig. 46A.

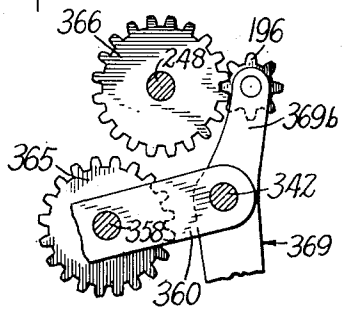
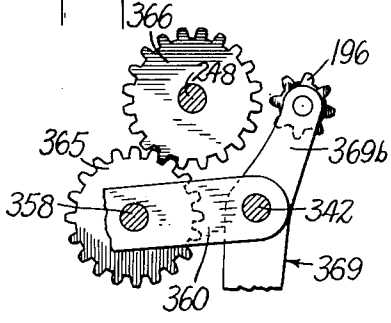


Fig. 46B.



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VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 23

Fig. 47.

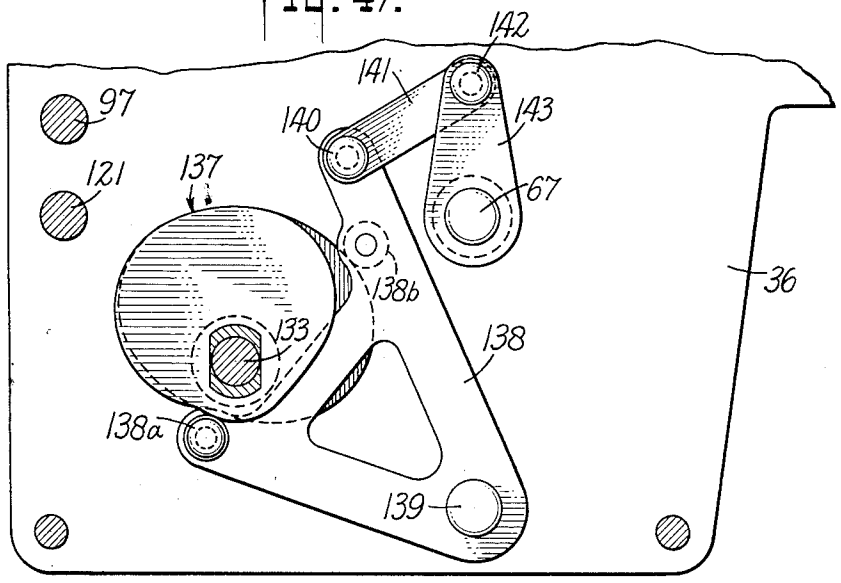


Fig. 62.

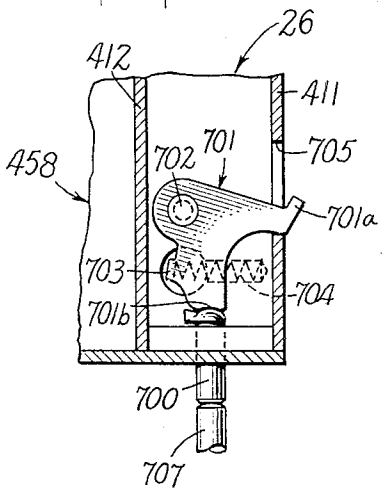
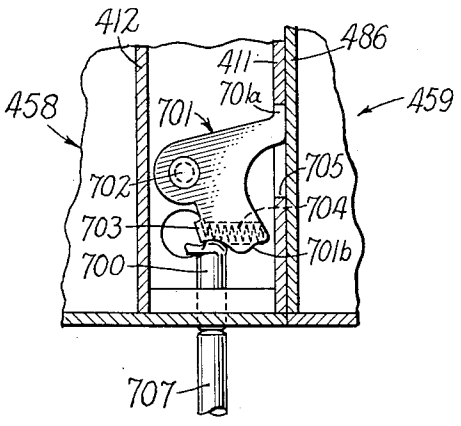


Fig. 63.



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Aug. 1, 1950 C. D. RYAN ET AL 2,516,920

VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 24

Fig. 48A.

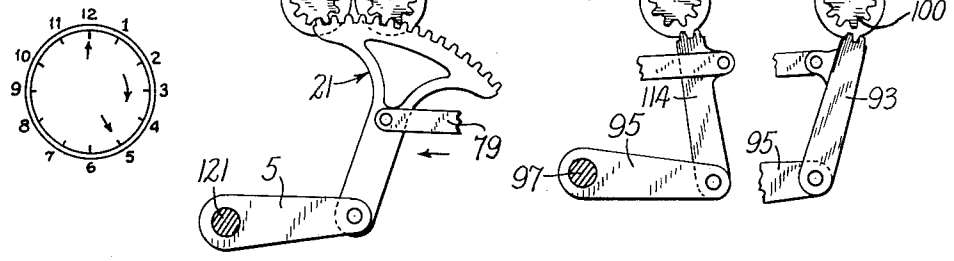


Fig. 48B.

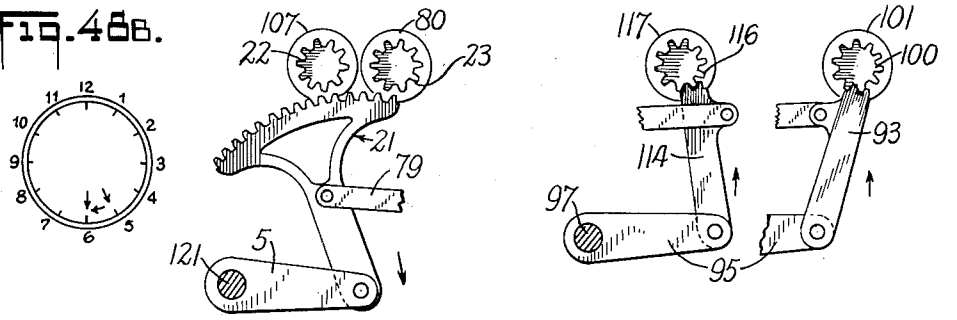


Fig. 48C.

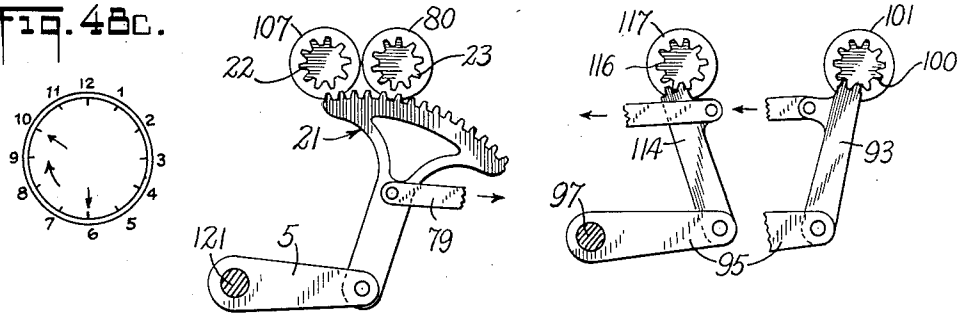
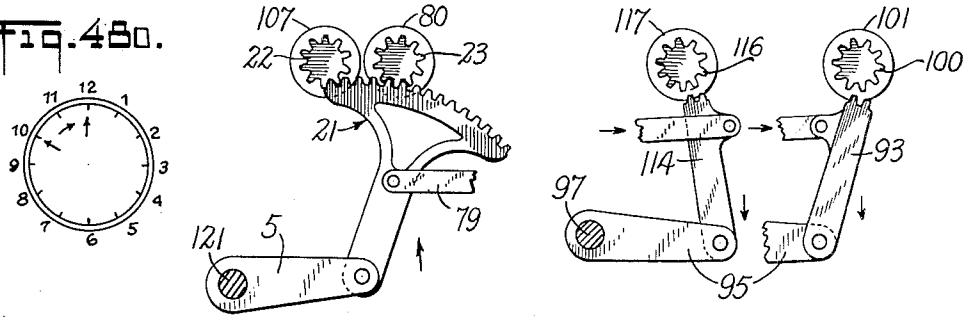


Fig. 48D.



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Aug. 1, 1950 C. D. RYAN ET AL 2,516,920

VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 25

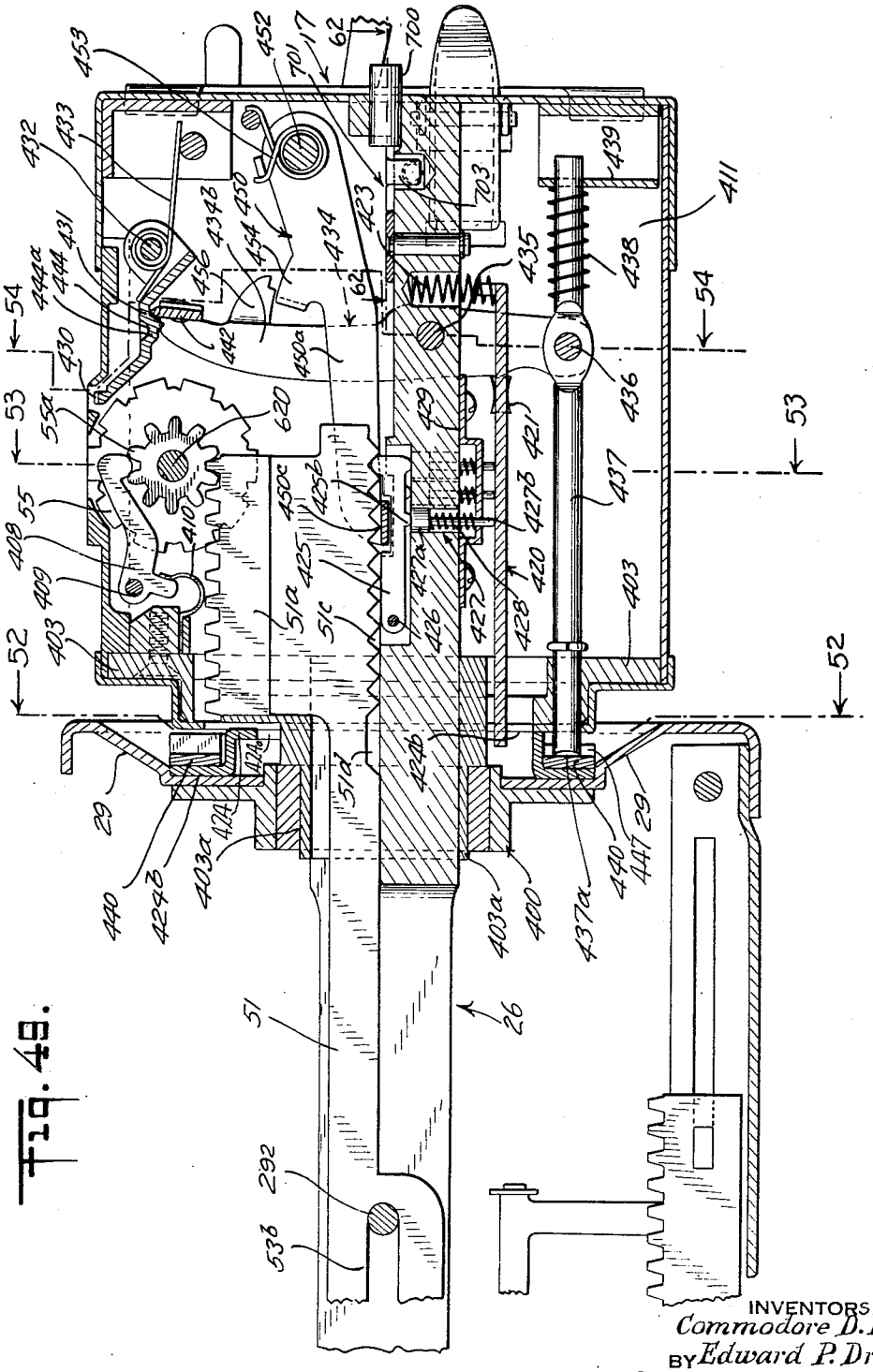

Fig. 49.

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Aug. 1, 1950 C. D. RYAN ET AL 2,516,920

VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 26

Fig. 50.

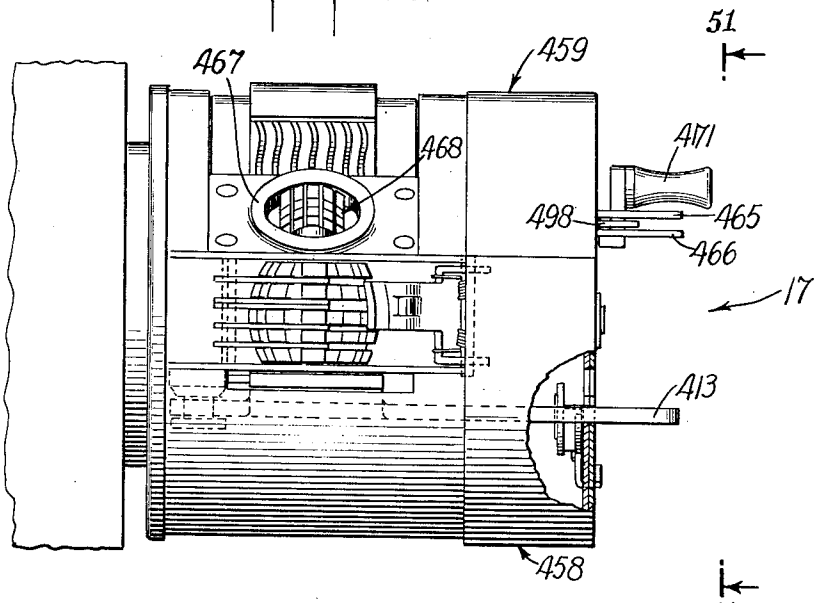
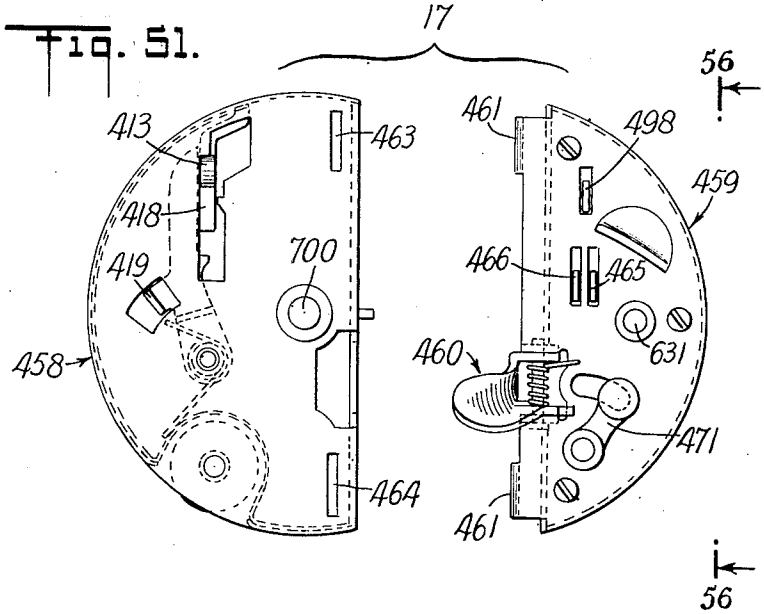


Fig. 51.



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Aug. 1, 1950 C. D. RYAN ET AL 2,516,920

VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 27

Fig. 52.

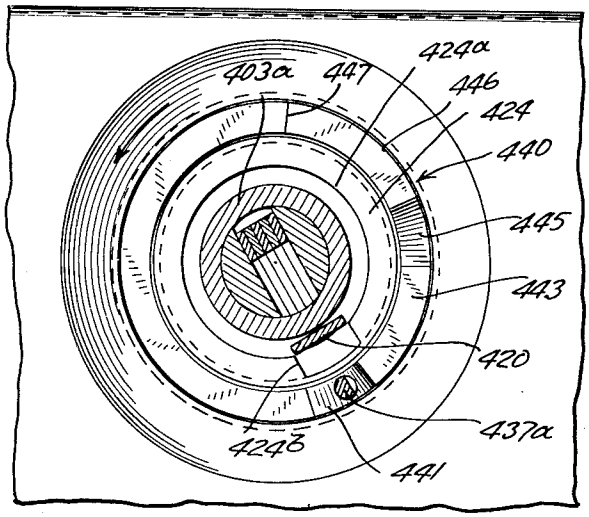


Fig. 52a.

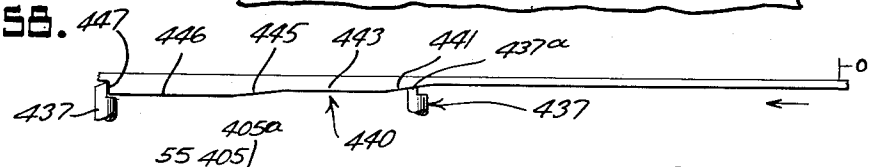
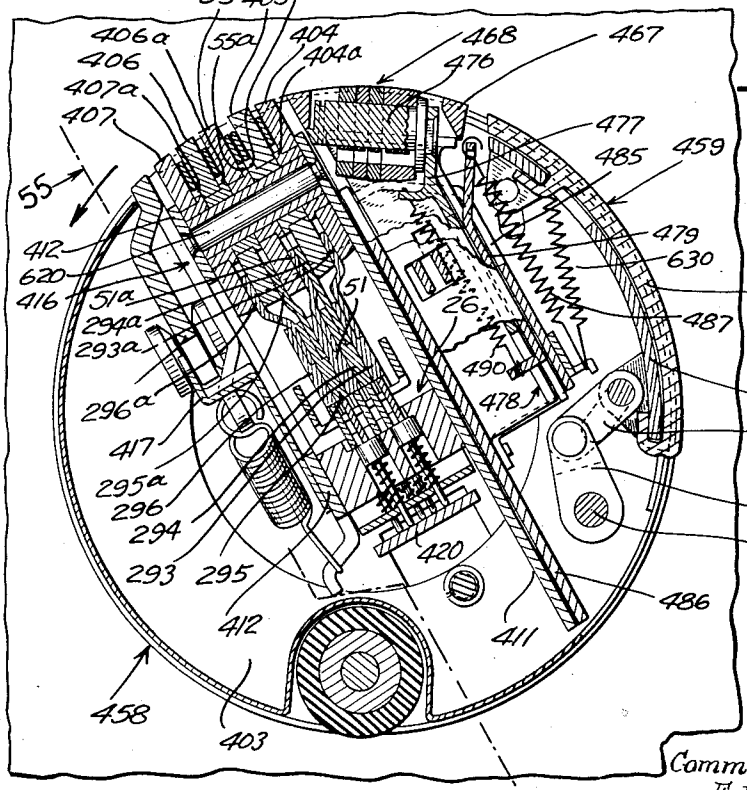


Fig. 53.



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Aug. 1, 1950 C. D. RYAN ET AL 2,516,920

VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 28

Fig. 54.

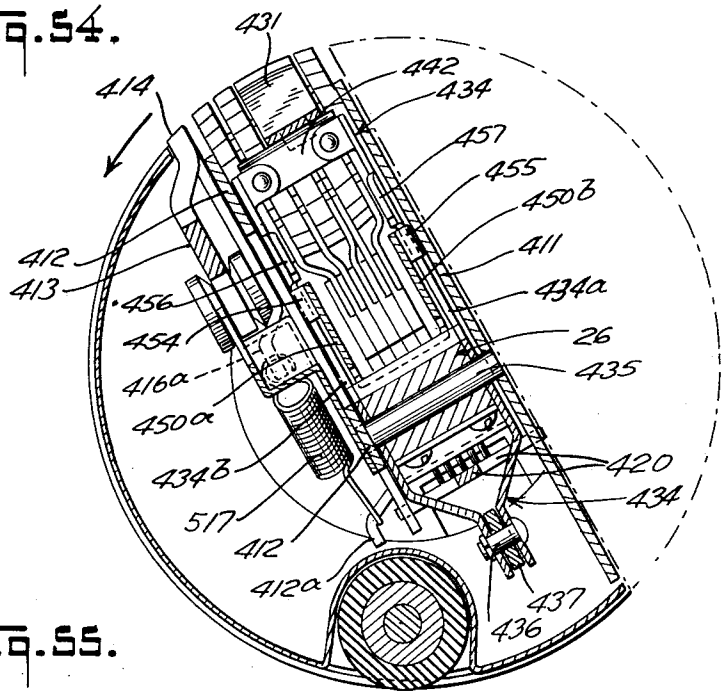
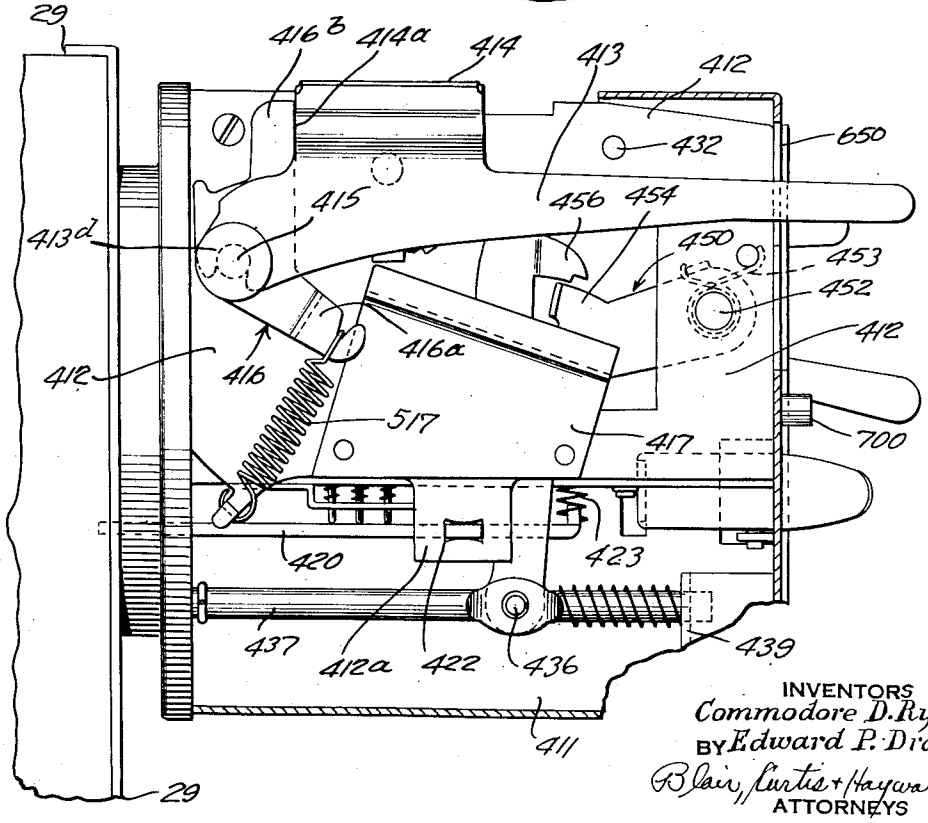


Fig. 55.



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Aug. 1, 1950 C. D. RYAN ET AL 2,516,920

VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 29

Fig. 56.

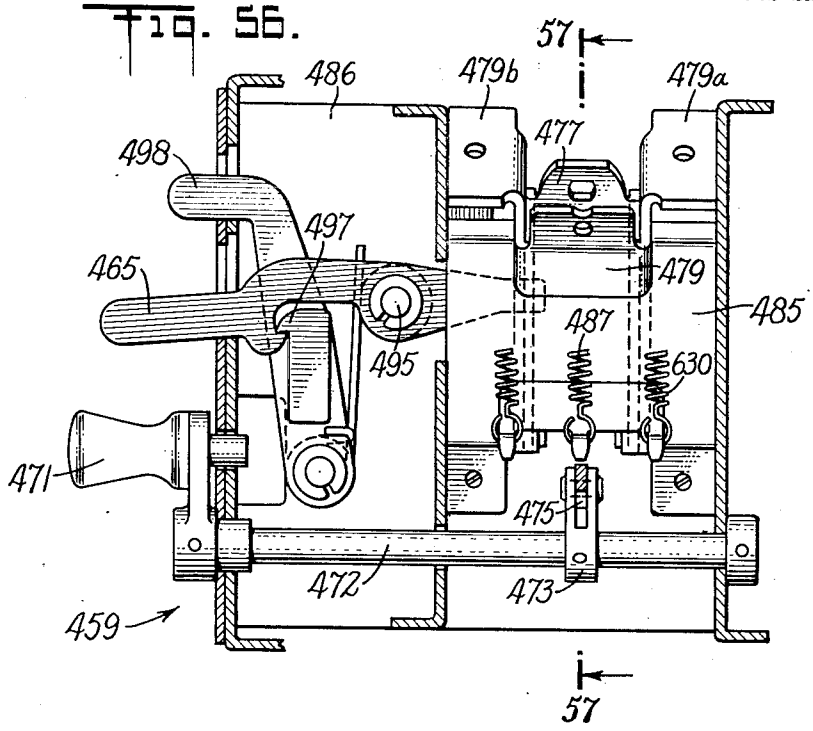
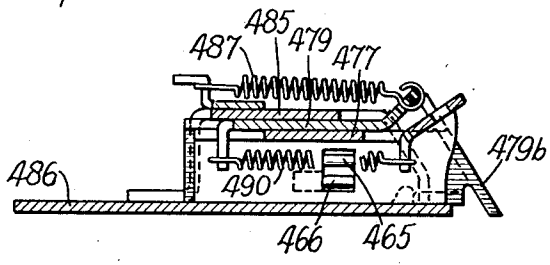


Fig. 57.



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Aug. 1, 1950 C. D. RYAN ET AL 2,516,920

VALUE PRINTING AND REGISTERING MECHANISM

Filed June 16, 1944 30 Sheets-Sheet 30

Fig. 59.

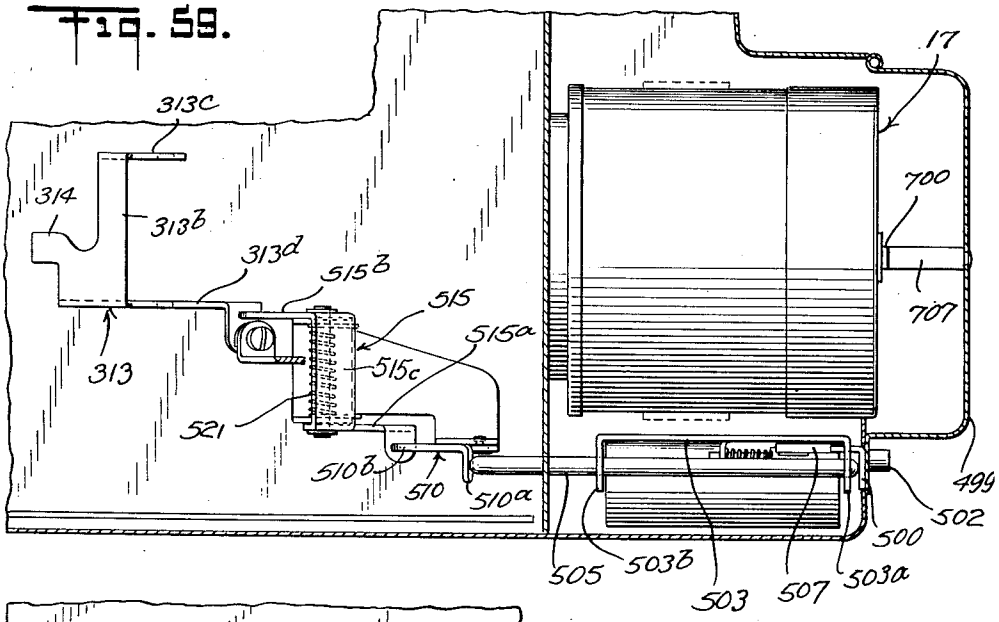


Fig. 61.

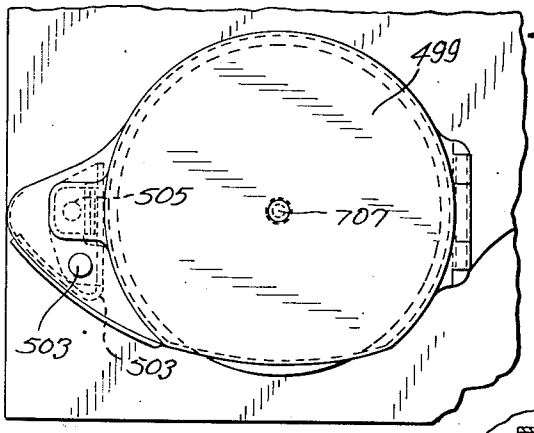
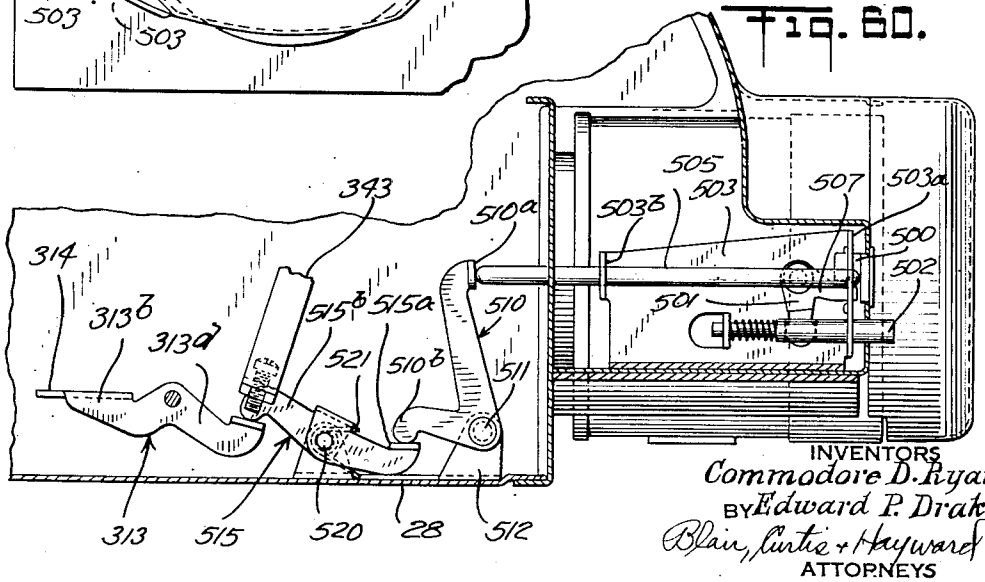


Fig. 60.



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Patented Aug. 1, 1950 2,516,920

UNITED STATES PATENT OFFICE

2,516,920

VALUE PRINTING AND REGISTERING MECHANISM

Commodore D. Ryan and Edward P. Drake, Los Angeles, Calif., assignors to Commercial Controls Corporation, a corporation of Delaware

Application June 16, 1944, Serial No. 540,728

18 Claims. (Cl. 101—91)

1

This invention relates to value printing and registering mechanism and more particularly to mechanism of the above type for use in connection with a mail stamping machine or the like.

One of the objects of this invention is to provide value printing and registering mechanism which is simple, thoroughly practical, and durable in use. Another object is to provide a construction of the above character which will be efficient and accurate in operation. Another object is to provide a construction of the above character which may be manufactured from inexpensive materials without undue labor costs. Another object is to provide a machine of the above character which may be assembled or repaired with extreme ease and few tools. Another object is to provide accurate and efficient mechanism of the above character for registering the amount printed. Another object is to provide a construction of the above character which will be light in weight. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, all as will be illustratively described herein, and the scope of the application which will be indicated in the following claims.

Referring now to the accompanying drawings, in which is shown one of the various possible embodiments of this invention,

Figure 1 is a top plan view of the machine with the housing removed;

Figure 2 is a front elevation of the machine, certain parts being removed for purposes of clarification;

Figure 3 is a rear elevation of the machine, certain parts being removed for purposes of clarification;

Figure 4 is a side elevation of one of the side plates of the machine;

Figure 5 is an end view of the supporting plate shown in Figure 6;

Figure 6 is a side elevation of a supporting plate;

Figure 7 is a side elevation of one of the side plates of the machine;

Figure 8 is a top plan view of the side plate shown in Figure 7;

Figure 9 is a side elevation of another supporting plate;

Figure 10 is a top plan view of the supporting plate shown in Figure 9;

Figure 11 is a perspective view of the mechanism mounted on the base of the machine;

Figure 12 is a top plan view taken substantially on the line 12—12 of Figure 20 showing the index rack bar supporting means and structure associated therewith;

2

Figure 13 is a vertical section taken on the line 13—13 of Figure 12;

Figure 14 is a vertical section taken on the line 14—14 of Figure 12;

Figure 15 is a vertical section taken on the line 15—15 of Figure 17;

Figure 16 is a vertical section taken on the line 16—16 of Figure 20;

Figure 17 is a vertical section taken on the line 17—17 of Figure 12, certain parts being shown in elevation and others shown in section;

Figure 18 is a vertical section taken on the line 18—18 of Figure 17;

Figure 19 is a vertical section taken on the line 19—19 of Figure 12;

Figure 20 is a vertical section taken on the line 20—20 of Figure 1, certain parts being shown in section and others in elevation;

Figure 20*a* is a side elevation of a portion of the aligning mechanism taken from the line 20*a*—20*a* of Figure 20;

Figure 21 is a diagrammatic showing of one unit of the digit registering mechanism of the machine;

Figures 22 and 23 diagrammatically illustrate the operation of a portion of the digit registering mechanism when the setting lever of that unit is set at zero;

Figures 24 and 25 diagrammatically illustrate the operation of a portion of the registering mechanism when the setting lever is set to register and print a sum;

Figure 26 is a vertical section taken on the line 26—26 of Figure 1, certain parts of the machine being removed for purposes of clarification;

Figures 27, 28, 29, and 30 illustrate the relative positions of the cams which actuate the transfer mechanism;

Figure 31 is a diagrammatic showing of the transfer mechanism;

Figure 32 is a vertical section taken on the line 32—32 of Figure 1;

Figure 33 is a side elevation of a portion of the transfer mechanism taken substantially on the line 33—33 of Figure 31, certain parts being shown in section and others in elevation;

Figure 34 is a horizontal section taken through the machine substantially on the line 34—34 of Figure 33, certain parts being removed for purposes of clarification;

Figures 35 and 35*a* diagrammatically illustrate the operation of a portion of the transfer mechanism actuated by one of the counterwheels of the descending register;

Figures 36 and 36*a* diagrammatically show the operation of the portion of the transfer mechanism actuated by one of the counterwheels of the ascending register;

Figures 37, 37*a*, 38 and 38*a* diagramatically illustrate the resetting of the transfer mechanism

and the locking of the setting lever segment during an operating cycle;

Figure 39 is a vertical section taken substantially on the line 39—39 of Figure 1;

Figure 40 is a horizontal section taken on the line 40—40 of Figure 21, certain parts of the machine being removed for purposes of clarification;

Figure 41 is a vertical section taken on the line 41—41 of Figure 1;

Figure 42 is a vertical section taken on the line 42—42 of Figure 1;

Figure 43 is a horizontal section taken on the line 43—43 of Figure 41, certain parts being shown in elevation and others in section;

Figure 44 is a side elevation of a portion of the machine taken on the line 44—44 of Figure 1;

Figure 45 illustrates diagrammatically the operation of a portion of the register resetting mechanism and is taken on the line 45—45 of Figure 44;

Figures 46*a* and 46*b* illustrate diagrammatically the operation of a portion of the register resetting mechanism and are taken substantially on the line 46—46 of Figure 41;

Figure 47 is a vertical section taken on the line 47—47 of Figure 40;

Figures 48*a*, 48*b*, 48*c*, and 48*d* diagrammatically illustrate the relative positions of the counterwheel actuating and transfer mechanisms during an operating cycle;

Figure 49 is a vertical section taken on an enlarged scale through the machine and through a portion of the front of the machine;

Figure 50 is a top plan view of the printing head of the machine;

Figure 51 is a front view of the machine head taken from the line 51—51 of Figure 50;

Figure 52 is a vertical section taken on the line 52—52 of Figure 49;

Figure 53 is a vertical section taken on the line 53—53 of Figure 49;

Figure 54 is a vertical section taken on the line 54—54 of Figure 49, showing only that portion of the head having the value printing wheels mounted therein;

Figure 55 is a vertical section taken longitudinally through the machine substantially on the line 55—55 of Figure 53;

Figure 56 is a view taken from the line 56—56 of Figure 51, the housing and certain parts of this section of the printing head being removed for purposes of clarification;

Figure 57 is a longitudinal section taken on the line 57—57 of Figure 56, certain parts being removed for purposes of clarification;

Figure 58 diagrammatically illustrates the cam which controls the printing of the postage meter number;

Figure 59 is a horizontal section taken through the machine, certain parts being removed for purposes of clarification and showing the lock for the printing head door;

Figure 60 is a vertical section taken through the machine illustrating the printing head door lock, certain parts being removed for purposes of clarification;

Figure 61 is a front elevation of the housing of the machine;

Figure 62 is a top plan view of a portion of the printing head taken from the line 62—62 of Figure 49; and,

Figure 63 is a view similar to Figure 62 with the parts in different relative positions.

Similar reference characters refer to similar parts throughout the several views of the drawings.

It might here be noted that reference hereinafter to a "forward" direction signifies a direction to the right, as viewed in Figure 1, and that the end of the machine adjacent the printing head 17 (Figure 11) is the front of the machine. A "rearward" direction denotes the direction opposite to the forward direction described hereinabove. An "upward" direction refers to a direction upwardly from the bottom of the machine to its top, while a "downward" direction denotes the opposite direction thereto.

The machine described hereinafter may be mounted on and used in conjunction with the mailing machine base described in the co-pending application of Frank P. Sager et al., Serial No. 332,305, filed April 29, 1940, for a Mail Treating Machine now Patent Number 2,371,070, issued March 6, 1945.

The machine is enclosed in a housing, generally indicated at 10 (Figures 59, 60 and 61), which is secured and sealed to the framework of the machine in such a manner as to indicate its unauthorized removal. Projecting through the front of the machine are a series of setting knobs 11, 12, 13, 14 and 15 (Figures 1 and 60). When these knobs are moved toward the rear of the machine, setting levers, such as setting lever 18 (Figure 21), on which the knobs are mounted act through gears and nested shafts, generally indicated at 19 (Figure 11), and racks, generally indicated at 20, to set type wheels, generally indicated at 16, in the rotatable printing head, generally indicated at 17.

Movement of each of the setting levers, such as setting lever 18 (Figure 21), also conditions linkage which, during the operating cycle of the machine, drives a counterwheel actuating member, such as member 21, causing it in turn to drive counterwheels in the ascending and descending registers, generally indicated at 8 and 9, the amount of the digit at which a setting knob is set. During the operation of the counterwheel actuating members, transfer means is conditioned as tens are accumulated in both the ascending and descending registers 8 and 9, and during the last portion of the operating cycle, the transfer mechanism is actuated to transfer or carry over any tens which have been accumulated by any counterwheel to the next higher counterwheel in its register.

In addition, zero locking mechanism is provided, including a zero locking bracket, generally indicated at 341 (Figure 42) which acts with link 343 to move a portion 344 of lever 342 into interlocking relationship with a disc 25 connected to head shaft 26 when all of the postage in resettable portion of the descending register has been exhausted. Furthermore, as is best shown in Figures 41 and 43, mechanism operated by handle 27 is disclosed to permit a clerk at a post office to quickly reset the descending register upon the purchase of a new amount of postage.

Referring now to the drawings in detail and to Figure 11 in particular, the machine includes a base plate 28 having front wall 29 and rear wall 30 extending upwardly therefrom. Front and rear walls 29 and 30 are connected to base plate 28 by reinforcing ribs 31, 32, and 33. The portions of these ribs flanging upwardly, rearwardly, and forwardly from base plate 28, wall 29, and wall 30 serve as supports to which the left and right side plates 34 and 35 (Figures 1,

4, and 7) are connected in any suitable manner, such as by screws. Side plates 34 and 35, together with supporting plates 36 and 37 (Figures 1, 6, and 9) and a plurality of spacing rods, such as rods 38 and 39 (Figure 1) form the framework (Figures 2 and 3) on which the registers, counterwheel actuating and transfer mechanism, setting mechanism for the type wheels, register resetting mechanism, and zero lock mechanism are mounted.

As the trains of mechanism leading from each setting knob to the value printing wheel associated with it in the rotatable printing head 17 (Figure 11) and for registering (Figure 20) the amount printed by its type wheel is substantially similar for each of the setting knobs, the mechanism associated with setting knob 13 (Figure 1) will first be described in detail.

Setting knob 13 actuates setting lever 18 (Figure 37) which is pivotally mounted by a pin 40 (Figure 37) on a supporting plate 41 (Figures 2, 21, and 37). Supporting plate 41 is rigidly mounted on a pair of spacing rods 42 and 43 connected to side plate 34 (Figure 2) and to supporting plate 37. Supporting plate 41 is parallel to the sides of the machine, thus insuring movement of setting lever 18 in a plane parallel to the side plates. The lower end of setting lever 18 (Figure 21) has a plurality of teeth 44 thereon which mesh with and turn a spur gear 45. Spur gear 45 (Figures 12 and 16) is connected by a sleeve 46 to a gear 47 which meshes with the teeth 48a (Figure 13) of rack bar 48. Rack bar 48 has an upwardly extending arm 48b thereon which extends upwardly from the main body of the rack bar and thence extends to the left, as viewed in Figure 16, where its teeth 49 (Figure 13) mesh with teeth 50 of a setting bar 51 (Figures 13, 16, and 49).

Setting bar 51 is mounted for longitudinal movement with respect to head shaft 26 in a cut out portion 52 (Figures 16 and 20) extending longitudinally therealong. Bar 51 is mounted on a pair of pins 54 and 292 (Figures 20 and 49) mounted on head shaft 26. These pins extend through slots 53a and 53b in bar 51 thus permitting bar 51 to be moved longitudinally of the head shaft. The forward end of bar 51 has a gear rack 51a thereon (Figure 49) which coacts with gear 55a to set value printing wheel 55 as bar 51 is moved longitudinally with respect to the head shaft.

Thus, as setting knob 13 (Figure 21) is moved to the digit which it is desired to print, the gear segment 18a of setting lever 18 acts through gear 45 (Figures 12, 16, and 21), sleeve 46, gear 47, rack bar 48 (Figure 13), and setting bar 51 (Figure 49) to set the value printing wheel 55 (Figure 49) at the value it is desired to print. During the operating cycle of the machine, teeth 49 and 50 unmesh (Figures 13 and 16) as the head shaft makes a revolution. At the end of the printing revolution, aligning and locking mechanism to be described hereinafter, assure the proper meshing (Figures 13 and 16) of the teeth on each of the upwardly extending arms, such as arm 48b, of each rack bar with the teeth on its setting bar, such as bar 51.

To assure alignment of setting lever 18 (Figure 21) on a digit during an operating cycle, a mechanically operated aligning arm, generally indicated at 252 (Figure 21) is provided. This arm is secured to a shaft 57 (Figures 2 and 34) which is rotatably mounted in a pair of bearings 58 and 59 secured to supporting plate 37 and side plate 34, respectively. A cam yoke 60 (Figure 37a) is connected to shaft 57 in any suitable manner adjacent the left-hand end thereof, as viewed in Figure 34. This cam yoke has a pair of cam rollers 60a and 60b (Figure 37a) which coact with the two cam discs 61 and 62 (Figures 34 and 37a) of a double cam, generally indicated at 63. Double cam 63 is connected to a shaft 64 which is turned by a crank 126 (Figure 1) or is driven through a single revolution during each cyclic operation of the machine.

Referring to Figure 37a, it will be seen that the peripheries of cams 61 and 62 are provided with raised and recessed portions 61a and 62a which coact with the cam rollers on cam yoke 60 to rock shaft 57. Cam discs 61 and 62 are so positioned on shaft 64 that at the beginning of a cycle as shaft 64 turns, shaft 57 is turned in a counterclockwise direction, as viewed in Figure 37, a sufficient distance to move a finger 252a (Figures 34 and 38) on aligning arm 252 between two of the teeth 18b on setting lever 18. Double cam 63 then acts through yoke 60, shaft 57, arm 252, and finger 252a to hold setting lever 18 in its set position until the end of the operating cycle is reached. At this time, cam 63 acts upon yoke 60 to turn shaft 57 in a clockwise direction and thus disengage finger 252a from teeth 18b. At the end of the cycle of operation finger 252a is out of engagement with teeth 18a thus permitting setting lever 18 to be reset.

Referring to Figure 37 when setting lever 18 is moved in a counterclockwise direction about its pivotal connection 40 to supporting plate 41, it positions link 65 (Figures 21 and 40) to condition the variable drive linkage, generally indicated at 66, so that when shaft 67 is rocked in a counterclockwise direction (Figure 21) during an operating cycle, counterwheel actuating member 21 is driven through link 79 to register the amount of the digit at which setting lever 18 is set. Referring to Figure 22, shaft 67 has an arm 69 connected thereto in any suitable manner. Link 70 of variable drive linkage 66 is pivotally mounted on shaft 67. Links 71 and 72 are pivotally connected to the outer ends of arm 69 and link 70 by pivot pins 73 and 74 and are pivotally connected to each other and to link 65 (Figures 21, 22, and 40) by a pivot pin 75. Referring to Figure 24, the distance from the center of pin 75 to the center of pin 74 is the same as the distance from the center of pin 75 to the center of the pin 76 which pivotally connects link 65 to setting lever 18. The distance between the center of pin 74 (Figure 22) and the axis of shaft 67 and the distance between the centers of pins 73 and 75 is the same, and the center of pin 73 and the axis of shaft 67 and pins 74 and 75 are also equidistantly spaced. Accordingly, considering the pivotal points of connection of arm 69, links 70, 71, and 72, these links and arm 69 form a parallelogram.

During the first portion of the cycle of operation of the machine, shaft 67 is rocked by means to be described hereinafter to move arm 69 from the position shown in Figure 22 to the position shown in Figure 23, and during the last half of the cycle of operation, shaft 67 moves arm 69 downwardly to return it to the position shown in Figure 22. If the setting knob of setting lever 18 is set at zero, then link 65 (Figure 24) is positioned beneath and in alignment with link 72 (Figure 22). Then during the operating cycle when arm 69 moves upwardly, as viewed in Fig-

ure 22, it acts through link 71 to raise link 72 (Figure 23). During this time, the center of rivet 75 follows the curve of dotted line 77 as links 72 and 65 (Figure 24) are of the same length (Figure 23) and thus the only portion of the variable drive linkage which moves at this time consists of arm 69, link 71, and link 72, with link 65 pivoting in alignment with link 72.

When setting lever 18 (Figure 24) is positioned on a digit between one and nine, the pin 76 connecting lever 18 to link 65 is moved downwardly toward the center of shaft 67. During a cyclical operation after link 65 is set in the position shown in Figure 24, the effective length of link 65 causes pin 75 to follow the curved line 78. It will be noted that as pin 75 follows line 78 upwardly during a cycle of operation to the position shown in Figure 25, the distance between pin 75 and the rest position 74*a* of pin 74 is continually being shortened. During the upward movement, pin 74 is thus forced to move from position 74*a* (Figure 25) to the position it occupies in Figure 25 and as it moves to this position, it acts through links 70 and 79 to move counterwheel actuating member 21 in a counterclockwise direction about pivot point 80. As at this time member 21 is in mesh with the gears 22 and 23 of counterwheels on both the ascending and descending registers 8 and 9, these registers are moved in proportion to the amount of counterclockwise movement of link 70 about shaft 67 as a pivot.

Thus, as setting lever 18 is moved to any setting between one and nine (Figure 1), pin 76 (Figure 24) moves with it. The farther pin 76 moves downwardly away from pin 74 during setting, the greater will be the drive given to member 21 by arm 69 (Figure 25) during its upward movement as the line of movement of pin 75 will continually come nearer to the rest position 74*a* of rivet 74, thus increasing the degree of movement of pin 74. The degree of movement of member 21 is always proportional to the amount which pin 76 is moved downwardly, as viewed in Figure 24. Thus linkage 66, together with controlling link 65, driving link 79, and member 21 (Figure 24), feeds the amount of the digit selected into counterwheels on both registers.

Referring now to Figures 31 through 36*a*, in which the counterwheel transfer mechanism for both the ascending and descending registers is shown, each counterwheel, such as counterwheel 80 (Figure 35), has a cam member 81 connected to it. This cam each time it makes a revolution acts upon a raised portion 82*a* of a transfer bar, generally indicated at 82, to move the transfer bar 82 downwardly. To the right of counterwheel 80 a detent 83 is pivotally mounted by a pivot pin 84 on a pair of supporting plates 85 and 86 (Figure 33) mounted on spacing rods 39 and 87. The nose 83*a* (Figure 35) of detent 83 is resiliently urged into contact with the right-hand end of transfer bar 82 by a spring 88 which acts between supporting plate 86 and the upper end of detent 83. The right-hand end of transfer bar 82, as viewed in Figure 35, is shaped so that when the end 82*b* of bar 82 is positioned above detent 83, the nose of detent 83 holds the transfer bar in a raised position and then when cam member 81 acts on raised portion 82*a* of bar 82, the end 82*b* of bar 82 is moved downwardly past the nose 83*a* of detent 83 in which position it is also held by the nose of the detent.

Transfer bar 82 is pivotally connected by a pin 91 to an arm 90 at its left-hand end, as viewed in Figures 35 and 35*a*, and this arm 90 is pivotally mounted on spacing rod 38 (Figure 3). Pin 91 (Figure 34) also conects arm 90 to a link 92 (Figure 35*a*) which is pivotally connected to and actuates the transfer member 93 through pin 94. Transfer member 93 is pivotally connected to a transfer arm 95 by pivot pin 96 and arm 95 in turn is connected to transfer control shaft 97 (Figures 3 and 35*a*). Transfer control shaft 97 (Figure 31) is turned first counterclockwise and then clockwise during a cyclical operation of the machine by a cam yoke 98 having cam rollers 98*a* and 98*b* thereon which coact with a double cam, generally indicated at 99. Cam 99 acting through yoke 98, shaft 97, and arm 95 controls the time and length of engagement of the teeth 93*a* of transfer member 93 with a transfer gear 100 (Figure 35*a*) connected to the counterwheel 101 to which the carry-over is being made from counterwheel 80 (Figures 1 and 35). As will be described more fully hereinafter, the transfer members, such as transfer member 93, are moved into contact with the transfer gears of their related counterwheels during the last portion of the cycle of operation of the machine or after the digits at which the setting knobs are set have been fed into the counterwheels.

Referring to Figures 35 and 35*a*, bar 82 has a pin 102 thereon which extends to the left thereof, as viewed in Figure 33. This pin forms the driving connection between a transfer actuating member, generally indicated at 103, and bar 82 to effect the actual carry-over of a digit from counterwheel 80 to counterwheel 101 (Figure 1) when bar 82 is moved downwardly (Figure 35*a*) by cam member 81 (Figure 35). Transfer actuating member 103 (Figures 31 and 35*a*) is pivotally mounted on shaft 67 and includes a pair of arms 103*a* and 103*b* having cam rollers 103*c* and 103*d*. Rollers 103*c* and 103*d* follow the peripheries of the two sections of a double cam 104, and these sections are so shaped that during the last portion of the cycle of operation, transfer actuating member 103 is moved a short distance in a counterclockwise direction and then returned to the position shown in Figure 31.

When counterwheel 80 (Figure 35) is moved a sufficient distance during the feeding of a digit into this counterwheel, cam 81 moves bar 82 downwardly so that its end 82*b* is cammed past nose 83*a* of detent 83. At this time pin 102 is positioned in a pocket 105 (Figure 35*a*) on arm 103*e* of transfer actuating member 103. Later during the same cyclical operation, cam 104 moves member 103 in a counterclockwise direction, and as pin 102 is seated in pocket 105, bar 82 is moved rearwardly. Referring to Figure 34, as bar 82 moves rearwardly, it acts through pin 91 to move link 92 (Figure 35*a*) in a rearward direction. This link acts through pin 94 to move transfer member 93 a sufficient distance to turn counterwheel 101 the distance of one digit, thus effecting a carry-over.

If cam member 81 (Figure 35) does not move bar 82 downwardly during the period which digits are fed into the counterwheels, then bar 82 remains in the position shown in Figure 35. Accordingly, as a driving connection is not established through pin 102 between bar 82 and member 103, when member 103 moves in a counterclockwise direction during the carry-over period of the operating cycle, bar 82 is not moved rearwardly in the machine and a carry-over is not effected.

The carry-over between counterwheels of the ascending register 8 (Figure 1) is effected in the same manner. A cam member 106 (Figure 36) connected to a counterwheel 107 acts upon a bar 108 (Figures 34 and 36) pivotally connected to an arm 109 by a pivot pin 110. Arm 109 is pivotally mounted on spacing rod 38. The right-hand end of bar 108, as viewed in Figure 36, is engaged by a detent 111 similar in construction and operation to detent 83 (Figure 35) and mounted between supporting plates 85 and 112 (Figure 33). Bar 108 (Figures 34, 36, and 36*a*) is also connected to a link 113 through pin 110 and link 113 is pivotally connected to a transfer member 114 by a pivot pin 115. The lower end of member 114 is pivotally connected to transfer arm 95 by pin 96, and accordingly member 114 moves upwardly to engage the teeth on its upper end with the transfer gear 116 of counterwheel 117 at the same time that member 93 (Figure 35*a*) moves into engagement with transfer gear 100.

Transfer actuating member 103 has a portion 103*f* (Figures 33 and 36*a*) having a pocket 118 therein adapted to receive transfer bar pin 119 when transfer bar 108 is cammed downwardly by cam member 106 (Figure 36). The action of bar 108 is substantially similar to that of bar 82 (Figures 35 and 35*a*). During the transfer portion of the cycle of operation, if bar 108 (Figure 36*a*) has been moved downwardly into operative position, when member 103 is actuated by double cam 104, it moves bar 108 rearwardly (Figure 36*a*) to effect a transfer through link 113 and transfer member 114. If bar 108 is not moved downwardly, then a driving connection is not established between arm 103 and bar 108 and thus a carry-over is not effected between counterwheels 107 and 117 (Figures 36 and 36*a*).

Referring to Figures 33 and 34, it will be noted that bars 82 and 108 are both actuated by transfer actuating member 103 acting through pins 102 and 119. Each of bars 82 and 108 has its own detent, namely, detents 83 and 111, and each bar and mechanism immediately associated with it operates independently of the other bar. Thus, a carry-over may be made in either of the registers without affecting the position of the counterwheels in the other. When a carry-over is not being made from either counterwheel 80 or 107, then transfer member 93 and 114 prevent rotation of counterwheels 101 and 117 during the transfer portion of a cycle of operation of the machine.

If either or both of transfer bars 82 and 108 are cammed downwardly during a cyclical operation, they are moved upwardly or reset by a finger 120 (Figures 33 and 34) on the rear end of aligning arm 56. As described hereinabove, at the end of an operating cycle, aligning arm 252 (Figure 38) moves upwardly to the position shown in Figure 37 to move finger 252*a* out of engagement with the teeth 18*b* on setting lever 18. Aligning arm 56 (Figures 31 and 34) is similar in construction and operation to arm 252 and at the end of a cycle, it moves upwardly to move finger 120 to the position shown in Figure 31. This moves the right-hand ends of bars 82 and 108 (Figures 35 and 36) upwardly with it if either or both of them have been cammed downwardly during an operating cycle. When either or both of the bars are moved up by finger 120, they are retained in their raised positions by their detents 83 and 111. Arm 56 remains raised at the end of a cycle of operation to permit adjustment of setting lever 18 and also holds bars 82 and 108 in a raised position to prevent their being accidentally moved downwardly between operating cycles. Then at the beginning of the next operating cycle it moves downwardly. Thus, arm 56 both prevents movement of setting lever 148 (Figure 34) during an operating cycle and also resets the transfer bars 82 and 108 (Figures 35 and 36) after a transfer has been accomplished.

Thus, to summarize the operation of the bank of the machine described hereinabove, as setting knob 13 is moved to the digit it is desired to print, it acts through setting lever 18 (Figure 21) to turn spur gear 45. Gear 45 (Figure 16) acts through nested shaft 46 and gear 47 to move rack bar 48 (Figure 13) longitudinally of the machine. As rack bar 48 is moved, it moves setting bar 51 longitudinally of the head shaft in which it is mounted and this movement acts through gearing to be described hereinafter to set one of the value printing wheels in printing drum 17 (Figure 11). At the same time lever 18 (Figure 21) is setting its related value printing wheel in the printing drum 17, lever 18 also adjusts link 65 with relation to variable drive linkage 66 (Figures 24 and 25) thus determining the amount to be registered on the counterwheels of the ascending and descending registers associated with counterwheel actuating member 21.

Referring now to Figures 48*a* through 48*d*, in which the movement of counterwheel actuating member 21 (Figure 21) and transfer members 93 and 114 (Figures 35*a* and 36*a*) during an operating cycle is diagrammatically shown, at the beginning of an operating cycle member 21 is in engagement with gears 22 and 23 of counterwheels 80 and 107. At this time transfer members 93 and 114 are positioned downwardly from and thus out of engagement with the transfer gears 100 and 116 of counterwheels 101 and 117. Counterwheels 101 and 117 are the next higher counterwheels in the descending and ascending registers above counterwheels 80 and 107. The clock 124 diagrammatically illustrates in Figures 48*a* through 48*d* the sequence of operations in one operative cycle. The vertical position of members 21, 93, and 114 is not changed by movement of control shafts 121 and 97 (Figures 3 and 20) from 12 o'clock to 5 o'clock (Figure 48*a*). During this time the variable drive linkage 66 (Figure 21) acts through link 79 to move member 21 to the left if lever 18 is set at a digit between one and nine. This movement of member 21 turns counterwheels 80 and 107 to register the digit for which the setting knob was set before the cycle of operation began.

After this part of the cyclical operation has been completed, transfer control shaft 97 is rocked in a counterclockwise direction, as viewed in Figure 48*b*, moving transfer members 93 and 114 upwardly into engagement with gears 100 and 116. After members 93 and 114 engage their respective gears, then control shaft 121 turns counterclockwise to move counterwheel actuating member 21 out of engagement with gears 22 and 23. This change in the vertical position of members 93, 114, and 121 takes place between 5 and 6 o'clock as indicated on the clock 124. During the next portion of the cycle, namely, that portion between 6 and 10 o'clock, members 21, 93, and 114 do not move vertically. However, during this period the variable drive linkage shown in Figure 21 acts through link 79 to move member 21 to the right, as viewed in Figure 48*c*. At the same

time member 103 moves rearwardly (Figures 35a and 36a) and it may act through the transfer mechanism connected to either or both links 92 and 113 (Figure 48c) to turn counterwheels 101 and 117 a distance of one digit.

After a carry-over, if any, has been completed, the control shaft 121 rocks moving member 21 (Figure 48d) into engagement with counterwheel gears 22 and 23. After member 21 has been moved upwardly, then shaft 97 rocks to move members 93 and 114 downwardly out of engagement with gears 100 and 116, and then these members are moved forwardly by the transfer mechanism acting through links 92 and 113. The operation described immediately hereinabove takes place between 10 and 12 o'clock and at 12 o'clock the operating cycle is complete.

At the beginning of a cycle of operation, the first action in the machine is the locking of setting lever 18 by finger 252a (Figure 21) on aligning arm 252 as aligning arm 252 moves to the position shown in Figure 38. At the end of the cycle, aligning arm 56 (Figure 31), the arm adjacent to arm 252, moves upwardly to the position shown in Figure 31. This movement resets the transfer bars 82 and 108 of the transfer mechanism if they have been cammed downwardly. If the setting lever is not moved at the end of a cycle, mechanism is provided, which will be described hereinafter, to retain rack bar 48 (Figure 16) in its adjusted position, thus insuring the same digit being printed over and over again until the setting of lever 18 is changed.

The machine is driven either through a coupling 125 (Figure 20) on the left-hand end of the head shaft 26 or by crank 126 (Figures 1 and 34) which turns drive shaft 64 (Figure 20). As described hereinabove, the machine is designed for cyclical operation and drum 17 (Figure 11) makes a complete revolution during each operation. If the drive is through crank 126 and shaft 64, crank 126 turns shaft 64 a complete revolution during each cycle of operation of the machine. Shaft 64 is mounted on bearings 127 and 128 (Figure 34) on side plates 34 and 35 and has a spur gear 129 pinned thereto. Spur gear 129 (Figure 39) is positioned at the opposite end of shaft 64 from crank 126 and engages an idler gear 130 mounted on a stud shaft 131 connected to side plate 35 (Figure 2). Gear 130 engages and drives a spur gear 132 (Figures 39 and 40) mounted on and connected to a cam shaft 133. Cam shaft 133 is mounted in bearings on supporting plate 36 (Figure 2) and side plate 34. Gear 132 (Figure 39) has the same number of teeth as gear 129 and accordingly each time gear 129 makes a revolution, gear 132 (Figure 9) makes a revolution. Cam shaft 133 (Figure 40) has a miter gear 134 connected to its inner end and this miter gear 134 (Figure 42) engages a miter gear 135, pinned to head shaft 26. Thus as cam shaft 133 (Figure 39) makes a revolution each time shaft 64 makes a revolution and as shaft 133 is geared through miter gears 134 and 135 (Figure 42) to head shaft 26, head shaft 26 (Figure 11) and thus drum 17 makes a revolution each time the crank is turned through a complete revolution. If the drive is through coupling 126 (Figure 20), then each time head shaft 26 is turned a single revolution through the same gearing, shaft 64 is turned a revolution.

Cam shaft 133 (Figure 40) has three double cams 99, 123, and 137. Cam 99 coacts with yoke 98 (Figure 31) to rock transfer control shaft 97 and thus move the transfer members connected to shaft 97 through their respective arms, such as arm 95, into and out of engagement with the counterwheels they transfer digits to. Cam 123 (Figure 40) coacts with yoke 122 (Figure 21) to rock control shaft 121 first counterclockwise and then clockwise. As control shaft 121 is rocked, it moves the counterwheel actuating members, such as actuating member 21, into and out of engagement with counterwheels on the ascending and descending registers. As described hereinabove, the rocking movement of shaft 121 is transferred to the members, such as member 21, through arms, such as arm 5, connected to shaft 121.

Double cam 137 (Figure 40) acts upon the cam rollers 138a and 138b (Figure 47) of a cam yoke 138 to move cam yoke 138 with a rocking movement about its pivotal connection 139 to supporting plate 36. One of the arms of yoke 138 is pivotally connected by a pivot pin 140 to a link 141. Link 141 is pivotally connected by pin 142 to a crank 143 and crank 143 is pinned or otherwise connected to shaft 67. Shaft 67 (Figure 40) extends transversely across the machine and is mounted in bearings 144 and 145 mounted on supporting plate 36 and side plate 35. Referring to Figures 40 and 47, as the rollers on yoke 138 follow cam 137, crank 143 is moved with a rocking action through the connecting link 141. Crank 143, through its connection to shaft 67, rocks 67 to move arms, such as arm 69 (Figures 21 and 22) of the variable drive linkage 66 first upwardly and then downwardly during an operative cycle as described hereinabove. This drive is the one which during the first portion of an operative cycle moves the counterwheel actuating members, such as member 21 (Figure 21), rearwardly to register the digit at which each setting knob is positioned in both the ascending and descending registers and then returns the counterwheel actuating members at the end of the cyclical operation to their original positions.

Referring to Figures 1, 34, and 39, there are provided both resettable and non-resettable piece counters, generally indicated at 610 and 611, for determining the operations of the machine. The non-resettable piece counter 611 is driven through a gear 612 (Figure 39) connected to its shaft 613, and gear 612 is driven by a gear 614 connected to drive shaft 64. Resettable piece counter 610 is driven by a gear 616 (Figures 1 and 34) connected to its shaft. Gear 616 is driven by a gear 615 connected to shaft 64. Piece counter 610 may be reset by knurled wheel 617.

Referring now to Figure 1, setting levers 146, 147, 148, and 149 (Figure 1) are mounted on supporting plates 150, 151, 152, and 153 (Figure 2) in the same manner as setting lever 18 is mounted on plate 41 (Figure 38). The upper portion of each of the setting levers includes a gear segment similar to gear segment 154 (Figure 21) on setting lever 18. Gear segment 154 engages a gear 155 connected to an indicator wheel 156 and thus as lever 18 is moved, gear segment 154 drives indicator wheel 156 through gear 155. In a similar manner, setting levers 146, 147, 148, and 149 (Figure 1) actuate and set indicator wheels 157, 158, 159, and 160 through their respective gear segments. These indicator wheels are provided with numerals which are visible through a window (not shown) in the housing and which

at all times indicate the setting of their related setting knobs.

As each of setting levers 146, 147, 148, and 149 (Figure 1) is moved during setting of the value printing wheels 16 in printing head 17 (Figure 11), each one conditions variable drive linkage, similar to variable drive linkage 66 (Figure 21), so that counterwheel actuating members 169, 170, 171, and 172 (Figure 1) turn the counterwheels associated with them to register the digits at which their respective setting levers are set. The variable drive linkages of levers 146, 147, 148, and 149 (Figure 40) are generally indicated at 165, 166, 167 and 168 and each includes a link, namely, links 161, 162, 163, and 164 similar in construction and operation to link 65 (Figures 21 and 24). Counterwheel actuating members 169, 170, 171, and 172 are pivotally connected to arms 173, 174, 175, and 176 (Figure 3) which in turn are connected to control shaft 121 and are similar in construction and operation to arm 5 (Figure 21). Thus as control shaft 121 rocks, as described hereinabove, all of the counterwheel actuating members are moved into and out of engagement with their respective counterwheels in unison during the first portion of the operating cycle.

Referring to Figure 1, counterwheel actuating member 169 meshes with and drives counterwheels 177 and 178 through gears 179 and 180. Actuating member 170 drives counterwheels 181 and 182 through gears 183 and 184. Actuating member 21 drives counterwheels 107 and 80 through gears 22 and 23. Actuating member 171 drives counterwheels 117 and 101 through gears 189 and 190, and actuating member 172 drives counterwheels 191 and 192 through gears 193 and 194.

In the descending register 9 counterwheel 192 carries over accumulated tens to counterwheel 195 through a standard Geneva transfer pinion 196 and a Geneva drive member 197 connected to counterwheel 192. The drive from counterwheel 195 to counterwheel 197 and from counterwheel 197 to counterwheel 198 is through Geneva transfer pinions 199 and 200. In the ascending register 8 the drive from counterwheel 191 to counterwheel 200 is through standard Geneva transfer pinion 201 and a Geneva transfer pinion drive member 202 connected to counterwheel 191. The carry-over from counterwheel 200 to counterwheel 203, from counterwheel 203 to counterwheel 204, and from counterwheel 204 to counterwheel 205 is through standard Geneva transfer pinions 206, 207, and 208. Thus, in operation, the counterwheel actuating members 169, 170, 21, 171, and 172 each drives a counterwheel in both the ascending and descending registers during the cyclical operation if their related setting knob has been set at any digit above zero. Additional counterwheels are provided in both the ascending and descending registers to which carry-overs may be made from the lower denomination counterwheels in each register as they occur. All of the ascending counterwheels are mounted on shaft 247 (Figure 31) and the descending counterwheels are mounted on shaft 248.

Referring now to Figures 1 and 34, transfer mechanism similar to the transfer mechanism described with respect to counterwheels 80, 101, 107, and 117 is provided to carry over accumulated tens from each counterwheel to the next higher one. Thus, transfer bar 209 is actuated by tripping cam 210, and a transfer member 211 effects a carry-over through a transfer gear 212 connected to counterwheel 181. The tripping cam 213 of counterwheel 181 acts upon a transfer bar 214 to effect a carry-over to counterwheel 107 through a transfer member 215 and a transfer gear 216 connected to counterwheel 107. Tripping cam 106 which is connected to counterwheel 107 described hereinabove acts through bar 108 and member 114 to effect a carry-over to counterwheel 117. Counterwheel 117 acts through its tripping cam 217, bar 218, and member 219 to turn transfer gear 220 which is connected to counterwheel 191 and thus effect a carry-over from counterwheel 117 to counterwheel 191.

In the descending register 9, counterwheel 178 has a tripping cam 221 which acts through bar 222 and member 223 which actuates transfer gear 224 to effect a carry-over between counterwheels 178 and 182. The tripping cam 225 of counterwheel 182 acts through transfer bar 226, member 227, and transfer gear 228 of counterwheel 80 to effect a carry-over between counterwheels 80 and 101 as described hereinabove. Counterwheel 101 acts through its tripping cam 230, transfer bar 231, and member 232 to turn the transfer gear 233 of counterwheel 192 and thus effect a carry-over between counterwheels 101 and 192.

The time and length of engagement of the transfer members with the transfer gears is controlled by shaft 97 (Figure 31) through arms similar to arm 95. Thus, transfer members 211 and 223 (Figures 3 and 34) are pivotally connected at their lower ends to transfer arm 234 and transfer members 215 and 227 are pivotally connected at their lower ends to arm 235. Transfer arms 219 and 232 are pivotally connected at their lower ends to transfer arm 236. Thus during a cyclical operation, as shaft 97 (Figures 3 and 31) is rocked by cam 99 acting through yoke 98, the teeth on the upper ends of the transfer members described hereinabove are moved into and out of engagement with the counterwheel gears so that they may effect a carry-over when it occurs.

To lock counterwheels 177 and 178 (Figure 1) against rotation during the transfer period, a locking member 238 (Figure 32) is provided.

At the left end of shaft 97, as viewed in Figure 3, an arm 237 (Figures 3 and 32) connected to shaft 97 extends forwardly in the machine in alignment with the other arms such as arm 95 (Figure 31) mounted on shaft 97. Arm 237 (Figure 32) is pivotally connected to locking member 238 by pivot pin 239 and member 238 is pivotally connected to side plate 35 by a link 243 and pivot pins 244 and 245. As shaft 97 is rocked to move the transfer members, it raises and lowers locking member 238 so that teeth 240 thereon engage and disengage gears 241 and 242 on the ascending and descending registers 8 and 9 (Figures 1 and 31). These gears are connected to counterwheels 177 and 178 and with locking member 238 (Figure 32) they hold counterwheels 177 and 178 stationary during the transfer or carry-over period of an operating cycle.

Ascending register counterwheels 177, 181, 107, 117, and 191 and descending register counterwheels 178, 182, 80, 101, and 192 at all times are in engagement either with the transfer members associated with them, such as transfer members 93 and 114 (Figure 31) or with their counterwheel actuating members, such as counterwheel actuating member 21 (Figure 21). Thus, the counterwheels can never be moved except by the mechanism of the machine as it is always in engagement with them. The higher counterwheels

in both the ascending and descending registers, namely, counterwheels 195, 197, 198, 200, 203, 204, and 205 are prevented from turning except during a transfer by the transfer pinions associated with them.

Referring now to Figures 26 and 34, a transfer actuating member, similar to member 193 (Figure 35a) is provided for each pair of transfer bars and these members actuate their respective bars as described hereinabove with respect to member 193 and bars 62 and 108 (Figures 35 and 36). Transfer actuating member 255 drives bars 209 and 222, member 256 drives transfer bars 214 and 226, and transfer actuating member 257 drives bars 218 and 231. These transfer actuating members are all pivotally mounted upon shaft 67 (Figures 31 and 34) and are actuated by double cams 258, 259, and 260, similar to cam 104, respectively, as these cams turn with shaft 64. These members effect a carry-over through their related transfer mechanisms whenever one of their transfer bars has been cammed downwardly during the first portion of the cycle of operation when digits were being fed into the counterwheels.

Referring to Figures 27, 28, 29, and 30, the actuating surfaces of cams 260, 104, 259, and 258 are in staggered relationship with respect to each other so that members 255, 256, 193, and 257 (Figure 26) are actuated in series during a cycle, one after another, beginning first with member 255. Thus, if the carry-over from a lower counterwheel to a higher counterwheel should trip the transfer bar associated with the higher counterwheel into operative position, then the transfer mechanism associated with that counterwheel can effect a carry-over to the next higher counterwheel because the transfer actuating member associated with the transfer bar cammed down would not move until the transfer action preceding it was completed. Accordingly, by staggering the operation of the transfer mechanisms has a material effect on the keeping of an accurate and efficient record by the registers.

Resetting of all of the transfer bars occurs at the end of an operating cycle as shaft 57 rocks and is accomplished in a manner similar to the resetting of bars 193 and 62 (Figures 34 and 35) by arm 56. Aligning arms 251, 252, 56, and 253 (Figure 34) have resetting fingers 251a, 252b, 120, and 253a which, when cam 63 acts through yoke 60 (Figure 37) to turn shaft 57 in a clockwise direction, resets the setting bars (Figure 34) positioned above them. These arms and arm 250 also have fingers extending across setting levers 146, 147, 148, and 149 which engage gear segments on the levers during an operating cycle to hold the levers stationary in a manner similar to the coaction of lever 18 and finger 252 (Figures 37 and 38) as described hereinabove. Thus, the aligning arms mounted on shaft 57 (Figures 34 and 38) both hold the setting levers in set positions during an operating cycle and also reset the transfer mechanism at the end of the cycle.

To set the value printing wheels in rotatable printing head 17, setting levers 146, 147, 148, and 149 (Figures 1 and 16) each have gear segments 146a, 147a, 148a, and 149a similar to gear segment 18a (Figure 21) on setting lever 18. These segments engage and turn spur gears 270, 271, 272, and 273 as their respective setting knobs are moved. Spur gear 270 is connected to a shaft 274 (Figures 11 and 16) extending transversely across the base of the machine and rotatably mounted on a supporting bracket 275 (Figure 11) and a supporting plate 276 (Figure 16). A spur gear 277 connected to the other end of shaft 274 engages the teeth of a rack bar 278. Gear 271 which is actuated by segment 147a is connected to gear 279 by a sleeve 280 rotatably mounted on shaft 274. Gear 279 actuates rack bar 281. The gear 272 associated with lever 148 is operatively connected to a gear 282 by a sleeve 283 rotatably mounted on sleeve 280. Gear 282 engages the teeth on rack bar 284. Gear 273 is rotatably mounted on sleeve 283 and directly engages the teeth of rack bar 285.

Rack bars 278, 281, 284, and 285 are substantially similar in construction to rack bar 48 (Figure 13) and each of gears 277, 279, 282, and 273 (Figure 16) engages teeth on their respective rack bars similar to teeth 48a (Figure 13) on rack bar 48. These rack bars are mounted for longitudinal movement with respect to the machine between a pair of supporting plates 275 and 286 (Figures 11, 12, and 16) which are secured to the base plate 28 of the machine. The rack bars are spaced by spacing plates 287, 288, 289, and 290 (Figures 12, 13, and 17) which are similar in construction to the side elevation of supporting plate 276 (Figure 20). These plates are secured to supporting plates 276 and 286 by pin 291 and pivot pin 329 (Figures 12, 13, and 20). Each of the spacing plates and supporting plate have slots similar to the slots 276a and 276b (Figure 20) in supporting plate 276. These slots are adapted to receive lugs extending to the right from each of the rack bars as may be seen in Figures 14 and 17. These lugs, such as lugs 48b and 48c on rack bar 48 (Figure 13), prevent vertical movement of the rack bars and also provide limits for longitudinal movement.

The extremities of the upwardly extending portions of each rack bar are similar to upwardly extending portion 48b of rack bar 48 (Figure 13) and extend to the left, as viewed in Figure 16, to engage teeth on setting bars mounted for longitudinal movement in head shaft 26 on pins 54 (Figure 20) and 292 (Figure 49). Both the setting bars and the upwardly extending portions of the rack bars are provided with teeth similar to the beeth 50 shown on setting bar 51 (Figure 13) and the teeth 49 on rack bar 48. Rack bars 285, 284, 281, and 278 (Figure 16) engage and actuate setting bars 293, 294, 295, and 296. Thus, when the mechanism of the machine is positioned in "home" or "rest" position (Figure 13) as the seting levers are moved they drive gears mounted on shaft 274 (Figure 16) through their gear segments. These gears act through the gears connected to them to move their related rack bars longitudinally of the machine. The rack bars in turn act through the teeth on their upwardly extending portions to move the setting bars longitudinally of head shaft 26 and thus set the type wheels in the printing head of the machine.

To assure alignment of related teeth on the rack bars and the setting bars at the end of an operating cycle, as shown in Figure 16, a disc 297 (Figures 1, 11, and 20) is connected to head shaft 26 adjacent the rear end thereof. An arm 298 pivotally mounted on a stud shaft 299 (Figure 11) has a roller 300 mounted on its end which engages the periphery of disc 297 (Figures 1 and 11). Arm 297 is resiliently urged in a counterclockwise direction (Figure 20a) by a spring 301 (Figures 1 and 11) to hold roller 300 in engagement with the periphery of disc 297. Disc 297 (Figure 20a) is provided with a recessed portion 297a in which roller 300 is positioned when the

machine is in "home" or "rest" position. At the end of each cycle, roller 300 coacts with the recessed portion 297a in disc 297 to align the teeth on the setting bars 293, 294, 51, 295, and 296 (Figure 16) with the teeth on the upwardly extending portions of rack bars 285, 284, 48, 281, and 278.

Referring to Figures 11 and 17, a machine lock, generally indicated at 302, is provided to permit the user to lock the machine against unauthorized use. The cylinder of the lock is turned by a key 303 and as this cylinder turns, it has a pin 304 mounted off center on a plate 305 secured to the inner end thereof. As pin 304 (Figures 12 and 18) turns, it acts in a cam slot 306a in cam plate 306 to rock a shaft 307 to which the hub (Figure 17) of cam plate 306 is connected. Cam plate 306 is resiliently urged toward a center position by a spring 308 (Figure 18) connected to cam plate 306 and a pin 309 on the casing 310 (Figure 17) of lock 302. Shaft 307 is rotatably mounted on the casing 310 of lock 302 and on an ear 311 (Figures 11 and 17) on supporting plate 286 extending upwardly from base 26. As shaft 307 turns in a clockwise direction, as viewed in Figure 18, it turns a cam member 312 (Figure 15) on its inner end (Figure 17) which acts on a downwardly extending projection 313a of leg 313c of a bracket, generally indicated at 313 (Figure 15) to move bracket 313 in a clockwise direction.

Bracket 313 is U-shaped and includes a center portion 313b and a pair of legs 313c and 313d (Figures 59 and 60). Referring to Figure 12, the legs 313c and 313d are pivotally connected by pivot pins 317 and 318 (Figures 13, 17, and 20) to ears 311 and 316 (Figures 11 and 12) on supporting plates 286 and 276. The center portion of bracket 313 includes a rearwardly extending projection 314 (Figures 12, 19, and 59) which enters a notch 315 (Figure 41) in a disc 25 (Figure 20) pinned to shaft 26. This locks the head shaft 26 against rotational movement when bracket 313 is moved in a counterclockwise direction, as viewed in Figures 13 and 15, by cam member 312. Thus, when the lock 302 (Figure 11) is in locked position, the machine cannot be operated.

A second bracket, generally indicated at 319 (Figure 12) includes a center portion 319a and a pair of legs 319b and 319c and is mounted above bracket 313. Legs 319b and 319c of this bracket are pivotally connected to ears 311 and 316 by pins 317 and 318 and are positioned between the ears 311 and 316 and the legs of bracket 313. The center portion 319a of this bracket is positioned above the center portion 313b of bracket 313 (Figure 15). Bracket 319 is resiliently urged downwardly by a spring 320 (Figure 17) positioned between bracket 319 and a bracket 321 connected to the base of the machine through a plate 322 (Figure 12). This plate is connected to supporting plates 276 and 286 and spacing plates 287, 288, 289, and 290.

Bracket 319 (Figures 12, 19, and 20) includes an arm 319e which extends rearwardly in the machine and is positioned over a pin 323 which forms an interlocking connection between the mechanism in the base on which the machine is mounted and the machine. When pin 323 is in raised position, as shown in Figure 19, then the mechanism in the base becomes locked. As the center portion 313b (Figures 13 and 19) of bracket 313 is positioned beneath the center portion 319a of bracket 319, when bracket 313 is raised, then bracket 319 is moved in a counterclockwise direction, as viewed in Figure 19, raising arm 319e to the position shown in Figure 19. This permits pin 323 to be raised by mechanism in the base on which the machine is mounted preventing further operation of the mechanism in the base when bracket 313 is moved to a locking position with respect to disc 25. Thus, when the machine lock is operated by the user, further operation of both the base on which the machine is mounted and the machine itself is prevented.

To align rack bars 278, 281, 48, 284, and 285 longitudinally with respect to the machine and thus insure accurate setting of the type wheels, a series of detents 324, 325, 326, 327, and 328 (Figure 12) are provided. These detents are similar in construction to detent 326 (Figure 13) and are pivotally mounted on a pin 329 extending transversely across the machine between side plates 276 and 286 (Figure 12) and are spaced from each other by spacing plates 287, 288, 289, and 290. The head 326a of detent 326 (Figure 13) engages a series of teeth 48d on rack bar 48 to align the rack bar and its related type wheel in the printing head. Each of the detents 324, 325, 326, 327, and 328 is resiliently urged into contact with the teeth on their respective rack bars 278, 281, 48, 284, and 285 by springs 330, 331, 332, 333, and 334 (Figure 14) which act between the under surface of plate 322 and the upper surface of the detents. Thus, effective means has been disclosed for aiding in the alignment of the machine rack bars and thus the type wheels in the printing head.

When the sum of postage which was set in the descending register at the post office is exhausted, then a zero lock operates which prevents further operation of the machine and automatically stops operation of the base on which the machine is mounted by permitting pin 323 (Figure 19) to be raised as described hereinabove. Counterwheels 195, 197, and 198 (Figure 1) are each connected to a notched ratchet wheel similar to the notched ratchet wheel 335 (Figure 42). When counterwheels 195, 197, and 198 have been turned to zero position, three locking fingers 338, 339, and 340 (Figures 41 and 43) enter the notches in the ratchet wheels thus preventing further operation of counterwheels 195, 197, and 198.

Fingers 338, 339, and 340 are mounted on a bracket, generally indicated at 341, which is U-shaped and includes a center portion 341a (Figures 42 and 43) and a pair of leg portions 341b and 341c. A shaft 342 rotatably mounted on supporting plates 36 and 37 extends through legs 341b and 341c pivotally mounting bracket 341 on the machine. A link 343 (Figure 42) is pivotally connected by a pin 345 to leg 341c of bracket 341 which extends forwardly from shaft 342. Link 343 is also pivotally connected to a bellcrank 344 which in turn is pivotally mounted on supporting plate 36 (Figure 41) by a stud shaft 346. Bellcrank 344 has a cam roller 347 which engages the periphery of a cam disc 348 mounted on cam shaft 133. Cam roller 347 is resiliently urged into contact with the periphery of cam disc 348 by a spring 349 which is connected to link 343 and to a pin 350 on supporting plate 36.

Locking fingers 339 and 340 (Figure 43) are similar in shape to locking finger 338 (Figure 42) and are resiliently urged into contact with their respective ratchet wheels by spring 349 which acts through arm 341c of bracket 341 to resiliently urge pivotal movement of bracket 341 in a clock-

wise direction. Accordingly, during the operation of the machine the locking fingers and their related ratchet wheels coact to align counterwheels 195, 197, and 198. Also, when counterwheels 195, 197, and 198 all reach zero position, then spring 349 acts through link 343 to cause the locking fingers 338, 339, and 340 to enter the notches in their respective ratchet wheels, thus locking the register.

This locking action is prevented in the middle of a cyclical operation by the action of cam 348 and bellcrank 344. As pointed out hereinabove, cam shaft 133 makes a complete revolution during each cyclical operation. It is shown in "home" or "rest" position in Figure 42 and in this position it will be noted that cam roller 347 rests in a concave portion 348*a* of the periphery of cam 348. When roller 347 is in the position shown in Figure 42, link 343 may be moved downwardly by spring 349 a sufficient distance to move the locking fingers into locking engagement with their respective notches. At the beginning of a cyclical operation, however, cam 348 turns bellcrank 344 in a counterclockwise direction, as viewed in Figure 42. This raises link 343 which acts through arm 341*c* of bracket 341 to prevent the fingers from entering their notches during an operating cycle. The fingers are held in this position until the end of the cycle at which time roller 347 again enters portion 348*a* of cam 348 and fingers 338, 339, and 340 lock the counterwheels with which they are associated if the counterwheels of the register reach zero setting during the operating cycle.

When link 343 moves downwardly (Figure 42), as fingers 338, 339, and 340 (Figure 43) enter the notches in the ratchet wheels of their respective counterwheels, the lower end of link 343 acts upon leg 313*d* of locking bracket 313 to move locking bracket 313 in a clockwise direction, as viewed in Figure 42. This moves the rearwardly extending portion 314 (Figures 19 and 41) of bracket 313 into the notch 314 of locking disc 25, thus preventing further operation of the machine. The timing of this locking action is also controlled by cam 348 (Figure 42) and thus occurs only at the completion of a cyclical operation. When leg 313*d* of bracket 313 is moved downwardly by the lower end of link 343 to the position shown in Figure 19, bracket 313 turns bracket 319 in a counterclockwise direction, as viewed in Figure 19. This permits pin 323 to be raised, thus locking the base on which the machine is mounted against further operation. Thus, the zero locking mechanism described hereinabove locks the descending register and the head shaft of the machine and through pin 323 prevents further operation of the base on which the machine is mounted.

After the postage in a machine has been exhausted, it is taken to the post office where the post office clerk resets the descending register. For resetting the machine, the right side plate 34 (Figures 1, 43, and 44) is provided with a key operated post office lock 351. The cylinder 351*a* (Figure 44) of lock 351 has a plate 352 connected to its inner end (Figures 39 and 43). A pin 353 mounted on plate 352 coacts with a cam slot 354*a* in a cam member 354 to turn shaft 355. During unlocking plate 352 is turned in a clockwise direction, as viewed in Figure 39, and pin 353 acting in cam slot 354*a* turns shaft 355 to which plate 354 is connected in a clockwise direction. A shutter 356 (Figures 43 and 44) is connected to the end of shaft 355 externally of side plate 34 (Figures 43 and 44) and as shaft 355 turns during unlocking of the resetting mechanism, shutter 356 moves downwardly to uncover a cup-shaped member 357 (Figure 43) within which the resetting crank 27 is positioned.

Crank 27 is connected to the end of a shaft 358 rotatably mounted on a pair of arms 359 and 360. Arms 359 and 360 have hubs 361 and 362 (Figure 43) which are pinned to shaft 342 (Figure 42) on which the zero lock bracket 341 is pivotally mounted. Arm 360 extends rearwardly in the machine (Figures 42 and 43) and it has a pin 363 thereon which is positioned in a cam slot 364*a* in cam member 364. Cam member 364 is mounted on shaft 355 and as shaft 355 is turned in a clockwise direction during unlocking of the register resetting mechanism, arm 360 is moved upwardly. As shaft 358 (Figure 43) is mounted on arms 360 and 359, when arm 360 (Figure 46*a*) moves upwardly to the position shown in Figure 46*b*, it carries shaft 358 and thus a resetting gear 365 connected to the inner end of shaft 358 (Figure 43) upwardly into engagement with the carry-over gear 366 (Figure 1) of counterwheel 195. Toward the end of the unlocking movement of cam member 364 (Figure 42), a lug 367 (Figure 42) thereon strikes the upper surface of the rear end of arm 341*b* and turns zero locking bracket 341 in a counterclockwise direction, as viewed in Figure 42. This moves the locking fingers 338, 339, and 340 out of locking engagement with the notches on the ratchet wheels of counterwheels 195, 197, and 198, thus preventing these fingers from interfering with the resetting of the descending register.

Referring to Figures 41, 42, and 43, an arm 368 and a bellcrank 369 are pivotally mounted on the right-hand end of shaft 342, as viewed in Figure 41. These members are connected by a shaft 370 (Figure 43) on which transfer pinion 196 (Figures 1 and 41) is mounted. Bellcrank 369 includes arms 369*a* and 369*b* and arm 369*a* has a pin 372 (Figures 42 and 45) which extends into a cam slot 374*a* in cam member 374. Cam member 374 is connected to shaft 355 and moves bellcrank 369 in a clockwise direction about shaft 342 as a pivot from the position shown in Figures 42 and 45 during the unlocking of the resetting mechanism. This movement carries transfer pinion 196 out of engagement with the transfer pinion gear 366 (Figure 46*b*) of counterwheel 195 (Figures 1 and 45).

A detent member 375 (Figures 41 and 45) is pivotally mounted on shaft 342 between arm 368 and bellcrank 369 (Figure 41). The nose 375*a* of detent 375 (Figure 45) is resiliently urged toward transfer pinion 196 by a spring 376 mounted on shaft 358 (Figure 41). The rear end 375*b* (Figure 45) of detent 375 is held upwardly by a lug 374*b* (Figures 43 and 45) when the resetting mechanism of the machine is locked. At this time the nose of detent 375 is out of engagement with the teeth of transfer pinion 196. When cam member 374 is moved in a clockwise direction, as viewed in Figure 45, during the unlocking of the resetting mechanism, then lug 374*b* moves downwardly, as viewed in Figure 45, and permits nose 375*a* of detent 375 to engage the teeth on transfer pinion 196 and hold it in adjusted position during the time it is out of engagement with the gear 366 of counterwheel 195.

To insure proper alignment of the digits on counterwheel 195 with the window (not shown) in the housing after resetting has taken place, a ratchet wheel 380 and a detent 382 (Figure 39)

are provided. Ratchet wheel 383 has its hub 381 pinned to shaft 358 (Figure 43) and detent 382 is pivotally mounted on shaft 342 (Figures 39 and 43). Detent 382 is resiliently pressed into engagement with ratchet wheel 380 by a spring 383 mounted on shaft 342. Thus ratchet wheel 380 and detent 322 align counterwheel 195.

In operation, when the key is turned in lock 351 (Figure 44) shutter 356 moves downwardly exposing crank 27. At the same time cam member 364 (Figures 42 and 43) acts on the pin 393 on arm 390 to move gear 366 upwardly (Figure 46b) into engagement with the transfer gear 365 of counterwheel 195 (Figure 1). Toward the end of the movement of cam member 364 (Figure 42) lug 367 acts upon the arm 341b of zero lock bracket 341 to move the fingers of the zero lock bracket out of locking position with respect to their counterwheels. At the same time and also actuated by movement of shaft 355 (Figure 43) cam member 374 acts upon bellcrank 369 through pin 372 (Figures 42 and 45) to move transfer pinion 196 out of engagement with transfer gear 366 of counterwheel 195 (Figure 1). As transfer pinion 196 moves out of engagement with gear 366, detent 375 (Figure 45) is released so that it engages the teeth of the transfer pinion to hold it in adjusted position during the resetting of the register. The register is reset by turning crank 27 in a clockwise direction, as viewed in Figure 44, and counterwheels 195, 197, and 198 may be set at any desired figure up to nine hundred and ninety-nine (Figure 1). Transfer pinions 199 and 200 act as carry-overs between counterwheels 195, 197, and 198 during the resetting of the descending register as well as during the operation of the machine.

After resetting has taken place, the key in lock 351 is turned in a counterclockwise direction, as viewed in Figure 44. This moves shutter 356 back to cover cup 357 (Figures 43 and 44) and thus crank 27. The zero lock bracket 341 is released by lug 367 to place it in operative condition. Transfer pinion 196 is returned by cam member 374 to the position shown in Figure 45 so that it again acts as the transfer pinion between counterwheels 192 and 195 (Figure 1) and detent 375 is moved out of engagement with its teeth. At the same time resetting gear 365 (Figure 46b) is moved from the position shown in Figure 46b to the non-operative position shown in Figure 46a by cam member 364.

The rotatable printing head 17 (Figures 11 and 49) is mounted on the forward end of head shaft 26. The printing head includes a rear plate 403 (Figures 49 and 53) which is cylindrically shaped and includes a flange 403a extending rearwardly through the bearing 400 mounting head shaft 26 in front wall 29. Flange 403a is connected to shaft 26 in any suitable manner, such as by a key (not shown) and mounts head shaft 26 in bearing 400.

As described hereinabove, setting bars 293, 294, 51, 295, and 296 (Figures 16 and 20) are mounted in a cut-out portion of shaft 26. These bars are mounted on pins 54 and 292 (Figures 20 and 49) for longitudinal movement with respect to head shaft 26. The forward end of each of the setting bars have gear racks, similar to gear rack 51a, formed on their upper edges. These gear racks 293a, 294a, 51a, 295a, and 296a (Figure 53) engage the setting gears 404a, 405a, 55a, 406a, and 407a of value printing wheels 404, 405, 55, 406, and 407 to turn and thus set the value printing wheels (Figure 49) as the setting bars are moved

longitudinally of the head shaft. Each counterwheel is provided with a detent, similar to detent 408 (Figure 49), which engages its setting gear to insure proper positioning of the digits on the value printing wheels during printing. Detent 408 is pivotally mounted on a pin 409 extending transversely across the head and is resiliently pressed into engagement with gear 55a by a spring 410.

Value printing wheels 404, 405, 55, 406, and 407 (Figures 49 and 53) are rotatably mounted on a shaft 620 which extends transversely across the printing head and is mounted between two supporting plates 411 and 412 (Figures 53 and 54). Forwardly from bearing 400 (Figure 49) head shaft 26 is of rectangular shape in cross section (Figure 53), and side plates 411 and 412 are connected to opposite sides of this portion of the head shaft to form a frame-work upon which a great deal of the mechanism of the printing head is mounted.

For third-class mail, in addition to the stamp, it is necessary to print "Section 562 P. L. and R." adjacent the stamp. For this purpose, a lever 413 (Figure 55) having a die 414 thereon is provided. This lever is pivotally mounted at its rear end on a stud shaft 415 connected to plate 412 and is pivotally urged in a clockwise direction about stud shaft 415 by a bellcrank member, generally indicated at 416, also pivotally mounted on stud shaft 415. Arm 416a of bellcrank 416 is resiliently urged downwardly by a spring 417 and the other arm 416b of bellcrank 416 contacts the left edge 414a of lever 413 and resiliently urges movement of lever 413 in a clockwise direction, as viewed in Figure 55, about shaft 415. When lever 413 is not positioned in printing posiiton, its lower edge is supported by a supporting plate 417 (Figures 53 and 55). Suitable latch mechanism including a catch 418 (Figure 51) and a releasing member 419 is provided on the forward end of the printing head to permit the lever 413 to be locked (Figure 55) in either printing or non-printing position. Lever 413 has a notched end 413d which permits it to be disconnected from stud shaft 415 and withdrawn thru the slot 650 in the front of the head 17. This permits die 414 to be removed to change the die. Latch member 419 when it is held to the left (Figure 51) permits lever 413 to drop downwardly to a position where it may be removed from the head.

To prevent movement of setting bars 293, 294, 51, 295 and 296 (Figure 53) longitudinally with respect to head shaft 26 (Figure 49) during a cyclical operation of the printing head, a locking member 420 (Figures 49, 53 and 55) is provided. Locking member 420 includes portions which extend into hole 421 (Figure 49) in supporting plate 411 and into hole 422 (Figure 55) in an ear 412a extending downwardly from supporting plate 412. The portions of member 420 in holes 421 and 422 pivotally mount member 420 between plates 411 and 412. The right end of member 420 (Figure 55) is resiliently urged downwardly by a spring 423 (Figures 49 and 55).

Referring to Figure 49, a ring-shaped member 424 is connected by rearwardly and then outwardly extending flange portions to the front wall 29 of the machine. The inner edge 424a (Figure 52) of ring member 424 is spaced from the flange portion 403a of rear plate 403 (Figures 49 and 52). The rear end of member 420 is positioned between flange 403a and the inner edge 424a of

ring member 424 and the distance between flange 403a and edge 424a is such that the rear portion of member 420 (Figure 49) cannot move outwardly with respect to the axis of rotation of the printing head except at one point, namely, when the printing head is in "home" or "rest" position (Figure 52). At this time the rear end of member 420 is aligned with a notch 424b in ring member 424. Accordingly, at this time the rear end portion of member 420 (Figure 49) may be moved outwardly with respect to the axis of rotation of the printing head.

The under surface of each of setting bars 293, 294, 51, 295, and 296 (Figure 53) is provided with a series of ratchet teeth similar to ratchet teeth 51c (Figure 49) on setting bar 51. The ratchet teeth on each bar coact with a detent substantially similar to detent 425 and all of the detents are pivotally mounted on head shaft 26 by a pin 426. These detents are resiliently urged into contact with their respective sets of ratchet teeth by plunger members mounted in head shaft 426 which are all similar in construction to plunger member 427 (Figure 49). This plunger member has a head 427a which is resiliently pressed into contact with a boss 425b on detent 425 by a spring 428. The pin 427b connected to head 427a of plunger member 427 (Figures 49 and 53) extends downwardly through a supporting bracket 429 and its lower end is positioned immediately above locking member 420 when locking member 420 is in the position it occupies in Figure 49.

When the machine is in "home" or "rest" position, as the setting bars are moved longitudinally with respect to the printing head 17, the detents of the setting bars being moved are moved downwardly as the heads of the detents pass over the ratchet teeth on the lower edge of each bar. As the detents move downwardly, they act through their respective plunger members to move the left portion of locking member 420 (Figure 49) downwardly. After a setting in the printing head has been made and a cyclical operation begins, then the inner end of locking member 420 (Figures 49 and 52) passes from the position where it can be moved downwardly into notch 424b (Figure 52), and as the head rotates, the rear end of member 420 is positioned between flange 403a and inner edge 424a of ring shaped member 424. During the period that the inner end of member 420 is positioned between the inner edge of member 424 and flange 403a or throughout a complete cyclical operation, the rear end portion of locking member 420 cannot be moved outwardly with respect to the axis of rotation of the printing head. Thus, during this period the plungers, such as plunger 427 (Figure 49), cannot be moved downwardly as the outer ends of their pins are in engagement with member 420. Thus, the head portions of each of the detents are locked in position between two of the ratchet teeth to prevent movement of the setting bars during rotation of the printing head.

Accordingly, it will be seen that the setting bars in head shaft 26 are locked against longitudinal movement with respect to the head shaft during a cyclical operation. Also the setting levers 146, 147, 18, 148, and 149 (Figure 1) are locked in their set positions during a cyclical operation by their respective aligning arm (Figure 38) as described hereinabove. Thus, as the setting levers are directly geared to the rack bars 278, 281, 48, 284, and 285, these rack bars cannot be moved longitudinally with respect to the machine during a cyclical operation. Thus, maintenance of the respective positions of all mechanism in the train leading from a setting lever to a value printing wheel in the printing head is assured because of the locks described above. More particularly the teeth on the setting bars and rack bars such as teeth 49 on rack bar 48 and teeth 50 on setting bar 51 are held in alignment with respect to each other during a cyclical operation.

Referring now to Figure 49, a postage meter number printing die 430 is mounted on a bracket, generally indicated at 431. Bracket 431 is pivotally mounted on a shaft 432 extending transversely across the machine head between supporting plates 411 and 412 (Figure 54). A spring 433 (Figure 49) mounted on shaft 432 resiliently urges movement of bracket 431 in a counterclockwise direction, as viewed in Figure 49. Printing die 430 is moved into and out of inking and printing positions by an actuating plate on a U-shaped bracket, generally indicated at 434 (Figures 54 and 49). Bracket 434 includes a pair of legs 434a and 434b which extend upwardly on opposite sides of the setting bars adjacent supporting plates 411 and 412. This bracket is pivotally mounted on a pin 435 (Figure 54) which extends transversely across the head shaft 26 through legs 434a and 434b and into side plates 411 and 412

The lower end of bracket 434 (Figures 49 and 54) is pivotally connected by a pin 436 to a rod 437 mounted on the printing head parallel to the axis of the head shaft 26. Rod 437 (Figure 49) is urged in a rearward direction by a spring 438 acting between a bracket 439 and the lower end of bracket 434. The rear end 437a of rod 437 rides on a ring-shaped cam plate 440 which is mounted on the outwardly extending flange 424b of ring member 424. Cam plate 440 is secured through this flange to the framework of the machine, and thus, as the head rotates, the end 437a of rod 437 follows the forward surface of cam plate 440, causing rod 437 to move forwardly or rearwardly according to the surface of the cam ring as the printing head 17 rotates.

At the beginning of a cyclical operation of the machine, the end 437a of rod 437 (Figures 49 and 52) is positioned in the position shown in Figure 52. In the diagrammatic showing of the cam ring in Figure 58, the action of cam plate 440 and the end of rod 437 to actuate the postage meter printing die 430 is shown. As a cyclical operation begins, the end of rod 437 moves up incline 441 (Figure 58) actuating plate 442 (Figure 54) secured to the upper ends of the legs of bracket 434 which moves to the left, as viewed in Figure 49. The raised portion 444 on the under surface of bracket 431 coacts with actuating plate 442 to move die 430 outwardly into inking position. After rod 437 has followed up incline 441 and has reached dwell 443 (Figure 58), then the upper end of actuating plate is positioned on dwell 444a (Figure 49) on portion 444. Accordingly, the printing die 430 remains in inking position until the end of rod 437 (Figure 58) reaches inclined portion 445.

Inclined portion 445 moves rod 437 further to the right, as viewed in Figure 49, causing actuating plate 442 to move to the left-hand side off dwell 444a on bracket 431 permitting die 430 to drop below the printing surface. The end of rod 437 again follows a dwell 446 (Figure 58) on cam plate 440 until the printing die 430 is positioned

immediately above the surface on which the impression is to be made or is facing directly downwardly. At this time the end of rod 437 (Figure 58) passes over a drop 447 in cam ring 440. This permits spring 438 (Figure 14) to move rod 437 to the left, as viewed in Figure 49, thus causing actuating plate 442 to move from a position at the left-hand side of raised portion 444 on bracket 431 to the right-hand side thereof. As it passes from one side of raised portion 444 to the other, die 430 moves downwardly to print and then is immediately retracted.

Thus, effective mechanism has been disclosed for moving printing die out from a receded position only when it is passing the inking member and during the actual time when a printing impression is being made. Accordingly, these are the only times that it is possible to obtain a correct impression from the dies mounted on the printing head, thus making it impossible to obtain more than one impression from the printing die for each cyclical operation.

When all of the setting bars, such as setting bar 51 (Figure 49), are in zero position so that the value printing wheels in the printing head are set at zero, then a locking bracket, generally indicated at 450, is provided to prevent the operation of bracket 434 and thus actuation of die 430. Locking bracket 450 is U-shaped and includes a pair of legs 450*a* and 450*b* (Figure 54) connected by a center portion 450*c* (Figure 49) extending transversely across the head shaft beneath the ratchet teeth on the setting bars (Figure 49). The right-hand ends of legs 450*a* and 450*b* are pivotally mounted on a shaft 452 which extends between supporting plates 411 and 412. Locking bracket 450 is resiliently urged in a clockwise direction (Figure 49) by a spring 453 mounted on shaft 452.

At the left-hand end of each set of ratchet teeth (Figure 49) an enlarged notch similar to notch 51*d* in setting bar 51 is provided. When all of the bars are moved to their extreme right-hand positions, as viewed in Figure 49, then center portion 450*c* of U-shaped bracket 450 is moved upwardly into the notches in the setting bars by spring 453. This places a pair of fingers 454 and 455 (Figures 49 and 54) in position to engage a pair of rearwardly extending arms 456 and 457 on bracket 434. The engagement of these fingers and arms holds bracket 434 in a non-printing or left-hand position (Figure 49) with respect to raised portion 444 on bracket 431 as long as locking bracket 450 is in a raised position. As soon as any one of the setting bars is moved longitudinally with respect to the head shaft, the tooth on that setting bar adjacent the notch therein cams portion 450*c* of bracket 450 downwardly so that it no longer holds actuating member 434 in an inoperative position. Thus, whenever all of the setting bars are positioned in zero position, locking bracket 450 locks actuating member 434 in a set position and thus prevents movement of the postage meter printing die into printing position.

As is clearly shown in Figure 51, the rotatable printing head is made in two sections, generally indicated at 458 and 459. Section 458 which is the section which has been described immediately hereinabove is connected directly to the head shaft of the machine. Section 459 is detachably connected to section 458 in any suitable manner, such as by the catch member, generally indicated at 460, and a pair of lugs 461 and 462 which fit in openings 463 and 464.

Section 459 includes a pair of levers 465 and 466 (Figure 50) which may be manually operated to move a date circle 467 and the date wheels, generally indicated at 468, into and out of printing position depending on the type of postage which is to be printed. By these levers, the date circle may be moved out into printing position without the date wheels 468, or both the circle and date wheels may be positioned in printing position at the same time, or both the date circle and printing wheels may be moved out of printing position.

Referring to Figure 53, a slogan die 469 is mounted on a retractable plate 470 so that the slogan may be moved into and out of printing position by turning crank 471 (Figure 56). Crank 471 is connected to the end of a shaft 472 which extends longitudinally of the rotatable printing head parallel to the axis thereof and is mounted on the framework of section 459. A crank 473 (Figures 53 and 56) connected to shaft 472 acts through a link 475 pivotally connected to the end of crank 473 and to plate 470 to move slogan die 469 into printing position as crank 471 is turned against the action of a spring 630. Spring 630 moves plate 70 downwardly as viewed in Figure 53, when a button 431 (Figure 51) releases catch means associated therewith.

The date circle wheels 468 are mounted on a shaft 476 (Figure 53) connected to the top portion 477 (Figures 53 and 57) of a bracket 478 which is U-shaped in cross section and which slides within another U-shaped bracket, generally indicated at 479 (Figure 57). U-shaped bracket 479 has a pair of flanged portions 479*a* and 479*b* (Figure 56) which extend forwardly and rearwardly from the side walls of this bracket. The date circle 467 (Figures 50 and 53) is connected to flanges 479*a* and 479*b* (Figure 56) by screws. Bracket 479 is positioned within a bracket 485 similarly U-shaped in cross section (Figures 53 and 56) and connected to the base plate 486 (Figure 53) of section 459 of the rotatable printing head. Bracket 479 (Figure 53) is resiliently urged downwardly, as viewed in Figure 53, by a spring 487 and bracket 478 is resiliently urged in the same direction by a spring 490 connected to bracket 479.

Referring to Figures 50 and 56, levers 465 and 466 are substantially similar in construction. Both levers are pivotally mounted on a stud shaft 495 and the inner ends of both levers extend through a slot in the side wall of guiding bracket 485 into slots in the inner brackets 477 and 479, respectively, to move the type wheel and date circle brackets to be moved into printing position. A catch 497 (Figure 56) is provided, which engages levers 465 and 466 (Figures 50 and 56) to hold date circle and date wheels in printing position. When lever 498 of catch 497 is pressed rearwardly levers 465 and 466 are released and both the date circle and date printing wheels are withdrawn to non-printing positions by the springs 487 and 490. Levers 465 and 466 are independent of each other so that either one or both can be operated.

Thus a practical and efficient printing head has been disclosed in which the date circle and date wheels may be adjusted so that any type of postage stamp may be printed and furthermore the slogan mounted on the rotatable printing drum may be moved into or out of printing position at will. The rotatable printing head being in two sections, the section having the date wheels

may be removed at any time from the housing to reset the date wheels or to change the slogan. Thus, by having one section of the rotatable printing head removable, the door in the housing through which these acts were formerly accomplished has been eliminated.

Referring to Figures 59, 60, and 61, a lock is shown for locking the housing door 499 in front of the rotatable printing drum 17. To prevent this door from being opened or left open during an operating cycle with the chances of resultant injury to the operator by his or her being caught on one of the knobs or setting levers on the forward end of the rotatable printing drum, as it rotates, an interlocking system is provided to lock the machine whenever the door 499 is opened. Door 499 is provided with a catch 500 which coacts with a latch member 501 to hold the housing door 499 in locked position. Latch member 501 is pivotally mounted on a bracket 503 (Figure 61) and is operated by a push button 502 (Figures 59, 60 and 61). Bracket 503 includes a pair of flanged portions 503a and 503b (Figure 60) having aligned holes therein in which a rod 505 is mounted for sliding movement longitudinally with respect to the machine housing.

The forward end of rod 505 (Figure 59) is positioned in alignment with the base portion of catch 500 and the rear end of rod 505 engages a flanged portion 510a (Figures 59 and 60) of a bellcrank 510 pivotally mounted by a pin 511 and bracket 512 on the machine base 28. The end of arm 510b of bellcrank 510 acts upon an outwardly extending portion 515a of a bracket, generally indicated at 515. Bracket 515 is of U-shaped construction and includes a pair of legs 515a and 515b and a center portion 515c (Figure 59). This bracket is resiliently urged in a counterclockwise direction (Figure 60) about the shaft 520 on which it is pivotally mounted by a spring 521. Leg 515b of bracket 515 engages leg 313d of locking bracket 313.

As described hereinabove, with respect to the zero lock lever 343 (Figure 42), when bracket 313 (Figure 59) is turned in a clockwise direction, the rearwardly extending portion 314 (Figure 41) moves into a notch 315 in locking disc 25. This prevents further rotation of head shaft 26 and thus further operation of the machine. In operation, when door 499 is opened, rod 505 is free to move to the right, as viewed in Figure 60. Spring 521 then acts through bracket 515 to move bracket 313 into locking position.

When door 499 is closed, it strikes and moves rod 505 to the left, as viewed in Figures 59 and 60. This movement is transmitted to bracket 515 through bellcrank 510 causing bracket 515 to be turned in a clockwise direction (Figure 60), thus releasing the pressure on bracket 313 and permitting spring 320 (Figure 17) to move portion 314 of bracket 313 out of locking engagement with locking disc 25. Thus, each time the door is opened, the machine is locked and it cannot be operated until the door is closed again.

Referring now to Figures 51, 62 and 63 a button 700, movement of which is controlled by a trigger generally indicated at 701, prevents the closing of door 499 (Figure 59) and thus operation of the machine when section 459 (Figure 51) of head 17 is not connected to section 458. Button 700 is slidably mounted on head 17 (Figure 49 and 63) in alignment with the axis of rotation of the head. Trigger 701 is pivotally mounted on head shaft 26 by a pin 702 and has a lug 703 thereon extending into a bore in the head shaft. A spring 704 also mounted in head shaft 26 acts upon lug 703 to resiliently urge movements of trigger 701 in a clockwise direction as viewed in Figure 63.

A finger 701a forming a part of trigger 701 extends thru a slot 705 in supporting plate 411 when the sections are separated (Figures 51 and 62). The trigger is pivoted in a clockwise direction by the base plate 486 of section 459 (Figure 63) when section 459 is mounted on section 458. This pivoting of trigger 701 moves a stop portion 701b of the trigger out of the path of movement of button 700 so that it may be moved inwardly.

Inward movement of button 700 permits the cover 499 (Figure 59) to be closed as pin 700 may be moved inwardly by a pin 707 mounted on cover 499 when the cover is closed. Thus, to summarize the operation, whenever the cover 499 is opened and section 459 disconnected from section 458 (Figure 51) spring 703 (Figure 62) turns trigger 701 so that finger 701a extends outwardly through plate 486. As trigger 701 moves, it cams pin 706 forwardly until the stop portion 701b of the trigger is positioned behind pin 706 blocking rearward movement of this pin. At this time door 499 cannot be closed as pin 707 strikes against pin 706. Thus, the machine cannot be operated when section 459 is detached, as the machine cannot be run when door 499 is open because of the interlock described hereinabove. When section 459 is mounted on section 458, then trigger 701 is pivoted against the action of spring 703 as base plate 486 acts on finger 701a. When trigger 701 is moved to the position shown in Figure 63, then door 499 may be closed as door pin 707 can move pin 706 rearwardly. Accordingly, the mechanism described hereinabove prevents operation of the machine whenever the section 459 is detached from head 17.

Thus, a thoroughly practical and efficient machine has been disclosed which prints the amount set on the setting levers and registers the amount printed. Furthermore a machine is disclosed which is capable of handling an extremely large number of pieces of mail per hour and accurately recording the amount of postage printed. Other features such as resetting and the head door interlock are provided which insure of the machine with a maximum of both speed and safety.

As many possible embodiments may be made of the mechanical features of this invention, and as many changes might be made in the embodiment above set forth, it is to be understood that all matter herein before set forth, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

We claim:

1. In a machine of the character described, in combination, a framework, a shaft mounted on said framework, a cyclically operated printing drum mounted on said shaft, a plurality of value printing wheels mounted on said drum having digits from zero to nine thereon, setting levers for selectively setting said printing wheels, a train of mechanism connecting each setting lever to a value printing wheel, a portion of each train of mechanism being mounted on said framework and another portion of each train of mechanism being mounted on said head shaft, the two portions of each train of mechanism being disconnected during each cyclical operation, and means to align the two portions of each

train of mechanism at their point of connection at the end of each operative cycle.

2. In a machine of the character described, in combination, a framework, a shaft mounted on said framework, a cyclically operated printing drum mounted on said shaft, a plurality of value printing wheels mounted on said drum having digits from zero to nine thereon, setting levers for selectively setting said printing wheels, a train of mechanism connecting each setting lever to a value printing wheel, a portion of each train of mechanism being mounted on said framework, teeth formed on the elements in each portion of each train of mechanism at their point of connection, said teeth meshing when said printing drum is in a "rest" position, said teeth being disconnected during each cyclical operation, and means to align the teeth on each of the two portions of each train of mechanism at the end of an operative cycle.

3. In a machine of the character described, in combination, a framework, a shaft mounted on said framework, a cyclically operated printing drum mounted on said shaft, a plurality of value printing wheels mounted on said drum having digits from zero to nine thereon, setting levers for selectively setting said printing wheels, a train of mechanism connecting each setting lever to a value printing wheel, a portion of each train of mechanism being mounted on said framework and another portion of each train of mechanism being mounted on said head shaft, the two portions of each train of mechanism being disconnected during each cyclical operation, means to align the two portions of each train of mechanism at their point of connection at the end of each operative cycle, means to lock the portion of each train of mechanism mounted on said framework during an operative cycle, and means to lock the portion of each train of mechanism mounted on said shaft during an operative cycle.

4. In a machine of the character described, in combination, a framework, a shaft mounted on said framework, a cyclically operated printing drum mounted on said shaft, a plurality of value printing wheels mounted on said drum having digits from zero to nine thereon, setting levers for selectively setting said printing wheels, actuating means having a positive connection to said printing wheels at all times mounted on said shaft, means connecting each of said setting levers to said actuating means, the point of connection between said last-mentioned means and said actuating means being broken during each cyclical operation causing said actuating means to move out of alignment with respect to said last-mentioned means, means to lock said actuating means in a set position during an operative cycle, means to lock said setting levers in their set positions during an operative cycle, and means to lock the means forming the connection between said setting levers and said actuating means in a set position during an operative cycle.

5. In a machine of the character described, in combination, a framework, a shaft mounted on said framework, a printing drum mounted on said shaft, means for cyclically driving said shaft, a plurality of value printing wheels for printing digits from zero to nine mounted on said printing drum, setting bars mounted on said shaft and movable longitudinally with respect thereto, rack means on each of said setting bars operatively engaging a pinion connected to each of said value printing wheels, setting levers for selectively setting said value printing wheels,

rack bars mounted on said framework and operatively connected to said setting levers, said rack bars moving longitudinally with respect to the axis of said head shaft, said rack bars and said setting bars having teeth thereon which mesh when said shaft is in "rest" position and are disconnected with respect to each other during a cyclical operation, and means to align the teeth of each pair of rack bars and setting bars at the end of a cyclical operation.

6. In a machine of the character described, in combination, a printing drum, a shaft, means for cyclically driving said shaft, said drum being mounted on said shaft, a plurality of value printing wheels for printing digits from zero to nine mounted on said printing drum, setting bars mounted on said shaft and extending longitudinally thereof, said setting bars operatively engaging said value printing wheels at all times, setting levers for selectively setting said wheels, rack bars associated with said setting levers, said rack bars operatively engaging said setting bars when the shaft is in "rest" position and being disconnected from said setting bars during an operative cycle, said setting bars and said rack bars moving out of alignment during each operative cycle, means to lock said setting bars during an operative cycle, means to lock said rack bars during an operative cycle, means to lock the setting levers during an operative cycle, and means to align said setting bars with respect to said rack bars at the end of an operative cycle.

7. In a machine of the character described, in combination, a framework, a shaft mounted on said framework, a printing drum mounted on said shaft, means for cyclically driving said shaft, a plurality of value printing wheels for printing digits from zero to nine mounted on said drum, setting bars mounted on said shaft and movable longitudinally thereof, said setting bars including rack portions engaging portions of said printing wheels at all times, whereby when said setting bars are moved longitudinally of said shaft said wheels may be set, setting levers for selectively setting said wheels, a plurality of rack bars mounted on said framework, said rack bars being movable longitudinally with respect to the axis of said shaft, gear means operatively connecting each of said setting levers to its rack bar, said rack bars including means operatively engaging means on said setting bars when said shaft is in "rest" position, said last-mentioned means being disconnected during an operative cycle, detent means resiliently engaging teeth on each of said setting bars for controlling longitudinal movement of said setting bars, means for locking said detent means in engagement with said teeth to prevent longitudinal movement of said setting bars during a cyclical operation, and means for locking said setting levers in a set position during each cyclical operation.

8. In a machine of the character described, in combination, a framework, a rotatable printing head mounted on said framework, means for cyclically driving said printing head, a plurality of value printing wheels having digits from zero to nine mounted on said head, setting bars for setting said value printing wheels, said setting bars being movable axially with respect to said printing head and being operatively connected at all times to said wheels, a plurality of setting levers, means forming a connection between said setting levers and said setting bars, detent means engaging teeth on each of said bars for aligning said bars to properly position said printing

wheels, and means for locking said detent means in engagement with said teeth for locking said value printing wheels in their set positions during a cyclical operation.

9. In a machine of the character described, in combination, a printing drum, a cyclically driven shaft, means mounting said drum on said shaft, value printing wheels having digits from zero to nine thereon mounted on said drum, manually operable setting means for selectively setting said wheels, actuating means on said shaft having a positive connection to said printing wheels at all times, mechanism operatively connecting said setting means and said actuating means, the connection between said mechanism and said actuating means being broken during an operative cycle, and means to lock said actuating means in its set position during an operative cycle.

10. In a machine of the character described, in combination, a printing drum, a cyclically driven shaft, means mounting said drum on said shaft, value printing wheels having digits from zero to nine thereon positioned on said drum, manually operated setting levers for selectively setting said wheels, actuating means on said shaft having a positive connection to said printing wheels at all times, mechanism operatively connecting said setting levers and said actuating means, the connection between said mechanism and said actuating means being broken during an operative cycle, means to lock said actuating means in its set position during an operative cycle, and means to lock said setting levers in their set positions during an operative cycle.

11. In a machine of the character described, in combination, a printing drum, a cyclically driven shaft, means mounting said drum on said shaft, value printing wheels having digits from zero to nine thereon positioned on said drum, manually operated setting levers for selectively setting said printing wheels, actuating means on said shaft having a positive connection to said printing wheels at all times, mechanism operatively connecting said setting levers and said actuating means, the connection between said mechanism and said actuating means being broken during an operative cycle causing said actuating means to move out of alignment with respect to said mechanism, means to lock said actuating means in its set position during an operative cycle, means to lock said setting levers in their set positions during an operative cycle, and aligning means to insure realignment of said mechanism and said actuating means at the end of an operative cycle.

12. In a machine of the character described, in combination, a printing drum, a shaft, means for cyclically driving said shaft, said drum being mounted on said shaft, a plurality of value printing wheels having digits from zero to nine thereon mounted on said printing drum, setting bars mounted on said shaft and extending longitudinally thereof, said setting bars operatively engaging said value printing wheels, setting levers, rack bars associated with said setting levers for selectively setting said printing wheels, said rack bars operatively engaging said setting bars when the shaft is in "home" position and being disconnected from said setting bars during an operative cycle.

13. In a machine of the character described, in combination, a printing drum, a shaft, means for cyclically driving said shaft, said drum being mounted on said shaft, a plurality of value printing wheels having digits from zero to nine thereon mounted on said printing drum, setting bars mounted on said shaft and extending longitudinally thereof, said setting bars operatively engaging said value printing wheels, setting levers, rack bars associated with said setting levers for selectively setting said printing wheels, said rack bars operatively engaging said setting bars when the shaft is in "home" position and being disconnected from said setting bars during an operative cycle, and means for locking said setting bars during an operative cycle.

14. In a machine of the character described, in combination, a printing drum, a shaft, means for cyclically driving said shaft, said drum being mounted on said shaft, a plurality of value printing wheels having digits from zero to nine thereon mounted on said printing drum, setting bars mounted on said shaft and extending longitudinally thereof, said setting bars operatively engaging said value printing wheels, setting levers, rack bars associated with said setting levers for selectively setting said printing wheels, said rack bars operatively engaging said setting bars when the shaft is in "home" position and being disconnected from said setting bars during an operative cycle, means to lock setting bars during an operative cycle, and means to lock the setting levers during an operative cycle.

15. In a machine of the character described, in combination, a printing drum, a shaft, means for cyclically driving said shaft, said drum being mounted on said shaft, a plurality of value printing wheels having digits from zero to nine thereon mounted on said printing drum, setting bars mounted on said shaft and extending longitudinally thereof, said setting bars operatively engaging said value printing wheels, setting levers, rack bars associated with said setting levers for selectively setting said printing wheels, said rack bars operatively engaging said setting bars when the shaft is in "home" position and being disconnected from said setting bars during an operative cycle, said setting bars and said rack bars moving out of alignment during an operative cycle, means to maintain said rack bars in set positions during an operative cycle, and means to align said setting bars with respect to said rack bars at the end of an operative cycle.

16. In a machine of the character described, in combination, a printing drum, a shaft, means for cyclically driving said shaft, said drum being mounted on said shaft, a plurality of value printing wheels having digits from zero to nine thereon mounted on said printing drum, setting bars mounted on said shaft and extending longitudinally thereof, said setting bars operatively engaging said value printing wheels, setting levers, rack bars associated with said setting levers for selectively setting said wheels, said rack bars operatively engaging said setting bars when the shaft is in "home" position and being disconnected from said setting bars during an operative cycle said setting bars and said rack bars moving out of alignment during an operative cycle, means to lock said setting bars during an operative cycle, means to lock the setting levers during an operative cycle, and means to align said setting bars with respect to said rack bars at the end of an operative cycle.

17. In a machine of the character described, in combination, a framework, a rotatable printing head mounted on said framework, means for cyclically driving said printing head, a plurality of value printing wheels having digits from zero to nine thereon mounted on said head, setting

bars for selectively setting said value printing wheels, said setting bars being in engagement with said wheels at all times, detent means engaging teeth on said setting bars for longitudinally aligning said bars to properly position said value printing wheels, and means for locking said detent means in engagement with said teeth for locking said value printing wheels in their set positions during a cyclical operation.

18. In a machine of the character described, in combination, a framework, a rotatable printing head mounted on said framework, means for cyclically driving said printing head, a plurality of value printing wheels having digits from zero to nine thereon mounted on said head, setting bars for selectively setting said value printing wheels, said setting bars being in engagement with said wheels at all times, detent means resiliently engaging teeth on said setting bars for longitudinally aligning said bars to properly position said printing wheels, a locking member on said drum, said locking member being capable of locking said detent means in engagement with

said teeth to prevent longitudinal movement of said setting bars, and means on said framework for holding said locking member in locked position during a cyclical operation of said drum.

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