

Sept. 27, 1949.

F. Q. RAST

2,482,935

VALUE PRINTING AND REGISTERING MECHANISM

Filed April 15, 1944

20 Sheets-Sheet 1

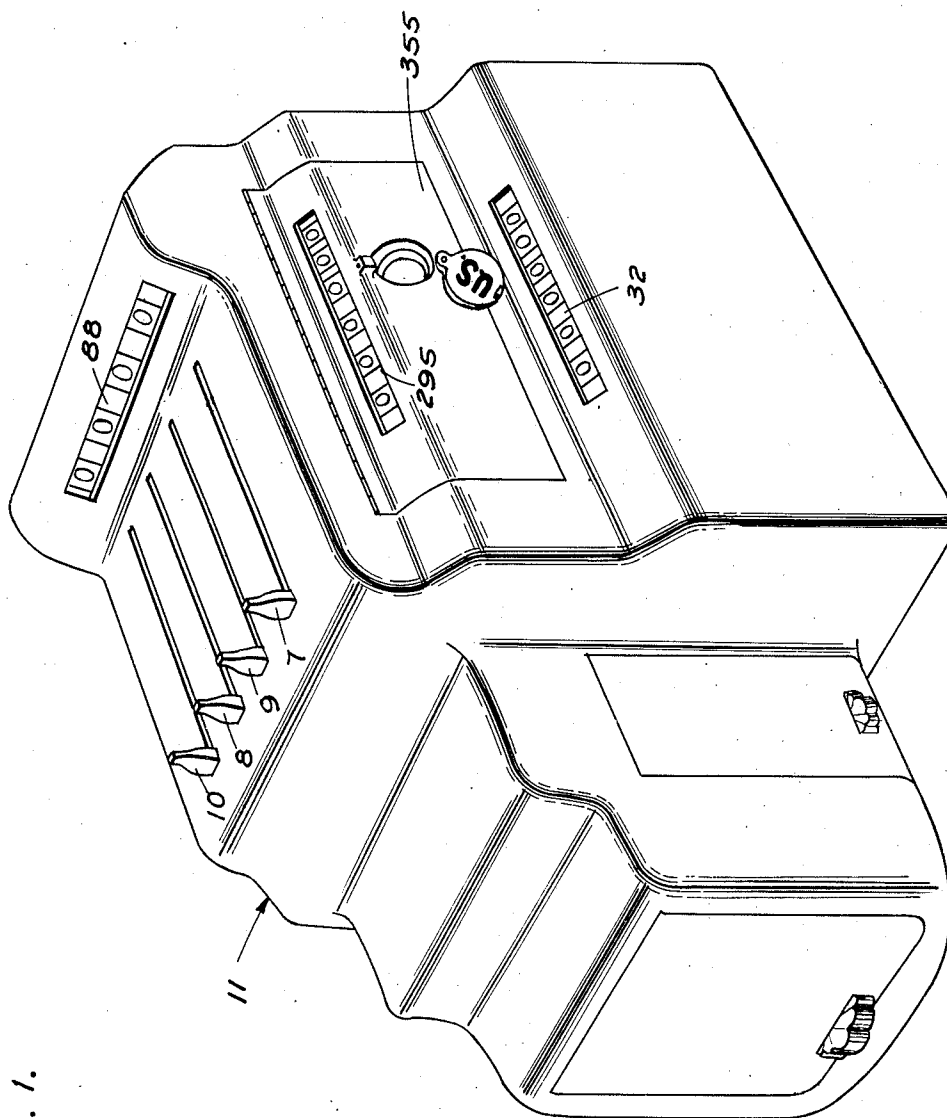


FIG. 1.

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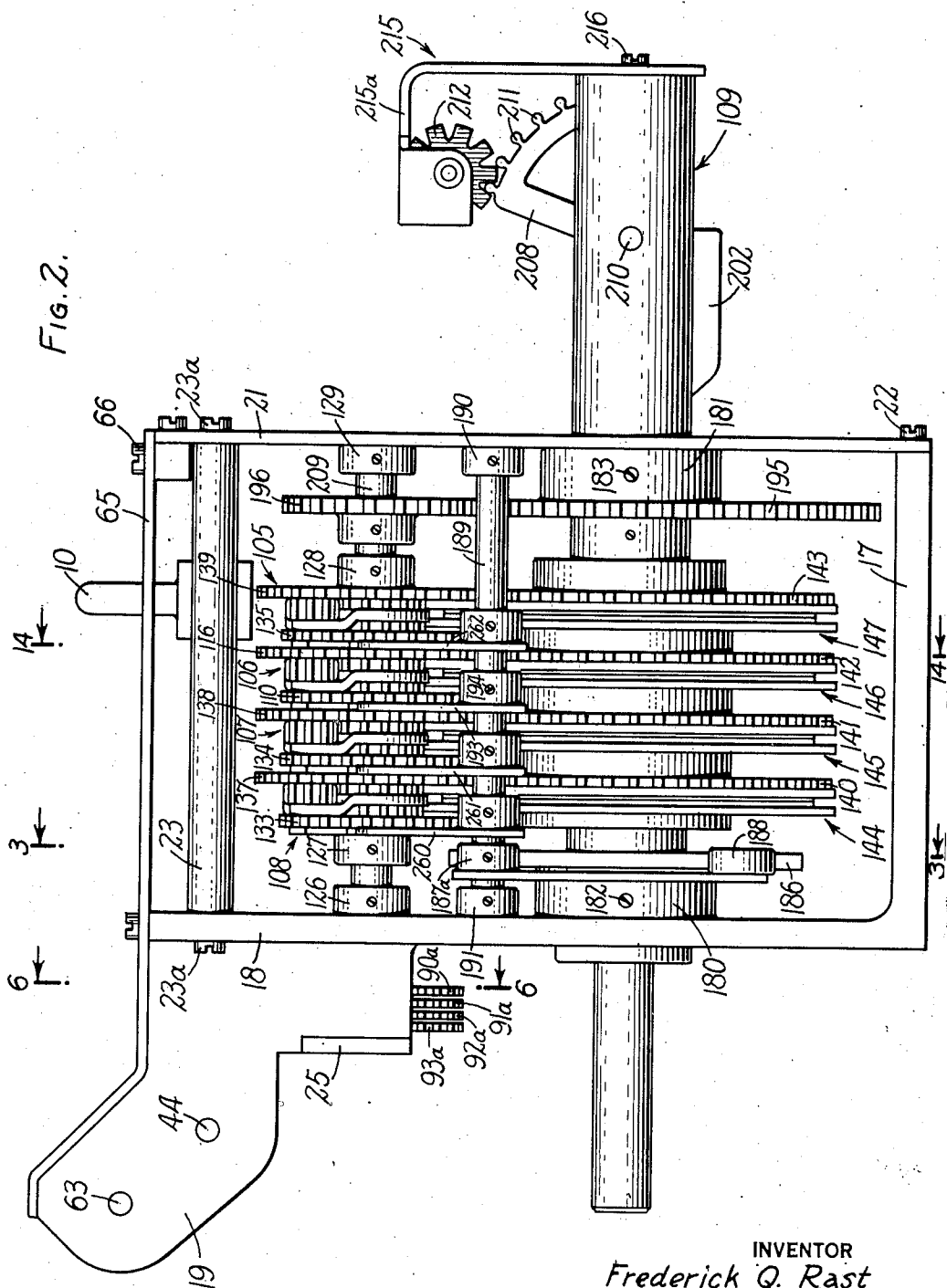
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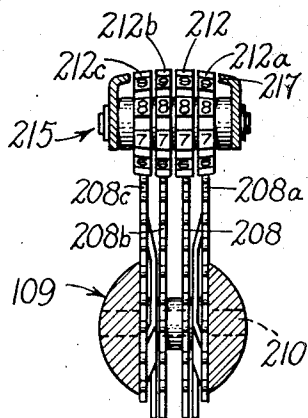
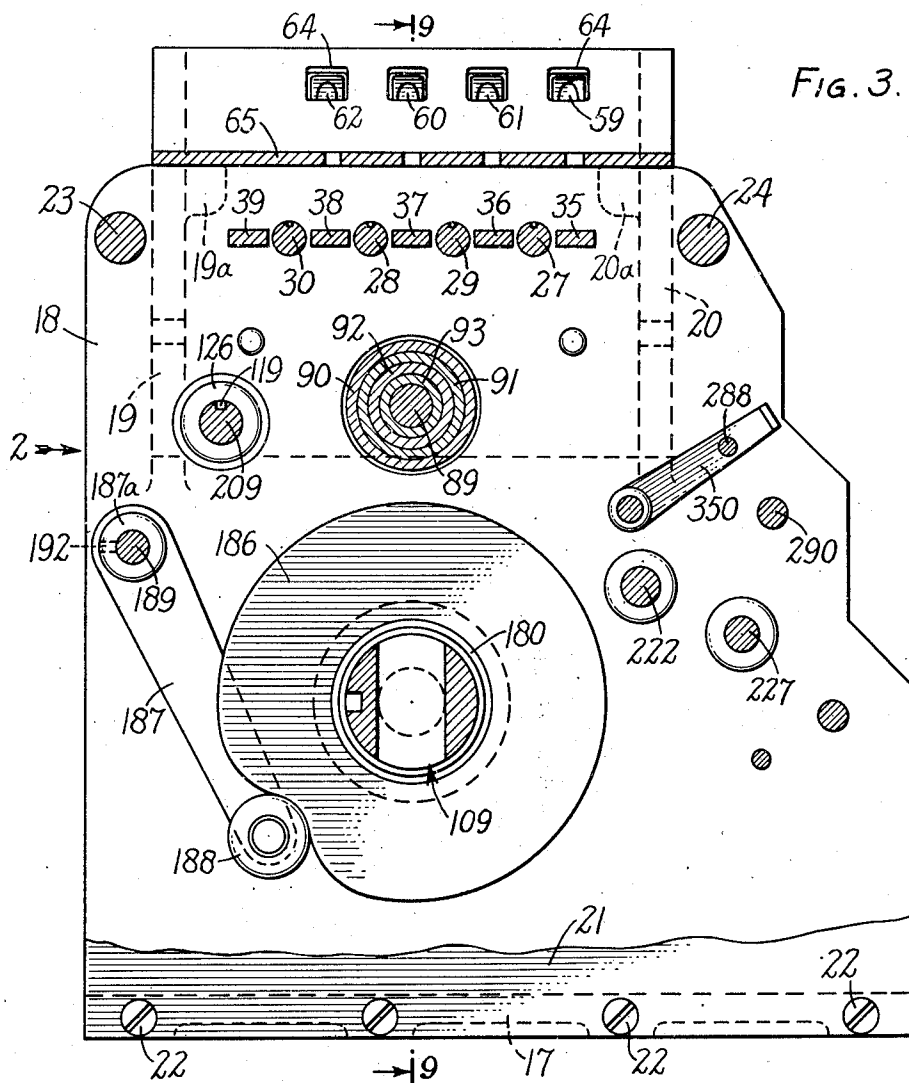
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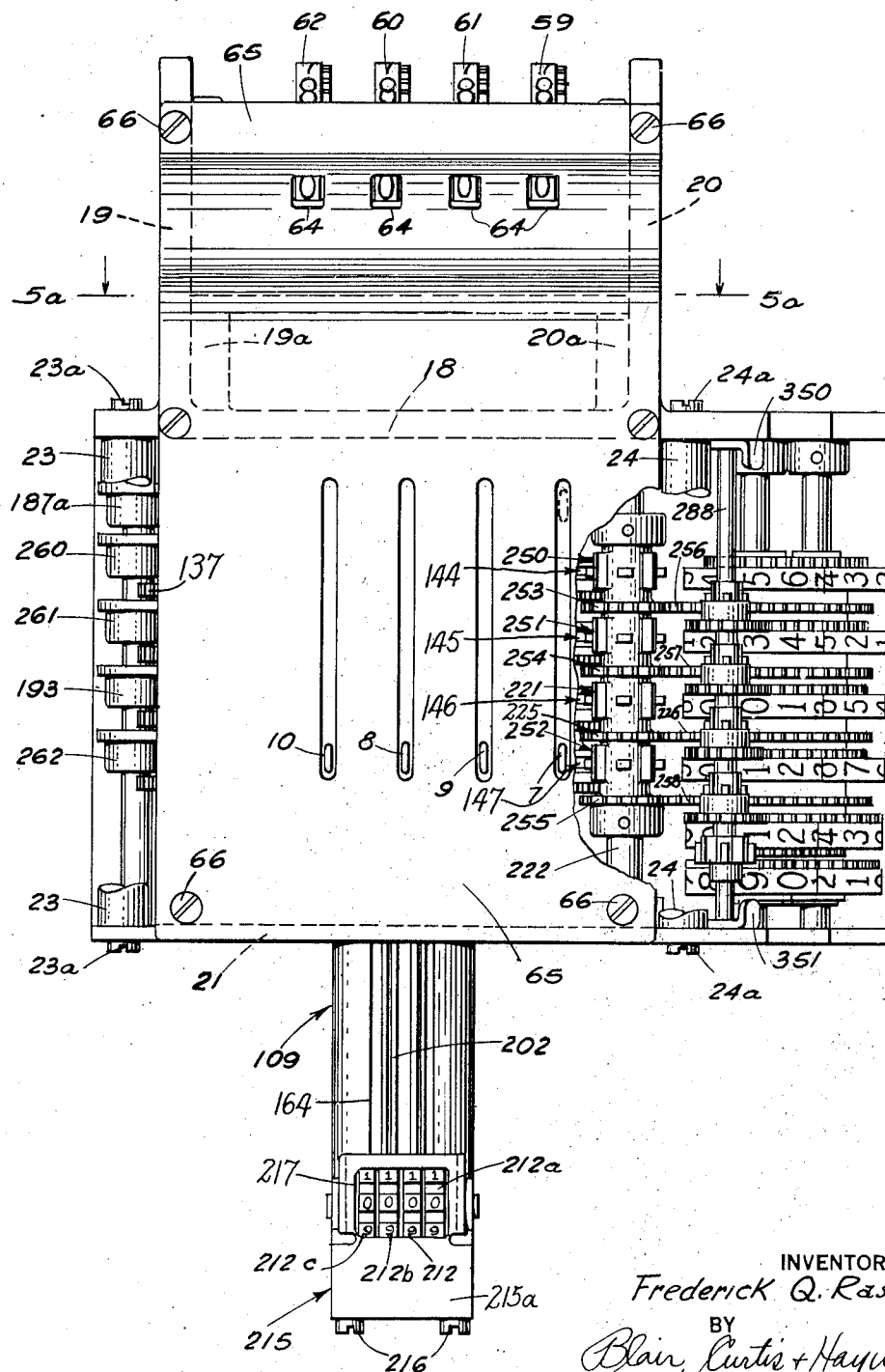
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FIG. 4.



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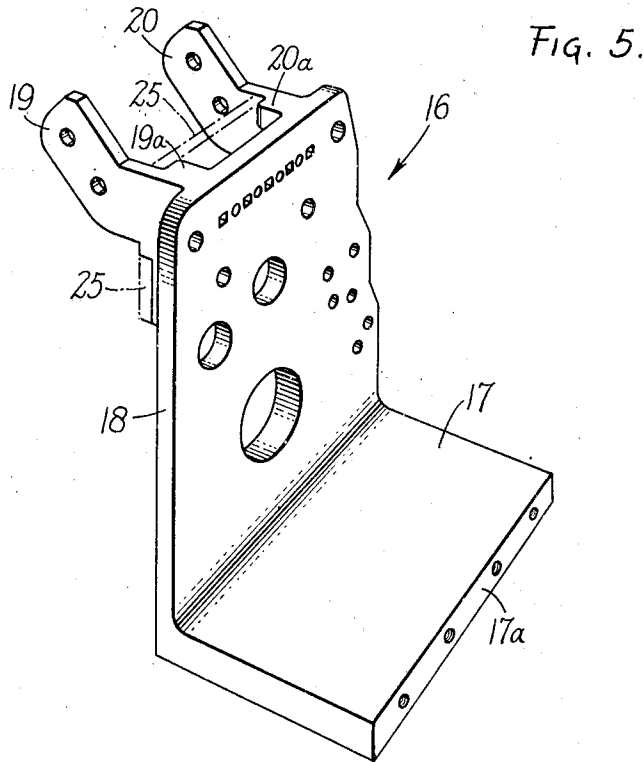
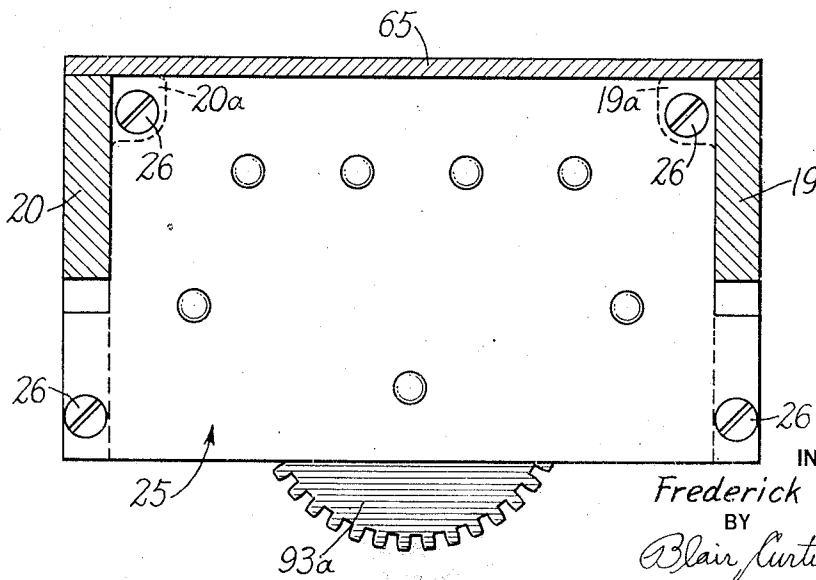


Fig. 5A.



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Fig. 6.

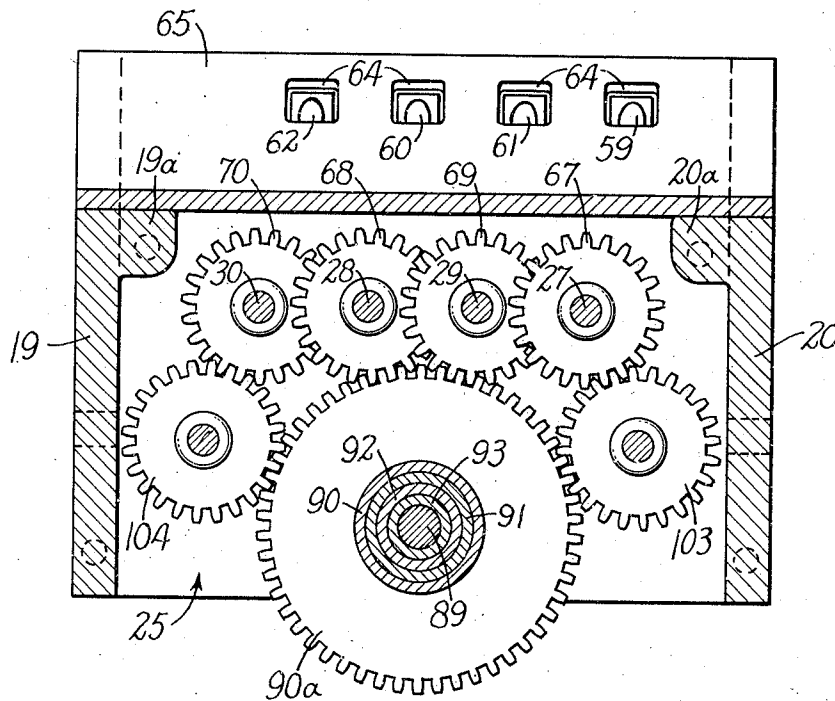
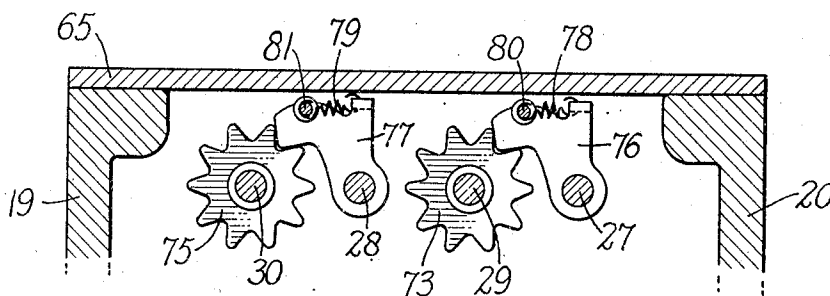


Fig. 8.



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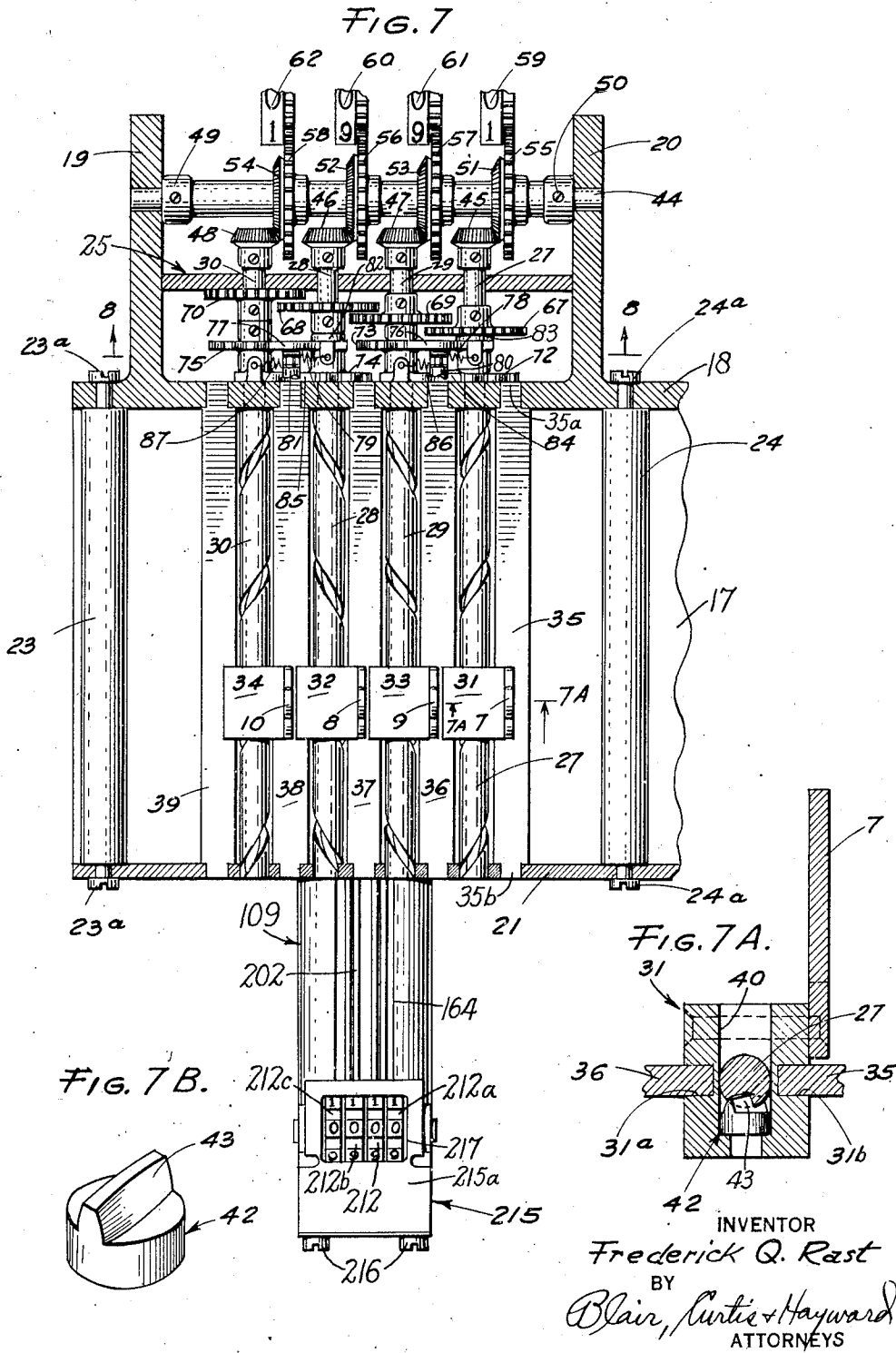
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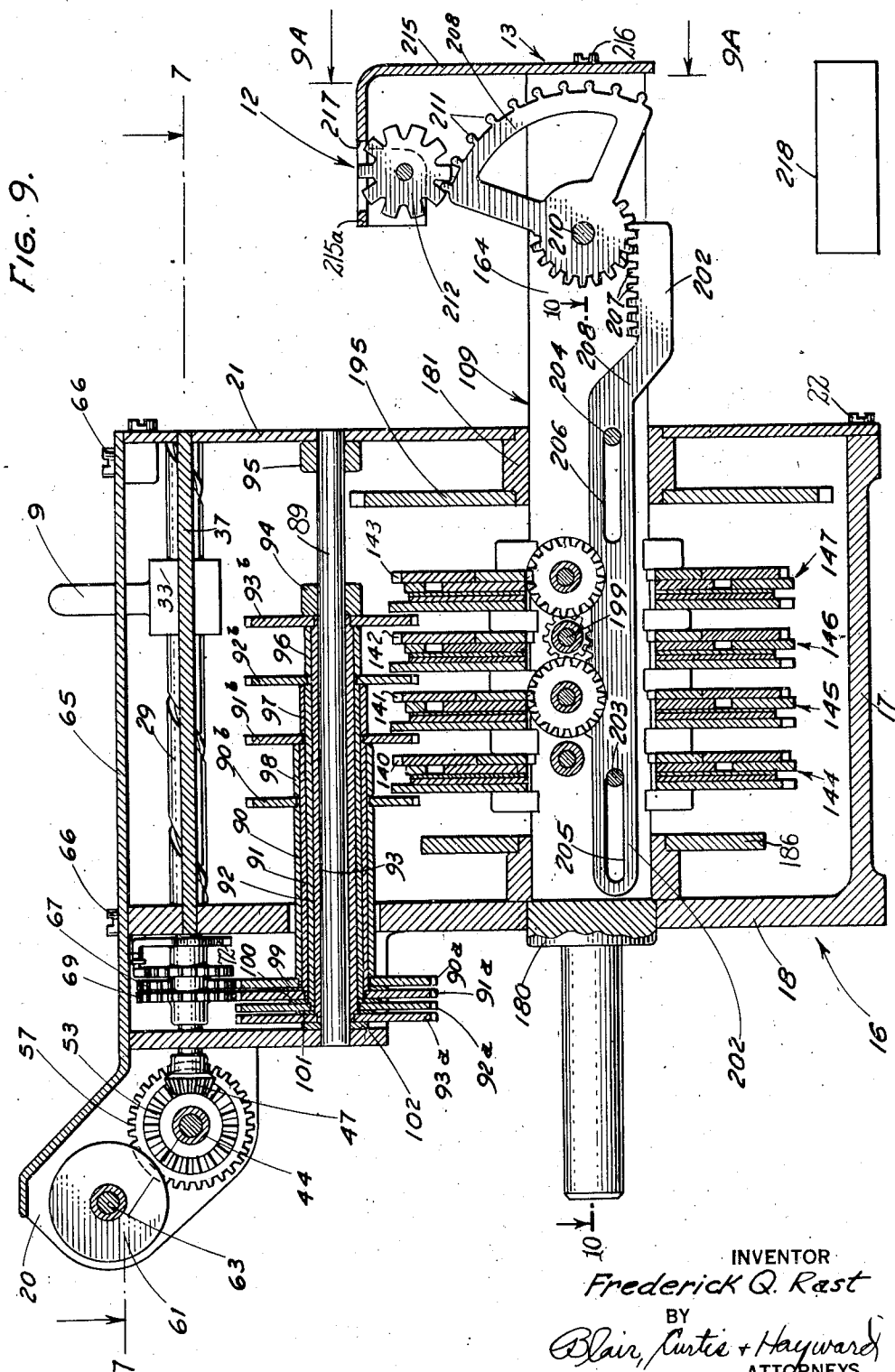
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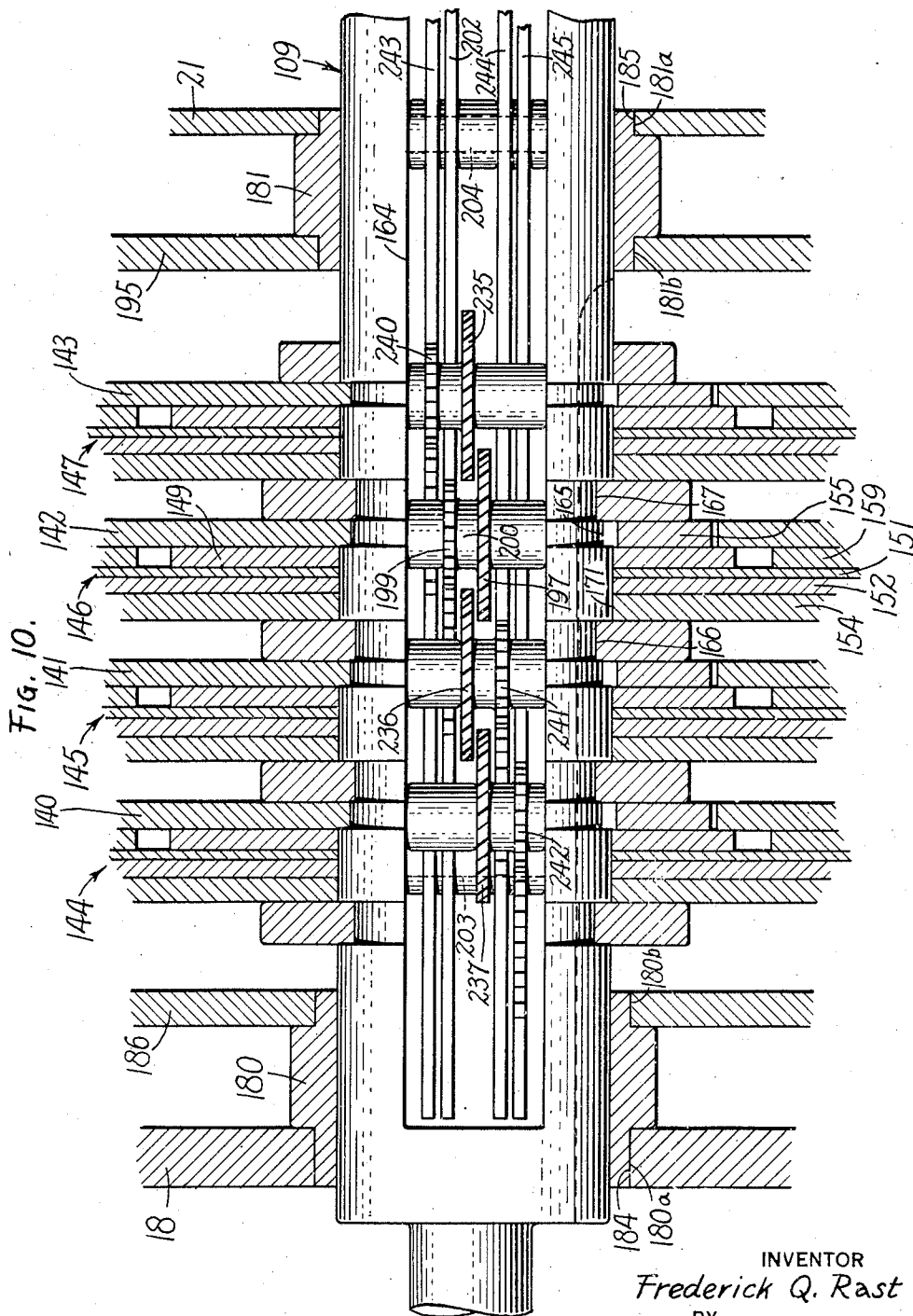
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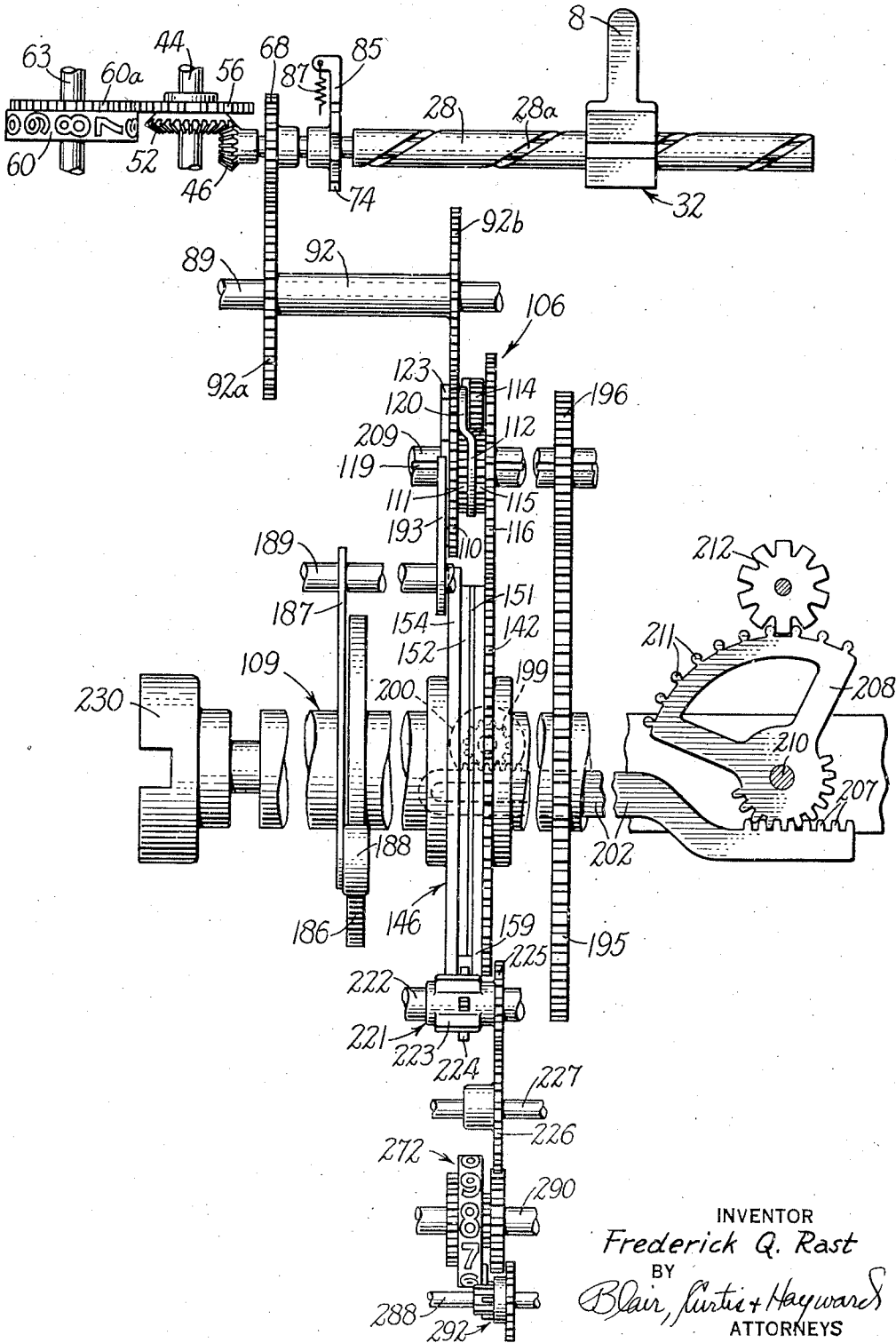
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FIG. 11.



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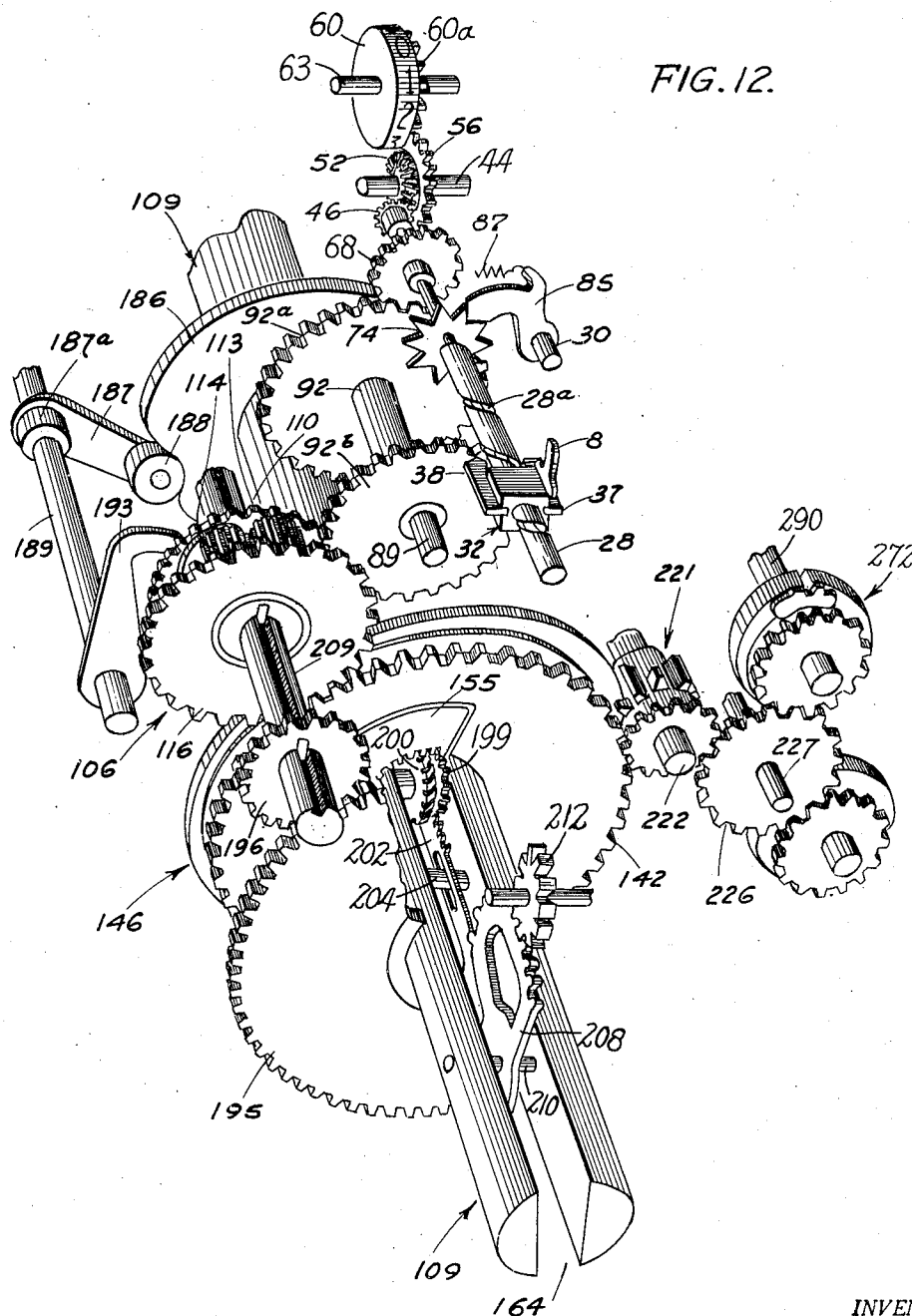
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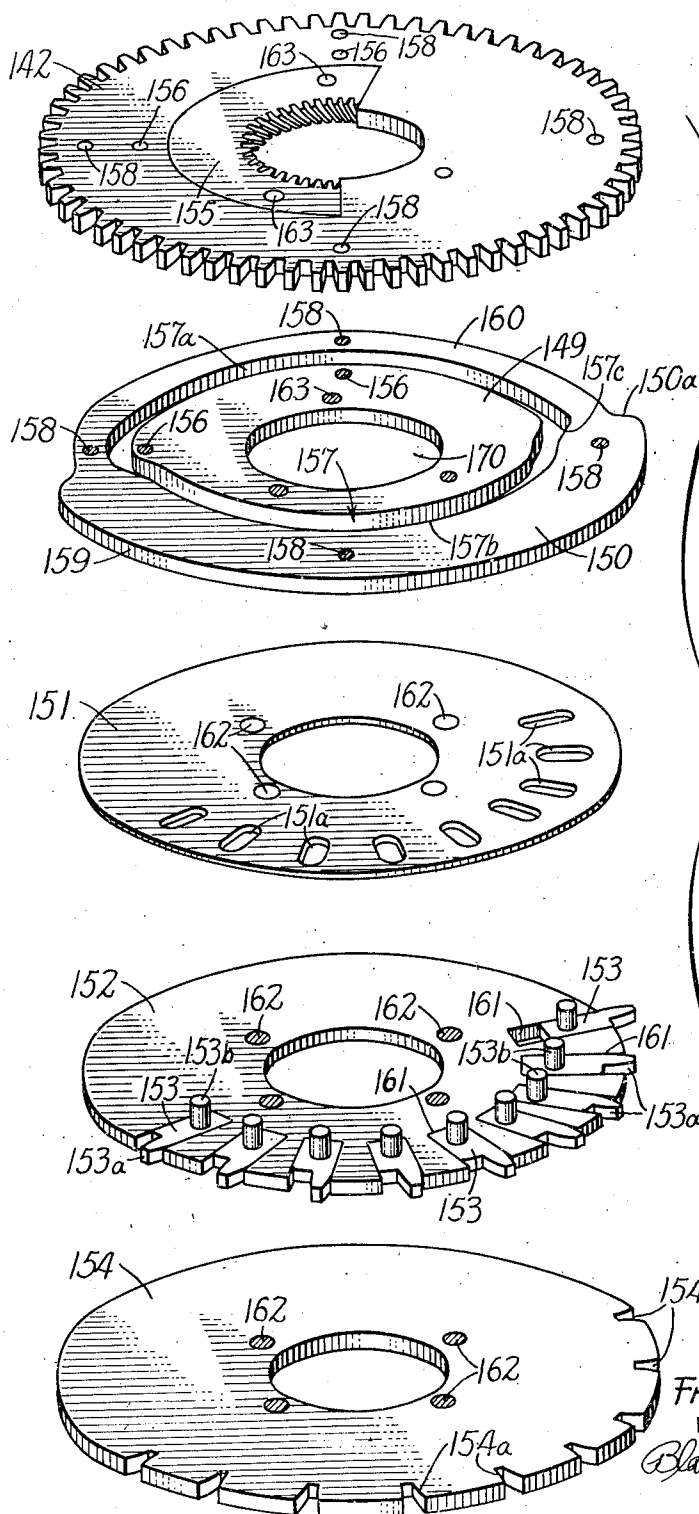
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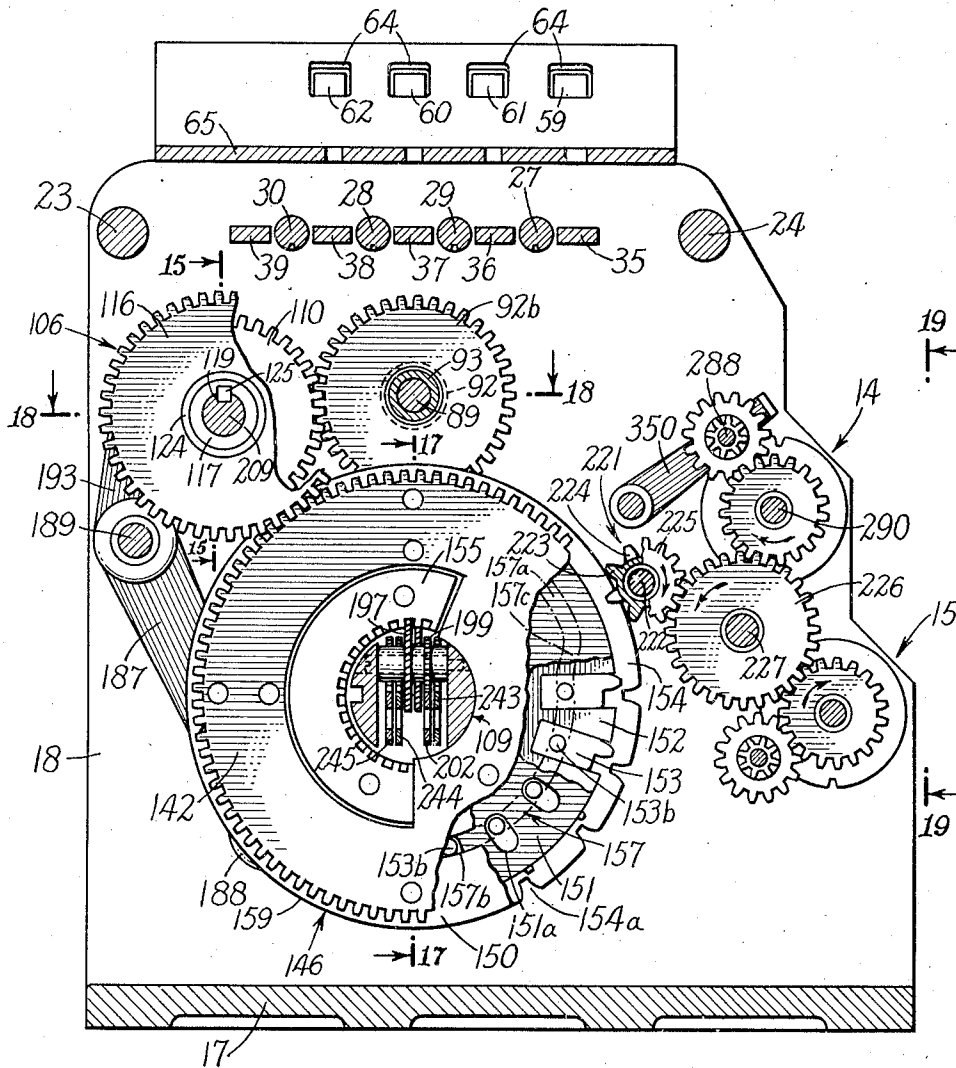
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Fig. 14.



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Fig. 15.

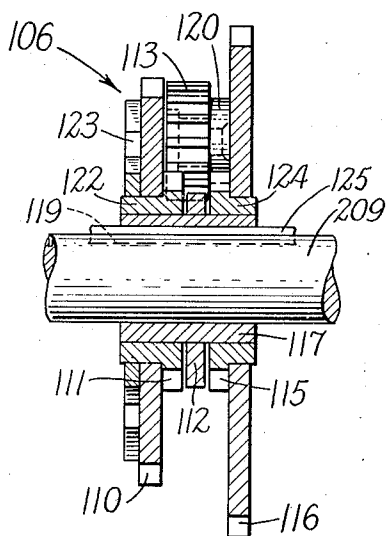


Fig. 16A.

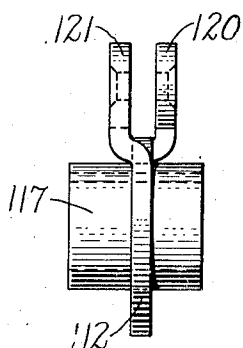
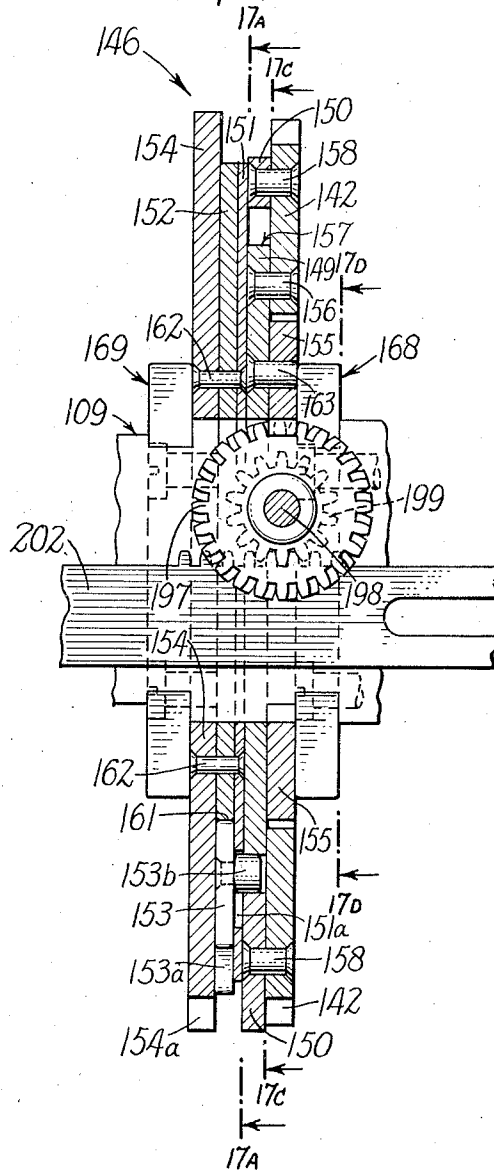


Fig. 17.



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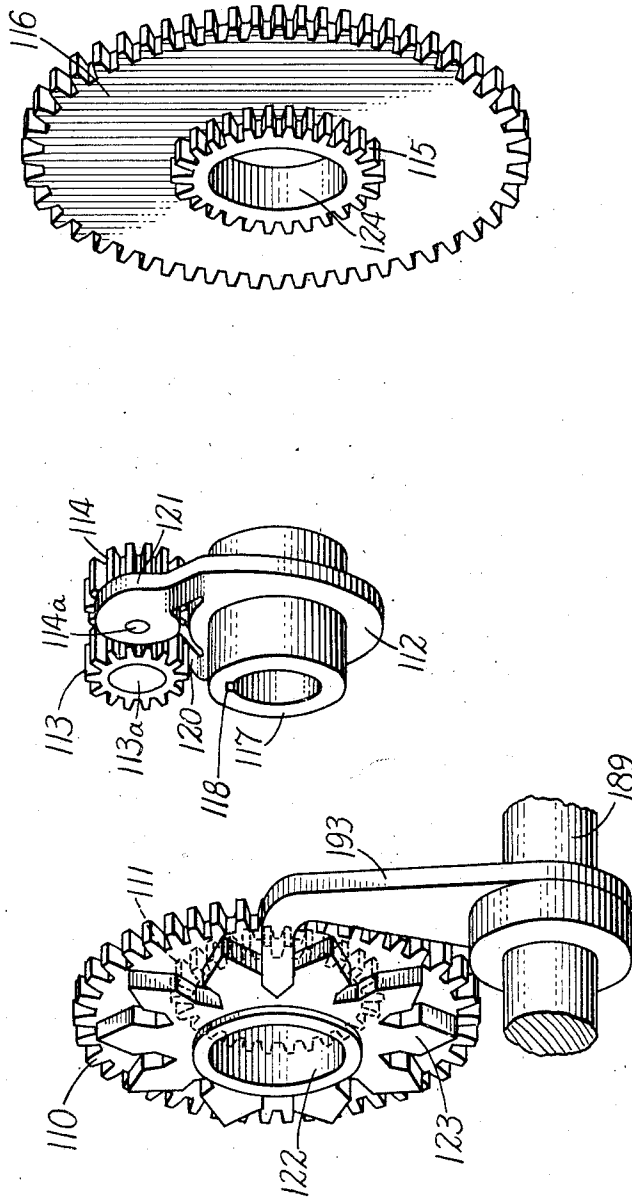
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Fig. 16.



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Fig. 17A.

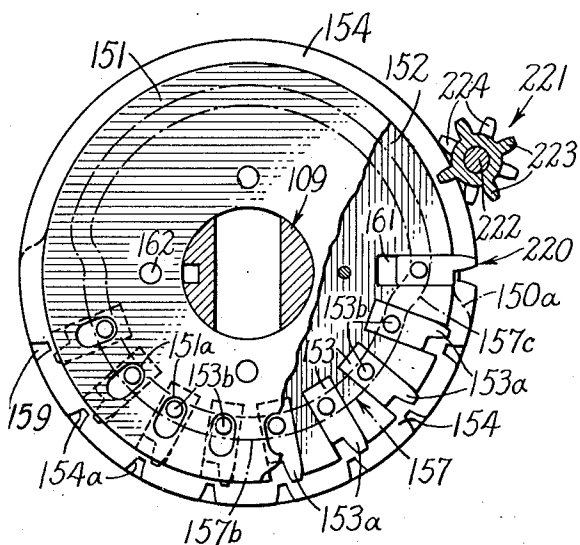


Fig. 17B.

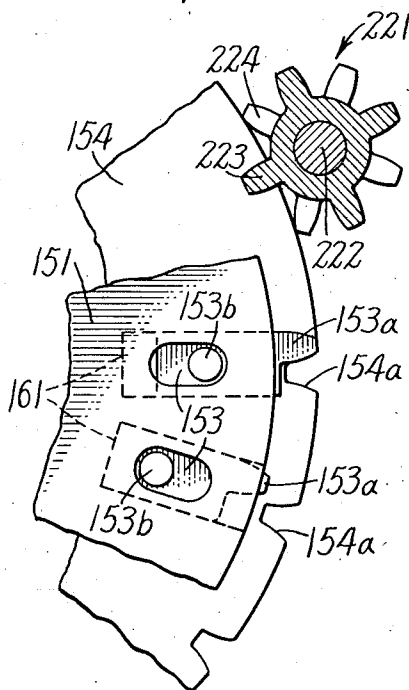


Fig. 17c.

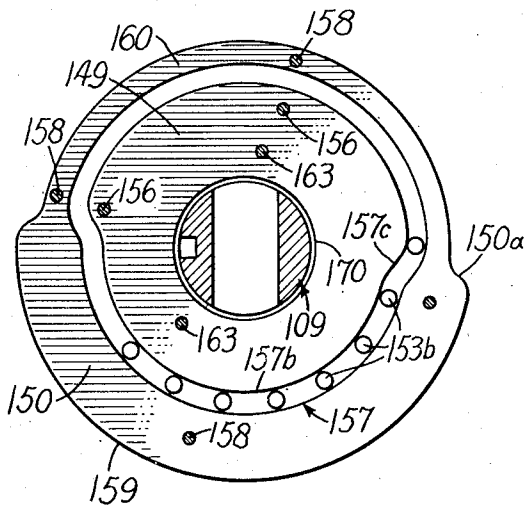
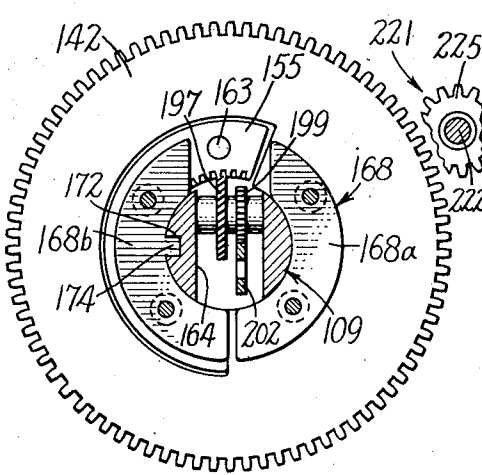


Fig. 17D.



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Fig. 18.

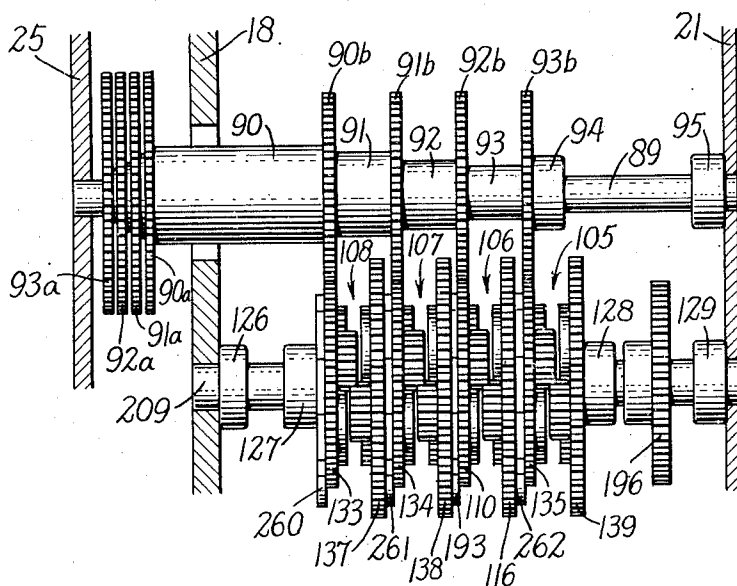
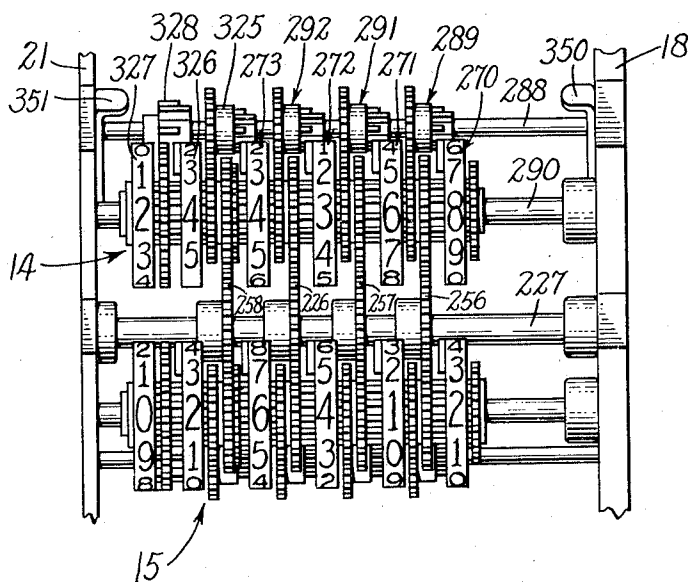


Fig. 19.



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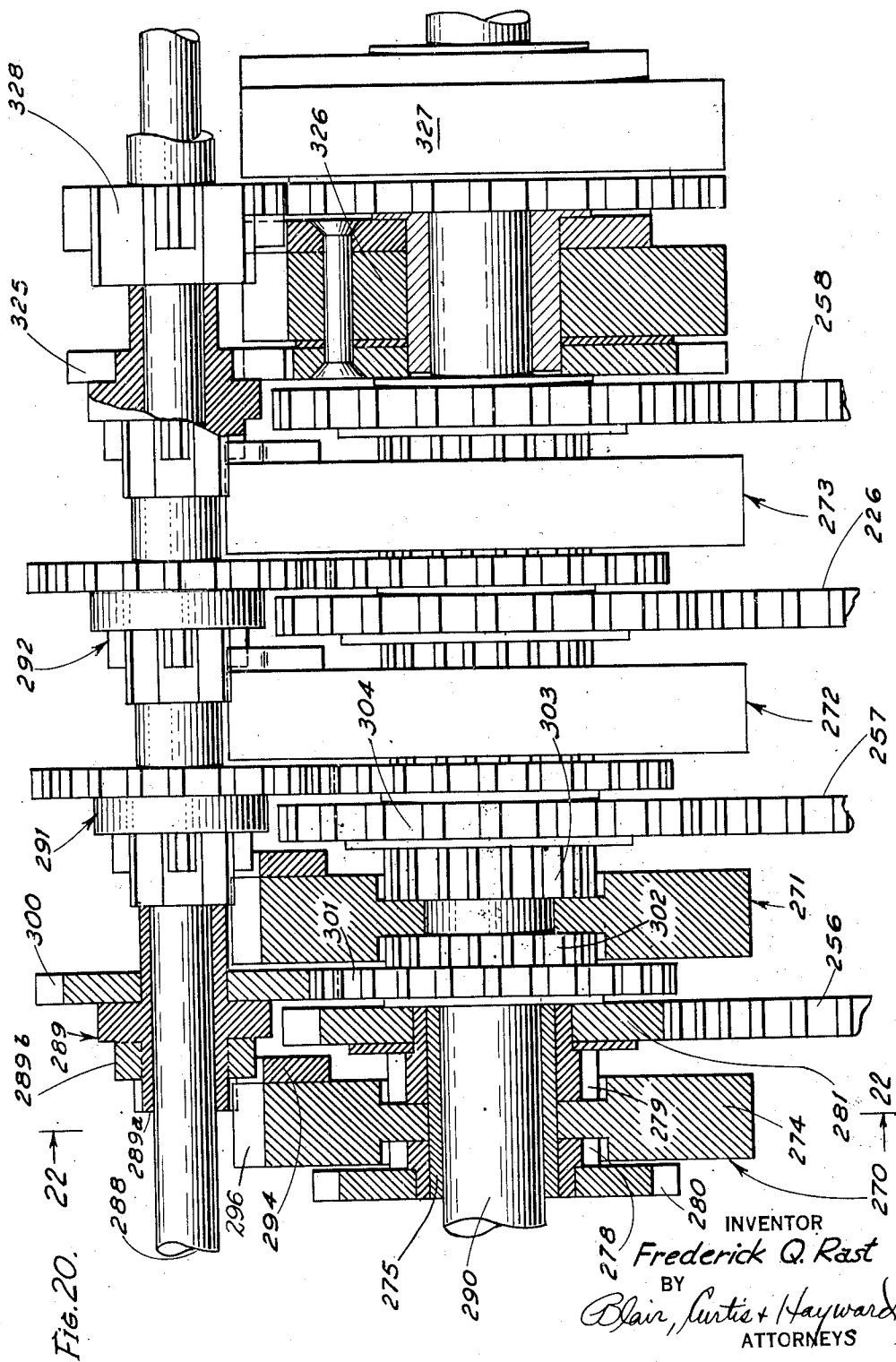
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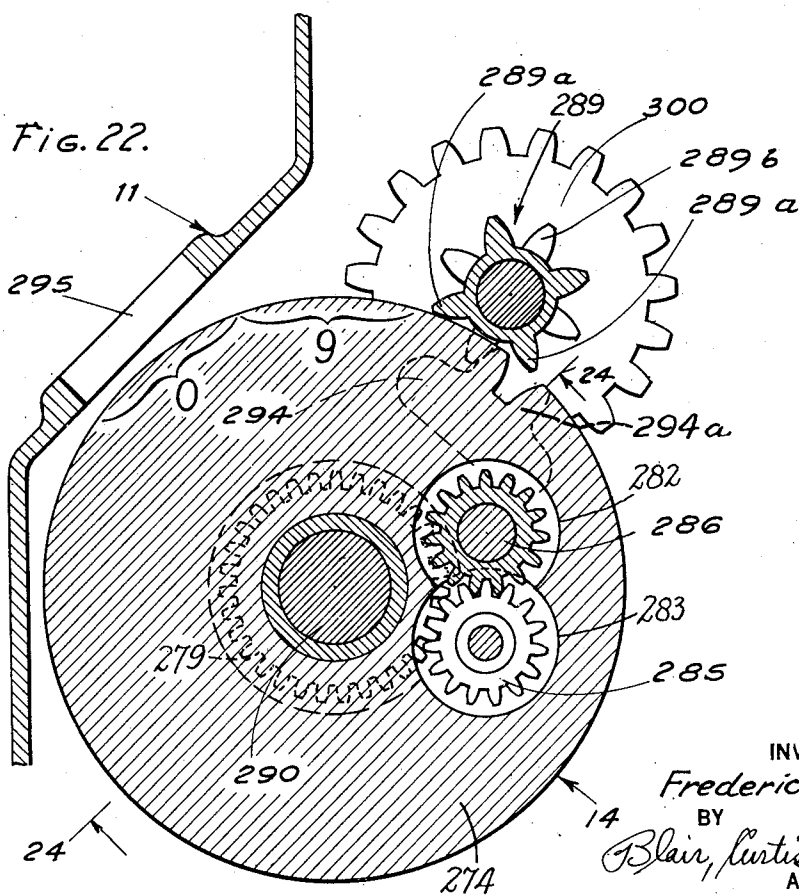
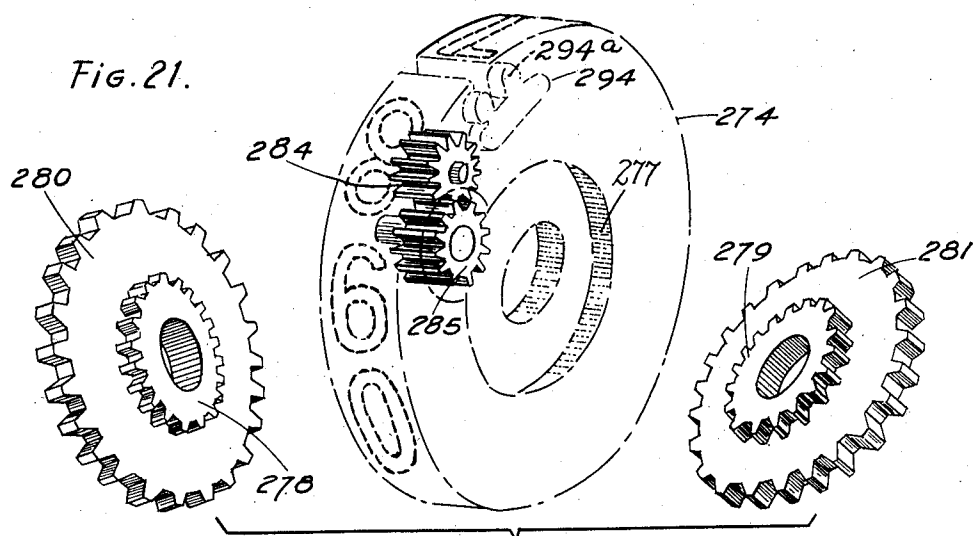
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Fig. 23.

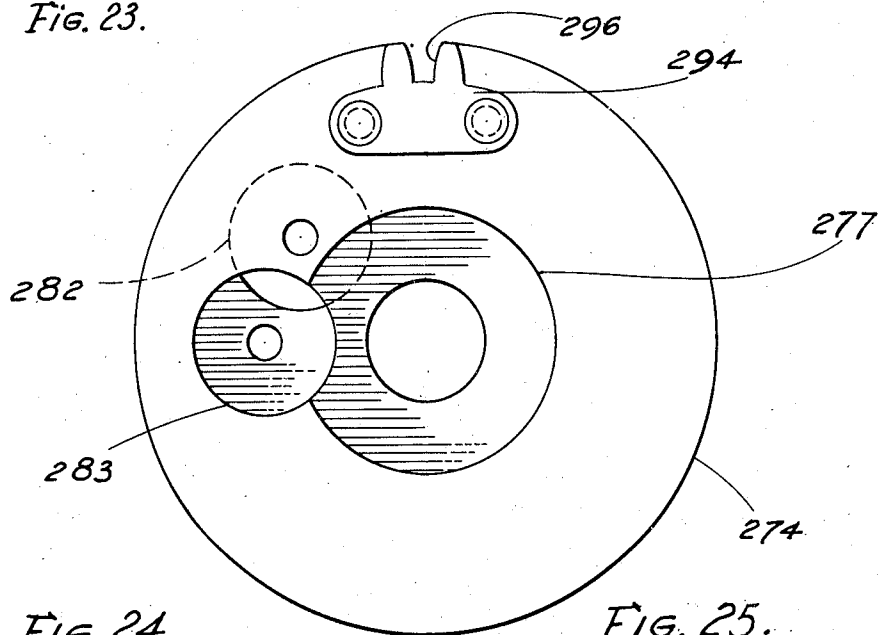


FIG. 24.

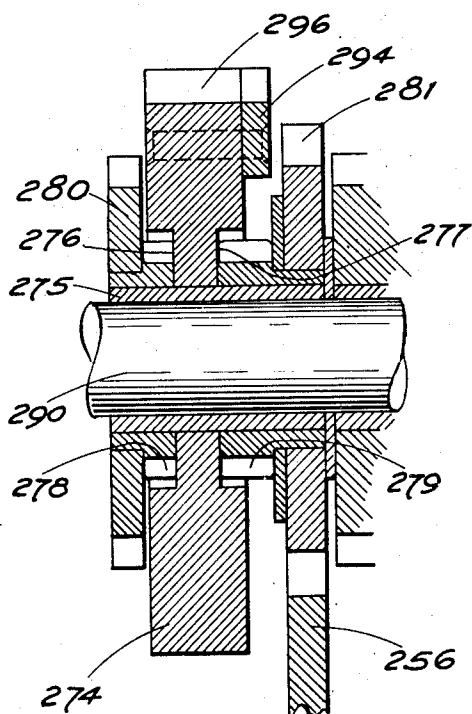
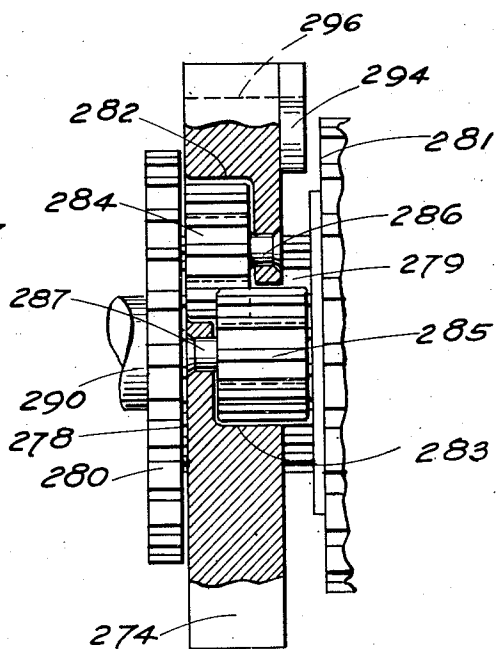


FIG. 25.



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UNITED STATES PATENT OFFICE

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VALUE PRINTING AND REGISTERING
MECHANISMFrederick Q. Rast, Rochester, N. Y., assignor to
Commercial Controls Corporation, a corpora-
tion of Delaware

Application April 15, 1944, Serial No. 531,232

11 Claims. (Cl. 235—101)

1

This invention relates to a meter, and more particularly to a meter for use in connection with a mail stamping machine or the like.

One of the objects of this invention is to provide a meter which is simple, thoroughly practical, and durable in use. Another object is to provide a meter which will be strong and well able to withstand the strains of hard usage. 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 construction of the above character which may be assembled with extreme ease and few tools. 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 will be light in weight. A further object is to provide an accurate register for registering the amounts printed by the meter. Another object is to provide a meter register having a minimum of parts. A still further object is to provide a construction of the above character which will print the amount set on the meter and will accurately and efficiently register the amount printed. 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 perspective view of the meter;

Figure 2 is a side elevation of the meter, with the housing removed, taken from the direction of the arrow 2 in Figure 3;

Figure 3 is a vertical section taken through the meter on the line 3—3 of Figure 2;

Figure 4 is a top plan view of the meter with the housing removed, certain portions of the drawing being broken away for purposes of clarification;

Figure 5 is a perspective view of a casting forming the base and the rear wall of the meter;

Figure 5a is a vertical section taken on the line 5a—5a of Figure 4;

Figure 6 is a vertical section taken on the line 6—6 of Figure 2;

Figure 7 is a horizontal section taken on the line 7—7 of Figure 9, certain parts of the meter being removed for purposes of clarification;

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Figure 7a is a vertical section taken on the line 7a—7a of Figure 7;

Figure 7b is a perspective view of the setting shoe shown in Figure 7a;

5 Figure 8 is a vertical section taken on the line 8—8 of Figure 7;

Figure 9 is a vertical section of the meter taken on the line 9—9 of Figure 3;

10 Figure 9a is a vertical section taken on the line 9a—9a of Figure 9;

Figure 10 is a horizontal section on an enlarged scale taken on the line 10—10 of Figure 9, certain portions being broken away and others being shown in elevation;

15 Figure 11 is a diagrammatical showing in elevation of one of the banks of the meter;

Figure 12 is a diagrammatical perspective showing of one of the banks of the meter;

20 Figure 13 is an exploded perspective view on an enlarged scale of parts forming a type wheel setting and registering assembly;

Figure 14 is a vertical section taken on the line 14—14 of Figure 2;

25 Figure 15 is a section taken on the line 15—15 of Figure 14, some of the parts being shown in elevation for purposes of clarification;

Figure 16 is an exploded perspective view on an enlarged scale of the differential shown in Figure 15;

30 Figure 16a is a side elevation of the differential pinion support and its bushing;

Figure 17 is a vertical section on an enlarged scale taken on the line 17—17 of Figure 14;

35 Figure 17a is a vertical section taken on the line 17a—17a of Figure 17 with the parts in different relative positions;

Figure 17b is an enlarged scale view of a portion of Figure 17a;

40 Figure 17c is a vertical section taken on the line 17c—17c of Figure 17 with the parts in different relative positions;

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

45 Figure 18 is a section taken on the line 18—18 of Figure 14 partly in elevation for purposes of clarification;

Figure 19 is a side elevation taken on the line 19—19 of Figure 14 showing the ascending and descending registers;

50 Figure 20 is a side view on an enlarged scale of one of the meter registers partly in section and partly in elevation for purposes of clarification, this figure being taken from the opposite side of the register from the side shown in Figure 19;

5b

3

Figure 21 is an exploded perspective view of one of the register indicator wheels and parts associated therewith;

Figure 22 is a vertical section taken on the line 22—22 of Figure 20;

Figure 23 is a side elevation of one of the register indicator wheels;

Figure 24 is a section taken on a line similar to line 24—24 of Figure 22 through one of the register indicator wheels and parts associated therewith; and,

Figure 25 is a side elevation of one of the register indicator wheels partly in section to show the mounting of the differential pinions thereon.

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 9, toward the printing head 13 and that the end of the meter adjacent the printing head is the front of the meter. A "rearward" direction denotes a direction opposite to the forward direction described hereinabove. An "inward" direction refers to a direction from either side of the meter, as viewed in Figure 3, toward the section line 9, whereas the term "outward" will denote a direction outwardly from either side of section line 9 in Figure 3. An "upward" direction refers to a direction upwardly from the bottom of the meter to its top, while a "downward" direction denotes the opposite direction thereto.

In general, referring to Figure 1, the meter is enclosed in a housing, generally indicated at 11, which is secured and sealed to the framework of the meter in such a manner as to show unauthorized removal of the housing. On the top of the meter are a series of setting knobs 7, 8, 9, and 10 which are movable longitudinally of the meter. By using these knobs, the user may set type wheels, generally indicated at 12 (Figure 9) in the printing head, generally indicated at 13. When the meter is tripped, printing head 13 makes a single revolution during which a stamp is printed and mechanism set by the setting knobs 7, 8, 9, and 10 (Figure 1) registers the amount printed by type wheels 12 in the ascending and descending registers of the meter, generally indicated at 14 and 15, respectively, (Figure 14). Thus each time the meter is operated, it prints a stamp of the amount set by the operator, and the amount of the stamp printed is recorded on both the ascending and descending registers.

Each setting knob has a complete train of mechanism associated with it leading from it to the type wheel associated therewith in the printing head and to the indicator wheels associated therewith in the ascending and descending registers. Each of these trains of mechanisms, which will be hereinafter called "banks," are independent with respect to each other and each acts individually to set its type wheel and to register the amount printed by its type wheel in the meter registers. Suitable means are provided to insure joint operation of the banks during printing and registration, all as will be pointed out clearly hereinafter.

As described hereinabove, this meter has four setting knobs and accordingly four banks. As each bank operates as an individual train of mechanism, a complete bank will first be described. Referring to Figures 11 and 12 in which a complete bank is diagrammatically shown, setting knob 8 is secured to a setting block 32 which

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is mounted for longitudinal movement with respect to the meter on a pair of guide bars 37 and 38 (Figures 7 and 12). Setting block 32 has a shoe similar to shoe 43 (Figure 7a) mounted therein which coacts with a spiral groove 28a (Figures 11 and 12) in shaft 28 to rotate shaft 28 as the setting block is moved longitudinally with respect to shaft 28. As shaft 28 rotates, it turns a beveled pinion 46 secured to its rear end by a set screw. Beveled pinion 46 meshes with another beveled pinion 52 which forms a part of an idler gear which includes a spur gear 56. Spur gear 56 meshes with a gear 60a secured to an indicator wheel 60. Thus as setting block 32 is moved longitudinally of the meter, it acts through its shoe to rotate shaft 28 which in turn acts through bevel gears 46 and 52, spur gear 56, and gear 60a to set indicator wheel 60 so that the digit thereon appearing in housing window 88 (Figure 1) shows the setting of the setting knob 8.

To insure proper alignment of the digits on the indicator wheel with window 88, a ratchet wheel 74 (Figures 11 and 12) and a detent 85 are provided. Ratchet wheel 74 (Figure 12) is secured to shaft 28 and detent 85, which is pivotally mounted on a shaft 30 adjacent shaft 28, is resiliently urged into contact with the ratchet wheel by a spring 87. Ratchet wheel 74 has ten spaces between its teeth or one for each digit on the indicator wheel. These spaces are aligned with the indicator wheel 60 when the meter is assembled so that when the detent is positioned between two teeth of the ratchet, the digit indicating the setting of the setting knob is correctly positioned in window 88 (Figure 1). When the setting knob 8 is positioned at the forward end of its slot in the top of the meter, as shown in Figure 1, the digit appearing in the window 88 is zero. As the setting knob is moved rearwardly, the digits appearing in the window 88 (Figure 1) indicate the number to be printed by the type wheel in the bank of which the knob forms a part and in the register indicator wheels on which that bank registers.

Shaft 28 has a spur gear 68 (Figures 11 and 12) mounted thereon and secured thereto by a set screw. This spur gear meshes with a gear 92a which is mounted on and secured to a sleeve 92. Sleeve 92 is rotatably mounted on shaft 89 and has a gear 92b secured to its right-hand end, as viewed in Figure 11. Gear 92b meshes with and drives the left-hand setting gear 110 of a differential assembly, generally indicated at 106. This differential assembly, which is mounted on shaft 209, in addition to gear 110 (Figures 15 and 16) includes a sun gear 111 connected to gear 110, a differential pinion support 112, a pair of differential pinions 113 and 114 mounted on the differential pinion support 112, a sun gear 115, and a setting gear 116 connected to sun gear 115.

Differential support 112 is mounted on and secured to a bushing 117 having a key slot 118 extending longitudinally thereof. Bushing 117 is mounted on shaft 209 and keyed to a key slot 119 extending longitudinally of the shaft. Differential pinion support 112 has a pair of pinion supports which extend out of the plane of the body of the differential support in opposite directions (Figure 16a) to form a pair of arms 120 and 121 on which differential pinions 113 and 114 are mounted. These pinions are rotatably mounted on pins 113a and 114a on arms 120 and 121 with their teeth in engagement with each other and

each pinion is in engagement with the teeth of its sun gear.

Referring to Figure 15, sun gear 111 is mounted on and secured to a bushing 122 which is rotatably mounted on bushing 117. Left-hand setting gear 110 and an aligner disc 123, the purpose of which will be described in detail hereinafter, are mounted on bushing 122 and secured to sun gear 111 so that they rotate with the sun gear. Sun gear 115 is mounted on and secured to bushing 124 which is rotatably mounted on the right-hand end of bushing 117. Right-hand setting gear 116 is mounted on bushing 124 and secured to sun gear 115. Sun gears 111 and 112 are held in spaced relationship by the body of the differential pinion bracket 112 and differential pinions 113 and 114 are mounted on differential pinion bracket 112 so that differential pinion 114, in addition to meshing with differential pinion 113, meshes with sun gear 115, and differential pinion 113 meshes with sun gear 111. When the left-hand setting gear is rotated and shaft 209 is held stationary, gear 116 is driven through sun gear 111, pinion 113, pinion 114, and sun gear 115, and when left-hand setting gear 110 is held stationary and shaft 109 is driven, it drives the differential pinion support, thus driving sun gear 115, together with the right-hand setting gear 116.

The right-hand differential setting gear 116 (Figure 11) meshes with the setting gear 142 of a type wheel setting and registering assembly, generally indicated at 146. Assembly 146 is mounted on head shaft 109 and includes setting gear 142 (Figure 13), a helical gear segment 155, a cam disc 149, a cam ring 150, a retaining disc 151, a Geneva tooth guide disc 152, a plurality of Geneva slides 153, and a Geneva disc 154. The head shaft assembly 146 is composed of two sections, one of which includes gear 142 (Figures 13 and 17), gear segment 155, cam disc 149, and cam ring 150, and the other section includes retaining disc 151, guide disc 152, and Geneva disc 154. The first section is rotatable with respect to head shaft 109 (Figure 12). During setting it is rotated with respect to the head shaft to set the type wheel associated therewith in the head 13 (Figure 9). At the same time movement of this section moves the teeth 153a on slides 153 (Figure 13) in the other section which is keyed to shaft 109 into operative position so that when the head shaft rotates during each operating cycle of the meter, a Geneva carry-over pinion 221 (Figures 11 and 12) is actuated to register the amount being printed by the type wheel. During the time that the head shaft is rotating, both sections of this assembly rotate together and it is only during setting that the sections rotate with respect to each other.

Gear 142 forms the base for the section of which it is a part. Cam disc 149 (Figures 13 and 17) is secured to the left-hand surface of gear 142, as viewed in Figure 17, by rivets 156 (Figure 13) and cam ring 150 is also secured to the same surface of gear 142 by rivets 158 to form a cam slot 157 between the inner edge of cam ring 150 and the periphery of cam disc 149. The outer surface of cam ring 150 is cam shaped, as is best shown in Figure 17c, and includes a section 159 having the same radius as Geneva disc 154 and a section 160 of smaller radius. Helical gear segment 155 (Figure 13), which is of the same thickness as gear 142, is mounted in a cut-out portion of gear 142 on studs 163 extending forwardly from cam disc 149. This mem-

ber is mounted in gear 142 so that the helical gear portion thereof is concentric to the axis of the head shaft when gear 142 is mounted thereon.

The left-hand section of the assembly, as viewed in Figure 17, is mounted on Geneva disc 154 as a base. Guide disc 152 is mounted on top of disc 154, as viewed in Figure 13, so that when Geneva slides 153 are positioned in the slots 161 cut therein, the teeth 153a (Figure 17b) of each of the slides are positioned counterclockwise of the notches 154a cut in the periphery of Geneva disc 154. A retaining disc 151 is then mounted on top of guide disc 152, as viewed in Figure 13, so that the pins 153b on Geneva slides 153 project through slots 151a in retaining disc 151. The three discs of this assembly are then riveted together by rivets 162 (Figure 17). In all, there are nine teeth mounted in guide disc 152 and there are a corresponding number of notches cut in the disc 154 and slots in retaining disc 151. When the type wheel setting and registering assembly is mounted on the head shaft 109, pins 153b, which extend through the slots 151a in retaining disc 151, extend into cam slot 157 in the first section of the assembly.

Head shaft 109, which has a cut-out portion 164 (Figures 10 and 12) extending longitudinally thereof, has a portion 165 of reduced diameter which forms a bearing surface for gear 142. There are two other portions 166 and 167 of still further reduced diameter in which are mounted split collars, generally indicated at 168 and 169 (Figure 17) which hold the type wheel setting and registering assembly in assembled relationship with respect to shaft 109. Gear 142, as pointed out hereinabove, when the assembly is mounted on shaft 109, is positioned on portion 165 of shaft 109.

The holes in the centers of retaining disc 151, guide disc 152, and Geneva disc 154 are of slightly greater diameter than the diameter of shaft 109, and they are mounted on the portion 171 (Figure 10) of the head shaft. The section of the assembly comprising discs 151, 152, and 154 is connected to the head shaft by split collar 169 which is similar in construction to split collar 168 (Figure 17d). This collar includes two portions which are of the same width as reduced portion 167 (Figure 10) on shaft 109 and which do not bridge the opening at the top of cut-out portion 164. Shaft 109 has a key slot 172 extending longitudinally thereof which coacts with a key 174 formed on portion 168b of split collar 168.

When collar 168 is mounted on portion 167 of shaft 109, the two portions of this collar are secured by screws to the assembly positioned to the right thereof, as viewed in Figure 17. As collar 169 is similar in construction to collar 168 and as it has a key similar to key 174 (Figure 17b) which coacts with the key slot 172 when collar 169 (Figure 17) is secured to the left-hand section of assembly 146, as viewed in Figure 17, this section of assembly 146 is connected to and thus rotates with head shaft 109.

Referring to Figure 14 in which the type wheel setting and registering assembly is shown in "home" or "rest" position before setting, it will be noted that the pins 153b on Geneva slides 153 are positioned in a portion 157b of cam slot 157 of smaller radius than the portion 157a of cam slot 157 positioned uppermost in Figure 14. During setting, the section of the assembly comprising retaining disc 151 (Figures 10 and 17),

guide disc 152, and Geneva disc 154 is held stationary as it is keyed to head shaft 109 which during setting of the meter does not move. The other section of the assembly is turned through gear 142 by the right-hand differential setting gear 116 (Figures 11 and 12) and moves in a clockwise direction, as viewed in Figure 14. This causes the shoulder 157c (Figure 14) of cam slot 157 to act on pins 153b and move Geneva slides 153 outwardly until the pins 153b enter the portion 157a of cam slot 157 having the greatest radius.

It will be noted that there are nine Geneva slides or one for each of the nine digits from one to nine which must be registered as they are printed. By rotating gear 142 and thus turning cam slot 157, any number of Geneva slides from one to nine may be moved outwardly. It will be noted that the teeth 153a on slides 153 are so positioned on the slides that when a slide is moved outwardly, the tooth is positioned immediately counterclockwise of the notch 154a in cam disc 154 (Figures 14 and 17b) associated with it.

As described hereinabove, cam ring 150 (Figure 17c) has one portion 159 of its periphery of considerably greater radius than the other portion 160. When the type wheel setting and registering assembly is in "home" or "rest" position before setting, as shown in Figure 14, the portion 159 of cam ring 150 (Figure 17c) covers the same angular area as the notches 154a in cam disc 154. When the section of the assembly including gear 142, cam disc 149, and cam ring 150 (Figure 17) is rotated in a clockwise direction, as viewed in Figure 14, the shoulder 150a between the portion 160 of smaller radius and the portion 159 of the greatest radius is moved from its covering position to consecutively uncover notches in cam disc 154 (Figure 17a). It coacts with cam slot 157 so that each time a Geneva slide is moved outwardly into operative position, the shoulder 150a moves clockwise and is positioned beyond the notch with which the tooth is aligned so that the notch and tooth may act as a Geneva tooth and notch to actuate transfer pinion 221.

Transfer pinion 221 is rotatably mounted on a shaft 222 (Figures 4 and 14). This shaft extends longitudinally of the meter, and its axis is parallel to the axis of shaft 109. Referring to Figure 11, the transfer pinion is of the standard type of Geneva transfer pinion and includes four long teeth 223 and four short teeth 224. Referring to Figure 11, the short teeth 224 of transfer pinion 221 are of the same width as guide disc 152 and are positioned in alignment with this disc when transfer pinion 221 is mounted on shaft 222. The right-hand ends of the long teeth, as may be seen in Figure 11, are positioned immediately to the left of gear 142, as viewed in this figure, and these teeth are of sufficient length to extend across the edge of cam disc 154. When a setting is not made in the bank, then none of the Geneva teeth 153a (Figure 14) are in a position to strike the short tooth 224 extending inwardly toward the guide disc. During rotation of the shaft 109, the long teeth slide on the periphery of Geneva disc 154 (Figures 11 and 17b) and cannot be accidentally tripped by one of the notches in this disc because the long teeth also slide on the portion 159 (Figures 14 and 17b) of cam ring 150 when the notched portion of the disc 154 is passing the transfer pinion.

When a setting is made in the bank, as shown in Figure 17a, then each tooth in a raised posi-

tion strikes a short tooth of and thus trips the Geneva transfer pinion. As described hereinabove, when a tooth is moved out into tripping position, the portion 159 of cam ring 150 having the greatest diameter is moved out of its covering position with respect to a notch 154a in Geneva disc 154 adjacent the tooth moved out. Upon completion of setting the teeth moved out and the notches exposed correspond to the digit selected. Thus, after a setting is made, when the assembly rotates with the head shaft, the raised teeth strike the short teeth of the Geneva transfer pinion actuating it, the long teeth of the transfer pinion positioned counterclockwise of the short teeth acted upon (Figure 17a) entering the notches adjacent the operative teeth. Thus, any number of teeth up to nine in assembly 146 may be placed in operative condition during setting of the meter and each time one of these teeth passes the transfer pinion, it coacts with the transfer pinion to move the transfer pinion a distance of two teeth.

Transfer pinion 221 (Figure 14) transfers the amount fed to it by the Geneva teeth on assembly 146 through a spur gear 225 (Figure 11) connected to its hub into an idler gear 226 (Figures 11 and 14) mounted on a shaft 227 extending longitudinally of the meter parallel to shaft 222. Gear 225 has twenty teeth on it and thus it moves idler gear 226 a distance of five teeth each time a tooth on assembly 146 actuates the transfer pinion 221.

Head shaft 109 (Figures 2 and 9) has two bearings 180 and 181 mounted thereon and secured thereto by set screws 182 and 183. These bearings have portions of reduced diameter 180a and 181a (Figure 10) which are journaled in aligned holes 184 and 185 in rear and front walls 18 and 21 of the framework, respectively. Bearing 180 has another portion of reduced diameter 180b positioned forwardly of wall 18 on which is mounted a cam disc 186. Cam disc 186 is secured to bearing 180 and thus rotates with head shaft 109 (Figures 3 and 12).

Cam disc 186 actuates a cam arm 187 (Figure 3) through a cam roller 188 mounted on the inner end of the cam arm. Cam arm 187 is mounted on shaft 189 (Figure 2) which extends longitudinally of the meter parallel to shaft 109 and has its ends journaled in front and rear walls 21 and 18. Longitudinal movement of this shaft with respect to the meter is prevented by a pair of collars 190 and 191 secured to shaft 189 by set screws. The hub 187a of cam arm 187 is connected to shaft 189 by a set screw (Figure 3) and cam roller 188 on the other end of cam arm 187 follows the periphery of cam disc 186 as the head shaft 109 rotates and is resiliently urged into contact therewith by a spring (not shown). The position of the head shaft shown in Figure 3 is the "home" or "rest" position of the head shaft and at this time it should be noted that cam roller 188 is positioned in a concave depression in the periphery of cam disc 186.

Shaft 189 (Figure 12) has an aligner detent 193 mounted thereon and secured thereto by a set screw 194 (Figures 2 and 4). Detent 193 coacts with aligner disc 123 (Figures 15 and 16) to positively align differential assembly 106 (Figure 2) on one digit even though a setting knob is inadvertently held in an intermediate position and thus align the complete gear trains leading from the differential to the type wheel in the printing head and to the registers. Aligner disc 123, as is best shown in Figures 16, has ten teeth providing ten notches between the teeth or

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one for each of the ten digits from zero to nine that the parts of a bank may be positioned in. After setting has taken place, as soon as the shaft 109 (Figure 3) starts to turn, cam roller 188 and thus cam arm 187 are cammed in a clockwise direction. This rocks shaft 189 and causes detent 193 to enter one of the notches of the aligner disc (Figures 11 and 16) and thus align the gear trains leading from the differential assembly. Accordingly, it may be seen that the meter is not dependent for alignment on detent 85 and ratchet wheel 74 (Figure 12) but is provided with positive mechanical alignment.

Referring to bearing 181 (Figure 10) which mounts the head shaft in front wall 21, it has a portion of reduced diameter 181b on which a gear 195 is mounted. A gear 196 (Figures 2, 11, and 12), the hub of which is connected to differential shaft 209 by a set screw, meshes with gear 195 and thus gears the differential shaft 209 and the head shaft 109 together. Accordingly, whenever the head shaft is driven, differential shaft 209 is driven through this gear train.

As described hereinabove, gear 142 (Figures 10, 12, 17, and 18), which forms the base of one section of the type setting and registering assembly 146, has a helical gear segment 155 mounted in and secured to it. Gear 142 and its gear segment 155 are rotatably mounted on shaft 109 in reduced portion 165 (Figure 10). This permits the teeth of the helical gear segment 155 to mesh with teeth of a helical gear 197 (Figures 10, 12, and 17) mounted on a shaft 198 extending transversely across the cut-out portion 164 (Figure 12) of the head shaft. A spur gear 199 (Figure 10) is mounted on and secured to the hub 200 of helical gear 197. The teeth of this gear 199 mesh with the teeth 201 (Figure 9) on a rack bar 202 which is mounted in the cut-out portion 164 (Figures 9 and 10) of head shaft 109 on a pair of pins 203 and 204 (Figure 9) extending transversely across the head shaft. These pins pass through longitudinal slots 205 and 206 in the rack bar 202 permitting the rack bar to be moved longitudinally with respect to head shaft 109 by spur gear 199.

The forward end of rack bar 202 (Figure 9) extends downwardly and thence forwardly after passing through front wall 21. Its forward end has teeth 207 on the upper edge thereof which mesh with the teeth on the lower end of a sprocket 208 pivotally mounted on the head shaft 109 on a shaft 210 extending transversely across the head shaft 109. The upper edge of sprocket 208 has ten teeth 211 thereon which mesh with the teeth of a type wheel 212. Type wheel 212 is pivotally mounted on a shaft mounted on a bracket, generally indicated at 215, which is secured to the outer end of head shaft 209 by screws 216 (Figure 4). Each of the teeth of type wheel 212 (Figure 9) carries a digit in raised type thereon which when it is positioned in the opening 217 in the rearwardly extending portion 215a of bracket 215 prints at the end of half of revolution of the head shaft by coating with a platen diagrammatically shown at 218. Thus as gear 142 is turned with respect to head shaft 109 (Figures 12, 17, and 17a) its gear segment 155 acts through helical gear 197 and spur gear 199 (Figure 10) to move rack bar 202 outwardly. As the rack bar 202 moves outwardly (Figure 9) it acts through sprocket 208 to set type wheel 212.

In operation, referring to Figures 11 and 12, when the setting knob 8 is left in its forward or

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zero position on the housing (Figure 1), the gear train leading from gear 68 through gear 92a, nested shaft 92, gear 92b, and the differential assembly 106 to gear 142 of the type wheel setting and registering assembly 146 is not moved. At this time the Geneva slides 153 (Figure 14) carrying teeth 153a are in the positions shown in this figure. Head shaft 109 (Figure 11) is then driven through coupling 230 from a source of power passing through a single revolution clutch (not shown) each time the meter is tripped. When the head shaft turns in a counterclockwise direction, as viewed in Figure 14, cam roller 188 (Figure 3) is cammed out of the concave portion of cam disc 186 so that shaft 189 is rocked. This causes aligner detent 193 (Figures 12 and 16) to move into the zero notch in aligner disc 123. As aligner disc 123 is secured to setting gear 110 (Figure 15) and sun gear 111 and as these parts are rotatably mounted on the bushing 117 to which the differential pinion support is connected, sun gear 111 is held stationary by the aligner detent.

At the same time gear 195 (Figure 2), which is connected to head shaft 109, begins driving differential shaft 209 through gear 196. This drives the differential pinion support 112 through its bushing 117 (Figure 15) which is keyed to this shaft and as sun gear 111 is held stationary, the differential pinions drive sun gear 115 as pinion 113 rides around stationary sun gear 111. As sun gear 115 is connected to setting gear 116 and as setting gear 116 (Figure 12) meshes with gear 142 of assembly 146, gear 142 is driven as the head shaft 109 makes its revolution. The gear ratio between gear 195, gear 196, the differential assembly 106, and gear 142 is such that gear 142 is driven at the same rate of speed as head shaft 109. Thus, the section of the assembly connected to shaft 109 comprising discs 151, 152, and 154 rotates in unison with gear 142 and associated parts each time the meter is tripped to print a stamp. The gear train which positively drives gear 142 from the head shaft 109 effectively prevents any movement between the two sections of the assembly which might change the setting of the teeth 153a on slides 153 in the assembly and the setting of the type wheels in the head of the meter.

When a setting is made by moving setting knob 8 toward the rear of the meter (Figure 1) gear 68 (Figures 11 and 12) turns setting gear 110 of the differential assembly 106 through gear 92a, sleeve 92, and gear 92b. As gear 110 turns, sun gear 111 turns with it. During setting of the meter, shaft 209 is stationary because it is geared to the head shaft 109 through the gears 195 and 196 (Figure 2). Accordingly, the differential pinion support 112 (Figure 15), which is connected to shaft 209 through bushing 117, is held stationary and the drive passes through sun gear 111, pinion 113, pinion 114, and sun gear 115 into the setting gear 116. Setting gear 116 meshes with gear 142 (Figure 12) and turns this gear in a clockwise direction, as viewed in Figure 14. This causes cam slot 157 (Figure 17a), which moves with gear 142 to move as many teeth 153a out into operative position as are indicated on the indicator wheel at the top of the housing (Figure 1) which indicates the amount of movement given to setting knob 8.

At the same time the teeth are being moved into operative position during setting, gear segment 155 (Figure 14) is acting through helical gear 197 (Figures 9 and 10), spur gear 199, rack

bar 202, and sprocket 208, to set type wheel 212. Type wheel 212 is in zero position at zero setting of the setting knob 8 and the gear train just described hereinabove is such that each time during setting a tooth 153a (Figure 14) is moved out into operative position with respect to the transfer pinion 221, the type wheel is moved a distance of one tooth so that the next higher digit prints when the meter is tripped.

When the clutch is tripped, cam disc 186 again acts through roller 188 (Figure 3), arm 187, and shaft 189 to move the aligner detent into a notch in the aligner disc 123 (Figure 16). This locks the setting of the bank and then through the gear train described hereinabove including gears 195 and 196 (Figure 2), gear 142 of the type wheel setting and registering assembly 146 is driven at the same rate of speed as the head shaft. During this revolution, the teeth 153a (Figure 17a) which were moved out into operative position during setting act on the transfer pinion 221 to rotate it a distance of two teeth for each operative Geneva tooth. As described hereinabove, idler gear 226 (Figure 11) which feeds into both the ascending and descending registers is driven a total of five teeth by gear 225 each time one of the teeth on assembly 146 acts on the transfer pinion 221. Thus mechanism is shown which sets the type wheels in the printing head and sets assembly 146 to register the amount being printed. Both of these settings are locked in the positions in which they have been set as soon as the meter is tripped, thus insuring that the meter prints the amount set and registers the amount being printed.

As stated hereinabove, the meter has four banks of the type just described. Specific details of the mounting of these four banks in the meter and their interrelation therein will now be given.

Referring now to Figure 5, the framework includes a casting, generally indicated at 16, comprising a base plate 17, a rear wall 18, and a pair of supports 19 and 20 extending rearwardly from wall 18. Supports 19 and 20 (Figure 4) are parallel to each other and are perpendicularly positioned with respect to wall 18. A front wall 21 (Figure 9) is secured to the forward edge 17a (Figure 5) of base plate 17 by a series of screws 22 (Figure 3). Extending rearwardly from the upper edge of front wall 21 adjacent the outer edges thereof (Figure 4) are a pair of spacing rods 23 and 24. These rods extend between the front and rear walls 21 and 18 of the framework to maintain them in parallel relationship with respect to each other and are held in position by screws 23a and 24a (Figures 4 and 7).

Supports 19 and 20 (Figures 4 and 5), which extend rearwardly from rear wall 18, have a pair of bosses 19a and 20a formed thereon. These bosses, together with the lower portions of supports 19 and 20, form a seat for a supporting plate, generally indicated at 25 (Figure 5a). Supporting plate 25 (Figure 5) is parallel to the rear wall 18 of the framework and is secured to bosses 19a and 20a and the lower portions of supports 19 and 20 by screws 26.

Setting knobs 7, 8, 9, and 10 (Figure 7) are secured to setting blocks 31, 32, 33, and 34. These setting blocks, which are similar in construction, are mounted for longitudinal movement with respect to the meter on guide bars 35, 36, 37, 38, and 39 (Figures 7 and 14). These guide bars are rectangularly shaped in cross section and have reduced ends, such as ends 35a and 35b on guide

bar 35 (Figure 7) which fit into rectangular shaped openings extending through the rear and front walls 18 and 21. These bars are parallel with respect to each other and each juxtaposed pair of bars fit in grooves similar to grooves 31a and 31b extending longitudinally through the side wall of the setting block 31 (Figure 7a) thus mounting the setting blocks for longitudinal movement with respect to the meter.

Mounted between each juxtaposed pair of guide bars are a series of shafts 27, 28, 29, and 30. These shafts are mounted in the same plane as the guide bars and each is journaled in aligned bearings in front wall 21, rear wall 18, and support plate 25. The rear portions of each of these shafts is reduced in diameter immediately in front of rear wall 18 and the reduced portions of the shafts extend through rear wall 18 and support plate 25. Each of shafts 27, 28, 29, and 30 extends through a bore in its respective setting block, and has spiral grooves thereon which coact with a shoe mounted in each setting block to cause each shaft to be turned as its setting block is moved longitudinally with respect to the meter. As the coaction between each setting block and its shaft is substantially similar, specific description of the turning of a shaft by a setting block will be limited to the turning of shaft 27 by setting block 31. Setting block 31 has a vertical bore 40 (Figure 7a) extending downwardly therein below the hole 41 through which shaft 27 passes. Bore 40 receives a cylindrically shaped setting shoe, generally indicated at 42, having an actuating ridge 43 formed thereon. Shoe 42 is rotatably seated in the bottom of bore 40 and its ridge 43 extends upwardly into the spiral groove of shaft 27. As block 31 is moved longitudinally with respect to the meter (Figure 7), rotational movement of the block is prevented by the guide bars on which it slides and thus the ridge on shoe 42 (Figure 7a) coacts with the spiral groove in shaft 27 to cause shaft 27 to rotate as the setting block is moved with respect to the meter. Thus as each setting block is moved during setting of the meter, each of shafts 27, 28, 29, and 30 is rotated proportionally to the amount of movement of its setting block.

Referring to Figures 7 and 9, a series of bevel gears 45, 46, 47, and 48 are secured by set screws to the rear ends of shafts 27, 28, 29, and 30. Each of these gears coacts with a bevel gear rotatably mounted on a shaft 44 mounted on supports 19 and 20. Transverse movement of shaft 44 with respect to supports 19 and 20 is prevented by a pair of collars 49 and 50 which are secured to shaft 44 by set screws. Each of the bevel gears 51, 52, 53, and 54 have spur gears 55, 56, 57, and 58 mounted on and secured to their hubs. The bevel gears are held in spaced relationship with respect to each other by spacing sleeves mounted on shaft 44 which insure proper engagement of each related pair of bevel gears.

Spur gears 55, 56, 57, and 58 each mesh with the spur gears of a series of indicator wheels 59, 60, 61, and 62 (Figure 4) mounted on a shaft 63 (Figure 9) which extends through and is supported by supports 19 and 20. Indicator wheels 59, 60, 61, and 62 are rotatably mounted on shaft 63 and are held in spaced relationship thereon by spacing sleeves (not shown) so that the spur gears thereon (Figure 4) mesh with spur gears 55, 56, 57, and 58 (Figure 7). Thus each time a setting block is moved longitudinally with respect to the meter, the bevel gear on the inner end of the shaft

coacting with the setting block is turned an amount proportional to the amount of movement of the setting block. As the bevel gears on the end of the shafts being turned are directly geared to the indicator wheels (Figure 4), the indicator wheels indicate the setting of the setting knobs.

Referring to Figure 4, it can be seen that setting knobs 7, 8, 9, and 10 extend upwardly through slots in a plate 65 secured to the meter framework by screws 66. The length of the slots in plate 65 and the pitch of the spiral grooves on shafts 27, 28, 29, and 30 is such that when the knobs are moved from the forward ends of the grooves to the rear ends thereof, the digits shown by the indicator wheels will move from zero up to nine.

To maintain alignment of the spiral shafts 27, 28, 29, and 30, and the indicator wheels so that the digits thereon will be properly aligned with the cut-out portions 64 in plate 65, each shaft is provided with a ratchet wheel which coacts with a detent to align the shaft correctly for each digit. Referring to Figures 7 and 8, shafts 27, 29, 28, and 30 have ratchet wheels 72, 73, 74, and 75 mounted thereon. Ratchet wheels 72 and 74 are positioned adjacent the rear surface of rear wall 18 and their hubs which extend rearwardly therefrom are secured to shafts 27 and 28 by set screws. Ratchet wheels 73 and 75 on shafts 29 and 30 are positioned rearwardly of the hubs of ratchet wheels 72 and 74 and the hubs of ratchet wheels 73 and 75 extend forwardly toward rear wall 18. Detents 76 and 77 (Figure 3) are rotatably mounted on shafts 27 and 28 in alignment with ratchet wheels 73 and 75 (Figure 7). These detents are resiliently urged into contact with the ratchet wheels on shafts 29 and 30 (Figure 8) by springs 78 and 79 which extend between lugs extending forwardly from the detents and two pins 80 and 81 which extend rearwardly from rear wall 18. These detents are held in proper alignment with their respective ratchet wheels by spacing collars 82 and 83 (Figure 7).

Ratchet wheels 72 and 74 coact with detents 84 and 85 pivotally mounted on shafts 29 and 30, respectively. These detents are similar in construction to the detents shown in Figure 8 and are resiliently urged into contact with their respective ratchet wheels by springs 86 and 87 which act between lugs extending rearwardly from each of these detents and pins 80 and 81 mentioned hereinabove. Each ratchet wheel which is secured to its respective shaft by a set screw is so aligned with its shaft that when a detent is positioned between two of its teeth, the digit showing in the window 88 (Figure 1) on the indicator wheel associated with the ratchet wheel is in proper alignment with its window.

Referring to Figures 7 and 9, a series of spur gears 67, 68, 69, and 70 (Figure 6) are mounted on shafts 27, 28, 29, and 30 between support plate 25 and rear wall 18. The hub of each of these gears is pinned to its respective shaft and the gears are positioned in staggered relationship with respect to each other.

Referring to Figures 6, 9, and 14, a shaft 89 extending longitudinally of the machine is mounted in bearings on front wall 21 and support plate 25. This shaft carries a series of nested shafts 90, 91, 92, and 93 which are rotatably mounted on shaft 89 and rotatably mounted with respect to each other. The rear ends of each of these shafts have spur gears 90a, 91a, 92a, and 93a (Figure 9) thereon which are of the same diameter and have the same number of teeth. A series of spur gears 90b, 91b, 92b, and 93b are mounted on

and secured to the forward ends of nested shafts 90, 91, 92, and 93. A pair of collars 94 and 95 secured to shaft 89 by set screws prevent longitudinal movement of shaft 89 with respect to the meter and hold the nested shafts in assembled relationship. Spacers 96, 97, and 98 are provided between the gears at the forward ends of the nested shafts and washers 99, 100, 101, and 102 are provided between the gears at the rear ends of the shafts to insure proper alignment of the gears. Gears 91a and 92a are driven directly by spur gears 69 and 68 (Figure 6) and gears 90a and 93a (Figure 9) are driven by gears 67 and 70 (Figure 6) through idler gears 103 and 104.

Referring to Figure 7, it will be noted that the spiral grooves on shafts 27 and 30 run in opposite directions from the grooves on shafts 28 and 29. Thus shafts 27 and 30 are turned by their setting blocks in opposite directions from shafts 28 and 29. This ensures all of the nested shafts (Figure 9) being turned in the same direction as the drive from shafts 27 and 30 passes through idler gears 103 and 104 (Figure 6) before passing into the spur gears 90a and 93a connected to nested shafts 90 and 93.

Each of the spur gears on the forward ends of nested shafts 90, 91, 92, and 93 (Figures 9 and 18) meshes with and drives a gear connected to the sun gear of a differential assembly. These differential assemblies are generally indicated at 105, 106, 107, and 108 and are mounted on a shaft 209 (Figures 2 and 14), the ends of which are journaled in bearings in front wall 21 and rear wall 18. All of these assemblies are substantially similar in construction to differential assembly 106, the parts and operation of which have been specifically described hereinabove.

As pointed out hereinabove, one of the differential assemblies described hereinabove is mounted on shaft 209 (Figures 2 and 18) for each of the four nested shaft gears 90b, 91b, 92b, and 93b. The differential pinion supports of each of these assemblies 105, 106, 107, and 108 (Figure 2) is keyed to shaft 209 by a key 125 (Figure 14). These assemblies are maintained in proper alignment on shaft 209 by collars 126, 127, 128, and 129. When the assemblies are mounted on shaft 209, nested shaft gear 90b (Figures 9 and 18) meshes with and drives left-hand setting gear 133 of differential pinion assembly 108; nested shaft gear 91b meshes with and drives left-hand setting gear 134 of differential assembly 107; nested shaft gear 93b meshes with left-hand setting gear 135 of differential assembly 106, and as described hereinabove, gear 92b meshes with and drives gear 110 of assembly 106. The right-hand setting gears 137, 138, 116, and 139 (Figure 2) of the differential assemblies engage and drive the setting gears 140, 141, 142, and 143 of the four type wheel setting and registering assemblies, generally indicated at 144, 145, 146, and 147.

As is best shown in Figures 2 and 14 and as described hereinabove, an aligner shaft 189 having its ends journaled in front wall 21 and rear wall 18 carries four aligner detents 260, 261, 193, and 262. Each of these aligner detents coacts with an aligner disc mounted on the differential assembly associated therewith. Detents 260, 261, and 262 are all actuated at the same time as detent 193 or at the beginning of the turning of the head shaft 109. At this time each detent moves into one of the notches in the aligner disc associated therewith and both aligns and locks the settings made in each bank by the setting knob associated therewith.

Each of type wheel setting and registering assemblies 144, 145, and 147 is similar in construction and operation to assembly 143, as described hereinabove. Each assembly includes a setting gear, a helical gear segment, a cam ring, a cam disc, a retaining disc, a guide disc, and a Geneva disc. As each bank is set by its setting knob, the helical gear segments in each setting gear act through the helical gears mounted in the cut-out portion 164 of head shaft 109 to set the type wheel associated therewith in the printing head of the meter. Thus, helical gear 235 (Figure 10) is actuated by the gear segment in gear 143, helical gear 236 is actuated by the gear segment in gear 141, and helical gear 237 is actuated by the gear segment in gear 140. It will be noted that helical gears 235, 197, 236, and 237 (Figure 10) are positioned in the center portion of the cut-out portion 164 of head shaft 109. These gears are positioned in staggered relationship with respect to each other and each gear is mounted on a shaft mounted on and extending transversely across the head shaft 109.

Each of helical gears 235, 236, and 237 has a spur gear, namely, spur gears 240, 241, and 242, mounted on and connected to its hub. Spur gears 240, 241, and 242 coast with rack bars 243, 244, and 245, similar to rack bar 202 (Figures 4, 9, 9a, and 10), and with sprockets 208a, 208b, and 208c, similar to sprocket 208, to move type wheels 212a, 212b, and 212c associated therewith to a position corresponding to the position of the setting knobs. Rack bars 243, 244, and 245 (Figure 10) are mounted on pins 203 and 204 (Figure 9) and the bars are held in spaced relationship with respect to each other, as shown in Figure 10, by spacer sleeves and washers mounted on pins 203 and 204. Thus as each type wheel setting and registering assembly is actuated by the setting knob associated therewith, the type wheel in the printing head associated with the same assembly is set so that it prints the amount set by the setting knob.

The Geneva teeth on each of assemblies 144, 145, and 147 which actuate the transfer pinions, generally indicated at 250, 251, and 252, respectively (Figure 4), are set and actuated in the same manner as the teeth 153a associated with assembly 146, as described hereinabove. Thus during setting, any number of teeth in each bank from one to nine may be moved out into operative position and as each of the teeth on an assembly passes a bank's transfer pinion, it moves the transfer pinion a distance of two teeth. As the spur gears 253, 254, and 255 associated with transfer pinions 250, 251, and 252 have twenty teeth like spur gear 225, a total of five teeth are fed into the register idler gears, generally indicated at 256, 257, and 258 for each of the component parts of each of the numbers being printed by each bank.

Referring now to Figures 20 through 25, in which one of the meter registers is shown and to Figure 20 in particular, each of idler gears 256, 257, 226, and 258 feeds into a register assembly including a pair of sun gears and an indicator wheel having two differential pinions mounted thereon. The units idler gear 256 feeds into the indicator wheel assembly, generally indicated at 270, the tens idler gear 257 feeds into the indicator wheel assembly, generally indicated at 271, the dollars idler gear 226 feeds into the indicator wheel assembly 272, and the tens of dollars idler gear 258 feeds into the indicator wheel assembly, generally indicated at 273.

Referring first to indicator wheel assembly 270, the indicator wheel 274 (Figure 24) is rotatably mounted on a bushing 275 mounted on the register shaft 290. Indicator wheel 274 has two sun gear bores 276 and 277 cut into the opposite sides thereof concentric to the axis of rotation of the indicator wheel. These bores are made to receive two sun gears 278 and 279 (Figures 21 and 24) which are rotatably mounted on bushing 275 on opposite sides of indicator wheel 274. Sun gear 278, which has twenty teeth, has a gear 280 mounted on and connected to its hub and this gear is connected to the framework of the meter so that both gears are held stationary at all times. The sun gear 279, which has twenty teeth, has a spur gear 281 mounted on and connected to its hub. This gear has twenty-five teeth.

Indicator wheel 274 has two other bores 282 and 283 (Figure 23) extending into the body of the indicator wheel from opposite sides thereof. These bores 282 and 283 are in overlapping relationship with respect to each other (Figure 23) and bore 282 overlaps sun gear bore 276 and bore 283 overlaps sun gear bore 277. Differential pinions 284 and 285 are rotatably mounted on pins 286 and 287 (Figure 25) mounted on the indicator wheel 274. When sun gears 278 and 279 and the indicator wheel 274 are in assembled relationship, the differential pinions 284 and 285, which mesh at the point bores 282 and 283 (Figure 23) overlap, mesh with sun gears 278 and 279 (Figures 21 and 25), respectively. Thus, when sun gear 279 is turned by idler gear 256 acting through gear 281, indicator wheel 274, which in fact is a planetary support for the differential pinions, is rotated as pinion 284 runs on stationary sun gear 278.

As described hereinabove, idler gear 256 (Figure 20) is turned a distance of five teeth for each unit of one in the number being printed. As gear 256 meshes with gear 281 which has 25 teeth and the sun gear 279 connected to gear 281 has twenty teeth, the sun gear moves four teeth each time a unit is fed into indicator wheel assembly 270. There are ten digits on indicator wheel 274 and thus as sun gear 278 is stationary when sun gear 279 moves a distance of four teeth then the indicator wheel 274 moves a distance of two teeth or one unit.

Referring to Figure 20, a transfer pinion shaft 288 has a series of standard Geneva transfer pinions, generally indicated at 289, 291, and 292 rotatably mounted thereon which carry over tens from each indicator wheel to the next higher one. The long or sliding teeth 289a (Figures 20 and 22) of transfer pinion 289 slide on the periphery of indicator wheel 274. A pair of Geneva carry-over teeth 294 are mounted on the right-hand side of indicator wheel 274 as viewed in Figures 20 and 24 and these teeth are in radial alignment (Figure 20) with the short teeth 289b of the Geneva transfer pinion.

Referring to Figure 14, Geneva transfer pinion 271 is driven in a clockwise direction by assembly 146. This drives idler gear 226 in a counterclockwise direction. Idler gear 256 is driven in the same direction as gear 226 and in turn drives indicator wheel 274 in a counterclockwise direction, as viewed in Figure 24, acting through gears 281, 271 and pinions 285 and 284.

As the indicated figure in the window 295 in housing 11 (Figures 1 and 22) passes from zero to nine, the leading tooth 284a of Geneva teeth 284 strikes a short tooth of transfer pinion 289.

This turns the transfer pinion a distance of two teeth, the long tooth on the transfer pinion entering a notch 296 (Figures 23 and 24) in the periphery of indicator wheel 274 and entering the space between Geneva teeth 294.

Geneva pinion 289 is turned in a clockwise direction, as viewed in Figure 22, when a carry-over is effected by Geneva teeth 294, and a spur gear 300 (Figures 20 and 22) mounted on and connected to the hub of transfer pinion 289 turns with it. Spur gear 300 has twenty teeth and thus is moved a distance of five teeth each time a carry-over is effected because the Geneva pinion which has eight teeth is turned two teeth or one-quarter of a revolution by a carry-over.

Spur gear 300 meshes with and drives a gear 301 mounted on and connected to the hub of a sun gear 302 of indicator wheel assembly 271. Sun gear 302 and spur gear 301 are rotatably mounted on a bushing similar to bushing 275 (Figure 24) on shaft 290 and the remainder of assembly 271 is similar in construction to assembly 270.

In operation, units may be fed into both spur gears 281 and 304 at the same time through idler gears 256 and 257. This drives the sun gears 279 and 303 and if a carry-over is not taking place, both sun gears 278 and 302 are held stationary, sun gear 278 being held by mechanical means on the meter and sun gear 302 is held stationary by its association with transfer pinion 289 through spur gears 301 and 300. When a carry-over takes place, then spur gear 300 drives spur gear 301 a total of five teeth. As sun gear 302 has twenty teeth, it is moved a distance of four teeth. If at this time units are being fed into this indicator wheel assembly by idler gear 257 then sun gear 303 is also turned a distance of four teeth in the same direction. At this time because both sun gears are turned together the indicator wheel 271 is moved a distance of four teeth thus registering the carry-over from the units wheel at the same time it is registering the unit being fed into it by idler gear 257.

If idler gear 257 is not feeding units into the indicator wheel assembly 271, then sun gear 303 is held stationary by idler gear 257. Accordingly, when there is a carry-over from the units indicator wheel then spur gear 301 is moved a distance of five teeth, sun gear 302 having twenty teeth moves a distance of four teeth and the differential then coacts with the stationary sun gear 303 to move the indicator wheel two teeth or one digit. Thus a carry-over may be readily made at any time during the operation of the register.

The operation of indicator wheel assemblies 272 and 273 is the same as the operation of indicator wheel assemblies 270 and 271. Tens are carried over from assembly 271 to assembly 272 by Geneva transfer pinion 291 and tens are carried from assembly 272 to assembly 273 by Geneva transfer pinion 292. In this register units may be fed into all four assemblies at the same time and carry-overs are made from one assembly to another whenever they occur.

The transfer pinion 325 actuated by assembly 273 feeds into a standard indicator wheel 326. This wheel carries over tens accumulated by it to another standard indicator wheel 327 through a transfer pinion 328. Any number of wheels may be added to the register, the total depending on the largest accumulated total that is desired. Furthermore, the indicator wheel assemblies may consist of any number above a pair, the limit be-

ing determined only by the number of banks feeding into the register.

The descending and ascending registers 14 and 15 (Figure 14) are of similar construction, the indicator wheel idler gears 256, 257, 226, and 258 (Figure 19) driving spur gears in aligned indicator wheel assemblies in both registers at the same time and in the same direction. The only difference between the ascending and descending registers 15 and 14 is that the digits on their indicator wheels run in opposite directions.

A zero lock (not shown) of any well known type may be used in conjunction with register 14 to lock the meter when this register reaches zero setting. Thus the register may be loaded with a certain sum by a post office clerk and when this sum is exhausted the zero lock is actuated to prevent further use of the meter. To reset register 14, the transfer pinion shaft 288 which is mounted on a pair of arms 350 and 351 (Figures 3, 4, and 19) is raised. Arms 350 and 351 are pivotally mounted at their inner ends to the front and rear walls of the framework thus permitting shaft 288 to be raised. Raising shaft 288 moves the transfer pinions and their associated spur gears thereon out of meshing engagement with the indicator wheel assembly spur gears. At this time the indicator wheels may be set at any desired sum. Thus it is very easy for a post office clerk to reset the meter through door 355 (Figure 1).

Thus it will be seen that an efficient and practical meter has been disclosed in which the several objects hereinabove mentioned as well as many others are successfully accomplished. The gear train from the meter to the type wheels in the head is always in mesh and the mechanism described hereinabove accurately prints the amount set and registers the amount printed. Furthermore, an efficient and practical register is disclosed. Carry-overs in this register may be made while units are being fed into the indicator wheel assembly to which the carry-over is being made. Thus a register is disclosed which both registers any sum and carries over the tens accumulated as the sum is being registered.

As many possible embodiments may be made of the above invention all without departing from the scope of the invention it is to be understood that all matter hereinbefore set forth, or shown in the accompanying drawings, is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a value printing and registering mechanism, in combination, a cyclically operated head shaft, printing means mounted on said head shaft, said printing means including a type wheel for printing digits from zero to nine, a register, an assembly mounted on said head shaft, said assembly including setting and registering sections, said setting section being rotatably mounted on said head shaft, an internal helical gear on one of said sections coacting with mechanism mounted on said head shaft for setting said type wheel when said section is moved relatively to said head shaft, means securing the registering section to said head shaft, means on said last-mentioned section conditioned for registration during relative movement of said sections with respect to each other, and means for transferring the amount set in said last-mentioned section to said register when said head shaft is rotated during the printing operation.

2. In a value printing and registering mechanism, in combination, a cyclically operated head shaft, printing means mounted on said head

shaft, a register, an assembly mounted on said head shaft, said assembly including registering and setting sections, said setting section being rotatably mounted on said head shaft, internal helical gear means mounted on the setting section of said assembly, a gear meshing with said internal helical gear means mounted on said head shaft, a rack mounted on said head shaft operated by said gear, means operatively connecting said rack to said printing means, whereby when said setting section is rotated with respect to said head shaft said printing means is set, means securing the registering section to said head shaft, means on said registering section conditioned for registration during relative movement of said sections with respect to each other, and means for transferring the amount set in said registering section to said register when said head shaft rotates during the printing operation.

3. In a value printing and registering mechanism, in combination, a cyclically operated head shaft, printing means mounted on said head shaft, a register, an assembly mounted on said head shaft, said assembly including registering and setting sections, said setting section being rotatably mounted on said head shaft, internal helical gear means mounted on the setting section of said assembly, a gear meshing with said internal helical gear means mounted on said head shaft, a rack mounted on said head shaft operated by said gear, means operatively connecting said rack to said printing means, whereby when said setting section is rotated with respect to said head shaft said printing means is set, means securing the registering section to said head shaft, means on said registering section conditioned for registration during relative movement of said sections with respect to each other, means for transferring the amount set in said registering section to said register when said head shaft rotates during the printing operation, and driving means actuated by said head shaft for driving said setting section at the same rate of rotation as said head shaft during each cyclical operation.

4. In a value printing and registering mechanism, in combination, a cyclically operated head shaft, printing means mounted on said head shaft, said printing means including a printing element settable for printing digits from zero to nine, a register, an assembly mounted on said head shaft including registering and setting sections, said registering section being connected to said head shaft, means operatively connecting said registering section to said register, means operatively connecting the setting section to said printing element, means for moving said setting section relative to said register section, movement of said setting section relative to the register section setting the printing element in the printing means and means connected to said registering section for causing registration of the amount of the digit set for printing on said printing element, the transfer of said last-mentioned amount taking place during the cyclical operation of said printing means, a gear mounted on said head shaft, a second shaft, gear means mounted on said second shaft meshing with said first-mentioned gear, means operatively connecting said gear means to said setting section, said gear means driving said setting section during a cyclical operation at the same rate of speed as said head shaft.

5. In a value printing and registering mechanism,

in combination, a framework, a head shaft rotatably mounted on said framework, head shaft driving means, said last-mentioned means driving said head shaft through a single revolution each time a printing operation is effected, settable numerical printing means mounted on said head shaft, a register, manually controlled means mounted on and rotatable with respect to said head shaft for setting said numerical printing means and for transferring the amount set on said printing means to said register when said printing is effected, and gear means driven by said head shaft, said gear means being operatively connected to said manually controlled means, said gear means driving said manually controlled means at the same rate of speed as said head shaft, whereby the setting of said manually controlled means is kept by positive means during each cycle of operation.

6. In a value printing and registering mechanism, in combination, a cyclically operated head shaft, printing means for printing digits from zero to nine mounted on said head shaft, an assembly mounted on said head shaft, said assembly including registering and setting sections, said registering section being connected to said head shaft and said setting section being rotatably mounted thereon, means operatively connecting said setting section and said printing means, said setting section when rotated with respect to said head shaft setting said printing means, a register, a plurality of teeth mounted on said registering section, said teeth being operatively connected to said setting section to permit them to be moved into operative position by rotation of said setting section, means forming a plurality of notches in the periphery of said registering section, one notch being positioned adjacent each tooth, shield means actuated by said setting section for covering said notches, said shield means being moved out of covering position with respect to a notch as the tooth related to the notch is moved into operative position, a register and gear means operatively connected to said register and actuated during a cyclical operation by those teeth which have been moved into operative position, said notches controlling the operation of said gear means and said shield means preventing said gear means being accidentally tripped by one of said notches when its related tooth is not in operative position.

7. In a value printing and registering mechanism in combination, a cyclically operated head shaft, printing means for printing digits from zero to nine mounted on said head shaft, an assembly mounted on said head shaft, said assembly including registering and setting sections, said registering section being connected to said head shaft and said setting section being rotatably mounted thereon, means operatively connecting said setting section and said printing means, said setting section when rotated with respect to said head shaft setting said printing means, a register, a plurality of teeth mounted on said registering section, said teeth being operatively connected to said setting section and being moved into operative position upon rotation of said setting section with respect to said registering section, means forming a plurality of notches in the periphery of said registering section, one notch being positioned adjacent each tooth, shield means actuated by said setting section for covering said notches, said shield means being moved out of covering position with respect to a notch as the tooth related to the notch is moved into operative

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position, and a Geneva transfer pinion including four long and four short teeth operatively associated with said registering section and said register, the short teeth on said pinion being actuated by the settable teeth on the registering section and the four long teeth extending across the periphery of the registering section, said notches controlling the operation of said Geneva transfer pinion and said shield means preventing said Geneva transfer pinion from being accidentally tripped by one of said notches when its related tooth is not in operative position.

8. In a value printing and registering mechanism, in combination, a cyclically operated head shaft, printing means for printing digits from zero to nine mounted on said head shaft, gear means rotatably mounted on said head shaft, manually controlled means for actuating said gear means, gear means operatively connecting said first-mentioned gear means and said printing means, and differential gear means driven by said head shaft for driving said first-mentioned gear means at the rate of rotation of said head shaft during each cyclical operation.

9. In a value printing and registering mechanism, in combination, a cyclically operated head shaft, printing means for printing digits from zero to nine mounted on said head shaft, gear means rotatably mounted on said head shaft, manually operable differential gear means for actuating said first-mentioned gear means to set said printing means, means operatively connecting said first-mentioned gear means and said printing means, said printing means being set when said last-mentioned gear means is rotated with respect to said head shaft, and mechanism operatively connecting said head shaft and said differential means, said head shaft driving said first-mentioned gear means at the same rate of rotation as said head shaft during each cyclical operation.

10. In a value printing and registering mechanism, in combination, a cyclically operated head shaft, printing means for printing digits from zero to nine mounted on said head shaft, gear means rotatably mounted on said head shaft, manually operable differential gear means for actuating said first mentioned gear means to set said printing means, means operatively connecting said first-mentioned gear means and said printing means, said printing means being set when said last mentioned gear means is rotated with respect to said head shaft, means for locking one

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side of said differential gear means during each cyclical operation, and means operatively connecting said head shaft and said differential gear means at the side which is not locked during a cyclical operation for driving said first mentioned gear means at the same rate of rotation as said head shaft during each cyclical operation.

11. In a value printing and registering mechanism, in combination, a cyclically operated head shaft, printing means for printing digits from zero to nine mounted on said head shaft, an assembly mounted on said head shaft, said assembly including setting and registering sections, said setting section including a gear rotatably mounted on said head shaft and said registering section being connected to said head shaft, means operatively connecting said setting section to said printing means, manually operable differential gear means for actuating said setting section to set said printing means, said printing means being set when said setting section is rotated with respect to said head shaft, means for locking one side of said differential gear means during each cyclical operation, mechanism operatively connected to said head shaft and to said differential gear means for driving said setting section at the same rate of rotation as said head shaft during each cyclical operation, a register, means on said registering section conditioned for registration during the setting of said setting section, and means for transferring the sum set in said registering section into said register during each cyclical operation.

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