June 7, 1949. S. HINDS 2,472,478

VARIATING MECHANISM

Filed Dec. 2, 1944 8 Sheets-Sheet 1

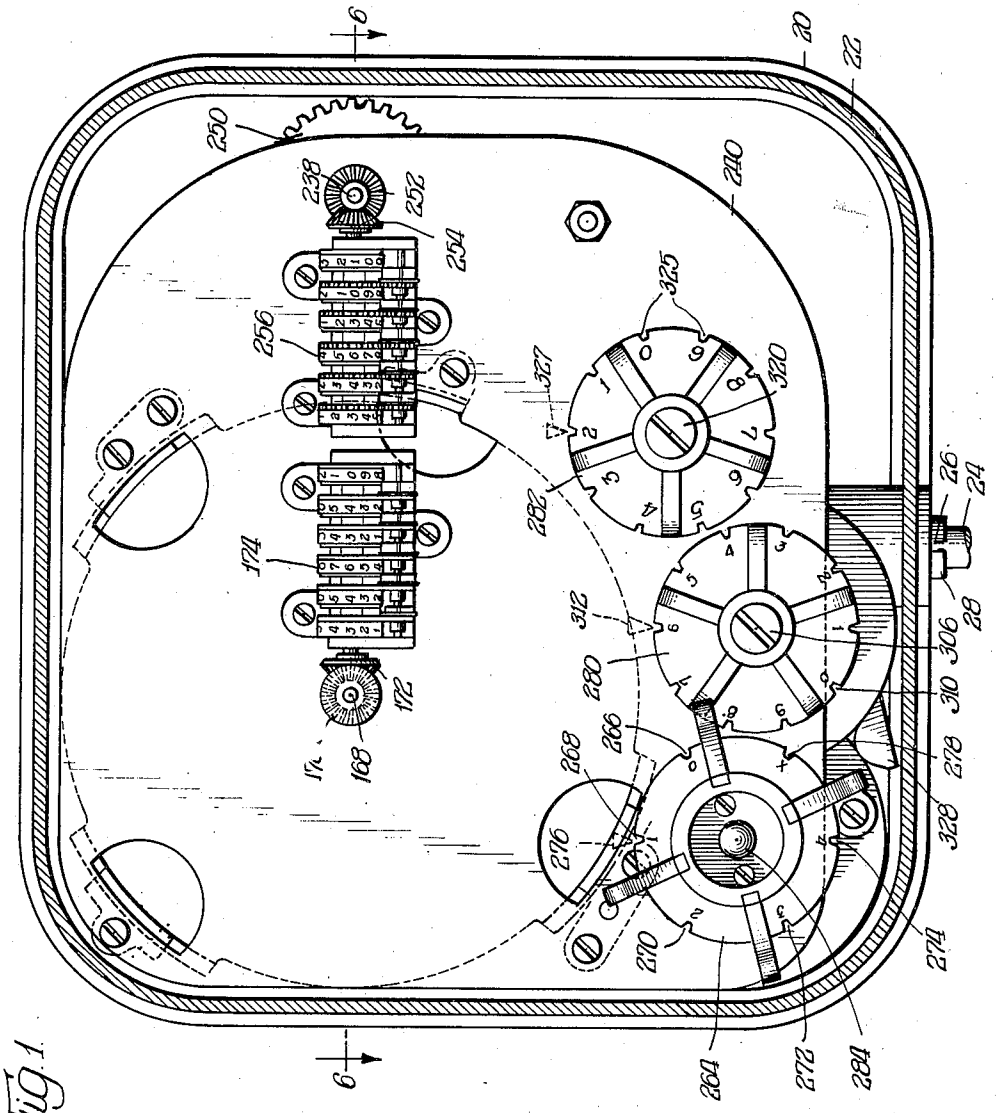


Fig. 1.

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VARIATING MECHANISM

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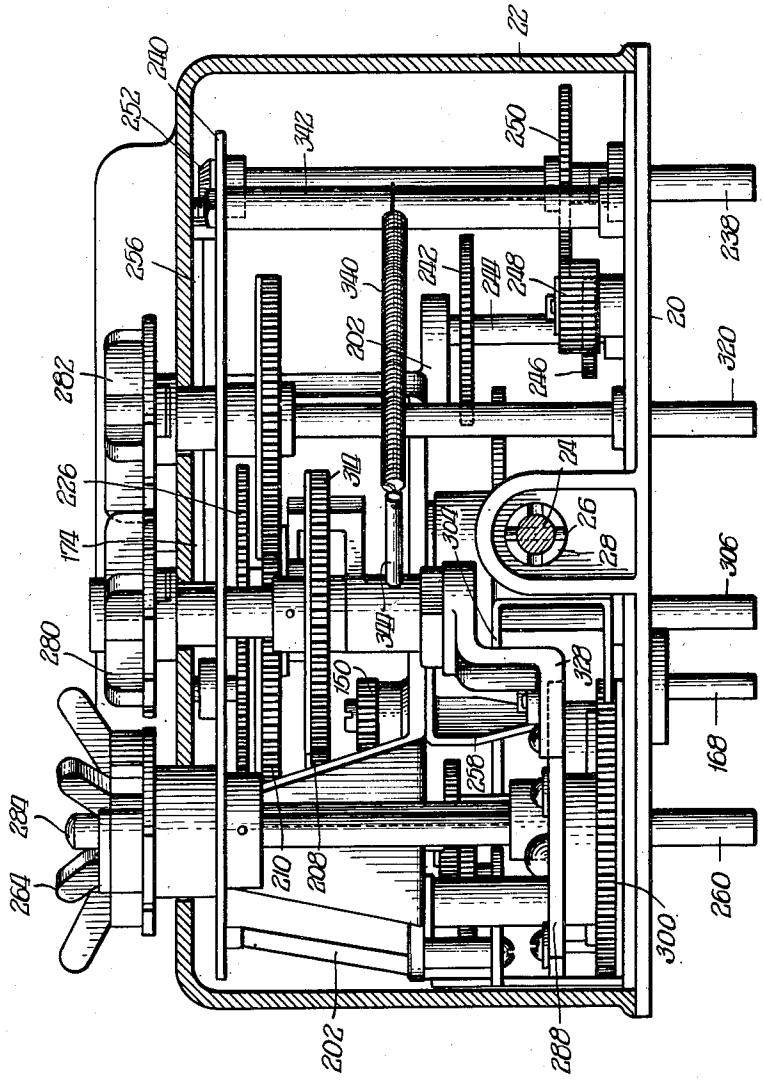


Fig. 2.

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VARIATING MECHANISM

Filed Dec. 2, 1944 8 Sheets-Sheet 3

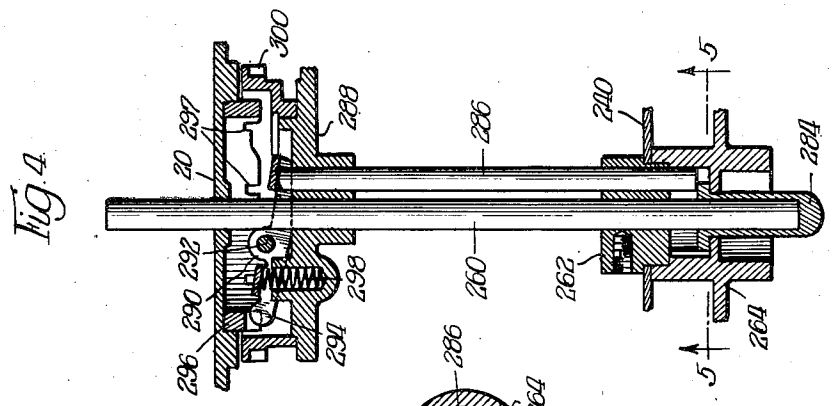


Fig. 4

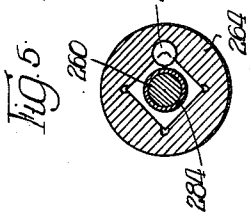


Fig. 5

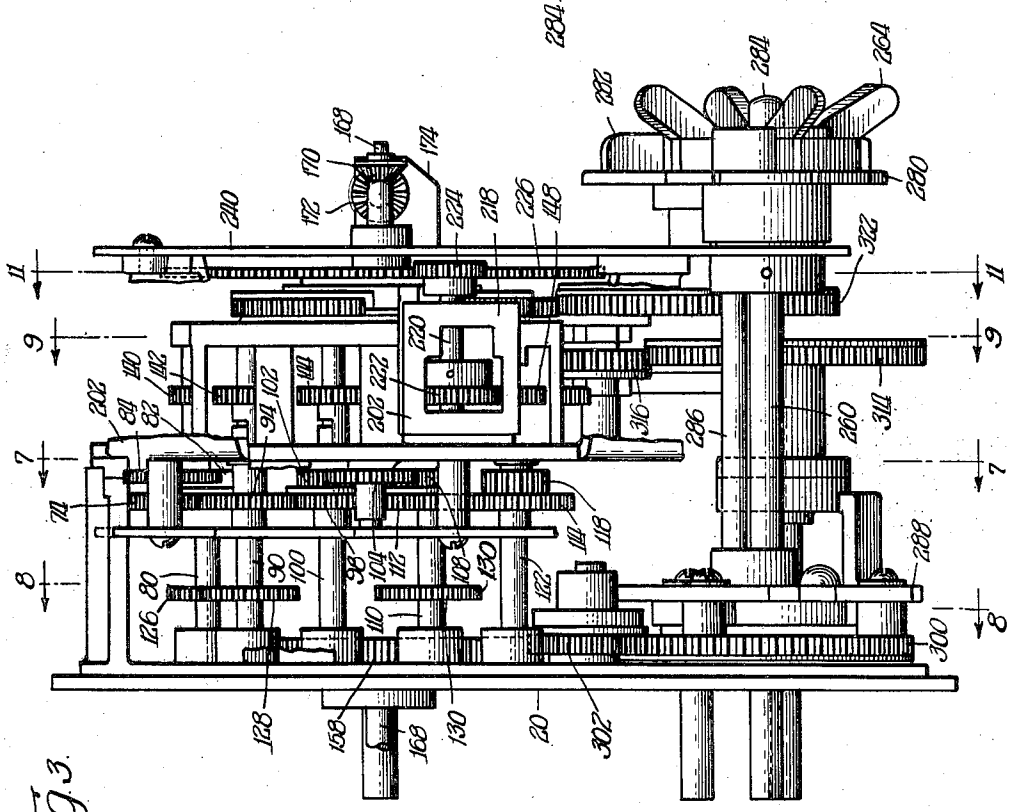


Fig. 3

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VARIATING MECHANISM

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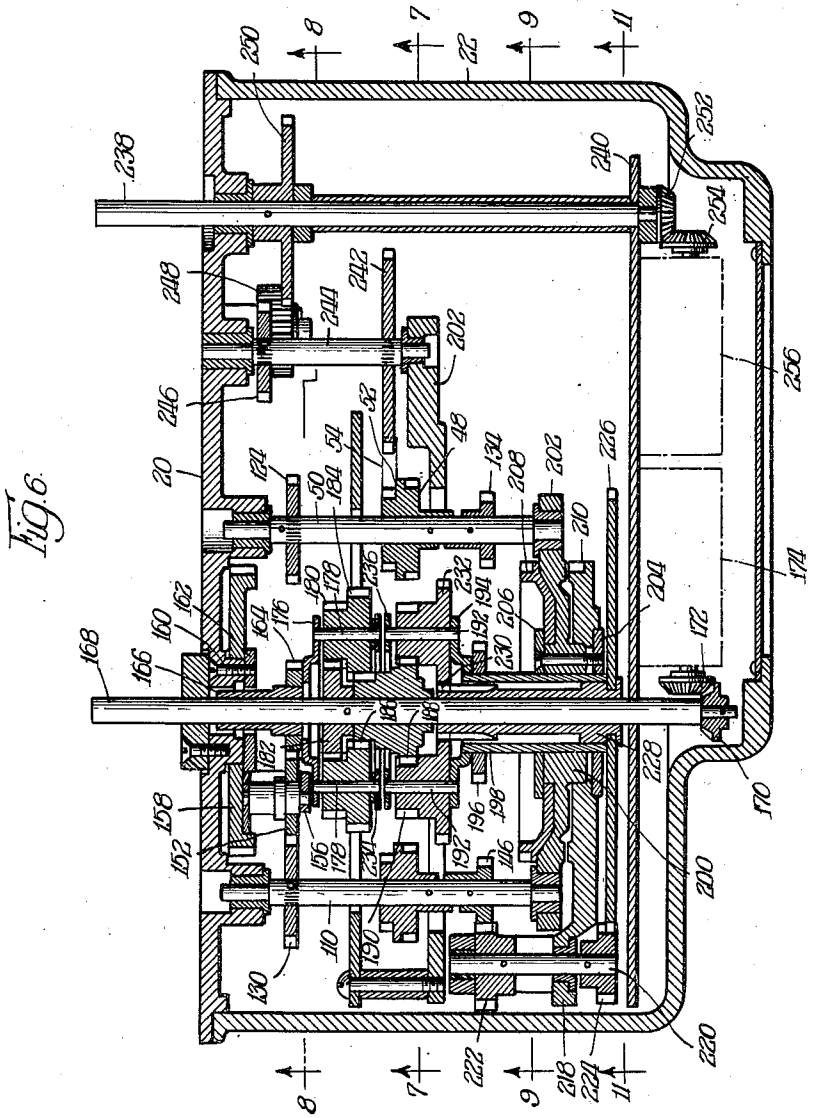


Fig. 6.

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VARIATING MECHANISM

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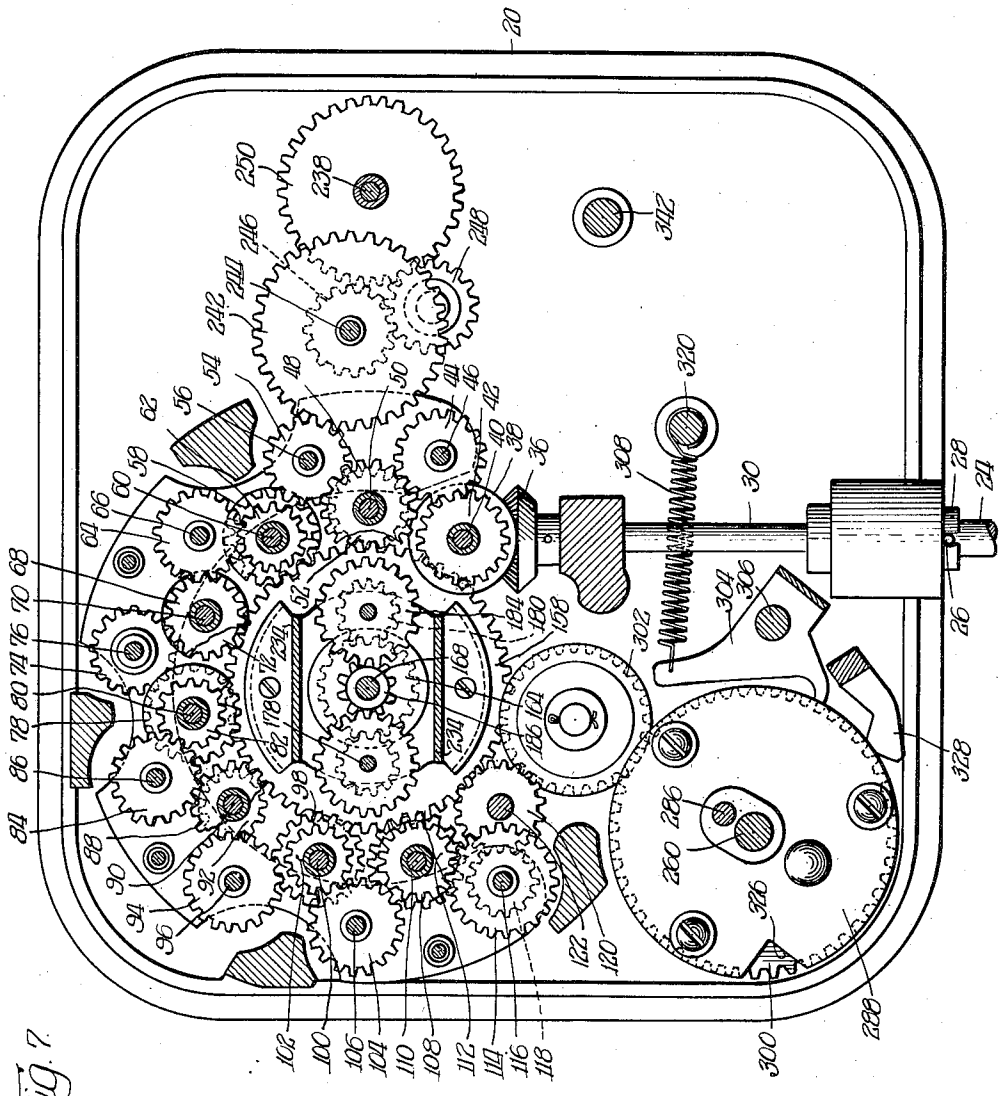


Fig. 7

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VARIATING MECHANISM

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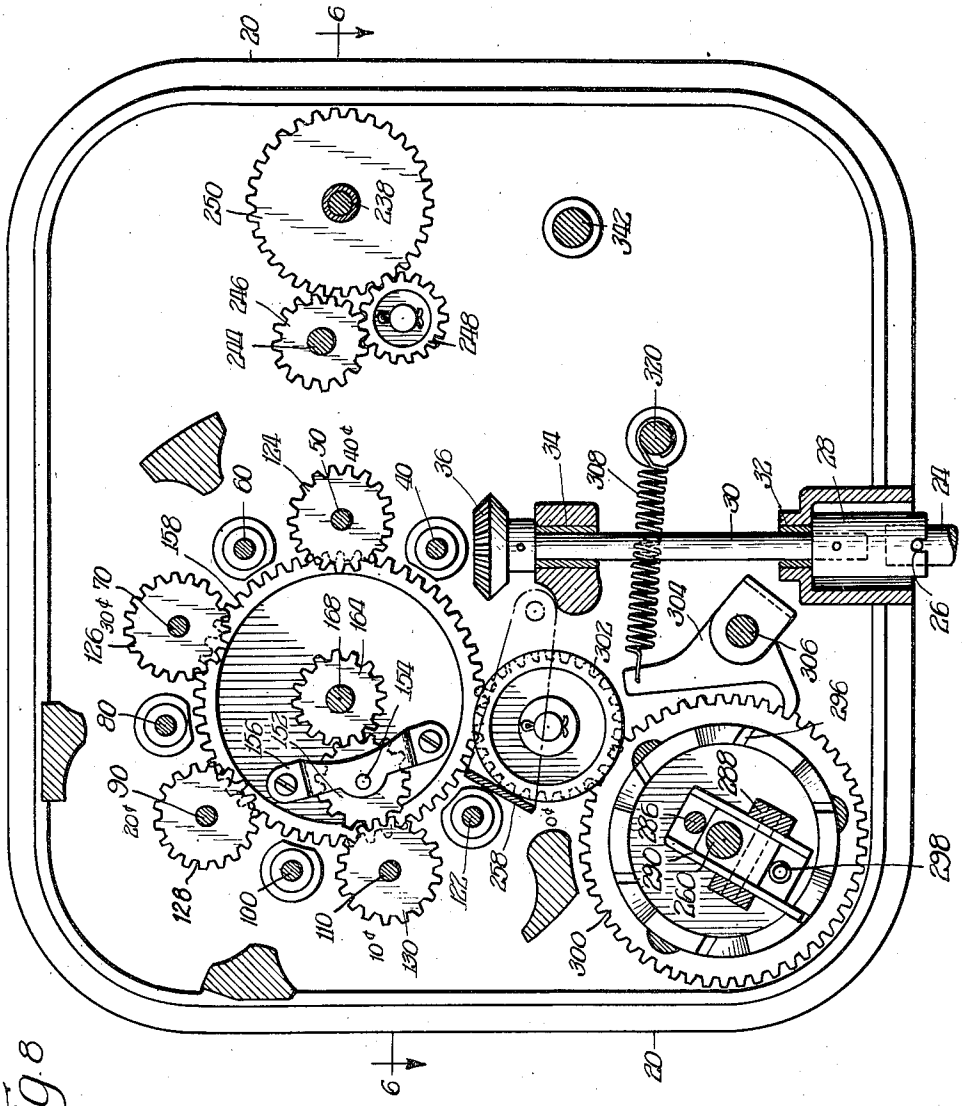


Fig. 8

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VARIATING MECHANISM

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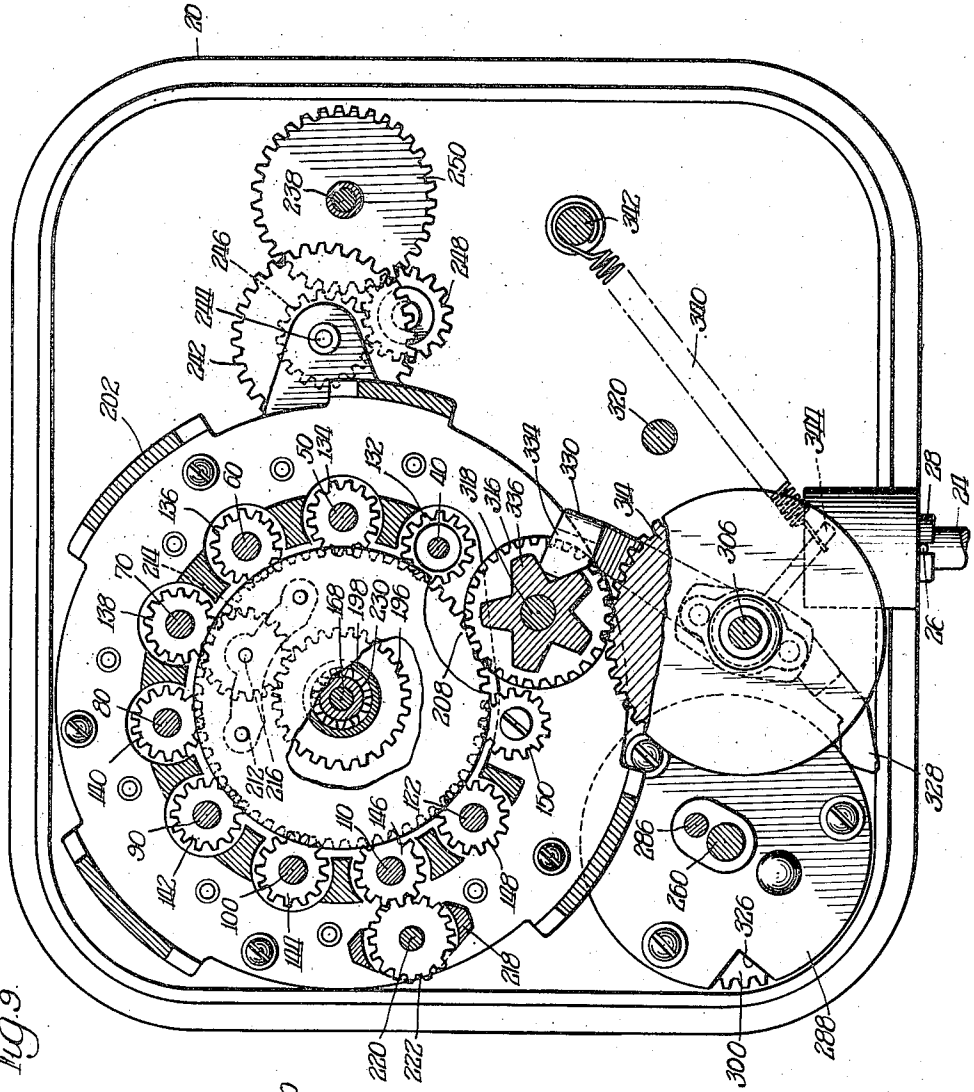


Fig. 9.

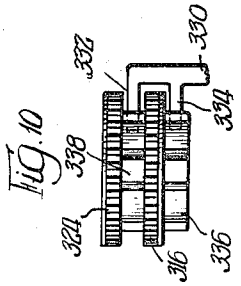


Fig. 10.

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June 7, 1949. S. HINDS 2,472,478

VARIATING MECHANISM

Filed Dec. 2, 1944 8 Sheets-Sheet 8

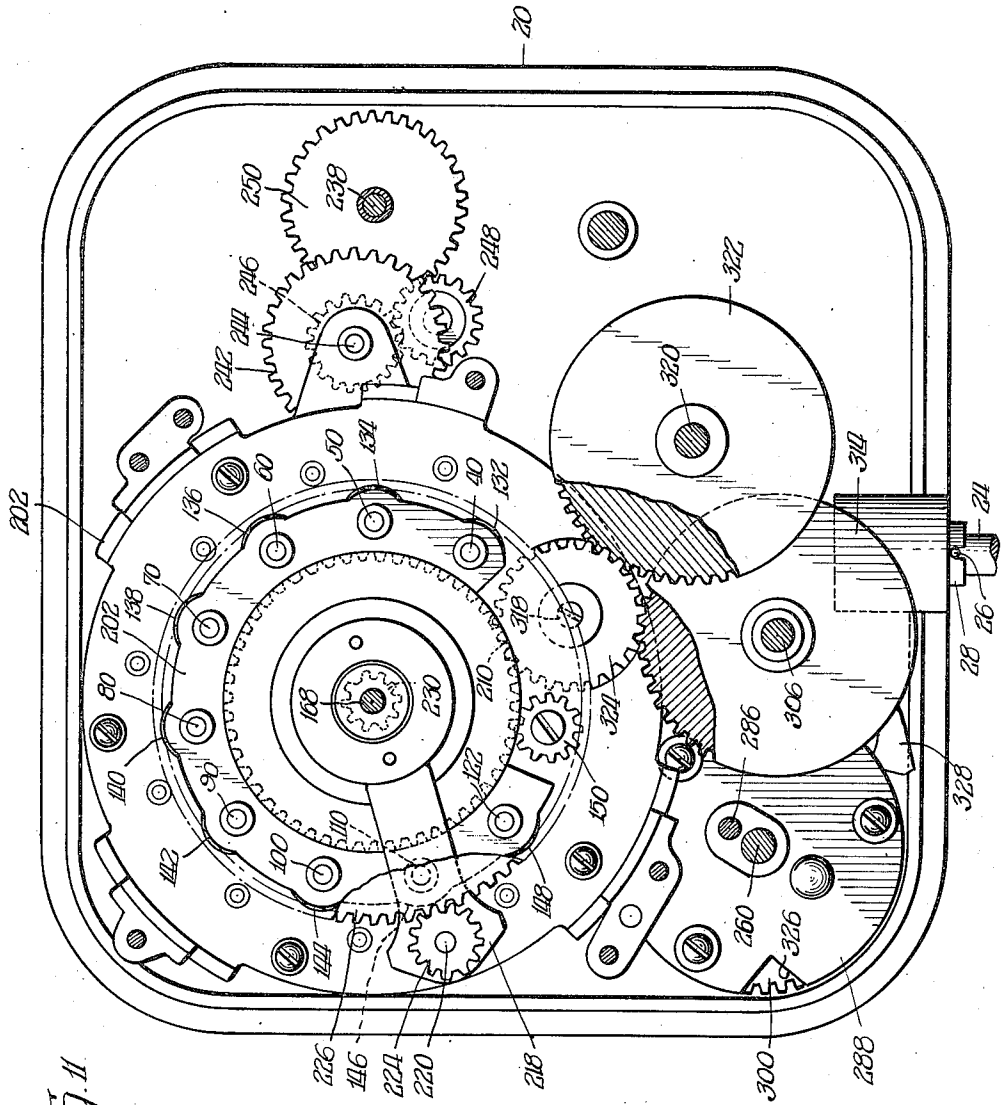


Fig. 11

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Patented June 7, 1949 2,472,478

UNITED STATES PATENT OFFICE

2,472,478

VARIATING MECHANISM

Sherwood Hinds, Columbia City, Ind., assignor to The Wayne Pump Company, Fort Wayne, Ind., a corporation of Maryland

Application December 2, 1944, Serial No. 566,336

26 Claims. (Cl. 74—353)

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This invention pertains to variating or integrating mechanism, and more particularly to a speed variator for computing the price characteristic of a computing head for liquid dispensing apparatus and the like.

It is an object of this invention to provide variating mechanism for a computing head of a liquid dispensing apparatus wherein the selective setting is accomplished at one panel.

Another object of the invention is to provide variating mechanism for a computing head wherein the selective gear shafts constantly rotate.

Still another object of the invention is to provide a computing head which can be set by reference to the register instead of attempting to read a small scale at the variator, but if desired is also adapted to be set by reference to a readily readable scale at said variator.

A different object is to provide variating mechanism for an electrical computing device which can be disposed in an explosion proof case, but wherein the mechanism is so arranged that it can be readily set externally of the case.

A still different object is to provide variating mechanism for an electrical computing system which is adapted for use with multiple registering means.

Yet a different object is to provide variating mechanism which is inexpensive and compact, and wherein the assembly can readily be made through sub-assemblies, and wherein the drive for the variator can be had from a plurality of points on the variator.

Still another different object is to provide variating mechanism which can be set without interference with associated mechanism, such as the registering mechanism, by virtue of disconnecting means between the variator and registering mechanism.

Another object is to provide a variator wherein all undue wear on the gear faces is eliminated as all of the gears rotate except for zero selection, the gears other than the selected gears operating as idlers.

Another object is to provide a variator wherein the selecting gears are arranged in tiers, making it possible to place the shafting substantially in a circle common to all tiers, thereby providing ready setting means.

Another object is to provide variating means which will compute only at the figures at which it is set.

Another object is to provide variator mechanism having the operating shafts arranged substantially circularly about a centrally disposed differential or output means permitting the use of selecting means operating circularly, this being made possible by carrying the shafts through the tiers of the mechanism and providing gearing in

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such a way as to properly compound certain of the gearing.

Another object is to provide a variator which is compact and strong, and is so constructed and arranged as to be easily assembled, permitting the use of simple tools and fixtures necessary for assembly.

Another object of the invention is to provide a form of variating mechanism in which the groups of gears are all of substantially the same size and so disposed that the center lines of the shafts thereof are on the same periphery so as to provide rapid selective gear change in order that the price setting of said variator may be readily varied.

Another object of the invention is to provide groups of gears of substantially the same size mounted on drive shafts, the axes of which are on a common periphery, connecting means for the selecting gears being through differential or output means whereby the summation of the movements of the selected of said selecting gears is delivered to a common shaft, the shifting gears between the differential mechanism and the selecting gears being movable by rotative setting of setting means for predetermined price ranges to engage the selected of said selecting gears for said ranges, and the zero setting of any of said predetermined price ranges being accomplished by the same rotative setting.

Another object is to provide a variator wherein selector rings are provided for setting the device, the rings being so constructed and arranged that a ring can only make one selection at a time, yet selection may be easily accomplished as it is done only by a rotative movement, the movement and relation of the parts being such that gears do not have to be felt for, as where the faces of gears must be meshed.

Another object of the invention is to provide variating mechanism wherein the setting means is so arranged that it must be positively and entirely set or it will be inoperative, and in the setting one of the setting means must be moved to a predetermined position from its locked position prior to setting the other setting means.

With these and various other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings which illustrate embodiments of the device and wherein like reference characters are used to designate like parts—

Figure 1 is an elevation, partly in section, of the variating mechanism embodying the invention, the same being shown with the cover cut away;

Figure 2 is a sectional bottom plan view of the variating mechanism illustrated in Figure 1;

Figure 3 is a fragmentary side elevation of the variating mechanism illustrated in Figure 1, the view looking toward the right as viewed in Figure 1, and being taken with the cover omitted;

Figure 4 is an enlarged fragmentary sectional elevation of the highest denomination shaft of the variating mechanism;

Figure 5 is a sectional plan view taken substantially at the plane as indicated by the line 5—5 of Figure 4;

Figure 6 is a sectional top plan view of the variating mechanism illustrated in Figure 1, the same being taken substantially in the plane as indicated by the line 6—6 of Figure 1;

Figure 7 is a sectional elevation showing the drive from the meter shaft to the integer shafts, the same being taken substantially in the plane as indicated by the line 7—7 of Figures 3 and 6;

Figure 8 is a sectional elevation showing the mechanism for the ten to forty cents calculation, the same being taken substantially in the plane as indicated by the line 8—8 of Figures 3 and 6;

Figure 9 is a sectional elevation for the one to nine cents calculation, the same being taken substantially in the plane as indicated by the line 9—9 of Figures 3 and 6;

Figure 10 is a fragmentary side elevation showing a double pawl and ratchet mechanism used in the variating mechanism;

Figure 11 is a sectional elevation showing the mechanism for the one-tenth to nine-tenth calculations, the same being taken substantially in the plane as indicated by the line 11—11 of Figures 3 and 6.

In the form of variator or variating mechanism illustrated, there is provided a base plate 20 on which is supported the cover 22 within which is provided the variator or calculating mechanism. The main driving shaft 24, which may be the meter shaft where the device is used in a liquid dispensing apparatus, is coupled as at 26 to the coupling 28 non-rotatably provided on the variator driving shaft 30 (Figures 7 and 8). Said shaft, journalled as at 32 and 34, is designed, in the embodiment shown, to make eight revolutions for each gallon passing through the meter and said shaft 30 is provided with the 12-tooth bevel gear 36 (Figures 7 and 8) meshing with the 16-tooth bevel gear 38 (Figure 7) disposed on the selected gear drive shaft 40 (Figures 7, 8, 9 and 11).

The shaft 40 is also provided with the 16-tooth gear 42 (Figure 7) which meshes with the idler 44 rotatably mounted on the shaft 46. The idler 44 meshes with the 18-tooth gear 48 fixedly mounted on the selected gear drive shaft 50. The gear 48 is provided with the 14-tooth gear 52 meshing with the idler 54 rotatably mounted on the shaft 56. The idler 54 meshes with the 16-tooth gear 58 fixedly mounted on the selected gear drive shaft 60 and said shaft is provided the 12-tooth gear 62 meshing with the idler 64 rotatably mounted on the shaft 66.

The idler 64 meshes with the 14-tooth gear 68 fixedly mounted on the selected gear drive shaft 70 and said shaft is provided with the 15-tooth gear 72 meshing with the idler 74 rotatably mounted on shaft 76. The gear 74 meshes with the 18-tooth gear 78 fixedly mounted on the selected gear drive shaft 80 and said shaft is nonrotatably provided with the 12-tooth gear 82 meshing with the idler 84 rotatably mounted on the shaft 86. The gear 84 meshes with the 15-tooth gear 88 fixedly mounted on the selected gear drive shaft 90 and said shaft is provided with the 12-tooth gear 92 meshing with the idler 94 rotatably provided on the shaft 96.

The gear 94 meshes with the 16-tooth gear 98 non-rotatably provided on the selected gear drive shaft 100 and said shaft is provided with the 12-tooth gear 102 meshing with the idler 104 rotatably mounted on shaft 106. The gear 104 meshes with the 18-tooth gear 108 nonrotatably provided on the selected gear drive shaft 110 and said shaft is provided with the 15-tooth gear 112 meshing with the 20-tooth idler gear 114 rotatably provided on the shaft 116, said idler being provided with the 14-tooth idler gear 118 meshing with the 21-tooth gear 120 non-rotatably provided on the selected gear drive shaft 122.

Shafts 50, 70, 90 and 110 are non-rotatably provided with the 24-tooth selected (tens) gears 124, 126, 128 and 130 respectively (Figure 8). Shafts 40, 50, 60, 70, 80, 90, 100, 110 and 122 are non-rotatably provided with the 16-tooth selected gears 132 (for 9¢ and $\frac{9}{10}$¢), 134 (for 8¢ and $\frac{8}{10}$¢), 136 (for 7¢ and $\frac{7}{10}$¢), 138 (for 6¢ and $\frac{6}{10}$¢), 140 (for 5¢ and $\frac{5}{10}$¢), 142 (for 4¢ and $\frac{4}{10}$¢), 144 (for 3¢ and $\frac{3}{10}$¢), 146 (for 2¢ and $\frac{2}{10}$¢), and 148 (for 1¢ and $\frac{1}{10}$¢), (Figure 9) and a locked zero 16-tooth gear 150 is provided on the same circumference as said gears 132 to 148 inclusive. These gears 132 to 150, inclusive, are for units or cents, and tenths calculation as will later appear. The (tens) gears 124, 126, 128 and 130 (Figure 8) for 10¢ to 40¢ in multiples of ten, are adapted to be selectively engaged by the 20-tooth idler selecting gear 152 pivoted, as at 154, to the strap 156 secured to the 66-tooth setting gear 158 which is pivotally mounted on the boss 160 (Figure 6) provided on the base 20 and retained by the retaining plate 162.

The idler 152 meshes with the 20-tooth differential carrier gear 164 (Figures 6 and 8), said gear being non-rotatably provided with the sleeve 166 (Figure 6), pivotally mounted on the money driven shaft 168, which shaft is adapted to drive suitable money recording mechanism or a distributor for such mechanism as shown in Patent No. 2,379,785, granted July 3, 1945 to Kenly C. Bugg. The opposite end of the shaft 168 (Figure 6) is provided with a mitre gear 170 meshing with the mitre gear 172 for operating the money totalizer 174.

The carrier gear 164 (Figures 6 and 8) is provided with the carrier 176 (Figure 6) provided with the pins or shafts 178 on which are pivotally mounted the 12-tooth gears 180 (Figures 6 and 7) meshing with the 24-tooth gear 182 non-rotatably mounted on the shaft 168. The gears 180 are provided with the 20-tooth gears 184 meshing with the 15-tooth gear 186 rotatably mounted on the shaft 168. Gear 186 is provided with the 24-tooth gear 188 meshing with the 12-tooth gears 190 pivotally mounted on the pins or shafts 192 provided on the carrier 194, the carrier 194 being provided with the 30-tooth carrier gear 196 (Figures 6 and 9) and the carrier 194 and carrier gear 196 being rotatably mounted on the stationary bearing sleeve 198.

The sleeve 198 is fixedly secured to the hub 200 of the upper supporting member 202, the member 202 and the base 20 providing means whereby the shafts 40, 50, 60, 70, 80, 90, 110 and 122 may be journalled. The member 202 is provided with the retaining members 204 (Figure 6) and 206 for

the 64-tooth setting gears 208 (Figures 6 and 9) and 210 (Figures 6 and 10). The gear 208 (Figure 9) is provided with the strap 212, and the 19-tooth idler selecting gear 214 is pivotally connected to the gear 208 and to the strap 212 as at 216, said idler 214 being adapted to be moved by the gear 208 into selected engagement with the selected (cents) gears 132, 134, etc. (Figures 6 and 11). The idler 214 meshes with the gear 196 for imparting movement to the carrier 194.

The gear 210 is a segmental gear (Figures 6 and 11) and is provided with the support arm 218 having the shaft 220 pivoted thereto, said shaft being provided with the inner 16-tooth gear 222 (for tenths calculation) (Figures 6 and 9) selectively meshing with the gears 132, 134, 136, 138, 140, 142, 144, 146, 148 or 150 and said shaft 220 is provided with the outer 16-tooth gear 224 (Figures 6 and 11) meshing with the 100-tooth gear 226. The gear 226 is fixedly connected to the sleeve 228 rotatably mounted on the shaft 168 and bearing within sleeve 198. The inner end of the sleeve 228 is provided with the 12-tooth gear 230 meshing with the 24-tooth gears 232 provided on the gears 190. The shafts 178 and 192 are secured to the carriers 176 and 194 respectively, on one side, and are secured to the supports 234 and 236 respectively, on the other sides thereof.

In order to operate the gallons or quantity driven shaft 238, which is journalled in the base 20 and auxiliary supporting plate 240, the gear 54 (Figures 6 and 7) meshes with the 35-tooth idler gear 242 fixedly mounted on the shaft 244, the shaft being journalled in the base 20 and support 202, and the shaft 244 is fixedly provided with the 15-tooth idler gear 246 meshing with the 20-tooth idler gear 248 pivoted on the base 20, said idler gear 248 meshing with the 32-tooth gear 250 fixed to the shaft 238. The shaft 238 is adapted to operate suitable registering mechanism for indicating the quantity or gallons, or may operate distributors such as shown in said Patent No. 2,379,785. The shaft 238 is provided with the 12-tooth mitre gear 252 meshing with the 12-tooth mitre gear 254 for operating the gallons or quantity totalizer 256.

In the variator as shown, the mechanism is set to compute at 16.2 cents. In this position, the gear 152 meshes with gear 130 (Figure 8), this setting providing for a computation of ten cents. The gear 214 (Figure 9) is set to mesh with gear 138, this being for a six cent computation and gear 222 (Figures 6 and 9) meshes with gear 146, this being for a computation of two-tenths cents. In order to change the set price, means must be provided for moving gears 152, 214 and 222. It is understood that in order to change the price from ten cents to zero tens of cents, the gear 152 must be moved to engage the fixed projection or stop 258 (Figure 8), and, in the device illustrated, when the gear 152 is in engagement with gear 128 it is set for twenty cents, when the gear 152 is in engagement with gear 126 it is set for thirty cents and when in engagement with gear 124 it is set for forty cents.

Similarly, gears 132 to 148 (Figure 9) represent even cents, that is, 9¢, 8¢, 7¢, etc., when said gears are engaged by the gear 214, and when they are engaged by the gear 222 (Figure 6) they represent tenths of cents, that is, $\frac{9}{10}$¢, $\frac{8}{10}$¢, etc. It is understood, of course, that when gears 214 and 222 are engaged with the locked gear 150 they are set for zero computation.

In order to effect a change in the tens of cents, shaft 260 (Figure 4) is journalled in the base 20 and is provided with the collar 262 journalled in the support 240, the shaft extending outwardly of the cover plate 22 and being provided with the knob 264 (Figures 1, 2 and 3), the knob being provided with indices 266, 268, 270, 272 and 274 adapted to be selectively aligned with a pointer 276 provided on the cover plate 22. When in such alignment, a setting of the tens portion of the variator is indicated. In the embodiment shown the tens shows that it is set for ten cents. Another index marked 278 is provided in the knob 264, which index must be moved into alignment with the pointer 276 in order to set the knobs 280 and 282 of the cents and tenths of cents portion of the variator.

The knob 264 is provided with the push button 284 engageable with a slidable rod 286 (Figures 4 and 8), the rod extending inwardly through the pawl carrier 288 and engaging one end of the pawl 290. The pawl 290 is pivoted as at 292 to the pawl carrier and the opposite end 294 of the pawl is urged into engagement with the fixed ratchet 296 by means of the spring 298. The fixed ratchet has spaced notches 297 corresponding to the positions of engagement of the gear 152 and the selected gears 124, 126, etc. The pawl carrier 288 is provided with the 66-tooth gear 300 meshing with the 32-tooth idler gear 302 (Figure 8) which in turn meshes with the gear 158. Thus rotating the shaft 260 causes rotation of the gear 158 through gears 300 and 302, it being seen that it is first necessary to depress the button 284 to cause release of the pawl 294 from the engaged tooth of the ratchet 296.

The shaft 260 can be rotated in only one direction and for this purpose the pawl 304 (Figure 8) is provided pivotally connected to the shaft 306, a spring 308 being provided for urging the pawl toward engagement with the gear 300. The knob 280 is provided on shaft 306 and is provided with indices 310 representing from zero to nine cents, said indices being adapted to be aligned with the fixed index 312 provided on the cover plate, whereby the setting of the cents portion of the variator can be readily determined, it being noted that in the present instance it has been set for six cents. Shaft 306 is provided with the 70-tooth gear 314 (Figures 2 and 9) meshing with the 32-tooth idler 316 which in turn meshes with gear 208, gear 316 being rotatably mounted on the fixed shaft 318, said shaft being carried by the support 202. Thus rotation of shafts 306 rotates gear 208 to move the gear 214 bodily to positions to engage selected gears 132, 134, etc.

Knob 282 is provided with the shaft 320, said shaft being provided with the 70-tooth gear 322 (Figure 11) meshing with the 32-tooth idler gear 324 pivoted to the shaft 318 and meshing with the gear 210. Thus rotation of the shaft 320 causes rotation of the gear 210 and, consequently selectively moves the gear 222 to engage the selected gears 132, 134, etc. Knob 282 is provided with the indices 325 from zero to nine, corresponding to the tenths indications, said indices being adapted to be aligned with pointer 327 on the housing 22 for readily reading the tenths setting.

Shafts 260, 306 and 320 may, of course, be mechanically or electrically connected to daily price indicating means such as shown in Slye et al. Patent No. 2,151,239, granted March 21, 1939, or Bugg Patent No. 2,323,374, granted July 6, 1943.

The pawl carrier 288 (Figure 9) is provided with a notch 326 which is adapted to be aligned with the pawl 328 when the knob 264 is moved to a position where the index 278 (also marked "x")

is in alignment with the index 276. The pawl 328 is pivoted to the shaft 306 and is provided with the inner arm 330 (Figures 9 and 10) having the spaced pawls 332 and 334 adapted to engage in ratchets 336 and 338 respectively provided on idlers 316 and 324. The ratchet teeth on ratchets 336 and 338 are so spaced as to represent the movement between the adjacent selected gear drive shafts 40, 50, etc., so that when the pawls 334 and 332 are in engagement, that is, in the position shown in Figure 9, engagement between the idler 214 and the selective gears 132, 134, etc., and engagement between idler 222 and the selective gears 132, 134, etc., is insured.

The spring 340 is secured at one end to the support 342 and at the other end to the arm 344 provided on pawls 328, 334 and 332. The pawls 332 and 334 are thus urged into engagement with the ratchets 338 and 336 as shown in Figure 9 and in that position, unless the notch 326 is moved into alignment with the pawl 328, the shafts 306 and 320 cannot be rotated as a positive lock is provided between pawls 328 and the carrier 288. When the variating mechanism is being set, that is, when the notch 326 has been moved into alignment with the pawl 328, unless the gears 214 and 222 are in engagement with one of the gears 132, 134, etc., it is impossible to set the knob 264 as the pawl 328 cannot be moved out of the notch 326, due to the fact that unless the gears 214 and 222 are in engagement with the selected gears, the ratchets 338 and 336 are so disposed as to prevent reception of the pawls 332 and 334 so that pawl 328 cannot be removed from notch 326.

It is to be understood that this application is not to be limited by the exact embodiments of the device shown, which are merely by way of illustration and not limitation, as various and other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In variating mechanism, the combination of a driving shaft, output means, drive shafts arranged around said output means, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, stop means for preventing rotation of said selecting gears when engaged thereby, setting means for moving said selecting gears to mesh with the selected of the selected gears or to engage said stop means, said setting means including a movable member for each of said selecting gears, and means associated with one of said movable members for preventing operation of said variating mechanism unless each of said selecting gears is operatively connected with one of said selected gears, or to said stop.

2. In variating mechanism, the combination of a driving shaft, output means, drive shafts arranged around said output means, operative connections between said driving and drive shafts, a selected gear on certain of said drive shafts, coplanar selecting gears movable to selectively connect said selected gears to said output means, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, and setting means for moving said coplanar selecting gears to mesh with the selected of the selected gears.

3. In variating mechanism, the combination of a driving shaft, output means, drive shafts arranged around said output means, operative connections between said driving and drive shafts, a selected gear on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, certain of said selecting gears being coplanar, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, stop means for preventing rotation of said selecting gears when engaged thereby, setting means for moving said selecting gears to mesh with the selected of the selected gears, said setting means including a movable member for each of said selecting gears, and means associated with one of said movable members for preventing operation of said variating mechanism unless each of said selecting gears is operatively connected with one of said selected gears, or to said stop.

4. In variating mechanism, the combination of a driving shaft, output means, drive shafts arranged around said output means, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears, said setting means including a movable member for each of said selecting gears, and means controlled by one of said movable members for preventing setting of the other movable members, until the first named movable member is moved to a predetermined position.

5. In variating mechanism, the combination of a driving shaft, output means, drive shafts arranged around said output means, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears, said setting means including a movable member for each of said selecting gears, means controlled by one of said movable members for preventing setting of the other movable members until the first named movable member is moved to a predetermined position, and means preventing movement of said first named member to said predetermined position or toward a selected set position except in a single direction.

6. In variating mechanism, the combination of a driving shaft, output means, drive shafts arranged around said output means, operative connections between said driving and drive shafts, a selected gear on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, a stop for each selecting gear, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears or said stops, said setting means including a member rotatable to rotate a selecting gear to engage a selected gear or stop, said member being provided with a carrier having a notch at a predetermined place therein, a pawl adjacent

said member and operatively associated therewith permitting said member to be rotated in only one direction, a rotatable member for a second selecting gear rotatable to move said second selecting gear to engage a selected gear or stop, a ratchet member interposed between said second selecting gear and its rotatable member, and pawl means engageable with said ratchet member when the second selecting gear is in engagement with its selected gear or stop, said pawl means having a portion adapted to be received in said notch when the first named member is moved to a predetermined position which permits said pawl means to release the ratchet member whereby the second selecting gear may be moved by said rotatable member, said portion of said pawl means being held by said carrier in a position to engage said ratchet member to prevent said rotatable member from being rotated except when said notch is in said predetermined position to receive said pawl portion.

7. In variating mechanism, the combination of a driving shaft, output means, drive shafts arranged around said output means, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, a stop for each selecting gear said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears or said stops, said setting means including a member rotatable to rotate a selecting gear to engage a selected gear or stop, said member being provided with a carrier having a notch at a predetermined place therein, a rotatable member for a second selecting gear rotatable to move said second selecting gear to engage a selected gear or stop, a ratchet member interposed between said second selecting gear and its rotatable member, and pawl means engageable with said ratchet member when the second selecting gear is in engagement with its selected gear or stop, said pawl means having a portion adapted to be received in said notch when the first named member is moved to a predetermined position which permits said pawl means to release the ratchet member whereby the second selecting gear may be moved by said rotatable member, said portion of said pawl means being held by said carrier in a position to engage said ratchet member to prevent said rotatable member from being rotated except when said notch is in said predetermined position to receive said pawl portion.

8. In variating mechanism, the combination of a driving shaft, output means, drive shafts arranged around said output means, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, a stop for each selecting gear, certain of said selecting gears being coplanar to be moved to mesh with selected gears which are coplanar therewith, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears or said stops, said setting means including a member rotatable to rotate a selecting gear to engage a selected gear or a stop, said member being provided with a pawl carrier having a pawl member engageable with an adjacent fixed ratchet having predetermined points of engagement by said pawl member, means for releasing said pawl member from said fixed ratchet for rotating said member, said carrier having a notch at a predetermined place therein, the predetermined points of said fixed ratchet corresponding to the engagement between the selecting gear operated by said member and its selected gears and stop and to the position of said notch, a pawl adjacent said member and operatively associated therewith permitting said member to be rotated in only one direction, rotatable members for said coplanar selecting gears for moving said coplanar selecting gears to engage selected coplanar selected gears or stops, ratchet means interposed between said coplanar selecting gears and their rotatable members, and pawl means engageable with said ratchet means when said coplanar selecting gears are in engagement with the selected of said coplanar selected gears or their respective stops, said pawl means having a portion adapted to be received in said notch when the first named member is moved to a predetermined position which permits said pawl means to release the ratchet means whereby the coplanar selecting gears may be moved by their rotatable members, said portion of said pawl means being held by said carrier in a position to engage said ratchet means to prevent said last named rotatable members from being rotated except when said notch is in said predetermined position to receive said pawl portion.

9. In variating mechanism, the combination of a driving shaft, output means, drive shafts arranged around said output means, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively connect the selected of said selected gears to said output means, setting means for moving said selecting gears to mesh with the selected of the selected gears, said setting means including a movable member for each of said selecting gears, means associated with one of said movable members for preventing setting of the other movable members until the first named movable member is moved to a predetermined position, and means preventing movement of said first named member to said predetermined position or toward set position except in a single direction.

10. In variating mechanism, the combination of a driving shaft, output means, drive shafts arranged around said output means, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, a stop for each selecting gear, certain of said selecting gears being coplanar to be moved to mesh with selected gears which are coplanar therewith, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, setting means for moving said selecting gears to mesh with the selected of said selected gears or said stops, said setting means including a member rotatable to rotate a selecting gear to engage a selected gear or a stop, said member being provided with a pawl carrier having a pawl member engageable with an adjacent fixed ratchet having predetermined points of engagement by said pawl member, means for releasing said pawl member from said fixed ratchet for rotating said member, said carrier having a notch at a predetermined place therein, the predetermined points of said fixed ratchet corresponding

to the engagement between the selecting gear operated by said member and its selected gears and stop and to the position of said notch, rotatable members for said coplanar selecting gears for moving said coplanar selecting gears to engage selected coplanar selected gears or stops, ratchet means interposed between said coplanar selecting gears and their rotatable members, and pawl means engageable with said ratchet means when said coplanar selecting gears are in engagement with the selected of said coplanar selected gears or their respective stops, said pawl means having a portion adapted to be received in said notch when the first named member is moved to a predetermined position which permits said pawl means to release the ratchet means whereby the coplanar selecting gears may be moved by their rotatable members, said portion of said pawl means being held by said carrier in a position to engage said ratchet means to prevent said last named rotatable members from being rotated except when said notch is in said predetermined position to receive said pawl portion.

11. In variating mechanism, the combination of a driving shaft, output means, drive shafts, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, stop means for preventing rotation of said selecting gears when engaged thereby, setting means for moving said selecting gears to mesh with the selected of the selected gears or to engage said stop means, said setting means including a movable member for each of said selecting gears, and means associated with one of said movable members for preventing operation of said variating mechanism unless each of said selecting gears is operatively connected with one of said selected gears, or to said stop.

12. In variating mechanism, the combination of a driving shaft, output means, drive shafts, operative connections between said driving and drive shafts, a selected gear on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, a stop for each selecting gear, certain of said selecting gears being coplanar to be moved to mesh with selected gears which are coplanar therewith, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, setting means for moving said selecting gears to mesh with the selected of said selected gears or a stop, said setting means including a member rotatable to rotate a selecting gear to engage a selected gear or a stop, said member being provided with a carrier having a notch at a predetermined place therein, rotatable members for said other selecting gears for moving said other selecting gears to engage selected of the selected gears or stops, ratchet means interposed between said other selecting gears and their rotatable members, and pawl means engageable with said ratchet means when said other selecting gears are in engagement with the selected of said selected gears or their respective stops, said pawl means having a portion adapted to be received in said notch when the first named member is moved to a predetermined position which permits said pawl means to release the ratchet means whereby the other selecting gears may be moved by their rotatable members, said portion of said pawl means being held by said carrier in a position to engage said ratchet means to prevent said last named rotatable members from being rotated except when said notch is in said predetermined position to receive said pawl portion.

13. In variating mechanism, the combination of a driving shaft, output means, drive shafts, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively connect said selected gears to said output means, said output means being adapted to operate drive means in accordance with the rotation of the selected of the selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears, said setting means including a movable member for each of said selecting gears, and means associated with one of said movable members for preventing setting of the other movable members until the first named movable member is moved to a predetermined position.

14. In variating mechanism, the combination of a driving shaft, output means, drive shafts, operative connections between said driving and drive shafts, a selected gear on certain of said drive shafts, certain selected gears of certain drive shafts being coplanar, selecting gears movable to selectively connect said selected gears to said output means, certain selecting gears being coplanar to selectively engage said coplanar selected gears, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears, said setting means including a movable member for each of said selecting gears, and means associated with one of said movable members for preventing setting of the other movable members until the first named movable member is moved to a predetermined position.

15. In variating mechanism, the combination of a driving shaft, output means, drive shafts, operative connections between said driving and drive shafts, selecting gears on certain of said drive shafts, certain selected gears of certain drive shafts being coplanar, selecting gears movable to selectively connect said selected gears to said output means, certain selecting gears being coplanar to selectively engage said coplanar selected gears, said output means being adapted to operate driven means in accordance with the rotation of the selected of the selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears, said setting means including a movable member for each of said second named gears, means associated with one of said movable members for preventing setting of the other movable members until the first named movable member is moved to a predetermined position, and means preventing movement of said first named member to said predetermined position or toward set position except in a single direction.

16. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of said drive shafts being disposed on the periphery of a common circle, operative connections between said driving and drive shafts, a selected gear on certain of said drive shafts, selecting gears movable to selectively engage said selected gears, setting means for moving said selecting gears to mesh with the selected

of the selected gears, said setting means including a movable member for each of said selecting gears, and means associated with one of said movable members for preventing operation of said device unless each of said selecting gears are in a predetermined position.

17. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of said drive shafts being disposed on the periphery of a common circle, operative connections between said driving and drive shafts, a selected gear on certain of said drive shafts, selecting gears movable to selectively engage said selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears, said setting means including a movable member for each of said selecting gears, and means associated with one of said movable members for preventing setting of the other movable members until the first named movable member is moved to a predetermined position.

18. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of said drive shafts being disposed on the periphery of a common circle, operative connections between said driving and drive shafts, a selected gear on certain of said drive shafts, selecting gears movable to selectively engage said selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears, said setting means including a movable member for each of said selecting gears, means associated with one of said movable members for preventing setting of the other movable members until the first named movable member is moved to a predetermined position, and means preventing movement of said movable member to said predetermined position or toward set position except in a single direction.

19. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of said drive shafts being disposed on the periphery of a common circle, operative connections between said driving and drive shafts, a plurality of selected gears on each of said drive shafts, certain selected gears on said drive shafts being coplanar with certain selected gears on other of said drive shafts, selecting gears movable to selectively engage said selected gears, certain selected gears being coplanar to selectively engage said coplanar selected gears, setting means for moving said selecting gears to mesh with the selected of the selected gears, said setting means including a movable member for each of said selecting gears, and means associated with one of said movable members for preventing movement of the other movable members unless said first named movable member has been moved to a predetermined position.

20. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of said shafts being disposed on the periphery of a common circle, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, a selecting gear movable to selectively engage said selecting gears, said selecting gear being rotatably mounted on a setting gear concentric with said common circle, a gear train engaging said setting gear, a ratchet wheel formed integrally with one of the gears of said gear train, a pawl adapted to engage said ratchet wheel, the teeth on said ratchet wheel being so spaced that when said pawl is seated between two adjacent teeth, said selecting gear is in engagement with one of said selected gears, and a movable member adapted to normally maintain said pawl in such seated position but adapted to allow said pawl to free said ratchet wheel when moved to a predetermined position.

21. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of said shafts being disposed on the periphery of a common circle, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively engage said selected gears, each of said selecting gears being rotatably carried by a setting gear concentric with said common circle, a gear train engaging each of the concentrically disposed setting gears, a ratchet wheel formed integrally with one of the gears in all but one of said gear trains, a pawl adapted to engage said ratchet wheels, the teeth on said ratchet wheels being so disposed that when said pawl is seated between adjacent teeth on each of said ratchet wheels, said selecting gears carried by the concentrically disposed setting gears engaged by said last named gear train are each in engagement with one of said selected gears, and means carried by one of said gears in the gear train not having a ratchet wheel as a part thereof, adapted to normally maintain said pawl in such seated position but allowing said pawl to free said ratchet wheels when said means is moved to a predetermined position, said predetermined position also being such that the selecting gear carried by the concentrically disposed setting gear engaged by said last named gear train is disengaged from any of said selected gears when said means is moved thereto.

22. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of said shafts being disposed on the periphery of a common circle, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively engage said selected gears, each of said selecting gears being rotatably carried by a setting gear concentric with said common circle, a gear train engaging each of the concentrically disposed setting gears, a ratchet wheel formed integrally with one of the gears in all but one of said gear trains, a pawl adapted to engage said ratchet wheels, the teeth on said ratchet wheels being so disposed that when said pawl is seated between adjacent teeth on each of said ratchet wheels, said selecting gears carried by the concentrically disposed gears engaged by said last named gear trains are each in engagement with one of said selected gears, means carried by one of said gears in the gear train not having a ratchet wheel as a part thereof adapted to normally maintain said pawl in such seated position but allowing said pawl to free said ratchet wheels when said means is moved to a predetermined position, said predetermined position also being such that the selecting gear carried by the concentrically disposed gear engaged by said last named gear train is disengaged from any of said selected gears when said means is moved thereto, stop means for locking said last named gear train in any one of a plurality of positions of adjustment, as desired, in which positions said selecting gear carried by the concentrically mounted gear engaged by said last named gear train engages one of said selected gears, and means for releasing said stop means to permit movement of said last named

gear train to another position of adjustment, as desired.

23. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of which are disposed on the periphery of a common circle, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively engage said selected gears, each of said selecting gears being rotatably carried by a setting gear concentric with said common circle, setting means for rotating the concentrically disposed setting gears, a movable member associated with said setting means, said movable member being adapted to normally lock all but one of said setting means in positions of adjustment such that the selecting gears associated therewith are in engagement with said selected gears, said movable member also being adapted to free the restrained setting means when that one setting means is moved to a predetermined position, said predetermined position also being such that the selecting gear carried by the concentrically disposed setting gear associated with said last named setting means is disengaged from any of said selected gears when said setting means is moved thereto.

24. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of which are disposed on the periphery of a common circle, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively engage said selected gears, each of said selecting gears being rotatably carried by a setting gear concentric with said common circle, setting means for rotating the concentrically disposed setting gears, a movable member associated with all but one of said setting means, and a second movable member associated with that one setting means adapted to normally maintain said first named movable member in locking engagement with the remaining setting means, said remaining setting means being positioned when so locked so that the selecting gears associated therewith are in engagement with said selected gears, said second movable member also being adapted to free the restrained setting means when said setting means with which it is associated is moved to a predetermined position, said first named movable member being adapted to lock said second movable member in said predetermined position when any of the setting means not associated with said second movable member are then moved so that any one of the selecting gears associated therewith is not engaged with any one of said selected gears, and stop means for locking said setting means with which said second movable member is associated in any one of a plurality of positions of adjustment, as desired, in which positions the selecting gear carried by the concentrically mounted setting gear associated with said last named setting means engages one of said selected gears.

25. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of which are disposed on the periphery of a common circle, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively engage said selected gears, each of said selecting gears being rotatably carried by a setting gear concentric with said common circle, setting means for rotating the concentrically disposed setting gears, a movable member associated with all but one of said setting means, and a second movable member associated with that one setting means adapted to normally maintain said first named movable member in locking engagement with the remaining setting means, said remaining setting means being positioned when so locked so that the selecting gears associated therewith are in engagement with said selected gears, said second movable member also being adapted to free the restrained setting means when said setting means with which it is associated is moved to a predetermined position, said first named movable member being adapted to lock said second movable member in said predetermined position when any of the setting means not associated with said second movable member are then moved so that any one of the selecting gears associated therewith is not engaged with any one of said selected gears, and stop means for locking said setting means with which said second movable member is associated in any one of a plurality of positions of adjustment, as desired, in which positions the selecting gear carried by the concentrically mounted setting gear associated with said last named setting means engages one of said selected gears, and means for releasing said stop means to permit movement of said last named setting means to another position of adjustment, as desired.

26. In a device of the character described, the combination of a driving shaft, drive shafts, the axes of which are disposed on the periphery of a common circle, operative connections between said driving and drive shafts, selected gears on certain of said drive shafts, selecting gears movable to selectively engage said selected gears, each of said selecting gears being rotatably carried by a setting gear concentric with said common circle, a plurality of setting means for moving the concentrically disposed setting gears so that said selecting gears selectively engage said selected gears, locking means adapted to permit the selective movement of all but one of said setting means when that one setting means is in a predetermined position and any one of said selecting gears carried by the concentrically disposed setting gears associated with any but the last named setting means is out of engagement with said selected gears, said locking means also being adapted to prevent the movement of all but said last named setting means when the latter is not in said predetermined position.

SHERWOOD HINDS.

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Certificate of Correction

Patent No. 2,472,478. June 7, 1949.

SHERWOOD HINDS

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 12, line 14, claim 13, for the word "drive" read *driven*;

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of November, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.