May 15, 1956 V. G. KLEIN ET AL 2,745,290

TIMING MECHANISM

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FIG. 1.

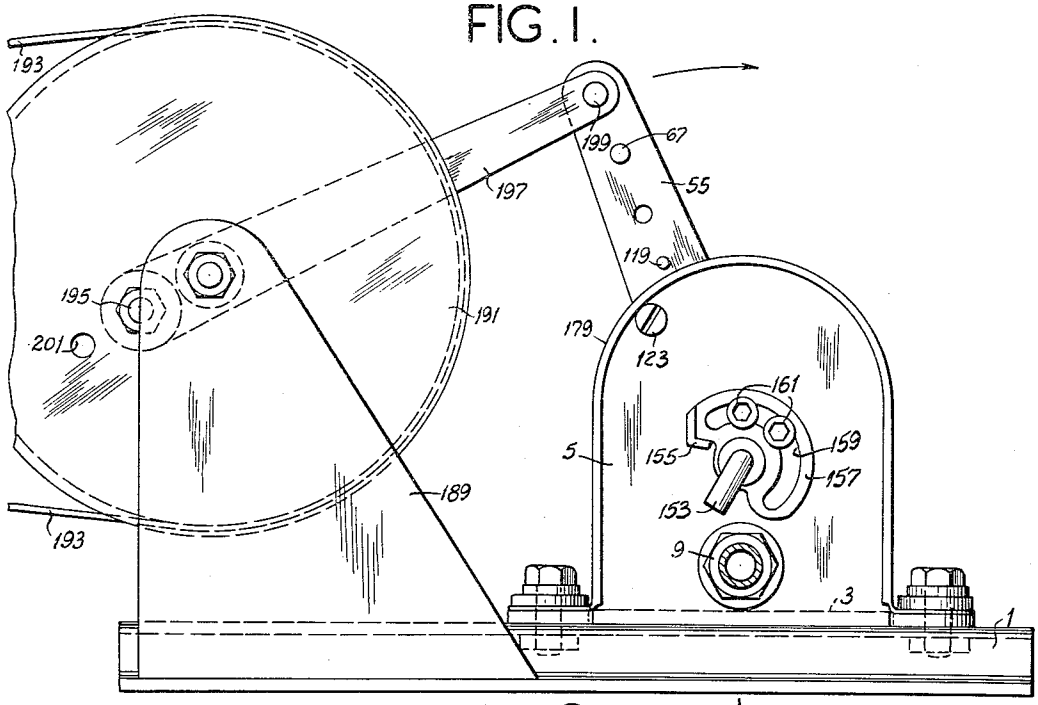


FIG. 2.

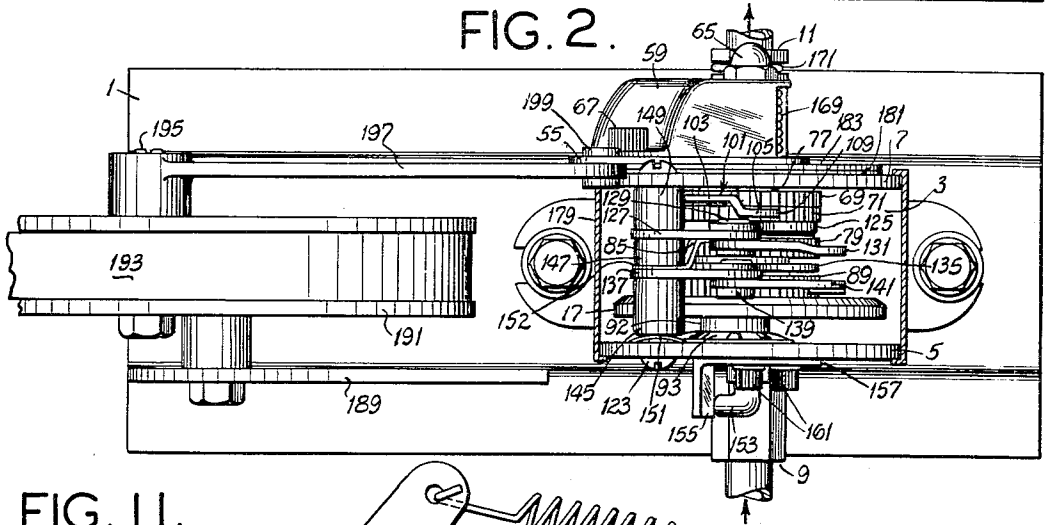
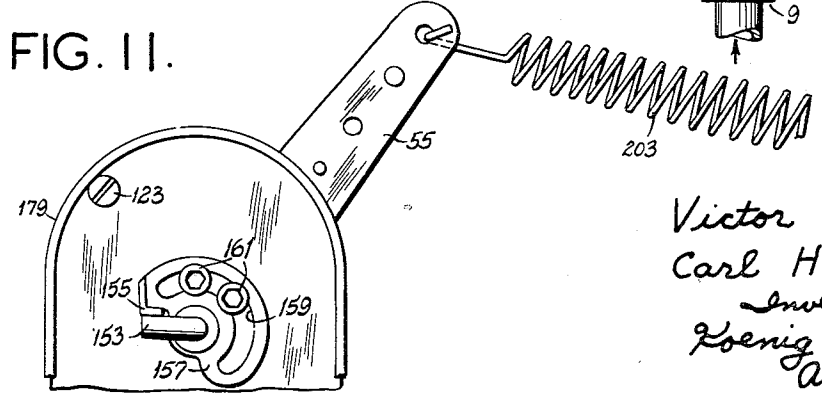


FIG. 11.



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FIG. 3.

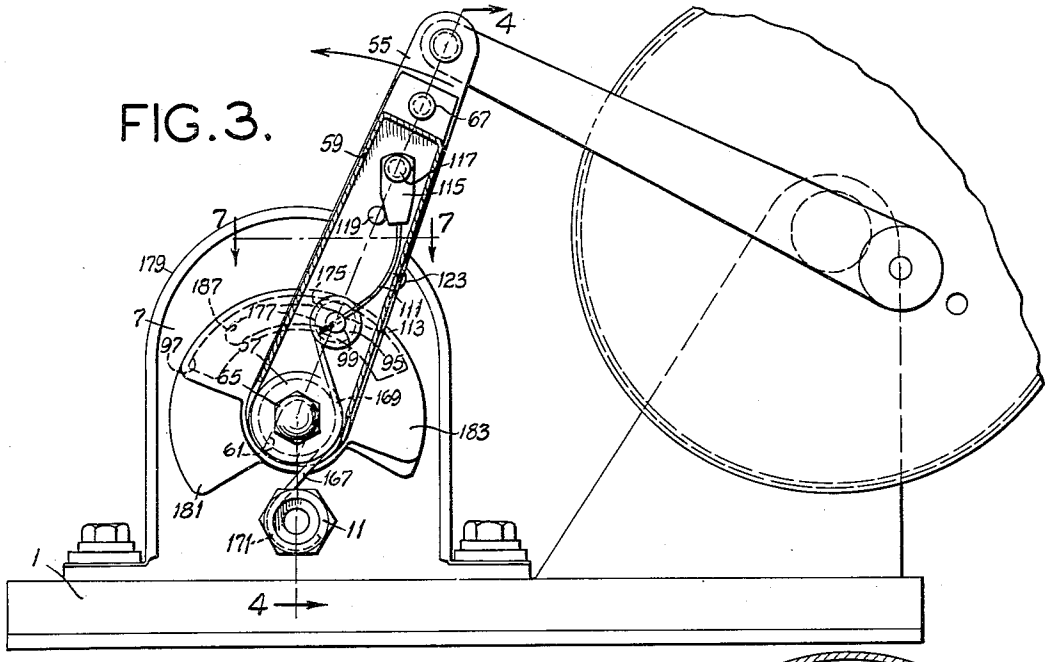


FIG. 4.

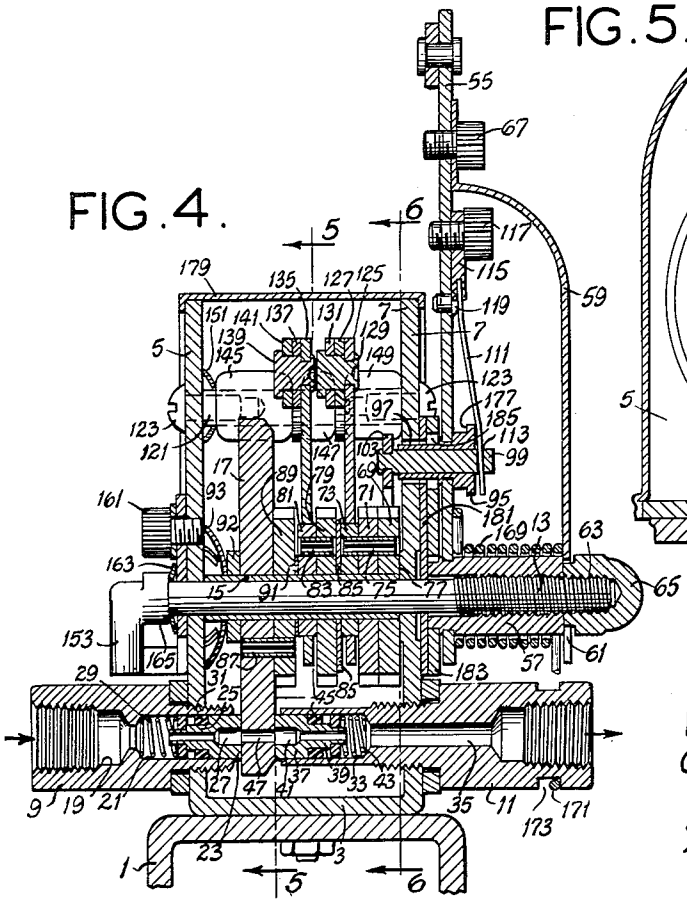
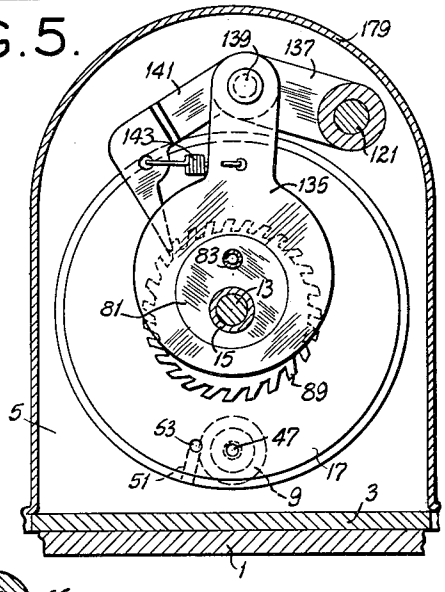


FIG. 5.



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TIMING MECHANISM

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FIG. 12.

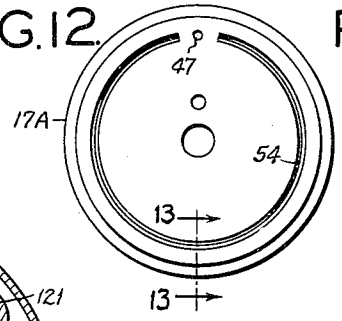


FIG. 13.

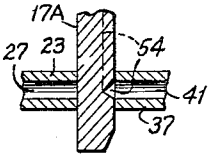


FIG. 6.

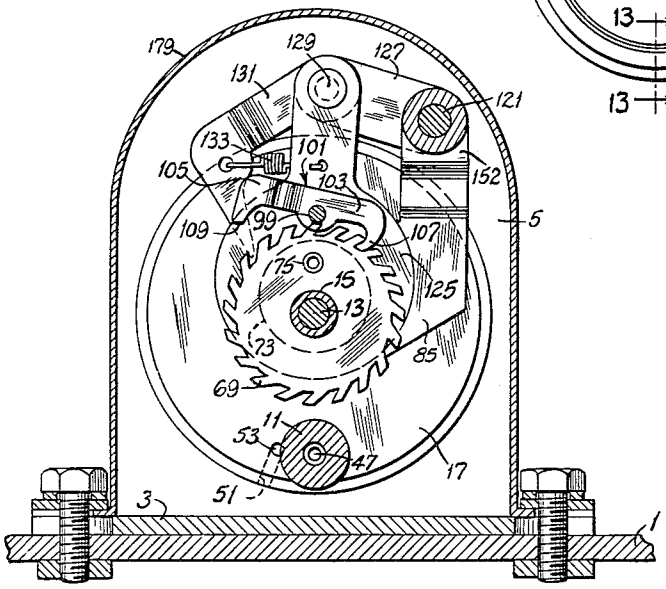


FIG. 9.

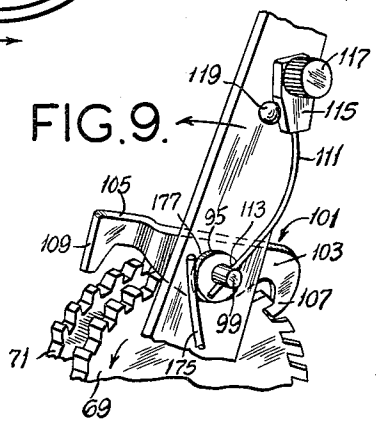


FIG. 7.

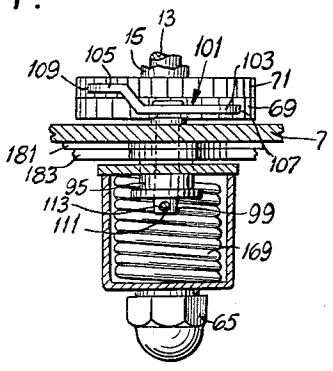


FIG. 10.

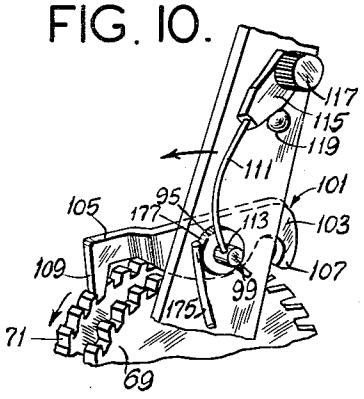
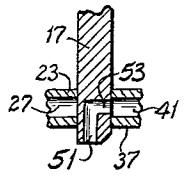


FIG. 8.



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United States Patent Office 2,745,290 Patented May 15, 1956

2,745,290

TIMING MECHANISM

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Application May 2, 1952, Serial No. 285,722

8 Claims. (Cl. 74—142)

This invention relates to timing mechanism, and more particularly to such mechanism for operating a valve.

In particular, the invention relates to an improvement upon the valve timing mechanism disclosed in our copending U. S. application entitled Lubrication System and Control Valve Therefor, Serial No. 272,934, filed February 23, 1952. It will be understood, however, that the timing mechanism per se of this invention is not limited to valve actuation, and may be adapted for actuating devices other than a valve.

Among the several objects of the invention may be noted the provision of an improved timing mechanism of the pawl and ratchet type for obtaining a single cycle of operation of an auxiliary device, such as a valve, in response to a predetermined and relatively high number of operations of a primary device; the provision of a timing mechanism of this class which is capable of being readily set to obtain a multiplicity of different reduction ratios, i. e., different values of the number of cycles of operation of the primary device required for one cycle of operation of the auxiliary device; and the provision of a timing mechanism of this class which is economical to manufacture, reliable in operation, and long-lasting in service. Other objects will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of which will be indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

Fig. 1 is a view of one side of a valve which includes a timing mechanism of our invention, also illustrating a means for powering the timing mechanism;

Fig. 2 is a plan of Fig. 1;

Fig. 3 is a view of the other side of Fig. 1, with parts broken away and shown in section;

Fig. 4 is an enlarged section taken on line 4—4 of Fig. 3;

Fig. 5 is a vertical transverse section taken on line 5—5 of Fig. 4;

Fig. 6 is a vertical transverse section taken on line 6—6 of Fig. 4;

Fig. 7 is a horizontal section taken on line 7—7 of Fig. 3;

Fig. 8 is a fragment of Fig. 4, illustrating a valve member in a moved position;

Fig. 9 is a fragmentary perpective illustrating one setting of the timing mechanism, certain ratchets being shown spaced apart for clarity, though actually in sidewise engagement;

Fig. 10 is a view similar to Fig. 9 illustrating an alternative setting of the timing mechanism;

Fig. 11 is a fragmentary view illustrating a different means for powering the timing mechanism;

Fig. 12 is a view of one side of a modified form of valve member; and,

Fig. 13 is a section taken on line 13—13 of Fig. 12.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to the drawings, a timing mechanism of this invention is shown incorporated in an air control valve comprising a base 1 on which is mounted a U-shaped support having a bottom 3 and parallel side walls 5 and 7. An air inlet fitting 9 is fixed in an opening in the wall 5. An air outlet fitting 11 is fixed in an opening in the wall 7 in line with the inlet fitting. The inner ends of the fittings between the walls 5 and 7 are opposed to one another and spaced apart. The side walls serve as bearings for a shaft 13 received in openings in the walls, the shaft being located above and extending parallel to the fittings. On the portion of the shaft between the side walls 5 and 7 is a sleeve 15. Rotatable on the sleeve is a disk 17 constituting a valve member. The disk reaches between the opposed spaced-apart inner ends of the fittings 9 and 11, the axis of the fittings intersecting the disk adjacent its periphery.

The inlet fitting 9 has an inlet passage 19 leading to a cylindrical recess 21 in its inner end. Slidable in this recess is a sealing member 23 having a reduced extension 25. The sealing member is passaged as indicated at 27 for flow of air therethrough. A spring 29 in the recess biases the sealing member toward the right as viewed in Fig. 4 into sealing engagement with the left side of the valve disk 17. Packing for making a sliding seal is indicated at 31. The outlet fitting 11 has a cylindrical recess 33 in its inner end. This leads to an outlet passage 35. A sealing member 37 having a reduced extension 39 is slidable in the recess 33, being passaged for flow of air as indicated at 41. A spring 43 biases the sealing member 37 toward the left as viewed in Fig. 4 into sealing engagement with the right side of the valve disk 17. Packing for making a sliding seal in the recess 33 is indicated at 45.

A port 47 extends through the disk 17 from one side to the other at the radius of the passages 27 and 41 with respect to the axis of the shaft. Thus, upon rotation of the disk to the rotary phase shown in Figs. 4–6 wherein the port 47 is in registry with passages 27 and 41, air may flow from the inlet fitting through the port 47 to the outlet fitting. The valve disk also has a vent port spaced from the port 47 for venting the outlet fitting to atmosphere in another rotary phase of the disk. As best illustrated in Fig. 8, the vent port is formed by boring a radial hole 51 in the disk leading inward from its periphery and by boring a lateral hole 53 from the right side of the disk as viewed in Fig. 8 to an intersection with the radial hole 51 and at the radius of the passage 41 with respect to the axis of the shaft. In the Fig. 8 venting position of the valve disk the inlet is blocked, and the outlet is vented to atmosphere. In all positions of the valve disk other than its Figs. 4 and 8 positions both the inlet and outlet fittings are blocked.

Figs. 12 and 13 illustrate a modified version of the valve disk in which provision is made for venting throughout about 340° of rotation of the disk. In this case, instead of having the vent port 51—53, the disk, here numbered 17A, is provided with an arcuate groove 54 in its right side extending for 340° of arc on the radius of the passage 41, sarting about 10° to one side of port 47 and terminating about 10° from the other side of port 47.

The shaft 13 projects beyond the side wall 7 to the right as viewed in Fig. 4 and an oscillable member 55, specifically a lever or control arm, is mounted upon its projecting portion. The control arm 55 is fixed to a hub 57 threaded on the projecting end portion of the shaft and extends upward. At 59 is shown a sheet metal cover having a slot 61 in its lower end. The shaft is threaded as indicated at 63 to receive the hub and an

acorn nut 65 which is threaded up against the hub 57. With the nut 65 threaded against the hub, the hub 57 and arm 55 are locked to the shaft so that the oscillation of the arm results in oscillation of the shaft. A screw 67 holds the upper end of the cover 59 to the arm 55. The screw is removable for removal of the cover. The inner end of the acorn nut is received in the slot 61.

Rotatable on the sleeve 15 on the shaft 13 adjacent the side wall 7 is a cluster of parts comprising conjointly rotatable first and second ratchets 69 and 71, respectively, and a cam or eccentric disk 73. These parts are pinned together to form the cluster by a split tubular pin 75. The first ratchet 69 is located adjacent the side wall 7, its right side as viewed in Fig. 4 engaging a bearing boss 77 formed integrally with the side wall. The second ratchet 71 is held against the left side of the first ratchet 69, and the eccentric disk 73 is held against the left side of the second ratchet. The ratchets, as illustrated, are of the same diameter, but have a different number of teeth. For example, the first ratchet 69 has twenty teeth and the second ratchet 71 has twenty-five teeth.

On the sleeve 15 adjacent the eccentric disk 73 is a second cluster of parts comprising a third ratchet 79 and a second cam or eccentric disk 81. These parts are pinned together to form the cluster by a split tubular pin 83. The third ratchet 79 is located adjacent the eccentric disk 73 with a spacer 85 between them. Pinned to the valve disk 17 by a split tubular pin 87 on its right side as viewed in Fig. 4 adjacent the eccentric disk 81 is a fourth ratchet 89. A washer 91 between the ratchet 89 and the disk 81 serves as a spacer. The third ratchet 79 and the fourth ratchet 89 are of the same diameter as ratchets 69 and 71 and have the same number of teeth (twenty-five, for example) as the ratchet 71, although this is not essential. On the left side of the valve disk 17 is a washer 92, and a spring 93, specifically a spring washer, reacts from the left side wall 5 against washer 92 to bias the entire array of parts on the sleeve 15 toward the right side wall 7, all these parts being free to slide axially. This engenders sufficient frictional engagement of the parts to prevent their reverse rotation, and eliminates any necessity for providing holding pawls for preventing reverse rotation of the various ratchets.

Fixed in an opening in the control arm 55 is a bushing 95. This extends from the control arm through an arcuate slot 97 (see Figs. 3 and 4) in the side wall 7. Rotatable in this bushing is a pawl pivot pin 99. Fixed to the inner end of this pin on the inside of the side wall 7 is a dual pawl generally designated 101. As shown best in Figs. 6, 7, 9 and 10, this pawl consists of a piece of sheet metal bent so as to have a main body portion 103 and a forward offset extension 105. The pin 99 is fixed in an opening in the main body portion 103 by staking. The main body portion 103 at its rearward end is formed with a tooth 107 directed for engagement with the first ratchet 69 to effect rotation of cluster 69—71—73 in counterclockwise direction as viewed in Figs. 6, 9 and 10. The extension 105 is formed at its forward end with a tooth 109 directed for engagement with the second ratchet 71 to effect rotation of cluster 69—71—73 in the same direction. The pawl 101 is located with its main body portion 103 in the plane of the first ratchet 69 and with its offset extension 105 in the plane of the second ratchet 71, as best shown in Fig. 7.

A pawl-biasing spring 111 has one end inserted in a diametrical opening 113 in the outer end of the pawl pivot pin 99 and has its other end secured to a bracket 115 held to the arm 55 by a screw 117. The spring consists of a normally generally straight length of spring wire. The bracket 115 may be located by loosening the screw 117 on one side or the other of the head of a stud 119 fixed in an opening in the arm 55 between the pawl pivot pin 99 and the hole in the arm 55 for the screw 117. With the bracket 115 positioned on the right side of the stud 119 as viewed in Fig. 9, the spring 111 is buckled in such direction as to bias the pin 99 and the pawl 101 to rotate clockwise for engagement of the first tooth 107 with the first ratchet 69 and disengagement of the second tooth 109 from the second ratchet 71. Thus, with the bracket 115 in the Fig. 9 position, oscillation of the arm 55 will effect counterclockwise rotation of the cluster 69—71—73 via engagement of the pawl tooth 107 with the ratchet 69. With the bracket 115 positioned on the left side of the stud 119 as viewed in Fig. 10, the spring 111 is oppositely buckled and biases the pawl 101 to rotate counterclockwise for engagement of the second tooth 109 with the second ratchet 71 and disengagement of the first tooth 107 from the first ratchet 69. Thus, with the bracket 115 in the Fig. 10 position, oscillation of the arm 55 will effect counterclockwise rotation of the cluster 69—71—73 via the engagement of pawl tooth 109 and the ratchet 71. It will be observed that, for any given extent of oscillation (throw) of the arm 55, the cluster 69—71—73 will be rotated through a greater angle upon each oscillation of the arm with the parts in the position shown in Fig. 9 than with the parts in the Fig. 10 position, since ratchet 69 has fewer teeth than ratchet 71, and a one-tooth advance of 69 rotates it through a greater angle than a one-tooth advance of 71.

A pivot pin 121 is fixed by means of end screws 123 in position between the side walls 5 and 7 parallel to and above the shaft 13 and offset to the right of the vertical plane of the shaft and the inlet and outlet fittings 9 and 11 as viewed in Figs. 5 and 6. Rotatable on the eccentric disk 73 is a strap 125. This is pin-connected at its upper end to one end of a pivot arm 127 pivoted at its other end on the pivot pin 121 (see Figs. 2, 4 and 6). The pin connecting the strap 125 and the arm 127 is designated 129. Pivoted on this pin is a driving pawl 131 for the third ratchet 79. The pawl 131 is arranged to effect counterclockwise rotation of the cluster comprising the third ratchet 79 and the eccentric disk 81 in response to oscillation of the strap 125 by the eccentric disk 73. The pawl 131 is biased into engagement with the third ratchet 79 by means of a tension spring 133 connected at one end to the pawl and at its other end to the strap 125.

Rotatable on the eccentric disk 81 is a strap 135. This is pin-connected at its upper end to one end of a pivot arm 137 pivoted at its other end on the pivot pin 121 (see Figs. 2, 4 and 5). The pin connecting the strap 135 and the arm 137 is designated 139. Pivoted on this pin is a pawl 141 located for engagement with the fourth ratchet 89. The pawl 141 is arranged to effect counterclockwise rotation of the fourth ratchet 89 and the valve disk 17 in response to oscillation of the strap 135 by the eccentric disk 81. The pawl 141 is biased into engagement with the fourth ratchet 89 by means of a tension spring 143 connected at one end to the pawl and at its other end to the strap 135.

The pivot arms 127 and 137 are axially slidable on the pivot pin 121 and are held in properly spaced relation by means of spacers 145, 147 and 149 (see Figs. 2 and 4). The entire assembly of parts on the pivot pin 121 is biased toward the right side wall 7 by means of a spring 151, specifically a spring washer, reacting from the left side wall 5 against the spacer 145. The spacer 85, which is made of thin springy sheet metal, has an extension 152 which at its upper end has an opening receiving the pivot pin 121 and which is located between arm 137 and spacer 147 (see Figs. 2 and 6).

At the left as viewed in Fig. 4, the shaft 13 projects beyond the left side wall 5 and its left end is bent to provide a radial finger 153. This finger is adapted for engagement with a stop constituted by a shoulder 155 on a stop bracket 157 adjustably positioned on the outside of

the side wall 5. As shown best in Figs. 1, 4 and 11, the stop bracket 157 has an opening receiving the shaft 13 and is rotatable around the shaft. It also has an arcuate slot 159 on an arc centered in the shaft axis. Extending through this slot are two screws 161 threaded in tapped holes in the side wall 5. By loosening the screws, the stop bracket may be adjusted to different angular positions of the shoulder 155, and may be then locked in adjusted position by tightening the screws 161. A spring washer 163 is provided between a shoulder 165 on the shaft and the stop bracket.

The control arm 55 is biased to rotate clockwise as viewed in Fig. 3 by a spring 167. This has an intermediate helical coil 169 surrounding the hub 57, one end 171 hooked around the outlet fitting 11 in a groove 173 in the fitting, and its other end 175 hooked around the bushing 95 between a step 177 on the bushing and the arm 55. The entire mechanism between the side walls 5 and 7 is enclosed by a cover 179. To keep the arcuate slot 97 in the side wall 7 closed, inside and outside cover plates 181 and 183, respectively, are mounted on the shaft 13 between the side wall 7 and the control arm 55. The outside plate 183 is semicircular, and the inside plate 181 is of sector shape somewhat greater in arcuate extent than semicircular. The bushing 95 extends through a circular opening 185 (Fig. 4) in the outside plate 183 and through an arcuate slot 187 (Figs. 3 and 4) in the inside plate 181.

Provision may be made for oscillating the control arm 55 from a primary device in various suitable ways. For example, the primary device might be a trailer brake-operating motor, as in our aforesaid copending application, and the valve employed for controlling the trailer lubrication system. Another possibility is illustrated in Figs. 1–3, showing a crank mechanism for oscillating the arm 55 comprising a bearing bracket 189 on the base 1 in which is journalled a pulley 191. The pulley is driven by a belt 193 from a rotatable element of a primary device (not shown). The pulley carries a crank pin 195. A link 197 extends from the crank pin to a pin connection at 199 with the upper end of arm 55. In this case the extent of oscillation or throw of arm 55 is determined by the throw of the crank pin, and finger 153 and stop 155 are not utilized. The throw may be changed by providing means whereby the throw of the crank pin may be changed, as by providing the pulley 191 with an additional hole 201 for relocating the crank pin at a different radius. Still another possibility is indicated in Fig. 11, showing the arm 55 being oscillated through a spring 203 as, for example, from a reciprocating element of a primary device (not shown). The spring 203 provides a lost-motion connection allowing for changing the throw of the arm 55 by the use of finger 153 and stop 155, as will be made clear, despite constancy of the throw of the reciprocating element of the primary device.

Operation is as follows:

Assuming that spring 111 is set as shown in Fig. 9, overcentered to the right, upon oscillation of the arm 55 the cluster 69—71—73 will be driven counterclockwise as viewed in Figs. 6 and 9, rotating upon each stroke of the arm 55 a fraction of a revolution determined by the throw of the arm and the number of teeth of the ratchet 69. Upon each complete revolution of the cluster 69—71—73 (which requires a plurality of strokes of the arm 55) the first strap 125 will be cycled through one oscillation or stroke by the rotation of the eccentric disk 73. Each stroke of the strap 125 results in one stroke of the driving pawl 131 for the third ratchet 79, and the latter is stepped counterclockwise through a fraction of a revolution corresponding to the throw of pawl 131. For maximum reduction, the throw of pawl 131 is made such that ratchet 79 is stepped one tooth upon each stroke of the pawl 131. Upon each complete revolution of the third ratchet 79 and the eccentric disk 81 which rotates with ratchet 79, the second strap 135 will be cycled through one oscillation or stroke by the rotation of disk 81. Each stroke of the strap 135 results in one oscillation or stroke of the driving pawl 141 for the fourth ratchet 89 and the latter and the valve disk 17 are stepped counterclockwise through a fraction of a revolution corresponding to the throw of pawl 131. For maximum reduction, the throw of pawl 141 is made such that ratchet 89 is stepped one tooth upon each stroke of the pawl 141.

Thus, upon oscillation of the arm 55, the valve disk 17 is driven slowly in counterclockwise direction as viewed in Figs. 5 and 6 from the first cluster 69—71—73 by the speed-reducing means comprising the strap 125, pawl 131, the cluster 79—81, strap 135, pawl 141 and ratchet 89. The reduction from the cluster 69—71—73 to the valve disk is determined by the number of teeth of ratchets 79 and 89 and the throw of pawls 131 and 141. If each of these ratchets has twenty-five teeth, for example, and the throw of the pawls is such as to step the ratchets one tooth upon each stroke of their respective pawls, the cluster 69—71—73 makes 625 complete revolutions to effect one revolution of the valve disk. Now if the throw of arm 55 is such as to step the cluster 69—71—73 through the fraction of a revolution corresponding to one tooth of the ratchet 69, and this ratchet has twenty teeth, it will require 20 times 625 or 12,500 strokes of the arm 55 to effect one revolution of the valve disk 17.

To obtain a higher reduction ratio, the spring 111 is set as shown in Fig. 10, overcentered to the left, so that the tooth 107 of the double pawl 101 is clear of ratchet 69 and tooth 109 is in driving engagement with ratchet 71. Ratchet 71 having twenty-five teeth, and being stepped one tooth upon each stroke of the arm 55, it will now require 25 times 625 or 15,625 strokes of the arm 55 to effect one revolution of the valve disk 17.

Lower reduction ratios may be obtained for either setting of the spring 111 by increasing the throw of the arm 55. For example, if the throw of arm 55 is made such as to effect two-tooth advance of either ratchet 69 or 71 per stroke, with spring 111 set for engagement of tooth 107 with ratchet 69, the ratio will be 6250 to 1, and with spring 111 set for engagement of teeth 109 with ratchet 71, the ratio will be 7812 to 1. Thus, by changing the setting of the spring 111 and the stroke of arm 55, any one of an extensive series of reduction ratios may be readily obtained.

Different throws of the arm 55 may be obtained in the case of the drive shown in Figs. 1–3 by changing the location of the crank pin 195 to different radii with respect to the axis of the pulley 191. Different throws of the arm 55 may be obtained in the case of the drive shown in Fig. 11 by changing the location of the stop 155 on the stop bracket 157. In this case, one limit of the stroke of arm 55 is determined by engagement of bushing 95 with the right end of slot 97 as viewed in Fig. 3, noting that the arm is biased toward this limit by spring 167, and the other limit by engagement of finger 153 with the stop 155 (see Fig. 11). Different positions of the stop are obtained by loosening screws 161 and rotating bracket 157 on the shaft 13.

It will be observed that all the ratchets are driven in the same direction, i. e., counterclockwise as viewed in Figs. 5 and 6, upon counterclockwise swing of their respective driving pawls. As the pawls swing back clockwise, they drag on the ratchets, but reverse (clockwise) rotation of the ratchets is prevented by the frictional engagement of the parts on shaft 13 engendered by spring 93. Thus, no holding pawls are needed.

As herein described, the speed-reducing means operated by the clustered ratchets 69 and 71 includes two ratchets 79 and 89. It will be understood that it is within the scope of the invention to employ a train of more than two ratchets driven from 69—71.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. In combination, a pair of spaced supports, a shaft extending between said supports, a cluster comprising a first and a second ratchet having a different number of teeth conjointly rotatable and axially slidable on the shaft, a third ratchet independently rotatable and axially slidable on the shaft, an arm oscillatable on the shaft axis, a driving pawl for the cluster carried by the arm and movable with respect to the arm and having a first and a second tooth selectively constantly engageable with either the first or the second ratchet, a pivot extending between the supports, a driving pawl for the third ratchet pivoted and axially slidable on the pivot, means for driving said third ratchet driving pawl from the cluster, and a spring biasing said third ratchet and cluster axially on the shaft toward one of the supports and engendering sufficient frictional resistance to rotation of the third ratchet and cluster to prevent their reverse rotation.

2. Timing mechanism comprising a first shaft, a series of ratchets rotatable on the first shaft, each of said ratchets except the last of the series having an eccentric disk rotatable therewith, an oscillatable member, a pawl carrier by said oscillatable member engageable with a first ratchet of the series for driving it, a plurality of straps, one for each eccentric disk, each strap being rotatable on a respective eccentric disk, a second shaft parallel to the first shaft, a plurality of arms, one for each strap, pivoted on the second shaft, each strap having a pivotal connection to a respective arm, and a series of driving pawls, one for each ratchet in the series following the first ratchet, each of said driving pawls being pivotally carried by a respective arm.

3. Timing mechanism comprising a first shaft, first and second ratchets having a different number of teeth conjointly rotatable on said first shaft, third and fourth ratchets independently rotatable on said first shaft, a first eccentric disk conjointly rotatable with said first and second ratchets, a second eccentric disk conjointly rotatable with said third ratchet, an oscillatable member, a first driving pawl carried by said member having a first and a second tooth selectively engageable with either the first or the second ratchet, a first strap rotatable on the first eccentric disk, a second strap rotatable on the second eccentric disk, a second shaft parallel to the first shaft, a first arm pivoted on said second shaft, said first strap having a pivotal connection to said first arm, a second driving pawl for the third ratchet pivotally mounted on said first arm, a second arm pivoted on said second shaft, said second strap having a pivotal connection to said second arm, and a third driving pawl for the fourth ratchet pivotally mounted on said second arm.

4. Timing mechanism as set forth in claim 3 wherein the second and third driving pawls are pivotally mounted on the pivotal connections between the straps and the arms.

5. Timing mechanism as set forth in claim 3 wherein said oscillable member comprises an arm oscillable on the shaft axis, wherein the first driving pawl is pivoted on said oscillable arm for rotation on an axis parallel to the first shaft, said first tooth being on one side of the pawl pivot in the plane of the first ratchet for engagement with the first ratchet and the second tooth being on the other side of the pivot and in the plane of the second ratchet for engagement with the second ratchet, and wherein there is provided a spring carried by said oscillable arm connected to said first pawl and capable of being set in one position to bias said first pawl for engagement of its first tooth with the first ratchet and in a second position to bias said first pawl for engagement of its second tooth with the second ratchet.

6. In a timing mechanism as set forth in claim 5, the pivot for said first pawl being rotatable, the spring comprising a normally generally straight length of spring wire connected at one end to said first pawl pivot, extending generally lengthwise of said oscillable arm, and connected at its other end to means adjustably mounted on said oscillable arm for buckling the wire in one direction or the other.

7. In a timing mechanism as set forth in claim 6, the connection between the wire and said first pawl pivot being made by inserting the wire in a diametrical hole in the pivot.

8. In a timing mechanism as set forth in claim 6, the means adjustably mounted on said oscillable arm comprising a member pivoted on said arm for swinging movement about an axis parallel to said first pawl pivot and adapted to be locked in oppositely angled positions for oppositely buckling the wire.

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