July 16, 1940. H. STAKE 2,208,140

SPEED RECORDING DEVICE

Filed June 14, 1938 4 Sheets-Sheet 1

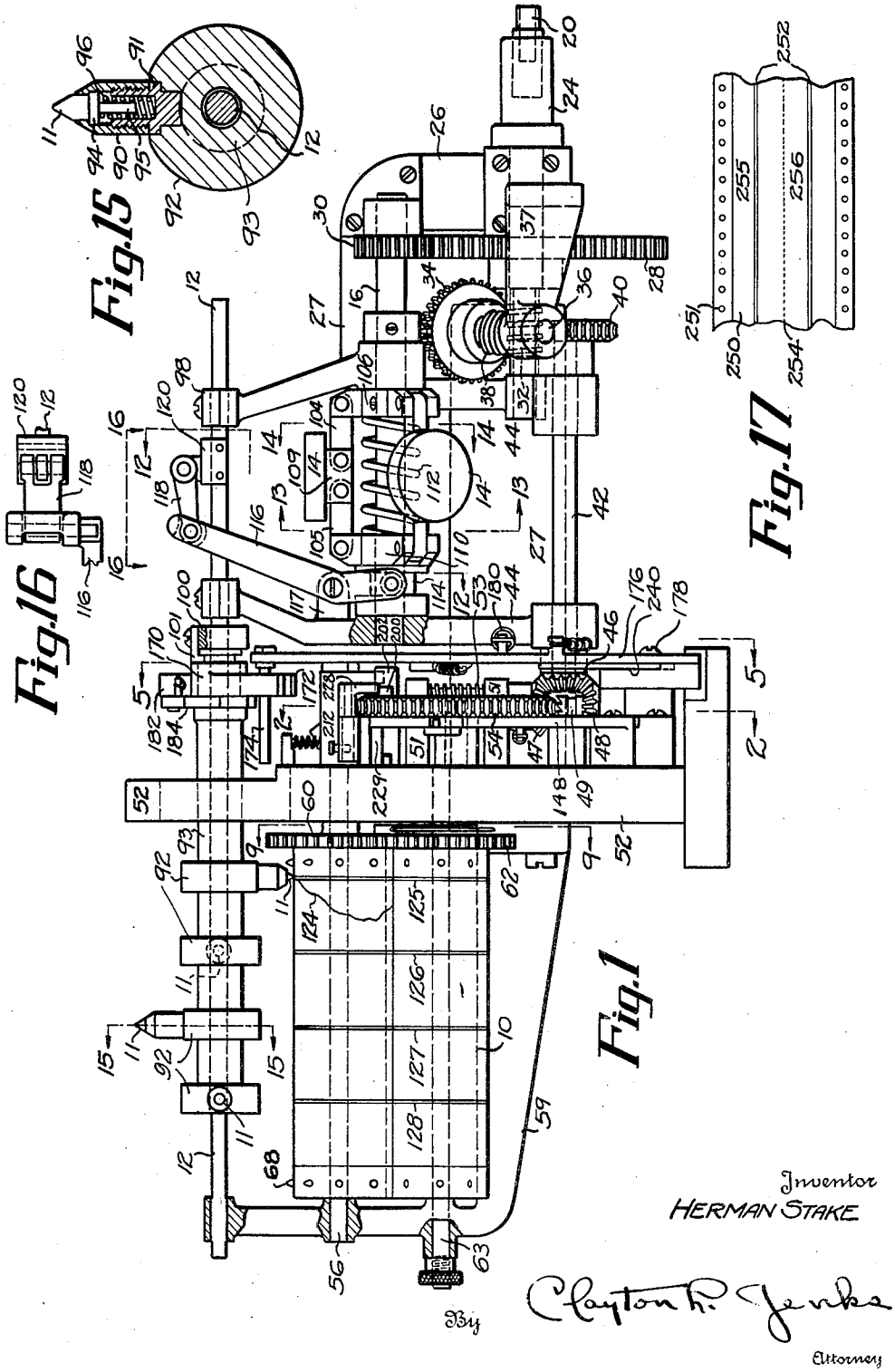


Fig.15



Fig.16



Fig.17

Fig.1

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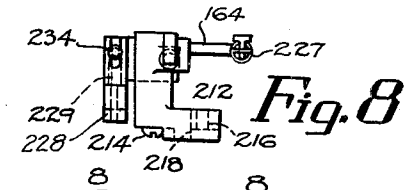


Fig. 8

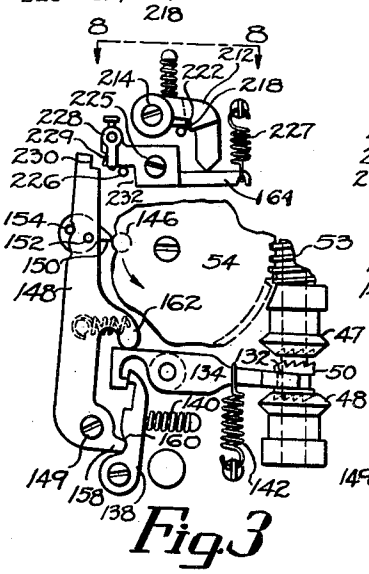


Fig. 3

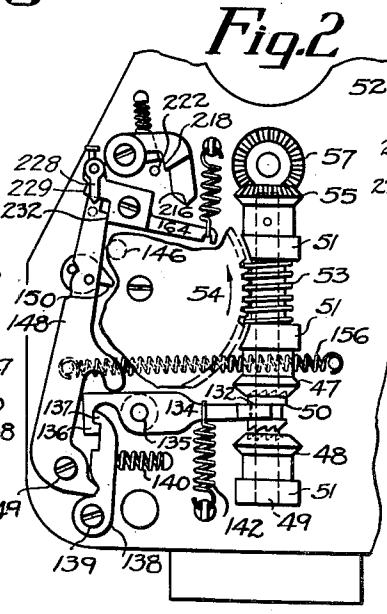


Fig. 2

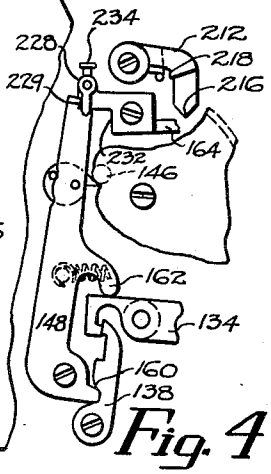


Fig. 4

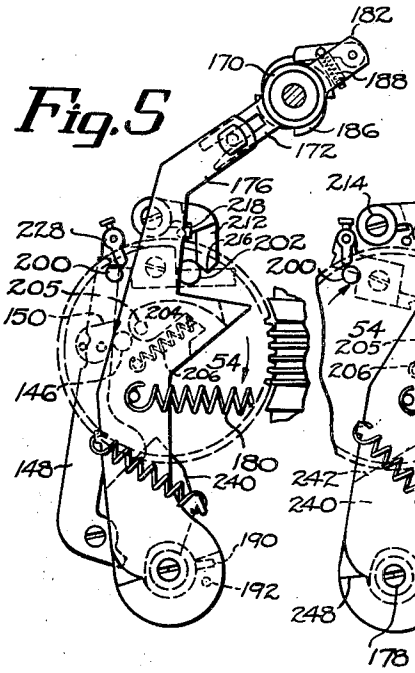


Fig. 5

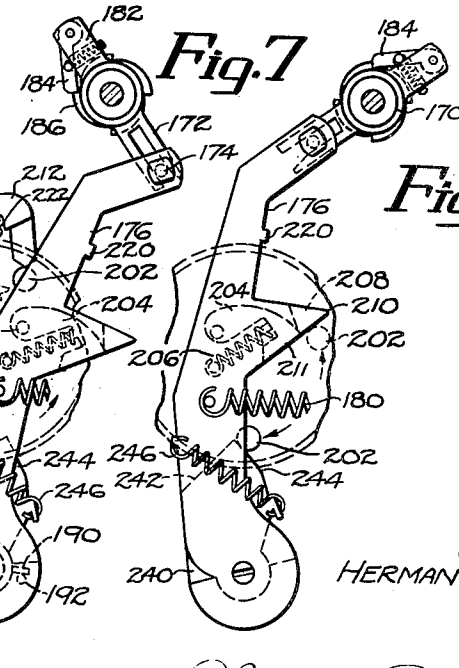


Fig. 7



Fig. 6

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SPEED RECORDING DEVICE

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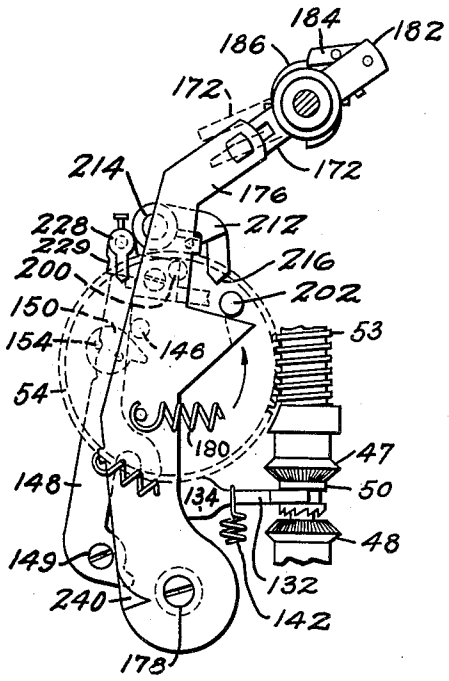



Fig. 5a.

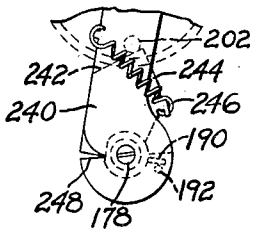



Fig. 7b.

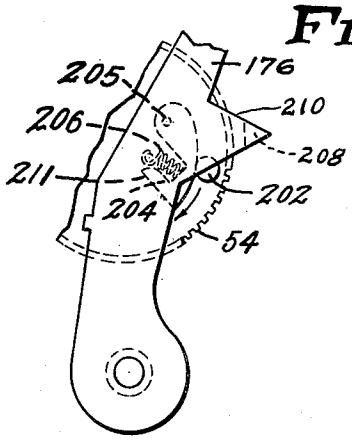



Fig. 7a.

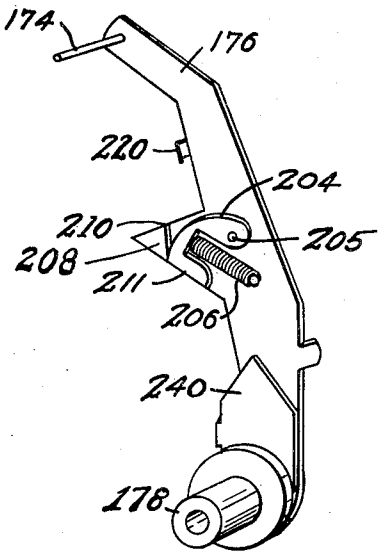



Fig. 3a.

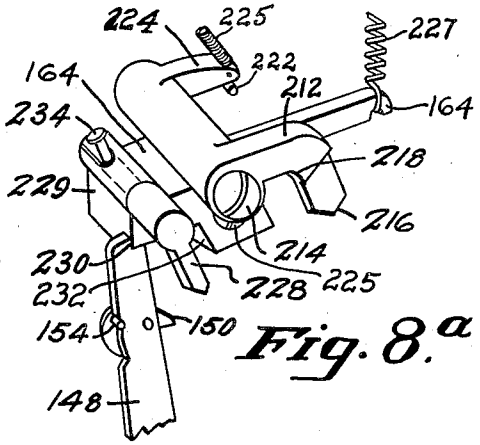



Fig. 8a.

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SPEED RECORDING DEVICE

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Fig.9

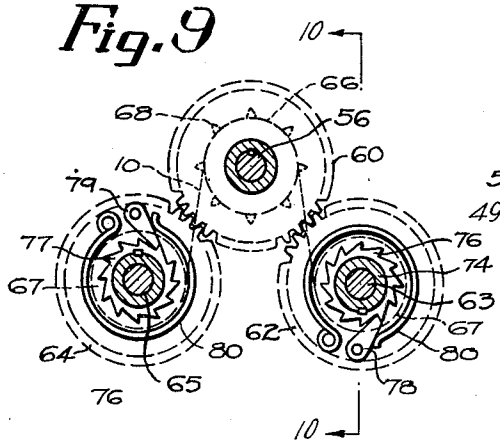



Fig.10

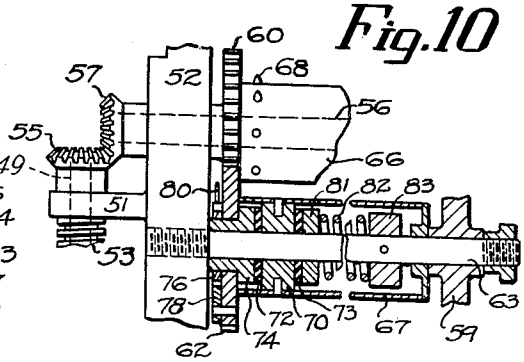



Fig.11

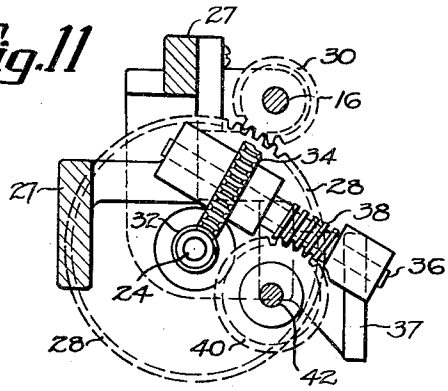



Fig.12

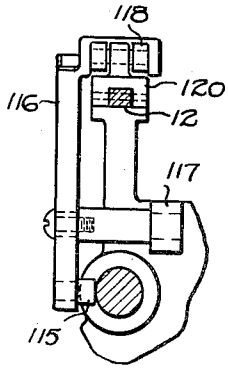



Fig.13

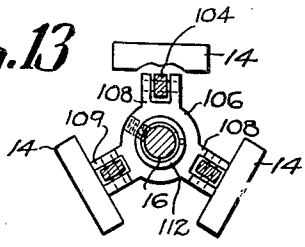
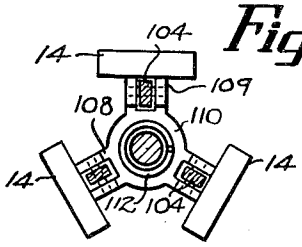



Fig.14




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Patented July 16, 1940

2,208,140

# UNITED STATES PATENT OFFICE

2,208,140

## SPEED RECORDING DEVICE

Herman Stake, Worcester, Mass., assignor, by direct and mesne assignments, of one-half to Helen Alice Cutler, Spencer, Mass., and one-half to Ensley A. Weir, Worcester, Mass.

Application June 14, 1938, Serial No. 213,710

12 Claims. (Cl. 234—31)

This invention relates to a speed recording device and more particularly to a device which is especially adapted for application to an automobile, railroad engine or other driving or driven mechanism for the purpose of making a continuous record of the speed thereof.

It is often desirable to make a record of a steam locomotive trip, so as to determine where the engineer loses time and over what strips of the road he is able to make up for lost time. It would also enable the state authorities to place responsibility for an accident on the road, if each automobile were equipped with a sealed record of the vehicle's speed at the time just prior to an accident. The high number of fatalities on the road due to excessive speed or improper driving of automobiles indicates the need of a record showing how a given driver operates his vehicle at all times. Numerous devices have been proposed for recording the speed of such engines and vehicles, but these have presented many disadvantages and particularly that of not providing a record in a compact form which gives the history of the movement of the vehicle throughout a long period of time. The mechanism should also be capable of standing the shocks of the road and the record be not affected thereby, since the record must obviously be truthful and the device must work the same under all road conditions. It is further desirable that the mechanism be fully automatic and that it do not need the attention of the operator of the engine.

The primary object of this invention is to satisfy these requirements and to provide a speed recording device which is simple in its construction and may be economically built and which will make a long period record of speed without attention on the part of the operator.

A special object is to provide a recording device in which a wide record sheet may be employed and a plurality of records made in substantially parallel relationship thereon.

A further object is to provide a special type of record control mechanism which will record speed variation by means of one of a plurality of styli operating successively on a record sheet while the latter is moved at a continuous rate which indicates the mileage of the vehicle and which comprises a timing device adapted to bring the styli successively into operation when the record sheet reaches a limit in its travel.

Another object is to provide such a device which comprises a record sheet arranged to travel in opposite directions which has a plurality of marking paths for successive use by a plurality of styli, together with a special timing device which will be operated by the main driving mechanism and serve to reverse the direction of travel of the record sheet and at the same time bring another stylus into operative association therewith. Further objects of the invention will be apparent in the following disclosure.

In the preferred embodiment of my invention, I have provided a speed recording device which comprises a record sheet, such as sensitized paper, moved continuously past a marking stylus and which is reversed in direction when the end of the sheet has been reached by the stylus. This mechanism is so arranged that when the complete length of the sheet has been utilized for a speed record and its direction of movement is reversed, another stylus will be automatically brought into play by a special timing device and a second record marking will be made in another path which is at the side of and substantially parallel with the first. Thus, it is possible to utilize a roll of record paper of reasonable length and to make a plurality of records in parallel arrangement thereon and so multiply the length of the paper, as it were, by the number of records that can be made. The construction is also so arranged that while the record sheet is being moved continuously in accordance with the speed of the vehicle, a suitable mechanism, such as a centrifugal governor, serves to move the recording stylus relative to the sheet and thus indicate the speed. Fixed markings on the sheet may also serve to indicate the mileage traversed by the vehicle, if an automobile record is being made, thus giving a full record of the trip of the vehicle without any reference to the time of day at which the trip may have taken place.

Referring to the drawings illustrating my preferred embodiment of the invention, I have there shown various views of the device from which parts have been removed for the sake of clarity, and of which:

Fig. 1 is a vertical side elevation of the device, with parts broken away;

Fig. 2 is a fragmentary side elevation and section taken on the line 2—2 of Fig. 1, looking in the direction of the arrows, which shows the arrangement of the clutch control mechanism just prior to the reversal of direction of movement of the record sheet;

Fig. 3 is a fragmentary view corresponding with Fig. 2, which shows the position of the mechanism at the time the clutch is thrown;

Fig. 3a is a perspective view of the stylus actu-

ating arm and associated parts looking in the opposite direction from that shown in Fig. 7;

Fig. 4 is a similar view showing the parts just after the completion of this movement;

Fig. 5 is a fragmentary elevation and section on the line 5—5 of Fig. 1 showing the actuating mechanism for revolving the stylus support, the positions of the parts being those just before reversal of the record sheet and movement of the stylus when the gear 54 is rotating in a clockwise direction;

Fig. 5a is a similar view showing the positions of the parts just prior to reversal of the clutch, when the gear 54 is rotated in a counterclockwise direction;

Fig. 6 is a similar view showing the location of the parts just as the stylus actuator is moved into the position of Fig. 5;

Fig. 7 is a similar view showing the positions and movements of the parts after the stylus shaft has been turned through 90° from the position of Fig. 5;

Fig. 7a is a fragmentary detail showing the stylus actuating lever and the operation of the escapement cam thereon;

Fig. 7b is a fragmentary detail of the lower end of the stylus actuating lever;

Fig. 8 is a top plan view of a part of the latch mechanism looking in the direction of the arrows 8—8 in Fig. 3;

Fig. 8a is a perspective view of the latch mechanism and a portion of the clutch actuating lever;

Fig. 9 is a sectional view on the line 9—9 of Fig. 1, which shows the mechanism for driving the recording strip;

Fig. 10 is a fragmentary view, partly in section, taken at right angles to Fig. 9 and on the line 10—10 of Fig. 9;

Fig. 11 is a detail showing the worm and gear mechanism which drives both the centrifugal governor and the record strip;

Fig. 12 is a detail view on the line 12—12 of Fig. 1 showing the governor control connections;

Fig. 13 is a section on the line 13—13 of Fig. 1;

Fig. 14 is a similar view on the line 14—14 of Fig. 1;

Fig. 15 is a sectional view on the line 15—15 of Fig. 1, showing the construction of a marking stylus;

Fig. 16 is a detail plan view taken on the line 16—16 of Fig. 1, showing the connecting link between the stylus shaft and the governor mechanism; and

Fig. 17 is a plan view, broken away, of a modified form of record sheet.

The mechanism illustrated is especially adapted for use on an automobile and is intended to be connected through a flexible cable with a driving part of the vehicle, such as a shaft connected with the engine or a gear operated by one of the vehicle wheels. The construction comprises in general a record sheet 10 made of suitable material, such as plain or sensitized paper, and a plurality of styli 11 revolubly mounted on a reciprocable rod 12 which are so arranged that a stylus is moved transversely on the record strip 10 to positions which indicate the instantaneous speed of the vehicle at any time. This rod 12 is moved laterally by a centrifugal governor mechanism comprising a plurality of governor weights 14 which are so mounted on a suitably mounted rotatable shaft 16 that as the speed of the shaft varies, the weights will assume different centrifugal positions which determine the position of the slide rod 12.

*Record strip driving mechanism*

The record strip 10 and the governor shaft 16 are driven by power mechanism connected with a moving part of the vehicle. The power may be received from a flexible cable and, if desired, from the cable mechanism which operates a speedometer for giving a visual indication of the instantaneous value of the speed. This cable may be suitably connected to the socketed or squared end 20 of the driving shaft 24, which is suitably mounted in bearings on an arm 26 and the main frame 27 of the machine. A large gear 28 (Figs. 1 and 11) is mounted on the shaft 24 and suitably meshes with a small driven gear 30 near the end of the governor shaft 16 and thereby serves to rotate the latter.

The shaft 24 also carries a worm 32 which meshes with and drives a worm wheel 34. This wheel 34 is carried on a transverse shaft 36 suitably mounted for rotation in bearings on the frame 27, and an arm 37 projecting from the frame arm 26. Fixed on that shaft 36 is a worm 38 which in turn meshes with the worm wheel 40 on the end of the shaft 42 which is also suitably mounted in brackets 44 projecting laterally from the framework 27. It is to be understood that suitable provisions are to be made for bearings of the various shafts and for assembling and oiling the same, as will be readily understood by a mechanic skilled in the art.

The shaft 42 has a bevel gear 46 (Fig. 1) on its left hand end, and this gear in turn meshes with bevel gears 47 and 48 which are loosely mounted on the vertical shaft 49 (Figs. 1 and 2) arranged at right angles to the shaft 42. Suitable clutch mechanism comprising a shiftable toothed clutch member 50 slidably keyed to the shaft 49 serves to connect one or the other of gears 47 and 48 with that shaft and to rotate it periodically in opposite directions. A worm 53 (Fig. 2) on the shaft 49 is driven thereby, and this in turn drives the worm gear 54 which operates mechanism for shifting the clutch when the machine has run through a predetermined cycle of movement which corresponds substantially with the length of the record strip 10. The shaft 49 is mounted vertically in bearings on the three parallel brackets 51 projecting from the vertical wall 52 which forms the main support for the other parts of the framework.

As shown in Figs. 1, 2 and 10, this shaft 49 also carries a beveled gear 55 which serves to drive the record sheet winding mechanism. The bevel gear 55 (Fig. 10) drives a shaft 56 through a bevel gear 57 keyed thereon. One end of this shaft is mounted in bearings in the main supporting wall 52 of the apparatus, the opposite end of the shaft being carried in bearings on the arm 59 projecting from the wall 52. This shaft 56 has keyed thereto a driving gear 60, which meshes with a driving gear 62 loosely mounted on a lower shaft 63 carried by the wall 52 and the arm 59. The gear 60 also meshes with another gear 64 loosely mounted on the end of a shaft 65 directly back of the shaft 63.

The record strip 10 is a long roll of material, such as paper, carried over the drum 66 fixed on the shaft 56 from one to the other of the two drums 67 revolvable about the axes of the shafts 63 and 65. As indicated in Figs. 1, 9 and 10, the strip is driven and guided by means of sprocket points 68 on drum 66 projecting through per-

forations in the margin of the paper and by the frictional drive of the surfaces of the other driven drums contacting directly with the strip.

In order that this paper may be driven in opposite directions in accordance with the movement of the driving worm 53 and the clutch position, I employ a special arrangement of drum mounting. Each of the shafts 63 and 65 is held stationary by being threaded into the framework. The drums 67 are loosely mounted on the shafts 63 or 65 and each comprises a hollow tube having its outer end wall forming a bearing on the shaft. As shown in Fig. 10, a plug 70 has a driving fit within the inner wall of the cylinder and forms a bearing on the shaft for the left hand end of the drum. On opposite sides of this cylindrical plug 70 are two fiber or other suitable friction washers 72 and 73. The inner washer 72 rests against the end face of a flanged sleeve 74 which is loose on the shaft 63. On the inner end of and keyed to that sleeve is a ratchet wheel 76. A similar ratchet wheel 77 is mounted on the corresponding sleeve surrounding the shaft 65, but the two ratchets have their teeth facing in opposite directions as illustrated in Fig. 9. A pawl 78 mounted on the inner face of the gear 62 and another pawl 79 similarly mounted on the gear 64 serve to drive these ratchets, springs 80 serving to hold the pawls in engagement with the ratchet teeth. A collar 81 also loose on the shaft 63 is pressed against the fiber washer 73 by means of a spring 82, the opposite end of the spring being a disk shaped member 83 pinned to the shaft. It will be seen that this construction permits slippage of the drum to compensate for the increasing or decreasing size of the paper roll and that this frictional drive holds the paper taut and moves it properly for making the record.

*Governor mechanism for controlling the stylus record*

The record may be made by means of a lead pencil or a fountain pen marking on ordinary paper, or as indicated in the drawings the record sheet may comprise a sensitized paper of standard commercial type which is marked by means of a resiliently mounted brass point. The stylus point 11 in this case may be a conical member having a shank slidably mounted, as shown in Fig. 15, within a sleeve 90 which is threaded onto a hollow boss 91 suitably secured within a collar 92 fixed on the sleeve 93, which in turn is rotatably and slidably mounted on the rod 12. The marking point 11 has a flanged head 94 engaging a flanged portion of the end of the sleeve 90 so that the stylus 11 cannot escape. The shank 95 of the stylus is surrounded by a spring 96 located within the hollow boss 91. The spring thus serves to hold the stylus 11 in an outwardly projected position where it will mark against the paper 10 with a resilient pressure as it passes over the upper drum.

The stylus sleeve 93 (Fig. 1) is rotatably and slidably mounted on the rod 12, which has a squared end sliding in a similarly shaped bearing 98 so that the rod may move longitudinally without rotating. The other end of the rod 12 may be round if desired. The sleeve 93 carries the four stylus points 11 arranged at 90° to each other, as indicated in the drawings, and it is connected to the rod 12 for longitudinal movement therewith by means of a collar 100 (Fig. 1) which is suitably secured to the rod 12, as by means of a cap screw. This collar carries an angle iron 101 which has a downwardly projecting lip engaging an annular groove in the right hand end of the sleeve 93. This connection permits rotation of the sleeve and the stylus members, but insures that the recording stylus will be moved transversely of the record paper in accordance with the movement of the rod 12.

Sliding movement of the rod 12 and the stylus points is effected by means of a centrifugal governing mechanism and suitable linkage. This comprises a set of governor weights 14 so mounted on the rotating shaft 16 that centrifugal force will move them outwardly as the speed increases. To this end, each weight 14 is mounted on links 104 and 105. The right hand mounting is shown in Figs. 1 and 13. As thus indicated, a sleeve 106 is secured to the shaft 16 by a set screw, and this sleeve has radially extending spaced lugs 108 between which is pivotally secured the arm 104. The opposite end of this arm is also pivotally secured to a radially projecting lug 109 secured to the weight 14. As indicated in Fig. 14, a further sleeve 110 is mounted near the left hand end of the shaft 16, and this sleeve has the same general construction as sleeve 106 in regard to the lugs 108 and linkage construction for supporting the weights 14. This sleeve is, however, slidably mounted on the shaft 16. A spring 112 (Fig. 1) surrounds the rod 16 and extends between the two sleeves 106 and 110 and exerts a force tending to move the weights inwardly against the action of centrifugal force. The sleeve 110 at the left hand side of the governor mechanism is provided with an annular groove 114 within which rides the ends of a yoke forming one arm of a bell crank lever 116. This lever is pivotally mounted on a bracket 117 projecting laterally from one of the frame members 44. The upper end of the lever 116 is pivotally connected by a link 118 to a member 120 secured rigidly on the rod 12 (Figs. 1 and 16).

It will thus be seen that when the shaft 16 is rotated, the centrifugal weights 14 tend to move outwardly against the pressure of the spring 112 and to draw the movable sleeve 110 towards the right and so move the upper end of the arm 116 and connecting parts 118 and 120 and the rod 12 towards the left. When the machine is standing still, one stylus 11 is resting on a zero line 125 on the marking paper (Fig. 1) but as the speed increases, this stylus gradually moves outwardly to the left and thus produces a mark, as indicated by the line 124. If the record paper 10 is ruled with parallel lines running lengthwise of the paper, these will indicate speed, and similarly ruled parallel transverse lines will indicate mileage. Then by means of the recorded curve, one may determine the number of miles which the vehicle has traveled at the speed indicated by the stylus marking.

*Clutch reversing and timing mechanism*

The right hand stylus will make a record in the right hand path of the record paper, represented by the space between the two sets of parallel zero lines 125 and 126 in Fig. 1. The paper moves in one direction until the end has been reached, and then the direction of travel of the paper is to be reversed and another stylus brought into position to mark the paper in another path, such as that between the zero lines 126 and 127 or 127 and 128. To this end, a clutch reversing mechanism and a timing device are provided. The driving mechanism for the gear 54 is so constructed that the latter will make only about a

single revolution while the strip of paper 10 is moving throughout substantially its entire length from one winding drum to the other or until any desired limit is reached. When the gear 54 has about completed its revolution, a set of pins thereon serve to operate mechanism which causes the driving clutch member 50 to be thrown and reverse the direction of travel of the paper. At the same time, mechanism controlled by the revolution of the gear 54 rotates the sleeve 93 on the rod 12 and brings another stylus into contact with an unmarked path on the record strip. Thus, the gear 54 serves as a timing device movable through a fixed cycle in opposite directions and arranged to control the timing of the clutch as well as the stylus actuator.

Referring first to Figs. 2, 3 and 4 which are directed to the clutch reversing mechanism, a shiftable clutch yoke 132 is arranged to straddle the shiftable clutch member 50 and ride in an annular groove thereon so as to permit rotation of the clutch member. This yoke forms the outer end of a lever 134 pivoted at 135 to a suitable stud mounted on the framework of the machine. The left hand end of this lever 134 is notched as illustrated to provide a locking hook 136 which is arranged to engage a locking hook 137 on the upper end of the pivoted latch 138. The latter is pivoted at 139 on the framework and pressed towards the left (Fig. 2) by means of a spring 140 suitably arranged for the purpose. The hooks on the lever 134 and the latch 138 are so constructed that before the lever 134 can be pulled downwardly by means of the spring 142 to cause the sliding clutch member 50 to engage the lower gear 48, these locking hooks must be out of engagement, as shown in Fig. 3; but when the clutch member 50 is moved upwardly, the hooks 136 and 137 engage, as shown in Fig. 2, and thus hold the clutch member 50 in its uppermost position with the clutch teeth meshing with teeth on the gear 47.

The clutch yoke lever 134 is caused to move in these opposite directions by means of a pin 146 on the back side of the gear 54 which serves as a timing disk. A substantially vertical lever 148 is pivotally mounted at 149 on a stud carried on the framework. This lever 148 has a cam 150 projecting to the right thereof, as shown in Figs. 2, 3 and 4, and this cam is pivotally mounted on a pin 152 on one side of the lever. A further pin 154 on the side of the cam rides in a cut out slot on the edge of the lever as shown, so that the cam nose 150 may have a limited motion as determined by the length of that slot. A spring 156 (Fig. 2) suitably secured to the lever 148 and the machine frame tends to hold the lever 148 tipped towards the right. If, however, the pin 146 is moving counterclockwise, the parts are so constructed and arranged that this pin 146 will strike the cam nose 150 and thrust the lever 148 to the left. At the same time, the short cam shaped end 158 on the bottom of the lever 148 moves substantially upwardly along the cam face 160 (Fig. 3) of the latch 138 and causes that latch to move to the right, thus releasing the interlocked hooks 136 and 137 from the position shown in Fig. 2 and permitting the spring 142 to throw the clutch lever 134 into the position shown in Fig. 3, thereby disconnecting the clutch member from gear 47 and connecting it to gear 48 so as to rotate the worm 53 and gear 57 in the opposite direction and thus reverse the travel of the paper. When the pin 146 moves clockwise, it merely lifts the cam 150 and passes freely.

The lever 148 has an outwardly projecting and downwardly curved cam or lug 162, and this cam is always substantially in contact with the top surface of the yoke lever 134 and serves to move the clutch upwardly. That is, when the vertical lever 148 moves to the right from the position of Fig. 3 to that of Fig. 2, the cam 162 moves downwardly and thus lifts the yoke 132 and causes the clutch 50 to engage the upper gear 47. When the cam 162 moves in the opposite direction, it travels somewhat upwardly and thus permits the clutch to be reversed by the spring 142. When the cam 162 has moved the clutch member upwardly, the locking hooks 136 and 137 come into proper position to engage and lock the clutch yoke 132 in position (Fig. 2). The lever 148 is locked in position after pin 146 leaves the cam 150 by a special latch 164 to be described later.

*Stylus revolving mechanism*

The sleeve 93 carries the stylus points in their 90° spacing, and each one properly located opposite a zero line of its path on the paper. The mounting therefor is such that the styli are brought successively into operative or marking relationship with the proper paths on the record strip 10. To this end, a sleeve 170 (Fig. 1) is rotatably mounted on the right hand end of the sleeve 93, and this sleeve has a bifurcated arm or yoke 172 (Figs. 1 and 5) projecting downwardly therefrom between which a pin 174 is adapted to ride. This pin projects from one side of a vertical arm 176 pivotally mounted on a stud 178 near the base of the machine. A spring 180 is secured to the framework and tends to move this lever 176 towards the right, as indicated in Figs. 5, 5a, 6 and 7. When it moves, the pin 174 riding within the yoke 172 causes sleeve 170 to rotate. The sleeve 170 has an upstanding portion 182 carrying a pawl 184 pivotally secured thereon. This pawl is arranged to engage one of four ratchet teeth 186 suitably formed on the sleeve 93 and the parts are so arranged that when the lever arm 176 moves to the right (Figs. 5 and 7) the pawl 184, which is held in engagement with the ratchet teeth by a spring 188, will serve to rotate the sleeve 93 counterclockwise through an arc of 90°. When the arm 176 travels towards the left, then the pawl will ride idly over the ratchet teeth 186 and into position ready to rotate the sleeve 93 again. This 90° movement of the sleeve 93 will serve to remove one recording stylus from contact with the paper and swing another stylus down into position over a second path on the paper. A pin 190 is fixed on the hub of the lever 176, as shown at the bottom of Figs. 5 and 7, and this pin is adapted to revolve into contact with and be stopped by another pin 192 fixed on a stationary portion of the framework.

*Cam and latch mechanism of timing device for shifting stylus and clutch*

The arm 176 is positively moved by the gear 54 and the mechanism shown in Figs. 3 to 7 inclusive. This comprises two pins 200 and 202 mounted on the front face of the gear 54 and projecting laterally therefrom. They are located relative to the position of pin 146 as shown in Figs. 5 and 5a. Mounted on the inner face of the lever arm 176 and in the path of movement of pin 202 is an escapement cam 204 pivoted at 205. This cam is curved on its top face and cut away on its under side. It is arranged to be held in an uppermost position by means of a spring 206 secured at one end to the lever 176 and pressing into the cut away portion of the

cam at its other end. The cam is held by the spring against the lower corner of a triangular shaped lug 208 projecting into the path of pin 202 when the lever 176 is in the position of Fig. 6. This lug projects laterally from the end of the V-shaped portion 210 of lever 176. The lower face 211 of the cam 204 lies normally in the plane of the bottom edge face of the projection 210, so that the pin 202 will ride along the lower surfaces of parts 204, 208 and 211, when traveling upwardly or counterclockwise, so that this pin 202 will cause the arm 176 to swing to the left from the position shown in Fig. 7 to that of Fig. 6. This moves the arm 172 far enough backwards through a little over 90° (Fig. 5a) to let the pawl 184 drop from one tooth 186 to the next one. When the pin 202 travels clockwise, as shown in Fig. 7a, the pin will merely force the cam 204 downwardly against the spring pressure and so slip past it without moving the lever 176, which is held in position by spring 180, with stop 190 (Fig. 5) against pin 192 at the bottom of the lever.

The lever is locked in the left hand position by a latch 212 (Figs. 2, 3, 4, 8 and 8a) pivotally mounted at 214 on a suitable portion of the framework. This latch is shaped as shown particularly in Fig. 8a, and comprises a horizontal bearing portion mounted on the stud 214 and provided with a laterally and downwardly projecting arm terminating in a V-shaped end 216 located in the path of movement of the pin 202. It also has a laterally projecting lug 218 normally located in the path of movement of a rearwardly projecting lug 220 on the right hand edge portion of the lever arm 176, as shown in Figs. 3a, 6, 7 and 8. A stationary pin 222, Figs. 2 and 7, prevents the latch 212 from falling too far. Hence, as shown in Fig. 5, when the latch is in its lowermost position, the lever 176 is prevented from moving to the right by the lug 218 contacting with the lug 220. But when the pin 202 strikes the V-shaped end 216 of the latch in its rotation in either direction it lifts the latch and thus releases the lever 176 and allows the spring 180 to pull it towards the right and thus move the stylus from the position of Figs. 5 and 5a to that of Fig. 6. As shown in Fig. 8a, the rocking latch 212 has an arm 224 held down against the pin 222 by a suitably mounted compression spring 225, thus holding the V-end 216 of the latch in the path of the pin 202.

A further latch, shown particularly in Figs. 2, 3 and 8a, comprises a lever 164 pivoted beneath the latch 212 on a stud 225 on the framework. This lever is held against a pin 226 (Fig. 3) by a spring 227. A small latch 228 is pivotally mounted on the left hand end and side of that lever in the path of pin 200. A shoulder 229 (Figs. 3 and 8a) on the end of the lever 169 is shaped to interfit with the top notched end 230 of the lever 148. The parts are so arranged, as shown in Fig. 2, that when the clutch member is thrown into its uppermost position, the top of the lever 148 is held by the stop 232 on the under left hand end of the lever 164 until the pin 146 in its counterclockwise motion rides up the cam 150 and thrusts the lever 148 to the left and so moves it away from the stop 232 and thus allows the left hand end of lever 164 to spring downwards into the locking position shown in Fig. 3 under the influence of the spring 227, so that the shoulder 229 will catch the notched end 130 when the lever later moves to the right, as shown in Fig. 4, after the pin 146 has left the cam 150. The pin 146 does not pass the cam, because the clutch is thrown at that time and reverses the direction of travel of the pin 146. The latch 228 is mounted to swing on its pivot through a slight arc towards the left, as permitted by pin 234 fixed on the shaft carrying the latch which projects through a wide slot in the pivot bearing on the lever 164. The parts are so arranged that the pin 200 may pass the latch 228 freely in a counterclockwise direction. But when the pin 200 moves clockwise (Fig. 5) it cannot pass the latch 228 without lifting the left hand end of lever 164 and releasing the clutch actuating arm 198 and letting it fly to the right or to the position of Fig. 7.

A further cam 240 is mounted to swing about the pivot 178 and is located on the inner face of the lever 176, as shown in Figs. 3a, 5, 6 and 7b.

This swinging cam 240 is provided with V-shaped cam faces 242 and 244 which are located in the path of movement of the pin 202. A spring 246 tends to hold the swinging cam 240 towards the left (Fig. 5). When the gear 54 is traveling in a counterclockwise motion, the pin 202 strikes the cam face 242 and swings it against the pressure of the spring without affecting any of the other parts, after which the cam 240 swings back against the shoulder 248 on the lever (Fig. 7b). But when the pin 202 is traveling in a clockwise direction (Fig. 6) it strikes the cam face 244, and since the cam 240 engages the shoulder 248 on the lever, it causes the lever to swing towards the left to its starting point where the lug 220 becomes locked against the stop 218.

*Operation*

The operation of the device will be apparent in view of the above disclosure. Power is derived through shaft 24 from the mechanism whose speed is to be recorded, and this power is transmitted through the clutch mechanism to move the paper at a rate dependent on the speed so that markings thereon may indicate mileage or other measurements. At the same time, the governor moves the slidable and revolvable support 93 to cause the stylus to record the speed on the record sheet. The timing disk 54 is being revolved continuously in one direction or the other by the clutch driving mechanism. Assuming that this disk is traveling in a counterclockwise direction, as indicated in Fig. 2, then when the pin 146 strikes the cam nose 150 and thrusts the lever 148 to the left and moves the latch 138 to the right and unlocks the same, the clutch member is moved downwardly by the spring 142 to engage the lower driving gear 48 and reverse the direction of travel of the paper as well as the timing disk 54.

Prior to reversal of the clutch, the latch members were in the positions shown in Figs. 2 and 5a and the upper end of the lever 148 was resting against the shoulder 232 on the latch 164. When the pin 146 moves the lever 148 to the left, this releases the latch 164 and allows it to fly upwardly into the position shown in Fig. 3. Then when the pin 146 reverses its direction and leaves the nose of the cam 150 in a clockwise direction, the lever slips back into the position of Fig. 4, wherein its upper end 230 engages the notch 229 of the lever 164. Thus, the lever 148 is held in its outer position and the hooks 136 and 137 in the positions of Figs. 3 and 4 during the subsequent clockwise motion of the timing disk 54.

Previous to the clutch movement and while the gear 54 is traveling counterclockwise the lever

176 is first moved from the position of Fig. 7 to that of Fig. 6 by the pin 202 riding up the cam surface 211 counterclockwise, after that pin has idly passed the cam 240 which may move freely only to the right. This serves to set the pawl 184 in position for moving the stylus when the arm 176 is released. This release is accomplished by the pin 202 passing beneath and lifting the V-shaped end 116 of the latch 212 at substantially the same time or slightly ahead of the movement of pin 146 which throws the clutch. This allows the lug 220 on the lever 176 to escape from the locking lug 218 on the latch 212. Hence, the spring 180 quickly thrusts the lever 176 towards the right and moves the stylus sleeve through 90°. During this counterclockwise movement, the pin 200 goes idly past the swinging pawl 228 in its counterclockwise motion.

After reversal of the clutch, the pins 146, 200 and 202 start back in a clockwise direction. The pin 146 leaves the rocking cam 150 (Fig. 4). The pin 202 ultimately strikes and swings the escapement cam 204 and slips past to the lower side of the cam path 211. Then in time, the pin 202 reaches the cam path 244 on the lower cam 240 and forces the lever 176 again to the left into the position of Fig. 6 and causes the lug 220 to lift and interlock with the lug 218 on the latch 212 and to remain there in a re-set position. When the pin 202 has gone all the way around and again lifts the latch 212, it allows the lever arm 176 to move once more to the right and again actuate the stylus sleeve. At the same time that the pin 202 lifts the latch 212, the pin 200 (Fig. 5) has reached the bottom of the latch 228, and since the latter cannot swing to the right but is free to move only to the left, this pin 200 lifts that end of the latch against the action of spring 227 and thus allows the lever 148 to be pulled forward by its spring 156. This causes the curved cam 162 to ride to the right along the top of the clutch lever 134 and thus exert a pressure against the spring 142 which moves the clutch 50 into its uppermost position; and simultaneously it causes the hooks 136 and 137 to interlock. Then the pin 146 travels another complete cycle in a counterclockwise direction before it again affects the lever 148. This pin 146 moves the lever only to the left, whereas the spring 156 moves the lever to the right when the latch 228 is lifted by pin 200. The pin 202 lifts the latch 212 in either direction of its travel and thus releases the arm 176 for right hand movement under its spring pressure. That lever arm is moved to the left first by the pin 202 working on cam 211 and then by pin 202 working on cam 244.

*Record sheet*

The record sheet 10 and mechanism, as above described, are for the purpose of making single records. If, however, it is desired to make two or more records simultaneously, then the record sheet may be made as indicated in Fig. 17, wherein the strip 250 of paper or other suitable material is provided with the perforations 251 adjacent one or both edges of the sheet for engagement with the sprocket teeth 68 of the driving drum. The sheet has suitable lines 252 or other markings adapted to form a plurality of paths on a strip for the stylus records. A perforated, indented or other suitably marked line 254 is arranged centrally and lengthwise of the sheet so that the sheet may be readily torn into two portions. For use with this particular record sheet, the first and third styli are arranged to mark the sheet simultaneously, and the second and fourth styli are likewise in parallel arrangement so that they may be brought simultaneously into contact with the sheet. Hence, the first and third styli will make marks in paths 255 and 256 and the other two styli will mark the remaining two paths. This makes it possible for duplicate records of the speed markings to be maintained so that two different persons may possess the same records. If desired, a larger number of styli and record paths may be provided.

In view of the above disclosure, it will be understood that this device is capable of many uses, such as for recording the speed of an engine on the railroad, or an airplane in the air, or an automobile along the road, or for recording the speed of various types of stationary engines. This instrument is adapted for use on many mechanical devices, such as measuring the yardage of cloth produced by a loom or for recording the amount of asphalt spread in a given distance on a road. In other words, it may be attached to innumerable types of devices wherein a record is to be made of the speed travel of a moving part.

It will also be appreciated that this device may be materially simplified in its construction by the omission of various mechanically operated parts, so that the clutch may be thrown manually and the styli similarly moved by hand to bring a new stylus into play. Hence this simplified mechanism is to be considered as within the scope of certain of the appended claims. Many other modifications and variations may be made in the constructional features of this device as will be readily understood by a mechanic skilled in the art; hence the above description is to be considered as merely illustrative and not as a limitation on this invention, and the claims are to be accordingly given a broad interpretation.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A device for recording the speed of a moving part comprising mechanism for continuously moving a record sheet, a plurality of styli arranged to be brought successively into marking contact with the sheet, a driving mechanism operated in timed relation with the speed of said moving part, means including a governor driven by said mechanism which moves the contacting and recording stylus to make a continuous speed record, means including a reversing clutch driven by said mechanism for moving the record sheet in opposite directions and a timing mechanism arranged to shift said styli when the clutch is reversed so as to remove the contacting stylus and bring another into contact with the sheet.

2. A speed recording device comprising drums for carrying a long record sheet, means for revolving the drums and moving the record sheet continuously during operation of the device, a plurality of styli, a mounting for the styli whereby they may be brought successively into recording contact with the sheet, a governor mechanism for moving the contacting stylus to record the speed on the sheet, means including a clutch actuated driving mechanism for driving the record sheet in opposite directions, means for reversing the clutch and direction of sheet movement when the sheet reaches a limiting position and means operated in timed relationship with the clutch mechanism for removing the contacting stylus and bringing another stylus into contact with the record sheet.

3. A speed recording device comprising a main driving mechanism for moving a record sheet continuously, means including a clutch connected with the driving mechanism for moving the sheet in opposite directions, a plurality of styli mounted to be brought successively into operative contact with the record sheet, means driven by said mechanism which serves to move the contacting stylus and make a continuous speed record, and means including a timing device driven by said mechanism for throwing the clutch to reverse the direction of paper travel and for bringing a second stylus into operative association with the record sheet.

4. A speed recording device comprising a main driving mechanism for continuously moving a record sheet, means including a clutch driven by said mechanism for moving the sheet in opposite directions, a plurality of styli arranged to be brought successively into marking contact with the record sheet, a centrifugal governor driven by said mechanism and connected to move the styli and make a speed record on the moving sheet, a timing device comprising a member rotated by said mechanism through a definite cycle related to the record sheet movement and means operated by said rotated member which reverses the clutch and removes one stylus and brings another stylus into position when the record sheet has reached substantially the limit of its travel.

5. A device of the type covered by claim 3 wherein the timing device comprises a rotatable member and cam mechanisms operated thereby in timed relationship, one of which controls the clutch movement and another controls the styli movement.

6. A device of the type covered by claim 4 wherein the styli are mounted in a definite angular relationship on a revolvable and reciprocable support movable lengthwise by the governor and connections are provided between the timing device and the revolvable support for moving the latter when the clutch is reversed to bring another stylus into operation.

7. A device of the type covered by claim 3 wherein the timing device comprises a disk revolvable by the clutch mechanism in opposite directions through a fixed cycle, and cam and spring actuated, latch controlled mechanism which throws the clutch and causes another stylus to be brought into contact with the record strip at each reversal of direction of travel of the sheet.

8. A device of the type covered by claim 3 wherein the timing device comprises a rotatable member driven in opposite directions by the clutch mechanism, means including a latch mechanism controlled by said member for holding the clutch stationary and means for releasing the latch and causing the clutch to be reversed.

9. A device of the type covered by claim 3 wherein the styli are mounted on a reciprocable and rotatable support and the timing device comprises a disk revolvable in opposite directions by the clutch and means connected to revolve the stylus support through a definite angle which is actuated by a spring and cam mechanism controlled by said disk.

10. A device of the type covered by claim 3 wherein the styli are mounted on a reciprocable and rotatable support and the mechanism for rotating said support comprises a member rotated through a definite cycle and a lever connected to move the support through a definite angle, a spring to move the lever in one direction and means including cams and associated parts on said member and lever which control the lever and move it in the opposite direction.

11. A device for recording the speed of a moving part comprising means for supporting and continuously moving a record sheet which is arranged to provide a plurality of record paths, a plurality of styli, a mounting therefor whereby they may be moved to contact successively with and continuously mark different paths on the record sheet, means moved in timed relation with the speed of said moving part for causing a relative lateral movement between the contacting stylus and the record sheet to make a continuous record of the speed, and means for automatically removing the contacting stylus when the record sheet reaches a limiting position and shifting a second stylus into operative contact with a different path on the sheet so as to provide a substantially continuous record by means of several styli on a single record sheet.

12. A device for recording the speed of a moving part comprising means for supporting and continuously moving a record sheet which is arranged to provide a plurality of record paths, a plurality of styli, a mounting therefor whereby they may be moved to contact successively with and continuously mark different paths on the record sheet, means moved in timed relation with the speed of said moving part for causing a relative lateral movement between the contacting stylus and the record sheet to make a continuous record of the speed, means for automatically removing the contacting stylus when the record sheet reaches a limiting position and shifting a second stylus into operative contact with a different path on the sheet so as to provide a substantially continuous record by means of several styli on a single record sheet and means for automatically reversing the direction of travel of the record sheet at the time when the styli are shifted.

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