Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 1

Fig. 1

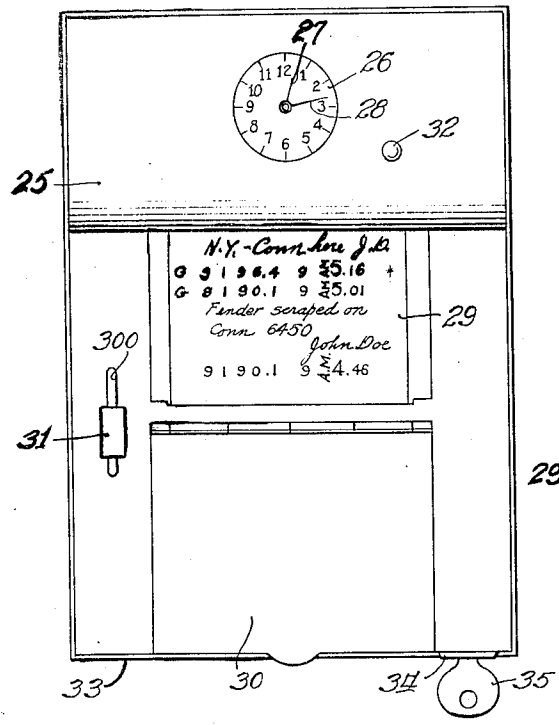


Fig. 2

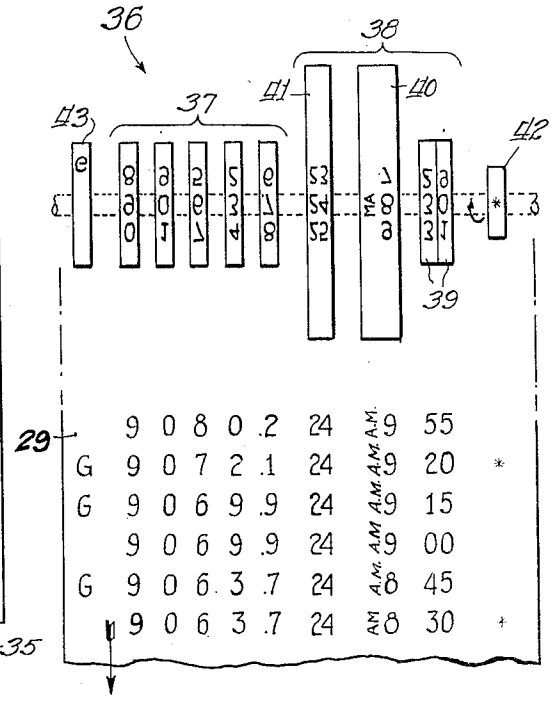
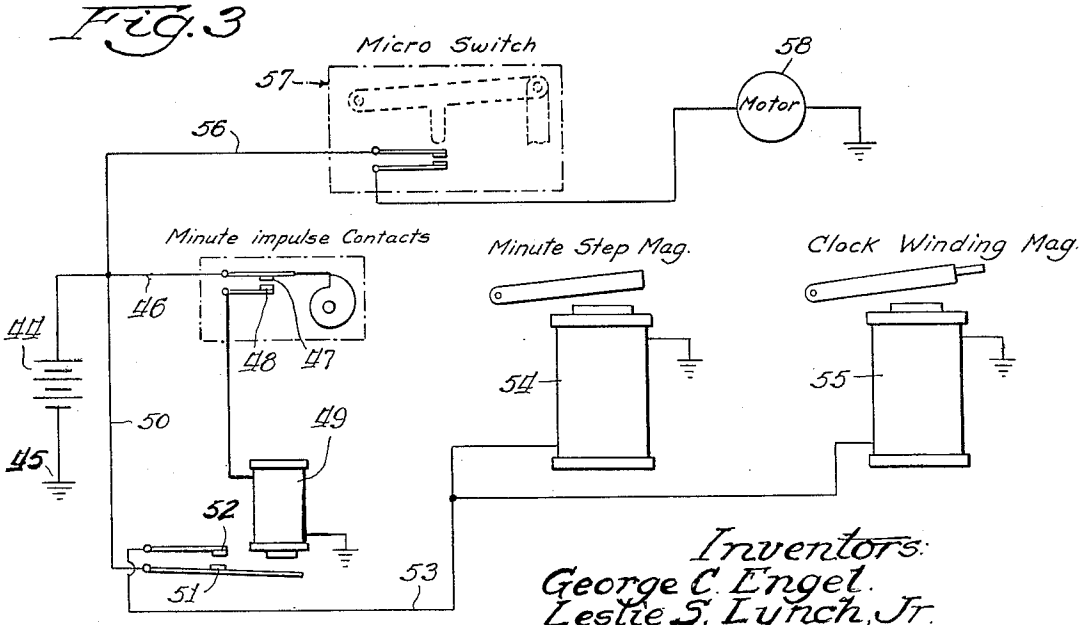


Fig. 3



Inventors:
George C. Engel.
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased,
by Ethel I. Eidmann, Executrix

By: W. A. Hulse

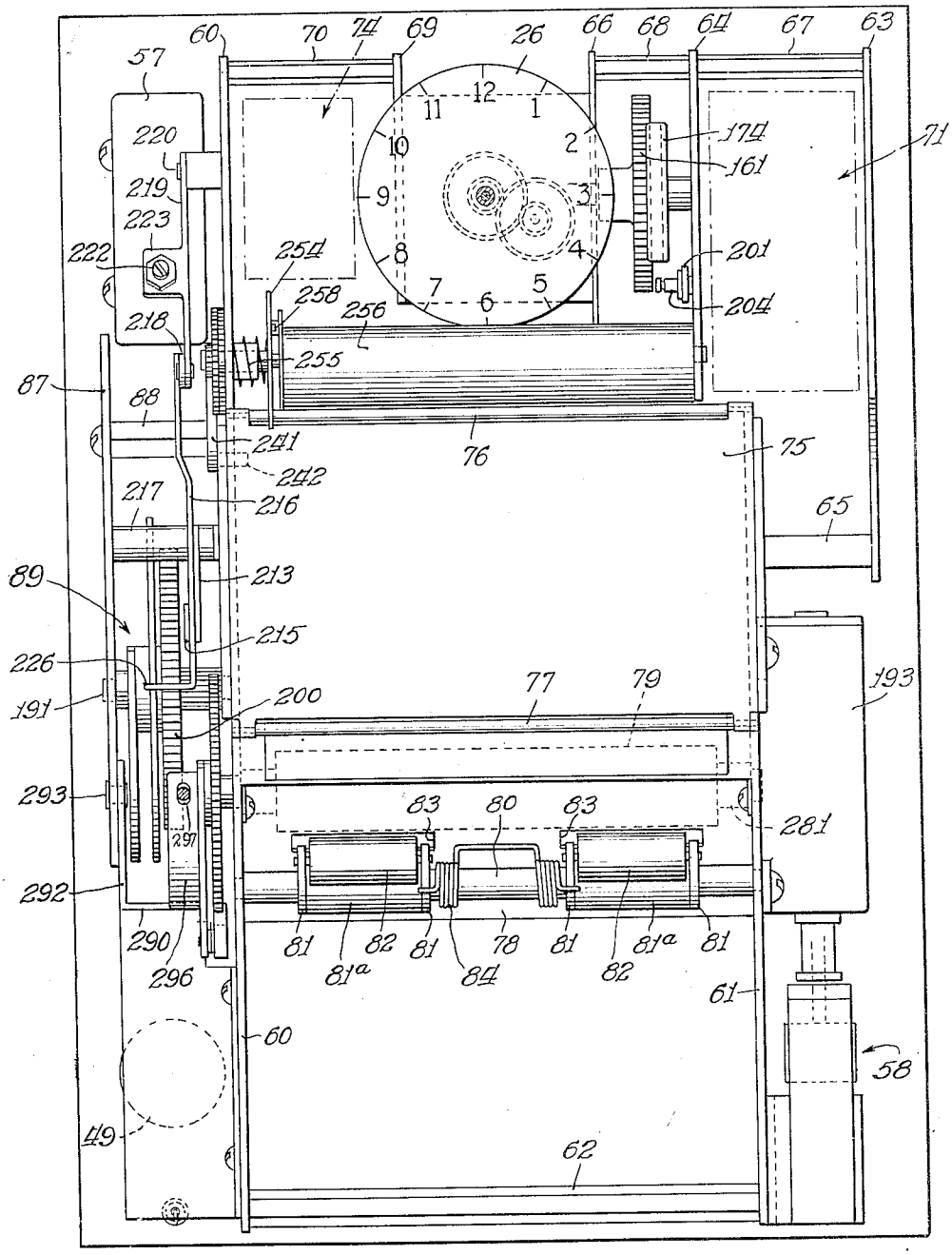
Atty.

Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 2

Fig. 4



Inventors:
George C. Engel,
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased,
by Ethel I. Eidmann, Executrix

By: H. H. Hulse Atty.

Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 3

Fig. 6

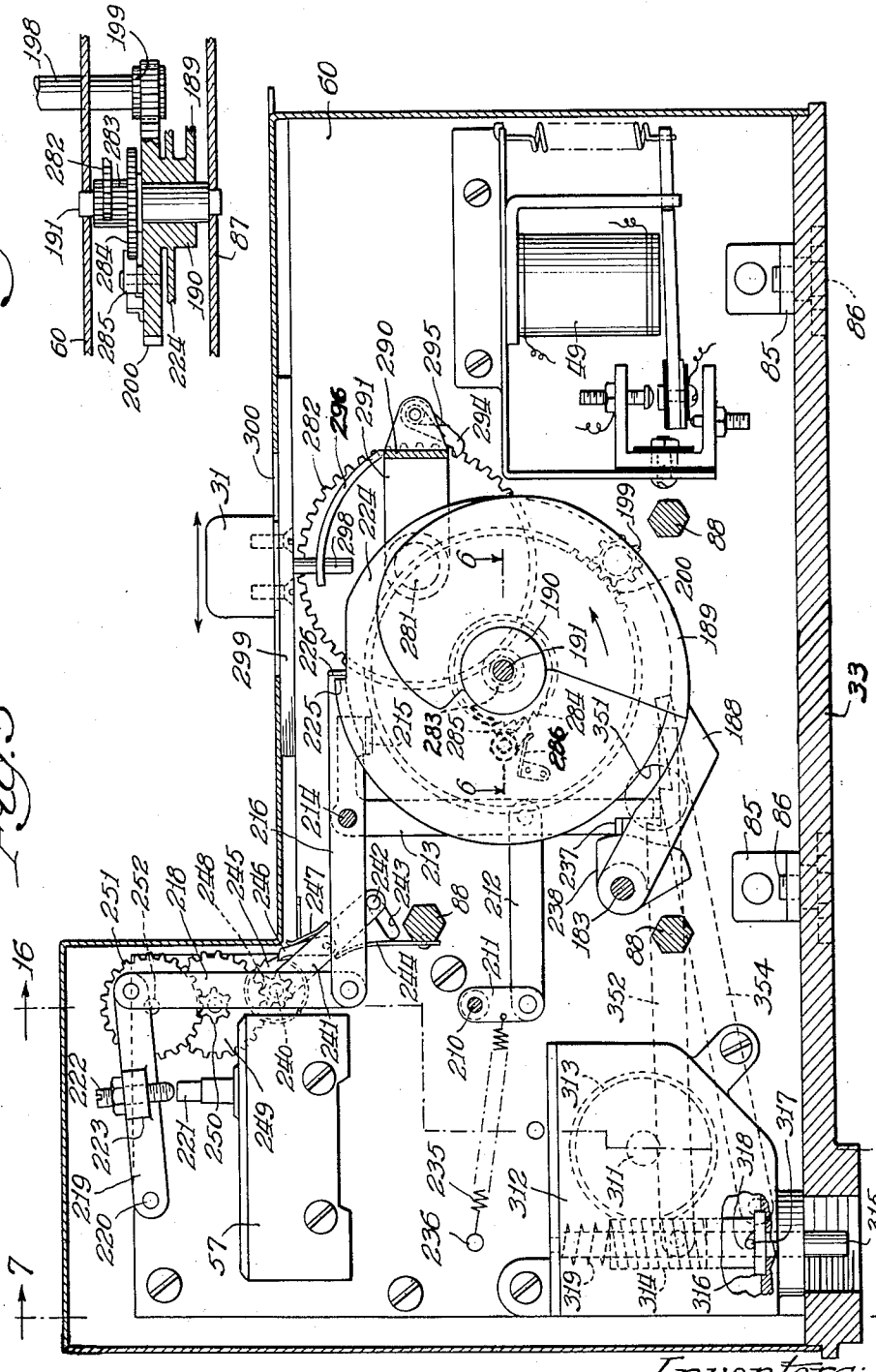


Fig. 5

Inventors:
George C. Engel.
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased,
by Ethel I. Eidmann, Executrix

By: W. A. Hulse Atty.

Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 4

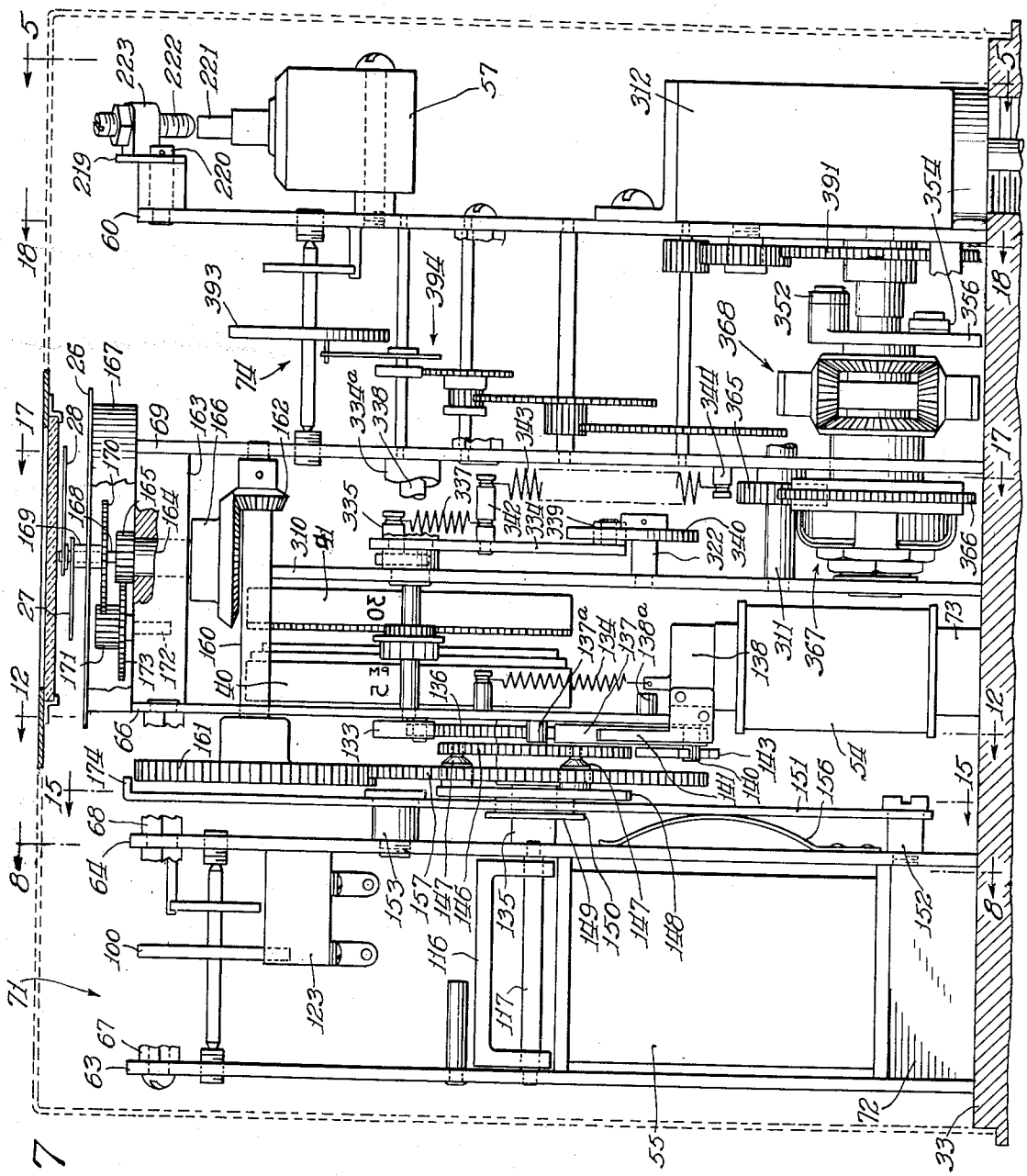


FIG. 7

Inventors:
George C. Engel.
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased,
by Ethel I. Eidmann, Executrix

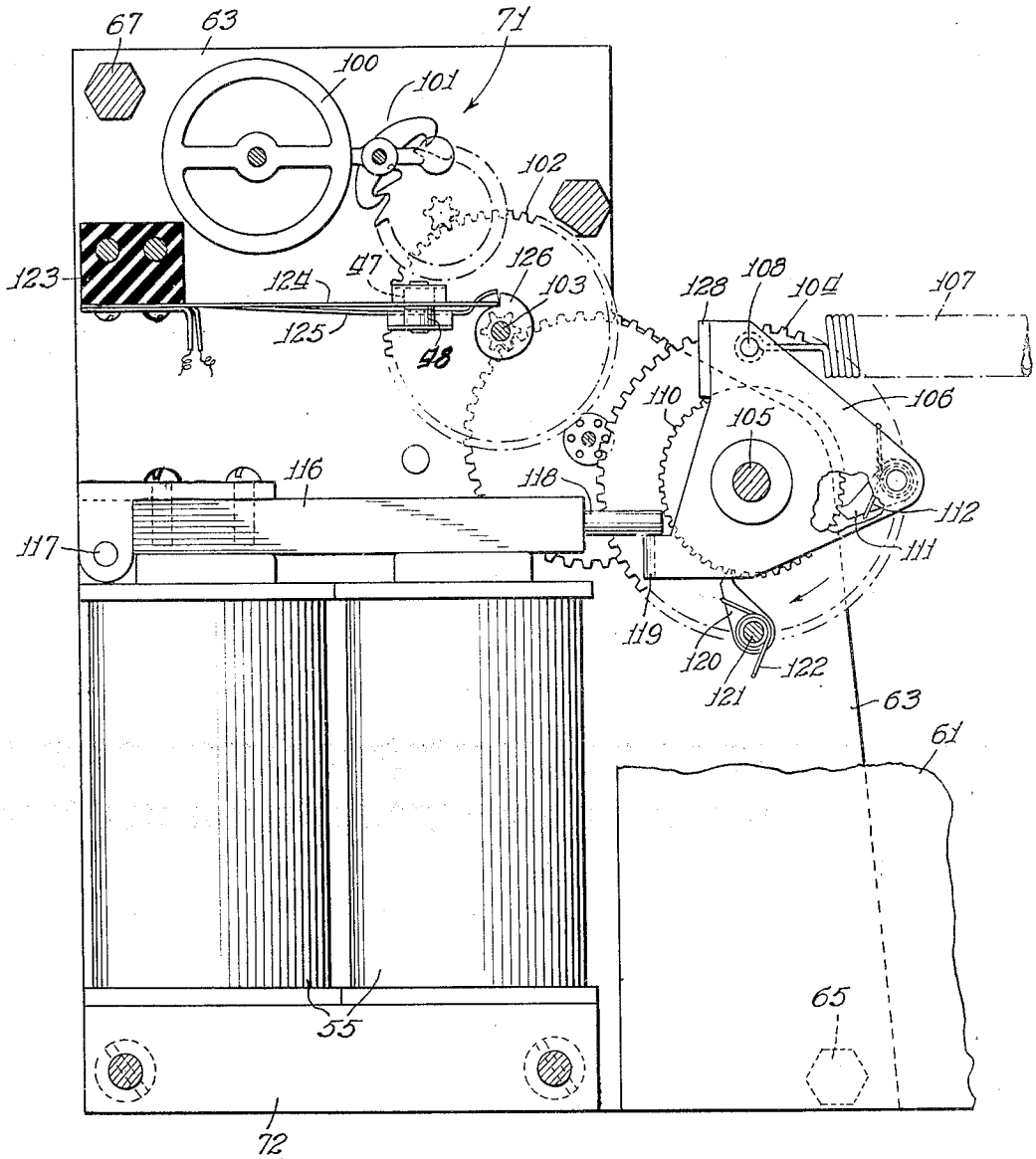
By: H. K. Hulse Atty.

Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 5

Fig. 8



Inventors:
George C. Engel.
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased,
by Ethel I. Eidmann, Executrix

By: H. H. Hulse Atty.

Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 6

Fig. 9

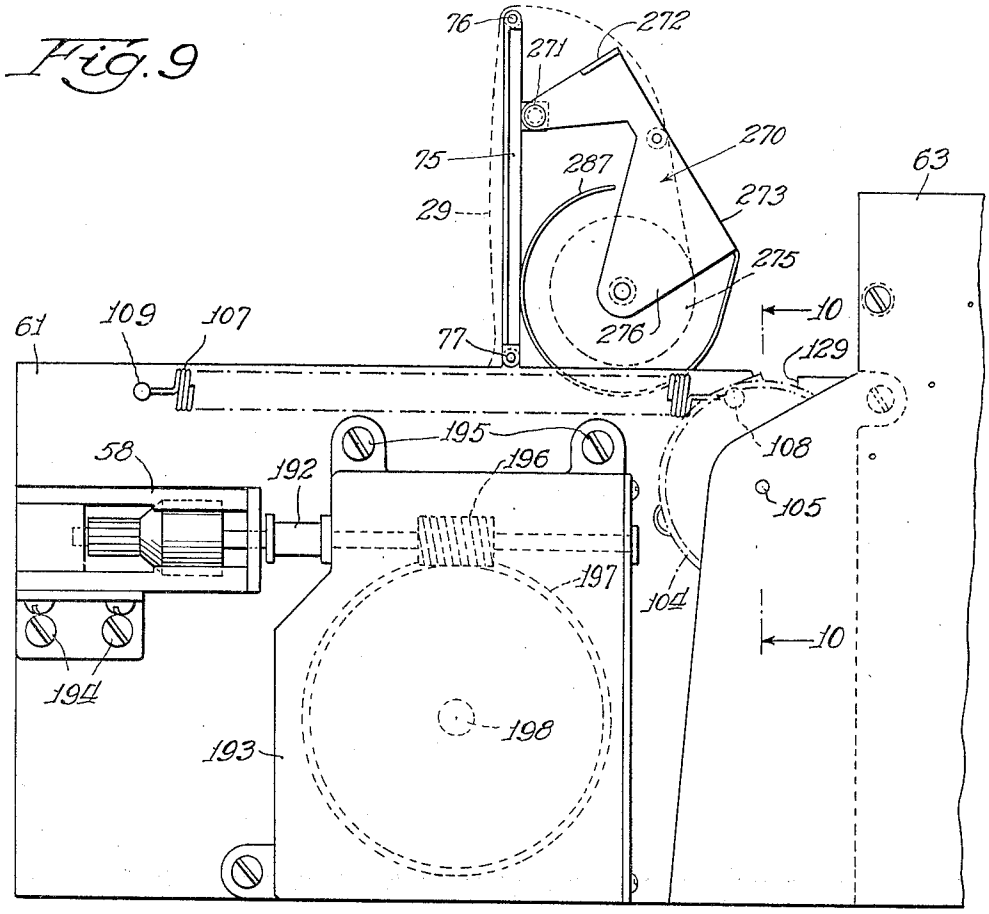


Fig. 11

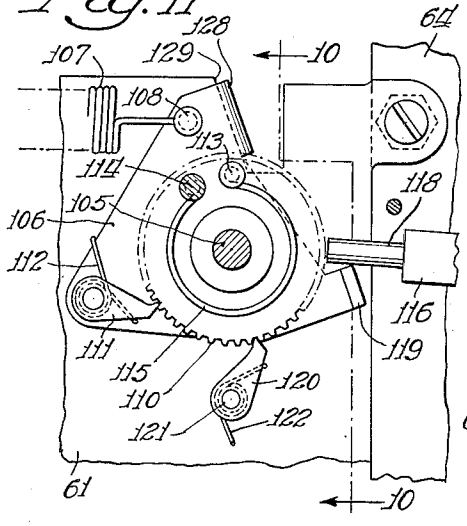
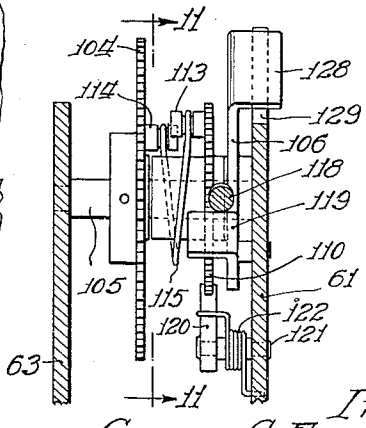


Fig. 10



Inventors:
George C. Engel.
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased,
by Ethel I. Eidmann, Executrix

By: H. H. Hulse Atty.

Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 7

Fig. 12

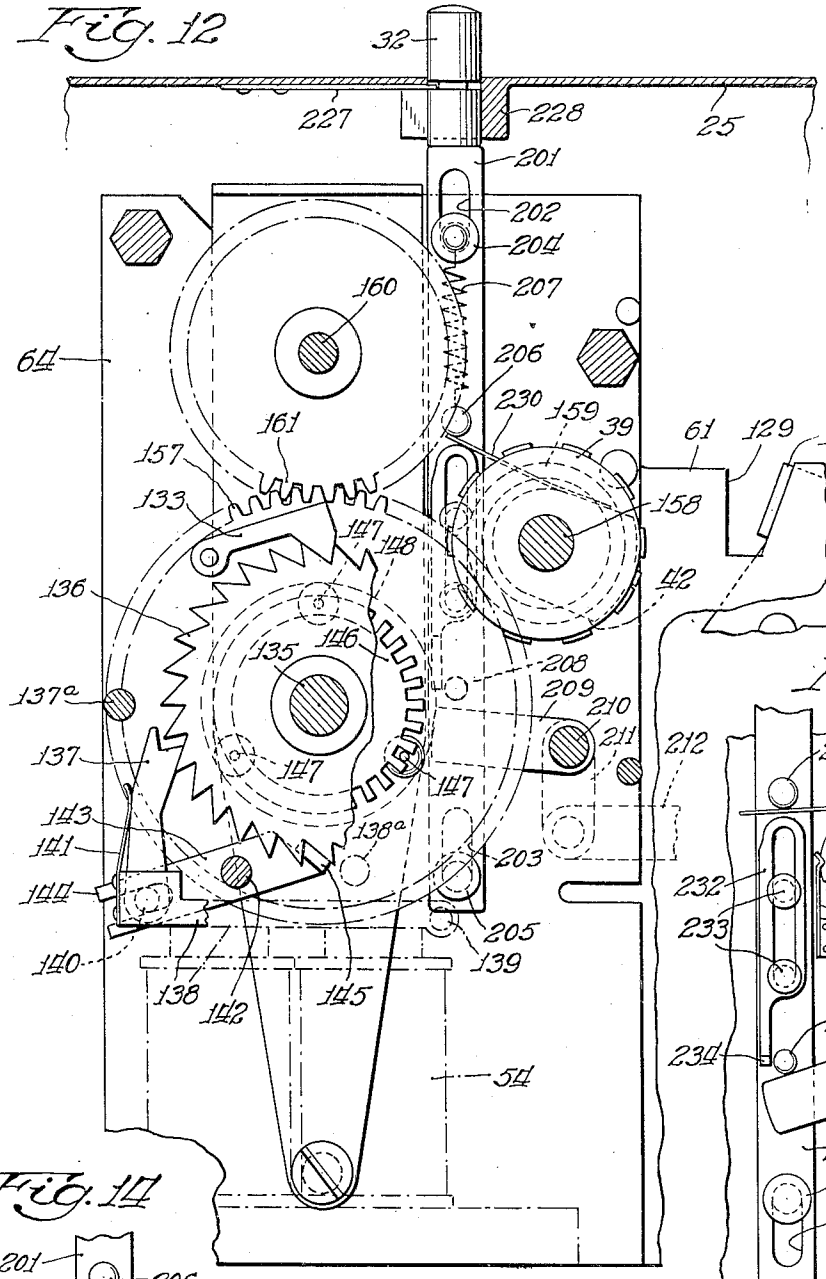


Fig. 13

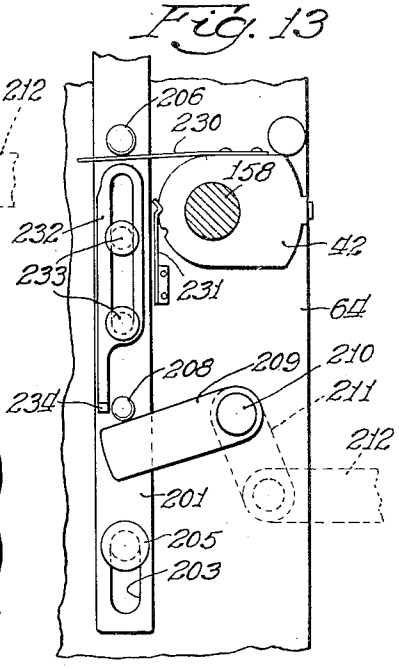
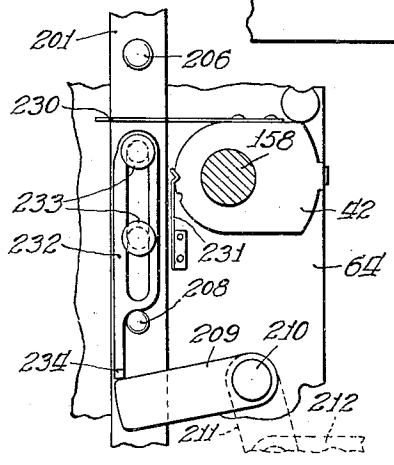


Fig. 14



Inventors:
George C. Engel.
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased,
by Ethel I. Eidmann, Executrix

By: [signature]

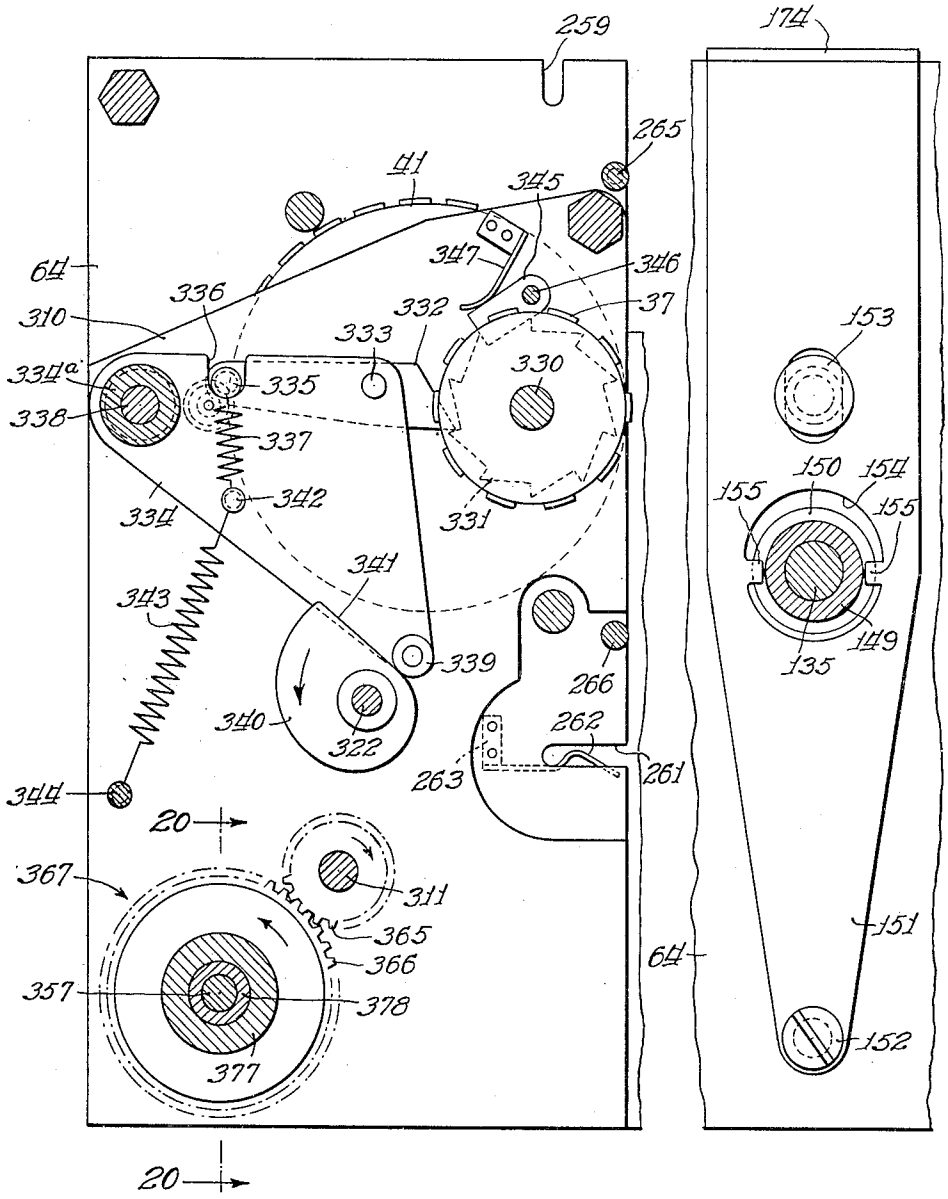
Atty.

Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 8

Fig. 17 Fig. 15



Inventors:
George C. Engel.
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased,
by Ethel I. Eidmann, Executrix

By: H. A. Hulse Atty.

Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 9

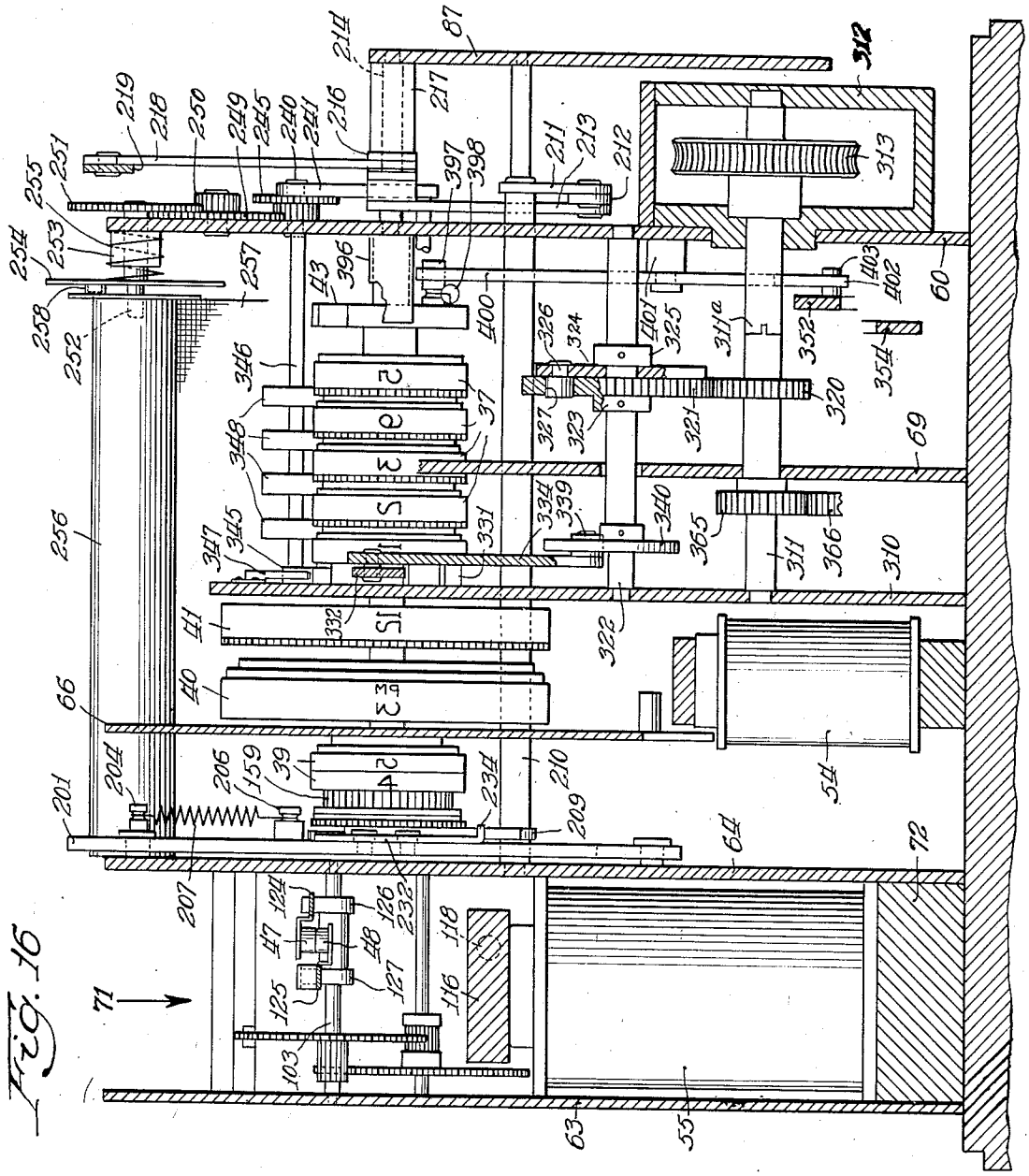


Fig. 16

Inventors:
George C. Engel.
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased,
by Ethel I. Eidmann, Executrix
By: H. A. Hulse Atty.

Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 10

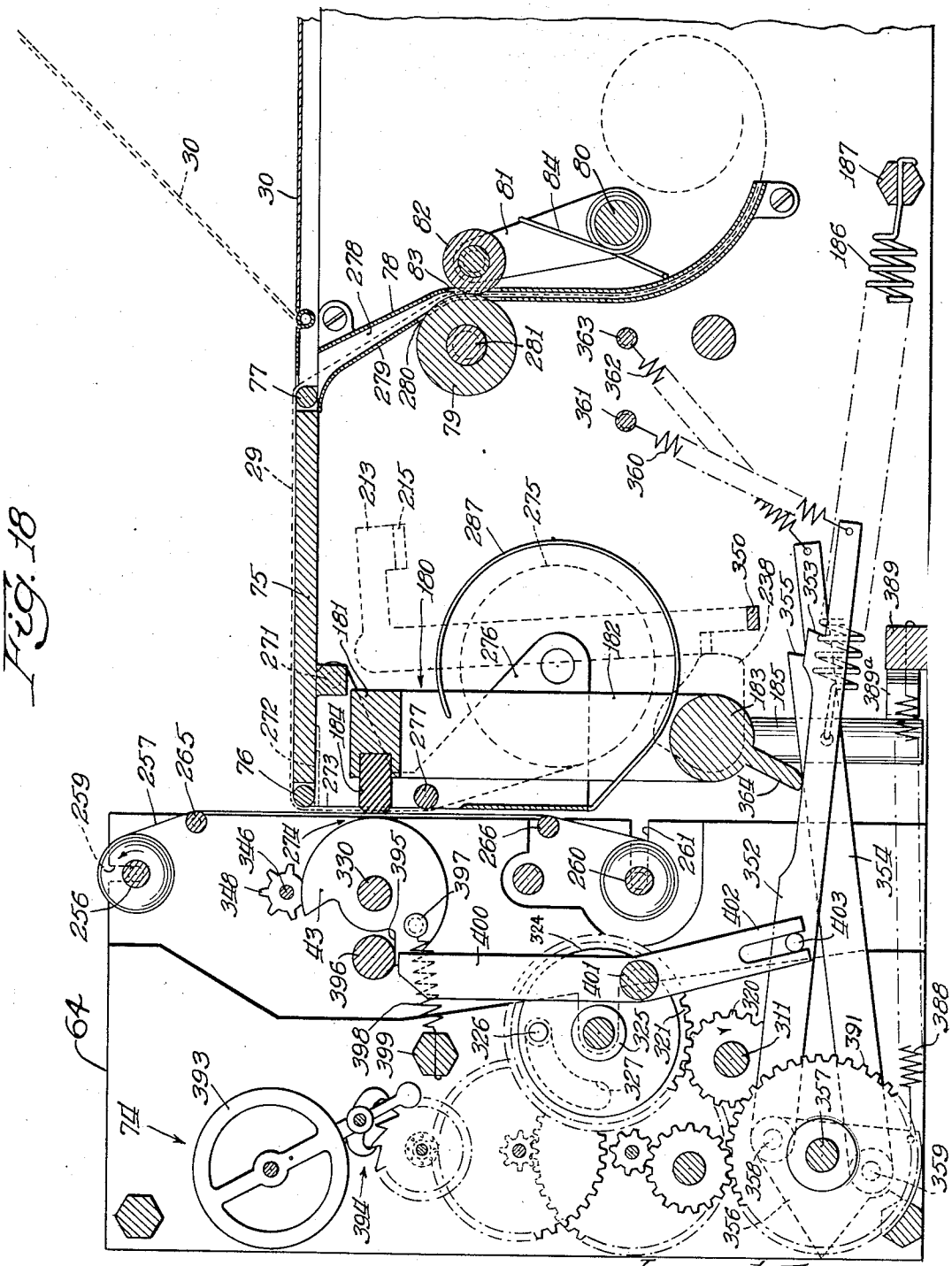


Fig. 18

Inventors:
George C. Engel
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased
by Ethel I. Eidmann, Executrix

By W. A. Kuelz Atty.

Jan. 8, 1946. G. C. ENGEL ET AL 2,392,467

RECORDING DEVICE

Filed May 4, 1942 11 Sheets-Sheet 11

Fig. 20

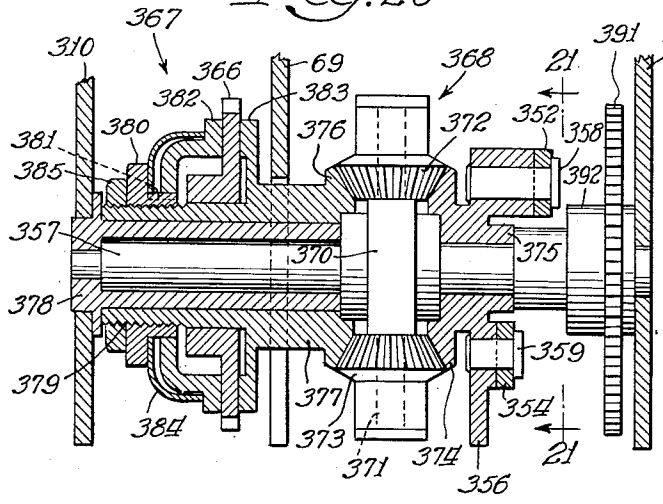


Fig. 21

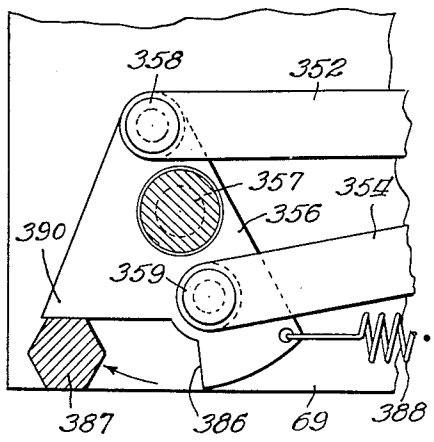
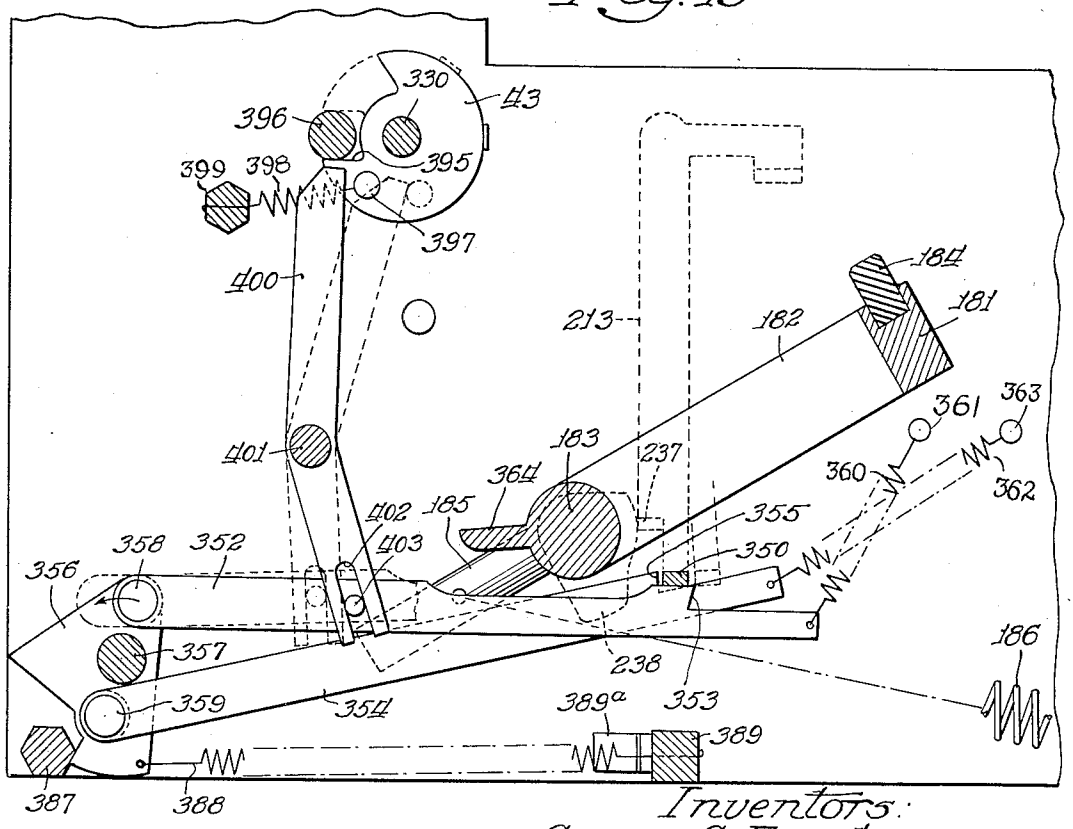


Fig. 19



Inventors:
George C. Engel.
Leslie S. Lynch, Jr.
Frank L. Eidmann, Deceased,
by Ethel I. Eidmann, Executrix
By: H. A. Hulse Atty.

Patented Jan. 8, 1946

2,392,467

UNITED STATES PATENT OFFICE

2,392,467

RECORDING DEVICE

George C. Engel, Ridgewood, N. J., Leslie S. Lynch, Jr., Flushing, N. Y., and Frank L. Eidmann, deceased, late of Princeton, N. J., by Ethel I. Eidmann, executrix, Princeton, N. J., assignors to General Time Instruments Corporation, New York, N. Y., a corporation of Delaware

Application May 4, 1942, Serial No. 441,756

45 Claims. (Cl. 234—36.5)

This invention relates to improvements in recording devices, and in particular to improvements in devices which are adapted to record the starting and stopping of a rotatable element in terms either of time or of the number of rotations of said rotatable element or of both.

That embodiment of the invention herein shown and described is adapted primarily for use on trucks or other motor vehicles to record the times at which the truck is started and is stopped. A printed record of such starts and stops is often desired by trucking companies to determine the actual driving time put in by their employees, and the number and duration of the stops made by them.

This particular embodiment also provides means to record mileage when the time is recorded, so that the locations of stops may be approximated, and further to provide a check on the average speed of the truck. Because of the fact that numerous stops of short duration are made, especially in cities, due to driving conditions, means are provided to render the device inoperative with respect to such stops.

A primary object of this invention is to provide an improved recording mechanism which is actuated by the starting and by the stopping of a rotatable element.

A further object is to provide means for actuating such a recording member after a predetermined time interval subsequent to the stopping of a rotatable element.

A still further object is to provide an improved truck recorder which records the time at which a truck is started and is stopped together with the mileage of the truck at such times. Such a truck recorder will record stops even when the motor is left running, as contrasted with the recorders of the prior art which are actuated by the operation of the ignition switch.

Another object of this invention is to provide in a truck recorder, means to advance the record tape in an exposition position so that the truck driver may make notations thereon opposite the times and mileages record on said tape.

Still another object is to provide in a truck recorder, improved means to actuate the same either manually or automatically, and also to provide means to indicate on the record tape the manner in which a particular entry is made.

Other objects are to provide for a truck recorder or the like, improved means for actuating both the type wheels which record time and the type wheels which record mileage, and to provide printing means for cooperation with said type wheels.

Other objects, features and advantages of this invention will become apparent as the description proceeds.

In the appended drawings which form a part of this application and in which like reference numerals designate like parts,

Fig. 1 is a plan view of a preferred embodiment of this invention;

Fig. 2 is a diagrammatic view showing the relation of the record tape to the type wheels, and showing the various types of entries which may be made on the tape;

Fig. 3 is a circuit diagram of the preferred embodiment herein shown;

Fig. 4 is a plan view similar to Fig. 1 but with the cover removed in order to show the location of the various parts of the mechanism. In this figure, and in the other figures, certains parts may be omitted, or broken away for the purpose of clarity;

Fig. 5 is a side elevation of the mechanism shown in Fig. 4, this view being taken along line 5—5 of Fig. 7;

Fig. 6 is a detailed sectional view taken along line 6—6 of Fig. 5;

Fig. 7 is a rear elevation of the mechanism with the cover removed, this view being taken along line 7—7 of Fig. 5;

Fig. 8 is a sectional view taken along line 8—8 of Fig. 7;

Fig. 9 is a side elevation of a portion of the mechanism;

Fig. 10 is a detailed enlarged sectional view taken along lines 10—10 of Fig. 9 and of Fig. 11;

Fig. 11 is a detailed sectional view taken along line 11—11 of Fig. 10;

Fig. 12 is a sectional view taken along line 12—12 of Fig. 7;

Fig. 13 is a detailed view of certain parts shown in Fig. 12;

Fig. 14 is a view similar to that shown in Fig. 13, but showing the parts in a changed position;

Fig. 15 is a sectional elevation taken along line 15—15 of Fig. 7;

Fig. 16 is a rear sectional elevation taken along line 16—16 of Fig. 5;

Fig. 17 is a sectional elevation taken along line 17—17 of Fig. 7;

Fig. 18 is a sectional elevation taken along line 18—18 of Fig. 7;

Fig. 19 is a detailed sectional view showing certain of the parts shown in Fig. 18 in a changed position;

Fig. 20 is an enlarged sectional view taken along line 20—20 of Fig. 17;

Fig. 21 is a section taken along line 21—21 of Fig. 20.

With reference now to Fig. 1, reference numeral 25 designates the housing of a truck recorder, the housing being cut away to expose a clock dial 26 which is provided with the usual hour hand 27 and minute hand 28. The housing is also cut away to expose a portion of a paper tape 29 which is provided with certain figures which have been printed thereon by the recording mechanism. The front end of the housing is provided with a hinged cover 30, which may be elevated to provide access to the free end of the tape 29.

A manually actuated slide 31 is provided along the left-hand edge of the housing 25 for advancing the tape 29. A printing button 32 extends upwardly through the housing and is adapted to be depressed manually in order to actuate the printing mechanism.

The housing 25 is mounted over a base 33, as shown in Figs. 5 and 7, and is adapted to be secured thereto by means of a lock 34, indicated generally in Fig. 1. A key 35 is provided for the lock.

Within the housing are disposed various type wheels 36, together with means for advancing the type wheels, and printing mechanism by means of which the position of the type wheels may be recorded on the tape 29. As shown in Fig. 2 the type wheels 36 comprise five wheels 37 which record the cumulative mileage of a truck, these wheels being similar to the usual speedometer wheels, except that they are type wheels and are not merely indicating wheels. The type wheels also comprise a plurality of time wheels indicated generally as at 38, these wheels consisting of two minute wheels 39, an hour wheel 40 and a day of the month wheel 41. A wheel 42 is provided which is adapted to print an asterisk when the printing operation is actuated manually. A wheel 43 is also provided which is adapted to print a "G" to indicate whether the entry is made when the truck is going.

The mileage type wheels 37 are driven through the speedometer cable of a car which is adapted to be connected to the truck recorder. The time wheels 38 are advanced by a pawl and ratchet mechanism which is actuated by a minute step magnet 54 shown in Figs. 3, 7, and 12. The printing mechanism is actuated by a motor shown in Fig. 3. The recorder is connected to the battery 44 of the truck as shown in Fig. 3, one terminal of the battery being grounded as shown at 45, and the other terminal being connected to three conductors 46, 50 and 56.

The conductor 46 leads to the minute impulse contacts 47 and 48 which are cam actuated. The rotation of the cam is controlled by suitable clockwork hereinafter described. The contact member 48 is in circuit with a relay 49, the relay being provided with contacts 51 and 52. The conductor 50 is in circuit with the contact 51, and the contact 52 is in circuit with a conductor 53 to which the minute step magnet 54 and the clock-winding magnet 55 are connected in parallel. The clockwork which controls the operation of the cam actuated minute impulse contacts is automatically tensioned every minute by the clock-winding magnet 55, and the minute impulses generated by the minute impulse contacts cause the type wheels 38 to be advanced each minute by magnet 54 as shown in Figs. 7 and 12.

The conductor 56 leads to the motor 58 which drives the printing mechanism, and the operation of the motor is controlled by a microswitch 57 in circuit therewith. The return circuit of the motor and of the various electromagnets may be grounded as herein shown.

The general organization of the parts is shown in Figs. 4 and 7. The mechanism is mounted on or between a plurality of parallel plates 60, 61, 63, 64, 66 and 69 which are suitably secured to the base and to each other. The plates may be secured to the base 33 as shown in Fig. 5 by means of lugs 85 and studs 86, which studs extend through the base and are threaded into the lugs; or certain of the plates may be maintained in fixed position with respect to the other plates by suitable spacers. For instance, a spacer 62 is provided for plates 60 and 61, a spacer 65 for plates 61 and 63, a spacer 67 for plates 63 and 64, a spacer 68 for plates 64 and 66, and a spacer 70 for plates 60 and 69. Other plates and other spacers, not shown in Fig. 4, but illustrated in the other figures, will be pointed out as the description proceeds.

Between the plates 63 and 64 is disposed the clockwork, indicated generally in Figs. 4, 7 and 16 by the reference numeral 71, for operating the minute impulse contacts 47 and 48. The clock-winding magnet 55 is provided with a core member in the form of a base 72 which is disposed between and secured to the plates 63 and 64. A similar core member in the form of a base 73 is provided for the minute step magnet 54 which is disposed between the plate 64 and another plate 310. The relay 49 which controls the operation of the magnets 54 and 55 is mounted on plate 60 at the front end of the recorder. Disposed between plates 60 and 69 is a clockwork indicated generally by the reference numeral 74, this clockwork being provided to control the two minute delay subsequent to the stopping of the truck and after which the printing mechanism is automatically actuated. The motor 58 is mounted at the forward end of the plate 61, and the microswitch 57 which controls the operation of the motor is mounted at the rear portion of the plate 60 as shown in Fig. 4. The clock dial 26 is mounted above the plates 66 and 69.

A horizontal plate 75 which is hinged at its forward edge, is disposed between the plates 60 and 61, and it is over this plate that the exposed portion of the tape 29 is advanced, the plate serving as a backing when the truck operator makes pencil notations on the tape. The printing hammer and a roll of tape are disposed beneath the hinged plate 75. Guide rollers 76 and 77 are disposed along the rear and front edges respectively of the plate 75, and an apron 78 extends downwardly and forwardly between the plates 60 and 61 in front of the plate 75 and beneath the hinged cover 30, as shown in Fig. 18.

A roller 79 is mounted beneath the apron 78 and engages the forward end of the tape 29 in order to advance it. As indicated in Fig. 4, a cross member 80 extends between the plates 60 and 61 and is disposed in front of and above the apron 78, on which cross member a plurality of arms 81 are journalled in pairs by means of hubs 81a. Rollers 82 are mounted between each pair of arms 81, and extend into cut-away portions 83 of the apron 78. The rollers 82 are adapted to engage the tape 29 and hold it against the roller 79 so that as the latter roller is rotated, the tape will be advanced. A spring 84 is provided which engages the levers 81 in order to force the

rollers 82 into operative engagement with the tape 29.

The position of the rollers 79 and 82 is shown in elevation in Fig. 18, in which it will be noted that a metal sheet 279 is spaced from the apron 78 and cooperates therewith to form a channel 278 through which the tape 29 is advanced. The sheet 279 is cut away to permit the roller 79 to extend into the channel, just as the apron 78 is cut away to permit the rollers 82 to extend into the channel. It will be seen therefore that as the roller 79 is automatically advanced after each printing operation, the tape 29 will be advanced through the channel and will be held taut over the hinged plate 75. The manner in which the roller 79 is automatically advanced will be described later.

A plate 87 is disposed exteriorly of the plate 60 and, as shown in Fig. 4, is held in spaced relationship thereto by means of suitable spacers 88. The mechanism which controls the operation of the printing hammer is disposed between the plates 87 and 60 and is designated generally by the reference numeral 89.

The mechanism for advancing the time wheels 38 will first be described, and this mechanism comprises time controlled means for generating minute impulses and means which are actuated by the impulses to advance the type wheels step by step.

The clockwork 71 is shown in Fig. 8 to comprise the usual balance wheel 100 and escapement mechanism 101, together with a gear train which includes a gear 102 mounted on a shaft 103, journalled in plates 63 and 64, which is adapted to be driven at the rate of one revolution per minute. A driving gear 104 is provided for the clockwork which gear is mounted on a shaft 105 journalled in the plates 61 and 63.

A plate 106 is rotatably mounted on the shaft 105, and a clock spring 107 extends from a lug 108 formed on the plate 106 to a pin 109 which extends outwardly from the plate 61, as shown in Fig. 9. The plate 106 forms a part of a pawl and ratchet mechanism through which the power of the spring 107 is transmitted to the driving gear 104.

A ratchet wheel 110 is rotatably mounted on the shaft 105, and is adapted to be engaged by a pawl 111 which is carried on the rotatable plate 106. A spring 112 is provided to urge the pawl 111 into engagement with the teeth of the ratchet wheel 110. A pin 113 (Figs. 10 and 11) extends perpendicularly from the surface of the ratchet wheel 110, and a pin 114 extends perpendicularly from the surface of the gear 104, toward the pin 113. A spring 115, in the form of a single loop of wire, is secured at either end to the pins 113 and 114 so as to form a resilient coupling through which the pawl and ratchet mechanism drives the gear 104 in a clockwise direction as shown in Fig. 8, or in a counter-clockwise direction as shown in Fig. 11.

Means are provided to tension the spring 107 at regular intervals so that the clockwork 71 may be continuously driven by the driving gear 104. This tensioning means includes an armature 116 for the clock-winding magnet 55, the armature being pivoted on a pin 117 which extends between the plates 63 and 64 (Fig. 7). The armature is provided with a projection 118 which engages a bent-over lug 119 on the plate 106 so that when the magnet 55 is energized, as viewed in Fig. 8, the plate 106 will be rocked in the counter-clockwise direction, thereby tensioning the spring 107.

A locking pawl 120 is mounted on a pin 121 which extends outwardly from the surface of the plate 61, and a spring 122 is provided to force the locking pawl 120 in engagement with the ratchet wheel 110 to prevent reverse rotation thereof while the spring 107 is being tensioned. It will be seen that while the clockwork is being driven by the spring 107, that the spring 115, which forms a resilient connection between the ratchet wheel and the driving gear 104, is always under tension. It is the tension of this spring 115 which drives the clockwork during the short interval that the spring 107 is being tensioned by the reverse rotation of the plate 106.

An insulating block 123 is suitably secured to the plate 64, and secured to the insulating block are resilient contact arms 124 and 125, the former carrying contact 47, and the latter carrying contact 48, as shown in Figs. 8 and 16. It will be observed that the arms 124 and 125 are horizontally spaced from one another, and that the contacts 47 and 48 are carried in vertical alignment with each other at a point between the spaced resilient arms. Two cams 126 and 127 are secured to the shaft 103, which as pointed out above, is part of the clockwork and is driven at the speed of one revolution per minute. Cam 126 engages the end of the resilient arm 124, and cam 127 engages the resilient arm 125, and it will be observed that the end of the latter arm is bent upwardly so as to permit the contacts 47 and 48 to be in contact with each other when the parts are in the position shown in Fig. 8. The drop face of cam 126 is somewhat ahead of the drop face of cam 127 so that as the shaft 103 rotates into the position shown in Fig. 8, the arm 124 will drop first thereby closing the circuit. A second or so later, the arm 125 will drop, thereby breaking the circuit through contacts 47 and 48, and during the remainder of the revolution of the cams 126 and 127, the resilient arms and their contacts will maintain their open circuit relationship with each other.

In operation, the contacts 47 and 48 are closed every minute, thereby closing the circuit of relay 49 (Fig. 3), and causing an impulse of short duration to be transmitted to the minute step magnet 54 and to the clock-winding magnet 55. Energization of the latter causes the clock spring 107 to be tensioned so as to cause further rotation of the cams 126 and 127, whose rotation is limited by the clockwork 71 to one revolution per minute. In Fig. 8, the spring 107 is shown in its tensioned position, the circuit being closed through the contacts 47 and 48 and through the magnet 55. In Fig. 11, the spring 107 is shown in its run-down position. It will be observed that the plate 106 is provided with a projecting lug 128 which extends through a notch 129 in the plate 61. These parts not only limit the rotation of the plate 106, but the lug also affords a means to tension the spring manually. This manual operation is necessary when the recorder is first connected into the battery circuit, and the lug 128 is readily accessible when the hinged plate 75 is elevated as shown in Fig. 9.

The mechanism for advancing the time wheels 38 is shown in Fig. 12, and includes a shaft 135 journalled in plates 64 and 66 together with a ratchet wheel 136 which is rotatably mounted on the shaft. A pawl 137 cooperates with the ratchet wheel to advance it one tooth at a time, the pawl being mounted on an armature 138 which is

pivoted at 139. The armature is mounted directly above the minute step magnet 54, and is biased against a stop pin 138a into its inoperative, raised position by a spring 134, as shown in Fig. 7. The pawl 137 is associated with the armature 138 by means of a pin 140 extending laterally from the armature, and upon which the pawl is journalled. A leaf spring 141 secured to the end of the armature engages the pawl 137 and urges it into contact with the teeth of the ratchet wheel 136.

Forward rotation of the ratchet wheel 136, when the armature is in its attracted position, is prevented by a rock lever 143 which is pivotally mounted on a pin 142 secured to plate 66. One end of the rock lever 143 is forked as shown at 144 and engages the pin 140, and the other end is provided with a bent-over portion which forms a tooth 145 adapted to engage the teeth of the ratchet wheel 136. When the armature is in its attracted position as shown in Fig. 12, the lever 143 will be rocked so that the tooth 145 engages the ratchet wheel, thereby preventing rotation of the ratchet wheel. Reverse rotation at this time is prevented by a locking pawl 133 which may be provided with suitable spring means not shown herein to urge it into engagement with the ratchet wheel 136.

A stop pin 137a is secured to plate 66 and is engaged by the sloping rear edge of the pawl 137, so that the pawl is positively held against the ratchet wheel to lock the latter in a predetermined position when the armature is in its unattracted position.

The rotation of the ratchet wheel 136 is transmitted to the type wheels through a clutch which comprises a toothed wheel 146 which is secured to the ratchet wheel 136 and is engaged by a series of three pins 147 which are carried by and project laterally from a wheel 148. The wheel 148 is associated with a sleeve 149, the sleeve being mounted on the shaft 135 in axially shiftable relationship, as shown in Figs. 7 and 15. The sleeve is provided with a flange 150 so that it may be engaged by the lever 151 in order to disengage the pins 147 from the toothed wheel 146. The lever 151 is in the form of a strip which is mounted on plate 64 by means of studs 152 and 153 as shown in Fig. 15. The lever is provided with an aperture 154 which has inwardly directed lugs 155, these lugs fitting in between the flange 150 and the wheel 148. A leaf spring 156, which is mounted on the plate 64, bears against the lever 151 to maintain the parts in clutched relationship. A gear 157 is mounted on the shaft 135 and is provided with apertures through which the pins 147 extend. It will be seen that the rotation of the ratchet wheel 136 is transmitted through the pins 147 to the gear 157, except during such times as the lever 151 is manually retracted. A shaft 158, which is journalled in the plates 64 and 66, is provided for the minute wheels 39, and on this shaft is also mounted a gear 159, which is associated with the minute type wheels so as to drive them in the usual manner. The gear 159 meshes with the gear 157 so that as the ratchet wheel is advanced step by step by each minute impulse, the minute type wheels 39 will be advanced one minute for each impulse

A shaft 160 is journalled in the plates 66 and 69 as shown in Fig. 7, the shaft extending through plate 66 and being provided with a gear 161 which meshes with the gear 157. The shaft 160 is also provided with a bevelled gear 162 which is adapted to drive a bevelled bear 166 which is associated with the hour and minute the hands 27 and 28. A block 163 is mounted at the top of the recorder between the plates 66 and 69, and journalled in the block is a vertical shaft 164 which is maintained in position by means of the pinion 165. The bevelled gear 166 is secured to the lower end of the shaft 164. The dial 26 is spaced above the block 163 and may be provided with a skirt 167 which is broken away in Fig. 7 to show the usual reduction gearing enclosed thereby. The upper portion of the shaft 164 is reduced as indicated at 168 and extends through the dial 26 and carries the minute hand 28. A sleeve 169 surrounds the reduced portion and carries the hour hand 27, the sleeve also carrying at its lower end a gear 170. The sleeve and the hour hand are driven by reduction gears comprising a pinion 171 mounted on a stub shaft 172 which also carries a gear 173, which gear in turn is driven by the pinion 165.

As the minute wheels 39 are advanced by the gear 157, the hands 27 and 28 will also be advanced one minute at a time in the usual manner. It will be observed that the upper end of lever 151 is provided with a bent-over portion 174 which overlaps the gear 161. The setting of the hands and the type wheels may be changed by rotating the gear 161 by the thumb of the operator. The lever 151 may be laterally displaced by the same manual operation due to the proximity of the bent-over portion 174 to the gear 161.

The hour type wheel 40 is driven in the usual manner by the minute type wheels 39, and the date type wheel 41 is advanced one day at a time by each complete revolution of the hour type wheel in the usual manner.

Recording is effected by the cooperation of a printing hammer indicated generally by the reference numeral 180 with the type wheels 36. As shown in Fig. 18, the printing hammer comprises a channelled block 181 which is carried on arms 182, the arms being secured to the hammer shaft 183. A strip 184 of rubber or other somewhat resilient material is held in the channelled block 181 in a position to contact the type wheels. In Fig. 18 the hammer is shown in its printing position. A lever 185 forms a part of the hammer shaft 183, and an operating spring 186 serves to urge the printing hammer into its printing position, one end of the operating spring being secured to the lever 185, and the other end being secured to a spacer 187. A shock absorbing leaf spring 389a, riveted to a spacer 389, is engaged by the lever 185 at the end of the hammer stroke and also prevents a double or blurred printing impression.

The hammer shaft 183 is journalled in the plates 60 and 61, and is extended outwardly beyond plate 60 and carries at its outer end a cocking lever 188 as shown in Fig. 5. A cam 189 is provided for the cocking lever 188, the cam being mounted on a hub 190 which is rotatably journalled on a shaft 191. The shaft is journalled in plates 60 and 87 as shown in Fig. 6, and the cam 189 is adapted to be rotated by the motor 58 in order to cause the hammer to be drawn back into cocked position.

As shown in Figs. 4 and 9, the motor 58 is mounted by means of suitable screws 194 at the forward end of plate 61, the motor being a high-speed six volt direct current motor. A gear reduction box 193 is also mounted on plate 61 by means of screws 195, the speed reduction prefer-

ably being effected by means of a worm and gear 196 and 197. The worm 196 is driven by the motor 58 through a suitable coupling 192, and the gear 197 is mounted on a shaft 198 which is journalled in the plates 60 and 61. A pinion 199 is carried at the end of shaft 198 and drives a gear 200 which is secured to the hub 190, as shown in Fig. 6.

In operation it will be seen that the motor, through pinion 199 and gear 200, causes the cam 189 to rotate, thereby causing the cocking lever 188 to drop off the cam, and the operating spring 186 to actuate the hammer. As the cam 189 continues its rotation, the printing hammer is withdrawn to its cocked position. Means hereinafter described, cause the cam to come to a stop in the position shown in Figs. 5 and 19, wherein the parts are in position for another operation.

Both manual and automatic means are provided for closing the motor circuit through the microswitch 57, and for maintaining the circuit closed until the cam 189 has made a complete revolution. The operation of the manual means is controlled by a slide bar 201 which as shown in Figs. 12 to 14, is mounted on plate 64 by means of the studs 204 and 205 which project through apertures 202 and 203 in the slide bar 201. The heads of the studs confine the slide bar closely against the plate 64. A pin 206 projects outwardly from the slide bar 201, and a spring 207 is tensioned between the pin 206 and the stud 204 to maintain the slide bar in elevated position. The manually depressible button 32, which is slidably mounted in the housing 25 (see also Fig. 1), engages the upper edge of the slide bar 201. It will be noted that a leaf spring 227 engages the push button 32, and maintains it in elevated position within a U-shaped lug 228 formed on the under surface of the housing 25. A pin 208 forms a part of the slide bar 201, and is positioned toward the lower end thereof in a position to engage the lever 209 when the button 32 is depressed. The lever 209 is mounted on a shaft 210 which extends across the recorder, being journalled in plates 64 and 87, the lever and the shaft forming a part of a linkage for operating the microswitch 57. This linkage includes an arm 211 secured to the shaft 210, as shown in Fig. 5 and a link 212 extending between the arm 211 and a crank 213. The crank is pivoted on a horizontal member 214 extending between the plates 60 and 87. The horizontal arm of the crank 213 is provided with a bent-over lug 215 which actuates a second linkage which includes a horizontally disposed lever 216 which is also pivoted on member 214. A spacer 217 (Figs. 4 and 16) serves to maintain the horizontal member 216 against the horizontal arm of the crank 213. A vertically disposed link 218 extends between the lever 216 and another lever 219, the latter lever (Figs. 4, 5 and 7) being pivotally mounted on plate 60 by means of a stud 220. The microswitch 57 is provided with an upwardly extending plunger 221, which plunger is engaged by a set screw 222 carried in a lug 223 formed on the horizontal lever 219, as shown in Figs. 4 and 5. It will be seen that when the push button 32 is depressed, that the crank 213 will be rocked, thereby causing the second linkage comprising the members 216, 218 and 219 also to be rocked, and thereby closing the circuit through the microswitch.

A second cam 224 is carried on the hub 190, this cam being provided with a drop face 225. The horizontal lever 216 is provided at its forward end with a bent-over portion in the form of a cam rider 226. When the circuit through the microswitch is closed by the depression of the button 32, it will be seen that the second linkage will be maintained in closed circuit position throughout one complete revolution of the cams 224 and 189, even though the pressure on the button 32 is released. At the end of this revolution, the rider 226 drops at the drop face 225, thereby releasing the pressure on the plunger 221, and opening the motor circuit. In this position of the parts the hammer has been cocked and is ready for another printing operation.

As shown in Figs. 13 and 14, the segment 42, which is rotatably mounted on the shaft 158, is provided with type in the form of an asterisk which when printed with the time record indicates that the printing operation has been effected manually. This segment is normally maintained in a depressed position as shown in Fig. 12 but is provided with a spring arm 230 which is engaged by the pin 206, upon depression of the slide bar 201, which serves to elevate the segment into position to print the asterisk as shown in Fig. 13. A click 231 is mounted on plate 64 to maintain the segment 42 in either one of the two positions shown.

Means are provided to return the segment 42 to its depressed position automatically after the completion of a manual printing operation. This means includes a slotted plate 232 which is slidably associated with the slide bar 201 by means of studs 233. The lower portion of the slotted plate 232 is provided with a bent-over lug 234 which extends into the path of the lever 209. As shown in Fig. 5, a spring 235 extends between the arm 211 and a pin 236, mounted in plate 60 so as to cause the linkage comprising the crank 213, the arm 211 and the lever 209 to be turned to their normal position. When the pressure on the button 32 therefore, is released, the spring 235 causes the slotted plate 232 to be returned to its elevated position, the upper portion of the slotted plate 232 engaging the spring arm 230 and rotating the segment 42 so that the asterisk type is depressed. In Fig. 13, the parts are shown during the depression of the push button, and in Fig. 14 the parts are shown immediately after the pressure has been released from the push button, but just before the lever 209 has been returned to its normal position due to the action of the spring 235.

This latter action is delayed by virtue of a cam 238 which is provided on the hammer shaft 183, the cam engaging a bent-over lug 237 at the lower portion of the vertical arm of the crank 213. It will be seen therefore that when the hammer is in its printing position (Fig. 18), the cam 238 displaces the crank 213 and the lever 209, and maintains these parts in displaced position until the hammer has again been withdrawn into its cocked position. This action also prevents the opening of the motor circuit, in case the pressure on the button 32 is released before the rider 226 has cleared the cutaway portion of the cam 224.

A stud 240 extends outwardly from plate 60 and carries an arm 241, which arm is provided with a pin 242 which extends through a slot 243 into the path of the hammer arm 182 as shown in Figs. 4, 5 and 16. A leaf spring 244, which is secured to the spacer 88, engages the arm 241 to maintain the same in the position shown in Fig. 5. During each printing operation, the hammer

arm 182 engages pin 242 and depresses the lever 241 to actuate the ribbon advancing mechanism.

The ribbon advancing mechanism includes a ratchet wheel 245 which is rotatably mounted on the stud 240, and which is adapted to be advanced by a pawl 246 carried on the lever 241. A leaf spring 247 serves to maintain the pawl in engagement with the ratchet wheel. The motion of the arm 241 is sufficient to cause the ratchet wheel to be advanced one tooth during each printing operation. A pinion 248 is secured to the ratchet wheel 245, and drives a gear 249 which is mounted on the plate 60. A pinion 250 is associated with the gear 249, and drives a ribbon-advancing gear 251 which is secured to a shaft 252, journalled in a collar 253 which is secured to the plate 60. The shaft 252 is axially displaceable, and a spring 255 is disposed between the plate 60 and a plate 254 which is mounted on the axially displaceable shaft 252. A ribbon spool 256 is mounted at one end on the axially displaceable shaft 252, and means, such as a pin 258, is provided to cause the spool to rotate with the plate 254. The other end of the spool 256 may be provided with a spindle which fits into a slot 259 (Figs. 17 and 18) formed in the plate 64. A ribbon 257 is wound around the upper spool 256, and extends to a lower spool 260. The plate 64 may be suitably slotted as shown in Figs. 17 and 18 at 261 to receive the spindle of the lower spool. A leaf spring 262, secured to a block 263 on the plate 64, serves to lock the lower spool in position. The other end of the lower spool may be held in place by an axially displaceable member, not shown herein, but similar to the plate 254 shown in connection with the upper spool.

In operation it will be seen that the upper spool 256 is advanced to a slight degree with each printing operation, thereby causing the ribbon 257 to be unwound from the lower spool 260 onto the upper spool 256. Ribbon guides 265 and 266, as shown in Figs. 17 and 18, may be provided to hold the ribbon taut just in front of the type wheels 36.

The tape 29 is supplied from a roll 275 which is held in a bracket 270 secured to the underside of the hinged plate 75, as shown in Fig. 9. The bracket 270 is pivotally associated therewith as shown at 271, the bracket being provided with bent-over ears 272 which engage the upper edges of the plates 60 and 61 when the hinged plate 75 is in closed position, so as to cause the bracket to be suspended perpendicularly from the plate 75. The rear portion of the bracket comprises a wall 273 which is disposed immediately in front of the type wheels, the wall being slotted as indicated at 274 in Fig. 18 to permit the operation of the hammer 180. It will be noted that the side members 276 of the brackets 270 are disposed interiorly of the arms 182 of the printing hammer 180. A guiding member 277 for the tape 29 is journalled in the side members 276 and cooperates with the rollers 76 and 77 to guide the tape 29 upwardly in front of the type wheels and forwardly over the surface of the plate 75. The tape is then guided through the channel 278 formed between the members 279 and 78, the former being cut away at 280 to permit the tape advancing roller 79 to engage the tape.

The roller 79 is mounted on a shaft 281 which is journalled in the plates 60 and 61, the shaft extending through plate 60 and being provided with a gear 282 at its end, this gear being shown in Figs. 5 and 6. A pinion 283, and a ratchet wheel 284 which is secured thereto, are mounted on the shaft 191, and are driven from the gear 200 by means of a pawl 285. A spring 286 biases the pawl 285 into engagement with the ratchet wheel 284.

In operation it will be seen that during each printing operation, the tape 29 will be automatically advanced by the operation of the recorder. A pawl and ratchet mechanism for the tape advancing roller 79 permits the tape to be advanced manually in the event that it is desired to bring the last entry up to an exposed position overlying the plate 75 so that it may be seen, or so that a written notation may be made in connection therewith. The means for advancing the tape manually comprises a yoke member 290 which may be reciprocated by the slide 31 in order to advance the gear wheel 282. The yoke member has an arm 291 which is pivoted on the shaft 281, and an arm 292 which is pivoted on a stud 293 extending inwardly from plate 87, as shown in Figs. 4 and 5. A pawl 294 is carried on the yoke member which engages the gear 282, a spring 295 being provided to urge the two into engagement. The yoke also includes an arc-shaped member 296 which is provided with an aperture 297 through which a pin 298 extends. The pin 298 is secured to the underside of a sliding plate 299, and the manually actuated slide member 31 is secured to the upper surface of the sliding plate 299. The housing 25 is slotted as shown at 300 to permit manual reciprocation of the knob 31, sliding plate 299 and the pin 298. It will be noted that the knob 31 and the plate 299 overlap the sides of the slot 300.

In operation when the knob 31 is pushed rearwardly, the pawl 294 rides over the teeth of the gear 282; when the knob is pushed forwardly, the gear 282 and the tape advancing roller 79 are caused to rotate, thereby advancing the tape.

The mileage wheels 37 are driven from the speedometer cable of the truck by means which are shown in Figs. 16 and 17. A plate 310 is mounted between the plates 66 and 69 and secured in spaced relationship thereto by suitable spacers which are not shown. A split shaft 311, provided with a flexible coupling 311*a*, is journalled in plates 310, 69, 60, and in the outer wall of a gear reduction box 312. A worm gear 313 is suitably secured to the shaft 311 within the gear reduction box, and is adapted to be driven by a worm 314 (Fig. 5) which is in the form of a sleeve slidably mounted on a vertical shaft 315. The shaft 315 is journalled in the top and bottom walls of the gear box 312, and is provided with a collar 316 and a pin 317 which extends through the shaft 315 immediately above the collar. A notch 318 is provided in the lower end of the worm sleeve 314 so that the sleeve may be engaged by the pin 317 and rotate with the shaft. A spring 319 is confined between the upper end of the worm sleeve and the top of the gear box so as to urge the parts in operative relationship. This construction permits reverse rotation of the speedometer cable without rotating the gear 313. It will be noted that the collar 316 takes the vertical thrust on the shaft 315. The lower end of the shaft 315 is adapted to be secured to the speedometer cable.

When the truck is going in the forward direction, the rotation of the vertical shaft 315 is transmitted through the worm and gear mechanism to the shaft 311, and to a gear 320 which is secured thereto. A gear 321, which meshes with the latter, is rotatably mounted on a shaft 322, this shaft being journalled in plates 310 and 60.

The gear **321** is confined between a collar **323** and a disk **324**, the collar being pinned to the shaft, and the disk being secured to the shaft by means of a hub **325**. A pin **326** is disposed in the disk **324** and extends into an arcuate slot **327** in the gear **321** so that the shaft **322** may have a limited amount of rotation with respect to the gear **321**. The mileage wheels **37** are of the usual construction and are mounted on a shaft **330** which is journalled in the plates **310** and **60**. A ratchet wheel **331** is rotatably mounted on the shaft **330** in a position to drive the mileage wheels. A pawl **332**, as shown in Fig. 17, is pivotally mounted at **333** on a rock plate **334**, the pawl being provided at its rear end with a pin **335** which engages the plate **334** in a slot **336**. A spring **337** extends between the pin **335** and a pin **342**, the latter being mounted in plate **334**, so as to maintain the parts in the position shown in Fig. 17. This construction permits the pawl **332** to be retracted over a tooth of the ratchet wheel **331** when the plate **334** is rocked as hereinafter described.

The plate **334** is pivotally mounted, by means of a hub **334***a*, on a pillar **338** extending from plate **310**, and is provided with a roller **339** at its lower corner. A cam **340** is mounted on the shaft **322**, the cam having a drop face **341**, so that as the cam is rotated in the direction shown by the arrow, the plate **334** will be elevated, and the pivotally mounted pawl **332** will be withdrawn over one tooth of the ratchet wheel **331**. After the drop face **341** has cleared the center line of the roller **339**, the spring **343**, which is tensioned between a pin **344** and the pin **342**, will cause the plate **334** to be returned to its normal position, thereby advancing the ratchet and the type wheels by one step. A locking pawl **345**, which is mounted on a shaft **346** journalled in plates **310** and **60**, is provided to prevent reverse rotation of the ratchet wheel **331** during operation of the pawl **332**. A leaf spring **347** is provided to urge the locking pawl into contact with the ratchet wheel **331**. As shown in Fig. 16, the usual pinions **348** are rotatably mounted on a shaft **346** which provide the carry-over from one of the mileage wheels **37** to an adjacent wheel.

In operation, it will be seen that the mileage wheels are advanced step by step by the rotation of the speedometer cable through the pawl and ratchet mechanism which is actuated by the cam **340**. The association of the gear **321** with the shaft **322** is such as to permit the substantially instantaneous drop-off of the plate **334** with respect to the cam **340**. This provides a step by step advance of the mileage wheels, which is desirable in a printing recorder, as contrasted with a continuous rotation of the tenths of a mile indicating wheel in the usual speedometer. Furthermore there is sufficient power in the spring **343** to advance not only the tenths of a mile wheel, but also any of the other wheels which are at that moment being carried over or advanced one step.

Means are also provided to actuate the printing hammer **180** automatically by the starting and by the stopping of the truck. These means include an arm **350** (Figs. 5, 18 and 19), which comprises a bent-over portion at the end of the vertical arm of the crank **213**, this arm extending horizontally through an aperture **351** in plate **60**. The arm **350** is adapted to be engaged and displaced in a forward direction by either an upper pusher bar **352** or a lower pusher bar **354**, each of these bars being provided with shoulders **353** and **355** respectively which effect this displacement. The pusher bars are linked to a rock plate **356** by means of studs **358** and **359** respectively, this construction being shown in Figs. 18 to 21. The rock plate **356** is mounted on or forms a part of a hub **375**, which hub is rotatably mounted on a shaft **357** which is journalled in the plates **310** and **60**.

A spring **360** supports the forward end of the upper pusher bar **352**, the other end of the spring being secured to a pin **361** mounted in plate **60**. The forward end of the lower pusher bar **354** is similarly supported by a spring **362** which is secured to a similar pin **363**. In operation, it will be seen that the springs **360** and **362** urge the pusher bars upwardly against the arm **350**. When the truck is started, the rock plate **356** is rocked in the clockwise direction from its position shown in Fig. 21 to the position shown in Fig. 19, thereby causing the upper pusher bar to displace the arm **350** and actuate the printing hammer. When the truck is stopped, means are provided to rock the plate **356** in the opposite direction, causing displacement of the arm **350** by the lower pusher bar **354**. When the arm **350** is displaced, the crank **213** is rotated and the recorder circuit through the microswitch **57** is closed in the manner hereinbefore described.

An arm **364** extends downwardly from the hammer shaft **183** in a position so that it will engage both of the pusher bars **352** and **354** during the printing operation. This causes both pusher bars to be depressed against the tension of the springs **360** and **362** and to clear the arm **350** so that the latter may return to its normal position through the action of the spring **235**. When the hammer is again cocked at the conclusion of the printing operation, the pusher bars again engage the arm **350** in a manner so as to permit subsequent operation.

A pinion **365** is mounted on the shaft **311** and engages a gear **366** which forms a part of a clutch assembly illustrated in Fig. 20 and designated generally by the reference numeral **367**. This clutch assembly and a differential assembly **368** are mounted on the shaft **357** and constitute means to rock the rock plate **356** in order to initiate the printing operation.

A hub member **370** is provided on the shaft **357** and supports a shaft **371** which is perpendicular to the shaft **357**. Bevelled pinions **372** and **373** are suitably mounted on the perpendicular shaft **371**, and form a part of the differential assembly **368**. A bevelled gear **374** is secured to, or may form a part of the hub **375**, and meshes with the bevelled pinions **372** and **373**. Another bevelled gear **376** is disposed on the other side of the differential assembly and meshes with the pinions **372** and **373**, this bevelled gear **376** being mounted on or forming a part of a sleeve **377**. The sleeve **377** is carried on a bushing **378**, which bushing is staked to plate **310**. The reduced end of the shaft **357** is journalled in the end of the bushing **378**.

One end of the sleeve **377** is provided with screw threads **379** which cooperate with a threaded flanged sleeve **380**. The flanged sleeve may be provided with a keyway **381** in its sleeve portion, and a clutch plate **382** is slidably mounted on this sleeve portion and is keyed thereto so as to rotate therewith. Another clutch plate **383** forms a part of the sleeve **377**, and the two clutch plates **382** and **383** cooperate with the gear **366** in clutched relationship. A spring **384** in the form of a spider is confined between the flanged sleeve **380** and the clutch plate **382** and serves to urge the latter against the gear **366** with a predetermined degree of tension. A lock nut **385**

may be provided for the threaded portion 379 of the sleeve 377 so that the tension of the spring 384 may be regulated.

It will be seen that as the gear 366, which is rotatably mounted on the sleeve 377, is rotated by the speedometer cable, that its rotation will be transmitted through the clutch plates 382 and 383 to the bevelled gear 376 which forms one element of the differential assembly 368. Inasmuch as rotation of the hub 370 is limited, the rotation of the bevelled gear 376 will cause the bevelled gear 374 and the rock plate 356 to be rotated in the clockwise direction as shown in Fig. 21. This action occurs when the truck is first started, and causes the printing operation to take place.

The rock plate 356 is provided with a shoulder 386 which abuts against a spacer member 387 to limit the rotation of the rock plate in the clockwise direction. A spring 388 extends between the rock plate 356 and a spacer 389. When the truck is started as above described, the rotation of the rock plate in the clockwise direction will tension the spring 388, and after the rock plate and its associated parts have reached the limit of their rotation, the clutch assembly 367 will slip, but the rock plate will remain in its "going" position as shown in Fig. 19 due to the action of the clutch.

When the truck has come to a stop, the bevelled gear 376 will remain stationary, and the spring 388 will cause the rock plate 356 to be rotated in a counter-clockwise direction, the extent of its rotation in this direction being limited by the abutting of the corner 390 of the rock plate against the spacer 387. The speed with which the rock plate is returned to its "stopped" position is determined by the clockwork 74 which is associated with the middle element of the differential, namely the hub 370. This limitation on the speed of the rotation of the rock plate in the counter-clockwise direction determines the two minute delay after the truck has come to a stop and after which the printing mechanism is actuated.

A driving gear 391 is secured to the shaft 357 by means of a hub 392, and as shown in Fig. 18, it drives the usual clock work comprising the balance wheel 393 and the escapement mechanism 394 through the usual train of gears.

In Figs. 5 and 21 the pusher bars are shown in their position when the truck is stopped. Just after the truck has been started, the arm 350 has been displaced to its dotted line position as shown in Fig. 19 by the shoulder 353 of the upper pusher bar 352. In this position of the arm 350, the motor circuit through the microswitch 57 is closed, and when the hammer 180 has been released, the arm 364 depresses the pusher bars as shown in Fig. 18 so that they clear the arm 350. The relationship of the arm 364 with respect to the cam 238, which is also on the hammer shaft 183, is such that before the pusher bars are permitted to return to their elevated position, the crank 213 and the arm 350 have moved back into the position as shown in Fig. 19 wherein the arm 350 has cleared the shoulder 353 and is in position to be engaged by the shoulder 355 of the lower pusher bar 354. This is the normal position of the parts as long as the truck is going.

After the truck has stopped, there will be a delay of two minutes as above described, before the shoulder 355 of the lower pusher bar 354 has displaced the arm 350 to an extent sufficient to initiate the printing operation. During the printing operation, the pusher bars will be depressed to permit the return of the arm 350 to its normal position, and at the conclusion of the printing operation, the parts will be again in the position as shown in Figs. 5 and 21, in which the upper pusher bar 352 has been retracted sufficiently so that the shoulder 353 is in position to engage the arm 350 when the truck is again started. Of course if the truck starts before the two minutes are up, the plate is immediately rocked in the clockwise direction as viewed in the drawings, retracting the lower pusher bar 354 so that the printing hammer will not be tripped.

The means for rotating the "G" wheel 43 into and out of printing position is shown in Figs. 16, 18 and 19. As pointed out above, this wheel prints a "G" if the printing operation is made while the truck is going, but if the printing operation occurs when the truck is stopped, no G will be printed. This action is effected by linking the G wheel 43 to the upper pusher bar 352.

A cut-away portion is formed in the G wheel 43 so as to provide a shoulder 395 which is adapted to abut against a pin 396, extending inwardly from the plate 60. A pin 397 projects from the side of the G wheel 43, and a spring 398 is tensioned between the pin 397 and between a spacer 399 so as to urge the shoulder 395 against the pin 396, this being the printing position of the G wheel. An actuating lever 400 is pivoted on a pivot pin 401 extending inwardly from the plate 60, the lower end of the actuating lever being bifurcated as shown at 402 and engaging a pin 403 in the upper pusher bar 352.

When the truck is at rest, the upper end of the actuating lever 400 bears against the pin 397 so as to rotate the G wheel 43 into non-printing position, the position of the parts at this time being shown in dotted lines in Fig. 19. When the truck is going however, the pusher bar 352 is maintained in an advanced position, which causes the actuating lever 400 to be withdrawn from contact with the pin 397, and the spring 398 maintains the type wheel 43 in its printing position. This position of the parts is shown in solid lines in Fig. 19 and in Fig. 18.

It will be observed in Fig. 5 that when the parts are at rest, there is a certain amount of clearance between the lug 215, forming a part of the crank 213, and the horizontal lever 216. This clearance provides a certain amount of free movement or play when the button 32 is depressed before the second linkage, which includes the horizontal member 216, is engaged to close the microswitch 57. It is during this free movement of the first linkage which includes the crank 213 that the segment 42 is brought into its printing position. Similarly, when the printing operation is automatically effected by the starting of the truck, this free movement permits the G wheel 43 to be brought into printing position before the printing operation.

As pointed out above, after stopping the truck it requires two minutes to take up this free movement together with any additional play which is provided by the clearance between either one of the shoulders 353 or 355 of the pusher bars and the arm 350, before the motor circuit is closed, this delay being controlled by the clockwork 74. Similarly, the truck must be driven a predetermined distance after starting, before the recorder circuit is closed, this distance being determined by the extent of the rotation permitted by the

rock plate 356 and also by the speed of the rotation of the clockwork. This slight delay eliminates unnecessary printing operations in the event that there are several stops and starts, due to traffic conditions, when the truck is first started. In the embodiment of the invention herein shown, the recording operation does not take place after the truck has been started, until after the truck has gone from eighty to one hundred feet. Obviously this delay can be changed one way or the other by proportioning the parts in a different manner.

The operation of the various parts and mechanisms have been pointed out above in connection with the description of those parts. When the recorder is first installed in the truck, a connection is made between the speedometer cable and the lower end of the shaft 315. The clock hands 27 and 28 are then set to the correct time by rotating the gear 161 after the latter parts have been declutched by the displacement of the lever 151. The date wheel 41 is so associated with the hour wheel 40 that it may be set merely by manually rotating the same. The clockwork 71 is then started by displacing the lug 128 in order to tension initially the clock spring 107. This lug 128 is readily accessible when the hinged plate 75 is lifted.

A roll of tape 275 may at this time be placed between the arms 276 of the bracket 270, and the end of the tape threaded around the guides 277, 76 and 77 and fed into the channel 278 and between the rollers 79 and 82. It will be noted that an additional guide member 287 in the form of a curved strip of metal attached to the wall 273 of the bracket, is provided to maintain the tape 26 clear of the hammer 180 and its associated mechanism, in the event that the roll of tape 275 tends to unwind too quickly. The housing 25 is then placed over the base 33 and is locked in position.

A typical series of entries on the tape 29 is shown in Fig. 2. When the truck driver checks in in the morning, his time can be recorded by pressing the button 32. This entry, the bottommost entry on the tape as shown in Fig. 2, is indicated by the asterisk as being a manual entry. The absence of the "G" indicates that the entry is made when the truck is stopped. The second entry indicates the time and mileage of starting, in this entry the "G" indicating that the entry was made while the truck was going, and the absence of the asterisk indicating that the entry was made automatically. The third entry was automatically made two minutes after the truck had been stopped, and the fourth entry shows that the truck got started again fifteen minutes later. The fifth entry is indicated by the presence of the "G" and the asterisk to be a manual entry which was made while the truck was going, this entry presumably being made in accordance with certain instructions for the employee to record the time and mileage when a predetermined point, such as a state line, is passed. The sixth entry indicates the times and mileage of another stop, which may be the termination of the trip.

The manner in which the tape may be advanced manually to make written entries thereon is indicated in Fig. 1.

The first or bottommost entry indicates that a stop was made at 4:46 due to an accident. The operator manually advanced the tape and entered the cause of the stop on the tape, thus providing valuable evidence as to the time and location of the accident. The second entry shows that, after the accident, the truck got going fifteen minutes later. The third entry is a manual entry and the figure shows how the tape may be advanced to indicate that a state line had been crossed at this point.

The tape 29 and the inked ribbon 257 are automatically advanced during each printing operation. If it is desired to make a written notation to explain any stop, or any other entry, this can be done by operating the slide 31 to bring that entry on the tape into exposed position as shown in Fig. 1. The entry can then be made on the tape, the plate 75 serving as a backing.

Although this invention has been shown primarily as applied to a truck recorder, it is obvious that the mechanism is well adapted for many other applications. For instance whenever the stopping or starting of any rotatable element is to be recorded, this mechanism can be adapted to make such a record, showing both the time and the number of revolutions of the rotatable element. For instance this invention may be adapted to be used as a production meter, and, in any such specific application, the automatic delay may be lengthened, or it may be shortened to any degree, or omitted altogether.

It will be obvious to those skilled in the art that various modifications and changes in the size, shape and proportion of the parts may be effected without departing from the spirit of this invention. The above description relates to a preferred embodiment only and is not intended to limit the scope of this invention which is defined in the appended claims.

We claim:

1. A truck operation recorder comprising recording mechanism, automatic means for actuating said recording mechanism after the truck is started, a timing mechanism, means driven thereby, means effective when the truck comes to a stop for initiating the operation of said means driven by said timing mechanism to measure a predetermined time interval, and means effective at the end of said interval for automatically causing the actuation of said recording mechanism.

2. A truck operation recorder comprising recording mechanism, automatic means for actuating said recording mechanism after the truck is started, automatic means for actuating said recording mechanism after said truck has stopped, additional recording means, and means for rendering said additional recording means operative only when said truck is in motion for differentiating between entries made by the stopping and by the starting of said truck.

3. A truck operation recorder comprising recording mechanism, automatic means for actuating said recording mechanism after the truck is started, manual means for actuating said recording mechanism, additional recording means, and means associated with said manual actuating means for rendering said additional recording means operative to differentiate those entries made by manual actuation from those made automatically.

4. A truck operation recorder comprising a tape, recording mechanism for printing entries on said tape, automatic means for actuating said recording mechanism after the truck has started and after the truck has stopped, manual means for actuating said recording mechanism, additional recording mechanism associated with said manual actuating means for recording on said tape indicia indicating whether or not a particular entry was made by automatic or by man-

ual actuation, and other additional recording mechanism associated with said automatic actuating means for recording on said tape indicia indicating whether or not a particular entry was made after the truck has started or after the truck has stopped.

5. In a recording device, type wheels, a printing hammer for cooperation therewith, means for operating said printing hammer including a displaceable member for initiating operation thereof, a rotatable driving element, means frictionally associated with said driving element and adapted to be driven thereby upon rotation of said driving element in order to displace said displaceable member, and means adapted for operation after said driving element has come to a stop for displacing said displaceable member.

6. In a recording device, type wheels, a printing hammer for cooperation therewith, means for operating said printing hammer including a displaceable member for initiating operation thereof, a rotatable driving element, means frictionally associated with said driving element and adapted to be driven thereby upon rotation of said driving element in order to displace said displaceable member, means adapted for operation after said driving element has come to a stop for displacing said displaceable member, and clockwork associated with said last named means to delay the operation of said printing hammer for a predetermined interval after said driving element has come to a stop.

7. In a recording device, a rotatable driving element, printing mechanism adapted for automatic operation upon the starting and stopping thereof, a rock plate associated with said driving element and associated with said printing mechanism so as to cause the operation thereof when rocked in either direction, means to limit the displacement of said rock plate from its original position, means to transmit torque to said rock plate from said driving element to cause the operation of said printing mechanism during rotation of the rock plate into displaced position and to cause said rock plate to remain in said displaced position during the continued rotation of said driving element, and means to return said rock plate to its original position after said driving element has ceased its rotation to cause another operation of said printing mechanism.

8. In a recording device, type wheels, a printing hammer for cooperation therewith, means for operating said printing hammer including a displaceable member for initiating operation thereof, a rotatable driving element, a rock plate frictionally associated with said driving element and adapted to be rotated thereby to a limited extent, two reciprocable elements associated with said rock plate and adapted alternatively to engage said displaceable member to initiate the operation of said printing hammer so that when said driving element starts its rotation, said rock plate will be rotated through a predetermined distance by said rotating driving element causing one of said reciprocable elements to engage said displaceable member and the other of said reciprocable elements to be retracted, and means associated with said rock plate to bias it in a direction opposite to that in which it is rotated by said rotatable driving member whereby said second reciprocable element engages said displaceable member and said first reciprocable element is withdrawn after said driving element has ceased its rotation.

9. In a recording device, type wheels, a printing hammer for cooperation therewith, means for operating said printing hammer including a displaceable member for initiating operation thereof, a rotatable driving element, a rock plate frictionally associated with said driving element and adapted to be rotated thereby to a limited extent, two reciprocable elements associated with said rock plate and adapted alternatively to engage said displaceable member to initiate the operation of said printing hammer so that when said driving element starts its rotation said rock plate will be rotated through a predetermined distance by said rotating driving element causing one of said reciprocable elements to engage said displaceable member and the other of said reciprocable elements to be retracted, means associated with said rock plate to bias it in a direction opposite to that in which it is rotated by said rotatable driving member whereby said second reciprocable element engages said displaceable member and said first reciprocable element is withdrawn after said driving element has ceased its rotation, and means associated with said printing hammer and operable therewith to cause disengagement of said reciprocable elements from said displaceable member whereby the latter is automatically restored to its normal position after each printing operation.

10. In a recording device, a rotatable driving element, printing mechanism adapted for automatic operation upon the starting and stopping thereof, a displaceable member adapted, when displaced, to actuate said printing mechanism, a rock plate frictionally associated with said driving element and adapted to be rotated thereby to a limited extent in a forward direction, two reciprocable elements associated with said rock plate and adapted alternatively to engage said displaceable member so that said rock plate will be rotated in a forward direction through a predetermined distance by the rotation of said driving element thereby causing one of said reciprocable elements to engage said displaceable member and the other of said reciprocable elements to be retracted, differential mechanism interposed between said rock plate and said rotatable driving member so as to permit reverse rotation of said rock plate independently of said rotatable driving member, and means associated with said rock plate to bias it in said reverse direction whereby said second reciprocable element engages said displaceable member and said first reciprocable element is withdrawn after said driving element has ceased its rotation.

11. In a time recording device, a rotatable driving member the starting and stopping of which are to be recorded, recording mechanism, an oscillatable control member associated with said recording mechanism in a manner so as to cause operation thereof each time its motion is reversed, time responsive driving means for said control member, and means for associating said driving member with said control member so as to cause movement of the latter in a direction opposite to that in which said time responsive driving means tends to move said control member, when said driving member is rotating in excess of a given speed, whereby the direction of said control member will be reversed to cause operation of said recording mechanism each time said driving member starts and stops.

12. In a time recording device, a rotatable driving member the starting and stopping of which are to be recorded, recording mechanism, an oscillatable control member associated with said

recording mechanism in a manner so as to cause operation thereof each time its motion is reversed, a three element differential mechanism, said control member being associated with one element thereof, said driving member being associated with the second element thereof in a manner to drive said control member in a given direction, and clockwork associated with the third element of said differential in a manner to drive said control member in a direction opposite to said given direction at a rate of speed less than the normal speed of said driving member whereby the motion of said control member will be reversed to cause operation of said recording mechanism each time said driving member starts and stops.

13. In a time recording device, a rotatable driving member the starting and stopping of which are to be recorded, recording mechanism, an oscillatable control member associated with said recording mechanism in a manner so as to cause operation thereof each time its motion is reversed, means to bias said control member in one direction, a three element differential mechanism, one element being associated with said control member, a second element being associated with said rotatable driving member and tending to move said control member in the opposite direction, the third element being free for unidirectional rotation when one or the other of said elements is rotated, and an escapement mechanism driven by said third element to limit the speed of rotation thereof to a speed less than the normal speed of rotation of said rotatable driving member, whereby the motion of said control member will be reversed by the starting and by the stopping of said rotatable driving member.

14. In a recording device for recording an interruption exceeding a predetermined minimum, a rotatable driving member the interruption of which is to be recorded, recording mechanism, a rock plate mounted for limited displacement from a normal position and associated with said recording mechanism in a manner so as to cause operation thereof when returned to normal position, means to bias said rock plate into normal position, a three element differential mechanism, one element being associated with said rock plate, a second element being frictionally associated with said rotatable driving member, and the third element being free for unidirectional rotation when one or the other of said elements is rotated, and an escapement mechanism driven by said third element to limit the speed of rotation thereof.

15. In a time recording device, a rotatable driving member whereof the starting and stopping times are adapted to be recorded, recording mechanism, a rock plate mounted for limited rotation and associated with said recording mechanism in a manner so as to cause operation thereof when rocked through certain positions, one position being provided for each direction of rotation, means to bias said rock plate in one direction, a three element differential mechanism, one element being associated with said rock plate, a second element being frictionally associated with said rotatable driving member, and the third element thereof being free for unidirectional rotation when one or the other of said elements is rotated, and an escapement mechanism driven by said third element to limit the speed of rotation thereof to a speed less than the normal speed of rotation of said rotatable driving member, whereby said rock plate will be rotated against said biasing means to the limit of its rotation in one direction by the starting of said rotatable driving member, thereby causing the operation of said recording mechanism, and said rock plate will be rotated in the opposite direction by said biasing means after the stopping of said rotatable driving member, thereby causing the operation of said recording mechanism after an interval determined by the speed of rotation of said third element.

16. In a truck operation recorder of the class described comprising type wheels, a pivotally mounted printing hammer for cooperation with said type wheels, means for biasing said printing hammer into contact with said type wheels, an arm associated with said hammer, a cam mounted for cooperation with said arm to rotate said hammer into a retracted position in opposition to said biasing means, means for rotating said cam, and means for interrupting the rotation of said cam in a position wherein said hammer is maintained in said retracted position, whereby subsequent rotation of said cam will permit said arm to drop off said cam, thereby permitting said spring to operate said hammer.

17. In a truck operation recorder of the class described comprising type wheels, a pivotally mounted printing hammer for cooperation with said type wheels, said printing hammer being secured to a rotatable shaft, a spring for biasing said shaft and said printing hammer into contact with said type wheels, an arm secured to said shaft, a cam mounted for cooperation with said arm to withdraw said hammer into a cocked position against the bias of said spring, a motor for driving said cam, and means for stopping said motor in a position wherein said hammer is withdrawn into cocked position, whereby subsequent rotation of said cam will permit said arm to drop off said cam, thereby permitting said spring to operate said hammer.

18. In a truck operation recorder of the class described, a pivoted printing hammer biased into printing position, a cam for causing said printing hammer to be retracted into a cocked position and for subsequently releasing said hammer, an electric motor for rotating said cam, a switch in circuit with said electric motor to interrupt the operation thereof just prior to the release of said hammer, a control cam driven by said motor, a pivoted member for cooperation with said control cam and associated with said switch so that when displaced by said cam, the switch will be maintained in closed circuit position, said control cam being provided with a drop face at one point in its periphery to permit the switch to return to open circuit position after said control cam has been rotated through a complete revolution, and means engaging said pivoted member for initially closing the circuit through said switch and through said motor whereby said first mentioned cam will be caused to rotate through a single cycle.

19. In a truck operation recorder of the class described, a pivoted printing hammer biased into printing position, a cam for causing said printing hammer to be retracted into a cocked position and for subsequently releasing said hammer, an electric motor for rotating said cam, a switch in circuit with said electric motor to control the operation thereof, and means to operate said switch, said means including a second cam coaxially secured to said first cam and a switch actuating member adapted to be displaced by said second cam to maintain said switch in closed

circuit position, said second cam being provided with a drop face at one point in its periphery to permit the switch to return to open circuit position after said second cam has been rotated through a complete revolution, the angular relationship of said first and second cams being such that said switch actuating member will drop and cause the circuit to be opened when said printing hammer is in cocked position, and prior to the release thereof by said first cam.

20. In a truck operation recorder of the class described, a pivoted printing hammer biased into printing position, a cam for releasing said printing hammer and for subsequently retracting the same into a cocked position, an electric motor for driving said cam, a switch in circuit with said electric motor to control the operation thereof, and single cycle control means for said switch, said means including a second cam coaxially mounted on said first cam, a switch actuating member adapted to be displaced by said second cam to maintain said switch in closed circuit position, said cam being provided with a drop face at one point in its periphery to permit the switch to return to open circuit position after both of said cams have been rotated through a complete revolution, means engaging said pivoted member for initially closing the circuit through said switch and through said motor, and means associated with said printing hammer for maintaining said last named means in displaced position after the printing hammer has been tripped and until such time as said cam engages said pivoted member and maintains the same in closed circuit position.

21. Recording mechanism comprising type wheels, a printing hammer for cooperation therewith, a motor for controlling the operation of said printing hammer, a switch for said motor, a cam driven by said motor, a cam follower associated with said switch for maintaining said switch in closed circuit position during a complete printing operation, a spring biased member adapted to be displaced into engagement with said cam follower to close said switch and to initiate said printing operation, a rock plate, two reciprocable bars associated therewith and adapted alternatively to engage said spring biased member to initiate said printing operation as said rock plate is rotated in either direction, a rotatable driving member, the starting and stopping of which is to be recorded, means to transmit torque from said rotatable driving member to said rock plate during rotation of the former, additional means for applying a lesser torque to said rock plate in the opposite direction, and means to limit the extent of the rotation of said rock plate in either direction, whereby said rock plate will be rocked to the limit of its rotation in one direcion to effect a printing operation by said rotatable driving element when the latter commences to rotate, and will be rocked to the limit of its rotation in the opposite direction by said additional torque applying means when said rotatable driving element ceases its rotation to effect another printing operation.

22. Recording mechanism comprising type wheels, a printing hammer for cooperation therewith, a motor for controlling the operation of said printing hammer, a switch for said motor, a cam driven by said motor, a cam follower associated with said switch for maintaining said switch in closed circuit position during a complete printing operation, a spring biased member adapted to be displaced into engagement with said cam follower to close said switch and to initiate said printing operation, manually displaceable means for engaging and displacing said spring biased member, means associated with said printing hammer for maintaining said spring biased member in displaced position until said printing hammer has performed a printing operation, a type wheel for cooperation with said printing hammer and adapted for rotation into and out of printing position to indicate whether a given printing operation was effected by said manually displaceable means, said latter, upon manual displacement, engaging said type wheel to rotate the same into printing position, and said spring biased member engaging said type wheel to rotate the same out of printing position so as to provide the desired indication by said type wheel even though the manual pressure on said manually displaceable member is released prior to the printing operation.

23. Recording mechanism comprising type wheels, a printing hammer for cooperation therewith, a motor for controlling the operation of said printing hammer, a switch for said motor, a cam driven by said motor, a cam follower associated with said switch for maintaining said switch in closed circuit position during a complete printing operation, a spring biased member adapted to be displaced into engagement with said cam follower to close said switch and to initiate said printing operation, a rock plate for displacing said spring biased member to initiate said printing operation as said rock plate is rotated in either direction, a rotatable driving element, the starting and stopping of which is to be recorded, means responsive to the starting of the rotation of said driving element to rock said rock plate in one direction and responsive to the stopping of the rotation of said driving element to rotate said rock plate in the opposite direction, and a rotatably mounted type wheel actuated by said rock plate to indicate whether said printing operation has been effected during rotation of said rotatable driving member, or when the same is at rest.

24. In a truck operation recorder for recording the times at which a truck is started and stopped, type wheels for recording said times, electromagnetic means for advancing said type wheels, clockwork for controlling the operation of said electromagnetic means, a second electromagnetic means for tensioning said clockwork when said first mentioned electromagnetic means is operated, and manual means for initially tensioning said clockwork whereby the device may be initially set in operation.

25. In a truck operation recorder, a printing hammer, actuating means to effect a printing operation, a speedometer cable, a cam having a drop face driven by said speedometer cable, mileage indicating type wheels, a ratchet wheel in driving relationship thereto, a pawl for said ratchet wheel, said pawl being operated by said cam so that said ratchet wheel and said type wheels will be advanced step by step when said pawl drops off said drop face, said cam having a limited amount of free movement with respect to said speedometer cable to permit a complete drop on the part of said pawl, and a spring to effect said drop.

26. In a recording mechanism, type wheels, a ratchet wheel associated with said type wheels, an electromagnet adapted to be energized by minute impulses, an armature for cooperation with said electromagnet, a pawl mounted on said

armature for cooperation with said ratchet wheel to advance the same one notch at a time, a second pawl actuated by said armature for engaging said ratchet wheel when said armature is in attracted position to prevent rotation of said ratchet wheel, and an operating spring associated with said armature for advancing said ratchet wheel after deenergization of said electromagnet.

27. In a recording mechanism, type wheels, a ratchet wheel associated with said type wheels, an electromagnet adapted to be energized by minute impulses, an armature for cooperation with said electromagnet, a pawl mounted on said armature for cooperation with said ratchet wheel to advance the same one notch at a time, a second pawl actuated by said armature for engaging said ratchet wheel when said armature is in attracted position to prevent rotation of said ratchet wheel, an operating spring associated with said armature for advancing said ratchet wheel after deenergization of said electromagnet, and means to hold said first pawl against said ratchet wheel when said armature is in unattracted position to prevent rotation of said ratchet wheel until subsequent energization of said electromagnet.

28. In a recording mechanism, type wheels, a ratchet wheel associated with said type wheels, an electromagnet adapted to be energized by electric impulses, an armature for cooperation with said electromagnet, a pawl pivotally mounted on said armature for cooperation with said ratchet wheel to advance the same one notch at a time, a stop member disposed adjacent to an edge of said pawl to prevent pivotal movement of said pawl away from the surface of said ratchet wheel when said armature is in unattracted position whereby said ratchet wheel is locked in a predetermined position against forward rotation, and an operating spring associated with said armature for advancing said pawl and said ratchet wheel after deenergization of said electromagnet into said predetermined locked position.

29. In a recording mechanism having type wheels which are advanced step by step by an electromagnetically actuated pawl and ratchet mechanism, a ratchet wheel geared to said type wheels, an armature, a pawl pivotally mounted on said armature, and means for locking said ratchet wheel in a series of predetermined positions against accidental rotation, said means including a spring biased locking pawl to prevent reverse rotation of said ratchet wheel at all times, a second locking pawl normally disengaged from said ratchet wheel but actuated by the movement of said armature into its attracted position to lock said ratchet wheel against forward rotation while said armature remains in its attracted position, and means to wedge said first mentioned pawl against said ratchet wheel to lock the same against forward rotation when said armature is in its unattracted position.

30. In a recording mechanism, type wheels, electromagnetic means for driving said type wheels including a pawl driven by said electromagnet means, a ratchet wheel for cooperation with said pawl, a shaft for said ratchet wheel, an axially shiftable sleeve mounted on said shaft, clutching means associated with said ratchet wheel and with said axially shiftable sleeve so as to permit rotation of the latter by the former, said type wheels being associated with said axially shiftable sleeve so as to be driven by said ratchet wheel through said clutch means and manually actuated means engaging said sleeve for shifting the same in an axial direction so as to cause disengagement of said clutching means, whereby the position of said type wheels may be shifted with respect to said ratchet wheel.

31. In a recording mechanism of the type described, rotatable type wheels, driving mechanism therefor, a clutch interposed between said type wheels and said driving mechanism, a laterally displaceable control member for said clutch, a spring biasing said control member and said clutch into engaged position, and a manual setting wheel for said type wheels disposed adjacent an end of said control member, the end of said control member being bent over to obstruct ready access to said manual setting wheel whereby said control member may be displaced to permit free rotation of said manual setting wheel and of said type wheels and said manual setting wheel may be rotated in a single operation.

32. A truck operation recorder of the class described including time recording type wheels, electromagnetic means for advancing said time recording type wheels, a circuit including said electromagnetic means, a relay for controlling said circuit, a control circuit for said relay, means for closing said control circuit at predetermined intervals, clockwork for controlling said circuit closing means, and second electromagnetic means forming a part of said first mentioned circuit for tensioning said clockwork at said predetermined intervals.

33. A truck operation recorder of the class described including time recording type wheels and mileage recording type wheels, a speedometer cable for driving said mileage recording type wheels, electromagnetic means for advancing said time recording type wheels, a circuit including said electromagnetic means, a relay for controlling said circuit, a second circuit for said relay, contact means for momentarily closing said second circuit at predetermined intervals, spring driven clockwork for controlling said circuit closing means, second electromagnetic means in circuit with said first mentioned electromagnetic means for tensioning said clockwork at said predetermined intervals, impression means for cooperation with said type wheels, a third circuit including an electric motor for controlling the operation of said impression means, and a switch for said third circuit which is actuated by the starting and stopping of said speedometer cable.

34. In a truck operation recorder, clockwork, a spring for driving said clockwork, cam means driven by said clockwork, an electric control circuit including contact members which are operated by said cam means, electromagnetic means controlled by said control circuit for tensioning said spring, a rock plate driven by said spring, pawl and ratchet mechanism for associating said rock plate and said clockwork in driving relationship, type wheels for recording the time at which said truck is started and stopped, and second electromagnetic means controlled by said control circuit for advancing said type wheels step by step.

35. In a truck operation recorder, clockwork, a spring for driving said clockwork, cam means driven by said clockwork, an electric circuit including contact members which are operated by said cam means, a rock plate driven by said spring, pawl and ratchet mechanism for associating said rock plate and said clockwork in driving relationship, electromagnetic means engaging said rock plate for rocking the same in the reverse direction to tension said spring when the circuit through said cam means is closed, a re-

silient coupling between said pawl and ratchet mechanism to maintain said clockwork under driving tension during reverse rotation of said rock plate, type wheels for recording the time at which said truck is started and stopped, and means controlled by said clockwork for advancing said type wheels.

36. A truck operation recorder of the class described including time recordling type wheels and mileage recording type wheels, a speedometer cable for driving said mileage recording type wheels, electromagnetic means for advancing said time recording type wheels step by step, time controlled means for controlling the operation of said electromagnetic means, printing means for cooperation with said type wheels, an electric motor for actuating said printing means, and control means for said electric motor responsive to the starting and stopping of said speedometer cable for causing a printing operation to take place when the truck starts and stops.

37. A time recorder comprising time responsive driving means, time indicating type wheels controlled thereby, impression means cooperating with said type wheels whereby a printed record may be made, a rotatable driving element, the times of the starting and stopping of which are adapted to be recorded by the cooperation of said impression means with said type wheels, additional time responsive driving means, and tripping means for said impression means responsive to the stopping and starting of said rotatable driving element, said tripping means being actuated alternately by the rotation of said rotatable driving element and by said additional time responsive driving means.

38. Recording mechanism comprising type wheels, a printing hammer for cooperation therewith, means for operating said printing hammer, a spring biased member for initiating a printing operation when displaced, a rock plate for displacing said spring biased member to initiate said printing operation as said rock plate is rotated in either direction, a rotatable driving element, the starting and stopping of which is to be recorded, and means responsive to the starting of the rotation of said driving element to rock said rock plate in one direction and responsive to the stopping of the rotation of said driving element to rotate said rock plate in the opposite direction.

39. Recording mechanism comprising type wheels, a printing hammer for cooperation therewith, means for operating said printing hammer, a spring biased member for initiating a printing operation when displaced, a rock plate for displacing said spring biased member to initiate said printing operation as said rock plate is rotated in either direction, a rotatable driving element, the starting and stopping of which is to be recorded, means responsive to the starting of the rotation of said driving element to rock said rock plate in one direction and responsive to the stopping of the rotation of said driving element to rotate said rock plate in the opposite direction, and means associated with said printing hammer for releasing said spring biased member immediately after said printing operation to prevent a second printing operation until subsequent rocking of said rock plate.

40. Recording mechanism comprising type wheels, a printing hammer for cooperation therewith, means for operating said printing hammer, a spring biased member for initiating a printing operation when displaced, a rock plate, two reciprocable bars associated therewith and adapted alternatively to engage said spring biased member to initiate said printing operation as said rock plate is rotated in either direction, a rotatable driving element, the starting and stopping of which is to be recorded, means responsive to the starting of the rotation of said driving element to rock said rock plate in one direction and responsive to the stopping of the rotation of said driving element to rotate said rock plate in the opposite direction, a rotatably mounted type wheel biased into printing position to indicate that a printing operation has been effected during rotation of said rotatable driving member, and a lever actuated by the movement of one of said reciprocal bars and engaging said type wheel to rotate said type wheel out of printing position when said rock plate is rotated in said opposite direction and to maintain said type wheel out of printing position until after said rotatable driving member has again started.

41. Control means for a truck recorder of the class described comprising a rotatable element responsive to the motion of the truck, a spring biased rock plate adapted to be rotated into a displaced position and maintained therein by the continued rotation of said rotatable element, an escapement mechanism to limit the rate of rotation of said rock plate back to normal position after said rotatable element has come to a stop, and means associating said escapement mechanism with said rotatable element and with said rock plate so that it will be unidirectionally rotated, first by said rotatable element and then by said spring biased rock plate, said rotation being continuous until said rock plate has been rotated back to its normal position.

42. In a recording device adapted to record the times at which the starting and stopping of a rotatable element occur, said recording device including printing means, tripping means for said printing means to initiate a printing operation, and means to actuate said tripping means including a rotatable element adapted to rotate at a speed in excess of a given rate, a second rotatable element driven thereby, a friction coupling between said rotatable elements, means to limit the rate of rotation of said second rotatable element, a second power source for causing the continued rotation of said second rotatable element when said first rotatable element has come to a stop, and means for storing energy in said second power source by the rotation of said rotatable element whereby said tripping means is actuated by said first rotatable element when the latter is first started, and is actuated by said second power source after said rotatable element has come to a stop.

43. In a recording device, a rotatable element, the starting of which is adapted to be recorded, printing mechanism, means for actuating said printing mechanism including a control member adapted for rotation through a predetermined distance after which said printing mechanism is actuated, two clutch plates secured thereto, and a gear disposed between said clutch plates and driven by said rotatable element whereby a continuous torque will be applied to said control member through said clutch plates to cause rotation thereof through said predetermined distance after the starting of said rotatable element, and means to block further rotation of said control member.

44. In a recording device having a rotatable control element adapted for rotation from a nor-

mal into a displaced position, and a driving element therefor, the starting of which is to be recorded as said control element is rotated through an intermediate position, clutch means interposed between said driving element and said control element whereby a torque may be continuously applied to the latter to cause it to be rotated into said displaced position and maintained therein upon the starting of and during the continued rotation of the former, said clutch means comprising a cylindrical member associated with said control element provided with a threaded end, a clutch plate rigidly secured to said cylindrical member, a second clutch plate keyed to said cylindrical member in axially shiftable relationship adjacent said threaded end, a nut on said threaded end, a gear wheel driven by said driving element and rotatably mounted on said cylindrical member between said clutch plates, and resilient means confined between said nut and said second clutch plate to urge the latter against said gear wheel and said gear wheel against said first clutch plate whereby the torque transmitted from said gear wheel to said clutch plates may be regulated by adjustment of said nut.

45. In a truck operation recorder, recording mechanism, a reciprocable member having two extreme positions, means for moving said member to one extreme position responsive to movement of the truck, timing mechanism for moving said member to its other extreme position after stopping of the truck, and means controlled by said member at each extreme position for actuating said recording mechanism.

GEORGE C. ENGEL.
LESLIE S. LYNCH, JR.
ETHEL I. EIDMANN,
Executrix of the Last Will and Testament of Frank L. Eidmann, Deceased.