March 1, 1955 H. K. RIXFORD ET AL 2,703,268

COORDINATED TIMING MECHANISM AND HAMMER MECHANISM FOR RECORDING APPARATUS

Original Filed Sept. 28, 1949 6 Sheets-Sheet 1

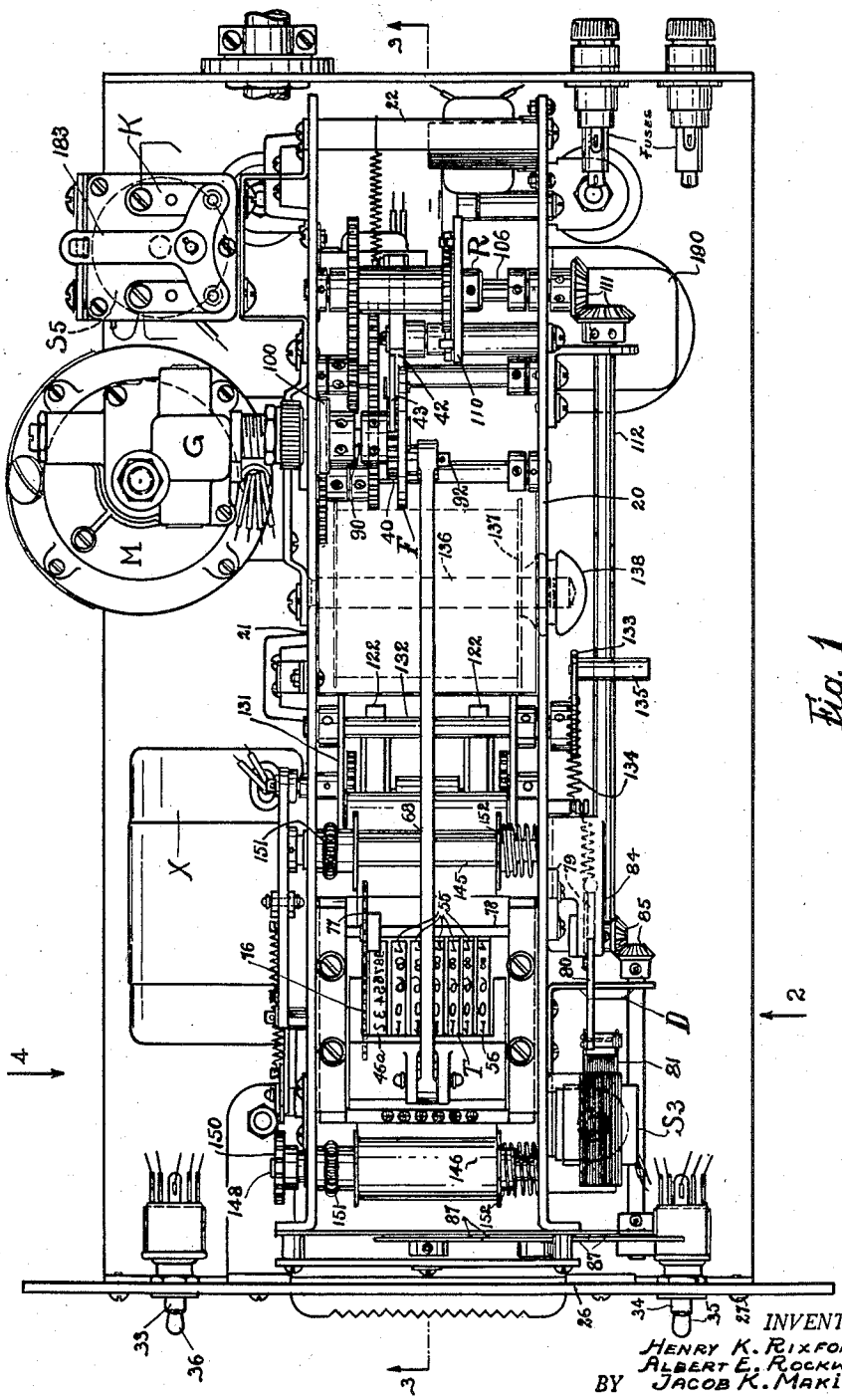


Fig. 1

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COORDINATED TIMING MECHANISM AND HAMMER MECHANISM FOR RECORDING APPARATUS

Original Filed Sept. 28, 1949 6 Sheets-Sheet 2

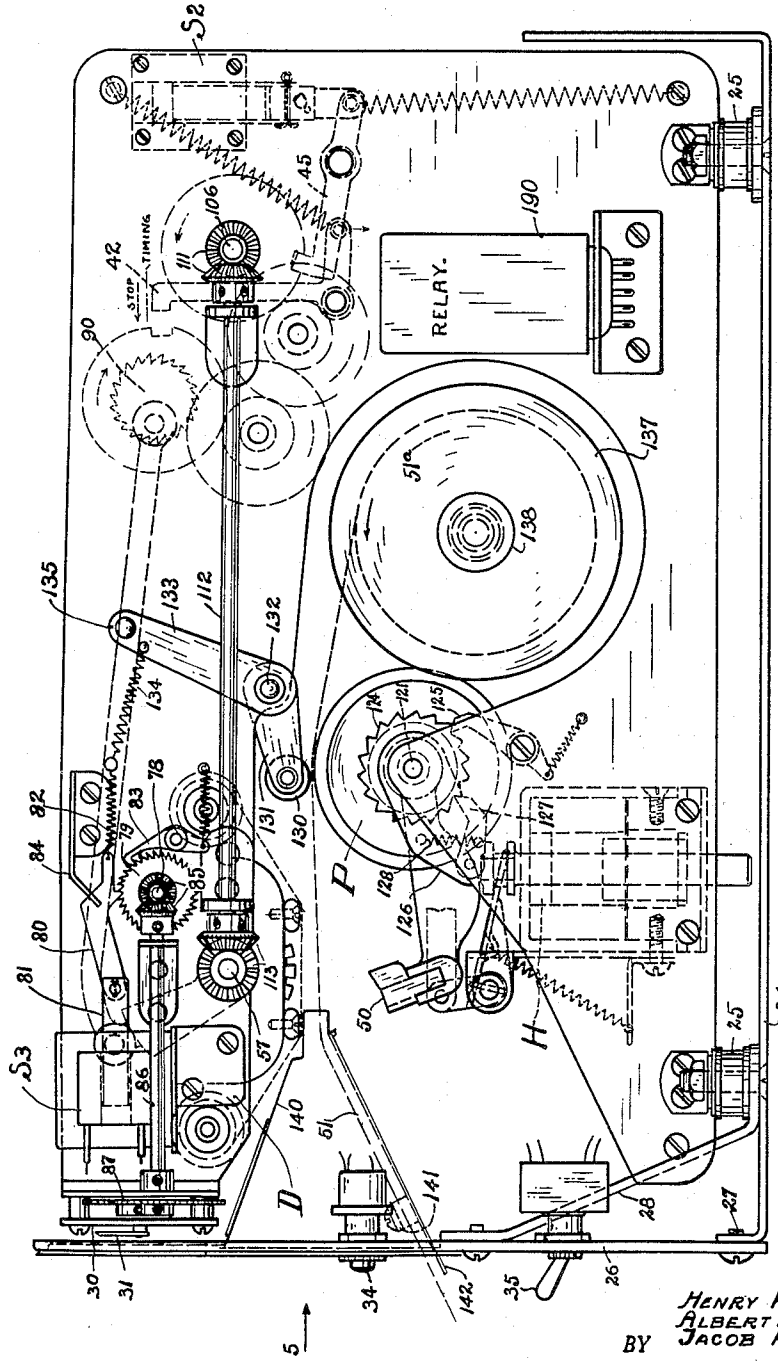


Fig. 2

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COORDINATED TIMING MECHANISM AND HAMMER MECHANISM FOR RECORDING APPARATUS

Original Filed Sept. 28, 1949 6 Sheets-Sheet 3

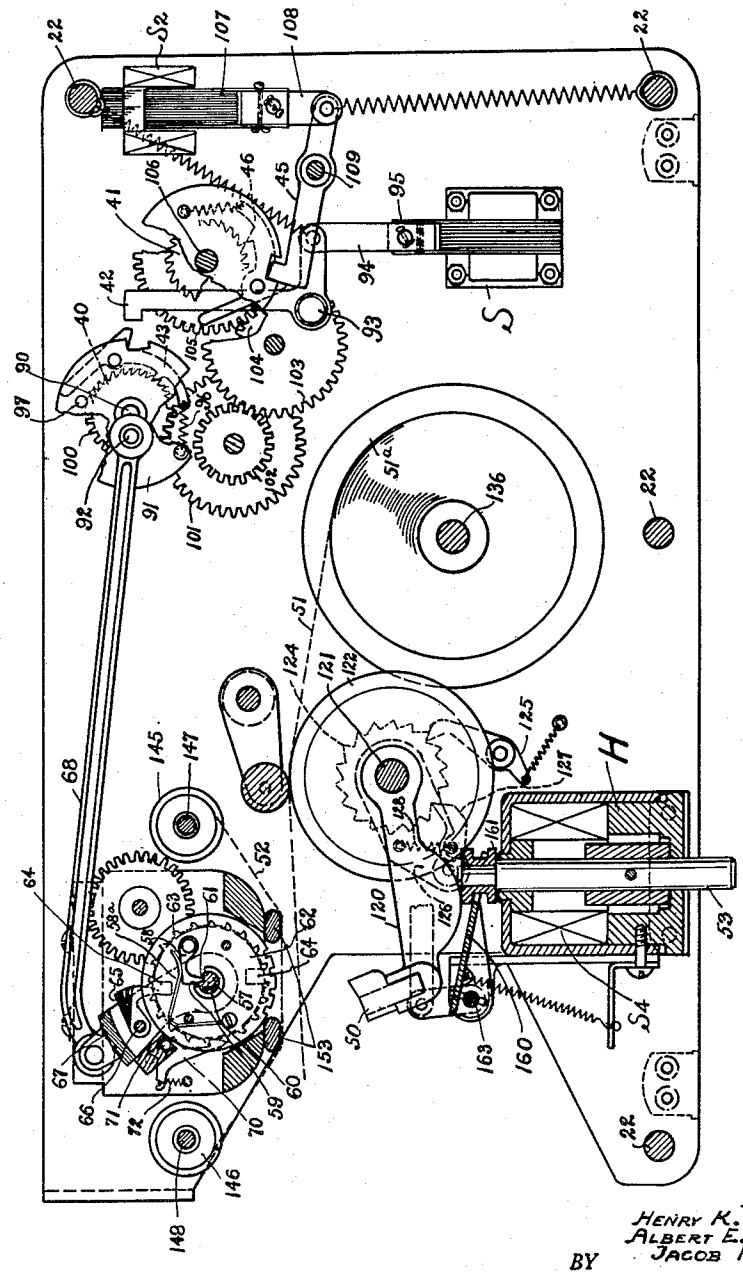


Fig. 3

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COORDINATED TIMING MECHANISM AND HAMMER MECHANISM FOR RECORDING APPARATUS

Original Filed Sept. 28, 1949 6 Sheets-Sheet 4

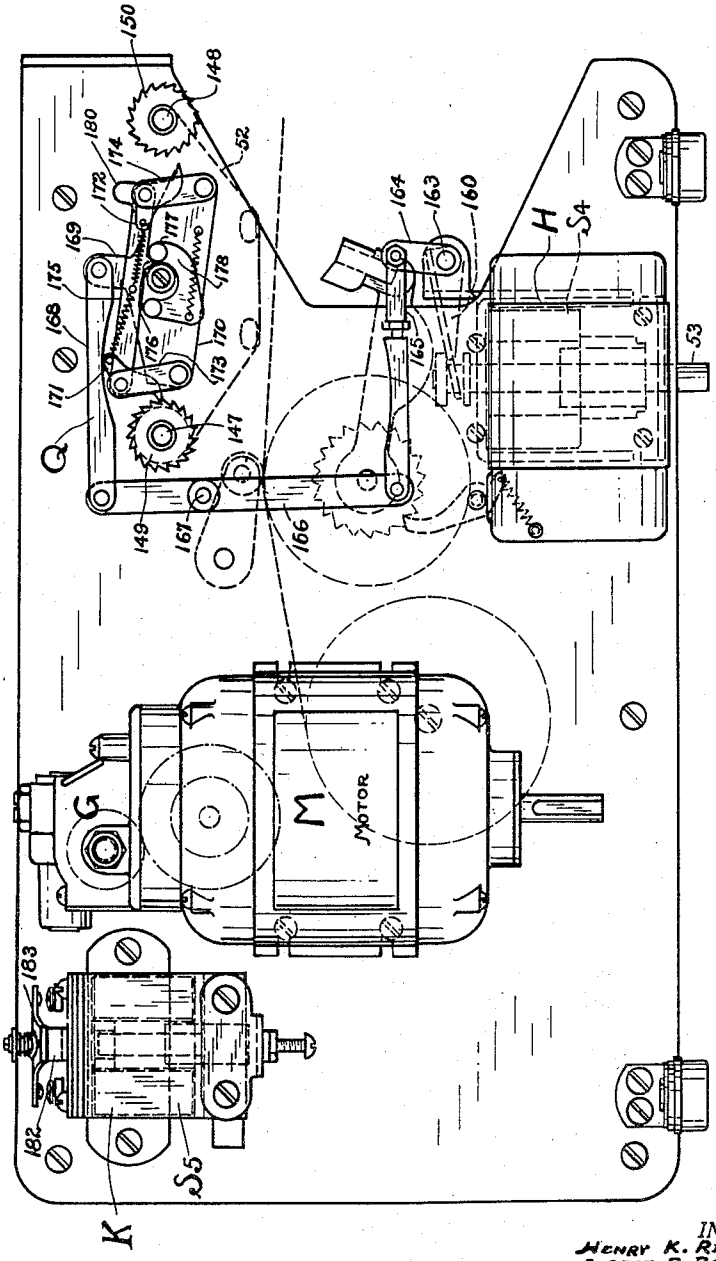


Fig. 4

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COORDINATED TIMING MECHANISM AND HAMMER MECHANISM FOR RECORDING APPARATUS

Original Filed Sept. 28, 1949 6 Sheets-Sheet 5

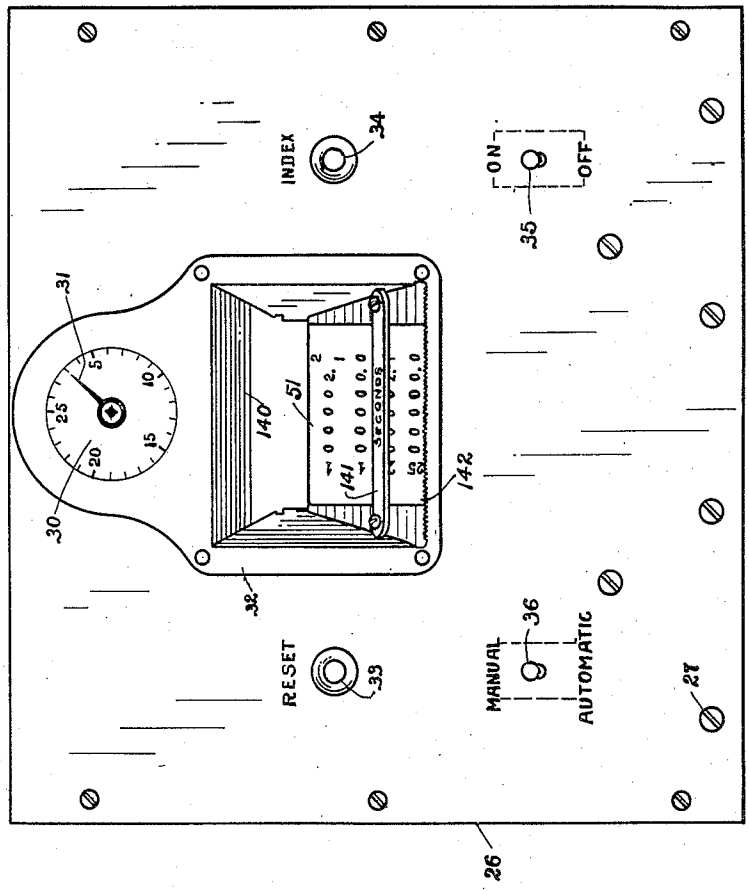


Fig. 5

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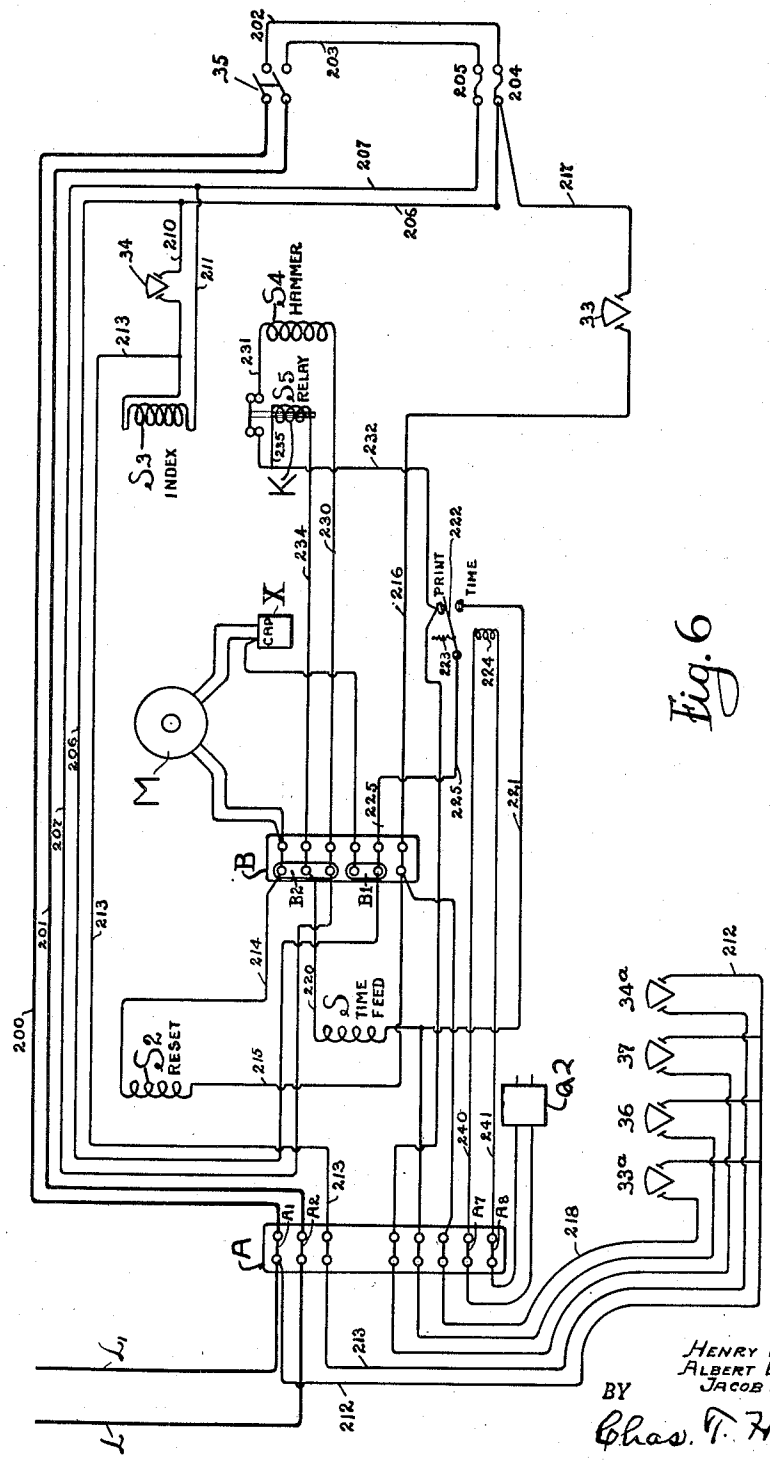


Fig. 6

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2,703,268

COORDINATED TIMING MECHANISM AND HAMMER MECHANISM FOR RECORDING APPARATUS

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Original application September 28, 1949, Serial No. 118,344, now Patent No. 2,631,666, dated March 17, 1953. Divided and this application December 13, 1951, Serial No. 261,552

2 Claims. (Cl. 346—81)

This invention relates to apparatus designed for measuring and recording a time interval and is a division of our prior application, Serial No. 118,344, filed September 28, 1949, now Patent No. 2,631,666 issued March 17, 1953.

It is the general object of our present invention to provide improved apparatus for feeding one or more typewheels, for making a record therefrom, and for coordinating the operation of the typewheel feed and the hammer or impression mechanism.

Our invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawings, in which

Fig. 1 is a top plan view of our improved apparatus;
Fig. 2 is a right-hand side elevation thereof;
Fig. 3 is a right-hand sectional elevation, taken along the line 3—3 in Fig. 1;
Fig. 4 is a left-hand side elevation of the apparatus;
Fig. 5 is a front end elevation; and
Fig. 6 is a wiring diagram.

Our improved apparatus includes type wheel mechanism T (Fig. 1), feed mechanism F, reset mechanism R, index feeding mechanism D, hammer operating mechanism H (Fig. 2), holding relay mechanism K, paper feed mechanism P, and ribbon feed mechanism Q (Fig. 4). A continuously rotating synchronous motor M (Fig. 4) provides power for the whole apparatus.

The apparatus in general is mounted on a sheet metal supporting frame comprising side plates **20** and **21** (Fig. 1) held in spaced relation by cross rods **22** (Fig. 2). The side plates are bolted to a bottom plate **24** (Fig. 2) and rubber cushions **25** absorb vibration. A front plate **26** (Fig. 2) is secured to the bottom plate **24** by screws **27** and brackets **28**.

The front plate **26** (Fig. 5) supports an escutcheon covering an index dial **30** and index hand **31**, and said front plate is provided with a frame **32** surrounding the paper delivery chute to be described. The plate **26** also supports a manual reset button **33**, a manual index button **34**, a power switch **35**, and a manual time feed button **36**.

General operation

The motor M runs continuously and drives a ratchet wheel **40** (Fig. 3) at relatively high speed and a ratchet wheel **41** at relatively low speed.

A solenoid S withdraws a lock lever **42** and allows a feed pawl **43** to engage the ratchet wheel **40** and to be rotated thereby to advance the time type wheels in the timing mechanism T one space for each rotation of the ratchet wheel **40**.

A second solenoid S2 withdraws a lock lever **45** and allows a reset pawl **46** (Fig. 3) to engage the ratchet wheel **41** and to thereby cause the reset mechanism R to operate at the end of a test. A third solenoid S3 (Fig. 2) feeds the index type wheel **46***a* (Fig. 1) one space for each operation of the solenoid S3.

A fourth solenoid S4 (Fig. 3) operates the hammer mechanism H and swings the hammer **50**, the paper tape **51**, and ink ribbon **52** against the type wheels in the timing mechanism T. On the return stroke of the hammer **50**, the paper tape **51** is fed forward one space. The ribbon feed mechanism Q is also actuated from the plunger **53** of the solenoid S4. A second and consecutive movement of the hammer **50** and associated parts is prevented by the holding relay mechanism K (Figs. 1 and 4).

Time type wheel mechanism T

The details of construction of the time type wheel mechanism T are best shown in Figs. 1 and 3. Five type wheels **55** are provided, each numbered 1 to 9—1 to 9, and one type wheel **56** is numbered .1 to .9—.1 to .9. These type wheels are each rotatable clockwise as viewed in Fig. 3 on the reset shaft **57**.

Each type wheel also has a pawl **58** movable into a slot **59** in the hub **60** of the type wheel and normally seated in a longitudinal groove **61** in the reset shaft **57** by a spring **58***a*. As the type wheels are fed clockwise, the pawls **58** are moved away from the groove **61**.

Each time type wheel **55** or **56** has a feed plate **62** with two sets of ten teeth and with two deep notches **64**. A series of pawls **65** are pivoted at **66** on a rocker **67** which is intermittently oscillated by a feed link **68**. The pawls **65** are spirally arranged and each pawl holds the next pawl raised and inoperative until the first-named pawl enters one of the deep notches **64**. Holding pawls **70** are pivoted in a fixed comb **71** and are moved to holding position by springs **72**.

Indexing mechanism D

The index type wheel **46** (Fig. 1) is also loosely mounted on the reset shaft **57** and is numbered 1 to 25. The type wheel **75** has a gear **76** engaged by a gear **77** on an index shaft **78**. A ratchet wheel **79** (Fig. 2) on the shaft **78** is engaged by a feed pawl **80** pivoted on the plunger **81** of the index solenoid S3. The plunger **81** is moved to the left in Fig. 2 and withdraws the pawl **80** when the solenoid S3 is energized.

A spring **82** returns the plunger **81** and pawl **80** and feeds the ratchet wheel **79** one space. A yieldingly mounted holding pawl **83** prevents return movement of the ratchet wheel. A guide plate **84** positions the pawl **80**.

The index shaft **78** is connected by bevel gears **85** to a countershaft **86** which is connected to rotate the index finger **31** through a train of gears **87**. The solenoid S3 is energized by pressing the index button **34** or may be operated automatically at the start of each test.

Type wheel feed mechanism F

The type wheel feed mechanism F is actuated by the continuously rotating synchronous motor M, which drives a power shaft **90** (Figs. 1 and 3) through any suitable reduction gearing G (Figs. 1 and 4). A suitable capacitor X (Fig. 1) is supplied for the motor M.

The power shaft **90** supports and rotates the ratchet wheel **40** previously described. A disc **91** is loosely mounted on the shaft **90** adjacent the ratchet wheel **40** and carries the pawl **43** and also a crank-pin **92** for the link **68**. The disc **91** is normally held from rotation by the lock lever **42**, which also holds the feed pawl **43** away from the rotating ratchet wheel **40**.

The lock lever **42** has a fixed pivot **93** (Fig. 3) and is connected by a link **94** to the plunger **95** of the solenoid S. When the solenoid S is energized and withdraws the lock lever **42**, the disc **91** and pawl **43** are released and the pawl **43** is moved by a spring **96** to engage the ratchet wheel **40** and to be advanced thereby.

The rocker **67** is given one full oscillation for each rotation of the pawl **43** and crank disc **91** and advances the first or decimal type wheel one space. The gear ratio is such that each full oscillation takes $\frac{1}{10}$ of a second. This intermittent feed of the type wheels will continue as long as the circuit controlling the solenoid S remains closed.

When the solenoid S is de-energized, the lock lever **42** disengages the pawl **43** and again locks the disc **91**.

Reset mechanism R

Special provision is made for resetting the time type wheel mechanism T. For this purpose, a pinion **100** (Fig. 3) on the power shaft **90** is connected through gears **101** to **105** to a shaft **106** which supports and rotates the

reset ratchet wheel **41**. The lock lever **45** is connected to the plunger **107** of the solenoid S2 by a link **108**. The lock lever **45** has a fixed pivot **109**.

Each time the reset solenoid S2 is energized, the lock lever **45** is withdrawn, the disc **110** and the reset pawl **46** mounted thereon are released, the pawl **46** engages the ratchet wheel **41**, and the shaft **106** makes one full revolution.

The shaft **106** is connected by bevel gears **111** (Fig. 1) to a countershaft **112** which in turn is connected by bevel gears **113** (Fig. 2) to the reset shaft **57**. The shaft **57** is thus given a full revolution at each reset operation.

The rear shoulder of the groove **61** in the reset shaft **57** progressively engages the several pawls **58** and returns each time type wheel to zero position. The solenoid S2 may be either manually or automatically controlled.

Hammer mechanism H

The hammer **50** (Fig. 3) is fixed to a hammer lever **120** which is mounted on a hammer shaft **121** which loosely supports two paper feed rolls **122**. A rounded lower surface of the lever **120** rests on the plunger **53** of hammer solenoid S4. When the solenoid is energized, the plunger **53** rises and the hammer **50** strikes a single blow. A second consecutive blow is prevented by a relay mechanism K to be described.

Paper feed mechanism F

Each feed roll **122** has a ratchet wheel **124** (Figs. 1 and 2) fixed thereto and has a holding pawl **125** coacting therewith. The hammer shaft **121** has an arm **126** supporting a feed pawl **127** for each ratchet wheel **124**. Each pawl has a spring **128** (Fig. 2). Each time the hammer is raised, the feed pawls move back one tooth. On the return or downward swing, the feed rolls are advanced to feed the paper tape **51**. The return movement of the hammer is by gravity.

A pressure roll **130** (Fig. 2) is pivoted in arms **131** fixed on a shaft **132**. An arm **133** fixed on the outer end of the shaft **132** is tensioned by a spring **134**. A stud **135** (Fig. 1) may be used to manually relieve the pressure when renewing the paper supply.

The paper tape **51** (Figs. 1 and 2) is drawn from a roll **51***a* mounted on a fixed stud **136**, and the roll is held thereon by a disc **137** having a yieldingly engaged hub or knob **138**.

The tape **51** is delivered forward to the contracted inner end of a flaring chute **140** (Figs. 2 and 5) which is aligned with the open frame **32**. The paper tape **51** passes under a cross bar **141** and may be torn off over the serrated edge **142** of the bottom member of the chute **140**.

The flaring chute permits the printed record to be inspected as soon as the record is advanced into the chute.

Ribbon mechanism Q

The ink ribbon **52** is fed between spools **145** and **146** (Fig. 3) mounted on short arbors **147** and **148** (Fig. 4) having ratchet wheels **149** and **150** (Fig. 4). Springs **151** (Fig. 1) apply friction to the spools **145** and **146** and spring plungers **152** support the opposite ends of the spools. The ribbon **52** is drawn over fixed guide members **153** (Fig. 3) adjacent the printing point.

The ribbon feed is operated by a forked lever **160** (Fig. 3) embracing a collar **161** on the plunger **53** of the hammer solenoid S4. The lever **160** is fast on a rock shaft **163** (Fig. 4) having an arm **164** connected by an adjustable link **165** with the lower end of a lever **166** pivoted at **167**.

The upper end of the lever **166** is connected by a link **168** to an arm **169** integral with a rock plate **170**. Feed pawls **171** and **172** are mounted on pivoted arms **173** and **174** connected by a link **175**. The link **175** has a lug **176** adapted to be positioned at either the left or the right of a pin **177** in a spring-actuated lock lever **178**. The link **175** has a lug **180** by which the pawl assembly can be manually shifted to render either pawl **171** or **172** selectively operative to feed the ribbon in either direction. This ribbon shift mechanism is similar to that shown in Deane Patent No. 2,122,518.

Hammer relay K

The hammer relay mechanism K (Figs. 1 and 4) is provided to prevent a second consecutive hammer blow by rebound on a single closing of the circuit for the hammer solenoid S4 (Fig. 4).

The relay mechanism K comprises a solenoid S5 having a plunger **182** which engages and lifts a double contact member **183** inserted in the hammer solenoid circuit. The solenoid S5 (Fig. 6) is in a shunt circuit and remains closed after the hammer solenoid circuit is broken.

The solenoids S4 and S5 are parallel and are energized at the same time but the solenoid S4 acts more promptly than the solenoid S5. For a more complete description, reference is made to Ruttiman Patent #2,330,387.

Shift relay

It is essential that the type wheel feed be stopped and that the record be printed instantly at the end of a test or run. For this purpose, a shift relay **190** (Figs. 1 and 2) is provided which comprises essentially a single-pole, double-throw contact member which in normal position closes a gap in the time-feed circuit but in raised position opens the time-feed circuit and closes the hammer-solenoid circuit.

This shift relay is very quick-acting and the record is printed "on the fly" and without waiting for a feeding movement to be completed. The hammer **50** (Fig. 2) is made wide enough to print from two adjacent types if neither is in exact printing position. Less than $\frac{1}{10}$ of a second can thus be read or estimated on the record.

Wiring system

In Fig. 6, we have shown a diagram of wiring connections by which our improved apparatus may be operated and controlled.

Line wires L and L' supply current to plates A1 and A2 in a terminal block A. These terminals A1 and A2 are connected by wires **200** and **201** to the main power switch **35** and then through wires **202** and **203**, fuses **204** and **205**, and wires **206** and **207** to terminal plates B1 and B2 on a terminal block B.

The motor M is connected directly to the plate B2 and through the capacitator X to the plate B1 and thus runs continuously when the switch **35** is closed.

The index solenoid S3 is connected through the push-button **34** and wires **210** and **211** to the power wires **206** and **207**. One or more additional push-buttons **34***a* may be connected in parallel with push-button **34** by wires **212** and **213** for remote index control.

The reset solenoid S2 is connected by the wire **214** to the line terminal plate B2, and through the wires **215** and **216** to the reset push-button **33** and thence through wire **217** to the fuse **204** on the other side of the line. One or more additional push-buttons **33***a* may be connected in parallel with push-button **33** by wires **212** and **218** for remote control.

The time type wheel feed solenoid S is connected on one side through a wire **220** to the terminal plate B2. The other side of the solenoid S is connected through wire **221** to one terminal of a single pole double-throw switch **222** forming the operating part of the shift relay **190** previously described. The switch **222** has a spring **223** and a solenoid **224**. The switch is connected through a wire **225** to the terminal plate B1.

The hammer solenoid S4 is connected by a wire **230** to the terminal plate B2 and by wire **231** to relay device K and thence through wire **232** to the upper terminal of switch **222**. When the switch is raised, the hammer circuit is completed through the wire **225** and terminal plate B1.

Hammer relay solenoid S5 is connected to terminal plate B2 by wire **234** and by wire **235** to wire **232** previously named. Solenoid S5 is thus in parallel to solenoid S4 but is not connected through relay device K. As stated, S5 acts more slowly than S4 but remains energized after the hammer solenoid circuit is broken by relay device K.

The time-print control solenoid **224** is connected by wires **240** and **241** to plates A7 and A8 in terminal block A. When type wheel feed is to start, the circuit of solenoid **224** is energized through any suitable control device Q2 (Fig. 6) which may be manually closed, and the time-feed solenoid S is energized for the interval to be timed. The circuit is broken at the end of the test or other interval to be measured, whereupon the spring **223** breaks the time-feed circuit and closes the hammer circuit. The time is then printed exactly at the end of the time interval and without perceptible delay.

Push-button **37** gives manual control of the hammer

mechanism, so that a record may be printed at any time. Push-button **36** will start the time-feed manually whenever needed and for as long as desired.

Having described the construction and operation of a preferred form of our invention, it will be clear that we have provided an improved timing and recording apparatus, together with indexing and resetting mechanism, and that our improved apparatus is adapted for use for many different purposes and in many applications.

The claims of this divisional application relate particularly to the hammer mechanism, the time feed mechanism, and the selective devices which prevent simultaneous operation of these two mechanisms.

Having thus described our invention and the advantages thereof, we do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what we claim is:

1. In a timing and recording apparatus, a set of time type wheels, a continuously operated motor, means to feed said type wheels by said motor for a selected time interval to be measured, a hammer to print a record from said type wheels, means to actuate said hammer, a selective device effective in one position to render said type wheel feed operative and effective in a second position to cause said hammer actuating means to operate, and means to shift said selective device to cause said

hammer-actuating means to operate at the end of the selected time interval and immediately on cessation of type wheel feed.

2. In a timing and recording apparatus, a set of time type wheels, a continuously operated motor, means to feed said type wheels by said motor for a selected time interval to be measured, a hammer to print a record from said type wheels, means to operate said hammer, a selective device effective in one position to render said type wheel feed operative and effective in a second position to render said hammer means operative, a first means to move said selective device to type-wheel feeding position, and a second means effective to move said selective device to cause said hammer to operate as soon as said first moving means is rendered inoperative by interruption of the time feed at the end of the selected time interval.

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