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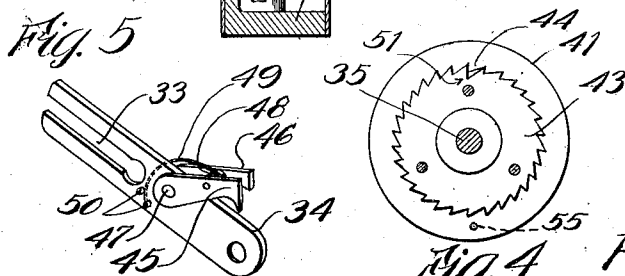
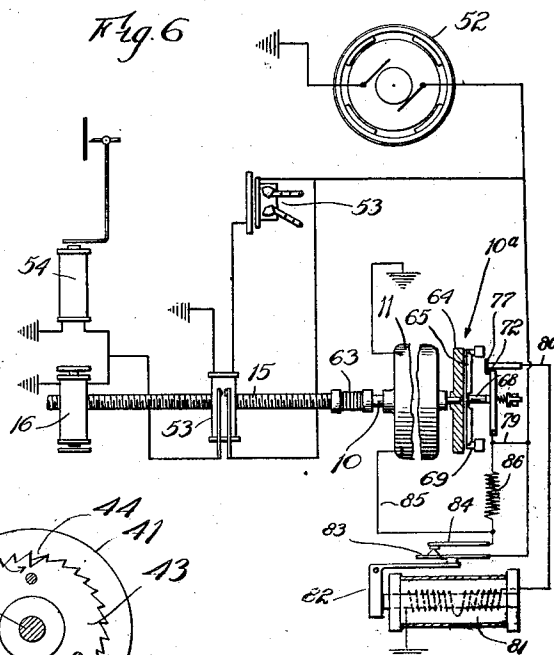
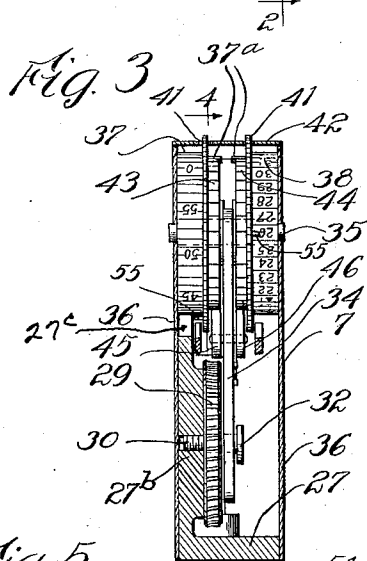
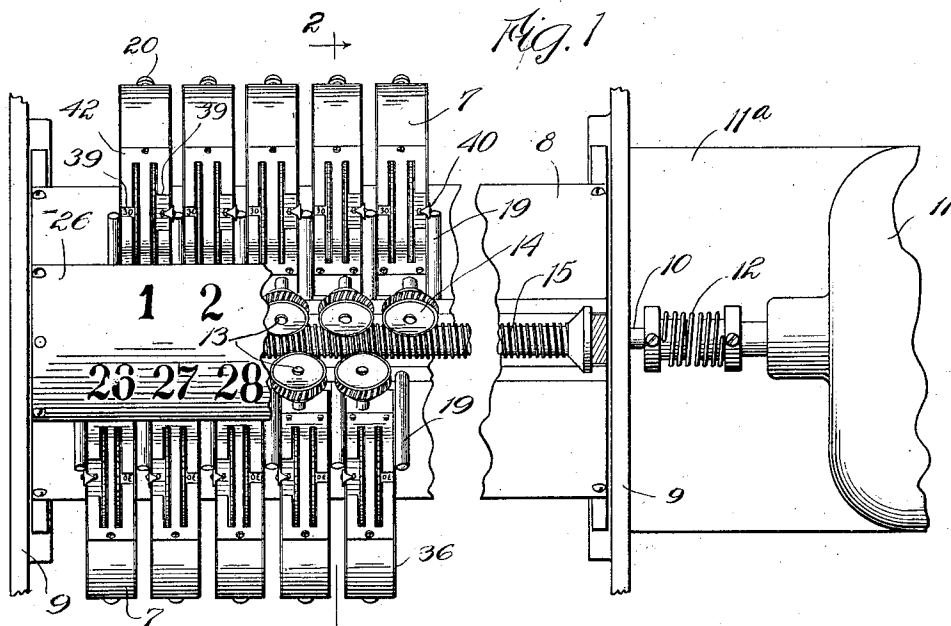
P. A. COONEY

1,787,934

TIME REGISTER

Filed April 19, 1923

2 Sheets--Sheet 1



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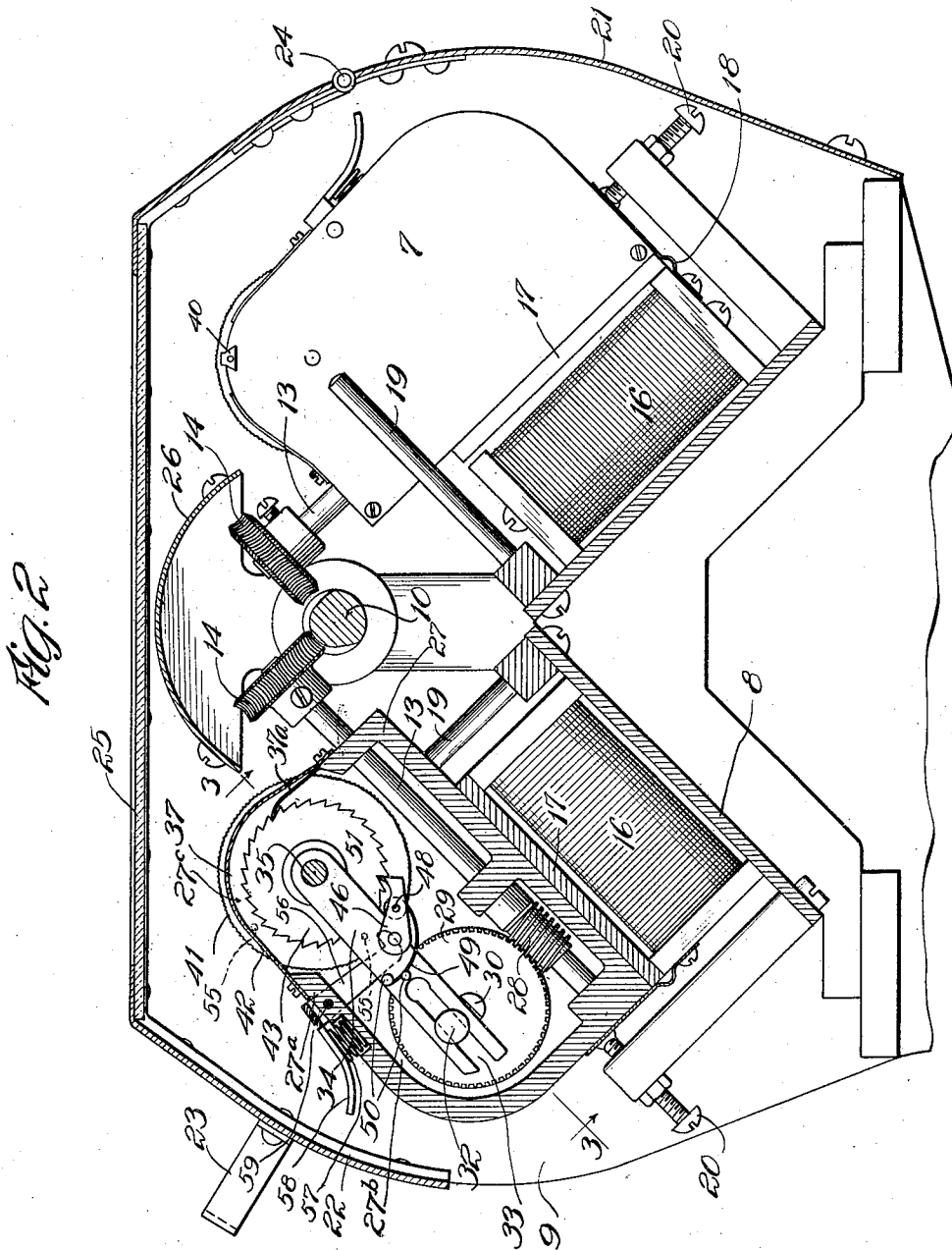
P. A. COONEY

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TIME REGISTER

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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WARE

TIME REGISTER

Application filed April 19, 1923. Serial No. 633,052.

The invention has general reference to machines adapted for use in connection with plant management for the purpose of enabling the elimination of waste with a resulting increase in the efficiency of the plant.

An important element of such machines is the mechanism for registering the time during which one or more machines are in productive operation, it being obvious that a failure of this element of the machine to function accurately necessarily involves a failure of the entire machine to accomplish the intended result.

Time registering devices as heretofore employed have, so far as I am aware, been inoperative to register with any degree of accuracy the productive time, and it is the primary object of this invention to produce a register of a highly efficient character capable of eliminating substantially the inaccuracies attending the operation of prior devices.

With this object in view, the invention contemplates the production of a time register which is positively actuated through the medium of reduction gearing by power derived from a shaft driven at a high rate of speed, as by means of an electric motor, the latter being controlled by means of a speed limiting device so as to render the speed of operation of the motor shaft substantially constant.

The provision of a construction and arrangement such that the registering device is actuated through a positive gearing connection with the actuating shaft as distinguished from a friction clutch connection such as has heretofore been commonly employed, is a feature of substantial importance. This I accomplish by the provision of an actuating spindle for each of the registers, which spindle is moved under electromagnetic control into and out of engagement with a common actuating shaft.

By thus employing a high speed driving unit, in combination with reduction gearing capable of effectually transmitting power to the registering device at a sufficiently reduced speed to register time, slight fluctuations in the speed of the driving element are

rendered practically negligible, whereas such fluctuations in the case of previous driving elements which are commonly actuated at a very slow rate of speed under the control of a clock mechanism, are transmitted substantially in the same proportion to the registering device, rendering its operation wholly undependable.

The invention embraces other minor objects and advantages which will appear in the progress of the following specification in which reference is made to the accompanying drawings forming a part hereof, wherein Figure 1 is a plan view of a set of registers mounted on a support common to all, each register being individual to a certain machine for registering its operation when producing or running idle, or both, as desired. Fig. 2 is a transverse vertical section on an enlarged scale taken in the plane of line 2—2 of Fig. 1. Fig. 3 is a horizontal section of one of the registers and is a view taken on line 3—3 of Fig. 2. Fig. 4 is a sectional detail of a part of a register and is taken looking in the direction of the arrow of line 4 of Fig. 3. Fig. 5 is an isolated perspective detail of another part of the operating mechanism of one of the registers, and Fig. 6 is a circuit diagram showing the electrical connections between a recording chart mechanism and the time registers, and including the governor for the motor.

This application constitutes in part a continuation of my copending applications Ser. Nos. 494,426 filed August 22, 1921, and No. 585,593 filed Sept. 1, 1922.

The apparatus, of which the registers form a part, is in practice usually kept in the office of the plant or other place for ready inspection by the person whose duty it is to note the operation of the various machines. These registers are mounted upon a support within a suitable case (not shown). Herein this support is in the form of an inverted V-frame 8 comprising vertical end members 9 which provide bearings for a shaft 10. The shaft 10 passes through one of the members 9 and is connected with an electric motor 11 mounted preferably upon a bracket 11^a on the outside of the frame. This motor is of any

suitable type capable of operating continuously at a high rate of speed, and for maintaining the speed uniform I provide a governor 10^a hereinafter described. A coiled torsion spring 12 forms a universal connection between the shaft 10 and the motor.

The registers 7, herein shown as ten in number, are disposed in opposed relation on opposite sides of the shaft 10 upon the inclined sides of the frame 8. Each register has an operating spindle 13 to the free end of which is secured a worm gear 14. The shaft 10 has rigid therewith a worm 15 which may, if desired, be formed as an integral part of the shaft. The worm gears 14 are adapted to mesh with the worm 15 upon the energization of the coils of the electromagnets 16. These coils are energized intermittently upon the completion of each rotation, reciprocation or other operating movement, or cycle of movements, of a machine element such as the cylinder of a printing press. The coil 16 upon being energized attracts its armature 17 fastened to the lower side of the registers 7, thereby swinging the same inwardly on the hinge spring 18 so that the worm wheel 14 meshes with the worm 15. Suitable guide posts 19 may be provided on opposite sides of the registers to prevent lateral displacement thereof upon engagement of the worm gears 14 with the worm 15. An adjustable set screw 20 is also provided for each register to limit the extent of return movement thereof.

The registers and associated parts are preferably enclosed within a protective housing 21 which may have a hinged lid 22 swingable by a handle 23 upon hinges 24 to afford access to the parts as when it becomes necessary to lubricate the same or to reset the registers. The top of the housing is formed by a glass plate 25 which permits the operator readily to observe the registers. An arcuate plate 26 is carried by the end members 9 beneath the plate 25, and is provided on its upper face (Fig. 1) with numbers or other preferred indicia adjacent the several registers, to identify them with the shop machines to which they severally are connected.

Referring now particularly to Figs. 2 to 5, inclusive: Each register 7 comprises a casing which is preferably cast to form a base 27 (Fig. 2), a peripheral wall 27^a and one side wall 27^b, the other side being open (Fig. 3). The operating spindle 13 is journaled in the peripheral wall 27^a at opposite ends of the casing and has a worm 28 rigid with its inner end. The worm 28 meshes with a worm gear 29 rotatable upon a stud 30 carried by the wall 27^b of the casing. A crank pin 32 projects from the outer face of the worm gear 29 and operates in the forked end 33 of a rocker arm 34. The arm 34 is pivoted upon a pin 35 mounted in side plates 36 secured upon opposite sides of the casing, the latter being cut away in its forward por-

tion as at 27° (Figs. 2 and 3) to receive a seconds wheel 37 and a minutes wheel 38 also mounted on the shaft 35. These wheels constitute time indicating elements and thus are provided with indicia upon the periphery thereof, which, in the operation of the register, may be observed through windows 39 (Fig. 1) provided in a plate 42 closing the opening 27°. This plate is slotted to receive annular flanges 41 rigid with and projecting radially outwardly from the wheels 37 and 38, and the peripheries of these flanges are serrated to facilitate their manipulation in resetting the register wheels. A suitable index finger 40 may be provided to enable the readings in minutes and seconds to be taken.

The wheels 37 and 38 for registering the seconds and minutes are actuated in the reciprocation of the rocker arm 34 in a manner to be presently described, by power derived from the shaft 10 rotating at high speed and transmitted to the spindle 13, the operative connections between the shaft and spindle, between the spindle and the rocker arm, and between the rocker arm and the wheels constituting reduction gearing rendering it possible to employ a high speed drive.

The connection between the rocker arm and the register wheels comprises a pawl and ratchet mechanism. Thus a ratchet wheel 43 is riveted or otherwise secured to the inner side of the seconds wheel 37 at one side of the rocker arm 34, and on the opposite side of the wheel 38 is fastened another ratchet 44 (Fig. 3), in a similar manner to the minutes wheel 38. The rocker arm 34 carries a pair of pawls 45 and 46 adapted to engage and move the ratchets 43 and 44 to advance the wheels 37 and 38. These ratchets have detent springs 37^a to hold the same yieldingly in adjusted position. The pawls (see Fig. 5) are pivoted on a common pivot pin 47 and are connected together rigidly by another pin 48 so that they constitute a couple. A coiled tension spring 49 acting between the pin 48 and a pair of pins 50 projecting from the side of the rocker arm 34 normally urges the pawls in a counter-clockwise direction (Fig. 2) into engagement with the ratchets to be driven thereby. It will be observed that the toe of the pawl 45 is somewhat longer than that of the pawl 46, there being a difference equal to the depth of a tooth of the ratchet 44. Due to this provision the pawl 46 is held out of engagement with the ratchet 44 until the pawl 45 engages in a deep tooth 51 provided in the ratchet 43. This occurs only once in a complete turn of the wheel 37, so that the wheel 38 is advanced one step to each complete turn of the wheel 37. The arrangement is such that in the continuous productive operation of a shop machine, the wheel 37 is moved through a complete turn in sixty seconds, and in the same time the

wheel 38 is advanced one step, which is equivalent to one minute.

For holding the indicator wheels 37 and 38 against return movement in the operation of the pawl and ratchet mechanism, any suitable means may be employed. Herein I have shown for this purpose, a holding dog 37^a (Fig. 2) in the form of a leaf spring mounted upon the base 27 and enclosed within the casing by the plate 42.

For facilitating the resetting of the indicator wheels to zero, I provide means comprising two pins 55 rigid with the wheels 37 and 38 respectively and a pivoted dog 56 mounted at 59 in the peripheral wall 27^a of the casing of the register 7 and having a laterally projecting finger 58 between which and said peripheral wall is interposed a coiled compression spring 57. The arrangement is such that the dog is normally held by the spring out of the path of travel of the pins 55. When, however, the finger 58 is depressed the dog is moved into position to be engaged by the pins when the wheels are moved manually through the medium of the serrated flanges 41, said pins being so arranged in the wheels that when they engage with the dog, the wheels will be positioned at zero with respect to the index fingers 40.

The operation of the register is as follows: Assume that the electro-magnet 16 is included in series in a circuit furnished with current from a generator 52 (Fig. 6) which circuit is adapted to be closed at regular intervals by a switch 53 on the machine whose operation is being registered. The armature 17 upon a flow of current through the coil of electromagnet 16 is attracted, thus moving the register 7 inwardly to effect an intermeshing engagement of the worm gear 14 with the worm 15, which latter operates at substantially constant speed as above described. The spindle 13 is thus rotated to drive the worm 28, which in turn operates the worm gear 29 to communicate rocking movement to the arm 34 through the medium of the crank pin 32. In the rocking movements of the arm 34 the pawls 45 and 46 are reciprocated. The pawl 45, being in engagement with the ratchet 43, moves the same to advance the seconds wheel 37. Upon the completion of one turn of the ratchet 43, the mutilated or deep tooth 51 is encountered by the pawl 46. The latter swinging in farther than otherwise permits engagement of the pawl 46 with the ratchet 44 to move the same to advance the minutes wheel 38 one step. This cycle of movements may occur upon each rotation, reciprocation or other operating movement of the machine element 53.

In Fig. 6 the electrical connections existing between the electromagnets 16 of the time registers and the electromagnet 54 of

a chart marker or stylus are shown. This circuit includes, besides the generator 52 and the electromagnets just referred to, a controller mechanism 53 for controlling the operation of the registers and the stylus mechanism, as set forth in my said application Serial No. 585,593.

The speed of the motor 11 may be controlled by any suitable or preferred means. I have provided for this purpose a governor mechanism 10^a which is like that fully illustrated and described in my said application Serial No. 585,593. This mechanism comprises a disk 64 (Fig. 6) fixed upon the motor shaft and having pivoted thereto a pair of bell crank levers 65 having weighted arms 69 adapted when the speed of the motor increases to open a switch 72, 77 through the medium of a pin 68 alined with the motor shaft. One side of said switch is connected by means of a conductor 79 directly with the source of electric energy provided by the generator 52 and the other side is connected by a conductor 80 with an electromagnet 81. The latter has an armature 82 in the form of a bell crank lever having insulated contact with a movable switch member 83 adapted to engage a stationary contact 84 connected by means of a conductor 85 with the field of the electric motor 11. Normally the circuit through the contacts 72 and 77 is closed, energizing the magnet 81 so that the circuit through the contacts 83 and 84 is also closed, with the result that energy is supplied directly to the motor 11. When, however, the speed of the motor exceeds a predetermined rate, the weighted arms 69 acting through the pin 68 break the circuit closed by the contacts 72 and 77. In this event, a resistance element 86 is interposed in the connection between the contact member 72 and the conductor 85, thus retarding the speed of the motor.

It will be observed that while the governor mechanism produces, strictly, a constantly fluctuating speed of the motor, such fluctuations are substantially uniform, and therefore an average or mean speed which is substantially constant is maintained. It will also be evident that because the shaft rotates at a high rate of speed, and the various devices actuated thereby are driven at an exceedingly low rate of speed, the variations in the speed of the shaft when transmitted to the time registering devices render any inaccuracies practically negligible.

I believe that I am the first to employ a high speed shaft for actuating a time register. In prior devices it has been customary to employ a shaft driven by a clockwork mechanism at a slow rate of speed and through the medium of connections such that errors occurring in the transmission of the power from the drive shaft are transmitted

directly to such devices rendering them grossly inaccurate.

I claim as my invention:

1. In an apparatus of the character described, the combination of a time register, a drive shaft, means including an electric motor for driving said shaft at a relatively high substantially constant rate of speed, said time register including a rotary indicating device, a drive spindle for said device, a disengageable operative connection between said shaft and said spindle adapted to drive the spindle at a substantially reduced speed, and an operative connection between said spindle and said indicating device adapted to drive the latter at time registering speed.

2. In apparatus of the character described, the combination of time registering means, a shaft carrying a worm, means for driving the shaft at a high and substantially constant speed including an electric motor and an automatic governor therefor, and means for actuating the time registering means from the shaft positively and at suitably reduced speed including a spindle carrying a worm gear movably mounted to shift the gear into and out of engagement with the worm on the shaft and operatively connected by pawl and ratchet mechanism with the time registering means.

3. In apparatus of the character described, the combination of time registering means, a shaft carrying a worm and driven at a high and substantially constant speed, means for actuating the time registering means from the shaft positively and at suitably reduced speed including a spindle movable to shift a worm gear carried thereon into and out of engagement with the worm on the shaft and operatively connected with the time registering means, and electromagnetic means controlled by a switch and adapted in turn to control the operative engagement of the spindle with the shaft.

4. In apparatus of the character described, the combination with a plurality of time registering units each provided with an actuating spindle carrying a worm gear, of a worm shaft, an electric motor operatively connected with and adapted to drive the shaft at a high and substantially constant rate of speed, and means for detachably mounting the time registering units in ranks on the opposite sides of the worm shaft with the worm gear carried by the spindle of each in operative relationship with the shaft.

5. In apparatus of the character described, the combination with a plurality of time registering units each provided with a spindle carrying a worm gear, and speed reducing actuating connections between the spindle and time registering elements, of a worm shaft, an automatically regulated electric motor connected with and adapted to drive the shaft at a high and substantially constant

speed, and means including inclined supports for removably mounting the time registering units in staggered ranks on the opposite sides of the shaft with the worm gear carried by the spindle of each in operative relationship with the shaft.

In testimony whereof, I have hereunto affixed my signature.

PETER A. COONEY.