

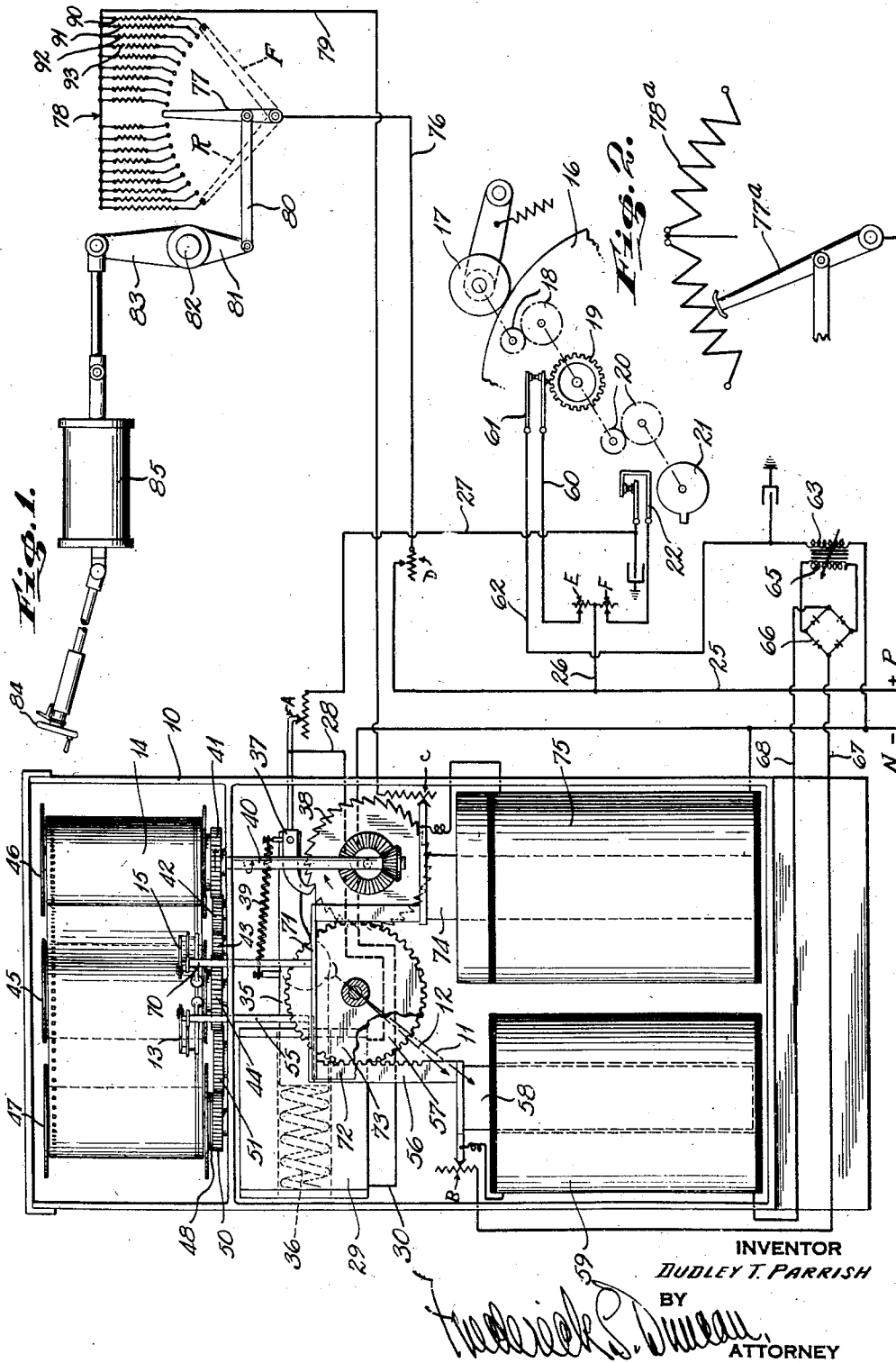
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SPEED RECORDING APPARATUS

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SPEED RECORDING APPARATUS

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The present invention has for an object to provide improvements in apparatus for indicating on a dial and for recording on a tape locomotive speeds and cut-off valve settings.

One of the main objects of this invention is the provision of improved electrically operated means for controlling speed and cut-off hands and speed and cut-off tape recorders and for feeding a tape.

Another object of this invention is the provision of improved electrically operated means for positioning the cut-off hand under control of the cut-off mechanism in accordance with the characteristics of the locomotive.

Another object of this invention consists in the provision of means for recording speed and cut-off on a tape right-side up and for feeding the tape from right to left so that the readings may be read from left to right from the front face of the tape.

Other objects of the invention will appear from the following description taken in connection with the drawing, in which—

Fig. 1 is a side view of tape operating means and speed and cut-off recording and indicating means, and shows a diagrammatic arrangement of circuits for controlling the operation of the same; and

Fig. 2 is a modification of the means for controlling the movement of the cut-off indicator and cut-off recorder in accordance with the characteristics of the locomotive.

For the purpose of disclosure, I have illustrated more or less diagrammatically in Fig. 1 a preferred form of my invention.

In this figure is shown a frame 10 in which is mounted indicating and recording mechanism for indicating and recording the cut-off settings and the speed of the locomotive. The instrument includes the usual speed hand 11 indicated by dot and dash line which moves over a dial, not shown, graduated as usual in miles per hour. It also includes a cut-off hand 12 also indicated by dot and dash line cooperating with the same dial to indicate the amount of cut-off. As the locomotive is started and after it has obtained a certain speed the cut-off and speed hand should be maintained alined until the desired speed has been obtained after which the cut-off may be shortened to save fuel.

The recording mechanism includes a marker 13 for recording the speed and a marker 15 for recording the cut-off on a tape 14. As these markers are not new they have been illustrated more or less diagrammatically. Reference may be

had, if desired, to United States Letters Patent to Bond #2,099,100, November 16, 1937, for variant forms of indicators and tape recorders.

The tape 14 is moved to travel distances proportionate to the travel of the locomotive under control of the driver 16 of the locomotive. Co-operating with the driver 16 is a wheel 17 which through reduction gears 18 rotates an interrupter or breaker cam 19 which as described later controls the positions of the speed hand and the speed marker. The wheel 17 through the reduction gears 18 and reduction gears 20 rotates an interrupter or breaker cam 21 which operates breaker points 22 to make and break a tape feeding circuit once for every unit of distance traveled by the locomotive. This circuit may be traced from the positive side P, of a current generator or other source of electric energy over the line 25, line 26, variable resistor F, breaker points 22, line 27, variable resistor A, line 28, to one side of the coil of the tape operating solenoid 29 and from the other side over line 30 to negative side N of the current generator. When the circuit across the solenoid 29 is closed the core 35 is moved towards the left against a spring 36. Secured to the core is an operating pawl 37 which operates a ratchet wheel 38, the pawl being held in operative engagement with the ratchet wheel by a spring 39. When the circuit for the solenoid 29 is opened the spring 36 will move the pawl 37 to the right and rotate the ratchet wheel 38 clockwise which through the gear mechanism disclosed will rotate the shaft 40 clockwise as viewed from the bottom of the figure, rotating gear 41 clockwise, gear 42 counter-clockwise, gear 43 clockwise, and gear 44 counter-clockwise, which rotates a feeding cylinder 45 counter-clockwise to feed the tape 14 from right to left. A supply roll is indicated at 46 and any suitable means well known in the art may be provided for exerting a braking action on the supply roll. The take-up roll 47 is driven through well known friction driving mechanism 48 in a counter-clockwise direction through a gear 50 meshing with a gear 51 that in turn meshes with the gear 44, at a faster rate than the feeding cylinder 45 for purposes well known in the art. By means of the mechanism described the tape will be fed from right to left distances proportionate to the travel of the locomotive.

As the tape 40 is moved from right to left the marker 13 will record the speed of the locomotive, the lowermost position indicating no speed and higher positions indicating higher speeds. The

marker 13 is supported on a rod 55 connected with an actuating rack 56 cooperating with a gear wheel 57 which operates the speed hand 11. The gear rack 56 is secured to the movable core 58 of an operating solenoid 59 which is operated under control of the interrupter 19. The circuit for the solenoid 59 may be traced from the positive side P of the source of current over line 25, line 26, variable resistor E, line 60, make and break contacts 61, line 62 across the primary coil 63 of a transformer to the negative side N of the source. Current through the primary coil causes a flow of current through the secondary coil 65 of the transformer and a rectifier 66 in a quantity directly proportional to the numbers of times the current was interrupted by the breaker points 61. The circuit through the solenoid 59 may be traced from the rectifier over line 67 and variable resistor B to one terminal of the solenoid and from the other terminal of the solenoid over line 68 to the rectifier. When the locomotive is at rest the solenoid 59 is deenergized and its core will be in the lowermost position as indicated and the speed hand 11 and speed marker 13 will be in their lowest positions as indicated in Fig. 1. As the speed of the locomotive is increased the rate of interruption will be increased and the value of the current across the coil of the solenoid 59 will be increased raising the core 58 and moving the speed hand 11 clockwise and the speed marker 13 upwardly toward the upper edge of the tape.

The cut-off marker 15 is supported on a rod 79 carried by a member 71 which carries a rack 72 cooperating with a gear 73 which moves the cut-off hand 12. The member 71 is supported on and connected to a core 74 of a solenoid 75 which is operated over a circuit from the positive side P of the source of energy over line 25, variable resistor D, line 76, arm 77 and one of the resistances 78, line 79, and variable resistor C across the coil of the solenoid to the negative side N of the source of current.

The arm 77 is connected by means of a link 80 to an arm 81 which moves with the tumbler or cut-off shaft 82 which is operated by an arm 83 in accordance with the position of a cut-off wheel 84 by a power cylinder 85 or by any other suitable means as is well understood. When the cut-off wheel 84 is in the neutral position the arm 77 will be in the position indicated in Fig. 1 in which position the circuit across the solenoid 75 will be open, and the cut-off hand 12 and cut-off marker 15 will be in the positions indicated in this figure. When it is desired to start the locomotive, in a forward direction for example, the cut-off wheel 84 will be moved to swing the arm 77 into its right-hand dotted line position F in which the cut-off is fully retarded. In this position the circuit for the solenoid 75 will be completed across the arm 77 through a resistance 99 which is so constructed that the current across the solenoid 75 will preferably be insufficient to lift its core 74 or it may lift it any desired amount depending upon what position it is desired to have the cut-off hand 12 when the locomotive is started. In operating the locomotive, as the speed increases after it has obtained a certain predetermined value, the cut-off will be advanced throwing in the resistances 91, 92, 93, etc., in succession which causes an increased amount of current to pass over the coil of the solenoid 75, rotating the hand 12 clockwise and moving the marker 15 upwardly.

The resistances 90, 91, 92 and 93, etc., are so chosen that maximum draw bar pull is obtained when the cut-off hand is alined with the speed

hand and this depends upon the characteristics of the locomotive with which the invention is used. The locomotive is tested and the resistances are so chosen that they will control the solenoid 75 to move the cut-off hand 12 and the cut-off marker 15 disproportionately to the movement of the cut-off wheel 84 and into alinement with the speed hand 11 when the cut-off has been set to produce maximum draw bar pull at the indicated speed.

When it is intended to run the locomotive backward, the cut-off wheel 84 is operated to move the arm 77 into position R shown in dotted lines in Fig. 1 and the circuit for the solenoid 75 will be made across the resistances at the left side which control the current across the solenoid 75 in the same manner as the resistances 90, 91, 92, 93, etc.

Instead of employing a plurality of resistances such as disclosed in Fig. 1, I may employ a resistance of the type shown in Fig. 2 at 78a which is so constructed that the value of the current across the solenoid 75 will be such as to move the cut-off hand and cut-off marker in the same manner as in the first modification, as the arm 77a is moved into its various positions under control of the cut-off wheel 84.

Each of the devices indicated by the references A, B, C, D, E and F in Fig. 1 is a variable resistor. The resistor A is for the sole purpose of regulating the current across the solenoid 29 which actuates the tape feeding mechanism. If at any point in the stroke of this solenoid it is considered desirable to reduce or increase the current, this resistor can be adjusted accordingly.

The resistors B and C are placed in the circuits of the speed recording solenoid 59 and the cut-off recording solenoid 75 for calibration purposes. In case the solenoid 59 effects an indication of say either 59 or 60 miles per hour when the actual speed is 55 miles per hour, the variable resistor B can be adjusted so that the instrument will indicate 55 miles per hour. This resistor is mechanically actuated by the armature of the solenoid so that a given value of resistance may be established and set into the circuit to provide whatever correction is necessary at any point along the travel of the armature. The resistor C is used for the same purposes in controlling the solenoid 75.

The resistors D, E, and F are placed in the circuits between the generator and the resistors 90, 91, 92, etc., and the interrupter 61, and the interrupter 22, respectively, for the purposes of providing for primary control of the current admitted into the respective circuits.

While I have disclosed one form of means for carrying out my invention which I now regard as a preferred form, it is to be understood that I intend to reserve the right to all such changes and modifications as fall within the principles of the invention and the scope of the appended claims.

I claim:

1. The combination in an instrument for recording the speed of a locomotive, of a recording tape, a marker for recording speeds thereon, solenoids for feeding the tape and for operating the marker, a source of electrical energy for supplying a constant current for operating said solenoids, a circuit connecting the tape feeding solenoid directly to said source, means for interrupting said circuit at equal increments of distance of travel of the locomotive, a primary circuit connected to the source of electrical en-

ergy for operating the solenoid which operates the marker, an interrupter for interrupting said latter circuit for equal but smaller increments of distance of travel of the locomotive, a transformer the primary of which is connected in said last mentioned circuit and the secondary of which controls the circuit over the speed recording solenoid, and a rectifier connected in the circuit of said secondary coil and said speed recording solenoid.

2. The combination in an instrument for recording the speed of a locomotive, of a recording tape, a marker for recording speeds thereon, solenoids for feeding the tape and for operating the marker, a source of electrical energy for supplying a constant current for operating said solenoids, a circuit connecting the tape feeding solenoid directly to said source, means for interrupting said circuit at equal increments of distance of travel of the locomotive, a primary circuit for operating the solenoid which operates the marker, an interrupter for interrupting said latter circuit for equal but smaller increments of distance of travel of the locomotive, a transformer the primary of which is connected in said last mentioned circuit and the secondary of which controls the circuit over the speed record-

ing solenoid, a rectifier connected in the circuit of said secondary coil and in the circuit of said speed recording solenoid, and a train of gears for operating said interrupters from the drive wheel of the locomotive and said second mentioned interrupter at a faster rate than the first mentioned.

3. The combination in an instrument for recording the speed of a locomotive, of a recording tape, a marker for recording speeds thereon, means for feeding the tape, a solenoid for operating the marker, a source of electrical energy for supplying a constant current for operating said solenoid, a transformer, a circuit connecting the primary coil of the transformer to said source, a rectifier connected in the circuit of the secondary coil of the transformer, the output terminals of said rectifier being connected in the circuit of said solenoid, an interrupter in said first mentioned circuit, and a driving connection driven from the driving wheel of the locomotive for feeding said tape and operating said interrupter at the proper relative speeds to produce a continuous speed curve on said tape for indicating the speed of the locomotive at any point along the right of way.

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