

Feb. 29, 1944.

F. E. SAARI

2,342,895

TRACK SANDING DEVICE

Original Filed Dec. 23, 1939

2 Sheets-Sheet 1

Fig. 1.

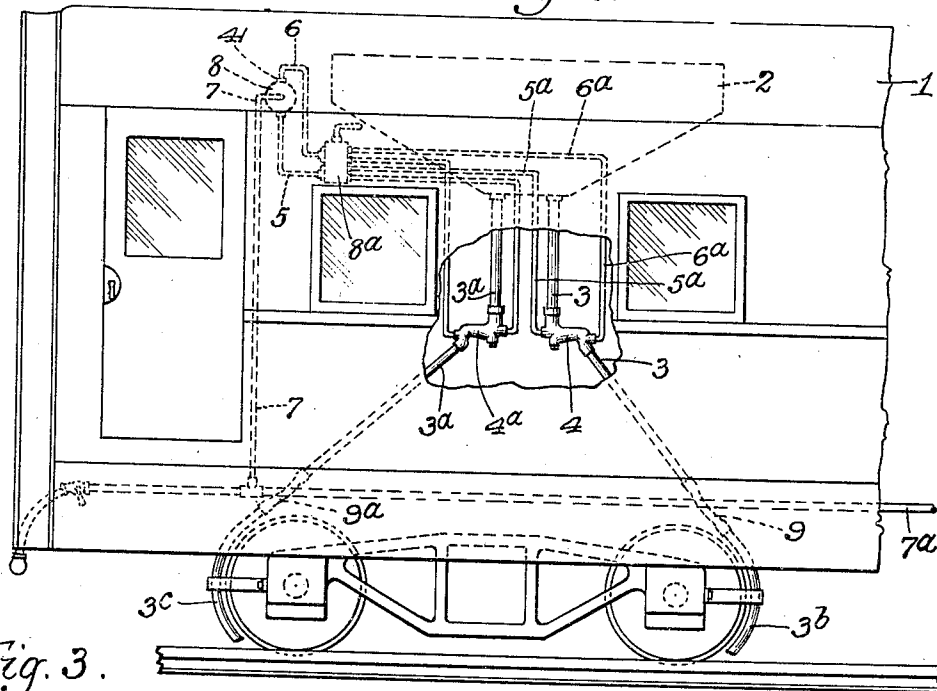
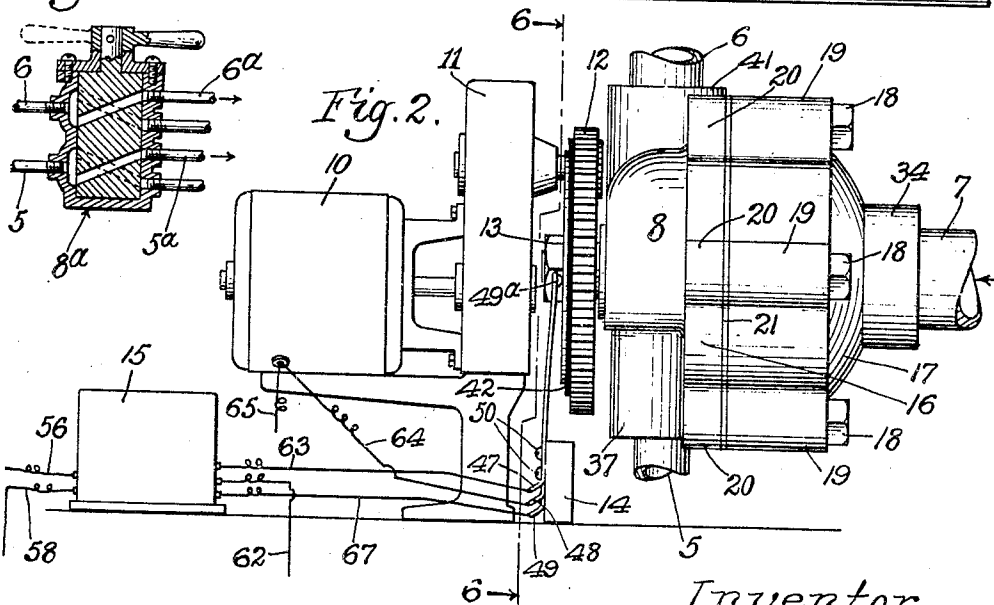


Fig. 3.



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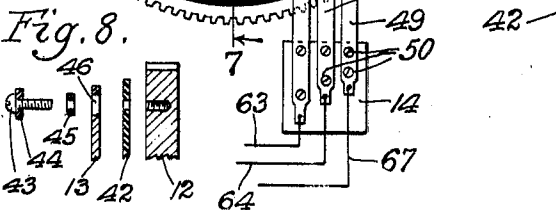
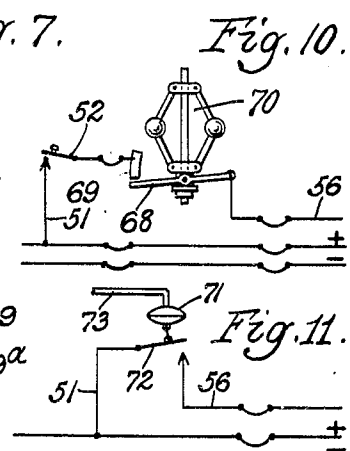
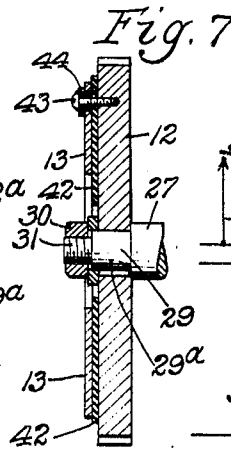
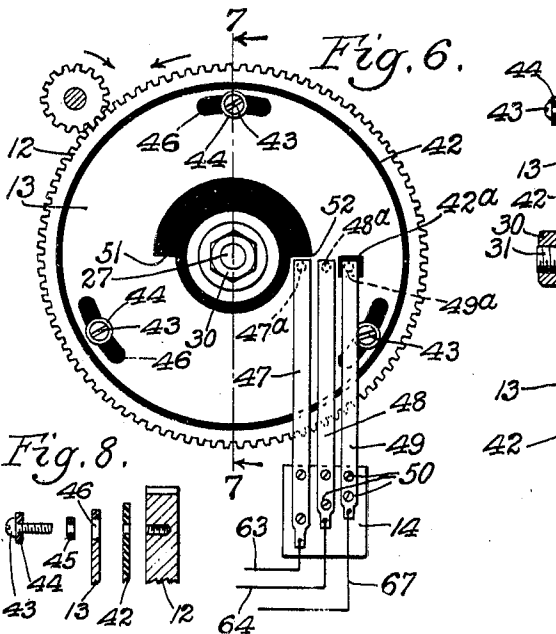
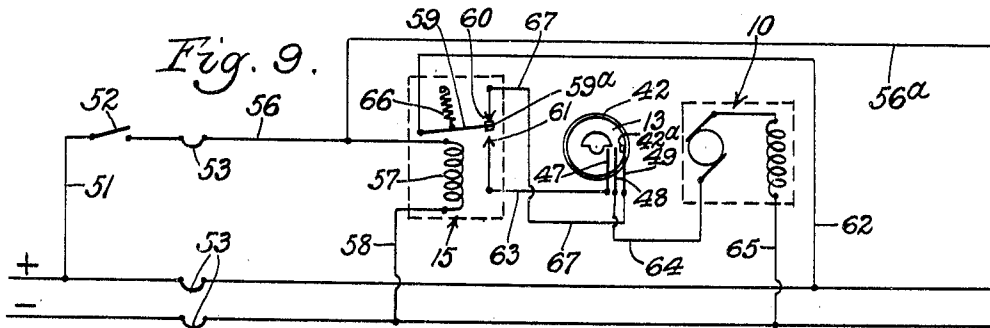
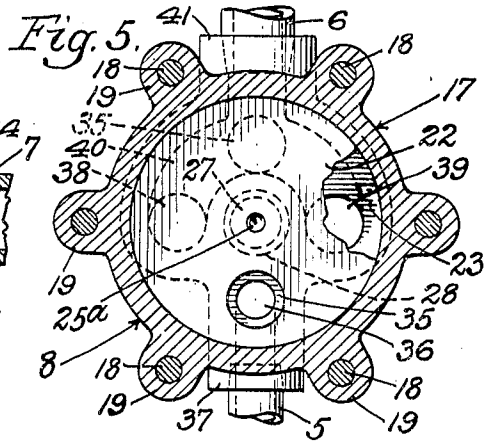
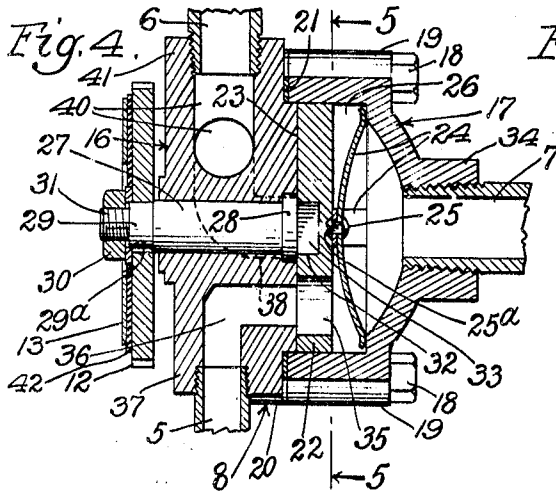
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,342,895

TRACK SANDING DEVICE

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Continuation of application Serial No. 310,793,
December 23, 1939. This application June 4,
1942, Serial No. 445,770

6 Claims. (Cl. 291—5)

This invention relates to an improved track sanding device particularly adapted to be used in train line application for delivering sand to the wheels of railway cars and has as its object to provide a new and improved device of this description.

The invention has as a further object to provide means for delivering sand to the rails immediately in front of the wheels on passenger cars and coaches or other similar train equipment as may be deemed necessary or requisite to insure greater braking efficiency of such equipment. The invention has as a further object to provide a motor operated valve provided with means for utilizing the electric current and air supply customarily supplied on passenger cars and similar train equipment. The invention has as a further object to provide a novel arrangement of a sanding mechanism or unit comprising a sand supply, delivery lines therefrom to the rails and sand traps installed in such delivery lines controlled by a motor operated valve. The invention has as a further object to provide for single or multiple operation of this valve unit from one or more control stations either manually, automatically, or both, as disclosed by the specification and wiring diagram appended hereto.

The invention has a further object to provide a valve construction which when used with a sanding device effectively regulates and controls the operation of the sand traps which are located in the sand delivery lines for the purpose of retaining the sand supply when movement of the sand therein is not influenced by the application of compressed air or other fluid through the valve, thus suspending delivery of the sand and preventing its escape to the rails.

The invention has as a further object to provide for the removal of any obstruction or accumulation of sand, moisture or foreign matter in the delivery pipes by providing, in the operation thereof, adequate means of discharging clean out blasts of compressed air or other fluid through the delivery pipes before and after every sanding operation.

A further object of my invention is to provide remote manual or automatic control of sand delivery to the rails from suitable boxes or containers located for the storage of a sand supply in passenger or other cars, particularly on modern "high speed" trains, where the delivery of sand to the rails may be made simultaneously with or automatically upon the application of

the brakes for such length of time as may be desired during brake application.

I have designed this motor operated valve so that its installation and use can be made on all standard passenger cars and coaches without necessitating any great change in the equipment used on the same or their present method of operation or the addition of air lines or other equipment in between the cars with the exception of providing but one control conductor from the locomotive cab or control station to the last valve unit in the train line.

The invention has as a further object to provide a motor operated valve so that the current consumption for the unit as a whole shall be very small and so that the current in the control circuit is of such small value that the circuit may be connected to and controlled by any of the present or standard braking control circuits installed on high speed trains without interfering with the operation of the other circuits and so that the individual motor circuits may be connected locally to any available supply in the cars as the valve motors are small and require very little power and that only while the valve is opened or closed, as no power is required during the actual sanding which is effected by means of compressed air as hereinafter described.

This invention has further objects which are more specifically set out in the accompanying description.

This application is a continuation of my application Serial Number 310,793, filed December 23, 1939, for Sanding valve.

Referring now to the drawings, wherein I have shown one form of the device embodying the invention, Fig. 1 is a diagrammatic side elevation of a passenger car showing a truck section thereof and the application of my invention thereto;

Fig. 2 is an assembly of the motor driven valve unit, showing relay, rotary switch and spring contacts;

Fig. 3 is a sectional view of a double-three-way valve;

Fig. 4 is a sectional view of a valve designed for motor operation;

Fig. 5 is a cross sectional view of the valve taken along line 5—5 of Fig. 4;

Fig. 6 is a view of the rotary switch showing the spring contacts and rotary switch plate mounted on the valve driving gear, as seen along the line 6—6 of Fig. 2;

Fig. 7 is a cross sectional view of the valve driving gear and rotary switch plate taken along

line 7—7 of Fig. 6 and showing in detail the means of insulating and mounting the switch plate on the valve driving gear;

Fig. 8 is a detail with parts separated as shown in section;

Fig. 9 is a wiring diagram showing the motor connections, rotary switch, spring contacts and the control circuit, including switch and relay;

Fig. 10 illustrates a modified form of the control circuit employing application of a governor controlled switch;

Fig. 11 is a further modification of a part of the control circuit showing the installation of a pneumatic switch.

Like numerals refer to like parts throughout the several figures.

Fig. 1 is illustrative of a truck section of a passenger car 1, which is equipped with a sand box 2 located in the car body in proximity to the truck as space, dependent upon the construction of the car, may permit, to which is connected a delivery pipe 3 adapted for the purpose of delivering sand from sand box 2 to the rails in front of the car wheels. Free escape of sand through the delivery line 3 is prevented by the installation of a sand trap 4 to which the valve control air lines are connected, so that when air under pressure is admitted into the sand trap 4 through the nozzle therein provided, the sand trapped and entering therein will be blown downwardly through delivery line 3 to the rail.

This operation will be hereinafter designated the "sanding operation" in connection with further explanation of the motor operated valve. An air supply line 7 is connected to the main reservoir line 7a for supplying air to the motor driven valve 8, and from thence by means of air line 5 connected to valve 8, air is supplied to and through valve 8a and into line 5a, by means of which air is introduced into sand trap 4 for the sanding operation. In a similar manner, by means of air line 6 connected to said valve 8, air is supplied to and through valve 8a and into air line 6a leading into sand trap 4 for the clean out blasts before and after the sanding operation. The principle involved in respect to the sequence and the timing of the sanding and clean out air deliveries will be explained in detail in the specification of the valve 8 as shown in Figs. 5 and 6.

There is provided a double three-way valve 8a, a cross sectional view of which is shown in Fig. 3. The function of the three-way valve 8a is to provide a selective sanding operation by changing or diverting delivery of air from the sand trap 4 and delivery line 3 to sand trap 4a and delivery line 3a. The valve 8a and its application and operation applies only to passenger cars or coaches or similar equipment which are termed "reversible," as differentiated from cars or coaches made up into articulated units, as is the case in the operation of present day high speed trains, intended to operate in one direction only, in which instance, the valve 8a is omitted and air lines 5 and 6 are connected directly to the sand trap 4.

Flexible sections 9a and 9 are inserted in delivery pipes 3a and 3 and attached to sections comprising the delivery nozzles 3b, 3c, which are securely attached to the truck frame to provide positive alignment of the delivery nozzle in respect to the rail, irrespective of any shifting or lateral movement of the car body occasioned

in train operation over or along curves in the road bed.

In Fig. 1 only the necessary equipment as applied to one side of the car is shown to explain the operation of my valve unit in delivering sand to one rail and in respect to the truck wheels bearing on said rail. Identical equipment is used to perform the sanding operation on the other rail and by making the proper connections in the air lines leading from valve 8a, sanding on both rails is made simultaneously by the operation of my valve.

In Fig. 2, which is an assembly of the valve unit in which the valve proper is 8, the motive power which is supplied by motor 10 thereto, is designed to operate on current available in the cars or coaches. The power is transmitted through and by means of speed reduction unit 11 for which proper gearing arrangement is made so as to mesh with the valve driving gear 12, upon and to which the plate 13 of the rotary switch is mounted (Fig. 6). There is a mounting block 14 of electrically insulating material on which the spring contacts of the rotary switch are mounted. There is a relay 15 (Fig. 9) of standard construction, which is shown as a single pole double throw type. The motor, relay and rotary switch connections are incorporated and their function indicated in the wiring diagram of Fig. 9 and the function of the rotary switch shown therein.

In Fig. 4 the body of the valve proper 8 consists of two parts, hereinafter shown as "front half" 16 and "back half" 17 of said body. These two halves are fitted and fastened together by means of bolts 18 which extend through projecting ribs or lugs 19 in the "back half" 17 and are threaded into similar lugs 20 in the "front half" 16. A gasket 21 is inserted in between the two halves at the junction, to insure an air tight joint. The valve disc 22 is shown assembled in the valve in Figs. 4 and 5. This disc is made of wear-resisting metal and the face thereof is ground and highly polished to insure a perfect seal to air and to reduce friction when rotated on the valve seat 23, which seat is a polished surface on the "front half" 16 of the valve 8. Numeral 24 designates springs of resilient metal being shaped as shown, fastened together permanently at the center at right angles to one another by means of a square shank rivet 25 through square holes in the springs 24. The ends of these springs rest on the surface of the back of the valve chamber 26. The rivet has a rounded head 25a which fits into a similar recess 25a in the center of the disc 22, thus centering and seating the disc 22 at all times against the valve seat 23 and by pressure of air against the disc a perfect seal is formed against passage of air through the valve and effectively retains the air in the chamber 26 when the valve is in closed position.

A cylindrical valve shaft 27 extends through the center and protrudes from the "front half" 16 and is held in place by a collar 28 which is preferably a part of the shaft itself. The shaft 27 is also provided with a reduced section 29 upon which the gear 12 is mounted to rotate with shaft 27 and is held in place by suitable means, such as a key 29a locked in position by jamb nut 30 for which suitable threads 31 are provided. A rectangular shaped recess 32 is cut into the center of the disc 22 into which the rectangular shaped end 33 of shaft 27 is fitted so that it will rotate disc 22 only when motive power is applied to gear 12. The disc 22 and the construction of

valve 3 are arranged to cause disc 22 to make a complete revolution during each complete operation of valve 3. 34 is a threaded boss which is part of "back half" 17 and by means of which the reservoir air line 7 is connected to valve 8.

In Fig. 4 the view as shown is that of the valve with the disc 22 in sanding position and the air from the reservoir line 7 enters chamber 26 and is released through the port 35 in disc 22 into communicating port or duct 36 and from thence into the sanding air line 5. The air line is fastened to the "front half" 16 by means of threaded boss 37.

To discontinue the sanding operation, the disc 22 is rotated in a clockwise direction, see Fig. 5, and when the port 35 is passing over port 38 in the "front half" 16, air is released through port 38 into inverted Y shaped communicating duct 40 embodied in the structure of the "front half" 16, and from thence into clean out air line 6 which is attached to "front half" 16 by means of threaded boss 41. The valve disc 22 comes to rest when port 35 assumes the position indicated by dotted lines denoting the end of the operating cycle of the valve, which is then ready for the next brake application. In a similar manner, upon application of motive power to the valve 8, or during the first half of the operating cycle when the port 35 is passing over port 39, air is released into the duct 40 and thence into clean out air line 6 to effect the clean out of delivery line 3 before the sanding operation.

Referring to Figs. 6, 7 and 8, a metallic plate 13, hereinafter termed rotary switch plate, is mounted on gear 12 from which it is insulated electrically by means of a disc 42 of insulating material. The plate 13 is fastened to gear 12 by means of screws 43 which are fitted with insulating washers 44 and bushings 45, all of which are shown in detail in Fig. 8. The fastening screws 43 and bushings 45 are fitted through the equally spaced slots 46 which are cut through the plate 13 near the outer edge thereof. The slot 46 provides a means of adjustment for the timing of the valve by loosening the screws 43, which permits plate 13 to be shifted or rotated as required and of retightening the screws 43 to refasten the plate 13 in the desired position. Springs 47, 48 and 49 have attached thereto contacts 47a, 48a and 49a respectively. The springs are fastened to block 14 by means of screws 50 and block 14 is so located as to cause spring contacts 47a, 48a and 49a to make contact on plate 13 or rest upon some section of insulating disc 42. Normally, when the unit is not in operation (see Fig. 6) the spring contacts 47a, 48a and 49a rest in alignment with contacts 47a and 48a, making contact with plate 13 while contact 49a rests upon insulating block 42a fitted into a recess in plate 13 thus insulating it from same.

When the valve 8 is operated by the rotation of gear 12, plate 13 rotates with it until contact 47a rides off edge 51 of plate 13, thus cutting off the current supply to motor 10 and valve 8 registers in sanding position, while contacts 48a and 49a still remain on and in contact with plate 13. To discontinue sanding, power is applied so as to cause the valve to rotate to closed position. To accomplish this, plate 13 rotates until contact 48a rides off plate 13 onto block 42a, thus suspending current supply to the motor, upon which happening, the valve is completely closed with contact 47a resting on plate 13 after mounting edge 52 which places the valve unit in readiness for the next application.

In the wiring diagram in Fig. 9 the two customary current supply lines are indicated by the signs "+" positive and "-" negative which usually run throughout the length of the train, connection being made between cars or coaches by jumpers 53. In the control circuit the current is supplied from the positive line by conductor 51 to switch 52 located in the locomotive cab, thence by conductor 56 to winding 57 of double throw relay 15, energizing the same and from which the circuit is completed to the negative line by means of conductor 58.

Upon energizing the relay winding 57 armature 59 is drawn down so that armature contact 59a is moved away from contact 60 and brought into contact with contact 61, thus completing the motor circuit in which current is supplied from the positive line by conductor 62 to armature 59 and through contacts 59a and 61 to conductor 63 leading to spring of the rotary switch. From there the current flows across plate 13 to center spring 48 and by means of conductor 64 it is supplied to motor 10 from which the circuit is completed to negative line by conductor 65.

Thus the motor 10 continues to rotate the valve unit until the valve registers in sanding position, at which time the current to the motor is cut off by having contact 47a ride off plate 13 at point 51 as explained previously. Sanding is therefore continued until the current supply in the control circuit is suspended by opening switch 52 deenergizing the relay coil winding 57, in which event armature 59 is drawn up by the spring 66 with armature contact 59a to rest upon contact 60, thereby completing the motor circuit. In like manner, the current flows from armature 59 through contacts 59a and 60 to conductor 67 leading to spring contact 49 of the rotary switch. From there the current flows across plate 13 to center spring contact 48 and to the motor by means of conductor 64, thus completing the motor circuit, whereby the valve unit is rotated by the motor 10 until the valve registers in closed position, at which time current to motor is suspended by means of contact 48a riding off plate 13 onto block 42a, thus completing the operating cycle of the unit and placing it in readiness for the next operation. A conductor 55a connects with additional units.

The valve 8 is prevented from being left open accidentally in any position to cause reduced air pressure on the train line and loss of sand by limiting the size of block 42a so that any partial rotation of the valve unit will cause spring contact 49a to ride off of block 42a and come in contact with plate 13, thereby completing the motor circuit which will cause the valve to be rotated to closed position.

In Fig. 10 a governor 70 is shown which may be located on the locomotive or on any one of the coaches, and is mounted so as to enable it to be driven directly from the axle by a belt or other suitable means and is in operation at all times while the train is in motion. Contact arm 68 is operated by governor 70 and is moved over across and on the contact 69, making electrical contact thereon. The governor unit is connected in the line 56 so that the circuit is completed from the switch 52 to the relay winding 57 only when the arm 68 is on contact 69. Thus, by having the governor adjusted so that arm 68 remains on contact 69 only during a predetermined speed range and by closing switch 52, located on the locomotive cab, the valve unit

will operate and deliver sand under the car wheels only when the train is traveling within the set speed range and sanding is automatically shut off when the speed of the train extends beyond the setting of the governor or upon opening switch 52, thus preventing escape of sand to the rails while the train is not in motion or operating at a speed when sanding is not required.

In Fig. 11, the switch 72 is operated by pneumatic means consisting of a chamber 71, enclosing a diaphragm which closes switch 72 when acted upon by pressure of air from line 73. Air line 73 is connected directly to the brake application air line or directly to the air brake operating valve. Thus, by operating the air brake valve to actuate the brakes, air is also supplied to the pneumatic switch closing the control circuit to operate the valve unit for the purpose of supplying sand under the car wheels in conjunction with brake application, or suspending the sanding when the brakes are released.

Heretofore it has been the practice to apply track sanders on the locomotives or power units only, as distinguished from train or car units; in other words, the use and application of sand to the rails, which is just as efficacious on a freight or passenger car wheel under air brake control, has not been successfully extended to the cars comprising the train itself, due, primarily to the fact that no device in the shape of a cab control or operating valve, has yet been used which would enable the engineer to apply sand, not alone on the power unit, but on every car on the train, at one and the same time, in order to increase the tractive power of the wheels on the rails or reduce the speed of the train as desired.

All modern passenger trains are fully equipped with air supply pipes and electrical wiring systems. The same are joined, car to car, by flexible connections, and the addition of a sand box connected with said traps over or adjacent to any set of trucks in the entire train, and the herein motor driven sander valve arrangement, connected with the electrical wiring and air reservoir, would, at the option of the engineer, transmit sand to the rails, either before or behind, the trucks of the several cars or the drivers of the power unit at one and the same time, and makes such a sanding system practical and commercially acceptable.

Moreover, the speed governor, which is part of the air brake system, and is electrically controlled, can be connected with the herein described motor driven sander valve so as to automatically open and close the sander valve to deliver and suspend delivery of sand to the rails with the application and release of the brakes on the governor impulse, a function entirely without possibility on any other existing sanding valve or system.

The herein described device is a completely rotating disc, the one port therein moving clockwise over a clean out port, to free the track delivery pipes from obstructions like snow or ice, then to a sanding port which is piped into a sand trap and blows sand in prearranged volume down to the rail.

The present valve, therefore, makes it possible to provide a sanding system where all of the wheels of the different cars of a train may be provided with sand, controlled from the locomotive or power unit. This is not possible with the valves that move a certain distance and then

must be moved back to their initial position. By providing the cars of a train with this sanding valve and arrangement, the wear and tear on the brake shoes will be greatly reduced. At the present time the cost of supplying brake shoes on the railroad stands number two as to the expense item, the highest item being the cost of coal or fuel.

With such a system applied to the fast trains going, say, 100 miles an hour, such trains could be stopped in one-fourth of the distance required under present sanding conditions. The simplicity, dependable performance and properly balanced clean out and sanding operations of the present device, and its utilization of a minimum of air and electric current makes it a commercially advantageous construction.

I claim:

1. A track sanding device for car wheels running on rails, comprising a sand trap for the sand, a delivery pipe extending from the sand trap to a point in proximity to the point where the wheels make contact with the rail, a valve for controlling the delivery of fluid under pressure for blowing sand from the sand trap through said delivery pipe, said valve comprising a casing, pipes for connecting it to a source of fluid under pressure and with said sand trap, a rotary valve disc in said casing, ports in said valve disc and said casing controlled by the movement of said valve disc for controlling admission of fluid to the pipe connected with the sand trap, which disc makes a complete revolution in a single direction in every operation of the valve, an electric motor for rotating said disc and circuit means for said motor including means for supplying operating current to said motor to open said valve, means for automatically shutting off said current when said valve reaches open position, and means for supplying operating current to said motor to close said valve.

2. A track sanding device for car wheels running on rails, comprising a sand trap for the sand, a delivery pipe extending from the sand trap to a point in proximity to the point where the wheel makes contact with the rail, a valve for controlling the delivery of fluid under pressure for blowing sand from the sand trap through said delivery pipe, said valve comprising a casing, pipes for connecting it to a source of fluid under pressure and with said sand trap, a rotary valve disc in said casing, ports in said valve disc and said casing controlled by the movement of said valve disc for controlling admission of fluid to the pipe connected with the sand trap, which disc makes a complete forward revolution in a single direction in every operation of the valve, an electric motor operatively connected with said disc for rotating it, electrical circuit connections for said motor, including means for supplying operating current to said motor to move said disc to open said valve, means for automatically shutting off said current when said valve reaches open position and while the sand is being delivered to the rail, and means for supplying operating current to said motor to move said disc to close said valve.

3. A track sanding device comprising a sand trap having cleanout and sanding nozzles, a source of fluid under pressure, a fluid controlling valve having cleanout and sanding ports controlled by a movable part, an electric motor for actuating said valve, means supplying operating current to said motor to open said valve, automatic means for shutting off the current to said motor when said valve reaches its open position,

and means for supplying operating current to said motor to close said valve, said valve being connected to said source of fluid under pressure and said nozzles and constructed to deliver a clean out air blast into said sand trap before and after each sanding operation, the movable part of said valve being rotated by said motor in the same direction a complete revolution at every operation.

4. A track sanding device for cars running on rails other than the power units to which the cars are attached and having a main air line thereon, comprising a sand trap thereon, a sand delivery pipe extending from said sand trap to the rail in proximity to a wheel of the car, a connection between said main air line and said sand trap, a valve in said connection comprising a casing, a rotary valve disc in said casing, which makes a complete revolution in a single direction in every operation of the valve, ports in said valve disc, and said casing controlled by the movement of said valve disc for controlling the admission of air under pressure to the pipe connected with said sand trap for blowing sand from said sand trap through said delivery pipe, an electric motor for rotating said disc, a source of current for said motor controlled from the power unit and circuit controlling means for supplying operating current to said motor to open said valve and for automatically disconnecting the motor from the source of current when the valve reaches its open position and sand is being delivered from said sand trap to the rail and connecting said motor with said source of current to close said valve so that the motor is using no current while sand is being delivered from the sand trap to the rail and is only using current when the valve is being moved to connect the sand trap with the main air line and to disconnect the sand trap from the main air line.

5. A track sanding device for cars other than the power units to which the cars are attached and having a main air line thereon, comprising a sand trap thereon, a sand delivery pipe extending from said sand trap to the rail in proximity to a wheel of the car, a connection between said main air line and said sand trap, a valve in said connection comprising a casing, a rotary valve disc in said casing, ports in said valve disc and said casing controlled by the movement of said valve disc for controlling the admission of air under pressure to the pipe connected with said sand trap for blowing sand from said sand trap

through said delivery pipe, which valve disc makes a complete revolution in a single direction in every operation of the valve to connect the sand trap with the main air line and to disconnect the sand trap from said main air line, an electric motor for rotating said disc, a source of current for said motor controlled from the power unit and circuit means for said motor, including means for supplying operating current to the motor to open said valve, means for automatically shutting off said current when said valve reaches open position, and means for supplying operating current to said motor to close said valve so that the motor is using no current while sand is being delivered from the sand trap to the rail and is only using current when the rotary valve is being moved to connect the sand trap with the main air line and to disconnect the sand trap from the main air line.

6. A track sanding device for a plurality of cars running on rails connected with a power unit, said cars having a main air line extending there-through, said track sanding device comprising a separate sand trap on each of said cars, a sand delivery pipe extending from each of said sand traps to the rail in proximity to a wheel of each of said cars, a connection between said main air line and each of said sand traps, for blowing sand from said sand traps through said delivery pipes, a valve in each of said connections comprising a casing, a rotating disc in said casing which makes a complete revolution in a single direction in every operation of the valve, ports in said valve disc, and said casing controlled by the movement of said valve disc for controlling the admission of air under pressure to the said sand traps, an electric motor for actuating each of said valve discs, a source of current for said electric motors extending through said cars and controlled from the power unit and circuit means for said motors, including means for supplying operating current to said motors to open said valves, means for automatically shutting off said current when said valves reach open positions, and means for supplying operating current to said motors to close said valves, so that the motors are using no current while sand is being delivered from the sand receptacles to the rail and are only using current when the valves are being moved to connect the sand receptacles with the main air line and to disconnect the sand receptacles from the main air line.

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