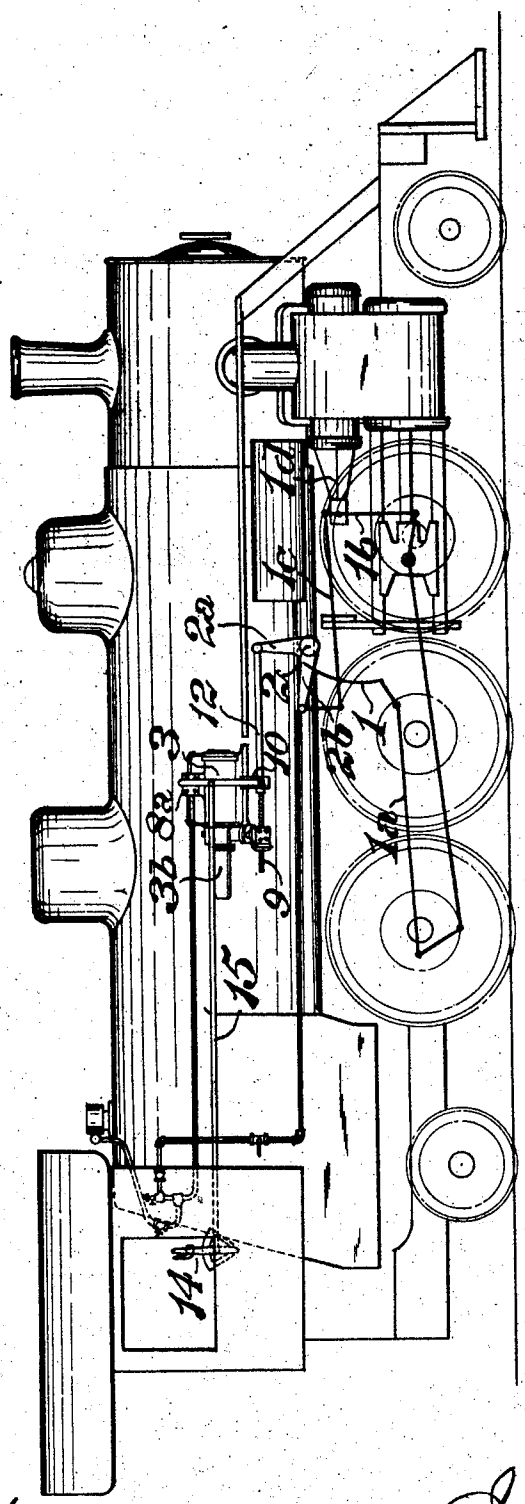
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STEAM ENGINE VALVE REVERSING GEAR

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- FIG. 1 -

WITNESSES

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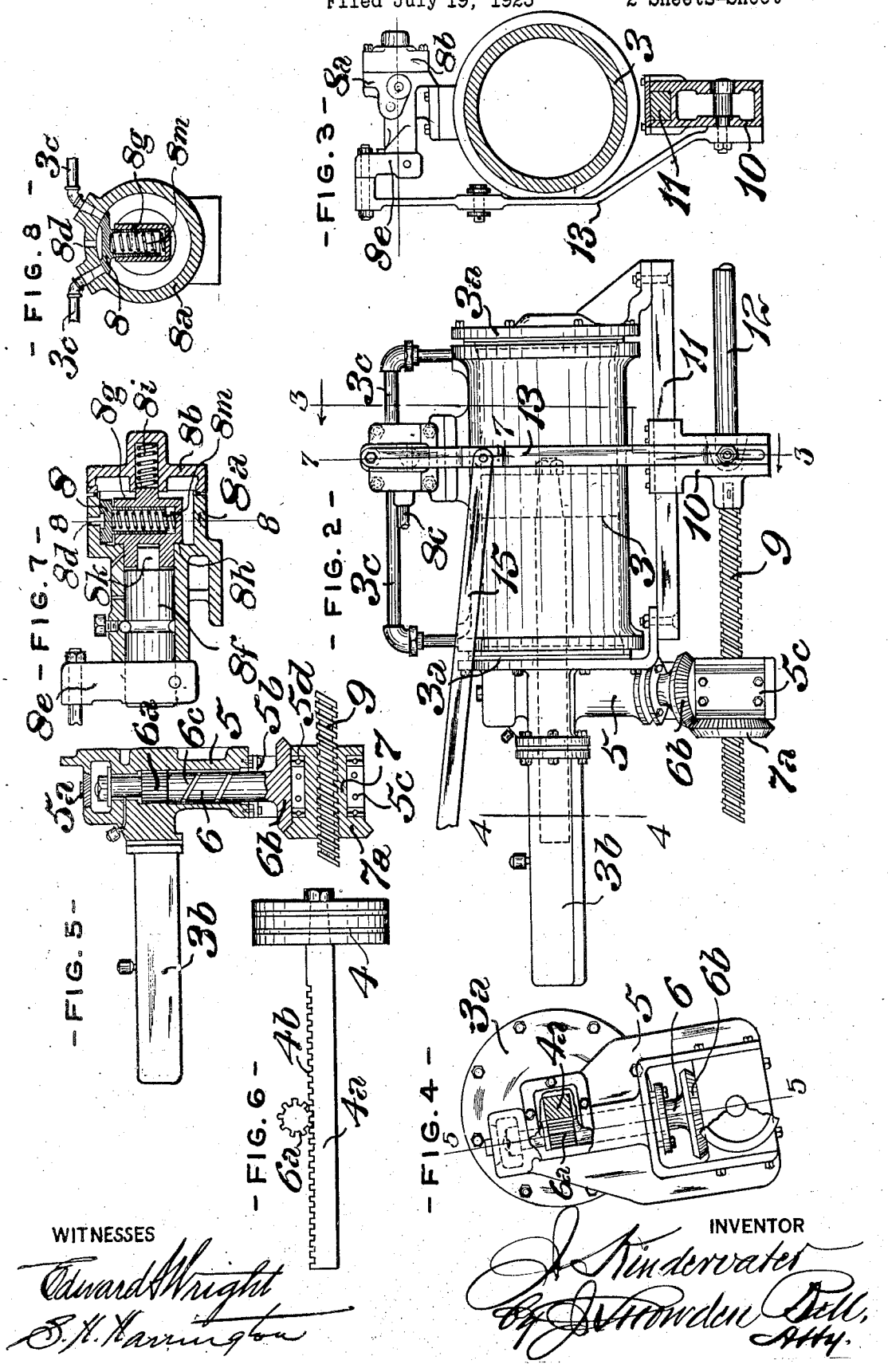
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STEAM ENGINE VALVE REVERSING GEAR

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UNITED STATES PATENT OFFICE.

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STEAM-ENGINE VALVE REVERSING GEAR.

Application filed July 19, 1923. Serial No. 652,542.

My invention relates to power actuated reversing gear for steam or other fluid pressure engines, more particularly those of locomotives, and its object is to provide an appliance of such type which will be of simple and inexpensive construction and ready applicability in connection with valve gears of any of the various standard constructions, and in the operation of which, positive and accurate adjustment will be attained, and creeping be fully prevented.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a diagrammatic side view, in elevation, of a locomotive engine, illustrating an application of my invention; Fig. 2, a side view, in elevation, of a steam engine valve reversing gear embodying my invention; Fig. 3, a transverse section on line 3—3 Fig. 2 through the reversing cylinder and cross head guide, and a view, in side elevation, of the related members, as seen from the right; Fig. 4, a similar view, partly in section on line 4—4 Fig. 2, of the major portion of the appliance, as seen from the left; Fig. 5, a vertical section, on the line 5—5 of Fig. 4; Fig. 6, a view of the piston and piston rod, and the pinion which they operate, detached; Fig. 7, a vertical longitudinal section through the valve chest, on the line 7—7 of Fig. 2; and, Fig. 8, a transverse section through the same, on the line 8—8 of Fig. 7.

My invention, which is applicable in connection with any of the well known types of distribution valve mechanism, is illustrated in Fig. 1 as applied for the control of a Walschaerts valve gear of the ordinary construction, which comprehends a link, 1, eccentric rod, 1^a, combination lever, 1^b, and radius bar, 1^c, and is connected to a distribution valve stem 1^d. The radius bar is coupled to the lower arm, 2^b, of a reverse shaft, 2, and is raised and lowered, throughout its range of traverse on the link, 1, by my improved reversing mechanism hereinafter described, which is coupled to the upper arm, 2^a, of the reverse shaft.

In the practice of my invention, referring descriptively to the specific embodiment thereof which is herein exemplified, a reversing cylinder, 3, is supported on the boiler of the locomotive, and is closed, at its ends, by removable heads, 3^a. A properly packed piston, 4, is fitted in the cylinder, and is secured on a piston rod, 4^a, which passes through the rear head of the cylinder and projects into a casing, 3^b, which is secured thereto and is closed at its outer end. The piston rod is of rectangular section, and a rack, 4^b, is cut on one of its sides. The admission and exhaust of motive fluid, which may be either steam or compressed air, to and from opposite ends of the cylinder, 3, is controlled by an operating valve, 8, fitted in a valve chest, 8^a, which is secured on the cylinder, closed, at its outer end, by a removable head, 8^b, and provided with a connection to a supply pipe, 8^c, and with an exhaust outlet, 8^d. Induction and eduction pipes, 3^c, connecting the valve chest and cylinder are governed by the valve, 8.

A gear case, 5, the upper portion of which is closed at top, by a removable plug 5^a, is disposed transversely to the line of traverse of the piston, and is supported on the rear head of the cylinder, 3, adjoining the casing, 3^b, on the side next the rack, 4^b, of the piston rod. A gear shaft, 6, is fitted truly in the case, 5, and extends through a packing gland, 5^b, in the bottom thereof. A pinion, 6^a, formed on the shaft, 6, engages the rack, 4^b, and a bevel gear, 6^b, which is formed or fixed on the lower end of the shaft, engages a corresponding gear, 7^a, formed on one end of a nut, 7, which is journalled in a support, 5^c, having ball bearings, 5^d, to ensure easy operation, and connected to the gear case, 5, at the lower end thereof. Oil is supplied to the gear case, through the opening closed by the plug, 5^a, and flows to the lower end of the space in which the shaft, 6 is, rotated, through a helical groove, 6^c, cut in said shaft. The nut, 7, and adjoining portion of the reversing screw are also preferably encased, so as to be caused to rotate in a bath of oil.

The nut, 7, is continuously in engagement with a reversing screw, 9, the forward end of which is connected to a cross head, 10, which traverses longitudinally on a guide, 11, secured to the heads of the cylinder, 3. The cross head is coupled to the rear end of

a reach rod, 12, the forward end of which is coupled to the upper arm, 2^a, of the reverse shaft 2.

The operating valve, 8, which is of the rocking type, works on a finished face on the inside of the valve chest, 8^a, and in its movements over said face, controls communication between the fluid pressure supply pipe, 8^c, and one or the other of the pipes, 3^c, leading from the valve chest to the opposite ends of the reversing cylinder, or between one or the other of said pipes and the exhaust outlet, 8^d, according to the position into which it may be moved by a quadrant lever, 14, journalled in the cab of the locomotive, and connected, by a reversing rod, 15, to a floating lever, 13. The upper end of said lever is coupled to a rocker arm, 8^e, on the shaft, 8^f, of the operating valve, and its lower end is coupled to the crosshead, 10.

The operating valve is fitted in a casing, 8^g, which is held against a seat, 8^h, in the valve chest, by a spring, 8^i, and is provided with a squared recess which is engaged by a tenon, 8^k, on the inner end of the valve shaft, 8^f. The operating valve is held to its seat by a spring, 8^m, fitting in the casing, 8^g. It will be seen that, under the above construction, no packing is required, and that when the head, 8^b, of the valve chest, is securely bolted in place, the valve chest will be tightly sealed.

In the operation of the appliance, the quadrant lever being moved in the desired direction, motive fluid is, by the corresponding movement of the operating valve, 8, admitted to one end of the reversing cylinder, 3, and exhausted from the opposite end, thereby effecting the movement of the piston, 4, therein. Corresponding movement of the cross head, 10, and connected reach rod, 12, is effected by the engagement of the rack, 4^a, of the piston rod, with the pinion, 6^a, on the shaft, 6. Said shaft, through the gears, 6^b and 7^a, rotates the nut, 7, which imparts longitudinal movement to the reversing screw, 9, and cross head, 10. In the event of a failure of motive supply, as by the breaking of a pipe, no movement of the valve mechanism results, and consequently no engine failure can occur by reason of broken or leaky pipes. The appliance can be operated manually, in case of emergency, requiring such operation, by removing the plug, 5^a, and applying a wrench to the shaft, 6, by the rotation of which the cross head can be moved to any desired position.

It will be obvious to those familiar with the construction and operation of locomotive engines, that a reversing gear of the construction and manner of operation substantially as herein set forth, is readily and conveniently applicable for the control of any of the distribution valve gears known in present standard practice, without substantial cost of construction or maintenance, and that in its operation, by reason of the transference of the operating power from the piston to the cross head, through a nut and screw, the important advantages, in practice, of ensuring positive and accurate adjustment, and completely eliminating creeping after adjustment, are fully attained.

I claim as my invention and desire to secure by Letters Patent:

1. In a valve cut-off and reversing gear, a fluid pressure cylinder, a piston fitted to traverse therein, means for admitting motive fluid to the cylinder, a piston rod secured to the piston and having a rack on one of its sides, a gear shaft journalled transversely to the line of traverse of the piston, a pinion on said shaft engaging the rack of the piston rod, a nut rotatably mounted, gears transmitting rotary motion from the gear shaft to said nut, a reversing screw engaging said nut, and a cross-head actuated by said reversing screw and operatively connected to the valve; said fluid admission means comprising an operating valve for controlling the supply and exhaust of motive fluid to and from the fluid pressure cylinder, a link between said operating valve and the cross-head, and a control rod operatively connected to said link.

2. In a valve cut-off and reversing gear, a fluid pressure cylinder, a piston fitted to traverse therein, means for admitting motive fluid to the cylinder, a closed casing communicating with one end of the fluid pressure cylinder, a piston rod secured to said piston and projecting into the casing, a rack formed on one side of said piston rod, a gear case disposed transversely to the line of travel of the piston, and having a closed upper portion communicating with the closed casing of the cylinder, a gear shaft journaled in said closed upper portion, a pinion on said shaft engaging the rack on the piston rod, a nut rotatably mounted, gears for transmitting rotary movement from the gear shaft to said nut, a reversing screw engaging said nut, and a cross-head actuated by said reversing screw and operatively connected to the valve; said fluid admission means comprising an operating valve for controlling the supply and exhaust of motive fluid to and from the fluid pressure cylinder, a link between said operating valve and the cross-head, and a control rod operatively connected to said link.

3. In a valve cut-off and reversing gear, a fluid pressure cylinder, a piston fitted to traverse therein, means for admitting motive fluid to the cylinder, a gear case disposed transversely to the line of traverse of the piston, and having a closed upper portion, a removable plug closing an opening in the top of the gear case, a gear shaft journalled within the gear case and operatively connected for rotation by the movement of the piston, said shaft being accessible by removal

of the plug, a nut rotatably mounted, gearing for transmitting rotary motion from the gear shaft to the nut, a reversing screw engaging said nut, and a cross-head actuated by said reversing screw and operatively connected to the valve.

4. In the structure defined in claim 3, said fluid admission means comprising an operating valve for controlling the supply and exhaust of motive fluid to and from the fluid pressure cylinder, a link between said operating valve and the cross-head, and a control rod operatively connected to said link.

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