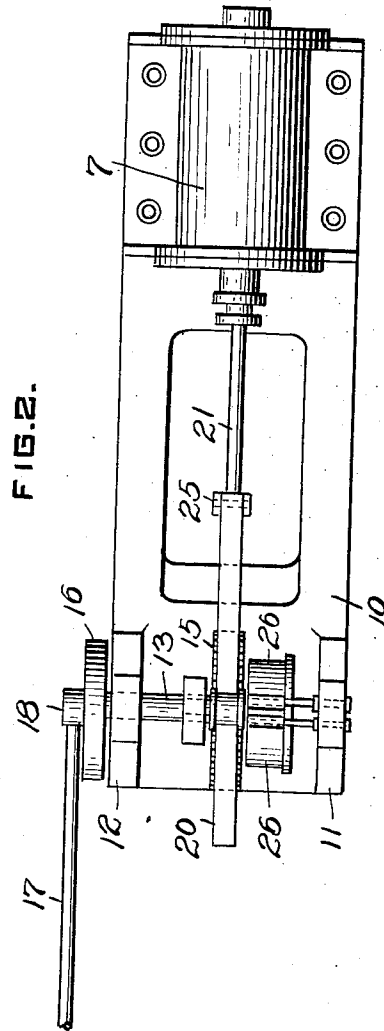
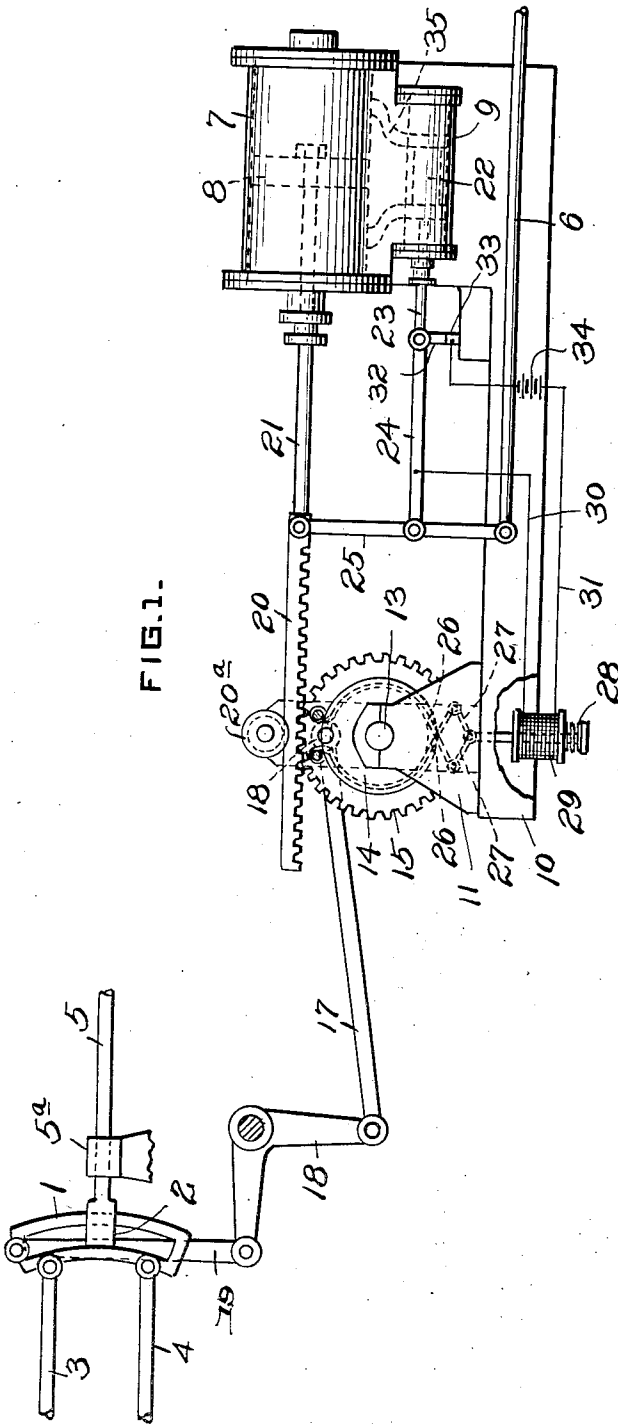


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REVERSING MECHANISM FOR ENGINES.
APPLICATION FILED JULY 17, 1920.

1,403,569.

Patented Jan. 17, 1922.
2 SHEETS—SHEET 1.



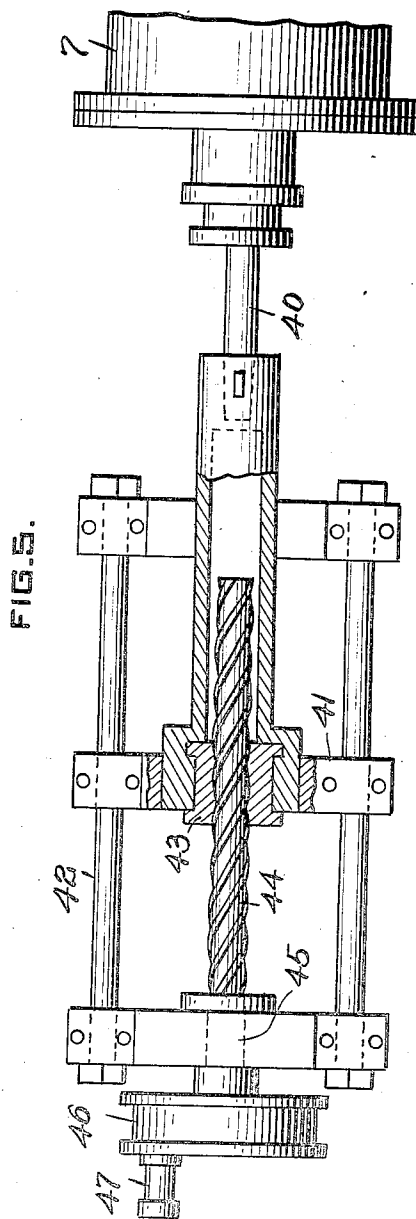
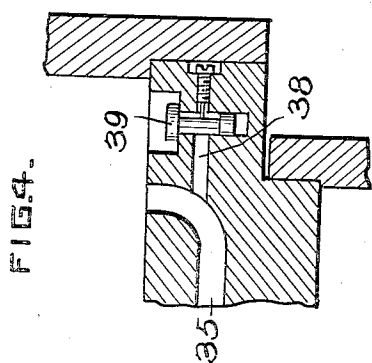
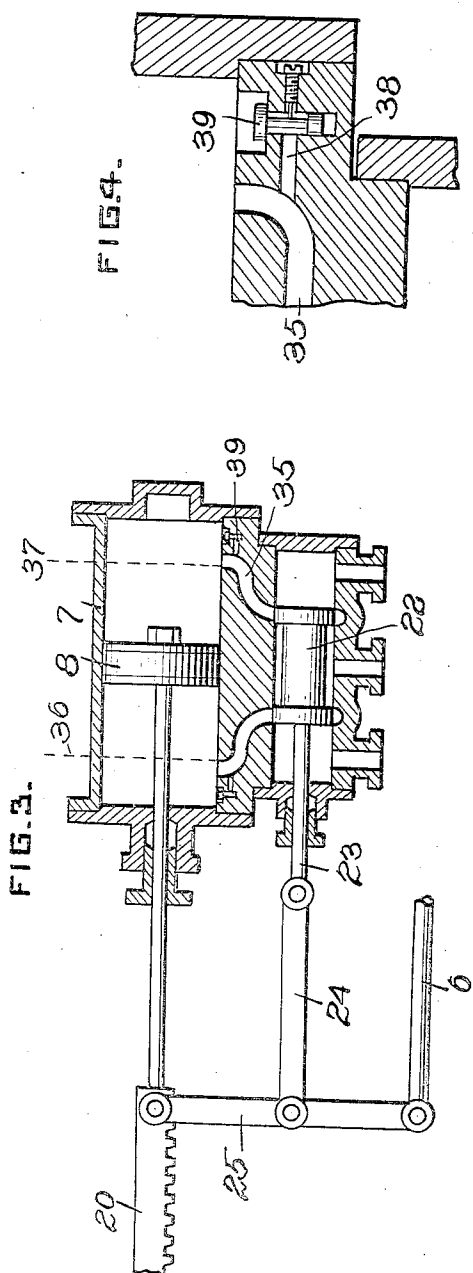
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WILLIAM H. ROGERS, OF PERTH AMBOY, NEW JERSEY.

REVERSING MECHANISM FOR ENGINES.

1,403,569.

Specification of Letters Patent. Patented Jan. 17, 1922.

Application filed July 17, 1920. Serial No. 396,938.

To all whom it may concern:

Be it known that I, WILLIAM H. ROGERS, a citizen of the United States, and a resident of Perth Amboy, in the county of Middlesex and State of New Jersey, have made new and useful Improvements in Reversing Mechanism for Engines, of which the following is a specification.

The invention relates to controls for reversing mechanism such as the engines employed in rolling mills, although not limited to this use. Such engines are ordinarily reversed by means of link mechanism controlled by a reversing lever but operated by a supplemental power means so that the labor imposed upon the operator is reduced. The controls heretofore used have employed the floating lever principle and it is the primary object of the present invention to improve the control of this floating lever mechanism. More specifically stated, the improved mechanism is designed, (1) to provide a more rapid reversing movement and a better means for locking the reversing device in its operative and in neutral positions than the mechanism heretofore commonly used with a cataract cylinder, (2) to provide for controlling the movement of the reversing link as it approaches its extreme positions thus eliminating the danger of over travel, (3) to eliminate any jarring action when the piston of the power mechanism reaches the end of the stroke and to accomplish this result without increasing the travel of the link block or slowing down the movement of the piston as it approaches such end positions; (4) to eliminate any vibratory movement of the reversing mechanism when the reversing link reaches the position to which it is intended it shall be moved; (5) to operate the link so accurately and easily that the control mechanism can be used alone to substantially stop and start the engine without recourse to the throttle of the engine, and (6) to secure the results stated by a simple and reliable device readily applicable in connection with the standard control mechanism and engines now in use.

Certain of the desired functions of the present apparatus have been heretofore accomplished by the use of a hydraulic throttling cylinder known as a cataract cylinder connected to the power cylinder and such a device does operate to lock the piston of the power cylinder in its desired position and eliminate the jar incident to the arrival of

the piston at the end of its stroke, but such cataract cylinder apparatus has been generally abandoned in practice due to the slowing up of the reversing operation incident to the slow throttling action and consequent slow movement of the cataract and steam pistons as their valves approach the end of their closing movement. Certain embodiments of the invention in simple and somewhat diagrammatic form for clearness and simplicity of explanation are illustrated in the accompanying drawings wherein;

Fig. 1 is a side elevation of the improvement. Fig. 2 is a plan view, Fig. 3 is an enlarged section through the cylinder and valve chest of the apparatus; Fig. 4 is an enlarged section through a part of the cylinder and valve casings showing a detail of the invention, and Fig. 5 is a side elevation of a modified form of a part of the device.

Referring to the drawings, 1 and 2 are link members of the conventional form employed in reversing mechanism, 1 being the guide member and 2 the wrist block member mounted to slide in the guide member. The member 1 is connected to the eccentric rods 3 and 4, such rods being secured at their other ends to eccentrics in the usual way, while the wrist block 2 carries the valve rod 5 extending forward to the engine valve and supported in the guide 5^a. The guide member 2 is shown in neutral position at which time the valve controlled by the rod 5 is in cut-off position. When the block 2 is at one extreme of the slot in the guide member 1 the relation of the valve and eccentrics is such that the engine runs in one direction while a reversal occurs when the block occupies the other end of the slot, this relation being one which is well known in the art, and it being understood that the present invention relates to the means for controlling the relative movement of the link members 1 and 2 as it is common to secure the necessary relative movement either by moving the block or by moving the slotted guide member.

The manual control of the link member 1 is accomplished from the connecting rod 6 which is secured at its right hand end to the engineer's reversing lever (not shown). This operation of the reversing link is accomplished indirectly by means of the power cylinder 7 with its piston 8 and the connections intermediate such piston and the block or link member 2.

The cylinder 7 with its steam chest 9 and

the supplementary mechanism employed is carried upon a base 10, such base having at its left hand end a pair of upwardly extending standards or brackets 11 and 12 which provide bearings for a transverse shaft 13. Keyed upon this shaft is a brake drum 14, a spur gear 15 and a crank 16, such crank being connected by means of a rod 17 with one arm of the bell crank lever 18, the other arm of such bell crank lever being connected by the rod 19 with the end of the link member 1. Engaging the upper face of the spur gear is an operating rack 20, which rack is held down by the roller 20^a and is connected at its right hand end with the piston rod 21 of the piston 8.

The movement of the piston 8 is controlled by the valve 22 in the steam chest 9, such valve being preferably of the piston type and being provided with a valve rod 23 pivoted at its forward end to a connecting rod 24.

This connecting rod is pivoted at its other end to the lever 25, such lever having pivotal connection at its lower end to the manually operated rod 6 and at its upper end to the rack 20. This member may be properly termed a floating lever since none of its points of pivotal connection are fixed and such lever is commonly referred to in the art as a floating lever.

Extending around the brake drum 14 is a pair of brake bands 26, connected at their lower ends to the toggle members 27, which members are in turn pivoted to the upper end of the core or rod 28 of the solenoid coil 29, the device as a whole constituting a magnetically operated brake which for convenience of illustration is shown in a simple and diagrammatic form. The ends of the solenoid winding are connected by the leads 30 and 31 to the contact members 32 and 33, one of which is carried by the piston rod 23 while the other is fixed upon the frame or base 10 of the machine. A suitable source of current 34 is interposed in one of the leads and it will be understood that the purpose of the device is to cause the automatic application of the brake when the parts arrive at the position illustrated in Fig. 1, that is, with the valve 22 in middle or neutral position. When the parts are in the position illustrated in Figs. 1 and 3 the link member 2 is in neutral position so that no steam is being admitted to the cylinder of the engine and at this time the valve 22 of the power cylinder 7 is in cut off position so that no steam is admitted to the cylinder and the brake drum 14 is locked against movement so that the link 2 is positively held against movement. To start the engine the operator moves his reversing lever so as to move the rod 6 either in one direction or the other. Assuming it is moved to the right the operation is as follows. The

movement of the rod 6 to the right moves the rod 24 and valve 22 to the right admitting steam through the passage 35 to the right hand end of the cylinder 7. This causes the piston and rack 20 to move to the left rotating the gear 15 and crank 16, and through the connections 17, 18 and 19 moving the link 2 upward so that the operation of the eccentrics of the engine causes the reciprocation of the valve rod 5. The movement of the rod 6 to the right also breaks the contact between the members 32 and 33 thus releasing the magnetic brake and leaving the shaft 13 and the parts carried thereby to rotate.

The movement of the piston 8 to the left carries the upper end of the lever 25 to the left and the parts are so arranged and proportioned that when the piston 8 reaches its position to the left as determined by the position of the reversing lever, the lever 25 has carried the rod 24 and valve piston rod 23 back to its original starting position, thus cutting off the supply of steam to the cylinder 7 and causing the application of the magnetic brake when the contact 32 engages the contact 33. The parts are thus brought to rest and locked in position and this position is maintained until the rod 6 is operated either to cause the movement of the block or link 2 back to neutral position or to some other position as determined by the position of the reversing lever, the operation as heretofore described being reversed and the rod 6 being moved to the left instead of to the right. One advantage incident to the use of the crank connection between the piston rod 21 and the reversing link as opposed to a direct connection such as has been heretofore used resides in the fact that the movement of the reversing link is gradually decreased as the end of the stroke is approached, due to the fact that the crank in revolving from the position illustrated in Fig. 1 to a position ninety degrees therefrom, approaches dead center, at which its effective movement acting to turn the bell crank lever 18 is reduced to a minimum. This eliminates the danger of over travel. The speed of movement is also correspondingly greater during the first portion of the movement of the link thus bringing the valves of the engine to their desired position more rapidly. The use of the automatically applied brake also involves an advantage as the parts are positively locked when the valve reaches cut off position so that there is no wavering movement of the reversing link after it reaches its final position. Only a slight amount of force is required to move the rod 6 since there is no oil control valve to move as in the case of the use of a cataract cylinder, and when once moved the reversing link is carried by the control mechanism

to its desired position very quickly and positively stopped in such position when the floating lever brings the valve 22 and contacts 32 and 33 back to the position illustrated in Fig. 1.

In order to avoid any jarring action when the piston 8 reaches the end of its travel, a clearance space is provided at each end of the cylinder, the normal movement of the piston being indicated in Fig. 3 by the dotted lines 36 and 37. The use of this clearance is permissible in connection with this apparatus because of the reduced speed of travel of the reversing link as it approaches extreme position as heretofore set forth, so that a slight over travel of the piston such as becomes possible by reason of the clearance spaces does not cause any material over travel of the reversing link. The apparatus in this particular has an advantage over the ordinary type of direct connected reversing devices wherein compression at the end of the cylinder as the piston approaches such end is depended upon to limit the movement of the reversing link, which compression causes the link and engine to be slow in getting their full stroke and in which a corresponding jarring action is prevented at each end of the travel of the piston. The use of the crank feature in connection with the magnetic brake gives such accuracy and ease of control of the reversing link that the stopping and starting of the engine may be almost controlled from the reversing lever alone without recourse to the throttle valve of the engine.

Fig. 4 illustrates a detail of construction for permitting of the starting of the piston 8 from its end position in case the piston should have overtravelled one of the ports 35 so that admission to such end of the cylinder is blocked. This result is accomplished by the use of a small supplemental passage 38 provided with the upwardly opening check valve 39. It will be seen that this permits an admission to the end of the cylinder even though the port 35 is blocked by the piston 8.

Fig. 5 illustrates a modified arrangement for translating the reciprocatory movement of the piston of the power cylinder to rotary or crank movement in order to secure the decreasing speed of travel as the reversing link or block approaches the end of its stroke and to guard against over travel. In this type of construction the piston rod 40 of the power cylinder is connected with a crosshead 41 mounted to move along the guides 42 and such crosshead is provided with a threaded nut 43 adapted to engage a screw 44. This screw 44 is swivelled at its forward end in the bearing 45 and is provided with a brake drum 46 and a crank 47 corresponding to the brake drum and crank

in the construction of Fig. 1. Suitable connection is made between the crank shaft pin 47 and the reversing link so that the rotation of the crank causes the movement of the link. Other modifications might obviously be made for securing the desired result, namely a reduced speed in the movement of the reversing link or block as it approaches its end position, and it will be understood that the invention contemplates any and all means of accomplishing this function. It will also be understood that various forms of brakes or retarding devices automatically put into action may be employed and the invention is generic to this feature of applying a brake when the valve of the power cylinder reaches central or cut off position. The invention is illustrated in a simple and diagrammatic form throughout and it will be understood that the apparatus is restricted in no way in matters of detail to the construction shown.

What I claim is:

1. In combination in reversing mechanism for engines, a reversing link member, a power cylinder and piston, a valve for controlling the operation of the piston, a floating lever having connection with the said piston and valve, a connection for manually operating the lever, and speed reducing connections intermediate said piston and the reversing link member for operating such link member at decreasing speed from its neutral to its extreme positions.
2. In combination in reversing mechanism for engines, a reversing link member, a power cylinder and piston, a valve for controlling the operation of the piston, a floating lever having connection with the said piston and valve, a connection for manually operating the lever, speed reducing connections between the said piston and the reversing link member for operating such link member at reducing speed as it approaches the end of its movement, and means for automatically applying a brake to the said connections when said valve arrives at its central or neutral position.
3. In combination in reversing mechanism for engines, a reversing link member, a power cylinder and piston, a valve for controlling the operation of the piston, a floating lever having connection with the said piston and valve, a connection for manually operating the lever, and speed reducing connections including a crank intermediate said piston and the reversing link member for operating the link at decreasing speed as the link member approaches its end positions, at which time the crank is approximately on dead center.

In testimony whereof, I have hereunto subscribed my name.

WILLIAM H. ROGERS.