W. H. STANTON.

STEAM MOTOR.

APPLICATION FILED MAY 14, 1908.

996,158. Patented June 27, 1911.

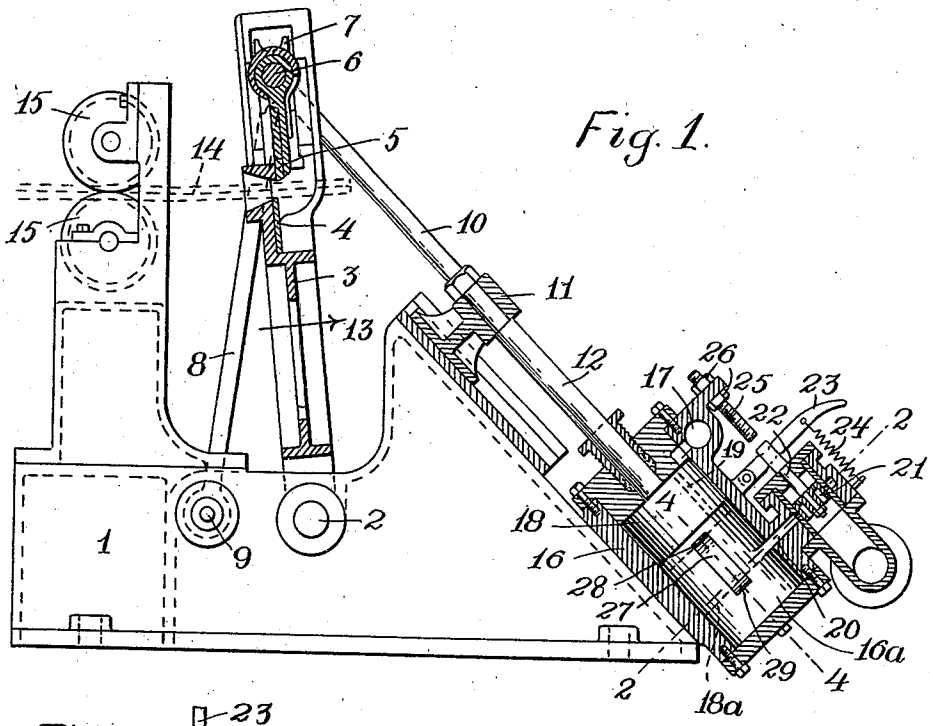

Fig. 1.

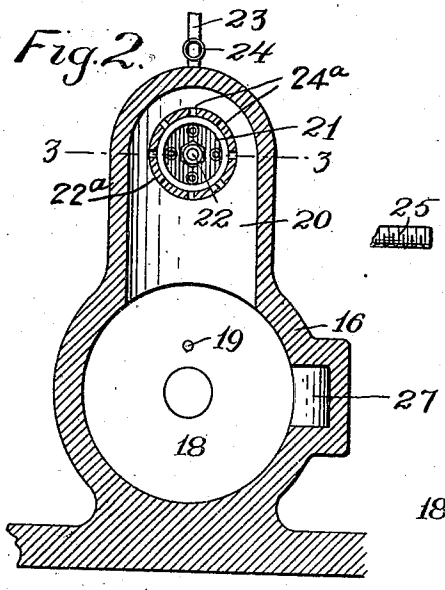

Fig. 2.

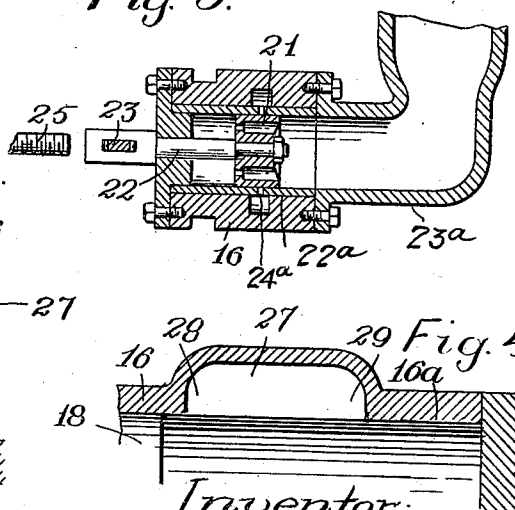

Fig. 3.

Fig. 4.

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STEAM-MOTOR.

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To all whom it may concern:

Be it known that I, WILLIAM H. STANTON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Steam-Motors, of which the following is a specification.

The object of my present invention is to provide a steam motor, comprising a piston equipped cylinder into which steam is admitted at one end through an inlet port to actuate the piston in one direction, and to provide a cushion at the end of the piston stroke, and to return the piston with a retarded movement to its initial position, such results being accomplished by the instantaneous opening and closing of a single exhaust valve.

Although my invention is applicable to a variety of purposes to which a steam motor having a quick movement in one direction and a retarded reverse movement may be applied, I have herein described and illustrated my invention in a steam motor as applied to the operation of what is known as a flying shear, employed in rod or bar mills for the purpose of severing a bar of metal as it is delivered from the final rolls of the mill and while it is yet in motion. The flying shear hereinafter described and shown in the accompanying drawings forms no part of my present invention, but is used to illustrate the character and nature of my invention as embodied in the motor by which said shear is operated.

In the accompanying drawings forming a part of this specification, Figure 1 represents a side elevation of a flying shear partly shown in cross section and connected with a steam motor embodying my invention, said motor being shown in central longitudinal sectional view. Fig. 2 is an enlarged transverse sectional view on the plane of the broken line 2—2, Fig. 1. Fig. 3 is a sectional view on the broken line 3—3, Fig. 2, and Fig. 4 is an enlarged partial section on the line 4—4, Fig. 1.

Similar reference letters and figures refer to similar parts in the different views.

Referring to Fig. 1 of the drawings 1 denotes a framework on which is pivotally mounted at 2 a swinging shear frame 3 carrying a fixed shear blade 4, and a movable shear blade 5 pivotally suspended from a rod 6 carried in a sliding head 7, which is pivotally connected by a link 8 with the framework of the machine at 9. The sliding head 7 is also pivotally connected to a rod 10, which is carried in the sliding cross head 11, said cross head 11 being connected with the piston rod 12 of my improved motor, by the operation of which the swinging shear frame 3 may be quickly swung in the direction of the arrow 13, causing the movable shear blade to sever a metal bar, which has been projected between the shear blades in the position indicated by the broken lines 14, by means of rolls 15, 15. At the completion of the swinging movement of the shear frame 3 it is again returned to its normal position with a retarded movement by the steam motor. All the above described features of construction and operation form no part, however, of my present invention, which relates entirely to the construction and operation of the steam actuating motor as hereinafter described, the novel features of my invention being pointed out in the annexed claims.

The steam motor which forms the subject of my present invention, as illustrated in the accompanying drawings, consists of a steam cylinder 16 having an inlet port 17 at one end, and inclosing a piston 18 attached to the rod 12 and normally standing at the inlet end of the cylinder. The piston is provided with a small hole 19, therethrough, to form a restricted steam passage connecting the cylinder spaces on opposite sides of the piston. The cylinder 16 is provided with an exhaust port 20 near its opposite end, which is normally closed by a sliding exhaust valve 21, carried upon a valve rod 22 and connected with a hand lever 23 pivotally attached to the cylinder and acted upon by a spring 24, to normally hold the exhaust valve in position and close the exhaust port 20. As shown in Fig. 2, the shell of the cylinder 16 incloses an annular portion of the opening 20 which surrounds the exhaust valve 21, and is separated therefrom by a cylindrical bushing 22^a. The opening 20 communicates with the exhaust pipe 23^a through an annular series of openings 24^a in the bushing 22^a. These openings 24^a are normally closed by the valve 21. The exhaust port 20 is opened, when desired, by

hand, by rocking the lever 23 against the tension of the spring 24, the movement of the valve rod 22 being limited by an adjusting screw 25, which is held in position by checking nuts 26, 26, in order to allow the exhaust valve to be moved just far enough to open the exhaust port 20 and by the release of the hand lever to be immediately closed by the spring 24. The steam cylinder is provided with a by-pass 27, Fig. 4, one end of said by-pass opening into the cylinder approximately midway its length at 28, and the other end opening into the cylinder near its exhaust end at 29. Although I have shown but one by-pass 27, in some cases, two or more similar by-passes are preferably employed.

The normal position of the operative parts of my steam motor is shown in Fig. 1, with the exhaust valve 21 closed, and with the steam piston 18 at the inlet end of the cylinder, and with the inlet port 17 in open and constant communication with a boiler or other source of pressure. In the normal position, as shown, of the several operating parts of the motor, boiler pressure will exist upon both sides of the piston, owing to the steam passage 19 which connects the inlet and exhaust ends of the cylinder, but the pressure upon the exhaust side of the piston will be sufficient to hold the piston in its normal position, as the effective piston area upon its exhaust side is as much greater than that upon its inlet side as the area in cross section of the piston rod 12. The piston 18 is, therefore, a differential piston, steam from the boiler being admitted to the cylinder through the inlet port 17 upon the piston rod side only and passing to the opposite side through the restricted opening 19 during the entire stroke of the piston, and through the larger by-pass 27 during a partial stroke of the piston. The cylinder extends beyond the exhaust opening 20 to form a compression chamber 16^a in order to cushion the advance stroke of the piston. The relative positions of the exhaust opening 20 and the by-pass 27 are such that, when the piston has advanced into the position indicated by the broken lines 18^a, Fig. 1, the exhaust opening 20 will be closed by the piston independently of its closing by the exhaust valve 21. The end 28 of the by-pass 27 is then just being cleared by the piston 18 and the end 29 is open to the compression chamber 16^a. In this position of the piston steam is permitted to flow freely through the by-pass 27 during the movement of the piston over the end 29 of the by-pass. At the end of the advance stroke the energy of the compressed steam in the chamber 16^a will be applied to the initial return movement of the piston, and the reverse movement of the piston will be completed by steam at boiler pressure admitted through the opening 19, due to the difference in the effective pressure areas between the two sides of the piston, causing a retardation in the movement of the piston as it approaches its normal position at the inlet end of the cylinder.

I claim,

1. A steam motor having a cylinder and a piston, said cylinder provided with an inlet port at one end open continuously, a valve controlled exhaust port at some distance from the other end, and a by-pass shorter than the stroke of said piston connecting the central portion of the cylinder with the exhaust end beyond said exhaust port.

2. A steam motor, having a cylinder provided at one end with an inlet port open continuously and at some distance from its other end with an exhaust port, a valve for said exhaust port, a by-pass leading from approximately the center of the cylinder to the exhaust end beyond said exhaust port, and a piston having different effective pressure areas upon its opposite sides.

3. A steam motor, having a cylinder and a piston, said cylinder provided at one end with an inlet port open continuously and a valve controlled exhaust port at some distance from the other end of the cylinder, a by-pass smaller than said inlet port communicating with opposite sides of the piston at all times, and a second by-pass arranged to communicate with opposite sides of the piston only after it has completed a portion of its stroke.

4. A steam motor, having a cylinder provided with an inlet port open continuously at one end and a valve controlled exhaust port at some distance from the other end, a piston arranged to be moved in one direction by steam through said inlet port when said exhaust port is open, and by-passes of different lengths and sizes communicating with opposite sides of said piston to return said piston at different speeds in different parts of its stroke when said exhaust port is closed.

5. A steam motor, having a cylinder provided at one end with an inlet port open continuously and at the other end with a valve controlled exhaust port, a piston having the effective pressure area on its exhaust side greater than upon its inlet side, means for the gradual passage of steam from said inlet side to said exhaust side during the entire stroke of the piston, and independent means for passing steam from said inlet side to said exhaust side during the latter portion of said stroke.

6. A steam motor, having a cylinder provided at one end with an inlet port open continuously, a valve controlled exhaust port at the other end, a piston having the effective pressure area on its exhaust side greater than upon its inlet side, a by-pass smaller than said inlet port operative during the whole

stroke of the piston, and a second by-pass of larger area shorter than the stroke of the piston.

7. A steam motor, having a cylinder provided at one end with an inlet port open continuously and with an exhaust port at the other end, a valve for closing said exhaust port and means for holding said valve normally closed, a piston normally held at the inlet end of said cylinder, a by-pass smaller than said inlet port around said piston at any position of said piston, and a second by-pass around said piston during the latter part of its movement toward the exhaust end of said cylinder.

8. In a steam motor, the combination with a piston equipped cylinder having an inlet opening at one end and an exhaust opening near its opposite end, of a valve normally closing said exhaust opening, means for opening said valve, a spring for closing said valve, means for admitting steam from the inlet end of the cylinder into the exhaust end at any position of the piston, and a separate by-pass for conveying steam into the exhaust end of the cylinder when the piston has completed a partial movement toward the exhaust end of the cylinder.

9. A steam motor, having a cylinder, a piston and a piston rod attached to one side of the piston, said cylinder having an inlet opening open continuously on the piston rod side of the piston, and an exhaust opening normally closed on the free side of the piston at some distance from the end of the cylinder, thereby forming a compression chamber between said exhaust opening and the end of the cylinder, a by-pass around said piston, and a second by-pass arranged to be open only during a portion of the stroke of said piston.

10. A steam motor, having a cylinder and a piston, said cylinder with an inlet port open continuously at one end and an exhaust opening at some distance from the opposite end, a by-pass around said piston during the entire stroke of the piston, and a second by-pass around said piston operative only during a portion of the stroke, with said exhaust port arranged to be closed by said piston while said second by-pass is open.

Dated this seventh day of May 1908.

WILLIAM H. STANTON.

Witnesses:
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JAMES HOPKINS.