(No Model.)

R. A. PARKE.

FLUID PRESSURE ENGINE.

No. 508,525. Patented Nov. 14, 1893.

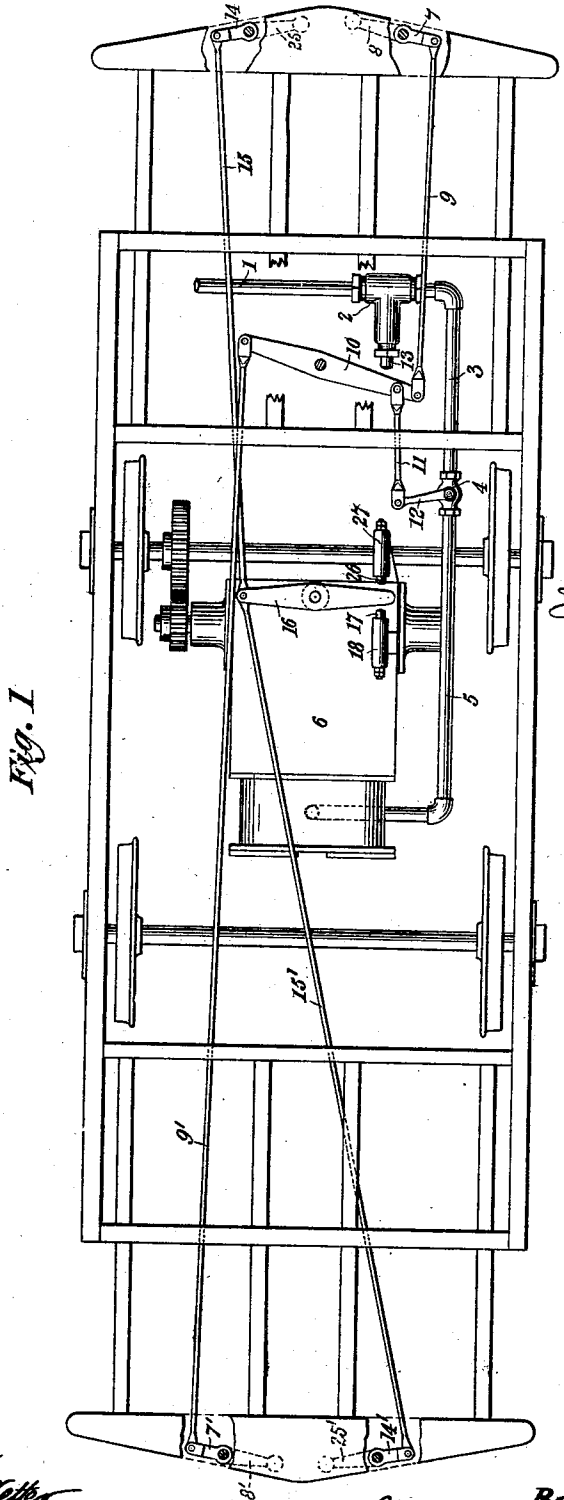

Fig. 1

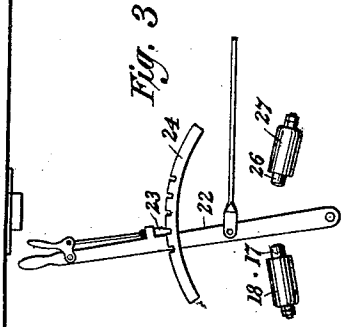

Fig. 3

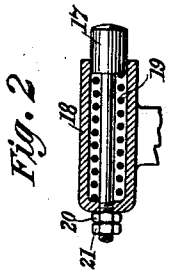

Fig. 2

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FLUID-PRESSURE ENGINE.

SPECIFICATION forming part of Letters Patent No. 508,525, dated November 14, 1893.

Application filed August 4, 1893. Serial No. 482,383. (No model.)

To all whom it may concern:

Be it known that I, ROBERT A. PARKE, a citizen of the United States, residing at the village of New Brighton, county of Richmond, and State of New York, have invented certain new and useful Improvements in Fluid-Pressure Engines or Motors, of which the following is a specification.

My invention relates to the economical use of steam, compressed air or other fluids, in the operation of engines or motors, under such circumstances that more or less frequent starting and stopping of the same are essential to the purposes for which they are employed.

It is well known that the economical use of steam, compressed air or other gases requires that, after the admission of such gas to the operating cylinder through a certain portion of the travel of the piston, the admission of the gas under pressure must then be cut off and the gas permitted to expand during a further portion of the movement of the piston. It also frequently occurs that, when the engine has been fairly started, it is, for the sake of economy, desirable to permit the compressed gas to enter the working cylinder only during a shorter period of the travel of the piston than was necessary when the operation of the engine began. For this purpose, suitable arrangements of the valve motion controlling the entrance of the compressed gas to the working cylinder are used, so that, by the movement of a lever or other suitable connection with the valve gear, the operator may permit the entrance of the necessary volume of gas in starting and subsequently reduce the volume entering to that which will give a greater economy in the use of the same. It also frequently occurs that, in order to cause the engine or motor to quickly attain considerable speed, it is desirable to admit the gas to the working cylinder of the motor at a higher pressure than is subsequently desirable for the economical operation of the engine. In cases therefore where it is necessary to quickly start an engine or motor into operation while under a load, it is necessary that the operator should control both the degree of pressure under which the gas enters the working cylinder and, also, the volume of the same which shall enter the working cylinder. This requires intelligence and thoughtfulness on the part of the operator, in as much as negligence on his part to reduce the pressure of the gas entering the working cylinder, or to reduce the volume of gas admitted to the working cylinder, or both, will result in an extravagant use of needless waste of power. My invention is intended to prevent such waste of power, by causing the pressure and volume of the gas to be automatically reduced to the economical amount predetermined after the engine or motor has been fully started, and by requiring a physical exertion on the part of the operator against an elastic resistance, to increase either the pressure or volume of gas admitted to the working cylinder at the time of starting.

Briefly stated, my invention consists in the combination of a valve operating mechanism having a free predetermined movement such as will permit the passage through the valve of a definite volume or pressure of air, steam or gas, in combination with an elastic resistance device so arranged and connected with the valve operating mechanism that any greater movement of the valve will be opposed by the elastic resistance.

To enable others skilled in the art to make and use my invention, I will now describe it by reference to the accompanying drawings, which form a part of this specification and in which—

Figure 1 represents the floor plan of a street car operated by a motor, wherein compressed air is used as the motive power, the motor being so connected by levers and rods, that it may be operated from either end of the car and both the degree of pressure and volume of air entering the working cylinder of the motor are established for the economical operation of the same, when the car is under headway. It also shows my improvements which permit the use of a somewhat greater pressure or the entrance of a somewhat greater volume of air in the working cylinder, either separately or in conjunction, only by the operator overcoming the resistance of a spring in either case. Fig. 2 is a detailed view, in section, of an arrangement of one of the resisting springs. Fig. 3 shows a modification of the apparatus, by which my invention may

be utilized in connection with the reversing lever of a locomotive or other engine, operated in that manner.

The compressed air is stored in a reservoir or reservoirs mounted on the car in the usual way, as will be well understood, and is conducted therefrom through tube 1 to a reducing valve 2 which may be any suitable one of the several well known forms found in the market, and it is therefore unnecessary to give a detailed description of the same. The spring of this reducing valve is adjusted so that only a certain predetermined pressure, regardless of the pressure in the reservoir or tube 1, can enter the tube 3 which is connected with the opposite end of the valve. Projecting from the side of the reducing valve 2 is a stem 13 which is held outward to a certain normal position by the regulating spring, and which when forced inward causes the air pressure in the tube 3 to be increased. The tube 3 leads directly, as shown in the drawings, (or indirectly through a heating apparatus) to a throttle valve 4 which is operated by means of the lever 12, pivoted rod 11 and pivoted lever 10. One end of the lever 10 is connected by the rod 9 and crank 7 to a vertical shaft at one end of the car, at the upper end of which shaft is a lever 8 shown in dotted lines, by which the operator can open or close the throttle valve 4. The throttle valve may be operated from the other end of the car by means of a similar lever 8′ connected by the crank 7′ and rod 9′ to the opposite end of the pivoted lever 10. The compressed air is conducted by means of the tube 5 from the throttle valve 4 to the motor 6 which drives the car. The motor 6 is provided with the usual reversing valve gear, which is operated by the lever 16 in the usual manner to cause the car to move in either direction. One end of the lever 16 is connected by the rod 15 and crank 14 to a vertical staff, at the upper end of which is the lever 25 at one end of the car, and to a similar staff provided with a lever 25 at the other end of the car, by means of the rod 15′ and crank 14′, so that the valves connected to the lever 16 may be operated from either end of the car. The other end of the lever 16 vibrates between two stems 17 and 26, which respectively project from casings 18 and 27, and in such manner, that, when the lever 16 has been moved in one direction through a prescribed distance, it comes into contact with one of these stems and its further motion can only occur by forcing the stem into its casing. Fig. 2 shows more clearly the arrangement of the casing 18 and stem 17. In this figure, 18 is the casing in section; 17 shows the stem to be the enlarged end of a bolt passing through the casing and held in position by the nut 20 and check nut 21. Within the casing 18 and encircling the reduced portion of the stem 17, is the spring 19, which permits the stem 17 to be forced inward into the casing 18, only through a compression of the spring. The distance which the stem 17 projects from the casing 18 may be regulated by the nut 20 and check nut 21 and the projection of the stem 26 from the casing 27 may be regulated in a similar manner, so that, within certain limits, the free movement of the lever 16, between the stems 17 and 26, may be regulated. The lever 10 is permitted to move in a direction to open the throttle valve 4, through a certain prescribed distance, when the lever 10 comes in contact with the stem 13 of the reducing valve 2. The lever 10 can only be moved farther in such direction, by forcing the stem 13 inward into the reducing valve 2, compressing the reducing valve spring and increasing the pressure of the air delivered into the tube 3.

The operation of my invention is as follows. It being desired to move the car in a direction to the right, in Fig. 1, the operator moves the lever 25, causing the lever 16 to turn until the end comes in contact with the stem 17 and, in order to permit the entrance of a sufficient volume of air, into the working cylinder of the motor 6, to start the car, he continues the movement of the lever 25 and, consequently, of the lever 16, forcing the stem 17 inward into the casing 18 against the resistance of the spring 19. At the same time, he moves the lever 8 and, through the intermediate connections, the levers 10 and 12, until the lever 10 comes in contact with the stem 13, thus opening the throttle valve 4 and permitting the compressed air to enter the working cylinder of the motor 6 through the tube 5. Should a greater air pressure be required than is thus permitted to enter the motor, when the lever has been stopped in its motion by the stem 13, the operator uses sufficient force to move the lever 8 still farther, forcing inward the stem 13 in the reducing valve and permitting a higher air pressure to enter the motor 6. The car having been started in its motion, he relaxes his tension upon the lever 8, permitting the stem 13 to be forced outward, by the spring in the reducing valve, to its normal position, by which the pressure of the air delivered to the motor is again reduced to that for which the reducing valve is normally adjusted. He also relaxes the tension upon the lever 25, permitting the stem 17 to be forced outward in its casing 18 by the spring 19, by which the lever 16 is returned to its normal position for moving the car in that direction and thus causing a re-adjustment of the motion of the valve gear by which the volume of compressed air entering the working cylinder, at each stroke, is reduced to the normal amount for economical operation. When it is desired to move the car in the opposite direction, the operator is stationed at the other end of the car and performs in a precisely similar manner; although, in this case, the lever 16 is moved in the opposite direction, reversing the valve gear of the motor, and the extent of this movement is regulated by the stem 26 and the spring

within the casing 27. In this manner, while the operator has within his control the means for utilizing a considerable volume of air at a sufficiently high pressure to quickly start the car in motion, no inadvertence on his part will permit the continuance of such use of the compressed air when it is no longer needed, as both the volume and pressure of the air are automatically reduced to the point of normal requirement, as soon as he relaxes the physical exertion necessary to increase either the volume or pressure used.

Fig. 3 shows my improvement applied to the ordinary reversing lever of a locomotive, in which the reversing lever 22 corresponds to the lever 16 in Fig. 1. It is usually customary to use, in connection with the lever 22 a notched quadrant 24, so that the lever 22 being moved in a desired position, a latch 23 drops into a notch of the quadrant 24 and holds the valve gear in a position corresponding to such position of the lever 22. The stems 17 and 26, in the casings 18 and 27 respectively, correspond to those of similar numbers in Fig. 21 and are so located, with reference to the lever 22, that, when the lever 22 is moved to a position where it comes in contact with either of the stems 17 or 26, the volume of steam or air entering the working cylinder is such as should be normally required. The lever 22 may be locked in this position by putting the latch 23 in the last notch, but it cannot be moved to a position to increase the volume of steam or air used in the working cylinder, without meeting the resistance of the spring behind the stem 17 or 26, which resistance will immediately force the lever 22 back to the normal position, as soon as the physical force of the operator is relaxed.

For the purpose of thus permitting a free movement of the valve motion, effecting the entrance of different volumes of the steam or air to the working cylinder, up to a certain point, and a further movement of the valve gear against an elastic resistance, by which a greater volume of air may be admitted to the working cylinder, it is evident that the resisting spring or medium may be placed at any other convenient point in the train of mechanism operating the valve gear, than that shown in the drawings. The same is also true of the position of the elastic spring, which ordinarily prevents the use of a higher degree of pressure than one specifically determined. I do not, therefore, confine myself to the specific positions of such springs, shown in the drawings, but may place them elsewhere in the operating mechanism as convenience may suggest.

While I have also shown a spring as the medium of resistance, in each case described, it is obvious that any other elastic resistance, such as the pressure of a gas or liquid against a piston, would produce the same effect, as will be readily understood, and I do not confine myself to the use of any specific form of elastic resistance. It is also obvious that by simple mechanical connection of the various levers the separate valves for regulating the pressure and volume may both be operated by one lever on each platform.

While I have illustrated my improvement as applied to separate valves for controlling the pressure and volume, it is apparent that there is no necessary connection between them, and that the invention resides in the use of an elastic resistance to control the movement of a valve beyond a certain predetermined point, whatever may be the purpose for which the valve is used.

What I claim as my invention is—

In a fluid pressure engine, the combination of a valve operating mechanism, having a predetermined limited range of free movement, with an elastic resistance device opposing any movement of such operating mechanism beyond such predetermined range.

In testimony whereof I have hereunto affixed my signature this 3d day of August, 1893.

ROBERT A. PARKE.

Witnesses:
THOMAS B. KERR,
ROBERT SHERIDAN.