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AUXILIARY MOTOR FOR REVERSING REVERSIBLE INTERNAL COMBUSTION MOTORS.

APPLICATION FILED APR. 24, 1909.

948,730. Patented Feb. 8, 1910.

Fig: 1.

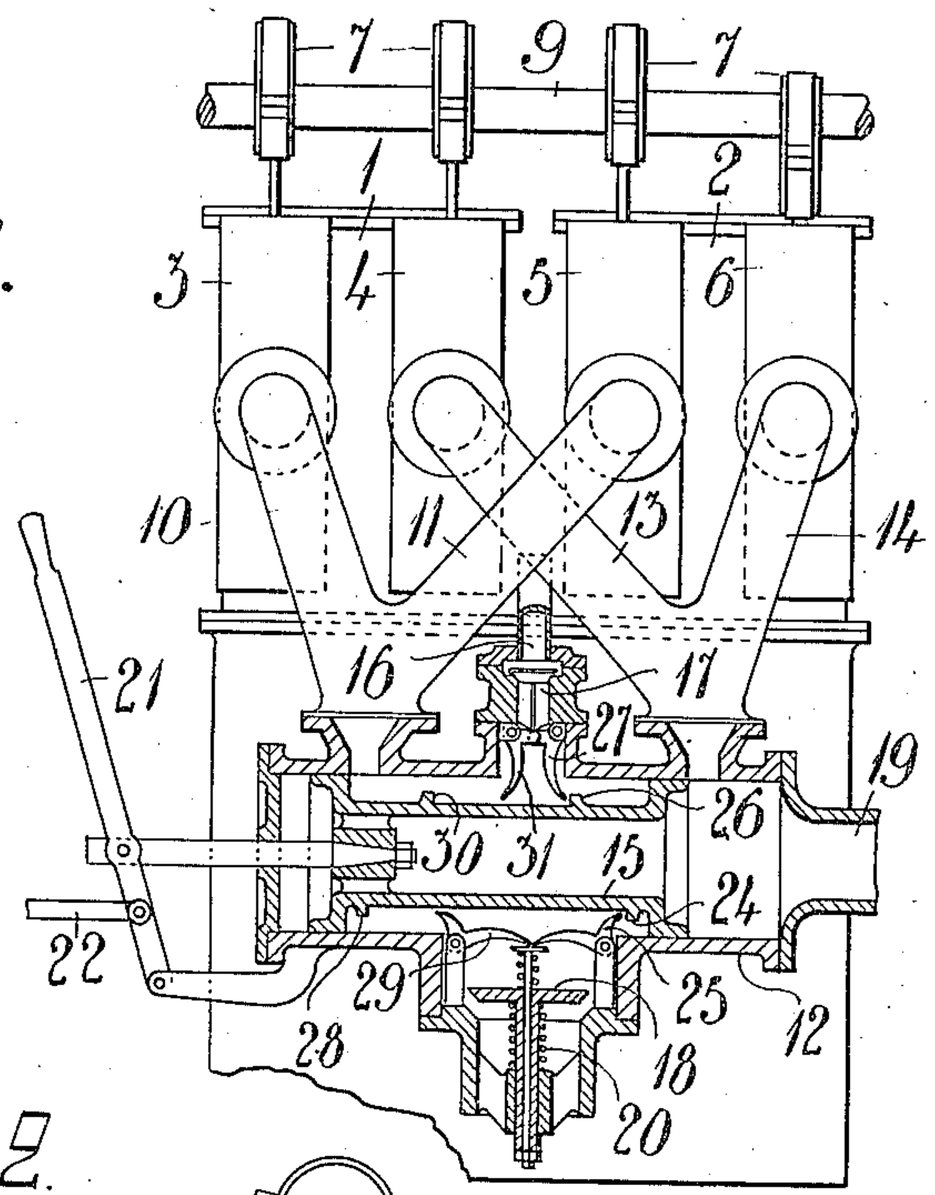


Fig: 2.

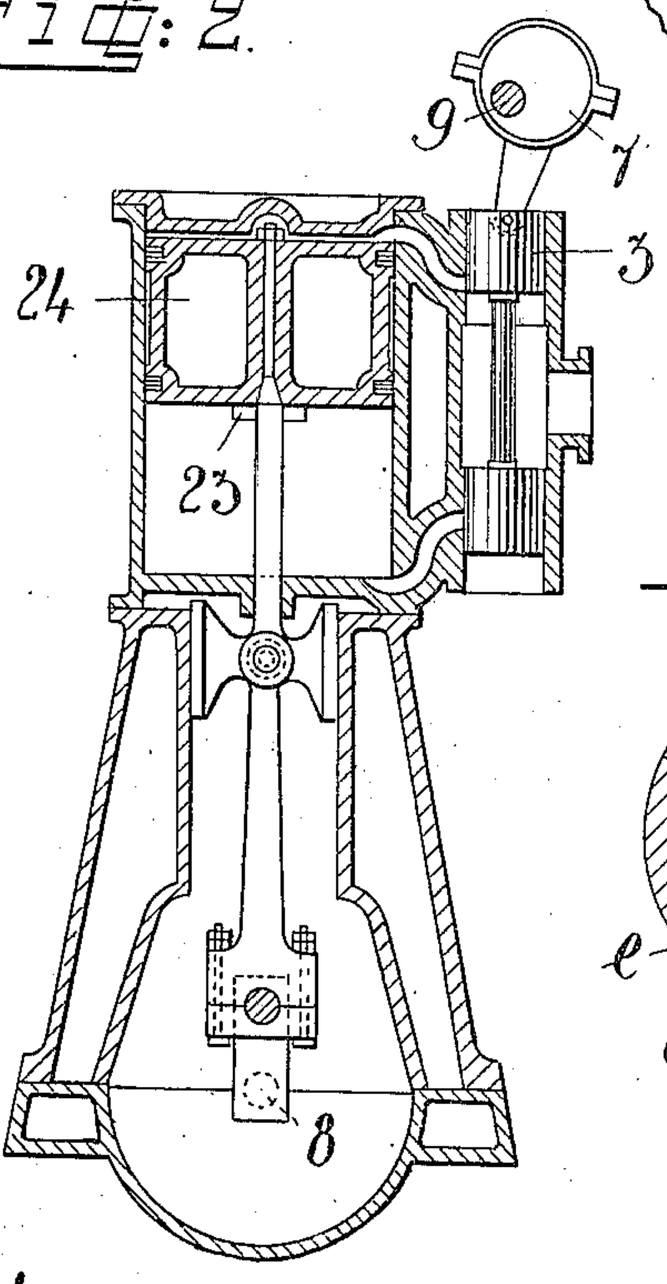
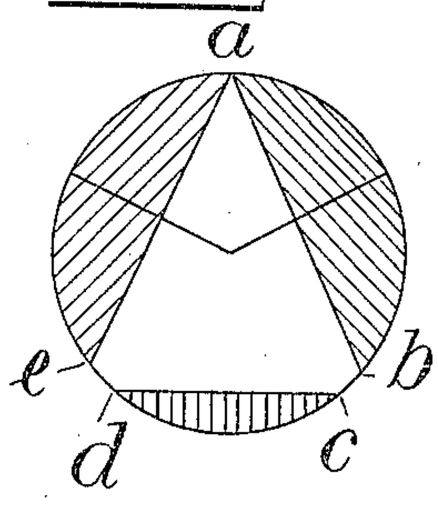


Fig: 3.



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AUXILIARY MOTOR FOR REVERSING REVERSIBLE INTERNAL-COMBUSTION MOTORS.

948,730. Specification of Letters Patent. Patented Feb. 8, 1910.

Application filed April 24, 1909. Serial No. 491,902.

To all whom it may concern:

Be it known that I, KNUT JONAS ELIAS HESSELMAN, a citizen of the Kingdom of Sweden, residing at Saltsjö-Storängen, Stockholm, Sweden, have invented new and useful Improvements in Auxiliary Motors for Reversing Reversible Internal-Combustion Motors, of which the following is a specification.

This invention relates to improvements in auxiliary motors for reversing reversible internal combustion motors.

Reversible internal combustion motors having auxiliary piston motors without dead centers, coupled directly to them for reversing purposes are known. In such cases the reversing of the internal combustion motor has been effected by first reversing the distributing mechanism of the auxiliary piston motor, and this has been necessarily done hitherto by shifting links, cams, screw-wedges and so on.

Now the present invention has for its object to dispense with these reversing parts and to provide a simple construction of the auxiliary piston engine, and to enable the reversing operation to be effected with greater convenience and reliability.

The invention consists substantially in providing each working space of the auxiliary motor with two distributing devices each being adapted for starting in one direction, and with an exhaust device having its period or time of operation always at or near the dead center. The distributing devices are connected by suitable ducts with a multiple way valve or with a similar device by means of which the distributing devices can be placed in communication alternately with a pressure vessel and with the atmosphere. This peculiar combination enables the distributing devices to be arranged with periods or times of operation that are fixed relatively to the various positions of the piston. By this is meant that one of the distributing devices can be set for starting the motor, say forward, and the other set for starting the motor, say backward.

One form of apparatus embodying the present improvements is illustrated by way of example in the accompanying drawings in which:—

Figure 1 is a side elevation of an auxiliary motor with a multiple valve for reversing shown in section. Fig. 2 is a vertical section of the auxiliary motor, and Fig. 3 is a diagram.

In the example shown, 1 and 2 are the auxiliary motor cylinders. The cylinder 1 is fitted with two distributing devices in the form of slide valves, 3 and 4, and the cylinder, 2, is also fitted with two distributing devices, likewise in the form of slide valves, 5 and 6. Each slide valve consists of two pistons (one for each end of the cylinder) fixed to each other, actuated by an eccentric, 7, mounted on a shaft, 9, driven from the crank shaft, 8, of the motor. The slide valves, 3 and 5, are set for starting the motor, say, forward, and the slide valves, 4 and 6, are set for starting the motor say, backward.

The slide valves, 3 and 5, are connected by pipes (or ducts) 10, and 11, to one end of the casing, 12, of a multiple way valve. The slide valves, 4 and 6, are likewise connected by pipes (or ducts) 13 and 14, to the other end of the valve casing, 12. In this casing is a piston valve, 15, which works steam-tight only at its ends against the sides of the valve casing, so as to leave an intermediate annular space between the valve and the sides of the valve casing. The valve casing communicates through a pipe, 16 and valve 17, with a pressure vessel (not shown) and through a valve, 18, with the atmosphere and through a pipe, 19, with a flushing air vessel (not shown). The valve, 17, is kept normally closed by the pressure in the pressure vessel, and the valve, 18, is normally kept open by a spring, 20. The piston valve, 15, is operated by means of a hand lever, 21, or the like, which actuates by means of a rod, 22, the part or parts of the internal combustion engine that requires or require reversing.

The exhaust device hereinbefore referred to consists in the example shown of an aperture, 23, in the side of the cylinder, which is uncovered by the piston 24, at each end of its stroke.

In Fig. 1 the piston valve, 15, is shown in the position which it occupies when the motor is running in the forward direction, in accordance with the hereinbefore stated setting of the slide valves, 3, 4, 5, and 6.

The slide valves, 3 and 5 are in communication with the atmosphere through the multiple-way valve, and the slide valves, 4 and 6 are in connection with the flushing air vessel.

The operations taking place in the spaces of the auxiliary motor, for instance in the upper space of the cylinder 1, are as follows:—Referring to the diagram Fig. 3, *a* represents the top dead center at which the slide valve, 3, opens, whereupon atmospheric air is drawn in until the point, *b*, is reached where the slide valve closes. A short period of expansion then takes place and continues to the point, *c*, whereupon the aperture, 23, is uncovered while the piston is passing through the bottom dead center. When the aperture, 23, has been closed by the piston at the point, *d*, compression takes place until the point, *e*, is reached whereupon the slide valve opens and the air contained in the cylinder space under discussion is forced into the flushing air vessel, until the slide valve, 4, closes at the point, *a*, and the slide valve, 3, opens again, and so on. When the main motor is to be started for forward running, the piston valve, 15, is moved a little farther toward the left in Fig. 1, whereby this valve first closes the valve, 18, through the medium of a projection, 24, and a bell crank lever, 25, or equivalent means, and immediately afterward opens the valve, 17, by means of a projection, 26, and a bell crank lever, 27, or equivalent devices. The slide valves, 3 and 5, which are set for forward running are now placed in communication with the pressure vessel, while the slide valves, 4 and 6, remain in communication with the flushing air vessel. The operations in the cylinder spaces of the auxiliary motor are now as follows:—Referring to the diagram, Fig. 3; from *a* to *b*, admission of pressure fluid by the slide valves, 3 and 5, respectively; from *b* to *c*, expansion; from *c* to *d*, exhaust of the compressed air; from *d* to *e*, compression and from *e* to *a*, forcing of air into the flushing air vessel, and so on. As soon as the internal combustion motor is started, the piston valve, 15, is moved back by hand into the position shown in Fig. 1. When it is desired to reverse the motor, the piston valve, 15, is first pushed to the right until its projection, 28, and lever, 29 (or equivalent devices) have closed the valve, 18, and its projection, 30, and lever, 31 (or equivalent devices) have immediately afterward opened the valve, 17. The slide valves, 4 and 6 have thus come in communication with the pressure vessel, while the slide valves, 3 and 5, have come in communication with the flushing air vessel. The operation of the auxiliary motor is then as follows:—Referring to the diagram of Fig. 3, admission of the pressure medium through the slide valves, 4 and 6 respectively, from *a* to *e;* expansion from *e* to *d;* exhaust from *d* to *c;* compression from *c* to *b;* and from *b* to *a*, forcing of air through the slide valves, 3 and 5, respectively, into the flushing air vessel, and so on. As soon as the motor has been reversed, or has been started to run backward, the piston valve is moved by hand to the left so as to close the valve, 17, and open the valve, 18, whereby the slide valves, 4 and 6, are placed in communication with the atmosphere while the slide valves, 3 and 5, remain connected to the flushing air vessel. The operations taking place in the cylinder spaces are then as follows:—Drawing in of atmospheric air through the slide valves, 4 and 6, respectively, from *a* to *e* (Fig. 3); expansion from *e* to *d*, communication with the atmosphere through the aperture, 23, from *d* to *c;* compression from *c* to *b;* and forcing of air through the slide valves, 3 and 5, respectively, into the flushing air vessel from *b* to *a*.

From the foregoing description it will be seen that the motor can be operated entirely as desired by the aid of the multiple way valve, that is to say without causing or necessitating any alteration in the periods or times of operation of the distributing devices (*i. e.* in the example shown, the slide valves, 3, 4, 5 and 6) of the auxiliary motor relatively to the positions of the piston. The advantage thus gained, is obviously very great, because the devices which have been necessary hitherto for reversing the distributing devices are disadvantageous from an economical as well as from a constructional point of view. For other reasons also it is an advantage to replace such devices by a comparatively simple valve or its equivalent.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. For starting and reversing reversible internal combustion motors, an auxiliary piston motor comprising in combination with a working space, exhaust means having its time of operation always at or near the dead center, two distributing devices each being adapted to start the motor in one direction, and means adapted to place the distributing devices alternately in communication with a pressure vessel and with the atmosphere, for the purpose of enabling the distributing devices to have times of operation that are fixed relatively to the positions of the piston.

2. For starting and reversing reversible internal combustion motors, an auxiliary piston motor comprising in combination with a working space, exhaust means having its time of operation always at or near the dead center, two distributing devices each being adapted to start the motor in one direction, and means adapted to place the dis-

tributing devices alternately in communication with a pressure vessel and with the atmosphere, and also adapted to be connected with a flushing air vessel into which air is delivered through one or the other of the distributing devices during normal working and also in starting.

3. For starting and reversing reversible internal combustion motors, an auxiliary piston motor comprising in combination with a cylinder having an exhaust aperture in its side, and a piston of a length to open said aperture in both end positions of the piston, two distributing devices each being adapted to start the motor in one direction, and means adapted to place the distributing devices alternately in communication with a pressure vessel and with the atmosphere, substantially as and for the purpose set forth.

4. For starting and reversing a reversible internal combustion motor having a part that is reversed in reversing the motor, an auxiliary piston motor comprising in combination with a working space, exhaust means having its time of operation always at or near the dead center, two distributing devices each being adapted to start the motor in one direction, means adapted to place the distributing devices alternately in communication with a pressure vessel and with the atmosphere, and means for actuating the last named means and connected with the said part of the first named motor.

5. For starting and reversing reversible internal combustion motors, an auxiliary piston motor comprising in combination with a working space, exhaust means having its time of operation always at or near the dead center, two distributing devices each being adapted to start the motor in one direction, and a multiple-way valve adapted to place the distributing devices alternately in communication with a pressure vessel and with the atmosphere, for the purpose of enabling the distributing devices to have times of operation that are fixed relatively to the positions of the piston.

6. For starting and reversing a reversible internal combustion motor, an auxiliary piston motor comprising in combination with a working space, exhaust means having its time of operation always at or near the dead center, two distributing devices each being adapted to start the motor in one direction, and a multiple-way valve adapted to place the distributing devices alternately in communication with a pressure vessel and with the atmosphere, and also adapted to be connected with a flushing air vessel into which air is delivered through one or the other of the distributing devices during normal working and also in starting.

7. For starting and reversing reversible internal combustion motors, an auxiliary piston motor comprising in combination with cylinders having exhaust apertures in their sides, and pistons of a length to open said apertures in both end positions of the pistons, two distributing devices for each cylinder, each distributing device being adapted to start the motor in one direction, and a multiple-way valve having a casing connected with the distributing devices and adapted to be connected, at an intermediate point of its length, with a pressure vessel, and, at one end, with a flushing air vessel, and also having a piston valve body and an exhaust port, a valve for closing said exhaust port, a valve in the duct adapted to be connected with the pressure vessel, and means whereby on movement of the piston valve body the exhaust valve is closed and the valve in said duct is opened.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

KNUT JONAS ELIAS HESSELMAN.

Witnesses:
JOHN DELMAR,
EDWARD DELMAR.