April 28, 1931. A. THRANE 1,802,851

REVERSING MECHANISM FOR ENGINES

Filed Dec. 10, 1928 2 Sheets-Sheet 1

Fig. 5.

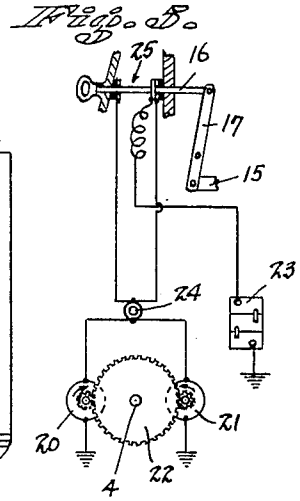


Fig. 2.

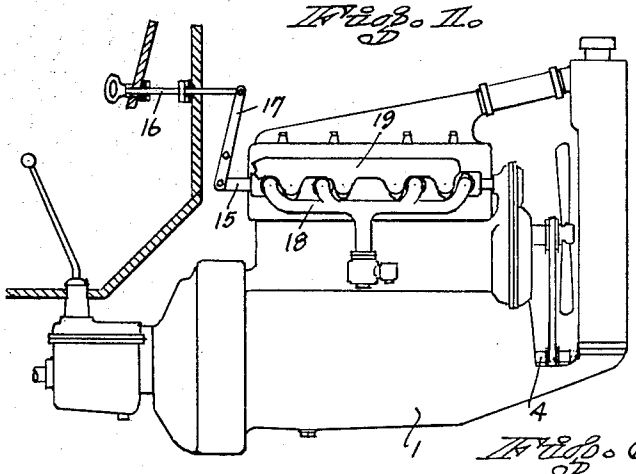


Fig. 6.

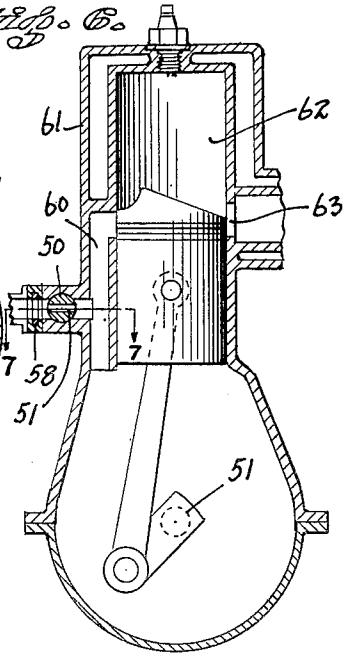


Fig. 3.

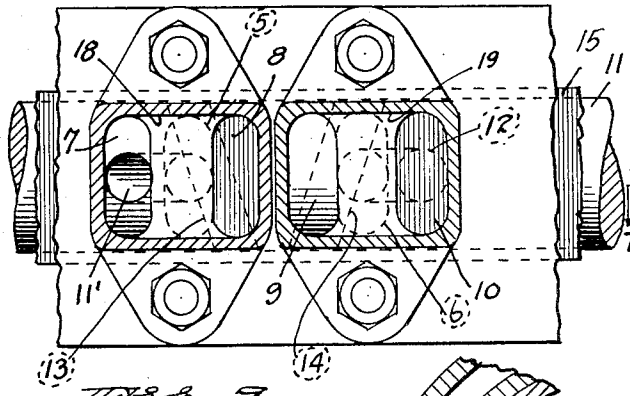
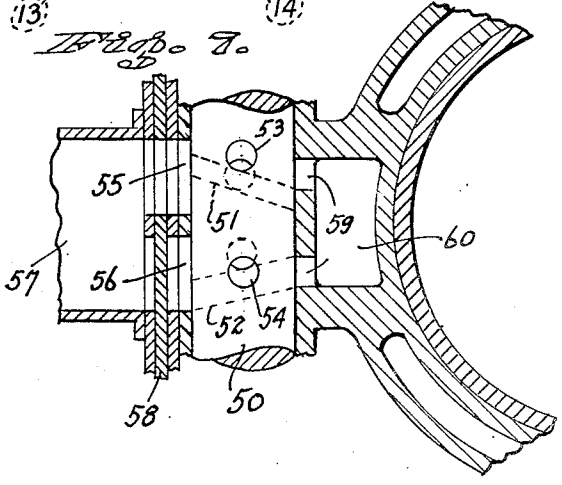


Fig. 7.

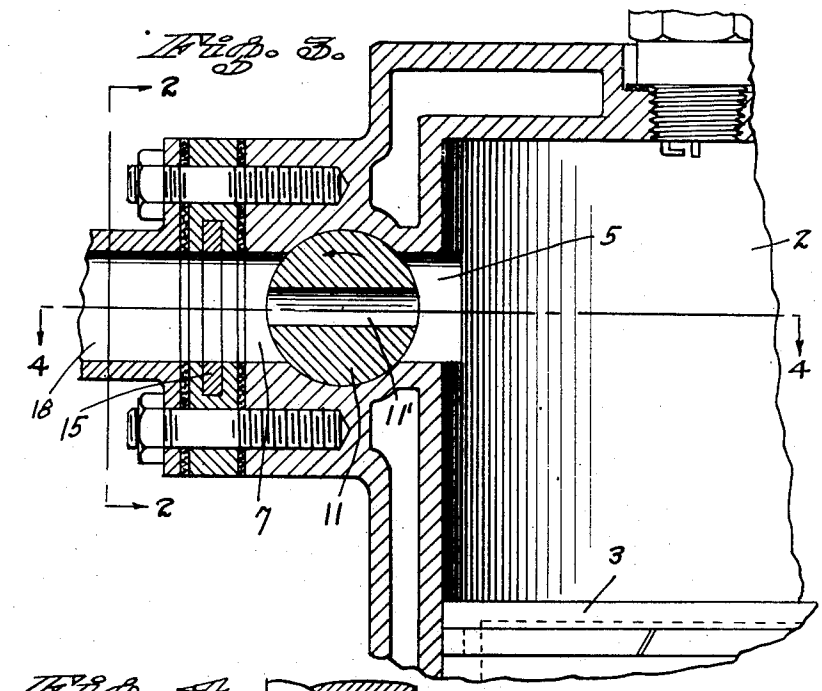


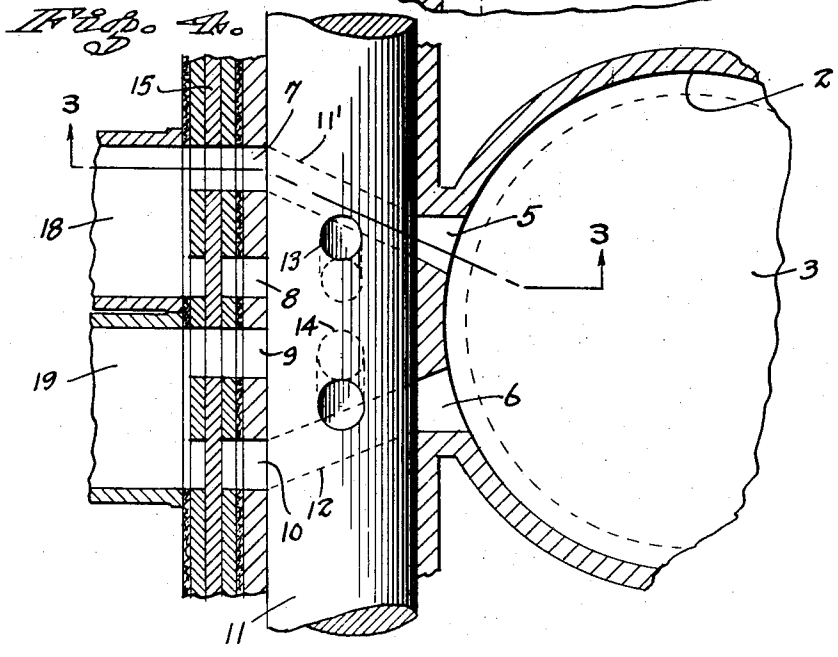
INVENTOR.
AXEL THRANE
BY
ATTORNEYS.

April 28, 1931. A. THRANE 1,802,851

REVERSING MECHANISM FOR ENGINES

Filed Dec. 10, 1928 2 Sheets-Sheet 2





INVENTOR.
AXEL THRANE
BY
ATTORNEYS.

Patented Apr. 28, 1931 1,802,851

UNITED STATES PATENT OFFICE

AXEL THRANE, OF OAKLAND, CALIFORNIA

REVERSING MECHANISM FOR ENGINES

Application filed December 10, 1928. Serial No. 324,985.

My invention relates to improvements in reversing mechanism for engines, and it consists in the combinations, constructions and arrangements hereinafter described and claimed.

An object of my invention is to provide an engine which will reverse its action and operate just as efficiently backward as forward, thus doing away with the necessity of providing a reversing gear mechanism.

A further object of my invention is to provide a device of the type described which makes use of a rotary valve of novel design, this valve cooperating with a manually controlled sliding valve to permit the operator to shift the sliding valve and reverse the rotation of the engine crank shaft without the necessity of bringing the engine to a stop and then restarting it.

Other objects and advantages will appear as the specification proceeds, and the novel features will be particularly pointed out in what I hereinafter claim.

My invention is illustrated in the accompanying drawing forming a part of this application, in which

Figure 1 is a side elevation of the engine;

Figure 2 is a section along the line 2—2 of Figure 3;

Figure 3 is a section along the line 3—3 of Figure 4;

Figure 4 is a section along the line 4—4 of Figure 3;

Figure 5 is a wiring diagram;

Figure 6 is a vertical section through a two-cycle engine showing the valve in proper position; and

Figure 7 is a section along the line 7—7 of Figure 6.

In carrying out my invention, I provide an engine indicated generally at 1. This engine is similar to a standard four-cycle internal combustion engine with the exception of the construction of the valve which is so designed as to permit the engine to be reversed at any time and to function just as efficiently while rotating in the reverse direction as it formerly did while rotating in the forward direction.

In Figures 3 and 4 I show a cylinder 2 and a piston 3. In the present form of the device, I have shown four such cylinders in Figure 1, although the number may be increased or diminished at will without departing from the spirit and scope of my invention. The pistons 3 are connected to a crank shaft 4 (see Figure 1) in the usual manner.

Each cylinder is provided with an intake port 5 and an exhaust port 6. The port 5 is adapted to be placed in communication with inlet openings 7 or 8, depending in which direction the engine is rotating, while the exhaust port 6 is adapted to be placed in communication with exhaust opening 9 and 10. A rotary valve 11 is placed between the sets of openings, and this valve has passageways 11′ and 12 which connect the openings 5 and 7 together and the openings 6 and 10 together. Additional ports 13 and 14 place the opening 5 in communication with the opening 8 and the opening 6 in communication with the opening 9.

Only two of the openings are used at a time. For example, when the engine is rotating in one direction, the openings 7 and 9 are used, and when the engine is reversed the openings 8 and 10 are used. A simple sliding valve 15 (see Figure 4) is utilized for controlling the openings 7, 8, 9 and 10. Referring to Figure 1, it will be seen that the valve 15 is actuated by a manually-controlled rod 16 that is connected to the valve by a lever 17.

An intake pipe 18 registers with the openings 7 and 8, and an exhaust pipe 19 communicates with the openings 9 and 10.

In Figure 5 I show a wiring diagram for starting the engine to rotate in either direction. Two starters 20 and 21 are operatively connected to a gear 22 mounted upon the shaft 4. These starters are of the standard type that will mesh with the gear 22 only until the engine is started and then will automatically disengage. If the shaft 4 is to be rotated in a clockwise direction when looking at Figure 5, the starter 21 is used, and the starter 20 is used when the shaft is rotated in the opposite direction. The starters are electrically connected to a source of current 23 and are controlled by a common push

button 24. A selective switch indicated generally at 25 is actuated by the rod 16 and automatically connects the right starter with the source of current that corresponds with the position of the slide valve 15.

In Figure 3 I have shown the valve 11 as rotating in a counter-clockwise direction when the passageways 11′ and 14 are being used. The passageway 11′ is shown smaller than the opening 5 for the purpose of providing communication between the openings 5 and 7 during a substantially ninety degree movement of the valve 11. During this movement the crank shaft 4 is moving through an arc of one hundred eighty degrees. The crank shaft therefore rotates twice as fast as the valve 11. The timing is such that gases will be passing in through the passageway 11′ during the intake stroke and will be passing out through the passageway 14 during the exhaust stroke. During the firing and the compression strokes, all of the passageways 11 to 14 inclusive will be closed.

If the operator wishes to reverse the engine, all that is necessary is to slow the speed down to a point where the valve 15 can be shifted for causing gases to flow into the cylinders in such a manner as to reverse the cycle of operation. In this case the passageways 13 and 12 are used in place of the passageways 11′ and 14, and the openings 8 and 10 are substituted for the openings 7 and 9. In all other respects, the operation of the engine is identical to that already described. The valve 11 in this instance will rotate in a clockwise direction when looking at Figure 3.

In Figures 6 and 7 I show a form of the device adapted to a two-cycle engine instead of a four-cycle. A rotary valve 50 is geared to the crank shaft 51 so as to rotate at the same speed as the crank shaft. The valve 50 has passageways 51, 52, 53 and 54 corresponding to the passageways in the valve 11. Two intake openings 55 and 56 communicate with an intake pipe 57, and these openings are controlled by a valve 58 similar to the valve 15. The passageways 51 to 54 inclusive place the openings 55 and 56 in communication with openings 59 that empty into the passageway 60 in the engine box 61. Two openings 51 and 53 or 52 and 54 register with the passageway 60 during the upstroke of the piston.

Figure 6 shows the block 61 as having a cylinder 62 therein, the latter having the exhaust opening 63 and the intake opening 60 therein.

The operation of this form of the device is identical to that set forth in the four-cycle engine.

Although I have shown and described two embodiments of my invention, it is to be understood that the same is susceptible of various changes, and I reserve the right to employ such changes as may come within the scope of the invention as claimed.

I claim:

1. In a reversing engine, a cylinder, said cylinder having intake and exhaust ports, a rotary valve having two sets of intake and exhaust passageways for registering with the ports in said cylinder in a predetermined manner, an intake and an exhaust manifold for said cylinder having two ports in each, and a manually-controlled valve for placing said manifolds in communication with either set of intake and exhaust passageways in said rotary valve.

2. In a reversible engine, a cylinder, said cylinder having intake and exhaust ports, a rotary valve having two sets of intake and exhaust passageways for registering with the ports, an intake and an exhaust manifold having two ports in each, said passageways placing the manifolds in communication with the ports in the cylinder, and a manually-controlled reversing valve for placing either set of intake and exhast passageways in communication with the manifolds.

3. In a reversible engine, a cylinder having intake and exhaust ports, a rotary valve, a manifold having two intake and two exhaust ports, said valve having intake and exhaust passageways for registering with the intake and exhaust ports of said cylinder and manifold in a predetermined manner, and a reversing valve for bringing into registration with the passageways in the rotary valve either one of the two sets of intake and exhaust ports of said manifold.

4. In a reversible engine, a cylinder having intake and exhaust ports, a rotary valve, a manifold having two intake and two exhaust ports, said valve having intake and exhaust passageways for registering with the intake and exhaust ports of said cylinder and manifold in a predetermined manner, and a reversible valve for bringing into registration with the pasageways of the rotary valve either one of the two sets of intake and exhaust ports of said manifold, said reversible valve normally being stationary and being moved only when the engine is reversed.

5. In a reversible engine, a cylinder having two ports formed in its wall, a manifold having two spaced openings, a rotary valve with two sets of passageways extending obliquely therethrough one set for each port, one end of each of said passageways terminating so as to register with its port in said cylinder when the valve is rotated, the opposite ends of said passageways being spaced along the length of said valve and being registerable with the openings in said manifold, and a valve for closing either of the openings in said manifold.

AXEL THRANE.