

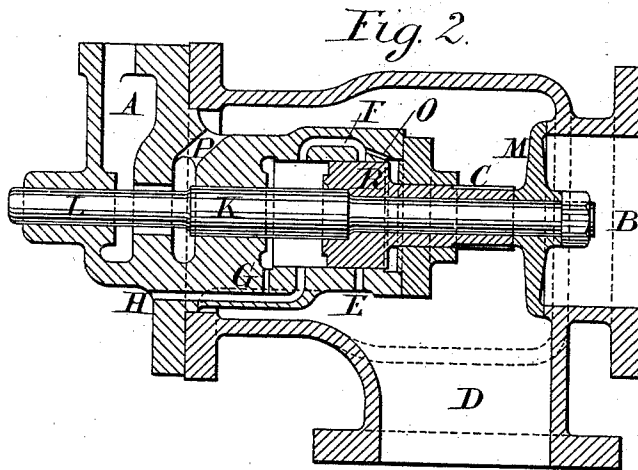
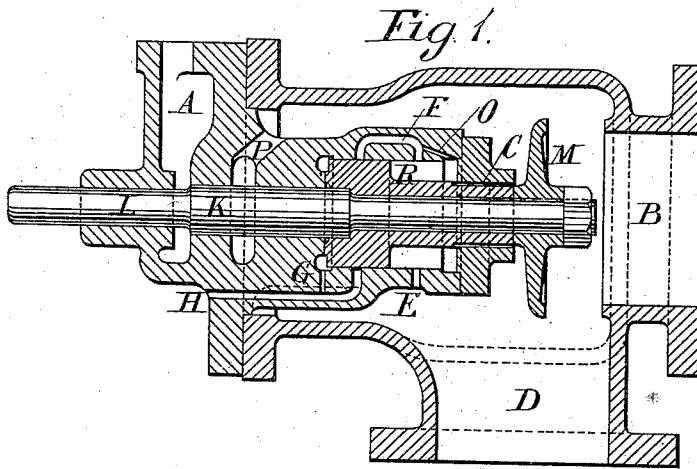
(No Model.)

W. B. YEO.

STARTING VALVE FOR COMPOUND ENGINES.

No. 449,457.

Patented Mar. 31, 1891.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

WILLIAM B. YEO, OF MANCHESTER, ENGLAND.

## STARTING-VALVE FOR COMPOUND ENGINES.

SPECIFICATION forming part of Letters Patent No. 449,457, dated March 31, 1891.

Application filed October 28, 1890. Serial No. 369,601. (No model.) Patented in England December 31, 1889, No. 20,910.

*To all whom it may concern:*

Be it known that I, WILLIAM BEATER YEO, a citizen of England, residing at 9 Herbert Street, Moss Lane East, Manchester, in the county of Lancaster, England, have invented a new and useful Starting-Valve for Compound Engines, (for which I have obtained Letters Patent in Great Britain, dated December 31, 1889, No. 20,910,) of which the following is a specification.

When it is desired to start a compound steam-engine, it may be that the piston of the high-pressure cylinder is near the extreme of its stroke when its crank is on a dead-center, or is in such a position that the high-pressure-steam supply is cut off, and it may also be that the reservoir for supplying the low-pressure cylinder with exhaust from the high-pressure cylinder does not contain steam at sufficient pressure to move the low-pressure piston. In order to provide for starting under such circumstances, compound engines are usually furnished with a cock or valve, by which steam from the boiler can be admitted into the reservoir, so as to give pressure sufficient for starting the low-pressure piston. The sudden inflow of high-pressure steam is apt to produce violent shocks, the valves are liable to be violently closed by the exhaust-steam from the high-pressure cylinder, and when the engine is lightly loaded they are often subject to a hammering action, by which they are broken, and the fragments may occasion great damage in the valve chests and cylinders.

My invention has for its object to avoid these evils by a construction of starting-valve such as I shall explain, referring to the accompanying drawings.

Figure 1 is a section of starting-valve according to my invention in the condition which it has when the engine is working or when it is stopped. Fig. 2 shows its condition when it has been moved to admit steam to the reservoir at the starting of the engine.

The valve-box is fixed so as to have a passage A in communication with the pipe supplying the high-pressure valve-chest, a passage B in communication with the high-pressure exhaust, and a passage D leading to the low-pressure valve-chest, so that the interior of the valve-box forms part of the intermediate reservoir supplying the low-pressure cyl-

inder with exhaust-steam from the high-pressure cylinder. The valve-rod K has a part L of smaller diameter projecting through the cover, or it might be through a packed stuffing-box in the cover, and under the cover there is a passage P into the valve-box. On the rod is fixed a piston R, having a long boss C, which is larger in diameter than the rod K, and has a small groove or several small grooves cut along it so far as to extend, when the valve is closed, as shown in Fig. 1, into the cylindrical cavity in which the piston R is fitted to work, allowing free escape of water of condensation. This cavity has a port E opening into the valve-box, a passage H opening to the outer air, and a small branch passage G into H, also a communicating port F, having its mouths about as far apart as the depth of the piston R, and a small branch passage O into F. On the valve-rod K there may also be fixed, as shown, a valve M, fitted to seat on the mouth of the passage B. If, however, the grooved boss C of the piston R be made of such area that the pressure of the steam in the valve-box—that is to say, the exhaust-steam from the high-pressure cylinder—acting on it is sufficient to overcome the pressure of the atmosphere on the area of L and that of the high-pressure steam on the annular area of K, then the valve M may be dispensed with.

The valve operates in the following manner: For the purpose of starting the engine the high-pressure-steam-supply valve is opened, admitting steam to the passage A. The pressure in the body of the valve-box and in the passages B and D being at this time low the pressure on the annular area of the rod K forces it into the position shown in Fig. 2, so that steam can pass freely from A to P into the valve-box and by the passage D to the low-pressure cylinder. In this action the valve M may be of advantage, because by closing B it prevents steam from the valve-box passing to the high-pressure cylinder. When the valve-rod first begins to move, the piston R does not operate as a check, because air or steam can pass freely from under the piston by the port E and the grooves of C, and air can enter above the piston by the passages H and G; but as the piston R descends, closing the port E and taking the grooves of C

beyond the bottom of the cylindrical cavity, the only escape from below the piston being by the small passage O, the piston is so much retarded in its descent that the opening to P and the closing of M are gradual. Again, when after certain movement of the engine exhaust steam comes into the valve-box by the passage B, the valve-rod is forced back to the position shown in Fig. 1, but with retardation due to the partial cushioning of the piston R as it ascends after covering the lower mouth of H, when the only escape is by the small passage G.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

In a starting-valve for compound engines, the combination of the shouldered valve-rod K L with the passages A P, the piston R, its grooved boss C, and the ports and passages E F O H G, arranged and operating substantially as and for the purposes set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 13th day of October, A. D. 1890.

W. B. YEO.

Witnesses:

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