(No Model.) 2 Sheets—Sheet 1.

J. M. SEARLE.

VACUUM OR HAND ACTUATED BY-PASS VALVE FOR STEAM ENGINES.

No. 524,614. Patented Aug. 14, 1894.

Fig. 1.

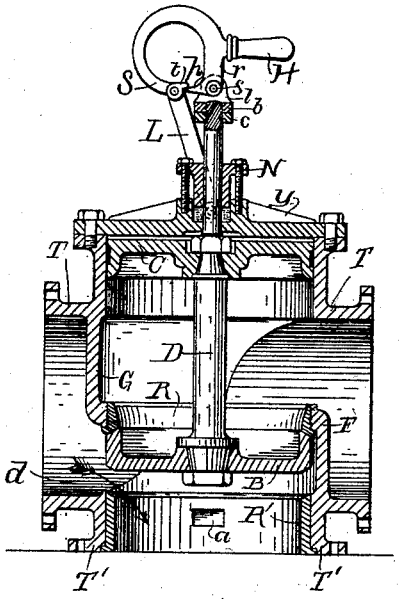
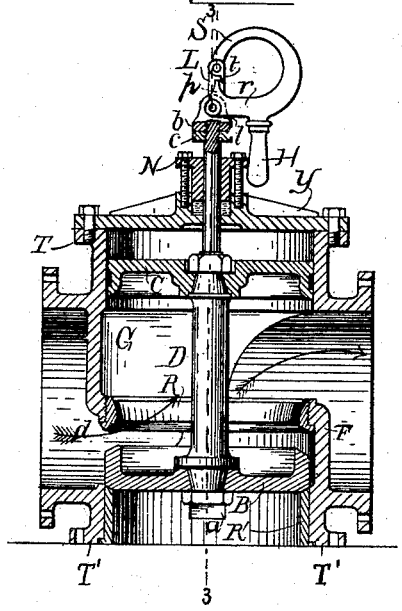


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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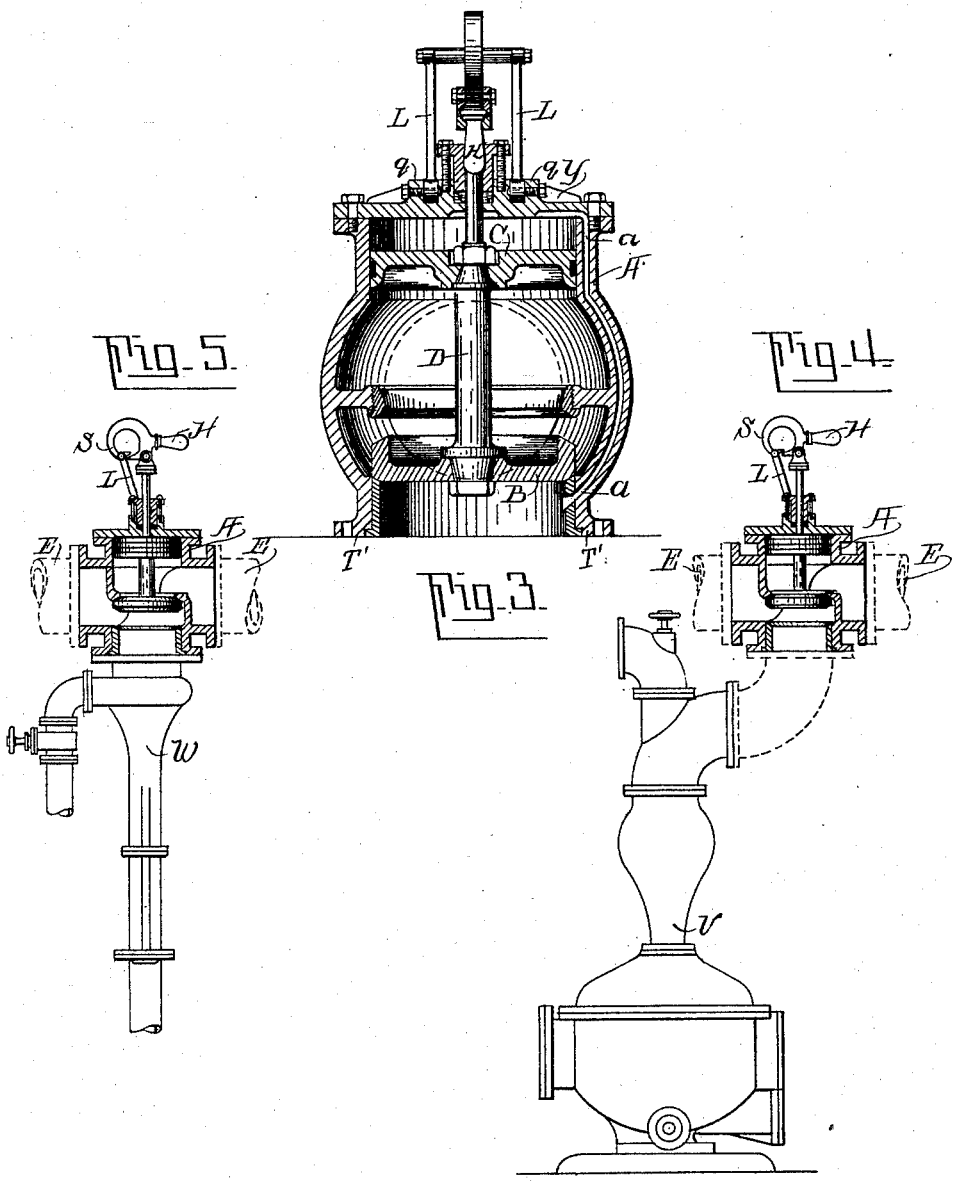

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UNITED STATES PATENT OFFICE.

JOSEPH MINER SEARLE, OF GRAND RIVERS, KENTUCKY.

VACUUM OR HAND-ACTUATED BY-PASS VALVE FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 524,614, dated August 14, 1894.

Application filed April 19, 1894. Serial No. 508,202. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH MINER SEARLE, a citizen of the United States, residing at Grand Rivers, Livingston county, Kentucky, have invented certain new and useful Improvements in Vacuum or Hand-Actuated By-Pass Valves for Steam-Engines, of which the following is a specification.

My invention relates to vacuum, or hand actuated by-pass valves for steam engines.

In condensing steam engines now in use there is frequently a disastrous back flow of water from the condenser to the engine; and where relief and check valves are used upon the exhausts of such engine to prevent this, the weight upon such valves causes a serious back pressure interfering with the economical operation of the engine; and it often happens that a vacuum, after having broken, reforms with such frequency as to cause dangerous racing of the engine.

The objects of my invention are to overcome these serious objections by providing a free exhaust valve for a steam engine which can be automatically opened to the atmosphere and locked in such position, cutting out the condenser and turning the exhaust into the atmosphere. I attain these objects by the improvement now to be described and illustrated in the accompanying drawings.

Figure 1, is a vertical longitudinal section of the valve, the spindle thereof being shown in elevation with the upper end in broken section. Fig. 2, is a similar view of the valve closed to the condenser and open to the atmosphere. Fig. 3, is a vertical cross section on line 3—3, Fig. 2. Figs. 4 and 5, show the valve in section applied to the Worthington and Bulkley condenser, respectively.

My valve is located between the engine and the condenser in the exhaust pipe, E, to which the valve shell or casing, A, provided with flanges, or threaded ends, is secured by suitable bolts, or threaded ends corresponding to those of exhaust pipe. As shown, this valve chamber is preferably of circular cross section, and is provided upon each side thereof with flanged or threaded extensions, T, having passages which communicate with the exhaust pipe of the engine and with the atmosphere. The bottom of the valve casing has a flanged extension, T′, to be secured to the pipe or passage leading to the condenser. Projecting interiorly from the bottom and top of the valve casing are two circular flanges, F, G, to which is preferably secured the ring, R, forming the upper valve seat. The lower valve seat is formed at the bottom of the valve chamber by a ring, R′, upon which the valve, B, is adapted to the seat for the purpose of cutting off communication between the engine and the condenser. Through the side of the flange, F, is a port opening, *d*, through which the exhaust may be directed to the condenser or to the atmosphere, according as the valve is closed against its lower or upper seat.

Secured to the stem, D, passing through a suitable stuffing box, N, is the disk valve, B, and the piston, C, above the same, the latter being adapted to reciprocate in the vacuum chamber at the top of the valve casing. This chamber is of greater sectional area than the opening in the valve seat and the piston, C, has a greater area than the valve, B, so that the tendency of the vacuum acting between the two is to raise the valve to its upper seat because of the greater area of the piston. This vacuum chamber is connected below the lower valve seat with the passage leading to the condenser by a small duct or passage, *a*, cast in the valve shell, so that a vacuum in the pipe leading to the condenser will cause a vacuum above the piston, C. This duct or passage, *a*, it is obvious, might equally well be a separate pipe outside of the valve casing; or the valve stem, D, might be hollow with a port leading from the same above the piston and opening into the vacuum chamber. Any of these means may be adopted for the purpose designated.

The upper end of the stem is provided with two nuts, *b* and *c*, adjustable vertically thereon, the upper one of which has a lug, *l*, carrying the pivot pin, *s*, upon which the handle, H, is pivoted, which handle has a curved thin metal arm forming a spring extension, S, whose free end is pivotally attached to the double link, L, that is adapted to oscillate upon pivot pins, *q*, in the top of the cap or cover, Y, closing the vacuum chamber. The spring arm or extension of the handle, H, is provided with a projection or stop, *t*, adapted to engage a corresponding projection, *p*, which forms a

part of a second arm or extension, *r*, of the handle, H. The nuts, *b* and *c*, may be adjusted so as to regulate the extent to which these two projections overlap each other, thereby regulating the amount of force or pressure necessary to disengage them.

As shown in Fig. 2, the valve is closed upon its lower seat cutting out the condenser and opening the exhaust to the atmosphere. The piston in the vacuum chamber being of greater area than the valve will have a tendency to be pulled upward and unseat the valve from its lower seat when a vacuum is formed in the condenser, but the valve is locked against its lower seat and it is necessary to unlock the valve by hand, the vacuum will then raise the handle, H, and valve, B, from the position shown in Fig. 2, to that shown in Fig. 1, in order to move the valve to the upper seat; for it will be seen by reference to Fig. 2, that the link, L, is of such length and so connected with the spring arm, S, that in the locked position of the valve the central line of the link is slightly to the right of the central line of the valve stem, or between the handle and the central line of the stem, so that the stronger the upward pull on the piston the more firmly is the valve locked against its lower seat, because the handle, H, when lowered will be pushed with greater force against the stuffing box which acts as a stop. Should the vacuum form suddenly, thereby tending to raise the valve with a jerk, before the valve has been unlocked by hand, the excessive strain on the spring, S, will be relieved by the projection, *p*, which is so adjusted by the nuts, *b* and *c*, as to allow sufficient clearance for the connection between the links and the spring to pass by the central line of the valve. It will thus be seen that when the valve is in normal position, Fig. 1, the exhaust steam will be conveyed to the condenser, and whenever the vacuum in the condenser is destroyed by the backward flow of water from the condenser or by any other cause, the valve instantly drops to its lower seat from which it can only be unlocked by the operative, the exhaust in the meanwhile passing into the atmosphere. The vacuum cannot be again put in communication with the engine until the valve has been unlocked by the hand of the operative who must be at his post, and the operation of the valve as described will effectively prevent back flow of water from the condenser to the engine while the frequent reforming of the vacuum after it is broken can have no effect upon the engine tending to produce the dangerous racing which would otherwise result.

While I have shown my valve applied to Worthington and Bulkley condensers it is to be understood that it is equally applicable to other forms of condensers.

I claim as my invention—

1. The combination with the exhaust pipe of an engine, of a valve casing provided with passages leading to the atmosphere and to the condenser, two valve seats in said chamber, a valve in said chamber between said seats, a piston of larger area than the valve connected to the valve, adapted to hold the valve against the upper seat when a vacuum is maintained above said piston and a passage connecting the space above the piston with the passage to the condenser below the valve, substantially as described.

2. The combination with the valve casing having the two seats and the passages connecting the said casing with the atmosphere and the condenser, of the valve between the two seats, the piston of larger area connected to the valve and reciprocating in a chamber in the top of the casing, a passage connecting the space above the piston with the passage to the condenser below the lower seat, whereby the valve may be closed against the lower seat when the vacuum in the condenser is destroyed, substantially as described.

3. The combination with the valve casing located in the exhaust pipe of an engine and provided with passages to the atmosphere and condenser, of the two valve seats, the valve spindle, the valve between the two seats, the piston of larger area than the valve on the spindle above the valve, the passage connecting the space above the piston with the condenser passage, and a locking device upon the upper end of the spindle for automatically locking the valve when it is closed against its lower seat as the vacuum in the condenser is destroyed, substantially as described.

4. The combination with the valve casing, the spindle passing through the stuffing box and provided with the valve and the piston for actuating the same, the hand lever pivotally secured to said spindle, the spring arm connected to the handle at one end, and the links pivotally attached to the valve casing at one end and connected to the spring at the other end, whereby the valve is automatically locked against its lower seat when closed by the piston, substantially as described.

5. The combination with the valve casing and the spindle provided with the valve and the piston for actuating the same, of the adjustable nuts upon the spindle, the handle provided with an arm having a stop thereon and pivoted to one of said nuts, the spring extending from the handle and having a stop adapted to engage the stop on the said arm, and the link pivotally connected with the end of said spring and to the casing, substantially as described.

6. The combination with the casing of the valve, spindle passing through the stuffing box on the casing, of the handle attached to the spindle, the spring extension on said handle, and the link pivotally connecting said spring extension with the valve casing, and arranged so as to have the central line of the link between the handle and central line of spindle when said handle is locked, substantially as described.

7. The combination with the exhaust pipe of an engine, of the valve casing connected with the condenser and the atmosphere, the spindle and the double seated valve thereon, the piston of larger area than the valve connected therewith, a passage connecting the space above the piston with the condenser passage, the locking handle having the spring arm, S, connected by an adjustable pivot to the spindle at its upper end, and the link pivotally connecting the spring arm of said handle with the casing, 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.

JOSEPH MINER SEARLE.

Witnesses:
JOHN ROBERTS,
M. R. P. LUESTEN.