G. H. Reynolds,

Condenser Valve.

No. 112,183. Patented Feb. 28. 1871.

Fig. 1.

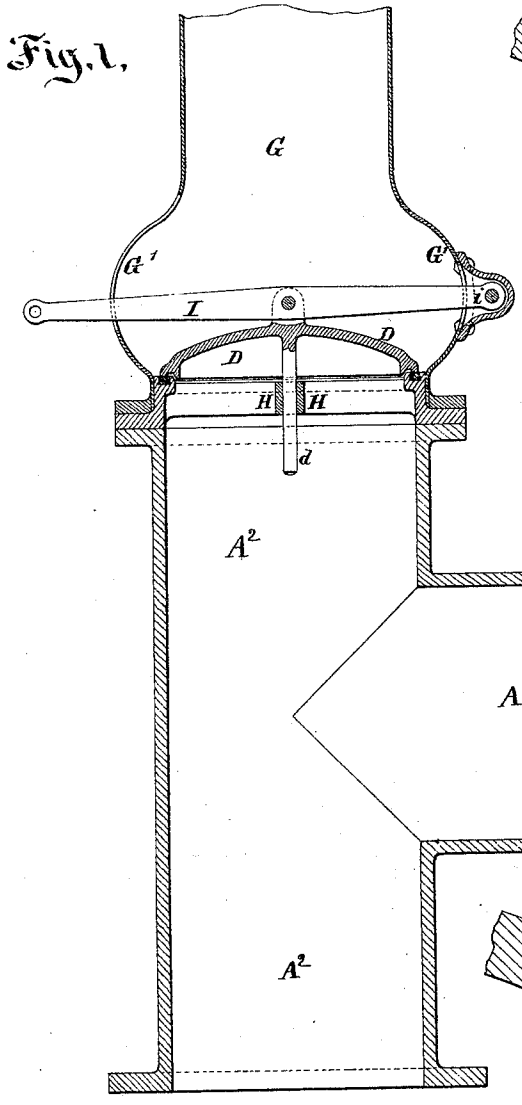


Fig. 2.

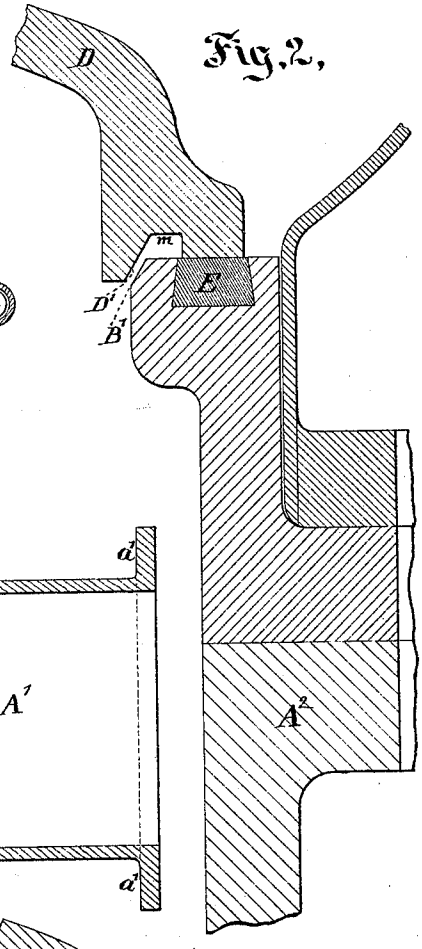
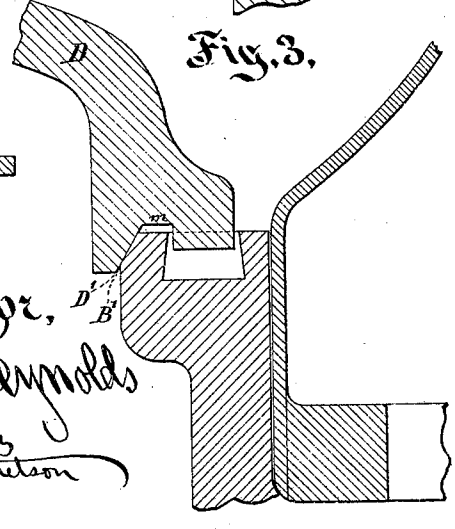


Fig. 3.



Witnesses,
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GEORGE H. REYNOLDS, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF, CORNELIUS H. DELAMATER, AND ALEXANDER K. RIDER, OF SAME PLACE.

Letters Patent No. 112,183, dated February 28, 1871.

IMPROVEMENT IN VALVES FOR CONDENSERS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, GEORGE H. REYNOLDS, of the city and county of New York, in the State of New York, have invented certain new and useful Improvements in Valves and Connected Parts in Condensing Steam-Engines; and I do hereby declare that the following is a full and exact description thereof.

My invention is intended to better provide for relieving the condenser and all parts from strain in cases where a tubular condenser is employed and from any cause becomes hot and fails to properly condense the steam. It provides automatically, and without even a momentary interruption of the action of the engine, for a full and complete change of the engine from condensing to non-condensing, and *vice versa*. It provides a cheap, tight, and noiseless seat, of rubber or analogous material, for the valve under ordinary conditions, and guards effectually against danger of total failure in case the rubber or its equivalent becomes practically or entirely destroyed or removed.

I will proceed to describe what I consider the best means of carrying out my invention.

The accompanying drawing forms a part of this specification.

Figure 1 is a central vertical section on a small scale;

Figure 2 is a section, full size, showing the valve closed in its ordinary condition; and

Figure 3 is a corresponding section showing the valve closed in an unusual condition.

The drawing shows only the novel parts, with so much of the other parts as is necessary to show their relation thereto.

Similar letters of reference indicate like parts in the drawing.

A^1 is a branch or T from a hollow casting. It is connected by the flange *a'* to the exhaust-port of an engine, not represented.

Through this the steam from the engine is conducted freely into the vertical pipe or chamber A^2, having a peculiar duplex valve-seat at the top and a provision for a flanged or other connection to a condenser (not represented) at the bottom.

The valve-seat is finished conically on its inner edge B', and adapted to receive a conically-faced valve. A little outside of and concentric to this conical seat, it is deeply recessed, and the recess is filled with rubber.

The rubber E is a ring of well-vulcanized material of a dovetailed section. It is crowded into the correspondingly-dovetailed recess, cored or otherwise formed in the casting. It should project a little above the surface of the iron. It is so arranged that the valve in sinking will slightly compress the rubber and form a tight seat by resting thereon.

D is a poppet-valve, suitably mounted and guided, so as to have simply a rising and sinking motion.

There is a stout lip, D', on its under face, adapted to fit tightly within the conical seat at the top of the apparatus.

Concentric to this lip D', outside thereof, is, first, a little space, as indicated by *m*, and next, a sufficiently broad continuous bearing extending quite around.

When working under these conditions the lip D' does not sink quite to a bearing against the corresponding conical surface below, but stands off at a distance of one-sixteenth of an inch, more or less, when the valve is tightly resting on the rubber E. But when the rubber fails, from being dissolved by oil or other solvent, from being compressed by too great mechanical force, and caused to change its form, or, (a very common contingency,) in case the rubber becomes removed altogether, or fails from any cause whatever, then the valve D will sink a little lower than before, and come to a bearing with its conical lip D' fitting firmly and tightly into the corresponding conical seat below. In other words, the valve rests upon rubber when in full and perfect working order; but when the rubber is washed out by a violent action of the water, or becomes otherwise removed, deranged, or ineffective, then the valve sinks a very little lower, and comes to a bearing on its conical face, and still forms a tight fit.

The valve-seat and the valve fitting thereon should be inclosed, as represented, within the globular or swelled casing G', at the foot of a suitable escape-pipe or chimney G.

The stem *d* of the valve D may be guided in one or more steadiments, H, within the casing A^2.

A lever, I, pivoted at *i*, may also be connected, as shown, to allow it to be aided in its rising or sinking motion, as required in any particular exigency.

Supposing the parts suitably connected and the condenser properly supplied with cold water, my valve D will sink to a fair but tight bearing on the rubber ring E, and will not rise while the work proceeds under ordinary conditions. But when, from any cause, as an unusual quantity of steam or extraordinary speed in the engine, or a reduction in the quantity of condensing water, or the like, the pressure in the condenser, and consequently in the casing A^2, increases until it equals and a little exceeds that of the atmosphere, the valve D rises and allows the steam to escape freely.

There may be circumstances under which it is desirable to work for a considerable period under these conditions. In such case the valve D remains open either of itself, or is held open by the aid of the lever I, and the steam travels directly up past it into the escape-pipe G and is discharged into the atmosphere.

Rubber has been before fitted to the working faces of valves or seats, to reduce noise and concussions and secure tightness. It is not unusual, in quick-working propellers and other steam vessels, for circumstances

to arise which partially destroy or entirely throw out such rubber. In such cases my engine will work successfully until port is reached, by reason of the tight fit of the part D' on its seat.

In practice a pair of engines, or even one engine working at full force, with imperfect condensation, lifts the valve D up clear of its seat, causing it to either stand steadily or to dance in that position. In either event the steam escapes without inducing any appreciable back pressure against the piston of the engine.

The steam which escapes from my valve D has not been in the condenser, and has in no wise contributed to the heating thereof. When my engine works condensingly my valve D remains tight upon its seat. When it has occasion to change to working non-condensingly, or to discharge any part of its steam uncondensed, the valve D automatically rises, and constitutes the engine, either entirely or partially, a non-condensing engine.

The change in the opposite direction is equally easy and instantaneous. The moment the pressure of the steam in the condenser is reduced by condensation below that of the atmosphere, the steam begins to enter it and the valve D begins to fall during some portion of each stroke. When the pressure in the condenser is reduced sufficiently to receive and dispose of all the steam which issues from the engines, the valve D again remains tightly closed.

My arrangement of the valve and passages differs from any before known to me in the convenience and completeness with which it provides for all exigencies. A slight cord attached to the lever I and tied to any point above holds up the valve steadily, and allows the engine to work high pressure, not only without flutter of the valve, but also absolutely without any resistance from the condenser. This is very different from any valve on the condenser to allow steam to escape from the condenser, because it not only avoids the resistance of the water, but also all friction due to passing among and through pipes and passages in the condenser.

It should be remarked that in most vessels the condenser is below the level of the sea, and becomes immediately filled with water when thrown out of use, and an engine exhausting into the air through a condenser is in most cases impracticable for that reason.

I claim as my invention—

1. The within-described arrangement of the passages A^1 A relatively to the steam coming from the engine and to the condenser, and to the large tight self-acting valve D, the latter being provided with means for holding it steadily open, in addition to being free to act automatically, all substantially as herein set forth.

2. The within-described construction and arrangement of the valve with India-rubber or other elastic and noiseless seat, and with a separate seat to serve when the rubber shall fail, all substantially as herein specified.

In testimony whereof I have hereunto set my name in presence of two subscribing witnesses.

GEO. H. REYNOLDS.

Witnesses:

A. HOERMANN,

C. C. LIVINGS.