No. 859,745. PATENTED JULY 9, 1907.

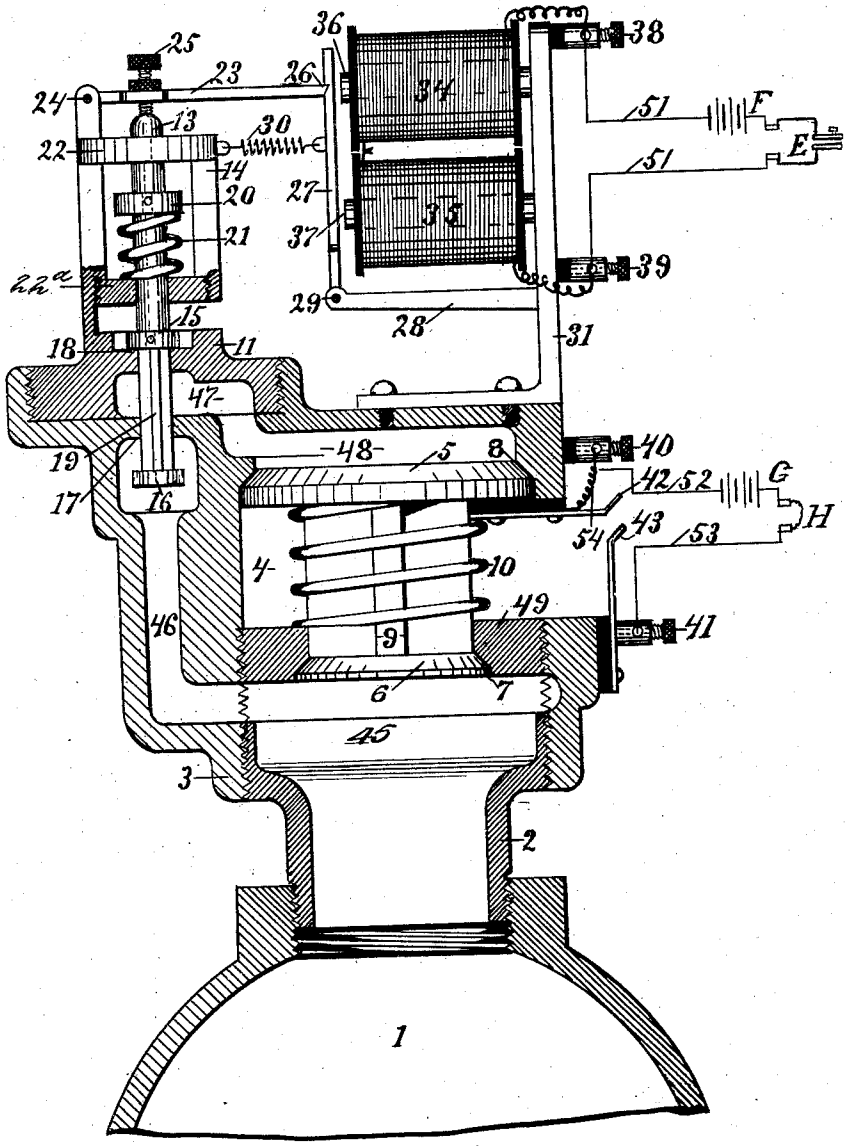
E. L. CRIDGE.

VACUUM CONTROL VALVE.

APPLICATION FILED APR. 13, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



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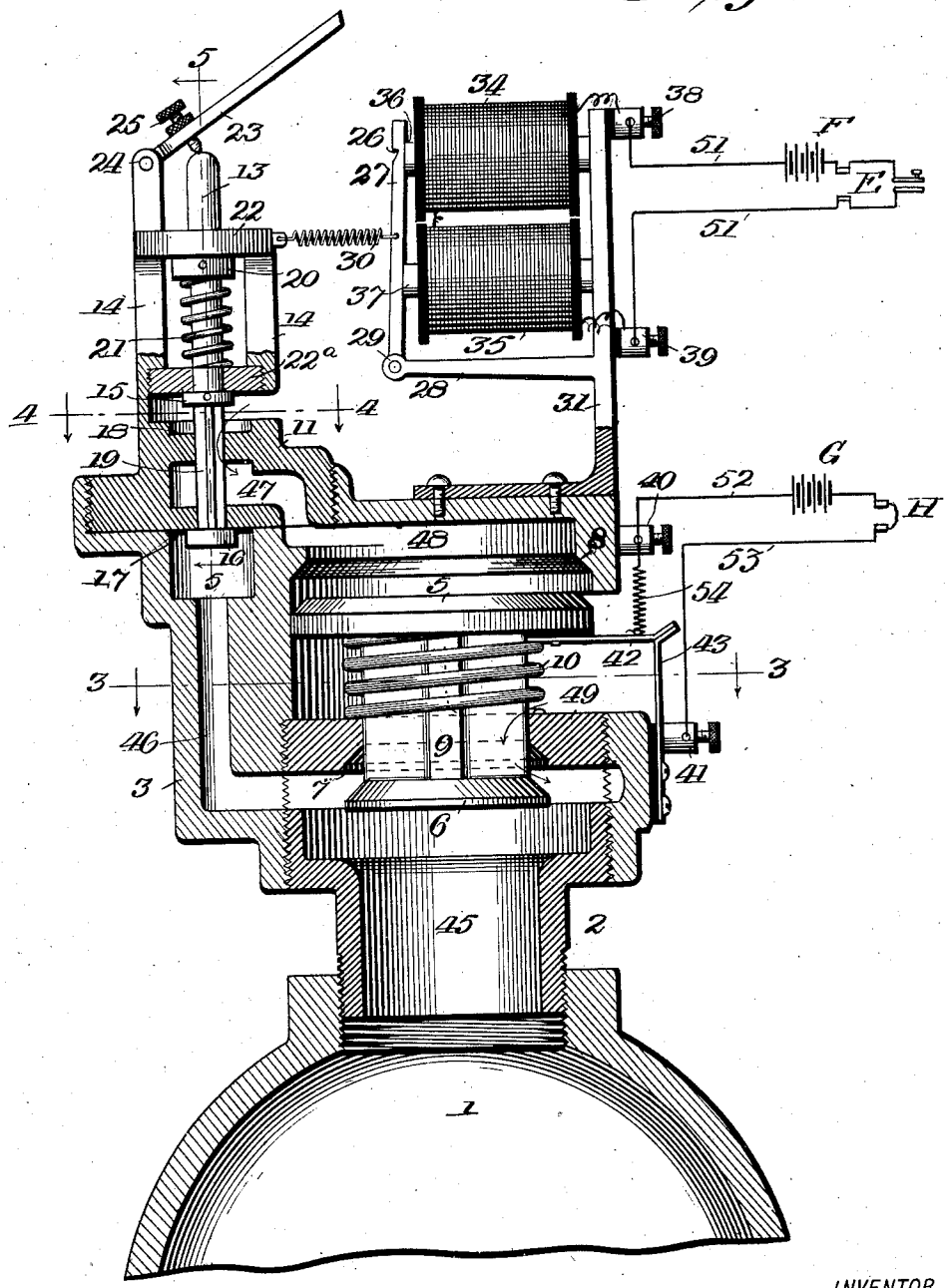
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

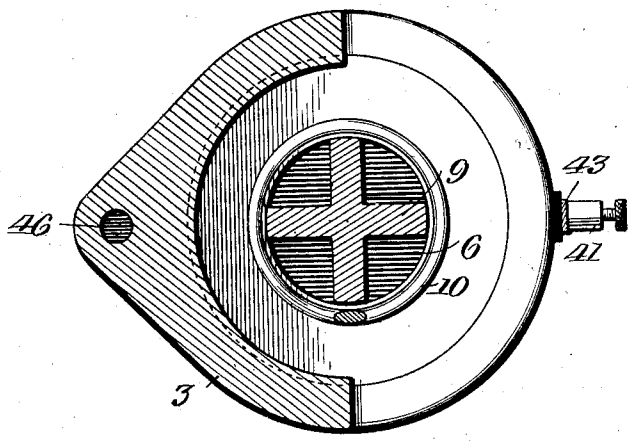


Fig. 4.

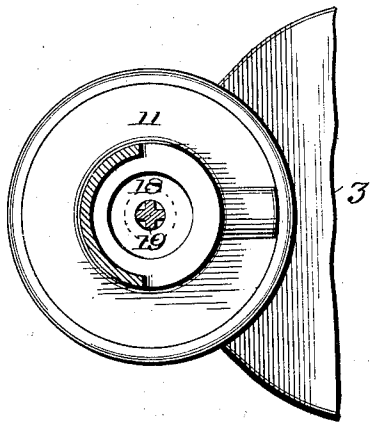
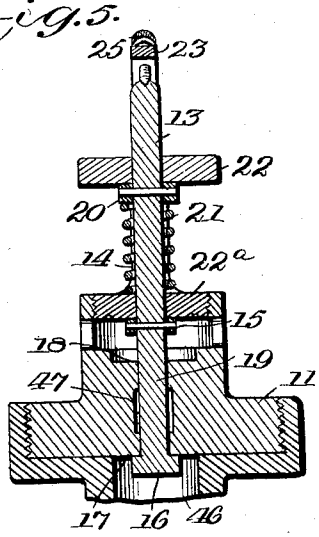


Fig. 5.



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EDMUND LOMAX CRIDGE, OF PASSAIC, NEW JERSEY.

VACUUM-CONTROL VALVE.

No. 859,745. Specification of Letters Patent. Patented July 9, 1907.

Application filed April 13, 1906. Serial No. 311,553.

To all whom it may concern:

Be it known that I, EDMUND LOMAX CRIDGE, a citizen of the United States, and a resident of Passaic, in the county of Passaic and State of New Jersey, have invented an Improved Vacuum-Control Valve, of which the following is a specification.

My invention is an improved mechanism for relieving the vacuum formed in the condenser of condensing engines. It is adapted to operate automatically for instantly admitting atmospheric air to the condenser and thereby relieving the vacuum therein when live steam is shut off from the cylinder of the engine. Thus the engine will be stopped immediately in place of continuing to operate after the steam has been shut off. In other words, my improved apparatus operates to quickly break or destroy the vacuum, by the admission of atmospheric air, so that the motor which extracts air from the condenser will be stopped more quickly than would be otherwise practicable, and also the danger of water being drawn into the cylinder of the engine will be avoided.

The details of construction, arrangement, and operation of parts are as hereinafter described, and illustrated in the accompanying drawings, in which

Figure 1 is a central vertical section of the main portion of the apparatus. Fig. 2 is a similar view showing the movable parts in the position they occupy when the vacuum is relieved. Fig. 3 is a cross-section on the line 3—3 of Fig. 2. Fig. 4 is a cross-section on the line 4—4 of Fig. 2. Fig. 5 is a vertical section on the line 5—5 of Fig. 2.

Referring especially to Figs. 1 and 2, the numeral 1 indicates a chamber in which a vacuum exists, and 2 a nipple connected with the casing of the chamber by a screw-joint and serving as a support for the operative parts of the apparatus.

3 is a casing in which is formed a side air-passage 46, that communicates with the chamber 45 of the nipple 2. A horizontal plate 49, forming a valve-seat 7, is screwed into the part 3. A bevel valve 6 seats upward therein, and a larger valve 5 is similarly seated at 8 in the upper portion of the casing or frame 3. These valves are connected by a cruciform stem 9, see Fig. 3, and a spiral spring 10 encircles the same, and, by pressing upward against the valve 5, it tends to hold the two valves normally seated, as shown in Fig. 1. It is apparent that, if the valves be pressed downward to the position indicated in Fig. 2, the vacuum in chambers 45 and 1 will be relieved, since the atmospheric air may then pass the valve 6, as indicated by arrow in Fig. 2.

It will be seen that the plate 49 not only serves as a seat for the valve 6 but also as a guide for the stem 9. It being constructed as a nut, it may be rotated for adjusting it to take up any wear of the valves 5, 6, so that they may be at all times seated perfectly. The casing or frame 3 is provided with an air-chamber or passage 48 above the valve 5, and this communicates with a lateral passage 47 formed in the part 11 which screws into the part 3. In the part 11 are formed vertical coincident openings in which is arranged a cruciform stem 19 of a supplemental, or "pilot," valve. The latter has two disks 15 and 16 that serve as valves proper. In the normal condition, the disk 15 seats at 18 on the upper side of the opening in which the guide stem 19 is arranged, and the disk 16, at the lower end of said stem, is spaced from the seat 17.

It will be seen from Fig. 2 that when the valve is raised, this relation of the disks 15 and 16 to their seats is the reversed, 15 being then raised from the seat 18 and disk 16 being closed on the seat 17. It is apparent further, that in the normal position indicated in Fig. 1 there is an open communication between the lateral passage 46 and the passages 47, 48, on the upper side of the valve 5; and, when the valve is raised in Fig. 2, this communication is cut off by disk 16 and atmospheric air has free admission as indicated by the arrow, to the passages 47, 48. The upper portion, or stem, 13 of the pilot valve is adapted to slide in guides 22 and 22^a, the former being formed integral with a vertical frame or bracket 14 which is supported on the part 11 and the guide 22^a being screwed into the lower portion of said frame. The atmospheric air has free admission to the space between the valve-seat 18 and the part 22^a. Above the latter is arranged a spiral spring 21 which bears upward against a collar 20 on the stem 13. Said collar comes in contact with the part 22 when the valve is raised as in Fig. 2. The part 22 therefore serves both as a guide and stop. The pilot valve is held normally depressed, as in Fig. 1, by means of the lever 23 which is hinged at 24 to the frame 14, and a set screw 25, that bears directly on the head of the valve-stem. The free end of the lever 23 engages a notch 26 in the armature 27 of the electromagnets 34, 35, said armature being hinged at 29 to the lateral arm 28 of the bracket 31, that is attached by screws to the part 3 of the frame or casing. A spring 30 connects the armature 27 to the frame 14 and thus normally draws the armature away from the poles 36, 37, of the electromagnets. Binding-screws 38, 39, are insulated from the bracket 31, and electric circuit wires 51 are connected therewith, and branches extend to the magnets 34, 35, in a well understood manner. In the circuit is included a source of electrical supply F, and a device E which may be operated to close the circuit at will.

An electric contact 42 is attached to the under side of the valve 5 and insulated therefrom, and a similar contact 43 is attached to the side of the frame or casing 3, and insulated therefrom. The free ends of these parts are so arranged that they come in contact and close a circuit through the wires 52, 53, when

the differential valves 5, 6, are depressed, as indicated in Fig. 2. G indicates a battery or other source of electric supply, and H indicates a point where the conductors 52, 53, may be connected with a motor that actuates the vacuum-producing apparatus; or H may indicate an alarm which will be operated automatically when the circuit is closed by contact of the parts 42—43.

The operation of my invention will now be understood from the following brief statement. In the normal position, the vacuum-relief valves 5 and 6 are closed on their seats and the disk, or pilot, valve 15 is also on its seat. The circuit through wires 51 being open, the magnets 34, 35, are not energized, and consequently the spring 30 will hold the armature 27 engaged with the lever 23 so that the latter holds the pilot, or supplemental, valve depressed, the disk or valve proper 15 being held on the seat 18 and the corresponding valve 16 held away from its seat. Thus there is a vacuum in passages 47—48, also 46, and the chambers 45 and 1. Atmospheric pressure has free admission to the under side of the valve 5 and the upper side of the valve 6; but, owing to the difference in diameter or surface of these valves, the tendency is obviously to hold the valve seated. When it is necessary that the vacuum should be broken, the switch E is closed, and consequently the magnets 34, 35, are energized and attract the armature 27 as shown in Fig. 2, whereby the lever 23 is instantly released and the spring 21, encircling the stem 13 of the pilot valve, instantly raises the same until its collar 20 strikes the stop 22. This movement, however, raises the valve 15 from its seat and closes the valve 16 on its seat, so that air is cut off from passage 46 and the vacuum chambers 45 and 1, but freely admitted to passages 47—48 above the larger valve 5. Thus, at this time atmospheric air is allowed to press on the upper side of both valves 5 and 6, causing them to open, and simultaneously the parts 42, 43, contact and thus a circuit is closed through the motor or alarm, H.

I claim—

1. The combination, with a steam-condensing chamber and a casing or frame attached thereto and having air passages, of differential valves having a guide stem adapted to allow passage of air, a spring encircling such stem and tending to hold the valves normally seated upward, a pilot valve controlling passages leading to the vacuum chamber and the space above the upper relief valve and having two disks or valves proper, one of which seats downward when the other is open and vice versa, a spring applied for lifting the pilot valve, a pivoted lever adapted to bear on the stem of the pilot valve, electro-magnets, and a swinging armature adapted to engage said lever, an open electric circuit in which said magnets are included, electrical contact pieces, one of which is connected with the differential relief valves, and a normally open electric circuit of which the contacts form a part, whereby, upon closing the circuit through the electromagnets, the pilot valve is instantly released thus admitting air to the passage above the larger relief valve so that the relief valves are depressed and atmospheric air admitted to the vacuum chamber, substantially as described.

2. In an apparatus for the purpose specified, the combination, with a casing in which a vacuum may exist, of differential relief valves seated upward in the casing or frame in which they are arranged, said casing having a lateral passage communicating with the vacuum chamber and an upper passage leading to the upper side of the larger relief valve, a double pilot valve which, in the normal or closed position, allows communication between the vacuum chamber and the passage above the larger relief valve, a spring applied to such pilot valve for raising it, and electrical-control mechanism for holding the pilot valve normally depressed, substantially as described.

3. In a vacuum-control apparatus, the combination, with a casing connected with a steam-condensing chamber and having a vacuum relief valve which is held normally to its seat, a lateral passage leading to the vacuum chamber, a communicating passage extending to the upper side of the relief valve, a pilot valve which, when depressed, allows free communication between the passage above the relief valve and the vacuum chamber, a spring for raising the said pilot valve, and trip mechanism holding the pilot valve normally depressed but adapted to be operated for instantly releasing it, whereby admission of air to the upper side of the relief valve is instantly permitted, and lateral passage to the vacuum chamber closed, substantially as described.

4. In a vacuum-control apparatus, the combination, with a casing connected with the vacuum chamber, of differential valves to whose inner sides atmospheric air has free admission, a lateral passage communicating with the vacuum chamber, and another passage leading to the top of the larger relief valve, a supplemental, or pilot, valve adapted to close or open communication between said passages so that when the vacuum is formed in the chamber the differential pressure upon the relief valves tends to hold them normally seated, trip mechanism for holding the pilot valve normally depressed, and a spring for lifting said valve, substantially as described.

5. In a vacuum control apparatus, the combination, with a casing communicating with the vacuum chamber, of differential valves and a stem connecting them, a seat for the larger valve being formed in the casing, the seat for the lower valve consisting of a plate connected with the casing by a screw-joint and thus adapted for vertical adjustment, a lifting spring interposed between such plate and the larger relief valve, a supplemental valve for controlling the admission of air to the space above the larger relief valve, and a trip mechanism adapted to hold the supplemental valve normally depressed, but to release it at will, substantially as described.

6. In a vacuum-control apparatus, the combination, with a casing connected with a vacuum chamber, and a relief valve controlling admission of air thereto, of means for controlling admission of air to the upper side of said relief valve, an electric circuit including an electric device to be operated and contacts one of which is connected with the relief valve so that when the vacuum above the latter is relieved, air is admitted to the vacuum chamber below, substantially as described.

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Witnesses:
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