C. R. HOUGHTON.

UNLOADING VALVE.

APPLICATION FILED JUNE 3, 1911.

1,046,593.

Patented Dec. 10, 1912.

2 SHEETS—SHEET 1.

FIG. 1.

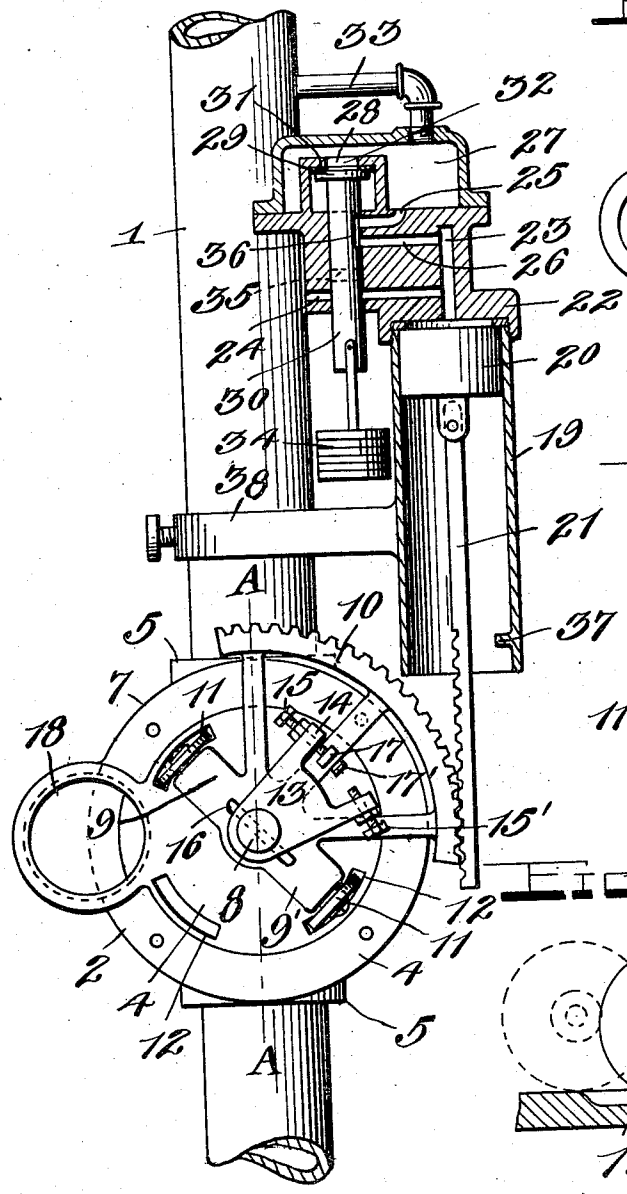

FIG. 4.

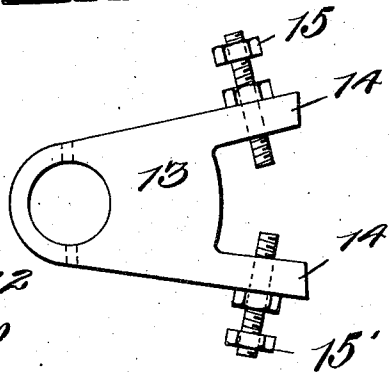

FIG. 5.

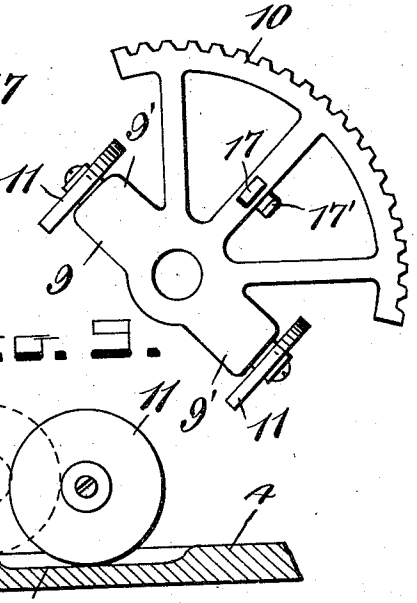

FIG. 3.

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2 SHEETS—SHEET 2.

FIG. 2.

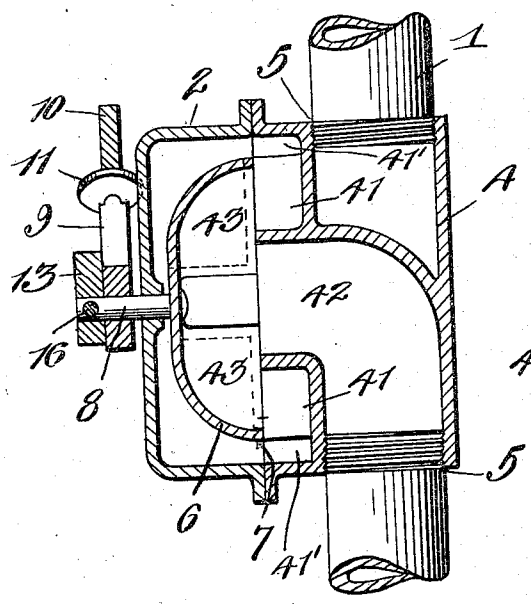

FIG. 3.

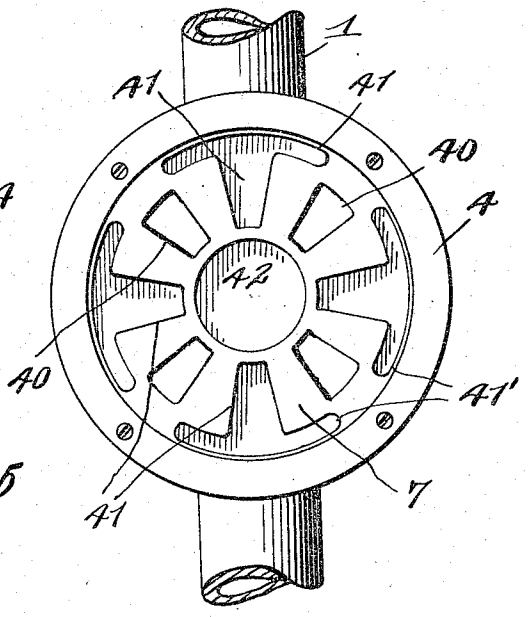

FIG. 6.

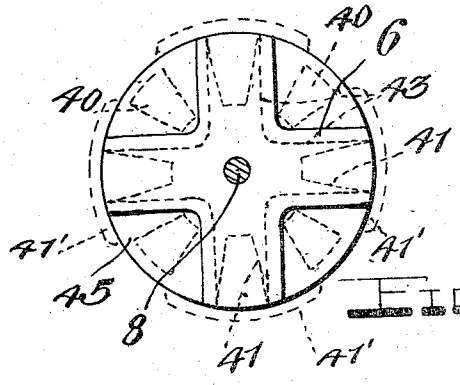

FIG. 7.

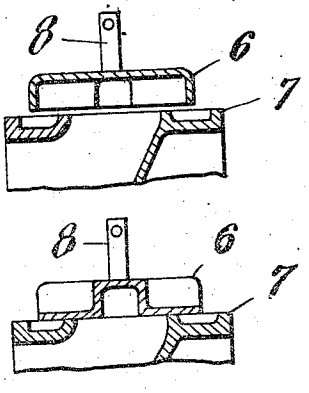

FIG. 4.

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UNITED STATES PATENT OFFICE.

CARL ROY HOUGHTON, OF CONNERSVILLE, INDIANA.

UNLOADING-VALVE.

1,046,593. Specification of Letters Patent. Patented Dec. 10, 1912.

Application filed June 3, 1911. Serial No. 631,104.

To all whom it may concern:

Be it known that I, CARL ROY HOUGHTON, a citizen of the United States, residing at Connersville, in the county of Fayette and State of Indiana, have invented certain new and useful Improvements in Unloading-Valves, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to unloading valves, and particularly those for use with vacuum cleaning systems and the like.

The object of my invention is to provide an unloading valve which will automatically take care of an unsteady load on a vacuum cleaning or similar system. It is well known that in a vacuum cleaning system there are often many hose outlets distributed over the air-line, and that the number used varies considerably from time to time, thereby causing the pump which operates the air-line to suffer from a fluctuating load, which is at present not suitably provided for; it is my object to make up for this deficiency and to provide a suitable valve which will keep a pressure or vacuum on the system close to normal amount and to save power at the pump by allowing it to run idle for a portion of the time.

Another object of my invention is to provide such a valve which will do its work efficiently and noiselessly.

A further object of my invention is to provide such a valve that can be easily installed or removed from the system.

Other objects of my invention will become apparent as it is more fully set forth.

In present systems, the pump that creates the vacuum usually pulls on the system at a steady rate, and as it has an unsteady load it quite often is necessary to provide other means of control which are usually unsatisfactory and, at any rate, cause the pump to work inefficiently.

In this invention, in case all the tools are cut out, the pump will run idle until they are used again, provided the air line is entirely closed, that is, air tight. This unloading valve is, therefore, used to cut out the pump from service from the air line and allow it to run idle when there is no load upon the system, and means are provided on my valve so that the vacuum in the system can be kept as uniform as possible by means of an adjustment which will be explained in detail in a later part of the specification.

In the accompanying drawings, which illustrate by way of example, an embodiment of my invention, Figure 1 represents a view in elevation, partly in section, of an unloading valve, embodying my invention, attached to an air line; Fig. 2 represents a sectional view along the line A—A of Fig. 1; Fig. 3 is an elevation of the inner valve casing section showing the valve seat and the ports and recesses therein; Fig. 4 is a detail of an armed element used in the threeway valve; Fig. 5 is a detail of a quadrant member used in the threeway valve; Fig. 6 is an elevation of the movable valve member, the pump supply ports of the inner casing section being shown in dotted lines; Fig. 7 is a diagrammatic view of a threeway valve in its ineffective position; Fig. 8 is a diagrammatic view of the threeway valve in its effective position; and Fig. 9 is a detail of the lifting slot and wheel in the top of the threeway valve casing.

Similar reference characters refer to similar parts throughout the various drawings.

In the drawings, 1 is a pipe or air line, whose upper portion is connected to a tank of the vacuum system, not shown in the drawings, and has installed in it a threeway valve 2 whose lower portion or outlet is connected with, by suitable connections, a vacuum pump (not shown). The threeway valve 2 is preferably constructed with a casing 4 adapted to receive the threaded ends of the pipe sections 1, as shown at 5. The outer section of the casing is provided with a movable valve plate 6 which is rotatable on the seating surface 7 of the inner valve casing section.

8 is the rod which supports and rotates the valve plate 6 and which projects out of the casing, as clearly shown in the drawings.

The valve plate 6 is preferably constructed so as to have a recess of a somewhat cross-like shape so that as it moves into its several positions it will open and close the ports 40, as desired.

Referring particularly to Fig. 1, 9 is a member which has a toothed quadrant 10 extending on one side of it and has a pair of arms 9′ which have wheels 11 mounted thereon. The wheels 11 are arranged to traverse the front face of the outer section of the casing 4 of the valve and are adapted to move in the recesses 12 which are arranged on this casing. As these wheels rotate on the outer section of this casing and

go in and out of the recesses 12 the whole quadrant is moved up and down and thereby causes the valve plate 6 to move up and down. Mounted upon the rod 8 is an armed element 13 which has adjusting screws 15 15′ mounted on the arms 14 which are arranged to vary the extent of rotation of the valve plate.

16 is a bolt which secures the element 13 to the rod 8.

The adjusting screws 15 and 15′ are adapted to be engaged by the projections 17 and 17′ which are mounted on one of the arms of the quadrant 10, said latter projection having its end angularly disposed in the path of the screw 15′.

Provided in the outer section of the casing 4 is an opening 18 which permits the air to be drawn from the atmosphere into the pump when the unloading valve is opened. Secured to the air line 1 above the threeway valve is an automatic acting check or vacuum valve which has a cylinder 19 provided with a plunger or piston 20 operating in it and which actuates a toothed rod 21, which engages with the quadrant 10 and actuates it with the other parts of the threeway valve. The cylinder 19 is suitably mounted to a framework 22 which has arranged in it air passages 23, 24, 25 and 26 that are clearly shown in Fig. 1, and has in the upper portion a receiving chamber 27 in which projects a plunger chamber 28 in which the upper portion 29 of the plunger 30 actuates and which normally presses against a gasket 31 to close the opening 32 in the upper portion of this chamber. The receiving chamber 27 is connected with the air line by a suitable pipe 33.

34 are suitable weights arranged on the plunger for adjusting the amount of vacuum the unloading valve is to act on. A hole 35 is provided in the plunger so that when it has reached its lowest position it will permit atmospheric air to go through the air passage 24 and destroy the vacuum that holds the plunger 20 in its upper position. In order to permit the plunger 20 to be held in its uppermost position when the vacuum is above that required, a recess 36 is provided in the plunger which connects the passages 25 and 26 together. Provided in the cylinder 19 is a stop 37 to prevent the plunger from falling below a desired point.

38 is a bracket for holding the cylinder in place on the air line.

In operation, the vacuum, when sufficiently great, will support or pull the plunger 30 up to its highest position and with its head 29 pressing against the gasket 31, which prevents any leakage of air past, keeps the plunger securely in this position. While the plunger is in this position, the vacuum draws the air through the passage 25, the recess 36, the passage 26, the passage 23, and draws on the piston 20 and thereby keeps it in its upper position. Should the vacuum lessen from any cause the weights 34 acting on the plunger, pull it down and thereby close the passages 25 and 26 and short circuit the passage 24 with the hole 35, which permits atmospheric air to rush in and destroy the vacuum that supports the piston 20 and thereby causes it to fall. In its fall, the piston rod 21 is pushed down and its teeth engaging with those of the quadrant rotate the quadrant. As the quadrant rotates, its wheels 11 ride out of the recesses 12 and lift the valve plate 6 which thereby eliminates any friction to be overcome between the edges of the plate and the valve surface 7. In the movement of the quadrant, its projection 17′ engages with the lower adjusting screw 15′ and rotates the valve element 13 which thereby rotates the valve plate 6 and closes entirely the atmospheric air from the pump and permits the pump to act directly on the air line. In this position of the valve the same is disposed with relation to the seating face 7 so that the channeled arms of the valve forming the passages 43 are disposed over the ports 40 of the inner casing section and connects said ports with the passage 42 in the casing section to which the pipe extending from the pump is connected, thus providing a circuitous passage through the valve between the latter pipe and the upper section of the air line pipe 1. When thus disposed the web plate 45 of the valve member 6 is disposed over the recesses 41 which are formed in the seating face 7 on the inner casing section between the ports 40. When the valve member is in its intermediate position or out of engagement with the seating face 7, the air inlet of the valve case is in communication both with the air line pipe and the pipe leading to the pump. When sufficient vacuum has been created in the air line, the plunger 30 is drawn back into position and then the piston 20 is raised to its highest position, which actuates the quadrant back and causes the projection 17 to act on the adjusting screw 15 and move the valve plate back to its former position as shown in Fig. 6 which permits the air from the atmosphere to go through the opening 18 into the chamber within the casing 4, and thence into the pump. In this position of the valve member 6, the passages 43 of said member are disposed opposite the recesses 41 in the seating face 7, the web plate 45 of said valve member closing the ports 40. Atmospheric air then enters through the port 18 and flows into the extended portions 41′ of the recesses 41, from which it finds its way through the passages 43 and 42 into the pump connecting pipe. This latter position of the valve member 6 is shown in Fig. 2. In Fig. 7 the inter

mediate position of the valve member with relation to the seating face 7 when said member is being moved from one of its effective positions to the other, is illustrated.

It can be seen that this unloading valve can be made to operate without the use of even a check valve in the air line because the flat surface of the valve plate 6 will close the parts in the casing 4 which connects to the system, for at each of the extreme positions of the piston 20 wheels 11 are in the recesses 12, thus allowing the valve plate 6 to seat tightly thereon.

While I have shown one particular type of valve, I do not wish to be limited to that exact shape, or in any way, otherwise than necessitated by the prior art, as I am aware that many modifications in the construction of my invention can be made, without departing from the principles thereof.

The advantages of this apparatus are that it works automatically, it works quickly and positively, and prevents undue strains being put upon the pump as well as other parts of the air line, and, further, it can be adjusted to any particular class of work for which such an unloading valve may be desirable.

The uniformity of the action of this device is of particular benefit as not only does it prevent strains upon the apparatus, but it increases the efficiency of all the parts and relieves the necessity of having an operator constantly on the watch to note the load being taken off of the air line.

My invention has a particular advantage in having all its parts easily accessible for inspection and repair and having an arrangement which can be easily suited for this class of work without entailing any great expense.

Having thus described the invention, I claim:—

1. In a valve of the character described, a casing having a valve seat provided with a plurality of openings and an intake port open to the atmosphere, air line pipes connected to the casing and adapted to communicate with each other through the openings in the valve seat, a valve in said casing over said openings adapted to open and close the openings, a stem connected to the valve, means rotatably mounted on said stem and co-acting with the valve case to move said valve away from its seat, means for actuating said valve lifting means, and additional means coöperating with said valve lifting means and actuated thereby to rotate the valve to open and close communication between the air intake port and the air line pipes.

2. In a valve of the character described, a casing having an intake port open to the atmosphere and provided with an interior valve seat having a plurality of openings, an air line pipe comprising two sections, each section connected to the casing and adapted to communicate with each other through the openings in the valve seat, a valve arranged within the casing adapted to open and close the openings, a stem connected to said valve and extending through the wall of the casing, a toothed quadrant loosely mounted on said stem, means carried by the quadrant and co-acting with the valve casing to lift the valve from its seat, a reciprocatory rack engaging said quadrant to actuate the same, and additional means rigidly mounted on the valve stem and coöperating with said quadrant to rotate the valve to open and close communication between the intake port and the air line-pipe sections.

3. In a valve of the character described, a casing having a port open to the atmosphere and an interior valve seat, provided with a plurality of openings, air line pipes connected to the casing and adapted to communicate with each other through the openings in said valve seat, one of the walls of the valve casing having a plurality of recesses in its exterior face, a valve arranged within the valve casing over the seat thereof, a stem connected to the valve extending through the wall of the valve case, means loosely mounted on said stem and coöperating with the recesses in the face of the valve case to lift the valve from its seat, means for actuating said valve lifting means, and additional means fixed to the valve stem and actuated by said valve lifting means to rotate the valve and open and close communication between the air intake port and the air line pipes.

4. In a valve of the character described, a valve casing having an intake port and provided with an interior valve seat having a plurality of openings, air line pipes connected to the valve case and adapted to communicate with each other through the openings in the valve seat, a valve arranged within said case over the seat thereof, a stem secured to said valve and extending exteriorly of the case, a toothed quadrant loosely mounted upon the stem for rotative movement, one of the walls of the valve case having a plurality of recesses therein, rollers carried by said quadrant movable into and out of said recesses, a reciprocatory rack engaged with the teeth of said quadrant to rotate the same, the movement of said rollers out of the recesses lifting the valve from its seat, and an element fixed to the valve stem having means co-acting with said quadrant to rotate the valve and open and close communication between the air intake port and the air line pipes.

5. In a valve of the character described, a casing having an intake port, air line

pipes connected to the casing, said casing being also provided with an interior valve seat having a plurality of openings which afford communication between the air line pipes and the intake port, a valve movable from its seat, a stem secured to said valve movable through the casing wall, said casing wall having a plurality of recesses in its outer face, a toothed quadrant rotatably mounted upon the valve stem and having oppositely extending arms formed thereon, rollers mounted on the ends of said arms for movement into and out of said recesses, an element fixed to the valve stem and having spaced arms formed thereon, and means adjustable in said arms to co-act with the quadrant to rotate the valve and open and close communication between the air intake port and the air line pipes.

6. In a valve of the character described, a casing having an intake port, air line pipes connected to the casing, said casing being also provided with an interior valve seat having a plurality of openings which afford communication between the air line pipes and the intake port, a valve arranged within the casing and movable from its seat, one of the walls of said case having a plurality of recesses in its outer face, a stem connected to the valve extending through said casing wall, a member loosely mounted on said valve stem for rotative movement, a pair of rollers carried by said member and movable into and out of said recesses whereby the valve is adapted to be lifted from its seat and permitted to engage therewith, means for actuating said lifting member, and additional means coöperating with said lifting member to rotate the valve and open and close communication between the air intake port and the air line pipes.

7. In a valve of the character described, a valve casing having an intake port, air line pipes connected to said casing, said casing being also provided with an interior valve seat having a plurality of openings which afford communication between the air line pipes and the intake port, a valve longitudinally movable with respect to the casing adapted to engage with and be disengaged from its seat, a rotatable member arranged upon the exterior of the valve casing, a loose connection between said member and the valve, oppositely arranged rollers carried by said member, said valve casing being provided with a plurality of recesses to receive said rollers, the movement of the rollers out of said recesses moving the valve longitudinally away from its seat, means for rotating said member, and additional means actuated by said member to rotate the valve and open and close communication between the air intake port and the air line pipes.

8. In a valve of the character described, a casing having an intake port, air line pipes connected to said casing, said casing also having an interior valve seat provided with a plurality of openings affording communication between said pipes and the intake port, a valve longitudinally movable within the casing toward and from its seat, a stem secured to the valve and movable through the casing wall, a toothed quadrant rotatable on said stem, a reciprocatory rack co-acting with the quadrant to rotate the same, the outer face of the casing wall having a plurality of recesses therein, rollers carried by the quadrant and movable into and out of said recesses adapted to lift the valve from its seat and to permit the same to engage thereon, a pair of lugs formed on the quadrant, a member rigidly fixed upon the valve stem, spaced screws adjustable in said member and adapted to engage with said lugs when the quadrant is rotated whereby said valve is rotated and communication between the intake port and the air line pipes opened or closed.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

CARL ROY HOUGHTON.

Witnesses:
JUNE ESHELMAN,
CHARLES MCGRAW.