No. 687,895. Patented Dec. 3, 1901.

T. D. MILLEA.

VACUUM BREAKING DEVICE.

(Application filed Jan. 20, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

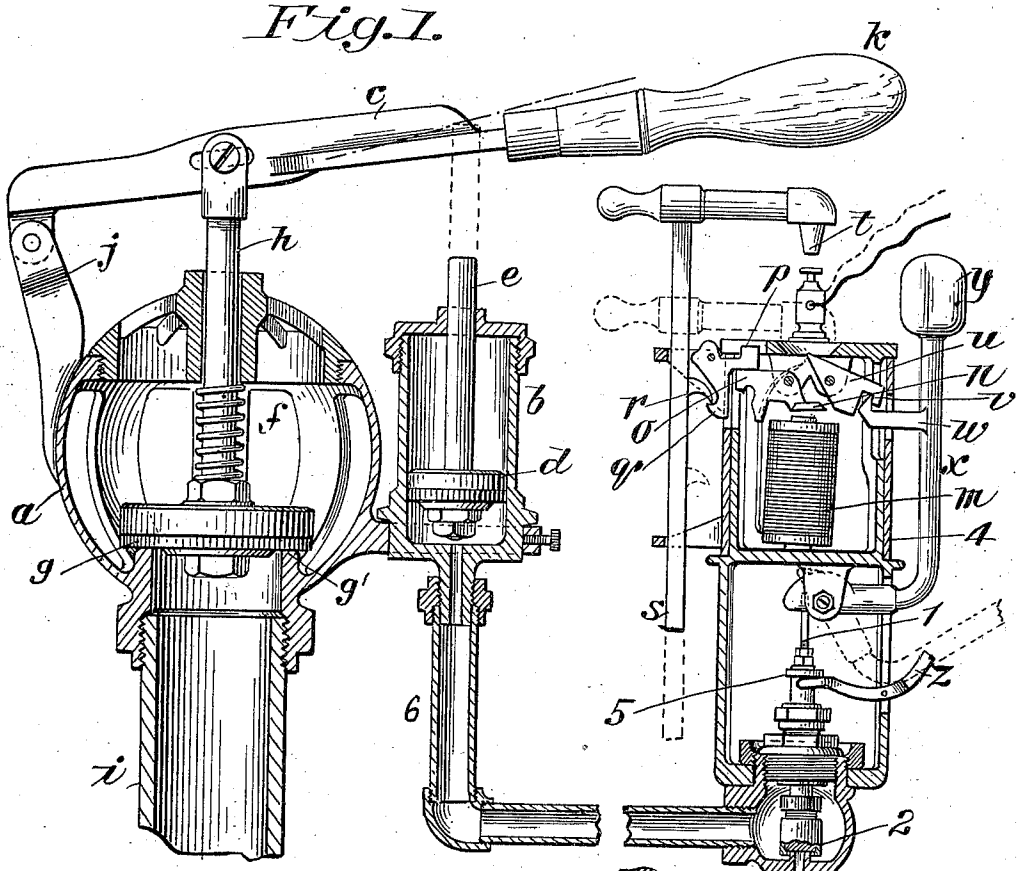


Fig. 3.

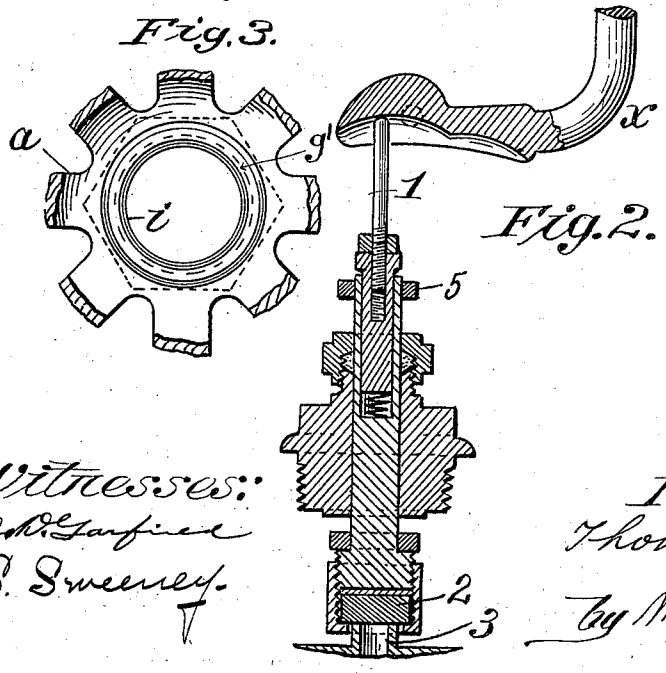


Fig. 2.

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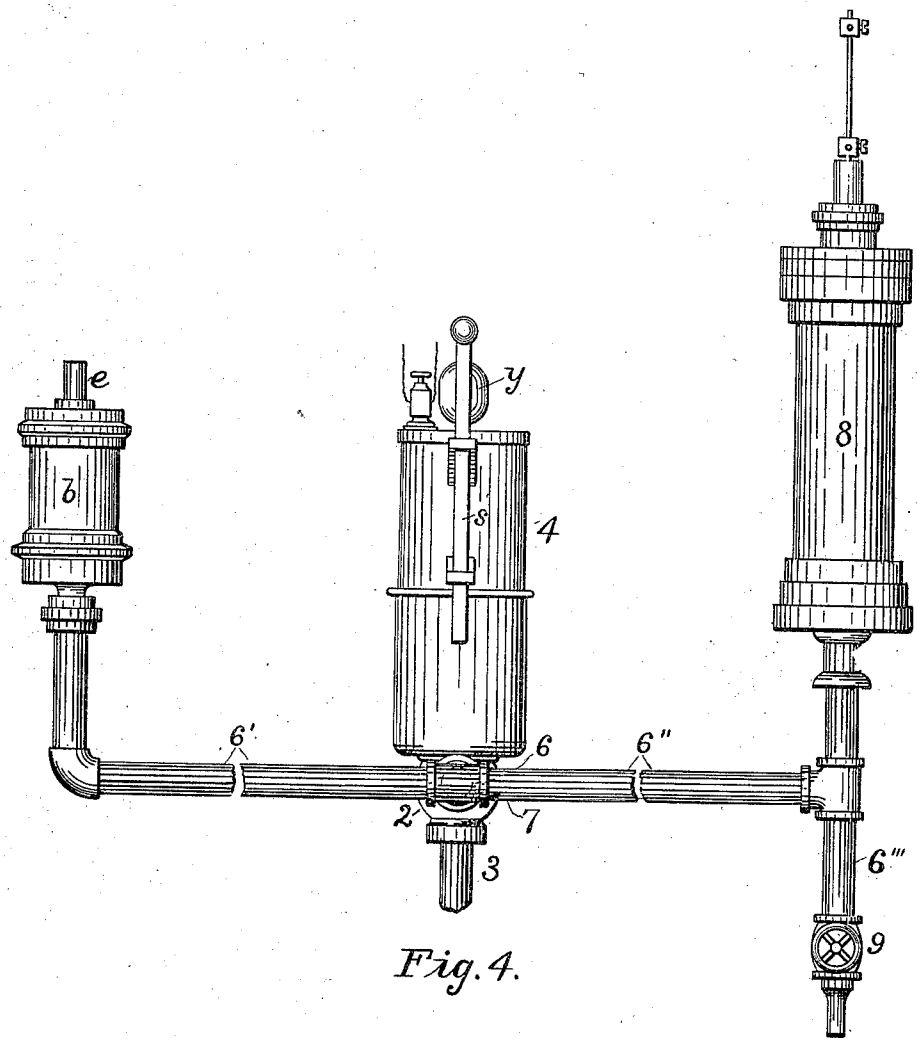


Fig. 4.

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# UNITED STATES PATENT OFFICE.

THOMAS D. MILLEA, OF SPRINGFIELD, MASSACHUSETTS, ASSIGNOR TO SPRINGFIELD ENGINE STOP COMPANY, OF NEW YORK, N. Y., A CORPORATION OF MAINE.

## VACUUM-BREAKING DEVICE.

SPECIFICATION forming part of Letters Patent No. 687,895, dated December 3, 1901.

Application filed January 20, 1900. Serial No. 2,234. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS D. MILLEA, a citizen of the United States of America, residing in Springfield, in the county of Hampden and State of Massachusetts, (whose post-office address is Springfield, Massachusetts,) have invented new and useful Improvements in Vacuum-Breaking Devices, of which the following is a specification, reference being had to the accompanying drawings and characters of reference marked thereon.

My invention relates to devices for destroying the vacuum in motors in which a vacuum is formed.

It is well known that in steam-engines where the steam is exhausted from a cylinder into a condenser a vacuum is formed in the condenser by the condensation of the steam. Further, in some types of engine a vacuum is maintained in the condenser by means of an air-pump to facilitate the exhaust. This vacuum sometimes causes the piston in the cylinder to continue to move after steam has been shut off and also to act to draw water from the condenser into the cylinder.

The object of my invention is to produce a device by which the vacuum may be quickly broken, preferably by the admission of air, so that the motor may be checked much more rapidly and also the danger of water being drawn into the cylinder be avoided. The device is applicable to any motor in which a vacuum may be formed. This class of apparatus is especially desirable if there be also provided apparatus operating in conjunction therewith by which the supply of steam or other motive force may be shut off at the same time and all operated from a point remote from the engine, so that in the event of accident rendering it desirable to stop the engine quickly the vacuum will not continue to operate the motor after the steam-supply has been cut off. It will readily be seen, however, that the present device alone is capable of practical application without being joined with any shut-off mechanism.

I accomplish the objects of my invention by the construction and arrangement herein pointed out.

In the accompanying drawings, in which like characters of reference indicate like parts, Figure 1 is an elevation, partly in section, of the preferred form of construction. Fig. 2 is a view, on an enlarged scale, of the preferred form of mechanism for holding the inlet-valve closed; and Fig. 3 is a plan view, on a scale larger than the other figures, of the valve-seat $g'$. Fig. 4 is a view showing the correlative parts of an engine-stop mechanism and my present invention connected.

Generally $a$ indicates a valve-casing; $b$, a cylinder; $c$, a lever; $d$, piston; $e$, piston-rod; $f$, spring; $g$, valve-disk; $g'$, valve-seat; $h$, valve-stem; $i$, conduit to vacuum; $j$, support for lever; $k$, handle for lever; $m$, electromagnet; $n$, armature; $o$, finger attached thereto; $p$, knob; $q$, latch attached thereto; $r$, catch on hammer-bearing rod; $s$, hammer-bearing rod; $t$, hammer; $u$, plate; $v$, catch attached thereto; $w$, latch attached to lever $x$; $x$, lever; $y$, weight on lever; $z$, auxiliary lever; 1, valve-rod; 2, small valve-disk; 3, conduit to main supply-pipe; 4, cylindrical shell for electromagnet; 5, nut on small valve-rod; 6, conduit between the vacuum-breaker and the valve controlling it.

The construction and operation of my device will be readily understood on reference to the accompanying drawings in connection with the following description.

By preference the valve-disk $g$ and valve-stem $h$ are arranged in a suitable case $a$. That shown is constructed of semicircular iron bands connected by suitable framework at the top and bottom. This construction is not essential to the device, but is provided for the purpose of keeping particles of paper and other material from obstructing the valve. Any other suitable casing may of course be used. The form of valve construction preferred by me is that illustrated, and consists, essentially, of a valve-casing $a$, provided with a valve-seat, and a stem $h$, provided with a valve-disk $g$, of soft rubber. Upon the valve-stem $h$ is adjusted a spring $f$ of sufficient strength to keep the valve from being shaken from its seat and to insure the closing of the valve, and thus to facilitate the forming of the vacuum. At the top of this stem is mounted a lever $c$, pivotally supported at $j$ upon an arm made part of or secured to the

valve-casing or otherwise suitably supported. This lever is provided with a handle for hand adjustment, which furnishes a means of resetting the valve in its normal position.

Suitably attached to the valve-casing or other support is a small cylinder *b*, containing a piston *d* and piston-rod *e*. This cylinder is connected by suitable conduit with the main supply-pipe of the motor. A valve 2 is conveniently located in this conduit.

For the purpose of operating the last-mentioned valve I by preference provide an electromagnet *m*, controlling an armature *n*. This armature is made one with or has attached to it a finger *o*, which is so arranged that when it is raised by the armature swinging on its pivot it strikes and lifts the knob *p*, supported pivotally by the shell 4. This knob has a latch *q*, which latch engages with a catch *r* on the hammer-bearing rod *s*. A plate *u* is also provided, formed at one end into a catch *v*, which locks with a latch *w* on the lever *x*. This plate is pivotally mounted and arranged in the downward path of the hammer *t*. When the circuit is open, the parts occupy the position shown in Fig. 1. When now the circuit is closed by means of push-buttons or automatically put in operation by any means, the armature *n* is drawn to the magnets *m*, thus raising the finger *o*, which lifts the knob *p*, which in turn swings on its pivot, thereby releasing the latch *o* from the catch *r* and allowing the rod *s* to drop and the hammer *t* to fall on the plate *u*. This raises the catch *v* and releases the latch *w* and allows the lever *x* to fall, thereby removing all pressure from the rod 1 and allowing the steam in the pipe 3 to force open the valve 2.

To make the action of the valve more sure, I furnish an auxiliary lever *z*, on which the lever *x* strikes and which presses against the nut 5 on the rod 1, thus forcing the valve open in case it should stick for any reason. This allows the steam or other motive force to enter the cylinder *b* and force the piston upward, thereby raising the lever *c*, which lifts the valve-stem *h* and opens the valve, thus allowing the atmosphere to enter the vacuum-chamber, destroying the vacuum and doing away with the possibility of getting water from the condenser into the cylinder of the motor and the damage which might arise from this and also making a quicker stop. The vacuum-breaker can be operated by hand, if the engineer desires, by simply lifting the handle *k*.

I do not confine myself to the method employed of operating the valve 2. I, however, have found the method shown to be very convenient in practice. Any other suitable mechanism may, however, be employed.

I do not confine myself to the specific forms of the elements herein combined. Those shown have been found very convenient in practice; but any other proper form of valve and auxiliary motor will do as well.

It will readily be seen that if it is desired to use this device in connection with an engine-stop it can easily be done by means of a T connection with the pipe leading from the valve 2 to the vacuum-breaker cylinder.

Referring to Fig. 4, it will be seen that a T, as 7, is placed on the pipe 6, to one arm or pipe 6′ of which the vacuum-breaker cylinder *b* is attached, and upon the other arm or pipe 6″ a cylinder 8 of an engine-stop is mounted. Both devices may be operated simultaneously by means of the single mechanism by which the valve 2 is operated. Since the construction and operation of engine-stops comprising a cylinder for a piston having a rod to actuate intermediate governor-operating members are well known, it is not deemed necessary to describe in detail the construction and operation of the same or to further illustrate them. A drip-valve 9 is located in the pipe 6‴ below the cylinder 8; but this may be suitably arranged below the cylinder *b* or at some point between the valve 2 and the cylinder connections.

Having therefore described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a vacuum-breaker, the combination with a conduit-pipe leading to the vacuum-chamber, a vertically-reciprocating valve seated on the end of the said pipe, and a lever fulcrumed to the free end of the stem of the valve, of a cylinder, a piston in the cylinder having a rod projecting through the end of the cylinder with its end in the path of the lever and adapted to lift the lever with the valve, and means to move the piston.

2. In a vacuum-breaker, the combination with a pipe communicating with the part of a motor wherein a vacuum is formed, a valve-casing on the pipe formed with a valve-seat, a reciprocating valve in the casing having a stem projecting therefrom, and a lever to lift the valve fulcrumed to the outer end of the said stem, of a steam-cylinder, a piston therein having a rod projecting therefrom in the path of the said lever, a steam-pipe leading from a steam source into the cylinder, a valve interposed in the steam-pipe having a projecting stem, a lever arranged to bear on the end of the stem to hold the valve closed and a laterally-extending catch on the lever, a pivotally-supported latch to engage the said catch and hold the lever in engagement with the valve-stem, and an electrically-controlled hammer to engage the latch to release the lever-catch, whereby the lever's pressure is removed from the valve, substantially as described.

3. The combination with the vacuum-pipe, a valve-casing thereon, a valve in the casing to open and close the vacuum-pipe, a lever to operate the valve, a steam-cylinder, a piston therein having a rod to engage with said lever, and steam-conduit pipe leading into the cylinder, of a valve in the steam-pipe having its stem projected beyond the casing, a suitably-fulcrumed lever to bear on the end of the

steam-valve's stem and formed with a catch, a pivotally-mounted latch to engage the lever-catch, an electromagnet, a pivotally-mounted armature to engage therewith, a latch actuated by the armature, and a hammer formed with a handle or bar having a catch to engage the latch in engagement with the armature, and whereby when this catch is released the hammer will descend and release the latch which holds the lever, and the steam-valve thus be opened.

4. In a vacuum-breaking device, the combination with a steam-valve in the steam-pipe, of a pivotally-supported lever bearing on the valve-stem and provided with a laterally-extending catch, a latch to engage said catch and prevent said lever from falling away from its valve-stem contact, and an electrically-controlled hammer to strike the latch and release the lever, said hammer being affixed to a longitudinally-movable rod.

5. In a vacuum-breaking device, the combination with the steam-valve in the steam-pipe, of a pivotally-supported lever bearing on the valve-stem and provided with a laterally-extending catch, a latch to engage the said catch and hold the lever in contact with the valve-stem, an electrically-controlled hammer to strike the latch and release the lever and an intermediate lever having one end in engagement with the valve-stem, and its other end extending in the path of the descent of the first-named lever, substantially as described.

6. In combination with and as the operating means of a vacuum-breaker, an electrical device for operating the valve, consisting of electromagnets controlling an armature, the armature pivotally supported on a frame and having a finger, a knob pivotally supported in the path of the finger, a latch on the knob, a rod in suitable guides free to move vertically having a hammer and provided with a catch which engages with the latch on the knob, a plate lying in the downward path of the hammer and having a latch thereon pivotally supported, a lever hinged on the frame below the magnet and having a catch to engage with the latch on the plate, arranged (when the lever swings on its pivot) to remove all pressure from the valve to be controlled, substantially as shown.

7. A vacuum-breaker consisting of a connection with the part of a motor in which a vacuum is formed, a valve suitably mounted thereon, a valve-rod controlling the latter, a lever to operate the valve-rod and arranged to be actuated by an auxiliary motor, another valve connecting with the power-supply of a motor and electrical means for operating that valve consisting of the electromagnet $m$, armature $n$, finger $o$, knob $p$, catch $q$, catch $r$, rod $s$, hammer $t$, plate $u$, catch $v$, latch $w$, lever $x$, having the weight $y$ at its upper end, auxiliary lever $z$, and the valve-stem 1, substantially as shown and described.

8. In a vacuum-breaker the combination of a valve connected with the supply-pipe of a motor, a valve-stem, a lever resting on the stem to keep the valve normally closed, a latch $w$ engaging with the catch $v$, a plate $u$ made one with the catch $v$ and pivotally supported, a hammer $t$ upheld by a rod $s$ and arranged as to strike the plate $u$ as it descends, a catch $r$ on the rod $s$, a latch $q$ clutching with the catch $r$, a knob $p$ integral with the latch $q$ and pivotally supported, a finger $o$ integral with an armature $n$ pivotally supported, and an electromagnet $m$, the whole being so arranged that by the motion imparted to the armature by the magnet when energized the hammer $t$ will be allowed to drop onto the plate $u$ and the lever $x$ be released, substantially as shown and described.

9. A vacuum-breaker, comprising a valve to control an inlet to the vacuum-chamber of a motor, a lever to lift the valve, an auxiliary motor comprising a cylinder, having connection to a steam-pipe, a piston in the cylinder provided with a rod to lift the lever, a valve in the steam-pipe having a projecting stem, a lever to hold the valve closed, and an electrically-controlled mechanism to trip the lever and release the valve, substantially as specified.

10. In combination, a valve to control an inlet to the vacuum-chamber of a motor or engine, a lever to lift said valve, a vacuum-breaking cylinder having a piston provided with a rod to lift said lever, a steam-inlet valve, means to operate the same, an engine-stop cylinder, and steam-pipe connections between said steam-inlet valve and said cylinders, substantially as set forth.

11. In combination, a valve to control an inlet to the vacuum-chamber of a motor or engine, a lever to lift said valve, a vacuum-breaking cylinder having a piston provided with a rod to lift said lever, a steam-inlet valve, means to operate the same, an engine-stop cylinder, steam-pipe connections between said steam-inlet valve and said cylinders, and a drip-valve suitably arranged in one of the steam-pipe connections, substantially as set forth.

12. In combination, a valve to control an inlet to the vacuum-chamber of a motor or engine, a lever to lift said valve, a vacuum-breaking cylinder having a piston provided with a rod to lift said lever, a steam-inlet valve having a projecting stem, an engine-stop cylinder, steam-pipe connections between said steam-inlet valve and said cylinders, a lever to hold the steam-inlet valve closed, and electrically-controlled mechanism to trip the steam-inlet-valve lever and release the valve, substantially as set forth.

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