No Model.)

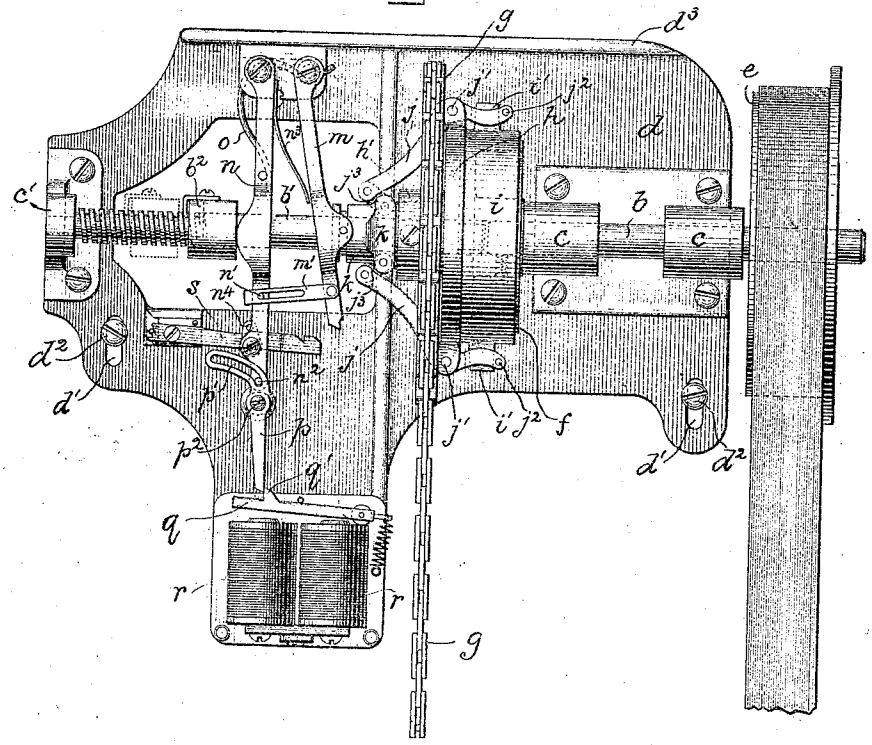
2 Sheets—Sheet 1

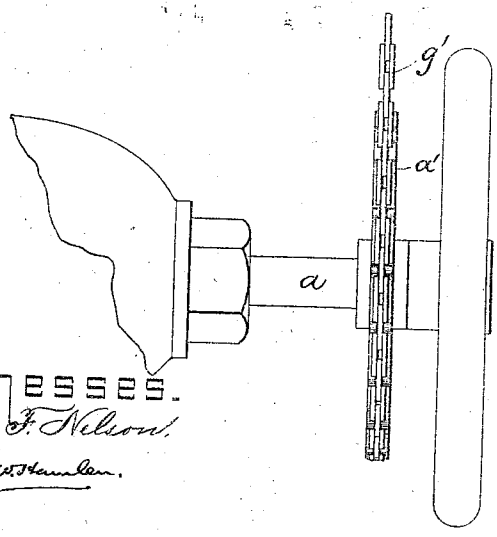
J. P. TIRRELL.

APPARATUS FOR STOPPING ENGINES.

No. 469,669. Patented Feb. 23, 1892.

Fig. 1.





Witnesses.
John F. Nelson.
Evangeline Hamilton.

Inventor.
J. P. Tirrell
by Wright Brown Quinby & Attys.

(No Model.)

2 Sheets—Sheet 2

J. P. TIRRELL.

APPARATUS FOR STOPPING ENGINES.

No. 469,669. Patented Feb. 23, 1892.

Fig. 3.

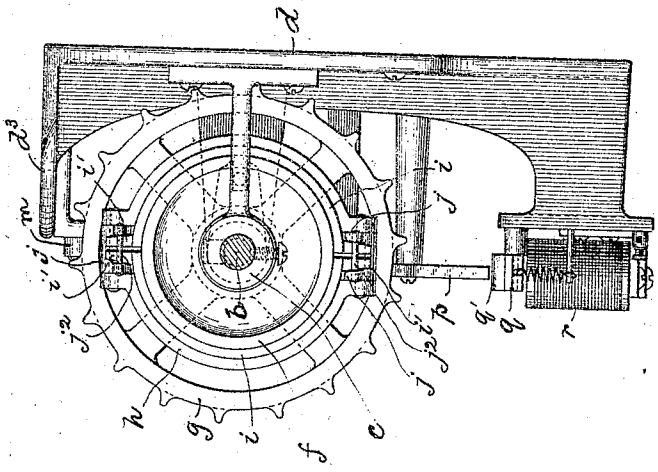
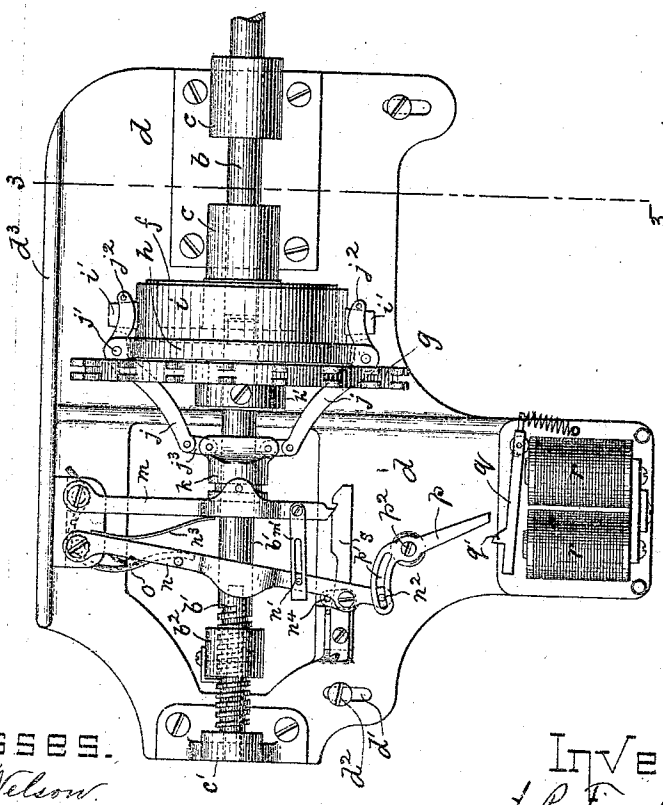


Fig. 2.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR STOPPING ENGINES.

SPECIFICATION forming part of Letters Patent No. 469,662, dated February 23, 1892.

Application filed October 24, 1891. Serial No. 409,356. (No model.)

To all whom it may concern:

Be it known that I, JACOB P. TIRRELL, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Stopping Engines and other Motors, of which the following is a specification.

This invention relates to an apparatus or means whereby the operation of a steam-engine or other motor—such as a water-wheel, &c.—may be quickly stopped from various parts of the building or establishment in which it is located.

My invention has for its chief object to provide an electrically-controlled mechanism of such construction that upon the closure (or breaking) of an electric circuit said mechanism will be automatically engaged with a moving part of the engine so as to receive power therefrom and will first transmit the power received to the throttle-valve, thereby closing the same and stopping the engine, and will then be automatically reset for another operation and disconnected from the engine, leaving the throttle-valve free to be opened by the engineer when it is desired to again start the engine. These results I attain by the improved mechanism which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of the stem of a throttle-valve and controlling mechanism therefor embodying my invention, said mechanism being shown in its inoperative position. Fig. 2 represents a similar view of said mechanism, the same being shown in its operative position as it appears during the operation of closing the valve. Fig. 3 represents a section on line 3 3 of Fig. 2, looking toward the left.

The same letters of reference indicate the same parts in all the figures.

I have shown and hereinafter described my apparatus as controlled by an electric circuit, which is normally open and is made operative when closed; but the operation may be effected by breaking a normally-closed circuit, as will be readily understood by those skilled in the art.

In the drawings, *a* represents the stem of a throttle-valve of a steam-engine, which valve may be of any suitable construction adapting it to be closed and opened by rotary movements of said stem. I do not show the construction of the valve because the same is well known. Moreover, my invention hereinafter described is not limited to use in connection with the throttle-valve of a steam-engine, but may be applied to the corresponding controlling devices of other motors—such as water-wheels, windmills, &c.—the adaptation of my improvements to such motors requiring only the exercise of ordinary mechanical skill and judgment.

b represents a short shaft journaled in fixed bearings *c c*, which are here shown as supported by a fixed bracket or frame *d*.

b' represents another short shaft, journaled in fixed bearings *c'*, the said shaft *b'* being arranged in line with the shaft *b*.

Affixed to one end of the shaft *b* is a pulley *e*, which is rotated by a belt connecting it with a pulley driven by the engine or motor, said pulley rotating the shaft *b*. Said shaft *b* has also affixed to it at its other end a pulley *f*, forming one part of a friction-clutch device hereinafter described. To the shaft *b'* are affixed a sprocket-wheel *g* and a disk *h*, the two being affixed to the same hub *h'*.

i i represent two clutch-bands surrounding the friction-pulley *f* on the shaft *b*, said bands being attached to the disk *h* on the shaft *b'* in a suitable manner, hereinafter described. Said bands *i* have ears *i' i'* projecting outwardly from their ends. The ear *i'* of one band *i* is normally slightly separated from the adjoining ear *i'* of the other band *i*, so that the pulley *f* will run between said bands without rotating the latter or the disk *h*, with which they are connected.

j j represent levers, which are pivoted at *i' j'* to ears on the disk *h*. The shorter arms of said levers are bifurcated and pass on the outer sides of two adjoining ears *i'* of the bands *i*, the bifurcated ends being preferably joined by an adjusting-screw *j²* at the farther side of said ears. The screw *j²* is adapted to adjust the bifurcated ends of the levers *j*, so as to compensate for wear of the ears *i'* or of the clutch devices, said bifurcated ends having sufficient play to allow them to be brought

nearer together by said screw j^2, thus bringing the ears i' i' nearer together and tightening the clutch-bands. It will be seen that the levers j support the bands i i and form a connection between them and the disk h.

k represents a collar sliding on the shaft b', with which the longer arms of the levers j j are connected in any suitable manner, preferably by means of short links j^3 j^3, forming a toggle-joint, as shown.

The outer surfaces of the ears i' are inclined, said ears being thinner at the outer end than at the base, so that if the collar k be moved away from the disk h, or to the left, as viewed in Fig. 1, the levers j will be moved so as to press inwardly upon the outer wedge-shaped surfaces of said ears, thus causing the bands i to tighten upon the pulley f, so that said bands and the disk h, and sprocket-wheel g connected therewith, and the shaft b', to which said parts are affixed, will all be rotated with said pulley f and the shaft b, to which it is affixed.

Figure 1 shows the device in the position it occupies when the bands i are loose upon the pulley f, so that the shaft b' is not rotated, while Fig. 2 shows the position when said bands are tightened upon said pulley, thus causing the shaft b' to rotate with the shaft b.

The sprocket-wheel g is connected by a sprocket-chain g' with a sprocket-wheel a' on the valve-stem a.

m represents an arm or lever pivoted to the supporting-frame d, and engaged with the collar k on the shaft b' by means of a pin affixed to said lever, running in a groove in said collar.

n represents an arm or lever, also pivoted to the supporting-frame. The levers m and n are connected with each other by means of a link m', which is pivoted on the lever m, and which has a slot which receives a pin n', projecting from the lever n. The lever n is normally pressed away from the lever m or toward the left, as viewed in Fig. 1, by a spring o, as shown. Said lever n is provided with a pin n^2 at its lower end, which moves in a slot p' in the upper end of a lever p, which is pivoted at p^2 to the supporting-frame. The lower arm of the lever p is engaged, when the device is "set" or ready for use, with a detent q' on the armature q of an electro-magnet. The form of the slot p' in the lever p is such that when the device is set, as shown in Fig. 1, the lever n is held against the pressure of its spring o and cannot move from said position.

In the form of the device shown in the drawings the electric circuits in which the electro-magnets r r are included is normally broken and may be closed by a push-button at any desired point or points or by any other suitable device. When the said circuit is closed, the magnets r r are energized and the armature q is drawn downwardly, thus releasing the lever p. It is to be here noted that the form of the lever p is such that when the device is set the pin n^2 of the lever n bears on said lever p at a point close to the pivot-point thereof, so that the lateral pressure exerted by the spring-pressed lever n on the longer end of said lever p and the detent q' on the armature q is but slight, and as a consequence a slight force is sufficient to draw said armature downwardly and release said lever, as above stated. This enables a great saving to be made in battery-power, and it has been found in practice that four ordinary cells are ample to energize the magnets r r to a degree sufficient to draw down the armature and release the lever. After the lever p is released by the detent q', as above stated, the spring o forces the lever n to the position shown in Fig. 2, said lever n pulling the lever m over to the position shown in said figure, and thus moving the collar k on the shaft b', so as to cause the clutch-bands i to tighten on the pulley f, and thus cause the shaft b' and the sprocket-wheel g to rotate with the shaft b. The lever m is engaged by a spring-catch or detent s when pulled over by the lever n, as shown in Fig. 2. While in this position the power of the engine rotates the sprocket-wheel g, and through the chain g' and sprocket-wheel a' also rotates the stem a of the throttle-valve.

To prevent the positive rotation of the sprocket-wheel g after the valve is closed and to reset the mechanism above described, I provide the following automatic devices.

The end portion of the shaft b' farthest from the clutch devices is screw-threaded, and a nut b^2 is placed on said screw-threaded portion. The nut b^2 is prevented from rotating with said shaft by means of an ear or lug b^4, (shown in dotted lines in Fig. 3,) said lug projecting from said nut and having an opening which receives a pin or guide b^5, affixed to the supporting-frame and arranged parallel with the shaft b', said ear sliding on said pin or guide. The nut b^2 is formed to engage the lever n and is adapted, when moved to the end of the screw-threaded portion of the shaft b' nearest said lever n, to move the same against the stress of its spring o back to its set position, as shown in Fig. 1.

The operation of these devices is as follows: As soon as the magnets r r have been energized and the lever p released, the lever n and lever m will assume the positions shown in Fig. 2, thus operating the clutch and causing the shaft b' to rotate with the shaft b, as above described. Whenever the shaft b' begins to rotate the nut b^2 is moved by the screw-thread on said shaft toward the lever n, or to the right, as viewed in Fig. 2. The said nut b^2, as it moves along, presses the lever n back toward its set position, or the position shown in Fig. 1, the said nut being so adjusted on the shaft b' that the number of revolutions of said shaft required to shut the throttle-valve will bring the said nut b^2 to the end of its inward movement, by which time said nut has completed its work of resetting the device. As

the lever n is being pressed back to its set position it will approach the lever m, the pin-and-slot connection of the two levers permitting this. As the lever n is pressed back, as described, it presses the lever m in the same direction by means of a spring n^3. The lever m is, however, held against pressure in this direction by its spring-catch s. The lever n, as it is pressed back by the nut b^2, also moves the lever p back to its set position, the end of the lever p riding over the detent q', the rear side of which is beveled for this purpose. The lever n is provided with a suitable projection, as n^4, which is adapted to press down the catch s and release the lever m, the latter being immediately forced back to its set position by the pressure of the spring n^3. The projection n^4 and the incline on the catch s, with which it co-operates, are so placed that said catch is displaced and will release the lever m immediately after the lever p has reached its set position and has again become engaged with the detent q', as shown in Fig. 1. When the lever m is released and moved back to its set position, the clutch device is made inoperative and the shaft b' ceases to rotate with the shaft b. The nut b^2 remains in the position shown in full lines in Fig. 1 until it is moved back to the position shown in dotted lines in said figure by the rotation of the shaft b' in the opposite direction by the opening of the throttle-valve by the engineer or other attendant, the movement of the valve-stem being communicated to the shaft b' by the sprocket-wheel a', chain g', and sprocket-wheel g.

I prefer to provide the supporting-bracket d with slots d' d', through which the screws d^2 d^2, which secure the said bracket to a suitable support, pass, the object of said slots being to enable the bracket d to be moved up or down to compensate for variations in the length of the sprocket-chain g' caused by wear or otherwise. I have also provided a suitable bolt (not shown) passing through the overhanging top d^3 of the bracket d and engaging a suitable nut fixed in a suitable support above said bracket for adjusting the latter.

It will be seen that the essential features or groups of elements of the apparatus are as follows: first, a connection between the throttle-valve and a moving part of the engine, this connection being in the present case the sprocket chain and wheels, the pulley e, and the belt that connects said pulley with a shaft forming a part of or driven by the engine or motor. Said connection must be separable or of such nature that it can be made alternately operative and inoperative, so that when operative it enables the momentum of the engine to close the throttle and when inoperative the operation of the engine has no effect on the throttle, this result being accomplished by the two clutch members, one of which is independently movable; secondly, means whereby the divisions of said connections may be connected or made operative to stop the engine by the act of an operator or attendant at a distant point. Suitable means for this purpose are here included in, first, the mechanical coupling device comprising the compressible or movable clutch member i i, the levers j j, and the devices for exerting pressure on said levers, and, secondly, the electrically-controlled detent adapted to prevent the engagement of said clutch members when the engine is in operation, excepting when it is desired to stop the engine. When the apparatus is constructed to automatically make the connections between the engine and throttle inoperative after the closing of the throttle, a final essential feature is a resetting device which restores the coupler to its inoperative condition, so that the apparatus is again in condition to be operated by an attendant at a distant point. I believe that these features or groups of elements have never before been combined in an organized apparatus. Hence I do not limit myself to the particular devices composing the several features or groups herein shown and described, and may variously modify the organization and details of each feature or group without departing from the spirit of the invention. It will be understood that my use of the term "throttle-valve" is generic and is intended to cover any device that controls the admission of the motive power to an engine or other motor.

I claim—

1. In an apparatus for stopping an engine or other motor, a power-controlling device, such as a throttle-valve, a connection between the same and the engine or motor, through which the power-controlling device may be operated by the momentum of the engine to shut off the source of power, said connection being composed of two normally separated and inoperative parts, and an electrically-controlled coupling device, whereby said parts may be operatively connected to stop the engine.

2. In an apparatus for stopping an engine or other motor, a power-controlling device, such as a throttle-valve, a compound lever adapted, when released, to connect a normally-inoperative part of the apparatus with a moving part of the engine, connections between said inoperative part and the power-controlling device, whereby the former will shut the latter when connected with the moving part of the engine, and means for holding said compound lever in its inoperative position and for releasing the same through the agency of an electric current, as set forth.

3. In an apparatus for stopping an engine or other motor, a power-controlling device, such as a throttle-valve, a shaft b, rotated by the engine, another shaft b' in line with said shaft b and having clutch devices, which, when operative, cause the shaft b' to rotate with the shaft b, connections between said shaft b' and the power-controlling device, whereby the latter is caused to shut off the power when the former is rotated by the shaft

b, and electrically-controlled mechanical devices, whereby said clutch mechanism is made operative, as set forth.

4. In an apparatus for stopping an engine or other motor, a power-controlling device, such as a throttle-valve, a shaft b, rotated by the engine, another shaft b' in line with said shaft b and having clutch devices, which, when operative, cause the shaft b' to rotate with the shaft b, connections between said shaft b' and the power-controlling device, whereby the latter is caused to shut off the power when the former is rotated by the shaft b, electrically-controlled mechanical devices, whereby said clutch mechanism is made operative, and means whereby said mechanical devices are reset for another engine-stopping operation by the same rotations of the shaft b' that cause the shutting of the power-controlling device, as set forth.

5. In an apparatus for stopping an engine or other motor, a power-controlling device, such as a throttle-valve, a shaft b, rotated by the engine, a pulley f, affixed to said shaft, another shaft b' in line with the shaft b, connections between said shaft b' and the throttle-valve, whereby the rotation of the former will close the valve, a clutch device on said shaft b', adapted, when operative, to act on the pulley f and cause the shaft b' to rotate with the shaft b, the spring-actuated lever n, normally adapted to render said clutch mechanism operative, the slotted lever p, engaged with the lever n, the armature q, having a detent which engages the lever p, and thus holds the lever n in its inoperative position, and an electro-magnet, which, when energized, will attract the armature q and cause the release of the levers p and n, and thus permit the latter to move to its clutch-operating position, as set forth.

6. In an apparatus for stopping an engine or other motor, a power-controlling device, such as a throttle-valve, a shaft b, rotated by the engine, a pulley f, affixed to said shaft, another shaft b' in line with said shaft b, connections between said shaft b' and the power-controlling device, whereby the rotation of the said shaft will cause the said device to shut off the power of the motor, a clutch device on said shaft b', adapted, when operative, to act on the pulley f and cause the shaft b' to rotate with the shaft b, the spring-actuated lever n, normally adapted, through suitable connections, to render said clutch device operative, the slotted lever p, engaged with the lever n, the armature q, having a detent which engages the lever p, and thus holds the lever n in its inoperative position, an electro-magnet, which, when energized, will attract the armature q and cause the release of the levers p and n, and thus permit the latter to move to its clutch-operating position, a locking device adapted to retain the clutch mechanism in operative position until the power has been shut off by the power-controlling device, and automatic devices to reset the apparatus for another engine-stopping operation while the power-controlling device is being operated and to release the clutch mechanism whenever the power is shut off and the apparatus reset, as set forth.

7. In an apparatus for stopping an engine or other motor, a power-controlling device, such as a throttle-valve, a shaft b, rotated by the engine, a pulley f, affixed to said shaft, another shaft b' in line with the shaft b, connections between the shaft b' and the throttle-valve, whereby the rotation of the shaft will close the valve, a clutch device on said shaft b', adapted, when operative, to act on the pulley f and cause the shaft b' to rotate with the shaft b, the lever m, connected with said clutch device, the spring-pressed lever n, connected with the lever m and adapted to move the latter so as to render the clutch operative, the connections between the levers m and n being such that the latter can approach the former, the slotted lever p, with which the lever n is engaged, the armature q, having a detent, which engages the lever p, and thus holds the lever n in its inoperative position, an electro-magnet, which, when energized, will attract the armature q and cause the release of the levers p and n, and thus permit said lever n to act and move the lever m to its clutch-operating position, a catch to lock said lever m in said clutch-operating position, a device operated by the rotation of the shaft b' to return the lever n to its inoperative position and to re-engage the lever p with the detent on the armature q, and devices to disengage the lever m from its catch whenever the lever p is engaged with the detent and return said lever m to its inoperative position, thus releasing the clutch, as set forth.

8. In an apparatus for stopping engines, the combination, with a shaft which is adapted to be rotated by the engine, and the throttle-valve of the engine, of a sprocket-wheel on said shaft, another sprocket-wheel on the stem of said valve, and a sprocket-chain running on said sprocket-wheels and forming a connection between the said shaft and valve-stem, whereby the latter is rotated by the rotation of the former, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 29th day of September, A. D. 1891.

JACOB P. TIRRELL.

Witnesses:

C. F. BROWN,

EWING W. HAMLEN.