No. 609,950. Patented Aug. 30, 1898.

# C. N. SCOTT.

## PUMPING ENGINE.

(Application filed Jan. 15, 1897.)

(No Model.) 2 Sheets—Sheet 1.

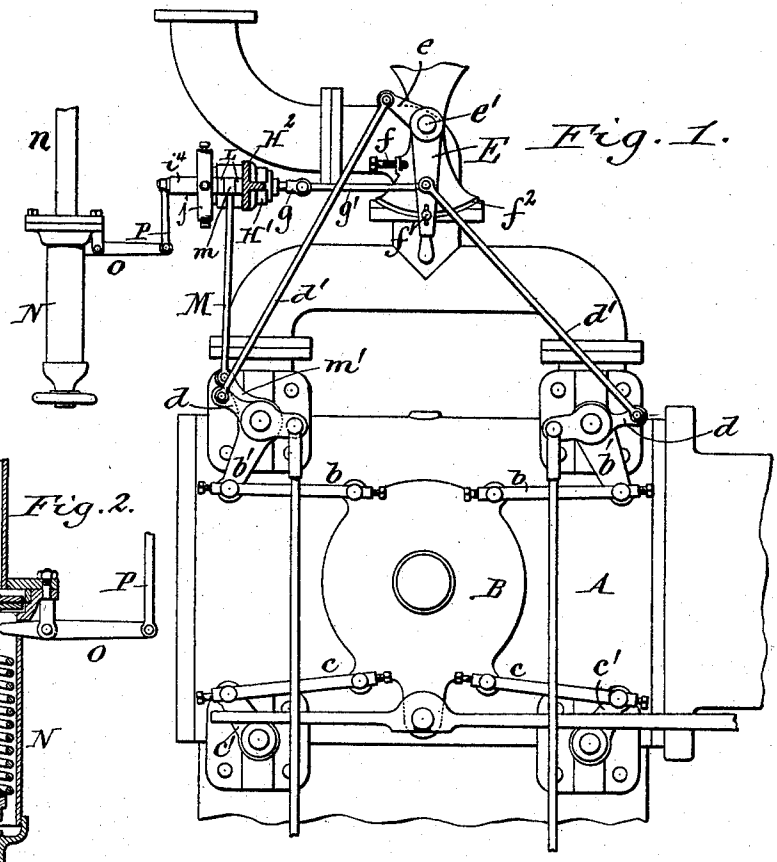



Fig. 1.




Fig. 2.

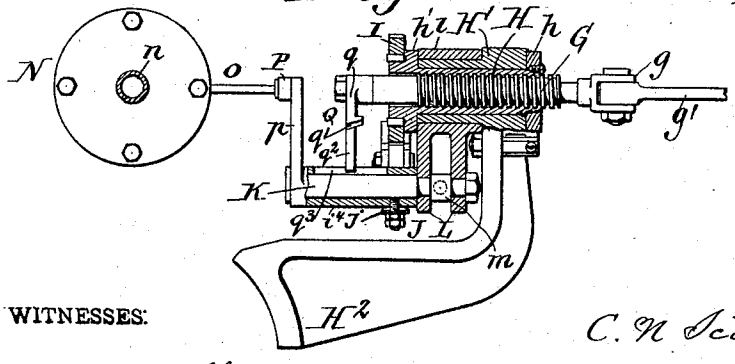



Fig. 3.

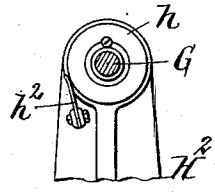



Fig. 4.

WITNESSES:

Chas. F. Burkhardt.
Henry L. Deck.

C. N. Scott INVENTOR.

By Wilkens Bonner

ATTORNEYS.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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Fig. 5.

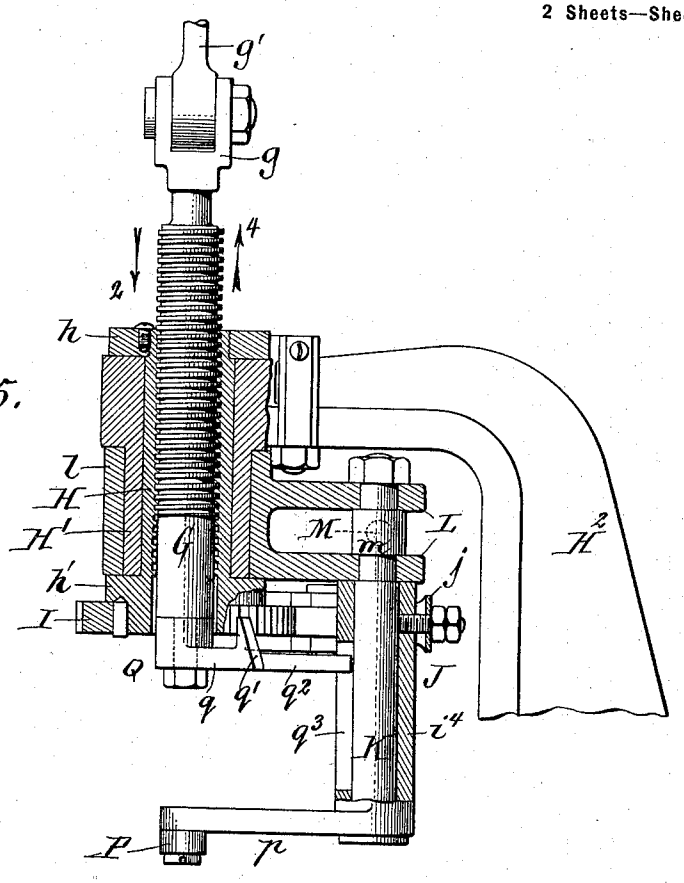
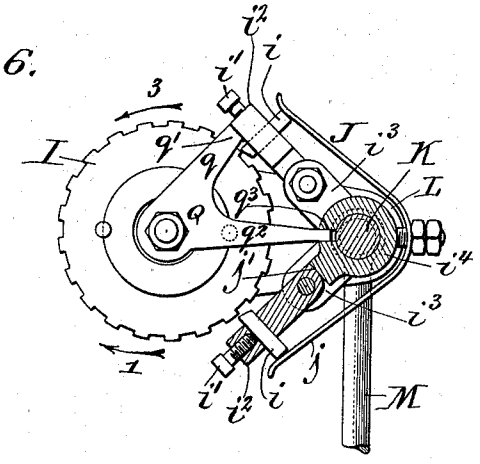



Fig. 6.




WITNESSES:

Chas. F. Burkhardt.
Henry L. Deck.

C. N. Scott
INVENTOR.

By Wilhelm & Bonner
ATTORNEYS.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

# UNITED STATES PATENT OFFICE.

CLARENCE N. SCOTT, OF BUFFALO, NEW YORK, ASSIGNOR TO THE SNOW STEAM PUMP WORKS, OF SAME PLACE.

## PUMPING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 609,950, dated August 30, 1898.

Application filed January 15, 1897. Serial No. 619,285. (No model.)

*To all whom it may concern:*

Be it known that I, CLARENCE N. SCOTT, a subject of the Queen of Great Britain, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Pumping-Engines, of which the following is a specification.

This invention relates to automatic cut-off regulators for pumping-engines, in which regulators the water-pressure acts upon the regulator mechanism and the latter automatically shifts the cut-off device or devices of the steam-engine in such manner as to increase the admission of steam when the water-pressure falls below the normal and decrease the admission when the pressure rises above the normal.

The object of my invention is to produce a simple, compact, and sensitive regulator of this character.

In the accompanying drawings, consisting of two sheets, Figure 1 is a side elevation of the steam-cylinder of a pumping-engine and the automatic cut-off regulator connected therewith. Fig. 2 is a vertical section, on an enlarged scale, of the diaphragm and connecting parts which are acted upon by the water-pressure. Fig. 3 is a horizontal section, on an enlarged scale, of the regulator screw-stem and connecting parts. Fig. 4 is a rear end view of the same. Fig. 5 is a horizontal section, on a still larger scale, of the regulator screw-stem and connecting parts. Fig. 6 is a front end view of the same, partly in section.

Like letters of reference refer to like parts in the several figures.

A represents the steam-cylinder of a pumping-engine, which cylinder and its valve-gear may be of any suitable construction. The valve-gear indicated in the drawings is of the Corliss type and contains the usual oscillating disk B, from which extend the upper rods *b*, which actuate the arms *b'* of the admission-valves, and the lower rods *c*, which actuate the arms *c'* of the exhaust-valves. *d* represents the arms of the cut-off cams, which arms are arranged concentric with the arms of the admission-valves and are held in position by rods *d'*, extending upwardly to arms E *e*. The arm E, which extends downwardly from its rock-shaft *e'*, connects with one of the rods *d'*, and the arm *e* connects with the other rod *d'* and forms an extension of the arm E or is secured to the same rock-shaft, so that by shifting the arm E or its rock-shaft in one or the other direction both cut-off cams are correspondingly shifted. This arm E is usually shifted by hand for changing the cut-off and secured in its adjusted position by a set-screw *f* and a clamping-screw *f'*, engaging with a segment $f^2$. All of these devices may be of any ordinary construction. My improved cut-off regulator connects with this arm E or with an arm on the same rock-shaft and shifts the cut-off devices controlled thereby automatically. The usual set-screw and clamping-screw shown in the drawings are released when the automatic regulator is employed. This automatic regulating mechanism is constructed as follows:

G represents a horizontal screw-stem which is provided at its rear end with a bifurcated head *g*, to which is pivoted a horizontal rod *g'*, which connects the screw-stem with the arm E or some other arm on the cut-off rock-shaft *e'*, so that the longitudinal movement of the screw-stem shifts the cut-off rock-shaft and the cut-off devices connected therewith accordingly. The screw-stem is held against rotary movement by the connecting-rod *g'* and passes through an internally-threaded sleeve H, which is journaled in a bearing H', carried by a bracket $H^2$. The latter is secured to any suitable stationary support, which may be a part of the pumping-engine or a pipe attached thereto. The screw-sleeve H is free to turn in the bearing H', but is held against longitudinal movement therein by a collar *h*, attached to the inner end of the sleeve, and a collar *h'*, formed on the outer end thereof. A detent-spring $h^2$ is secured to the rear portion of the bracket-bearing and bears against the rear collar *h* with sufficient friction to hold the screw-sleeve against rotation except when turned by force applied to the sleeve.

I represents a ratchet-wheel which is secured to the front end of the screw-sleeve, and J represents a duplex pawl which embraces or straddles with its arms part of the face of the ratchet-wheel and which is so con-

structed that both of its arms may be simultaneously out of engagement with the ratchet-wheel, as shown in Fig. 6, or that either of its arms may engage with the ratchet-wheel. In the construction of the duplex pawl shown in the drawings the pawl-heads $i$ are detachable steel blocks which are clamped by screws $i'$ in sockets formed in pawl-carriers $i^2$. The latter are pivoted between bifurcated jaws $i^3$, formed on the hub $i^4$. The pivoted pawl-carriers are pressed toward the ratchet-wheel by a spring $j$, which is secured to the hub $i^4$ and bears with its ends upon the outer ends of the pawls, and the pawl-carriers are prevented from swinging inwardly beyond their normal position by square shoulders $j'$ at the inner sides of their pivots, while they are free to swing outwardly against the spring-pressure in sliding over the teeth of the ratchet-wheel, the spring returning each pawl-carrier to its normal position after the pawl has cleared the tooth.

The duplex pawl is secured with its hub to a horizontal pin K, which latter is journaled in a double or bifurcated horizontal rock-arm L, mounted with its hub $l$ upon the cylindrical portion of the bracket-bearing H', so as to be capable of a rocking movement about the axis of the regulator screw-stem. The reduced rear portion of the pin K is journaled in the two parts of the rock-arm L and connects with the upper end of an upright rod M, whose head $m$ is arranged between the two parts of the rock-arm and embraces the reduced portion of the pin K. The rod M receives a vertical reciprocating movement by any suitable means—for instance, by connection with a rock-arm $m'$ of the valve mechanism, as represented in Fig. 1.

The vertical reciprocating movement of the rod M produces a rocking movement of the arm L and the duplex pawl connected therewith. So long as both arms of the duplex pawl are disengaged from the ratchet-wheel, as shown in Fig. 6, the reciprocating movement of the pawl produces no effect upon the regulator screw-stem and the latter and the cut-off devices controlled thereby do not change their position. If the pin K, to which the duplex pawl is secured, be slightly turned about its axis, so as to throw one of the pawl-arms into engagement with the ratchet-wheel, the latter is actuated by such arm and the regulator screw-stem is moved in one or the other direction and the position of the cut-off devices is correspondingly changed. The position of the pawl is automatically controlled by the following mechanism, which is actuated by the pressure of the water:

N represents a shallow chamber to which the water-pressure is admitted by a pipe $n$ and the bottom of which is formed by a flexible diaphragm $n'$, which is held up against the water-pressure by an adjustable spring $n^2$. The spring-pressure is so regulated as to balance the water-pressure which is to be maintained.

O represents a horizontal lever which is pivoted to the chamber N on one side thereof and which connects with its short inner arm to the coupling $o'$, by which the upper end of the spring is attached to the diaphragm, and so follows the movements of the diaphragm. The long outer arm of the lever O is connected by a vertical rod P (shown in full lines in Figs. 3 and 5) with a crank-arm $p$, which is secured to the front end of the pin K. The point of attachment of the rod P to the crank-arm $p$ is arranged in line with the axis of the regulator-screw, so that in the normal position of the diaphragm and connecting parts the crank-arm rocks with the pawl-supporting arm about the axis of the regulator screw-stem as a center and holds both arms of the duplex pawl out of engagement with the ratchet-wheel. When the water-pressure rises above the normal, the diaphragm is deflected downwardly by the water-pressure, whereby the long arm of the lever O and the rod P are raised, throwing the inner end of the crank-arm $p$ upwardly out of center and throwing the lower arm of the duplex pawl into engagement with the ratchet-wheel. The latter and the screw-sleeve are now turned by the pawl in the direction of the arrow 1, Fig. 6, whereby the regulator screw-stem is moved backwardly in the direction of the arrow 2, Fig. 5. This movement of the screw-stem shifts the position of the cut-off devices in such manner that the steam is cut off sooner, and this movement of the screw continues until the water-pressure has fallen to the normal, when the diaphragm is returned to its normal position by the spring and the lever connected with the diaphragm returns the crank-arm to its normal position and throws the pawl out of engagement. If, on the other hand, the water-pressure falls below the normal, the diaphragm is raised by the spring, the outer arm of the rock-lever and the connecting-rod descend, the crank-arm is thrown out of center downwardly, and the upper pawl-arm is thrown into engagement with the ratchet-wheel, turning the latter and the screw-sleeve in the direction of the arrow 3, Fig. 6, and moving the screw-stem forwardly in the direction of the arrow 4, Fig. 5. This movement of the screw-stem shifts the cut-off devices so as to cut off later and continues until the normal water-pressure has been restored, when the pawl is again automatically thrown out of gear by the diaphragm and connecting parts.

In order to prevent the forward movement of the screw-stem beyond a safe limit if the water-pressure should fall very far below the normal, so that it cannot be restored before the practical limit of the forward movement of the screw-stem has been reached, an automatic disengaging device is provided which throws the pawl out of gear when the limit of the permissible or desirable forward movement of the screw-stem has been reached. This disengaging device consists of a bifur-

cated arm Q, which is mounted loosely on the screw-stem in front of the ratchet-wheel and which has its upper arm $q$ provided with an inclined head $q'$, which is adapted to engage underneath the upper pawl-arm and lift the same out of engagement with the ratchet-wheel. The lower arm $q^2$ of the disengaging device projects into a longitudinal slot $q^3$ formed on the inner side of the hub of the pawl, which hub and slot are long enough to permit of the requisite longitudinal movement of the disengaging-arm with the screw-stem. The engagement of the disengaging device in the slot of the pawl connects the same with the pawl and causes the disengaging device to rock with the pawl and enables the disengaging device to follow the longitudinal movement of the screw-stem. During the ordinary play of the screw-stem the disengaging device stands at a greater or less distance in front of the pawl, as indicated in Fig. 3. When the screw-stem has about reached the limit of its permissible forward movement, the inclined head of the disengaging device lifts the upper pawl-arm out of engagement, as shown in Fig. 6, and so stops the further forward movement of the screw-stem.

While the described and illustrated details of construction of the various devices which enter into my automatic cut-off regulator are well adapted for producing the desired results and are the best known to me for the purpose, I do not wish to be limited in all respects to the same, as they can be modified in various ways without substantial departure from my invention.

I claim as my invention—

1. The combination with a longitudinally-movable regulator-stem, a rotatory screw-sleeve engaging the same, a stationary bearing in which said sleeve is held against longitudinal movement, and a ratchet-wheel secured to said sleeve, of a pawl-carrier mounted to oscillate concentric with said stem and sleeve, a duplex pawl carried by said support, and a pressure device whereby said pawl is automatically engaged with and disengaged from said ratchet-wheel, substantially as set forth.

2. The combination with a regulator screw stem and sleeve provided with an actuating ratchet-wheel, of a pawl-support mounted to oscillate concentric with said screw stem and sleeve, a duplex pawl mounted on said support and provided with a crank-arm having its free end arranged in line with the axis of said stem and sleeve, and a pressure device connected with the free end of said crank-arm and adapted to shift the same and the duplex pawl, substantially as set forth.

3. The combination with a regulator screw stem and sleeve provided with an actuating ratchet-wheel, of an arm mounted to oscillate concentric with said stem and sleeve, a pin journaled in the free end of said arm parallel with the screw stem and sleeve, a duplex pawl secured to said pin and adapted to engage said ratchet-wheel, a crank-arm secured to said pin and having its free end arranged in line with said stem and sleeve, and a pressure device connected with the free end of said crank-arm, substantially as set forth.

4. The combination with a longitudinally-movable regulator screw-stem, of a rotatory screw-sleeve engaging therewith, a ratchet mechanism whereby said sleeve can be rotated, a water-pressure device which automatically controls the operation of said ratchet mechanism, and a disengaging device whereby the ratchet mechanism is thrown out of gear when the regulator-stem has reached the desired limit of its movement, substantially as set forth.

5. The combination with a longitudinally-movable regulator screw-stem, of a rotatory screw-sleeve engaging therewith and provided with a ratchet-wheel, an oscillating pawl-support, a pawl mounted on the same and having a longitudinal groove in its hub, and a disengaging-arm connected with said stem and guided in said groove and having an inclined head adapted to disengage the pawl, substantially as set forth.

Witness my hand this 9th day of January, 1897.

CLARENCE N. SCOTT.

Witnesses:
JNO. J. BONNER,
EDWARD WILHELM.