R. C. STEVENS.

STEAM ENGINE.

APPLICATION FILED SEPT. 26, 1913.

1,106,338. Patented Aug. 4, 1914.

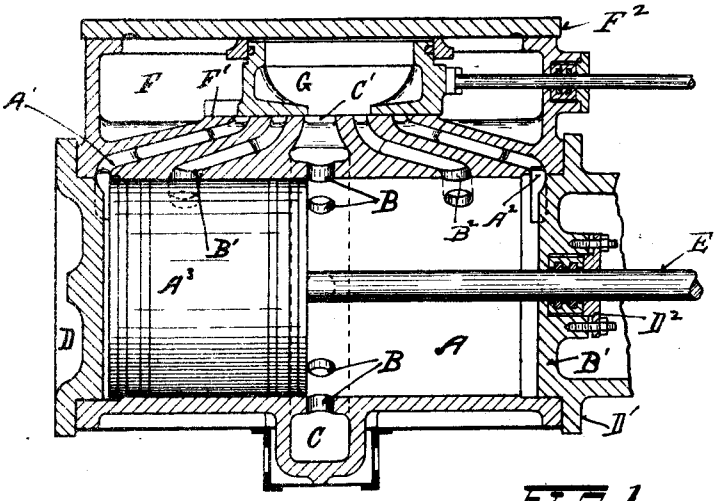


FIG. 1.

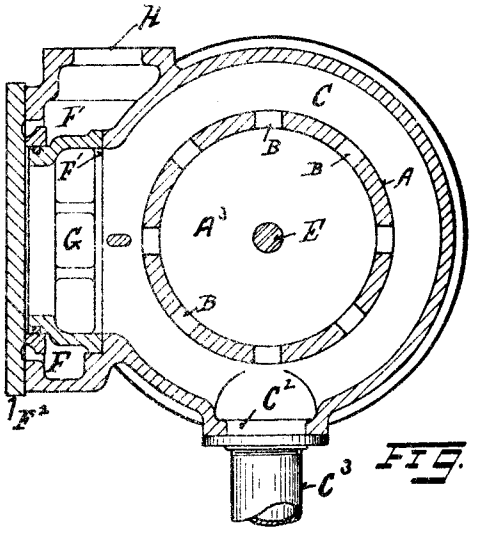


FIG. 2.

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STEAM-ENGINE.

1,106,338. Specification of Letters Patent. Patented Aug. 4, 1914.

Application filed September 26, 1913. Serial No. 791,994.

To all whom it may concern:

Be it known that I, ROBERT C. STEVENS, a citizen of the United States, residing at Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

My invention relates to steam engines and particularly to that type of steam engine in which steam is permitted to exhaust from the cylinder at a point removed longitudinally from the intake ports, whereby the partially cooled steam, during the exhaust period, is not forced against the hotter portions of the cylinder. This type is commonly called the "uniflow" type. Engines of this uniflow type are adapted for use in combination with a steam condenser wherein a partial vacuum in the exhaust is maintained, which is communicated to the engine cylinder upon the opening of the exhaust ports by the piston, and upon the return stroke of the piston, after the closing of the exhaust ports thereby, the partial vacuum in the cylinder must be converted to pressure before the clearance. inseparably incident to engine construction, is properly filled preparatory to the admission of steam thereinto. When, however, engines of this type are designed to be used without a condenser, auxiliary exhaust ports are located between the steam intake ports and the exhaust ports, so that compression commences only after such auxiliary exhaust ports are closed. Heretofore it has been customary to provide engines of this type with a valve for opening and closing each intake port, and each auxiliary exhaust port, thereby necessitating the employment of four valves, and their accompanying actuating gear.

The object of my invention is, therefore, to adapt engines of the "uniflow" type, whether condensing or noncondensing, to the use of a single valve, either of the plain, unbalanced, the ordinary balanced flat or piston, or of the semi-balanced expanding type, and retain the advantages of the uniflow engine.

These and other features of my invention are hereinafter fully set forth and explained, and are illustrated in the accompanying drawings, in which:—

Figure 1, is a central horizontal section of an engine cylinder embodying my invention. Fig. 2, is a central, vertical, transverse section thereof.

In these drawings, A, indicates an engine cylinder having steam inlet ports A′, and A^2, at each end thereof, main exhaust ports B, at the central portion thereof, and auxiliary exhaust ports B′, and B^2, between the central exhaust ports and the ends thereof. I have found that a desirable location at which to place these auxiliary exhaust ports is at substantially one third of the distance between the steam intake ports A′, and the main exhaust ports B, but it may be found desirable to vary this location somewhat. Within this cylinder A, there is a piston A^3, of suitable length to adapt it to act as a valve to open and close the central exhaust ports B, and the auxiliary exhaust ports B′, and B^2, during its reciprocations. The cylinder A, is also provided with an annular exhaust chamber C, which embraces the exhaust ports B, and with heads D, and D′, for closing the ends thereof, the head D′, being provided with the usual stuffing-box mechanism D^2, through which the piston-rod E, secured to the piston A^3, passes.

On the side of the cylinder A, I provide a valve-chest F, having a valve-seat surface F′, through which the steam inlet ports A′, and A^2, the exhaust chamber C, and auxiliary exhaust ports B′ and B^2 communicate with the interior of the valve-chest F. Upon the valve seat surface F′, I place a slide valve G, preferably of the semi-balanced, expanding type, adapted to alternately close the steam inlet port A^2, and open the auxiliary exhaust port B^2, in the right hand end of the cylinder and open the steam intake port A′, and close the auxiliary exhaust port B′, in the left hand end of the cylinder, while not at any time closing the opening C′, from the exhaust chamber C, into the interior of the valve G. The valve G, is held against its seat F′ and against the valve-chest cover F^2, by the action of the steam pressure, the valve being so proportioned that its outer or steam edges open and close the steam ports A′, and A^2, in the usual manner, but its inner or exhaust edges open and close

the auxiliary exhaust ports B′, and B², but never uncover the ports A′, and A². The valve-chest F, is provided with a steam intake opening, H, through which steam may be admitted into the chest around the valve G, and the exhaust chamber C, is provided with an opening C², with which an exhaust pipe C³, communicates.

In operation, steam is admitted into the valve-chest F, and in Fig. 1, the valve G, is shown as opening the steam inlet port A′, and the auxiliary exhaust port B²; the main exhaust ports B, having been opened by the piston A³, the steam will move the piston A³, toward the right, thereby closing the main exhaust ports B, and the remaining steam in the cylinder will be driven out through the auxiliary ports B², until the same are closed by the piston A³, unless they are sooner closed by the valve G, when adjusted for that purpose, when compression will commence and continue to the end of that stroke of the piston A³, when the main exhaust ports will be again opened by the passing of the left hand end of the piston, at which time the valve G, having already been moved toward the left, opens the steam inlet port A², for admission of steam at that end of the cylinder and the auxiliary ports B′, to exhaust, and closes the auxiliary exhaust ports B², which opening and closing of the auxiliary exhaust ports B′, and B², takes place when there is no pressure being exerted upon the valve through said ports.

Having thus fully set forth, explained and illustrated my invention so as to enable others to utilize the same, what I claim as new and desire to secure by Letters-Patent, is:—

1. In a steam engine, the combination of a cylinder having a steam inlet port at the end thereof, a main exhaust port and an auxiliary exhaust port in the wall thereof located between the inlet port and main exhaust port, a single valve controlling said inlet and auxiliary exhaust ports, and a piston in the cylinder covering and uncovering the main exhaust port, substantially as set forth.

2. In a steam engine, the combination of a cylinder having steam inlet ports at the ends, main exhaust ports at the intermediate portion thereof and auxiliary exhaust ports in the wall of said cylinder between said main exhaust ports and the ends of said cylinder, a piston in said cylinder adapted to cover and maintain said main exhaust ports closed, until the end of its stroke, a valve-chest, a valve therein adapted to alternately open and close said steam inlet ports, and to alternately close said auxiliary exhaust ports, and open said auxiliary ports to the exhaust with the opening of the main exhaust ports by the piston, substantially as set forth.

3. In a steam engine, the combination of a cylinder having steam inlet ports at the ends, main exhaust ports at the intermediate portion, and auxiliary exhaust ports in the wall thereof between said steam inlet ports and said main exhaust ports, and a piston in said cylinder, and a single valve located at one side of said cylinder adapted to open and close said steam inlet ports and said auxiliary exhaust ports, substantially as set forth.

4. In a steam engine, the combination of a cylinder having a steam inlet port at the end thereof, a main exhaust port at the intermediate portion thereof, and an auxiliary exhaust port located in the wall of said cylinder between the main exhaust port and said steam intake port, a single valve controlling said inlet and auxiliary exhaust ports, and a piston in the cylinder covering and uncovering the main and auxiliary exhaust ports, substantially as set forth.

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

ROBERT C. STEVENS.

Witnesses:
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P. V. GIFFORD.