No. 825,835. PATENTED JULY 10, 1906.

G. HOLLOWAY.

DEVICE FOR PREVENTING BACK FIRING IN EXPLOSIVE ENGINES.

APPLICATION FILED MAR. 13, 1905.

Fig. 1.

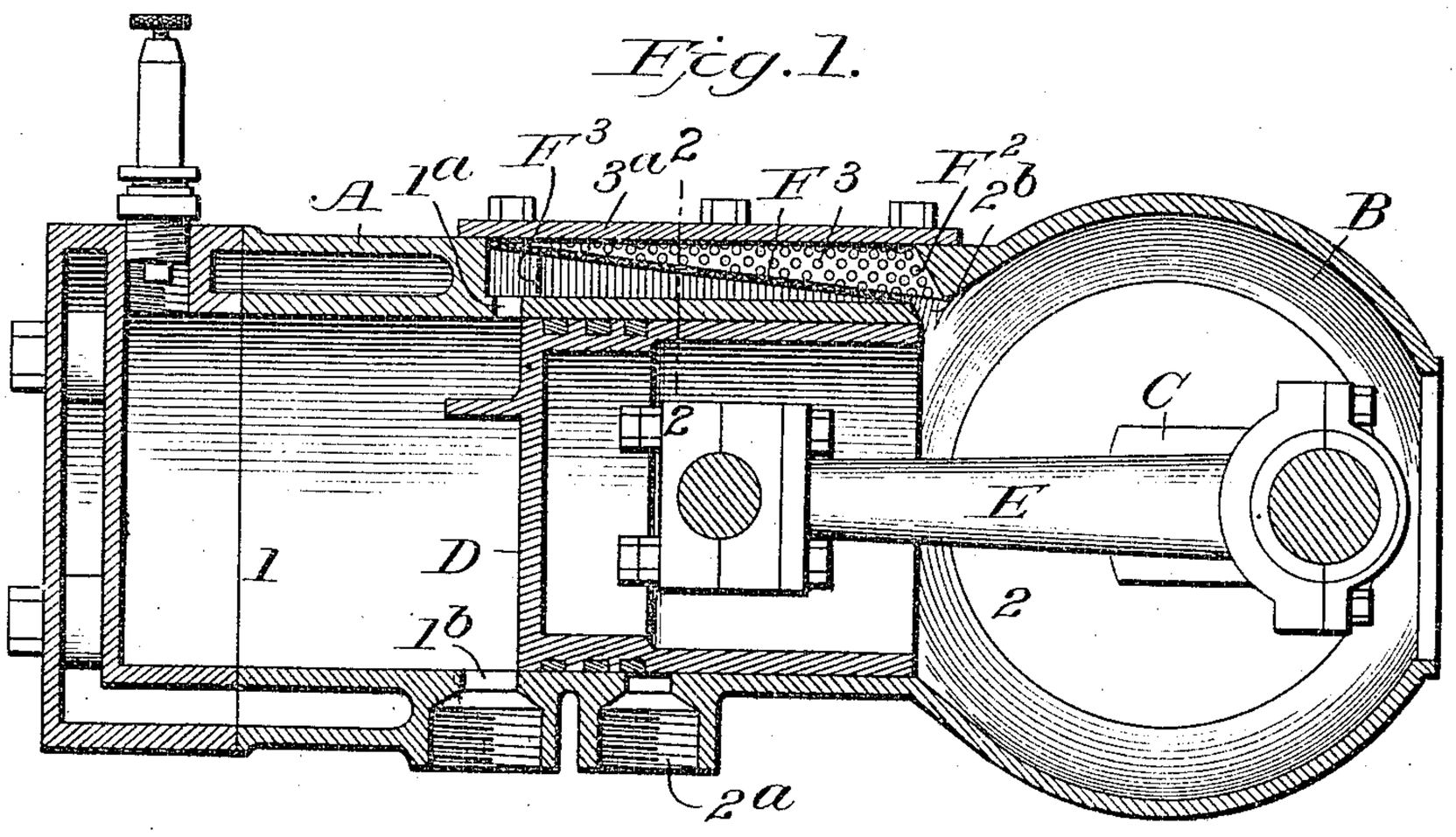


Fig. 2.

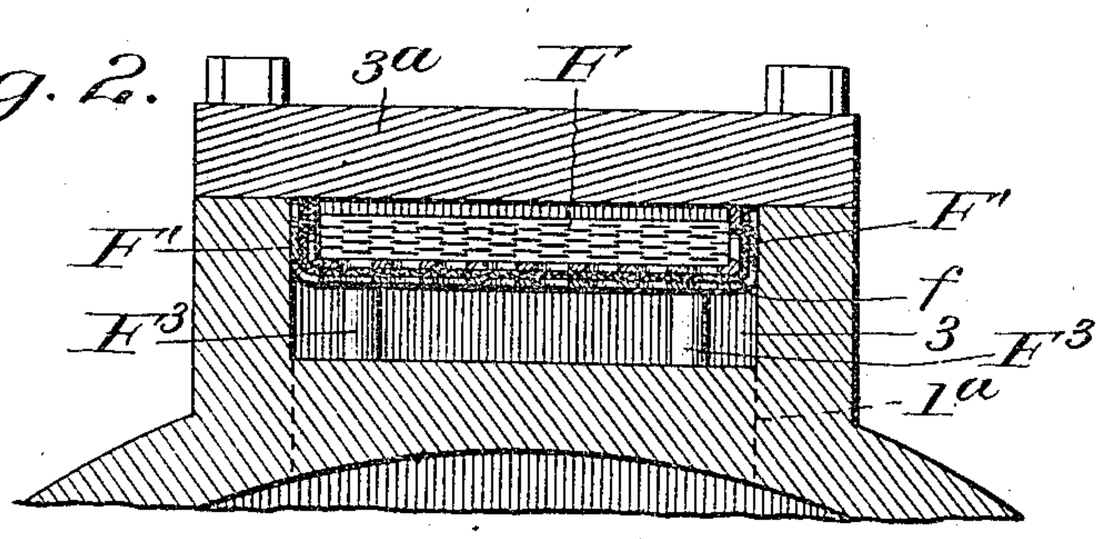
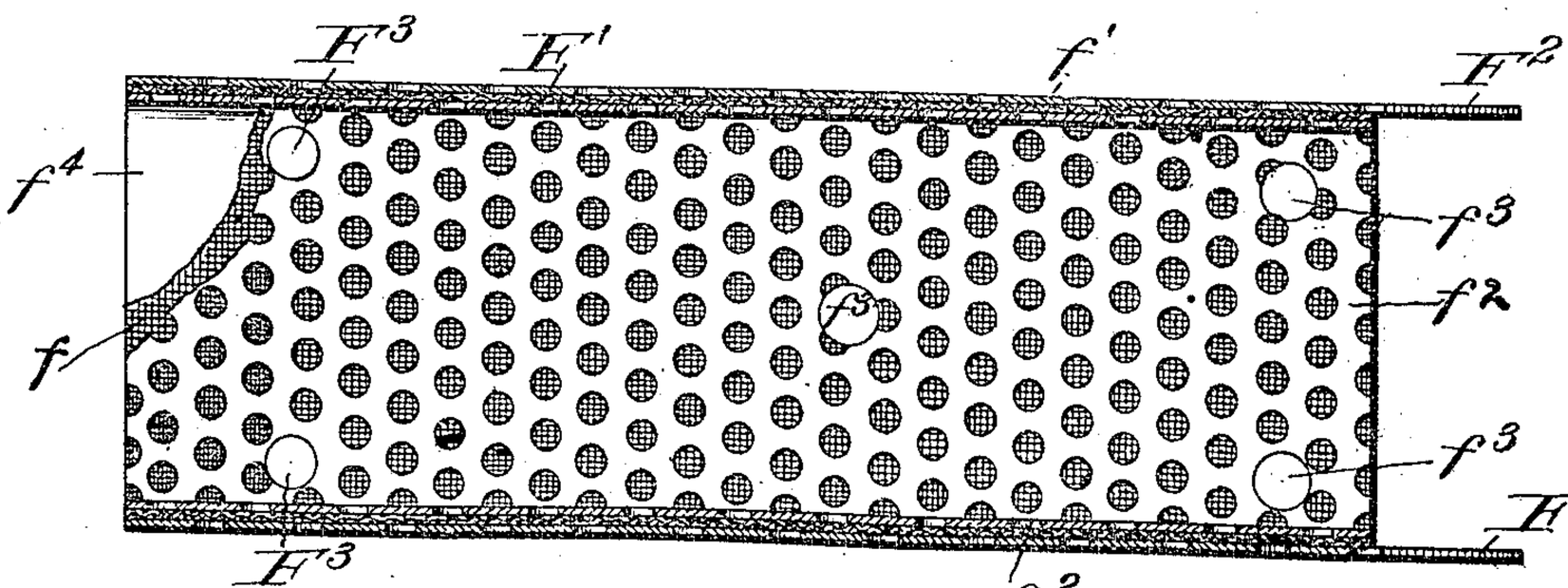


Fig. 3.



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DEVICE FOR PREVENTING BACK-FIRING IN EXPLOSIVE-ENGINES.

No. 825,835. Specification of Letters Patent. Patented July 10, 1906.

Application filed March 13, 1905. Serial No. 249,797.

To all whom it may concern:

Be it known that I, GEORGE HOLLOWAY, of Clyde, in the county of Sandusky and State of Ohio, have invented certain new and useful Improvements in Devices for Preventing Back-Firing in Explosive-Engines; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improvement in what are commonly termed "gas-engines" operated by the explosive force of gases or carbureted air, and has especial reference to the type of engines in which the explosive mixture is first compressed and then admitted into the working or exploding chamber in the cylinder and ignited, the compression occurring in the pump-chamber, which is ordinarily the crank-chamber of the engine. In this class of engines it is necessary to provide means to prevent "back-firing" or explosion of the mixture in the compression-chamber by reason of premature ignition of the gases in the by-pass and working chamber before the ports connecting the compression-chamber and the exploding chamber or cylinder proper are closed. Such back-firing or explosions in the by-pass and compression-chamber causes erratic running of the engine, blowing out the charge from the pump-chamber into the carbureter, and other annoyances. Various attempts have been heretofore made to prevent this back-firing; and the present invention consists in a novel and improved device for that purpose, comprising a screen of peculiar construction placed in the by-pass or passage between the compression and working chambers and by which even if premature ignition occurs in the working chamber the gaseous mixture in the compression-chamber will not be fired.

The invention therefore consists in the novel construction and arrangement of this screen, as hereinafter claimed, and said screen is illustrated in the accompanying drawings and hereinafter described in detail with reference thereto.

In said drawings, Figure 1 is a longitudinal sectional elevation of a gas-engine equipped with my invention for preventing back-firing. Fig. 2 is an enlarged detail section on line 2 2, Fig. 1. Fig. 3 is a plan view of the screen detached.

The engine comprises a cylinder A, connected to or formed with a crank-case B, in which the crank C of the main shaft is inclosed air-tightly. A piston D works in the cylinder and case, so as to serve both as the engine and pump-piston, and is connected directly with the crank by a rod E. The chamber 1 in the cylinder is the working chamber and the chamber 2 in the crank-case is the pump or compression chamber.

Explosive gases or mixtures thereof are admitted into chamber 2 through port 2^a, which may be connected to any suitable carbureter or gas-supply. This port 2^a is closed by the piston just after it begins its inward or working stroke. Chamber 2 also communicates by a port 2^b with a by-pass or passage 3, which is preferably a rectangular recess in the wall of the cylinder and casing, not marring their symmetry and which is covered by a removable plate 3^a and communicates through a port 1^a with the working chamber 1. When the piston is at the end of its working stroke, the burned gases escape from the chamber 1 through ports 1^b. The piston in the example shown forms the main valve of the engine and controls the ports 1^a, 1^b, and 2^a.

It is necessary to provide means to prevent the fresh gases in the by-pass 3 and chamber 2 being ignited when the port 1^a is opened by the heat of the walls of chamber 1 or by any burning, partly unconsumed gases remaining therein. For this purpose I place a baffle or screen F in the by-pass, which screen preferably consists of a layer *f* of finely woven or reticulated metal and one or more layers of coarsely perforated or reticulated metal. Preferably the screen is composed of one layer *f* of finely-woven brass or refractory wire inclosed between two layers f' f^2 of perforated sheet metal, all bound together by rivets f^3. The screen is arranged within and diagonally across the by-pass 3, and said screen extends from port 2^b to a point above the port 1^a, being closely fitted within the by-pass at its edges, so that there will be no chance of flame passing around the screen.

The screen is placed in a diagonal position to secure the greatest amount of space possible in the passage-way on account of the liability of the screen to become clogged by burned oil or a formation of carbon or other substances in the small perforations of the

screen, for if the screen were placed in a vertical position its area would be so small that it would soon choke, so that it must be a great deal larger than the ports or the passage-way between the ports. The sides of the screen are preferably upturned, as at F′, both to securely position it in place and to more effectually prevent the passage of gas between the screen and the sides of the by-pass. The screen is properly positioned in the by-pass by means of projections F^2 on the rear ends of the flanges F′, which position its rear edge relative to port 2^b, and its front end may be upheld over port 1^a by means of pins F^3, as shown, or in other suitable manner. Preferably part of one layer f' directly over the port 1^a is imperforate, as shown at f^4, so that if flame should spurt into the by-pass through port 1^a it would strike the imperforate part f^4 rather than the fine layer. By this construction the finer part of the screen is stiffened and protected by the coarser layers, and the durability of the screen is indefinitely prolonged as compared with the life of a single fine screen.

The coarsely-perforated layer f' breaks and disseminates any flame which might enter the by-pass before it contacts with the fine layer, and the strands of the fine layer must practically be burned entirely away before back-firing could occur. I consider the layer f' (adjacent port 1^a) more important than the layer f^2, (adjacent port 2^b,) and although the construction and arrangement shown in drawings is preferred I do not wish to be restricted to this particular construction, as it may be modified within the scope of my invention, and the form of the screen would necessarily be varied according to the dimensions and arrangement of the by-pass and ports.

While, as above stated, I prefer to make the fine layer f of reticulated or woven-wire mesh and the outer layers f' f^2 of coarsely-perforated sheet metal, I do not intend to restrict myself in the claims to either reticulated or woven or perforated layers, reticulated or woven wire and perforated sheets being well-known equivalents.

In the engine shown the cycle of operations is as follows: A charge of explosive gases having been admitted into chamber 1 and ignited, the piston D is driven forward and in so doing compresses the explosive mixture previously admitted into chamber 2. As the piston nears the end of its inward stroke it first uncovers port 1^b, allowing the burned gases to exhaust. Then it uncovers port 1^a, whereupon the compressed gases in chamber 2 rush through port 2^b into by-pass 3 and through the screen F and port 1^a into the working chamber, driving out the burned gases. Then as the piston moves back it closes ports 1^a and 1^b and compresses the fresh explosive gases until it has completed its return stroke, and during such stroke port 2^a is opened and fresh gases are drawn into chamber 2 to be compressed on the next power stroke of the piston caused by the ignition of the gases in chamber 1.

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

1. In combination, a gas-engine having a working chamber, and a pump-chamber in axial alinement, inlet and outlet ports to said chambers, a common piston working in and between said chambers and controlling said ports, and a by-pass connecting the pump-chamber with the inlet-port of the working chamber; with a baffle or screen in said by-pass having an imperforate portion directly over or opposite the inlet-port of the working chamber, substantially as described.

2. In combination with a gas-engine, an anti-back-firing device, arranged in the gas-inlet passage to the working chamber, and consisting of a finely-perforated metal layer, and coarsely-perforated layers inclosing the finely-perforated layer, said device having an imperforate portion directly over or opposite the inlet-port of the working chamber.

3. The herein-described device for preventing back-firing in gas-engines, consisting of a screen having its sides upturned, and provided with projections at one end, and an imperforate portion near its other end, substantially as set forth.

4. In combination with a gas-engine, an anti-back-firing device, arranged in the gas-inlet passage to the working chamber, and consisting of a finely-perforated metal sheet, and layers of coarsely-perforated metal inclosing the finely-perforated sheet, and said device having an imperforate portion directly over or opposite the inlet-port of the working chamber.

5. In combination, a gas-engine having a working chamber, and a pump-chamber in axial alinement, inlet and outlet ports to said chambers, a common piston working in and between said chambers and controlling said ports, and a by-pass connecting the pump-chamber with the inlet-port of the working chamber; with a baffle or screen in said by-pass formed of a central layer of finely-perforated metal, and inclosing layers of course perforated metal, and having an imperforate portion directly over or opposite the inlet-port of the working chamber, substantially as described.

6. In combination with a gas-engine having a working chamber, a pump-chamber, a piston adapted to compress explosive mixtures in the pump-chamber, and a by-pass for admitting explosive mixtures from the pump-chamber to the working chamber; a screen arranged within the by-pass and closing communication between the working and pump chambers except through its mesh, said

screen having an imperforate portion opposite the inlet to the working chamber, substantially as described.

7. In combination, an explosive-engine having a working chamber, a compression-chamber, and a by-pass between said chambers; with a screen in said by-pass having its sides upturned and closely fitting the sides of the by-pass for the purpose and substantially as described.

8. In combination, an explosive-engine, having a working chamber, a compression-chamber and a by-pass connecting said chambers; with a screen in said by-pass having an imperforate portion directly opposite the inlet to the working chamber, for the purpose and substantially as described.

9. In combination, an explosive-engine having a working chamber, a compression-chamber, and a by-pass leading from the compression-chamber to the working chamber; with an anti-back-firing screen arranged in the by-pass and having its sides upturned and closely fitting the sides of the by-pass to prevent the passage of gas around the edges of the screen, and provided with projections at one end for the purpose and substantially as described.

10. In combination, an explosive-engine having a working chamber, a compression-chamber, and a by-pass leading from the compression-chamber to the working chamber; with a device for preventing back-firing comprising a screen having its sides upturned and provided with projections at one end and an imperforate portion opposite the inlet to the working chamber, substantially as described.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

GEORGE HOLLOWAY.

In presence of—
J. C. CRAIG,
HOMER METZGAR.