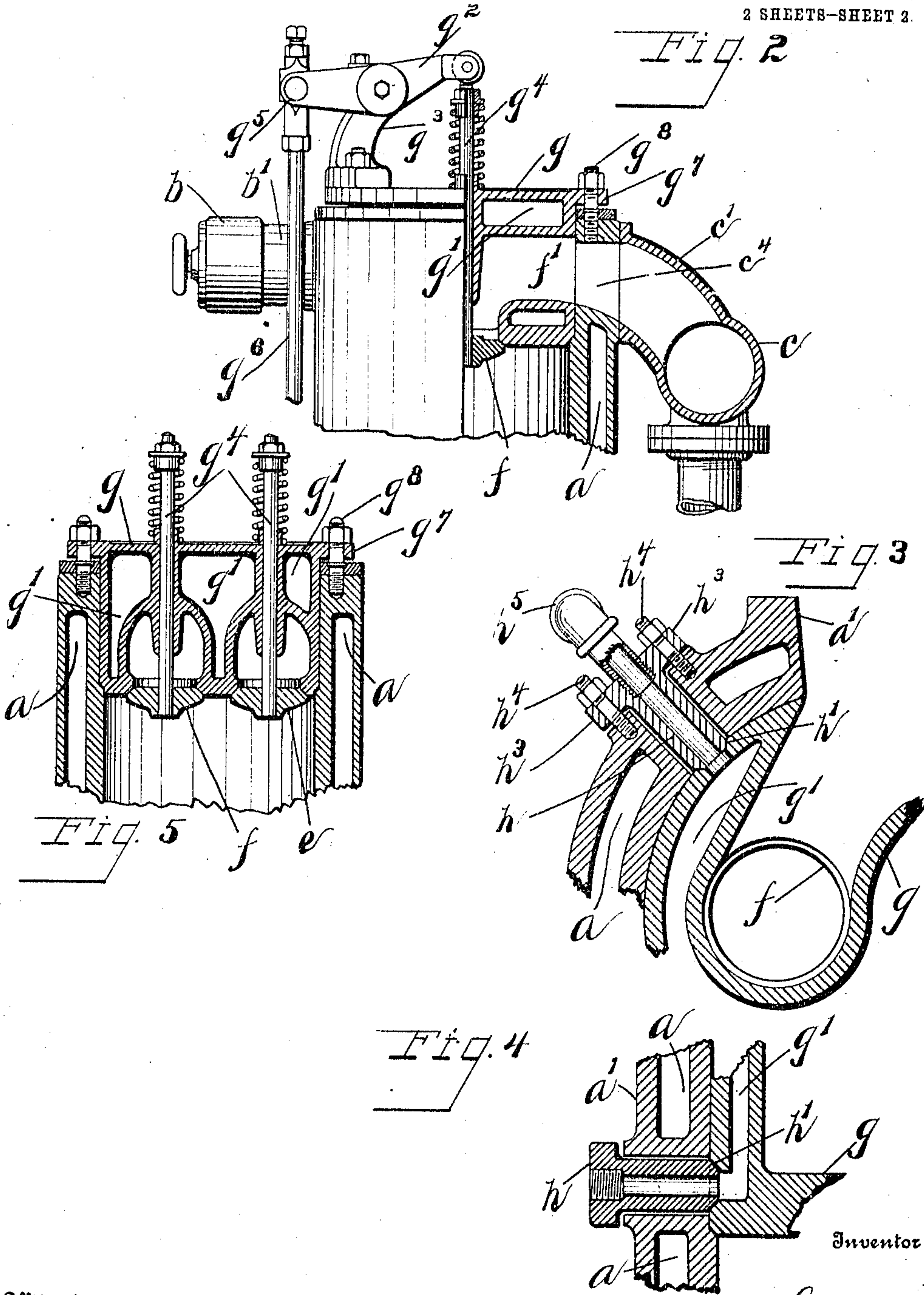


A. Y. EDWARDS.
EXPLOSIVE ENGINE.
APPLICATION FILED JULY 8, 1908.

993,664.

Patented May 30, 1911.

2 SHEETS—SHEET 2.



Witnesses

Chas. J. Melch
Maryne S. Morrow.

By

Inventor
Albert J. Edwards
Staley B. Brown
Attorney

UNITED STATES PATENT OFFICE.

ALBERT Y. EDWARDS, OF SPRINGFIELD, OHIO, ASSIGNOR TO THE FOOS GAS ENGINE COMPANY, OF SPRINGFIELD, OHIO, A CORPORATION OF OHIO.

EXPLOSIVE-ENGINE.

993,664.

Specification of Letters Patent.

Patented May 30, 1911.

Application filed July 8, 1908. Serial No. 442,461.

To all whom it may concern:

Be it known that I, ALBERT Y. EDWARDS, a citizen of the United States, residing at Springfield, in the county of Clark and State of Ohio, have invented certain new and useful Improvements in Explosive-Engines, of which the following is a specification.

My invention relates to improvements in explosive engines and it relates more particularly to improvements in the arrangement of the exhaust and inlet valves and the cylinder head.

The object of this invention is to provide an arrangement of the cylinder head and the inlet and exhaust valves so that valves of large area may be used in their proper relation to each other and to the piping or conduits leading therefrom; the arrangement being such that the valves will be readily accessible without disturbing the other parts which operate in connection therewith.

A further object of my invention is to so arrange these parts that they can be fully and completely protected by water jackets and the parts thus be kept cool.

I attain these objects and others, which will more clearly appear from the following description, by the construction shown in the accompanying drawings in which—

Figure 1 is a plan view of an explosive engine of a three-cylinder type, to which my improvement has been applied, one of the cylinders and its head being shown in section. Fig. 2 is a side elevation, partly in section, of the upper portion of one of the cylinder heads showing the arrangement of the supply and exhaust ports. Figs. 3 and 4 are detail views in section showing the arrangement and construction for supplying water to the jacketed valves and the means for disconnecting the same to permit a removal of the cylinder head and valves without disturbing the piping. Fig. 5 is a sectional elevation of a cylinder head showing the valve chambers and valves.

Like parts are represented by similar letters of reference in the several views.

In the said drawings a^1 , a^2 , a^3 represent the various cylinders. b is the gas supply pipe or conduit which leads to these various cylinders through branch connections b^1 , b^2 , b^3 . c is the exhaust pipe which connects

with the respective cylinders in a similar manner through branches c^1 , c^2 , c^3 . These connections, both for the inlet and the exhaust, are made in any suitable manner with the side of the cylinder preferably near its upper or outer end. Ports b^4 leading from the respective supply pipes b^1 , b^2 , b^3 and similar ports c^4 to the exhaust pipes c^1 , c^2 , c^3 are formed in the side of the cylinder and surrounded by the cylinder water jackets a . Both the supply and exhaust valves e and f are located in the cylinder head g , which is of a peculiar construction, that is, it is formed of sufficient length to project into the cylinder beyond the point where the inlet and outlet ports, b^4 , c^4 , pass through the walls of the cylinder and the cylinder head is provided with similar ports, e^1 and f^1 , which register with the ports, b^4 , c^4 , in the sides of the cylinder so that the supply and exhaust, to and from the valves, pass laterally through the walls of the cylinder and into the chambers formed in the cylinder head g . Each of the cylinder heads are identical in construction, hence a description of one answers for a description of all. Surrounding the ports e^1 and f^1 and the valves, the valve chambers and the valve stems is a water jacket, g^1 , in the cylinder head, which is suitably connected, in a manner hereinafter described, with the water circulation which keeps all of the parts cool.

The connection between the outside of the cylinder-head and the inside of the cylinder is preferably formed by means of a ground joint, the parts being accurately fitted so that, when in proper position, a tight joint is secured without the aid of packing material of any kind. The valves are open and closed to admit the supply and permit the discharge of the exhaust, in any suitable manner, preferably by the employment of an arm g^2 , supported on a bracket g^3 on the cylinder-head which arm connects directly with the valve stems g^4 , a suitable detachable connection, g^5 , being arranged between the end of this arm and the valve operating rod or connection g^6 . The cylinder head will be preferably formed with the usual flange g^7 and secured in place by the usual bolts g^8 .

It is one of the special features of importance in engines of this kind to be able to have access to the valves and the cylinder without the necessity of disconnecting the

supply and exhaust pipes or both, and for the water to the water jacket. It is also desirable that the water chamber completely surround the valve chambers and also be capable of being drained. To accomplish this I form a connection through the cylinder wall and through the outer wall of the cylinder head, as shown in Figs. 3 and 4, and in this opening I insert a hollow sleeve or plug h having at its inner end a joint h^1 preferably ground to fit a similar opening in the outer wall of the cylinder head, thus making a tight joint between the said cylinder head and the said plug or sleeve without the aid of packing material of any kind. This plug or sleeve is preferably provided with flanges h^3 and bolts h^4 , by means of which it is secured in place after the manner of a gland. To the outer end of this plug or sleeve is secured the circulating pipe from the water supply h^5 , this connection being more or less a permanent one. The other water connection to the water jacketed cylinder-head may be made by an ordinary pipe j , having a suitable union j^1 near its point of connection, so that by detaching the union the parts can be removed with the cylinder-head.

As thus constructed it will be seen that I furnish a device in which valves of large area for the inlet and exhaust are provided which may be placed in close proximity and side by side, also the valves, chambers and stems are completely surrounded by a water jacket, and, by disconnecting the arm g^2 at g^5 and the water connections j^1 and h , the cylinder-head, with the valves, can be removed without disturbing any of the other parts. In disconnecting the water connection h it is only necessary to loosen the same sufficiently to allow the end of the sleeve or connection h to be withdrawn to a point within the inner periphery of the cylinder, which will be permitted by the resiliency of the pipe connection h^5 without any other disconnection. Further, by having the plug h communicating with the extreme lower end of the water jacket of the cylinder head, the head may be completely drained, and, also, by the construction described, the head may be drained entirely independent of the cylinder jacket. The advantages of this construction are obvious and, other than mentioned, need not be described in detail.

The supply and exhaust are permanent and pass laterally through the walls of the cylinder and connect with the lateral ports in the cylinder-head and thus directly to the valves, securing large and simple passages free from friction and insures both a perfect exhaust and inlet. The ease and facility of the removal of the cylinder-head without disturbing the other parts, while keeping all of the parts completely water-jacketed, is especially advantageous.

Having thus described my invention, I claim:

1. The combination of a cylinder and a removable extended cylinder head located in the end thereof, a water jacket for said cylinder and a water jacket for said head, said jackets being independent of each other and non-communicating, and a water connection for said head water jacket extending through the walls of said cylinder, substantially as specified.

2. The combination of a cylinder and a removable extended cylinder head located in the end thereof, inter-communicating ports between the cylinder and head, an independent water jacket for each of said parts, said jackets being non-communicating, and a water connection communicating with the head water jacket and extending through the walls of said cylinder, substantially as specified.

3. The combination of a cylinder and a removable extended cylinder head located in the end thereof, independent non-communicating water jackets for said head and cylinder, respectively, and a water connection communicating with the lower end of the water jacket for said head and extending through the walls of said cylinder, substantially as specified.

4. In combination with a cylinder and an extending cylinder head formed in the end thereof and the inter-communicating ports in the walls of said cylinder and said cylinder head, a water chamber in said cylinder head, and a removable water connection communicating with said water chamber extending through the walls of said cylinder, substantially as specified.

5. In combination with a cylinder and an extending cylinder head formed in the end thereof, inter-communicating ports in the walls of said cylinder and said cylinder head, a water chamber in said head, a water connection extending through the wall of said cylinder and communicating with said water chamber, and a detachable water connection extending through said cylinder wall and communicating with said water chamber, substantially as specified.

6. The combination with a cylinder having ports through the walls thereof, supply and exhaust pipes communicating with said ports, a cylinder head having valves arranged adjacent to each other and valve chambers which communicate with said ports, valve stems connected to said valves, which valve stems extend through said cylinder head at right angles to the plane of said ports, a water jacket for said cylinder head surrounding said valve chambers, a water jacket surrounding said cylinder and said lateral ports, said jackets being independent and non-communicating, and a connection from said water-jacket in the cylinder-

der head through the cylinder walls, substantially as specified.

7. In combination with a cylinder and an extending cylinder head fitted in the end thereof, inter-communicating ports in the walls of said cylinder and in said cylinder head, a water-chamber in said cylinder head and a water connection consisting of a sleeve passing through the walls of said cylinder head, a water-passage through said sleeve,

and means for moving said sleeve longitudinally to connect and disconnect said water-passage to said water-jacket of the cylinder head, as and for the purpose specified.

In testimony whereof, I have hereunto set my hand this 3rd day of July, 1908.

ALBERT Y. EDWARDS.

Witnesses:

MARJOUX S. MORROW,
CHAS. I. WELCH.