E. E. SLICK.

EXPLOSIVE ENGINE.

APPLICATION FILED OCT. 25, 1906.

954,219.

Patented Apr. 5, 1910.

2 SHEETS—SHEET 1.

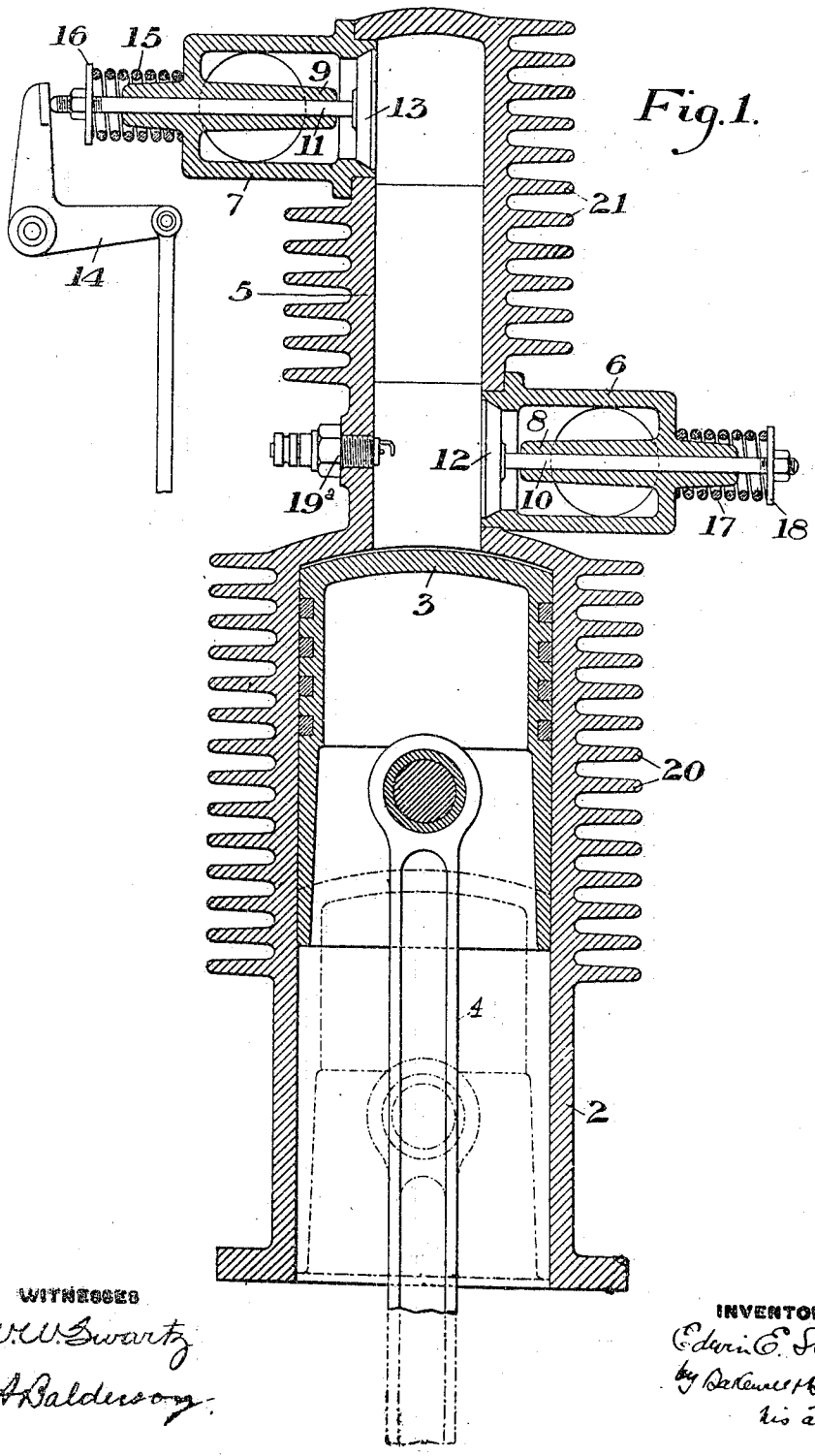

Fig. 1.

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 2

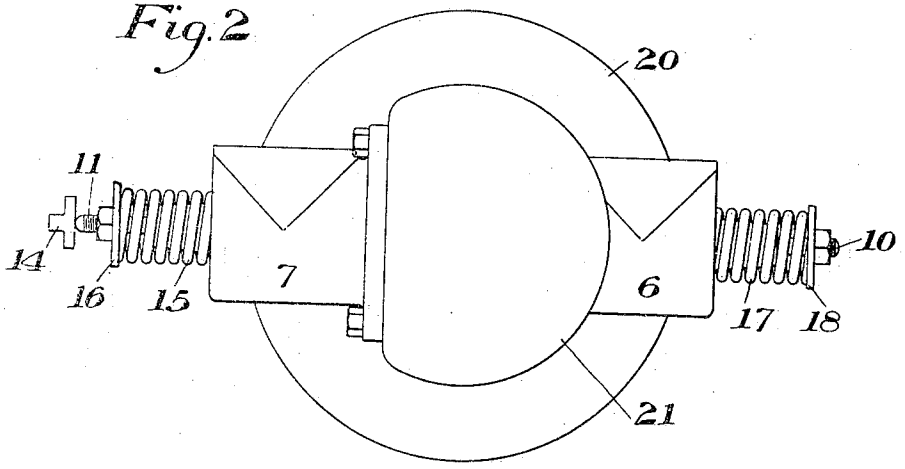
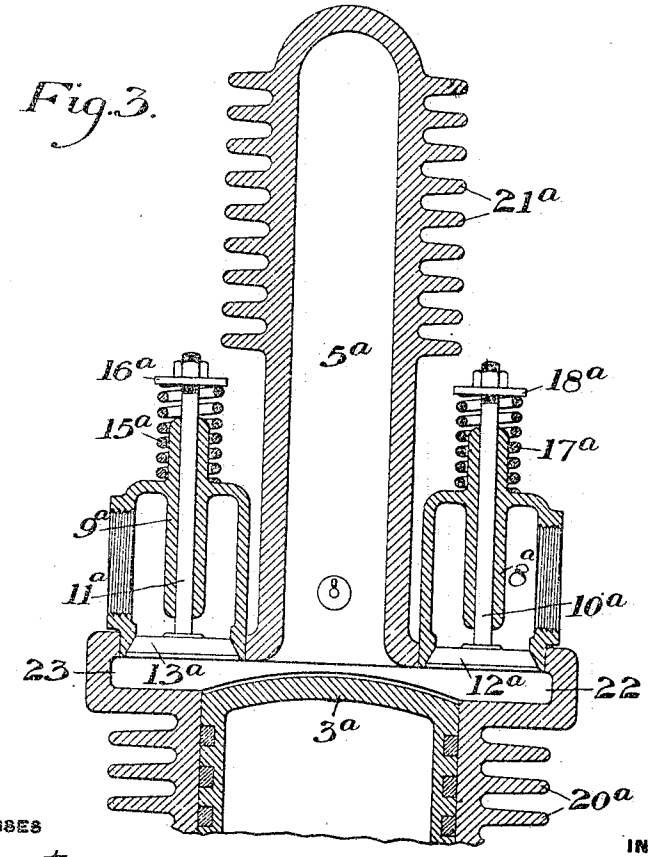


Fig. 3.



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UNITED STATES PATENT OFFICE.

EDWIN E. SLICK, OF PITTSBURG, PENNSYLVANIA.

EXPLOSIVE-ENGINE.

954,219. Specification of Letters Patent. Patented Apr. 5, 1910.

Application filed October 25, 1906. Serial No. 340,564.

To all whom it may concern:

Be it known that I, EDWIN E. SLICK, of Pittsburg, Allegheny county, Pennsylvania, have invented a new and useful Explosive-Engine, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a central vertical section showing one form of my improved gas engine; Fig. 2 is a top plan view of the same, and Fig. 3 is a partial sectional view of a modified form.

My invention relates to the class of explosive engines wherein a charge of mixed air and fuel is fed into the cylinder and exploded.

The object of the invention is to reduce or largely prevent the mixture of that portion of the burned gases which remains in the clearance space after the exhaust stroke, with the fresh entering charge.

To that end the invention consists in a clearance chamber extension for the cylinder in connection with a fuel inlet which is so arranged that the major portion of the waste gases is beyond the inlet and in the clearance space.

It also consists in arranging the igniter so that the major portion of the waste gases is beyond it in the clearance space.

In the drawings, referring to Figs. 1 and 2, in which I show a preferred form, 2 represents a single-acting engine cylinder, 3 the trunk piston, and 4 the connecting rod. The engine cylinder is preferably cast with an end extension 5 of smaller diameter than the cylinder, and arranged to receive the burned clearance gases. I have shown this extension as located centrally at the end of the cylinder, with the inlet valve casing 6 secured in one side thereof close to the end of the cylinder, and the valve casing 7 for the outlet valve secured in the other side thereof beyond the inlet valve. These valve casings may be screwed, or otherwise secured, in holes in the clearance chamber, and are preferably cast with tubular guides 8 and 9 for the valve stems 10 and 11. The inlet and outlet valves 12 and 13 seat against the inner ends of the valve casings, and the outlet valve is reciprocated by any suitable connections at its outer end beyond the casings. I have shown the outlet valve as opened by the bell crank lever 14, one arm of which butts against the end of the outlet valve stem 11, the valve being closed by the spring 15 bearing against an adjustable collar 16 on the valve stem. I have shown the inlet valve as an automatic suction valve, which is closed by a spring 17 bearing against adjustable collar 18 on the valve stem 10. This valve, however, may be either automatic or may be positively reciprocated by connection with the moving part of the engine. The igniting device 19 is preferably located at the inner end of the clearance chamber and opposite to the inlet valve, as shown. I have illustrated this device as being the ordinary spark plug screwed into a hole in the side wall of the clearance chamber in line with the inlet valve. The igniting device may, however, be made of any desired character, and its location may be varied. I have shown the cylinder and clearance chamber as provided with ribs or flanges 20 and 21 for air-cooling, but the cooling may be carried out either by liquid or fluid, and the clearance space may or may not be cooled as desired.

In Fig. 3 I show a form similar to that of Figs. 1 and 2, except that the inlet and outlet valves 12^a and 13^a are located in side extensions 22 and 23 of the cylinders and reciprocate in lines parallel with the cylinder axis. In this case the clearance chamber 5^a is between the valves and forms a close pocket containing the igniting device 19^a in its lower portion. In this figure parts similar to those of Figs. 1 and 2 are marked with similar numerals with the letter *a* applied thereto.

In the operation of the engine, which is preferably of the four-cycle type, the cycle is carried out in the ordinary manner, and after the explosion the return stroke of the piston forces out the burned gases through the exhaust valve which is then open. At the end of this stroke the exhaust valve closes, and the burned clearance gases fill the entire clearance chamber. The inlet valve then opens on the next stroke in the other direction and the fresh charge is drawn in. During this suction inlet stroke the major portion of the burned clearance gases lies in the closed pocket beyond the inlet valve, and consequently substantially the only part of them which is mixed with the entering charge is the small part which lies in the space in front of the inlet valve. After this stroke, the inlet valve closes, and

the return stroke of the piston compresses the charge into the inner portion of the clearance chamber. There will be a line of demarcation between this charge and the unmixed burned gases, which will then be compressed into the outer part of the clearance space; the charge then being exploded will give a large power, because of the small diluting effect of the burned gases.

The advantages of my invention result from providing a special clearance chamber or pocket as an extension of the cylinder and which shall contain the major amount of the burned clearance gases left in the clearance spaces. In this manner I provide the necessary volume to prevent injury to the cylinder at the time of explosion, while largely preventing the mixture of such burned gases with the entering charge. I can thus use a leaner mixture in the entering charge, while insuring proper explosion.

By making the clearance space between the piston and the inlet valve less than the space between the inlet and outlet valves, the outlet valve being beyond the inlet valve, I greatly reduce the diluting effect of the burned waste gases on the fresh charge and increase the power of the charge, as well as make it more uniform. By placing the inlet valve close to the position of the piston at the end of its stroke toward said valve, and making the exhaust valve more remote, I greatly reduce the diluting of the mixture, since substantially the only part of the waste gases which mix with the fresh charge is that between the inlet valve and the piston.

The inlet valve may be located in a side extension of the cylinder at one end instead of entering the clearance chamber; the clearance chamber containing the exhaust valve may extend sidewise from one end of the cylinder; the exhaust valve may be placed in any part of the clearance chamber; and many other changes may be made without departing from my invention.

I claim:—

1. An explosive engine cylinder, having a clearance chamber of constant volume with a fuel inlet valve for admitting a charge mixture intermediate the cylinder, and clearance chamber, the volume of the clearance space beyond the inlet valve being greater than that between the engine piston and the inlet valve; substantially as described.

2. An explosive engine cylinder, having a clearance chamber extension of constant volume at one end, an exhaust valve located in the outer part of such clearance chamber and a fuel inlet valve for a charge mixture entering the clearance chamber near the cylinder arranged to give a larger clearance volume between it and the exhaust valve than between it and the cylinder proper; substantially as described.

3. An explosive engine cylinder having a clearance extension chamber at one end, an exhaust valve located within said chamber and an igniting device arranged at the inner portion of said clearance chamber with the major volume of the clearance chamber beyond it, the volume of the clearance chamber being constant at all speeds of the engine together with an outlet valve for a charge mixture adjacent to the igniting device; substantially as described.

4. An explosive engine cylinder having exhaust outlet and fuel inlet valves and a clearance chamber of fixed volume, an igniting device located at the cylinder end of said clearance chamber, the igniter and the fuel inlet being located in the clearance space to divide this space into two unequal volumes, the volume of the space beyond the igniter and inlet valve being greater than that of the space between the igniter and inlet valve and the piston; substantially as described.

5. An explosive engine, having a clearance chamber extension at one end, a fuel inlet valve for the charge mixture, an exhaust valve, said valves communicating with said chamber near opposite ends thereof, and an igniter adjacent to the inlet valve, the volume of the space within said chamber beyond the igniter and inlet valve being greater than the volume of the space between the igniter and inlet valve and the piston at the end of its expansion stroke, substantially as described.

In testimony whereof, I have hereunto set my hand.

EDWIN E. SLICK.

Witnesses:
H. M. Corwin,
R. D. Little.