

Oct. 15, 1935.

O. J. GINGERICH

2,017,205

INTERNAL COMBUSTION ENGINE

Filed July 8, 1932

2 Sheets-Sheet 1

Fig. 1

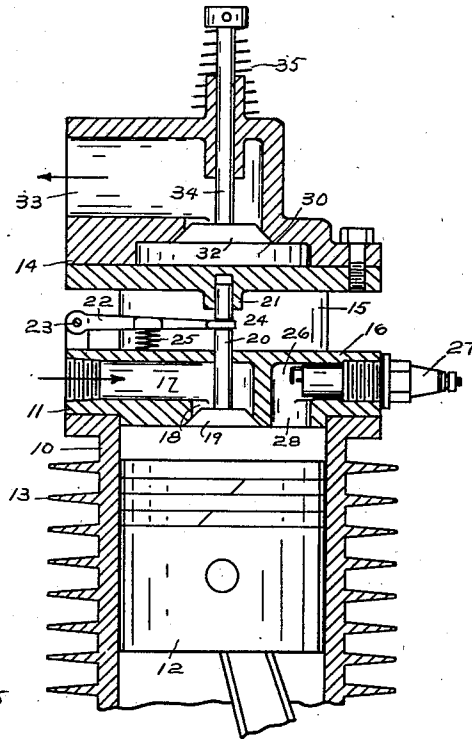
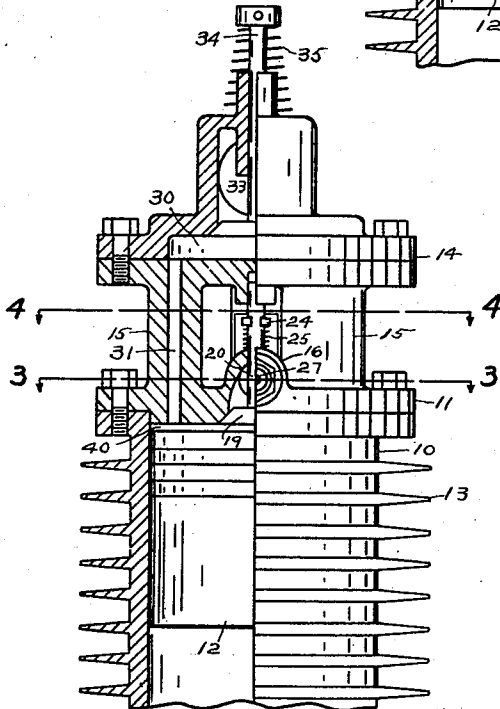


Fig. 2



INVENTOR
BY *Otto J. Esingerich,*
Fassett and Fassett,
ATTORNEYS.

Oct. 15, 1935.

O. J. GINGERICH

2,017,205

INTERNAL COMBUSTION ENGINE

Filed July 8, 1932

2 Sheets-Sheet 2

Fig. 3

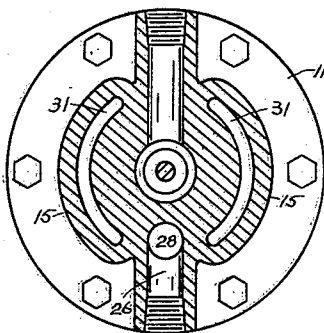


Fig. 4

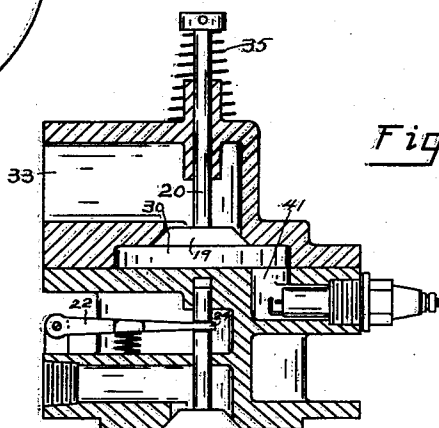
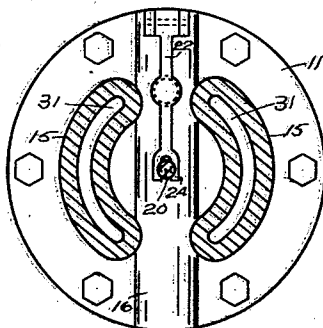
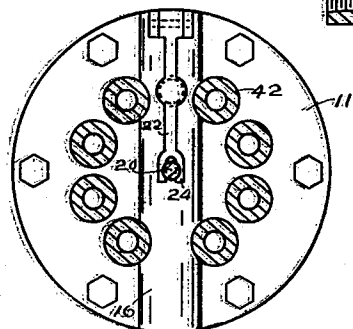


Fig. 5

Fig. 6



INVENTOR
Otto J. Gingerich,
BY *Fassett and Fassett,*
ATTORNEYS.

UNITED STATES PATENT OFFICE

2,017,205

INTERNAL COMBUSTION ENGINE

Otto J. Gingerich, Trenton, Ohio

Application July 8, 1932, Serial No. 621,391

12 Claims. (Cl. 123—191)

This invention relates to internal combustion engines, and its principal object is to obtain more power with the consumption of a given amount of fuel than is possible with engines heretofore produced. Another object is to prevent the formation of carbon in the cylinder and on the valves.

Among the several features of this invention that contribute to these results is that of providing a compression or combustion chamber which reduces the body of fuel to a very attenuated form. In a former application, Ser. No. 367,685, I disclosed and claimed means for doing this, which consisted in confining the fuel in broad, thin spaces while combustion takes place. This slows down the combustion of the fuel and makes the combustion more complete. In the present application I disclose an improvement in means for confining the fuel in broad thin spaces, and I also disclose means for confining part of the fuel in small tubes.

In said application, Ser. No. 367,685, I disclosed means for keeping excessive heat from the piston rings, thereby preventing leakage of the rings due to overheating. In the present application I disclose improved means for protecting the piston rings from heat. I also provide for equalizing expansion and contraction of the parts, thereby avoiding leakage around the rings resulting from distortion of the parts.

I shall now proceed to describe my invention, with the assistance of the accompanying drawings, in which,

Fig. 1 is a sectional elevation of a cylinder embodying my invention;

Fig. 2 is a composite view, partly elevational and partly sectional of the construction shown in Fig. 1, but seen from a position 90 degrees around from the position from which Fig. 1 is seen;

Fig. 3 is a sectional plan view taken on line 3—3 of Fig. 2;

Fig. 4 is a sectional plan view taken on line 4—4 of Fig. 2;

Fig. 5 is a sectional elevation of a modified construction;

Fig. 6 is a sectional plan of another modified construction.

Referring now to Figs. 1 and 2, the cylinder 10 has a head 11 and contains a piston 12. The cylinder is provided with the usual heat radiating fins 13, but if desired these may be replaced by the well known water jacket method of cooling. Above the cylinder head 11 is what I shall call a superhead 14, which is supported on the main

cylinder head by two columns, 15—15. Extending diametrically across the cylinder head, between the columns 15—15, is a boss 16. In this boss a hole 17 is bored to serve as a fuel inlet, which hole is tapered by a port 18 in the center of the cylinder head. The port 18 is closed by a valve 19 having a stem 20 that passes through the top of the boss 16 and into a hole bored in boss 21 formed on the bottom of the superhead 14. A lever 22, fulcrumed at 23, has a forked end 24 that engages transverse slots in the valve stem 20. A spring 25 raises the lever 22 and hence the stem 20, and keeps the valve on its seat. The valve is opened by suction on the downward stroke of the piston, but if desired mechanical means may be provided for opening the valve at proper intervals, as is commonly done in internal combustion engines. At its other end the boss 16 is bored to form a housing 26 for a spark plug 27, which housing is connected to the interior of the 20 cylinder by a hole 28.

The superhead 14 contains a circular chamber 30, which is connected to the cylinder by ports 31—31 that pass down through the columns 15—15. Referring to Fig. 4 it will be seen that the columns 15—15 are arcual to the longitudinal axis of the cylinder and that the auxiliary chambers or ports 31—31 are also arcual to the center of the cylinder. It will be seen also that while these ports are broad they are comparatively thin. Referring again to Figs. 1 and 2 it will be seen that the chamber 30 is circular, but thin. The purpose of this will be explained presently. Through a valve 32 the chamber 30 connects to an exhaust outlet 33, the valve having a stem 34 surrounded by a compression spring 35; whereby the valve is kept on its seat. It is to be understood that this valve will be opened periodically by suitable valve-operating mechanism, as is well understood.

The operation of my engine is easily understood. As will be inferred, it is a four cycle engine, and as the piston moves downward on its suction stroke fuel mixture, that is a mixture of air and hydro-carbon fuel, is drawn into the cylinder past the valve 19. Upon the return stroke of the piston this mixture is compressed and most of it is forced into the chamber 30 and ports 31, some of it, of course, remaining in the cylinder in the thin clearance space 40. See Fig. 2. This all of the mixture is reduced to a broad thin body.

Compressing the fuel mixture into these broad, thin spaces reduces the speed of combustion and for that reason it is possible to compress the fuel to a high degree without causing it to detonate

when it is ignited. Thus an action is obtained which is more like that in the cylinder of a steam engine than has heretofore been possible in a hydrocarbon engine. Another advantage of compressing the mixture into these broad thin spaces is that the thin or attenuated mass of fuel is thereby brought into contact with a very large area of hot wall, and thus all of it is heated to a high temperature. I lay emphasis on this point, as I believe that fuel-heating devices of the past have failed to produce expected results because the fuel has been in thick masses and in contact with relatively small areas of hot wall. Obviously, only the portions of these thick masses of fuel contiguous to the walls of the heating chambers could become heated in the short time that the fuel remained in the chambers. Heating the mixture uniformly to a high temperature, together with reducing the speed of combustion, produces very complete combustion, and as a result the deposit of carbon on the engine parts is practically nil. All of which produces an engine of high efficiency, an engine that delivers great power with a small consumption of fuel.

Another advantage derived from compressing the fuel mixture into broad thin spaces enclosed by hot walls is that the engine is thus enabled to run on low grades of gasoline, and even heavy oils. My engine will run on oils of such low quality that it is necessary to use a better grade of fuel to start it. After the engine has been heated up it can be switched over to a low grade of fuel and it will deliver a very high power with a small consumption of fuel, leaving practically no deposit of carbon or other residue in the cylinder or on the valves.

One of the objects of my present construction is to keep the piston rings from becoming overheated. This is effected by the construction described, which takes exhaust gases quickly away from areas of the cylinder walls that are contacted by the rings. Placing the exhaust valve and outlet in a superhead supported on columns that are surrounded by air, takes the heat away from the piston rings so effectively that the rings are never distorted by heat, and they therefore enable the piston to produce very high compression. Distortion of the cylinder and contiguous parts, including the piston and rings, by expansion and contraction is also to be avoided if possible. This I accomplish by carrying the exhaust gases from the cylinder through the two ports 31—31, one of which is on each side of the center of the cylinder head. Carrying this idea still farther I place the exhaust valve in the center of the chamber 30. In this way the cylinder and associated parts are made to expand and contract symmetrically.

It is to be noted that the fuel mixture is introduced into the cylinder cold. This adds to the protection of the piston rings, as the newly introduced mixture washes the cylinder walls and the piston head and tends to cool them. Introducing the fuel cold has the advantage that a larger charge of fuel is introduced into the cylinder than where the charge is heated before it enters the cylinder. This is because heating the charge expands it and therefore reduces the amount of fuel a charge of a given volume contains. When the fuel is compressed in the chamber 30 and ports 31—31, the air and fuel become very thoroughly mixed. This is due to the fact that when globules of atomized fuel come in contact with the hot walls of the spaces, the globules are broken up and forcefully thrown away from the hot

surfaces. This occurring to many thousands of globules causes a great commotion or turbulence in the spaces which mixes the air and fuel very thoroughly. It is probable that to a very limited extent this sort of thing occurs in the cylinder before and during the process of compressing the fuel. But because of the smallness of the wall area compared to the volume of fuel the effect is negligible. But when the fuel is reduced to a small volume and confined in attenuated spaces with their relatively large wall areas, the result is remarkably efficient fuel combustion.

The modified construction illustrated in Fig. 5 differs from the structure already described only in that the spark plug housing 41 communicates with the chamber 30 instead of communicating directly with the cylinder. The modification illustrated in Fig. 6 differs from that of Figs. 1 to 4 in that the superhead is supported by a plurality of cylindrical tubes 42, instead of the arcuate columns 15—15.

While I have shown the preferred embodiment of my invention together with two modifications, it is not to be understood that the invention is limited in its scope to the particular structures shown, for the scope of the invention is only limited by the appended claims, which are as follows:

I claim:

1. In an internal combustion engine, a cylinder having a fuel inlet in the center of its head, having an exhaust valve in alignment with the longitudinal axis of the cylinder, and having ports leading from each side of said fuel inlet to said exhaust valve.
2. In an internal combustion engine, a cylinder having a fuel inlet in the center of its head, a port in the cylinder head at each side of said inlet, leading to a common chamber, and an exhaust valve in said chamber, said ports, which serve alternately as exhaust ports and part of the combustion chamber, being broad and thin, whereby to reduce the explosive charge contained in them to broad, thin bodies of gas.
3. In an internal combustion engine, a cylinder having a fuel inlet in the center of its head, a superhead supported on said head by two free-standing columns, the superhead containing a broad, thin chamber, and the columns containing broad thin ports connecting the chamber with the cylinder, and an exhaust port in said chamber.
4. In an internal combustion engine, a cylinder having a fuel inlet in the center of its head, a superhead supported on said head by two free-standing columns, the superhead containing a broad, thin chamber, and the columns containing broad thin ports connecting the chamber with the cylinder, and an exhaust port in said chamber, said columns and the ports within them being arcual to the longitudinal axis of the cylinder.
5. In an internal combustion engine, a cylinder having a fuel inlet in the center of its head, a superhead supported on said head by a circle of free-standing tubes, the superhead containing a thin circular chamber with which said tubes connect, and an exhaust port in said chamber.
6. In an internal combustion engine, a cylinder having a head with a boss extending diametrically across its exterior, said boss being divided into two compartments, one of which houses a spark plug, the other serving as a fuel inlet and having a port to admit fuel to the cylinder, and a superhead containing a chamber hav-

ing an exhaust port, said superhead being supported by free-standing columns extending from the cylinder head, ports in said columns connecting said chamber to the cylinder.

5 7. In an internal combustion engine, a cylinder having a head with a boss extending diametrically across its exterior, said boss being divided into two compartments, one of which houses a spark plug, the other serving as a fuel
10 inlet and having a port to admit fuel to the cylinder, and a superhead containing a chamber having an exhaust port, said superhead being supported by free-standing columns, one on each side of said boss, said columns being arcuate in
15 cross section to the longitudinal axis of the cylinder and containing arcuate ports which connect the cylinder to said chamber, said ports and chamber being broad and thin.

8. In an internal combustion engine, a cylinder having a head with a boss extending diametrically across its exterior, said boss being divided into two compartments, one of which houses a spark plug, the other serving as a fuel inlet and communicating with the cylinder by way of a
25 valve in the center of the cylinder head, and a superhead containing a chamber with an outlet valve for exhaust gases, said superhead being supported on the cylinder head by hollow columns, the hollows of said columns connecting said
30 chamber to the interior of the cylinder.

9. In an internal combustion engine, a cylinder having a head, similar exhaust ports in said head arranged symmetrically around the longitudinal axis of the cylinder, said ports carrying
35 exhaust gases to a chamber which is also sym-

metrical with reference to said axis, said chamber having an outlet for exhaust gases, concentric to said axis.

10. In an internal combustion engine, a cylinder having a head, a superhead isolated from said head and containing a chamber, a plurality of tubular columns whereby said superhead is supported on said head and the cylinder is connected to said chamber, said columns being arranged in a circle concentric to the longitudinal axis of the cylinder, and an exhaust outlet from said chamber.

11. In an internal combustion engine, a cylinder having a head, a superhead containing a chamber, said chamber being broad and relatively thin, a plurality of ports connecting said chamber to the cylinder, the ports and chamber serving alternately as combustion chambers and exhaust passages, an exhaust outlet in said chamber, and a spark plug housed in a compartment that communicates with said chamber.

12. In an internal combustion engine, a piston, a cylinder having a head between which and the piston the clearance space is thin at the beginning of the power stroke, and auxiliary compression chambers connected with said clearance space, in which a substantial part of the compressed fuel charge is confined, said chambers being permanently shaped so that they reduce the fuel to attenuated masses having contact with relatively large areas of hot confining wall, said auxiliary compression chambers being connected to a common exhaust port at a point remote from the cylinder.

OTTO J. GINGERICH. 35