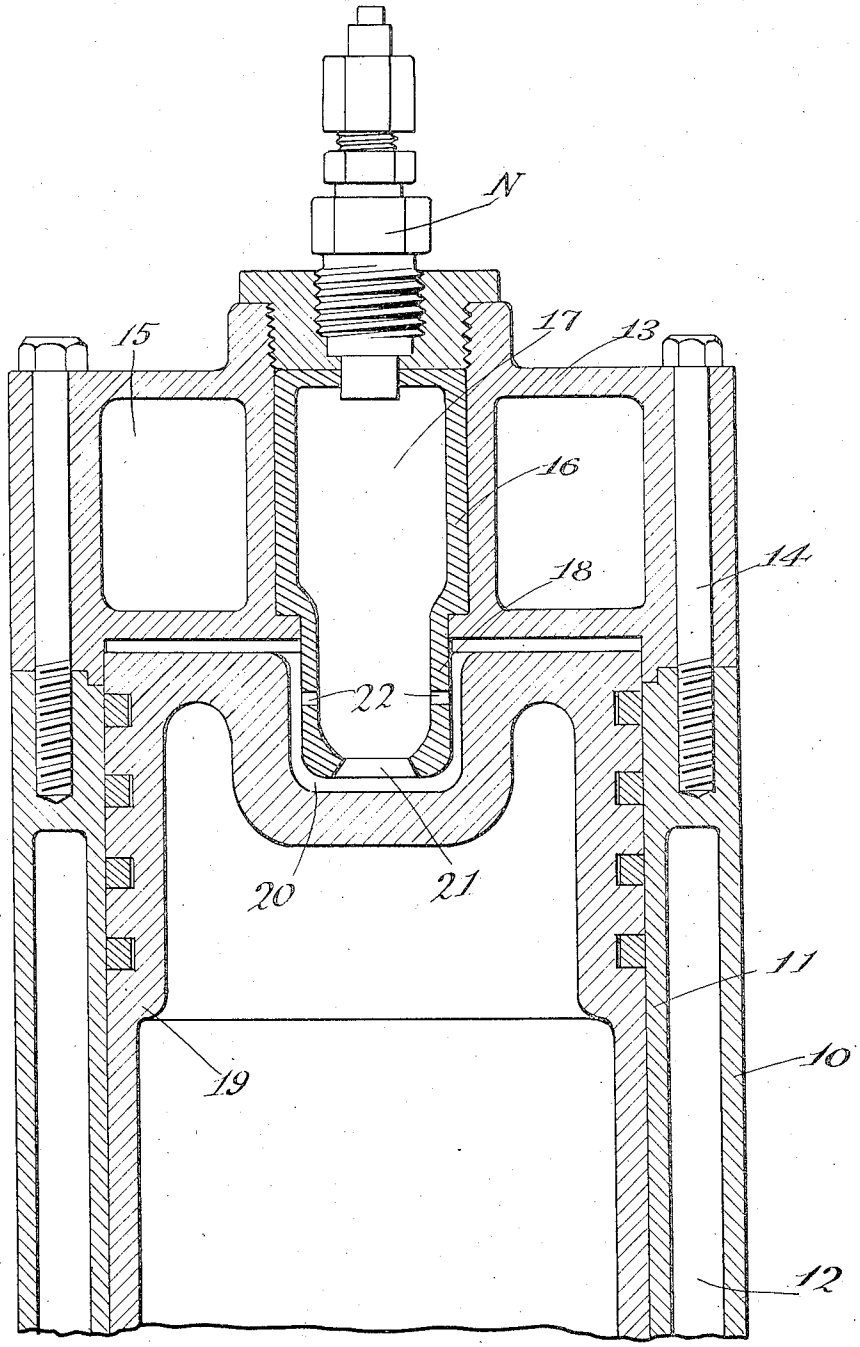
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E. KRETTINGEN

INTERNAL COMBUSTION ENGINE

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Witness:
W. J. Hale

Inventor:
Emanuel Krettingen.
by Hazard and Miller
Attorneys.

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EMANUEL KRETTINGEN, OF LOS ANGELES, CALIFORNIA.

INTERNAL-COMBUSTION ENGINE.

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This invention relates to improvements in internal combustion engines and particularly to internal combustion engines designed to operate in a manner similar to a Diesel engine.

An object of this invention is to provide an improved internal combustion engine which has a working cylinder provided with a precombustion chamber and to provide a novel piston and arrangement of the precombustion chamber so that the vapors and gases on passing from the precombustion chamber into the working cylinder will have the time of its greatest effectiveness on the piston delayed until the piston has started and has moved a considerable distance upon its downward working stroke.

Another object of this invention is to provide an improved internal combustion engine having a working cylinder and a precombustion chamber which is so arranged that a cold starting of the engine is possible.

With the foregoing and other objects in view which will be made manifest in the following detailed description and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

The figure is a vertical section through a cylinder of the improved engine, showing the piston in the working cylinder as being at the top of its stroke.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the body of the engine is indicated at 10 providing the working cylinder 11 which may be cooled as by a water jacket 12. The top of the block or body 10 has secured thereto the head 13 as by bolts 14. This head may be cooled such as by water jacket 15. In the head there is disposed a jacket 16 which provides the precombustion chamber 17 which is supplied with fuel through a nozzle N which may be of any desired or preferred construction. The piston 19 which reciprocates in the working cylinder 11 has a substantially cylindrical concavity 20 formed in its top. The jacket 16 which provides the precombustion chamber 17 is shown as being extended, as indicated at 18, below the bottom of the cylinder head 13. It is extended a sufficient distance so that when the piston 19 is at the top of its stroke, the extension 18 will enter the concavity 20. The precombustion chamber 17 and the extension 18 may be of any desired or preferred shape. It may be cast integral with the cylinder head 13 or made up of several parts. The extension is also illustrated as having a single opening 21 which discharges vapors and gases from the precombustion chamber into the working cylinder and against the bottom of the concavity 20. The particular formation of the port 21 leading from the precombustion chamber is immaterial and may be varied. Instead of using a single port, a plurality of ports may be employed. Lateral ports such as those indicated at 22 may also be used if such are desirable, or these ports can be omitted.

The advantages of the above described construction are as follows: During the compression stroke a part of the oxygen in the working cylinder is driven out of the working cylinder into the precombustion chamber 17. In the precombustion chamber the fuel is ignited and partly burned, the rest vaporized, and on expanding becomes effective upon the bottom of the concavity 20 in the piston. As this area is limited, and is much smaller than the total area on top of the piston, there will be no sudden impact imparted to the piston at the very start of its downward stroke. What impact is present is greatly reduced by the momentary inertia of the piston. The piston starting on its downward movement gradually decreases the area on the sides of the concavity which is opposite the sides of the extension 18, thus reducing the friction of fluid flow around the extension. This allows the vapors and gases to pass through the concavity to the space between the top of the piston and the bottom of the cylinder head, mixing there with the rest of the oxygen, burning and expanding. When the top of the piston is below the bottom of the extension, the vapors and gases can then readily pass from the precombustion chamber to the interior of the working cylinder and become effective over the entire top of the piston. In this way it will be understood that the expansive force of the hot gases becomes most effective on the piston only after the piston has started down and has moved a considerable distance on its downward stroke, thus reducing the pounding and knocking, and therefore be most ef-

fective on the piston at a position where the piston can impart the greatest working force to the crank shaft.

Another advantage of the improved engine is as follows: It will be noted that the vapors and gases from the precombustion chamber discharges at the center of the piston which is ordinarily the hottest part of the piston and it contacts with the piston at a point quite remote from the water jacket 15. Because of this it is possible to start the improved engine while cold, whereas many other types of internal combustion engines employing the Diesel principle require that they be warm in order to start them.

Furthermore, a more uniform and gradual burning of the fuel is effected with a corresponding gradual rise in pressure, as compared in contradistinction from the ordinary type of Diesel engine where the fuel is burned in such a manner as to cause a sudden rise in pressure on the piston. The construction of the piston top and the lower part of the precombustion chamber co-act to function as a shock absorber. Another advantage is the complete combustion of the fuel. The fuel now in the form of gases and vapors may contain minute particles of liquid fuel in suspension, which liquid particles become completely vaporized in flowing through the narrow passage formed by the hot walls of the piston top and lower part of the precombustion chamber, thus forming a homogeneous fuel mixture.

From the above described construction it will be appreciated that a novel internal combustion engine is provided which has a very advantageous improvement and such improvement is made possible by a very simple, durable and cheap construction.

It will be understood that various changes may be made in the detail of construction without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. An internal combustion engine having a cylinder, there being a precombustion chamber for the cylinder, a piston reciprocable in the cylinder having a concavity in its top, the lower end of the precombustion chamber being extended below the top of the cylinder such a distance as to enter the concavity in the piston when the piston is as the top of its stroke.

2. An internal combustion engine having a cylinder, a precombustion chamber therefor, a piston reciprocable in the cylinder having a concavity in its top, the precombustion chamber being extended into the cylinder and being so arranged that it will enter and substantially fill the concavity in the piston when the piston is at the top of its stroke.

3. An internal combustion engine having a cylinder, a precombustion chamber therefor, a piston reciprocable in the cylinder having a concavity in its top, the precombustion chamber being extended into the cylinder and being so arranged that it will enter and substantially fill the concavity in the piston when the piston is at the top of its stroke, the discharge opening from the precombustion chamber into the cylinder being so arranged as to discharge against the bottom of the concavity.

4. An internal combustion engine having a cylinder, a precombustion chamber for the cylinder, the lower end of the precombustion chamber being extended into a recess in the top of the cylinder piston when the piston is at the top of its stroke, the walls of such recess when the piston is at the top of its stroke being sufficiently close to the extension of the precombustion chamber to retard and gradute the discharge of fuel from the precombustion chamber into the cylinder until the piston top has receded beyond precombustion chamber extension.

5. An internal combustion engine having a cylinder, a precombustion chamber for the cylinder and communicating therewith, a piston reciprocable in the cylinder having a concavity in its top into which, when the piston is at the top of its stroke there projects an extension of the precombustion chamber, such extension of the precombustion chamber being sufficiently close to the walls of the concavity in the piston head to retard and graduate the flow of the fuel charge in the precombustion chamber into the cylinder.

In testimony whereof I have signed my name to this specification.

EMANUEL KRETTINGEN.