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PRECOMBUSTION CHAMBER FOR DIESEL ENGINES

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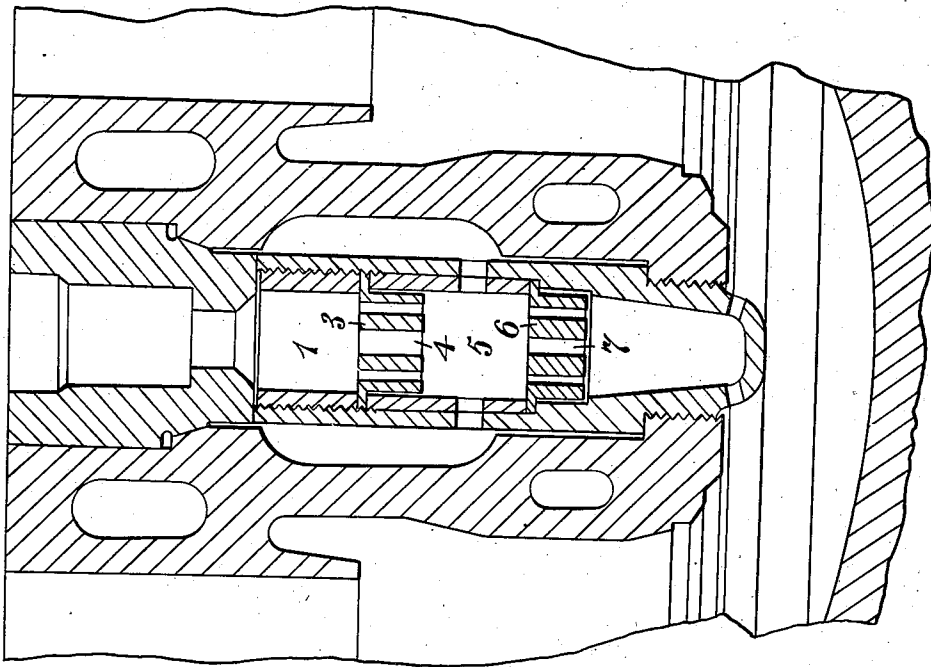


Fig. 2

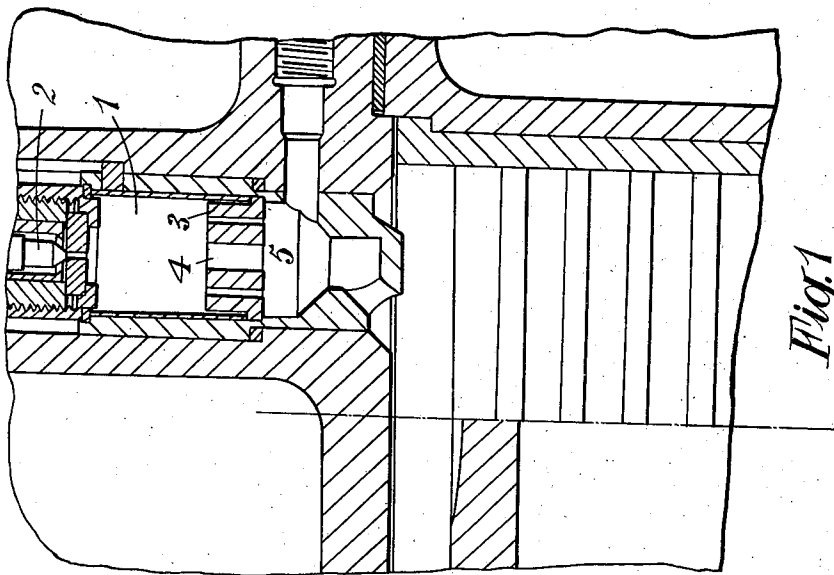


Fig. 1

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PRECOMBUSTION CHAMBER FOR DIESEL
ENGINES

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1 Claim. (Cl. 123—33)

This invention relates to Diesel engines operating with oils of all kinds, more particularly oils which do not readily ignite, such for instance as coal tar oils or oils from pressure hydrogenation products of coals and coal extracts.

Gas oils which are rich in hydrogen and ignite easily can be used in the Diesel engine without any trouble. In many countries which are poor in gas oils, however; these oils have to be imported. Whilst the synthetic manufacture of such easily ignitable Diesel oils which are rich in hydrogen is possible, it is extremely costly. On the other hand, oils which are poor in hydrogen, such for instance as oils obtained by the single stage hydrogenation of coals, coal extracts and the like are far cheaper to manufacture. These oils are, however, just as difficult to ignite as tar oils and cannot be used in modern Diesel engines, more particularly high speed Diesel engines. For this reason attempts have long been made to render cheap oils of poor quality, for instance coal tar oils and the like, suitable for use in Diesel engines.

It is an essential feature of the Diesel engine, that for initiating the ignition of the injected fuel a sufficiently high air temperature must be available at the moment of injection. This temperature must be all the higher, the more difficult the fuel being used is to ignite. Attempts have already been made to ensure the ignition of such oils by raising the air temperature beyond that corresponding to the compression ratio. For this purpose for instance incandescent bodies of the most varied construction have been introduced into Diesel engines. These incandescent bodies have not however been as satisfactory as was expected, as, more particularly at low load and idle running and during the starting up of the engine, they could not ensure ignition taking place.

The invention overcomes all disadvantages attending the use in Diesel engines of oils which are difficult to ignite, by the provision of a precombustion chamber having at least one partition member which divides the precombustion chamber into a plurality of spaces, said partition member, in addition to being provided with a large central bore located in the direction of the fuel jet, being provided at the edge with a plurality of smaller bores, so that only the finest particles at the edge of the jet are held back and ignited while the core of the jet, that is to say the greater part of the fuel, can pass through the central bore unhindered. By this means, that portion of the introduced fuel mist at the edge of the jet is mixed with the air which passes

through the marginal bores so as to form an ignitable mixture having an optimum mixture ratio and the ignition being thus made certain. In the hitherto known constructions of Diesel engines the entire quantity of the fuel is introduced into the combustion space in a more or less atomised form. In the region of the fuel jet there is thus always present an excess of fuel and consequently there is no mixture present of optimum ignitability. Especially when the engine is being started up and when it is running idle the small quantity of the injected fuel is not properly distributed in the hot air which is present, so that, in spite of the air temperature being artificially raised, no ignition will take place, as the next fuel jet will withdraw too much heat from the fuel and air mixture and no ignitable mixture will result.

Examples of Diesel engines illustrating the principle of the invention are shown in the accompanying drawing, in which

Fig. 1 is a section through a Diesel engine of the usual construction with a precombustion chamber,

Fig. 2 a section through another example of a Diesel engine of the precombustion chamber type embodying the arrangement according to the invention.

In Fig. 1 the dividing up of the jet is effected by a body 3 of cylindrical form and having a central opening, which is disposed in the precombustion chamber so as to divide it into an upper space 1 and a lower space 5. According to the size of the central opening 4 and the distance of the jet separator 3 from the nozzle 2 the dividing up of the fuel jet can be varied to suit the particular fuel. In the precombustion chamber Diesel engine illustrated in Fig. 1 over 70% of the fuel was conducted by the jet separator through the central opening into the lower space. After the jet separator had been mounted in the precombustion chamber, it was found possible to run the engine in a perfectly satisfactory manner, even when running idle for extended periods, with oils which do not ignite readily, for instance coal tar oils and oils from pressure hydrogenation of coals and coal extracts with only a small hydrogen content and of a predominantly aromatic or olefinic nature. The engine started up just as easily and with as little trouble as when running on gas oil. Through the interposition of the jet separator the mixture of the hot air and a portion of the introduced fuel mist was caused to lie in the region of the ignitable mixture. Of prime importance for en-

suring ignition are with the constructional form illustrated the size of the central opening of the jet separator and its distance from the fuel nozzle.

- 5 It thus becomes possible by means of the method according to the invention to make available for use in Diesel engines the low quality and cheap oils which do not readily ignite (coal tars and coal tar oils and the like, also oils from pressure hydrogenation products of coals and coal extracts and the like) and which hitherto have not been suitable for use with such engines, owing to the difficulties with the ignition.

- 10 When the engine is being started up and when it is running idle, that is to say, always when small quantities of fuel are being injected, or when, owing to the low speed of revolution of the pump, the atomisation of the injected fuel jet is insufficient (for instance, with Diesel engines driving vehicles the speed of revolution of the pump varies between $n=250$ and $n=1500$ revolutions per minute), it has been found that in many cases it is of advantage further to subdivide the combustion space or the precombustion chamber by disposing several jet separators one behind the other. By this means it has been found possible, even when the quantities of injected fuel are small, to ensure that in every case the ignition will be satisfactory and the engine will run smoothly. The number of the jet separators and their size and the size of the central opening differs with different types of engines and the various kinds of oil and must be determined from one case to another.

- 35 In Fig. 2, which is a section through a Diesel engine having a cylinder power of about 25 H. P., although it was possible to use oils which do not ignite readily, such as coal tar oils and oils from pressure hydrogenation products of coals and coal extracts quite satisfactorily in all load ranges, smooth running could not be obtained

with this engine. Through the introduction of a second jet separator 6, however, the central opening 7 of which is smaller than the central opening 4 of the jet separator 3, it was found possible to overcome all difficulties and not only to ensure completely satisfactory running of the engine in all load ranges, but also a smooth and undisturbed operation when the engine is running idle.

15 Through the introduction of further jet separators it is thus possible further to improve the running of Diesel engines using oils which do not ignite readily and which can be used successfully in such engines through the provision of a single jet separator.

What I claim is:

In a Diesel engine having a main combustion space and a fuel injection nozzle, a precombustion chamber arranged to receive the fuel from said fuel injection nozzle and communicating with the main combustion space, said precombustion chamber having a plurality of partition members arranged therein so as to lie in the path of the fuel jet from the injection nozzle and divide the precombustion chamber into a plurality of spaces, each of said partition members having a large central aperture located in the path of the fuel jet so as to allow the greater part of the fuel to pass unhindered to the other side of the partition member, the central aperture in each successive partition member being of smaller diameter than that of the central aperture of the partition member nearer the fuel nozzle, so as to hold back progressively larger quantities of fuel particles at the edge of the fuel jet, said partition members having a plurality of smaller apertures in the marginal regions thereof for admitting air to said fuel particles, so as to form therewith a series of ignitable mixtures in the precombustion chamber.

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