No. 883,207. PATENTED MAR. 31, 1908.

C. B. KURTZ.

AIR COOLED GAS ENGINE.

APPLICATION FILED AUG. 27, 1906.

Fig 1

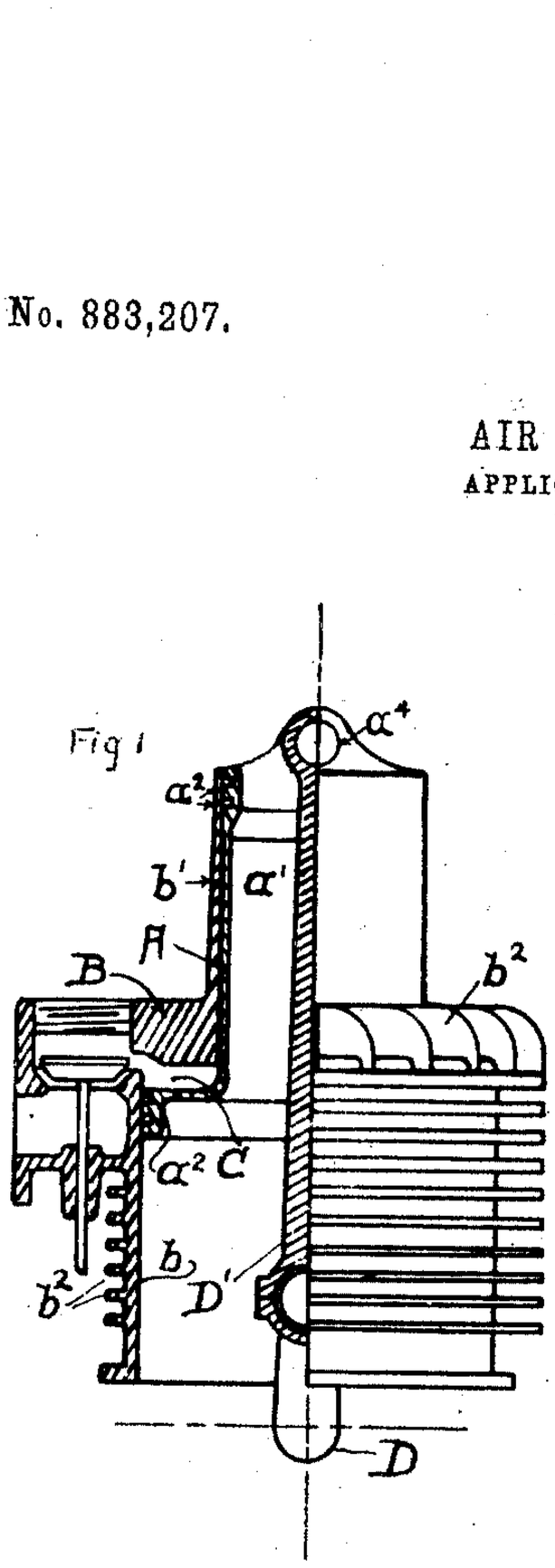


Fig. 2

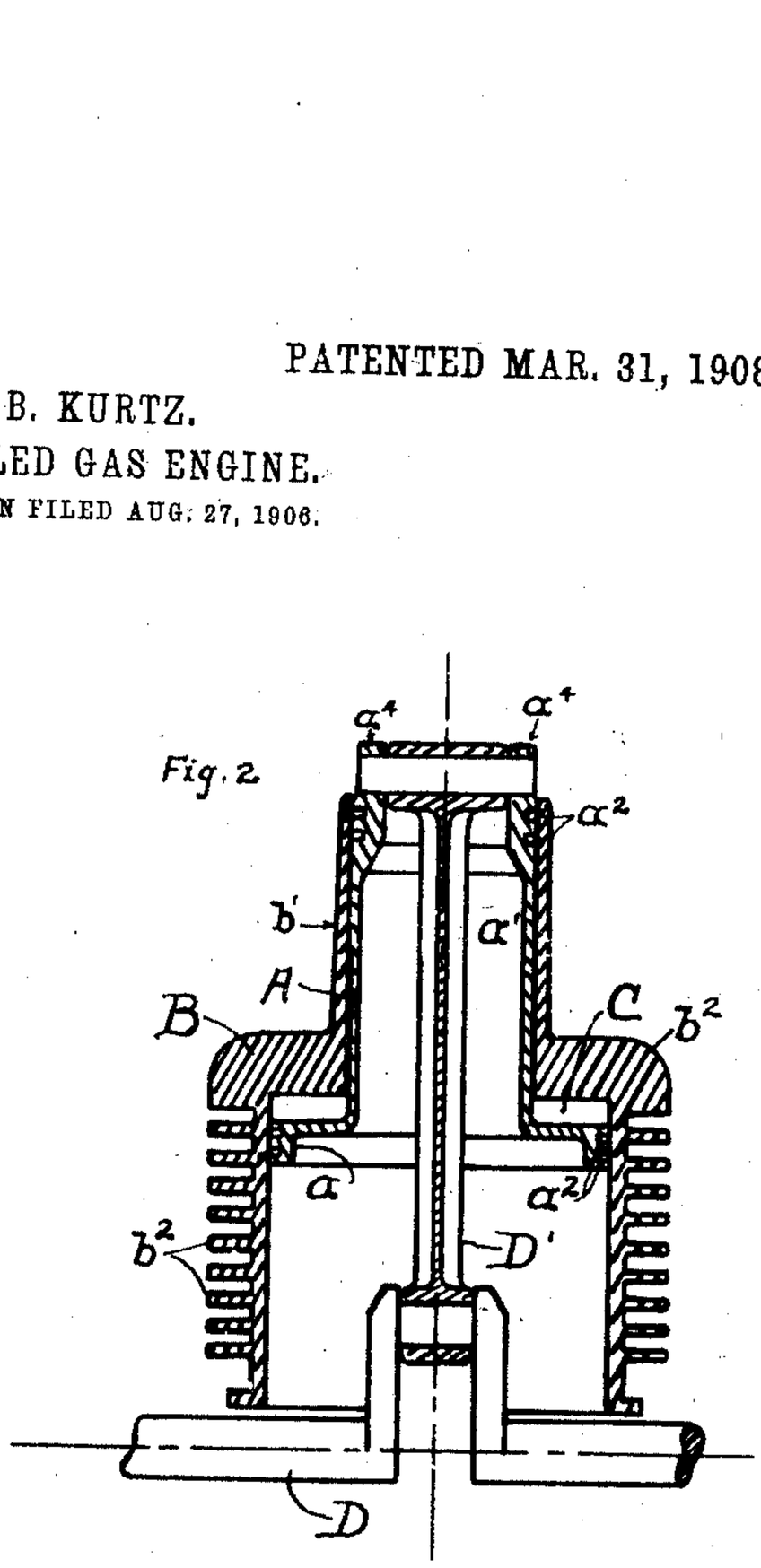


Fig 3

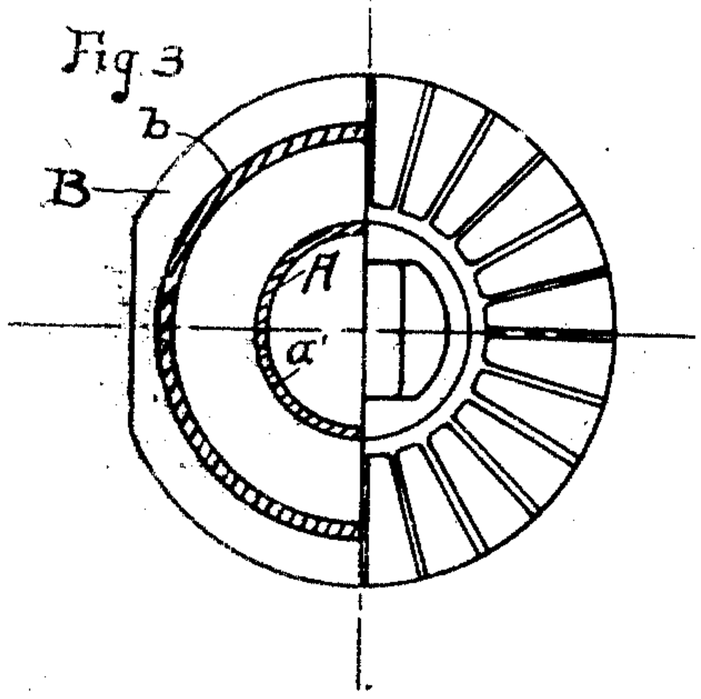
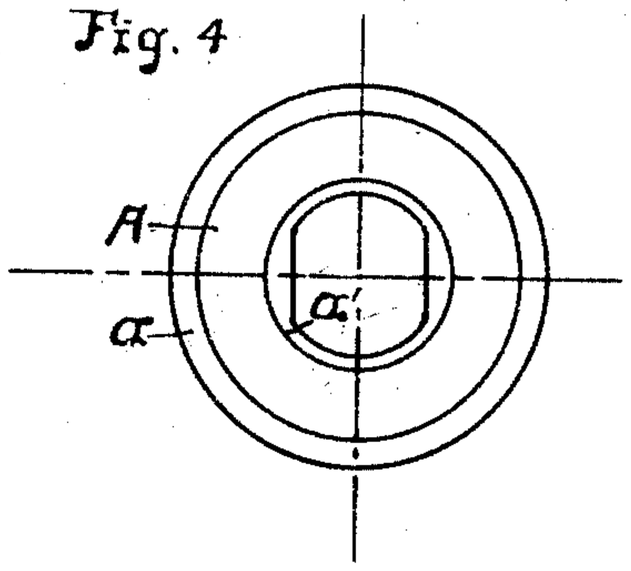


Fig. 4



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AIR-COOLED GAS-ENGINE.

No. 883,207. Specification of Letters Patent. Patented March 31, 1908.

Application filed August 27, 1906. Serial No. 332,127.

To all whom it may concern:

Be it known that I, CYRUS B. KURTZ, a citizen of the United States, resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Air-Cooled Gas-Engines, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle so as to distinguish it from other inventions.

My invention relates to improvements in explosion motors and particularly in explosion motors of the air-cooled type.

The object of my invention is to provide a motor in which not only the cylinder but also the piston may be kept at the proper temperature without the use of any cooling agent other than air.

Another object is the provision of means whereby the engine may be coupled up more closely to the crank-shaft, thus economizing space.

To the accomplishment of these and related ends said invention consists of the means hereinafter fully described and specifically set forth in the claims.

The annexed drawing and the following description set forth in detail certain means embodying the invention, such disclosed means constituting but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing:—Figure 1 represents partly in side elevation, and partly in axial cross-section as cut by a plane at right angles to the line of the crank-shaft, an Otto or four cycle gas-engine, embodying my several improvements; Fig. 2 is an axial cross-section of such engine as cut by a plane passing through the line of the crank-shaft; Fig. 3 is a transverse cross-section taken on a plane passing through line 3—3, Fig. 1; and Fig. 4, is a bottom plan view of the piston which forms a feature of my improved engine.

As has been indicated, I have chosen an Otto or four-cycle engine for the purpose of illustrating my invention. However, it should be fully evident from what follows that such invention is just as readily susceptible of incorporation in a two-cycle as in a four-cycle engine. Neither is it limited to an engine comprising but a single cylinder, as in the case of the one shown, but engines of any number of cylinders, alined or opposed, may be built on the lines of the invention.

From an inspection of the several figures of the drawing it is seen that the cylinder B of my improved engine is open at both ends. Such cylinder, furthermore, instead of being of a uniform bore throughout, comprises two axially alined portions b, b' of different diameters. The exterior surface of the lower portion b of the cylinder, the one of larger diameter, is preferably studded with flanges b^2, or equivalent heat radiating members; and the upper portion may also be similarly provided with flanges, if so desired, although in the particular engine here illustrated their use thereon is deemed unnecessary.

Within the cylinder is reciprocably mounted a hollow piston A, freely open at both ends and comprising two portions a a' respectively fitted to the two portions b b' of the cylinder. Each of these piston portions a a' is formed with a bearing surface provided with piston rings a^2 of the usual design whereby a tight fit is had with the cylinder bore. The obvious result of the construction just set forth is the formation of an annular combustion chamber C of varying volume depending upon the position of the piston within the cylinder. Such combustion chamber C is provided with inlet and exhaust ports for the admission of the charge and the expulsion of the spent gases such as are ordinarily employed in this connection.

By making the piston hollow and open at both ends a circulation of air through the same of such velocity as will be conducive of best results can be maintained by employing an air blast developed by a fan in the usual way or preferably by a blower especially provided for the purpose in connection with each engine cylinder. The interior walls of the piston, or at least those portions thereof which inclose combustion chamber C, may be provided, if desired, with radiator flanges, similar to those used on the outer surface of the cylinder. I am thus enabled to bring the cooling air-blast where most needed, *i. e.* against the hot walls of the piston. This in connection with the cooling of the external cylinder walls in the usual manner renders the air-cooled engine an entire success. Another advantage resulting from the piston construction just referred to is

that the engine can be coupled much more closely than in the standard type of motor. This will be readily apparent from an inspection of the figures, particularly Fig. 2, where it is seen that the base of the cylinder sets almost upon the crank-shaft D. This is made possible by the fact that the upper end of the connecting-rod D′ can be attached anywhere to piston A, such attachment in the case illustrated being made not only beyond the combustion chamber but to ears a^4 formed on the end of the portion of the piston of smaller diameter, which ears are adapted to project entirely without the cylinder as the piston reaches the upper limit of its stroke. Inspection and lubrication of connecting-rod pin *d* is thus greatly facilitated, and its removal made possible without the necessity of disassembling the engine.

In addition to the desirable results just noted as being achieved by the foregoing construction it may be pointed out in conclusion that by having the piston hollow and coupling the connecting rod thereto beyond the combustion chamber not only is a longer throw for given height of engine achieved than has been possible in the present design of engine, but two separated bearing surfaces for the piston are provided, thus decreasing its tendency to cant due to the angularity of the connecting rod and reducing the frictional loss to a minimum. The compactness of the engine will particularly commend it in the case of engines of the opposed type for automobile use, since it will now be possible to construct such engines short enough to be readily accommodated transversely of the automobile frame.

Having thus described my invention in detail, that which I particularly point out and distinctly claim is:

1. In an explosion motor, the combination with a crank-shaft and connecting-rod; of a cylinder open at both ends and comprising two portions having different diameters; and a hollow piston comprising two bearing portions fitted to the two portions of said cylinder, respectively, the portion of said piston having the smaller diameter being adapted in said piston's upper position to project without said cylinder and said connecting-rod being attached to such portion whereby the pin holding said connecting rod may be removed without withdrawing the piston from the cylinder.

2. In an explosion motor, the combination with a crank-shaft and connecting rod; of a cylinder open at both ends and comprising two portions having different diameters; and a hollow piston likewise open at both ends and comprising two bearing portions fitted to the two portions of said cylinder, respectively, the portion of said piston having the smaller diameter being adapted in said piston's upper position to project without said cylinder and said connecting-rod being attached to such portion whereby the pin holding said connecting-rod may be removed without withdrawing the piston from the cylinder.

3. In an explosion motor, the combination with a cylinder open at both ends and comprising two portions having different diameters, of an annular piston fitting in the larger of said cylinder portions, and provided on one side with a tubular extension fitting in the smaller of said cylinder portions, whereby an annular explosion chamber is formed, the inner surface of said larger cylinder portion being exposed to the air save for the portion included within such annular chamber.

4. In an explosion motor, the combination with a cylinder open at both ends and comprising two portions having different diameters; of an annular piston fitting in the larger of said cylinder portions and provided on one side with a tubular extension fitting in the smaller of said cylinder portions, whereby an annular explosion chamber is formed, the inner surface of said larger cylinder portion being exposed to the air save for the portion included within such annular chamber; a crank-shaft located opposite the larger end of said cylinder; and a connecting rod joining said shaft to said piston, the outer end of said connecting rod being attached to the tubular portion of said piston.

5. In an explosion motor, the combination with a cylinder open at both ends and comprising two portions having different diameters, of an annular piston fitting in the larger of said cylinder portions, and provided on one side with a tubular extension fitting in the smaller of said cylinder portions, a crank-shaft located substantially directly against the larger end of said cylinder, and a connecting rod joining said shaft to said piston, the outer end of said connecting rod being attached to the tubular portion of said piston, and the throw of said crank-shaft being sufficient to cause said outer rod end to project without the cylinder at the end of the piston's outward stroke.

Signed by me, this 24th day of August 1906.

CYRUS B. KURTZ.

Attested by—
G. W. SAYWELL,
JNO. F. OBERLIN.