A. I. SANDBO.

ENGINE CYLINDER.

APPLICATION FILED AUG. 31, 1912.

1,142,631.

Patented June 8, 1915.

2 SHEETS—SHEET 1.

Fig. 1.

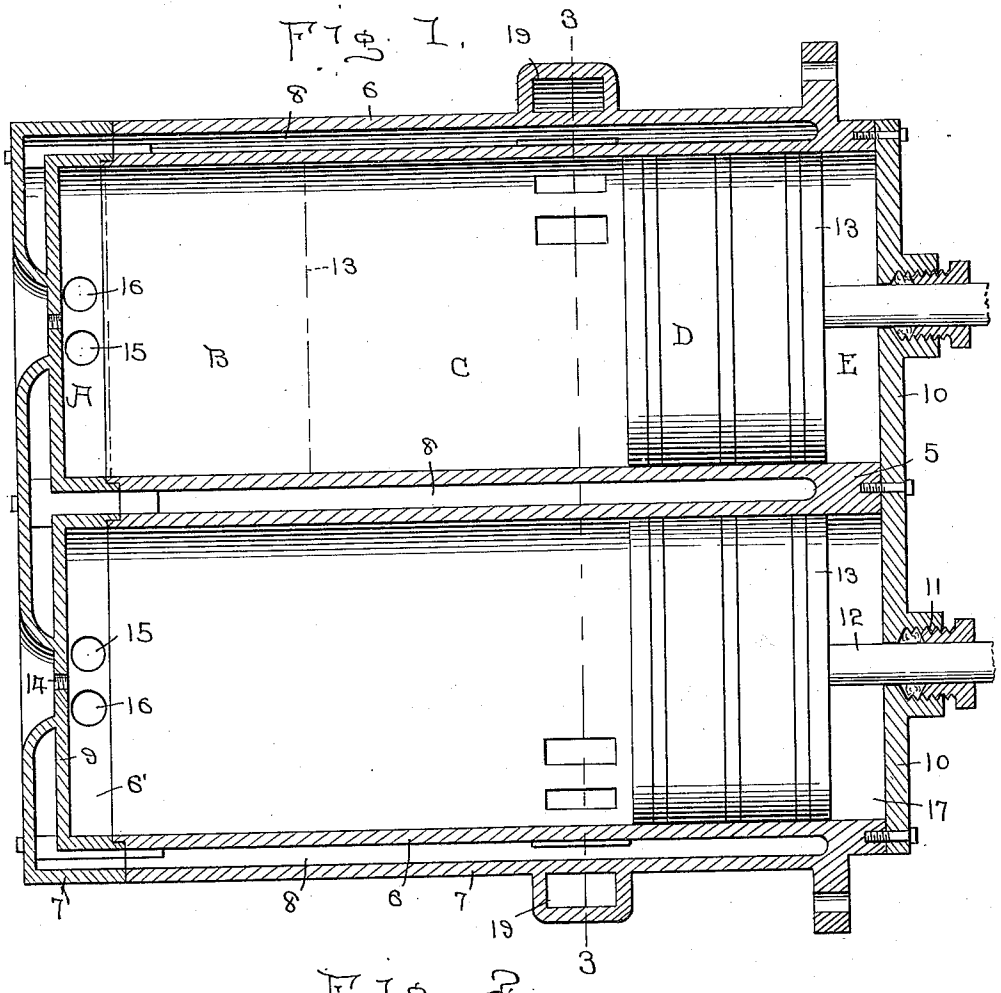
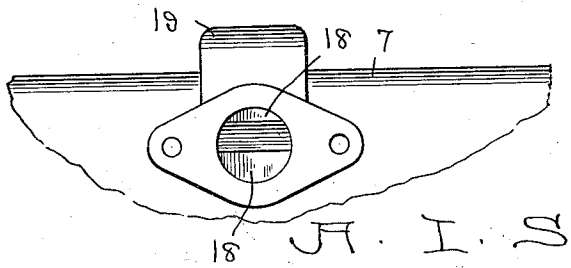


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

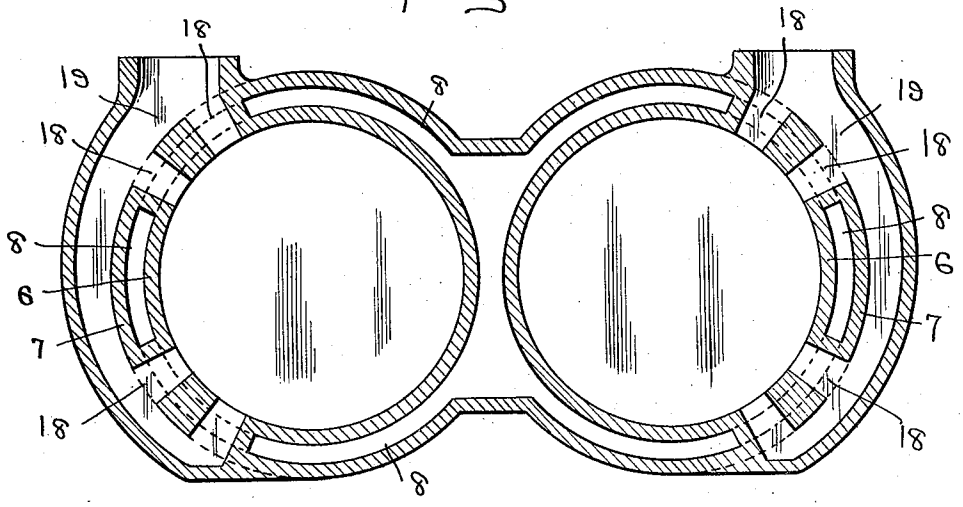
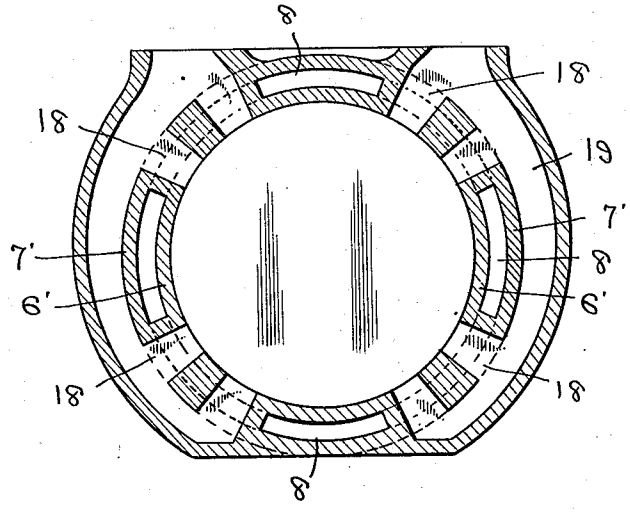


Fig. 4.



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UNITED STATES PATENT OFFICE.

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ENGINE-CYLINDER.

1,142,631. Specification of Letters Patent. Patented June 8, 1915.

Application filed August 31, 1912. Serial No. 718,027.

To all whom it may concern:

Be it known that I, ANTON I. SANDBO, a citizen of the United States, residing at Lansford, in the county of Bottineau and State of North Dakota, have invented certain new and useful Improvements in Engine-Cylinders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to engine cylinders, and it more particularly relates to a power generating mechanism which is applicable either to a two-cycle or four-cycle internal combustion engine.

An object of the invention is to provide one or more engine cylinders of the character hereinafter described, which is susceptible of application in many types of internal combustion engines.

Another object of the invention is to provide an engine cylinder which is self-protecting with regard to the detrimental tendencies of overheating.

Another object of the invention is to provide an engine cylinder of this character with an air cushion, whereby the usual excessive strain and loss of power is eliminated.

Another object of the invention is to provide a cooling jacket or water jacket around the engine cylinder in such relation to the exhaust ports that a considerable amount of heat from the exhausting products of combustion will be absorbed by the fluid within the cooling jacket and thereby distributed around the engine cylinder.

Another object of the invention is to provide an engine cylinder of this character having its exhaust ports remote from the section of the cylinder where explosion of the gas occurs, and thereby avoiding excessive heating of the explosion and compression end of the cylinder.

Other objects and advantages may be recited hereinafter and in the claims.

In the accompanying drawings which form a part of this application, Figure 1 is a longitudinal horizontal section through a pair of integrally formed cylinders, according to my invention, having pistons seated therein. Fig. 2 is a plan view of a fragmental portion including the outlet end of the exhaust duct. Fig. 3 is a vertical sectional view on line 3—3 of Fig. 1, and, Fig. 4 is a similar view of a single cylinder such as would be more applicable to a two-cycle engine.

Referring to the drawings in which similar reference characters designate corresponding parts throughout the several views, a main casting 5 constitutes the major portion of the two cylinders 6, inclosed within an outer casing or tubular body 7 which is spaced apart from the cylinders so as to provide a water space 8 which extends entirely around and between said cylinders. Cylinder heads 9 and 10 are secured on the opposite ends of the main casting, and the cylinder heads 9 are provided with an outer casing 7′ which joins onto the outer casing 7, while the space between the cylinder heads 9 and casing 7′ communicates with and forms a substantial part of the water jacket 8. These cylinder heads 9 also form a substantial part of the cylinders 6, being fixedly united therewith and having cylindrical flanges 6′, the interior surfaces of which register with those of the cylindrical inner surfaces of the castings 5. The integrally united cylinder heads 10 are provided with ordinary stuffing boxes 11 through which extend piston rods 12 from the pistons 13. Although these pistons are of ordinary construction, it is deemed advisable to describe and claim my invention in connection with the same, for the purpose of rendering the description and claims complete and lucid.

In one end of each cylinder is the usual threaded aperture 14 in which a sparking device (not shown) may be seated. An inlet port 15 and an outlet port or supplemental exhaust port 16 are provided in the combustion end of each cylinder, and any proper means (not shown) may be employed for opening and closing these ports 15 and 16 at the proper moment. No ports are provided at the end of the cylinder where the working stroke of the piston terminates, and a clearance space 17 of considerable extent is provided between the cylinder head 10 and the piston 13, so that air is compressed within the space 17, so as to provide an air cushion at the stroke terminus.

The pistons 13, in Fig. 1, are shown at their stroke terminus or at their end of travel after the working stroke, the dotted line position of one of the pistons indicating the starting point thereof. It may be seen,

therefore, that each engine cylinder is divided into five zones, viz: the explosion zone A, the starting zone B, the zone of travel C, the finish zone D and the air cushion zone E. The zone A is the portion of the cylinder in which the explosion takes place, the piston being approximately in its dotted line position, that is in zone B, the zone C is the portion of the cylinder between the two extreme alternative positions of the piston, the zone D is the portion of the cylinder in which the piston comes to rest after its working stroke, and the zone E is the portion of the cylinder in which air is compressed by the piston, to form the air cushion. Between the two extreme alternative positions of the piston, or within the zone C are a series of main exhaust ports 18, an exhaust duct 19 being formed on the outer casing 7 and extending on a radial plane at right angles to the axis of the cylinders from a point between the bottom thereof to the top. The exhaust ports 18 communicate with the exhaust ducts 19, said ports extending through the cooling jacket and in non-communicating relation thereto. Two series of the ports 18 are oppositely disposed in the main casting 5, and extend through the supports which connect the outlying portions of the cylinders with the casing or tubular body 7 for a purpose which will hereinafter be made clear.

Referring to Fig. 4, it is seen that the ports 18 are arranged in pairs which are oppositely disposed to each other, said pairs being equally spaced around the cylinder 6'. By this arrangement, it will be seen that when the heated products of combustion pass out through the ports 18 into the ducts 19, the adjacent peripheral portion of the cylinder will be uniformly heated thereby, so that the expansion thereof will be uniform. I thereby avoid curving of the cylinder and consequent binding of the piston therein. Similarly, where two cylinders are united as in Figs. 1 and 3, the heating and consequent expansion is equalized at the opposite sides of the cylinder casting.

In operation, assuming that a cylinder of this character is properly connected and combined with the essential adjuncts, for constituting a complete engine, the explosion of gas takes place within the zone A while the piston is in the zone B; the piston then passes through the zone C, crosses the ports 18 and comes to rest in the zone D. As soon as the ports 18 have become closed by the piston 13, in its working stroke, said piston begins to compress air within the zones D and E, and this compression of air continues until the piston has reached its stroke terminus or position of rest, as shown in full lines. The air cushion caused by this working stroke of the piston, compensates for the inertia of the piston, so as to relieve the engine shaft and connecting rod from the excessive strain which is usually inevitable in engines of ordinary construction. This air cushion also assists the engine shaft in starting the piston back on its exhaust stroke. However, in this improved engine, the products of combustion begin to exhaust before the piston reaches the end of its working stroke, or as soon as the piston begins to uncover the ports 18, and the exhaust continues until the ports 18 are again covered by the piston in returning to its initial position. During this return stroke of the piston, the remaining products of combustion are exhausted through the port 16, whereupon the piston again leaves the zone B and travels through the zone C, in making its suction stroke. In this connection, it may be seen that the inlet ports 15 are relatively small, so that when the piston is making its suction stroke, it tends to create a partial vacuum within the cylinder so that some of the exhaust fluid is sucked back through the ports 18, and when the piston starts back on its compression stroke, this exhaust gas is again forced out through the ports 18, so that the combustible gas is prevented from escaping through the ports 18. The piston continues its compression stroke until it reaches the zone B, whereupon combustion of gas takes place, and the piston begins its working stroke, which it completes when it reaches the zone D.

By the construction described in the foregoing, it will be seen that the engine cylinder is quickly relieved of the greater portion of the products of combustion through the ports 19, so that the power required for expelling the comparatively small remaining quantity of the products of combustion, is reduced to the minimum. It will be seen that products of combustion are drawn back through the ports 18 during the movement of the piston from the zone C toward the zone B; and when the piston returns from the zone B and crosses the ports 18 into the zone D, a portion of the combustion gas is compressed in the zone E. The compression of this combustion gas increases the heat thereof, and some of this heat is absorbed by the end of the cylinder and the cylinder head, so that the heating at this end of the cylinder and of the explosion end thereof and of the exhaust portion within the zone C is approximately equal, which results in approximately equal expansion and compression of all of the different parts of the cylinder; thereby greatly increasing the durability and efficiency thereof.

It will be seen that I have provided an engine of this character which is fully capable of attaining the foregoing objects, and in a thoroughly practical and efficient manner.

I do not limit my invention to the exact

details of construction, combination and arrangement of parts as herewith described and illustrated, but my invention may only be limited by a reasonable interpretation of the claims.

I claim:

1. A device of the character described comprising a pair of spaced cylinders, an outer casing formed integral with said cylinders at one end thereof and surrounding the same, said cylinders and outer casing being spaced apart throughout the remainder of their length, heads for the cylinders, a downwardly extending annular flange projecting from each of said heads and formed with a groove on the inner peripheral edge thereof, an outer casing surrounding said heads and having portions thereof extended inwardly and integrally joined thereto near the central portions thereof, an annular flange extended downwardly from said outer casing, an upstanding annular tongue extended from the inner peripheral edge of the upper end of each of the cylinders and adapted to extend into said annular groove of its respective head, the flange of said casing of the heads being adapted to rest upon the peripheral edge of the casing of the cylinders, and means projecting from the cylinders through the casing of the heads whereby the heads are held tightly upon the cylinders.

2. A device of the character described comprising a pair of spaced cylinders, an outer casing formed integral with said cylinders at one end thereof and surrounding the same, said cylinders and outer casing being spaced apart throughout the remainder of their lengths, a head for each of the cylinders, a downwardly extending annular flange projecting from each of said heads and formed with a groove on the inner peripheral edge thereof, an upstanding annular tongue extended from the inner peripheral edge of the upper end of each of the cylinders and adapted to interfit with said annular groove of its respective head, an outer casing surrounding said heads and having portions thereof indented inwardly and integrally joined to the respective heads near the central portions thereof, an annular flange extended downwardly from said outer casing, the flange of said casing of the heads being adapted to rest upon the peripheral edge of the casing of the cylinders, and securing straps arranged upon the exterior walls of the cylinders and projecting through the casing of the heads for securing the heads upon the cylinders.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANTON I. SANDBO.

Witnesses:
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L. C. CARSON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."