

Nov. 24, 1925.

1,562,555

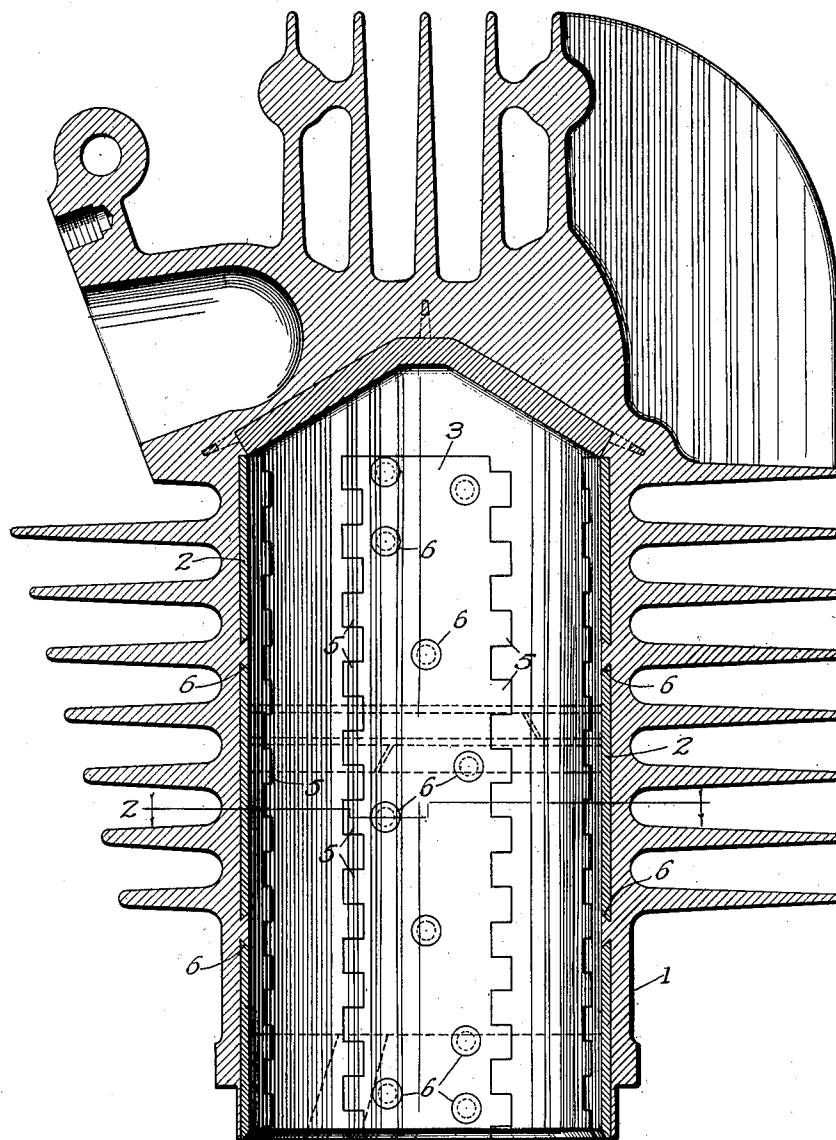
W. S. HARLEY

CYLINDER

Filed June 5, 1919

2 Sheets-Sheet 1

Fig. 1



Inventor
William S. Harley

By *Edwin B. H. Tower, Jr. Atty.*

Nov. 24, 1925.

1,562,555

W. S. HARLEY

CYLINDER

Filed June 5, 1919

2 Sheets-Sheet 2

Fig. 2.

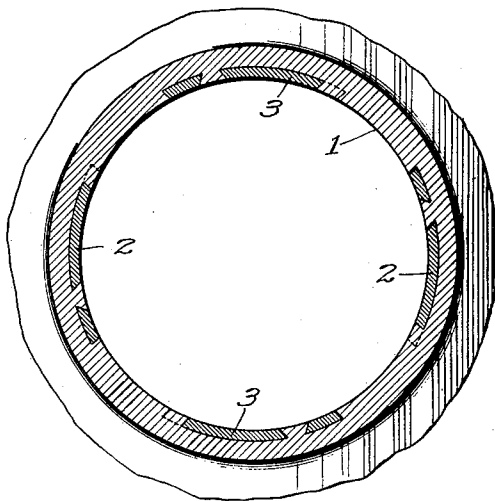


Fig. 3.

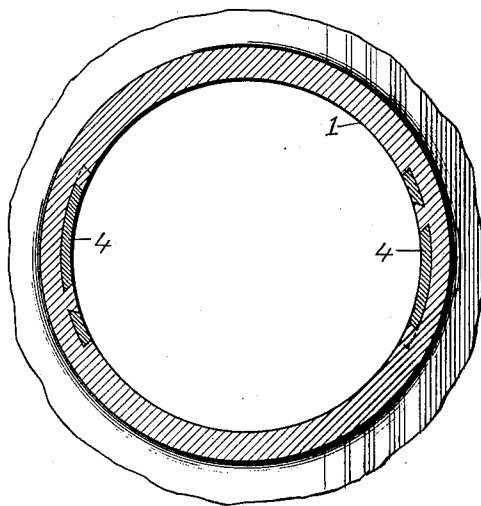


Fig. 4.

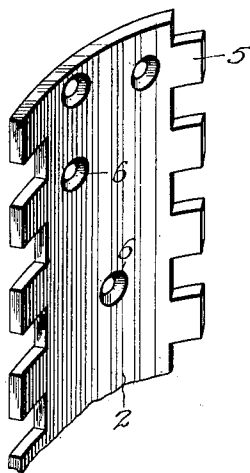


Fig. 5.

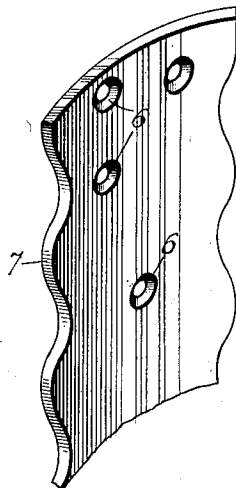
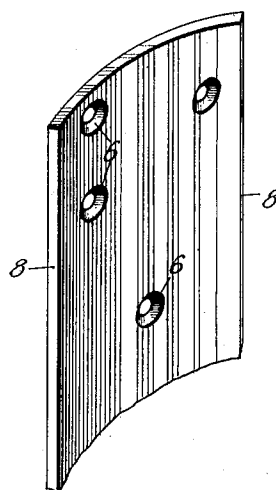


Fig. 6.



Inventor
William S. Harley
By: Edwin B. H. Town, Jr., Atty.

UNITED STATES PATENT OFFICE.

WILLIAM S. HARLEY, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO HARLEY-DAVIDSON MOTOR CO., OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

CYLINDER.

Application filed June 5, 1919. Serial No. 302,006.

To all whom it may concern:

Be it known that I, WILLIAM S. HARLEY, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Cylinders, of which the following is a specification.

This invention relates to cylinders.

One of the objects of this invention is to make a cylinder of a metal of high thermal conductivity.

A further object is to provide a cylinder of high radiating efficiency.

A further object is to make a cylinder having a large active radiating surface.

A further object is to make a light weight cylinder.

A further object is to minimize wear.

A further object is to reinforce the cylinder at the points where the greatest wear comes.

A further object is to produce a composite cylinder in such a manner that when the cylinder expands a metal to metal contact will be maintained whereby the maximum thermal conductivity will be maintained.

A further object is to provide a reinforce for a cylinder which will be securely anchored in place.

A further object is to provide a reinforce of such configuration that there will be a minimum possibility of a leak along the line of contact between the sides of the reinforce and the cylinder body.

A further object is to so arrange the reinforcing means that strains are properly distributed in the cylinder body.

Embodiments of the invention are shown in the accompanying drawings.

Fig. 1 is a longitudinal sectional view of a gasoline motor cylinder showing in dotted lines the position of the piston therein.

Fig. 2 is a transverse sectional view of the structure shown in Fig. 1, taken along the line 2—2 in Fig. 1.

Fig. 3 is a view similar to Fig. 2, showing a modified arrangement of reinforcing members.

Fig. 4 is a detail of the reinforcing member shown in Figs. 1, 2 and 3.

Figs. 5 and 6 show further forms of reinforcing members.

Fig. 1 shows a section of a cylinder composed of aluminum. Aluminum is used because of its high thermal conductivity. This property is utilized by employing long radiating fins, thereby securing a large effective radiating surface. The effective use of large radiating surfaces is possible when a metal of high thermal conductivity is used as the heat is readily transmitted to the extreme tips of the radiating fins, thereby making all of the radiating surface effective in securing proper cooling of the cylinder.

Fig. 1 further shows a section of a cylinder having a main or body portion 1, composed of aluminum and reinforced by a plurality of inserts 2 and 3, of harder wear-resisting material. These inserts are distinct and separate from each other, a section through the cylinder showing about equal alternate widths of reinforces and aluminum, as may be seen from Fig. 2.

The lateral thrust from the piston on its explosion stroke is toward one side of the cylinder and on its compression stroke toward the other side of the cylinder in a plane through the center line of the cylinder and at right angles to the crank shaft. This lateral thrust is borne successively by the two reinforces or inserts 2—2 on diametrically opposite sides of the cylinder.

Fig. 2 shows four of these reinforces arranged at 90 degree points around the inner portion of the cylinder. The pair of reinforces 3—3 are adapted to take up any wear coming upon the sides of the cylinder, and the reinforces 2 are adapted to take up the wear caused by the thrust of the piston previously described.

Fig. 3 is a sectional view similar to Fig. 2, showing a construction of cylinder in which there are two reinforces 4—4, corresponding to the reinforces 2—2 Figs. 1 and 2. In some cases it may be found desirable to provide only these two reinforces as they carry the main thrust of the piston.

Fig. 4 is a detail of the form of reinforce shown in Figs. 1, 2 and 3. This reinforce comprises a main body portion 2, having

outwardly projecting lugs or ears 5, provided on each side thereof and arranged in a staggered relation to secure proper anchoring of the reinforce. Additional means for anchoring the reinforce are provided by means of the countersunk holes 6.

Fig. 5 shows a reinforce similar to that shown in Fig. 4, except for the shape or configuration of the side edges thereof. These side edges are formed of a plurality of scallops forming a fluted or wave-like edge 7 for the reinforce.

Fig. 6 is a further form of reinforce in which the side edges 8 are straight.

In all of the forms of reinforcing or wear resisting members, the side edges are bevelled so that the surrounding aluminum has a gripping action thereon.

In making the cylinder the reinforces are properly positioned and cast in the aluminum cylinder, the aluminum passing through the countersunk holes and around the bevelled edges and securely anchoring the reinforces in place. Subsequently the aluminum cylinder and reinforces, or inserts, are machined out to the proper cylinder bore. This provides a uniformly smooth inner surface for the composite cylinder.

In the form of reinforce shown in Figs. 4 and 5, any slight opening that might occur between the edges of the reinforce and the cylinder body proper, due to unequal expansion, would offer a tortuous path to any leaking gases which might pass by the piston.

By having the reinforces of relatively small lateral dimensions as compared with the inner periphery of the cylinder, such reinforces will not tend to pull away from the cylinder body, but will move outwardly with the cylinder body as the cylinder expands, although the reinforces and cylinder may have different coefficients of expansion. This insures a cylinder of high thermal conductivity and unitary construction in which the strains are properly distributed in the cylinder body.

By forming the cylinder of a metal of high thermal conductivity and by providing wide radiating fins, a cylinder of high radiating efficiency is produced.

It is to be understood that where aluminum is referred to herein, that it is intended to include also aluminum alloys.

Obviously other structures may be devised which will embody the invention herein set forth.

What I claim is:

1. An aluminum cylinder having wear resisting inserts cast integral with the cylinder on opposite sides thereof to take the side thrust of the piston due to the crank connection, each independent insert having an extensive edge contacting directly with the aluminum body whereby an extended area is afforded for holding the insert in position and for dissipating heat.

2. An aluminum cylinder having wear resisting inserts cast integral with the cylinder on opposite sides thereof to take the side thrust of the piston due to the crank connection, there being substantial longitudinally extending portions of the aluminum body exposed within the cylinder.

3. An aluminum cylinder having a small number of relatively large wear resisting longitudinally extending inserts cast integral with the cylinder on opposite sides thereof to take the side thrust of the piston due to the angularity of the crank connection, each of said inserts having indented edges for engagement with the aluminum body for holding the insert in position and for dissipating the heat.

4. An aluminum cylinder having a wear resisting insert cast integrally therewith, said insert having countersunk openings for engagement by the aluminum forming the wall of the casing to securely anchor the inserts in position.

5. An aluminum cylinder having a pair of wear resisting inserts cast integrally therewith on opposite sides thereof and extending substantially the length of the cylinder to take the side thrust of the piston due to the crank connection, each of said inserts having irregular beveled edges for engagement by the aluminum body to securely anchor the same in position.

6. An aluminum cylinder having wear resisting inserts cast integrally therewith and extending longitudinally thereof, each of said inserts having irregular beveled edges and countersunk openings for engagement by the aluminum forming the wall of the casing to securely anchor the inserts in position.

In witness whereof, I have hereunto subscribed my name.

WILLIAM S. HARLEY.