

Aug. 25, 1931.

R. S. MOORE

1,820,475

GAS ENGINE

Filed April 20, 1929

3 Sheets-Sheet 1

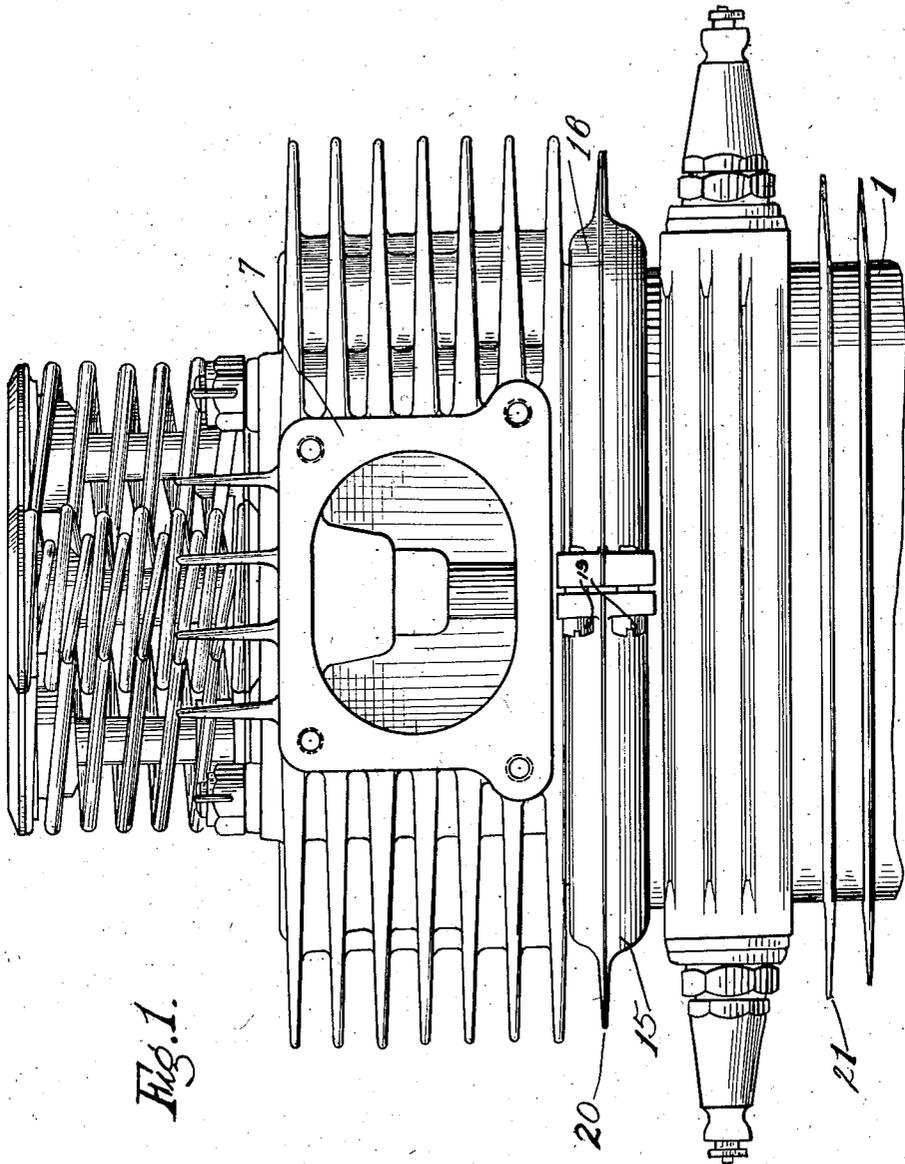


Fig. 1.

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Fig. 2.

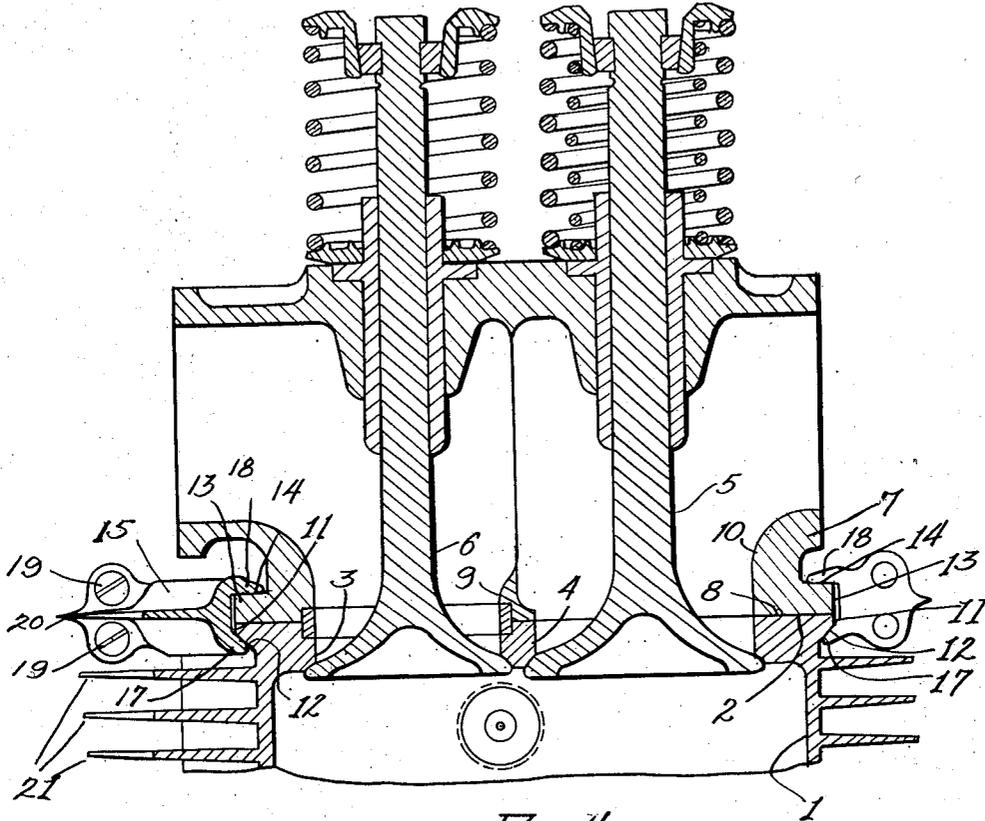
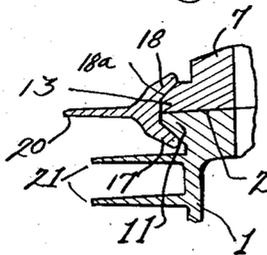


Fig. 4.



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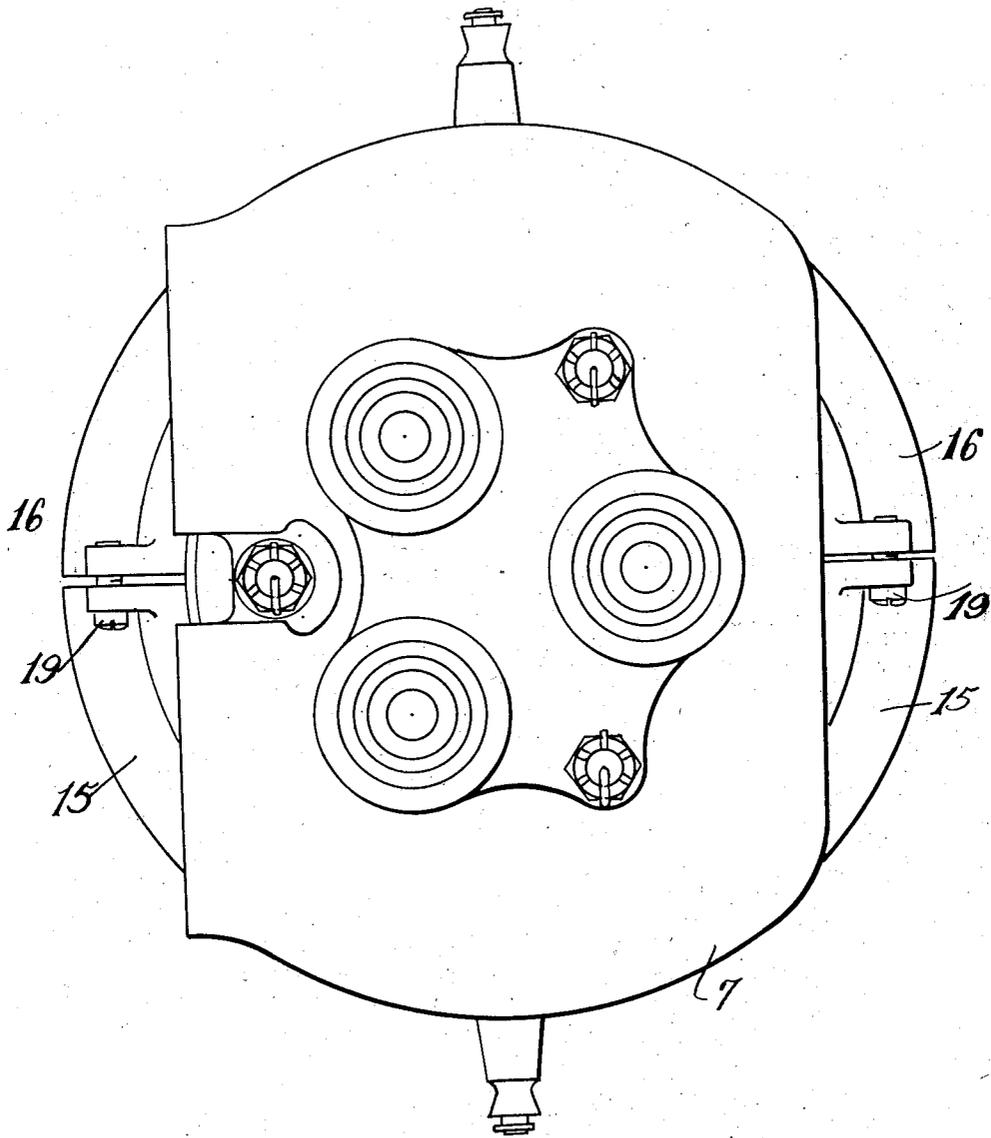
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Fig. 3.



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UNITED STATES PATENT OFFICE

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GAS ENGINE

Application filed April 20, 1929. Serial No. 356,713.

The invention relates to new and useful improvements in gas engines and more particularly to the construction of the head and attaching means therefor.

There are well known advantages derived from the use of an aluminum alloy head in connection with a steel cylinder in a gas engine construction. Considerable difficulty has been experienced in obtaining an efficient clamping means for securing the head to the cylinder due to the difference in the expansion and contraction of the metals under heat changes. An object of the invention is to provide an attaching means for a head of the above character whereby a very tight connection may be obtained between the head and the cylinder under all conditions of expansion and contraction.

A further object of the invention is to provide an attaching means for a cylinder and head of the above character which is so constructed that on expansion of the metal the parts will be more firmly seated in contact with each other.

In the drawings:—

Fig. 1 is a sectional view through the outer end of a cylinder and head therefor showing the improved attaching means for securing the head to the cylinder.

Fig. 2 is a side view of the same.

Fig. 3 is a plan view of the parts shown in Fig. 1.

Fig. 4 is a detail showing a slightly modified form of clamping means.

The invention is directed to a clamping means for securing an aluminum alloy head to a steel cylinder in a gas engine. It is well known that the aluminum head radiates heat quickly and that the heat which is generated in the cylinder is thrown out and radiated through the aluminum head. A great deal of difficulty has been experienced in perfecting the contact between the head and the cylinder so that a tight contact will be obtained at all times. Unless this perfect contact is secured the cylinder will overheat and the function of the aluminum head will be useless. In order to secure the necessary contact between the head and the cylinder to produce this desired radiation of the heat generated in the

cylinder out through the aluminum head, I have formed the steel cylinder with a face extending all the way across the cylinder, which is smooth and lies in a single plane. Within the limits of the cylinder end valve openings are provided. Extending all the way around the cylinder is a projecting ledge and the seating face extends to the extreme outer edge of this projecting ledge. The under face of the projecting ledge is machined so as to provide an accurate clamping face. The cylinder head at its lower end is also provided with a seating face extending all the way across which is smooth and lies in a single plane. This seating face is provided with openings to accommodate the valves. All the way around the seating face is a projecting ledge and the seating face extends to the extreme outer edge of the projecting ledge. The upper face of the projecting ledge is machined so as to form an accurate clamping face.

The two seating faces of the cylinder and the head are machined and scraped until they are very accurate so that when one is placed on the other there is a close contact between the faces throughout the entire extent thereof. This may be referred to as a poultice head due to the intimate contact between the upper end of the cylinder and the lower end of the head.

The head is secured to the cylinder by an annular clamping means formed of steel which is accurately machined so as to provide clamping members adapted to make contact with the clamping faces of the respective ledges. This clamping means is in the form of segments of a ring which are secured together by clamping bolts.

Referring more in detail to the drawings, the invention is shown as applied to a gas engine, which includes a cylinder 1 made of steel and having a seating face 2 which extends all the way across the end of the cylinder. This seating face is smooth and lies in a single plane. The seating face is bored so as to provide openings 3 and 4 at the lower portions of which are the valve seats. These openings are for the valves. There is a valve 5 in the opening 4 and a valve 6 in

the opening 3. The head of the cylinder indicated at 7 in the drawings is made of an aluminum alloy. The under face is provided with a seat 8 which extends all the way across. This face is smooth and lies in a single plane. The face is provided with openings 9 and 10 to accommodate the valves 5 and 6. The cylinder is provided with a projecting ledge 11 which extends all the way around the cylinder and the seating face extends to the extreme outer edge of the ledge 11. The under face 12 of this ledge 11 is machined so as to provide a clamping face which inclines outwardly and upwardly as shown in Fig. 1 of the drawings. The cylinder head 7 is provided with a projecting ledge 13. The seating face 8 extends to the extreme outer edge of this ledge. The upper face 14 is machined to form a clamping face, which as shown in Fig. 1, is horizontal or at right angles to the longitudinal axis of the cylinder.

The aluminum head is secured to the cylinder by an annular clamping device consisting, as shown, of segments 15 and 16. This annular clamping device is made of the best steel machined so as to provide a clamping member 17, the face of which is inclined to correspond to the inclination of the face 12 on the ledge 11. It is also formed with a clamping member 18 which is likewise shaped so as to engage the clamping face 14 on the projecting ledge 13. This clamping member 18 makes contact with the clamping face 14 throughout the entire extent of its overlap and the clamping member 17 makes contact with the clamping face 12 throughout substantially its entire extent of overlap. The two clamping members 17 and 18 are formed integral with a connecting shank portion which extends outside of the ledges so that there is no clamping means passing through the ledges. The two segments 15 and 16 are secured together by clamping bolts 19, 19.

After the parts have been properly constructed the head is placed on the cylinder and the annular clamping segments put in place and joined by the clamping bolts. By drawing up on the bolts the diameter of the annular clamping device is decreased and this brings the clamping members into firm gripping contact with the clamping faces on the seating ledges. Thus it is that the seating face of the head is drawn into very tight contact with the seating face on the cylinder.

It will be noted from Fig. 1 of the drawings that the expansion of the head in a lateral direction is permitted without disturbing the clamping means. The expansion of the cylinder in a lateral direction will force the upper clamping member into a more firm contact with the ledge on the head due to the inclination of the ledge on the

cylinder and the inclination of the face of the lower jaw and lower clamping member. Thus it is that the expansion of the metals draws the head into closer contact with the cylinder. The expansion of the metals in a longitudinal direction will, of course, cause the seating faces to be more firmly united. Thus it is that under the expansion of the metals due to the heat changes the parts are brought into more intimate contact, and as the heat generated in the cylinder increases the contact between the head and the cylinder is made more perfect and thus the heat of the cylinder is more efficiently and more quickly radiated out through the cylinder head.

In Fig. 4 of the drawings, I have shown a slightly modified form of clamping means in that the upper clamping member 18 has its clamping face 18a inclined and the clamping face of the ledge 13 is also inclined to correspond to the inclination of the clamping member. Both clamping members are inclined and the clamping faces with which they make contact are inclined. These inclinations are in the opposite direction and so disposed that the expansion of the head and the cylinder both laterally and longitudinally will increase the firm grip of the clamp on said parts, thus bringing the seating faces into a more intimate relation to each other. This annular clamping device is provided with a projecting radiating rib 20 similar to the radiating rib 21 on the cylinder.

It is obvious that minor changes in the details of construction and the arrangement of the parts may be made without departing from the spirit of the invention as set forth in the appended claims.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A gas engine including in combination a steel cylinder having its outer end closed except for the inlet and exhaust openings and terminating in a seating face lying in a single plane and having a projecting ledge extending all the way around the cylinder with a clamping face at the under side thereof, an aluminum alloy head for said cylinder having its lower end terminating in a seating face lying in a single plane and having a projecting ledge all the way around said lower end with a clamping face at the upper side thereof, one of said clamping faces being inclined, said seating faces extending to the outer edges of said ledges and making close contact with each other throughout the entire extent of said faces, and an annular clamping device for securing said head to said cylinder having members conforming to the clamping faces and making contact therewith throughout substantially their entire extent.

2. A gas engine including in combination a steel cylinder having its outer end closed except for the inlet and exhaust openings and terminating in a seating face lying in a single plane and having a projecting ledge extending all the way around the cylinder with a clamping face at the under side thereof, an aluminum alloy head for said cylinder having its lower end terminating in a seating face lying in a single plane and having a projecting ledge all the way around said lower end with a clamping face at the upper side thereof, one of said clamping faces being inclined, said seating faces extending to the outer edges of said ledges and making close contact with each other throughout the entire extent of said faces, and an annular clamping device formed of segments and having clamping bolts for securing said segments together, each segment being provided with members conforming to the clamping faces and making contact therewith throughout substantially their entire extent.

3. A gas engine including in combination a steel cylinder having its outer end closed except for the inlet and exhaust openings and terminating in a seating face lying in a single plane and having a projecting ledge extending all the way around the cylinder with a clamping face at the under side thereof, an aluminum alloy head for said cylinder having its lower end terminating in a seating face lying in a single plane and having a projecting ledge all the way around said lower end with a clamping face at the upper side thereof, one of said clamping faces being inclined, said seating faces extending to the outer edges of said ledges and making a close contact with each other throughout the entire extent of said faces, and an annular clamping device formed of segments and having clamping bolts for securing said segments together, each segment consisting of a single integral member having a portion conforming to the clamping face on the head and overlying the same and a portion conforming to the clamping face on the cylinder and overlying the same.

In testimony whereof, I affix my signature.
ROBERT SHERMAN MOORE.

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