July 31, 1934. A. S. WALKER 1,968,110

INTERNAL COMBUSTION ENGINE

Filed Feb. 29, 1932 3 Sheets-Sheet 1

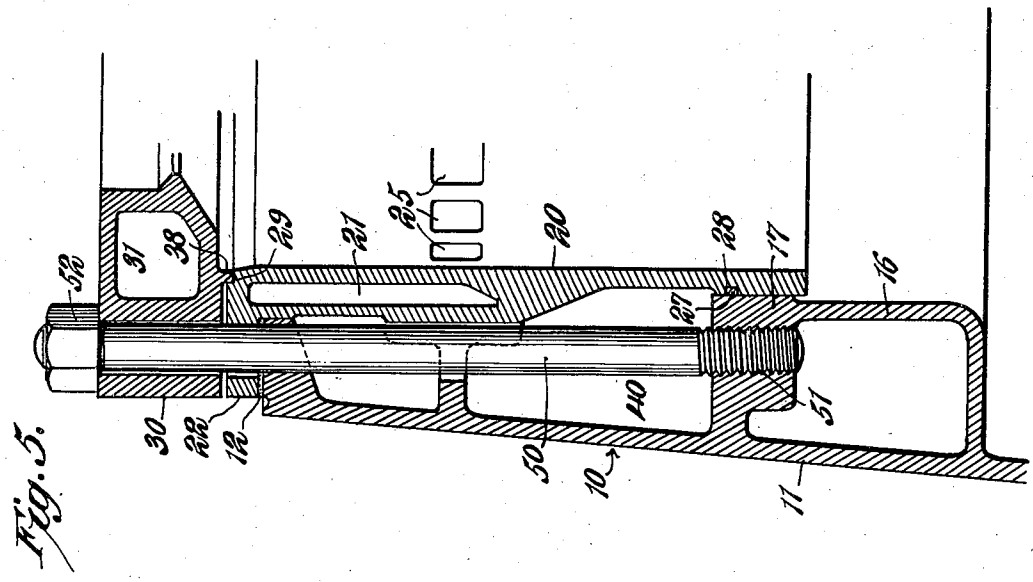


Fig. 5.

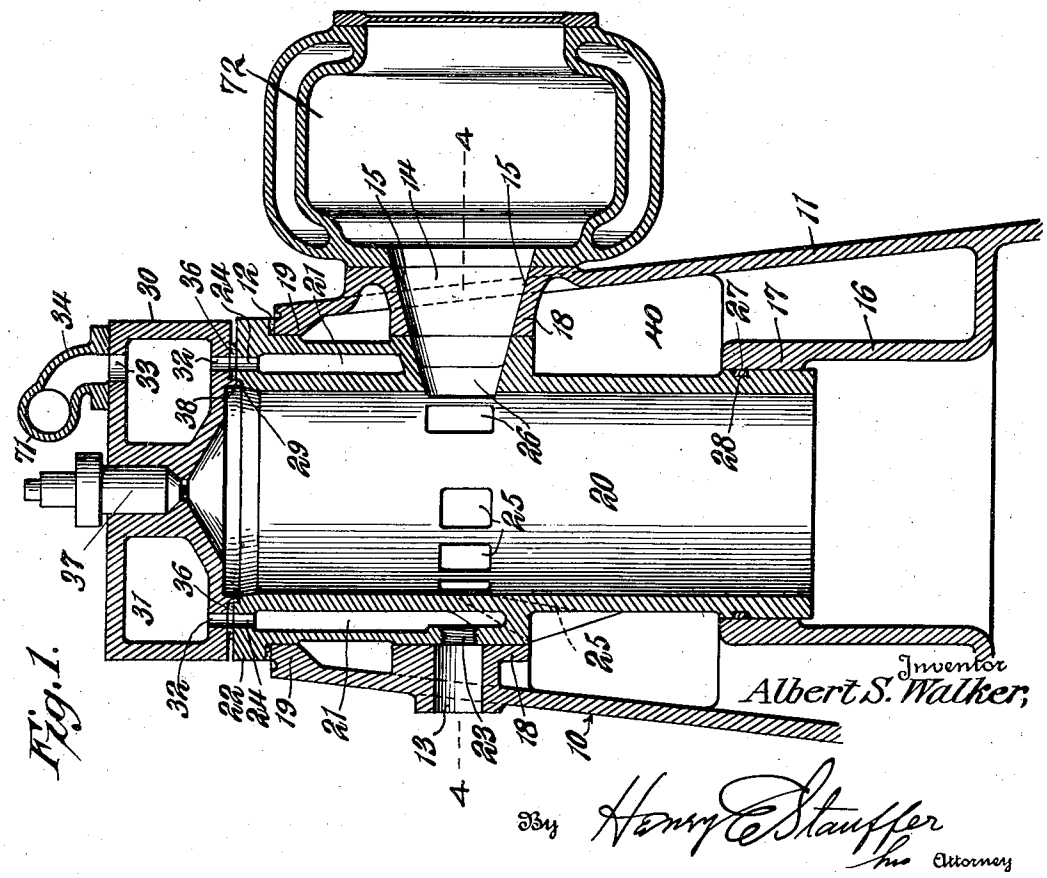


Fig. 1.

Inventor
Albert S. Walker,
By Henry C. Stauffer
his Attorney

July 31, 1934. A. S. WALKER 1,968,110

INTERNAL COMBUSTION ENGINE

Filed Feb. 29, 1932 3 Sheets-Sheet 2

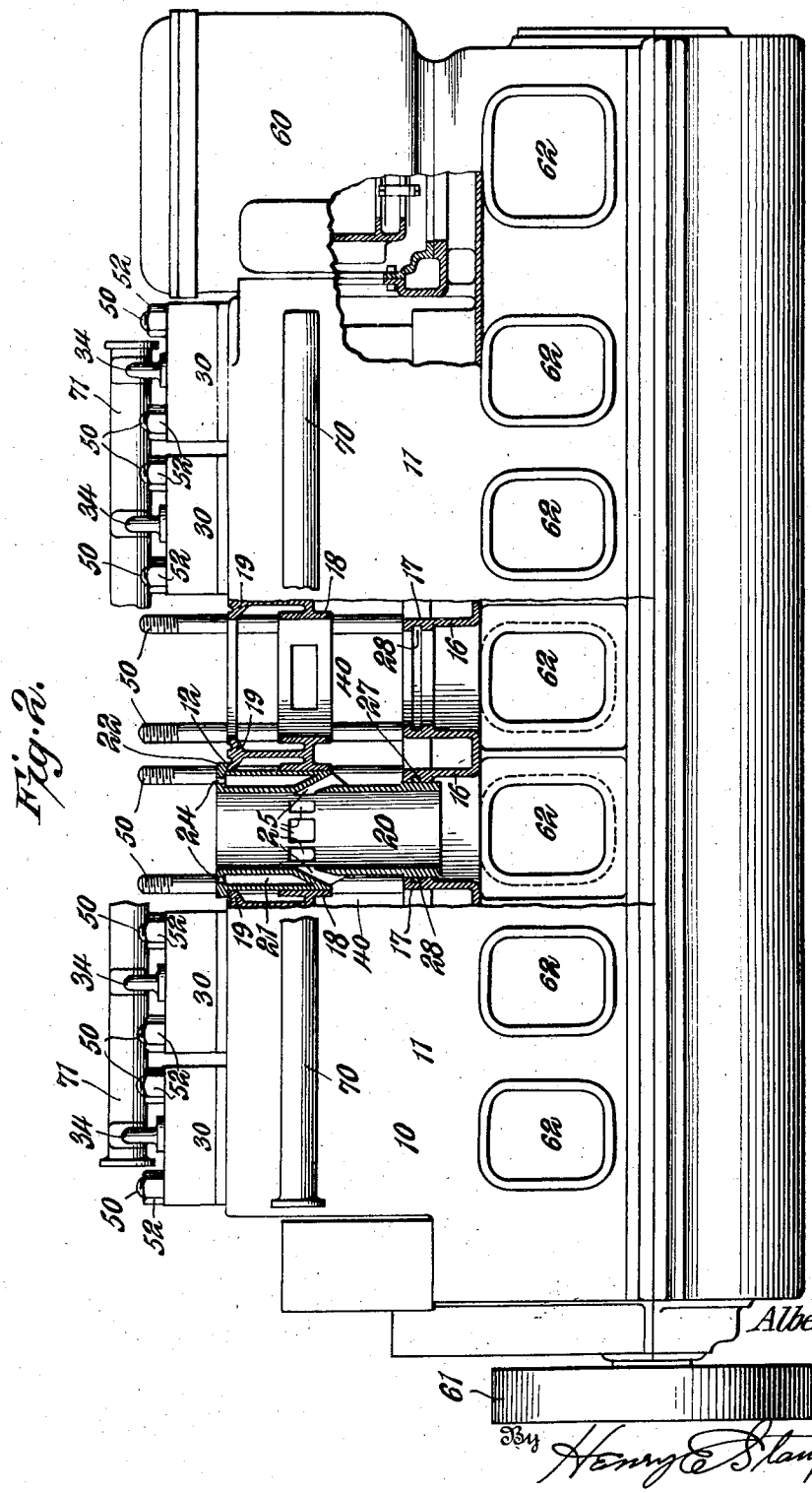


Fig. 2.

Inventor
Albert S. Walker,
By Henry E. Stauffer Jr. Attorney

July 31, 1934. A. S. WALKER 1,968,110

INTERNAL COMBUSTION ENGINE

Filed Feb. 29, 1932 3 Sheets-Sheet 3

Fig. 4.

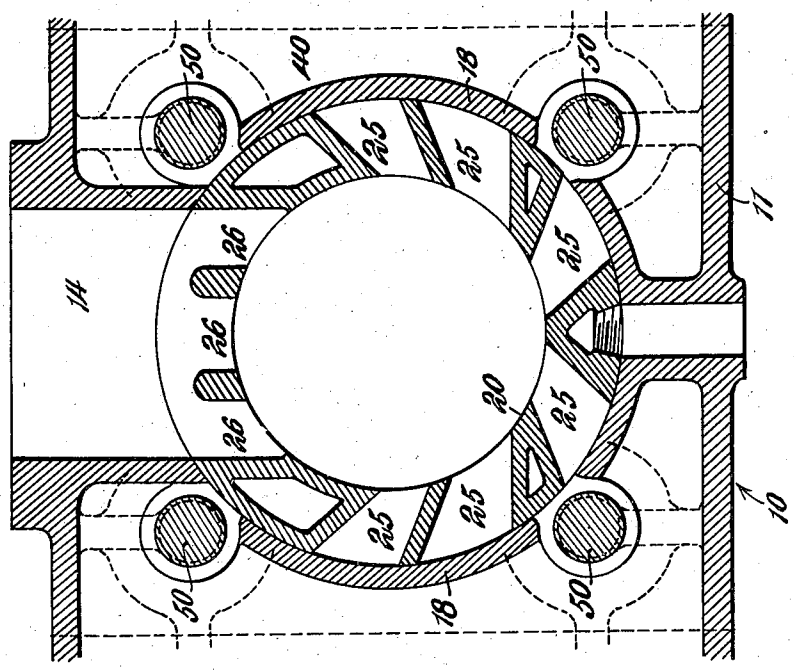
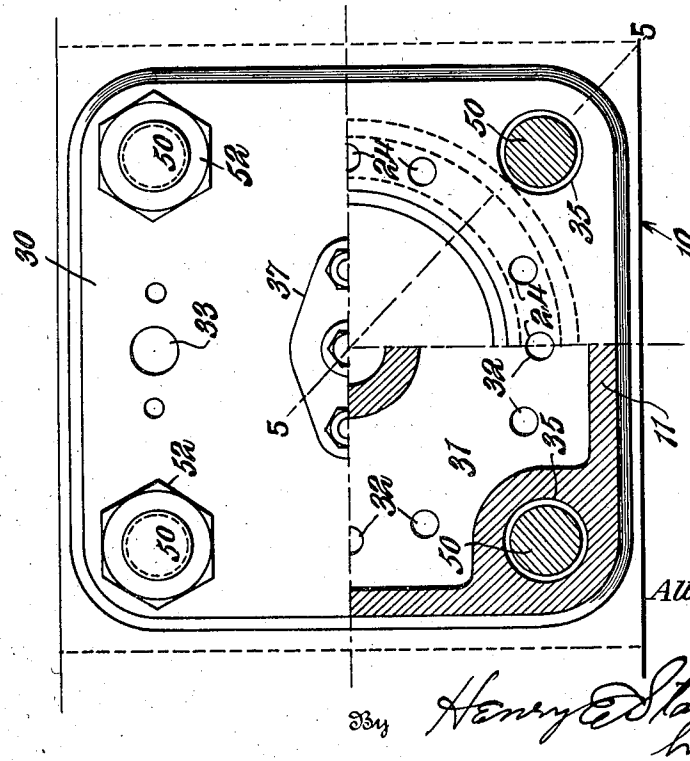


Fig. 3.



Inventor
Albert S. Walker,

By Henry E. Stauffer
his Attorney

Patented July 31, 1934 1,968,110

UNITED STATES PATENT OFFICE

1,968,110

INTERNAL COMBUSTION ENGINE

Albert S. Walker, Beloit, Wis.

Application February 29, 1932, Serial No. 595,880

7 Claims. (Cl. 123—173)

My invention relates to two cycle (or two stroke cycle) engines, and particularly to the manner of mounting and securing the cylinders thereof in the engine frame.

The object of the invention is to so support the cylinders that they will be rigidly clamped in position in the frame, and yet be free of strains and stresses in the body thereof. In order to carry out this idea, the engine frame is provided with recesses or chambers one for each cylinder; cylinders are made to fit these recesses, and each cylinder is constructed with a flange at its upper end by which it is supported in the frame. A head for each cylinder is clamped to the frame by bolts which pass through the head and the cylinder flange, and are secured in the engine frame itself. In this way all strains, due to the mounting of the cylinders and to the expansion and construction thereof, are taken off the cylinders, and yet the latter are mounted in a rigid and satisfactory manner.

By making the frame in the manner described, and mounting the cylinders as explained, it is possible to obtain a very light though rigid construction.

It is also possible with this system to cast the inlet and exhaust ports directly in the cylinder, and to make the cooling chambers integral with the cylinders themselves, at the same time obtaining a simple and light casting.

A further object of the invention is to provide each cylinder with an individual cooling jacket, and to so mount the cylinders and their jackets in the engine frame as to provide an air chamber therein common to all of the cylinders, so that all may receive their air supply from this source.

As illustrated in the accompanying drawings, the invention is applied to engines in which ignition is obtained by high compression. But while the engine illustrated is of the self ignition type, it is to be understood that the construction of the frame and the manner of mounting the cylinders, is in no way limited to engines of this particular type.

In the drawings:—

Fig. 1 is a section of an engine mounted to embody the invention;

Fig. 2 is a side elevation of a six cylinder engine with the frame broken away to show the recess for one cylinder, and with another cylinder in position in the frame;

Fig. 3 is a view looking down on the top of one of the cylinders showing the clamping bolts in position, and with a part of the head broken away to illustrate the bolts passing through the flange of the cylinder;

Fig. 4 is a horizontal section taken on the line 4—4 of Fig. 1, and showing the bolts which hold the cylinders, and the air inlet and outlet ports;

Fig. 5 is a partial longitudinal section taken on the line 5—5 of Fig. 3, showing how the bolts are secured in the frame.

The construction consists of four principal elements, or groups of elements; the frame indicated generally by the numeral 10; the cylinder or cylinders marked 20; the cylinder heads 30; and the bolts 50.

Frame

The length of the frame will depend upon the number of cylinders used. In Fig. 2 an engine of six cylinders has been illustrated, but it is to be understood that this is illustrative merely, for the engine may consist of only one cylinder or any number of cylinders, as requirements dictate.

The frame is shown in section in Fig. 1, and also on a smaller scale in Fig. 2. In Fig. 1 the lower portion of the frame is here broken away at the bottom thereof; but the sides will generally be made to extend to the medial line of the shaft. It is made of a height to reach nearly to the top of the cylinders which are almost entirely suspended therein, as will be explained hereinafter.

The frame may be cast of any suitable material, as iron or aluminum; or it may be built of sheet metal, as best suits the requirements of the use for which it is intended. But, where light weight is essential, I prefer to form the frame of cast aluminum or of some aluminum compound.

Referring more particularly to Fig. 1, the frame consists of the side member 11 extending down to the medial line of the shaft (Fig. 2), and of a height so that the top flange of the cylinders shall rest thereon, as indicated at 12. The frame on one side is provided with openings 13, one for each cylinder, through which a pipe for the cooling medium is inserted. The other side, is provided with openings 14 through which the products of combustion and the scavenging air escape. These openings have divergent walls 15 as is usual in engines of this type. The exhaust openings are all connected to any suitable exhaust manifold, or may discharge into the air.

As here illustrated, the frame is provided with an annular internal web 16 having at its upper end an enlargement 17 through which the frame

is bored to accommodate the cylinders, as will hereinafter be explained more in detail. The frame is also provided with an annular web 18 through which the frame is bored; and at the top thereof another annular ledge 19 through which likewise the frame is bored. These annular supports 17, 18 and 19 are for holding the cylinders in position. While three such supports are illustrated, the number is not of the essence of the invention, but must be as numerous as the circumstances require; and more or less than those shown may be used, depending upon the needs of the construction.

Cylinders

The cylinders, represented generally by the character 20, are illustrated best in Fig. 1, where one of them is shown as a part of the vertical sectional view of the engine frame and cylinder. One of these cylinders is illustrated in position in Fig. 2, and this figure also illustrates the frame as bored for the reception of another cylinder.

These cylinders are preferably of cast iron as is usual in such constructions, and each cylinder is provided with its own integral water cooling chamber 21, and with air inlet or scavenging ports 25, and exhaust or outlet ports 26 which communicate with the exhaust openings 14 in the frame.

Each cylinder is provided with a flange 22 at the top thereof, by which it rests upon the upper part 12 of the frame 10. The frame is bored at the points 17, 18 and 19 to receive the cylinder with a close fit, and the cylinders are machined to fit the frame 10 at these points. Thus it will be seen that while the cylinders are secured to the frame at the top only, they are fitted into the frame in a close and rigid manner so that they will be held on all sides thereof.

Cylinders mounted in this manner are relieved of all the stresses common to cylinders bolted to the frame at their lower ends, as is the usual practice. And, moreover, they are free to expand and contract longitudinally without restraint. They can therefore be made somewhat lighter than has heretofore been found necessary, and yet be strong enough and rigid enough to stand the stresses to which they are subjected.

Each cylinder is provided with an opening 23, registering with the opening 13 in the frame, so that a pipe may be inserted through the opening and be secured in the cylinder, so that water or other cooling medium may be supplied to the cylinder. The cooling chamber surrounds the cylinder, and is made integral therewith, and is provided at its upper end with one or more outlet ports 24 through which the cooling medium may flow into the cylinder head and thence out of the engine.

This cooling chamber, as said before, constitutes an integral part of each cylinder. The outside thereof is machined so as to fit closely the frame in the webs 18 and 19. The lower end of the cylinder is likewise machined to closely fit into the opening 17 in the web 16.

By making the water jackets integral with the cylinders, and supporting the latter at their upper ends, the cylinders and jackets are free to expand and contract under variations of temperature; and further the space between the cylinders and the frame may be used to hold compressed air to supply the cylinders.

Inasmuch as the engine here shown is what is known as a two cycle engine, each cylinder is provided with one or more air inlets 25, which lead from an air chamber in the frame to be hereinafter described, and with one or more exhaust ports 26 properly located and positioned, which are adapted to cooperate with the opening or openings 14 in the frame. The inlet ports 25 and the exhaust ports 26 are, of course, duplicated for each cylinder.

The inlet and the exhaust ports are controlled by the pistons which move in the cylinders. The pistons are not shown for their use in this relation is all old and well known, and so do not need to be illustrated.

Each cylinder at its lower end is provided with an expansible ring 27, resting in a suitable recess 28, which cooperates with the face of the flange 17 of the frame to form an air seal, thus preventing the leakage of air into the crank casing.

Each cylinder at its upper end is provided with an annular recess 29 to receive a suitable annular projection upon the cylinder head. This method of connecting the head is illustrative only, and any suitable means for centering the head or holding it in position may be employed. A suitable gasket is shown at 36.

Heads

The cylinder heads have been designated generally by the character 30. There is one head for each cylinder. These are made hollow, as indicated at 31, and are provided with one or more orifices 32 which register with the orifice or orifices 24 in the water jacket of the cylinder, so that the cooling medium may pass from the chamber 21 of the cylinder into the chamber 31 of the head. Each head is provided with one or more outlets 32 through which the cooling medium flows into the hollow in the head, thence to a suitable outlet passage 33 and into outlet fitting 34 and manifold 71. The openings 35 are to accommodate the bolts or studs which hold the heads on the cylinders.

Each head is also provided with an annular rib 38 which fits into the annular recess 29 of its cooperating cylinder; but, as said above, with respect to the annular ledge 29, any other means for connecting the head and cylinder may be used.

Each cylinder is provided with an oil injection nozzle, indicated generally by the character 37 through which oil is injected into the cylinder. This may be of any usual construction.

Tie rods

As explained above, the cylinders are secured in place by the flanges 22 at the upper ends thereof. These flanges are clamped between the ledges 12 of the frame and the cylinder heads 30. This is effected by means of bolts or studs 50, Figs. 2 and 5. As here illustrated, there are four of these bolts or studs for each cylinder. These bolts extend through the openings 35 in the cylinder heads, down the outside of the cylinders, and are secured at their lower ends in the frame itself at 51. Nuts 52 are applied to the tops of the bolts. When these are drawn down, the cylinder head 31 is brought to bear on the top of the cylinder flange 22, and the latter is forced down on to the frame at 12, thus holding the cylinder firmly in the frame.

This method of mounting the cylinders permits an easy assembly of the parts, but the principal advantage is that it takes the strains of mounting off the body of the cylinders, at the same time leaving the lower ends thereof to expand and contract without restraint.

Air chamber

The space between the outer walls 11 of the frame and cylinders proper constitutes an air chamber 40, into which air is forced by any suitable pump, as the pump 60, and from which it flows through the air nozzles 25 into the cylinders for supplying the necessary air for combustion and for scavenging the cylinders. The air chamber 40, as shown in these drawings, is common to all of the cylinders, this space not being sub-divided for each cylinder since it is necessary that all of the cylinders shall receive the requisite air.

An air pump 60 is mounted on the frame as a part of the engine structure. This pump may be of any preferred construction, and communicates with the air chamber 40, so as to deliver air under pressure thereto, and thence to the cylinders. The internal construction of the air pump is not illustrated, for it forms no part of this invention.

The fly wheel is shown at 61, and the engine frame is supplied with the usual openings 62, by means of which access can be had to the crank case of the engine.

A manifold for the cooling agent is shown at 70, and the outlet manifold at 71, (Fig. 2). The exhaust manifold is represented at 72. But these features are not peculiar to my construction, and are of the usual form and connected in the usual way.

What I claim is:—

1. In a two cycle internal combustion engine, the combination of an engine frame having a cylinder recess in the body and a seat at the top thereof, a cylinder with scavenge and exhaust ports together with integrally formed water jacket, having its jacket constructed to fit the recess in the frame and having a flange at the outer end adapted to rest on the seat, a cylinder head resting on the cylinder flange; and bolts passing through the head and the cylinder flange and secured in the body of the frame, whereby the cylinder is held in position between the cylinder head and the seat, and the tension stress is transmitted directly to the frame without passing through the cylinder.

2. In an internal combustion engine, the combination of an engine frame having a cylinder recess in the body and a seat on the top thereof, a cylinder the body of which is adapted to fit into the recess in the frame and having a flange adapted to rest upon the seat on the frame, a cooling chamber integral with the cylinder, a hollow cylinder head resting upon the cylinder having its interior in communication with the cooling chamber of the cylinder so that the cooling medium may circulate from the cooling chamber to the cylinder head, and bolts passing through the cylinder head and secured in the engine frame.

3. In a two cycle internal combustion engine, the combination of a frame having a cylinder recess in the body thereof and a seat at the top thereof, a cylinder having a flange at the outer end and air inlet and scavenging ports in the cylinder the jacket being adapted to fit the recess in the frame thereby forming with the frame an air chamber with which the air inlet ports communicate, means for securing the flange of the cylinder on the seat of the frame, and means for supplying air to the air chamber.

4. As an article of manufacture, an internal combustion engine cylinder having a cylindrical body of a size to accurately fit a recess in the frame in which it is to be mounted, a flange at the top thereof by which it is secured in position, an integral jacket for the cooling medium, and air inlet and scavenging ports in the cylindrical body below the jacket.

5. In an internal combustion engine, the combination of an engine frame, a web across the frame above the shaft of the engine having a cylinder opening therein, a cylinder and cooling jacket supported by the top thereof and having its lower end extending with a tight fit through the opening in the web, whereby an air supply chamber is formed between the frame and the cylinder.

6. In an internal combustion engine, the combination of an engine frame, a web across the frame above the shaft of the engine and having openings therein one for each of the cylinders of the engine, a plurality of cylinders each supported by its top on the frame of the engine and having its lower end extending through one of the holes in the web and having inlet and outlet and exhaust parts in its sides, whereby a chamber for compressed air common to all of the cylinders is formed between the frame and the cylinders.

7. In an internal combustion engine, the combination of a plurality of cylinders each having an inlet and an exhaust port, a frame having seats on the top thereof one for each cylinder, and a web across the bottom thereof having recesses therein equal in number to the cylinders used by which the latter are supported and guided, whereby a chamber for air under pressure is formed, and means for supplying air to the cylinders from the air chamber.

ALBERT S. WALKER.