E. W. WEAVER.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED FEB. 10, 1917.

1,311,196.

Patented July 29, 1919.

2 SHEETS—SHEET 1.

Fig. 2

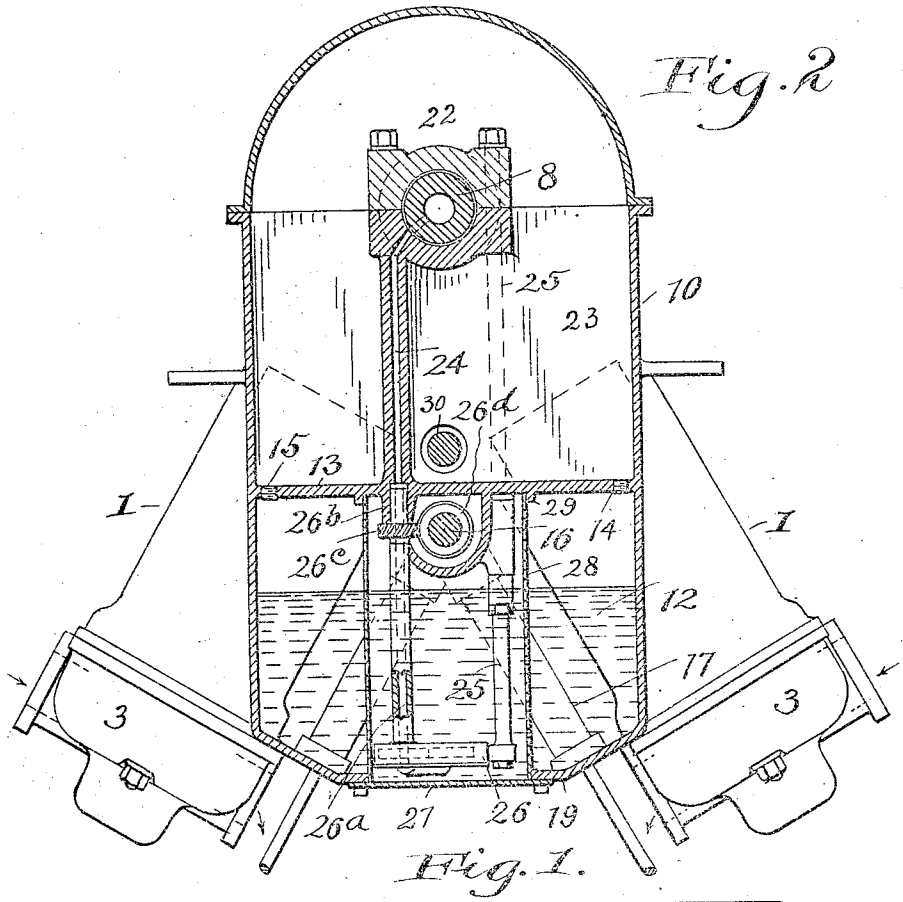


Fig. 1.

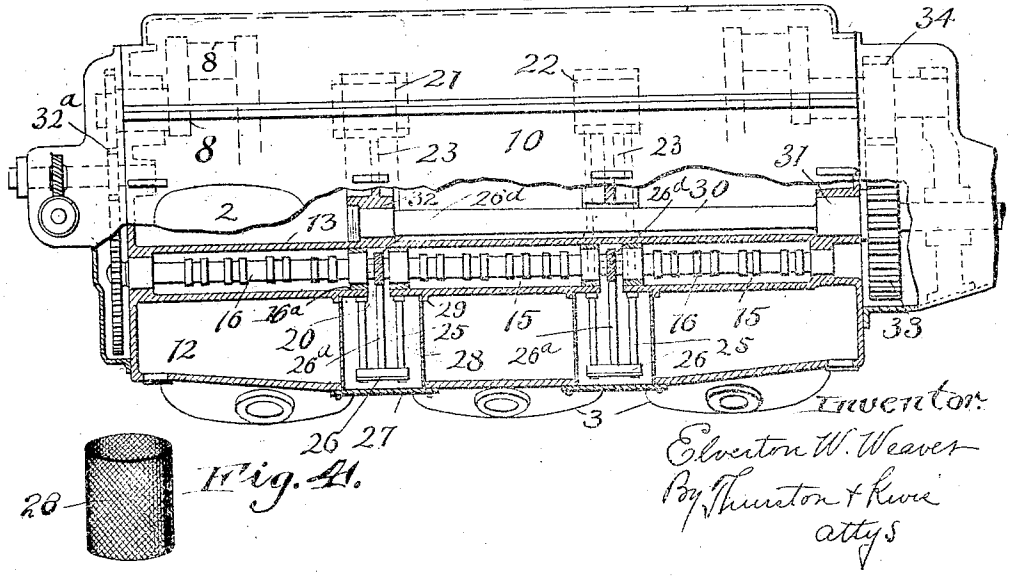


Fig. 4.

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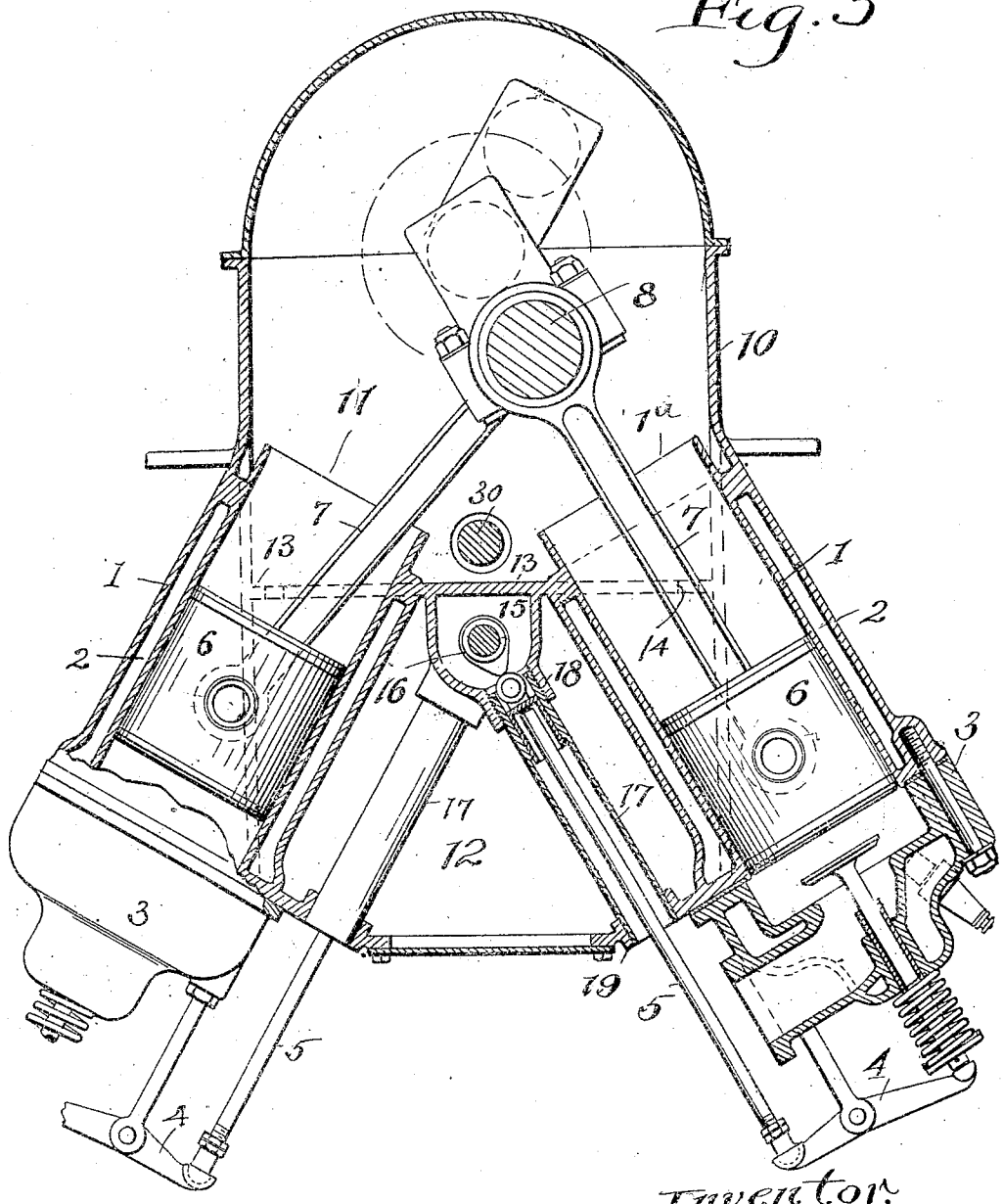
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2 SHEETS—SHEET 2.

Fig. 3



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

1,311,196. Specification of Letters Patent. Patented July 29, 1919.

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To all whom it may concern:

Be it known that I, ELVERTON W. WEAVER, a citizen of the United States, residing at Cleveland Heights, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Internal-Combustion Engines, of which the following is a full, clear, and exact description.

This invention relates to internal combustion engines. One object of the invention is to provide an engine which is especially adapted for use with aeroplanes although not confined to such use.

Another object of the invention is to provide an engine of such construction as to permit its being used with its cylinders inverted with respect to the usual upright position. A further object is to provide certain improved constructions associated with the crank case which are in a measure ancillary to the purposes for which the engine is to be used. Other objects will appear as the description of the invention proceeds.

Generally speaking, the invention may be said to comprise the elements and the combinations thereof set forth in the accompanying claims.

Reference should be had to the accompanying drawings forming a part of this specification, in which Figure 1 is a side elevation of an engine embodying my invention, with portions removed and other portions shown in section; Fig. 2 is a section upon the line 2—2 of Fig. 1; Fig. 3 is a sectional elevation upon the line 3—3 of Fig. 1; and Fig. 4 is an elevation of a screen.

Referring to the drawings, it will be seen that the various figures disclose a twelve-cylinder V-type engine, and while the invention is particularly designed for use in connection with a V-type of engine, it will be obvious that the number of cylinders employed is merely a matter of choice.

The cylinders of the engine are arranged in two rows with their axes forming a V. These cylinders are generally represented at 1. Surrounding the cylinders is the usual water jacket 2, and coöperating with the end of each cylinder is a cylinder head which is generally represented at 3, this cylinder head being preferably bolted to the cylinder jacket and has provision for the usual valves, inlet and exhaust passages for fuel, spark plug receiving openings, and provisions for water cooling the cylinders and heads.

The valves associated with the head of each cylinder are operated by suitable rocker arms as indicated at 4, and each rocker arm is actuated by a rod 5. Within each cylinder 1 is a piston 6 which has a piston rod 7 articulated thereto. And each piston rod is suitably articulated to the crank shaft 8.

Each cylinder 1 has an extending skirt 1^a which as shown in Figs. 2 and 3 extends into the crank cases and provides a wall around the inner end of the cylinder for preventing the entrance of lubricant into the cylinder as the engine is operated, as will appear more fully as the description proceeds.

The crank case is generally represented at 10, and comprises two chambered portions indicated at 11 and 12. These chambered portions are separated by a plate or floor 13 so that the crank case is divided into two distinct chambers. The floor 13 is provided with two or more openings which are indicated at 14. These openings are left unobstructed under certain conditions of use of the engine, but may be closed by means of plugs which are indicated at 15 in Fig. 2.

The cylinders, or at least the outer walls of the cylinders, are preferably cast integral with the crank casing, as will appear from an inspection of Fig. 3.

Extending longitudinally of the crank case and within the chamber 12 thereof there are a series of inclosed portions 15 through which the cam shaft 16 is adapted to extend. The cam shaft extends from one end of the casing to the other and is provided with the usual cams which are adapted to engage with the rods 5 that operate the rocker arms of the valves. At suitable places, for accommodating the rod 5, there are tubular members 17 which are received into threaded necks 18 of the walls of the chamber 15 which incloses the cam shaft. These tubes also extend through suitable openings formed in the outer wall portions of the chamber 12 as indicated at 19 in Fig. 3. Each tube 17 forms a housing for its valve rod 5, permitting the working or removal or replacement if necessary of the valve operating rod without in any way interfering with the crank casing.

The chamber 15 which incloses the cam shaft 16, is divided into a plurality of parts, and between the parts there are openings such as indicated at 20 in Fig. 1. These openings are provided for a purpose which will be later explained. However, in order

to maintain the chambered portions 15 sealed, the cam shaft 16 at the portions thereof which are adjacent the openings 20 are enlarged as indicated at 16ª, for the purpose of providing a practical seal so that only sufficient lubricant may pass the bearing to lubricate the same.

Within the chamber 11 of the crank casing is the crank shaft 8 and at opposite ends of the crank casing suitable bearings for the crank shaft are provided. Intermediate the ends of the crank casing there are crank shaft bearing members 21 and 22, the number of bearings employed being immaterial so far as this invention is concerned. These bearings 21 and 22 are preferably formed integral with suitable standards which are generally indicated at 23, and connect with the floor or plate 13. The standard, such as indicated at 23, is as shown, in the form of two crossing webs and through one of the webs there is drilled a lubricant conducting passage 24, as indicated at Fig. 2, this lubricant conducting passage communicating with the bearing surface of the bearing so that oil may be directly supplied to each bearing.

The caps for each of the bearings are held in place by suitable bolts, such as indicated at 25 there being a plurality of these bolts for the purpose.

Within the chamber 12 are located one or more lubricating pumps. These pumps as here shown, comprise in the main a casing 26 within which are located gears. The casing itself is preferably held by the same bolts 25 which hold the cap of the bearing for the crank shaft. From the pump casing there extends a pipe 26ª which communicates with the passage 24 before described. This pipe is readily removable from the casing 26.

In the construction shown the bolts 25 which hold the casing 26 are of such length that the pump casing is held at the lower part of the chamber 12.

The pipe 26ª which conducts lubricant from the casing 26, is operatively connected with one of the gears forming the oil pump within the casing 26, and forms a driving connection for the gears of the pump. For this purpose the pipe or hollow shaft 26ª has a bearing 26ᵇ within a suitable portion formed in the lower member 13 within the crank casing. The pipe 26ª also carries a suitable gear 26ᶜ which meshes with a gear 26ᵈ carried upon the cam shaft 16 so that the pump is driven directly from the cam shaft.

The gears 26ᵈ are located upon the cam shaft in the spaces 20 between the portions of the casing 15 which houses the cam shaft.

In the lowermost wall of the casing surrounding the chamber 12 there are suitable openings which are closed by means of covers 27, these covers being secured to the casing in any desired manner. Each pump mechanism which has thus been described is surrounded and incased in a cylindrical member 28 which is preferably formed of wire screen material of suitable mesh so that oil passing from the chamber 12 to the pump casing 26 will be suitably screened and filtered. Preferably this cylindrical screen 28 is directly carried by the plate or cover 27, and at its inner end coöperates with a flange 29 so that the inner end of the screen member 28 is held in its proper position.

While the description thus far given with respect to the pump and the parts operating therewith, has been described with respect to a single pump, it will be understood that the other pumps which may be used in connection with this engine construction are the same in construction and operation.

When the engine is used in the inverted position, as shown in the drawings, the openings 14 are unobstructed, so that the oil escaping from the bearings of the crank shaft, as it will, may run down the walls of the chamber 11 and passing through the openings 14, fall into the chamber 12 of the crank shaft. In this connection it will appear that the oil which may run down the walls of the chamber 11 may not enter the cylinders 1 because of the extension or wall 1ª at the inner end of each of the cylinders, this acting to deflect the oil in a manner which will be well understood.

The engine of my invention, when used for aeroplanes, may be provided with a shaft 30 extending into the crank case as far as necessary or desirable for proper support. This shaft 30 is at its ends provided with suitable bearings one of which is indicated at 31, and intermediate its ends, has suitable bearings 32 formed in the uprights 23, the shaft 30 extending through the lower portion of the chamber 11. When the engine is used as an aeroplane engine it may be desirable to drive the shaft 30 by a geared connection with the crank shaft.

The cam shaft may be geared to the crank shaft in any suitable manner as suggested by the gearing 32 indicated in Fig. 1.

When the engine shown in this construction is used in a position reversed from that shown in the drawings,—in other words, with the cylinders of the engine in an upright position, the openings 14 in the plate or floor 13 are closed, and all the oil which escapes from the crank shaft bearings, will collect at the lower portion of the cover 11ª for the chamber 11, and by a suitable pumping means not shown will be conveyed to the chamber 12.

When used in this manner, the pump 26 is brought nearer the partition or floor 13, so that the pump will be below the level of oil which will be maintained in the chamber 12. This may easily be accomplished, for the pipe 26ª may be removed, and a pipe of

shorter length substituted, and also the length of the bolts 25 may be decreased in a proper manner so as to bring the pump as near to the floor 13 as permissible.

An engine constructed as herein shown and described enables me to secure numerous advantages particularly in the matter of rigidity, compactness and lightness of construction, over internal combustion engines as generally constructed.

A further advantage lies in the fact that the oil may be maintained at a uniform temperature for its best working.

The advantages of the construction as shown in the drawings and having the cylinders inverted is manifold. For one thing, the cooling of the engine is much more easily accomplished than can be done with the cylinders in the upright position, for the movement of the water along the cylinders is in the direction in which the water naturally moves because of the heat supplied thereto by the cylinders.

Furthermore, the inverted construction provides an easy access to the crank shaft and for making any necessary inspection or repair thereto.

Having thus described my invention, what I claim is:—

1. In an internal combustion engine, two rows of cylinders arranged as a V, a lubricant containing receptacle located between the cylinders and within the V, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

2. In an internal combustion engine, two rows of cylinders arranged as a V, a crank case, an auxiliary casing adapted to contain lubricant located between the cylinders and within the V, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

3. In an internal combustion engine, a casing having a lubricant containing portion, and two rows of cylinders arranged as a V extending through said casing at the sides thereof, the lubricant containing portion of the casing lying between the cylinders and within the V, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

4. In an internal combustion engine, a casing having a partition across the same, and two rows of cylinders arranged as a V extending through the side walls of a portion of said casing and the partition, that portion of the casing between the cylinders serving as a lubricant containing casing and exit means from that portion of the casing which contains lubricant, whereby lubricant may pass to the engine parts to be lubricated.

5. In an internal combustion engine, a casing having a crank shaft portion and a lubricant containing portion, said casing having a partition across the same which separates the aforesaid portions of the casing, and two rows of cylinders arranged as a V extending through the side walls of the said casing, through the lubricant containing portion of the casing and the partition which divides the said portions of the casing, the lubricant containing portion of said casing lying principally between the cylinders and within the V, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

6. In an internal combustion engine, a casing having a partition across the same thereby forming a lubricant containing casing, and two rows of cylinders arranged as a V extending through the side walls of the casing and through said partition, the greater part of the lubricant containing portion of the casing lying between the cylinders within the V, a cam shaft within the lubricant containing portion, a casing surrounding the said cam shaft, tubular members connected with the casing around the cam shaft and extending without the lubricant containing portion of the casing for the purpose of receiving valve operating mechanism, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

7. In an internal combustion engine, a casing having a partition across the same to form a lubricant containing portion of the casing, two rows of cylinders arranged as a V and extending through the side walls of said casing and through said partition, the major portion of the lubricant containing casing lying between the cylinders and within the V, a cam shaft within the lubricant containing casing, a multipart casing within the lubricant containing casing which houses the cam shaft, the said cam shaft housing having portions which are spaced apart, means associated with said cam shaft casing to exclude lubricant from the cam shaft casing, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

8. In an internal combustion engine, a casing having a partition across the same, part of the casing serving as a lubricant container, two rows of cylinders arranged as a V extending through the side walls of said lubricant containing portion and through the said partition, a cam shaft within the lubricant containing portion of the casing, a casing surrounding the said cam shaft, said casing being divided into a plurality of parts, each of the said parts being provided with means to exclude lubricant, a pump operating gear carried by said cam shaft between adjacent portions of the cam shaft casing, a pump located in the lubricant containing portion of the cas-

ing, and a driving connection between the said pump and the said gear on the cam shaft.

9. In an internal combustion engine, a lubricant containing receptacle, a pump within the lubricant containing receptacle, said receptacle having an opening adjacent said pump, a cover for said opening, and a housing of screen material extending into the lubricant containing receptacle and surrounding the pump.

10. In an internal combustion engine, two rows of cylinders arranged as a V, a lubricant containing receptacle located between the cylinders and within the V, a crank case surrounding the ends of the cylinders and above the lubricant containing receptacle, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

11. In an internal combustion engine, two rows of cylinders arranged as a V, a receptacle adapted to contain the main body of lubricant for the engine located between the cylinders and within the V, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

12. In an internal combustion engine, two rows of cylinders arranged as a V, a crank case, an auxiliary casing for containing the main body of lubricant said casing being located between the cylinders and within the V, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

13. An internal combustion engine having two rows of cylinders arranged as a V and a lubricant containing receptacle located within the V between the cylinders, said receptacle having walls which in part conform to the V-shape between the cylinders, a closure member which extends transversely between the cylinders, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

14. An internal combustion engine having two rows of cylinders arranged as a V, a lubricant containing receptacle located within the V and between the cylinders said receptacle including portions of the cylinder jackets to form the side walls thereof, and exit means from the receptacle whereby lubricant may pass to the engine parts to be lubricated.

In testimony whereof, I hereunto affix my signature.

ELVERTON W. WEAVER.