F. L. H. PFEIL.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED MAR. 12, 1920.

1,423,680.

Patented July 25, 1922.

3 SHEETS—SHEET 1.

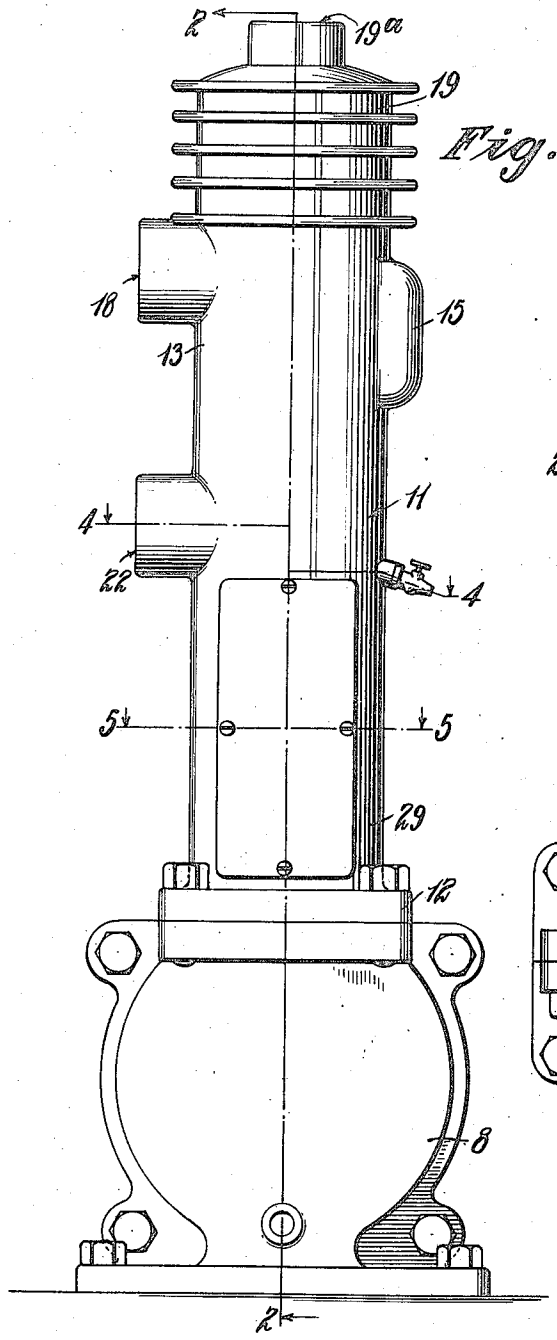


Fig. 1.

Fig. 4.

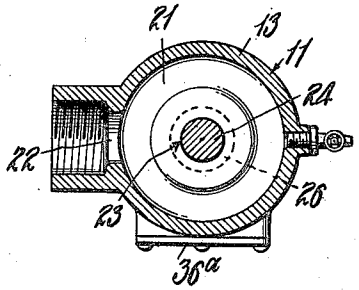
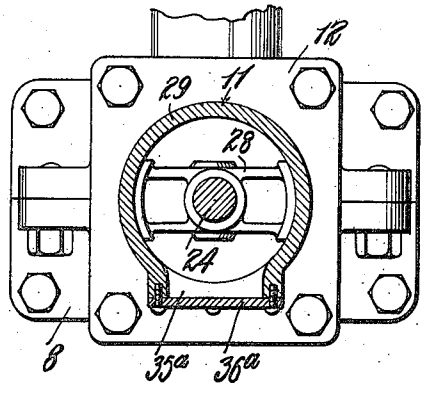


Fig. 5.



WITNESSES

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3 SHEETS—SHEET 2.

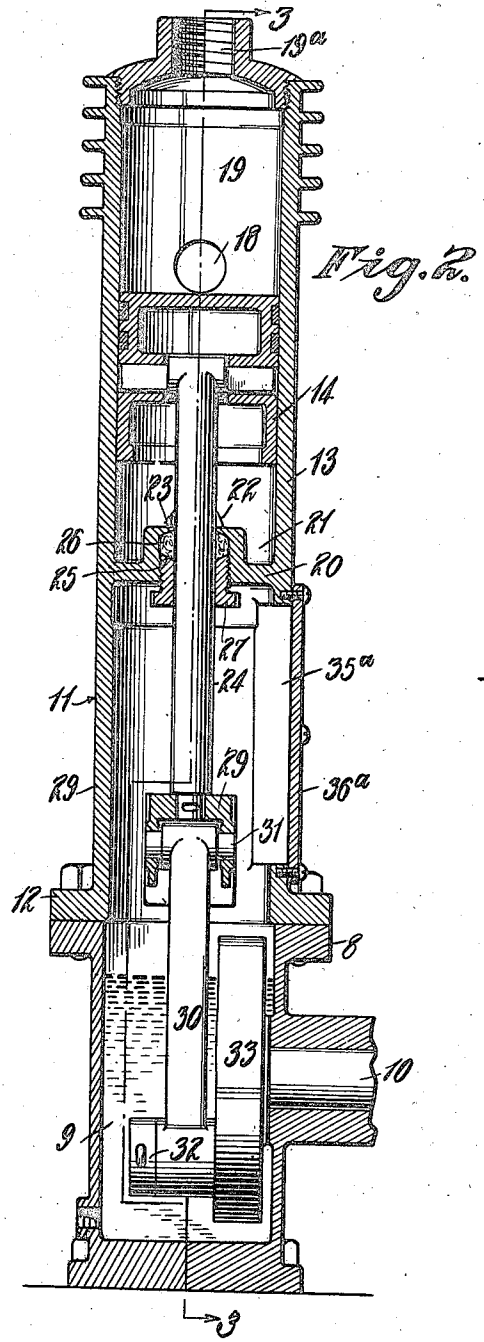


Fig. 2.

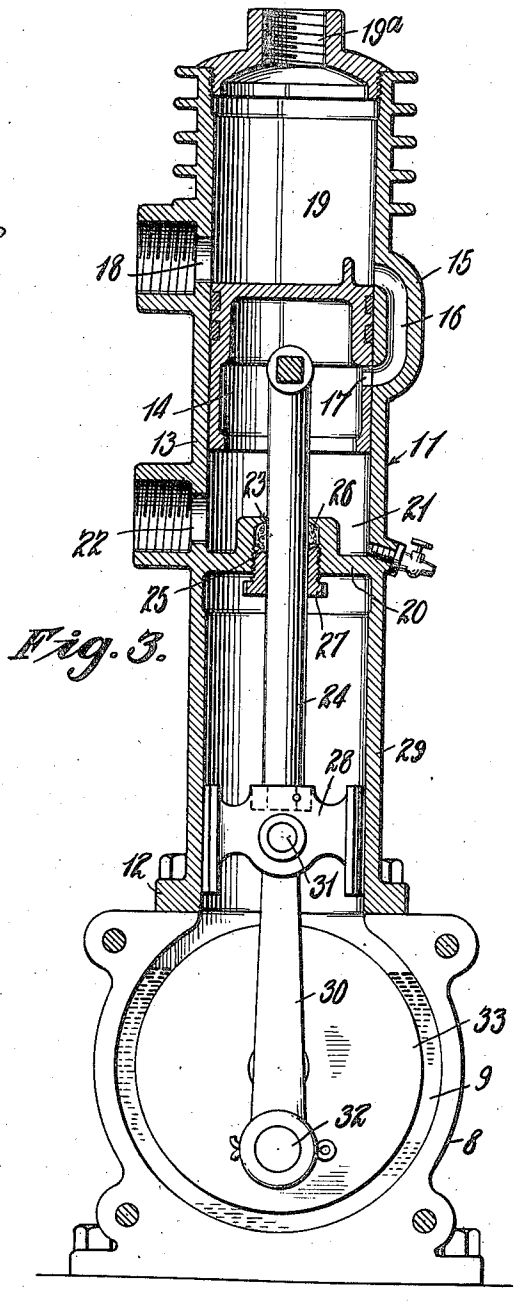


Fig. 3.

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3 SHEETS—SHEET 3.

Fig. 6.

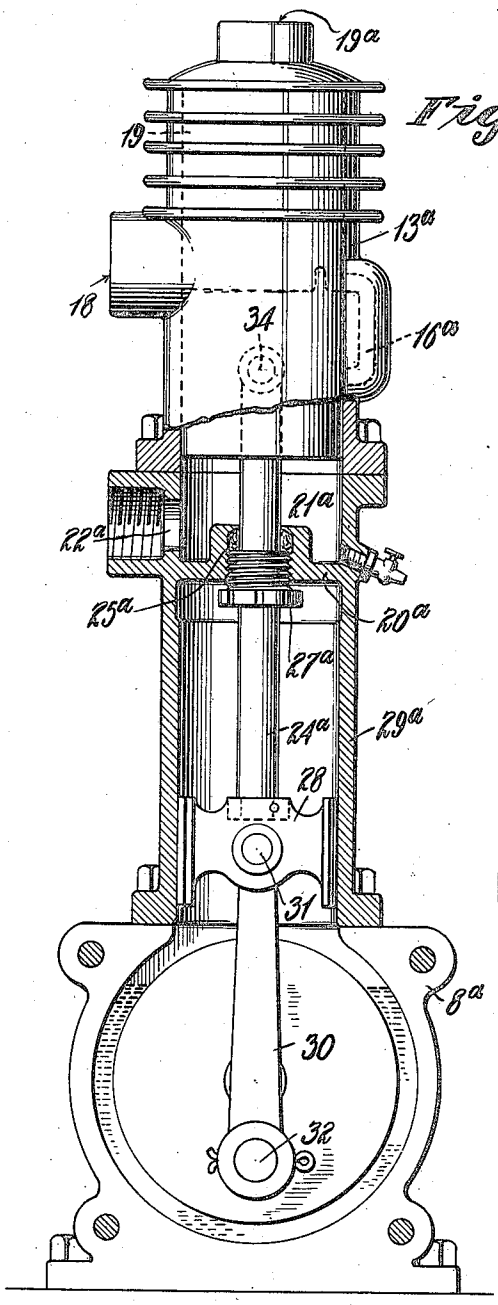
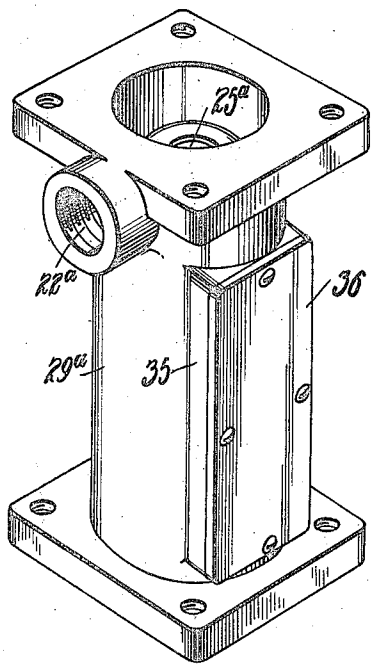


Fig. 7.



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INTERNAL-COMBUSTION ENGINE.

1,423,680. Specification of Letters Patent. Patented July 25, 1922.

Application filed March 12, 1920. Serial No. 365,272.

To all whom it may concern:

Be it known that I, FRANK L. H. PFEIL, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

In two-cycle internal combustion engines made prior to my present invention it was impossible to properly lubricate the crank pin and connected parts within the crank case for the reason that the crank case also served to provide a chamber into which the gas was admitted prior to passing into the explosion chamber. Thus it was impossible to fill the crank case with lubricating oil for the crank pin and connected parts and the only lubrication that these parts received was by admitting a small amount of oil with the gas or charge, which amount was not sufficient to properly lubricate the parts and in addition to this caused trouble and poor ignition due to the fact that the spark plug electrodes were quickly coated with carbon deposit which caused improper ignition and constant trouble. For this reason the use of two-cycle internal combustion engines, even though they have other good features, was extremely limited and if it were not for this objectionable feature they would be preferred for use for numerous purposes for the reason that they do not require any independently movable valves to permit their operation.

One of the main objects of my invention is to provide means whereby the crank pins and connected parts of two-cycle internal combustion engines can be properly lubricated without impairing or causing improper ignition.

Another object is to make my invention of a simple and durable construction and so that it can be applied either to two-cycle engines now in use or which can be applied as an integral part with a two-cycle internal combustion engine while the same is being made.

These objects, and other advantageous ends which will be described hereinafter, I attain in the following manner, reference being had to the accompanying drawings in which—

Figure 1 is a front elevation of a two-cycle internal combustion engine made in accordance with my invention,

Figure 2 is a sectional elevation taken on the line 2—2 of Figure 1,

Figure 3 is a sectional elevation taken on the line 3—3 of Figure 2,

Figure 4 is a transverse section taken on the line 4—4 of Figure 1,

Figure 5 is a transverse sectional plan view taken on the line 5—5 of Figure 1,

Figure 6 is an elevation, partly in section, showing how my invention can be applied to a two-cycle internal combustion engine as an additional part thereof, and

Figure 7 is a perspective view of one part of my invention illustrated in Figure 6.

Referring particularly to Figures 1 to 5 inclusive, 8 represents a crank case having a cavity 9 therein and which forms a bearing for a crank shaft 10. A cylinder 11 has a base flange 12 which is bolted to the top of the crank case 8 so that the cylinder 11 is positioned above the crank case. The upper portion 13 of the cylinder 11 is hollow and a piston 14 slidably fits within the portion 13 of the cylinder, as clearly shown in Figures 2 and 3. The wall of the portion 13 of the cylinder 11 is thickened at 15 and is provided with a passage 16 which communicates at its upper and lower ends with the interior of the cylinder at different levels as clearly shown in Figure 3. The piston 14 is hollow and is closed at its top end and open at its bottom end. This piston has a port or hole 17 which is adapted to register with the bottom end of the passage 16 when the piston is in its lowermost position as shown in Figures 2 and 3 and when in this position the top of the piston is below or level with the bottom of a discharge port 18 for the exhaust gases. Also when the piston is in its lowermost position the upper end of the passage 16 is positioned above the top of the piston 14 and thereby communicates with the explosion chamber 19.

The construction of the piston, passage 16, explosion chamber 19 and exhaust gas discharge port 18 does not form a part or my present invention since as illustrated they are of a type commonly employed in two-cycle internal combustion engines. However, the gas discharge is usually admitted directly into the crank case prior to passing into the explosion chamber through the me-

dium or the piston port 17 and passage 16 and as will be noted in the following description, such entrance of gas does not occur in view of the construction of the parts of my invention now to be described.

A partition 20 extends transversely across the cylinder 11 at a position below the lowest level reached by the piston 14 so as to provide a chamber 21 between the partition 20 and the piston 14 at all times. An inlet opening 22 is provided in the cylinder 11 above the partition 20 to admit a suitable discharge of gas into the chamber 21 under conditions hereinafter described. The partition 20 has a hole 23 extending therethrough through which a piston rod 24 is adapted to vertically slide. A stuffing box 25 is provided in the hole 23 and includes packing 26 and a gland nut 27 which is screwed within the hole against the packing to form a seal to prevent any gas from escaping from the chamber 21 through the hole 23. The upper end of the piston rod 24 is secured to the piston 14 and the lower end of the piston rod 24 is connected to a cross head 28 which slidably fits within the portion 29 of the cylinder 11 below the partition 20; said portion 29 of the cylinder being hollow and communicating with the cavitiy 9 of the crank case 8 but being entirely isolated from the chamber 21 by the partition 20. A crank connecting rod 30 is pivotally connected at 31 to the cross head 28 and is also pivotally connected to a crank pin 32 which projects from a crank plate or disk 33 on the crank shaft 10.

It will be noted that with the construction above described that the piston is free to move vertically and the piston rod 24 and cross head 28 are also slidable vertically so as to impart a rotatable movement to the crank shaft 10 through the medium of the crank connecting rod 30, crank pin 32 and crank disk 33. It will be further noted that when the piston 14 is in its lowermost position that a gas charge within the chamber 21 is free to pass through the port 17 in the piston and passage 16 in the cylinder into the explosion chamber 19 above the piston 14 and when the explosion takes place the piston will be forced downwardly to compress the charge of fresh gas which can be admitted into the chamber 21 and permit the exhaust of exploded gases from the chamber 19 to pass outwardly through the port 18 in the manner of operation in a two-cycle engine. It will be noted furthermore that in view of the fact that the gas is not admitted into the crank case as has usually been the custom that the crank case may be filled with lubricating oil without in any manner interfering with the gas charge or with the compression of the gas. Also there is no possible chance of leakage of the gas out of the chamber 21 and thus my invention presents an advantage for the reason that previously when the gas was admitted to the crank case for compression, leakage often occurred due to the wearing of the bearings of the crank shaft. Therefore with my invention I am enabled to confine the gas within a chamber, such as the chamber 21, of a proper size without chance of leakage.

In the form of my invention shown in Figures 6 and 7 I have illustrated the same as having been added to a two-cycle gas engine of the usual type merely by separating the cylinder from the crank case and interposing a part which forms an extension to the cylinder and which provides a chamber for the entrance and compression of the gas charge so that the latter will be isolated from the crank case. In this instance the top of the piston rod can be connected to the wrist pin 34 of the piston so that the old form of piston can be used and I connect the crank rod 30 with the cross head instead of connecting the crank rod to the wrist pin of the piston as is usually the custom. In other words, I have illustrated in Figures 6 and 7 how I can adapt my invention to a well known type of two-cycle internal combustion engine using the parts already on the engine and interposing a cylinder section 29^a between the upper cylinder portion 13^a and the crank case 8^a. In this instance the upper end of the cylinder section 29^a is bolted to the bottom of the cylinder portion 13^a and to the top of the crank case and a partition 20^a extends across the cylinder section 29^a below its top to provide a chamber 21^a which has an inlet opening 22^a for the gas charge so that the gas will be compressed within the chamber 21^a during the descending movement of the piston and will pass through the passage 16^a in the cylinder portion 13^a in the same manner as described in connection with Figures 1 to 5 inclusive. The side of the cylinder section 29^a has an opening 35 which is normally covered by a plate cover 36 so that if desired access may be had to the interior of the section 29^a below the partition 20^a for the purpose of adjusting the gland nut 27^a in the stuffing box 25^a which is provided in the partition 20 and through which the piston rod 24^a extends. In all other respects the construction shown in Figures 6 and 7 is similar to that described in connection with Figures 1 to 5 inclusive and I have therefore given corresponding parts similar reference characters.

In similar manner the lower portion 29 of the cylinder shown in Figures 1 to 5 inclusive is provided with an opening 35^a and cover 36^a to permit access to the interior of the portion 29 of the cylinder 11 below the partition 20. Thus it will be understood

that I can insert as much lubricating oil in the crank case as desired for the reason that the gas compression chamber is isolated or partitioned from the crank case. Also I can secure a much better compression of the fresh charge of gas for the reason that I have made it possible to have the exact dimensions necessary for the best running conditions of the engine without interfering with the dimensions of the piston or crank case and have also eliminated the possibility of leaky main bearings which cause loss of compression. Furthermore I am enabled to make a smaller compression space than is possible when the gas is admitted to the crank case since the crank case must necessarily be sufficiently large to permit the inclusion of the working parts therein. In addition to this the gas can be kept free of lubricating oil; thus reducing carbon or other deposit to a minimum and increasing the efficiency of the explosion and the more proper ignition of the charge.

Thus with my invention I can keep the gas charge from being contaminated with the lubricating oil with obvious advantageous results. I can provide for the proper compression of the charge without possibility of leakage and I can confine the charge in a space suitable to the best working condition of the engine; no one of these advantages being present in an engine of this general type in which the gas charge is admitted into the crank case. In addition to this and one of the most important advantages is that I can avoid wear of the parts for the reason that I can supply as much lubricating oil in the crank case as necessary to thoroughly lubricate the parts.

It will be understood that a check valve is interposed between the inlet opening 22 and the carburetter, if a carburetter is used, so as to prevent return of the intake charge during compression. Furthermore it will be understood that spark plugs can be inserted so as to provide ignition within the explosion chamber 19 and if desired a spark plug can be inserted downwardly through the top 19^a.

While I have described my invention as taking a particular form, it will be understood that the various parts of my invention may be changed without departing from the spirit thereof, and hence I do not limit myself to the precise construction set forth, but consider that I am at liberty to make such changes and alterations as fairly come within the scope of the appended claims.

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

1. The combination with a two-cycle internal combustion engine having a piston rod, cross head, and connecting rod, of a structure adapted to be interposed between the explosive cylinder and the crank case of said engine, said structure including a hollow cylinder section with a partition located inwardlly from one end thereof to provide a space between said end and the partition, said partition having a stuffing box through which the piston rod of the engine can extend for attachment to said cross head, said cylinder section having a guideway for said cross head and located between said partition and the opposite end of said cylinder section whereby the cross head can be connected to the connecting rod leading outward from the crank case, said first end of the cylinder section having a portion for attachment to the explosive cylinder of the engine whereby said space will form a compression chamber for the gas to permit compression of the latter during the movement of the piston in the explosive cylinder, the opposite end of said cylinder section having a portion for attachment to the crank case; substantially as described.

2. The combination with a two-cycle internal combustion engine having a piston rod, cross head, and connecting rod, of a structure adapted to be interposed between the explosive cylinder and the crank case of said engine, said structure including a hollow cylinder section with a partition located inwardly from one end thereof to provide a space between said end and the partition, said partition having a stuffing box through which the piston rod of the engine can extend for attachment to said cross head, said cylinder section having a guideway for said cross head and located between said partition and the opposite end of said cylinder section whereby the cross head can be connected to the connecting rod leading outward from the crank case, said first end of the cylinder section having a portion for attachment to the explosive cylinder of the engine whereby said space will form a compression chamber for the gas to permit compression of the latter during the movement of the piston in the explosive cylinder, the opposite end of said cylinder section having a portion for attachment to the crank case, said cylinder section including a portion providing an inlet opening for the gas charge; substantially as described.

3. A two-cycle internal combustion engine including a cylinder; a piston operative within said cylinder, said cylinder providing an explosive chamber at one end of said piston and an independent inlet gas compression chamber at the opposite end of said piston, said piston and cylinder having passages adapted to register during movement of the piston due to the explosion of a charge in said explosion chamber and compression of a fresh charge in said compression chamber by said movement of the piston

whereby communication is afforded between the explosion chamber and the compression chamber, said cylinder having a partition separating said inlet gas compression chamber from another hollow portion of said cylinder.

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

FRANK L. H. PFEIL.

Witnesses:
CHAS. E. POTTS,
ANNA RENTON.