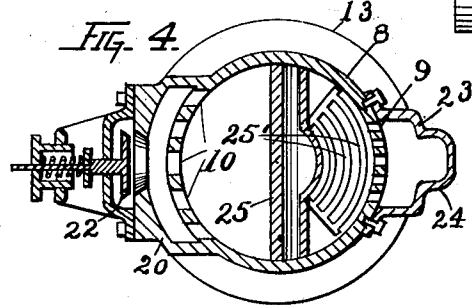
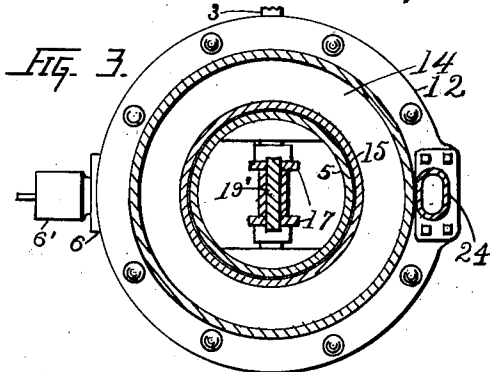
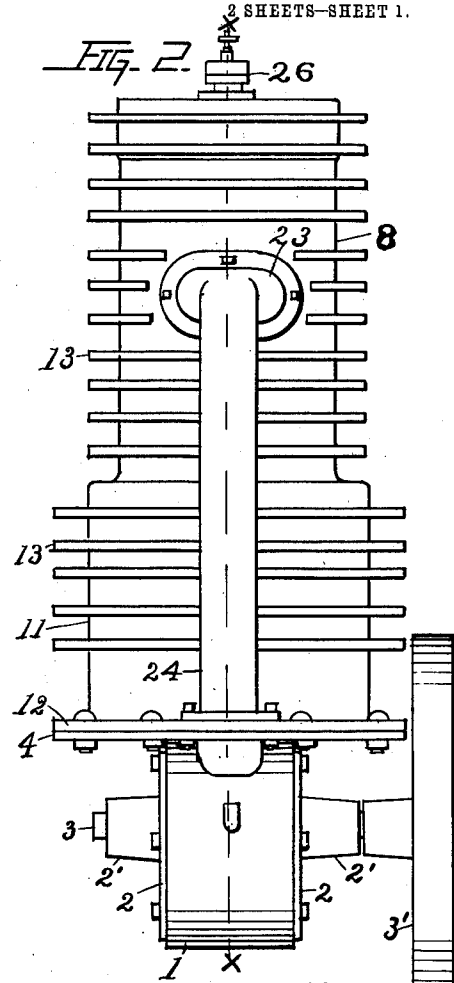
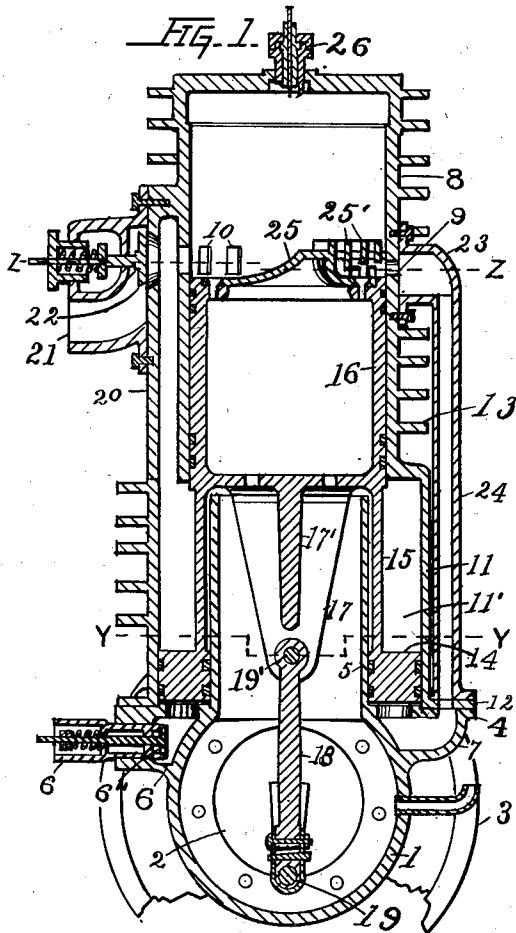


W. R. BERGMAN.
EXPLOSION ENGINE.
APPLICATION FILED DEC. 5, 1911.

1,058,534.

Patented Apr. 8, 1913.

2 SHEETS—SHEET 1.



WITNESSES:
Luke E. Hinton
Dairy Check

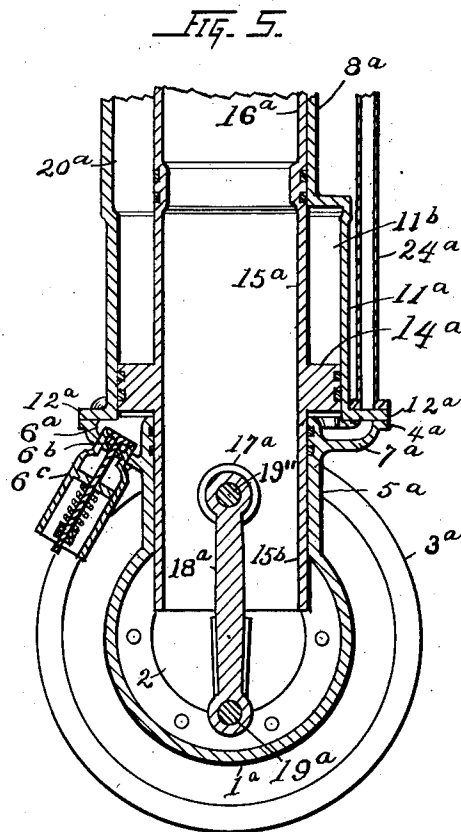
INVENTOR.
William R. Bergman
BY
George W. Hinton
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UNITED STATES PATENT OFFICE.

WILLIAM R. BERGMAN, OF ST. JOSEPH, MISSOURI.

EXPLOSION-ENGINE.

1,058,534.

Specification of Letters Patent.

Patented Apr. 8, 1913.

Application filed December 5, 1911. Serial No. 664,124.

To all whom it may concern:

Be it known that I, WILLIAM R. BERGMAN, a citizen of the United States, residing at St. Joseph, in the county of Buchanan and State of Missouri, have invented certain new and useful Improvements in Explosion-Engines, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to improvements in explosion engines of the two cycle type; and the objects of my improvements are, first; to provide a simple, substantial, compact and durable engine, which shall be neat in appearance and comparatively cheap in cost of manufacture, second; to provide direct connected pumping means, whereby exploded gases are quickly withdrawn from the power cylinder and an incoming charge of unexploded gases is forced into said cylinder under such pressure and in such volume, as causes the same to completely fill said cylinder, while the engine is being operated at the highest speed, thereby providing an engine of the two cycle type which is operated with perfect freedom at extremely high speed, coupled with the maximum of efficiency, third; to so construct the vacuum and charge pumping means of an explosion engine that no part of said pumping means shall communicate with the crank case, thereby avoiding leakage of the explosive mixture through the crank shaft bearings, and also providing charge pumping means, whereby charges of greater volume and higher pressure are pumped than can be obtained by crank case compression. I attain these objects by the mechanism illustrated in the accompanying drawing, in which:—

Figure 1 is a longitudinal section on the line X X, seen in Fig. 2, looking toward the right. Fig. 2 is a rear elevation of the engine. Fig. 3 is a horizontal section on the line Y Y, seen in Fig. 1, looking downward. Fig. 4 is a horizontal section on the line Z Z, seen in Fig. 1, looking upward. Fig. 5 is a section similar to Fig. 1, showing one of the other forms in which the crank case and the pump piston may be constructed.

Referring to Figs. 1 and 2, crank case 1 is provided with plates 2, detachably secured thereon. Said plates, each have a bearing 2' formed therewith, in which crank shaft 3 is rotatably mounted. Said shaft has fly wheel 3' secured on one end thereof. Crank case 1 has flange 4, internal cylinder 5, inlet cham-

ber 6 and outlet chamber 7 formed therewith. Power cylinder 8 has a plurality of inlet ports 9, and a plurality of exhaust ports 10, formed through the wall thereof. Said power cylinder has pump cylinder 11 formed on its lower end, the latter cylinder being provided with flange 12 hermetically secured on flange 4. Both of said cylinders are provided with radiating flanges 13, for acting as cooling means.

Cylinder 5 and cylinder 11, form the concentric pump space 11' between them, in which concentric pump piston 14 is reciprocated. Said pistons are rigidly connected by the cylindrically formed piston connector 15. Power piston 16 has bearing brackets 17 and transverse tie plate 17' formed therewith. Connecting rod 18 pivotally connects the lower ends of said brackets with crank 19, formed with crank shaft 3.

Exhaust ports 10 connect power cylinder 8 with the upper end portion of exhaust chamber 20 formed with said cylinder and having its lower end opening into said concentric pump space. Said exhaust chamber is provided with exhaust conducting means 21 leading therefrom into the open air, and with exhaust valve 22 in said conducting means.

Cylinder inlet ports 9 connect power cylinder 8 with compression chamber 23, secured on said cylinder, said chamber being connected by pipe 24 with outlet chamber 7, which opens into the lower end of concentric pump space 11'. The lower end of said pump space is also connected with inlet chamber 6, provided with mixture conducting means, adapted to have an ordinary carbureter, not shown, connected therewith, for admitting an explosive gaseous mixture of fuel and air into the lower end of said pump space. Said mixture conducting means has inlet valve 6'' therein.

Power piston 16 has its upper end closed by deflector plate 25, having a plurality of charge deflectors 25', formed therewith and adapted to deflect an incoming charge of said mixture upward in a vertical direction.

An ordinary spark plug 26 is secured in the upper end of power cylinder 8 for igniting a charge of said explosive mixture.

In operation shaft 3 is manually rotated by grasping fly wheel 3', thereby moving the described pistons upward. The upward movement of piston 14 draws a charge of said mixture through conducting means 6',

thereby opening inlet valve 6". Said charge then passes said valve and is drawn through chamber 6 into the lower end portion of pump space 11'. Continued manual rotation of shaft 3 moves said pistons downward, upon which valve 6" is closed and piston 14 forces said charge of mixture from pump space 11' through outlet chamber 7 and pipe 24 into compression chamber 23, in which said charge is compressed until said power piston in its downward movement uncovers inlet ports 9. At this juncture said compressed charge, by its expansion, passes through ports 9 into power cylinder 8, and is deflected upward by deflectors 25'.

It will be understood that the cubic displacement of piston 14 is slightly more than that of piston 16, thereby providing means whereby said charge of mixture is of such volume as completely fills cylinder 8. Continued manual rotation of shaft 3, again drives said pistons upward, upon which the previously described operation of drawing a charge of explosive mixture into pump space 11' is repeated. At the same time piston 16 compresses the previously described charge in the upper end portion of cylinder 8. While said piston is passing through the upper end portion of its movement, said charge, compressed thereby is ignited by an electric spark at the lower end of spark plug 26 in the usual manner. The energy of the thus exploded charge drives pistons 16 and 14 downward, exhaust valve 22 closes and piston 14 produces a vacuum in the upper end portion of pump space 11' and in exhaust chamber 20. When piston 16 in its downward travel, uncovers exhaust ports 10, said exploded charge of mixture is quickly drawn through said ports into said exhaust chamber and the upper end portion of pump space 11' by the action of said vacuum. When said vacuum is thus filled to a pressure slightly above the pressure of the outer air, exhaust valve 22 is thereby opened and an incoming unexploded charge of mixture expels the small remainder of said exploded charge from cylinder 8. Thereafter, upward movement of piston 16 closes ports 10, and such portion of said exploded charge as remains in pump space 11' is forced therefrom through exhaust chamber 20, past valve 22, through exhaust conducting means 21 into the open air, by piston 14.

It will be understood that the described vacuum relief accelerates the exhaust of said exploded gases from cylinder 8 and when coupled with the described pumping and compressing means, for unexploded charges of ample volume, provides a combination of parts, whereby the freedom of action, speed and efficiency of a two cycle explosion engine are increased to the maximum.

While I have shown and described my in-

vention in the foregoing manner, it is evident that various other forms of pistons and cylinders could be constructed for forming a concentric pump space, in which a concentric pump piston acts both as a fresh charge compressor and a vacuum producer, for the previously described purposes, without departing from the spirit of my invention, which I reserve the right to do. One of such other forms of pistons and cylinders is seen in Fig. 5 in which crank case 1^a has cylinder 5^a formed therewith, in which piston extension 15^b is reciprocated. Said extension is formed with concentric piston 14^a and forms the inner wall for concentric pump space 11^b, below said piston, while piston connector 15^a forms the same above said piston.

Since the upper end portions of piston 16^a, cylinder 8^a, and exhaust chamber 20^a are exactly like the upper end portions of piston 16, cylinder 8 and exhaust chamber 20 as seen in Fig. 1, said upper portions are not shown in Fig. 5.

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

1. In an explosion engine, a power cylinder having an open lower end and a plurality of exhaust ports formed through its central portion on one common level and a plurality of inlet ports formed through said cylinder diametrically opposite to the lower end portions of said exhaust ports; a power piston in said power cylinder said piston being adapted by movement thereof to cover and uncover said ports; a pump cylinder formed on the open lower end of said power cylinder; a pump piston in said pump cylinder; piston connecting means whereby said power piston and said pump piston are rigidly connected; a crank case; reciprocating means in said crank case whereby said pistons are reciprocated; gas tight separating means whereby said pump cylinder and said crank case are separated; mixture inlet means adapted to admit a charge of explosive gaseous mixture into said pump cylinder beneath said pump piston; an inlet valve in said mixture inlet means; communicating means whereby the lower end of said pump cylinder is connected with said inlet ports; an exhaust chamber formed with said power cylinder said chamber having its lower end connected with the upper end of said pump cylinder and its upper end connected with said exhaust ports; exhaust conducting means connected with the upper end of said exhaust chamber; and an outlet valve in said exhaust conducting means said valve being in front of said exhaust ports and being adapted to be opened by the impact of a charge of exploded gases exhausted through said exhaust ports.

2. In an explosion engine, a power cylinder having a plurality of exhaust ports formed through the wall thereof and a plurality of inlet ports similarly formed and
5 diametrically opposite to said exhaust ports; a power piston in said power cylinder said piston being adapted to cover and uncover said ports by movement of said piston; a deflector plate secured on the upper end of
10 said piston said plate having a plurality of charge deflectors formed therewith the upper portions of all of said deflectors being extended above said plate to one common level while the lower portions of said de-

flectors are extended below said plate to
15 such levels in steps that the deflector nearest the center of said plate is extended the lowest and the deflector nearest the outer edge of said plate is extended to the highest level for evenly dividing and vertically
20 deflecting an admitted charge of fuel mixture.

In testimony whereof I affix my signature in the presence of two witnesses.

WILLIAM R. BERGMAN.

Witnesses:

LUKE E. HINTON,

DAISY CHECK.