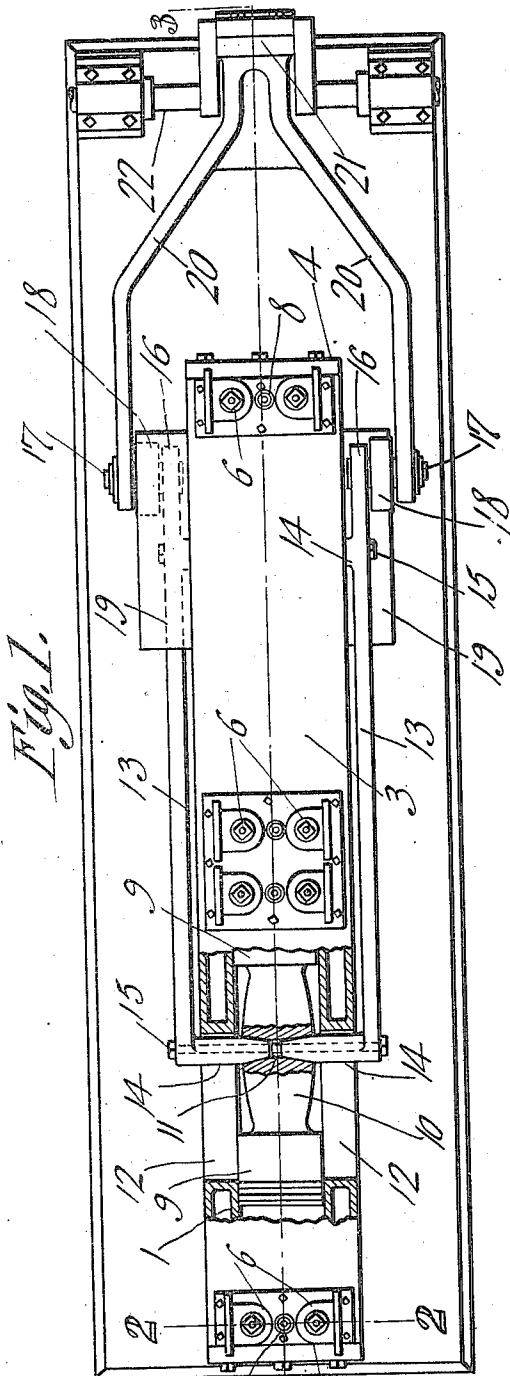
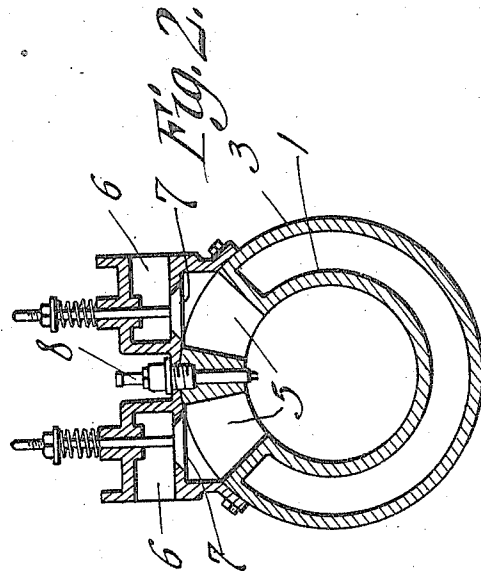


C. L. WALL.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED NOV. 10, 1916.

1,233,003.

Patented July 10, 1917.
2 SHEETS—SHEET 1.



Witnesses

J. R. Darling
R. L. Parker

C. L. Wall

Inventor

by

C. A. Snow & Co.
Attorneys

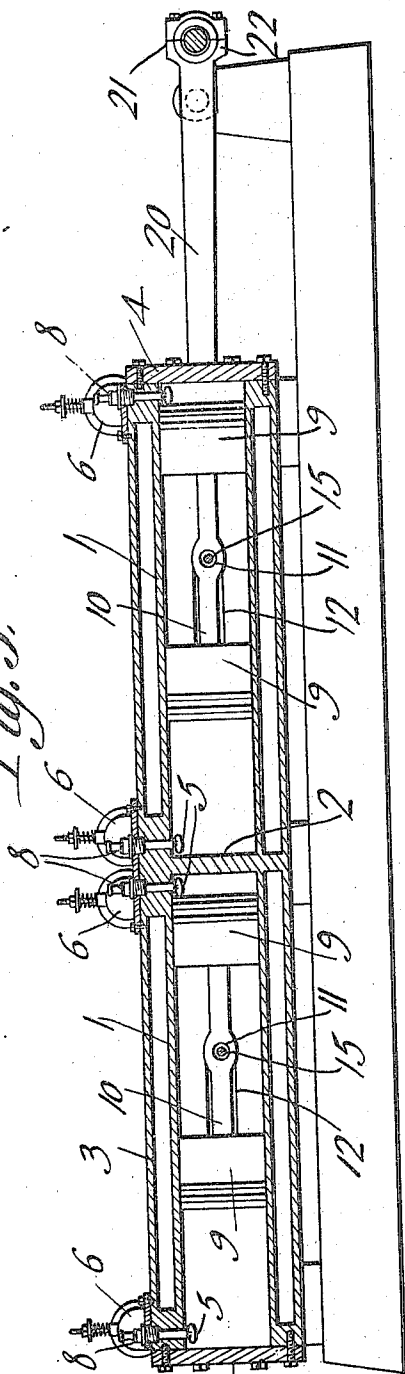
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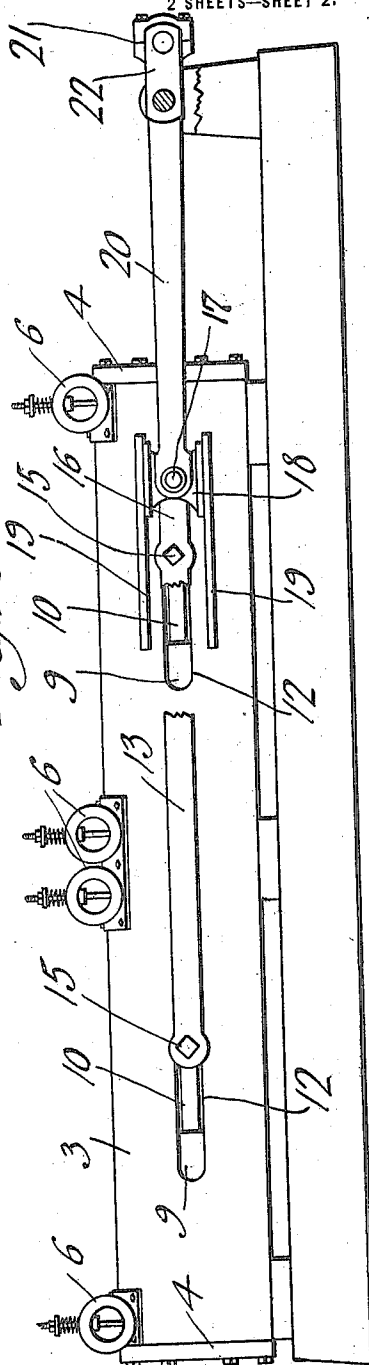
Fig. 3.



Witnesses

J. R. Daming
R. L. Parker.

Fig. 4.



C. L. Wall

Inventor

by

C. A. Snow & Co.

Attorneys

UNITED STATES PATENT OFFICE.

CHARLES L. WALL, OF LAWRENCE, KANSAS.

INTERNAL-COMBUSTION ENGINE.

1,233,003.

Specification of Letters Patent.

Patented July 10, 1917.

Application filed November 10, 1916. Serial No. 130,621.

To all whom it may concern:

Be it known that I, CHARLES L. WALL, a citizen of the United States, residing at Lawrence, in the county of Douglas and State of Kansas, have invented a new and useful Internal-Combustion Engine, of which the following is a specification.

The present invention appertains to internal combustion engines, and aims to provide a multiple cylinder engine of simplified construction and efficient operation, which is distinguished over ordinary internal explosion engines by its elimination of numerous parts, such as internal bearings, its reduction in the number of connecting rods, size of crank shaft, and the like, with the resultant economy in weight per horse power and number of working parts.

It is the object of the invention to provide an internal combustion engine whose component parts are assembled in a novel and advantageous manner, to enhance the utility and efficiency of the engine, and providing in addition to the advantages above noted, other important attributes such as the reduction in the weight of the reciprocating parts to eliminate as much as possible the disadvantages incident to momentum, the reduction of side thrusts on the pistons as in ordinary engines, the direct transmission of power between the pistons and to the driven element to reduce friction and resistance to a minimum, the accessibility of the various parts for purpose of cleaning, examination, repair or replacement, the cushioning action of the pistons as in steam engines due to the reciprocation of the pistons in unison or as a unit, and the general arrangement and construction of the engine.

With the foregoing and other objects which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a plan view of the engine, portions being broken away and shown in section.

Fig. 2 is an enlarged cross section taken on the line 2—2 of Fig. 1.

Fig. 3 is a longitudinal section on the line 3—3 of Fig. 1, portions being shown in elevation.

Fig. 4 is a side elevation of the engine, portions being broken away.

The engine as illustrated is the equivalent to an ordinary four cylinder engine, but it is to be understood that the present engine can be provided with any number of cylinders, and the number of the engine units can be disposed side by side to increase the power.

The engine embodies a pair of alining cylinders 1 continuous from end to end and which may be integral as illustrated, with a dividing partition 2 between them. These cylinders being in alinement occupy little space, and enable the entire engine to be built within a relatively small compass. The cylinders 1 are inclosed by a water jacket 3 for cooling them, and the remote ends of the cylinders are provided with removable heads 4 for the insertion and removal of the pistons. The cylinders are provided at their remote and adjacent ends with pairs of intake and exhaust ports 5 above which suitable valve casings 6 for the attachment of intake and exhaust manifolds are secured, and suitable valves 7 are provided for controlling the intake and exhaust, these valves being operated in any suitable manner. Spark plugs 8 or other igniting devices are applied to the cylinders at the opposite ends thereof for igniting the charges at the proper times.

Mounted for reciprocation within each cylinder is a piston composed of spaced piston heads 9 connected by a stem 10 which is provided between its ends with a transverse opening 11 having its ends tapered. The piston heads 9 reciprocate as a unit, and there are four explosion chambers, two between the pistons and the partition 2, and two between the piston and the heads 4, whereby there can be an explosion for each stroke of the two pistons in unison.

Each cylinder 3 is provided at diametrically opposite sides with longitudinal slots 12 between the piston heads 9, and which do not extend to the explosion chambers. In order to connect the two pistons, longitudinal bars 13 are disposed at the opposite sides of the cylinders and each bar 13 has in-

wardly projecting tubular pins 14 extending through the respective slots 12, and the inner ends of said pins are tapered and fitted rigidly in the tapered ends of the bores 11 of the respective pistons, bolts 15 or equivalent members being engaged through the pins 14 of the two pairs for drawing the pins of each pair toward one another to bind them in place within the opening 11, whereby to rigidly connect the bars 13 with the pistons rigidly connected for reciprocation as a unit.

In order to assist in guiding the bars 13 and in transmitting the power to the driven element, the bars 13 having extensions 16 projecting beyond the pins 14 at one end, and said extensions are engaged with pivots 17 carried by cross heads 18 which are slidable longitudinally between outstanding longitudinal guide flanges 19 with which the respective cylinder is provided. A bifurcated connecting rod having the diverging arms 20 is provided at its crotch portion with a bearing 21 journaled upon a single crank of the crank shaft 22, and the ends of the arms 20 engage the pivots 17, whereby the reciprocatory movement of the pistons is made to rotate the crank shaft, although the power can be transmitted from the pistons in any other suitable manner.

The engine operates on the usual four-cycle principle, and by the provision of the four explosion chambers, there can be an explosion for each stroke of the pistons, the explosions occurring in succession, as well as the intake, compression and exhaust of the gases. It will be evident that an explosion in any one of the chambers will drive the pistons, whereby a charge is drawn into a second chamber, the charge compressed in a third chamber, and the burnt charge ejected

from the fourth chamber. Since the pistons reciprocate as a unit, this provides a cushioning effect found in steam engines, and friction, side thrust, and resistance are decreased to a minimum. By removing the bolts or clamping elements 15, the bars 13 can be readily removed from the pistons, and the pistons can then be readily removed from the cylinders when the heads 4 are taken off. The construction is exceedingly simple and embodies but few working parts.

Having thus described the invention, what is claimed as new is:

1. An engine embodying alining cylinders, a piston working in each cylinder having spaced piston heads connected by a stem, each cylinder having opposite longitudinal slots between the piston heads, longitudinal bars at opposite sides of the cylinders having inwardly projecting portions extending through said slots and engaging said stems, and means extending through said portions for drawing them toward one another into rigid engagement with said stems.

2. An engine embodying alining cylinders, a piston working in each cylinder including spaced heads connected by a stem, said stems having transverse openings with tapered ends, each cylinder having opposite longitudinal slots between the piston heads, opposite longitudinal bars having inwardly projecting pins extending through said slots, said pins having tapered ends fitting in the ends of said openings, and clamping elements engaged through the pins for drawing them toward one another into wedged engagement with said stems.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

CHARLES L. WALL.