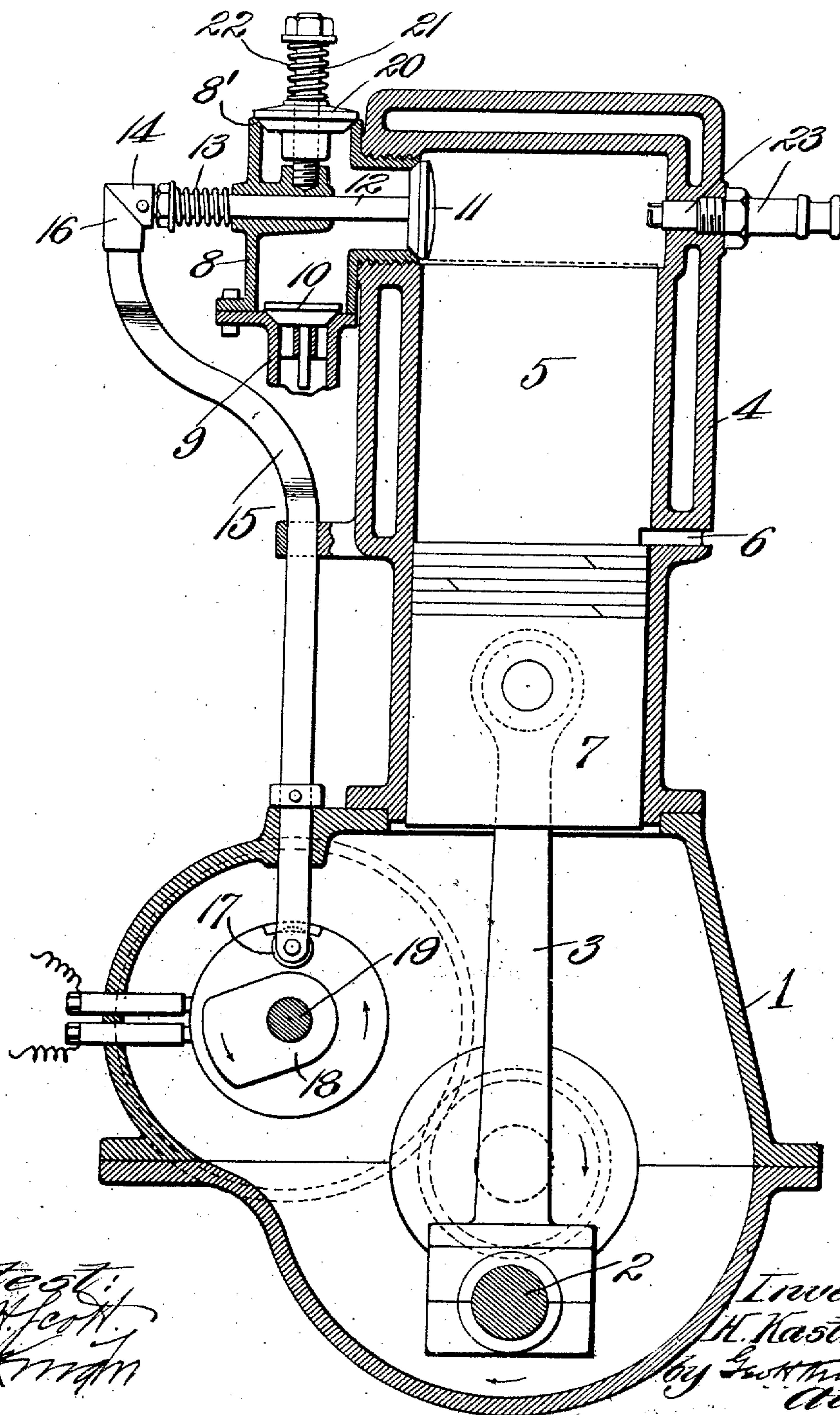


No. 860,547.

PATENTED JULY 16, 1907.

H. KASTRUP.
FOUR CYCLE EXPLOSIVE ENGINE.
APPLICATION FILED AUG. 26, 1906.



Attest:
Wm. H. Fort,
E. J. Kinn

Inventor
H. Kastrup,
by Geo. H. Wright
Atty.

UNITED STATES PATENT OFFICE.

HERMAN KASTRUP, OF ST. LOUIS, MISSOURI.

FOUR-CYCLE EXPLOSIVE-ENGINE.

No. 860,547.

Specification of Letters Patent.

Patented July 16, 1907.

Application filed August 25, 1906. Serial No. 331,966.

To all whom it may concern:

Be it known that I, HERMAN KASTRUP, a citizen of the United States of America, residing in the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Four-Cycle Explosive-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

10 My invention relates to a four-cycle explosive engine and it has for its object to produce an engine of this type which is of simple and inexpensive construction and so designed as to provide for the production of a high degree of power.

15 The drawing is a vertical sectional view of my engine.

1 designates the crank housing of the engine, in which is journaled the crank shaft or power shaft having a wrist 2 that has connected to it the piston rod 3.

20 4 designates the cylinder of the engine which surmounts the crank housing and contains the combustion chamber 5 and is provided with a radial exhaust port 6, intermediate of the crank housing and the head of the engine cylinder, through which free communication from the combustion chamber to the exterior of the engine cylinder is provided.

7 is the piston which is connected to the wrist 2 of the power shaft by the piston rod 3 and is adapted to operate in the combustion chamber on a forward stroke and be withdrawn to a position back of the exhaust port 6 when the burned gases from the explosive agent are to be exhausted at its next forward movement.

8 designates a three way or T-valve housing that is connected to the engine cylinder adjacent to its head and through which communication from a vertical conducting pipe 9 connected to its lower end and leading from a suitable carbureter (not shown) to the combustion chamber 5 is obtained, in order that the explosive agent may be admitted to said combustion chamber.

10 is a controlling outer-inlet valve seated in the conducting pipe 9 and which is adapted to open automatically by suction when the explosive agent is to be delivered from said pipe into the valve housing and therefrom into the combustion chamber, but which at other times remains seated to prevent escape of explosive agent from said pipe.

11 designates an inner inlet valve controlling communication between the valve housing 8 and combustion chamber 5, this inner inlet valve being carried by a reciprocatory valve stem 12 that is mounted in the valve housing. On the reciprocatory valve stem exterior of the valve housing is a retractile spring 13 that serves to normally hold the inner inlet valve 11 to its seat. At the outer end of the reciprocatory valve

stem is a head 14 having an inclined face at its lower side.

15 designates a reciprocatory trip rod that is mounted in a horizontal arm projecting from the side of the engine cylinder having a doubly curved arm provided at its upper end with a head 16 having an inclined face at its upper side opposing the inclined face of the reciprocatory valve stem head 14. The trip rod 15 extends downwardly into the power shaft housing and in the lower end of said rod is mounted an anti-friction roller 17. 18 is a cam fixed to a countershaft 19 that is geared to the power shaft in a manner common in explosive engines, and for which no invention is herein claimed. This cam 18 is formed with approximately parallel sides and rounded forward edge and is eccentrically mounted upon the countershaft 19. During the rotation of the power shaft and the countershaft 19 geared to the first named power shaft, the cam 18 strikes against the anti-friction roller mounted in the trip rod 15 upon each complete rotation of the countershaft 19, thereby causing said trip rod to be moved outwardly or upwardly. As the trip rod moves outwardly or upwardly its head 16 by acting against the head 14 of the reciprocatory valve stem 12 serves to impart an inward movement to said reciprocatory valve stem and unseat the inner inlet valve 11 at the proper time during the operation of the engine. In the valve housing 8 is a vertical vent opening 8'. This vertical vent opening is controlled by upwardly opening relief valve 20 that is loosely fitted to a guide rod 21 mounted in a horizontal support projecting into the chamber of the valve housing and is normally held to its seat by a surmounting pressure spring 22. 23 is an igniter that extends into the combustion chamber 5 beneath the head of the engine cylinder and to which an electrical current is conducted in any suitable or well known manner for the purpose of creating a spark in said combustion chamber for the ignition of the explosive agent delivered thereinto.

In the practical use of my engine the cam 18 acts to operate the trip rod 15 and unseat the inner inlet valve 11 while the piston 7 is receding and the charge of explosive agent is drawn into the combustion chamber. The forward stroke of the piston then occurs immediately and the admitted charge is compressed in the combustion chamber until said charge is ignited and exploded through the spark produced in the igniter 23 as usual, it being understood that the inner inlet valve 11 was permitted to resume its seat previous to such compression and the explosion of the explosive agent, due to the disengagement of the cam 18 from the trip rod 15. Upon the return or working stroke of the piston it passes the exhaust port 6 and the burned gases or products of combustion escape through said exhaust port; then as the piston again moves forwardly the cam 18 actuates the trip rod 15 with the result of unseating the inlet

valve 11 and the burned gas present in the combustion chamber is forced therefrom by the piston into the valve housing 8, from which it is vented by reason of the gas pressure acting to unseat the relief valve 20. The combustion chamber is thus freed of gas and the piston immediately starts upon its return stroke. While the piston is returning at this time, the unseated valve 11 is held in an open position, due to the continued engagement of the cam 18 with the trip rod 15 and a fresh supply of explosive agent is drawn into the combustion chamber, the unseated valve being permitted to resume its seat just previous to the completion of the return stroke of the piston. The piston then instantly starts upon its forward stroke and the explosive agent is compressed thereby in the combustion chamber in the same manner as previously described, as a precedent to the ignition and explosion of the explosive agent in the same manner as that previously explained.

I claim:—

- 20 A four-cycle explosive engine comprising a crank housing, a cylinder having a combustion chamber provided with a radial exhaust port and surmounting the crank housing,

a power shaft journaled in the crank housing and having a crank provided with a wrist, a piston, a piston rod connecting the piston with the wrist, a countershaft journaled in the crank housing, gear wheels connecting the power shaft with the countershaft, a U-shaped cam formed with approximately parallel sides and a rounded forward edge and mounted eccentrically upon the counter-shaft, a three-way valve housing having a horizontal support projecting into the chamber thereof, a controlling outer inlet valve, an inner inlet valve, controlling communication between the valve housing and the combustion chamber and having a reciprocatory valve stem having a head provided with a lower inclined face and mounted in the valve housing, a vertical reciprocatory trip rod having a head at its upper end provided with an upper inclined face opposing the inclined lower face of the head of the reciprocatory valve-stem, and raised by the U-shaped cam, a guide stem mounted in the horizontal support, an upwardly opening relief valve for the valve housing fitted to the guide stem, a retractile spring for seating the inner inlet valve and returning the trip rod to normal position and a spring for seating the relief valve.

HERMAN KASTRUP.

In presence of—
E. S. KNIGHT,
WM. H. SCOTT.

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