

(No Model.)

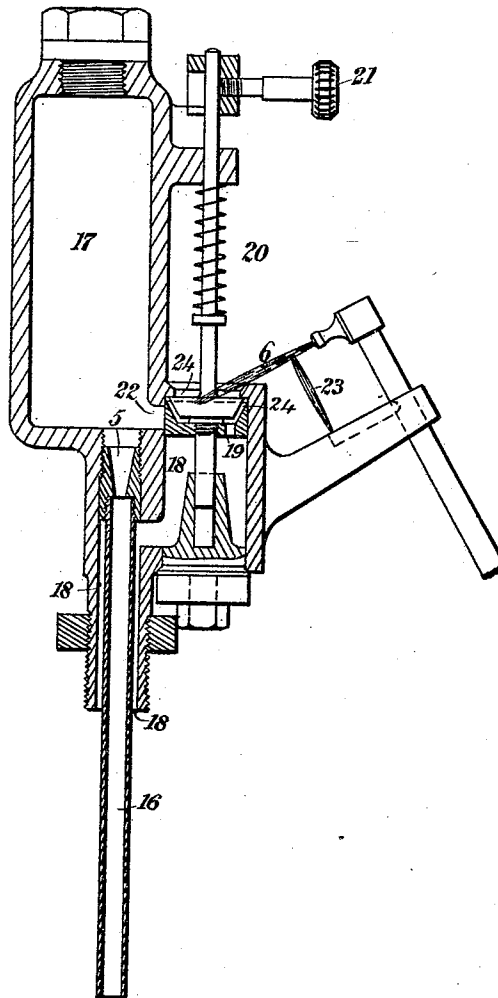
F. W. LANCHESTER.
GAS ENGINE STARTER.

2 Sheets—Sheet 1.

No. 459,405.

Patented Sept. 15, 1891.

Fig 1



Witnesses:
W. H. Chadsey
J. M. Foster

Inventor.
F. W. Lanchester.
by Herbert W. Jenner.
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(No Model.)

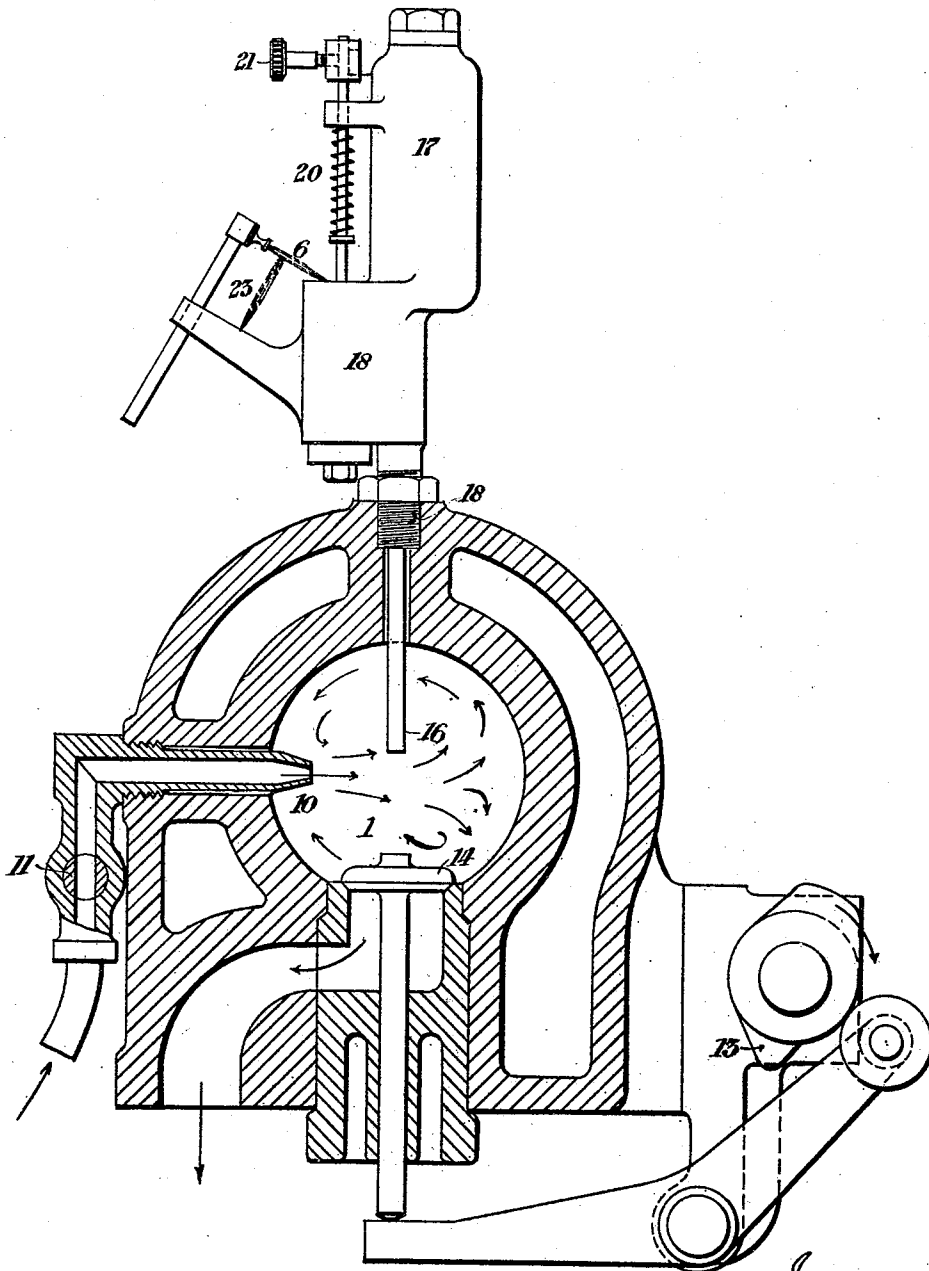
2 Sheets—Sheet 2.

F. W. LANCHESTER.
GAS ENGINE STARTER.

No. 459,405.

Patented Sept. 15, 1891.

Fig 2



Witnesses:
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Inventor.
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UNITED STATES PATENT OFFICE.

FREDERICK WILLIAM LANCHESTER, OF LONDON, ENGLAND.

GAS-ENGINE STARTER.

SPECIFICATION forming part of Letters Patent No. 459,405, dated September 15, 1891.

Original application filed December 19, 1890, Serial No. 375,209. Divided and this application filed May 15, 1891. Serial No. 392,896. (No model.) Patented in Belgium November 8, 1890, No. 92,641, and in France November 10, 1890, No. 209,400.

To all whom it may concern:

Be it known that I, FREDERICK WILLIAM LANCHESTER, a subject of the Queen of Great Britain and Ireland, residing at 13 Bedford Row, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Gas-Engine Starters, (for which I have obtained patents in Belgium, No. 92,641, dated November 8, 1890, and in France, No. 209,400, dated November 10, 1890;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention for improvements in gas-engine starters relates to engines of that class in which inflammable gas or vapor together with a certain proportion of atmospheric air is introduced into the working cylinder and after compression exploded to increase the pressure to propel the piston during the working stroke, and has for its object to provide improved means for starting the said engines.

This invention consists, substantially, in introducing gas or explosive mixture into the working cylinder behind the piston while on some part of its working stroke and in providing means whereby a portion of the contents of the cylinder are allowed to escape through a flame or other ignitor, so that after external ignition takes place, on cutting off or reducing the supply of gas or mixture or otherwise sufficiently diminishing the flow through the ignitor, the ignition passes back to the cylinder and explodes its contents, whether at atmospheric pressure or under compression to propel the piston. The gas or explosive mixture for the first explosion is introduced either through a special supply-tap by the ordinary pressure in the gas-supply pipes or through the ordinary supply-valves, which are opened by hand, and the engine turned in the proper direction by hand to draw in combustible mixture, and then turned slightly back in the reverse direction to force a portion of the said mixture through the ignitor or through a check-valve by means of a hand-pump, the internal ignition taking place as soon as the piston of the hand-pump has

completed its stroke. The explosive mixture for the subsequent explosions is introduced in the same manner as in ordinary working; but in order to insure perfect starting the exhaust-port is kept open during more or less of the compressing stroke by means of a relief-cam which can be readily thrown out of action when the engine has attained a sufficient speed to overcome the resistance of compression, and a series of explosions at a low compression are obtained as follows: A portion of the said mixture is during the partial compression forced through the ignitor-nozzle into a small chamber where it burns, so that at the end of the compression, after the crank has passed its dead-center, the ignition passes back into the cylinder to explode the contents. An automatic valve prevents the escape of the mixture during the partial compression into the atmosphere, but allows of such escape at low pressure, such as that in the gas-supply pipes.

In the accompanying two sheets of drawings, Figure 1 is a section of a starter constructed according to this invention; and Fig. 2 is a cross-section of the cylinder of a gas-engine, showing the complete arrangement for starting fitted in place.

The starter-nozzle 5 is connected to the compression-space 1 of the cylinder by the tube 16 and opens to a chamber 17. The annular passage 18, surrounding the tube 16, is also connected to the compression-space and communicates with the lower side of the automatic valve 19, which, when closed, closes all communication with the atmosphere, and which can be maintained in its raised or closed position against the resistance of the spring 20 by means of the thumb-screw 21. When the engine is to be started, the automatic valve 19 is relieved from the screw 21 and is thrust down by the spring 20 or by its own weight, and an external flame 6 is arranged to play into the open space above it. The engine is placed in such position that its crank is somewhat over the in center of the working stroke, or it may have been stopped in this position from the previous working, and the gas is then turned into the cylinder through the cock 11 and causes an escape through the valve 19. The flame 6 comes by the passage

22 into contact with any gases proceeding from the nozzle 5, and when they become explosive they are ignited and burn within the chamber 17. The current through the nozzle 5 is then stopped or is sufficiently reduced by turning the cock 11, and the flame at once passes back to the cylinder through the pipe 16 and the first explosion takes place. This closes the valve 19, and the engine-shaft revolves. The piston in the next stroke discharges the burned gases and takes in a fresh charge, as in ordinary working, and the exhaust-valve is kept open during more or less of the usual compression-stroke by a relief-cam 13, and is closed before the end of the stroke, but after the gases proceeding from the nozzle 5 are ignited. The pressure in the cylinder then gradually rises and closes the valve 19, which was opened on the suction-stroke, and the flame from the nozzle 5 continues to burn in the chamber 17 till the pressure in the said chamber rises to that in the cylinder, or nearly so, when the ignition passes back and explodes the mixture in the cylinder. The proportions of the nozzle 5 and chamber 17 are arranged that the explosion occurs at the end of the stroke. In this manner an explosion under partial compression is obtained at every second revolution by means of the starter to start the engine until the cam 13 is put out of action when the engine continues to work in the ordinary manner. The valve 19 is opened when the pressure in the cylinder falls to nearly atmosphere by the spring or its own weight. A pilot-jet 23 is adopted to relight the main external flame 6, as it is blown out to each explosion. The valve 19 is formed with a channel or gutter 24 to cause leakage through the valve to be supplied from the annular passage 18, instead of from the chamber 17, so that the action of the nozzle need not be interfered with in the event of the valve leaking.

I do not herein claim my method of starting a gas-engine, as the same is fully described and claimed in application filed December 19, 1890, Serial No. 375,209.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A gas-engine starter consisting of an auxiliary chamber of determined capacity, a tube and nozzle serving as a means of communication between the said chamber and the cylinder, an automatic valve opening communication between the said nozzle and

the external atmosphere, a means of communicating the pressure in the cylinder to the under side of the valve, and an external flame arranged to play over the valve and into the said chamber when the valve is open, substantially as described.

2. A gas-engine starter consisting of an auxiliary chamber of determined capacity, a tube and nozzle serving as a means of communication between the said chamber and the cylinder, an automatic valve opening communication between the said nozzle and the external atmosphere, a means of communicating the pressure in the cylinder to the under side of the valve, an external flame arranged to play over the valve and into the said chamber when the valve is open, and a special means for introducing inflammable gas or vapor into the engine-cylinder, substantially as described.

3. A gas-engine starter consisting of an auxiliary chamber of determined capacity, a tube and nozzle serving as a means of communication between the said chamber and the cylinder, an automatic valve opening communication between the said nozzle and the external atmosphere, a means of communicating the pressure in the cylinder to the under side of the valve, an external flame arranged to play over the valve and into the said chamber when the valve is open, and means for keeping the exhaust-port open during more or less of the usual compressing stroke and which can be readily thrown out of action when the engine is running, substantially as described.

4. In a gas-engine starter, the combination, with an ignition-chamber communicating with the combustion-chamber of the engine and provided with an opening 22, through which the contents of the said ignition chamber may be ignited, of a valve-chamber also communicating with the said combustion-chamber and a valve sliding in the valve-chamber and adapted to close the said opening 22 automatically when the contents of the combustion-chamber have been ignited by the contents of the ignition-chamber, substantially as set forth.

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

FREDERICK WILLIAM LANCHESTER.

Witnesses:

WALTER J. SKERTEN,
THOMAS LAKE.