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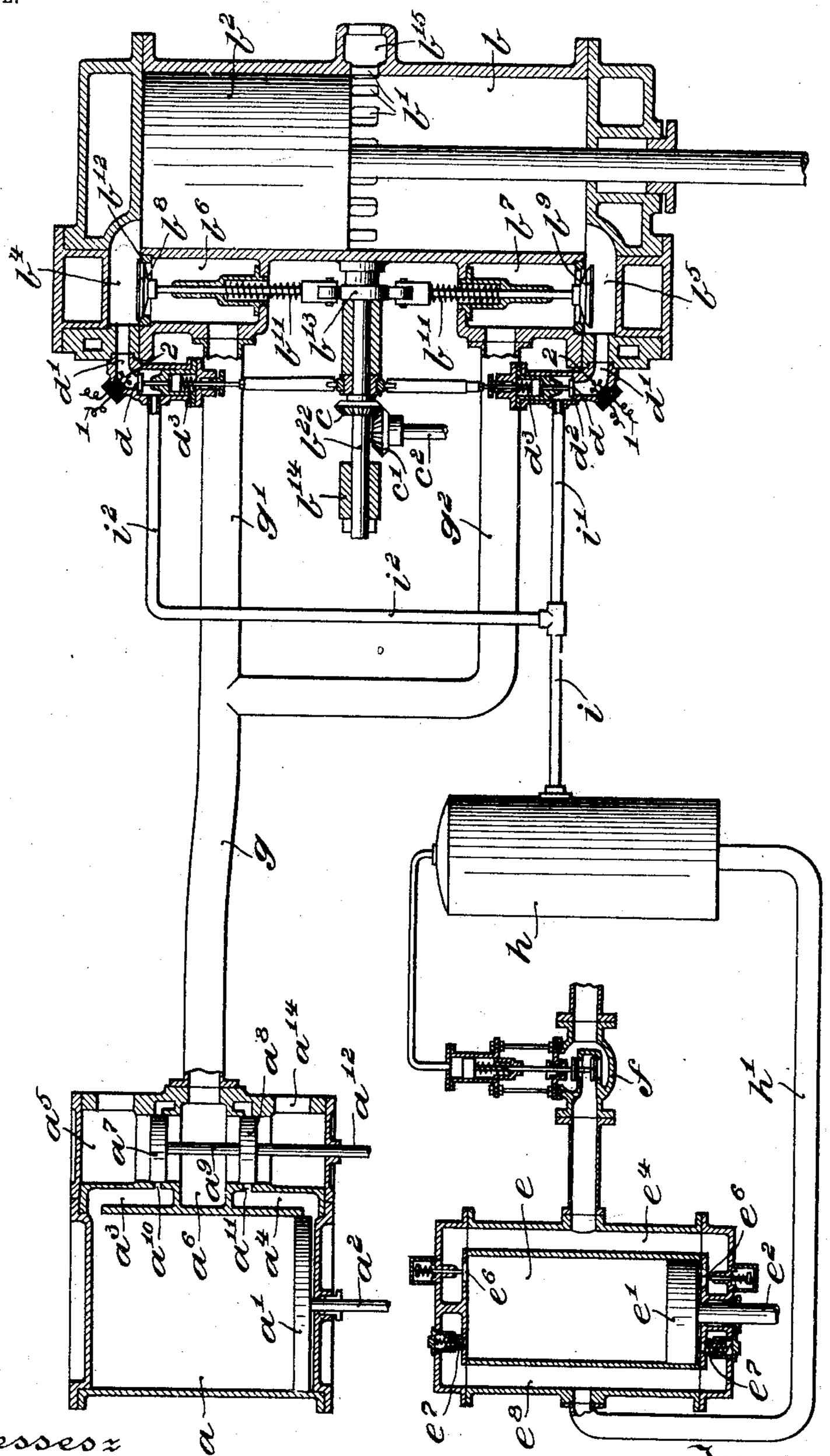
B. M. ASLAKSON.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED OCT. 30, 1903.

NO MODEL.



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No. 765,159. Patented July 19, 1904.

UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

SPECIFICATION forming part of Letters Patent No. 765,159, dated July 19, 1904.

Application filed October 30, 1903. Serial No. 179,170. (No model.)

To all whom it may concern:

Be it known that I, BAXTER M. ASLAKSON, a citizen of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

My invention has relation to a suitable apparatus or internal-combustion engine for economically converting heat derived from fuel into energy.

The principal object of my invention is to provide in an internal-combustion engine means for compressing air first slightly outside the working cylinder of the engine and then compressing the air to a maximum degree inside the working cylinder, means for compressing a gaseous fuel outside the working cylinder to a degree higher than the maximum compression of the air, means for forcing the gaseous fuel gradually into and through the compressed air, an incandescent body arranged to ignite the gas to thereby combine the same with the air at the maximum pressure of both gas and air and prior to the entrance of the gas into the working cylinder, and a piston arranged in the working cylinder to constitute a resistance against the expansion of the combined gas, air, and products of combustion, whereby an appreciable increase of temperature or pressure of the combined gas and air is prevented.

The nature and scope of my present invention will be more fully understood from a practical exemplification of my invention embodied in the drawing, which illustrates in section and in elevation one form of a double-acting or two-cycle type of engine which has been found efficient for carrying into effect essential features of the mode of converting heat derived from fuels into energy of my said invention.

In the drawing, a is a cylinder in which is arranged a piston a', receiving its reciprocatory movement by means of a piston-rod a^2, actuated by any suitable mechanism. (Not shown.) The cylinder a at its upper and lower ends is connected, by means of ducts or ports a^3 and a^4, with a cylinder a^5, provided with a centrally-arranged chamber a^6. This chamber a^6 is normally closed at either end by valve-pistons a^7 and a^8, actuated by a piston-rod a^{12} and connected with each other by means of a rod or tube a^9, so as to be adapted to operate in unison. The valve-pistons a^7 and a^8 also serve to open or close annular ducts or ports a^{10} and a^{11}, arranged in the cylinder a^5, which communicate with the ducts a^3 and a^4. When the piston a' of the cylinder a occupies the position shown, the valve-pistons a^7 and a^8 are moved upward and in so doing uncover the ducts or ports a^{10} and a^{11}. By the following upward movement of the piston a' in the cylinder a the pure air previously admitted into the same in a manner to be hereinafter more fully described is compressed and forced through the ducts or ports a^3 and a^{10} into the central chamber a^6. At the same time pure air is sucked or drawn into the cylinder a by the upward movement of the piston a', in this instance through the lower opening a^{14} of the cylinder a^5 and from the same through the duct or port a^{11}, chamber a^6, and port a^4 into the cylinder a, to be compressed and to be fed to the chamber a^6 by the downward stroke of the piston a' and the valve-pistons a^7 and a^8. The chamber a^6, by means of conduits or tubes g, g', and g^2, is connected with air-receiving chambers b^6 and b^7, preferably formed integral with a motor or working cylinder b of a double-acting engine. In the receiving-chambers b^6 and b^7 the air is stored at a pressure of about five pounds to the square inch and is kept therein until the inlet or air valves b^8 and b^9, arranged in the chambers b^6 and b^7, permit of the entrance of the same into the combustion-chambers b^4 and b^5, arranged adjacent to but not in either end of the motor or working cylinder b. Each of the air or inlet valves b^8 and b^9 is normally closed and held upon its seat b^{12} by a spring b^{11}. The opening of the inlet-valves b^8 and b^9 against the tension of the spring b^{11} is controlled by a cam b^{13}, arranged on a shaft b^{22}, which is carried by a bracket b^{14}, suitably secured to the working cylinder b. The shaft b^{22} receives its rotary movement by means of gear-wheels c c' and shaft c^2, which shaft c^2 is operated by means (not shown) which operate the piston b^2.

The motor or working cylinder b is provided with a piston b^2, and in its central portion is arranged a series of outlet or exhaust ports b', adapted to connect the interior of the cylinder b with an exhaust conduit or duct b^{15}, which is in communication with the open air. Before the piston b^2 has been moved into the position shown or has reached the end of its upward stroke the same will uncover or free the exhaust-ports b', and will thus permit the products of combustion of a previous charge to escape into the atmosphere. As soon as the uncovering of the exhaust-port b' by the piston b^2 takes place the lower air or inlet valve b^9 will be opened by the cam b^{13} and permit of the admission of pure compressed air from the valve-chamber b^7 into the working cylinder b. The pressure of the products of combustion of the previous charge having been reduced by the escape of the same into the atmosphere, the pure air entering the working cylinder b at this moment will be enabled to completely expel the remaining products of combustion. Nothing but pure air under pressure will now remain in the working cylinder b. This air is prevented from escaping into the atmosphere by the back stroke of the piston b^2, which again closes the exhaust-ports b', and so confines the air in the working cylinder b. From the closing of the ports b' begins the further compression of the previously slightly-compressed air, which compression continues until the piston b^2 has reached the end of its back stroke and occupies a position opposite to that shown. The air in its further compression in the working cylinder b is forced by the piston b^2 into the lower combustion-chamber b^5 and is held in the same under a compression varying from three hundred to three hundred and fifty pounds to the square inch, more or less. The combustion-chamber b^5 is in open communication with a duct or conduit d', partially formed by the housing of the motor or working cylinder b and partially formed by the housing of a gas-inlet valve d. The end of this duct d' is closed by the gas-inlet valve d, which is normally held on its seat d^2 by a spring d^3. In this duct d', which is filled with highly-compressed pure air, is arranged an igniting device of any suitable construction, but preferably consisting of a wire 1, suitably insulated from the housing of the valve d. Through this wire either an alternating or direct electric current is sent, which holds the portion 2 of the same in a constantly-incandescent state, which is sufficient to ignite a fuel introduced into the duct d' in the presence of the highly-compressed pure air.

In the present instance gas is used as the fuel, which, however, before being permitted to enter the duct d' and the combustion-chamber b^5 is highly compressed to a degree exceeding that of the air, which, as hereinbefore explained, has been separately compressed, first slightly and then highly.

The compression of the gas prior to its delivery to the ducts d' and combustion-chambers b^4 and b^5, arranged at either end of the motor or working cylinder b, is accomplished in a cylinder e by means of a piston e', actuated by a rod e^2, which receives its movement from any suitable mechanism. (Not shown.) Gas from any suitable source (not shown) is admitted through a balanced valve f into a chamber e^4 and from thence is drawn into the cylinder e by the upward movement of the piston e', the suction action of which opens a gas-inlet valve e^6, arranged in the chamber e^4. In the same manner gas will be drawn into the cylinder e by the downward stroke of the piston e', and this gas is now compressed by the upward stroke of the same and after reaching a certain degree of compression by the piston e'—say to about four hundred pounds to the square inch, more or less—is permitted to escape into a chamber e^8 through an outlet-valve e^7. The chamber e^8 by a tube h' is connected with a storage-receptacle or receiver h, into which the compressed gas is forced and stored for use. From the receiving-tank h the gas, by means of the tubes i, i', and i^2, is conducted to the gas-inlet valves d, arranged at either end of the working cylinder b. The lower valve d being opened, the gas is gradually admitted into the duct d' in the presence of the compressed air, which surrounds an igniter or glower 2. The gas being held under a higher compression than the air forces its way through the same, and as soon as the gas reaches the glower 2 it is instantly ignited in the presence of the air. This ignition extends into the narrow or oblong combustion-chamber b^5, causing only a slight increase of temperature of the highly-compressed charge, and the heat generated by the gradual combustion is immediately converted into energy by the expansion of the air, gas, and the products of combustion, which drive the piston b^2 upward into the position illustrated. Owing to the expansion of the gases in the motor-cylinder b, an instant decrease in temperature is obtained, which counteracts the increase in temperature which would otherwise be obtained through the combustion of the gases. Furthermore, this expansion of the gases also prevents an increase in pressure, so that only an actual increase in energy through the combustion is obtained. On its upward stroke the piston b^2 highly compresses a charge of slightly-compressed air previously permitted to enter the working cylinder b by the air-inlet valve b^8, and when the piston has reached the end of its upward stroke gas under higher compression than air is admitted through the upper inlet-valve d and into the combustion-chamber b^4 in the manner and for the purpose hereinbefore fully explained.

From the foregoing description it will be understood that the air is first slightly compressed outside the working cylinder and then highly compressed in the working cylinder, from which it is forced into the combustion-chamber, and that the gas is compressed to its maximum pressure outside the working cylinder and then forced gradually into and through the compressed air to be therewith combined in the presence of an incandescent body, so that the highest temperature of combustion is obtained not during combustion, but before and independently of the combustion, and also that a constant and high compression, and consequently the highest possible economy, are obtained by the hereinbefore-described mode of converting heat derived from fuels into energy for its utilization. Moreover, thoroughly reliable ignition of a charge under all circumstances is insured without premature or self ignition of the charge being possible.

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

1. In an internal-combustion engine, a working cylinder, means for first compressing air slightly outside the working cylinder and thereafter compressing said air highly in said working cylinder, a combustion-chamber communicating with the working cylinder, an incandescent body located in the combustion-chamber, a source of gaseous-fuel supply, means for compressing said fuel outside the working cylinder to a pressure higher than the maximum pressure of the compressed air, and means for gradually feeding the compressed gas into and through said air and in contact with the incandescent body to thereby cause the gas and air to combine prior to the passage of the gas into the working cylinder.

2. In an internal-combustion engine, a working cylinder, means for first compressing air slightly outside the cylinder and thereafter highly in the cylinder, a combustion-chamber communicating with the working cylinder, an incandescent body located in said combustion-chamber, a source of gaseous-fuel supply, means for compressing said fuel outside the working cylinder to a pressure greater than the maximum pressure of the compressed air, means for gradually feeding the compressed gas into and through the compressed air and in contact with said incandescent body to thereby combine the gas, air and products of combustion prior to their entrance into the working cylinder, and a piston in said working cylinder constituting a resistance against the expansion of the combined gas, air and products of combustion, whereby appreciable increase of temperature and pressure of the combined gas and air is avoided.

In testimony whereof I have hereunto set my signature in the presence of two subscribing witnesses.

BAXTER M. ASLAKSON.

Witnesses:
J. WALTER DOUGLASS,
THOMAS M. SMITH.