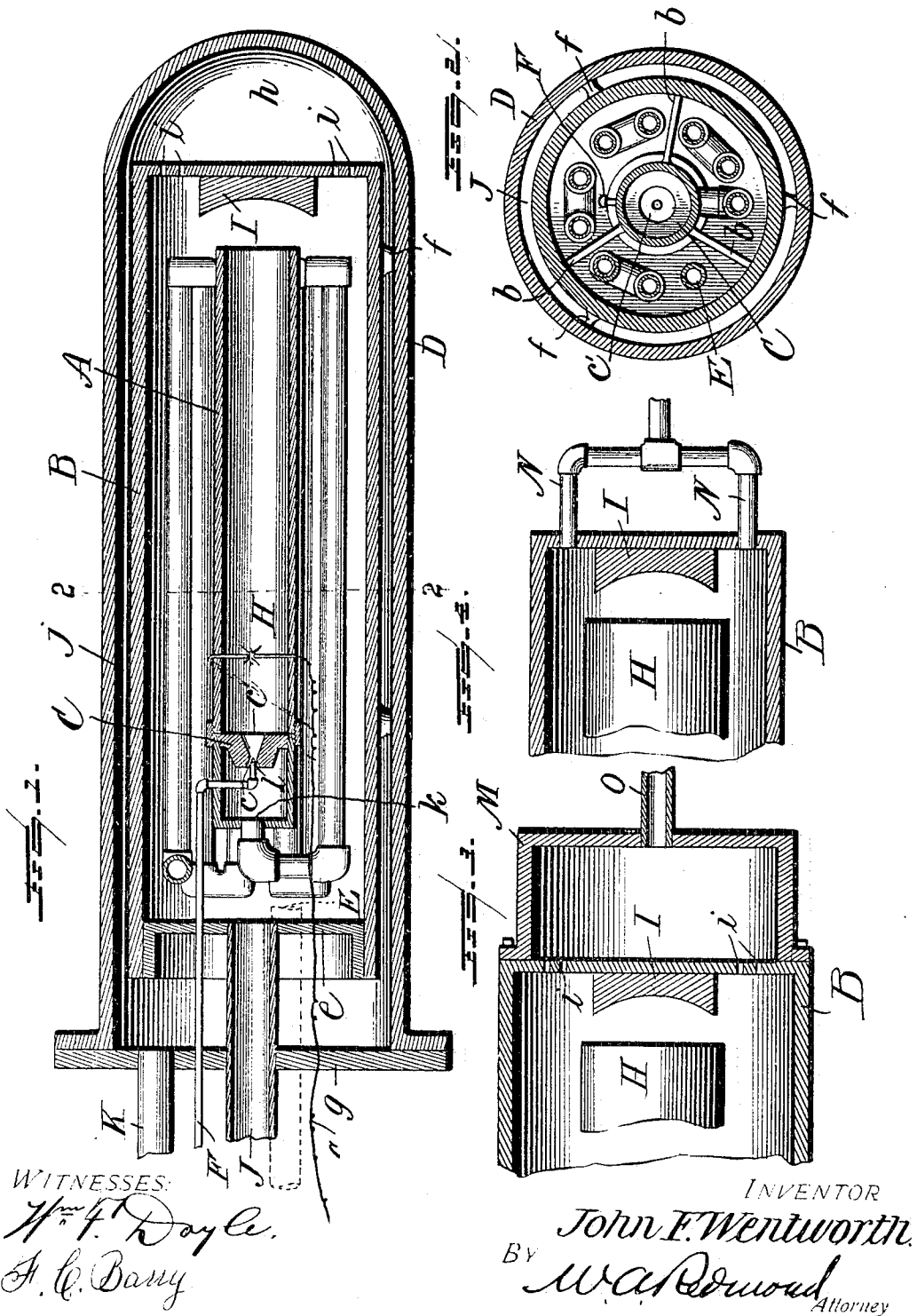


No. 798,855.

PATENTED SEPT. 5, 1905.

J. F. WENTWORTH.
COMBUSTION CHAMBER.
APPLICATION FILED OCT. 9, 1901.



UNITED STATES PATENT OFFICE.

JOHN F. WENTWORTH, OF WASHINGTON, DISTRICT OF COLUMBIA.

COMBUSTION-CHAMBER.

No. 798,855.

Specification of Letters Patent.

Patented Sept. 5, 1905.

Application filed October 9, 1901. Serial No. 78,042.

To all whom it may concern:

Be it known that I, JOHN F. WENTWORTH, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Combustion-Chambers; and I do 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 relates generally to internal-combustion engines, and particularly to the combustion-chamber for producing the working fluid for internal-combustion engines; and it has for its object to provide a combustion-chamber separated or removed from the working chamber and from the compression-chamber, but connected to said chambers, in which the working fluid is produced ready for use, so that it may be conducted to the engine in a manner similar to the delivery of steam from a boiler to an engine, thus insuring perfect combustion and avoiding the injurious effect of combined heat and pressure acting upon the metal; and it consists of the parts and combinations of parts herein-after described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a longitudinal vertical section through my improved combustion-chamber; Fig. 2, a transverse vertical section on the line 2 2, Fig. 1; and Figs. 3 and 4 sectional views of modified forms of one part of the invention.

Similar letters refer to similar parts throughout the several views.

In carrying out my invention I employ air compressors and reservoirs for the compressed air which are water-jacketed; but I entirely avoid the use of such jackets on the engine and the combustion-chamber, the compressed air, partly cooled, being conducted directly to the combustion-chamber and serving to reduce the temperature of the products of combustion as well as to take up the heat radiated from said chamber and which is now usually taken up by a water-jacket and goes to waste, whereas I utilize said heat by converting it into work.

In the drawings I have omitted the compression apparatus and the engine as well as valves for controlling the fluid fuel and air and gases, as I make no claim for any novel features in such apparatus or devices.

Referring now to the drawings, the combustion-chamber proper comprises an inner chamber A and an outer chamber B, the former being closed at one end and in communication with the outer chamber at its other end, while the outer chamber is closed at both ends and surrounds and extends beyond the inner chamber at each end, as clearly shown. Any suitable means may be employed to support the inner chamber centrally within the outer chamber, so as to provide a space between said chambers at all points, and I show as a convenient means for so supporting the inner chamber a series of webs *b*, extending from said inner chamber and resting against the inner surface of said outer chamber. At a suitable distance from the closed end of the chamber A is secured, preferably by screwing the same in place, a block or plug C, having a passage centrally therethrough which at both ends is formed flaring, as at *c c'*, Fig. 1, the mouth *c'* being of the greatest diameter, so as to cause the fluids to be sprayed and mingled in the inner chamber as they issue from the passage. The inner and outer chambers are preferably cylindrical in shape, and the inner chamber is preferably made in two parts and joined by a coupling *d*. The outer chamber B is closed at one end by the head *e*, bolted in place, while the other end is preferably closed by a head cast therewith.

Surrounding and inclosing the chambers A and B is a jacket D, which supports the shell of chamber B centrally in said jacket by the webs *f*, projecting from said shell. One end of the jacket D is closed by a head *g*, securely bolted to a flange on the jacket, and the other end is preferably formed dome-shaped, so as to provide a somewhat enlarged chamber or space *h* at the end of chamber B, with which space said chamber B has communication through a series of openings *i*, formed in the end wall of said chamber B.

K represents a pipe through which air is fed to the interior of jacket D. The diameter of the jacket is such that a space *j* is provided at all points surrounding the chamber B, and which space has direct communication with the space *h* at the end of the chamber B.

E represents a pipe which leads from an air-compressor (not shown) through the head *g* of the jacket and head *e* of chamber B and

extends back and forth in the space between the chambers A and B the full length of the inner chamber, said coil thus formed terminating in the closed end of said chamber A at *k*, so as to discharge within said chamber the supply of air necessary to support combustion.

Represents a fluid-fuel pipe leading through the heads *g* and *e* and entering the inner chamber A in front of the block C and terminating in a nozzle *l*, which discharges into the flaring mouth of the opening in said block.

G represents the wires of any suitable electrical sparking device H, arranged within the inner chamber in advance of the block C to ignite the mixture. A block of refractory material I is secured to the end wall of chamber H in line with the inner chamber to protect the said end wall from the direct action of the hot gases.

J represents a pipe through which the products of combustion or hot gases are conducted to the cylinder of an engine or elsewhere, as desired for use.

In operation air which has been compressed and cooled as nearly simultaneously as possible at a point removed from the combustion-chamber enters the pipe E under pressure and circulates through the coil to be heated by the gases in the outer chamber B before entering the inner chamber and thus aid combustion. The fluid fuel is fed through pipe F under pressure and is discharged through the nozzle *l* into the flaring-mouthed passage of block C and is sprayed into inner chamber A. The heated air from the coil enters the inner chamber at *k* and passes through the passage in block C and is mixed or mingled with oil spray and ignited by the sparker H, and the products of combustion pass out of said inner chamber and into chamber B and from the latter to the engine through pipe J. The air-jacket D receives the cooled compressed air through pipe K, and it circulates in the space surrounding the outer chamber B and takes up the heat radiated from said chamber B and conducts it through the space *j* to the chamber or space *h*, from which it escapes into the said chamber B through the opening *i*, where it is converted into work.

In Fig. 3 I show a chamber M at the end of the outer cylinder into which cooled compressed air enters through a pipe O and escapes into the said chamber in order to reduce the temperature of the hot gases, and in Fig. 4 I show pipes N, which are intended to convey cooled air directly to the said chamber B without the intervention of a chamber M or space *h*.

The theory of this invention is to divide the combustion-chamber into two or more separate zones of equal heat, the inner chamber being intended to receive the air (after it has

been warmed by circulation in the outer chamber) and the fluid fuel in the form of a spray. By means of this previous heating of the air and allowing the proper proportions of air to enter with the fuel a very intense heat is obtained within the inner chamber, which heat is high enough to accomplish the complete combustion of any combustible fluid. The temperature obtained would be about 2,000° Fahrenheit, and with a pressure of five hundred pounds per square inch or even much less there is no metal which can withstand the combined stress of pressure and this high temperature. In my improved combustion-chamber as the product of combustion or the working fluid leaves this inner chamber it meets the surplus of cooled compressed air and mingling with it forms a gas of reduced temperature. This gas having a temperature of about 700° Fahrenheit can be contained in an ordinary metal reservoir. Hence this gas surrounding and being on all sides of the inner chamber takes away the effect of the pressure, leaving the inner chamber to stand only the effect of the heat, which can be accomplished by means of asbestos or some similar lining. The air-jacket when used is to prevent loss by radiation as much as is possible. The cool compressed air entering the jacket and flowing over the surface of the outer chamber takes up a large part of the heat which the outer chamber would otherwise lose by radiation and carries it back to the outer chamber, where it mingles with the hot gas and, forming with it a mechanical mixture of such temperature as the metal of the cylinder can stand, goes to the working chamber to give up its heat in the form of work. The coil of pipe is merely one way for exposing the incoming air which is to be used to support combustion to a higher temperature in order by the aid of warming the air to make combustion of the less volatile oils more certain.

The aim of this invention is to provide a combustion-chamber capable of control and manipulation, it being designed to have no limit to the temperature of combustion and to reduce this maximum temperature to any desired degree of temperature by mingling cooler compressed air with the products of combustion. In this way the advantages of the extreme temperature as an aid to combustion and of a more moderate temperature for use can be obtained.

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

1. An inner combustion-chamber, an outer commingling-chamber for air and products of combustion and an air-jacket inclosing and communicating with said chambers, and a compressed-air supply for said jacket.

2. A combustion-chamber comprising an inner and an outer chamber, an air-pipe leading into the outer chamber and forming a coil about the inner chamber and terminating within the inner chamber, a fluid-fuel pipe delivering within said inner chamber, a suitable igniter within the inner chamber, an air-jacket surrounding and in communication with said outer chamber, and an exhaust or delivery pipe leading from said outer chamber. 10

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

JOHN F. WENTWORTH.

Witnesses:

M. L. SPELLMAN,

HUGH M. STERLING.