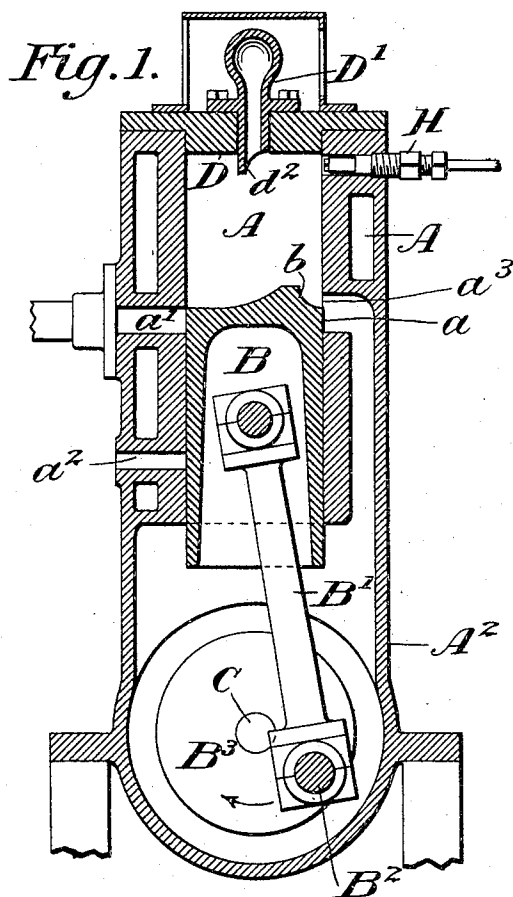
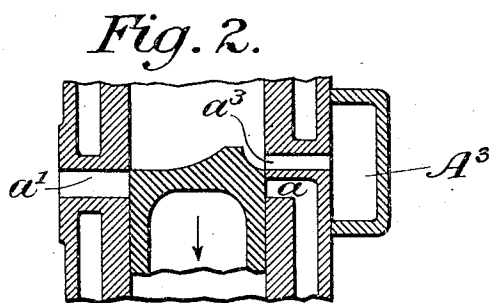


No. 792,300.

PATENTED JUNE 13, 1905.

C. W. WEISS.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED AUG. 26, 1904.



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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

SPECIFICATION forming part of Letters Patent No. 792,300, dated June 13, 1905.

Application filed August 26, 1904. Serial No. 222,311.

To all whom it may concern:

Be it known that I, CARL W. WEISS, a citizen of the United States, residing in the borough of Manhattan, in the city of New York, in the State of New York, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

In internal-combustion engines of the well-known type to which this invention generally relates and in which the exhaust and air-inlet ports are opened by the piston as it approaches the limit of its forward stroke the exhaust-port is arranged to be opened slightly in advance of the air-inlet port. In the practical operation of such engines not only is it generally desirable to employ a muffler because of the high pressure of the exhaust, but the exhaust contains more or less unburned gases, and it has also been found that the exhaust generally contains more or less air or oxygen which has not been combined in combustion with the vapor of the fuel charge. The existence of the unburned gases and uncombined oxygen in the exhaust is perhaps due to the existence in the working cylinder at the end of each working stroke in proximity to the air-inlet port of a small volume of the mixture which is not sufficiently rich in vapor to burn or which would burn slowly if at all. Such mixture is discharged from the cylinder when the exhaust-port is opened first. At all events it has been found in the development of the present invention that what may be termed the "main exhaust"—viz., that which is discharged from the engine—becomes practically free from unburned gases and from uncombined oxygen if provision is made for the escape from the working cylinder of such mixture as lies near the air-inlet port before the main exhaust-port is opened. To accomplish this, there is provided what may be termed an "auxiliary" exhaust-port, which is preferably arranged so as to permit such mixture to escape into the air-passage which terminates in the air-inlet port or into the air-compression chamber or into a chamber connected therewith, and such auxiliary port

may, in fact, be in one opening with the air-inlet port, the same being arranged to be opened slightly before the exhaust-port is opened.

The invention will be more fully explained hereinafter with reference to the accompanying drawings, in which for purposes of explanation of the nature of the invention it is illustrated as embodied in a convenient and practical form.

In the drawings, Figure 1 is a central section of enough of an internal-combustion engine to illustrate the application of the invention thereto. Fig. 2 is a partial similar view illustrating a modification.

The general features of the engine may be of ordinary construction and will be briefly referred to so far as they are shown in the drawings.

The cylinder A may be provided with a water-jacket A', as usual, and the casing A² of the cylinder may be extended forward to inclose the crank or crank-disk and to receive the bearings of the crank-shaft, forming an air-compression chamber into which the air is admitted through a port a² when the piston approaches the limit of its rearward stroke. The trunk-piston B may be connected by a pitman B' to the crank-pin B², carried by crank-arms or crank-disks B³, secured directly to the crank-shaft C. The air-compression chamber is connected, through a suitable duct, with the working cylinder A through a port a, which is so arranged as to be closed by the piston during its rearward movement. A main exhaust-port a' is arranged to be covered by the piston except when the latter approaches the limit of its forward movement. A deflector b may be formed upon the face of the piston B for the purpose of directing a strong blast of air from the compression-chamber rearwardly into the explosion-chamber and against a dash-plate d², which may form a part of a tubular igniter D', secured to the cylinder-head D. The fuel-oil is discharged through a nozzle H against the dash-plate d², where it is immediately vaporized, the vapor being distributed through the working cylinder in combination with the inrushing air from the air-compression chamber A².

As will be observed upon reference to Fig. 1, the main exhaust-port a' is located, as usual, so that it is completely opened as the piston reaches the limit of its forward stroke. The air-inlet port a may also be located substantially as heretofore, except that it is elongated rearwardly toward the head of the piston to form what may be termed an "auxiliary" exhaust-port a'' , the latter being so arranged as to be opened by the piston somewhat in advance of the main exhaust-port a' . It will be apparent that when this auxiliary exhaust-port is first opened, while the main exhaust-port a' is still closed, the gases in the cylinder being then under high pressure, which is considerably above the pressure in the air-compression chamber, escape in part from the working cylinder, carrying with them the mixture of unburned gases and air which was in proximity to the air-port. The effect of this will be, first, to reduce the high pressure in the working cylinder, so that when the main exhaust-port a' opens the exhaust therefrom will be so nearly noiseless as to render the use of a muffler unnecessary. The second result will be that the mixture of unburned gases and air will be out of the working cylinder at the time when the main exhaust-port is opened, and consequently will not escape therethrough. As a further result, with the construction shown in Fig. 1 the increase of pressure in the air-compression chamber A^2 by the communication of the working cylinder therewith in advance of the opening of the main exhaust-port will bring about a more forcible discharge of the contents of the air-compression chamber into the working cylinder when the main exhaust is opened, which will not only return the mixture of unburned gases and air above referred to into the working cylinder, thereby increasing the efficiency of the engine, but will produce a much more violent disturbance of the contents of the working cylinder with a consequently more perfect mixture.

In the modification illustrated in Fig. 2 the auxiliary air-port a'' is arranged to communicate with an auxiliary chamber A^3 , which is shown as independent of the air-compression chamber. As soon as the port a'' is opened by the piston the pressure in the working cylinder will be relieved through the port a'' and the body of unburned vapor and uncombined oxygen will be carried out of the cylinder into

the auxiliary chamber. This arrangement therefore accomplishes the reduction in the noise of the exhaust and the elimination of the unburned vapor and uncombined air from the main exhaust. Thus the contents of the auxiliary chamber A^3 will be returned to the working cylinder as soon as the pressure therein has been reduced; but they will not escape through the main exhaust-port.

Other modifications will suggest themselves in view of the disclosure herein, and it is to be understood that it is not intended to limit the invention to the precise construction and arrangement shown and described.

I claim as my invention—

1. In an internal-combustion engine, the combination of a piston, a working cylinder having a main exhaust-port arranged to be opened as the piston approaches the limit of its forward stroke, an air-inlet port and an auxiliary exhaust-port arranged to be opened in advance of the main exhaust-port, and a closed chamber communicating with the auxiliary exhaust-port, into which the gases which lie near the piston are discharged before the main exhaust takes place and from which such gases are returned to the cylinder as the pressure therein is reduced by the opening of the main exhaust, substantially as described.

2. In an internal-combustion engine, the combination of a piston, a working cylinder and an air-compression chamber, said cylinder having a main exhaust-port arranged to be opened as the piston approaches the limit of its forward stroke, and a port communicating with the air-compression chamber and arranged to be opened in advance of the main exhaust-port, substantially as described.

3. In an internal-combustion engine, the combination of a piston, a working cylinder, and a closed crank-chamber, said cylinder having a main exhaust-port arranged to be opened as the piston approaches the limit of its forward stroke, and a port communicating with said closed crank-chamber and arranged to be opened in advance of the main exhaust-port, substantially as described.

This specification signed and witnessed this 17th day of August, A. D. 1904.

CARL W. WEISS.

In presence of—

JOHN M. SCOBLE,
LUCIUS E. VARNEY.