

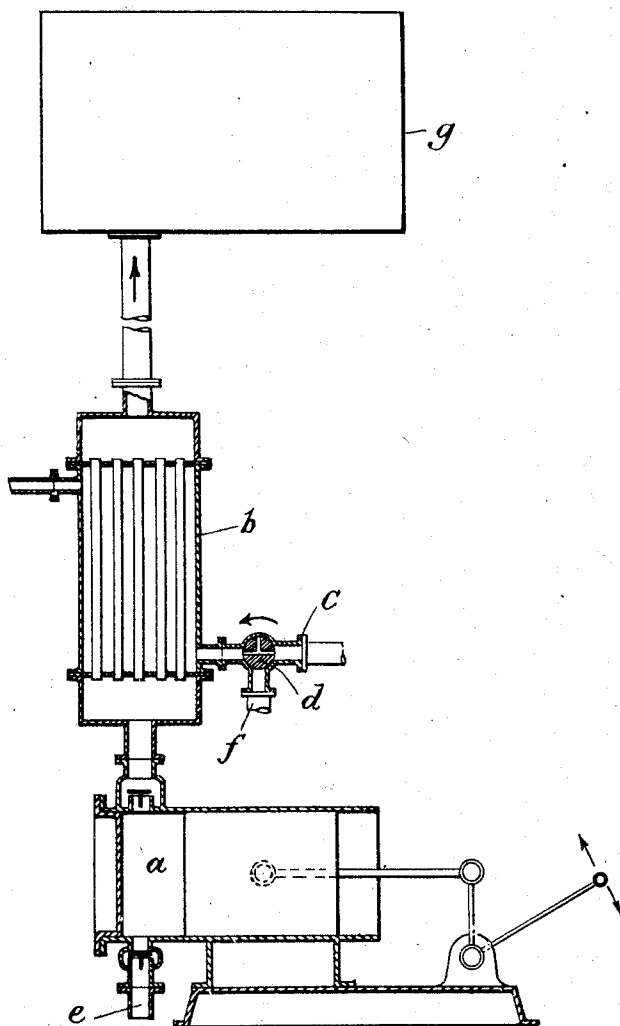
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R. MAYER

METHOD OF STARTING INTERNAL COMBUSTION ENGINES

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Rudolf Mayer

INVENTOR

BY *lie*

Pennic, Davis, Marvin, & Edmonds
ATTORNEYS

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RUDOLF MAYER, OF GOLDSCHMIEDEN KREIS, Breslau, GERMANY, ASSIGNOR TO THE FIRM OF MASCHINENFABRIK AUGSBURG-NUERNBURG, AKTIENGESellschaft, OF AUGSBURG, GERMANY, A GERMAN CORPORATION.

METHOD OF STARTING INTERNAL-COMBUSTION ENGINES.

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(GRANTED UNDER THE PROVISIONS OF THE ACT OF MARCH 3, 1921, 41 STAT. L., 1313.)

To all whom it may concern:

Be it known that I, RUDOLF MAYER, a citizen of Germany, residing at Linden Str., Goldschmieden Kr., Breslau, Germany, have invented certain new and useful Improvements in Methods of Starting Internal-Combustion Engines (for which I have filed application in Germany, July 5, 1915), of which the following is a specification.

10. The present invention relates to a method of starting internal combustion engines of the type in which ignition is effected by means of the high temperature attained in the cylinder during the compression stroke, and in which the products of combustion are expelled from the cylinder by an inrush of air.

15. It is common in engines of this type to provide means for cooling the scavenging air during the operation of the engine for the purpose of increasing the weight of air which is compressed at each stroke of the piston, or starting the engine, however, when the parts are cold, it is usually necessary that the scavenging air be heated in order to generate a temperature sufficiently high to cause ignition.

20. It is accordingly a principal object of the present invention to provide a method for starting engines of the above type in which the air passing to the cylinder is heated during the starting period and is normally cooled during the time when the engine is in operation.

25. More specifically it is an object of the invention to utilize the same means which are provided to normally cool the scavenging air for the purpose of heating such air during the starting period. The entire system is thus rendered simple and accessible, since only a single unitary apparatus is required for heating and for cooling the scavenging air.

30. In the accompanying drawing, which is a view largely diagrammatic, I have illustrated by way of example a preferred embodiment of apparatus for carrying out my improved method.

35. In the said drawing *a* indicates the pump employed for compressing the scavenging air drawn from the atmosphere or other convenient source through a feed pipe *e*, and

passing it at any desired compression through the heat exchanger *b* into the reservoir *g*, from which it may be supplied to the internal combustion engine as required. The heat exchanger *b* may be of any well known type containing two fluid passages having leak-proof connections between them.

40. During the starting period of the engine when it is desirable that the scavenging air be heated, steam is supplied to the heating space of the exchanger *b* through the line *c* leading from a steam main or other convenient supply. In the line *c* there is provided a three-way valve *d* which may be turned to admit steam to the heat exchanger or which may be turned to permit a flow from the line *f* into the exchanger *b*, the line *f* being connected with a supply of cold water or other cooling medium for use in cooling the air during normal operation of the engine.

45. When the engine is first started valve *d* is turned to the position shown, in which case steam will be admitted to the heat exchanger *b* and will warm the air on its way to the engine. As soon as the engine begins to operate satisfactorily under its own power, the valve *d* is turned 90° in the direction indicated by the arrow, in which position it will shut off the flow of steam and will permit the cooling fluid to circulate through the exchanger *b*.

50. It is to be understood that any convenient fluid having a temperature materially higher than that of the air passing to the reservoir *g* may be employed as a heating medium, for instance, hot water, hot gases such as flue gases, and the like. Likewise any convenient cooling fluid other than cold water may be employed if desired. I have illustrated a preferred embodiment of the apparatus for carrying out my improved method, but it is to be understood that the apparatus may be variously constructed to carry out my invention as defined in the appended claims.

I claim:

1. In the operation of Diesel engines of the two-cycle type, in which air under pressure is introduced into the cylinder to scavenge the cylinder and to furnish the charge of air for combustion, the method which comprises the steps of heating the scaveng-

ing air before admission to the engine cylinder, and subsequently cooling said air after the engine begins to operate under its own power.

- 5 2. In the operation of Diesel engines of the two-cycle type, in which air under pressure is introduced into the cylinder to scavenge the cylinder and to furnish the charge of air for combustion, the method which
10 comprises the steps of heating the scavenging air before admission to the engine cylinder, and simultaneously discontinuing said heating and effecting a material cooling of said air after the engine begins to operate
15 under its own power.

3. In the operation of Diesel engines of the two-cycle type, in which air under pressure is introduced into the cylinder to scavenge the cylinder and to furnish the charge
20 of air for combustion, the method which comprises the steps of passing a heating medium into heat exchanging proximity with the scavenging air on its way to the engine cylinder, and replacing said heating medium
25 by a cooling medium after the engine begins to operate under its own power.

4. In a method for starting internal combustion engines whose scavenging air is normally cooled during the operation of the en-

gine, the step of temporarily passing a heating medium in heat exchanging proximity with said air along the same course normally traversed by the cooling medium. 30

5. In a starting system for internal combustion engines, a compressor for supplying
35 air to the engine cylinder at a pressure above atmospheric, a heat exchanger interposed between said compressor and said cylinder, said heat exchanger having a passage for conveying the air discharged from said compressor, and means for supplying said heat
40 exchanger successively with a heating medium and with a cooling medium.

6. In a Diesel engine, a compressor for supplying air to the engine cylinder at a
45 pressure above atmospheric, a heat exchanger interposed between said compressor and said cylinder, said heat exchanger having a passage for conveying the air discharged from said compressor, means for
50 supplying extraneous heat to said heat exchanger during the starting of the engine, and means for supplying a cooling medium to said heat exchanger during normal operation of the engine. 55

In testimony whereof I affix my signature.

RUDOLF MAYER.