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L. POCCIA

AIR COMPRESSOR

Filed June 16, 1923

Fig. 1.

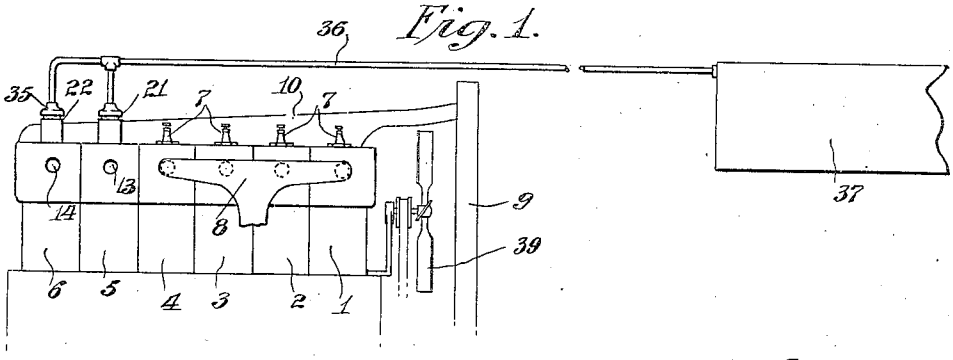
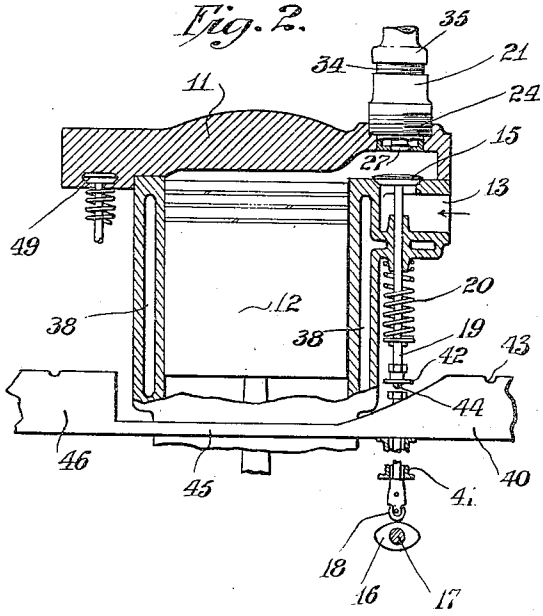
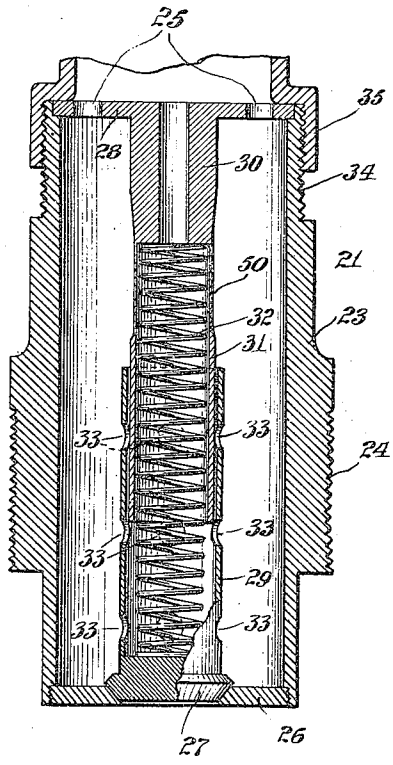



Fig. 3.

Fig. 2.




Lorito Poccia INVENTOR

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# UNITED STATES PATENT OFFICE.

LORETO POCCIA, OF MAMARONECK, NEW YORK.

## AIR COMPRESSOR.

Application filed June 16, 1923. Serial No. 645,393.

*To all whom it may concern:*

Be it known that I, LORETO POCCIA, residing at Mamaroneck, in the county of Westchester and State of New York, United States of America, having invented certain new and useful Improvements in Air Compressors, do hereby declare that the following is a full, clear, and exact description of the same.

This invention relates to air compressors and more particularly to air compressors operable by and applicable to gas engines provided on vehicles.

It is the object of the present invention to provide means for converting or adapting gas engines whereby the converted engine will perform both its original function of supplying motive or driving power and the function of acting as an air compressor.

With this object in view, I arrange a multi-cylinder gas engine in such a manner that one or more cylinders thereof are used as air compressors, the balance of the cylinders being used in the usual manner as parts of the power plant. Preferably, six cylinder engines are converted in this manner whereby two of the cylinders are used as air compressors, however, the invention is applicable to any other type of multi-cylinder gas engine.

The arrangement is so provided that old automobile engines may be thus converted to perform the above identified double function without the necessity of extensive alterations in the engine structure and assembly. The crank-shaft, the cam-shaft, the cooling system, the pistons and cylinders of the engine are left intact. However, the cams by means of which the intake valves of the air compressor cylinders are actuated, are so arranged that they will actuate the valves twice during each revolution of the cam shaft. The gasoline and ignition connections are severed from the air compressed cylinders and a new and improved exhaust valve is applied to such cylinders for controlling the connection between the cylinder and a compressed air storage tank.

As above stated, the invention is particularly applicable to automobile engines whereby the vehicle has a unitary power plant, and the arrangement is so provided that old engines can be readily remodeled for various industrial uses where a portable air compressor is required.

The above and other features of the invention will more readily appear from the following detailed description of an exemplification of the invention and the appended claims.

In the drawings Fig. 1 is a side elevation of as much of an automobile engine as is necessary for a clear understanding of the invention; Fig. 2 is a sectional view of a cylinder used as an air compressor; and Fig. 3 is a sectional enlarged view of an air exhaust valve.

The engine is mounted on a vehicle in the usual manner and consists of six cylinders, 1, 2, 3, 4, 5 and 6. The engine comprises the usual crank shaft by means of which pistons provided within the cylinders are operated; a cam shaft 17 carrying six or more cams by means of which the gas valves of the cylinders are operated; gas supply means, including a manifold 8, and ignition means including spark plug 7. The illustration of the details of the engine construction are deemed unnecessary inasmuch as the operation of such engines is well known in the art and may be varied within wide limits without departing from the spirit of the present invention.

The cylinders 1—4 are used for supplying the motive power to the vehicle, and the cylinders 5 and 6 for compressing air. The construction of these cylinders 5 and 6 is the same and they are as far as possible retained in their original form of gas engine cylinders. The spark plugs 7 are removed from cylinders 5 and 6, and these are disconnected from the manifold 8 but remain connected with the radiator 9 through the water connection 10. The heads 11 of these cylinders are filled in so that their inner surface is in close proximity to the piston 12 when the latter is fully raised by the crank shaft. As will be noted from Fig. 2, the usual gas exhaust valve 49 is rendered inoperative or it may be removed. Instead of being connected with the manifold these cylinders 5 and 6 connect directly with the outside atmosphere through openings or air intake ports 13 and 14 controlled by valves like 15. The intake valves 15 are preferably identically the same as were provided for the cylinders of the gas engine. However, these valves are actuated by double cams 16 mounted on the cam shaft 17, the cams of the valves controlling cylinders 1 to 4 being arranged to actuate them only once during each revolution of the cam shaft 17. Preferably, these

double cams are formed by simply adding a tailpiece to the usual cam provided on the shaft, cams serving the various valves being radially displaced with respect to each other.

Through the agency of a roller 18, the cam 16 lifts a rod 19 against the pressure of a spring 20, whereby during each revolution of the cam shaft 17, the valve 15 will be twice lifted to let air into the cylinder 5. Through a similar valve and cam, air is admitted to cylinder 6 twice during each revolution of shaft 17.

The spark plugs 7 of cylinders 5 and 6 are replaced by air exhaust valves 21 and 22 the construction of which is shown more in detail in Fig. 3, the gas exhaust valves being permanently disconnected. The valves 21 and 22 consist of a cylindrical casing 23 screw threaded at 24 to engage with the internally screw threaded seat of the spark plug in the cylinder head 11. The cover 28 of the casing 23 is seated on a shoulder formed in the casing and is provided with a plurality of apertures 25. The bottom of casing 23 is closed by means of a disc 26 provided with an opening within which fits a valve 27 having sleeve shaped shank 29. The top 28 of the casing 23 has a downwardly projecting lug 30 terminating in a sleeve 31 projecting within the sleeve 29. A spiral spring 32 provided within the sleeves 29 and 31 rests with one end against the lug 30 and with its other end against the valve 27 and holds it down to close the exhaust port in the disc 26. The sleeve 29 is provided with a number of perforations 33 through which lubricating material may be introduced within this sleeve when the casing 23 is unscrewed from the cylinder head and without the necessity of disassembling the valve structure. The top of the valve casing 23 is screw threaded at 34 with which a union 35 cooperates to connect the valve with a pipe 36 leading to a storage tank 37.

The operation of the compressor will be clear from the above. Air entering within a cylinder 5 or 6 when the valve 15 is opened by the cam 16 is compressed during the upward travel of the piston 12, the valve 15 being closed at this time. The compressed air lifts the valve 27 against the action of spring 32 causing sleeves 29 and 31 to telescope, whereby the compressed air is driven from the cylinder 5 through the exhaust port in the disc 26, the opening 25, and the pipe 36 into the tank 37. The compressed air may then be conducted from the tank 37 for the ultimately desired purpose. It should be noted that the cams 16 of the cylinders 5 and 6 are radially displaced with respect to each other whereby these two cylinders will successively operate to dispatch compressed air into the tank 37. It should be noted also that the cooling jacket 38 of cylinders 5 and 6 are connected with the radiator 9 serving all the cylinders of the engine.

When it is desired to operate the engine without storing compressed air, the valves 15 of cylinders 5 and 6 are lifted and the roller 18 on the rod 19 is held out of engagement with the cam 16 by a wedge 40. This wedge is seated on a guide sleeve 41 surrounding rod 19 and fixed with respect thereto, and cooperates with a disc or washer 42 fixed to the rod. When the wedge 40 is displaced from right to left (Fig. 2) it will ride over the washer 42 and will therefore lift the rod 19 and roller 18 out of engagement with the cam 16. The valve 15 will thus be permanently opened. The wedge 40 is maintained in its actuated position by a notch 43 provided therein engaging a projection 44 provided on the washer 42. Through a strip 45, the wedge 40 is connected with a second wedge 46 by means of which the valve 15 of cylinder 6 is lifted out of cooperation with its cam corresponding to 16. When it is desired to operate the compressor, the wedges 40 and 46 are moved in a right hand direction. By means of suitable connections, the wedges 40 and 46 may be operated from the dash board of the vehicle.

Inasmuch as the sleeves 29 and 31 of valves 21 and 22 are usually filled with a lubricant, it is advisable to use as compressors the cylinders farthest removed from the fan 39. If the cylinder nearest the fan were used for this purpose, then the fan would spread the lubricating material leaking out of the associated valve over the other cylinders. Otherwise, any one of the cylinders may be equipped as a compressor and as many of the cylinders may be equipped in accordance with the present invention as is deemed necessary and advisable.

During the operation of the valves 21 and 22, the lubricating oil in these valves will be partially carbonized and the carbon particles will be deposited on the various parts of the valve structure. The carbon deposit will be thickest on that part of sleeve 31 which is nearest lug 30 because during the telescopic cooperation of the two sleeves, the sleeve 29 will usually not reach to said part of sleeve 31 and will therefore not scrape the carbon off this part of sleeve 31. Should the two sleeves be telescoped to an exhaust where one is entirely pushed within the other, the thick layer of carbon on sleeve 31 might cause the sticking of sleeve 29 whereby valve 27 would be maintained open. In order to obviate this, said part of sleeve 31 is ground off or narrowed at 50. The surface of the sleeve 31 being lower at 50 than at other points where it is continuously cooperating with sleeve 29, a fairly thick layer of carbon may be deposited there-

on before it will interfere with the proper operation of sleeve 29.

Obviously, the power of an engine will be reduced and its torque disturbed by cutting out one or more cylinders and operating them as air compressors. This may be counter-balanced to a great extent by a proper adjustment or timing of the ignition and gas supply systems. The manner in which such adjustments should be made will vary with the different makes of engines and the characteristics of the particular engine in hand. As is the case with all automobile engines, such adjustments must be changed from time to time depending on the quality of gasoline, temperature, the general condition of the engine and the work to be performed. Furthermore, these drawbacks are fully compensated by the saving effected in making possible the quick and inexpensive conversion of old automobile engines and their use for supplying both motive power and compressed air.

What I claim is:

1. In a gas engine, a cylinder, a piston operating therein, an air inlet for said cylinder, a valve therein, a cam on the cam shaft of said engine for opening said valve twice during each revolution, an air exhaust opening in said cylinder, and a valve in said exhaust opening responsive to compressed air in said cylinder.

2. In a gas engine for vehicles, a cylinder, a piston operating therein, a cylinder head the inside surface of which is in close proximity of the piston when fully raised, an air inlet to said cylinder, a spring pressed valve therein, a cam for opening said valve twice during each revolution of the cam, an outlet from said cylinder leading to a compressed air storage tank, and a spring pressed valve in said outlet and responsive to compressed air in said cylinder.

3. In a gas engine for vehicles, a cylinder, a piston operating therein, an air inlet to said cylinder, a valve therein, a cam on the cam shaft of said engine for opening said valve twice during each revolution of the cam shaft, an air exhaust opening in said cylinder, a casing surrounding said exhaust opening attached to said cylinder, a valve registering with said exhaust opening, a sleeve projecting from said valve, a second sleeve telescopically cooperating with said sleeve, a spiral spring within said sleeves engaging at one end said last mentioned valve and at its other end the casing, apertures in said first mentioned sleeve, apertures in the top of the casing, and an air pipe surrounding the top of the casing.

4. In an air valve for gas engine cylinders, an exhaust port, a valve therein, a sleeve shaped shank for the valve, apertures therein through which lubricating material may be introduced, a casing surrounding said valve, a cover for said casing provided with apertures, a sleeve downwardly projecting from said cover and telescopically cooperating with said shank, a portion of said sleeve projecting from said shank, being relatively narrow, and a spring within said sleeve separating said valve and cover.

5. In a gas engine for vehicles, a cylinder, a piston operating therein, an air inlet to said cylinder, a spring pressed valve therein, a cam for opening said valve twice during each revolution, an outlet from said cylinder leading to a compressed air storage tank, a valve in said outlet and responsive to compressed air in said cylinder, and telescoping sleeves supporting said valve, a portion of one of said sleeves projecting from the other having a lowered surface.

In witness whereof, I hereunto subscribe my name this 15th day of June, 1923.

LORETO POCCIA.