A. E. L. CHORLTON.

INTERNAL COMBUSTION ENGINE.

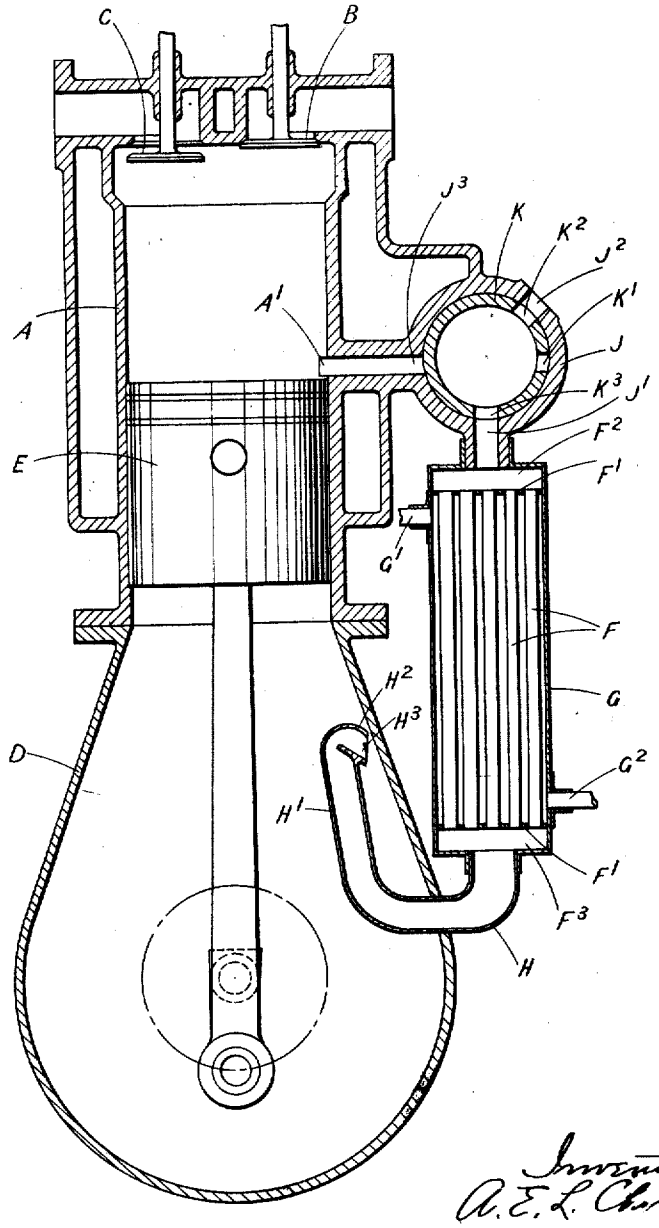
APPLICATION FILED MAY 25, 1917.

1,319,757.

Patented Oct. 28, 1919.

2 SHEETS—SHEET 1.

FIG. 1.



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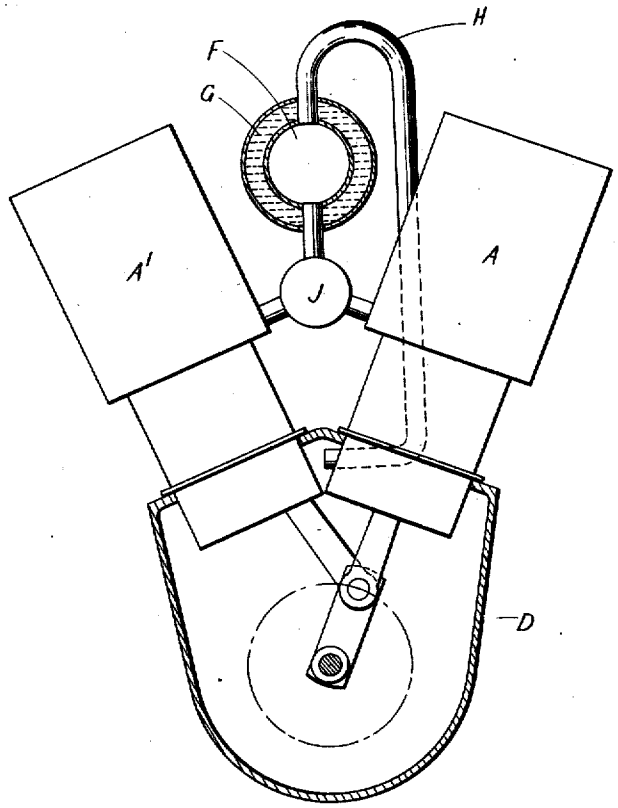
by Foster Freeman Watson & Coit
Attys.

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2 SHEETS—SHEET 2.

FIG. 2.



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UNITED STATES PATENT OFFICE.

ALAN ERNEST LEOFRIC CHORLTON, OF SWALLOWBECK, LINCOLN, ENGLAND.

INTERNAL-COMBUSTION ENGINE.

1,319,757. Specification of Letters Patent. Patented Oct. 28, 1919.

Application filed May 25, 1917. Serial No. 170,850.

To all whom it may concern:

Be it known that I, ALAN ERNEST LEOFRIC CHORLTON, a subject of the King of England, residing at Swallowbeck, Lincoln, in England, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to internal combustion engines of the type having a closed crank case in which by the action of the piston a gaseous fluid which may consist of air, combustible mixture or products of combustion is compressed for the purpose of supplying a supercharge to the cylinder and has for its object to effect this supercharging in such a manner as to secure that increased power and higher economy which should be thereby obtainable. In particular the present invention obviates the carrying over of oil from the crank case to the cylinder a disadvantage which is inherent in the design of those engines of this type which are so far in use.

According to this invention a separate chamber or receiver which may be suitably cooled is connected at one end to the crank case and at the other end to the engine cylinder or cylinders so that by the suction action of the piston or pistons in the crank case air or other gaseous fluid which is to serve as a supercharge is first drawn into the receiver and after compression is expelled therefrom into the engine cylinder or cylinders when supercharging is taking place. The result is that the gaseous fluid forming the supercharge is brought as little as possible into contact with the mist of oil in the crank case which arises from the lubrication of the moving parts therein. Thus is overcome the deleterious effect in the older types of such engines of discharging to the engine cylinder an excess of lubricating oil from the crank case.

The communication between the receiver and the interior of the crank case is such that while permitting free passage of gaseous fluid therethrough the orifice at the crank case end of this communication is so disposed or shielded and the passage itself is so formed that the possibility of oil being carried over into the receiver and thence to the cylinder is reduced to a minimum. The capacity of the receiver is preferably such that the whole or the major portion of the gaseous fluid which is to constitute the supercharge will not be drawn through the receiver into the crank case but will merely fill the receiver and be expelled thence into the cylinder by the pressure created in the crank case and communicated to the gaseous fluid in the receiver. The gaseous fluid in the crank case thus in effect acts as a piston to draw into the receptacle the gaseous fluid constituting the supercharge and subsequently compress it and force it into the cylinder. Conveniently air is employed for the supercharge but if preferred a combustible mixture or products of combustion may be utilized in the same way.

As has been the practice in previous constructions it is convenient and in most cases desirable to introduce the supercharge into the cylinder through ports in the wall thereof which ports are uncovered by the piston toward the end of its outstroke. As it is necessary to prevent the products of combustion from passing out of the cylinder into the receiver at the end of the working stroke of the piston a valve is employed to control the communication between the receiver and the interior of the cylinder. According to this invention this valve is conveniently of the rotary or semi-rotary type and is arranged not only to control the passage of the supercharge into the cylinder but also the orifice through which gaseous fluid is drawn into the receiver prior to compression therein.

The accompanying drawings illustrate somewhat diagrammatically and by way of example two methods of putting the invention into practice.

Figure 1 is a vertical sectional elevation of the cylinder and crank case of an internal combustion engine constructed in accordance with the present invention.

Fig. 2 is an elevation partly in section showing the application of the invention to an engine of the V-type.

Like letters indicate like parts throughout the drawings.

The cylinder A, which is provided with the usual inlet and exhaust valves B and C, is mounted on a closed crank case D into which the end of the cylinder opens. Thus the piston E as it reciprocates in the cylinder will exercise a pumping effect in the crank case D. Outside the cylinder and crank case is disposed a receiver which comprises a series of tubes F whose ends are carried in tube plates F' and open into small

chambers F^2 F^3 formed by the end portions of a cylindrical casing G which incloses the tubes F. Into this casing G toward its ends lead pipes G' G^2 through which water passes and by circulating about the tubes F cools the gases therein. The end F^3 of the tubular receiver communicates with the interior of the crank case D by means of a pipe H which passes horizontally through the wall of the crank case and is then carried upward as at H'. The end H^2 of this pipe, which is open, is directed downward and toward the wall of the crank casing D and is provided with an inclined lip H^3 which is extended into the pipe at the bend thereof for example in the manner shown in the drawings. By thus disposing the pipe H H' and forming its end the possibility of oil being splashed or carried over into it is minimized. Further in the event of any oil entering the pipe H H' it will be deposited in the lower part and will not tend to be carried upward into the receiver F. The lower part of this pipe or passage thus constitutes an oil trap and if necessary may be provided with some suitable device to permit of the escape thence of oil which may accumulate therein or to allow of such oil being drawn off from time to time.

The tubular receiver F is conveniently disposed vertically and communicates at its upper end F^2 with the interior of a cylindrical casing J in which is a rotatable hollow valve K. In this casing J are three ports suitably positioned. One of these ports J' leads to the end F^2 of the receiver, the second port J^2 leads to the atmosphere or to another source of gas supply, while the third port J^3 communicates by a short passage with one or more ports A' in the wall of the cylinder A. This port A' is so positioned that it will be uncovered by the piston when it nears the end of its outstroke. The rotary valve K also has three ports K', K^2 and K^3. These ports are so positioned that when the port K^2 registers with the port J^2 the port K^3 registers with the port J' in the valve casing. If the valve is rotated so that the port K^3 registers with the port J^3, the port K' will then register with the port J' while the port J^2 will then be closed. Thus by rotation of the valve K it is possible to place the tubular receiver F either in direct communication with the air or a source of supply of combustible mixture or in communication with the interior of the cylinder A. As shown in the drawings the valve K is in the position in which air or mixture can be drawn into the receiver F through the ports J^2 K^2, the interior of the valve K, and the ports K^3 J'. If the valve is rotated through 90° the gaseous fluid contained in the receptacle F can pass thence through the ports J' K', the interior of the valve K, and the ports K^3, J^3 and A' into the cylinder A.

The valve K is so operated by suitable mechanism that on the instroke of the piston E, when suction is taking place by the piston in the crank chamber D, the inlet J^2 is opened and gaseous fluid can flow freely into the receiver F, the delivery opening J^3 being as explained at this time closed. On the outstroke of the piston, when compression of the gaseous fluid thus drawn in is taking place in the crank case D, the valve is rotated so as to close the inlet port J^2. During the outstroke of the piston E, if this happens to be its charging stroke, the valve K is rotated so as to open the discharge orifice J^3 by the time the cylinder ports A' are uncovered by the piston. The valve port K^3 then registers with this discharge orifice and at the same time as already explained the ports K' and J' are in coincidence. The gaseous fluid which has previously been compressed in the receiver F and there cooled by the water circulating about the tubes is then delivered as a supercharge into the cylinder A. The delivery passage J^3 is then closed by rotating the valve K back again and this passage remains closed during the next three strokes of the piston, that is to say, during its compression, working and exhaust strokes. During each instroke of the piston E however the valve K may be rotated so as to open the inlet J^2 and subsequently close it in order to permit a fresh supply of gaseous fluid to be drawn into the receiver F and compressed and cooled therein.

The valve K may be so constructed and arranged that its movements may be controlled in such a manner as to allow of variation of the amount of the supercharge delivered to the cylinder A. This control may be brought about in various ways as for instance by adjustment of the oscillations of the valve K or by axial movement of it the formation of the valve and its casing J being such that when the valve is so moved the time during which the delivery outlet J^3 will be opened can be varied.

In place of the receiver being formed of a series of tubes as described above and shown in the drawings, it may be constructed as a pipe provided with means for cooling its exterior by air or water or it may be otherwise shaped and arranged to effect the desired cooling. Conveniently the capacity of the receiver is such that it is approximately equal to the volume swept through by the piston E so that the greater portion of the gaseous fluid drawn into the receiver will be confined thereto and will not pass into the crank chamber D.

The details of construction may be varied in accordance with requirements and the arrangement may be modified to suit the construction of the engine to which the invention is applied. Where the engine has more than one cylinder the chambers in

which the cranks corresponding to these cylinders rotate may be separated or connected in accordance with the relative positions of these cranks about the crank shaft. It may thus be possible to have two or more cylinders with a common crank casing or separate chambers which are in communication with a common receiver whence supercharges are delivered to the cylinders. Again by suitably coupling the cylinders in a multicylinder engine having cranks appropriately disposed the pressure derived from the compression of the gaseous fluid in a crank chamber of one or more cylinders may be utilized to deliver a supercharge in another cylinder or cylinders.

In Fig. 2 is shown how the invention may be applied to an engine having two or more cylinders disposed V-fashion on a common crank case. The pistons in the two cylinders A A′ illustrated in the figure are connected to one and the same crank pin and the timing is so arranged that when one piston is performing its working stroke the other piston is performing its suction stroke. The disposition of the receiver F, the valve casing J and conduits are shown diagrammatically for clearness of illustration but it is to be understood that the several elements constituting the present improvements would be otherwise arranged in practice to reduce clearances in the conduits to a minimum and thereby attain the highest possible efficiency. The valve casing J is provided with short passages leading to ports in the cylinders arranged after the manner described in reference to Fig. 1. A single receiver connected at one end by the pipe H to the crank case D and at the other end to the valve casing J serves for the supercharges of gaseous fluid which are supplied to each cylinder alternately. The valve within the casing J is so constructed with ports arranged to coöperate with those in the casing leading respectively to the two cylinders, the receiver, and the atmosphere, that by suitable movement of the valve it will be caused to control the entry of the gaseous fluid into the receiver and its passage thence into each cylinder in turn.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, and communicating with said piston controlled port, a pipe communication between the receiver and the interior of the crank case, means for establishing communication between the receiver and a source of supply of gaseous fuel when communication between the receiver and the port in the cylinder wall is cut off so that gaseous fluid can be drawn into the receiver by the action of the piston in the crank case, and for establishing communication between the receiver and the port in the cylinder wall when communication between the receiver and the sources of gaseous supply is cut off so that gaseous fluid can be forced from the receiver into the cylinder as a supercharge by the action of the piston in the crank case as set forth.

2. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, a pipe communication between the receiver and the interior of the crank case, a passage between the receiver and the piston controlled port in the cylinder wall, a chamber in this passage with ports respectively leading to the receiver, to the cylinder port, and to a source of supply of gaseous fluid, a valve in this chamber controlling these ports and adapted to establish such communication between them that the reciprocating action of the piston in the crank case will cause gaseous fluid to be drawn into the receiver and subsequently delivered into the cylinder as a super-charge, and means for operating this valve as set forth.

3. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber con-

stituting a receiver mounted outside the crank case and communicating with the piston controlled port of the cylinder, means for cooling the receiver, a pipe communication between the receiver and the interior of the crank case, means for establishing communication between the receiver and a source of supply when communication between the receiver and the port in the cylinder wall is cut off so that gaseous fluid can be drawn from the source of supply into the receiver by the action of the piston in the crank case, and means for establishing communication between the receiver and the port in the cylinder wall when communication between the receiver and the source of gaseous supply is cut off so that a supercharge of gaseous fluid can be forced from the receiver into the cylinder by the action of the piston in the crank case as set forth.

4. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case and communicating with the piston controlled port of the cylinder, a pipe extending from the receiver through the wall of the crank case with its end in the crank case carried up and the opening thereof directed toward the crank case wall, means for establishing communication between the receiver and a source of supply of gaseous fluid when communication between the receiver and the port in the cylinder wall is cut off so that gaseous fluid can be drawn from the source of supply into the receiver by the action of the piston in the crank case, and means for establishing communication between the receiver and the port in the cylinder wall when communication between the receiver and the source of gaseous supply is cut off so that a supercharge of gaseous fluid can be forced from the receiver into the cylinder by the action of the piston in the crank case as set forth.

5. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned were it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, means for cooling the receiver, a pipe communication between the receiver and the interior of the crank case, a passage between the receiver and the piston controlled port in the cylinded wall, a chamber in this passage with ports respectively leading to the receiver, to the cylinder port and to a source of supply of gaseous fluid, a valve in this chamber controlling these ports and adapted to establish such communication between them that the reciprocating action of the piston in the crank case will cause the gaseous fluid to be drawn into the receiver and subsequently delivered into the cylinder as a supercharge, and means for operating this valve as set forth.

6. In an internal combustion engine using a crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outsroke, a chamber constituting a receiver mounted outside the crank case, a pipe extending from the receiver through the wall of the crank case with the end in the latter, carried up and the opening thereof directed toward the crank case wall, a passage between the receiver and the piston controlled port in the cylinder wall, a chamber in this passage with ports respectively leading to the receiver, to the cylinder port and to a source of supply of gaseous fluid, a valve in this chamber controlling these ports and adapted to establish such communication between them that the reciprocating action of the piston in the crank case will cause gaseous fluid to be drawn into the receiver and subsequently delivered as a super-charge into the cylinder, and means for operating this valve as set forth.

7. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls

thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, means for cooling the receiver, a pipe extending from the receiver through the wall of the crank case with the end in the latter extending upward and the opening thereof directed toward the crank case wall, means for establishing communication between the receiver and a source of gaseous fluid supply when communication between the receiver and the port in the cylinder wall is cut off so that gaseous fluid can be drawn from the source of supply into the receiver by the action of the piston in the crank case, and means for establishing communication between the receiver and the port in the cylinder wall when communication between the receiver and the source of gaseous supply is cut off so that a super-charge of gaseous fluid can be forced from the receiver into the cylinder by the action of the piston in the crank case as set forth.

8. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, means for cooling the receiver, a pipe extending from the receiver through the wall of the crank case with the end in the latter extending upward and the opening thereof directed toward the crank case wall, a passage between the receiver and the piston-controlled port in the cylinder wall, a chamber in this passage with ports respectively leading to the receiver, to the cylinder port and to a source of supply of gaseous fluid, a valve in this chamber controlling these ports and adapted to establish such communication between them that the reciprocating action of the piston in the crank case will cause gaseous fluid to be drawn into the receiver and subsequently delivered into the cylinder as a super-charge, and means for operating this valve as set forth.

9. In an internal combustion engine using crank case compression for supercharging purposes, the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the cylinder of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case and of a capacity approximately equal to the volume swept through by the piston, a pipe communication between the receiver and the interior of the crank case, means for establishing communication between the receiver and a source of supply of gaseous fluid when communication between the receiver and the port in the cylinder wall is cut off so that gaseous fluid can be drawn from the source of supply into the receiver by the action of the piston in the crank case, and means for establishing communication between the receiver and the port in the cylinder wall when communication between the receiver and the source of gaseous supply is cut off so that gaseous fluid can be forced from the receiver into the cylinder as a super-charge by the action of the piston in the crank case as set forth.

10. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case and having a capacity approximately equal to the volume swept through by the piston, means for cooling the receiver, a pipe communication between the receiver and the interior of the crank case, a passage between the receiver and the piston controlled port in the cylinder wall, a chamber in this passage with ports respectively leading to the receiver, to the cylinder port and to a source of supply of gaseous fluid, a valve in this chamber controlling these ports and adapted to establish such communication between them that the reciprocating action of the piston in the crank case will cause gaseous fluid to be drawn into the receiver and subsequently delivered as a super-charge into the cylinder and means for operating this valve as set forth.

11. In an internal combustion engine using crank case compression for super-

charging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case and having a capacity approximately equal to the volume swept through by the piston, means for cooling the receiver, a pipe extending from the receiver through the wall of the crank case with the end in the latter extended upward and the opening thereof directed toward the crank case wall, a passage between the receiver and the piston controlled port in the cylinder wall, a chamber in this passage with ports respectively leading to the receiver, to the cylinder port and to a source of supply of gaseous fluid, a valve in this chamber controlling these ports and adapted to establish such communication between them that the reciprocating action of the piston in the crank case will cause gaseous fluid to be drawn into the receiver and subsequently delivered as a super-charge into the cylinder, and means for operating this valve as set forth.

12. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, a pipe communication between the receiver and the interior of the crank case, a cylindrical chamber with ports respectively communicating with the receiver, with the port in the cylinder wall and with a source of supply of gaseous fluid, a rotatable valve in this chamber so constructed that when in one position it will establish communication between the receiver port and the gas supply port and when in a second position it will establish communication between the receiver port and the cylinder port so that by the action of the piston in the crank case gaseous fluid can be drawn from the source of supply into the receiver and subsequently forced into the cylinder as a super-charge, and means for operating this valve as set forth.

13. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, means for cooling the receiver, a pipe communication between the receiver and the interior of the crank case, a cylindrical chamber with ports respectively communicating with the receiver, with the port in the cylinder wall and with a source of supply of gaseous fluid, a rotatable valve in this chamber so constructed that when in one position it will establish communication between the receiver port and the gas supply port and when in a second position it will establish communication between the receiver port and the cylinder port so that by the action of the piston in the crank case gaseous fluid can be drawn from the source of supply into the receiver and subsequently forced into the cylinder as a super-charge, and means for operating this valve as set forth.

14. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, a pipe extending from the receiver through the wall of the crank case with the end in the latter extended upward and the opening thereof directed toward the crank case wall, a cylindrical chamber with ports respectively communicating with the receiver, with the port in the cylinder wall and with a source of supply of gaseous fluid, a rotatable valve in this chamber so constructed that when in one position it will establish communication between the receiver port and the gas supply port and when in a second position it will establish communication between the receiver port and

the cylinder port so that by the action of the piston in the crank case gaseous fluid can be drawn from the source of supply and subsequently forced into the cylinder as a supercharge, and means for operating this valve as set forth.

15. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case and having a capacity approximately equal to the volume swept through by the piston, a pipe communication between the receiver and the interior of the crank case, a cylindrical chamber with ports respectively communicating with the receiver, with the port in the cylinder wall and with a source of supply of gaseous fluid, a rotatable valve in this chamber so constructed that when in one position it will establish communication between the receiver port and the gas supply port and when in a second position it will establish communication between the receiver port and the cylinder port so that by the action of the piston in the crank case gaseous fluid can be drawn from the source of supply into the receiver and subsequently forced into the cylinder as a super-charge, and means for operating this valve as set forth.

16. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a cylinder mounted on the crank case with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, a piston reciprocating in the cylinder, a crank disposed in the crank case on a shaft extending through the walls thereof and connected to the piston, a port in the wall of the cylinder positioned where it will be uncovered by the piston toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case and having a capacity approximately equal to the volume swept through by the piston, means for cooling the receiver, a pipe extending from the receiver through the wall of the crank case with the end in the latter extended upward and the opening thereof directed toward the crank case wall, a cylindrical chamber with ports respectively communicating with the receiver, with the port in the cylinder wall and with a source of supply of gaseous fluid, a rotatable valve in this chamber so constructed that when in one position it will establish communication between the receiver port and the gas supply port and when in a second position it will establish communication between the receiver port and the cylinder port so that by the action of the piston in the crank case gaseous fluid can be drawn from the source of supply into the receiver and subsequently forced into the cylinder as a super-charge, and means for operating this valve as set forth.

17. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a plurality of cylinders mounted on the crank case each with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in each cylinder head, pistons reciprocating in the several cylinders, a crank shaft disposed in the crank case, and connected to each piston, a port in the wall of each cylinder positioned where it will be uncovered by the piston therein toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, and adapted to communicate with said piston controlled port, a pipe communication between the receiver and the interior of the crank case, a chamber with ports respectively communicating with the receiver, with the piston controlled ports in the several cylinders and with a source of supply of gaseous fluid, a valve in this chamber so constructed as to control said ports in a manner which will permit the entry of gaseous fluid into the receiver and its passage thence into each cylinder in turn as a supercharge as a result of the action of the pistons in the crank case, and means for operating the last said valve as set forth.

18. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a plurality of cylinders mounted on the crank case each with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in each cylinder head, pistons reciprocating in the several cylinders, a crank shaft disposed in the crank case and connected to each piston, a port in the wall of each cylinder positioned where it will be uncovered by the piston therein toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, means for cooling the receiver, a pipe communication between the receiver and the interior of the crank case, a chamber with ports respectively communicating with the receiver, with the piston controlled ports in the several cylinders

and with a source of supply of gaseous fluid, a valve in this chamber so constructed as to control these ports in a manner which will permit the entry of gaseous fluid into the receiver and its passage thence into each cylinder in turn as a supercharge as a result of the action of the pistons in the crank case, and means for operating this valve as set forth.

19. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a plurality of cylinders mounted on the crank case each with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in each cylinder head, pistons reciprocating in the several cylinders, a crank shaft disposed in the crank case and connected to each piston, a port in the wall of each cylinder positioned where it will be uncovered by the piston therein toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, a pipe extending from the receiver through the wall of the crank case with the end in the latter extended upward and the opening thereof directed toward the crank case wall, a chamber with ports respectively communicating with the receiver, with the piston controlled ports in the several cylinders and with a source of supply of gaseous fluid, a valve in this chamber so constructed as to control these ports in a manner which will permit the entry of gaseous fluid into the receiver and its passage thence into each cylinder in turn as a super-charge as a result of the action of the pistons in the crank case, and means for operating this valve as set forth.

20. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a plurality of cylinders mounted on the crank case each with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in each cylinder head, pistons reciprocating in the several cylinders, a crank shaft disposed in the crank case and connected to each piston, a port in the wall of each cylinder positioned where it will be uncovered by the piston therein toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, a pipe communication between the receiver and the interior of the crank case, a cylindrical chamber with ports respectively communicating with the receiver, with the piston controlled ports in the several cylinders and with a source of supply of gaseous fluid, a rotatable valve in this chamber so constructed that according to the position into which it is moved it will permit the entry of gaseous fluid into the receiver and its passage thence into each cylinder in turn as a super-charge as a result of the action of the pistons in the crank case, and means for operating this valve as set forth.

21. In an internal combustion engine using crank case compression for supercharging purposes the combination of a closed crank case, a plurality of cylinders mounted on the crank case each with its end in open communication with the interior of the crank case, valve controlled mixture supply and exhaust ports in the cylinder head, pistons reciprocating in the several cylinders, a crank shaft disposed in the crank case and connected to each of the pistons, a port in the wall of each cylinder positioned where it will be uncovered by the piston therein toward the end of its outstroke, a chamber constituting a receiver mounted outside the crank case, means for cooling the receiver, a pipe extending from the receiver through the wall of the crank case with the end in the latter extended upward and the opening thereof directed toward the crank case wall, a cylindrical chamber with ports respectively communicating with the receiver, with the piston controlled ports in the several cylinders and with a source of supply of gaseous fluid, a rotatable valve in this chamber so constructed that according to the position into which it is moved it will permit the entry of the gaseous fluid into the receiver and its passage thence into each cylinder in turn as a super-charge as a result of the action of the pistons in the crank case, and means for operating this valve as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALAN ERNEST LEOFRIC CHORLTON.

Witnesses:

R. E. DUNBAR KILBURN,

M. M. NIGHTINGALE.