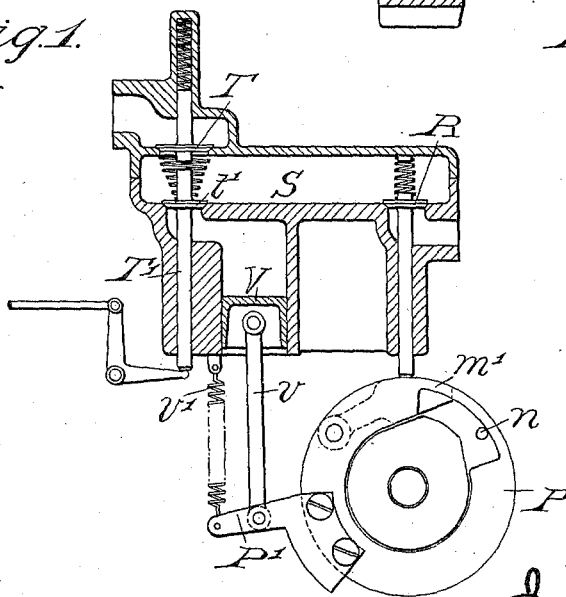
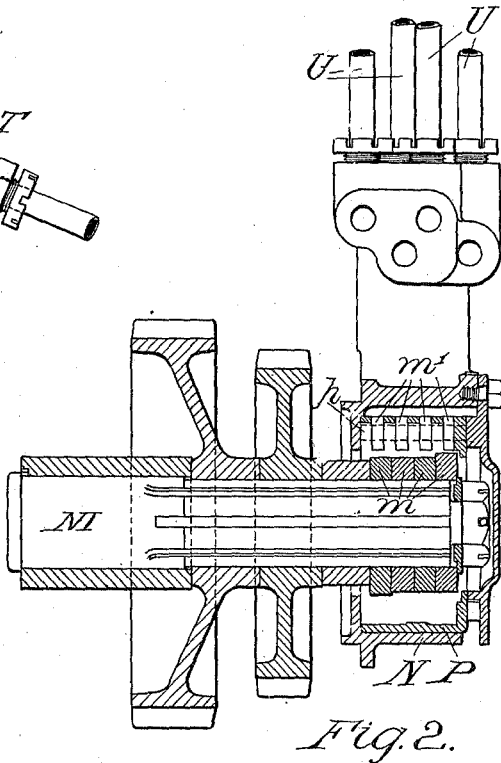
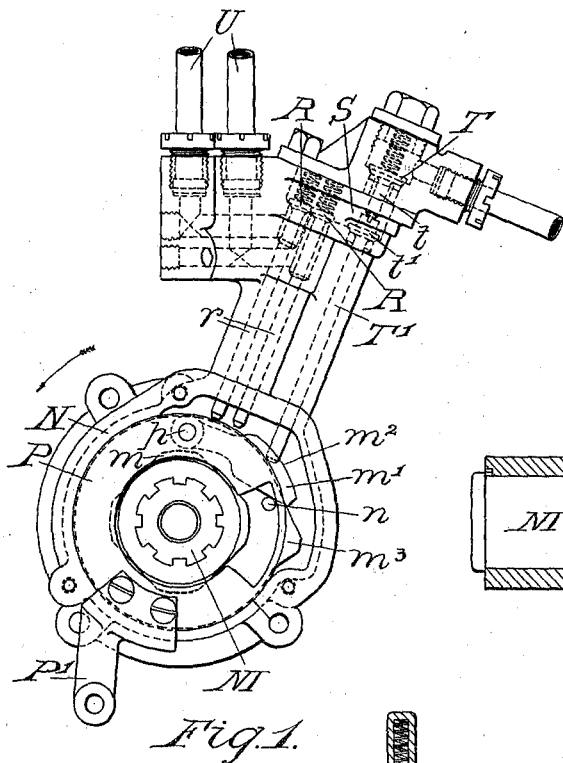


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 MEANS FOR USE IN STARTING INTERNAL COMBUSTION ENGINES OF AUTOMOBILES.
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UNITED STATES PATENT OFFICE.

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MEANS FOR USE IN STARTING INTERNAL-COMBUSTION ENGINES OF AUTOMOBILES.

1,098,406.

Specification of Letters Patent.

Patented June 2, 1914.

Application filed March 18, 1913. Serial No. 755,156.

To all whom it may concern:

Be it known that we, ALFRED ARNOLD REMINGTON and ARTHUR JOHN ROWLEDGE, both subjects of the King of Great Britain, and both residing at Birmingham, in the county of Warwick, England, have invented certain new and useful Improved Means for Use in Starting Internal-Combustion Engines of Automobiles, of which the following is a specification.

This invention relates to means for starting, by compressed air, four-stroke cycle internal combustion engines, of automobiles, having four or more motor cylinders.

The invention comprises improved mechanism for operating, only when required, valves which admit to the cylinders compressed air for starting the engine; and comprises also means whereby such mechanism, which is normally out of action, may be brought into action automatically by the pressure of air from a reservoir when the air is turned on therefrom for starting the engine.

In utilizing compressed air for starting an internal combustion engine, it has been usual to provide a starting valve which admits air to a valve-receiver which contains valves for distributing the compressed air to the cylinders. This starting valve has been provided with a stem or spindle which has passed out from the box within which the valve has been contained, so that the valve might be operated thereby, but there was found to be a tendency for compressed air to leak past the valve and escape into the atmosphere through the opening of the receiver through which the valve stem passed, and thus to become lost; and the invention further comprises means whereby the starting valve may be opened which avoid or minimize leakage of air.

The invention comprises also further features which will be hereinafter described.

According to the first part of this invention, each motor cylinder of the engine is provided with a check-valve for compressed air in starting, and a number of puppet-valves are arranged within a suitable chamber to which compressed air from a suitable reservoir is supplied for starting, openings which are controlled by these valves being connected, respectively, with openings which are controlled by the check-valves, all as is

usual. The puppet-valves are arranged in staggered positions in relation to one another and are operated, through the medium of levers, by a number of cams which are mounted on a shaft which runs at half the speed of the engine. The levers are pivoted in a carrier which may be turned about the axis of the cam shaft. When the carrier is turned into one position, the levers are moved clear of the cams, by bringing inclined ends of the levers across a fixed pin, and are also moved clear of the puppet-valve spindles. The carrier may also be formed or provided with a starting cam which, as the carrier is turned into its operative position, bringing the levers clear of the pin into position for operating the puppet-valves, bears against the end of the stem of the starting-valve and opens it, so that by a single turning movement of the carrier, the levers are brought into action and the starting valve is opened.

The carrier may be turned by hand, in each direction, or it may be turned by the force of a spring in a direction to throw the tappet levers out of action, and be turned back again by the pressure of the compressed air against a piston, as a result of opening the starting valve.

According to the second part of this invention, the valve which admits compressed air into the distributing receiver, is opened by means of a stem or rod which does pass out through the receiver but is itself formed with a valve which normally seats itself against a seating of the interior of the receiver which surrounds the opening through which such stem passes out, and thus, if any air leaks past the starting valve it cannot escape through the opening through which such stem passes. The spindles of the distributing valves pass, as is usual, through the openings which are controlled by such valves, and these valves, therefore, seal such openings.

If a piston arrangement for bringing into operative position mechanism for operating the distributing valves is employed, the compressed air may be admitted to the piston through the starting valve, and valve of the stem by which the starting valve is opened, the starting valve, only, in such case, being operated by hand.

In order that the invention may be clearly

understood, and readily carried out in practice, we will now describe convenient practical applications thereof which are illustrated, by way of examples, by the drawings herewith, of which:—

5 Figure 1 is an end elevation showing an arrangement of starting valve, puppet-valves for the distribution of air in starting, and means by which the puppet-valves are operated and the starting valve opened. 10 Fig. 2 is a longitudinal section, partly in elevation, of the apparatus shown by Fig. 1, and; Fig. 3 is an elevation, chiefly in section of an arrangement in which a piston 15 is operated by compressed air to bring into operative position mechanism for operating the distributing valves, the compressed air being admitted to the piston through the starting valve and the sealing valve of the stem which is operated to open the starting 20 valve.

M is the engine cam shaft, m a number of cams which are mounted thereon and revolve therewith.

25 N is a casing which surrounds the cams, and P is a carrier which is fitted to turn easily within the casing N. Pivoted within the casing by means of a pin p , which is common to them all, are a number of tongue 30 levers m' , corresponding to the number of the engine cylinders. A number of puppet valves R are seated within an air chest S, and their spindles r pass down into the casing N into position to be, respectively, operated by the levers m' as the shaft M, and 35 consequently the cams m , revolve. In the position into which the carrier P has been turned as shown by Fig. 1, the forward ends of the levers are resting upon a fixed pin n , 40 clear of the paths of the cams m , and are therefore, not operated thereby, and the levers m' are also shown to be clear of the ends of the spindles r , so that the puppet-valves R are then all firmly down upon their 45 seats. If the carrier P is then turned in the direction of the arrow, Fig. 1, by means of an arm P' thereof, the levers m' are all turned back clear of the pin n and drop upon the cams m , and portions m^2 of the outer 50 surfaces of the levers m' are brought in immediately under, and close to, the ends of the spindles r , so that as the cams m revolve they will, in turn, move out the levers and open the respective valves R, supplying 55 compressed air to the cylinders as required for starting the engine. T is a starting valve for admitting compressed air to the air receiver S. This valve is opened by means of a stem or rod T' which passes 60 through the bottom of the air receiver S and through a guide within which it has a sliding fit and is formed with a collar t' which constitutes a valve and normally seats itself in the bottom of the air receiver and 65 seals the opening therefrom through which

the stem passes. This starting valve is opened by a cam m^3 which is rigid with and turns with the carrier P, the cam lifting the stem T', the upper end of which presses against the end of a short stem t of the valve T which simply projects within the air receiver S. The openings which are controlled by the puppet-valves R communicate with pipes such as U, respectively, which communicate with check valves for the engine cylinders, respectively. 70 75

Referring now specially to the arrangement shown by Fig. 3:—A piston V, within a cylinder to which compressed air may be admitted through the starting valve T and sealing valve t' which surrounds the rod or stem T' by means of which the valve T is opened, is connected by means of a rod or link v with an arm P' of the carrier P, which correspond to the arm P' and carrier 80 P before described. Thus when the rod T' is raised, raising off its seat the surrounding valve or collar t' , and then opening the valve T, the compressed air enters the valve receiver, within which the puppet-valves R 85 (one only of which appears in this view) are seated, and compressed air passes from such receiver through the opening which is normally sealed by the valve t' , and presses the piston V outward and turns the 90 carrier P as required to bring the levers m' into position for operating the valves R. When the compressed air has been cut off from the piston V the piston is moved back by the force of a spring v' which moves back 100 the arm P' and turns the carrier P back again and brings the levers m' out of their operative positions.

Having fully described our invention, what we claim and desire to secure by Letters Patent, is:— 105

1. In a four-stroke cycle internal combustion automobile engine having not less than four cylinders, a receiver into which compressed air is admitted from a suitable 110 source, air distributing valves which correspond in number to the motor cylinders of the engine, cams for operating the said distributing valves in turn and themselves carried by a shaft which revolves at half speed 115 of the engine, and means, operable entirely independently of any portion of the main valve mechanism, in position between the starting cams and the valves, by which, at will, the cams and said distributing valves 120 may be put into and out of operative relation to one another, respectively, leaving the valves closed when the cams are out of operative relation thereto, for the purpose set forth. 125

2. In a four-stroke cycle internal combustion automobile engine having not less than four cylinders, a receiver into which compressed air is admitted from a suitable 130 source, air distributing valves which corre-

spond in number to the motor cylinders of the engine, cams, carried by a shaft which revolves at half the speed of the engine, for operating said distributing valves in turn, means between the cams and the valves by which, at will, the cams and said distributing valves may be put into and out of operative relation to one another, respectively, leaving the valves closed when the cams are out of operative relation thereto, and means whereby the putting of the cams into operative relation with the valves opens also the starting valve, for the purpose set forth.

3. In a four-stroke cycle internal combustion automobile engine having not less than four cylinders, a receiver into which compressed air is admitted from a suitable source, air distributing valves which correspond in number to the motor cylinders of the engine, cams, carried by a shaft which revolves at half the speed of the engine, for operating said distributing valves in turn, a movable carrier, levers pivoted to the carrier which, as the carrier is moved by a single movement in one direction only, are brought into position which puts the cams and said distributing valves into operative relation, and, as the carrier is moved in the reverse direction, are brought into position which puts said cams and valves out of operative relation for the purpose set forth.

4. In a four-stroke cycle internal combustion automobile engine having not less than four cylinders a receiver into which compressed air is admitted from a suitable source, air distributing valves which correspond in number to the motor cylinders of the engines, cams carried by a shaft which revolves at half the speed of the engine, for operating said distributing valves in turn, a movable carrier, levers pivoted to the carrier which, as the carrier is moved by a single movement in one direction only, are brought into position which puts the cams and said distributing valves into operative relation, and, as the carrier is moved in the reverse direction are brought out of operative position in relation to the cams, for the purpose set forth.

5. In a four-stroke cycle internal combustion automobile engine having not less than four cylinders, a receiver into which compressed air is admitted from a suitable source, air distributing valves which correspond in number to the motor cylinders of the engine, cams, carried by a shaft which revolves at half the speed of the engine, for operating said distributing valves in turn, a movable carrier, levers pivoted to the carrier which, as the carrier is moved in one direction to move the levers endwise, are brought into position which puts the cams and said distributing valves into operative relation, and, as the carrier is moved in the reverse direction are brought into position

which puts such cams and valves out of operative relation.

6. In a four-stroke cycle internal combustion automobile engine having not less than four cylinders, a receiver into which compressed air is admitted from a suitable source, air distributing valves which correspond in number to the motor cylinders of the engine, cams, carried by a shaft which revolves at half the speed of the engine, for operating said distributing valves in turn, a revoluble carrier, levers pivoted to the carrier which, as the carrier is turned in one direction, are brought into position which puts such cams and valves into operative relation, and, as the carrier is turned in the reverse direction, are brought out of operative relation, into position which puts such cams and valves for the purpose set forth.

7. In a four-stroke cycle internal combustion automobile engine having not less than four cylinders, a receiver into which compressed air is admitted from a suitable source, air distributing valves which correspond in number to the motor cylinders of the engine, cams, carried by a shaft which revolves at half the speed of the engine, for operating said distributing valves in turn, a movable carrier, levers pivoted to the carrier which, as the carrier is moved in one direction, are brought into position which puts the cams and the distributing valves, into operative relation and, as the carrier is moved in the reverse direction, are brought into position which puts such cams and valves out of operative relation, a piston which is acted upon by compressed air and tends to move said carrier in the first-mentioned direction, and a spring which tends to move said carrier in the reverse direction, for the purpose set forth.

8. In a four-stroke cycle internal combustion automobile engine having not less than four cylinders, a receiver into which compressed air is admitted from a suitable source, air distributing valves which correspond in number to the motor cylinders of the engine, cams, carried by a shaft which revolves at half the speed of the engine, for operating said distributing valves in turn, a movable carrier, valve-operating levers pivoted to the carrier, inclined surfaces of such levers, a fixed abutment across the surface of which the inclined surfaces of the levers slide as the carrier is moved in a direction to bring the levers out of their operative position, whereby the levers are moved outward clear of the paths of the cams, for the purpose set forth.

9. In a four-stroke cycle internal combustion automobile engine having not less than four cylinders, a receiver into which compressed air is admitted from a suitable source, a starting valve of the puppet type for admitting the air to said receiver, air

distributing puppet valves which correspond in number to the motor cylinders of the engine, means for operating said puppet valves, a rod which enters said receiver and is formed with a collar which constitutes a valve, a seat against which said collar seats itself and thereby seals the opening through which the rod passes into said receiver, and said rod situated in position to insure that when it is moved endwise to move its collar from said seat it will move the starting valve also from its seat and admit compressed air into said receiver, for the purpose set forth.

10. In a four-stroke cycle internal combustion automobile engine having not less than four cylinders, a receiver into which compressed air is admitted from a suitable source, a starting valve for admitting the air to said receiver, air distributing puppet valves which correspond in number to the motor cylinders of the engine, cams carried by a shaft which revolves at half the speed of the engine for operating said puppet-valves in turn, means for bringing said cams into operative relation to said last-

mentioned valves, respectively, a rod which enters said receiver and is formed with a collar which constitutes a valve, a seat against which said collar seats itself and thereby seals the opening through which the rod passes into said receiver, and said rod situated in position to insure that, when it is moved endwise to move its collar from said seat, it will move the starting valve also from its seat and admit compressed air into said receiver, a piston which is acted upon by compressed air which is admitted thereto through the opening which is normally closed by said collar, and means by which said piston brings the distributing valves and cams into operative relation with one another, for the purpose set forth.

In witness whereof we have hereunto signed our names this 5th day of March 1913, in the presence of two subscribing witnesses.

ALFRED ARNOLD REMINGTON.
ARTHUR JOHN ROWLEDGE.

Witnesses:

ALEXIS JACOB,
ROBERT G. GROVES.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."