June 28, 1927. 1,633,767

N. A. CHRISTENSEN

DIRECT DRIVE COMPRESSOR

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Fig. 2.

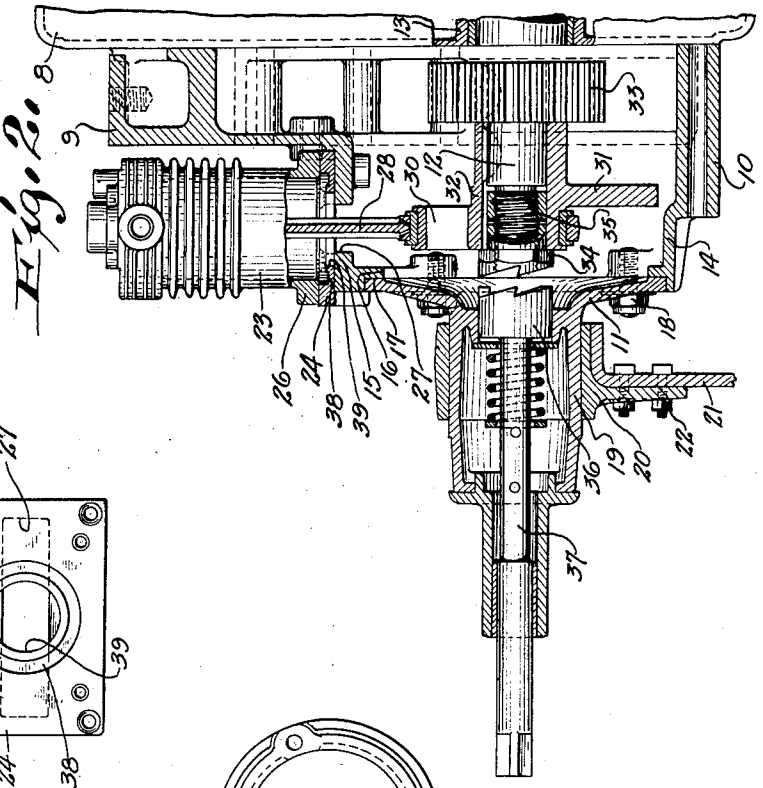
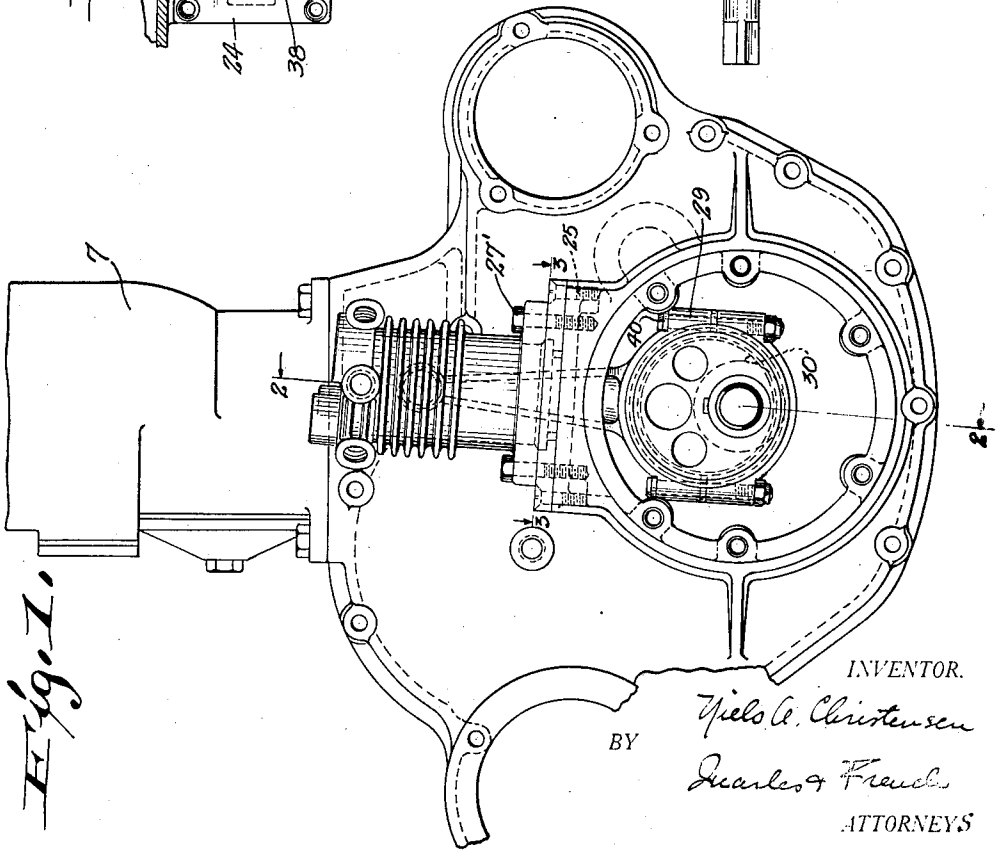


Fig. 3.

Fig. 1.



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Fig. 5.

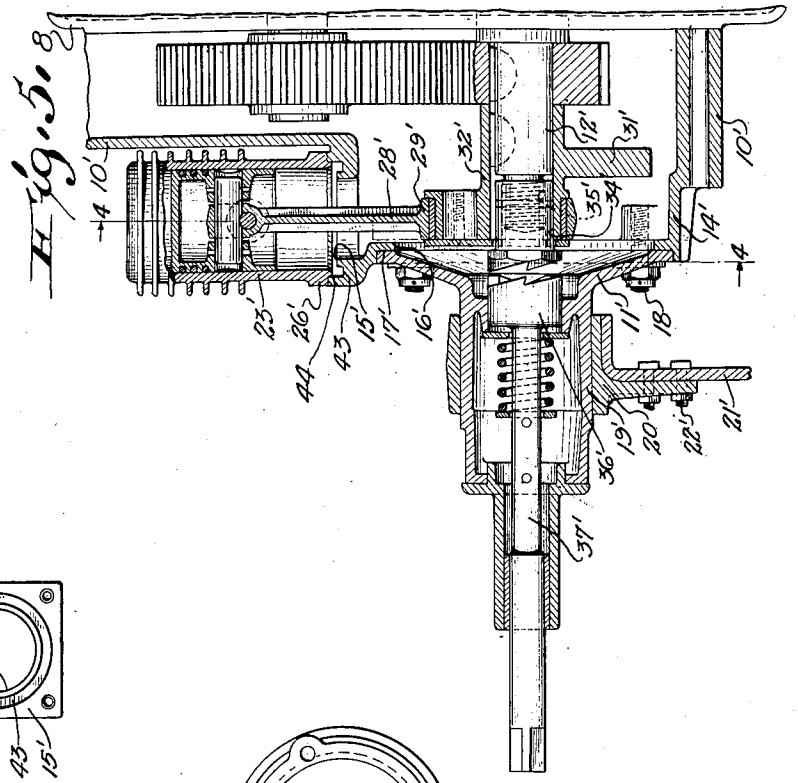


Fig. 6.

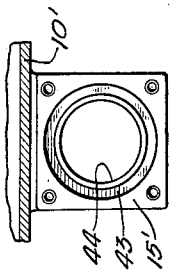
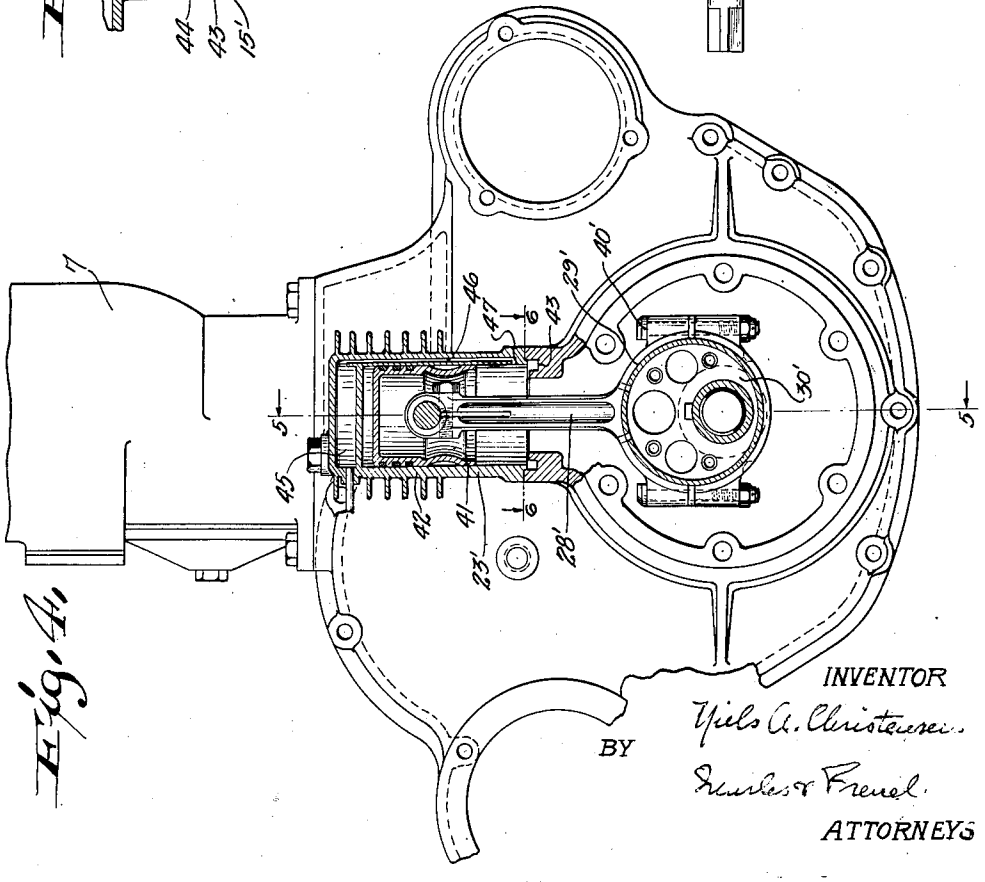


Fig. 4.



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UNITED STATES PATENT OFFICE.

NIELS A. CHRISTENSEN, OF CLEVELAND, OHIO.

DIRECT-DRIVE COMPRESSOR.

Application filed December 10, 1925. Serial No. 74,551.

The invention relates to compressors, and more particularly to compressors associated with an internal combustion engine for furnishing compressed air for starting the engine, or for the brake equipment where the engine is used on an automotive vehicle.

The object of the invention is to provide a compressor mounting in which the front end cover-plate of the engine is formed of separable sections, one of which provides a casing for the timing gear of the engine and compressor crankcase and the compressor cylinder support, and the other of which provides a removable end-plate for permitting ready inspection and adjustment of the bearings of the compressor upon its removal.

The invention further consists in the several features hereinafter set forth and more particularly defined by claims at the conclusion hereof.

In the drawings, Fig. 1 is a front elevation view of an engine equipped with apparatus embodying the invention, showing one of the sections of the cover-plate;

Fig. 2 is a vertical sectional view through the cover-plate, taken on the line 2—2 of Fig. 1, with the compressor cylinder mounted thereon and partly shown in section;

Fig. 3 is a detail sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 5, with one of the cover-plate sections removed, showing a modification;

Fig. 5 is a section through the complete compressor mounting, taken on the line 5—5 of Fig. 4;

Fig. 6 is a detail sectional view taken on the line 6—6 of Fig. 4.

Referring to Figs. 1 to 3, inclusive, the numeral 7 designates an internal combustion engine of the high speed or automotive type in which the timing gear for the cam-shaft drive and the other gears for the generator drive and fan are mounted at the front end of the crank 8 of the engine within a housing formed by the engine crankcase and the front cover-plate.

According to the present invention the front cover-plate 9 is formed of two sections 10 and 11 into which the front end 12 of the crank shaft of the engine extends. It will, of course, be understood that the main springs, such as the spring 13, part of which is shown in Fig. 2, for the crank shaft are within the engine crankcase proper, adjacent the throws of the crank shaft. The section 10 of the front cover-plate, which encloses the timing gears, is formed to provide a compressor crankcase portion 14 and a compressor cylinder-supporting portion at about 15. The section 9 has a recessed opening 16 therein with a flat base 17 upon which the rear end section 11 sets and to which it is held by a series of bolts or studs 18. The section 11 has a tubular extension or trunnion-bearing portion 19 which is inserted in a trunnion-bearing 20 suitably secured to a supporting frame member 21 as by bolts 22.

The compressor cylinder 23 may be mounted directly upon the pad portion 15 of the section 10, or, as shown, upon a trough plate 24 which is detachably secured to the pad by screws 25. The cylinder 23 has a flanged base 26 apertured to receive bolts 27′ which pass through the plate 24 and into the pad portion 15.

The pad portion 15 has an elongated slot 27 in which the connecting-rod works and by reason of which the big end of the connecting-rod may be lifted out through the slot when the trough plate 24 and cylinder are removed.

The connecting-rod is pivotally connected in the usual manner to the piston working in the cylinder 23, not shown in detail, and the big end 29 thereof is formed as a split adjustable eccentric strap fitting over the eccentric 30, provided with a counterbalance weight 31 and having a hub portion 32 keyed to the end 12 of the crank shaft adjacent one of the timing gears 33.

A starter claw member 34 has threaded engagement 35 with the threaded end of the crank shaft 12 and is shouldered adjacent the eccentric 30 to prevent endwise movement of the same. A cooperative claw member 36 is journalled in the tubular extension 19 of the section 11 and is secured to a shaft 37 adapted to be turned by any suitable crank for the hand starting of the engine.

The inlet and exhaust valves of the compressor are not shown in detail but may be of any suitable construction.

The plate member 24 has a trough 38 into which the lower end of the piston dips at the end of its suction stroke, and has a central opening 39 through which the connecting-rod works.

With this construction the piston of the compressor is driven by the engine crank

shaft to compress air in the compressor cylinder and expel it to the reservoir. As the cylinder is removable independent of the cover-plate, the piston rings and the wristpin may be readily inspected or removed, when desired, by taking off said cylinder. In case any adjustment of the big end portion of the connecting-rod is necessary, the jacking up of the engine crankcase so as to permit removal of the trunnion bearing 20 and the end plate section 11, by releasing the bolts 18, permits access to said big end-bearing. In case it is necessary to renew the big end-bearing of the connecting-rod, the removal of the cylinder 16 and the removal of the end section 11 permits access to the bolts 40 on the big end of the connecting-rod so that it may be loosened from the eccentric and then the connecting-rod may be pulled through the slot 27 for work on the bearing.

Inasmuch as the crankcase 14 of the compressor is an extension of the main crankcase of the engine, the lubricating system for the compressor may use the same lubricating oil as the engine, and the oil dripping or coming down from the walls of the compressor cylinder below the piston from the cooling system associated with the head of the system, not shown in detail here, will drip from the trough 38 to the big end of the connecting-rod into the bottom of the crankcase of the compressor and find its way into the crank-case of the motor, and return to the main oil sump of the engine.

With this construction it is an easy matter to remove the relatively small cover-plate section 11 while the front end of the engine is raised free of the support 21 in order to gain access to the big end-bearing of the compressor drive.

The construction shown in Figs. 4 to 6, inclusive, is generally similar to that previously described and the parts designated by the numerals 10′, 11′, 12′, 14′, to 23′, inclusive, 26′, 28′, to 32′, inclusive, and 35′ to 37′, inclusive, are similar to the full numbers 10, 11, 12, 14 to 23, inclusive, 26, 28 to 32, inclusive, and 35 to 37, inclusive, previously described and they function similarly.

In these views the piston 41 working in the cylinder 23′ is operatively connected through the connecting-rod 28′ by the wristpin 42. The pad portion 15′ has a trough 43 formed integral therewith and a central opening 44 through which the connecting-rod 28′ works. In this instance the big end-bearing of the connecting-rod may be adjusted as previously described in connection with the first construction, by removing the cover section 11′, but in order to take the connecting rod out of the crankcase it is necessary, after taking off the compressor cylinder 23′, to remove the wristpin 42 so that upon the separation of the parts of the big end-bearing, by removal of the bolts 40′, the connecting-rod may be worked down through the opening 44 and then out through the opening 16′ for the purpose of renewing the big end-bearing.

The cooling system, which is not shown in the first figures but which is used therein, is shown in detail in Fig. 4, in which the head has a jacket space 45 which receives the oil from the lubricating system of the main engine and from which the oil passes down through a passage 46 in the side of the compressor cylinder and is then discharged at the lower end 47 into the trough 43.

I desire it to be understood that this invention is not to be limited to any specific form or arrangement of parts except in so far as such limitations are specified in the claims.

What I claim as my invention is:

1. In an internal combustion engine, a front cover-plate comprising a cover section detachably secured to the crankcase of the engine and provided with a compressor crankcase portion, a compressor-cylinder-supporting portion and an open end, and a cover section detachably secured over the open end of said first-named section and having a trunnion-bearing extension.

2. In an internal combustion engine, a front cover-plate comprising a cover section secured to the crankcase of the engine and provided with a compressor crankcase portion, a compressor-cylinder-supporting portion and an open end, said open end permitting of the adjustment of the big end-bearing of the connecting-rod of the compressor, said cylinder-supporting portion having an elongated slot permitting removal of the connecting-rod therethrough, and a cover section detachably secured over the open end of said first-named section and having a trunnion-bearing extension.

In testimony whereof, I affix my signature.

NIELS A. CHRISTENSEN.