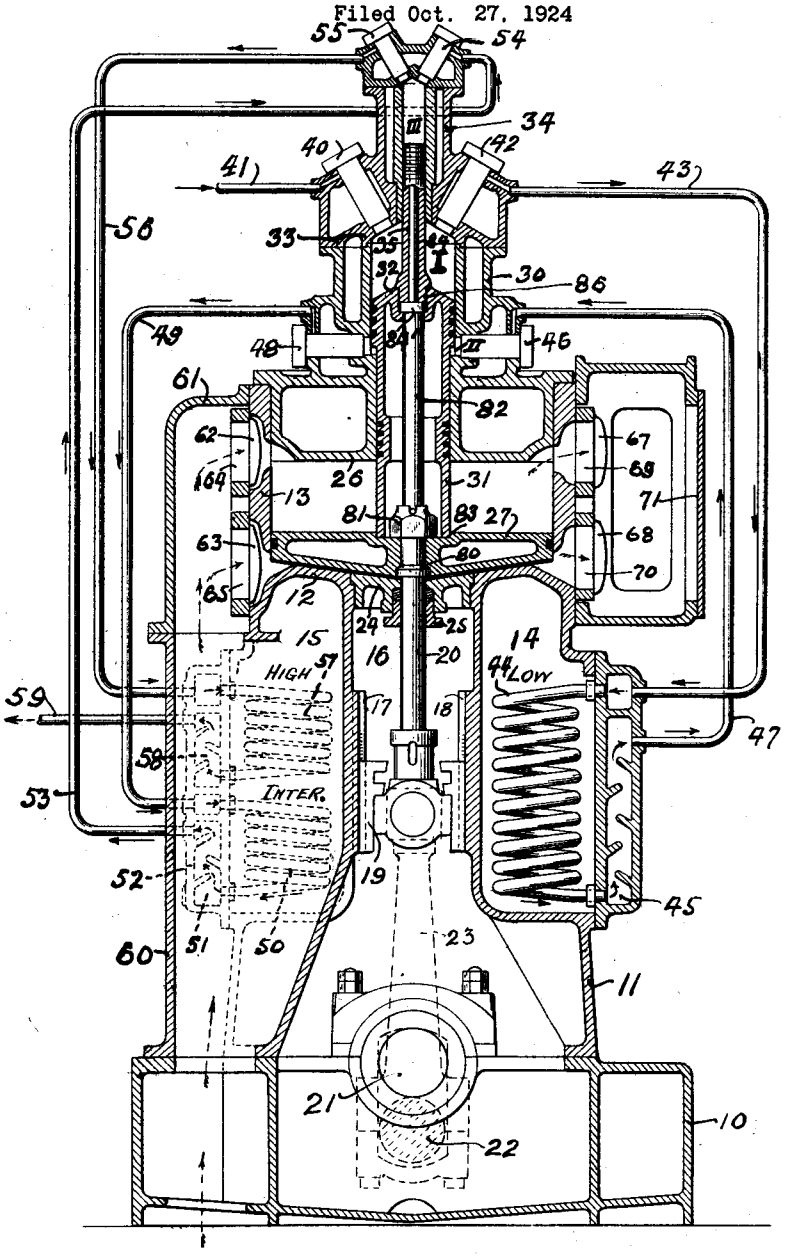
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COMPRESSOR AND SCAVENGER FOR DIESEL ENGINES

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COMPRESSOR AND SCAVENGER FOR DIESEL ENGINES.

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The invention resides in an improved arrangement in which a high duty multi-stage compressor for the air and a scavenger for the engine are incorporated into a compact and highly efficient construction, in which the elements co-operate in absolute synchronism in the performance of their functions.

Such arrangement has greatly lessened the cost of construction of the complex devices of older form having for their purpose the achievement of the same results, by reason of the simplification of the structure and the consequent elimination of many parts.

The construction will now be described in detail, and the novelty residing therein will be pointed out in the appended claims.

The drawing which accompanies this specification shows in vertical central section an apparatus embodying my invention, with the relative arrangement of the parts thereof.

In the drawing, the numeral 10 indicates the base of the multi-stage compressor and air pump, upon which is mounted the frame 11, supporting at its upper end the scavenging cylinder formation, the lower head 12 and the walls 13 of which may be integral with the said frame, as a matter of convenient construction. Between the base and the cylinder, the frame is provided at its sides with recesses 14 and 15 for the accommodation of the several coolers co-operating with the compressor, as will be later described.

Upon the opposed inner walls of the narrowed or constricted part 16 of the frame, and in the rear of the said recesses, vertical guides 17 and 18 are formed, these guides directing the movements of a sliding cross head 19, to which the piston rod 20 is connected at its lower end. The cross head is also connected to the shaft 21 and crank 22 thereon through the pitman 23, so that by means of the construction described the piston rod 20 is actuated to impart the desired motions to the several pistons with which the construction is provided.

The opening leading from the constriction 16 of the frame into the scavenging cylinder through the head 12, is closed by a plug 24, seated in the said opening so as to form a tight joint, and the piston rod passing through the plug is packed as at 25. The upper head 26 of the scavenging cylinder is constructed so as to permit the circulation of water to effect cooling and retard rise in its temperature. The piston 27, attached to the piston rod 20, operates in the scavenging cylinder 13.

A duplex or double duty compression cylinder 30, also water cooled, is mounted upon the head 26, which latter is provided with a central opening through which moves a tubular plunger 31, the upper end of which is formed with a piston 32, the upper side of which functions with the upper head 33 of the cylinder as a low or first stage compressor (I) for the air, the lower side of the piston acting as an intermediate or second-stage compressor (II), on the reverse stroke of the piston.

A third or high duty compression cylinder 34, likewise water-cooled, surmounts the cylinder 30, the lower side of the former constituting the upper head 33 of the latter. The piston 35, formed upon a continuation of the piston rod 20 functions with the upper end of the cylinder 34 as a final stage or high compressor (III).

An inlet valve 40 conducts the air through a feeding pipe 41 to the low pressure chamber (I), and an outlet valve 42 conducts the air in its state of initial compression through pipe 43 to the low pressure cooler 44, arranged in the recess 14 in the frame 11, after which the air is passed through a baffle 45, arranged upon the frame 11 and constructed so as to form a closure for the recess 14.

The intermediate pressure chamber (II) is provided with an inlet valve 46, to which the pipe 47 leads from the baffle 45. After the air admitted into the chamber has been subjected to intermediate compression, it passes through an outlet valve 48, and is conducted by a pipe 49 to the intermediate cooler 50, arranged in the recess 16 in the frame 11, after which it passes into a baffle 51, formed as a feature in the construction of the plate 52, which covers the recess 15.

From the baffle 51, the air passes through a pipe 53 to the inlet valve 54, with which the high pressure chamber (III) is provided. After being subjected to the third stage or high pressure in this chamber, the air passes therefrom through the outlet valve 55 and is conducted by the pipe 56 to the third cooler

57, also arranged within the recess 15, and then passed through the baffle 58, formed also in the plate 52, and from which it is conducted from the compressor by the pipe 59 to the engine.

A cover plate 60 resting upon the base 10 at one side of the frame 11 forms a conduit for the air which may be introduced into the apparatus through an opening in the base, and a cap piece 61, arranged at one side of the cylinder 13 completes the conduit. The scavenging cylinder is provided at one side with inlet valves 62 and 63, operating in ports 64 and 65 formed in the cylinder and through which the air is admitted at each stroke of the piston 27 working in the cylinder 13. The cylinder is also provided upon its other side with outlet valves 67 and 68 leading from ports 69 and 70, which likewise act to pass the air from the cylinder at each stroke of the piston 27. A casing 71 attached to the cylinder forms a closure for the space about the outlet ports and valves, and the air under pressure is forced therefrom into and is directed by the scavenging manifold of the engine.

The piston rod 20 is shouldered as at 80 to form a rest for the piston 27, which is held in position by the nut 81, threaded upon and connecting the reduced intermediate section 82 with the section 20. The tubular plunger 31 rests at its lower end in a concentric depression 83 formed in the contiguous face of the piston 27, and embraces at its upper end the reduced portion 82. Beyond the line of such engagement, the piston rod is further reduced in diameter as at 84. The opening in the piston 32 at the upper end of the tubular member 31 is enlarged for the reception of a collar or head 84' upon the upper end of the section 82, the collar being seated in the bottom of such enlargement, and holding the tubular member 31 in its position upon the piston 27, through the connection between the sections 20 and 82.

Into the said enlarged opening in the piston 32, the lower end of a sleeve 86 carrying the high pressure piston 35, mounted upon and secured to the upper section 84, is threaded so as to clamp the collar 85 against the seat formed in the piston 32. The connection between the reduced section 84 and the sleeve 86 causes the composite piston rod 20 and the elements assembled thereon to move as one part.

Tight joints at all points where connection is made will be insured by the use of copper gaskets in such connections. The valves employed in the apparatus are of usual or suitable construction.

Two distinct purposes are subserved by supplying air at different pressures, that at low pressure being admitted for combustion, and that at high pressure for atomizing the fuel, both inflows being kept separate until entered into the combustion chamber at different times.

Having thus described my invention, what I claim and desire to secure by Letters Patent of the United States, is:

1. A compressor and scavenger comprising a plurality of compression cylinders providing for compression in three successive stages ranging from low to high, pistons operating in such cylinders to effect compression in the order named, a scavenging cylinder, a piston therefor, a piston rod connection common to all of the pistons, a sliding cross-head to which one end of the piston rod is connected, and single actuating means therefor.

2. A compressor and scavenger comprising a plurality of compression cylinders providing for compression in three successive stages ranging from low to high, a plurality of pistons one for each cylinder and co-operating therewith to effect such compression, a scavenging cylinder to which the compression cylinders are attached a piston therefor, a piston rod connection common to all of the pistons, a sliding cross-head to which one end of the piston rod is connected, and single actuating means therefor.

3. A compressor and scavenger comprising aligned and connected compression cylinders and a scavenging cylinder, the former providing for compression in three successive stages from low to high, pistons for such cylinders, a piston rod connection common to all of the pistons, a sliding cross-head to which one end of the piston rod is connected, and single actuating means for the piston rod.

4. A compressor and scavenger comprising a plurality of compression cylinders providing compression in three successive stages ranging from low to high, pistons co-operating with the said cylinders to effect compression, a scavenging cylinder having air inlets and outlets at each end, a piston co-operating with the scavenging cylinder, a piston rod connection common to all of the pistons, a sliding cross-head to which one end of the piston rod is connected, and single actuating means for the piston rod.

5. A compressor and scavenger comprising a plurality of compression cylinders providing compression in three successive stages ranging from low to high, pistons operating in the said cylinders to effect such compression, a scavenging cylinder and a piston operating therein, a recessed frame upon which the cylinders are mounted, coolers located in the said recesses and connected intermediately to the compression cylinders, a piston rod connection common to all of the cylinders, a sliding cross-head to which one end of the piston rod is connected, and single actuating means for the piston rod.

6. A compressor and scavenger compris-

ing a plurality of compression cylinders providing compression in three successive stages from low to high, inlets and outlets for such cylinders, cooling devices connected with the outlet from one cylinder and the inlet to the cylinder next in succession, pistons working in the said cylinders to effect compression in the order stated, a scavenging cylinder and a piston operating therein, a frame supporting the cylinders and provided with recesses in which the cooling devices are arranged, a piston rod connection common to all of said pistons, a sliding cross-head to which one end of the piston rod is connected, and single actuating means for the piston rod connection.

7. A compressor and scavenger comprising a plurality of compression cylinders providing compression in successive stages from low to high, inlets and outlets for such cylinders, cooling devices connected with the outlet from one cylinder and the inlet to the cylinder next in succession, baffles interposed between the cooling device and the inlet connection, pistons working in the said cylinders to effect compression in the order stated, a scavenging cylinder and a piston operating therein, a frame supporting the cylinders and provided with recesses in which the cooling devices are arranged, a piston rod connection common to all of said pistons, and single actuating means for the piston rod connection.

In testimony whereof, I have signed my name at Milwaukee, this 20th day of October, 1924.

RUDOLF WINTZER.