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O. L. RIEGELS

ENGINE STARTING DEVICE

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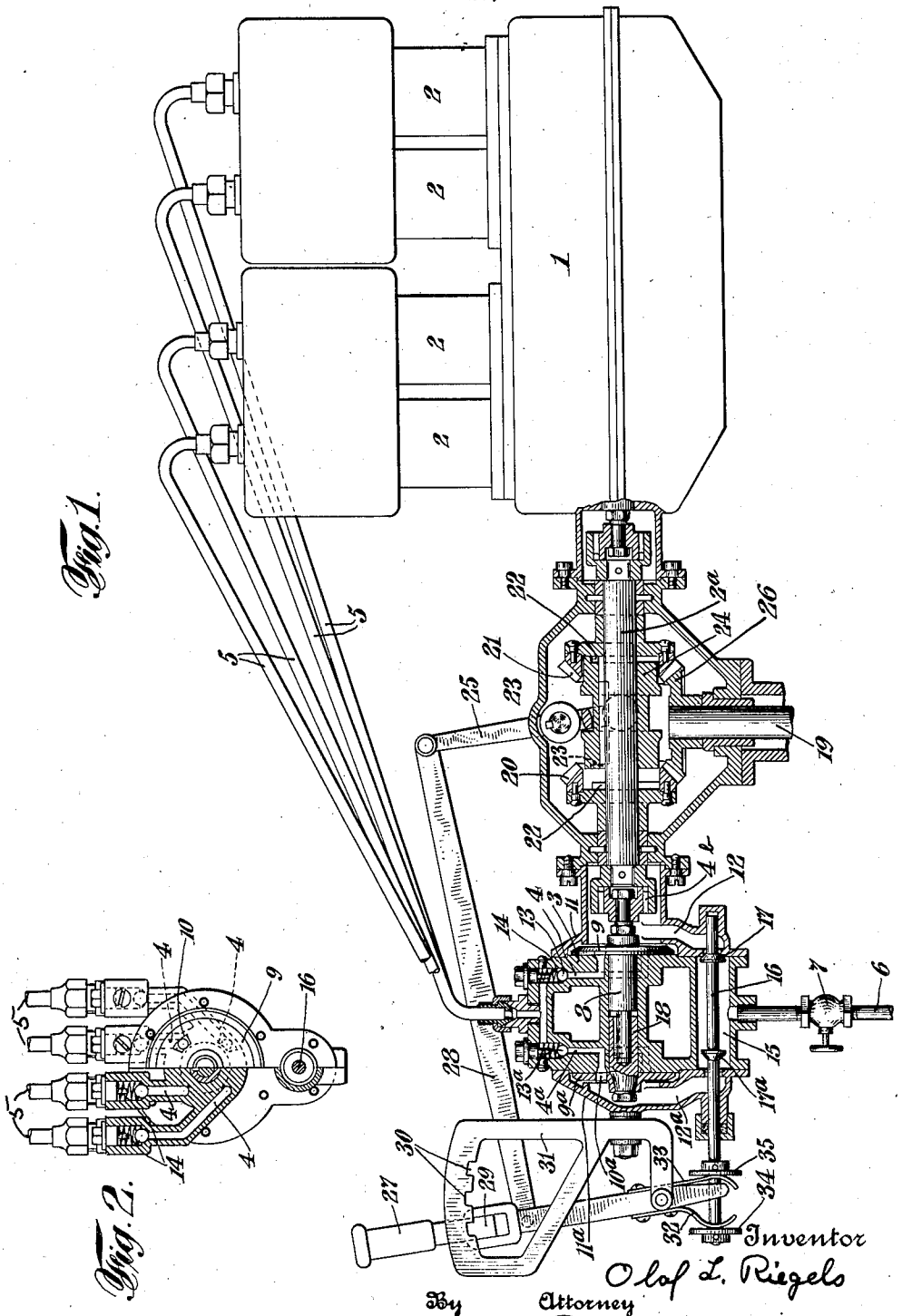


Fig. 1.

Fig. 2.

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ENGINE-STARTING DEVICE.

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To all whom it may concern:

Be it known that I, OLAF L. RIEGELS, of Skippersgate 9, Christiania, Division of Christiania, Norway, have invented a certain new and useful Improvement in Engine-Starting Devices, and do hereby declare that the following is a full, clear, and exact description thereof.

The invention has for an object to provide a starting device for engines, particularly of the internal combustion type, which will be simple in construction and readily operable to start the engine from any position which the latter has assumed when brought to rest.

Another object of the invention is to provide a device of the above character which may be operated to start the engine in either direction desired.

Another object of the invention if used for starting the engine either in forward or reverse direction, and if a separate reversing mechanism for an auxiliary driving shaft for operating a cam shaft or auxiliary machinery is used, is to interlock a control device of the starting mechanism with said reversing mechanism in such manner, that the auxiliary shaft is always driven in a single direction, no matter whether the crankshaft revolves in forward or reverse direction.

Further objects of the invention will be in part obvious and in part specifically pointed out in the description hereinafter contained, which description taken in connection with the annexed drawings, constitutes a disclosure of one embodiment of the invention; such embodiment, however, is to be considered merely as illustrative of its principle.

In the drawings,

Fig. 1 is a central longitudinal, sectional view showing a device made in accordance with the invention.

Fig. 2 is a transverse view partly in section of the valve head and associated parts shown in Fig. 1.

The starting device is illustrated as applied to a four cylinder internal combustion engine 1, having the usual cylinders 2 and main crank shaft (not shown). The engine is shown conventionally in Fig. 1 and need not be further described since it will be obvious that the type of engine, or the number of cylinders employed, are not essential to the invention.

In order to start the engine from a position of rest, a source of compressed gas (not shown) is employed, and placed in communication respectively with the cylinders of the engine at the proper times to cause the engine to rotate in the desired direction. In the present instance a rotary valve mechanism is employed, consisting of a valve head or casing 3 having a plurality of passages 4 leading from its surface and connected respectively to the cylinders 2 by means of suitable pipes 5; a compressed gas supply conduit 6 is connected to the head 3 and provided with a shutoff valve 7 which prevents escape of compressed air through conduit 6, when the device is not in use. Between passages 4 and the conduit 6, there is interposed a valve member adapted successively to open communication between the conduit and the cylinders when the pistons of the cylinders are in a position somewhat past dead center. In the embodiment illustrated, a rotary spindle 8 is journaled within the valve head 3, and centrally disposed with regard to the passages 4, and a disc valve 9 is mounted on such spindle, and provided with a port 10 adapted to register successively with the passages 4, as the spindle is rotated. The spindle 8 is driven in timed relation to the engine shaft 2^a, for instance by a suitable coupling 4^b in such manner that the port 10 comes into registry with the passage 4 which is connected to a given cylinder, when the piston of such cylinder is in a position somewhat past dead center for the direction in which it is desired to start the engine.

After operation a multi-cylinder engine comes to rest in such a position that the cranks connected to different pistons are on opposite sides of dead center. The piston of the cylinder which is connected to the passage 4 adjacent the port 10, will be somewhat past dead center and the port 10 may be made large enough to insure that it will communicate with one of the passages 4, over the range of angular positions within which the engine will stop. The valve 9 will, therefore, be in proper position to open communication from the compressed air supply to the proper cylinder, without being dependent upon turning the engine shaft by other means to proper starting position.

In the present construction the valve head 3 is provided with an end plate 11, which

overlies the disc valve 9 and is provided with suitable recesses 12 providing communication between the valve port 10 and conduit 6.

In order to prevent the explosion pressure in cylinders 2 from passing back through the starting device, check valves 13, pressed against their seats by suitable springs 14, may be placed in the passages 4, such valves, of course, being yieldable to permit the compressed air from conduit 6 to pass into the cylinders at the proper times.

If desired, the starting device may be arranged to start the engine in either direction, by selectively opening communication between the conduit 6 and the engine cylinders when the pistons of such cylinders are at either side of dead center. This is accomplished in the present construction by providing further passages 4^a, a further disc valve 9^a having a port 10^a, end plate 11^a with a passage 12^a, similar to the elements 4, 9, 10, 11 and 12 previously described, the disc valve 9^a, however, being angularly displaced with regard to valve 9 so that communication from the conduit 6 through port 10^a and a passage 4^a will be opened when the piston of the corresponding cylinder is on the other side of dead center. The air pressure from conduit 6 will, therefore, start the engine in a direction opposite to the direction of movement which would have been brought about by the use of the previously described valve 9. In the present form, valve head 3 is provided with a pressure chamber 15 which receives the air from conduit 6, and a control rod 16, provided with valves 17 and 17^a, is mounted to move within said chamber and thus open communication selectively to ports 10 and 10^a.

If desired, the disc valve 9^a may be mounted to provide a certain amount of play in its movement over the adjacent face of valve head 3, as by mounting the disc upon a sleeve 18 which is slidable along shaft spindle 8. With a construction of this nature, air pressure entering the recess 12^a will force the disc 9^a tightly against its valve head face, but when such air pressure is released the disc 9^a will not bear upon the valve head face so tightly as to cause undue wear between the parts, and still automatically take up wear.

In some installations a reversible engine driving reversible apparatus may also be employed to drive auxiliary apparatus, for instance a blower or air compresser, which should be run always in the same direction. In such situations, a reversing mechanism between the engine and such apparatus may be interlocked with the operating member of the starting device control valve, in such a way that when the device is changed to start the engine in the opposite direction, the reversing mechanism will be shifted to run the apparatus in the same direction. In the drawings there is illustrated a reversing gear of common type between the engine shaft 2^a and an auxiliary driven shaft 19, such reversing gear consisting of bevel gears 20 and 21, loosely carried by the shaft 2^a and each having clutch teeth 22 engageable with recesses 23 on a collar 24 splined to the shaft 3. A pivoted lever 25 engages collar 24 to shift same between bevel gears 20 and 21, so that such bevel gears selectively rotate a bevel gear 26, fixed to shaft 19, in opposite directions.

A pivoted lever 27 may be employed to operate the control member 16 for the starting device, and a link 28 connected between the levers 27 and 25, thus interlocking the two in such a way that a change in the direction in which the starting device will start the engine, effects a reversal of the clutch mechanism, and thus shaft 19 rotates always in the same direction.

Operating lever 27 may be provided with a latch 29 of ordinary form, co-operating with notches 30 in a frame 31, to hold the operating lever in proper position. The valves 17 and 17^a may also be yieldingly pressed toward proper position for the particular setting of operating lever 27, for instance by bent springs 32 and 33, engaging between the collars 34 and 35 on the rod 16. If the operating lever 27 is thrown to the left as shown in Fig. 1, spring 33 will engage collar 35 to press valve 17 firmly against its seat, or if the operating lever were thrown to the right, spring 32 would press valve 17^a against its seat in a similar manner, or if the lever were placed in neutral position, springs 32 and 33 would co-operate to maintain the valves 17 and 17^a both disengaged from their seats.

While a specific embodiment of the invention has been disclosed, it is obvious that many changes may be made without departing from the principle thereof as defined in the following claims.

What is claimed is:

1. An engine having a reversing mechanism between the same and a driven shaft, in combination with a starting device for said engine, and a control member adapted to set said device to start the engine to turn in either direction, and means interlocking said control member with said reversing mechanism whereby the operation of said control member to change the direction of rotation of the engine, shifts said reversing mechanism.

2. An internal combustion engine having a reversing mechanism between the same and a driven shaft, in combination with a compressed air starting device for said engine, a compressed gas supply conduit for said device, a control valve adapted to change

the connection from said conduit to said device to cause the latter to start the engine in opposite directions, and means interlocking the operating member of said control valve with said reversing mechanism whereby the operation of said control valve shifts said reversing mechanism.

3. An engine having a reversing mechanism between the same and a driven shaft, in combination with a starting device for said engine adapted to start the engine selectively in either direction, and means controlled as to position by said starting device for shifting said reversing mechanism to cause the driven shaft to rotate in the forward direction when the direction of rotation of the engine is reversed.

In testimony that I claim the foregoing, I have hereunto set my hand.

Dated 18/9, 1919.

O. L. RIEGELS.