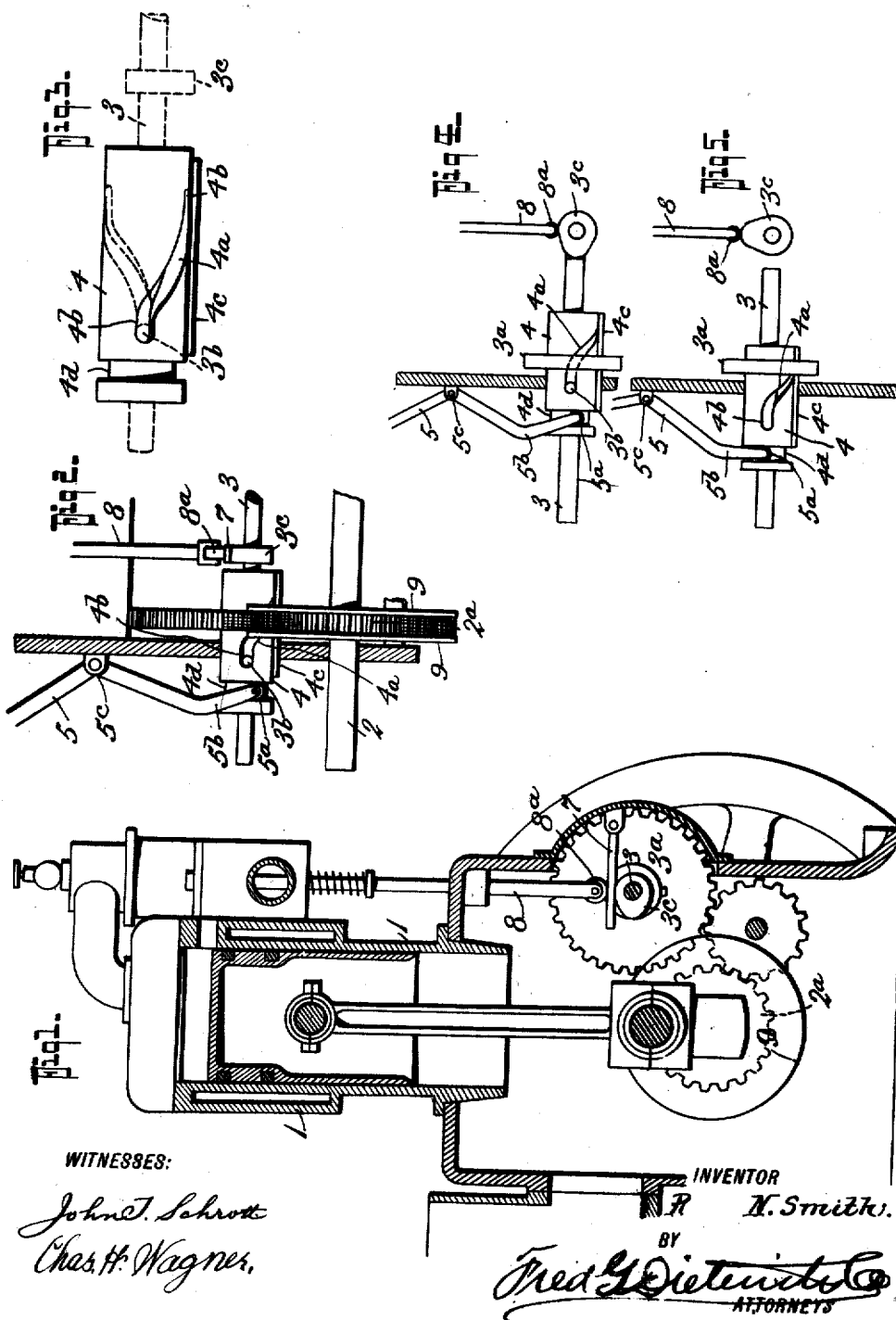


APPLICATION FILED JUNE 12, 1908.

Patented Aug. 3, 1909.



UNITED STATES PATENT OFFICE.

RUSSELL N. SMITH, OF ALMA, WISCONSIN.

REVERSING-GEAR.

No. 929,796.

Specification of Letters Patent.

Patented Aug. 3, 1909.

Application filed June 12, 1908. Serial No. 438,135.

To all whom it may concern:

Be it known that I, RUSSELL N. SMITH, residing at Alma, in the county of Buffalo and State of Wisconsin, have invented certain new and useful Improvements in Reversing-Gear, of which the following is a specification.

My invention relates to certain new and useful improvements in devices for reversing gas engines and the like, and in its generic nature the invention embodies an improved means for reversing a four-cycle gas engine, operating in conjunction with the exhaust valve of the engine whereby the valve may be arranged to open at different predetermined times to cause the engine to run either in one direction or the other.

More specifically my improved reversing mechanism comprises a sleeve longitudinally movable and partly rotatable on the reversing valve cam shaft, upon which sleeve the gear that meshes with the engine drive shaft gear is keyed, the sleeve having a longitudinal movement through the gear so that when the sleeve is moved longitudinally in one direction the cam shaft will be turned in one direction a predetermined distance with relation to the gear to cause the cams to operate the exhaust valve at a certain time to permit the engine to run in one direction, and when the sleeve is shifted in an opposite direction the cams will operate the exhaust valve at a different time to permit the engine to run in an opposite direction.

Those other novel details of construction, combination and arrangement of parts which will be hereinafter described and specifically pointed out in the appended claim also constitute a part of my invention.

Referring now to the drawings, it will be seen,—Figure 1, is a central longitudinal section of a gas engine embodying my invention. Fig. 2, is a central longitudinal cross section at right angles to Fig. 1. Fig. 3, is a detail view of the shiftable sleeve. Fig. 4, is a diagrammatic view showing the position of parts when the engine is arranged to run in one direction. Fig. 5, is a similar view showing the position of parts when the engine is reversed.

Referring now to the accompanying drawings, in which like letters and numerals of reference indicate like parts in all of the figures, 1 represents the engine, which may be of any approved construction of the four-

cycle type, and in which 2 represents the crank or drive shaft which carries the gear 2^a to mesh with the cam shaft gear 3^a that is mounted on the sleeve 4 and keyed to turn therewith by a key 4^c, as shown, the sleeve 4 being longitudinally slidable on the cam shaft 3 and susceptible of a limited rotary movement on such shaft. The sleeve 4 has two slots 4^a terminating in parallel ends 4^b, the slots 4^a being spirally arranged so that as the sleeve 4 is moved longitudinally it will receive a rotary movement on the shaft 3, a pin 3^b being carried by the shaft 3 and operating in the slots 4^a. The sleeve 4 also has a clutch lever receiving groove 4^d in which the anti-friction rollers 5^a of the fork 5^b of the shifting lever 5 operate, the shifting lever 5 being fulcrumed at 5^c to a fixed part of the engine, so that it can be moved to shift the sleeve 4. Any suitable gage mechanism may be provided to hold the lever 5 in its adjusted positions.

When the pin 3^b is in the end 4^b of the slot 4^a, the sleeve 4 will not be susceptible of rotation on the shaft 3 and hence this position of the pin will ordinarily be sufficient to prevent longitudinal displacement of the sleeve and the locking mechanism 6 for the lever 5 may not, in practice, be necessary.

The cam shaft 3 carries the cam 3^c which coöperates with the arm 7 that engages the roller 8^a of the valve rod 8 which operates the exhaust valve of the engine. In order to hold the gear 3^a from longitudinal movement with respect to the shaft 3 the crank shaft 2 may be provided with a pair of disks 9—9 of slightly larger diameter than the gear 2^a so as to embrace the gear 3^a, as shown in Fig. 2 of the drawings and hence prevent sidewise movement of the gear 3^a, as the sleeve 4 is shifted.

In the practical application of my invention, when the sleeve 4 is at one limit of its longitudinal movement, say, in the position shown in Fig. 4, the cams 3^c will operate the exhaust valve at such a time that the engine will rotate in one direction, it, of course, being understood that the usual timer and sparking devices (not shown) are provided to explode the mixture and these are set to explode the mixture at the proper time, depending upon the direction of rotation of the crank shaft. Supposing the engine to be running forwardly, say when the parts are in the position shown in such Fig. 4, and

it is desired to reverse the engine, it is only necessary for the operator to shift the lever 5 to move the sleeve 4 to the position shown in Fig. 5, when the shaft 3 will be rotated say $\frac{1}{4}$ revolution with respect to the gear 3^a and hence the cam 3^c will be proportionately changed in its operative relation to the exhaust valve so that the exhaust valve will operate at such a time that when the timing device is properly set the engine will operate in a direction reverse to that shown in Fig. 4. Any means may be provided for shifting the timer and advancing and retarding the spark, as such *per se*, form no part of my present invention. Should the four-cycle engine be provided with a positively operated inlet valve, the same mechanism may be duplicated to operate the inlet valve as I am aware that some types of four-cycle engines are provided with positively operated inlet valve.

While I have described my invention as being particularly adapted for use in connection with four-cycle gas engines, the same may be used also in connection with other types of gas engine in which a positively operated valve mechanism is a part.

From the foregoing description taken in

connection with the accompanying drawings it is thought the complete construction, operation and advantages of my invention will be readily understood by those skilled in the art to which the invention appertains.

What I claim is:

In a reversing gear mechanism the combination with a cam shaft and a crank shaft, a gear secured to the crank shaft to turn therewith, a sleeve longitudinally movable on the cam shaft, said sleeve having a spiral slot terminating in portions parallel to the cam shaft, a pin projecting through said slot and said cam shaft to cause said sleeve and said shaft to turn in unison, said sleeve having a groove, a lever cooperating with said groove, a roller carried by said lever to enter said groove to shift said sleeve longitudinally on said cam shaft when the lever is moved, a gear penetrated by said sleeve and keyed thereto, one of said gears having side disks to embrace the other gear to maintain their alignment at all times, substantially as shown and for the purposes described.

RUSSELL N. SMITH.

Witnesses:

J. S. McCABE,
JOHN HARRY.