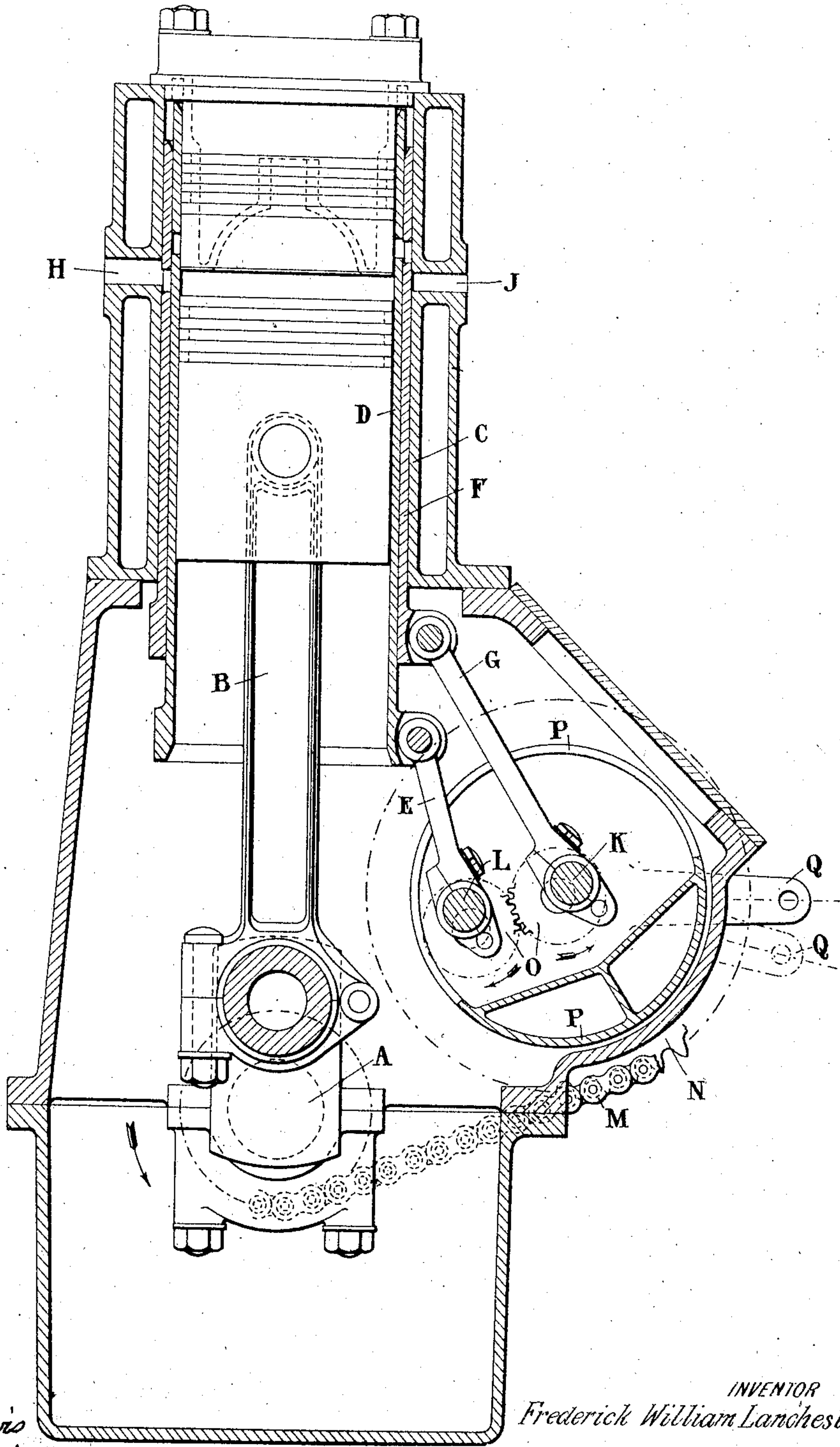


VALVE GEAR OF INTERNAL COMBUSTION ENGINES.

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WITNESSES

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VALVE-GEAR OF INTERNAL-COMBUSTION ENGINES.

990,752.

Specification of Letters Patent.

Patented Apr. 25, 1911.

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To all whom it may concern:

Be it known that I, FREDERICK WILLIAM LANCHESTER, a subject of the King of Great Britain and Ireland, residing at 53 Hagley road, Edgbaston, in the county of Warwick, England, have invented certain new and useful Improvements in the Valve-Gear of Internal-Combustion Engines, of which the following is a complete specification.

My invention relates to improvements in the valve gear of internal combustion engines, and refers more particularly to improvements in the actuating gear and method of control of valves of the sliding type especially applicable to engines employing the Otto cycle.

The invention has for its object the application of a variable cut-off to the intake of the working fluid in a simple and effective manner.

The invention consists in means for varying the valve operation in internal combustion engines having valves of the concentric sliding sleeve type, by varying the mean position and relative phase of operation of the inner sleeve.

The invention further consists in means for varying the valve operation in such engines, by giving the shaft which reciprocates the valve element translational and rotational movement.

The invention further consists in the improved valve gear for internal combustion engines hereinafter described.

In carrying my invention into effect as applied to an engine of known type, I preferably arrange the inner and outer concentric sleeve valves to be driven by independent lay shafts, and I mount the shaft by which the inner sleeve is driven in a frame or otherwise, so that it may be moved through a certain range, the said motion being at right angles to the axis of revolution. The motion is preferably arranged to take place concentrically to the gear by which the shaft is driven, so that the said gear remains constantly in mesh, consequently as the shaft is moved translationally it at the same time undergoes a rotary movement through a certain angle relatively to its former position, this rotary movement giving the necessary advance or retard to the inner sleeve valve aforesaid. The diameter of the gear and the direction of the motion imparted to the shaft and the positions of the various parts, are so adjusted that the change of tim-

ing due to the rotary displacement of the shaft is accompanied by a change in the position of the point of mid stroke of the valve, and thus the point of cut-off may be varied and the timing of the exhaust release may be simultaneously modified to any desired degree.

The operation of the shaft movement may be accomplished by a rotary governor either directly or through a relay of some kind, or any other kind of governor or hand control may be employed for the said purpose.

Referring to the accompanying sheet of drawings which show a vertical section transverse to the crank shaft of an engine constructed according to this invention. A is the crank shaft, B the connecting rod, and C the cylinder of an internal combustion engine working on the four stroke cycle. The inlet and exhaust ports J and H respectively are controlled in the customary manner by an inner sleeve D and an outer sleeve F. The sleeves D and F are driven by the connecting rods E and G from two parallel cranked shafts L and K which are caused to revolve at the same speed of revolution by an equal pair of gears O O; the shaft K is driven from the crank shaft by the usual two to one motion shown as a chain drive M N; the chain wheels are indicated by their pitch lines. T' parallel shafts L and K are mounted in a cylindrical container P which is mounted revolvably in apertures bored in the walls of the crank case in the manner shown. A lever Q is provided whereby the cylindrical container may be rotated through a suitable angle as indicated by the position of the lever indicated in dotted lines. The shaft K by which the outer sleeve is driven is mounted co-axially with the cylindrical container so that the position of the shaft K and the motion of the outer sleeve is unaffected by movements of the lever Q. The shaft L on the other hand receives motion of two kinds when the lever Q is operated; firstly it is displaced bodily parallel to itself in such a manner that the duration of the period during which the inner sleeve ports are uncovered is varied, the timing of mean position or dead center being substantially unaffected, and secondly it receives a rotary motion due to the epicyclic action of the gears, whereby the timing of mean position of the said period is also caused to vary. The variation of both the duration of the period and the timing of the opening and

cut-off is thus simultaneous, being effected by the simple movement of the one lever Q.

It will be understood that when the lever Q is set for full load, both sleeves function in the usual manner; the exhaust release takes place about 60 degrees before the out-center and the feed cut-off takes place about 20 or 30 degrees after the subsequent out-center. When the lever Q is set for running light, the exhaust may conveniently be made to open approximately at the out-center and the feed cut-off is arranged to take place at as short a period after the subsequent in-center as desired, in the limit the feed may be virtually suppressed when the engine will be brought to a standstill.

Having now described my invention, what I claim as new and desire to secure by Letter's Patent is:—

1. In an internal combustion engine, in combination, a sleeve valve, a working piston reciprocating within said sleeve valve, and means for displacing the point of mid travel of said sleeve valve.

2. In an internal combustion engine, in combination, a sleeve valve, a working piston reciprocating within said sleeve valve, and means for simultaneously altering the stroke time relatively to said piston and displacing the point of mid travel of said sleeve valve.

3. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, and means for altering the stroke time relatively to said piston of one of said sleeve valves.

4. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, and means for displacing the point of mid travel of one of said sleeve valves.

5. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, and means for displacing the point of mid travel of the inner of said sleeve valves.

6. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, and means for simultaneously altering the stroke time relatively to said piston and displacing the point of mid travel of one of said sleeve valves.

7. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, and means for simultaneously altering the stroke time relatively to said piston and displacing the point of mid travel of the inner of said sleeve valves.

8. In an internal combustion engine, in combination, a sleeve valve, a working piston reciprocating within said sleeve valve, means for displacing the point of mid travel of said sleeve valve, said means including a

shaft, a crank or eccentric carried on said shaft, means connecting said crank or eccentric to said sleeve valve, and means for moving said shaft parallel to itself.

9. In an internal combustion engine, in combination, a sleeve valve, a working piston reciprocating within said sleeve valve, means for simultaneously altering the stroke time relatively to said piston and displacing the point of mid travel of said sleeve valve, said means including a shaft, a crank or eccentric carried on said shaft, means connecting said crank or eccentric to said sleeve valve, and means for moving said shaft parallel to itself.

10. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for displacing the point of mid travel of one of said valves, said means including a shaft, a crank or eccentric carried on said shaft, means connecting said crank or eccentric to said sleeve valve, and means for moving said shaft parallel to itself.

11. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for simultaneously altering the stroke time relatively to said piston and displacing the point of mid travel of one of said valves, said means including a shaft, a crank or eccentric carried on said shaft, means connecting said crank or eccentric to said sleeve valve, and means for moving said shaft parallel to itself.

12. In an internal combustion engine, in combination, a sleeve valve, a working piston reciprocating within said sleeve valve, means for reciprocating said valve, said means including a shaft, an eccentric or crank carried by said shaft and connected to said valve, and means for altering the stroke time relatively to said piston of said valve, said means including bearings carrying said shaft and revoluble about a point eccentric to said shaft.

13. In an internal combustion engine, in combination, a sleeve valve, a working piston reciprocating within said sleeve valve, means for reciprocating said valve, said means including a shaft, an eccentric or crank carried by said shaft and connected to said valve, and means for displacing the point of mid travel of said valve, said means including bearings carrying said shaft and revoluble about a point eccentric to said shaft.

14. In an internal combustion engine, in combination, a sleeve valve, a working piston reciprocating within said sleeve valve, means for reciprocating said valve, said means including a shaft, an eccentric or crank carried by said shaft and connected to said valve, and means for simultaneously altering the stroke time relatively to said

piston and displacing the point of mid travel of said valve, said means including bearings carrying said shaft and revoluble about a point eccentric to said shaft.

15. In an internal combustion engine in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for reciprocating said valves, said means including two shafts, eccentrics or cranks carried by said shafts and connected to said valves, and means for altering the stroke time relatively to said piston of one of said valves, said means including bearings carrying the shaft connected to said valve and revoluble about a point eccentric to said shaft.

16. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for reciprocating said valves, said means including two shafts, eccentrics or cranks carried by said shafts and connected to said valves, and means for displacing the point of mid travel of one of said valves, said means including bearings carrying the shaft connected to said valve and revoluble about a point eccentric to said shaft.

17. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for reciprocating said valves, said means including two shafts, eccentrics or cranks carried by said shafts and connected to said valves, and means for simultaneously altering the stroke time relatively to said piston and displacing the point of mid travel of one of said valves, said means including bearings carrying the shaft connected to said valve and revoluble about a point eccentric to said shaft.

18. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for reciprocating said valves, said means including two shafts, eccentrics or cranks carried by said shafts and connected to said valves, and means for altering the stroke time relatively to said piston of one of said valves, said means including bearings carrying the shaft connected to said valve and revoluble about the shaft connected to the other of said valves.

19. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for reciprocating said valves, said means including two shafts, eccentrics or cranks carried by said shafts and connected to said valves, and means for displacing the point of mid travel of one of said valves, said

means including bearings carrying the shaft connected to said valve and revoluble about the shaft connected to the other of said valves.

20. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for reciprocating said valves, said means including two shafts, eccentrics or cranks carried by said shafts and connected to said valves, and means for simultaneously altering the stroke time relatively to said piston and displacing the point of mid travel of one of said valves, said means including bearings carrying the shaft connected to said valve and revoluble about the shaft connected to the other of said valves.

21. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for reciprocating said valves, said means including two shafts, eccentrics or cranks carried by said shafts and connected to said valves, and means for altering the stroke time relatively to said piston of the inner of said valves, said means including bearings carrying the shaft connected to said valve and revoluble about the shaft connected to the outer of said valves.

22. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for reciprocating said valves, said means including two shafts, eccentrics or cranks carried by said shafts and connected to said valves, and means for displacing the point of mid travel of the inner of said valves, said means including bearings carrying the shaft connected to said valve and revoluble about the shaft connected to the outer of said valves.

23. In an internal combustion engine, in combination, a working piston, two co-axial sleeve valves surrounding said piston, means for reciprocating said valves, said means including two shafts, eccentrics or cranks carried by said shafts and connected to said valves, and means for simultaneously altering the stroke time relatively to said piston and displacing the point of mid travel of the inner of said valves, said means including bearings carrying the shaft connected to said valve and revoluble about the shaft connected to the outer of said valves.

In testimony whereof I affix my signature in the presence of two subscribing witnesses.

FREDERICK WILLIAM LANCHESTER.

Witnesses:

JOHN MORGAN,
HARRY DAVIS.