

CPC**COOPERATIVE PATENT CLASSIFICATION****F01L****CYCLICALLY OPERATING VALVES FOR MACHINES OR ENGINES** (valves in general [F16K](#))**NOTE**

1. Groups [F01L 1/00](#) to [F01L 13/00](#) cover only valve-gear or valve arrangements without provision for variable fluid distribution.
2. Valve gear or valve arrangements specially adapted for steam engines are covered by groups [F01L 15/00](#) to [F01L 35/00](#).
3. Valve-gear arrangements specially adapted for machines or engines with variable working-fluid distribution are covered by groups [F01L 15/00](#) to [F01L 35/00](#).
4. Attention is drawn to the notes preceding class [F01](#), especially Note (3).
5. As regards the above-mentioned Note (3), attention is drawn to [F01B 3/10](#), [F01B 15/06](#), [F01C 21/18](#), [F02B 53/06](#), [F03C 1/08](#), [F04B 1/18](#), [F04B 7/00](#), [F04B 39/08](#), [F04B 39/10](#), and [F04C 15/06](#), [F04C 29/12](#).

Valve-gear for internal combustion piston engines or for other machines or engines with positive working-fluid displacement (valve gear specially for steam engines or specially for other machines or engines with variable fluid distribution [F01L 15/00](#) to [F01L 35/00](#))

F01L 1/00

Valve-gear or valve arrangements, e.g. lift-valve gear (lift-valve and valve-seat assemblies per se [F01L 3/00](#); slide-valve gear [F01L 5/00](#); actuated non-mechanically [F01L 9/00](#); valve arrangements in working piston or piston rod [F01L 11/00](#); modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations [F01L 13/00](#))

- [F01L 1/02](#) . Valve drive (transmitting-gear between valve drive and valve [F01L 1/12](#))
- [F01L 1/022](#) .. {Chain drive}
- [F01L 1/024](#) .. {Belt drive}
- [F01L 1/026](#) .. {Gear drive}
- [F01L 2001/028](#) .. {Pre-assembled timing arrangement, e.g. located in a cassette}
- [F01L 1/04](#) .. by means of cams, camshafts, cam discs, eccentrics or the like ([F01L 1/10](#) takes precedence)
- [F01L 1/042](#) ... {Cam discs}
- [F01L 1/044](#) ... {Reciprocating cams}
- [F01L 1/047](#) ... Camshafts
- [F01L 2001/0471](#) {Assembled camshafts, e.g. "gebaute Nockenwelle"}
- [F01L 2001/0473](#) {Composite camshafts e.g. with cams or cam sleeve being able to move relative to the inner camshaft or a cam adjusting rod}
- [F01L 2001/0475](#) {Hollow camshafts ([F01L 2001/0473](#) takes precedence)}
- [F01L 2001/0476](#) {Camshaft bearings}

F01L 2001/0478	....	{Torque pulse compensated camshafts}
F01L 1/053	....	overhead type
F01L 1/0532	.....	{the cams being directly in contact with the driven valve}
F01L 2001/0535	.....	{Single overhead camshafts [SOHC]}
F01L 2001/0537	.....	{Double overhead camshafts [DOHC]}
F01L 2001/054	....	{Camshafts in cylinder block}
F01L 1/06	...	the cams, or the like, rotating at a higher speed than that corresponding to the valve cycle, e.g. operating fourstroke engine valves directly from crankshaft
F01L 1/08	...	Shape of cams
F01L 1/10	..	by means of crank-or eccentric-driven rods {(F01L 1/044 takes precedence)}
F01L 1/12	.	Transmitting gear between valve drive and valve (simultaneously operating two or more valves F01L 1/26)
F01L 1/14	..	Tappets {(hydraulic tappets for automatically adjusting or compensating clearance F01L 1/24)}; Push rods
F01L 1/143	...	{for use with overhead camshafts}
F01L 1/146	...	{Push-rods}
F01L 1/16	...	Silencing impact; Reducing wear
F01L 1/18	..	Rocking arms or levers
F01L 1/181	...	{Centre pivot rocking arms}
F01L 1/182	....	{the rocking arm being pivoted about an individual fulcrum, i.e. not about a common shaft}
F01L 1/183	.....	{of the boat type}
F01L 1/185	...	{Overhead end-pivot rocking arms}
F01L 2001/186	...	{Split rocking arms, e.g. rocker arms having two articulated parts and means for varying the relative position of these parts or for selectively connecting the parts to move in unison}
F01L 2001/187	...	{Clips, e.g. for retaining rocker arm on pivot}
F01L 2001/188	...	{Fulcrums at upper surface}
F01L 1/20	.	Adjusting or compensating clearance
F01L 1/205	..	{by means of shims or the like}
F01L 1/22	..	automatically, e.g. mechanically
F01L 1/24	...	by fluid means, e.g. hydraulically
F01L 1/2405	....	{by means of a hydraulic adjusting device located between the cylinder head and rocker arm}
F01L 1/2411	....	{by means of a hydraulic adjusting device located between the valve stem and rocker arm}
F01L 1/2416	....	{by means of a hydraulic adjusting device attached to an articulated rocker}
F01L 1/2422	....	{by means of a hydraulic adjusting device located between the push rod and rocker arm}
F01L 2001/2427	....	{by means of an hydraulic adjusting device located between cam and push rod}
F01L 2001/2433	....	{Self contained, e.g. sealed hydraulic lash adjusters}
F01L 2001/2438	....	{with means permitting forced opening of check valve}

F01L 2001/2444	....	{Details relating to the hydraulic feeding circuit, e.g. lifter oil manifold assembly [LOMA]}
F01L 1/245	....	Hydraulic tappets
F01L 1/25	.....	between cam and valve stem
F01L 1/252	.....	{for side-valve engines}
F01L 1/255	.....	between cam and rocker arm
F01L 2001/256	.....	{between cam and push rod}
F01L 1/26	.	characterised by the provision of two or more valves operated simultaneously by same transmitting-gear; peculiar to machines or engines with more than two lift-valves per cylinder (with coaxial valves F01L 1/28)
F01L 1/262	..	{with valve stems disposed radially from a centre which is substantially the centre of curvature of the upper wall surface of a combustion chamber (F01L 1/265 takes precedence)}
F01L 1/265	..	{peculiar to machines or engines with three or more intake valves per cylinder}
F01L 1/267	..	{with means for varying the timing or the lift of the valves}
F01L 1/28	.	characterised by the provision of coaxial valves; characterised by the provision of valves co-operating with both intake and exhaust ports
F01L 1/285	..	{Coaxial intake and exhaust valves}
F01L 1/30	.	characterised by the provision of positively opened and closed valves, i.e. desmodromic valves
F01L 1/32	.	characterised by the provision of means for rotating lift valves, e.g. to diminish wear
F01L 1/34	.	characterised by the provision of means for changing the timing of the valves without changing the duration of opening {and without affecting the magnitude of the valve lift}
F01L 1/344	..	changing the angular relationship between crankshaft and camshaft, e.g. using helicoidal gear
F01L 1/34403	...	{using helically teathed sleeve or gear moving axially between crankshaft and camshaft}
F01L 1/34406	....	{the helically teathed sleeve being located in the camshaft driving pulley}
F01L 1/34409	...	{by torque-responsive means}
F01L 1/34413	...	{using composite camshafts, e.g. with cams being able to move relative to the camshaft}
F01L 1/34416	...	{using twisted cams}
F01L 1/3442	...	{using hydraulic chambers with variable volume to transmit the rotating force}
F01L 2001/34423	....	{Details relating to the hydraulic feeding circuit}
F01L 2001/34426	.....	{Oil control valves}
F01L 2001/3443	.....	{Solenoid driven oil control valves}
F01L 2001/34433	.....	{Location oil control valves}
F01L 2001/34436	.....	{Features or method for avoiding malfunction due to foreign matters in oil}
F01L 2001/3444	.....	{Oil filters}
F01L 2001/34443	.....	{Cleaning control of oil control valves}
F01L 2001/34446	.....	{Fluid accumulators for the feeding circuit}
F01L 2001/3445	....	{Details relating to the hydraulic means for changing the angular relationship}

F01L 2001/34453	.....	{Locking means between driving and driven members}
F01L 2001/34456	.....	{Locking in only one position}
F01L 2001/34459	.....	{Locking in multiple positions}
F01L 2001/34463	.....	{Locking position intermediate between most retarded and most advanced positions}
F01L 2001/34466	.....	{with multiple locking devices}
F01L 2001/34469	.....	{Lock movement parallel to camshaft axis}
F01L 2001/34473	.....	{Lock movement perpendicular to camshaft axis}
F01L 2001/34476	.....	{Restrict range locking means}
F01L 2001/34479	.....	{Sealing of phaser devices}
F01L 2001/34483	.....	{Phaser return springs}
F01L 2001/34486	...	{Location and number of the means for changing the angular relationship}
F01L 2001/34489	....	{Two phasers on one camshaft}
F01L 2001/34493	....	{Dual independent phasing system [DIPS]}
F01L 2001/34496	....	{Two phasers on different camshafts}
F01L 1/348	...	by means acting on timing belts or chains
F01L 1/352	...	using bevel or epicyclic gear
F01L 2001/3521	....	{Harmonic drive of flexspline type}
F01L 2001/3522	....	{with electromagnetic brake}
F01L 1/356	...	making the angular relationship oscillate, {e.g. non-homokinetic drive}
F01L 1/36	.	peculiar to machines or engines of specific type other than four-stroke cycle
F01L 1/38	..	for engines with other than four-stroke cycle, e.g. with two-stroke cycle (F01L 1/26 , F01L 1/28 take precedence)
F01L 1/40	..	for engines with scavenging charge near top dead centre position, e.g. by overlapping inlet and exhaust time (scavenging aspects F02B)
F01L 1/42	..	for machines or engines characterised by cylinder arrangements, e.g. star or fan
F01L 1/44	.	Multiple-valve gear or arrangements, not provided for in preceding subgroups, e.g. with lift and different valves
F01L 1/443	..	{comprising a lift valve and at least one rotary valve}
F01L 1/446	..	{comprising a lift valve and at least one reed valve}
F01L 1/46	.	Component parts, details, or accessories, not provided for in preceding subgroups
F01L 1/462	..	{Valve return spring arrangements}
F01L 1/465	...	{Pneumatic arrangements}
F01L 2001/467	..	{Lost motion springs}
F01L 3/00		Lift-valve, i.e. cut-off apparatus with closure members having at least a component of their opening and closing motion perpendicular to the closing faces; Parts or accessories thereof
F01L 3/02	.	Selecting particular materials for valve-members or valve-seats; Valve-members or valve-seats composed of two or more materials
F01L 3/04	..	Coated valve members or valve-seats

- F01L 3/06
 - Valve members or valve-seats with means for guiding or deflecting the medium controlled thereby, e.g. producing a rotary motion of the drawn-in cylinder charge ([for rotating lift-valves F01L 1/32](#))
- F01L 3/08
 - Valves guides; Sealing of valve stem, e.g. sealing by lubricant
- F01L 3/085
 - .. {Valve cages}
- F01L 3/10
 - Connecting springs to valve members
- F01L 2003/11
 - {Connecting valve members to rocker arm or tappet}
- F01L 3/12
 - Cooling of valves
- F01L 3/14
 - .. by means of a liquid or solid coolant, e.g. sodium, in a closed chamber in a valve
- F01L 3/16
 - .. by means of a fluid flowing through or along valve, e.g. air ([for sealing only F01L 3/08](#))
- F01L 3/18
 - ... Liquid cooling of valve
- F01L 3/20
 - Shapes or constructions of valve members, not provided for in preceding subgroups of this group
- F01L 3/205
 - .. {Reed valves}
- F01L 3/22
 - Valve-seats not provided for in preceding subgroups of this group; Fixing of valve-seats
- F01L 3/24
 - Safety means or accessories, not provided for in preceding sub- groups of this group
- F01L 2003/25
 - {Valve configurations in relation to engine}
- F01L 2003/251
 - .. {Large number of valves, e.g. five or more}
- F01L 2003/253
 - .. {configured parallel to piston axis}
- F01L 2003/255
 - .. {configured other than parallel or symmetrical relative to piston axis}
- F01L 2003/256
 - .. {configured other than perpendicular to camshaft axis}
- F01L 2003/258
 - .. {opening away from cylinder}
- F01L 5/00**
 - Slide valve-gear or valve-arrangements ([with pure rotary or oscillatory movement F01L 7/00](#))**
- F01L 5/02
 - with other than cylindrical, sleeve or part annularly shaped valves e.g. with flat-type valves
- F01L 5/04
 - with cylindrical, sleeve, or part-annularly shaped valves
- F01L 5/045
 - .. {Piston-type or cylinder-type valves arranged above the piston and coaxial with the cylinder axis}
- F01L 5/06
 - .. surrounding working cylinder or piston
- F01L 5/08
 - ... Arrangements with several movements or several valves, e.g. one valve inside the other ([with part-annularly shaped valves F01L 5/12](#))
- F01L 5/10
 - with reciprocating and other movements of the same valve
- F01L 5/12
 - ... Arrangements with part-annularly-shaped valves
- F01L 5/14
 - characterised by the provision of valves with reciprocating and other movements ([surrounding working cylinder or piston F01L 5/06](#))
- F01L 5/16
 - .. with reciprocating and other movement of same valve, e.g. longitudinally of working cylinder and in cross direction
- F01L 5/18
 - .. with reciprocatory valve and other slide valve
- F01L 5/20
 - specially for two-stroke engines ([F01L 5/06](#) and [F01L 5/14](#) take precedence)

- F01L 5/22
 - Multiple-valve arrangements (with valves surrounding working cylinder or piston [F01L 5/06](#); with reciprocatory and other slide valves [F01L 5/18](#); specially for two-stroke engines [F01L 5/20](#))
- F01L 5/24
 - Component parts, details or accessories, not provided for in preceding subgroups in this group
- F01L 7/00**
 - Rotary or oscillatory slide valve-gear or valve arrangements** (slide valves with combined rotary and non-rotary movements, combinations of rotary and non-rotary slide valves [F01L 5/00](#))
- F01L 7/02
 - with cylindrical, sleeve, or part-annularly shaped valves (of disc type [F01L 7/06](#); of conical type [F01L 7/08](#))
- F01L 7/021
 - .. {with one rotary valve}
- F01L 7/022
 - ... {Cylindrical valves having one recess communicating successively with aligned inlet and exhaust ports}
- F01L 7/023
 - ... {Cylindrical valves having a hollow or partly hollow body allowing axial inlet or exhaust fluid circulation}
- F01L 7/024
 - ... {Cylindrical valves comprising radial inlet and axial outlet or axial inlet and radial outlet}
- F01L 7/025
 - ... {Cylindrical valves comprising radial inlet and side outlet or side inlet and radial outlet}
- F01L 7/026
 - .. {with two or more rotary valves, their rotational axes being parallel, e.g. 4-stroke}
- F01L 7/027
 - .. {with two or more valves arranged coaxially ([F01L 7/045](#) takes precedence)}
- F01L 7/028
 - .. {having the rotational axis coaxial with the cylinder axis and the valve surface not surrounding piston or cylinder}
- F01L 7/029
 - .. {having the rotational axis of the valve parallel to the cylinder axis}
- F01L 7/04
 - .. Surrounding working cylinder or piston
- F01L 7/045
 - ... {with two or more valves arranged coaxially}
- F01L 7/06
 - with disc type valves
- F01L 7/08
 - with conically or frusto-conically shaped valves
- F01L 7/10
 - with valves of other specific shape, e.g. spherical
- F01L 7/12
 - specially for two-stroke engines ([F01L 7/04](#) takes precedence)
- F01L 7/14
 - Multiple-valve arrangements (with valves surrounding working cylinder or piston [F01L 7/04](#); specially for two-stroke engines [F01L 7/12](#))
- F01L 7/16
 - Sealing or packing arrangements specially therefor
- F01L 7/18
 - Component parts, details, or accessories not provided for in preceding sub-groups of this group
- F01L 9/00**
 - Valve-gear or valve arrangements actuated non-mechanically**
- F01L 9/02
 - by fluid means, e.g. hydraulic
- F01L 9/021
 - .. {the action of a cam being transmitted to a valve by a fluid column, e.g. a fluid conduit}
- F01L 9/023
 - ... {Hydraulic lifters, i.e. fluid chamber comprised between a piston actuated by a cam and a piston acting on a valve stem}
- F01L 9/025
 - {the volume of the chamber being variable, e.g. for varying the lift or the timing of a valve}

F01L 9/026	..	{Pneumatic}
F01L 2009/028	..	{Boost means, i.e. means for increasing initial opening force of the valve}
F01L 9/04	.	by electric means
F01L 2009/0401	..	{Driving circuits therefor}
F01L 2009/0403	..	{Electromagnetic actuators comprising one coil}
F01L 2009/0405	..	{Electromagnetic actuators comprising two or more coils}
F01L 2009/0407	...	{The two coils being disposed coaxially to the armature shaft}
F01L 2009/0409	...	{The armature being articulated perpendicularly to the coils axes}
F01L 2009/0411	..	{Electromagnetic actuators using a rotary motor}
F01L 2009/0413	..	{Piezo electric actuators}
F01L 2009/0415	..	{Moving coil actuators}
F01L 2009/0417	..	{Floating actuators for varying the valve stroke}
F01L 2009/0419	..	{Actuator position setting device, e.g. initial setting}
F01L 2009/0421	..	{Mixed arrangement with both mechanically and electromagnetically actuated valves}
F01L 2009/0423	..	{Electromagnetic actuators construction details}
F01L 2009/0425	...	{Shaft and armature construction}
F01L 2009/0426	....	{Arrangements for amplifying the armature stroke}
F01L 2009/0428	...	{Core and coil construction}
F01L 2009/043	...	{Casing construction}
F01L 2009/0432	...	{Biasing means}
F01L 2009/0434	....	{Helical springs}
F01L 2009/0436	.....	{Two opposed springs for intermediate resting position of the armature}
F01L 2009/0438	....	{Torsion springs}
F01L 2009/044	....	{Pneumatic springs}
F01L 2009/0442	....	{Means for varying the spring bias}
F01L 2009/0444	....	{Means for connecting springs to valve or anchor}
F01L 2009/0446	...	{Latching means}
F01L 2009/0448	....	{using permanent magnet}
F01L 2009/0449	...	{Means for varying the air gap}
F01L 2009/0451	...	{Damping means}
F01L 2009/0453	...	{Means for counteracting cylinder pressure}
F01L 2009/0455	...	{Lash adjusting means}
F01L 2009/0457	...	{Actor cooling means}
F01L 2009/0459	...	{Means for facilitating assembly}
F01L 2009/0461	...	{Wiring}
F01L 2009/0463	....	{Connectors}
F01L 2009/0465	....	{Harnesses}
F01L 2009/0467	...	{Sensing means}
F01L 2009/0469	....	{Position sensors}

F01L 2009/0471	....	{Vibration sensors}
F01L 2009/0473	....	{Temperature sensors}
F01L 2009/0474	....	{Flux sensors}
F01L 2009/0476	....	{Spring force sensors}
F01L 2009/0478	..	{Electromagnetic actuators; Method of operation thereof}
F01L 2009/048	...	{Engine starting}
F01L 2009/0482	....	{in normal conditions}
F01L 2009/0484	....	{Cold start}
F01L 2009/0486	...	{Soft landing, e.g. applying braking current; Levitation of armature close to core surface}
F01L 2009/0488	...	{Fail safe, e.g. valve kept closed if not opening properly}
F01L 2009/049	...	{Determination of valve speed}
F01L 2009/0492	...	{Determination of valve timing during particular working conditions, e.g. deceleration}
F01L 2009/0494	...	{Engine stopping; Engine stall}
F01L 2009/0496	...	{relating to sticking duration}
F01L 2009/0498	...	{relating to gap between armature shaft and valve stem end}
F01L 11/00		Valve arrangements in working piston or piston-rod
F01L 11/02	.	in piston
F01L 11/04	..	operated by movement of connecting-rod
F01L 11/06	...	operating oscillatory valve
F01L 13/00		Modifications of valve-gear to facilitate reversing, braking, starting, changing compression ratio, or other specific operations
F01L 13/0005	.	{Deactivating valves}
F01L 2013/001	..	{Deactivating cylinders}
F01L 13/0015	.	{for optimising engine performances by modifying valve lift according to various working parameters, e.g. rotational speed, load, torque}
F01L 13/0021	..	{by modification of rocker arm ratio}
F01L 13/0026	...	{by means of an eccentric}
F01L 13/0031	..	{by modification of tappet or pushrod length}
F01L 13/0036	..	{the valves being driven by two or more cams with different shape, size or timing or a single cam profiled in axial and radial direction}
F01L 13/0042	...	{with cams being profiled in axial and radial direction}
F01L 13/0047	...	{the movement of the valves resulting from the sum of the simultaneous actions of at least two cams, the cams being independently variable in phase in respect of each other}
F01L 2013/0052	...	{with cams provided on an axially slidable sleeve}
F01L 13/0057	..	{by splittable or deformable cams}
F01L 13/0063	..	{by modification of cam contact point by displacing an intermediate lever or wedge-shaped intermediate element, e.g. Tourtelot}
F01L 2013/0068	...	{with an oscillating cam acting on the valve of the "BMW-Valvetronic" type}

F01L 2013/0073	...	{with an oscillating cam acting on the valve of the "Delphi" type}
F01L 2013/0078	..	{by modification of cam contact point by axially displacing the camshaft}
F01L 2013/0084	..	{by modification of cam contact point by radially displacing the camshaft}
F01L 2013/0089	..	{with means for delaying valve closing}
F01L 2013/0094	...	{with switchable clamp for keeping valve open}
F01L 13/02	.	for reversing
F01L 13/04	.	for starting by means of fluid pressure
F01L 13/06	.	for braking
F01L 13/065	..	{Compression release engine retarders of the "Jacobs Manufacturing" type}
F01L 13/08	.	for decompression, e.g. during starting; for changing compression ratio
F01L 13/085	..	{the valve-gear having an auxiliary cam protruding from the main cam profile}
F01L 2013/10	.	{Auxiliary actuators for variable valve timing}
F01L 2013/101	..	{Electromagnets}
F01L 2013/103	..	{Electric motors}
F01L 2013/105	..	{Hydraulic motors}
F01L 2013/106	..	{Pneumatic motors}
F01L 2013/108	..	{Centrifugal force}
F01L 2013/11	.	{Sensors for variable valve timing}
F01L 2013/111	..	{Camshafts position or phase}
F01L 2013/113	..	{crankshafts position}
F01L 2013/115	..	{Pressure}
F01L 2013/116	..	{Temperature}
F01L 2013/118	..	{Valve lift}

Valve-gear or valve arrangements, e.g. with reciprocatory slide valves, specially for steam engine, or specially for other machines or engines with variable working-fluid distribution

NOTE

The groups under this guide heading do not fully embrace subject matter restricted to rotary, oscillatory, or lift-valve-gear or valve arrangements, classified in groups [F01L 33/00](#) and [F01L 35/00](#). However, the present groups do embrace the following subject-matter thereof; valves drives or means external to valves for adjustment during operation, tripping-gear, reversing-gear, use of pistons or piston-rods as valves or as valve-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines

F01L 15/00	Valve-gear or valve arrangements, e.g. with reciprocatory slide valves, other than provided for in groups F01L 17/00 to F01L 29/00 (valve drive or external valve-adjustment during operation, see the relevant groups, e.g. F01L 31/00; tripping-gear or tripping of valves F01L 31/00)
F01L 15/02	. with valves other than cylindrical, sleeve, or part-annularly-shaped, e.g. flat D-valves
F01L 15/04	.. main valve being combined with auxiliary valve (of drag valve type F01L 15/10)
F01L 15/06	... of Meyer or Rider type, i.e. in which the expansion is varied at the expansion valve itself

- F01L 15/08
 - . with cylindrical, sleeve, or part-annularly-shaped valves; Such main valves combined with auxiliary valves
- F01L 15/10
 - . with main slide valve and auxiliary valve dragged thereby
- F01L 15/12
 - . characterised by having means for effecting pressure equilibrium between two different cylinder spaces at idling
- F01L 15/14
 - . Arrangements with several co-operating main valves, e.g. reciprocatory and rotary
- F01L 15/16
 - . . . with reciprocatory slide valves only
- F01L 15/18
 - . Valves arrangements not provided for in preceding sub-groups of this main group
- F01L 15/20
 - . Component parts, details, or accessories, not provided for in preceding sub-groups of this main group

- F01L 17/00**

Slide valve-gear or valve arrangements with cylindrical, sleeve, or part annularly-shaped valves surrounding working cylinder or piston
- F01L 17/02
 - . Drive or adjustment during operation, peculiar thereto, e.g. for reciprocating and oscillating movements or for several valves one inside the other

- F01L 19/00**

Slide valve-gear or valve arrangements with reciprocatory and other movement of same valve, other than provided for in [F01L 17/00](#), e.g. longitudinally of working cylinder and in cross direction
- F01L 19/02
 - . Drive or adjustment during operation, peculiar thereto

- F01L 21/00**

Use of working pistons or pistons-rods as fluid-distributing valves or a valve-supporting elements, e.g. in free-piston machines
- F01L 21/02
 - . Piston or piston-rod used as valve members {([F01L 25/066](#) takes precedence)}
- F01L 21/04
 - . Valves arranged in or on piston or piston-rod

- F01L 23/00**

Valves controlled by impact by piston, e.g. in free-piston machines
{([F01L 25/063](#) takes precedence)}

- F01L 25/00**

Drive, or adjustment during the operation, or distribution or expansion valves by non-mechanical means
- F01L 25/02
 - . by fluid means
- F01L 25/04
 - . . . by working-fluid of machine or engine, e.g. free-piston machine
- F01L 25/06
 - . . . Arrangement with main and auxiliary valves, at least one of them being fluid-driven
- F01L 25/063
 - {the auxiliary valve being actuated by the working motor-piston or piston-rod}
- F01L 25/066
 - {piston or piston-rod being used as auxiliary valve}
- F01L 25/08
 - . by electric or magnetic means

- F01L 27/00**

Distribution or expansion valve-gear peculiar to free-piston machines or engines and not provided for in [F01L 21/00](#) to [F01L 25/00](#)
- F01L 27/02
 - . the machine or engine having rotary or oscillatory valves
- F01L 27/04
 - . Delayed-action controls, e.g. of cataract or dashpot type

- F01L 29/00**

Reversing gear (equally usable for control of degree of working-fluid admission and reversing being of secondary-importance [F01L 31/00](#))
- F01L 29/02
 - . by displacing eccentric

- F01L 29/04 . by links or guide rods
- F01L 29/06 . by interchanging inlet and exhaust ports
- F01L 29/08 . specially for rotary or oscillatory valves
- F01L 29/10 . Details, e.g. drive
- F01L 29/12 . . Powered reverse gear

- F01L 31/00** **Valve drive, valve adjustment during operation, or other valve control, not provided for in groups [F01L 15/00](#) to [F01L 29/00](#) (sensing elements measuring the variable or condition to be controlled or regulated [F01B](#))**
- F01L 31/02 . with tripping-gear ([for oscillatory valves \[F01L 31/06\]\(#\)](#)); Tripping of valves
- F01L 31/04 . . with positively-driven trip levers
- F01L 31/06 . with tripping-gear specially for oscillatory valves; Oscillatory tripping-valves, e.g. of Corliss type
- F01L 31/08 . Valve drive or valve adjustment, apart from tripping aspects; Positively-driven gear
- F01L 31/10 . . the drive being effected by eccentrics ([F01L 31/14 takes precedence](#))
- F01L 31/12 . . . Valve adjustment by displacing eccentric
- F01L 31/14 . . Valve adjustment by links or guide rods, e.g. in valve-gear with eccentric drive
- F01L 31/16 . . the drive being effected by specific means other than eccentric, e.g. cams; Valve adjustment in connection with such drives
- F01L 31/18 . . specially for rotary or oscillatory valves

Rotary or oscillatory slide valve-gear or lift-valve-gear or such valve arrangements specially for steam engines or specially for other machines or engines with variable working-fluid distribution (drive adjustment during operation, tripping-gear, reversing-gear, use of working pistons or piston-rods as valves or as valve-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines [F01L 15/00](#) to [F01L 31/00](#))

- F01L 33/00** **Rotary or oscillatory slide valve-gear or valve arrangements, specially adapted for machines or engines with variable fluid distribution (drive, adjustment during operation, tripping-gear, reversing-gear, use of working pistons or piston-rods as valves or as valve-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines [F01L 15/00](#) to [F01L 31/00](#))**
 - F01L 33/02 . rotary
 - F01L 33/04 . oscillatory

 - F01L 35/00** **Lift valve-gear or valve arrangements specially adapted for machines or engines with variable fluid distribution (drive, adjustment during operation, tripping-gear, reversing-gear, use of working pistons or piston-rods as valves or as valve-supporting elements, valve-gear or valve arrangements peculiar to free-piston machines or engines [F01L 15/00](#) to [F01L 31/00](#))**
 - F01L 35/02 . Valves
 - F01L 35/04 . Arrangements of valves in the machine or engine, e.g. relative to working cylinder
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- F01L 2101/00** **Using particular materials**
 - F01L 2101/02 . Using ceramic materials

F01L 2103/00	Manufacturing of components used in valve arrangements
F01L 2103/01	. Tools for producing, mounting or adjusting, e.g. some part of the distribution
F01L 2103/02	. Initial camshaft settings
F01L 2105/00	Valve arrangements comprising rollers
F01L 2105/02	. Mounting of rollers
F01L 2107/00	Preventing the rotation of tappets
F01L 2109/00	Self-contained lash adjusters
F01L 2111/00	Differential gears located between crankshafts and camshafts for varying the timing of valves
F01L 2113/00	Rotary valve drives
F01L 2201/00	Electronic control systems; Apparatus or methods therefor
F01L 2250/00	Camshaft drives characterised by their transmission means
F01L 2250/02	. the camshaft being driven by chains
F01L 2250/04	. the camshaft being driven by belts
F01L 2250/06	. the camshaft being driven by gear wheels
F01L 2710/00	Control of valve gear, speed or power
F01L 2710/003	. Control of valve gear for two stroke engines
F01L 2710/006	. Safety devices therefor
F01L 2740/00	Control of slide-valve gear; Control pistons
F01L 2740/003	. more than one slide-valve, e.g. for four stroke engines
F01L 2740/006	. more than one slide-valve, e.g. for two stroke engines
F01L 2750/00	Control of valve gear for four stroke engines directly driven by the crankshaft
F01L 2760/00	Control of valve gear to facilitate reversing, starting, braking of four stroke engines
F01L 2760/001	. for starting four stroke engines
F01L 2760/002	. for reversing or starting four stroke engines
F01L 2760/003	. for switching to compressor action in order to brake
F01L 2760/004	. . whereby braking is exclusively produced by compression in the cylinders
F01L 2760/005	. . in cooperation with vehicle transmission or brakes; devices to facilitate switching to compressor action by means of other control devices, e.g. acceleration pedal or clutch
F01L 2760/006	. for reversing two stroke engines
F01L 2760/007	. for starting two stroke engines
F01L 2760/008	. for reversing and restarting two stroke engines

F01L 2800/00**Methods of operation using a variable valve timing mechanism**

F01L 2800/01

- . Starting

F01L 2800/02

- . Cold running

F01L 2800/03

- . Stopping; Stalling

F01L 2800/04

- . Timing control at idling

F01L 2800/05

- . Timing control under consideration of oil condition

F01L 2800/06

- . Timing or lift different for valves of same cylinder

F01L 2800/08

- . Timing or lift different for valves of different cylinders

F01L 2800/09

- . Calibrating

F01L 2800/10

- . Providing exhaust gas recirculation [EGR]

F01L 2800/11

- . Fault detection, diagnosis

F01L 2800/12

- . Fail safe operation

F01L 2800/13

- . Throttleless

F01L 2800/14

- . Determining a position, e.g. phase or lift

F01L 2800/15

- . Balancing of rotating parts

F01L 2800/16

- . Preventing interference

F01L 2800/17

- . Maintenance; Servicing

F01L 2800/18

- . Testing or simulation

F01L 2800/19

- . Valves opening several times per stroke

F01L 2810/00**Arrangements solving specific problems in relation with valve gears**

F01L 2810/01

- . Cooling

F01L 2810/02

- . Lubrication

F01L 2810/03

- . Reducing vibration

F01L 2810/04

- . Reducing noise

F01L 2810/05

- . Related to pressure difference on both sides of a valve

F01L 2820/00**Details on specific features characterising valve gear arrangements**

F01L 2820/01

- . Absolute values

F01L 2820/02

- . Formulas

F01L 2820/03

- . Auxiliary actuators

F01L 2820/031

- .. Electromagnets

F01L 2820/032

- .. Electric motors

F01L 2820/033

- .. Hydraulic engines

F01L 2820/034

- .. Pneumatic engines

F01L 2820/035

- .. Centrifugal forces

F01L 2820/04

- . Sensors

F01L 2820/041

- .. Camshafts position or phase sensors

F01L 2820/042

- .. Crankshafts position

F01L 2820/043

- .. Pressure

F01L 2820/044	..	Temperature
F01L 2820/045	..	Valve lift