

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

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 ( <a href="#">F01L 1/26</a> , <a href="#">F01L 1/28</a> take precedence)
F01L 1/40	. . . . .	for engines with scavenging charge near top dead centre position, e.g. by overlapping inlet and exhaust time ( <a href="#">scavenging aspects F02B</a> )
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}
<b>F01L 3/00</b>		<b>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</b>
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 reciprocating 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

<b>F01L 15/00</b>	<b>Valve-gear or valve arrangements, e.g. with reciprocatory slide valves, other than provided for in groups <a href="#">F01L 17/00</a> to <a href="#">F01L 29/00</a> (valve drive or external valve-adjustment during operation, see the relevant groups, e.g. <a href="#">F01L 31/00</a>; tripping-gear or tripping of valves <a href="#">F01L 31/00</a>)</b>
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 <a href="#">F01L 15/10</a> )
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 valves-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
- 
- F01L 2101/00** **Using particular materials**
  - F01L 2101/02 . Using ceramic materials

<b>F01L 2103/00</b>	<b>Manufacturing of components used in valve arrangements</b>
F01L 2103/01	. Tools for producing, mounting or adjusting, e.g. some part of the distribution
F01L 2103/02	. Initial camshaft settings
<b>F01L 2105/00</b>	<b>Valve arrangements comprising rollers</b>
F01L 2105/02	. Mounting of rollers
<b>F01L 2107/00</b>	<b>Preventing the rotation of tappets</b>
<b>F01L 2109/00</b>	<b>Self-contained lash adjusters</b>
<b>F01L 2111/00</b>	<b>Differential gears located between crankshafts and camshafts for varying the timing of valves</b>
<b>F01L 2113/00</b>	<b>Rotary valve drives</b>
<b>F01L 2201/00</b>	<b>Electronic control systems; Apparatus or methods therefor</b>
<b>F01L 2250/00</b>	<b>Camshaft drives characterised by their transmission means</b>
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
<b>F01L 2710/00</b>	<b>Control of valve gear, speed or power</b>
F01L 2710/003	. Control of valve gear for two stroke engines
F01L 2710/006	. Safety devices therefor
<b>F01L 2740/00</b>	<b>Control of slide-valve gear; Control pistons</b>
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
<b>F01L 2750/00</b>	<b>Control of valve gear for four stroke engines directly driven by the crankshaft</b>
<b>F01L 2760/00</b>	<b>Control of valve gear to facilitate reversing, starting, braking of four stroke engines</b>
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