No. 745,756. PATENTED DEC. 1, 1903.

C. P. ALTMANN.

VALVE FOR STEAM ENGINES.

APPLICATION FILED MAY 28, 1903.

NO MODEL.

Fig. 1

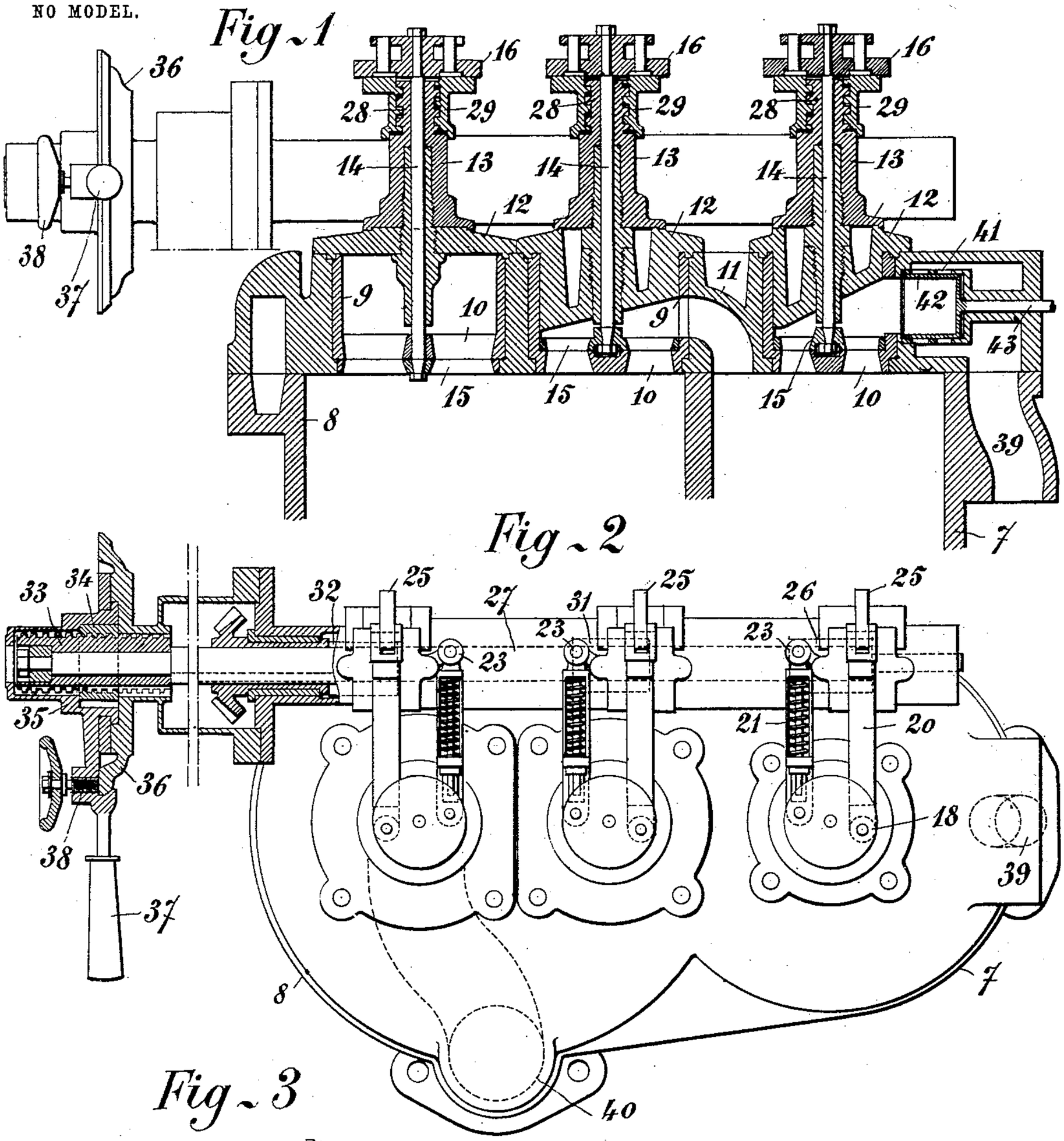



Fig. 2




Fig. 3

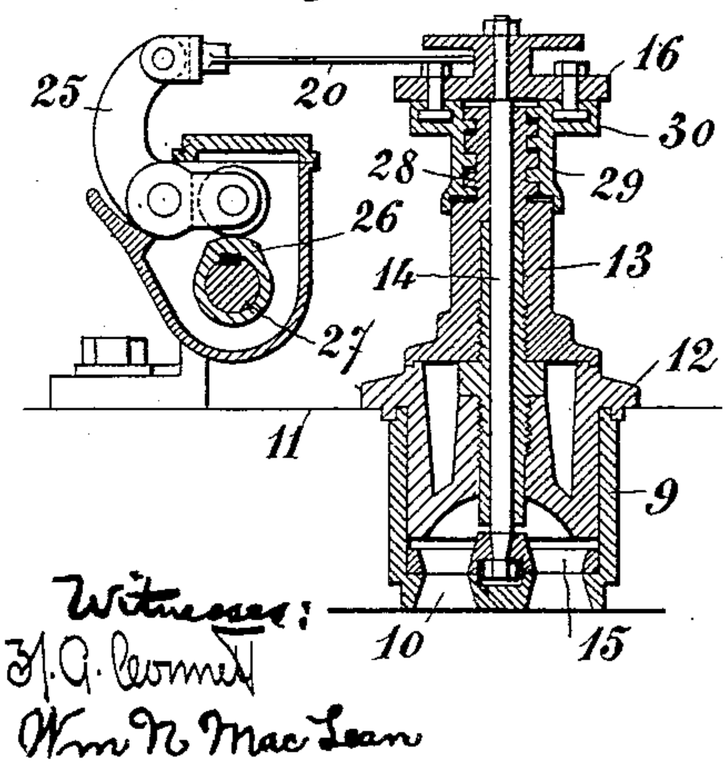
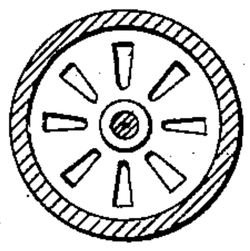



Fig. 4



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No. 745,756. Patented December 1, 1903.

# UNITED STATES PATENT OFFICE.

CHARLES PHILIPPE ALTMANN, OF LYONS, FRANCE.

## VALVE FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 745,756, dated December 1, 1903.

Application filed May 28, 1903. Serial No. 159,052. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES PHILIPPE ALTMANN, engineer, a citizen of the Republic of France, and a resident of 18 Rue de la Gare, Lyons, France, have invented certain new and useful Improvements in or Relating to Valves and Valve Mechanism for Steam-Engines and the Like, of which the following is a specification.

This invention relates to valves and valve mechanism particularly designed with a view to being used for superheated steam and high pressures in high-speed engines with one or more cylinders either single or double acting; but it is also applicable to engines using ordinary or saturated steam at any pressures and of any speed. This mechanism is characterized by an arrangement of parts which move with very little friction or shock, jars or jamming, especially in cases of high temperature, thus being avoided.

In the accompanying drawings, Figure 1 shows a vertical section of the mechanism applied to a two-cylinder engine. Fig. 2 is a plan of Fig. 1. Fig. 3 is a cross-section of the mechanism for operating one of the valves. Fig. 4 is a detail view of a perforated valve-seat according to this invention.

In the engine shown as an example there are three almost similar valves—one for admission of steam to the high-pressure cylinder 7, the second for admitting steam from that cylinder into the low-pressure cylinder 8, and the third controlling the exhaust from the low-pressure cylinder.

Each valve comprises a valve-chest 9, the bottom of which is flush with the end of the corresponding cylinder and is perforated, so as to form a kind of grating 10. The openings are formed radially, the solid intervals being considerably larger than openings, so as to insure that when closed no steam shall pass through. The chest 9 is held in the cylinder-head 11 by a cover 12, provided with a central projecting socket 13, in the interior of which the rod 14 for operating the valve can turn. To the lower end of this rod is keyed a perforated valve-disk 15, preferably identical with the disk or base 10 as regards its perforations. To the top of this rod 14 is keyed a disk 16 or a lever or equivalent provided with two pins 18 and 19, arranged diametrically opposite to each other, to one of which, 18, is pivoted a connecting-rod 20 and to the other, 19, a stiff spring 21, secured to a fixed point 23. The connecting-rod 20 may be rigid and also be provided with a spring which returns it to its position of rest when it is no longer under the influence of its controlling-lever, as will be seen later on. The other end of the connecting-rod 20 is pivoted to one end of a bell-crank lever 25, the other end of which is provided with a roller resting against a cam 26, keyed to a driven spindle 27, controlling the movements of the valve. This spindle 27 is driven by bevel-gearing from the main crank-shaft and rotates at the same speed as the latter.

The central socket 13 on the cover 12 is provided at its upper end with a screw-threaded portion 28, on which is screwed, with suitable longitudinal play, a screw-threaded disk or sleeve 29. This disk is provided on the top with a circular groove 30, of inverted-T shape in cross-section, with which engage the heads of two bolts which serve to secure the disk 16 to this sleeve 29 and to regulate its position.

The third mechanism, which controls the exhaust, differs from the other two only in that its perforated valve 15 is arranged under the perforated disk 10 of the chest 9 instead of being arranged above it, and the connecting-rod 20 is arranged in the opposite direction to that of the rods of the two other valves, as shown in Fig. 2.

The spindle 27 carries three cams 26 31 32, respectively, operating the levers 25 of the three valves. The projecting surfaces of these cams are not the same, but gradually decrease lengthwise, so that while admission or exhaust always begins at the same point the length or duration of admission varies according to the longitudinal position of the cam, as will be hereinafter explained.

At one of its ends the spindle 27 rotates in a bearing 33, arranged between two collars on the spindle, one of which is put on and held in place by a lock-nut. This bearing is externally screw-threaded for the purpose of receiving a nut 34, which bears against the side of a movable sleeve 35, which can rotate freely on a fixed disk 36 and is provided with

a handle 37. A set-screw 38 or any other suitable device enables the movable sleeve to be fixed to the fixed disk in any desired position.

The valve-chest 9 of the high or low pressure cylinder communicates through a suitable conduit with a steam-inlet pipe 39, cast on the side of the high-pressure cylinder 7, and the chest 9 of the exhaust-valve communicates in the same way with the exhaust-pipe 40, cast on the side of the large cylinder.

In communication with the inlet-pipe is a perforated casing 41, in which can freely turn a hollow cylindrical plug 42, lateral holes in which can be brought to coincide more or less with those of the casing, and this plug is provided with a spindle 43, which can be operated from the outside by a governor operated from the spindle 27.

*Working.*—Supposing the valves are closed—that is to say, in such a position that the perforated disk 15 is placed relatively to the lower one, 10; that the openings of the one are covered by the solid portions of the other, the disk 29 being adjusted so that on a small displacement of the rod 20 the screw-threads of this disk rise on the screw-threads 28 of the socket 13—if by means of the rod 20 the disk 16 and rod 14 and the disk 10 are turned to such an extent as to bring the perforations in the two disks 10 and 15 opposite or overlapping each other the disk 29 will be raised by the screw-threads 28 and will carry with it the rod 14 and the disk 15, so that the disk which was previously in contact with the fixed disk 10 when the valve was closed will move without friction slightly above the latter during the opening movement, as it is raised as soon as it begins to turn. When the rod 20 no longer acts on the disk 16, the spring 21 returns the disk to its original position, and the disk 15 is again applied against the disk 10 by the action of the spring or by a spring suitably arranged and forces the disk 29 to remain in contact with the screw-threads on the part 28.

The adjustment of the position of the disk 16 relatively to the sleeve 29 is effected by turning the disk 16 on the sleeve 29 into such position that the disk 15 is applied exactly against the part 10 at the moment of closing. This position is secured by screwing up the bolts whose heads engage in the T-shaped groove in the sleeve 29 and by means of any suitable locking device to prevent all displacement during working.

In the engine described the crank transmits the rotary movement to the driving-shaft 27, and consequently to the cams 26, 31, and 32. Steam enters first through the pipe 39 into the chest 9 of the inlet-valve of the high-pressure cylinder through the orifices of the casing 41 and of the plug 42. The cam 26 then acts on the roller of the lever 25, which pulls the rod 20, whereby the disk 16 is caused to turn and carries in its movement the spindle 14 and the disk valve 15, which uncovers the plate 10 and admits steam into the cylinder, the piston of which is forced downward. When the cam 26 has ceased to act on the lever 25, the disk 16 is brought back in the opposite direction by its spring 21, which, being compressed during the raising of the valve 15, expands and causes the disk 16 and sleeve 29 to turn rapidly, thus bringing the valve 15 into its closed position, bearing against the plate 10. When the disk valve 15 closes the plate 10, admission of steam is stopped, and the high-pressure piston continues to move under the influence of the expansion of the steam until the end of its stroke. Then under the action of the cam 31 the valve 15 of the second cylinder rises, uncovering the corresponding plate 10, and steam from the high-pressure cylinder 7 passes into the low-pressure cylinder 8, where it expands. Then the piston of the low-pressure cylinder descends, and at the end of its stroke (or a little before in case of an advance in the exhaust) the valve 15 of the exhaust turns and descends, uncovering the plate 10, the steam escaping from the cylinder through the exhaust-pipe 40 either into the atmosphere or into a condenser, according to circumstances. If the engine works too fast or too slowly, the governor turns the plug 42, so as to cover or uncover to a greater or lesser extent the orifices in the casing 41, which results in the passage for steam being reduced or increased and in the speed of the engine being correspondingly reduced or increased, as the case may be.

It is of great importance in a steam-engine to be able to regulate the cut-off according to the requirements of the work. For this purpose, the cams 26, 31, and 32 having, as already stated, a projection of varying development, it will be sufficient to displace them, together with the shaft 27, in order to bring opposite the rollers of the levers 25 a greater or smaller width of cam, in accordance with the cut-off to be obtained. In order to obtain this result, it is sufficient to turn the handle 37, carrying the sleeve 35, and the nut 34 in the required direction. As this nut cannot move longitudinally, it causes the screw-threaded bearing 33 to move longitudinally, carrying with it the shaft 27. It is obvious that an automatic action could be exercised on the shaft 27 by the governor without departing from the spirit of the invention; but this is a point that applies to all engines, and it is not necessary to explain further how this is effected.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A valve-gear for steam-engines and the like comprising a fixed valve-seat provided with a number of radial perforations, a movable valve also provided with a number of radial perforations, the width of the perfora-

tions being less than that of the solid portions between the perforations, a spindle carrying the movable valve and screw mechanism to rotate and simultaneously separate the valve from its seat substantially as described.

2. A valve-gear for steam-engines and the like comprising a fixed valve-seat provided with a number of radial perforations, a movable valve also provided with a number of radial perforations, the width of the perforations being less than that of the solid portions between the perforations, a spindle carrying the movable valve, screw mechanism to rotate and simultaneously separate the valve from its seat and means for adjusting the perforated valve on its perforated seat substantially as described.

3. In a valve mechanism of the kind described a valve-spindle rigidly secured to a disk or lever operated from a spindle driven from the main shaft, said disk being adjustably secured to a screw-threaded sleeve mounted on a screw-threaded support through which the valve-spindle passes substantially as described.

4. In a valve mechanism of the kind described a disk or lever carrying the valve-spindle and connected crankwise to a lever operated by a cam on the valve-operating shaft and a spring for returning the disk to its normal position substantially as described.

5. A valve mechanism of the kind described comprising a perforated valve, a valve-spindle, a crank disk or lever for rotating said spindle and connected to a lever in contact with a cam on a valve-operating shaft, the cam portion varying in diameter lengthwise of the shaft and means for displacing the shaft longitudinally substantially as described.

In witness whereof I have hereunto signed my name, this 13th day of May, 1903, in the presence of two subscribing witnesses.

CHARLES PHILIPPE ALTMANN.

Witnesses:

JOSEPH VILLARD,

FERNAND DECOEUR.