C. J. PEMBROKE.

DISTRIBUTING VALVE STARTING MECHANISM FOR EXPLOSIVE ENGINES.

APPLICATION FILED AUG. 2, 1912.

1,143,778. Patented June 22, 1915.

Fig. 1

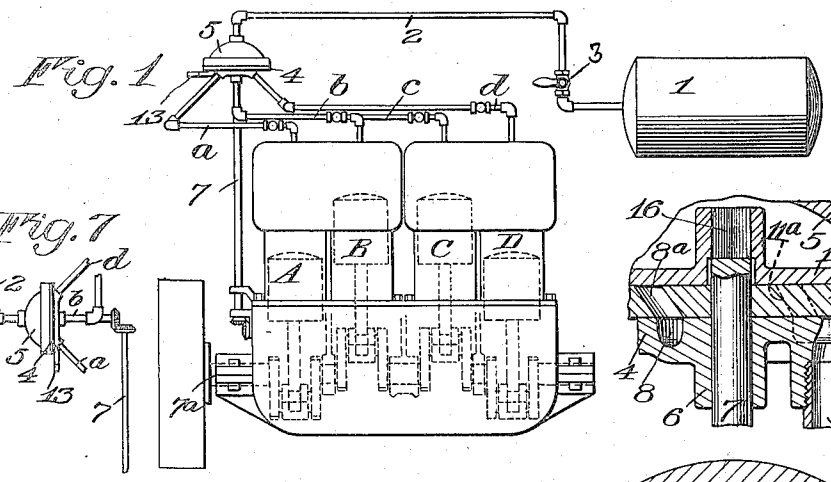


Fig. 7

Fig. 6

Fig. 2

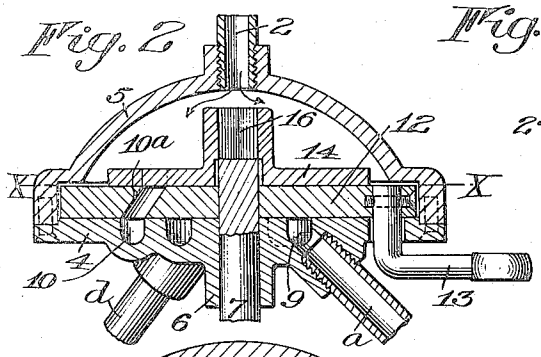


Fig. 3

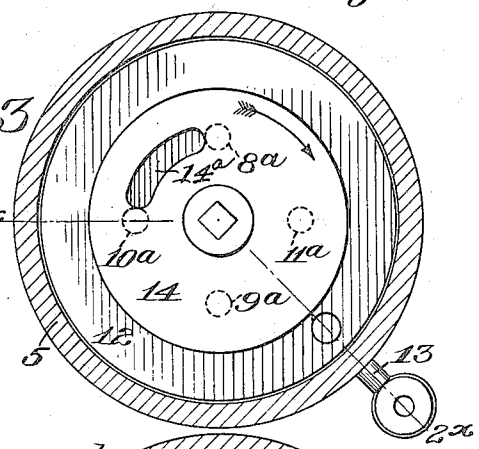


Fig. 4

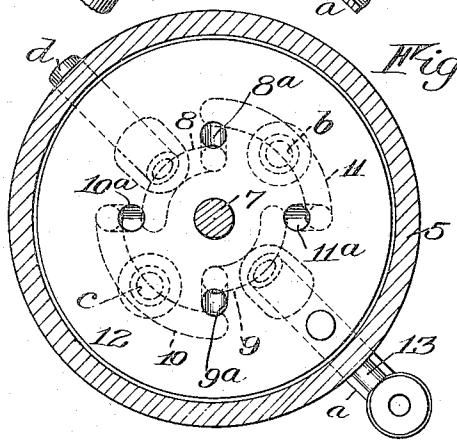
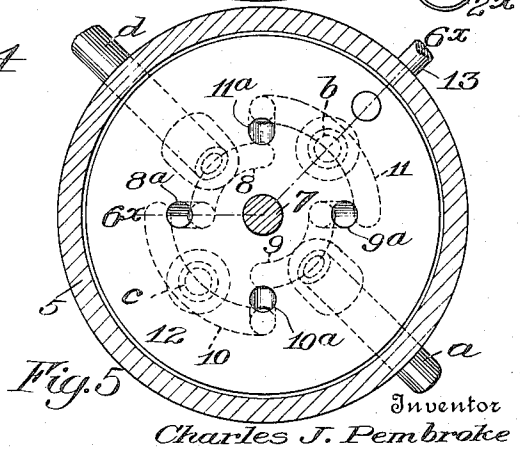


Fig. 5



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DISTRIBUTING-VALVE STARTING MECHANISM FOR EXPLOSIVE-ENGINES.

1,143,778. Specification of Letters Patent. Patented June 22, 1915.

Application filed August 2, 1912. Serial No. 712,933.

To all whom it may concern:

Be it known that I, CHARLES J. PEMBROKE, of Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Distributing-Valve Starting Mechanisms for Explosive-Engines.

My present invention relates to mechanism adapted to be used for starting the reciprocatory operation of the pistons of explosive motors, or engines, and of that type in which the pistons are caused to move in their respective cylinders by the introduction thereto of air or fluid under pressure, and my invention has for its object, to provide a novel form of valve mechanism for distributing the fluid pressure to the various cylinders of the engine in timed relation to the movement of the pistons.

To these and other ends the invention consists in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings: Figure 1 is a view showing in side elevation an explosive engine to which a valve mechanism embodying my invention is applied; Fig. 2 is a vertical sectional view showing the interior construction of the valve; Fig. 3 is a horizontal sectional view taken on the line *x*—*x* of Fig. 2, showing the rotary distributing disk. Figs. 4 and 5 are similar horizontal sectional views, taken on the section line X—X of Fig. 2, showing the controlling member in different positions of adjustment, and Fig. 6 is a detail vertical sectional view similar to Fig. 2 in which the controlling member is shown in the position which it occupies in Fig. 5, said illustration being taken along the section line indicated by 6^{x}—6^{x}, of Fig. 5. Fig. 7 is a detail view showing the valve mounted on its side to position its rotary parts in a vertical plane.

Similar reference numerals in the several figures indicate similar parts.

In illustrating my invention, I have shown it applied to a multi-cylinder engine, comprising the four cylinders A, B, C, and D. The pistons, within the latter, are connected to the usual crank shaft and are preferably arranged in pairs as shown in dotted lines. The air or gas under pressure to be used for purposes of starting the reciprocation of the pistons, is contained in a suitable reservoir 1, from which leads the outlet pipe 2, having a shutoff valve 3; said pipe leading to the valve mechanism, which will be described more fully hereinafter, by means of which the fluid pressure may be distributed to one or more of the cylinders through the pipes or conduits *a b c d*.

The distributing valve interposed between the source of supply 1 and the distributing pipes leading to the several cylinders of the engine, comprises a casing, preferably constructed of the lower section or bottom 4, and the top 5, made hemispherical or dome shaped to provide an interior chamber accommodating the rotary distributing disk and the controlling member. The casing may be supported in any suitable manner and is preferably arranged in proximity to the engine, the bottom 4 thereof having the center bearing 6 in which is journaled a rotary shaft 7, driven in timed relation to the rotation of the driving shaft 7^{a} of the engine. The inner face of the bottom 4 of the casing is a plane surface and formed therein are four arcuate recesses, arranged in pairs 8 and 9, 10 and 11, concentric to the shaft 7. From the bottom of these recesses, at convenient points, are the openings leading outwardly into communication with the several distributing points *a b c d*. One pair of these recesses is formed on a circle larger than that of the other pair, so that the ends of the respective pairs of recesses may overlap without being interconnected.

The controlling disk 12 is journaled on the inner end of the shaft 7 and is provided with two pairs of apertures 8^{a} and 9^{a}, 10^{a} and 11^{a}, and the respective apertures of each pair are arranged at diametrical points and the uppermost ends of all of them lie equidistantly from the axis of rotation of the controlling disk. The pair of apertures 8^{a} and 9^{a} converge as they pass through the member 12 so that their lower ends register with the recesses 8 and 9. The apertures 10^{a} and 11^{a} diverge, to bring their lower ends into register with the recesses 10 and 11. The member 12 is provided with a handle 13, extending outwardly through an aperture in the bottom of the casing by means of which it may be rotated a quarter revolution to change the position of the respective pairs of apertures 8^{a}, 9^{a}, 10^{a} and 11^{a} from that shown in Fig. 4 to the point of adjustment shown in Fig. 5.

The distributing disk 14 is loosely mount-

ed against the controlling member while the latter is journaled on the shaft 7 and both of said parts are free to move in a direction away from the bottom 4, so that normally the friction between the parts is reduced to a minimum. Where circumstances will permit I preferably locate the valve casing on its side as shown in Fig. 7, so that the distributing disk and controlling member, which are then in a vertical position, may separate slightly and remain in such position until fluid pressure is admitted to the chamber and causes the disk and member to be tightly seated. Rotary movement is imparted to the disk 14 by providing its hub and the end of the shaft 7 with coöperating angular shaped portions, as shown. The distributing disk is provided with an arcuate slot, or aperture 14^a, the inner and outer edges of which are cut on concentric circles of a diameter embracing the outer ends of the pairs of apertures 8^a, 9^a, and 10^a and 11^a, as shown in Fig. 3, and in length the slot is so made that during the rotary movement of the distributing disk, each of said apertures in the controlling member will be closed before a succeeding aperture is uncovered.

The distributing pipes *a b c* and *d*, lead from the engine cylinders and are connected to the recesses 8, 9, 10, and 11 in the bottom of the valve casing in the order of succession in which the explosions in the several cylinders take place, when the engine is operating under normal conditions. This arrangement causes the distributing disk to admit air under pressure to the cylinders successively in such a way that the driving shaft will be rotated continuously. The supply of fluid under pressure in the tank 1 is sufficient to drive the engine for a considerable period, but it will be understood that only a small quantity of the fluid is required to start the driving shaft sufficiently to enable the pistons of the various cylinders to draw in the carbureted mixture so that the engine will begin its regular cycle of operation, at which time the valve 3 may be closed.

In the use of the distributing valve, the engine being at rest, the operator upon opening the shut off valve 3, permits the fluid pressure to enter the valve casing 4—5. If it happens that the distributing disk 14, ceases rotation in the position shown in Fig. 3, so that none of the apertures in the controlling member are uncovered, said member may be operated slightly in one direction or the other, by the handle 13. The two pairs of curved recesses overlap at their ends, so that the controlling disk may be operated a full quarter revolution, which is ample to bring one of the apertures in the disk into register with the recess 14^a, in any position which the latter may happen to assume when the engine is at rest. The adjustment of the controlling disk admits the fluid under pressure, first to one cylinder and then to another, to cause the operation of the engine in its usual forward direction of rotation.

If the position of the pistons at the time of inlet of the fluid pressure, is such as to enable the crank to be thrown "over center," the engine will continue to rotate, but this is not always accomplished because, on account of the positioning of the cylinder valves, it is necessary to overcome compression in at least one of the cylinders and failing to do so will stall the engine. Under such circumstances reversal of the movements of the controlling member will admit fluid to the other cylinders and a reverse movement imparted to the engine enabling the various pistons to be so positioned that when the controlling member of the valve is again shifted a full stroke of the piston on the power stroke may be obtained.

I claim as my invention:

1. In a distributing valve, the combination with a casing having a wall provided with a plurality of channels disposed in pairs and forming outlets, the respective pairs being concentrically arranged on arcs of circles of different diameters, and a rotatable distributing member having a port, of an oscillatory controlling member arranged between the distributer and said wall and provided with a plurality of apertures coöperating with the port of the distributing member and the channels of the wall.

2. In a distributing valve, the combination with a casing having a wall provided with a plurality of channels disposed in pairs and forming outlets, the respective pairs being concentrically arranged on arcs of circles of different diameters, and overlapping at their ends and a rotatable distributing member having a port, of an oscillatory disk located between the distributer and the wall and having two pairs of apertures coöperating with said channels and said port in the distributer.

3. A distributing valve comprising a valve casing, a plurality of outlet openings, a movable controlling member provided with a plurality of ports spaced equi-distantly and respectively connecting at one side of the controlling member directly with the several outlet openings, and a movable distributer overlying the other side of said member and having an elongated port adapted to coöperate successively with the ports in the oscillatory member.

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