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CHARGING AND DISTRIBUTING DEVICE FOR EXPLOSIVE ENGINES.

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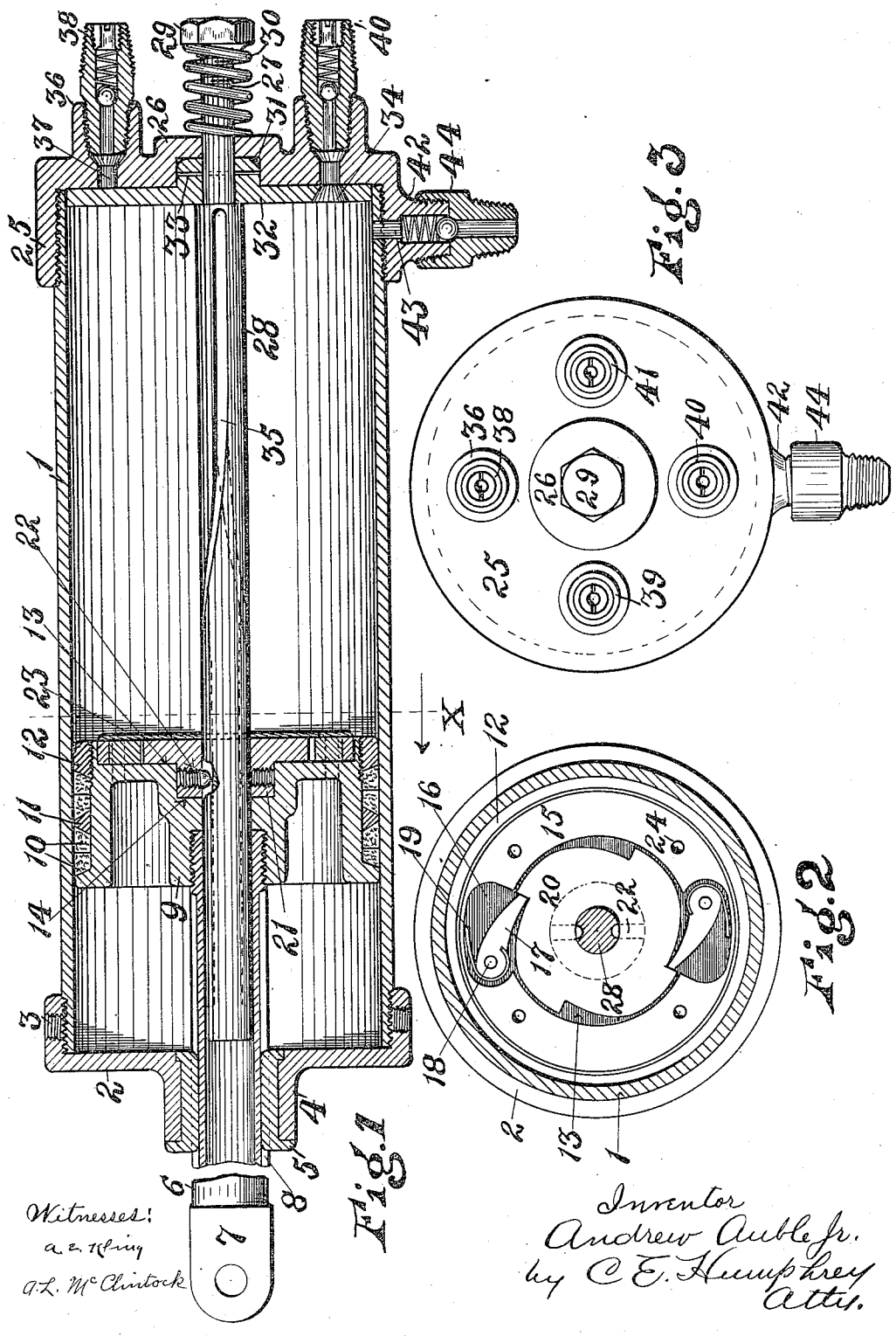

Fig. 1

Fig. 3

Fig. 2

Witnesses:
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UNITED STATES PATENT OFFICE.

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CHARGING AND DISTRIBUTING DEVICE FOR EXPLOSIVE-ENGINES.

1,069,665. Specification of Letters Patent. Patented Aug. 12, 1913.

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To all whom it may concern:

Be it known that I, ANDREW AUBLE, JR., a citizen of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented new and useful Improvements in Charging and Distributing Devices for Explosive-Engines, of which the following is a specification.

This invention has relation to a device for charging an explosive gas engine embodying a plurality of cylinders by distributing to them a proper amount of combined gas and air.

The object of the invention, broadly is, to provide a device for withdrawing an explosive mixture of gas and air from a source of supply and successively distributing it to the cylinders of an explosive engine, whereby, all cylinders may be charged before the ignition of the first charge which is immediately followed by the explosion in the succeeding cylinders thereby effectually starting the engine without the necessity of cranking the same. The explosions take place with such regularity and rapidity as to produce the necessary revolution of the shaft to start the engine.

More specifically, the invention contemplates such means as a pump having an inlet through which the mixture of gas and air is drawn to the cylinder of the pump and discharged therefrom through a selected outlet port.

The invention embodies means for opening each of the outlet ports successively and simultaneously closing the others, the charges arranged to be delivered by the pump automatically to successive outlet ports. In other words, at each reciprocation of the pump an explosive mixture is drawn into the pump and discharged into one of the cylinders and at the next reciprocation of the piston of the pump the next cylinder will be charged, and so on until all the cylinders of the engine are supplied with an explosive mixture, so that if the engine embodies four cylinders four reciprocations of the pump will charge them all.

A further object is to provide a simple and effectual device for accomplishing the charging of an explosive engine embodying a plurality of cylinders rapidly and quickly so that as the charges are ignited the engine shaft will be started without the necessity of cranking.

With the foregoing and other objects in view, the invention consists in the novel construction, combination and arrangement of parts constituting the invention to be hereinafter specifically described and illustrated in the accompanying drawings which form a part hereof wherein is shown the preferred embodiment of the invention, but it is to be understood that changes, variations and modifications can be resorted to which come within the scope of the claims hereunto appended.

In the drawings in which similar reference numerals indicate like parts in the different figures, Figure 1, is a longitudinal central sectional view of a device embodying this invention. Fig.-2, is a transverse sectional view of the device on line X of Fig. 1, and, Fig. 3, is an end elevation of the device looking from the right in Fig. 1.

Referring to the drawings in detail, the reference numeral 1 denotes a cylinder, the ends of which are preferably threaded. Mounted on one of the threaded ends of the cylinder 1 is a head 2, held against unintentional release by means of set screws 3, and is provided with an opening surrounded by an outwardly-projecting flange 4. Securely held by the flange 4 are a pair of keys 5 projecting into the opening. Mounted in this opening is a longitudinally-shiftable piston-rod 6 provided with a head 7 and further provided with oppositely-disposed key-ways 8 to receive the keys 5 for preventing rotation of the rod. The inner end of the piston rod 6 is threaded to receive a piston arranged to reciprocate within the cylinder 1.

The piston comprises a body portion 9 having an interiorly threaded opening to receive the end of the rod 6 with the remainder of the body portion approximately cup-shaped. Mounted on the outer face of the cup-shaped portion are a plurality of packing rings 10 between which is a spreader ring 11 properly inclined to force the packing outwardly against the interior of the cylinder 1. The outer face of the cup-shaped portion is provided with threads to receive an annular follower-nut 12 adapted to compress the packing rings to spread them for forming a fluid tight joint with the cylinder. The face of the piston opposite to that which receives the end of the piston rod 6 is provided with an annular recess 13 within which is a second smaller recess 14 and from this extends an opening to the threaded opening which receives the

end of the piston rod for a purpose to be later described.

Mounted in the recess 13 is an annulus 15 provided with recesses 16 communicating with the central opening therein. Mounted in the recesses 16 are pawls 17 pivotally mounted on pins 18 and provided with springs 19 the function of which is to force the free ends of the pawls into the opening inclosed by the annulus 15. Mounted within the space inclosed by the annulus 15 is a ratchet-wheel 20 provided with the same number of teeth as there are cylinders to be supplied by this device, and is provided on its rear face with a hub 21 in which are mounted a pair of pins 22 projecting into the central opening in the ratchet-wheel for a purpose to be stated. The pawls 17 are arranged to engage the teeth of the ratchet-wheel 20 and to be held there through the medium of the springs 19. In order to hold the parts just described in proper position there is placed over them a cover 23 held in place by means of hold-fast devices, such as screws, which pass through openings 24 in the annulus 15 and engage in suitable openings in the piston 9. The opposite threaded end of the cylinder is closed by means of a head 25 provided with a central outwardly-projecting boss 26 through which extends a central opening to constitute a bearing. Rotatively mounted in the bearing in the boss 26 is the reduced portion 27 of a shaft 28 the opposite end of which is in telescopic engagement with the piston rod 6. The outer end of the reduced portion 27 of the shaft 28 is threaded and is provided with an adjusting nut 29 between which and the outer face of the boss 26 is a coiled spring 30 to yieldingly resist any inward movement of the shaft 28. The central portion of the inner face of the head 25 is provided with a recess 31 to receive the integral hub of a circular distributing plate 32 which is mounted on the reduced portion 27 and abuts against the shoulder of the shaft 28 where it unites with the portion 27 and the distributer 32 is fixedly secured to the reduced portion 27 by means such as a pin 33. The distributer plate is provided with a single opening 34 for a purpose to be later described. The shaft 28 is provided with a pair of oppositely-disposed longitudinally-extending grooves 35 which are spirally-formed and are given a one-quarter turn and are adapted to receive the inner-projecting ends of the pins 22 which travel therein. Projecting from the outer face of the head 25 are four hollow interiorly threaded lugs 36 the interior of each of which communicates with the interior of the cylinder by means of a port 37. Mounted in the lugs 36 are outlet valves numbered respectively 38, 39, 40 and 41, and as these valves may be of any preferred type a detailed description of them is believed to be unnecessary. The lower part of the flange portion of the head 25 is provided with a radially-projecting exteriorly-threaded hollow boss 42, the interior of which is an open communication with the interior of the cylinder by means of an inlet port 43. Mounted in the boss 42 is an inlet valve 44. The exterior of the inlet valves 38, 39, 40 and 41 and the inlet valve 44 are preferably threaded so that suitable exhaust and supply pipes, respectively, may be attached to them, but as this is a common construction a further showing of the same is believed to be superfluous.

Assuming that the inlet valve 44 is connected by means of a supply pipe with a suitable carbureter or other source of supply for furnishing an explosive, such as a mixture of gas and air and that the piston 9 is at the lower end of its stroke with the pins 22 engaging in the grooves 35, the operation of the device will then be somewhat as follows: As the piston commences its upward stroke, meaning by this in the direction of the head 2 it will create a partial vacuum between itself and the head 25, and as all the outlet valves automatically close the ports 37 the valve 44 will open admitting a supply of explosive mixture below the piston. As the pins 22 which are mounted in the hub of the ratchet-wheel 20 travel upwardly in grooves 35 they encounter the spiral portions thereof and as the ratchet-wheel is held against revolution in that direction by means of the pawls 17 which are secured to the piston, which it must be remembered, is irrevoluble, a fractional rotation of the shaft 28 is produced, the amount of rotation being equivalent to the amount of curvature of the grooves. The rotation of the shaft 28 causes an equivalent rotation of the distributer 32 to bring the aperture 34 therein in registration with one of the ports 37 and leaves it, due to the pins 22 entering the upper straight-portions of the grooves 35, the friction incident to this engagement will cause them to shift the entire shaft 28 slightly to move the distributer 32 from its seat against the inner face of the head 25 and the hub thereof from its position in the recess 31 thereby reducing the friction incident to the rotation of the distributer. The spring 30 offers a yielding resistance to the movement of the shaft 28 and returns it to its former position after the pins have entered the straight portions of the grooves 35 beyond the spiral portions. There is now a charge of explosive mixture in the cylinder below the piston and the inlet-valve has automatically closed and the aperture 34 is in registering relation with one of the ports 37. As the piston descends, it forces the explosive mixture out through the port with which the aperture 34 registers, overcoming the outlet-valve and distributing the charge to the ap-

propriate cylinder. During this stroke of the piston the pins 22 traveling in the grooves 35, when they encounter the spiral portion give a partial revolution to the ratchet-wheel 20 which is permitted by the pawls which ride readily over the teeth of the wheel. During the return stroke the operation will be repeated.

It will be apparent that while the drawings and description have reference to a cylinder provided with four outlet ports for supplying an equal number of cylinders, the head 25 may be provided with any number of ports to serve an equal number of cylinders and in this case the curvature of the grooves 35 will necessarily be changed to suit the new requirement and the number of teeth on the ratchet 20 also changed, but as this is clearly evident from the foregoing description, the need of any further enlargement thereon is believed unnecessary.

I claim:

1. A device for distributing charges to a gas engine having a plurality of cylinders, comprising a pump cylinder provided with an inlet and a plurality of exhaust-ports, the latter adapted to be connected with the cylinders of an engine, a piston, a distributer adapted to establish communication between the interior of said cylinder and one of said exhaust-ports while simultaneously closing the others, and means carried by said piston for shifting said distributer.

2. A device for distributing charges to a gas engine having a plurality of cylinders comprising a pump cylinder provided with an inlet and a plurality of exhaust-ports, the latter adapted to be connected with the cylinders of an engine, a piston, a distributer adapted to successively open each of said exhaust-ports while simultaneously closing the others, and means carried by said piston for shifting said distributer.

3. A device for distributing charges to a gas engine having a plurality of cylinders, comprising a pump cylinder provided with an inlet and a plurality of exhaust-ports, the latter adapted to be connected with the cylinders of an engine, a piston, a rotary distributer provided with an opening and adapted to successively open each of said exhaust-ports while simultaneously closing the others, and means carried by said piston for inducing intermittent rotation of said distributer.

4. A device for distributing charges to a gas engine having a plurality of cylinders, comprising a pump cylinder provided with an inlet and a plurality of exhaust-ports, the latter adapted to be connected with the cylinders of an engine, a piston, a shaft extending longitudinally in said cylinder, a distributer mounted on said shaft adapted to successively open said exhaust-ports while simultaneously closing the others, and means carried by said piston and engaging said shaft for shifting the latter and said distributer.

5. A device for distributing charges to a gas engine having a plurality of cylinders, comprising a pump cylinder provided with an inlet and a plurality of exhaust-ports, the latter adapted to be connected with the cylinders of an engine, a piston, a shaft extending longitudinally in said cylinder, a distributer mounted on said shaft and adapted to successively open one of said exhaust-ports while simultaneously closing the others, and means carried by said piston and engaging said shaft for shifting the position of said distributer at each alternate reciprocation of said piston.

6. A device for distributing charges to a gas engine having a plurality of cylinders, comprising a pump cylinder provided with an inlet and a plurality of exhaust-ports, the latter adapted to be connected with the cylinders of an engine, a piston, a shaft supporting said piston and extending longitudinally in said cylinder, a distributer mounted on said shaft and adapted to open one of said exhaust-ports while simultaneously closing the others and means carried by said piston for partially rotating said shaft and distributer when said piston is reciprocated in one direction and inoperative during the reverse reciprocation.

7. A device for distributing charges to a gas engine having a plurality of cylinders, comprising a pump cylinder provided with an inlet and a plurality of exhaust-ports, the latter adapted to be connected with the cylinders of an engine, a piston, a distributer provided with an opening arranged to be brought successively into registration with said exhaust-ports, a shaft extending longitudinally in said cylinder and constituting a rotatable support for said distributer and means carried by said piston for intermittingly rotating said shaft and distributer to bring the opening in the latter into successive registration with said exhaust-ports.

8. A device for distributing charges to a gas engine having a plurality of cylinders, comprising a pump cylinder provided with an inlet and a plurality of exhaust-ports, the latter adapted to be connected with the cylinders of an engine, a piston, a shaft extending longitudinally in said cylinder and provided with a spiral groove therein, a distributer mounted on said shaft and provided with an opening arranged to be brought successively into registration with said exhaust-ports, coöperating means on said piston and shaft for imparting a partial rotation to the latter at every alternate reciprocation of said piston and arranged to be inoperative during the reverse reciprocation.

9. A device for distributing charges to a gas engine, having a plurality of cylinders, comprising a pump cylinder provided with an inlet and a plurality of exhaust-ports, the latter adapted to be connected with the cylinders of an engine, a piston, a shaft extending longitudinally in said pump and provided with a spiral groove therein, a distributer mounted on said shaft and provided with an opening arranged to be brought successively in registration with said exhaust-ports, a ratchet-wheel carried by said piston and provided with a pin engaging in said groove, a pawl engaging said ratchet-wheel for preventing the rotation of the latter in one direction but permitting a free reverse rotation thereof.

10. A device for distributing charges to a gas engine, having a plurality of cylinders, comprising a pump cylinder provided with an inlet and a plurality of exhaust-ports, the latter adapted to be connected with the cylinders of an engine, a piston, a shaft extending longitudinally in said pump and having a spiral groove therein, a distributer mounted on said shaft and provided with an opening adapted to be brought successively into registration with said exhaust-ports, revoluble means carried by said piston freely revoluble in one direction and locked against a reverse revolution, a pin carried by said means and engaging in said groove and frictionally engaging the sides thereof sufficiently to shift said shaft slightly longitudinally when said piston is reciprocated in one direction and means for returning said shaft to its normal position thereafter.

11. The combination with a multiple cylinder internal combustion engine, of means for forcing a charge into the cylinders of said engine, and means operated by said forcing means for distributing said charge to said cylinders successively.

12. The combination with a multiple cylinder internal combustion engine, of a pump for forcing a charge into the cylinders of said engine, and a distributing valve operated by said pump for distributing said charge to said cylinders successively.

13. The combination with a multiple cylinder internal combustion engine, of a pump for forcing a charge into the cylinders of said engine, and a rotary distributing valve rotated by said pump and adapted to distribute said charge to said cylinders successively.

14. The combination with a multiple cylinder internal combustion engine, of a pump comprising a hollow piston rod and a piston for forcing a charge into the cylinders of said engine, a rotary valve for distributing said charge to said cylinders successively, a stem secured to said valve and extending into said hollow piston-rod, and a spiral groove and spline connection between said piston and valve stem whereby said valve is rotated when said piston is reciprocated.

15. The combination with a multiple cylinder internal combustion engine, of a pump for forcing a charge into the cylinders of said engine and having a reciprocating piston, means for holding said piston against rotation as it is reciprocated, a rotary valve for distributing said charge to said cylinders successively, and means connecting said valve and piston whereby said valve is rotated when said piston is reciprocated.

16. The combination with a multiple cylinder internal combustion engine, of a pump for forcing a charge into the cylinders of said engine and having a reciprocating piston, and a hollow piston-rod, means for holding said piston rod against rotation as it is reciprocated, a rotary valve for distributing said charge to said cylinders successively, a stem secured to said valve and extending into said hollow piston-rod, and a spiral groove and spline connection between said piston and valve stem whereby said valve is rotated when said piston is reciprocated.

17. The combination with a multiple cylinder internal combustion engine, of a pump for forcing a charge into the cylinders of said engine, and having a reciprocating piston, a rotary distributing valve for distributing said charge to said cylinders successively, and means connecting said valve and piston whereby said valve is rotated when said piston is operated in one direction, said rotating means being inoperative when said piston is operated in the other direction.

18. The combination with a multiple cylinder internal combustion engine, of a pump for forcing a charge into the cylinders of said engine and having a reciprocating piston, a rotary distributing valve for distributing said charge to said cylinders successively, and means connecting said valve and piston whereby said valve is rotated when said piston is operated on its suction stroke, said rotating means being inoperative when said piston is operated on its compression stroke.

19. The combination with a multiple cylinder internal combustion engine, of a pump for forcing a charge into the cylinders of said engine, and having a reciprocating piston, a rotary distributing valve for distributing said charge to said cylinders successively, and means connecting said valve and piston whereby said valve is given a fractional rotation when said piston is operated on its suction stroke, said rotating means being inoperative when said piston is operated on its compression stroke.

20. The combination with a multiple cylinder internal combustion engine, of a pump for forcing a charge into the cylinders of

said engine and having a reciprocating piston, a rotary distributing valve for distributing said charge to said cylinders successively, and a pawl and ratchet mechanism connecting said valve and piston and provided with means whereby said valve is rotated when said piston is operated in one direction.

21. The combination with a multiple cylinder internal combustion engine, of a pump for forcing a charge into the cylinders of said engine and having a reciprocating piston, a rotary distributing valve for distributing said charge to said cylinders successively, a hollow piston-rod connected to said piston, a stem secured to said valve and extending into said hollow piston rod, a ratchet disk on said stem and having a spiral groove and a spline connection therewith, and a pawl connected with said piston and engaging said disk.

22. The combination with a multiple cylinder internal combustion engine, of a pump for forcing a charge into the cylinders of said engine and having a reciprocating piston, a rotary distributing valve for distributing said charge to said cylinders successively, and a pawl and ratchet mechanism connecting said valve and piston and provided with means whereby said valve is rotated when said piston is operated on its suction stroke and allowed to remain stationary when said piston is operated on its compression stroke.

23. The combination with a multiple cylinder internal combustion engine, of a manually operated pump for forcing a charge into the cylinders of said engine, and means operated by said pump for distributing said charge to said cylinders successively.

24. The combination with a multiple cylinder internal combustion engine, of a manually operated pump for forcing a charge into the cylinders of said engine, and a rotary distributing valve rotated by said pump for distributing said charge to said cylinders successively.

25. The combination of a cylinder, a piston therein, a hollow stem for manually operating said piston, a rotary distributing valve within said cylinder, and a stem for said rotary valve having a spiral telescopic engagement with said hollow stem whereby the reciprocatory movement of the latter will cause a rotative movement of the former and said distributing valve.

26. In starting mechanism for explosive engines embodying multiple cylinders, the combination of a cylinder, a piston arranged to operate in the cylinder for drawing in a gaseous mixture and expelling the same, and a valve mechanism having connection with the piston to be operated thereby and having connection with each of the cylinders of the engine for supplying the same with an initial charge to produce an explosion upon the passage of a spark.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ANDREW AUBLE, JR.

Witnesses:
C. E. HUMPHREY,
A. L. MCCLINTOCK.