T. MATSON.

EXPLOSION ENGINE.

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912,012. Patented Feb. 9, 1909.

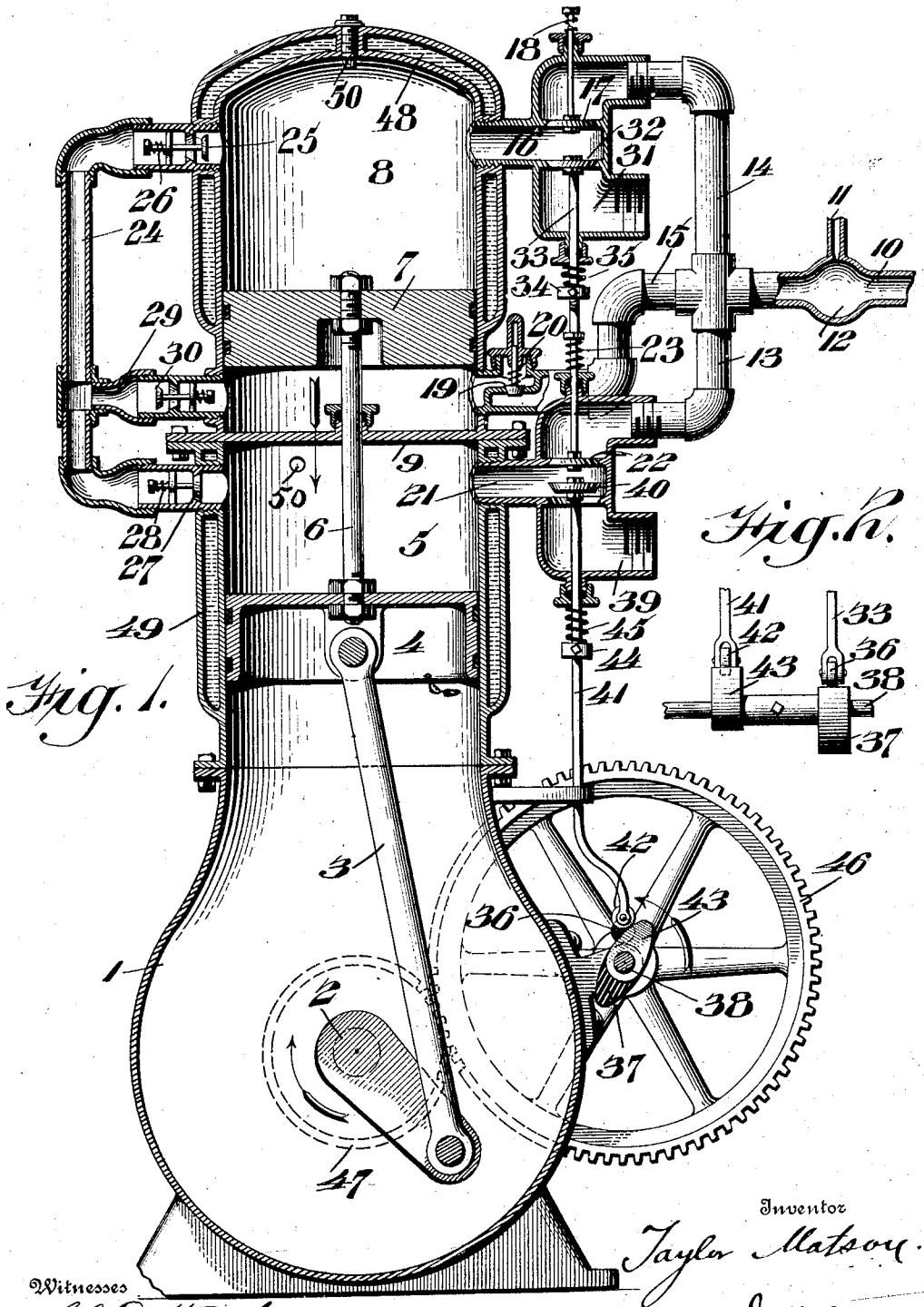


Fig. 1.

Fig. 2.

Witnesses

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EXPLOSION-ENGINE.

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To all whom it may concern:

Be it known that I, TAYLOR MATSON, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Explosion-Engine, of which the following is a specification.

My present invention consists of a novel construction of an explosion engine of the tandem cylinder four cycle type in which explosions are alternately produced in each cylinder and wherein the piston in one cylinder causes an excess of explosive mixture to be delivered intermittently to both piston chambers.

It further consists of a novel arrangement and correlation of the inlet and exhaust ports for the different chambers.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention, I have shown a preferred embodiment thereof which gives satisfactory results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized.

Figure 1 represents a sectional elevation of an explosion engine embodying my invention. Fig. 2 represents an elevation of a detail thereof.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, 1 designates the engine casing in which is mounted the crank shaft 2 which is connected by means of the crank 3 with the lower or inner piston 4 in the usual manner, said piston 4 being adapted to reciprocate in the lower piston casing 5.

6 designates a piston rod one end of which is adjustably secured to the lower piston 4, the other end thereof being adjustably secured to the upper or outer piston 7 located in the upper piston chamber 8, it being noted that the outer and inner piston chambers 5 and 8 are separated by a plate or diaphragm 9 and that the piston rod 6 passes through the diaphragm 9 and is provided with a stuffing box if desired.

10 is the air inlet, 11 the gas inlet and 12 the mixing chamber from which latter the explosive mixture may pass to the conduits 13, 14 and 15. The conduit 14 leads to the port 16 communicating with the outer end of the piston chamber 8 and controlled by an inwardly opening valve 17 provided with a spring 18 for normally maintaining the same closed. The conduit 15 leads to the inner end of the chamber 8 and is controlled by an inwardly opening valve 19 which is normally maintained closed by a spring 20. The conduit 13 leads to the port 21 and is controlled by an inwardly opening valve 22 which is normally maintained closed by a spring 23.

24 designates a conduit communicating with the outer end of the chamber 8 and provided at this end with an inwardly opening valve 25 normally maintained closed by a spring 26, said conduit 24 also communicating with the outer end of the chamber 5 and provided at this end with an inwardly opening valve 27 normally maintained closed by a spring 28.

29 designates a conduit provided with an outwardly opening check valve 30 and communicating with the conduit 24.

31 designates an exhaust outlet leading from port 16 and controlled by an inwardly opening valve 32 having a stem 33 which has mounted thereon an adjustable collar 34 between which and the exhaust conduit 31 is interposed a spring 35.

36 designates a roller carried by the stem 33 and coacting with a cam 37 mounted on a shaft 38 journaled in the casing 1.

39 designates an exhaust conduit leading from the conduit 21 and provided with an inwardly opening valve 40 having a stem 41 which carries a roller 42 adapted to coact with a cam 43 mounted on the shaft 38.

44 designates a set collar on the rod 41 between which and the conduit 39 is interposed a spring 45.

46 designates a gear mounted on the shaft 38 which meshes with a gear 47 mounted on the crank shaft 2.

48 and 49 designate water jackets for the cylinders 8 and 5 respectively.

50 designates the spark plug.

The operation is as follows:—The explosions in the different cylinders take place alternately. Assuming the parts to be in the position seen in Fig. 1, an explosion has just taken place in the cylinder 5 and as the piston 7 is drawn down by means of the connecting rod 6 an explosive mixture is then drawn through the inlet valve 17 into the

cylinder 8. Just before the piston 4 reaches the end of the down stroke the exhaust valve is opened through the medium of the cam connection and the products of combustion have free escape from the cylinder 5. During the upward stroke of the pistons 4 and 7 the former forces all the remaining gases through the open valve 40 while the latter draws in an auxiliary charge of explosive mixture through the port 19 and compresses the charge now in cylinder 8.

At the completion of the up stroke a spark from the plug 50 ignites the compressed charge above the piston 7 and the explosion drives both pistons on another down stroke during which piston 4 draws in a fresh charge through valve 22 and piston 7 forces an auxiliary charge through valves 27 and 30 to the portion of the cylinder above piston 4. Of course it will be understood that on this downward stroke of the piston 4 the valve 40 remains closed. As the piston 7 approaches the end of its downward stroke the valve 32 is opened by a cam movement similar to that operating valve 40 and on the return stroke of the piston 7 the exhaust products pass out through this valve 32, a new auxiliary charge is drawn through valve 19 and piston 4 is compressing a fresh mixture charge. At the end of this upward stroke the compressed charge above the piston 4 is ignited and again drives the pistons downwardly and the same operation is repeated except at this time the auxiliary charge beneath piston 7 passes upward through valve 25 and enriches the charge drawn through admission valve 17.

The action of the valves 26, 27 and 30 should be noted since they play an important part in the control of the charge which is delivered alternately to the portion of the cylinder above each of the pistons 4 and 7.

It will be understood that these valves are normally maintained closed through the medium of suitable springs, and at the time an explosion takes place within one cylinder, the pressure is sufficient to prevent the valve for that end of the cylinder opening so that all of the auxiliary charge is forced by the downwardly moving piston 7 through the other valve for the purpose already described. As these explosions take place alternately it will be readily apparent that first the valve 25 is held closed and valve 27 open and then valve 27 held closed and valve 25 open.

The exhaust valves 32 and 40 are positively opened at the desired time, since the rollers 36 and 42 coact with the cams 37 and 43 respectively on the shaft 38, the rotation of which latter is governed by the driving shaft 2 owing to the provision of the coacting gears 46 and 47.

The cylinders 8 and 5 are cooled by means of the water jackets 48 and 49 respectively.

It will now be apparent that I have devised a novel and useful construction of an explosive engine which embodies the features of advantage enumerated as desirable in the statement of invention and the foregoing description and while I have in the present instance shown and described a preferred embodiment thereof it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit and scope of the invention or sacrificing any of its advantages.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In an explosive engine, a plurality of cylinders, a piston for each cylinder, a plurality of mixture inlets and an exhaust outlet in each cylinder, a driving shaft operatively connected with said pistons, a partition forming with one of said pistons, an auxiliary chamber, an inlet and an outlet for said auxiliary chamber, and means to effect transfer of motive fluid from said auxiliary chamber to each cylinder.

2. In an explosive engine, a plurality of cylinders, a piston for each cylinder, a plurality of mixture inlets and an exhaust outlet in each cylinder, a driving shaft operatively connected with said pistons, a partition forming with one of said pistons an auxiliary chamber, an inlet and an outlet for said auxiliary chamber, and means to effect alternate transfer of motive fluid from said auxiliary chamber to each cylinder.

3. In an explosive engine, a plurality of cylinders, a piston in each cylinder, a plurality of mixture inlets and an outlet for each cylinder, a driving shaft operatively connected to said pistons, a partition forming an auxiliary chamber with one of said pistons, an inlet and an outlet for said chamber, a passage leading from said auxiliary chamber to each cylinder, and valves controlling said passage.

4. In an explosive engine, a plurality of cylinders, a piston in each cylinder, a mixture inlet and an outlet for each cylinder, a driving shaft operatively connected to said pistons, a partition forming an auxiliary chamber with one of said pistons, an inlet and an outlet for said chamber, a passage leading from said outlet to each cylinder, and valves controlling said passage.

5. In an explosive engine, a plurality of cylinders, a piston in each cylinder, a mixture inlet and an outlet for each cylinder, a driving shaft operatively connected to said pistons, a partition forming an auxiliary chamber with one of said pistons, an inlet and an outlet for said chamber, a passage leading from said outlet to the cylinders above both pistons, valves controlling said passage and operated by pressure in said cylinders.

6. In an explosive engine, a plurality of cylinders, a piston in each cylinder, a mixture inlet and an outlet for each cylinder, a driving shaft operatively connected with said pistons, a partition forming with one of said pistons an auxiliary chamber, an inlet and an outlet therefor, and means to effect alternate transfer of motive fluid from said auxiliary chamber to each cylinder.

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