No. 885,113.

PATENTED APR. 21, 1908.

J. P. WALSH.

ROTARY EXPLOSIVE ENGINE.

APPLICATION FILED AUG. 30, 1907.

3 SHEETS—SHEET 1.

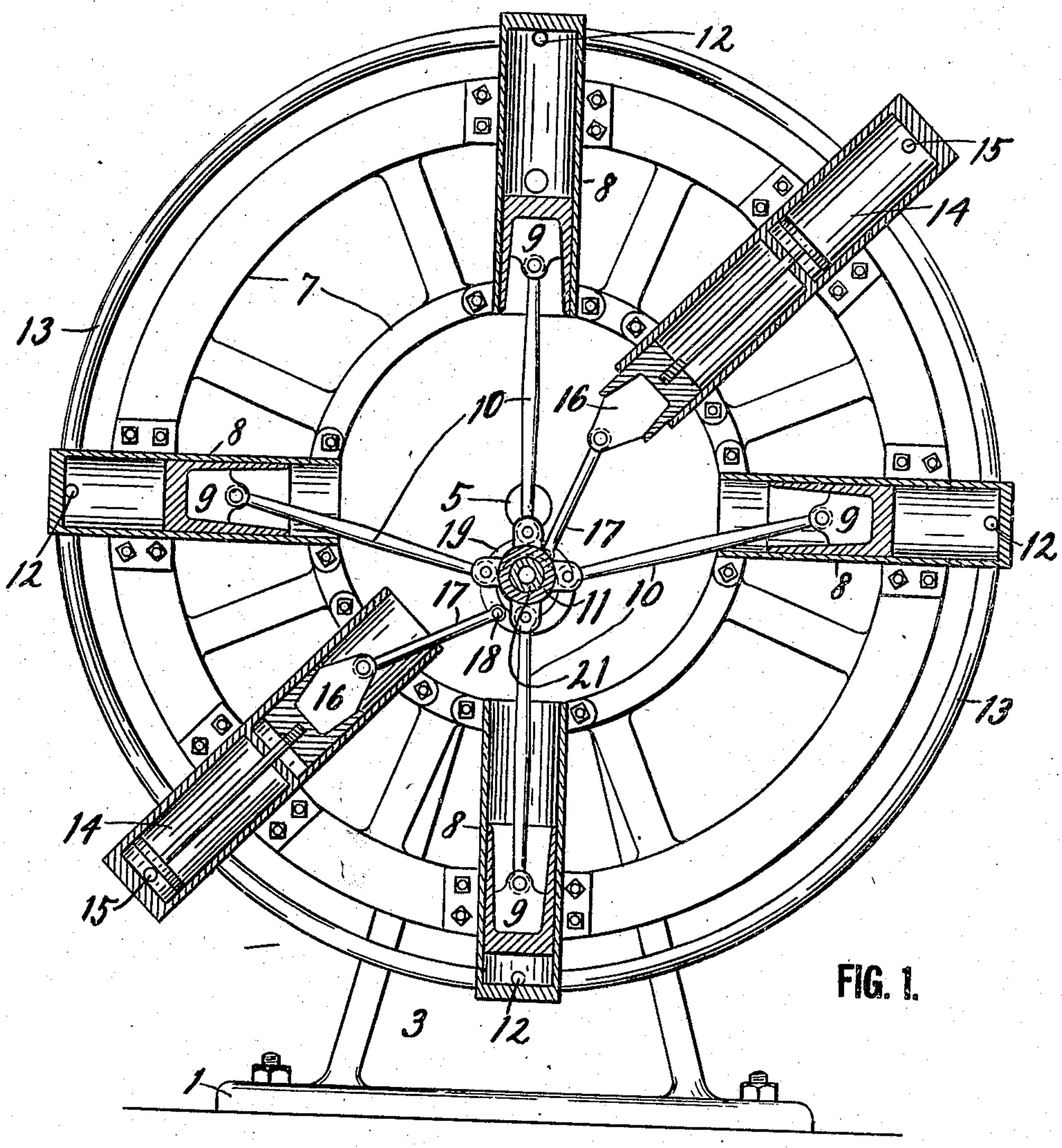


FIG. 1.

FIG. 5.

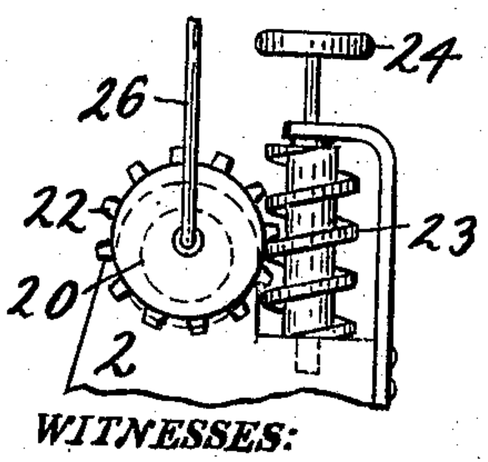


FIG. 6.

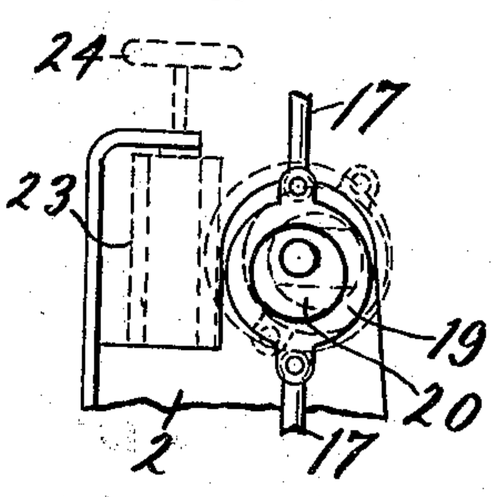
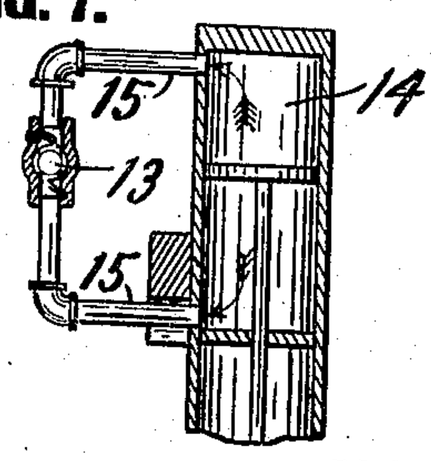


FIG. 7.



WITNESSES:

D. E. Carlsen.

W. M. Carlsen.

INVENTOR:

John P. Walsh.

BY HIS ATTORNEY:

A. M. Carlsen.

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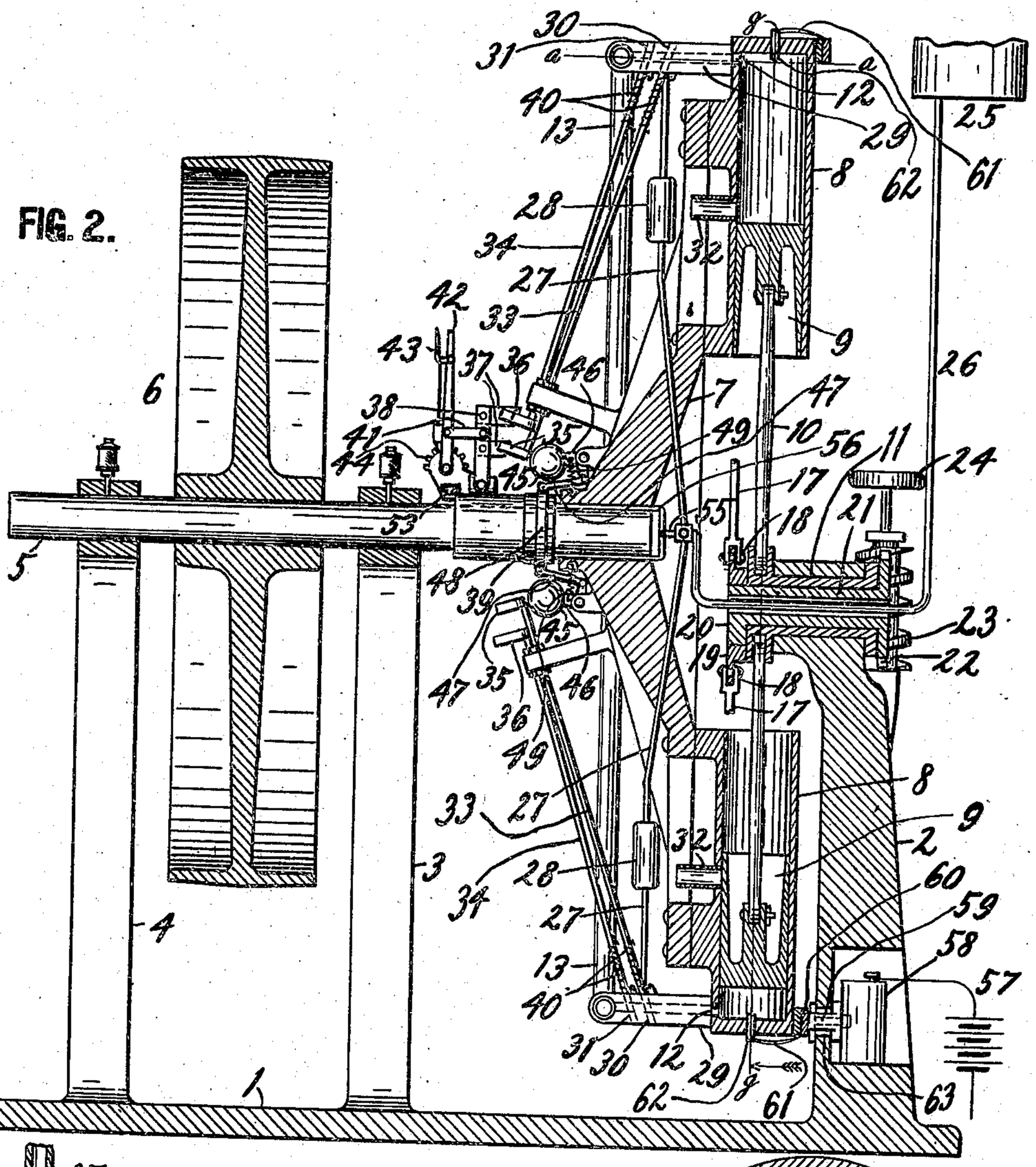
3 SHEETS—SHEET 2.

FIG. 2.



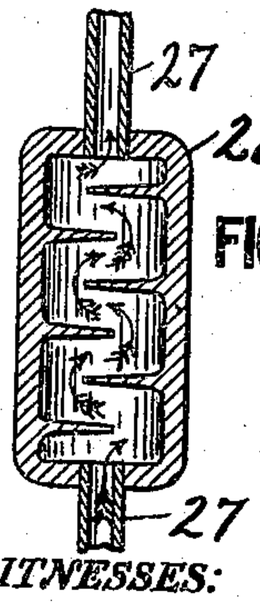


FIG. 3.

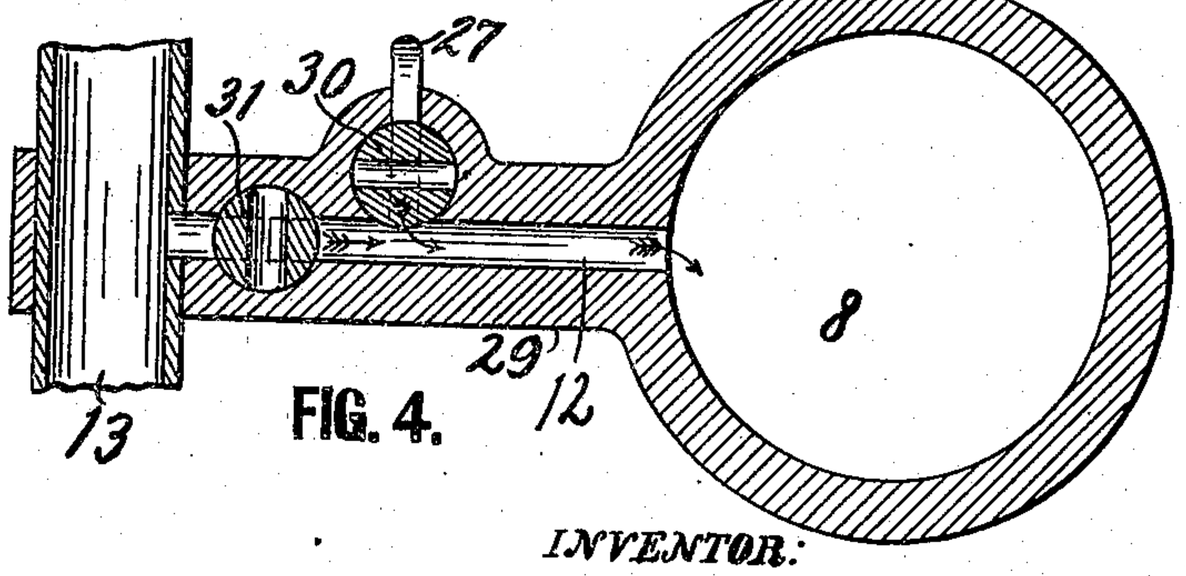


FIG. 4.

WITNESSES:

D. E. Carlsen.

W. M. Carlsen.

INVENTOR:

John P. Walsh.

BY HIS ATTORNEY:

A. M. Carlsen.

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3 SHEETS—SHEET 3.

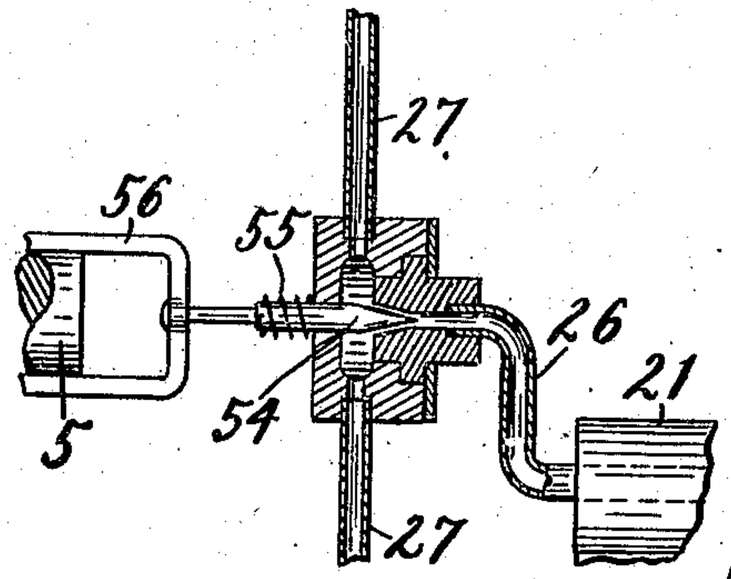

FIG. 9.

FIG. 8.

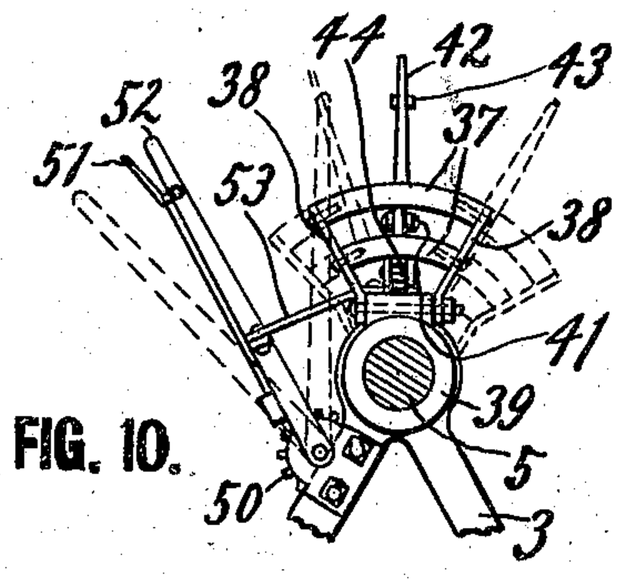

FIG. 10.

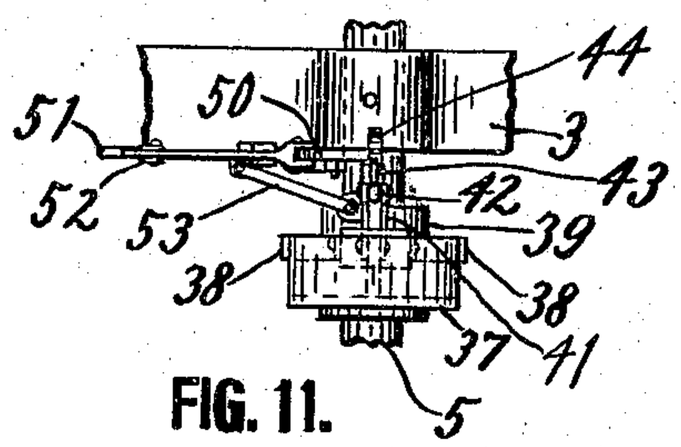

FIG. 11.

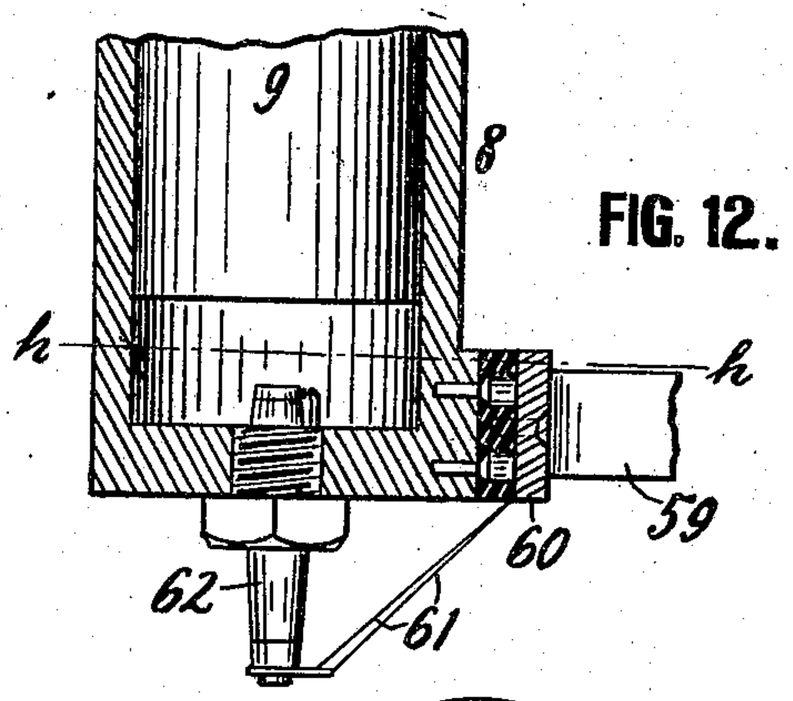

FIG. 12.

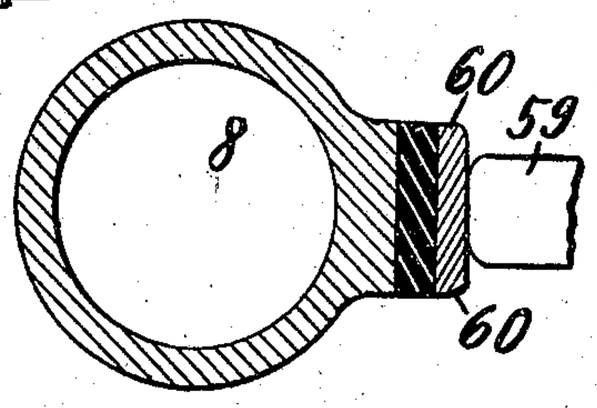

FIG. 13.

WITNESSES:

D. E. Carlsen.

W. M. Carlsen.

INVENTOR:

John P. Walsh

BY HIS ATTORNEY:

A. M. Carlsen.

UNITED STATES PATENT OFFICE.

JOHN P. WALSH, OF ST. PAUL, MINNESOTA.

ROTARY EXPLOSIVE-ENGINE.

No. 885,113. Specification of Letters Patent. Patented April 21, 1908.

Application filed August 30, 1907. Serial No. 390,739.

To all whom it may concern:

Be it known that I, JOHN P. WALSH, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented a new and useful Rotary Explosive-Engine, of which the following is a specification.

My invention relates to explosive engines, and the object is to provide a high power explosive engine requiring but little material for its construction and little space when in use. This and other objects I attain by the novel construction and arrangement of parts illustrated in the accompanying drawing, in which;

Figure 1 is a partly sectional front end elevation of my improved engine, about as on line *g—g* in Fig. 2. Fig. 2 is a substantially central vertical sectional view of the engine. Fig. 3 is a central sectional view of one of the mixers. Fig. 4 is an enlarged sectional view on line *a a* in Fig. 2. Fig. 5 is a front elevation of a central portion of the engine. Fig. 6 is a partly finished rear view of Fig. 5. Fig. 7 is a longitudinal central section of one of the air-compressing cylinders with adjacent piping. Fig. 8 is a front elevation of the main frame. Fig. 9 is a partly sectional view of feed valve for the oil, gas or like means from which the explosive force is derived, and some parts adjacent to said valve. Fig. 10 is a front view of the valve controlling mechanism shown partly in the middle of Fig. 2. Fig. 11 is a top view of Fig. 10. Fig. 12 is an enlarged portion of one of the explosion cylinders with an igniting plug and contacting means. Fig. 13 is a sectional view on line *h—h* in Fig. 12 with igniting plug omitted.

Referring to the drawing by reference numerals, the main frame comprises a bed plate or base 1 with three uprights or stands 2, 3 and 4. In the stands 3 and 4 is journaled the main shaft 5 of the engine. 6 is a pulley on said shaft for transmission of the power of the engine to other machinery.

Upon the front end of the shaft 5 is fixed a wheel 7, carrying four equidistant radially disposed explosion cylinders 8, each of which has a bucket-piston 9 connected by a link rod 10 to a bushing or hollow shaft 11, journaled in the front stand 2, as much below the center of the main shaft 5 as half the stroke of each piston, so that when the wheel makes one half revolution each piston makes a full stroke or motion equal to the length of the cylinder. The result of this arrangement is that every explosion in any of the cylinders while the rod 10 points beyond the center of the main wheel tends to revolve said wheel and by it the shaft 5 and pulley 6.

The compressed air mixed with gas of any serviceable kind is admitted into the cylinders through ports 12 leading from a ring-shaped compression chamber or reservoir 13, which is constantly kept filled by the two double-acting diametrically opposite air pumps 14 fixed on the wheel and connected with the reservoir 13 by pipes 15, as best shown in Fig. 7. The piston rods of said pumps are connected at 18 by crossheads 16 and link rods 17 to a ring 19, revolving on an eccentric 20 fixed or formed on the rear end of a hollow shaft 21 whose front end is provided with a worm-gear 22, turned by a worm-screw 23 and hand-wheel 24 fixed on same, whereby when the screw is turned the eccentric 20 reduces or increases the stroke of the pump pistons according to the air pressure desired.

In Figs. 5 and 6 the greatest stroke is indicated by a downward position of the eccentric, an upward position will give the shortest stroke, and a sidewise position will give the normal stroke, which would be equal to the stroke of the pistons.

If gasolene or similar oil is used for power the oil is fed from a tank 25 through a pipe 26 passing through the hollow eccentric shaft 21 into radial pipes 27, having each a mixer 28 and joining an abutment 29, connecting the reservoir 13 with each working cylinder. In said abutment are two valves 30 and 31, controlling respectively the passage of the oil vapor from the mixer 28 which is heated by the exhaust from spout 32, and the compressed air from the reservoir. Said two valves are rocked by shafts 33—34 having rocker arms 35 and 36 respectively, which when the main wheel revolves rock the shafts and the valves by coming into passing contact with cams 37 of a double arm 38 pivoted to a sleeve 39, sliding on the shaft 5. Said arm 38 is adjustable to and from the rocker arms 35—36 by a link 41, hand lever 42 and finger latch 43 engaging various notches in a sector 44 fixed on the sleeve, so that the amount of explosives admitted to the cylinders is regulated by the greater or lesser rocking movement of the valves. The

valves are returned to the closed position by springs 40.

The valves are similarly controlled by a governor comprising the balls 45 on bell-crank levers 46 pivoted to the main wheel and having their inner arms pivotally connected by links 47 to a yoke 48 engaging an annular groove in the sleeve 39, so that when the balls spread from too great a speed of the engine the yoke will slide the sleeve 39 and thereby diminish the contact of cams 37 with arms 35 and 36. 49 are springs for returning the bell-crank levers to normal position when the speed of the engine has been properly regulated by the governor. Thus the desired speed is regulated by lever 42 and such speed is maintained automatically by the governor.

The engine is stopped by swinging lever 42 in Fig. 2 so far to the left that the cams 37 get out of the circular path of the arms 35 and 36.

To regulate the time of intake of the explosives, and to reverse the engine I provide upon stand 3 (see Figs. 11 and 10) a toothed sector 50 which by means of a latch and a finger lever 51 holds hand lever 52 in various positions. Said hand lever is connected by a loosely pivoted link rod 53 to the sleeve 39, so that the sleeve and its valve operating parts may be turned and held in opposite positions for running the engine in opposite directions and in either direction the intake of the explosives may be admitted a little earlier or later than normally by setting lever 52 a notch outside or inside of the regular position. The various positions of the parts are fairly shown in dotted lines in Fig. 10, and in Figs. 10 and 11 is also shown that the cam faces 37 are of some length so as to hold the valve open for the period necessary to admit the required amount of explosives.

As shown in Fig. 2 and best in Fig. 9, the gas or gas producing oil, is admitted into the tubes 27 through a needle valve 54 normally held closed by a spring 55, and by a sliding yoke 56 connected with the sleeve 39, and thus opened by the governor as soon as the engine is given a few revolutions as is usual in starting gasolene engines by various means.

The igniting mechanism may be of any suitable kind, but I have in Fig. 2 indicated an electric battery 57 connected with a contact post 58 adjustably secured to the stand 2 (see also Figs. 8, 12 and 13) and having a contact finger 59 adapted to touch each contact plate 60 which are secured one near the end of each power cylinder and connected by wires 61 with a spark plug 62 of any suitable type. The finger 59 protrudes inward through a slot 63 in the stand 2, and is thus adjustable with the post 58 from side to side, whereby the igniting may be regulated so as to take place when the piston is on its dead center or a little before or after said point according to the speed at which the engine is run.

Having thus described my invention, what I claim is:

1. In an explosive engine and mounted in a suitable frame, the combination with a main shaft journaled in the frame, a wheel fixed on one end of the shaft, a series of cylinders radially secured upon the wheel, pistons in the cylinders, piston rods pivotally secured to the piston and projecting out of the inner ends of the cylinders, a revoluble hollow shaft journaled in the frame near the wheel in an eccentric position to the axis of the shaft and being pivotally secured to the inner ends of the piston rods, and means for introducing and for igniting explosives in the outer ends of said cylinders when each piston rod is in position to impart rotary motion to the wheel.

2. In an explosive engine, the combination with a suitable frame, of a main shaft journaled therein, a wheel fixed on one end of the shaft, a series of explosion chambers or cylinders fixed radially upon the wheel, pistons in the cylinders, piston rods or link rods pivotally secured to the pistons and projecting out of the inner ends of the cylinders, a revoluble hollow shaft 11 journaled in the frame near the wheel in an eccentric position to the axis of the shaft and being pivotally secured to the inner ends of the piston rods, an air reservoir fixed upon the wheel and having abutments communicating with all the explosion chambers, a plurality of air pumps fixed upon the wheel and adapted to compress air in the reservoir, the sleeve 21 journaled within the hollow shaft 11, the eccentric 20 at one end and the worm wheel 22 at the other end thereof, the eccentric yoke 19 revolving on said eccentric, double acting pistons in the pump cylinders, guided piston rods moving the pistons, link-rods connecting the piston rods with the yoke on the eccentric, and a hand-operated worm-screw engaging said worm wheel and automatically operated valves controlling the passing of the compressed air from the reservoir to the explosion chambers.

3. In an explosive engine, the combination with a suitable frame, of a main shaft journaled therein, a wheel fixed on one end of the shaft, a series of explosion chambers or cylinders fixed radially upon the wheel, pistons in the cylinders, piston rods or link rods pivotally secured to the pistons and projecting out of the inner ends of the cylinders a revoluble hollow shaft 11 journaled in the frame near the wheel, in an eccentric position to the axis of the shaft and being pivotally secured to the inner ends of the piston rods, an air reservoir fixed upon the wheel and having abutments communicating with all the explosion chambers, a plurality of air

pumps fixed upon the wheel and adapted to compress air in the reservoir, the sleeve 21 journaled within the hollow shaft 11, the eccentric 20 at one end and the worm wheel 22 at the other end thereof, the eccentric yoke 19 revolving on said eccentric, double acting pistons in the pump cylinders, guided piston rods moving the pistons, link-rods connecting the piston rods with the yoke on the eccentric and a hand-operated worm-screw engaging said worm wheel, and automatically operated valves controlling the passing of compressed air from the reservoir to the explosion chambers, an elevated reservoir for gasolene or other explosive oil, a pipe extending therefrom and through the sleeve 21 and branch tubes extending therefrom to the abutments conducting air to the explosion chambers, a valve at the inner ends of the branch tubes, a governor carried by the wheel and operatively connected with said valve, automatically operated valves controlling the inlet of the oil into the air passing to the explosion chamber; said inlet valves for air and oil or gas or the like being operatively connected with said governor and the mixers or heaters 28 on the branch tubes near the exhaust of the explosion cylinders whereby the gas or oil is prepared for mixing with the air.

4. In an explosive engine of the type set forth and mounted in a suitable frame, the combination with a revoluble main shaft and a wheel secured on one end thereof, and air pumps and explosion cylinders secured on the wheel and operated as described, of a ball governor mounted on the wheel, a yoke actuated by the governor, a sleeve slidable on the shaft and engaged by the yoke, spring-held valves carried by the wheel for admitting explosives into the explosion cylinders and having stems with rocker arms thereon, cams pivotally mounted on the sleeve and adapted to operate the valves as the rocker arms pass the cams and means for adjusting said cams into more or less contact or no contact with the rocker arms.

5. In an explosive engine of the type set forth and mounted in a suitable frame, the combination with a revoluble main shaft and a wheel secured on one end thereof and air-pumps and explosion cylinders secured on the wheel and operated as described, of a ball governor mounted on the wheel, a yoke actuated by the governor, a sleeve slidable on the shaft and engaged by the yoke, spring-held valves carried by the wheel for admitting explosives into the explosion cylinders and having stems with rocker arms thereon, cams pivotally mounted on the sleeve and adapted to operate the valves as the rocker arms pass the cams and means for adjusting said cams into more or less contact or no contact with the rocker arms; the lever 52 pivoted to the frame of the engine, a link-rod connecting it with the sleeve, and means for holding said lever in various positions for the purposes set forth.

In testimony whereof I affix my signature, in presence of two witnesses.

JOHN P. WALSH.

Witnesses:

THEODORE SANDERS,

BERTHA ENGELS.