

F. E. VAUGHN.
EXPLOSIVE GAS ENGINE.
APPLICATION FILED MAR. 26, 1908.

1,012,034.

Patented Dec. 19, 1911.

3 SHEETS—SHEET 1.

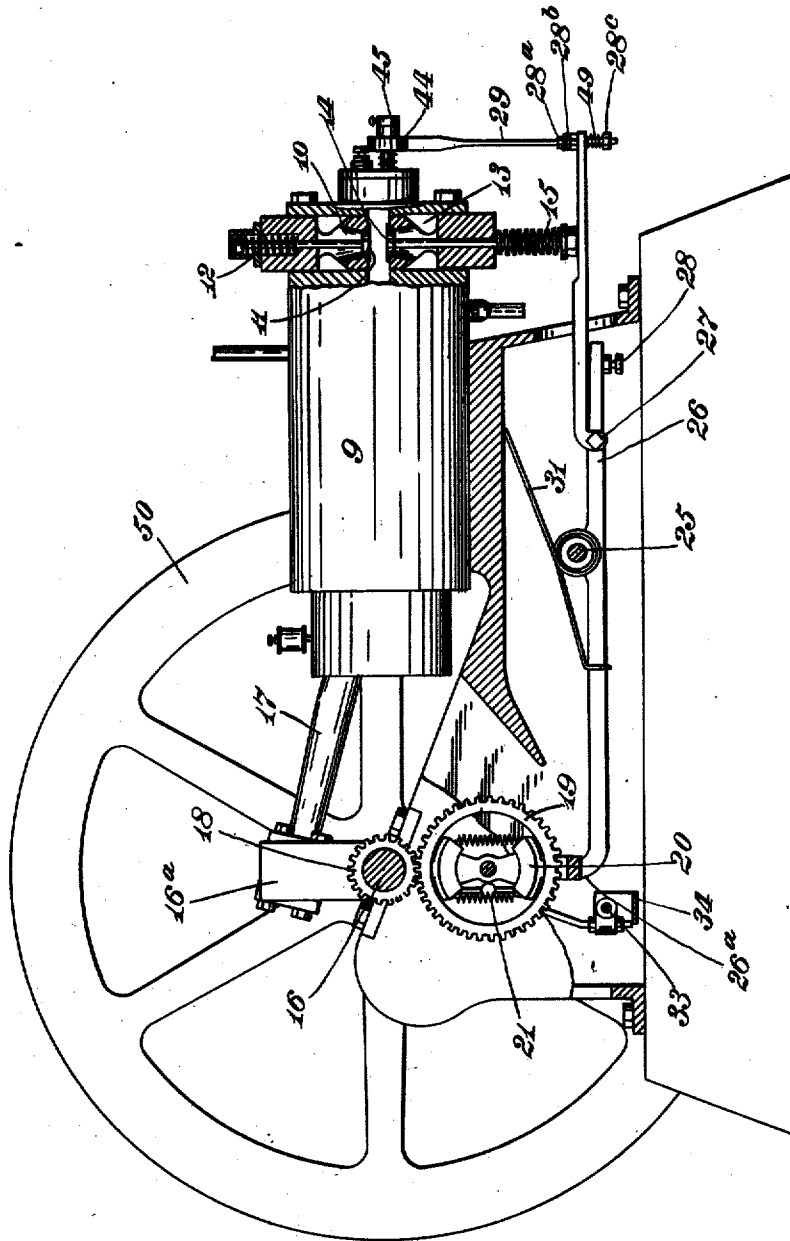


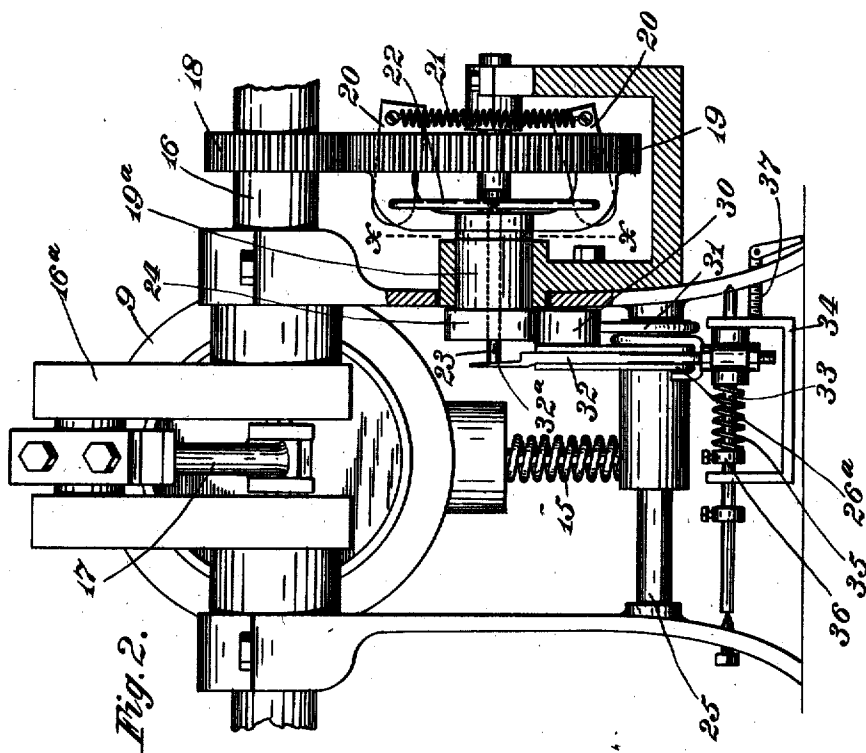
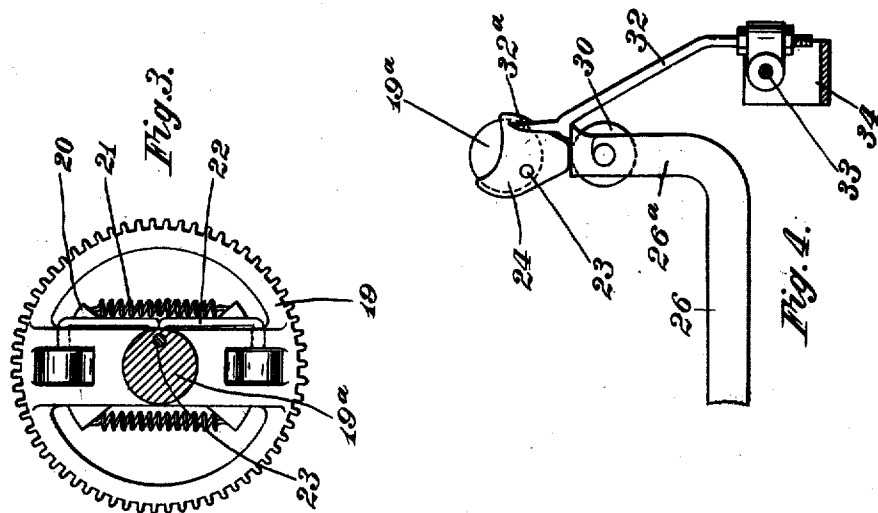
Fig. 1.

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3 SHEETS—SHEET 2



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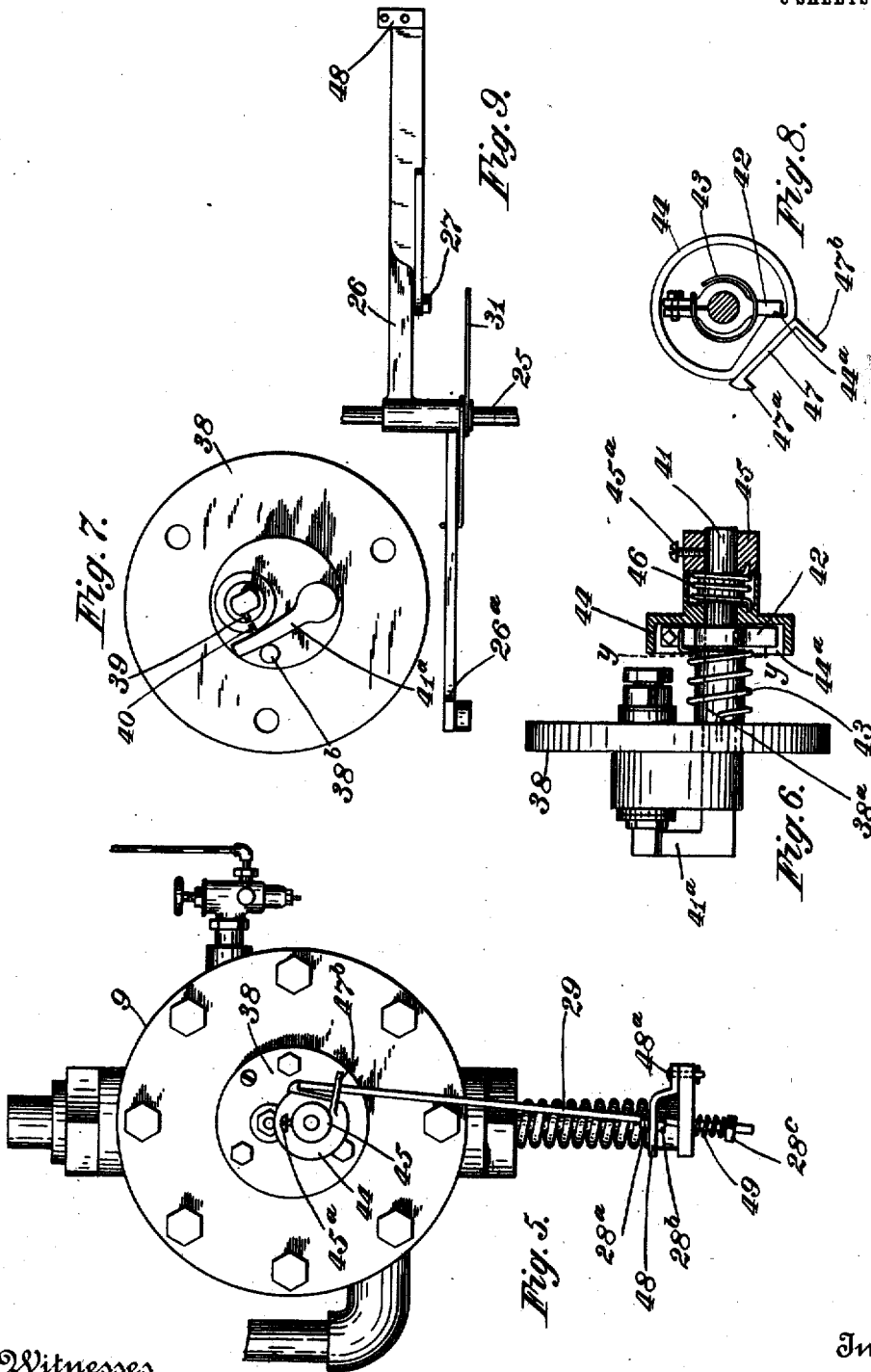
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

FRANCIS E. VAUGHN, OF TIPPECANOE CITY, OHIO.

EXPLOSIVE-GAS ENGINE.

1,012,034.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRANCIS E. VAUGHN, a citizen of the United States, residing at Tippecanoe City, in the county of Miami and State of Ohio, have invented a certain new and useful Improvement in Explosive-Gas Engines, of which the following is a specification.

The object of this invention is to construct a gas engine which is provided with an improved means for nicely regulating the speed and operating the "sparker" thereof.

Incidentally the objects are to provide other improvements in the details of construction of explosive gas engines.

The invention consists as hereinafter described and particularly pointed out in the claims, the inventor not being confined to precisely the details of construction shown.

In the accompanying drawings—Figure 1 is a view in side elevation of the engine with parts in section; Fig. 2 is an elevation looking at the fly-wheel end with parts in section; Fig. 3 is a side view of the governor taken from the plane $x-x$ Fig. 2; Fig. 4 is a detail illustrating the means for controlling the operation of the sparker-operating lever; Fig. 5 is an elevation of the cylinder end and sparker-operating devices appurtenant thereto; Fig. 6 is a side view of the sparker with parts in section; Fig. 7 is a view of the left-hand side of what is shown in Fig. 6 showing the sparking points; Fig. 8 is a section on the line $y-y$ looking to the right, Fig. 6; Fig. 9 is a plan view of the exhaust valve and sparker-operating lever.

In the views 10 designates the cylinder having in its head the fuel-supply port 10 furnished with a valve 11 controlled by a weak spring 12 tending to close the port, and an exhaust port 13 furnished with a valve 14 controlled by a stronger spring 15 tending to close said port 13 .

16 designates the crank shaft having the crank 16 connected with an ordinary piston in the cylinder by means of the rod 17 . The crank shaft has fixed to it a pinion 18 meshing with the gear wheel 19 of the governor. The circumference of the pinion 18 is half that of the gear 19 , or so that two revolutions of the crank shaft are required to effect one rotation of the gear 19 . The gear wheel 19 has pivoted in projections from it governor "balls" 20 the free ends of which

are held toward each other by a spring 21 and the pivoted ends of which have affixed thereto arms 22 that engage the outer end of a sliding pin 23 that extends eccentrically the axis of the shaft 19 of the governor. The inner end of the pin 23 projects also through a cam member 24 secured to the end of the shaft of the governor. When the engine is running at high speed the pin 23 is moved outward by centrifugal action on the governor balls, and conversely, when the engine slows down the pin is thrown inward to permit the closing of the exhaust port and the recharging of the cylinder with explosive gas, as hereinafter explained.

Fulcrumed at 25 below the cylinder 9 is a long lever 26 made up of two parts hinged together at 27 , one part being provided with a set screw 28 to engage the other to vary the angularity of the parts to each other. Referring to the position of the engine as viewed in Fig. 1, the right-hand end of the lever 26 reaches to position to engage the exhaust-port stem and to properly support a rod 29 for operating the sparker, while the left-hand end of said lever is upwardly bent, as seen at 26^a , and carries a roller 30 located under the cam member 24 and so as to be operated thereby. In connection with the lever 26 is a spring 31 that tends to hold the roller 30 up toward the cam member 24 and the lever is oscillated by the rotations of said cam member. When the speed of the engine is accelerated the lever is held down out of position to be operated by the cam device by means of a trip latch 32 having a finger 32^a that lies in the path of the pin 23 only when projected by the slowing speed of the engine due to the omission of gas charges and explosions, as hereinafter explained. The trip latch 32 is hinged and slidingly mounted on a shaft 33 between the arms of a yoke 34 . It is pressed against one arm of said yoke by a spring 35 secured to it and having its other end secured to a small collar 36 . The spring 35 also holds the upper end of the trip latch toward the arm 26^a . A set screw 37 is employed to adjust the position of the yoke so as to regulate the extent of projection of the pin 23 necessary to operate the trip latch and therefore so regulate the speed of the engine. For example, if the trip latch be moved to the left, Fig. 2, the mean speed of the engine will be made

slower because slower rotation of the governor wheel 19 will be required to project the pin 28 to a plane necessary to operate the trip latch to release the lever 26 and hence permit the exhaust 13 to be closed by its valve.

38 designates the sparkler head. This head is suitably secured in the cylinder head. It has a normally-stationary contact or electrode 39 and a cooperating movable electrode or contact 40, the latter being on the end of a crank-like arm 41* having a shaft 41. The shaft 41 has fastened to it a two-winged clip 42 that is engaged at one wing 15 by one end of a weak spring 43 secured at its other end to the sparkler head, said spring tending to hold the sparkler points weakly asunder. Loosely on the shaft 41 beyond the clip and inclosing the clip is a sleeve 44 having a lug 44* that impulsively engages the clip at the proper time to throw the sparkler points asunder, as will be presently explained. On the outer end of the shaft 41 beyond the sleeve 44 is a collar 45 20 containing a set-screw 45* for fixing the collar in adjusted position rotarily on said shaft; and between the said collar 45 and sleeve 44 and engaging both is a coiled spring 46 of greater power than the spring 43, said spring 46 being wound in a direction 30 contrary to that of the spring 43. The spring 46 is shown to be housed in an annular cavity in the smaller rim of the sleeve 44. A small space is left between the fixed 25 two-winged clip 42 and the end of a projecting shaft housing 38* on the head 38 so as to permit a slight longitudinal play of the shaft and the contact points on each other to help keep them clean. The throw 45 of the movable contact from the fixed one is limited by a stop pin 38*.

Secured on a straight cut away portion of the larger rim of the sleeve 44 is a dog 47 having a spur 47* at its upper end and a bifurcate guide 47* at its lower end. The rod 29 45 works in the guide 47* and against the spur 47*. When the rod is properly shoved up by the operation of the lever 26 the contacts are pressed together and tension placed 50 on the heavier spring 46, and upon continued upward pressure of said rod 29 its upper end passes the spur, and when said rod is drawn down the heavier spring 46 acting on the sleeve 44 and the lug 44* 55 thereon causes said lug to strike the lower wing of the clip 42 attached to the shaft 41 and thus separate the sparking points with great quickness. This quickness of separation renders more certain production of an 60 igniting spark.

The rod 29 has a laterally loose connection with the lever 26 by means of a bifurcate keeper 48 pivoted at 48* but is held from movement in an upright direction with 65 respect to said keeper by means of nuts 28*

and 28* above and below the keeper, said nuts permitting an adjustment of said rod to regulate the extent of its action on the sleeve 44. A spring 49 on the lower end of the rod 29 between the lever 26 and a nut 28* 70 cooperates with the aforesaid keeper to maintain said rod 29 in its proper operating position.

The operation is therefore briefly thus: When the port 13 is closed the suction of the 75 piston in its outward movement draws in the explosive charge; the reverse movement of the piston compresses the charge and the sparkler ignites it propelling the piston again outward; the next inward movement of the 80 piston exhausts the charge through the exhaust which was opened by the operation of the lever 26. When too high a speed is attained by repetition of the cycle the pin 23 will be withdrawn and the exhaust held 85 in open position by means of the trip latch 32. In such case further charges of the explosive agent are postponed, the piston on its outward stroke merely sucking and expelling the atmosphere through the exhaust 90 port. I provide the crank shaft with a good fly wheel 50 to keep up the operation of the engine until the pin 23 is amply projected to release the trip latch 32 from the lever 26, at which time the exhaust is again closed and 95 the gas charge or charges renewed.

It will be observed that with this construction great economy of operating gas is effected.

What I claim and desire to secure by Letters Patent is:

1. In an explosive gas engine, the combination with the exhaust port valve, of a two-part lever for operating the valve to open its port, and means for varying the angularity of the parts of said lever to each other, a trip latch for holding said lever in position to retain said valve in open position, a governor mechanism, and a member operated by said governor mechanism to release 105 said trip latch to close the valve when the speed of the engine is reduced to a degree below its intended mean.

2. In an explosive gas engine, the combination with the exhaust port valve, of a two-part lever for operating the valve to open 115 its port, and means for varying the angularity of the parts of said lever to each other, means for holding said lever in position to retain said valve in open position, a governor mechanism, and a member operated by said governor mechanism to release 120 said lever to close the valve when the speed of the engine is reduced to a degree below its intended mean.

3. In an explosive gas engine, the combination with the exhaust port valve, of a two-part lever for operating the valve to open its 125 port, and means for varying the angularity of the parts of said lever to each other,

means at one end of said lever for holding it in position to retain said valve in open position, a governor mechanism, a member operated by said governor mechanism to release
5 said lever to close the valve when the speed of the engine is reduced to a degree below its intended mean, a sparking device and means adjustable independently of the lever at the other end of said lever for operating said
10 sparking device.

4. In an explosive gas engine, the combination with the exhaust port and valve therefor, of a lever for operating the valve to open said port, a trip latch 32 for holding
15 said lever in position to retain said valve in open position, a governor mechanism, a pin operated by said governor mechanism, to release said trip latch to permit the valve to close when the speed of the engine is reduced
20 to a degree below its intended mean, and means whereby said trip latch can be shifted

toward or from a given path of the operative end of said pin.

5. In an explosive gas engine, the combination with the exhaust port valve, of a 25 lever for operating the valve to open the port, a trip latch for holding said lever in position to retain the valve in open position, a governor mechanism, carried on a shaft and driven by the engine, a sliding pin operated by said governor mechanism to release
30 said lever to close the valve when the speed of the engine is reduced to a degree below its intended mean, a sparking device also operated by said lever, and a cam device on 35 the shaft of the governor mechanism to actuate said lever.

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Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."