C. E. GREENLIEF.

ENGINE GEAR.

APPLICATION FILED MAR. 23, 1912.

1,051,837.

Patented Jan. 28, 1913.

2 SHEETS—SHEET 2.

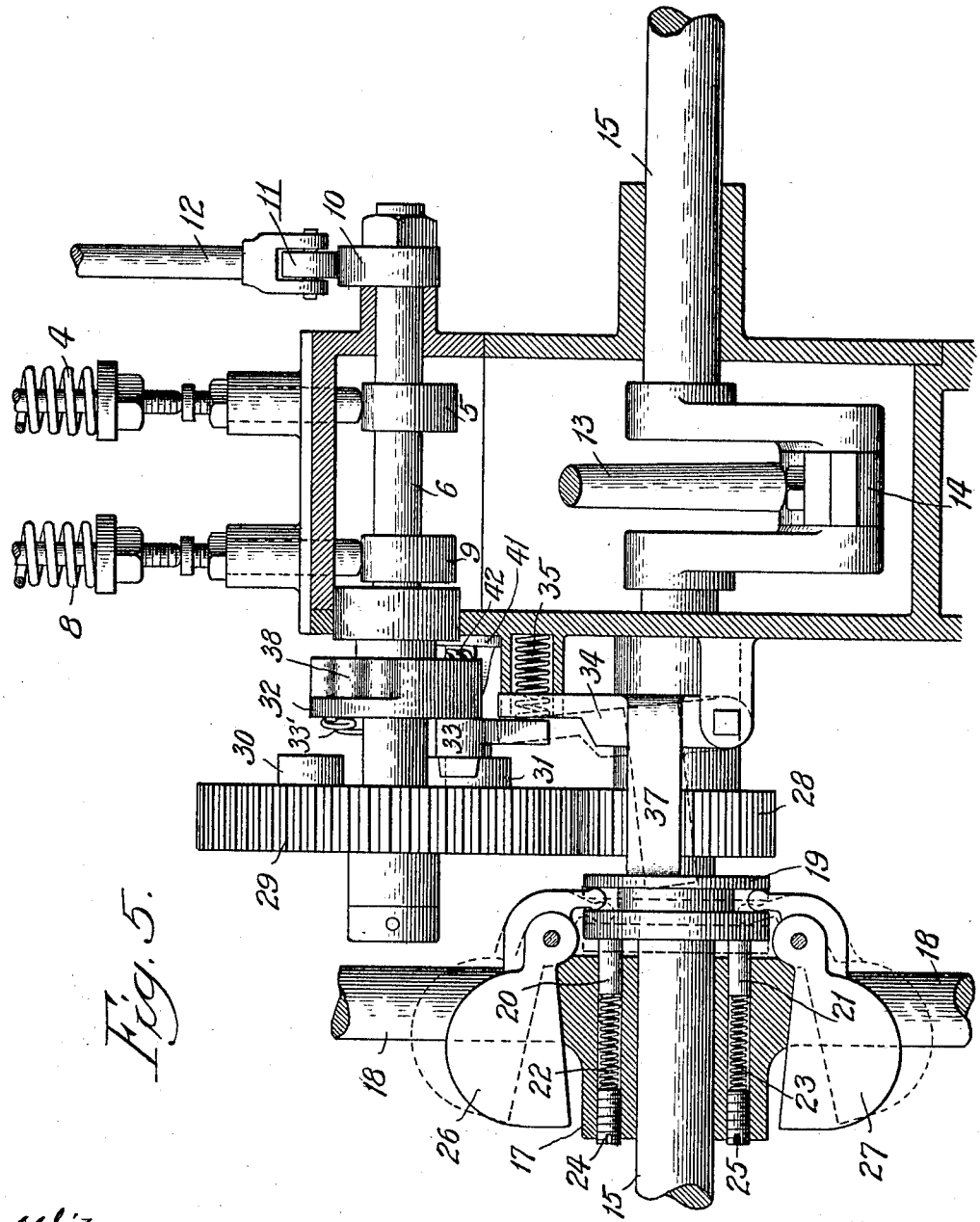

Fig. 5.

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2 SHEETS—SHEET 1.

Fig. 1.

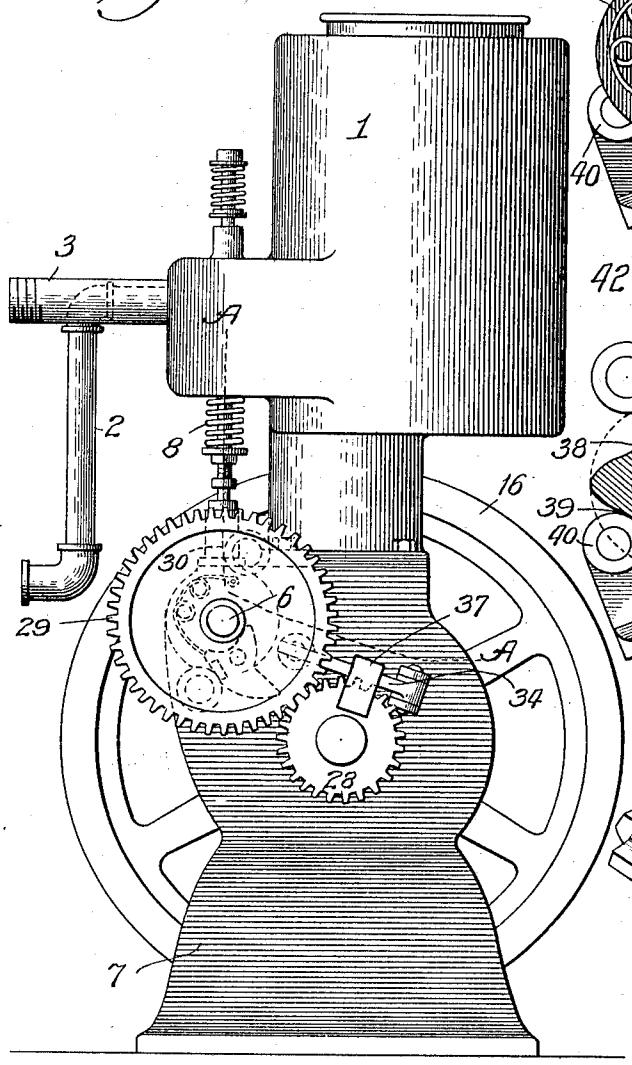


Fig. 2.

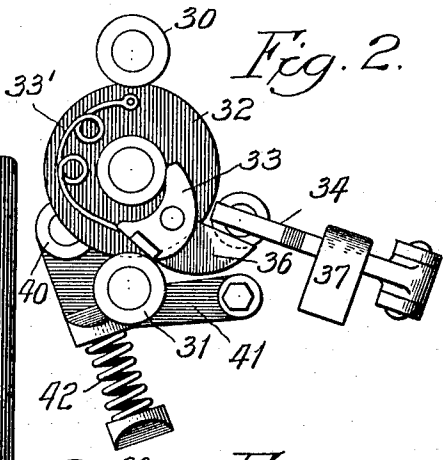


Fig. 3.

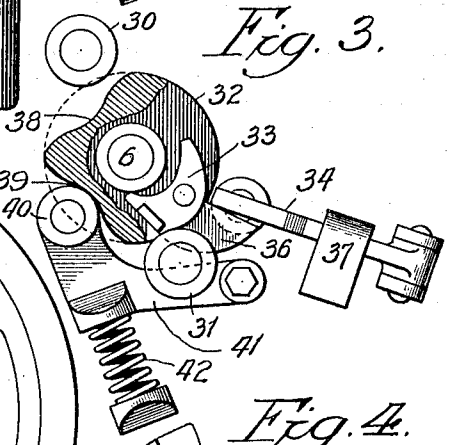
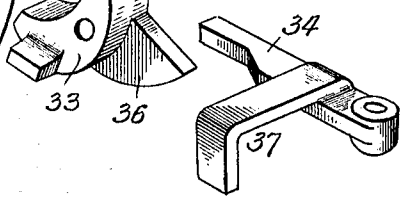


Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES E. GREENLIEF, OF NEWTON, IOWA, ASSIGNOR TO ONE MINUTE MANUFACTURING CO., OF NEWTON, IOWA, A CORPORATION OF IOWA.

ENGINE-GEAR.

1,051,837. Specification of Letters Patent. Patented Jan. 28, 1913.

Application filed March 23, 1912. Serial No. 685,749.

To all whom it may concern:

Be it known that I, CHARLES E. GREENLIEF, a citizen of the United States, residing at Newton, county of Jasper, and State of Iowa, have invented certain new and useful Improvements in Engine-Gears, of which the following is a specification.

It is the object of the present invention to provide an engine of the internal combustion type so equipped that automatic regulation of the speed of the engine may be attained by interrupting the supply of fuel to the engine after the speed has reached a predetermined value and, more particularly, by completely stopping the movement of the valve cam shaft so that the piston and its connected crank shaft and fly wheel can run free while the other movable parts of the engine remain stationary.

Other objects of my invention are pointed out more in detail hereinafter, and the details of my invention will be better understood from reference to the accompanying description taken in connection with the drawings forming a part of this specification, wherein:

Figure 1 is a side elevation of the engine with one of the fly wheels removed to expose part of the valve gearing, Figs. 2, 3 and 4 are details of the tripping dog, its coöperating roller disk, and the lever or "hook up" whereby the dog is tripped, and Fig. 5 is a transverse section along line A—A of Fig. 1 illustrating the geared relation between the crank shaft of the engine and the cam shaft for the valves.

In the construction shown, the engine comprises a water-cooled cylinder 1 having a fuel inlet or intake 2 and an outlet or exhaust port 3. The intake is controlled by a valve having a vertical spring pressed stem 4 which is periodically lifted by a cam 5 rigidly mounted on a cam shaft 6, which passes transversely through and has a bearing in the cast base 7 of the engine. The cam lifts the valve stem to open the intake, and the valve is subsequently closed through the action of its coiled spring. The exhaust passage 3 is controlled by a valve having a vertical stem 8 periodically lifted by a second cam 9 carried on the cam shaft 6. The positions and forms of cams 5 and 9 are arranged to open and close the intake and exhausts at the proper time intervals to produce efficient operation of the engine as a four cycle engine. The cam shaft 6 carries a third cam 10 located outside the casing of the engine and bearing against a roller 11 pivoted to a vertical push rod 12, whereby the sparking mechanism of the engine is timed and controlled. The details of this mechanism need not here be described.

The piston of the engine is connected through a suitable pitman 13 (Fig. 5) with a crank 14 which swings within the base 7 of the engine and serves to drive the main shaft 15. The main shaft 15 carries at each end a fly wheel, one of which, numbered 16, appears in Fig. 1, and the other of which has been broken away in Fig. 5 to disclose the hub 17 thereof and spokes 18. A governor is mounted on the main shaft adjacent to the fly wheel hub 17, this governor comprising a slotted collar 19 having lugs 20 and 21 fitted into sockets in hub 17 and normally pushed outwardly by coiled springs 22 and 23 seated in said hub and adjustable by means of projecting screw plugs 24 and 25. A pair of weights 26 and 27 are pivotally mounted on said hub 17, and each has a projecting tongue fitted within the groove of the collar 19 and adapted to shift that collar along the axis of the main shaft against the pressure of the coiled springs 22 and 23, when the engine speeds up and the governor weights swing outward under centrifugal action. This governor with its grooved collar, which moves nearer the fly wheel as the speed increases and is pushed toward the crank casing as the speed decreases, constitutes the control mechanism whereby driving connection between the main shaft and the cam shaft is established or interrupted in governing the supply of fuel to the engine.

The driving connections between the main shaft 15 and the cam shaft 6 include a pinion 28 keyed to the main shaft and meshing with a time gear 29, which is mounted on the cam shaft 6, but is not attached thereto. On the inner face of gear 29 are a pair of protruding rollers 30 and 31. Opposite said rollers is a disk 32 carrying a tripping dog 33. This dog is normally held outward by a suitable spring 31 in such position that one of the rollers 30 or 31 will engage with the dog and thereby establish a driving connection with the disk 32 and with the cam shaft 6, which is permanently and rigidly

connected with said disk. The establishment of such a connection will set the valves and the ignition cams into motion, controlling the supply of fuel to the engine and the combustion of that fuel in the usual manner. However, after the engine has reached a pre-determined speed, the exact value of which must depend upon the adjustment of the governor at the fly wheel, the dog 33 is unlatched, interrupting or breaking the connection between the cam shaft and its driving elements, thereby allowing the cam shaft to stop, but permitting other parts of the engine to run free. The unlatching, or "hook up" mechanism, whereby this interruption is insured includes an arm 34 pivoted to the crank casing and normally urged outward therefrom by a coiled spring 35, this arm, when moved outward by said spring, serving as a stop for the projecting finger 36 of the tripping dog, thereby swinging the other end of the dog inward, out of the path of the moving roller 31. The "hook up" device 34 has a lateral extension 37 which engages with the governor collar 19 and transmits the motion of the governor to other parts of the "hook up," for when the collar is drawn away from the extension 37 through outward movement of the governor weights 26 and 27, the spring 35 can push the "hook-up" device 34 upward into the path of the projecting finger 36, while an opposite movement of the collar 19 due to slowing down of the engine will force inward on the extension 37, thereby compressing spring 35 and unhooking the part 34 and thus releasing the tripping dog.

It will be understood that, when the engine is running above the predetermined or normal speed, the disconnection at the tripping dog will leave stationary the intake and exhaust valves, and also the ignition devices, so that there will be no wear on these parts. Furthermore, the engine, when "hooked up" has its cylinder in free communication with the air through the exhaust port, and the continued rotation of the main shaft will serve to pump air into and out of the cylinder, thereby cooling the walls and avoiding the development of heat which would occur if there were not this free communication between the cylinder and the outer air while the engine was "hooked up."

After each interruption in the rotation of the cam shaft 6 the speed of the engine will diminish until the grooved collar of the governor acting on the pivoted "hook up" will push the "hook up" beyond engagement with the tripping dog, so that the trip roller on the time gear will again engage the tripping dog, thus establishing a driving connection to the cam shaft and permitting another explosion or series of explosions until the speed is again raised to normal and the governor again acts. There is a special advantage in having two trip rollers 30 and 31 on the time gear to engage the tripping dog. With a four-cycle engine such as that above described, it is impossible for the engine to make more than a single revolution before an engagement of the tripping dog by one of the two trip rollers will cause another explosion. This insures a more even speed than could be obtained were there one trip roller, for in that case it would be possible for the engine to make two revolutions before an explosion occurred.

The disk 32 is cut away at 38 and 39 (Fig. 3) to form cam surfaces for engagement with the roller 40 mounted on a pivotal arm 41 supported by a coiled spring 42. The yielding engagement of roller 40 on the cam surfaces presents a certain impediment to free rotation of the disk 32 and its attached cam shaft 6 and insures quick stopping of the shaft after the dog 33 has been tripped to unlatch the engagement with one of the driving rollers 30 or 31.

Although I have herein shown in detail the specific embodiment of the present invention, it will be understood that various features may be modified without departing from the invention as defined by the appended claims.

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

1. In an internal combustion engine, the combination of control valves, a cam shaft for actuating said valves at properly timed intervals, a driving connection for said cam shaft, and governing means for breaking said driving connection when the speed of the engine is above a predetermined magnitude.

2. In an internal combustion engine, the combination of a main shaft, a cam shaft, intake and outlet valves controlled by said cam shaft, a driving connection between said shafts, and governing means for interrupting or breaking said connection when the speed of said engine exceeds a predetermined value.

3. In an internal combustion engine, the combination of a main shaft, a governor actuated thereby, a cam shaft, valves controlled in their movement by said cam shaft, a driving connection between said main shaft and said cam shaft, and hook up means actuated by said governor and positioned to break the driving connection to said cam shaft when the speed of said engine exceeds a predetermined magnitude.

4. In an internal combustion engine, the combination of a main shaft, a governor actuated thereby, control valves for the cylinder of said engine, actuating means for said valves, said means having a driving connection with said main shaft, and hook up means controlled by said governor and

positioned to break the driving connection to said valves when the speed of said engine exceeds a predetermined value.

5. In an internal combustion engine, the combination of a cylinder, intake and outlet valves for said cylinder, a piston for said cylinder, a main shaft driven through said piston, a governor actuated by said main shaft, a cam shaft operatively positioned for controlling said valves, a driving connection between said main shaft and said cam shaft, said connection including a tripping dog, and hook up means controlled by said governor and positioned to break said driving connection by tripping said dog when the said engine reaches a predetermined speed.

In witness whereof, I hereunto subscribe my name to this specification in the presence of two witnesses.

CHARLES E. GREENLIEF.

Witnesses:
F. H. BERGMAN,
GEORGE CLARK.