No. 859,415. PATENTED JULY 9, 1907.

J. P. & D. C. STOVER.

MEANS FOR GOVERNING INTERNAL COMBUSTION ENGINES.

APPLICATION FILED NOV. 10, 1905.

2 SHEETS—SHEET 1.

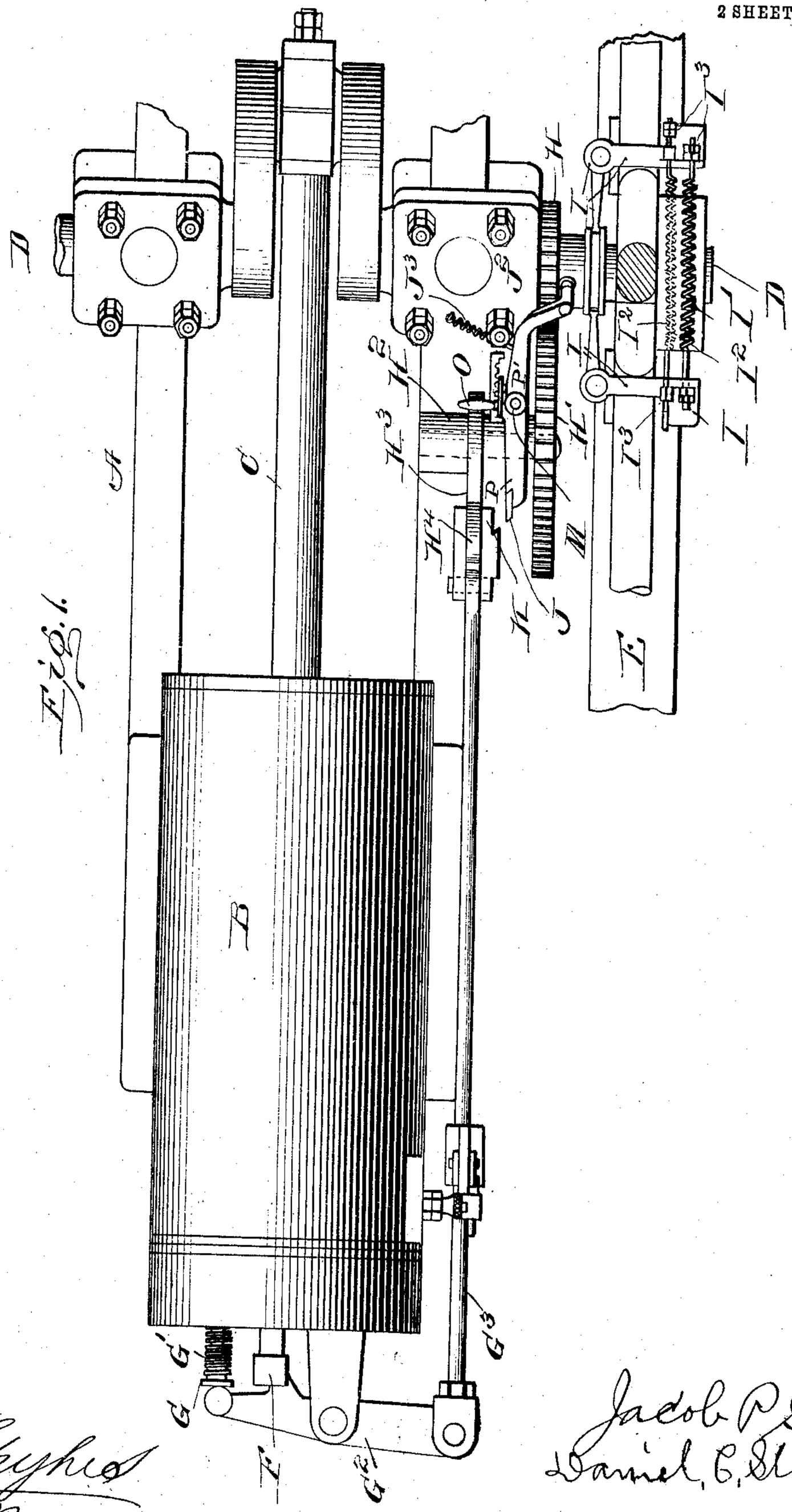

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

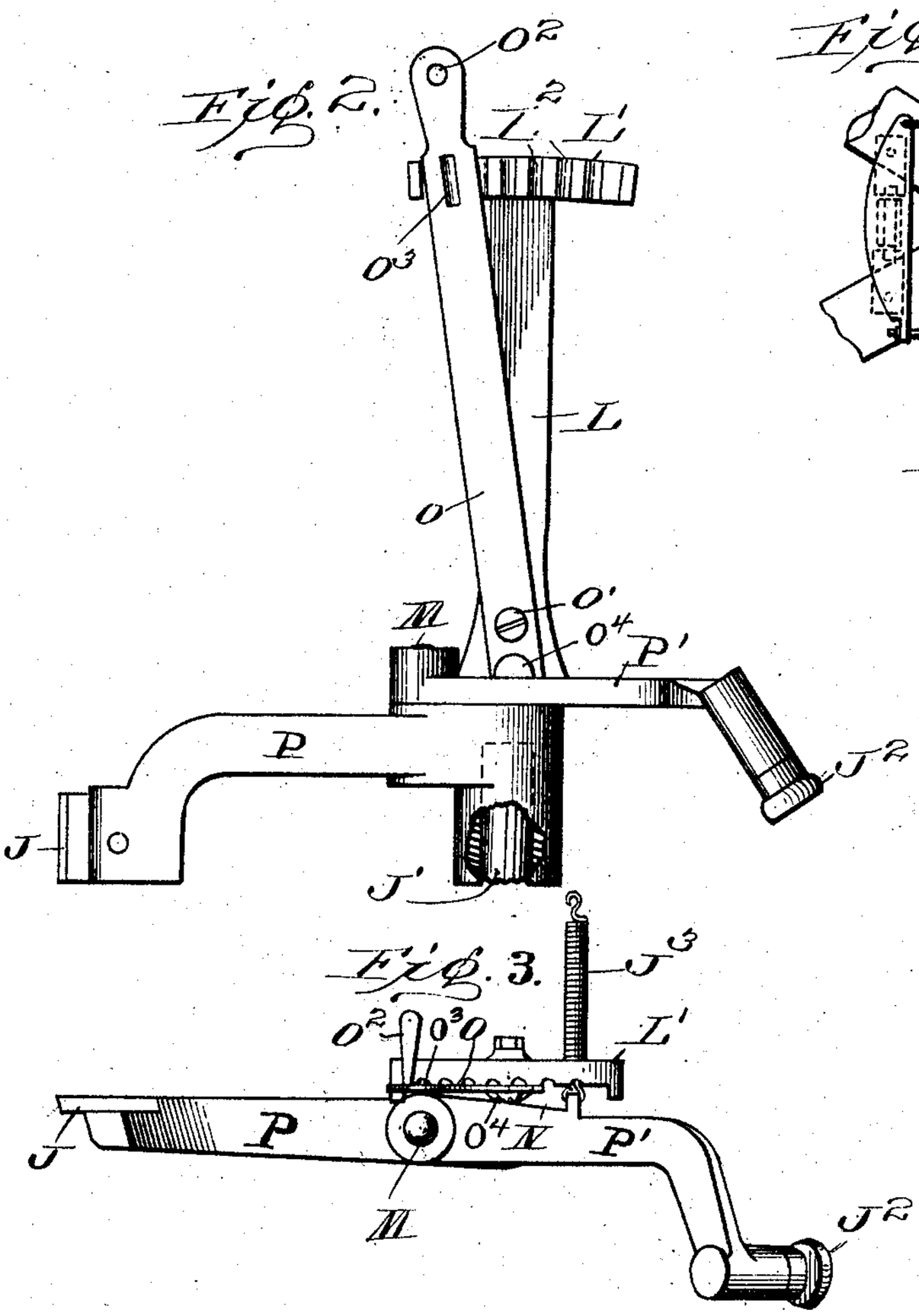


Fig. 3.

Fig. 4.

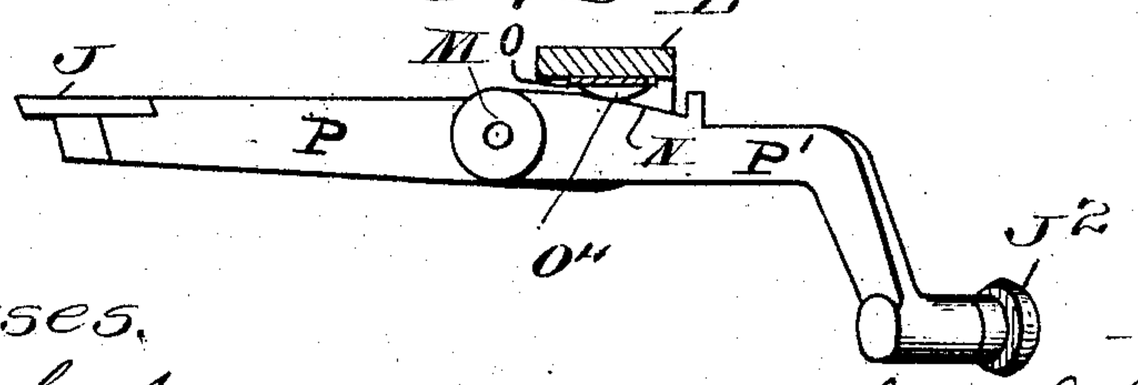


Fig. 6

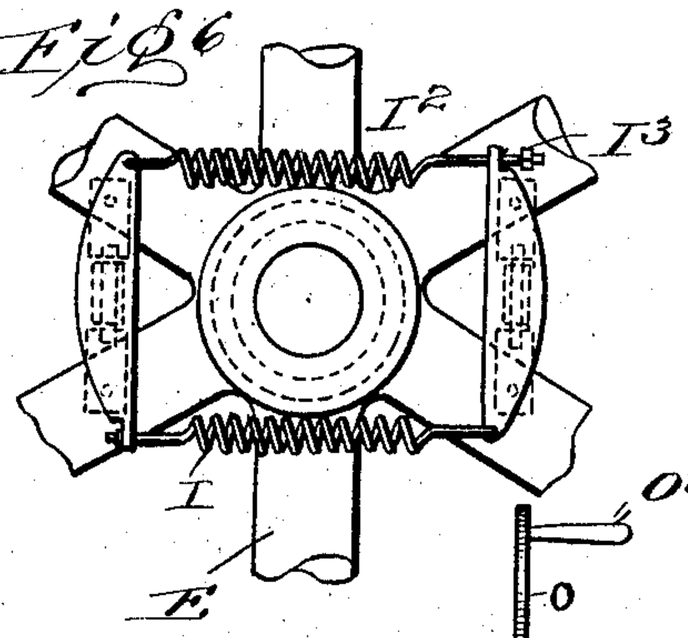
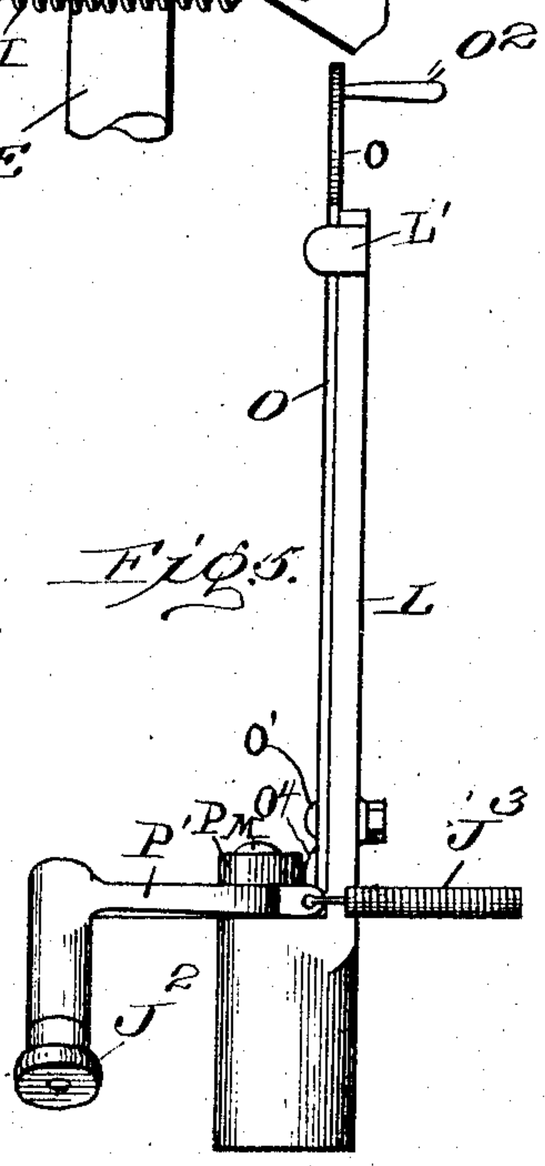


Fig. 5.



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L. Hughes
L. Madden

Inventors
Jacob P. Stover
David C. Stover

UNITED STATES PATENT OFFICE.

JACOB P. STOVER AND DANIEL C. STOVER, OF FREEPORT, ILLINOIS, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO STOVER ENGINE WORKS, OF FREEPORT, ILLINOIS, A CORPORATION OF ILLINOIS.

MEANS FOR GOVERNING INTERNAL-COMBUSTION ENGINES.

No. 859,415. Specification of Letters Patent. Patented July 9, 1907.

Application filed November 10, 1905. Serial No. 286,771.

To all whom it may concern:

Be it known that we, JACOB P. STOVER and DANIEL C. STOVER, citizens of the United States, residing at Freeport, in the county of Stephenson and State of Illinois, have invented new and useful Improvements in Means for Governing Internal-Combustion Engines, of which the following is a specification.

This invention relates to governing internal combustion engines, the general object being the usual one of securing approximately uniform speed. To this end I provide a centrifugal governor having devices whereby extra resistance to the outward movement of the governor arms is introduced as the speed rises, and further add to devices for automatically holding the exhaust valve open so long as the speed exceeds a predetermined limit, means for at will varying that limit while the engine is in action.

In the accompanying drawings, Figure 1 is a plan view of an engine provided with my devices parts being broken away. Fig. 2 is an enlarged plan view of a detent device seen in Fig. 1. Fig. 3 is a side elevation of the devices shown in Fig. 2. Fig. 4 is a plan view similar to Fig. 3 but with parts broken away. Fig. 5 is a view of the devices of Figs. 2, 3, 4, shown as seen from the right in Fig. 2. Fig. 6 is a front elevation of a portion of a fly wheel provided with a centrifugal governor.

In these drawings, A represents an engine bed, B the engine cylinder, C the piston rod, D the crank shaft, E a fly wheel thereon, F an admission valve, G an exhaust valve normally closed by a spring G^1 and opened at proper times by a centrally pivoted lever G^2 actuated by a rod G^3. The rod is itself operated from the crank shaft D by means of a gear H upon the latter and engaging a gear H^1 supported on the bed A and bearing upon its sleeve hub H^2 a cam H^3 against which a roller, H^4, mounted at the end of the rod G^3 is normally pressed by the valve spring G^1 before mentioned. The gear H is splined upon the shaft D and is moved outward upon the shaft, when the engine runs rapidly, by means of the weighted bell-crank levers I I pivoted upon the fly wheel E. The weighted arms of these levers are connected by a spring I^1 which yieldingly resists their separation. All the parts thus far described are without novelty herein claimed.

The arms I I are further connected by a second spring I^2 so arranged that it normally offers no resistance to separation of the arms, but when the arms separate sufficiently this spring adds its resistance to that of the spring I^1. As shown, this end is attained by arranging the spring to slide at one end in a bearing in the corresponding arm while it is made fast to the other, and placing upon the sliding end lock-nuts I^3 normally at some distance outside the bearing so that the arm may swing through a small angle before it meets the lock-nuts.

As the speed of the engine increases and the action of the governor, or the levers and springs just described, draw the gear outward, the latter continues to engage the gear H^1 and to operate the valves with synchronously increasing frequency.

To limit the speed, a detent J is arranged to engage a catch K upon the rod G^3 whenever the speed is unduly increased and disengage it when the speed falls, thereby preventing the rod from returning from the outermost position to which it is pushed by its cam H^3, and thus holding the valve open during engagement of the detent.

The detent J is borne by the free end of one arm P of a jointed lever the other arm, P′ of which carries a roller J^2 at its free end. The arm first mentioned swings upon a vertical pivot at J′ and the other arm overlaps the first and is hinged or pivoted thereto at a point M, between the detent and the pivotal point J′, to swing in a horizontal plane. From the rear side of the pivoted end of the arm P rises a rigid arm L bearing at its upper end an arc L′ provided with lateral notches L^2. A spring bar O is pivoted at O′ to the face of the arm L, to swing over the lateral notched face of the arc, and for convenience it is provided with a handle O^2. It is also provided with a rounded or V-shaped projection O^3 to engage the notches of the arc, and such engagement is yieldingly maintained by the resilience of the bar itself. The rear edge of the arm P′ has an incline N (Fig. 4), and this is normally held against the lower end of the bar O or a projection O^4 thereon, by a spring J^3 connecting the arm to a rigid portion of the engine structure. The roller J^2 is normally held against the face of the gear H, or in the gear's path, and at the same time against the lower end of the bar O, by the spring J^3, and necessarily the detent is at the same time held out of engagement as in Fig. 1. When the speed unduly rises, the gear advances on its shaft and meeting the roller J^2 swings the jointed lever about the pivotal axis at J′, causing the detent to engage, the movement of the lever being practically the same as if the lever were not jointed. When the speed falls and the gear moves back to normal position, the spring swings the jointed lever back to its initial position, disengaging the detent.

If at any time the spring bar be so swung as to move its lower end along the incline N toward the pivot or hinge M, it presses the arm P′ and the pivot M from

the member L, and since the arm P is free to swing about its pivot J′ while the spring J³ strongly resists movement of the arm P′ and at the same time maintains contact of the roller J² with the gear, the force exerted upon the pivot M swings the arm P upon the pivot J′ and carries the detent J farther from its point of engagement, thus giving the governor-controlled gear a greater distance to travel before it can cause such engagement by swinging the whole lever. In other words, the movement of the bar O along the arc L′ instantly varies the speed limit of the engine; and obviously the bar may be thus moved whether or not the engine is in action.

It is evident that the construction may be varied without passing the limits of my invention and I do not therefore wish to limit my claims to the forms set forth.

What I claim is:

1. The combination with an engine cylinder, and its exhaust valve, of a sliding rod arranged to hold the valve open while it is at one limit of its movement, a centrally pivoted detent lever adapted to engage said rod and retain it in position to hold said valve open, a centrifugal governor arranged to swing said detent lever into engagement as the speed increases, and means for at will varying the angle which the oppositely extending arms of said lever make with each other, to vary the time of such engagement.

2. The combination with an engine cylinder, its exhaust valve, and a sliding valve-actuating rod, of a centrally pivoted detent lever in position for swinging into and out of engagement with said rod to retain it in position for holding the valve open, said lever having two arms, one hinged to the other to turn in one direction out of its normal relative position, a spring resisting both such turning and the swinging of the lever upon its pivot, and a governor arranged to swing the lever in opposition to the spring as the speed of the engine increases.

3. The combination with the engine cylinder, piston, crank shaft, exhaust valve, and a sliding rod for opening the valve, of a jointed centrally pivoted detent lever, a governor arranged to swing the detent toward position for engaging said rod, as the speed increases, means for at will varying the angle made by the two jointed parts of the detent lever with each other to vary the time of the detent's engagement, and a spring tending to return the detent and its parts to normal positions.

4. The combination with an engine cylinder, piston, and crank shaft; of a governor having centrifugally actuated arms, a spring resisting separation of the arms, a second, normally inactive, spring arranged to resist further separation of the arms after they reach a certain angle, an exhaust valve, a sliding rod for opening the valve, a governor operated detent for engaging the rod and retaining it in position to hold the valve open, and means for at will varying the distance through which the governor swings the detent before its engagement.

5. The combination with an engine cylinder, its exhaust valve, and a sliding rod to open the valve, a jointed centrally pivoted detent arm to engage said rod and retain it in position for holding the valve open, a rigid arm projecting from said detent arm and bearing an arc, a spring bar pivoted to said arm and adapted to swing over said arc and engage it at any of many points, a second detent arm pivoted to the first and arranged to be turned upon its pivot by the movement of said spring bar, a spring resisting the movement of either detent arm, and a governor arranged to swing the compound detent bar toward engaging position as the speed of the engine increases.

In testimony whereof we affix our signature, in presence of two subscribing witnesses.

JACOB P. STOVER.
DANIEL C. STOVER.

Witnesses:
L. HUGHES,
L. MADDEN.