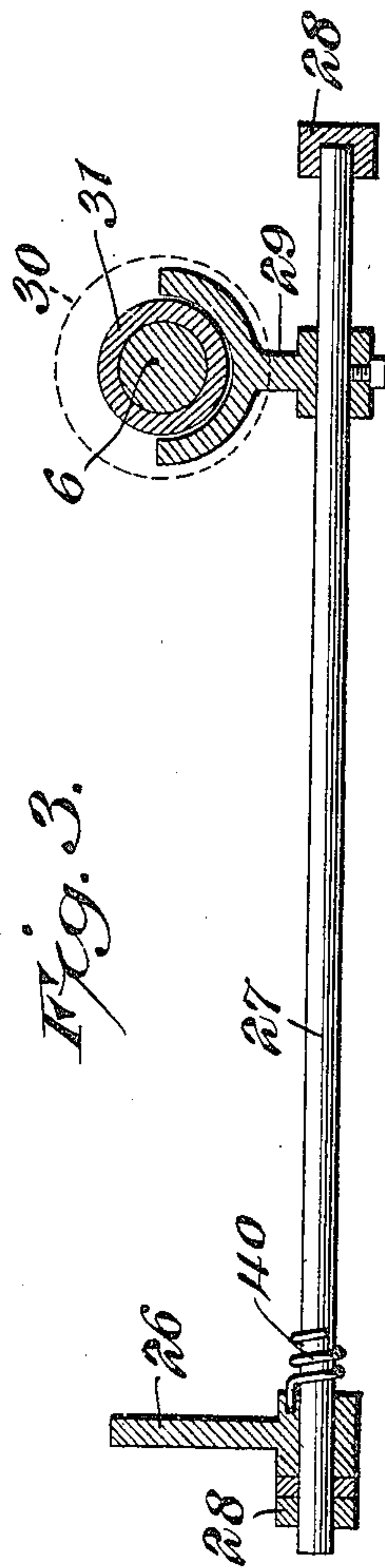


994,206.

Patented June 6, 1911.

2 SHEETS—SHEET 1.



Witnesses
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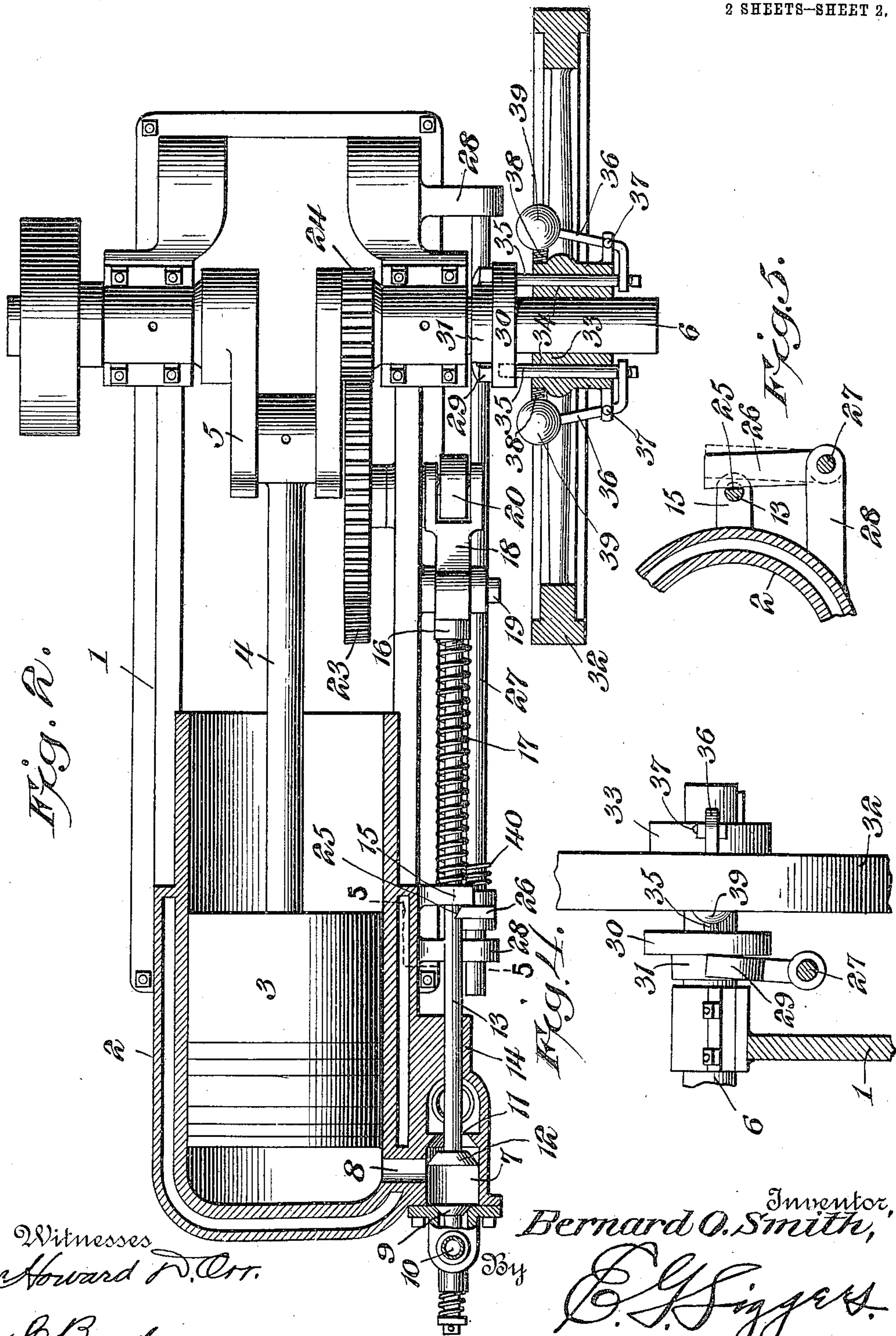
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GOVERNOR FOR EXPLOSIVE ENGINES.
APPLICATION FILED AUG. 9, 1909. RENEWED JAN. 23, 1911.

994,206.

Patented June 6, 1911.

2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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GOVERNOR FOR EXPLOSIVE-ENGINES.

994,206.

Specification of Letters Patent.

Patented June 6, 1911.

Application filed August 9, 1909, Serial No. 511,988. Renewed January 23, 1911. Serial No. 604,238.

To all whom it may concern:

Be it known that I, BERNARD O. SMITH, a citizen of the United States, residing at Stanley, in the county of Buchanan and State of Iowa, have invented a new and useful Governor for Explosive-Engines, of which the following is a specification.

This invention relates to a speed governor for internal combustion engines, and relates more particularly to a governing mechanism of the hit and miss type.

The invention has for one of its objects to improve and simplify the construction and operation of devices of this character so as to be comparatively simple and inexpensive to manufacture, and reliable and efficient in use.

Another object of the invention is the employment of a novel arrangement of devices whereby the exhaust valve will be held open through the medium of a speed responsive device when the speed exceeds a certain limit.

With these objects in view and others, as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawings, which illustrate one embodiment of the invention, Figure 1 is a side elevation of an engine constructed in accordance with the invention, a portion of the fly wheel being broken away. Fig. 2 is a horizontal longitudinal section of the engine. Fig. 3 is a longitudinal section of the governor-actuated device for holding the exhaust valve open. Fig. 4 is a detail view of the governor. Fig. 5 is a sectional view on line 5—5, Fig. 2.

Similar reference characters are employed to designate corresponding parts throughout the views.

Referring to the drawings, 1 designates the bed of the engine which supports a horizontally-disposed cylinder 2, in which reciprocates a piston 3 of the trunk type connected by a rod 4 with a crank 5 of the

horizontal shaft 6. The cylinder has a valve chamber 7 at one side that communicates with a combustion chamber through the port 8, and the fuel charge is admitted through an inlet valve 9 that controls the charge, the charge being drawn from a carbureter or other suitable mixing device connected with the pipe 10. The spent gases are discharged through an exhaust port 11 controlled by the valve 12, the stem 13 of which extends toward the engine shaft and is guided in bearings 14 and 15. The outer end of the stem has a head 16 which may be adjustable, and between this head and bearing 15 is a spring 17 for closing the valve. The stem is actuated by a bell crank lever 18 fulcrumed on a stud 19 extending from one side of the engine bed, and this lever has a horizontal arm carrying a roller 20 which rides on a cam 21 fixed to the secondary shaft 22 of the engine. This shaft is rotated by a gear wheel 23 on the inner end and meshing with a pinion 24 or gear teeth on the shaft 6. Thus, during every fourth stroke of the piston, the exhaust valve will be opened by the bell crank lever which is tilted by the high part of the cam 21. When the valve opens, the spring 17 is compressed and operates to seal the valve when the cam moves out of engagement with the roller of the bell crank lever.

The governing device herein disclosed is designed to hold the exhaust valve in open position when the speed becomes abnormally high. For this purpose, the valve stem is provided with a notch or recess at a point between the bearings 14 and 15 and into which engages a swinging arm or rocker 26 mounted on a rock shaft 27 extending parallel with the valve stem and journaled in bearings 28 on the engine bed. The rear end of the rock shaft 27 carries an upwardly-extending fork 29 which engages behind the annular flange 30 of a collar 31 slidable on the engine shaft 6. On the projecting end of the shaft 6 is a fly wheel 32, the hub 33 of which has diametrically-disposed passages 34 parallel with the axis of rotation and in which are slidable

rods or pins 35 that have their inner ends connected with the collar 31 and their outer ends connected with the ball-carrying arms 36 of the governor, which arms are fulcrumed at 37 on the fly wheel, there being suitably arranged springs 38 for opposing the centrifugal action of the weights or balls 39 carried by the arms.

During the normal speed of the engine, the locking arm 26 is held retracted from the exhaust stem 13, either by the governor springs 38 or other suitably arranged springs, and when the speed begins to rise, as when the load on the engine is lightened, the balls 39 of the governor move outwardly with the result that the collar 30 is shifted laterally by the arms and pins between the balls and the collar. This movement of the collar is transmitted by the fork 29 to the shaft 27 which is rocked in a direction to throw the arm or device 26 toward the valve stem 13, to thus engage in the recess 25 of the latter. This recess is so positioned that when the device 26 engages therein, the exhaust valve 12 will be held off its seat, as shown in Fig. 2, to permit the charge in the cylinder to be forced out of the engine through the exhaust port on the normal compression stroke of the piston. The result of this is that instead of an impulse on the succeeding stroke, the piston will recede without power being imparted thereto. The speed, therefore, decreases and the governor balls tend to return to their normal position, which releases the device 26 from the valve stem and allows the exhaust valve to close. The normal cycle of operation in the engine is thus restored until the speed again accelerates. A torsion spring 40 may be arranged on the rock shaft with its ends connected with the latter and the arm 26 to yieldingly hold the latter in engaging position. When the arm 26 is engaged in the recess 25 and the speed still accelerates, the governor balls will be free to have a further movement without placing strain on the member 26 or valve stem, since the rock shaft will have a limited rocking movement independently of the member 26, provided by the spring connection 40 between such member and rock shaft 27.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely illustrative and that such changes may be made when desired as are within the scope of the claims appended hereto.

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

1. In an explosive engine, the combination of a cylinder, a piston therein, a crank shaft connected with the piston, an exhaust valve, a stem connected therewith, a mechanism between the crank shaft and stem for operating the valve, a rock shaft disposed transversely to the crank shaft and extending from the latter to the cylinder, a speed responsive device connected with the crank shaft, and separate members on the rock shaft, one member being directly connected with the speed responsive device and the other member being arranged to directly engage the valve stem for holding the valve open upon excessive speed of the crank shaft.

2. In an explosive engine, the combination of a cylinder, a piston therein, a crank shaft connected with the piston, an exhaust valve, a stem connected with the valve and provided with a notch in its side, a spring connected with the stem for closing the valve, means operated from the crank shaft for moving the stem to open the valve, a rock shaft extending transversely to the crank shaft, a speed responsive device including a grooved collar, a crotched arm secured radially to one end of the rock shaft and engaging the grooved collar, and a radial locking arm on the opposite end of the rock shaft arranged to engage the notch in the side of the stem to hold the valve open when the speed becomes excessive.

3. In an explosive engine, the combination of a cylinder, a piston therein, a crank shaft connected with the piston, a speed-responsive device connected with the shaft, a shouldered collar on the shaft operatively connected with the device, a rock-shaft disposed transversely to the crank shaft, a fork on the rock-shaft spanning the collar and engaging the flange thereof to actuate the rock-shaft, an exhaust port for the cylinder, a valve controlling the port, a stem connected with the valve and extending adjacent the rock-shaft, means for actuating the stem, and a member yieldingly mounted on the rock-shaft to engage the stem for holding the valve open when the speed-responsive device is actuated.

4. In an explosive engine, the combination of a cylinder, a piston therein, a crank shaft connected with the piston, an exhaust valve in the cylinder, a stem connected with said valve, a mechanism between the crank shaft and stem for operating the valve, a rock shaft disposed transversely to the crank shaft and extending from the latter to the cylinder, a speed responsive device connected with the crank shaft, separate outstanding members at the ends of the rock shaft, one member being directly connected

with the speed responsive device and the
other member being arranged to directly en-
gage the valve stem for holding the valve
open upon excessive speed of the crank shaft,
5 and a yieldable connection between the rock
shaft and the said member.

In testimony, that I claim the foregoing

as my own, I have hereto affixed my signa-
ture in the presence of two witnesses.

BERNARD O. SMITH.

Witnesses:

H. A. BURDICK,

F. M. IRVINE.

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