

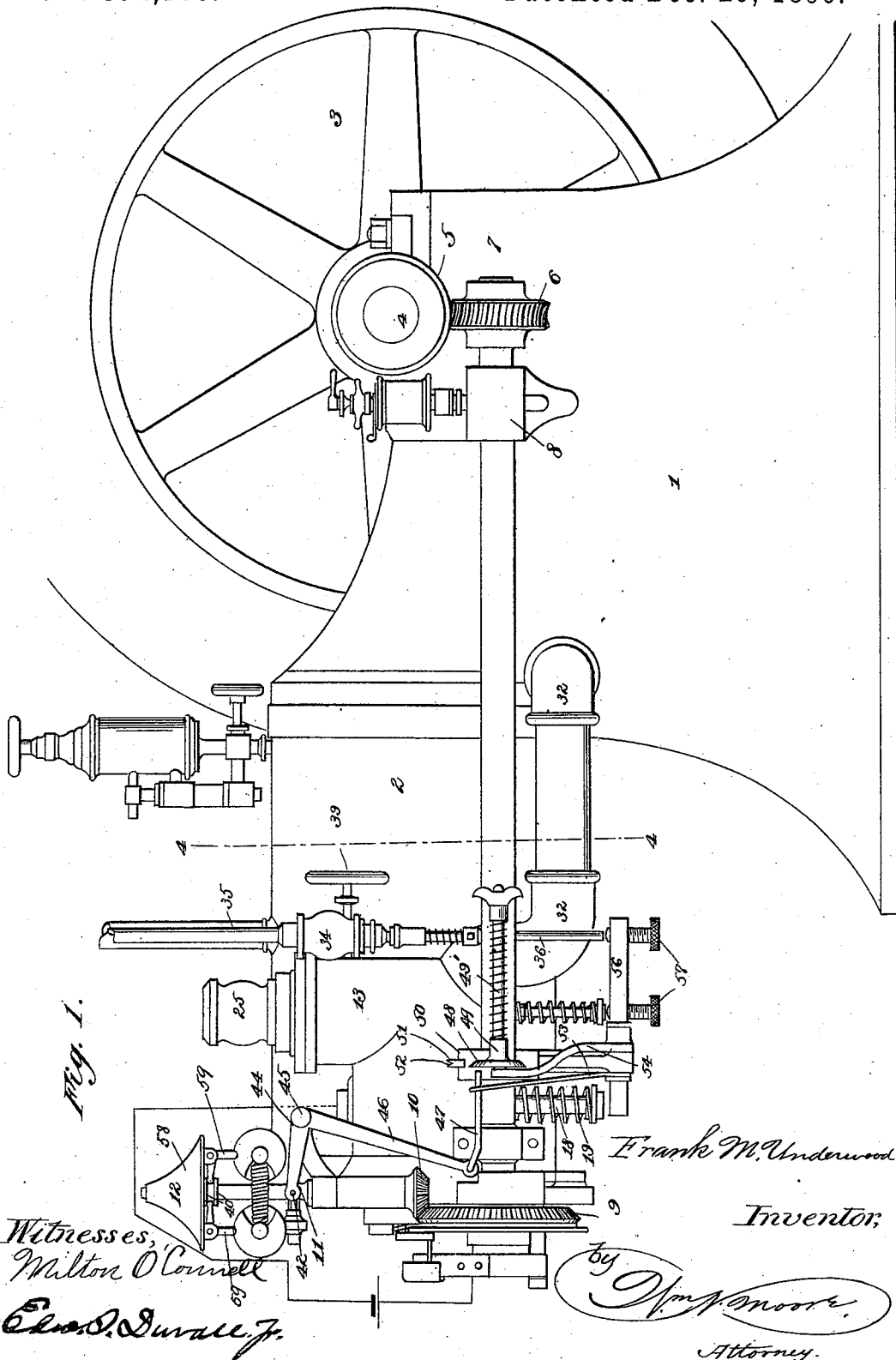
(No Model.)

5 Sheets—Sheet 1.

F. M. UNDERWOOD.
MIXER FOR GAS ENGINES.

No. 574,183.

Patented Dec. 29, 1896.



Witnesses,
Milton O'Connell
Chas. D. Durall Jr.

Frank M. Underwood

Inventor;

by *Wm. F. Moore.*
Attorney.

(No Model.)

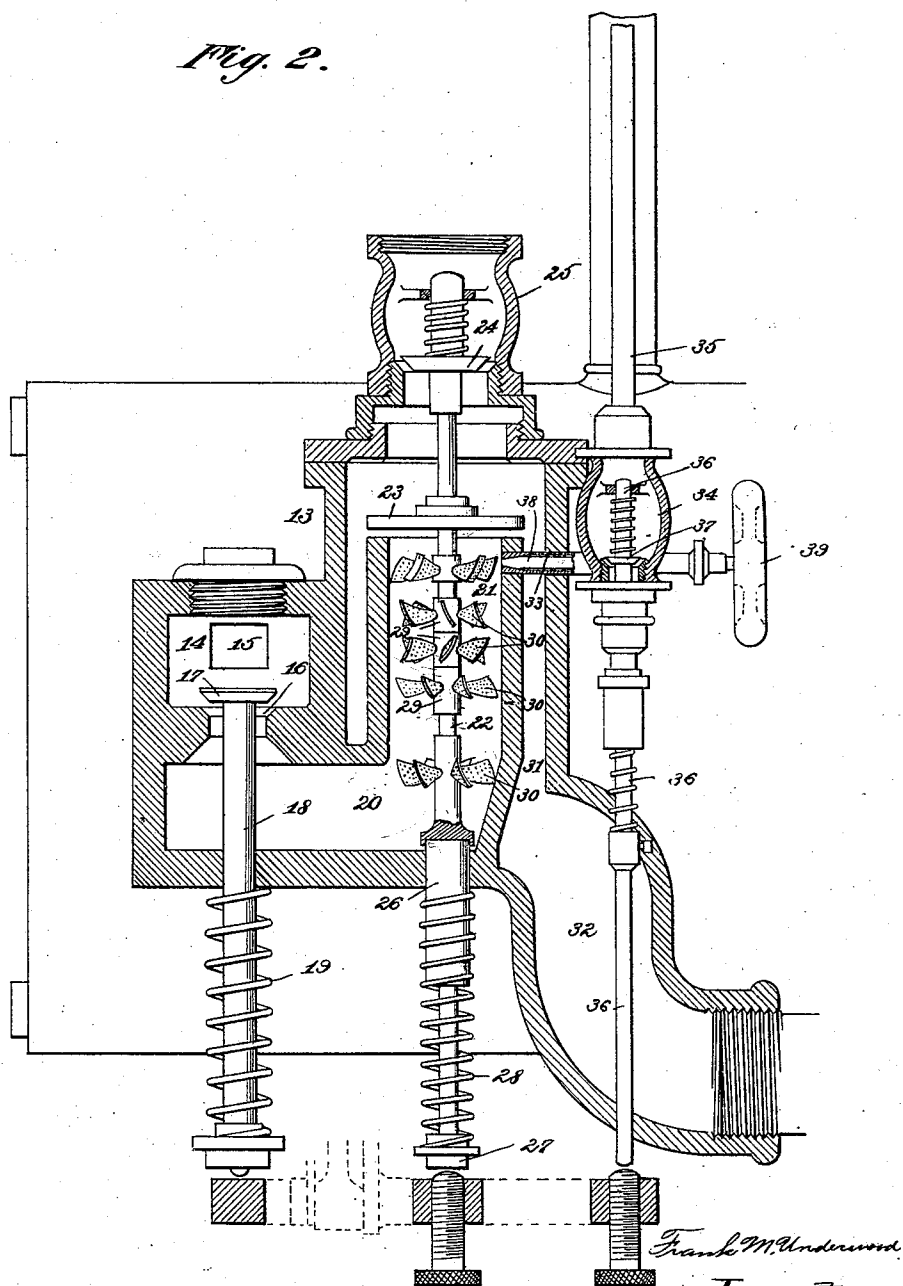
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Fig. 2.



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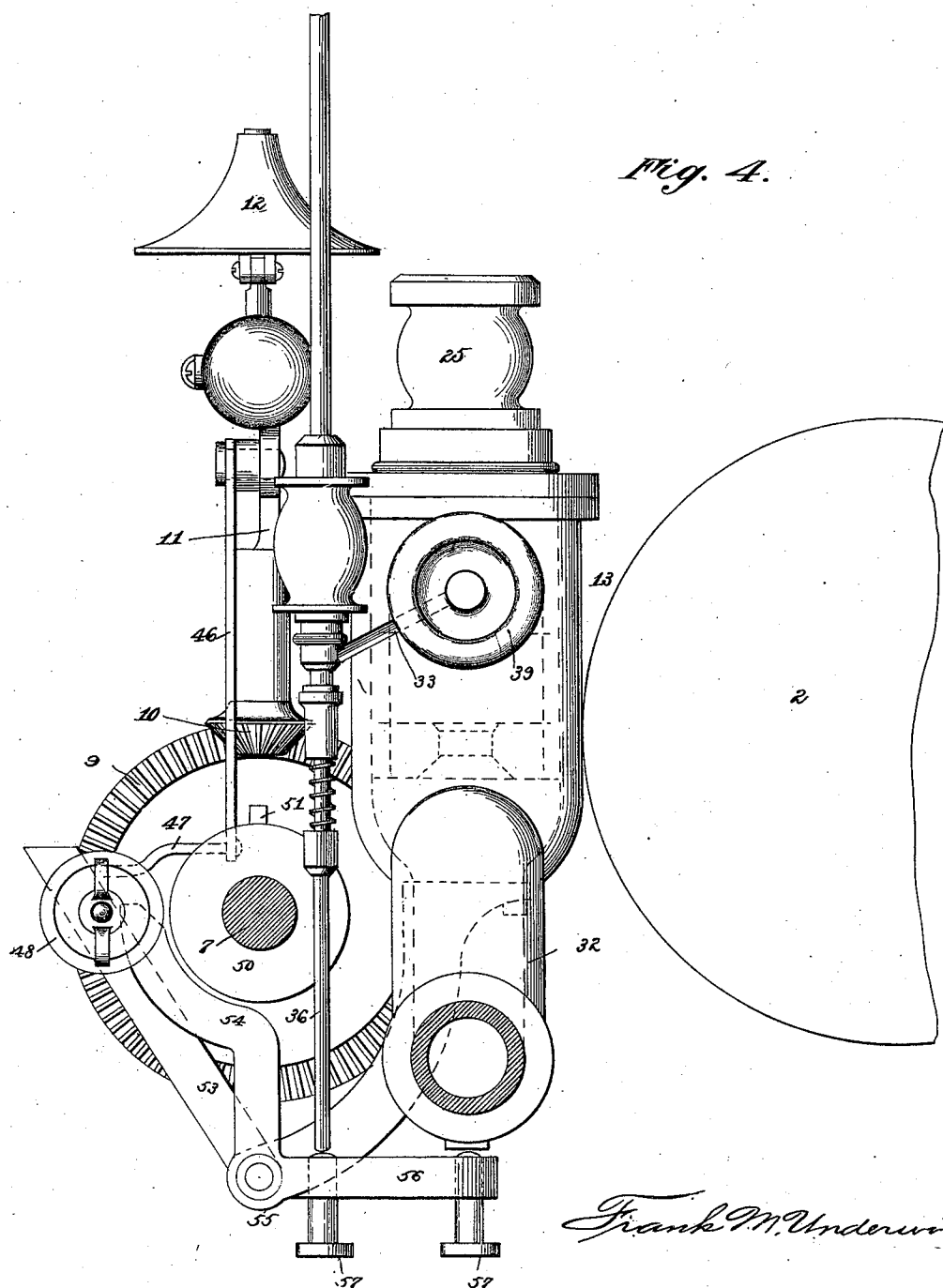


Fig. 4.

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(No Model.)

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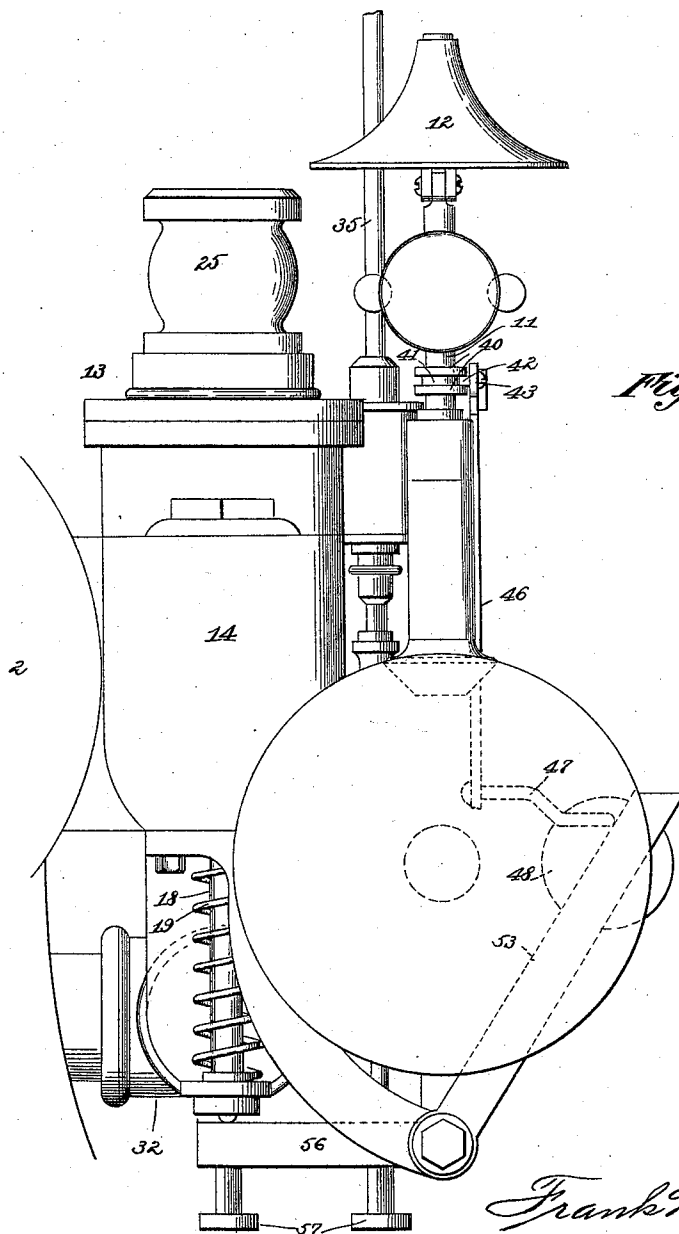


Fig. 5.

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By O. J. Moore,
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UNITED STATES PATENT OFFICE.

FRANK M. UNDERWOOD, OF UPPER SANDUSKY, OHIO.

MIXER FOR GAS-ENGINES.

SPECIFICATION forming part of Letters Patent No. 574,183, dated December 29, 1896.

Application filed March 14, 1895. Serial No. 541,704. (No model.)

To all whom it may concern:

Be it known that I, FRANK M. UNDERWOOD, a citizen of the United States, residing at Upper Sandusky, in the county of Wyandot and State of Ohio, have invented certain new and useful Improvements in Mixers for Gas-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in gas and gasolene engines, and has special reference to a mixer for gas and gasolene engines, the main object being the provision of a mixer of extremely simple and inexpensive construction which will thoroughly mix or commingle the air and gas or gasolene before it enters the cylinder and insure the explosion of the charge in the cylinder at the proper time.

Another object of my invention is the provision of a mixer which can be applied to any gas or gasolene engine at a comparatively low price, which can be very readily and easily repaired in case of breakage, which will be entirely under the control of the governor and will accommodate itself to the varying speed of the engine, and which will be thoroughly efficient and practical.

To attain the desired objects, the invention consists of a mixer embodying novel features of construction and combination of parts for service, substantially as disclosed herein.

Figure 1 represents a side elevation of a gas or gasolene engine equipped or provided with my improved mixer. Fig. 2 represents a sectional view through the mixer proper. Fig. 3 represents an enlarged plan view of the mixing apparatus; and Figs. 4 and 5 represent side elevations, or rather end elevations, of the mixer, taken from opposite sides or ends of the same.

Referring by numerals to the drawings, in which similar numerals of reference denote corresponding parts in the several views, the numeral 1 designates the bed or frame of the engine.

2 designates the cylinder.

3 designates the fly-wheel mounted on the shaft 4, carrying the gear 5, meshing with the worm-wheel 6, secured to one end of the longi-

tudinal shaft 7, mounted in bearings 8, and carrying at its other end the beveled gear 9, meshing with the bevel-pinion 10, secured to the lower end of the governor-shaft 11, carrying the governor mechanism 12, parts of which governor mechanism will be hereinafter described. From this construction it will be seen that the rotation of the fly or balance wheel imparts motion to the longitudinal shaft which carries the large beveled gear-wheel, and this in turn transmits its rotation to the governor-shaft, and thence the governor is operated.

Secured to one side of the cylinder is the mixing-chamber 13, having the compartment 14, provided with a port 15, which enters the cylinder, and this compartment is provided with a valve-seat 16, in which is arranged a valve 17, having its stem 18 extending downward and having a returning-spring 19 surrounding the same. Communicating with said compartment, by means of the channel 20, is the mixing, generating, or carbureting chamber 21. In this chamber is mounted the shaft 22, carrying the valve 23, and above this the spring-actuated valve 24, arranged in the casing 25. To the lower part of the shaft is connected the sleeve 26 and the head 27, and around said lower end is placed the coil-spring 28, which bears against the casing at one end and against the head at the other end, and serves to restore the shaft with its valve to the normal position. On said shaft are loosely mounted the sleeves or rings 29, each carrying a series of fans or paddles 30, and communicating with this generating-chamber, by means of the channel 31, is the air-supply pipe 32, which preferably leads from under the bed of the engine. Communicating with the said generating-chamber, near the top thereof and at one side, is the gas or gasolene injecting pipe 33, which leads from the supply-chamber 34, having the supply or feed 35. In this chamber is mounted the spring-actuated valve-stem 36, carrying the valve 37, and the lower end of said stem projects down about the same distance as the stems or shafts of the other valves, as most clearly seen in Figs. 1 and 2. To regulate the supply of gas or gasolene to the carbureting-chamber, I place in the injecting-pipe the adjustable needle-valve 38, having the hand-

wheel 39. From this construction it will be understood that the valves are retained in a normally-closed position by means of the coil-springs which surround the stem of each, but that when said valves are opened air immediately passes from the air-supply pipe into the carbureting or generating chamber at the top thereof. Gas or gasoline is also admitted simultaneously to the generating or carbureting chamber through the gas-injecting pipe and the gas or gasoline and air meet and are subjected to the action of the fans, which it will be understood have a vertical or sliding movement and also a rotary movement, the endwise movement being given to the fans by the lifting and falling motions of the valve-stem 22 and the rotary motion being given to the fans by the inflowing current of air when the valve 23 is opened. The fans by reason of this action thoroughly mix or commingle the air and gas or gasoline which leave the generating-chamber and pass into the cylinder through the port thereof, and the explosion occurs within the cylinder.

The valves are all operated simultaneously from the governor by means of novel and peculiar devices, which I will now proceed to describe.

The governor-shaft is provided at its upper end with a head 58, having on its lower side pairs of lugs. Between these lugs are fitted the levers 59, which have balls or weights at the outer ends of the long arms thereof. On the vertical governor-shaft is fitted a sleeve 40, which is keyed to the shaft so as to rotate therewith, but which sleeve is capable of an endwise or sliding movement on the governor-shaft. To the upper grooved end of this sleeve 40 are loosely connected the short arms of the levers 59, and to the lower grooved end of this sleeve is fitted the stud 42 on the horizontal arm of the bell-crank shipping-lever 44, which is fulcrumed upon an arm 45, rigidly secured to the engine, while the vertical arm 46 of said shipping-lever is connected at its lower end to a horizontal tappet-rod 47, the free end of which is guided in a vertical bar and is adapted to impinge or strike against the face of a beveled disk or roller 48, which is carried by a spring-actuated longitudinally-movable sleeve 49, which is loosely fitted on and carried by a horizontal spindle 49', the latter being attached rigidly to the upper end of the vertical arm 54 of a rocking tripper-lever 55. The sleeve 49 and its attached disk or roller 48 are free to rotate or turn on the fixed spindle carried by the tripper-lever, and this disk or roller 48 is normally held by the spring-pressed sleeve in the path of the projection 51 of the cam 50, the latter being fast with the longitudinal shaft 7 of the engine, said lug 51 being provided with a V-shaped groove 52, in which is adapted to fit the beveled periphery of the roller or disk 48 to insure proper engagement of the roller with the actuating-cam for the tripper-lever. This tripper-lever is in the form of a bell-crank

lever, fulcrumed at the juncture of its arms to a suitable bracket or other stationary part of the engine, and, as hereinbefore stated, the vertical arm of said tripper-lever carries the horizontal spindle on which the sleeve and roller 48 are slidably mounted, but the horizontal arm of said tripper-lever has a horizontal lifter-foot 56, which is arranged beneath all of the vertical operating-stems to the several controlling-valves 17, 23, and 24, and 36, whereby all of the stems and valves are adapted to be lifted simultaneously for the purpose of opening the controlling-valves to admit gas and air or gasoline and air to the mixing-chamber to produce the charge, and thence admit the charge to the working cylinder 2.

The operation of my gas-engine may be described as follows: When the speed of the engine is normal, the shaft 7 is driven from the main shaft, and the governor is actuated in the usual well-known manner, the weighted levers being held together by the coiled spring shown or by the gravity of the balls attached to the lever. In this position the sleeve 40 is raised to throw the shipper-lever 44 to a position where the tappet-rod does not interfere with the action or position of the roller or disk 48. This disk or roller is held by the spring-pressed sleeve normally in the path of the cam and its lug on the shaft 7, and at every revolution of this shaft 7 the cam and lug 50 51 ride against the roller or disk 48 to rock or turn the tripper-lever 55 on its fulcrum. This rocking movement of the lever 55 causes its lifter-foot 56 to press the three stems of the controlling-valves upward, thus forcing the several controlling-valves from their seats. By raising the valves 23 and 25 air and gas are admitted to the mixing-chamber of the mixer. By raising the valves 23 and 36 air and gasoline are admitted to the mixing-chamber. It will be understood that supply-pipes for gas and gasoline are respectively connected to the casings of the valves 25 36, and that each supply-pipe has a controlling-valve, which may be operated by the attendant according as it is desired to admit gas or gasoline to the mixing-chamber along with the air to produce the explosive charge. Now when the tripper-lever is operated to raise its foot 56, and thereby open the controlling-valves to the mixing-chamber and the valve 17 to the cylinder 2 a suction or draft is created by the piston moving toward one end of the cylinder through the mixing-chamber, so that the stirrers are rotated on the stem 29 to agitate the air and gas or air and gasoline in the mixing-chamber to thoroughly commingle the same, and as the valve 17 is opened at the same time the charge is drawn into the working cylinder to be exploded therein at the proper time. All this mixing of the air and gas or gasoline and its charge into the cylinder takes place very quickly while the lug of the cam rides against the roller or disk 48, and when the cam clears

this roller or disk the valves are quickly forced by their springs to their seats in the two chambers, whereby the further ingress of gas or gasoline and air is cut off from the mixing-chamber, and the valve 17 prevents any return of the charge back to the mixing-chamber, thereby obviating any explosion therein. This tripping of the lever 55 and operation thereby of all the valves is automatically accomplished so long as the engine is running at normal speed; but should the engine acquire excessive or abnormal speed the governor is actuated to automatically throw the roller or disk 48 and the tripper-lever out of action. The governor, it will be noted, is geared directly to the shaft 7, and when this shaft is rotated at too high a rate of speed the weighted levers will be thrown outward by centrifugal action, so that the levers cause their short arms to depress the sleeve 40, which in turn moves the shipping-lever to press the detent-rod against the disk or roller 48, whereby the disk or roller will be pressed back on the spindle 49' and held in such pressed-back condition out of the path of the cam on the shaft 7. It will now be obvious that the tripper-lever will not be actuated by the cam to lift the valve-rods and open the valves to supply the explosive charge to the cylinder, but when the speed of the engine again becomes normal the governor-levers again assume their normal position, raising the sleeve 40 to return the shipper-lever and its detent-rod back to their normal positions, thus permitting the spring-pressed sleeve to restore the roller or disk into the path of the cam and stud 50 51.

I claim—

1. In a gas or gasoline engine, the combination with a cylinder, and a main shaft, of a mixing-chamber communicating by a valve-controlled port with the cylinder, a valve-stem passing through the mixing-chamber and carrying a valve 23 and a series of rotary fans which are mounted loosely on the valve-stem, within the mixing-chamber, a valve-controlled gas or gasoline inlet to the mixing-chamber, and mechanism to actuate the valves, substantially as and for the purposes described.

2. The combination with a cylinder, of a mixer, controlling-valves for regulating the admission of air and gas or gasoline to the

mixer, a cam-shaft, a governor driven by said shaft, a tripper arranged to open the controlling-valves and carrying a slidable head or disk normally in the path of a cam on the cam-shaft, and means actuated by the governor to move the slidable head or disk out of the range of the cam, substantially as and for the purposes described.

3. The combination with a cylinder, of a mixer connected to said cylinder and having valves for admitting air and gas, or air and gasoline, to the mixer-chamber, a controlling-valve operating to establish and shut off communication between the mixer and cylinder, a tripper having a lifter-foot to raise all of the controlling-valves, and a cam-shaft to actuate the tripper, for the purposes described, substantially as set forth.

4. The combination with a cylinder, of a mixer having valves for admitting air and gas thereto, a separate valve arranged to establish and cut off communication between the mixer and cylinder, a shaft having a cam, a tripper having a lifter-foot to open all of the valves, a head or disk normally controlled by a spring which moves the head or disk into the path of the cam, a governor-shaft geared to the cam-shaft and having the weighted levers and grooved sleeve, and a shipper-lever connected with the governor and having a tappet to act against the slidable sleeve and head on the tripper-lever to force the head beyond the range of the cam when the speed becomes abnormal, substantially as and for the purposes described.

5. The combination with a cylinder, of a valved mixer mechanism having means for the admission of air and gas thereto and a vertically-movable valve for establishing and cutting off communication with the cylinder, and agitators loosely mounted on the valve-stem to partake of the endwise movement of the same and arranged in the mixer-chamber to agitate the air and gas admitted to said chamber and intimately mix or combine the same, as and for the purposes described.

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

FRANK M. UNDERWOOD.

Witnesses:

J. M. STEVENSON,
WARNER CLARK.