No. 675,351. Patented May 28, 1901.

G. W. HENRICKS.

SAFETY SPEED LIMITING MEANS.

(Application filed Mar. 14, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

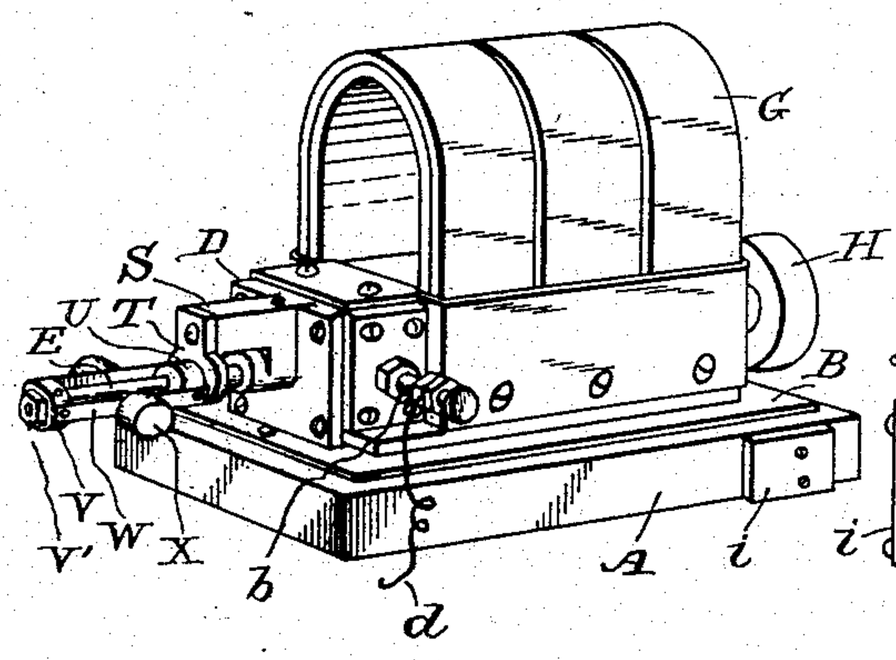


Fig. 2.

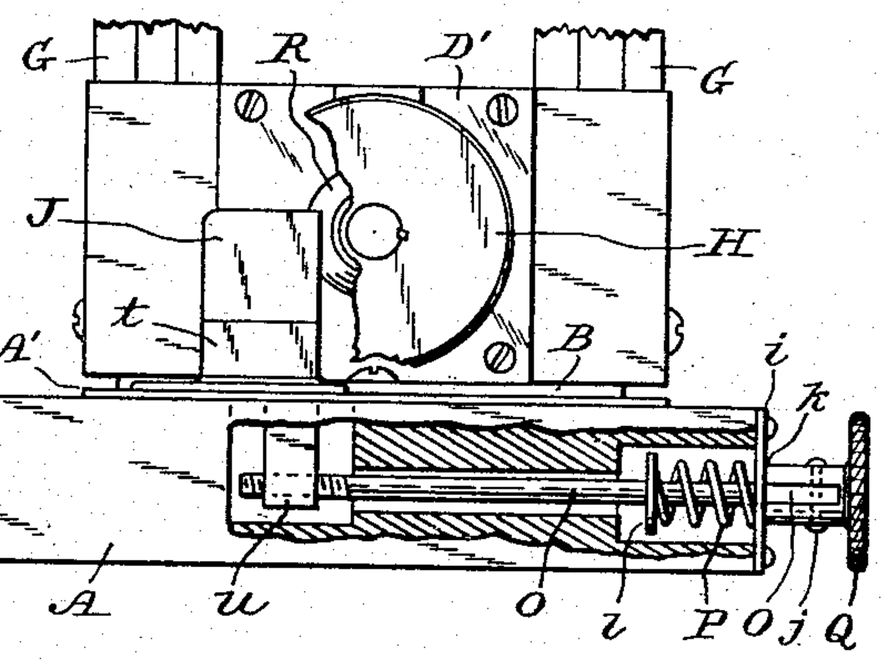


Fig. 3.

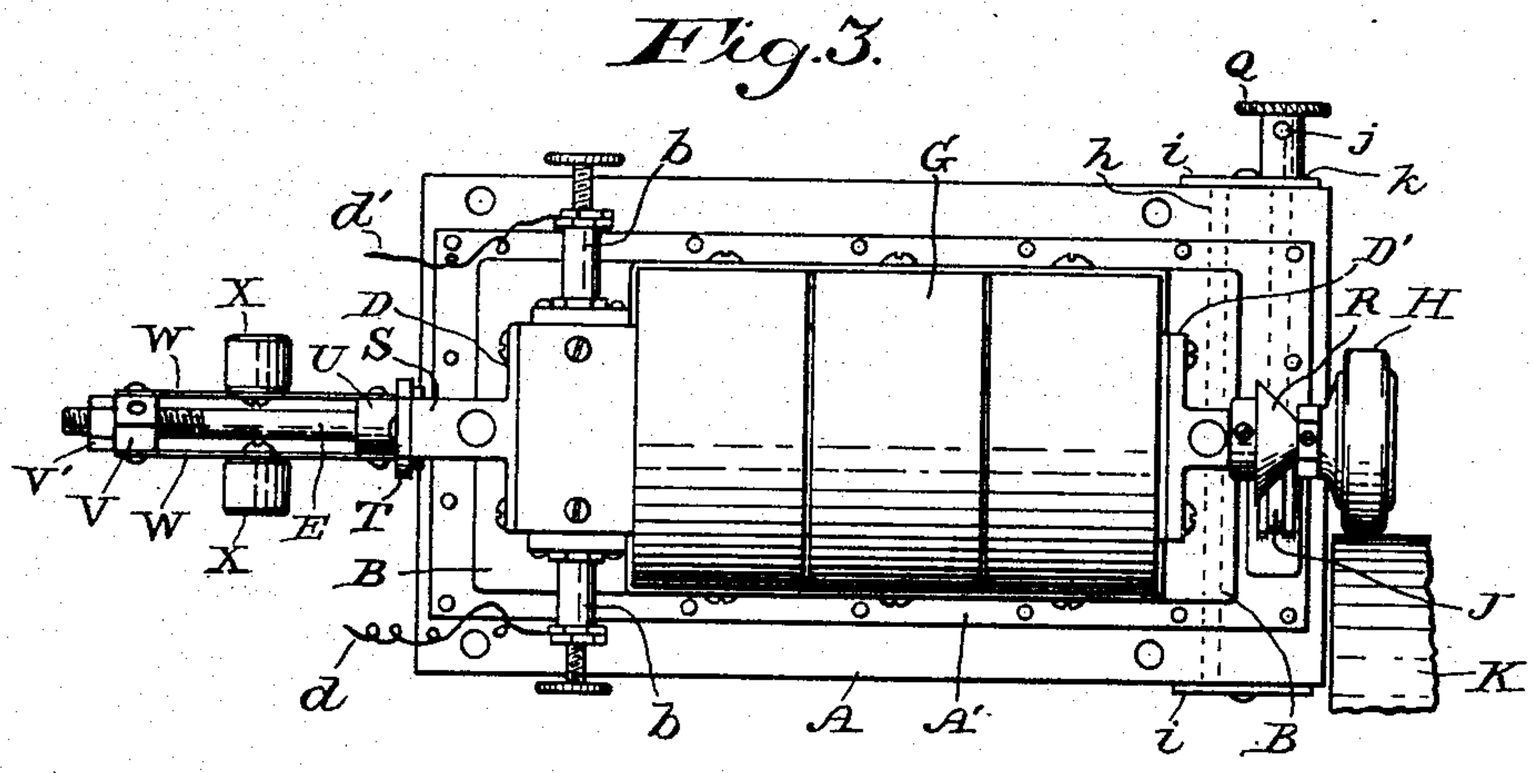
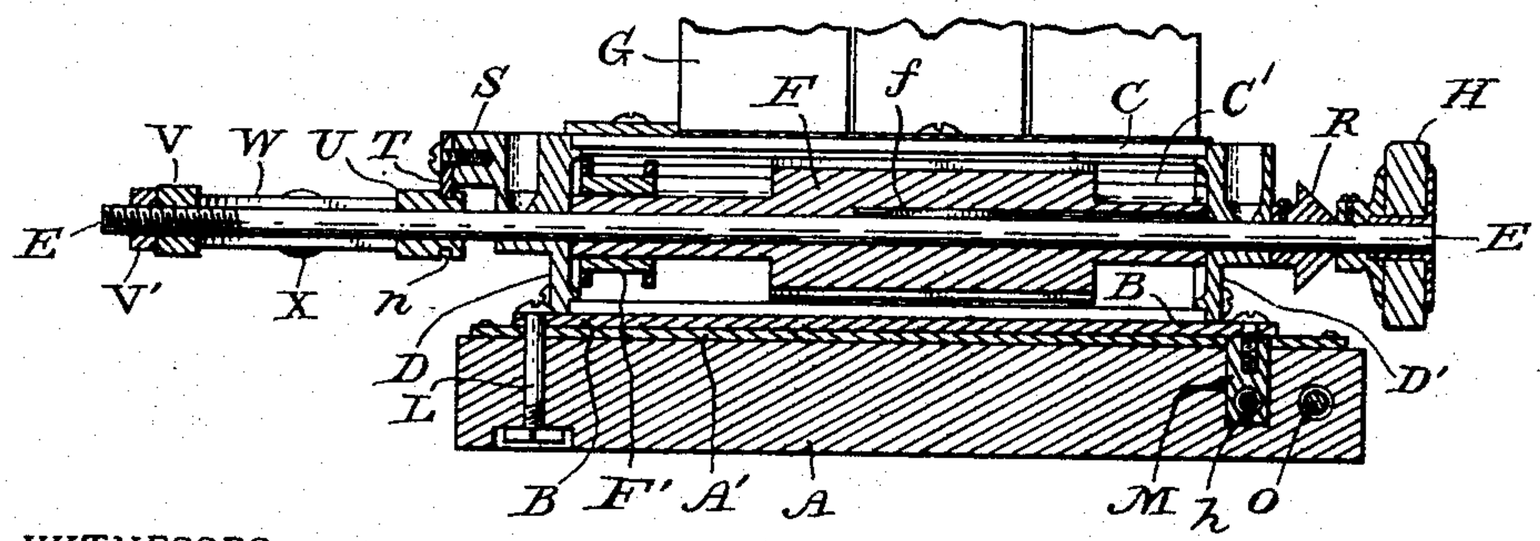


Fig. 4.



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SAFETY SPEED LIMITING MEANS.

(Application filed Mar. 14, 1901.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 5.

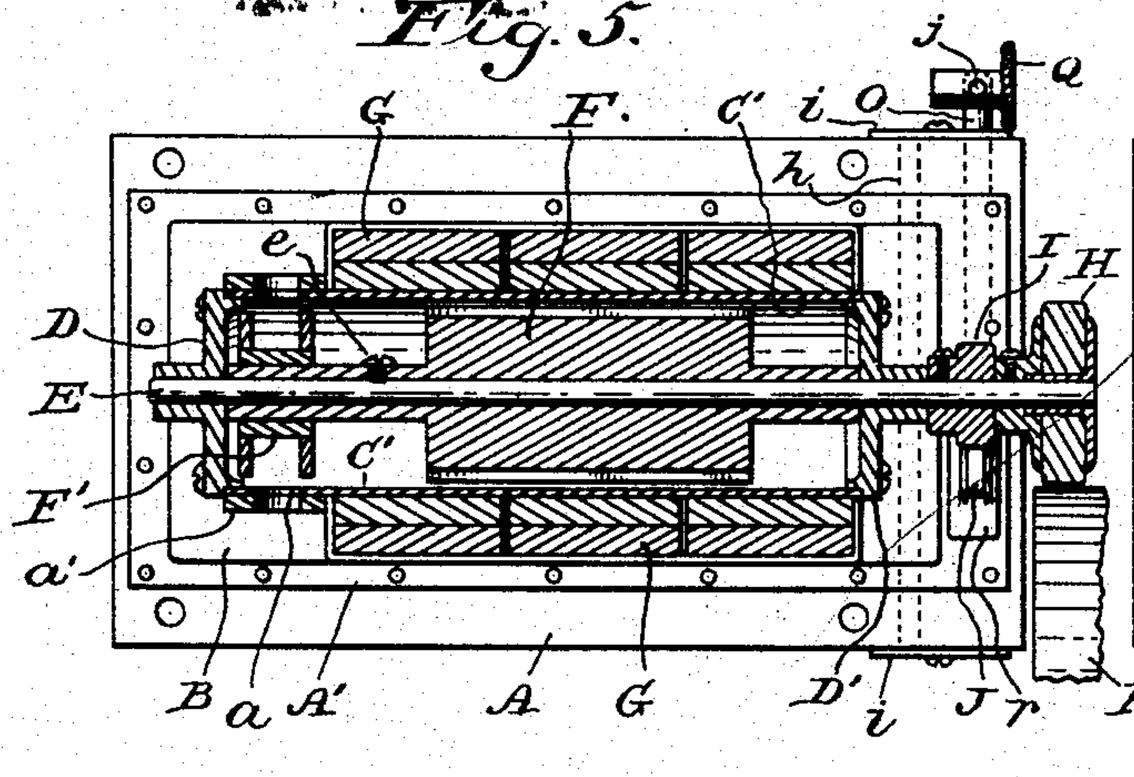

Fig. 6.

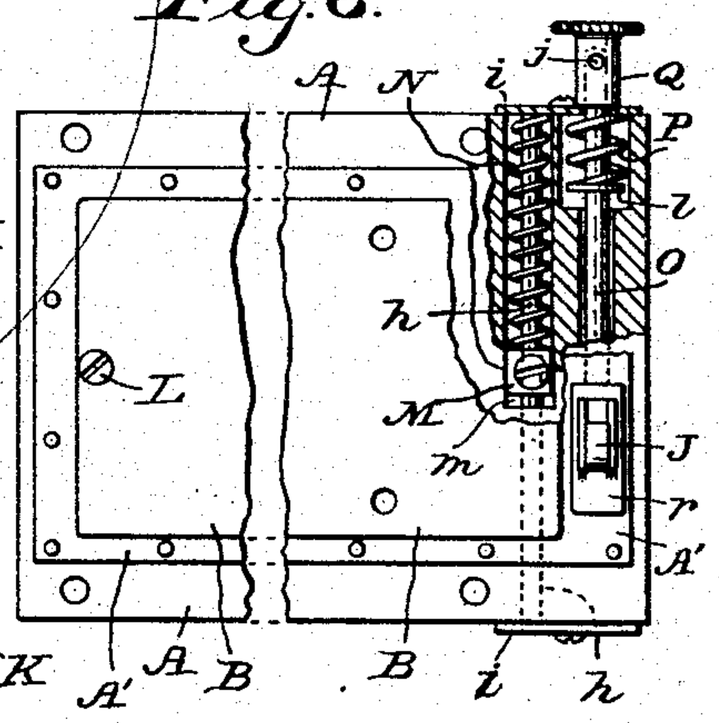

Fig. 7.

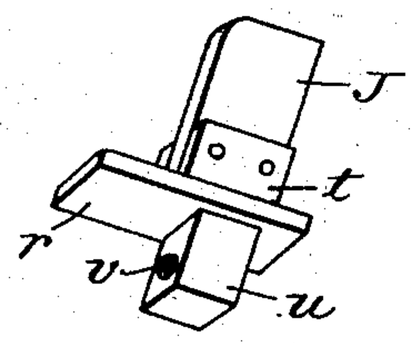

Fig. 8.

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UNITED STATES PATENT OFFICE.

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SAFETY SPEED-LIMITING MEANS.

SPECIFICATION forming part of Letters Patent No. 675,351, dated May 28, 1901.

Application filed March 14, 1901. Serial No. 51,045. (No model.)

To all whom it may concern:

Be it known that I, GARRETT W. HENRICKS, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Safety Speed-Limiting Means; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to the transmission of power from large to small machines generally, and particularly to the class of relatively small electricity-generating machines which are designed specially for operation in connection with and to be driven by gas-engines for producing low-voltage electric currents whereby to explode the gas charges in the engines.

The object of the invention, broadly, is to provide means whereby such electricity-generating machines may be made available cheaply and practically under the varying conditions found in the operation of gas-engines without employing belts or gear-wheels.

The object, specifically, is to provide means whereby the shaft of the generator or its driving-pulley may be safely held in fixed positions yet elastically with relation to the periphery of a rotative wheel of a gas-engine, so as to be impelled by the gas-engine without forcible contact therewith at a greatly-reduced rate of speed of the periphery of the generator-pulley relative to the peripheral speed of the engine-wheel. The fixed positions referred to are those at which the generator-pulley may partake in a small degree of the movement of the engine wheel or pulley which drives the generator and avoiding such hard contact between the two pulleys or wheels as might rack the smaller machine or cause grinding of the faces of the pulleys, and thereby causing facets to appear on the smaller pulley. In order to avoid such deterioration of the generator-wheel and delicate parts of the smaller machine and at the same time effect the desired reduction of speed, I provide that after the engine and the generator may have been put in motion the generator-pulley may be drawn off and held in a fixed position where it shall have but light contact and may be influenced only by the most infinitely slight contact with the engine-wheel and in some cases without having constant actual mechanical contact, the high-velocity air-current present about all fast-revolving wheels and in the present case generated by the engine-wheel having sufficient power usually to drive the small generator at sufficient velocity for efficiency. In case, however, there be slight variations from a true circle of the periphery of the engine-wheel or if its rim has a slightly eccentrical path, due to the thrust of the piston or lost motion in the shaft-bearings, a slight contact may take place at the protruding parts as they pass the generator-pulley, and this minute contact, if occurring, which may be regulated as to intensity, has been found to be sufficient in practice, as such generators require exceedingly small force for driving them, which is particularly true of my magneto-electric generator (shown herein in illustrating my improvements) and which is effective at a comparatively slow rate of speed, while not requiring to be run at a uniform speed. In order to take advantage of the film-like air-current surrounding the fast-moving engine-wheel, I find it preferable to apply my position-retaining means directly to the pulley-shaft of the generator in order to eliminate all lost motion, although where provision is made for adjusting the shaft-bearings I may connect with the bearings or with other parts of the generator in order to maintain the desired fixed position.

Having given the general characteristics of my invention, reference may now be had to the drawings, which show how the same may be practically carried out in a simple and inexpensive manner, equivalent elements for some of those illustrated, however, being entirely feasible and equally desirable.

In the drawings, in which similar reference characters indicate corresponding parts, Figure 1 is a perspective view of a machine having my invention applied thereto; Fig. 2, a fragmentary end elevation with parts broken

away and showing particularly the means employed for holding the generator-pulley from the engine-pulley; Fig. 3, a top plan view in which is shown means whereby the generator-pulley may also be automatically withdrawn from a too-close contact for economical reasons; Fig. 4, a fragmentary vertical central sectional view taken longitudinally of the machine; Fig. 5, a horizontal sectional view in the plane of the armature-shaft; Fig. 6, a top plan view of the main base and the generator-base, in which parts are broken away and exposing the means for controlling the positions of the generator-pulley and also a resistance-spring, whereby the generator-pulley may be pushed toward the engine-pulley and at the same time compensate for inaccuracy of the surface of the engine-pulley to avoid damage to the generator; Fig. 7, a perspective view of a part which has contact with the generator-shaft or other part of the generator for holding the generator-pulley, and Fig. 8 is a side elevation diagrammatically showing a gas-engine and the operative relation of my invention thereto.

Constructed as shown, A designates a main base or foundation, which may be suitably anchored to a floor or upon a bracket. It is designed to be fixed when in practical use and supports the whole mechanism of the generator. Usually it is surmounted by a cap-plate A'. A generator-base B is suitably pivoted to the main base A, as by means of a pivot-bolt L at ends of the members. At the opposite ends means are provided whereby the base B may be caused to swing about its pivot upon the main base A, as will be further explained.

C indicates magnetic poles that are the extremities of pole-pieces C', secured to the base B and supporting-heads D D', which are provided with journal-housings, in which an armature-shaft E is rotatively mounted, a suitable armature-core F being carried by the shaft E, as is also a commutator F'. To the pole-pieces C' are attached U-shaped magnets G. The usual armature-windings are omitted in the detail drawings, being unnecessary to an understanding of my invention. A small pulley H is secured to one end of the shaft E and obviously may be shifted with the base B and shaft E relatively to the main base A laterally thereto. The pulley H may in some cases have suitable wings or blades of well-known construction, whereby it may be more strongly influenced by an air-current. It should be understood that in practically carrying out my invention the heads D D' or similar shaft-supports may be attached to the generator-base or the supplemental base B and have no direct attachment with the pole-pieces C', and the generator-base B may be of any suitable form and may be pivoted to the base A in various ways for attaining the desired results, as will be obvious. A suitable pulley I is also attached to the shaft E and is adapted to be engaged by a movable post J, that is suitably operated and controlled, whereby the lateral movement of the shaft is caused and whereby the fixed positions of the pulley H referred to are maintained. The post has a base r and post-holder t, and also has a foot u, in which is a threaded hole v. A spindle O is mounted in the base A and has a threaded end working in the hole v, the base r sliding upon the top of the main base A or upon the plate A', while the foot extends through a suitable aperture therein. The spindle O extends through a plate i and preferably has a collar l, between which and the plate i is a spring P. To the outer end of the spindle O is attached a thumb-wheel Q, having a long bifurcated stem straddling the end of the spindle and connected thereto by a pivot-pin j, so that when once the spindle O is adjusted with relation to the post J the spindle may be moved longitudinally inwardly without disturbing the adjustment by simply turning the bearing end k of the stem of the wheel Q away from the plate i, as shown in Fig. 5. The thumb-wheel Q, having the long stem, as will be seen, is designed to operate eccentrically as a cam and illustrates a simple form of construction; but in some cases I may attain the same results by practically equivalent means, and the same may be prevented from accidentally shifting by other means than the spring P; also, the spindle O may be fixed to the foot u and be made adjustable with the thumb-wheel Q or similar device.

The armature-core F may be secured to its shaft E by any suitable means—such as a screw e or a key, or the shaft may be made in two parts and sunk into the ends of the core. An insulating-plate a' is attached to each pole-piece C', where it projects from the magnet, a hole a being provided, into which the brush-holder b is inserted and secured.

In order to normally press the pulley I into close contact with the post J, yet permit of breaking contact, I provide a resistance-spring, which in the present case is a coiled spring N, mounted on a rod h, which extends through the base A and bears against opposing plates i i, attached to the opposite sides of the main base. The spring is seated against that one of such plates against which the spring P bears and presses against a lug M, suitably secured to the under side of the base B and extending through an aperture m in the plate A', the rod h extending through the lug M and preventing the base B from being raised from the main base A. Obviously I may employ a plate-spring suitably disposed in lieu of the coiled spring N described; also, the post J or a similar device, operated substantially as described, may engage the housing of the shaft E or the shaft itself or any other suitable part of the pivoted portion of the machine; but the most delicate and desirable adjustment of the pulley H may be had with the use of the pulley

I, the post J having an antifrictional contact-face.

The construction above described is suitable more particularly where the generator is to be used solely in connection with a stationary engine; but when I design the generator so as to be equally adapted for use with the gas-engine of an automobile or the like locomotive vehicle where manual adjustment of the post J may be inconvenient, owing to the wide range of speeds of the vehicle-engine and also as between it and a stationary engine, I provide means whereby results are attained which, in effect, are identical with that of moving the post J from and toward the shaft E. To accomplish this, I provide that the shaft E be of greater length than usual and that it may move endwise in its bearings, either by securing a spline *f* to the shaft E and fitting the shaft slidingly in the core F and providing a splineway in the core or by securing the shaft E to the core F and making the core of such length as to be suitably shorter than the distance between the heads D and D′, against which it is stopped in its endwise movement. The latter has an advantage in that increased wearing-surface by the brushes on the commutator may thus be had. A conical pulley R is attached to the shaft E in lieu of the pulley I, and at the opposite end of the shaft I secure thereto a speed-controlled adjuster comprising a head V, which is adjustable on the shaft, preferably as a screw-nut, to be fixed by a jam-nut V′. To the head V, I attach a pair of plate-springs W, which normally extend parallel with the shaft E toward the opposite end thereof, the opposite ends of the springs being secured to a sleeve U, having an exterior groove *n* in which is inserted a stop-yoke T, secured to a projection S of the head D, the shaft working through the sleeve. Weights X X are secured to the springs W W, so as to be at opposite sides of the shaft E. Obviously I may employ an electrically-controlled adjuster in lieu of the speed-controlled devices.

When in operative position, the generator is situate in proximity to the balance-wheel K of a gas-engine, as the most advantageous position, or it may be located close to another suitable wheel or pulley of the engine, the pulley H being set so that it may be in contact therewith and withdrawn from contact when desired.

Y indicates the engine-cylinder, and Z an explosion-chamber, suitably-disposed binding-posts *w y* being provided, to which are connected conducting-wires *d d′*, having their opposite ends connected to the brush-holders *b b*. A spark-coil should be connected with one of the wires, as usual.

In practical use let it be assumed that the generator is designed for use with a stationary engine and has been set in place. The wheel K may then be rotated, the pulley H being in contact therewith, when a current will be at once generated of sufficient strength (especially by my improved machine) to produce a spark at the igniters. Then as the speed of the wheel K increases and when the generator-shaft may have attained an economical rate of speed consistent with proper lubrication of its journals the thumb-wheel Q may be manipulated so as to draw the pulley H off from a hard contact with the wheel K, the post J holding the pulley H at the exact required position, as above described, to maintain the desired velocity of the generator-shaft. No further adjustment will usually be required, as the ordinary variations of speed of the engine will not affect the utility of the generator. If now the engine be stopped, it may be found that when slowly rotating the wheel K it may have no contact with the wheel H, so that it may be necessary when again starting to turn the wheel Q, (eccentrically,) as in Fig. 5, and release the post J from contact, so that the spring N may push the pulley again into contact with the wheel K to so remain until the desired speed may again be attained by the generator-shaft, when the wheel Q may be again set in its normal position, as in Fig. 3. Should there be excessive eccentricity of the periphery of the driving-wheel K, all danger to the delicately-constructed generator will be avoided by reason of the action of both the resistance-spring N and the post J, as will be obvious.

If it be assumed that the generator is designed for motor-vehicles or to provide against the generator being carelessly run at damaging speeds, the adjuster is employed, which causes the pulley H to be held sufficiently remote from a hard contact with the driving-wheel K to prevent damage in case the post J may not have been itself closely adjusted. In the use of this construction, as described, the post may be first set as above described, and then after making tests the head V may be adjusted and set so that before a dangerously-excessive speed may have been reached the weights X X may by their weight and centrifugal force furnish power and spread the springs W W and cause the shaft E to move endwise and push the conical pulley R against the post J and diminish the intensity of the contact of the pulley H with its driving-wheel, thus preventing further acceleration of speed of the generator-shaft. This action is extremely sensitive and does not partake of the harsh jerking, fast-and-slow, or slip-and-catch action incidental to intermittently throwing the pulley H into and out of contact entirely with the driving-wheel; but the pulley H is maintained substantially in a fixed position with respect to the driving-wheel's peripheral path at which it may have been adjusted to run, causing a steady rate of speed and smooth motion proportionate to the intensity of the contact. When applied to a motor-vehicle, the engine-wheel may be run at great extremes of high and low velocity, and the balance-wheel being comparatively small re-

quires a different setting of the head V, as will be obvious, to suit the conditions that differ from stationary-engine practice, and it may be so adjusted that manipulation of the wheel Q may not be necessary after the first adjustment thereof, the speed-controlled adjuster automatically performing the required function.

Having shown operative means whereby the driven pulley may be held off in a fixed position, so as to be affected only by the merest contact with a true wheel or by peripheral protuberances of the driving pulley or wheel or by the air-current caused thereby, I do not confine my invention to such specific means, as I may employ other suitable equivalent mechanism for automatically adjusting the post J or its equivalent in lieu of the longitudinally-moving shaft and the other elements described specifically. The pulley H may be made of considerably greater width of face than herein indicated, so that greater vacuum-like or suction effect, which is highly important, may be obtained. It may be observed that my generator, to which my invention is more particularly applicable, is usually extremely small, the main base in some cases being but eight inches in length by five or less inches in width and other parts in proportion, so that it may be operated by an almost infinitesimal degree of power. The application of the post J and its connections are also desirable in order to be able to positively compensate for expansion and contraction as well as distortions of the driving wheel or pulley of the engine, so that all thrusts upon the generator-pulley may be avoided. In the operation of such small generators the advantages will be appreciated in employing the post J or positive stop, whereby advantage may be taken of the air-current acting as a subtle cushion between the two pulleys.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A mechanism including a driving-wheel, a driven wheel operated by means of the driving-wheel, and a stop member holding the driven-wheel axis off from and in a fixed position relative to the periphery of the driving-wheel, whereby the driven wheel may be rotated by the air-current generated by the driving-wheel.

2. A mechanism including a driving-wheel, a driven wheel operated by means of the driving-wheel, a stop member holding the driven wheel off in a fixed axial position so as to prevent hard contact with the driving-wheel, and power-controlled means whereby the fixed axial positions of the driven wheel may be changed, whereby the driven wheel may be rotated by the air-current generated by the driving-wheel.

3. A mechanism including a driving-wheel, a driven wheel operated by means of the driving-wheel, a spring operating to push the driven wheel into contact with the driving-wheel, and a stop member operating against the pressure of the spring and holding the driven-wheel axis off in a fixed position relative to the periphery of the driving-wheel, whereby the driven wheel may be actuated by the air-current generated by the driving-wheel.

4. A mechanism including a driving-wheel, a driven wheel operated by means of the driving-wheel, a spring operating so as to push the driven wheel into contact with the driving-wheel, a stop member restricting the action of the spring and holding the driven wheel off in a fixed axial position so as to prevent hard contact with the driving-wheel, and power-controlled means whereby the fixed axial positions of the driven wheel may be changed, whereby the driven wheel may be maintained in a proper position and relieved of forcible contact with the driving-wheel and thereby be prevented from being damaged by thrusts thereof.

5. A speed-reducing mechanism including a driving-wheel, a driven wheel operated by means of the driving-wheel, a spring operating to elastically push the driven wheel into contact with the driving-wheel, and means restricting the action of the spring and limiting the contact of the driven wheel to light constant degree or the protuberances of the driving-wheel periphery and to the air-current generated by the driving-wheel.

6. An electric generator provided with a base pivotally supporting an armature-shaft, a wheel attached to the armature-shaft for driving the same, and an adjustable stop member acting to hold off the armature-shaft in fixed positions relative to a driving-wheel, whereby the wheel on the shaft may be held in various fixed axial positions at the periphery of a driving-wheel so as to partake of only a fractional part of the speed thereof as transmitted by contact with the protuberances thereof and the air-current generated thereby.

7. An electric generator including a fixed base, a base pivoted upon the fixed base, an armature-shaft mounted on the pivoted base, a driven wheel attached to the armature-shaft, an adjustable fixed stop member adapted to limit the movement of the pivoted base and also that of the driven-wheel axis laterally, and a spring seated and acting to press the armature-shaft toward the stop member, and means whereby the stop member may be changed from and returned to its position without permanently altering its predetermined fixed position.

8. An electric generator comprising a main base, a supplemental base pivoted upon the main base, an armature-shaft supported upon the supplemental base, a driven wheel secured to the armature-shaft, a pulley also secured to the armature-shaft, a stop member slidingly supported upon the main base and engaging the pulley, a spindle mounted in the main base and operatively connected with

the stop member whereby the positions thereof may be adjusted and fixed, and a spring operating to force the pulley elastically against the stop member, whereby the axis of the driven wheel may be held off in fixed positions relative to the periphery of a driving-wheel.

9. An electric generator comprising a main base, a supplemental base pivoted upon the main base, an armature-shaft supported upon the supplemental base and movable endwise, a driven wheel secured to the armature-shaft, a conical pulley secured also to the armature-shaft, a stop member slidingly supported upon the main base and engaging the conical pulley, a spindle engaging the stop member whereby the positions thereof may be adjusted and fixed, a spring operating to force the conical pulley elastically against the stop member, and an adjusting mechanism operating automatically whereby the armature-shaft may be moved endwise and the conical pulley forced against the stop member, whereby the axial position of the driven pulley may be changed and fixedly held, so as to prevent injurious thrusts from an irregular peripheral surface of a driving-wheel being transmitted to the driven wheel.

10. An electric generator comprising a main base, a supplemental base pivoted upon the main base, an armature-shaft supported upon the supplemental base and movable rotatively and longitudinally, a driven pulley at one end of the armature-shaft secured thereto, a conical pulley secured to the armature-shaft in proximity to the driven pulley, a stop member slidingly supported and engaging the conical pulley, a spring forcing the conical pulley against the stop member, means whereby the positions of the stop member may be adjusted and fixed, a sleeve loose on the armature-shaft, means whereby movement of the sleeve longitudinally of the shaft may be prevented, a pair of plate-springs attached to the sleeve, a head attached to the plate-springs and also adjustably attached to the armature-shaft, and a weight attached to each one of the plate-springs, whereby when an excessive speed of the armature-shaft may be reached, the armature-shaft may be moved longitudinally and the conical pulley forced against the stop member, so that the axial position of the driven pulley may be altered and fixed relative to a driving-wheel periphery adjacent to the driven wheel, as and for the purposes set forth.

11. The combination, with a gas-engine having a rotative wheel and also having an igniter or sparking electrodes, of an electricity-generating machine including a generator, a rotative shaft for driving the machine, circuit-wires connecting the generator with the sparking electrodes, a stop member and mechanism whereby the rotative shaft may be held off from approaching the rotative wheel, a wheel on the rotative shaft driven by means of the rotative wheel of the engine, and means whereby the rotative shaft may be elastically pressed toward the stop member and also be permitted to be forced therefrom.

12. The combination, with a gas-engine having a rotative wheel and also having an igniter or sparking electrodes, of an electricity-generating machine including an armature, a rotative shaft for driving the machine, a commutator, commutator-brushes, circuit-wires connecting the brushes with the sparking electrodes, a stop member and mechanism for adjusting the same whereby the rotative shaft may be held off from approaching the rotative wheel, a wheel on the rotative shaft driven by means of the rotative wheel of the engine, means whereby the rotative shaft may be elastically pressed toward the stop member and also be permitted to be automatically forced therefrom, means whereby the stop member may be held in fixed positions, and means whereby the stop member may be released from operating against the rotative shaft while starting the operation of the machine.

13. The combination, with a gas-engine having a rotative wheel and also having an igniter or sparking electrodes, of an electricity-generating machine including an armature, a rotative shaft for driving the machine, a commutator, commutator-brushes, circuit-wires connecting the brushes with the sparking electrodes, a stop member whereby the rotative shaft may be held off in fixed axial positions from the rotative wheel, a wheel on the rotative shaft driven by means of the rotative wheel of the engine, means whereby the position of the stop member may be gaged, means whereby the stop member may be released from operation and again put into operation without permanently altering its prearranged gaged position, and an independent adjusting means operating automatically in coöperation with the stop member whereby the relative axial position of the rotative shaft may be changed toward and from the rotative wheel of the engine.

14. In an electricity-generating machine, a fixed main base, a supplemental base supported movably upon the main base, journal-housings supported by the supplemental base, a generator-shaft mounted rotatively in said housings, the spring acting against the supplemental base, the pulley or wheel attached to the generator-shaft whereby the machine may be driven, a conical pulley attached to the generator-shaft, and a stop member in contact with the conical pulley restricting the force of the spring, whereby the axial position of the pulley or wheel may be fixed against movement in one direction and permitted to move in the opposite direction.

15. In an electricity-generating machine, a fixed main base, a supplemental base, elastic means operating so as to change the relative positions of the supplemental base when not restrained, journal-housings supported by the supplemental base, a generator-shaft mount-

ed rotatively in said housings, a stop member preventing the movement in one direction of the supplemental base, the pulley or wheel attached to the generator-shaft whereby to drive the machine, a conical pulley connected with the generator-shaft and movable across the face of the stop member so that the lineal circumferential bearing contact thereof with the stop member may be increased and decreased, and automatically-controlled means whereby the conical pulley may be moved and controlled, in combination with a driving-wheel communicating to the pulley or wheel of the generator-shaft a diminished rate of peripheral speed without having forcible contact therewith.

16. In an electricity-generating machine, a stop member provided with an antifrictional contact-face, a conical pulley operating in contact with said stop member, a spindle or shaft connected with the stop member, a main base slidingly supporting the stop member, and an adjusting means connected with the spindle and adapted to be released from operation whereby to relieve the action of the stop member, in combination with the supplemental base, the generator-shaft supported upon the supplemental base and carrying the conical pulley, and means for elastically pressing the conical pulley against the stop member.

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

GARRETT W. HENRICKS.

Witnesses:
HARRY D. PIERSON,
E. T. SILVIUS.