No. 720,652. PATENTED FEB. 17, 1903.

V. G. APPLE.

SPEED REGULATOR.

APPLICATION FILED MAY 13, 1901.

NO MODEL.

Fig. 5

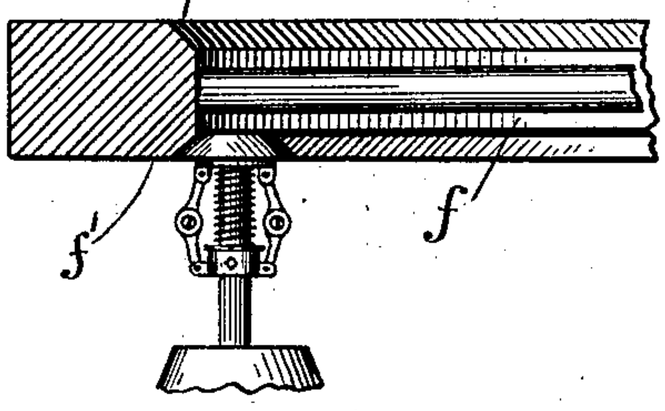


Fig. 6

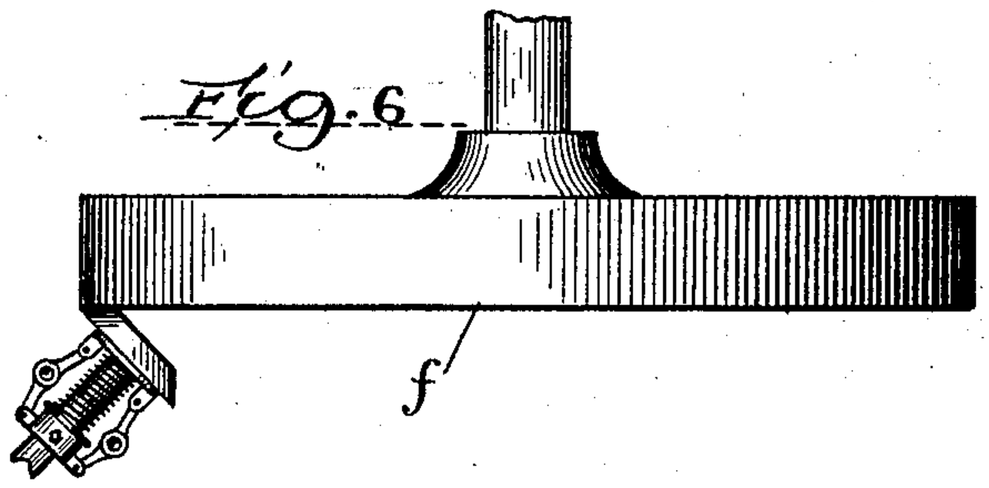


Fig. 1

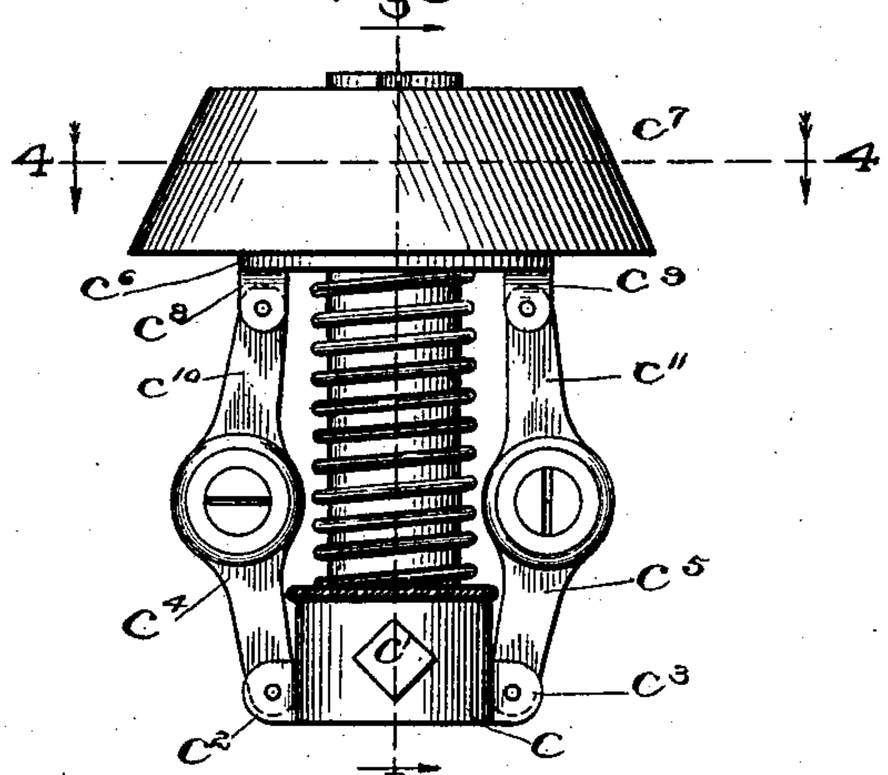


Fig. 2

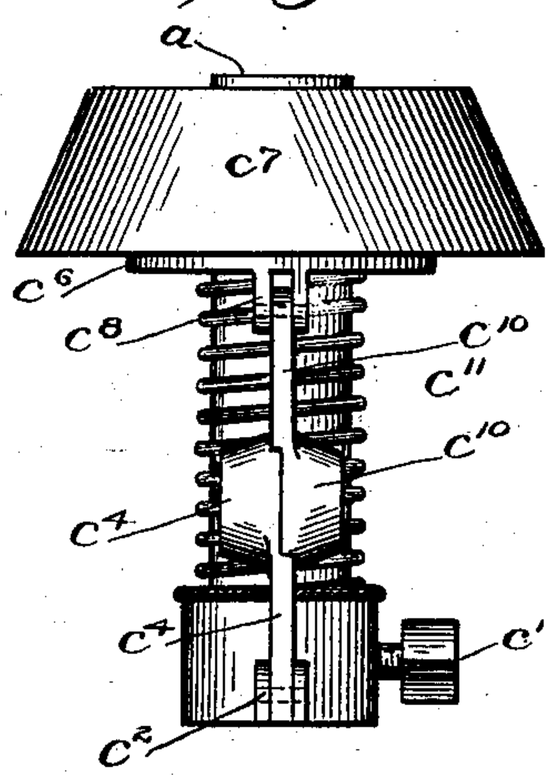


Fig. 3

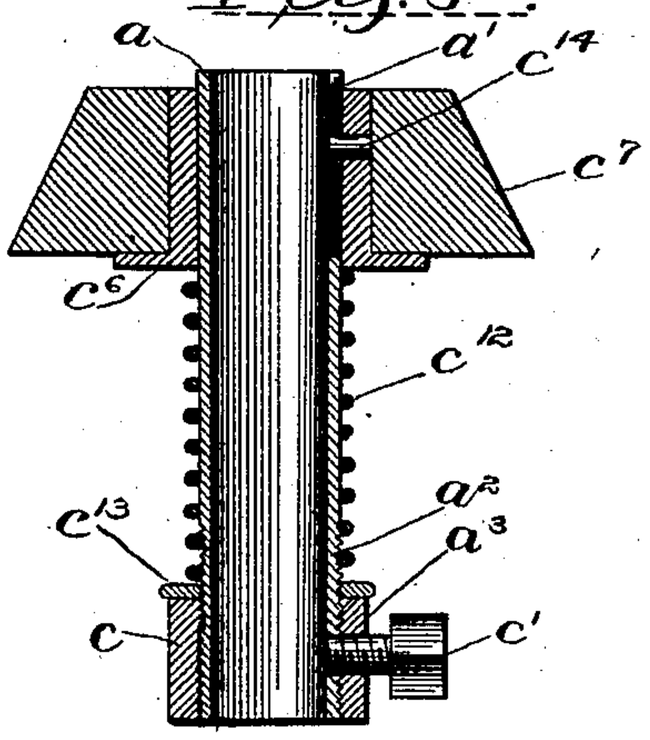
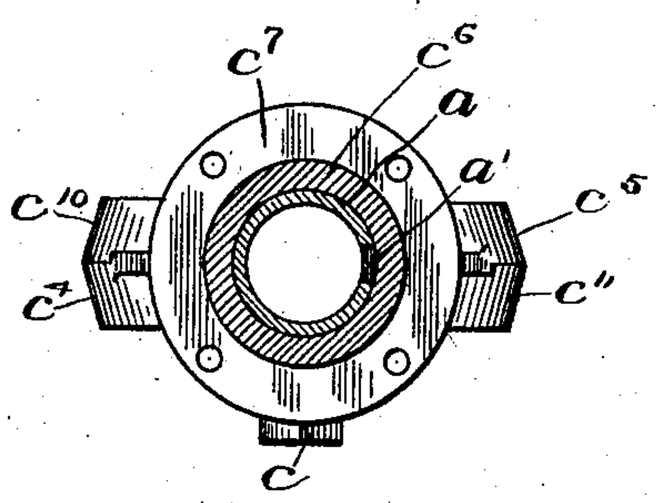


Fig. 4



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UNITED STATES PATENT OFFICE.

VINCENT G. APPLE, OF DAYTON, OHIO.

SPEED-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 720,652, dated February 17, 1903.

Application filed May 13, 1901. Serial No. 59,995. (No model.)

To all whom it may concern:

Be it known that I, VINCENT G. APPLE, of Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Speed-Regulators; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to speed-regulators.

The object of my invention is to provide a means whereby a shaft that it is desired to be driven at a constant speed may be rotated at an approximately predetermined number of revolutions within a given period of time independent of the increased speed or rate of motion of the driving-wheel or motor.

My invention is adapted, among other things, to regulate the speed of a dynamo-electric machine when the same is driven by an irregular power—such, for instance, as a gas-engine, water-wheel, and the like—and it is especially desirable for driving small dynamos or magneto-electric generators when used for producing the ignition-spark in the cylinder of gas-engines for the purpose of igniting the charges of gas compressed therein for producing power by effecting the successive explosions.

One especial advantage of my regulator when used with a dynamo for producing the spark in the cylinder of a gas-engine results from the fact that an initial high rate of inductive speed of the armature-conductors may be obtained with a comparatively small number of revolutions of the engine-wheel, as when starting a gas-engine by hand a sufficiently high rate of speed is attained thereby to operate the armature of the dynamo at the desired speed for producing sufficient current for the purpose intended. After the critical speed of the armature has been reached when the dynamo is not doing any work a further increase in the speed or the rate of speed of the engine-wheel will not tend to materially increase the speed of the armature of the dynamo, because of the intervening regulating effect of the said governor to maintain the speed of the armature below a dangerous velocity.

In the drawings, Figure 1 is a side view of one form of my speed-regulator shown self-contained upon a supporting-tube. Fig. 2 is a side view taken at right angles to the view shown in Fig. 1. Fig. 3 is a section through line 3 3 of Fig. 1. Fig. 4 is a section through line 4 4 of Fig. 1 with the pulley removed. Fig. 5 shows a fragment of a driving or fly wheel of a gas or other engine and the manner of applying my speed-regulator thereto. Fig. 6 is a similar wheel and another means by which my regulator may be applied thereto.

In all of the views the same letters of reference indicate similar parts.

a is a tube upon which my speed-regulator may be mounted, and upon which all the parts may be contained, so as to make it a self-contained regulator that may be applied to any shaft.

a' is a slot in the end of the tube or shaft. The other end of the tube is screw-threaded at a^2.

a^3 is a hole through the tube for the passage of the set-screw for holding said tube to the shaft.

c is a threaded collar adapted to be screwed over the end of the tube. c' is a set-screw let into the said collar and which passes through the hole a^3 in the said tube for the purpose of attaching the regulator to the shaft of the device to be controlled thereby. From the opposite sides of this collar projecting ears c^2 and c^3 are designed for pivotally supporting the arms c^4 and c^5.

c^6 is a flanged collar designed to be easily reciprocated on the end of the tube a and upon which the friction part of the friction-wheel c^7 is supported and built up. The part c^7 of the friction-wheel may be made of paper, wood, leather, or other material having a relatively high coefficient of friction. c^8 and c^9 are ears which project from opposite sides of the said flanged collar and into which the arms c^{10} and c^{11} are pivoted. These arms are loosely connected to the arms c^4 and c^5 by means of screws or other pivot through the extended heavy-weighted end portions, as shown in the drawings. These weights constitute the centrifugal devices, which respond to the changed centrifugal effect for the purpose of actuating the levers to move the friction-wheel from the driver, and thus perform the function of the regulator.

c^{12} is an open helical spring which surrounds the tube a and presses the friction-wheel from the fixed collar c along the tube or shaft. A threaded washer c^{13} is adapted to be moved longitudinally along the threaded end of the

tube a for the purpose of increasing or decreasing the tension of the spring c^{12}. c^{14} is a pin projecting on the inside from the flanged pulley-collar c^6 and which slides in the slot a' for the purpose of rotatively connecting the said friction-wheel to the said tube.

Fig. 5 shows the inside rim of the fly-wheel chamfered on approximately the same angle as the friction-surface of the pulley c^7, so that the device, which is rotated thereby, may be placed so that its axis is practically parallel with the axis of the said fly-wheel. In Fig. 7 the surface of the friction-wheel c^7 is applied to the face of the fly-wheel, so that the axis of the device is at an oblique angle from the axis of the fly-wheel.

The operation of the regulator is as follows: Normally the friction-surface of the wheel c^7 lies in close contact with the friction-surface of the driving-wheel and is persistently held in contact therewith by the spring c^{12}. When the regulator is driven so that its speed approaches a critical point or predetermined number of revolutions when the dynamo is not doing any work, the arms c^4 and c^5, c^{10} and c^{11}, which carry the respective centrifugal weights, (in this case parts of the said arms,) are caused by centrifugal effect to fly outwardly, and thereby the friction-wheel c^7 is drawn inwardly along the shaft or tube from contact with the friction-surface of the driving-wheel. The centrifugal weights act for this purpose against the tension device c^{12}. When the tension of the spring is made greater by adjustment, the critical speed is not reached until the regulator and the driven machinery have been rotated an increased number of revolutions within a given time. There is a constant contention between the said centrifugal weights and the said spring whereby the regulator is controlled under the conditions mentioned at a predetermined number of revolutions without regard to the speed at which the fly-wheel is rotated after the driving fly-wheel has been rotated at a sufficient velocity for the speed-regulator to have arrived at its critical speed, heretofore referred to.

By the use of my centrifugal speed-governor the speed of the dynamo-armature may be varied according to the torque or turning force necessary to rotate it. The governor is the means by which the contact between the driving and the driven pulley is reduced, and this is varied both as to the time and extent by the centrifugal effect of the said governor. The governor may be proportioned and adjusted so that it will exercise this function to a greater proportional extent to prevent an excessive speed of the dynamo after a definite critical speed has been reached. I prefer to construct the governor and to adjust the tension of the spring so that the dynamo will receive sufficient rotative force to produce a given current on a practically short circuit before the functional operation of the governor is brought into action, the difference between the rate of speed of the driving and the driven pulley in this case being accounted for by the slip between the respective surfaces, so that when the circuit from the dynamo is opened and resistance thereby introduced into the circuit the slip will be reduced, and the dynamo will be turned much faster as a result of the reduction of the current produced by it, and the electromotive force will be increased as a result of the increased speed of the armature until the speed of the armature reaches a critical point, at which time the functions of the governor will be brought quickly into operation, and thereby prevent a further increase of speed of the armature. The governor I prefer is one that is not affected by centrifugal force to any great extent until a critical speed is reached, when it will act to produce the results desired. Such a governor is embodied in the accompanying drawings and specification.

One of the many advantages of my device is that it is self-contained and that it may be removed from the shaft of a dynamo and replaced by an ordinary pulley when desired. The governor or regulator may be readily applied to any machine for which such results are desired.

The device is compact, efficient, and very simple and accomplishes the results with infallible certainty, and it is entirely practical in its operation.

Having described my invention, what I claim as new and useful, and desire to secure by Letters Patent of the United States, is—

1. As an article of manufacture, a speed-controlling device comprising a sleeve, screw-threaded at one end, and longitudinally slotted at its opposite end, a friction-wheel mounted upon said sleeve provided with a stud engaging the slot in the sleeve, a collar mounted on the threaded end of the sleeve, weighted centrifugal governor-arms connecting the friction-wheel and said collar, an adjusting-nut mounted on the threaded end of the sleeve above the collar, a spring interposed between said nut and the friction-wheel, and a set-screw extending through the sleeve, substantially as set forth.

2. In a power-transmitting device the tube a, the friction-wheel c^7 shiftingly movable and rotatably fixed on said tube, a collar fixed to said tube, the open helical spring c^{12} surrounding said tube and interposed between the said collar and said wheel, threaded washer c^{13} adapted to be moved longitudinally on said tube to adjust the tension of said spring, and hinged arms carrying weights connecting said fixed collar and said wheel.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

VINCENT G. APPLE.

In presence of—
C. E. TAYLOR,
L. M. ARNOLD.