(No Model.)

T. A. EDISON.

MEANS FOR CONTROLLING ELECTRIC GENERATION.

No. 482,549. Patented Sept. 13, 1892.

Fig. 4.

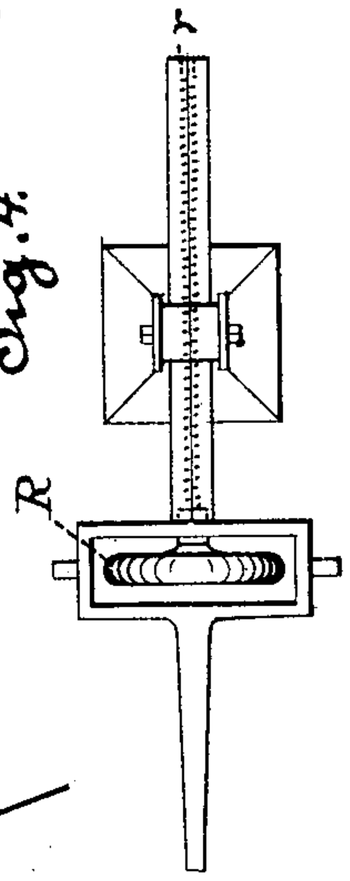
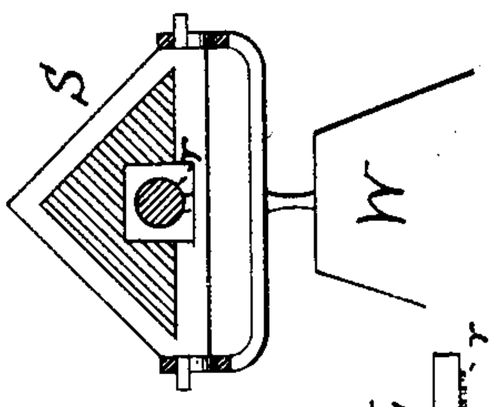


Fig. 3.



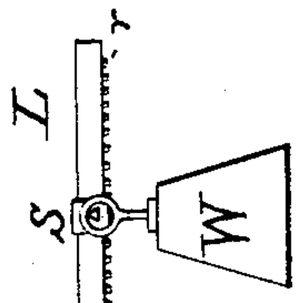
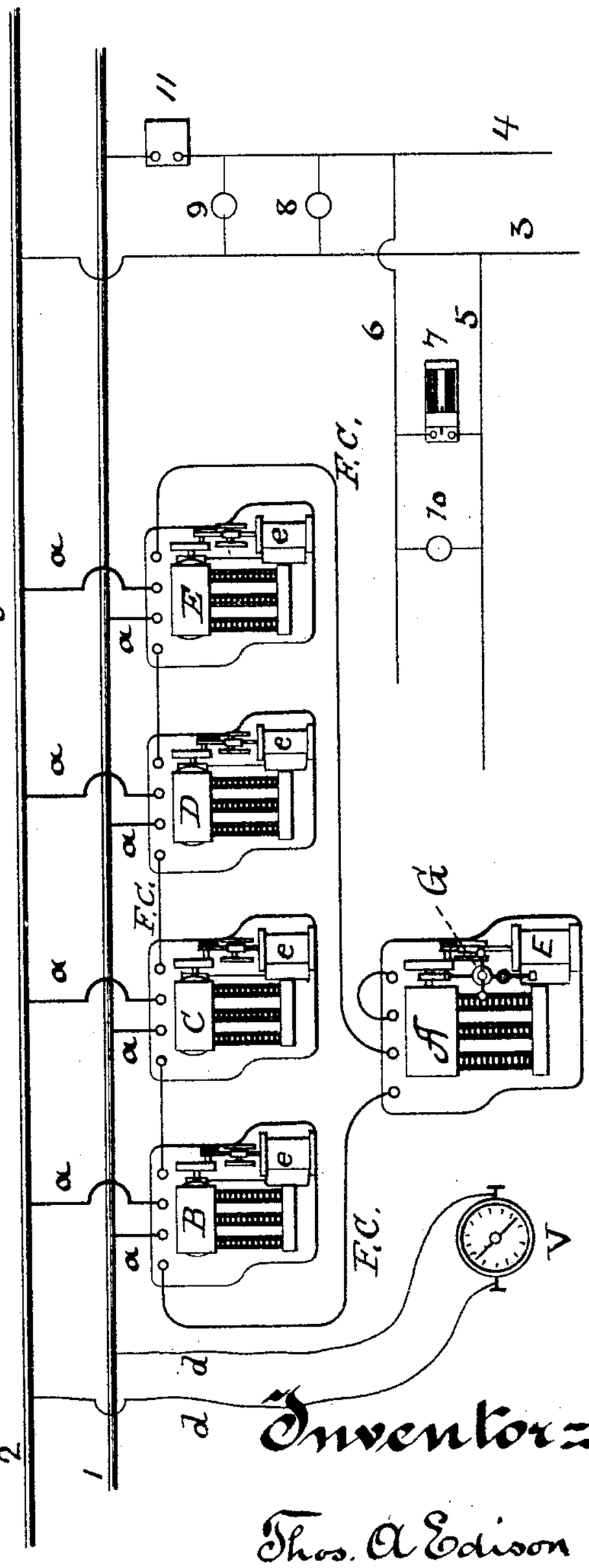


Fig. 2.

Fig. 1.



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UNITED STATES PATENT OFFICE.

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MEANS FOR CONTROLLING ELECTRIC GENERATION.

SPECIFICATION forming part of Letters Patent No. 482,549, dated September 13, 1892.

Application filed March 12, 1881. Serial No. 28,141. (No model.) Patented in England June 7, 1881, No. 2,482; in Germany July 20, 1881, No. 24,608; in Italy July 30, 1881, No. 13,198; in Belgium August 16, 1881, No. 55,302; in Victoria September 6, 1881, No. 3,078; in India October 13, 1881, No. 822; in New South Wales October 26, 1881; in France October 28, 1881, No. 144,103; in Spain November 2, 1881, No. 1,781; in Austria-Hungary November 13, 1881, No. 31 and No. 1,862; in Queensland December 30, 1881; in New Zealand January 4, 1882, No. 580, and in Canada November 23, 1882, No. 15,846.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Means for Controlling Electrical Generation, (for which I have obtained Letters Patent in Great Britain June 7, 1881, No. 2,482; in France October 28, 1881, No. 144,103; in Belgium August 16, 1881, No. 55,302; in Italy July 30, 1881, No. 13,198; in Austria-Hungary November 13, 1881, No. 31 and No. 1,862; in Spain November 2, 1881, No. 1,781; in Germany July 20, 1881, No. 24,608; in Canada November 23, 1882, No. 15,846; in Victoria September 6, 1881, No. 3,078; in New South Wales, registered October 26, 1881; in Queensland, registered December 30, 1881; in New Zealand January 4, 1882, No. 580, and in India October 13, 1881, No. 822;) and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings and to the letters of reference marked thereon.

In a system for supplying electricity from one source for a number of translating devices it is desirable that there be such an arrangement as will insure the generation of the proper amount of current and the preservation of the proper pressure, no matter how many or how few of the devices supplied in the system be in circuit, so that the amount of current requisite and of the proper pressure or electro-motive force be supplied to each device in circuit without regard to the increase or decrease of the total number in circuit; and it is also desirable that this should be done with the greatest possible economy and without the use of current-consuming resistances in the main or consumption circuit. For this purpose it is desirable that the generator or generators supplying the main or consumption circuit should be regulated by primarily varying the current flowing through their field-of-force circuit, so that the field magnet or magnets will be primarily varied below the point of saturation.

It is the object of my invention to accomplish this in a simple and efficient manner in the case of a generator or generators excited by a separate machine.

In prior applications I have shown how this may be accomplished, in one instance by varying the magnetic strength of the field-of-force magnets by shunting a portion of the current therefrom, or in another instance by interposing more or less resistance in the field-circuit, and in still another instance by throwing more or less counter electro-motive force into the field-circuit.

I have discovered another method of attaining this end, and which may be stated, in general terms, as consisting, where a special dynamo or magneto electric machine is used for generating the current for the excitation of the field-of-force magnets, of one or a battery of generators connected to the main or consumption circuit, in actuating such special generator, which may be termed the "prime generator," by a special motor-engine to which it is geared directly or from which it receives motion, and then governing this special motor-engine so as to vary the speed of the special or field-current generator by controlling its cut-off mechanism through an adjustable governor, which operation proportionately varies the current sent through the field-circuit of the one or battery of generators supplying the system, which in turn is followed by a proportionate variation in the generative capacity while a constant electro-motive force is maintained. In this way it will be seen that the generator or generators supplying the main or consumption circuit will be regulated by primarily regulating and varying the current flowing through the field-of-force circuit of such generator or generators, the field-magnets being in this way primarily varied in strength below the point of saturation. To accomplish this, an ordi-

nary centrifugal governor is used, with which is combined a weight adjustable upon an arm or lever and acting in conjunction with or in opposition to the governor-balls dependent on the fulcruming of the lever, so that the resistance of the governor to the force acting upon it may be controllably varied by movement of the weight upon the arm or lever, the resultant being that the special motor-engine may run at any one time with a speed proportionate to the demands of the system upon it.

A simple effective governor with a constant amount of work upon the engine would keep the engine at a constant speed and the generative capacity of its driven machine at a constant point; but as the number of translating devices in circuit varies the amount of current generated must be varied, while the electro-motive force of the system is maintained constant. This is effected by varying the amount of energy developed by the prime generator, which varies the strength of the field-magnets included in its circuit, making the field of force through which the generative-coils pass of greater or less intensity. This variation of generative capacity of the prime generator is accomplished by varying the speed of its connected engine by means of the adjustable weight connected to the governor, as before mentioned, whereby the required changes in strength of magnetic field and in the development of energy are insured, while a constant pressure or electro-motive force of the system is maintained independently of the number of devices in circuit. The present invention consists in an apparatus for carrying out the method above described.

In the drawings, Figure 1 is a diagrammatic view of a system embodying this method of regulation; Fig. 2, a detailed view of a governor suitable for the purpose, and Figs. 3 and 4 details of such a governor.

B C D E represent a battery of generators—in this instance magneto-electric machines—whose revolving armatures or inducing-bobbins are connected by multiple arcs *a a* with the main conductors 1 2 of a system, of which 3 4 and 5 6 represent consumption-circuits, on which are placed translating devices, such as lamps 8 9 10 and motors 7.

A is the special dynamo or magneto electric machine, which may be termed the "prime generator," whose circuit F C includes all the coils of the field-of-force magnets of the generators B C D E, which may be more or less in number. This prime generator A is geared directly to and driven by the special motor-engine E, while the other or supply generators may be driven each by its own engine *e*, or the whole series or battery may be driven by or from one engine.

The prime motor-engine E is provided with an adjustable governor G, having the usual centrifugal weights or balls and sliding sleeve attached thereto and moving therewith, which gives motion to two pivoted levers L and L′. Of these L′, through a connecting-rod *l*, controls the valve motion of the engine by controlling the cut-off mechanism. The other lever L carries the weight W, which is suspended from a saddle or stirrup S, capable of movement longitudinally upon the lever. To give it this movement, the lever L carries a screw-rod *r* with an attached hand-wheel R for turning it. In the thread of the screw takes a pin from the saddle or stirrup, so that rotation of the screw *r* by its handle R moves the weight along the lever L.

At the central station, where A B C D E are supposed to be located, is also an indicator showing any variations in the electro-motive force or pressure, in this case represented by an electro-dynamometer V in the derived circuit *d d*.

As seen in Fig. 2, the power or effect of W is in unison with that of the governor-balls *g g*, so that as it is moved toward the outer end of L the governor tends to operate the cut-off at a less speed than it otherwise would, while when it is moved to the extreme limit of inward movement the balls do not operate except when the speed necessary for the total work of the circuit has been exceeded. From this it will be seen that the production of current may be easily controlled and the electro-motive force or pressure maintained constant. For instance, when few translating devices are in circuit the engineer in charge moves the weight outwardly, so that the governor readily or at comparatively low speed operates the cut-off, keeping the engine and field-generator at low speed, sending a comparatively feeble current around the fields of the supply-generators. As more devices are put into circuit the increased needs of the circuit are indicated immediately upon V and he moves the weight inwardly, so that higher speed is required to cause the balls to cut off the engine, which, consequently, with the field-generator, runs at a higher rate, sending more current through the field-circuit, which acts upon the generators to cause an increased production of current. As devices are taken out of circuit the reverse takes place.

It is evident that the form of governor, of generator, and of engine may be modified without departing from the spirit of the invention. While the governor is here shown to be manually adjusted, it may be controlled and adjusted by a magnet in the main or in a derived circuit of the main line so that it may be automatically regulated. Such an arrangement, however, will form the subject-matter of a separate application.

What I claim is—

The combination, with a main or consumption circuit, of one or more magneto-electric machines connected therewith, an exciting-

machine supplying the field-circuit of the main machine or machines, means for varying the speed of the exciting-machine independently of the main machine or machines, and a suitable electrical indicator indicating the condition of the main circuit, substantially as and for the purpose set forth.

This specification signed and witnessed this 2d day of March, 1881.

THOS. A. EDISON.

Witnesses:
H. W. SEELY,
WILSON S. HOWELL.