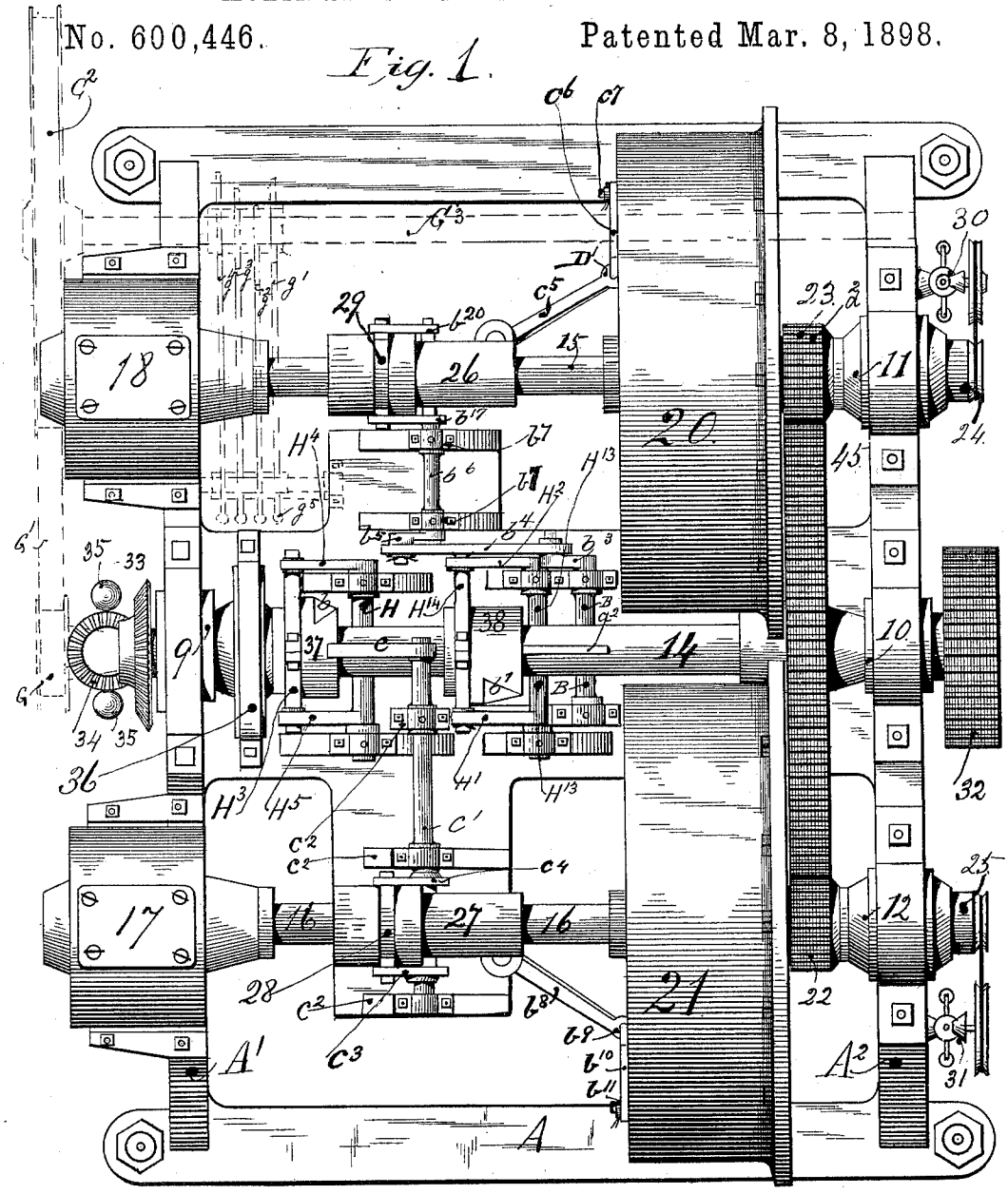
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B. C. POLE.

MULTIPLE ENERGIZER MOMENTUM ENGINE.

No. 600,446. Patented Mar. 8, 1898.

Fig. 1.



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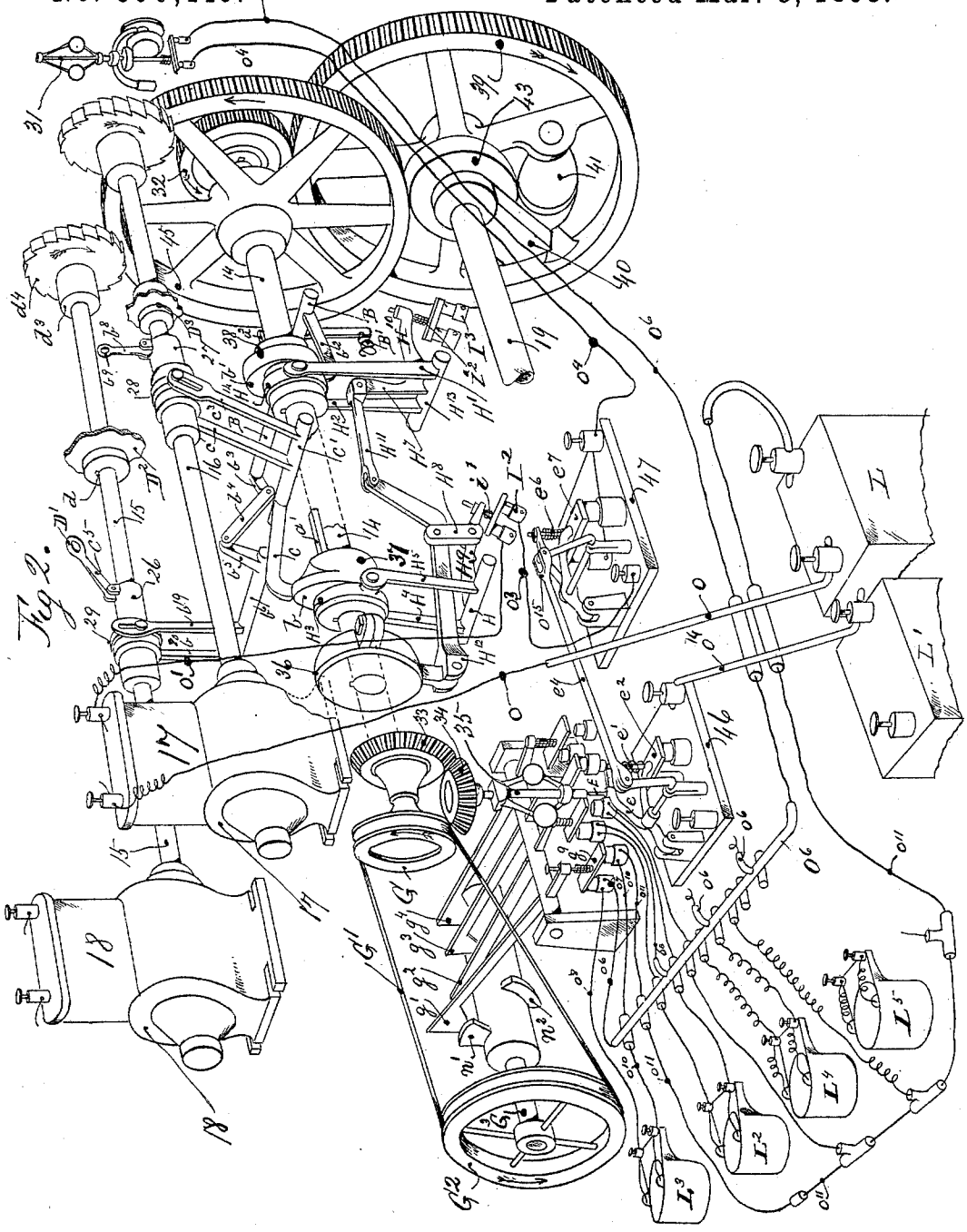
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MULTIPLE ENERGIZER MOMENTUM ENGINE.

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Fig 2.



Witnesses:
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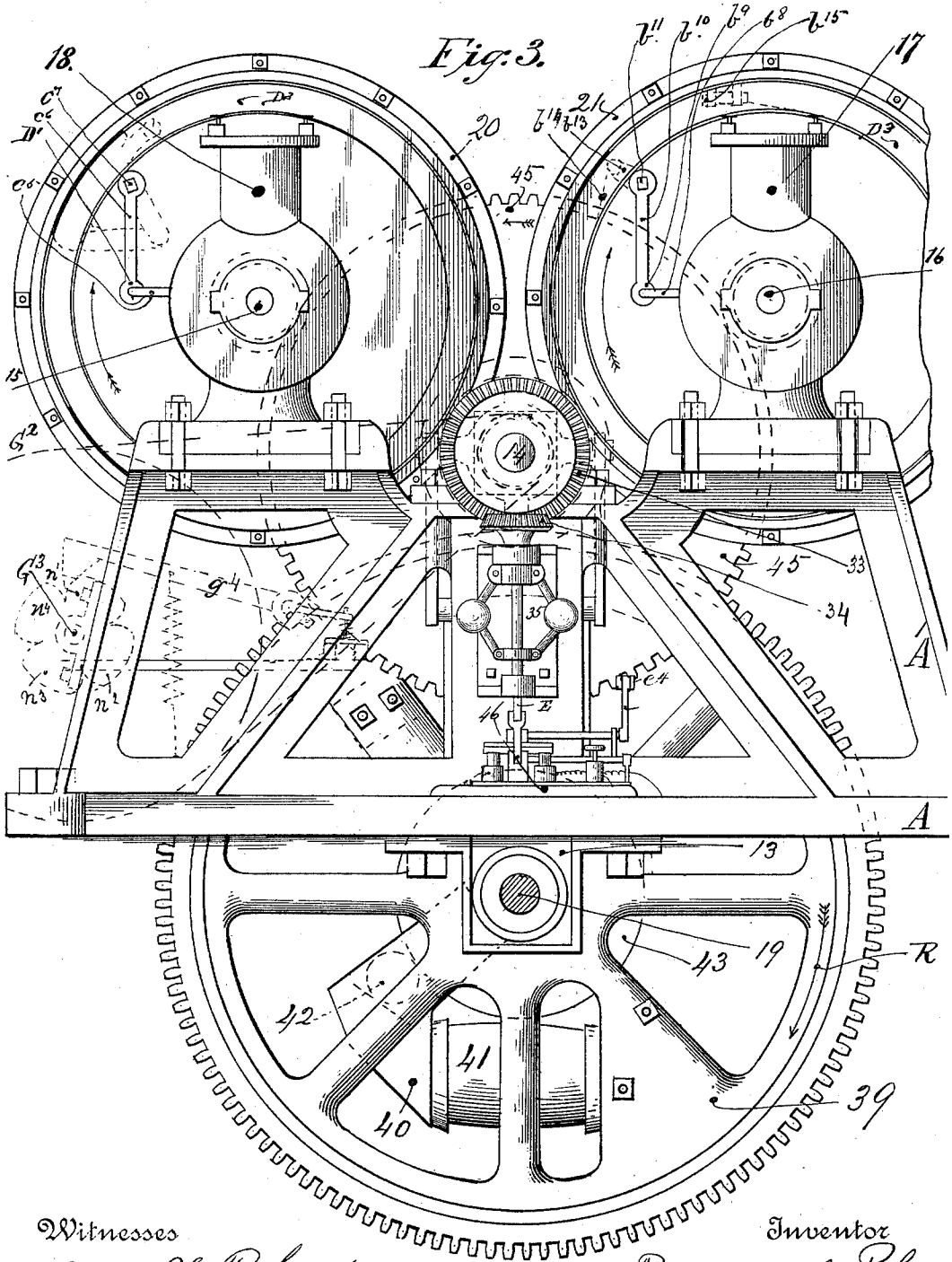
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No. 600,446. Patented Mar. 8, 1898.

Fig. 3.



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MULTIPLE ENERGIZER MOMENTUM ENGINE.

No. 600,446. Patented Mar. 8, 1898.

Fig. 4.

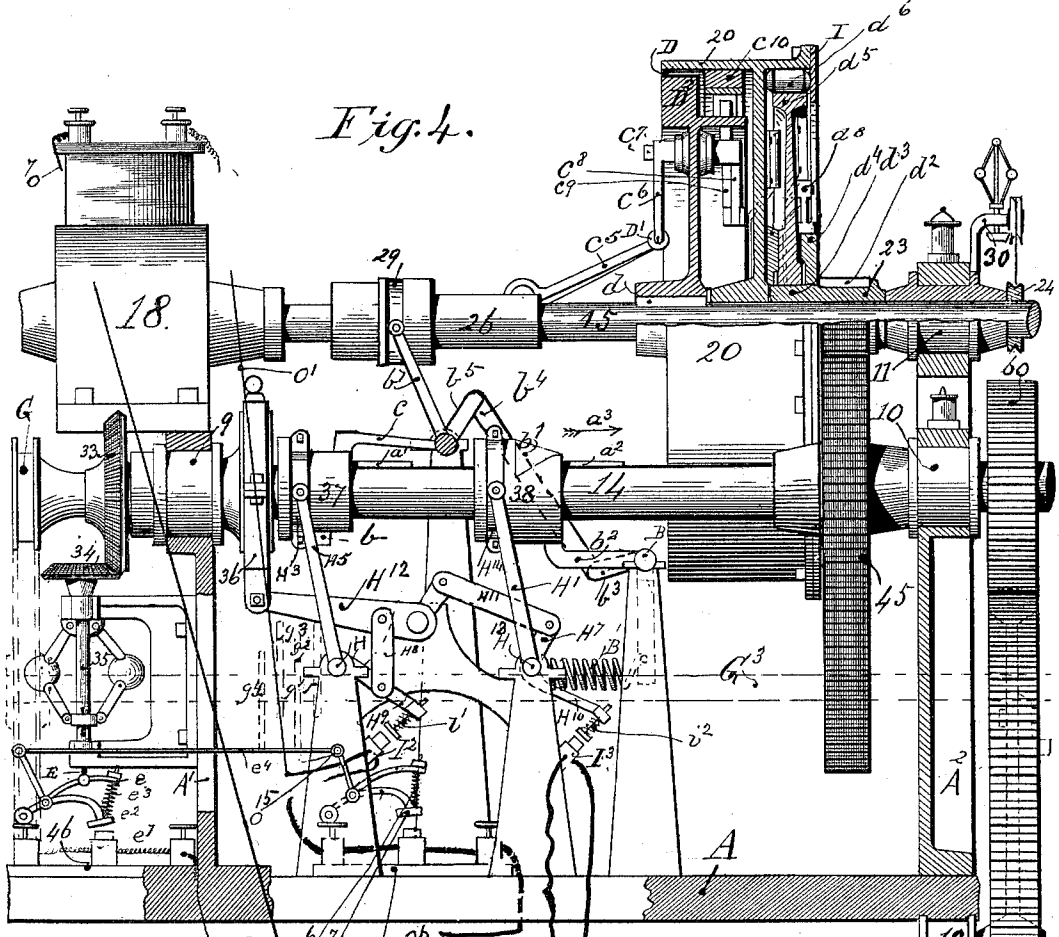


Fig. 22

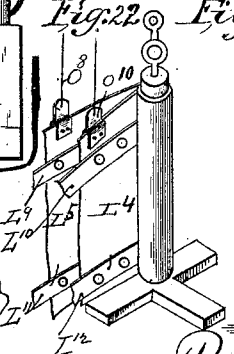


Fig. 21

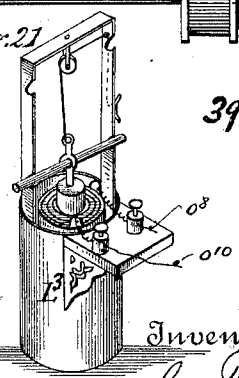


Fig. 23

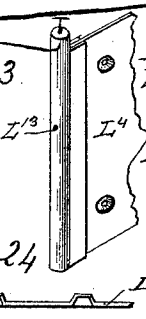
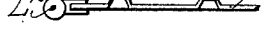


Fig. 24



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MULTIPLE ENERGIZER MOMENTUM ENGINE.

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Fig 5.

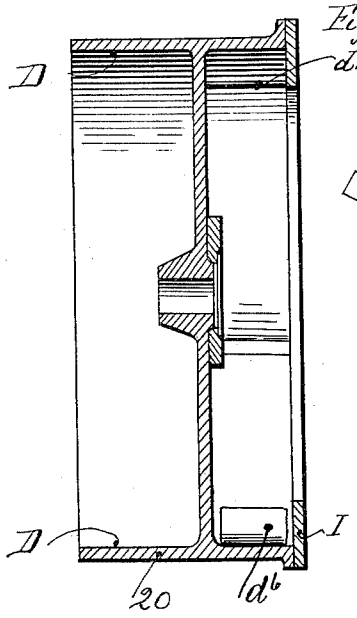


Fig 7

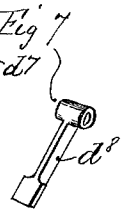


Fig 9

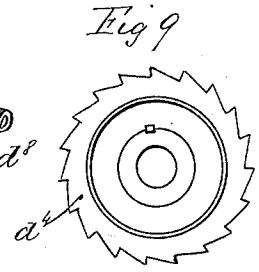


Fig 8.

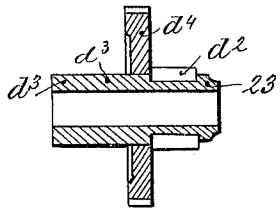


Fig 6

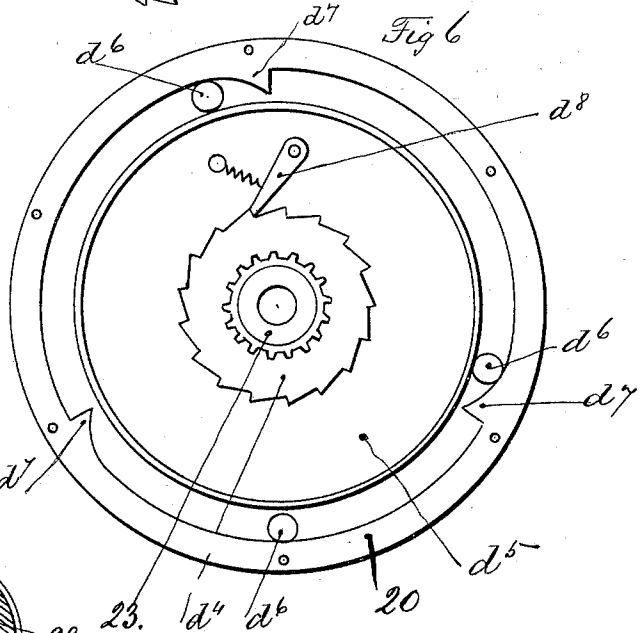
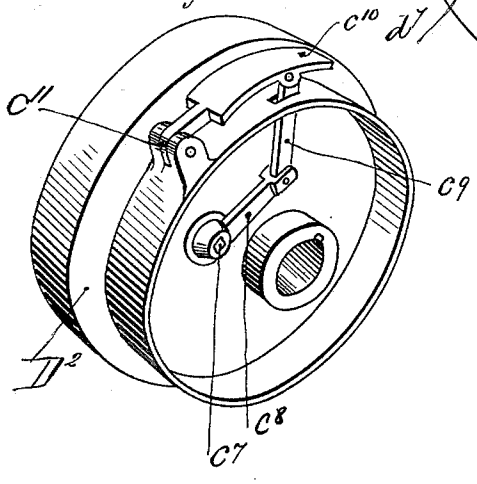


Fig 10.



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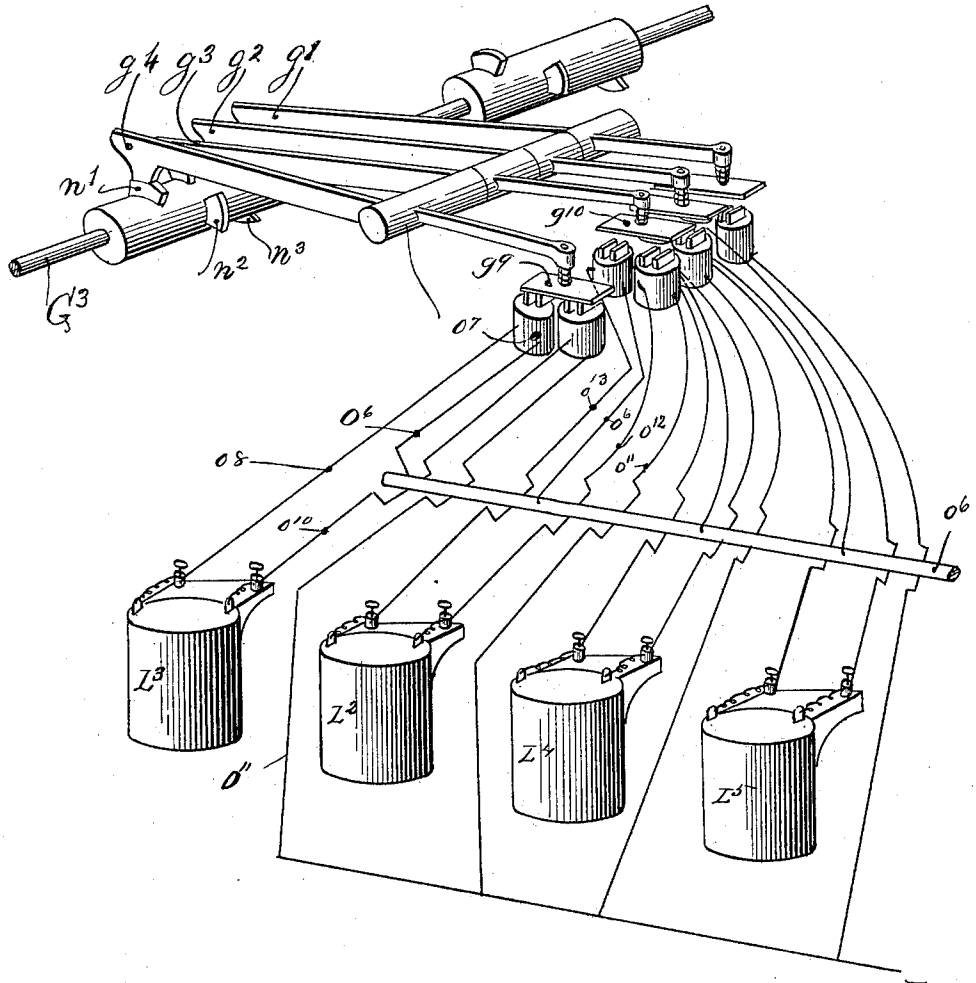
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Fig. 11



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B. C. POLE.

MULTIPLE ENERGIZER MOMENTUM ENGINE.

No. 600,446. Patented Mar. 8, 1898.

Fig. 12.

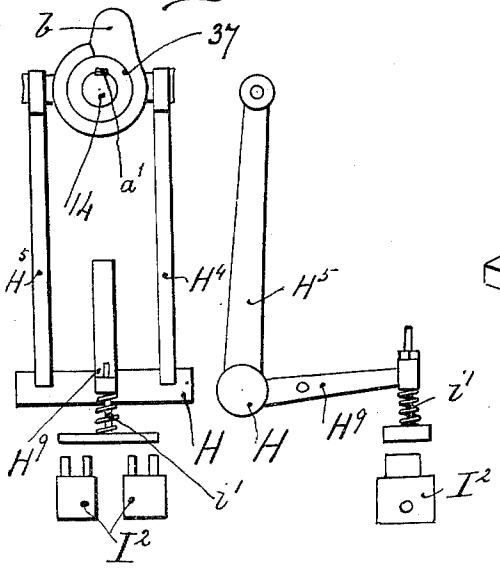


Fig. 13

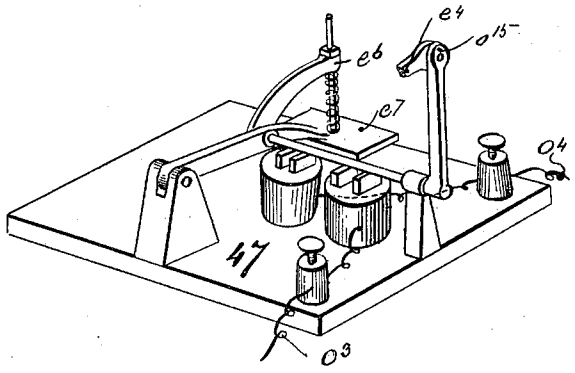


Fig. 15

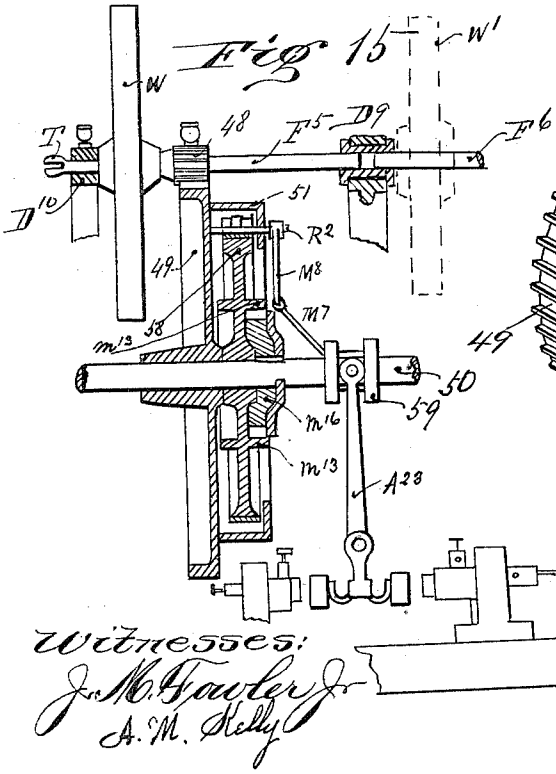
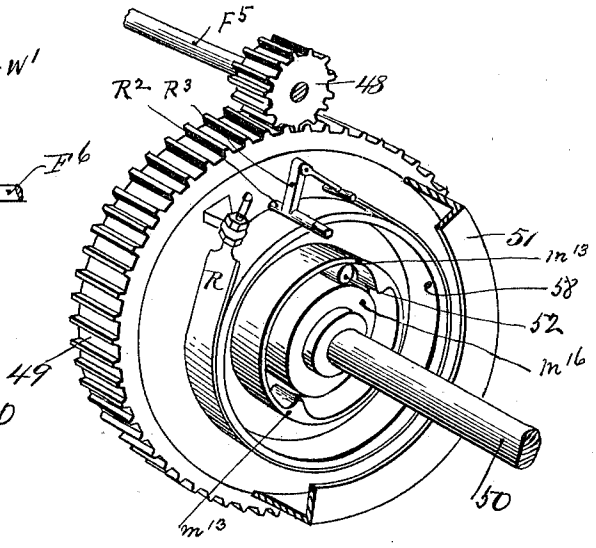


Fig. 16.



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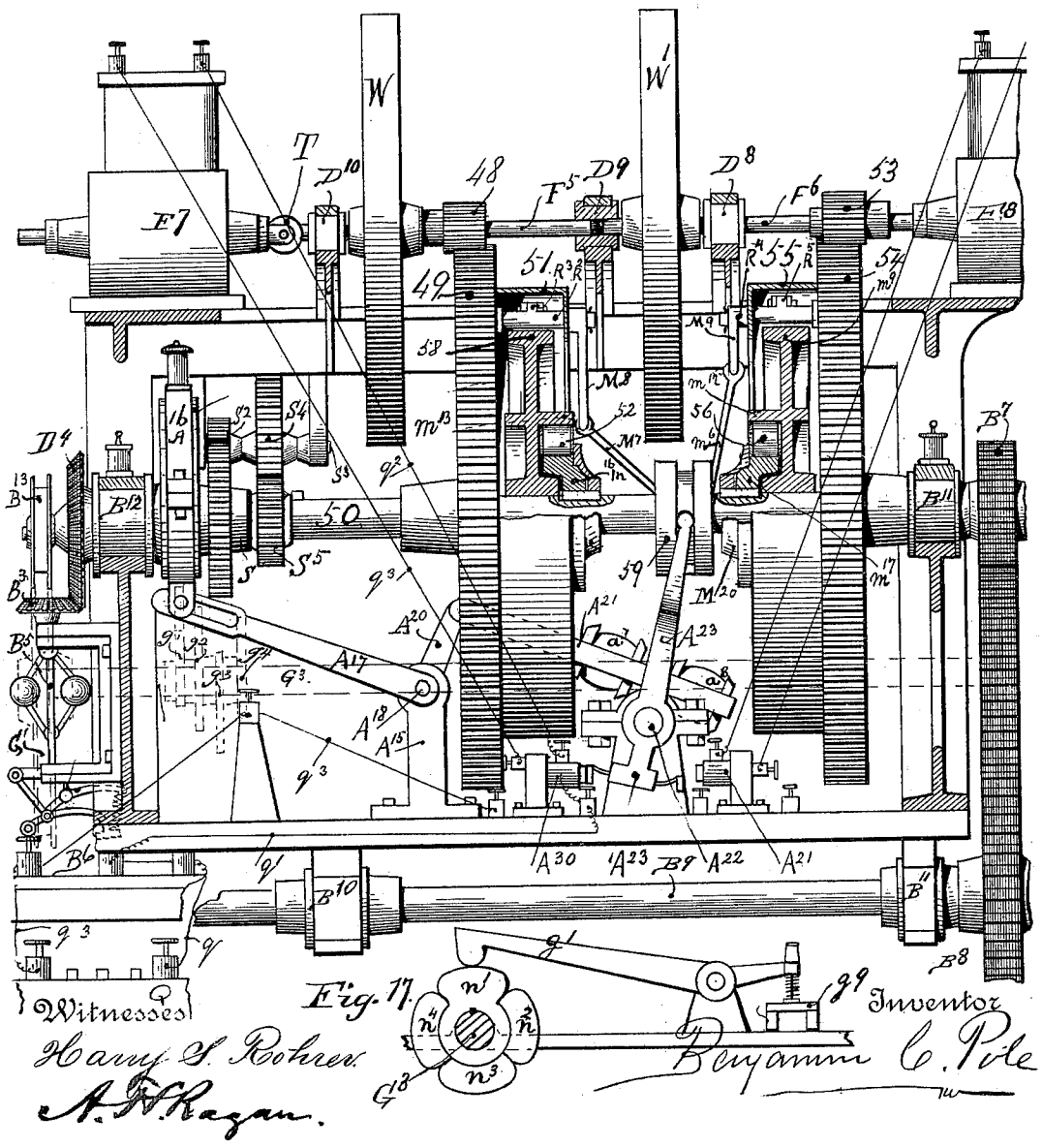
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MULTIPLE ENERGIZER MOMENTUM ENGINE.

No. 600,446. Patented Mar. 8, 1898.

Fig. 14.



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MULTIPLE ENERGIZER MOMENTUM ENGINE.

No. 600,446. Patented Mar. 8, 1898.

Fig. 18.

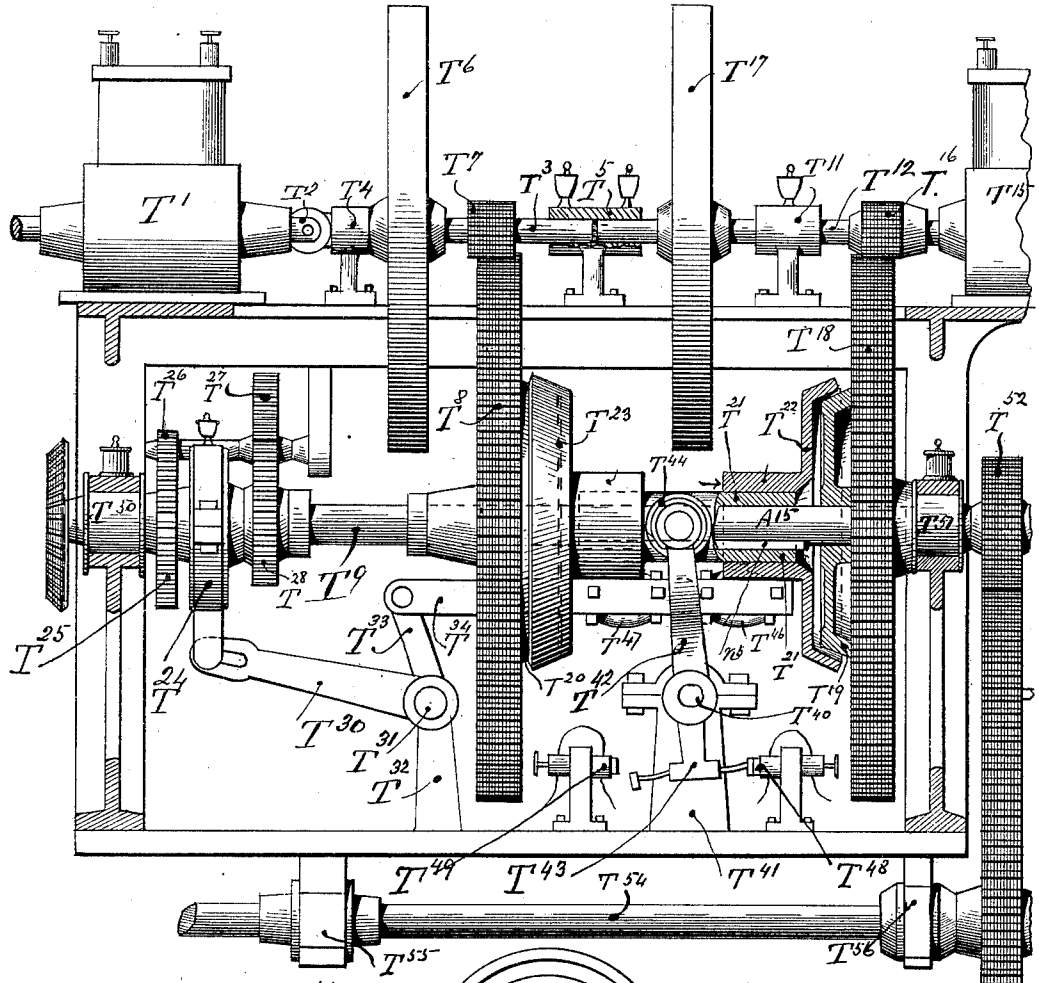


Fig. 20.

Fig. 19.

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UNITED STATES PATENT OFFICE.

BENJAMIN CHARLES POLE, OF CAMDEN, NEW JERSEY.

MULTIPLE ENERGIZER MOMENTUM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 600,446, dated March 8, 1898.

Application filed May 2, 1887. Serial No. 236,847. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN CHARLES POLE, engineer, a citizen of the United States, residing at Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Multiple Energizer Momentum-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.

The object of my invention is to economize in the use of any motive power to develop as far as possible the latent energies thereof. In this application for Letters Patent there are shown two electric motors as prime movers; but their place may be taken by steam-engines or gas-engines or any other motive power. I use a small volume of electricity and subdivide the currents of electricity, cutting them down so that the separate streams supplied to the motors are as small as possible, leaving just sufficient current to give speed to the armature of the motor and its fly-wheel by acceleration when the wheel is detached. I govern the speed of the motor and its fly-wheel, so that the fly-wheel will be governed to run at a desired speed, and as the fly-wheels are constantly losing speed, which must be restored, so as to enable them to do rotary work, I make this restoration of speed in a fly-wheel which is not engaged in giving off rotary foot-pound work—that is, it is detached and free to revolve on its own supporting-shaft—and the engine-motor (which can be any motive power) has only the resistances of the frictions of the journals and that of the atmosphere to overcome the fly-wheel's inertia. The several fly-wheels will get a slightly-varying speed, a diminution will take place while the fly-wheel is attached to the working load having to do rotary foot-pound work, and it is after this diminution has taken place to a certain degree, more or less, that the motor is called upon to restore the speed of fly-wheel belonging to it, and it will do so economically when that wheel is detached and has become, so to speak, a "loose" fly-wheel. The rims of the fly-wheels will be constantly passing and repassing each other in their rim speed by making the momentum thereof do the work and deliver the one stream of rotary foot-pound work. By development I save waste and bring out the latent qualities now lost in the present application of motive power. I find it is a loss at once to do rotary foot-pound work with any motive power.

This application is an improvement on Patent No. 382,008, dated May 1, 1888, which represents a single system, being one cylinder or motive-power-using motor energizing two fly-wheels. In this application two or more independent motors are employed, each one to energize its own fly-wheel.

By making one stream of electricity or any motive power at once do rotary foot-pound work a larger volt and amperage is required, and it is for the purpose of saving the volts and amperage that this invention is made, for there is a loss of the latent qualities of the first power due to the defects of the motors and defective mechanical application where made immediately to do work.

By acceleration of inert matter in the rims of fly-wheels as it is used in this invention a law of mechanics is brought into play whereby a mass of matter can be, by a small energy, propelled by rolling or revolving, which could not have been lifted by the same energy, and it is to use and take advantage of this principle that the multiple energizer momentum-engine is devised to make it do rotary foot-pound work by momentum derived from several fly-wheels and all delivered in one stream of work. I use a small amount of power and develop a potential power at a different point farther off from the common center. I afterward use the potential effect of the momentum, which is so situated to do the rotary foot-pound work. I add the accelerated energizing momentum feature of two or more fly-wheels, each to alternately and automatically do work in one stream. I subdivide down as small as possible the streams of electricity, change the sources of battery from which they are drawn, and govern the induction thereof, so as to regulate independently the speeds of each of the motors.

Therefore my invention is to make a developing multiple momentum mechanism, to develop nearly all the latent qualities of the first motor-engines, to transpose the position

of those powers, so as to make the rims of the fly-wheels at the radii thereof potential—that is, the accumulation of all the energies being the accelerations and momentums shall be reservoired in the rims of the wheels, securing a vantage point of leverage with which to do rotary foot-pound work in one single continuous stream.

The motor and its fly-wheel are alternately and automatically released from the strain of doing work by an automatic action, which may consist in levers and cams operating a friction-clutch, for the purpose of attaching the fly-wheels to make them do duty and revolve a shaft by momentum; and it is not necessary to the success of the invention that the diameter of the rims of the fly-wheels shall be greater than the diameter of the armature of the motor or, if a steam-engine is used, that the diameter of the fly-wheels shall be greater than that described by the radius to the crank-pin of that engine. It is a possible mechanical law to energize and revolve two thousand pounds of metal with fifty pounds constant revolving power with which to supply the motion to that metal and use the momenta as set forth. It is an economical conversion—a storage and transposition of the powers for subsequent use.

In the electric motor the pull of the armature is its power, and this is of lever value of one-half of the diameter of the armature. In the steam or gas engine it is the piston-pressure exerted at the radius of the crank-pin.

To apply in this invention the above rules, it becomes the most natural and economical condition in which inert matter could be placed to revolve it in the form of a fly-wheel by an engine-motor, especially when that fly-wheel is free to revolve on its shaft and supporting-journals and is resisted only with the friction of those journals and that of the atmosphere, and in this way the rims of the wheels become potential and of a value for doing rotary work of their weight by the square of the velocity, and as this weight of rim is necessarily at a distance from center the radius of that rim is the potential point with which to revolve a driven shaft and give off rotary foot-pound work. I also provide the controllers for the several streams of electricity, steam, or gas, or any motive powers which are regulated by governors, said governors being operated by the driven shaft. I also provide the governors, which are operated by each of the independent shafts, and these latter governors are supplied with the proper construction to turn on and off the fluid electricity and thereby govern the speed of the fly-wheel.

I show drums which cover in the friction-clutches and the escapement devices.

I show in the modification fly-wheels which are not covered in.

I show several constructions for friction-clutches which can operate alternately and be driven automatically by the mechanism.

I show escapement devices which are of the roller-friction order and the well-known pawl and ratchet. These are provided for the purpose of preventing the fly-wheels from working against each other, which they would do in view of the constantly-varying speed which they get, due to the way they are used.

Each motor is set by its own governor to maintain a speed of the rim of the fly-wheel and all the governors will be set in the machine to make the fly-wheels maintain the same speed, and when a fly-wheel is only resisted by the friction of its journals that small resistance, with that of the atmosphere, will permit the speed of the rim of fly-wheel to be most economically accelerated to the desired speed; and this same result could not be accomplished by the like motor and stream of electricity supplied to it if it should be called upon to give off rotary foot-pound work as a resistance to its movement, and it is by this method, through the action of the various parts shown in the invention, that the potential value of the rims of the fly-wheels is made to do work in one continuous stream.

I show reducing-gears to regulate the speed of the action of the friction-clutches. I provide levers and cams to make that action adjustable and gradual.

By referring to the drawings, and letters and figures of reference marked thereon, which form a part of this specification, it will be seen that Figure 1 is a plan view of my invention. Fig. 2 is a perspective view. Fig. 3 is an end elevation. Fig. 4 is a cross-section cutting through one of the drums. Fig. 5 is a cross-section of either of the drums 20 or 21. Fig. 6 is an end view of one of the drums, showing the pawl and ratchet as well as the roller friction devices. Fig. 7 is a view of the pawl belonging to the escapement. Fig. 8 is a cross-section of the gear-wheel and ratchet-wheel 23. Fig. 9 is an end view of the hub of the gear-wheel and ratchet-wheel, as in Fig. 8. Fig. 10 is a perspective view of the fly-wheel and friction-shoe belonging thereto in drum 20. Fig. 11 is a perspective view of the shaft, which is provided with the drum and cams to operate the levers by means of which the currents of electricity are changed from one battery to another. Fig. 12 is a view of the cam which operates the attaching and detaching levers of the friction-clutches and also the device which turns on and off the electric current, with a side view of the same. Fig. 13 is a perspective view of one of the controllers. Fig. 14 is a modification in the arrangement of the motors and fly-wheels, showing a different friction-clutch, also showing roller-escapements and reducing-gears adapted to operate the eccentric that operates the levers which operate the friction-clutches. Fig. 15 is a sectional elevation of the friction-clutch of Fig. 14. Fig. 16 is a perspective view of the friction-clutch and roller-escapement used in Fig. 14. Fig. 17 is a side view of the levers, as shown in Fig. 11. Fig. 18 is

another modification in the arrangement of the motors and their fly-wheels and shows a cone friction-clutch. Fig. 19 is a view looking into one of the cone friction-disks. Fig. 20 is a view of the lever and rod with rock-shaft which is used to operate the friction-clutch to open and close the currents of electricity. Fig. 21 is a perspective view of a calorometer electric battery. Fig. 22 shows the way the metal plates are arranged in the battery for generating the electric current. Fig. 23 represents the end of one of those metal plates of Fig. 22. Fig. 24 is a cross-section of one of the plates, as in Fig. 23.

Upon a bed-plate A are two upright frames A′ and A². Frame A′ carries the journals 9 and the motors 17 and 18 and the bracket which belongs to the governor 35. Frame A² carries the journals 10, 11, and 12 and also forms the support for the arm belonging to the governors 30 and 31.

On the under side of the bed-plate A is the journal 13 and its shaft 19. Loosely mounted on this shaft is the gear-wheel 39, and keyed to the said shaft is the wheel 43. Between the gear-wheel 39 and the wheel 34 is an escapement 42 and elastic device 40. A spring 41 is attached to the gear-wheel 39, and when it is in action it is forced against the loose arm 40. This arm 40 is loose upon the shaft 19, and on the inside of this arm is a friction-roller 42, (shown in dotted lines, see Fig. 3,) and by means of this construction the wheel 43, which is keyed to the shaft 19, is revolved. This permits the shaft 19 an independent revoluble action in one direction and is similarly shown in Letters Patent No. 401,855, dated April 23, 1889. The shaft 14 has journals 9 and 10 and has keyed to it the gear-wheels 32 and 45. The gear-wheel 45 intergears with two loosely-mounted gear-wheels 22 and 23. These wheels have independent shafts 15 and 16. Shaft 15 is sustained at one end by the motor 18 and at the other end by the journal 11. The other shaft 16 is sustained at one end by the motor 17 and at the other end by the journal 12. The two gear-wheels 22 and 23 are operated as follows: As they both intergear with the teeth of the gear-wheel 45, the speeds of these two gear-wheels 22 and 23 must necessarily be the same at all times, and these said wheels are a part of the means for the transmission of power to revolve the gear-wheel 45.

I will now describe the way the transmission is accomplished: The wheel 22 may be the one which is transmitting the power by having the greatest speed, and in doing so it is the one wheel which will drag along the other wheel 23, and that order of transmission will be constantly changing from one wheel to the other. There is provided at these wheels certain escapements to permit the above action. Wheel 23 is mounted loosely on shaft 15. The gear-teeth of the wheel are marked d^2, (see Fig. 8,) and there is provided a sleeve or hub d^3, and keyed to this hub is the ratchet-wheel d^4. All can be made in one piece, if desired. Loosely mounted on the hub d^3 is the smooth-faced wheel d^5. This wheel is provided at its side with a pawl d^8, which is made to engage the ratchet-wheel d^4, and by doing so when in action will revolve the gear-wheel 23. It can do so only in one direction. On and against the flat face of the wheel d^5 (see Fig. 6) are placed the roller-frictions d^6, and these rollers are made to jam against inclined planes d^7, which are formed on the inside of the flange of drum 20, and when this drum revolves in one direction it will, through the action of the friction-rollers d^6, revolve the wheel d^5. This wheel actuates the ratchet-wheel d^4 through the pawl d^8, and thus the gear-wheel 23 is revolved by the action of the drum in one direction. The drum 20 itself is loosely mounted on shaft 15 and is actuated itself by a friction-clutch from the movement derived from the action of the fly-wheel D². Said fly-wheel being keyed to the shaft 15 at d is energized by the motor 18, and the object of all this escapement device is that when the gear-wheel 45 is revolved by the power supplied to it by the gear-wheel 22 and its connections the connections which belong to the gear-wheel 23 will have no retarding influence to the free revolution of the gear-wheel 23 on the wheel 45. Thus is prevented a conflict between the momentum of the fly-wheels and connections which are supplied to the said wheels 22 and 23, with which to drive the same. As said before, the shaft 15 is operated by the armature of the motor 18. The belt 24 connects the shaft 15 to its governor. On this shaft 15 is loosely mounted a sleeve 26. This sleeve is provided with a loose collar 29, and this collar connects the two levers b^{19} and b^{20}, one on either side, which are designed to slide back and forth the sleeve 29 on the shaft 15. Hinged at the side of the sleeve 29 is the connecting-link c^5. This connects at a chain-eye D′ to a lever c^6. This lever is rigidly attached to a rock-shaft c^7. This shaft is loosely mounted and carried by the fly-wheel D². This fly-wheel is keyed to the shaft 15 by the key d. (See Fig. 4.) At the inner end of the rock-shaft c^7 and connecting to it is a lever c^8. (See Figs. 4 and 10.) This lever connects to a connecting thrust-rod c^9, and to this is hinged the shoe c^{10}. This shoe c^{10} hinges to the fly-wheel D² at c^{11} and forms the friction-clutch to connect the fly-wheel with the inside flange D of the drum 20, and by the action of forcing outward this shoe c^{10} there is the result of a friction-clutch, as set forth in Letters Patent No. 330,576, dated November 17, 1885.

In drum 21, which is loose on the shaft 16, there is shown in dotted lines a strap-friction to act as the connection between the said drum and the fly-wheel D³, which is keyed to the shaft 16. The strap-friction is shown in Letters Patent No. 382,008, dated May 1, 1888, and in the drum (either 20 or 21) the shoe construction just described can be used.

I do not confine myself to any form of friction-clutch or escapement class of ratchet-and-pawl and roller friction devices with which to operate my invention. By referring to the drawings it will be seen that the rim of the fly-wheel D^2 is of a radius greater than that of the armature of the motor 18; but it is not necessary to the success of the invention that the diameter of the fly-wheel shall be greater than the diameter of the armature of the motor 18, or, for that matter, the motor 17, which belongs to the other fly-wheel upon the other independent shaft 16; but it is necessary for the fly-wheel to have a period of freedom from the restraint of doing rotary foot-pound work, for it is during the freedom from that duty that the rims of the fly-wheels D^2 or D^3 become potential through the well-known powers of an engine-motor to accelerate and thus to accumulate by acceleration momentum, and this power is transmitted by the graduated action to the drums, (either 20 or 21,) is given to those drums alternately and automatically, and the roller-friction and pawl mechanism transmits this power to the gear-wheels, (either 22 or 23, as the case may be,) and thence to the gear-wheel 45, to which and with which they intergear.

The acceleration of the fly-wheel D^2 takes place during the period of freedom from doing rotary foot-pound work, and it is at this time, which is the most natural and economical time or condition of affairs, to accelerate the said wheel—that is, when it is free to revolve and be energized—that the momentum of the fly-wheel D^2 is connected by a friction-clutch and through the connection hereinbefore described energizes the shaft 14. It is unnecessary to say that the friction-clutches and escapement devices can be of like nature and construction and are for the similar purposes situated in the drum 21. A different friction-clutch is shown dotted in, but its duty is the same as that clutch which is placed in drum 20. Mounted loosely on shaft 16 is a loose sleeve 27, which is provided with a loose collar 28. At the side of the sleeve 27 is the connecting-link b^8. This connects to a chain-eye b^9, which connects to a lever b^{10}, and is connected to a rock-shaft b^{11}, and said shaft is carried by and journaled in the fly-wheel D^3. This fly-wheel D^3 is keyed to the shaft 16 and is energized by the motor 17. This fly-wheel belongs to the drum 21 and at the inner end of the rock-shaft b^{11} and connecting to it is a lever b^{13}. (Shown in dotted lines, Fig. 3.) This lever b^{13} is to tighten the end of the strap b^{14}, and by doing so makes or forms a friction-clutch with which to connect the fly-wheel D^3 to the drum 21. In either drum the friction-clutches can be alike. In drum 21 (shown in dotted line) is a tightening-nut b^{15} to tighten the friction-strap b^{14} at the opposite end. This construction is shown in Letters Patent No. 365,273, dated June 21, 1887. Shaft 14 is rotated by the gear-wheel 45 and revolves the cams 37 and 38. It also revolves the eccentric and its strap 36. By this action a rising-and-falling action is imparted to the strap, and this in turn is given to a lever H^{12}. Connected to and hinged to this lever is the link H^8. This hinges to the lever H^9 on the rock-shaft H. (See Figs. 1, 2, and 3.) This shaft has two upright levers H^4 and H^5, which connect on either side to the loose collar H^3 of the sliding cam 37. This cam is prevented from independent revolution on the shaft 14 by the key a'. (See Fig. 4.) By revolving the shaft 14 the cam 37 will be revolved, and it will slide back and forth on the shaft 14 by the action imparted to it through the movement of the eccentric and its strap 36 and the levers just described. The reason for sliding the cam 37 back and forth is to bring the projection b farther and tighter under the lever c. (See Figs. 2 and 4.) This lever is connected onto the rock-shaft c', (see Fig. 1,) and the rock-shaft c' is carried in journals c^2 c^2 c^2 and is provided with the two upright levers c^3 and c^4. These connect at either side with the loose collar 28 of the loose sleeve 27. Through these connections and by the revolution of the shaft 14 the automatic alternate friction-clutch connection is made between the fly-wheel in drum 21 and thence by and through the escapement devices to the gear-wheel 22, and as this intergears to gear-wheel 45 a continuous connection is made back to the shaft 14.

Connected to the rock-lever H^{12} is the lever H^{11}. This connects with the lever H^7, which is on rock-shaft H^{13}, (see Fig. 4,) and on this rock-shaft H^{13} are the two upright levers H' and H^2. These connect at either side with the loose collar H^{14} on the sliding cam 38, and, as in the instance of the cam 37, this cam 38 is prevented from free revolution on shaft 14 by the key a^2, (see Fig. 4,) and the cam 38 is made to revolve by the shaft 14. Cam 38 is slid back and forth on shaft 14 by the action of the eccentric and its strap 36 and by the connections herein shown. By this action the projection b' is brought tightly under the lever b^2. This lever is on a rock-shaft B. (See Figs. 2 and 4.) The lever and spring B' (shown in dotted lines) pull the lever b^2 up against the cam 38 and its projection b', (see Fig. 4,) and especially is the projection b' made to operate the lever b^2 when the cam 38 is slid along the shaft 14, thereby tightening its action on the lever b^2. (See Fig. 4.) The position occupied by these cams 37 and 38 on the shaft 14 shows an alternating action and automatic action for the opening and closing of the friction-clutches. At the side of the rock-shaft B and connecting therewith is the lever b^3. This hinges to the connecting-rod b^4, which hinges to the lever b^5 on the rock-shaft b^6. (See Fig. 1.) This rock-shaft b^6 is journaled at b^7 and b^8 and is provided with the two upright levers b^{19} and b^{20}. These levers connect at the side with the loose collar 29 on the loose sleeve 26, which is mounted on shaft 15. Thus the automatic connection is made to the drum 20, then through the es-

capement devices to the gear-wheel 23, and as this intergears to and with the gear-wheel 45 a continuous connection is made back to shaft 14. This connection is therefore only broken by the automatic and alternate action brought about by the revolution given to the cams 37 and 38 on shaft 14. The rock-shaft H is provided with a lever H^9. (See Fig. 2.) This lever has a spring and bolt i', which is for the purpose of making an adjustable connection for the current opening and closing device I^2, and this construction makes it possible for the electric current to be turned on and off and regulated by the action of the shaft 14 and the actions which operate the automatic attaching and detaching friction-clutches, and this opening and closing device I^2 is shown as operating a current of electricity for motor 17; but the wires can be so run, if desired, to make this device I^2 operate the current for motor 18. The rock-shaft H^{13} is provided with a lever H^{10}. This lever has a spring and bolt i^2 to make an adjustable connection for the opening and closing electric-current device I^3, and this construction makes it possible for the current of electricity to be regulated (turned on and off) at this point by the motion of shaft 14 and the mechanism which operates the automatic attaching and detaching friction-clutches. Again, the device I^3 can be wired so as to carry the current of electricity to operate either motor.

Keyed to the shaft 14 is the beveled gear-wheel 33. This intergears to the beveled gear-wheel 34, which is mounted on the shaft of the ball-governor 35, (see Fig. 4,) and the well-known centrifugal action of this governor raises and lowers the rod E, according to the velocity of the shaft 14, and this construction of governor is to operate the controllers 46 and 47. The rod E connects to a lever e, which is provided with an adjustable bolt and spring e', which regulates the raising and lowering plate e^2 of the controller 46. The action of the rod E through this construction turns on and off or regulates the current of electricity which shall have to pass this point. The controller 46 is for motor 18. It can be wired to carry the current for either of the motors. A connecting-rod e^4 connects at o^{15}. (See Fig. 13.) This connects to an adjustable bolt and spring e^6, and this is connected to the plate e^7 of the controller 47, thus forming an adjustable connection to open and close or regulate the current of electricity and control the same at this point. This controller is shown as wired to carry the current of electricity to motor 17. It is governed by the governor 35 and can be wired to carry the current of electricity to either motor. All of these electric devices, electric motors, and current turn-on-and-off plates, which are known in the art as being a plate of metal, are capable of conveying the electric current. Attached to governors are similar devices which can be substituted for engines and valves when steam or gas engines or other motive power may be used to act as a substitute for the motors 17 and 18. Also keyed to shaft 14 is the pulley-wheel G, which is provided with a belt G' to connect to a pulley G^2, and this pulley is mounted on and keyed to the shaft G^3. This shaft is carried in journals on the frames A' and A^2. Mounted on the shaft G^3 is a suitable number of cams n', n^2, n^3, and n^4, so positioned that as this shaft is revolved by the action of the shaft 14 the pulleys G, the belt G', and the pulley G^2 on shaft G^3 causes a number of levers, by the cams before mentioned, to be raised and lowered. These levers g', g^2, g^3, and g^4 (see Fig. 11) are raised and lowered alternately, thereby opening and closing successively currents of electricity from first one and then the other of the batteries. (Shown in the order in the drawings as L^2, L^3, L^4, and L^5.) By reference to Fig. 2 it will be seen that a wire o connects directly to the motor 17, and for the purpose of description on returning is marked as o'. This wire comes to the opening and closing device I^2, and, passing thence as o^3, it is carried through the opening and closing devices of the controller 47, is there governed and regulated by the speed of shaft 14. From thence, as o^4, it is carried to the opening and closing device of the ball-governor 31, which is to regulate the speed of shaft 16 and its motor 17, and is belted at 25 to said shaft. After passing governor 31 the wire o^6 passes behind both of the wires o and o^{14} and is led around to the end of the wire, crossing over several wires and shown enlarged as o^6. At the end of this enlargement it is lettered as o^7 at the connection-point. From this point there is the wire o^8, which runs to the battery L^3, and the plate g^9, coming down upon the points, as shown, makes the connection between the wires o^8, o^{10}, and o^{11} at the point o^7, and in this way the current is in wire o^{11}, so that the battery L has been placed in circuit with the current from the battery L^3 through the revolution of the shaft G. Now the cam n^2 lifts the lever g^3, and the plate g^{10} closes on the connection ends, so that the current which shall be in wire o^6 connects to and with wire o^{13}, and this connects to battery L^2, and the plate g^{10} makes a connection between the wires o^6, o^{13}, o^{14}, and o^{11}, and in this way the current of electricity, being in wire o^{11}, is returned to battery L; but the battery L^2 has been placed in circuit and the battery L^3 has been cut out of circuit, so the rising and falling of the several levers g', g^2, g^3, and g^4 automatically change, put on, and cut out the currents from the said batteries for the supply of electricity to the motors. Therefore the return-current o is directly to the battery L, while the current supplied to the motor is regulated and constantly enriched by the change of battery-wire o^{14} to the controller 46 from battery L'.

As heretofore stated, boilers may be used instead of batteries when the steam-engine takes the place of the motors 17 and 18.

I show in Figs. 21, 22, 23, and 24 the calorimeter electric battery. This battery is made by two sheets of zinc and copper made up in a roll and a cloth or other non-conducting substance interposed between the two rolls, and the object of showing this battery is to make it clear that the invention is to use such a current of electricity or motive power as is possible to be generated by that class of battery. I also show a system which is to relieve the battery and give it time to rest. This is fully set forth in Fig. 11. It is there shown that the opening and closing and coupling device brings into circuit and out of circuit successively and alternately first one battery and then the other, and this battery system is especially shown for the purpose of exposing the improper, out-of-place, and misuse of the word "energy" in speaking of such an invention as this. There can be no doubt that the energy equals the work, and the rotary foot-pound work at that, or the work would not be accomplished if it did not equal it; but every scientific engineer skilled in the art is well aware that the rotary foot-pound work now performed by engine-motors does not equal all the energy which was generated by either batteries or the heat of the coal which is consumed to generate steam in the boiler, and this invention is to use up as nearly as possible all the elements of such class of energy and supply a current for use by the motors 17 and 18. In the instance of steam it is the unit of heat made by the combustion of the coal; in the gas-engine the expansion of that unit of heat, &c.

By referring to battery L^8 (shown in Fig. 21) the rows of zinc, cloth, and copper are submerged in acid, as shown in Fig. 22, and the two wires o^8 and o^{10} are the negative and positive poles. The cloth strips L^9, L^{10}, L^{11}, and L^{12} are shown to interpose between the beforementioned sheets of metal, and the form of the end of one of the sheets of metal can be shown as at L^{13}, and its cross-section can be shown as at L^{14}. Any kind or form of battery may be used.

To the mechanics skilled in the art it is well known that a properly balanced and journaled fly-wheel, which may weigh two thousand pounds, in the rim thereof will be revolved on its axis by the application of a fifty-pound weight out at the rim, so as to put that fly-wheel out of balance, and even less than that weight will bring about the same result. The motors 17 and 18 are for the purpose of applying their power so as to continually make and be the means of a displacement of balance of the said fly-wheels to which they are attached; but as it is necessary to the success of the invention to make a rapid acceleration of the rims of the fly-wheels when they have had a diminution of their speed the proportion of motor-power by pound-weight to the rim of fly-wheel should be two hundred pounds of electric-motor-armature pull to the two thousand pounds in the rims of the fly-wheels, and the two hundred pounds of pull may not have to travel the same distance as that of the distance traveled by the rims of the fly-wheels, and to energize the rims of the fly-wheels rapidly this amount of pull is necessary. It is of course understood that this small amount of tort of armature must be automatically released during the period of energizing the two-thousand-pounds rims of fly-wheels.

I find the proportion forty to one is too sluggish in energizing the wheels, and if the proportion forty to one has to be used there have to be several fly-wheels in the system, so as to give the fly-wheels a longer time in which to be energized. This involves a number of motors and fly-wheels to be alternately and automatically released to be reattached to deliver their momentum in one stream of rotary foot-pound work.

I will now describe the construction as shown in the modification illustrated by Fig. 14. Here there are arranged on one axial line the shafts which belong to the two motors. The motors and shafts are made to face each other and the division is shown in journal-box D^9. The electric motor F^7 is elastically connected at T to the shaft F^5. One end of this shaft is in the journal-box D^9. Keyed to shaft F^5 is fly-wheel W and a gear-wheel 48. Also resting in journal D^9 is the shaft F^6. This connects to the motor F^8, and keyed on to this shaft is the fly-wheel W′ and gear-wheel 53. The gear-wheel 48 intergears with the loosely-mounted gear-wheel 49, and this wheel is provided at its side with a projecting covering 51. This covering is made to envelop the strap R of the friction-clutch. The gear-wheel 49, with this covering 51 and the strap R, will vary in speed according to the speed given to them by the motor F^7 and its fly-wheel W and the gear-wheel 48. (See Figs. 15 and 16.) This variation of speed is to be made up as has heretofore been described as taking place by a diminution of speed which takes place during rotary foot-pound work.

The gear-wheel 53 intergears with the loosely-mounted gear-wheel 54, and this wheel is provided at its side with a projecting covering 55 to envelop the strap friction-clutch, which is of the same construction as that shown as being enveloped by the cover 51. (See Figs. 15 and 16.) The wheel 54 and its cover 55 together with the strap for the friction will vary in speed, and that speed will have to be made up by the motor F^8 and its fly-wheel W′ and the connecting gear-wheel 53. The shaft F^6 is supported in the journals D^8 and D^9 and by the electric motor F^8. The shaft F^5 is supported by the journals D^9 and D^{10}. The electric motor F^7 has elastic coupling T on the same line of shafting and between it and the motor F^5 and is thus relieved of the necessity of acting as one of the supports for shaft F^5. By this construction it is also relieved of the jars and concussions incidental to running said shaft.

The gear-wheel 49 is loosely mounted on

the shaft 50, and also mounted loosely on this shaft 50 is the friction-wheel 58, and this wheel is for the purpose of receiving the friction that is made by clasping or closing down tightly to it the strap R. Wheel 58 is also provided with the flange m^{13}. This flange is made to engage with a roller-friction 52, and this friction device forms the escapement between the driven shaft 50 and the motor F^7. By this construction the shaft 50 is permitted an independent motion, revolution in one direction, and this escapement shown in this construction is placed there for the same purposes as hereinbefore described, and that is to prevent the conflict of the movement of the two fly-wheels W and W'. (See Fig. 14.) As already explained, the fly-wheels W and W' in the operation of the invention will be constantly passing and repassing each other in their rim speed. The roller m^{10} is held in position by a ring M, and the roller 52 is made to travel on a solid pulley m^{16}. This pulley is keyed to the shaft 50, so that when the strap R is operated by closing it, so as to tighten it on the loose wheel 58, it will impart motion to that wheel and that wheel will transmit that motion to the friction-roller and this roller coming in contact with the inclined plane on the flange m^{13}, thereby revolves said shaft 50. In the covering 55 is a similar strap-clutch to that one which is shown in Figs. 15 and 16. In the action whereby this clutch is brought into use the strap is made to close down on the loosely-mounted wheel m^9, and this wheel is provided with the roller-friction 56. This roller is made to travel on the solid pulley m^{17}, and this pulley m^{17} is keyed onto the shaft 50. The ring M^{20} is to hold the friction-roller 56 in position, and the duty of this roller-friction and the friction-clutch is the same and for the same purposes as that one contained in the covering 51. On the shaft 50 is the eccentric and its strap A^{16}, and there is rigidly attached to the hub of this eccentric the gear-wheel S. This wheel intergears with a gear-wheel S^2 and is keyed onto a counter-shaft S^3. There is also keyed to this shaft S^3 the gear-wheel S^4. This gear-wheel intergears with a gear-wheel S^5, and this latter wheel is keyed onto shaft 50, and by the revolution of the shaft 50 and the movement of these wheels S^5, S^4, S^2, and S there is a speed-reducing gear, and this makes the revolution of the eccentric and its strap A^{16} different from that of the shaft 50. The eccentric and its strap A^{16}, when in action, impart a raising-and-lowering action to the lever A^{17}, and this lever is rigidly connected to a rock-shaft A^{18}. This rock-shaft is held in journals A^{15} and at its opposite end is rigidly attached to the lever A^{20}. This connects to an elastic connecting-rod A^{21}, in which rod are the springs a^7 and a^8. These are made to act, connect with, and operate an upright lever which is arranged in the same way as the one shown at N^{10}—that is to say, this is the same kind of lever connection for the connecting-rod. The lever just mentioned is upon the rock-shaft A^{22}, and this shaft has on it the upright lever A^{23}. The upper end of this lever forms a yoke, which is to engage with the sliding sleeve 59 and is to slide this sleeve back and forth on the shaft 50. At the lower end of the lever A^{23} there is provided a device to open and close an an electric current. It is therefore plain that this lever will have to perform the duty of sliding back and forth the sleeve 59, and will also operate (by this motion before mentioned) the current of electricity. Connected to one of the loose collars on the sleeve 59 is the connecting-link M^7. This link is provided with the chain-eye to connect it to the lever M^8. This lever is rigidly attached at one end to the rock-shaft R^2, and this shaft is carried by and journaled in the cover 51 and the gear-wheel 49, (see Figs. 15 and 16,) and the movement of forcing out the lever M^8 causes the rock-shaft R^2 to vibrate the lever R^3 and tighten the strap R onto the loose wheel 58. This forms the friction-clutch connection for shaft 50 with the moving power, and connected to the loose collar 59 is the connecting-link m^6. This link has the chain-eye to connect it to the lever M^9. This lever is rigidly attached to a rock-shaft R^4, and this rock-shaft is carried by and journaled in the cover 55 and the loose gear-wheel 54. Rock-shaft R^4 has the projecting arm R^5, which is to tighten the friction-strap in the same way and for the same purpose as is done in the covering 51. This strap clutches on the loose wheel and the roller-friction 56 jams in the flange m^{12} and pulley m^{17}, which is keyed to shaft 50. All of these parts operate so that the momentum of the fly-wheel W' will be connected to shaft 50 to drive the same. On the shaft 50 is the beveled gear-wheel D^4. This intergears with the beveled gear-wheel B^3. This gear-wheel is on the governor B^5, and this governor is to work a controller, here shown as B^6, which is for the same purpose and duty as the duty and purpose set forth for the controllers heretofore mentioned and marked as 46 and 47.

The battery Q supplies the current of electricity to the wire q. This wire passes to the controller, as q', and thence to the make-and-break A. From here the wire is carried, as q^2, to the motor F^7, and the current is carried back through the wire q^3 to the battery Q. The lever A^{23} is made to make the opening and closing for the battery Q.

Shaft 50 is provided with the journals B^{11} and B^{12}. It has keyed onto it the gear-wheel B^7. This wheel intergears with the gear-wheel B^8, which is upon the shaft B^9. This last shaft is provided with the journals B^{10} and B^{11}. On the shaft 50 is the pulley-wheel B^{13}, and from this point can be operated the mechanical device to change the batteries, as is shown in Fig. 11. By reference to the modification shown in Fig. 18 the motors and shafts are divided and arranged in one axial

line, as was set forth as being the arrangement of the motors and shafts in the modification shown by Fig. 14. The motor T′ is provided with the elastic connection T^2. This is interposed between said motor and the line-shaft T^3. This shaft is supported on the journals T^4 and T^5. Shaft T^3 has keyed to it the fly-wheel T^6 and the gear-wheel T^7. This latter wheel intergears with the loosely-mounted gear-wheel T^8. Said wheel is sustained on the shaft T^9, and said shaft is provided with the journals T^5 and T^{11} to support it. The shaft T^{12} is supported by the journal T^{11} and the electric motor T^{15}, and keyed onto the shaft T^{12} are the gear-wheel T^{16} and the fly-wheel T^{17}. Intergearing with the gear-wheel T^{16} is the loosely-mounted gear-wheel T^{18}, and at one side of this gear-wheel T^{18} is the cone friction-disk T^{19}, and on the inside face of the loosely-mounted gear-wheel T^{18} is placed the before-mentioned cone friction-disk. Mounted upon the shaft T^9 is the sleeve T^{21}. This sleeve is prevented from freely revolving on the shaft T^9 by the key n^5, and connected with and mounted on the sleeve T^{21} are the two friction-disks T^{22} and T^{23}. These disks are forced alternately and automatically against the face of the disks T^{19} and T^{20}. The friction-disk T^{20} is mounted on and belongs to the loose gear-wheel T^8. By the act of sliding back and forth along the shaft T^9 the friction-disks are brought in contact with either the face of the disk T^{19} or T^{20}, as the case may be, and by this action and the revolution of the gear-wheels, either T^8 or T^{18} are connected to the shaft T^9 to revolve the same. On the shaft T^9 and loosely mounted thereon is the strap and its eccentric T^{24}, and on the hub of this eccentric, rigidly attached thereto, is the gear-wheel T^{25}. This intergears with a gear-wheel T^{26}, which is mounted on a counter-shaft. Also on the same counter-shaft is the gear-wheel T^{27}. This latter gear-wheel intergears with the gear-wheel T^{28}, which is keyed to the shaft T^9. By this device a speed-reducing gear is made, and the revolution of the eccentric and its strap is less than that of the shaft T^9. Motion is imparted to the lever T^{30} through the strap on the before-mentioned eccentric. This lever connects to a rock-shaft T^{31}. Said rock-shaft is journaled at T^{32}. At the other end of the rock-shaft T^{31} is the lever T^{33}. Here it is connected to the elastic connecting-rod T^{34}. This connects to the lever N^{10} on the rock-shaft T^{40}. Said shaft is supported by journals T^{41}, and at the other end of the rock-shaft 40 there are the yoke T^{42} and the lever T^{43}. The yoke T^{42} is provided with the rollers T^{44} and T^{45}. The elastic connecting-rod has in it the springs T^{46} and T^{47}, and the action which is derived from the action of the eccentric and its strap is positive. The elastic connecting-rod is here placed in position so that the application of power by friction shall be properly graduated. The lever T^{43} is made to have at one end the current opening and closing device, so as to operate the same at the points T^{48} and T^{49}. The shaft T^9 is supported by the journals T^{50} and T^{51}. Keyed at one end of the shaft T^9 is the gear-wheel T^{52}. This wheel intergears with the gear-wheel T^{53}, and this wheel is supported by the shaft T^{54}. Said shaft is supported by the journals T^{55} and T^{56}. These two modifications, as heretofore just set forth, are equivalent mechanisms for the purposes of storing and using momentum and operating friction-clutches for the purpose of and the same duty of using that momentum in a driven shaft, and are provided with escapements and devices to open and close the currents of electricity or any motive power which may be used to drive the mechanism.

The governors which belong to the engine-motors are all set to operate the engines at one speed, and the governor on the driven shaft is set for a speed somewhat above those of the fly-wheels of the engine-motors, so that should one of the fly-wheels revolve the driven shaft at too high a speed then the driven shaft's governor will act, as it also will do if the said shaft should be too slow.

The proper speed to set the governors 35 or B^5 is that of the speed a few revolutions in excess of that of the fly-wheels, so that the shaft should at no time be in jeopardy of being run too rapidly.

Having thus described the construction and operation of my invention, what I desire to secure by Letters Patent of the United States is as follows:

1. A multiple engine consisting of the following elements: separate motors each having a fly-wheel suitably and permanently connected thereto, a driven shaft, connections for driving such shaft from each of said fly-wheels, and means connected to such driven shaft for automatically making and breaking such connections to and with said driven shaft, substantially as and for the purposes set forth.

2. The multiple engine consisting of the following elements: two separate engine-motors each having a fly-wheel suitably and permanently connected thereto, a driven shaft, connections between each of the fly-wheels and said driven shaft, and automatic means for disconnecting from and engaging the driven shaft to and from each fly-wheel with its motor, substantially as and for the purposes set forth.

3. The multiple engine consisting of the following elements: separate engine-motors, fly-wheels connected thereto, clutches upon each of said fly-wheels, a driven shaft, and devices to automatically and periodically open and close said clutches, substantially as and for the purposes set forth.

4. The multiple engine consisting of separate engine-motors, fly-wheels connected thereto, clutches on said fly-wheels, escapements, a driven shaft, connections between said motors and fly-wheels and said driven shaft, and means for alternately and auto-

matically releasing and engaging an engine-motor together with the fly-wheel belonging thereto, substantially as and for the purposes set forth.

5. The multiple engine provided with the following elements: separate motors, each motor provided with a governor, a fly-wheel suitably connected to each of said motors, a driven shaft provided with a governor, and automatic means for releasing the fly-wheels and to reëngage them alternately with said driven shaft, substantially as and for the purposes set forth.

6. The multiple engine consisting of the following elements: separate motors each having a fly-wheel connected thereto mounted on line-shafts, clutches in said fly-wheels, escapements in said fly-wheels, a driven shaft suitably connected to the fly-wheels, means to automatically alternately release and again reëngage each engine-motor and its fly-wheel, and governors to regulate the speed thereof, substantially as and for the purposes set forth.

7. The multiple engine, two or more separate motors fly-wheels suitably connected thereto, each fly-wheel provided with clutches, escapements, a driven shaft suitably connected to the fly-wheels and motors, speed-governors to regulate the speed of the multiple engine, automatic and graduated means to release alternately and reëngage alternately an engine-motor and its fly-wheel, all operating together for the purposes set forth.

8. In a multiple engine, two or more separate motors, each provided with a governor and fly-wheel connected thereto, a driven shaft provided with a governor, means to release and reëngage the fly-wheels alternately and automatically with said driven shaft, a revoluble shaft G^3 suitably connected, cams on said shaft G^3, levers to operate against said cams, said levers provided with means to open and close the supply of power to the motors for the purposes described.

9. In a multiple engine, the combination, with the driven shaft 14, of the rigidly-mounted gear-wheel, the non-independently-revoluble but sliding disks 37 and 38, the eccentric and its strap 36, the governor 35 suitably connected to said driven shaft, the eccentric-strap as a means to operate the levers, sliding disks, and the rock-shafts to operate the friction-clutches belonging to the alternately and automatically operating clutches, as and for the purposes set forth.

10. The multiple engine, the driven shaft provided with and carrying friction-clutches, escapements, also engine-motors and fly-wheels connected thereto, and means to alternately and automatically operate the clutches, substantially as and for the purposes set forth.

11. In the multiple-engine motor, the combination therein of separate engine-motors, each motor-engine provided with a fly-wheel, a governor, a friction-clutch, escapements, also a driven shaft suitably connected to each engine-motor and to a fly-wheel, suitable automatic devices to operate the friction-clutches alternately and periodically and to supply the electricity or other power supplied to the engine-motors, governors to regulate the speed, all combined and working together substantially as and for the purposes set forth.

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

BENJAMIN CHARLES POLE.

Witnesses:

J. R. BUCKELEW,

C. F. WATSON.