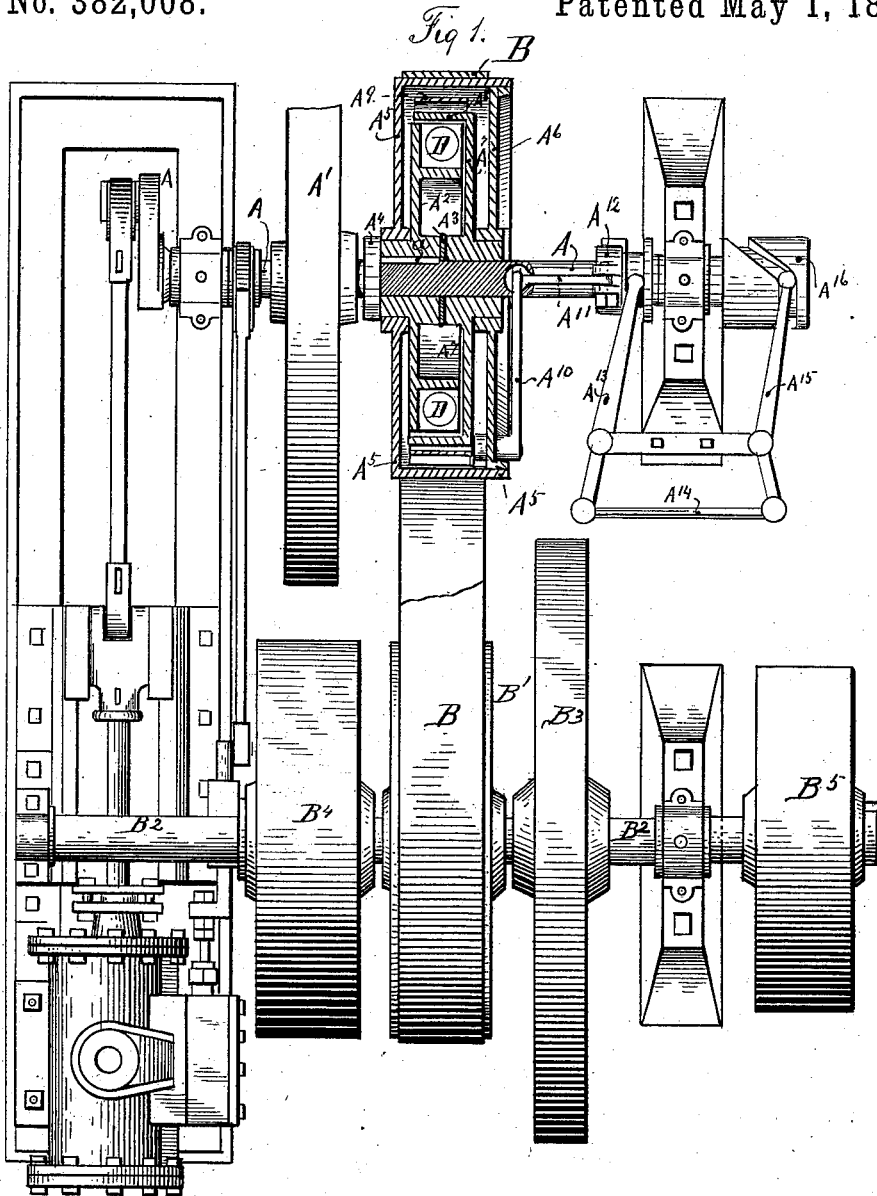


B. C. POLE.  
STEAM OR GAS MOTOR ENGINE.

No. 382,008.

Patented May 1, 1888.



Witnesses:  
H. J. England.  
Harry S. Polner.

Inventor  
Benjamin C. Pole.

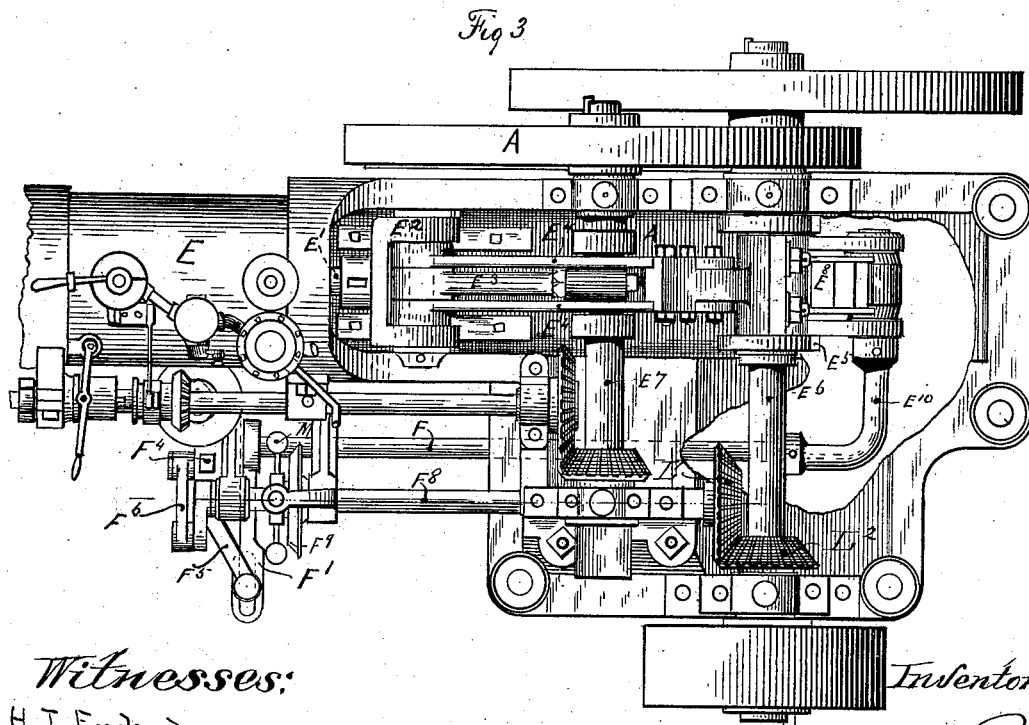
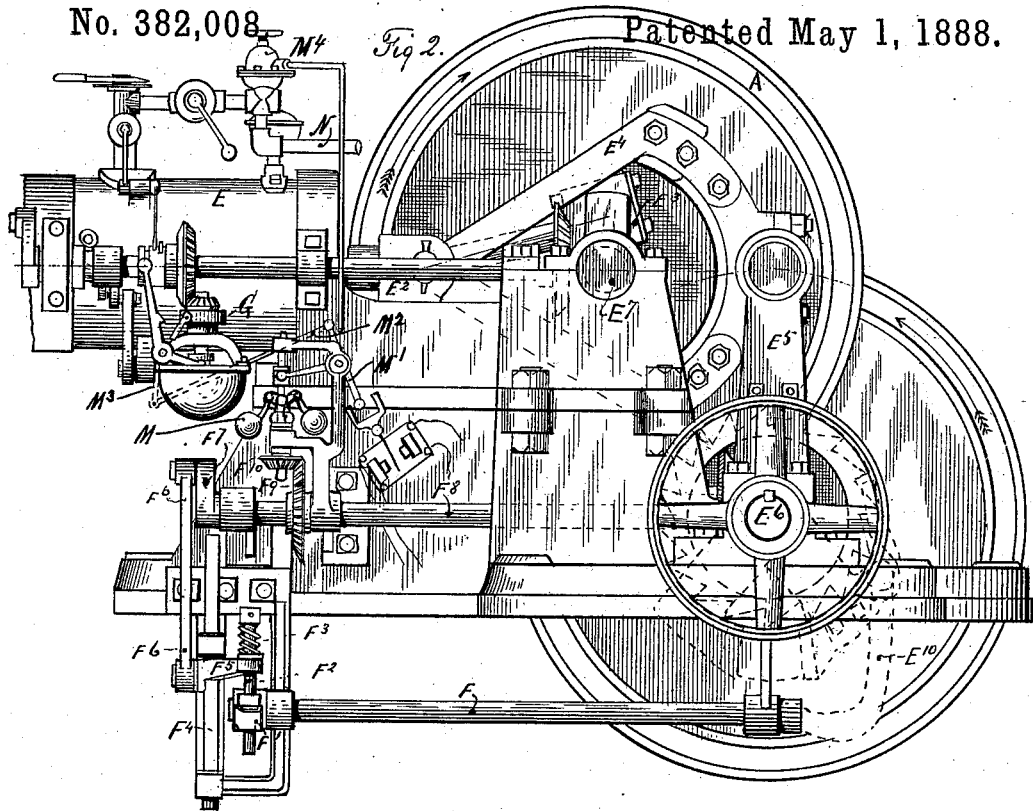
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4 Sheets—Sheet 2.

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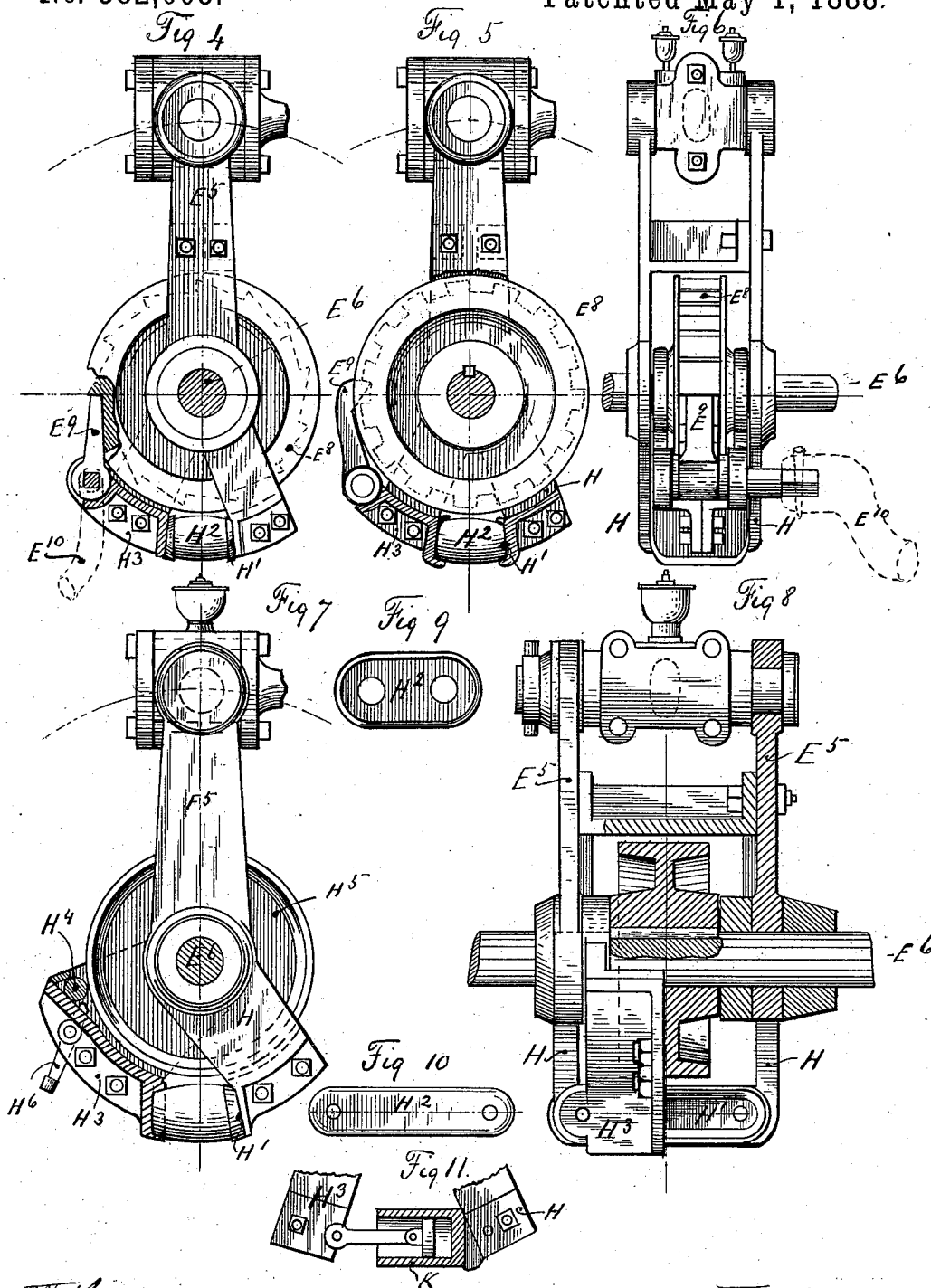
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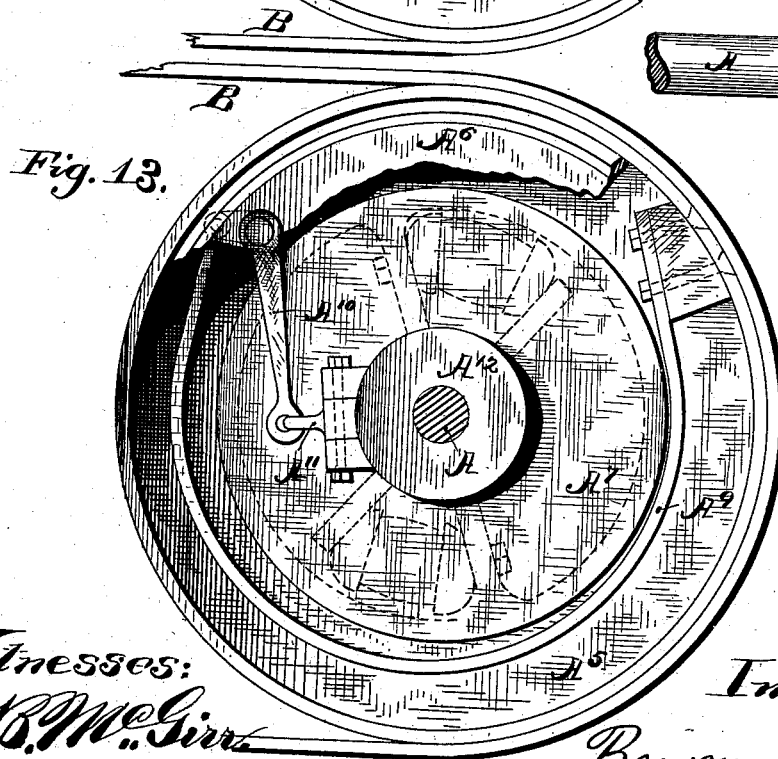
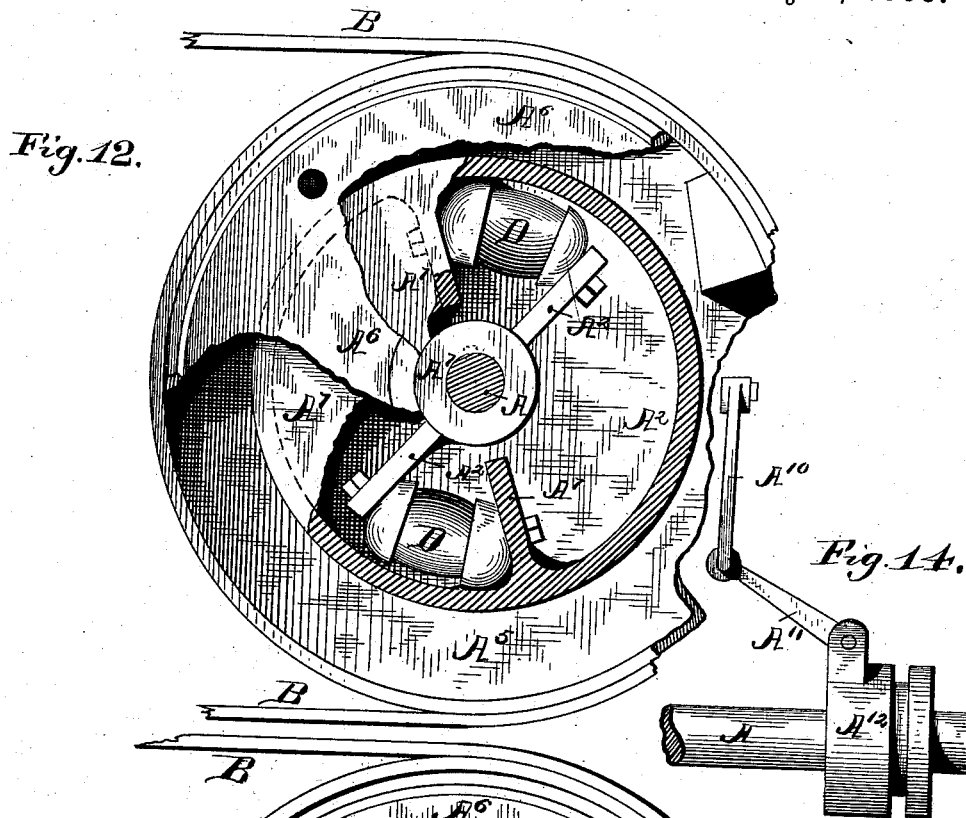
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Patented May 1, 1888.



*Witnesses:*

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*Inventor:*

Benjamin C. Polk

# UNITED STATES PATENT OFFICE.

BENJAMIN C. POLE, OF CAMDEN, NEW JERSEY.

## STEAM OR GAS MOTOR-ENGINE.

SPECIFICATION forming part of Letters Patent No. 382,008, dated May 1, 1888.

Application filed June 12, 1886. Serial No. 204,976. (No model.)

*To all whom it may concern:*

Be it known that I, BENJAMIN C. POLE, a citizen of the United States, residing at Camden, in the county of Camden, State of New Jersey, have invented certain new and useful Improvements in Steam or Gas Motor Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to certain new and useful improvements in engines; and it consists in certain constructions whereby the engine is free and unloaded at suitable intervals, and in permitting the engine to be connected with its work automatically and elastically. For the purpose of attaining this point several constructions, hereinafter described, are adapted to this use.

Figure 1 represents a steam-engine provided with my improvement. Fig. 2 represents a gas-engine with my improvements connected. Fig. 3 is a plan of Fig. 2. Fig. 4 is a part sectional side elevation of a device for imparting power under this invention. Fig. 5 is a modified form of Fig. 4. Fig. 6 is a front view of Fig. 5. Fig. 7 is a modified form of applying power under this invention. Fig. 8 is a part sectional front view of Fig. 7. Figs. 9 and 10 are views of different forms of rubber for providing yielding surface for this invention. Fig. 11 is an air-cylinder for elastic action of the device. Fig. 12 is a side elevation of the friction-brake, showing in broken section the form of side plates and with the friction brake-strap removed. Fig. 13 is a side elevation of the friction-brake, showing the friction-strap in full line and its operating-arm and a piece of the side plate in section. Fig. 14 represents the sliding clutch and operating-arms therefor.

Similar letters refer to similar parts.

Referring to the drawings, the crank-axle A of the ordinary steam-engine is provided with the fly-wheel A', and keyed on the said shaft is a wheel, A<sup>2</sup>, to the side of which is a washer and collar, A<sup>3</sup> A<sup>4</sup>. Upon A<sup>2</sup> is a cover, A<sup>5</sup>, and this connects with a side cover, A<sup>6</sup>. This cover A<sup>5</sup> is permitted to ride on a free wheel, A<sup>7</sup>. On the outside of A<sup>7</sup> and at its top rim, A<sup>8</sup>, is a friction-brake, partly of construction as shown in Letters Patent No. 365,279, June

21, 1887. A strap, A<sup>9</sup>, is tightened by the lever A<sup>10</sup>. This lever is forced in and out by the link A<sup>11</sup>, which is connected to the sliding sleeve A<sup>12</sup>. This in turn is operated by the lever A<sup>13</sup>, connecting rod A<sup>14</sup> and lever A<sup>15</sup> to cam A<sup>16</sup> on the end of shaft A. The outer rim, A<sup>5</sup>, is made a pulley-wheel connecting with the belt B on the pulley B', which is on the second shaft, B<sup>2</sup>, provided with fly-wheel B<sup>3</sup>, inside or outside working pulleys B<sup>4</sup> B<sup>5</sup>.

The operation of this invention is simply that the steam applied to the piston of the engine surges forward at a high velocity the fly-wheel A' on the crank-shaft A, and this shaft A is keyed at a to wheel A<sup>2</sup>, and is only connected to the belt B by the case A<sup>5</sup>, which is also free and independent, carrying with it the strap A<sup>9</sup>, the side A<sup>6</sup>, the lever A<sup>10</sup>, the link A<sup>11</sup>, and sleeve A<sup>12</sup>. Upon the cam A<sup>16</sup> throwing in the lever A<sup>15</sup> and the connecting-rod A<sup>14</sup>, lever A<sup>13</sup> pushes out the sleeve A<sup>12</sup>, which lifts the lever A<sup>10</sup> and closes down the strap A<sup>9</sup> on the top of the wheel A<sup>7</sup>. This wheel has interposed between it and wheel A<sup>2</sup> suitable rubber springs, D. The closing of this strap causes the power of the engine to be thrown elastically into the belt B on the pulley B', imparting momentum to the fly-wheel B<sup>3</sup> on the shaft B<sup>2</sup>, which is the driving-shaft of the engine. Governors for regulating the speed of the engine will be on both the shafts A and B<sup>2</sup>, for the purpose of unison of action.

In the instance of the gas-engine—a machine which takes its power only at one end of the stroke, and in some cases only at every second revolution—certain additional construction is necessary to make operative the unison action in the method of employing this invention. The cylinder E of the gas-engine is provided with the ordinary water-jacket system for the purpose of keeping the cylinder cool, and has the piston-rod E' and a cross-head, E<sup>2</sup>, the connecting-rod E<sup>3</sup>, and an additional connecting-yoke, E<sup>4</sup>, to a vibrating arm, E<sup>5</sup>. This arm is upon the shaft E<sup>6</sup>, while the connecting-rod E<sup>3</sup> is upon the crank-shaft E<sup>7</sup>.

On the shaft E<sup>6</sup> is keyed the ratchet-wheel E<sup>8</sup>, having the ratchet-pawl E<sup>9</sup>. The bolt of said ratchet is made to be operated by a flexible shaft, E<sup>10</sup>. Said flexible shaft is operated by a shaft, F, which has on the end a rising

and falling crank, F'. This crank is raised and lowered by a guide-bolt, F<sup>2</sup>, and spring F<sup>3</sup>. The operation of this guide-bolt is by means of the sliding bar F<sup>4</sup>, having the projection F<sup>5</sup>, which engages with the bolt F<sup>2</sup>. The connecting-rod F<sup>6</sup> connects with a crank, F<sup>7</sup>, which is upon a shaft, F<sup>8</sup>, which revolves once for every two revolutions of the shaft E<sup>6</sup>.

The shaft F<sup>8</sup> is provided with the beveled pinion F<sup>9</sup>, and on the governor is a beveled wheel, F<sup>10</sup>, that operates a pair of governors to open and close the gas-supply valves, either in conjunction with or independently of the governor system G of the gas-engine, said governor system G being operated by beveled pinions of like nature to that upon shaft F<sup>8</sup>, these pinions operating the gas-engine well-known system of valves common to that class of engines, or, in the instance of steam, operating the cut-offs in similar way.

The vibrating arm E<sup>5</sup> is provided with an extension, H, and this extension is provided with a seat, H', upon which is a rubber spring, H<sup>2</sup>. This spring H<sup>2</sup> connects with a freely-riding piece, H<sup>3</sup>, that may be provided in some instances with pawl E<sup>9</sup> or roller H<sup>4</sup>, or, by vibrating the lever E<sup>5</sup>, with its extension H to springs H<sup>2</sup>, and construction H<sup>3</sup>, and pawl E<sup>9</sup>, or roller H<sup>4</sup>, engages the wheel E<sup>3</sup>, and, according to the action desired and by the movement of flexible shaft E<sup>10</sup>, engages the smooth wheel H<sup>5</sup>, which is keyed upon the shaft E<sup>6</sup>, through the medium of said roller, when allowed to do so by the catch-action H<sup>6</sup>, that is connected to flexible shaft E<sup>10</sup>.

An air-cylinder, K, making a cushion, may be provided in place of the rubber H<sup>2</sup>.

The operation of my invention is as follows: The development of power is due to the use of energical velocity given to a fly-wheel when in an unloaded condition by an engine-motor; and referring to Fig. 1 a stationary engine is provided with a crank and axle, A, and this axle is free to revolve at a speed regulated by a governor. The shaft A is provided with a cam, A<sup>6</sup>, that revolves with the shaft, and by the revolution of this cam, through the medium of the connection hereinbefore described, a friction-brake is made to attach and detach the crank and axle shaft from the cover of the said brake and belt B, which rides thereon, and through the medium of the friction brake and the fly-wheel, that has received the impetus from the power of the engine, the connection is made by the belt B and to the second shaft, B<sup>2</sup>, and in this manner the concussion of the energical velocity to the fly-wheel B<sup>2</sup>, and this fly-wheel is regulated in its speed by a governor to check too high a speed given by the engine. The operation of the gas engine simply varies in that a rocking or vibrating arm, E<sup>5</sup>, is provided with the spring H<sup>2</sup>, with the connection H<sup>3</sup>. This in turn imparts motion to the pawl E<sup>9</sup> or roller H<sup>4</sup>, and by either of these devices connects to the wheel H<sup>5</sup> or to the ratchet-wheel E<sup>3</sup>, whichever may be used. The

attachment of the vibrating arm or H<sup>5</sup> is regulated by the construction shown. This construction merely raises and lowers automatically certain levers with the revolution of the shaft E<sup>6</sup>, upon which is the beveled wheel L<sup>2</sup>, intergearing into the beveled wheel L', and these in turn revolve the shaft F<sup>8</sup> and crank F<sup>7</sup>. The connecting-rod F<sup>6</sup> raises and lowers or vibrates the rod F<sup>4</sup>, and this raises and lowers the arm F'. This in turn moves up and down the spring F<sup>3</sup> and bolt F<sup>2</sup>, provided with the spring to elastically move the arm F' on shaft F. This shaft F terminates in a flexible shaft, E<sup>10</sup>, attached to the bolt on which the pawl E<sup>9</sup> is hinged. Therefore when the pawl E<sup>9</sup> is forced in and on the ratchet the arm E<sup>5</sup> is pushed out by the power of the engine, and the pawl E<sup>9</sup> is engaged to the wheel E<sup>3</sup>, revolving the shaft E<sup>6</sup>, and the attachment by the pawl E<sup>9</sup> or roller H<sup>4</sup> is adjusted so that the explosion or expansion which gives power to the engine-motor shall take place when the engine-motor is detached and unloaded from its work. Thus the energizer, being any kind of motive power, is unloaded, and afterward by itself automatically attached to the work expected to be done by the engine-energizer. The governor M raises and lowers the arm M'. This in turn can be connected to the governor G by means of the rod M<sup>2</sup> and lever M'; or it may connect an electric stop-valve, M<sup>4</sup>, upon the gas-pipe N, and by means of the fluid vapors for working the engine-motor the energizer may be regulated or stopped or checked in an undue speed and any power may be used.

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

1. In combination with an engine energizer, a coupling connecting it with a second shaft, said coupling being automatically operated by said energizer, substantially as and for the purpose set forth.

2. In an engine-motor, the energizer, combined with a second shaft by a friction-brake automatically operated by said energizer, substantially as and for the purpose set forth.

3. In an engine-motor, the energizer, combined with a second shaft by a rocking arm, and ratchet-and-pawl mechanism adapted to be automatically operated by said energizer, substantially as and for the purpose set forth.

4. In an engine-energizer, combined with a second shaft by a friction-brake automatically attached and detached by said energizer, the governors to regulate the speed thereof, substantially as and for the purpose set forth.

5. In an engine-motor, the energizer, combined with a second shaft by a rocking arm, ratchet-and-pawl mechanism adapted to be automatically operated by said energizer, and the governors to regulate the speed thereof, substantially as and for the purpose set forth.

6. In an engine-energizer, as set forth, connected with two shafts, one or both shafts pro-

vided with governors for regulating the speed thereof, substantially as and for the purpose set forth.

7. In an engine-energizer, combined with a second shaft, a pawl and ratchet-wheel or roller-friction automatically operated by itself, substantially as and for the purpose set forth.

8. In an engine-energizer, combined with a second shaft, a connection adapted to operate the clutch of a friction-coupling connecting said energizer with said shaft, as and for the purposes set forth.

9. In an engine-energizer provided with a piston-rod and cross-head, a connecting-rod to a vibrating arm adapted to receive the percussion of the fly-wheels and connected by a pawl and ratchet or friction-roller to a second shaft, substantially as and for the purpose set forth.

10. An engine-energizer, combined with a second shaft, provided with automatic connections, being cams or cranks, to operate a connecting-rod, adapted to attach and detach mechanism that connects the energizer with the second shaft, substantially as and for the purpose set forth.

11. An engine-motor provided with the following elements: an energizer, combined with fly-wheels and adapted to be automatically attached and detached to and from a second shaft, provided with governors to regulate the

speed thereof, substantially as and for the purpose set forth.

12. The combination, in a gas-engine energizer operating its own and a second shaft, of the governor to control the supply of gas used by the energizer and adapted to control the speed of the second shaft, substantially as and for the purpose set forth.

13. The combination, with an engine-energizer, of a friction-brake provided with an outer rim, A<sup>5</sup>, and a side-cover, A<sup>6</sup>, provided with an interior free wheel, A<sup>7</sup>, and a wheel, A<sup>2</sup>, that is keyed on shaft A, also provided with springs, and an operating-strap to a clutch mechanism suitably connected and operated by said energizer, as and for the purposes set forth.

14. The combination, with an engine-energizer, of the connection E<sup>1</sup> to the vibrating arm E<sup>5</sup>, operating the yoke, with pawl E<sup>9</sup>, or friction-roller H<sup>4</sup>, to a wheel, H<sup>5</sup>, or ratchet E<sup>8</sup>, combined and keyed on a shaft, E<sup>6</sup>, adapted to be automatically connected with the moving power by yielding or flexible connection E<sup>10</sup> to the energizer, as and for the purposes set forth.

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

BENJAMIN C. POLE.

Witnesses:

HARRY S. ROHRER,  
H. J. ENGLAND.