

No. 782,502.

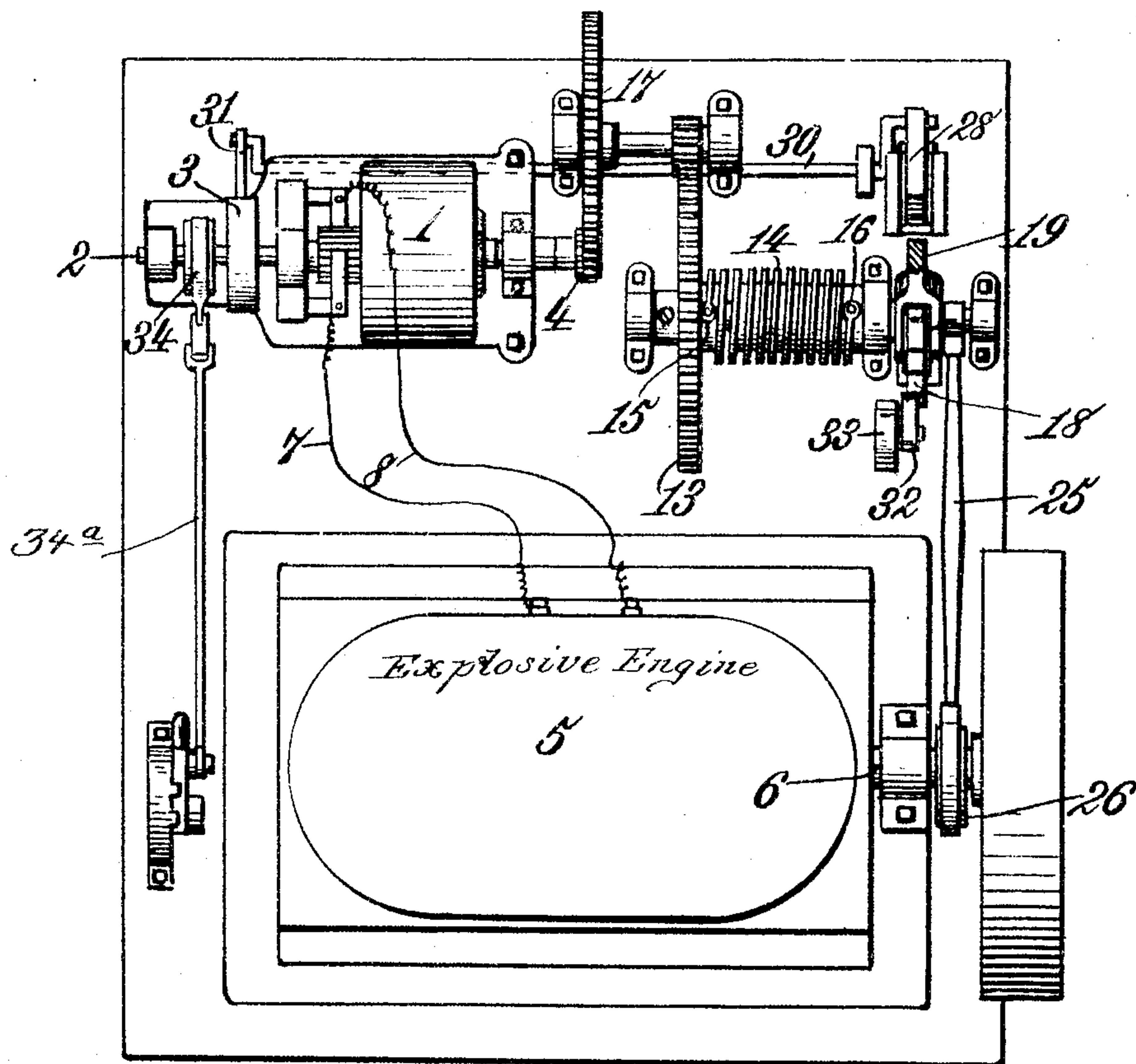
PATENTED FEB. 14, 1905.

W. B. HAYDEN.  
ATTACHMENT FOR EXPLOSIVE ENGINES.

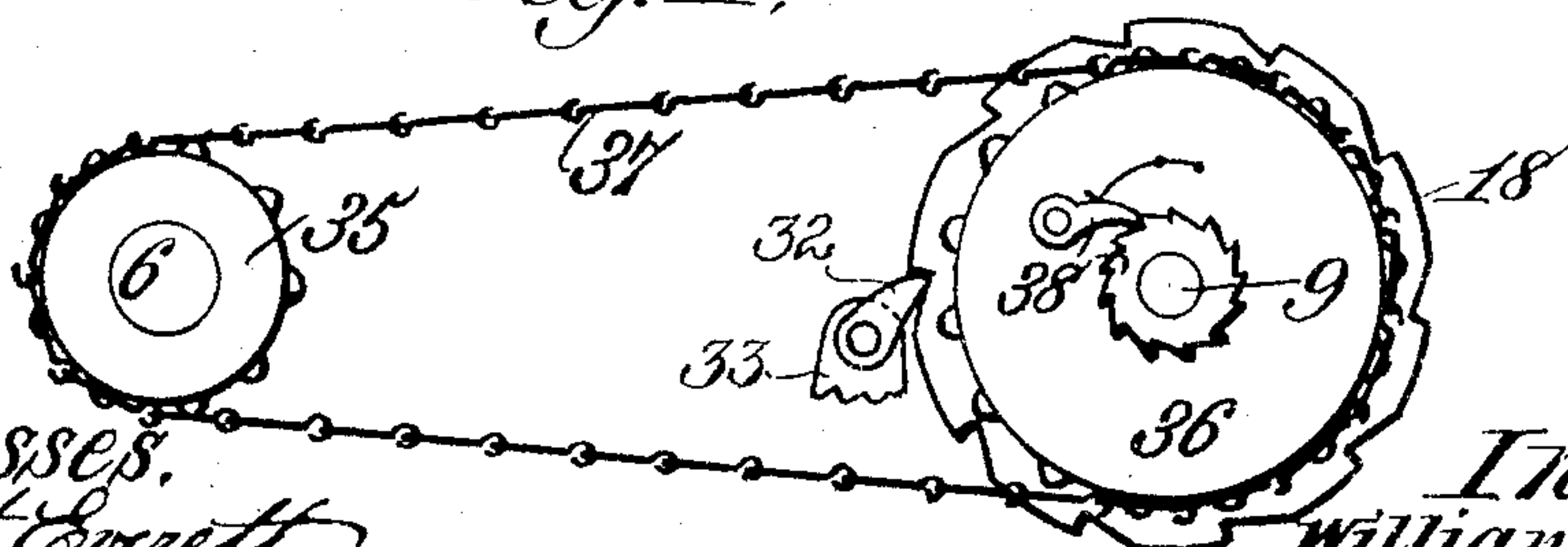
APPLICATION FILED FEB. 15, 1904.

2 SHEETS—SHEET 1.

*Fig. 1.*



*Fig. 4.*



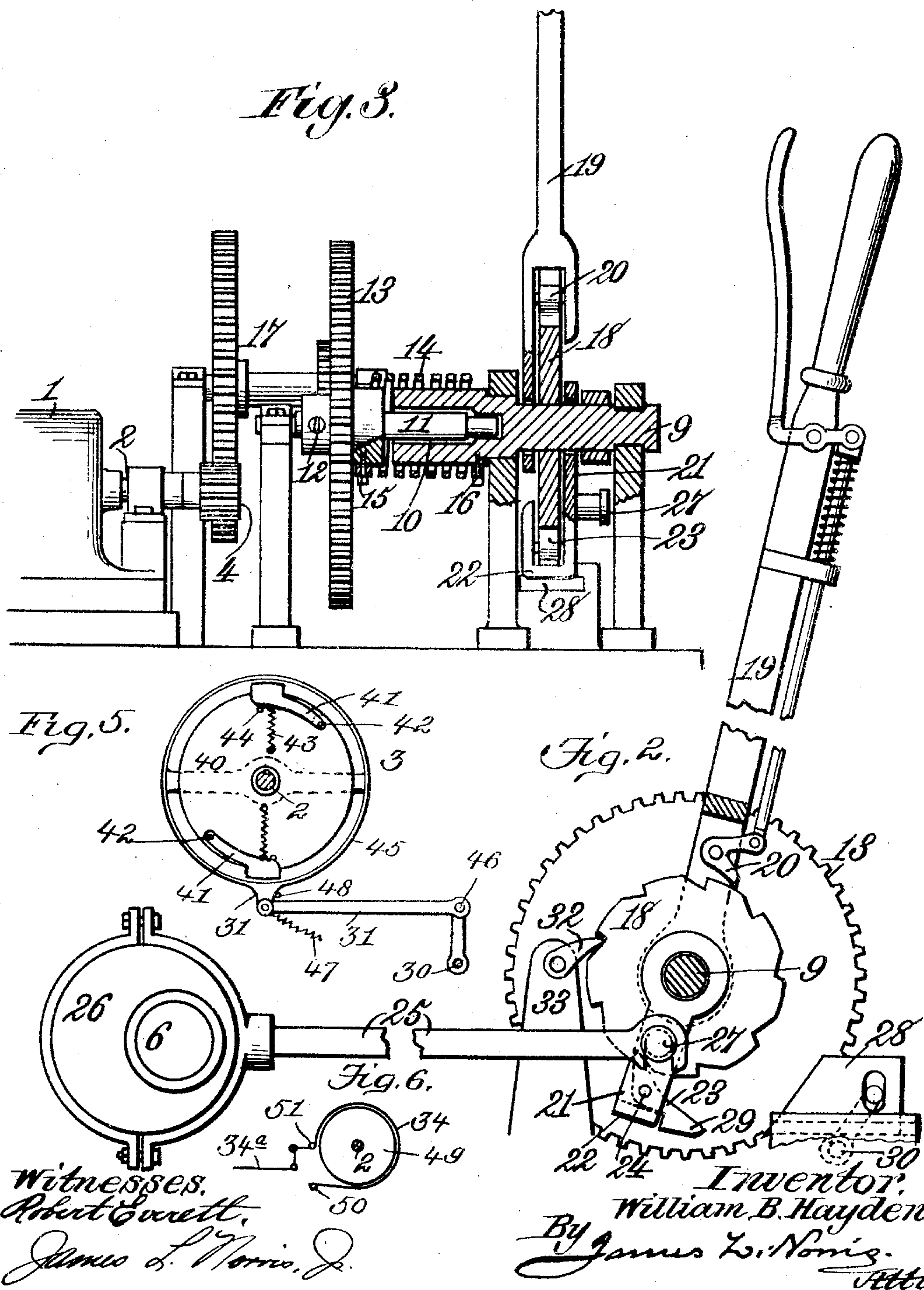
Witnesses,  
Robert Everett,  
James L. Norris, Jr.

Inventor  
William B. Hayden.  
By James L. Norris,  
Atty.

W. B. HAYDEN.  
ATTACHMENT FOR EXPLOSIVE ENGINES.

APPLICATION FILED FEB. 15, 1904.

2 SHEETS—SHEET 2.



Witnesses.  
Robert Everett,  
James L. Norris, Jr.

Inventor,  
William B. Hayden.  
By James L. Norris,  
Att'y.



# UNITED STATES PATENT OFFICE.

WILLIAM B. HAYDEN, OF NEW YORK, N. Y.

## ATTACHMENT FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 782,502, dated February 14, 1905.

Application filed February 15, 1904. Serial No. 193,621.

*To all whom it may concern:*

Be it known that I, WILLIAM B. HAYDEN, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented new and useful Improvements in Attachments for Explosive-Engines, of which the following is a specification.

This invention relates to attachments for explosive-engines of the class in which is employed an electrical sparking device for the explosive mixture.

Primarily the invention resides in a connecting means between the generator and the engine, and aims particularly to obtain an equal regularity of the speed of the generator-shaft, as well as obtaining a steady and continuous rotary motion of the generator-shaft, whether the power-transmitting means for said shaft be a reciprocating or a rotary one, said means being further adapted to prevent sudden shocks to the generator and also enabling the storing up of sufficient power so that the generator can be operated in advance of its operation by the engine, as well as obtaining the operation of the generator in one direction whether the engine is reversed or running ahead.

The invention further aims to provide means for automatically throwing out of operation the generator when the engine is racing and to further provide means to permit of operating the generator manually, so that the generator can be operated in advance of the engine to obtain sufficient electrical energy to form a spark, so as to ignite the explosive or combustible mixture at the proper moment to prevent premature explosion and the kicking back of the engine when initially starting.

The invention further aims to provide new and novel attachments for obtaining the objects hereinbefore set forth and which shall be simple in construction, strong, durable, efficient in use and operation, and comparatively inexpensive to set up.

With the foregoing and other objects in view the invention consists in the novel combination and arrangement of parts hereinafter more specifically described, illustrated in the

accompanying drawings, and particularly pointed out in the claims hereunto appended.

In describing the invention in detail reference is had to the accompanying drawings, forming a part of this specification, wherein like reference characters denote corresponding parts throughout the several views, in which—

Figure 1 is a top plan view of the engine with the attachments applied thereto. Fig. 2 is a side elevation of a portion of the attachments, showing a means for manually operating the generator, a part of the coupling device, and one form of power-transmitting means between the coupling and the engine. Fig. 3 is a sectional elevation of the yielding coupling device. Fig. 4 illustrates a modified form of power-transmitting means between the engine and the coupling. Fig. 5 is a sectional detail elevation of one form of a governing device, and Fig. 6 is a sectional detail elevation of one form of a band-brake.

Referring to the drawings by reference characters, 1 denotes an electrical generator; 2, its shaft; 3, a governing device mounted on one end thereof, and 4 a pinion mounted on the other end of the generator-shaft 2.

The reference character 5 denotes the engine, 6 the engine-shaft, and 7 8 sparking-circuit wire connections between the generator and the engine.

The yielding coupling device between the generator and the engine consists of a shaft 9, having a socket 10 formed in one end thereof, and into said socket extends a bearing-stud 11, upon which is fixed, as at 12, a gear 13. The gear 13 is connected to the shaft 9 through the medium of a coil-spring 14, surrounding a portion of the shaft 9 and the hub of the gear 13. One end of the spring 14 is connected, as at 15, to the gear 13, and the other end is attached, as at 16, to the shaft 9. Interposed between the pinion 4 (as well as meshing therewith) and the gear 13 (as well as meshing therewith) is a train of multiplying-gearing 17. The pinion 4, gear 13, and gearing 17 may be of any suitable form or construction, and the gearing 17 may be supported in any suitable manner, as well as the bearing-stud 11 and shaft 9. Fixed upon the



shaft 9 is a toothed wheel 18, which can be manually operated, so as to rotate the shaft 9. Said wheel 18 is manually operated through the medium of a hand-lever 19, loosely mounted upon the shaft 9 and which carries a spring-actuated lever-and-pawl connection 20. It will be evident that when the lever-and-pawl connection 20 is normally operated the pawl of said connection will engage in the teeth of the wheel 18, and then by oscillating the lever 19, which carries the lever-and-pawl connection 20 therewith, motion will be imparted to the wheel 18, which in turn will operate the shaft 9, winding up or increasing the tension of the spring 14, the latter in turn rotating the gear 13, the latter imparting movement to the gearing 17, which in turn will rotate the pinion 4, thereby imparting motion to the generator-shaft 2.

In Fig. 2 of the drawings is shown a reciprocating power-transmitting means between the engine-shaft and the shaft 9, and said means comprises a hanger 21, loosely mounted upon the shaft 9. Said hanger 21 at its lower end is substantially yoke-shaped, as at 22, for partly surrounding the toothed wheel 18, and said yoke-shaped portion 22 of the hanger 21 carries a dog or pawl 23, which is supported therein through the medium of the pin 24. The pawl or dog 23 is adapted to engage in the teeth of the wheel 18 for imparting motion thereto. The hanger 21 is adapted to be oscillated, so that such action of the pawl 23 as just stated will take place. The oscillations of the hanger 21 are obtained through the medium of a reciprocating rod 25, connected at one end to an eccentric 26, mounted on the engine-shaft 6, and at its other end to a wrist-pin 27, secured to the hanger 21. From the construction just set forth it is evident that when the engine is operated the rod 25 will be reciprocated through the medium of the eccentric 26 and oscillate the hanger 21, which will carry the pawl 23 therewith, so that said pawl 23 will engage in the teeth of the wheel 18 and rotate the same in one direction, thereby imparting a rotary movement to the shaft 9, and said movement of the shaft 9 will transmit motion in the manner as hereinbefore set forth to the generator-shaft 2.

The means for discontinuing the operation of the generator when the engine is racing comprises an automatically-movable releasing-arm 28, which is adapted to be slid in the path of the pawl 23 and engage said pawl 23, so as to cause the same to ride over and not engage in the teeth of the wheel 18, and consequently the motion imparted to the wheel 18 through the medium of the pawl 23 will be discontinued. For moving the pawl 23 so as to ride over the teeth of the wheel 18 the pawl 23 is provided with a protuberance 29, adapted to be engaged by said arm 28, thereby by rocking the pawl 23 to such a position as

to cause it to ride over the teeth of the wheel 18. The arm 28 is slid into the path of the pawl 23 through the medium of a rock-shaft 30, rocked by means of an actuating-arm 31, carried by the governor 3, when the speed of the generator exceeds a certain point or when the engine is racing. The action of the governor 3 under the conditions just set forth is such as to cause the actuating-arm 31 to rock the shaft 30 and slide the arm 28 in the path of the protuberance 29 of the pawl 23.

In Fig. 2 is shown a means for preventing back rotation of the toothed wheel 18, and said means consists of a pawl 32, mounted upon the standard 33. The pawl 32 also acts in conjunction with a suitable braking means 34 for the generator-shaft 2. In this particular it will be stated that when the shaft 9 is operated the tension of the spring 14 will be increased, and if the engine is stopped the operation of the generator will be continued for a certain length of time, in view of the energy stored in the spring 14; but it has been found advantageous that upon the stopping of the engine it is well to stop the operation of the generator-shaft, so as to store up the energy in the spring 14, and this operation is obtained by means of any suitable braking device, as indicated by the reference character 34, operated by the brake-lever 34<sup>a</sup>. When the brake is applied to the generator-shaft, back rotation of the toothed wheel 18 is prevented through the medium of the pawl 32. When the brake is released before the engine is started, it is evident that sufficient energy is stored in the spring 14 so that the generator will be operated in advance of the engine. It may be well to state that the engine may be started in any suitable manner.

In Fig. 4 of the drawings is shown a modified arrangement for connecting the shaft 9 with the engine, and this modified arrangement is termed a "rotary" one and consists of the sprocket-wheel 35, carried by the engine-shaft, and a sprocket-wheel 36, carried by but loose upon the shaft 9. The wheels 35 and 36 are connected by a chain 37. The wheel 36 and shaft 9 are provided with a pawl-and-ratchet mechanism 38 for driving said shaft. Back rotation, as in the other structure, is prevented through the medium of the pawl 32 engaging the wheel 18.

In Fig. 5 is shown one form of a governing device and which consists of a disk wheel 40, secured to the shaft 2 and revolving therewith, friction-levers 41, pivoted to the wheel 40, as at 42, and revolving with said wheel 40, pulling-springs 43, connected at one end to the wheel 40 and at their other ends to the levers 41 for retaining said levers 41 normally against the stops 44, and a band-wheel 45, loosely mounted upon the shaft 2 and inclosing the levers 41. The band-wheel 45 carries the arm 31, which is connected to the shaft 30, as at 46. A pulling-spring 47 is provided



to retain the arm 31 against a stop 48. The operation of the governing device is such that when the generator reaches its maximum speed the levers 41 engage the band-wheel 45, causing the same to travel therewith and operating the rod 31, thereby actuating shaft 30 in a manner as hereinbefore referred to.

In Fig. 6 of the drawings the form of band-brake illustrated consists of a disk 49, fixed to the shaft 2 and inclosed by a band 34. The band 34 is fixed at one end, as at 50, and connected at its other end, as at 51, to the brake-lever 34<sup>a</sup>.

The interposition of the gearing 17 between the spring 14 and the generator is for the purpose of obtaining the proper speed of the generator for a low-speed or other form of engine, as well as obtaining the necessary speed of the generator for initially starting the same by the manual operation hereinbefore set forth without much effort on the part of the operator when oscillating the lever 19, for the reason that but a few oscillations of the lever 19 are all that is needed when it is necessary to initially start the generator or start the engine.

By the employment of the yielding spring connection 14 in the manner as set forth it has been found that the said spring connection acts to ward off sudden shocks to the generator and also obtains a steady and continuous motion, as well as equal regularity in speed of the generator-shaft. The spring connection, together with the other parts of the coupling means between the generator and the engine, will also cause the operation of the generator in but one direction whether the engine is reversed or running ahead.

The means hereinbefore set forth for throwing the generator out of operation when the engine is racing also acts as a means to throw the generator out of operation when the engine is going at such a rate of speed as would be injurious to the generator. In this particular the governing device will act upon the arm 28 in the manner as hereinbefore set forth, consequently disconnecting the power-transmitting means from the engine to the shaft 9.

It is thought the many advantages of the foregoing invention can be readily understood from the description thereof, taken in connection with the accompanying drawings, and it will furthermore be evident that changes, variations, and modifications can be resorted to without departing from the spirit of the invention or sacrificing any of its advantages, and I therefore do not wish to restrict myself to the details of construction hereinbefore described and as set forth in the annexed drawings, but reserve the right to make such changes, variations, and modifications as come proper for the adaptation of the invention to any usages for which it may be employed, said changes, variations, and modifications to

come properly within the scope of the protection prayed.

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

1. The combination of an electrical generator, a gearing for operating it, an engine for operating the gearing, a rotatable spring connection between the engine and gearing for operating the latter, said connection operated by the engine and adapted when operated to store up energy, means for discontinuing the operation of the generator and said gearing in advance of the discontinuing of the operation of the engine, thereby storing up energy in said connection, and means to release the generator so as to cause it to be operated by the energy stored in said connection.

2. The combination of an electrical generator, an engine, a spring coupling device between said engine and generator for operating the latter when the engine is operated, and means for intermittently disconnecting the generator from the engine when the engine is racing so that the speed of the generator will not rise above a certain maximum.

3. The combination with an electrical generator and an engine, of a yielding coupling device between the engine and generator for operating the latter when the engine is operated, and means for storing energy in the coupling device when the engine is stopped so as to operate the generator in advance of the operation of the engine.

4. The combination with an electrical generator, and an engine, of a multiplying-gearing for operating said generator, a yielding coupling device between said engine and said gearing for operating the latter when the engine is operated, and means for storing energy in said coupling device when the engine is stopped to permit of operating the generator in advance of the engine.

5. The combination with an electrical generator and an engine, of a multiplying-gearing for operating said generator, a yielding coupling device between said engine and said gearing for operating the latter when the engine is operated, means for storing energy in said coupling device when the engine is stopped to permit of operating the generator in advance of the engine, and a manually-operated means for operating said coupling device, causing thereby the operation of the generator in advance of the engine.

6. The combination with an electrical generator and an engine, of a multiplying-gearing for operating said generator, a yielding coupling device between said engine and said gearing for operating the latter when the engine is operated, means for storing energy in said coupling device when the engine is stopped to permit of operating the generator in advance of the engine, a manually-operated



means for operating said coupling device causing thereby the operation of the generator in advance of the engine, and means for intermittently disconnecting the generator  
5 from the engine when the engine is racing so that the speed of the generator will not rise above a certain maximum.

7. The combination of an electrical generator, an engine, a rotatable combined energy-  
10 storing and coupling device between said engine and the generator for operating the latter when the engine is operated, said device adapted to be operated by the engine and when operated storing energy, means for discontin-  
15 uing the operation of the said device and generator in advance of the discontinuing of the operation of the engine, thereby storing up energy in said device, and means for releasing said device, causing thereby the oper-  
20 ation of the generator independently of the engine.

8. The combination with an electrical generator and an engine, of a yielding coupling device gearing with the generator and suitably  
25 connected with the engine and adapted when the engine is operated to have movement imparted thereto, causing thereby the operation of the generator, said device consisting of a shaft rotatably connected with the engine and  
30 having a socket formed in one end, a bearing-stud extending in said socket, a gear fixed to said bearing-stud, a spring surrounding said shaft and having one end connected to said gear and its other end connected to said shaft,  
35 combined with means for manually operating said device, causing thereby the operation of the generator independent of the engine, said means consisting of a toothed wheel fixed to  
40 said shaft, a lever-and-pawl connection engaging with said wheel for rotating it, and a lever loosely mounted on the shaft and carrying said lever-and-pawl connection.

9. In combination an electrical generator, an engine, a rotatable yielding coupling de-  
45 vice gearing with the generator and adapted to operate it, an oscillatory-hanger suspended from said coupling device, a toothed wheel fixed to said coupling device, a pawl carried by said hanger and adapted to engage with  
50 said toothed wheel for rotating it, causing thereby the rotation of said device, a reciprocatory connection between said hanger and the engine for imparting oscillation to the hanger when the engine is operated, and means  
55 for intermittently throwing said pawl out of engagement with said wheel to discontinue the operation of the coupling device when the engine is racing or running at such a rate of speed that would cause the speed of the gen-  
60 erator to rise above a certain maximum.

10. In combination, an electrical generator, an engine, a rotatable yielding coupling de-  
vice gearing with the generator and adapted to operate it, an oscillatory hanger suspended  
65 from said coupling device, a toothed wheel

fixed to said coupling device, a pawl carried by said hanger and adapted to engage with said toothed wheel for rotating it, causing thereby the rotation of said device, a recip-  
70 rocatory connection between said hanger and the engine for imparting oscillation to the hanger when the engine is operated, means for intermittently throwing said pawl out of en-  
75 gagement with said wheel to discontinue the operation of the coupling device when the engine is racing at such a rate of speed that would cause the speed of the generator to rise above a certain maximum, and means for pre-  
venting back rotation of said toothed wheel.

11. In combination with an electrical gen- 80 erator and an engine, of a rotatable shaft, a toothed wheel carried by the shaft, a connection between said wheel and said engine for imparting motion to the shaft when the en-  
85 gine is operated, a train of gearing for operating the generator, a yielding connection between the shaft and gearing causing thereby the operation of the latter, and means for automatically discontinuing the operation of said  
90 wheel when the generator is operating at too great a speed.

12. In combination with an electrical gen- erator and an engine, of a rotatable shaft, a toothed wheel carried by the shaft, a connec-  
95 tion between said wheel and said engine for imparting motion to the shaft, a train of gear- ing for operating the generator, a yielding connection between the shaft and gearing, causing thereby the operation of the latter,  
100 and means for automatically discontinuing the connection between the engine and wheel to discontinue the operation of the shaft.

13. The combination with an electrical gen- erator and an engine, of a rotatable shaft, a gearing for operating the generator, a spring  
105 connected at one end to said shaft and at its other end to said gearing for operating the latter when the shaft is operated, a toothed wheel carried by the shaft, a connection be-  
110 tween said wheel and engine for imparting motion to the shaft, and means for storing the tension of said spring when the engine is stopped to permit of operating the generator in advance of the engine.

14. The combination with an electrical gen- 115 erator and an engine, of a rotatable shaft, a gearing for operating the generator, a spring connected at one end to said shaft and at its other end to said gearing for operating the  
120 latter when the shaft is operated, a toothed wheel carried by the shaft, a connection between said wheel and engine for imparting motion to the shaft, means for storing the ten-  
125 sion of said spring when the engine is stopped to permit of operating the generator in advance of the engine, and means for automatically disconnecting the said connection means between the engine and the wheel to discon-  
tinue the operation of the shaft.

15. The combination of an electrical gen- 130



erator, an engine, a yielding coupling device interposed between the generator and engine and adapted when operated to impart movement to the generator, a connection between the engine and said yielding coupling for operating the latter and the generator in one direction whether the engine is reversed or running ahead, and means for storing tension in said coupling device when the engine is stopped to permit of operating the generator independently of the engine.

16. The combination of an electrical generator, an engine, a yielding coupling device interposed between said generator and engine and adapted when operated to impart movement to the generator, a reciprocatory connection between the engine and said yielding coupling for operating the latter and the generator in one direction whether the engine is reversed or running ahead, and means for storing tension in said device when the engine is stopped to permit of operating the generator independent of the engine.

17. The combination of an electrical generator, an explosive-engine, an igniting device suitably connected with the generator and with the engine, a yielding coupling device interposed between said generator and engine and adapted when operated to impart movement to the generator, causing thereby the sparking of said igniting device, a reciprocating connection between the engine and said yielding coupling for operating the latter and the generator in one direction whether the engine is reversed or running ahead, and means for storing tension in said coupling when the engine is stopped to permit of operating the generator in advance of its operation by the engine, causing thereby the operation of the sparking device and the operation of the engine.

18. The combination of an electrical generator, an explosive-engine, an igniting device suitably connected with the generator and with the engine, a yielding coupling device interposed between said generator and engine adapted when operated to impart movement to the generator, causing thereby the sparking of said igniting device, a reciprocatory connection between the engine and said yielding coupling for operating the latter and the generator in one direction whether the engine is reversed or running ahead, means for storing tension in said coupling when the engine is stopped to permit of operating the generator in advance of its operation by the engine, causing thereby the operation of the sparking device and the operation of the engine, and means for manually operating said coupling device independently of the engine, causing thereby the operation of said generator and said sparking device to start the engine.

19. The combination of an electrical generator, an explosive-engine, a yielding device

interposed between said generator and engine and adapted when operated to impart movement to the generator, an igniting device suitably connected to the generator and the engine, a connection between the engine and said yielding coupling for operating the latter and the generator, causing thereby the operation of the igniting device, and means for storing tension in said coupling device when the engine is stopped to permit of operating the generator, causing thereby the operation of the igniting device and the starting of the engine.

20. The combination of an electrical generator, an explosive-engine, an igniting device for said engine operated by the generator, a spring coupling member between said engine and generator for operating the latter when the engine is operated and means for locking the generator when the engine is in motion causing thereby the storing of energy in said member and the discontinuing of the ignition, said means when released adapted to cause the operation of the generator by the energy stored in said member, the operation of said igniting device by the generator, the starting of the engine by said igniting device and the operation of the said member by the engine, thereby continuing the operation of the generator.

21. The combination with an electrical generator and an engine, of a rotatable shaft, a toothed wheel carried by the shaft, a connection between said wheel and said engine for imparting motion to the shaft when the engine is operated, a train of gearing for operating the generator, a yielding connection between the shaft and gearing causing thereby the operation of the latter, means for automatically discontinuing the operation of said wheel when the generator is operating at too great a speed, and means for preventing back rotation of said toothed wheel.

22. In combination with an electrical generator and an engine, of a rotatable shaft, a toothed wheel carried by the shaft, a connection between said wheel and said engine for imparting motion to the shaft, a train of gearing for operating the generator, a yielding connection between the shaft and gearing, causing thereby the operation of the latter, and means for automatically discontinuing the connection between the engine and wheel to discontinue the operation of the shaft, and means for preventing back rotation of said toothed wheel.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM B. HAYDEN.

Witnesses:

FRANCIS W. LUNGSTOOTH,  
RICHARD M. HOUSTETTER.