No. 831,930. PATENTED SEPT. 25, 1906.

C. C. CLARK.

MOTOR OR ENGINE.

APPLICATION FILED SEPT. 13, 1905.

Fig. 1.

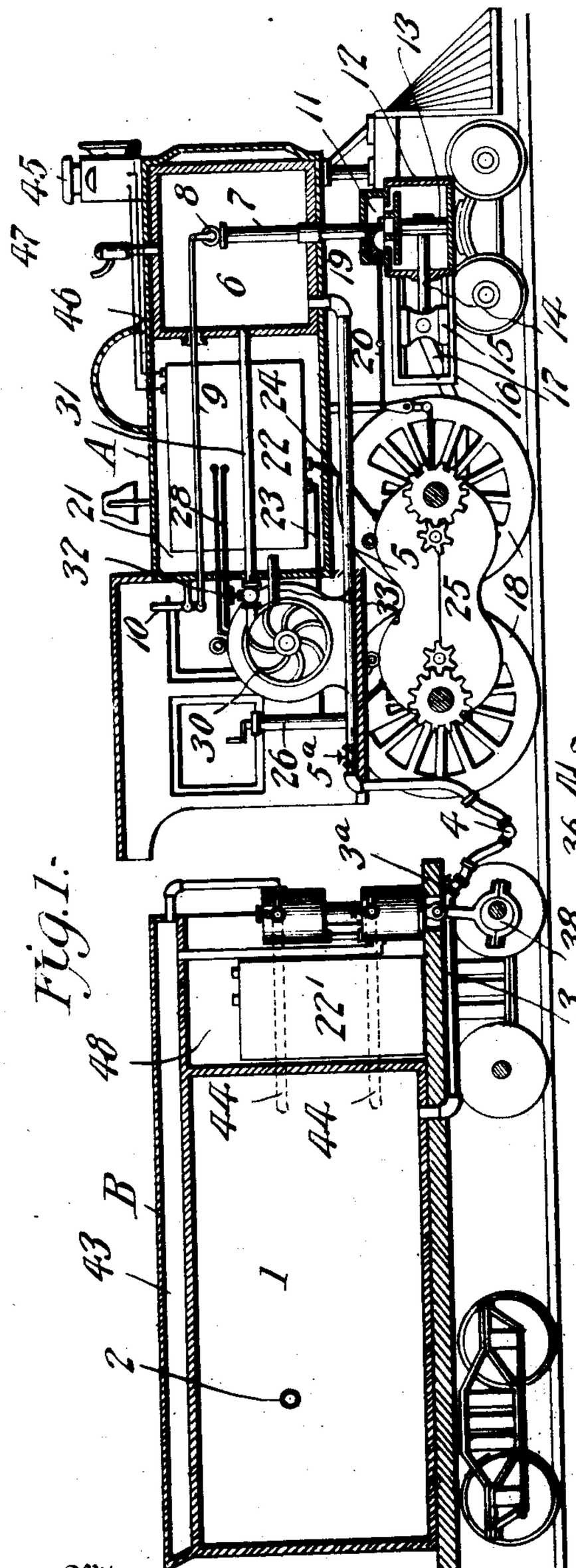


Fig. 3

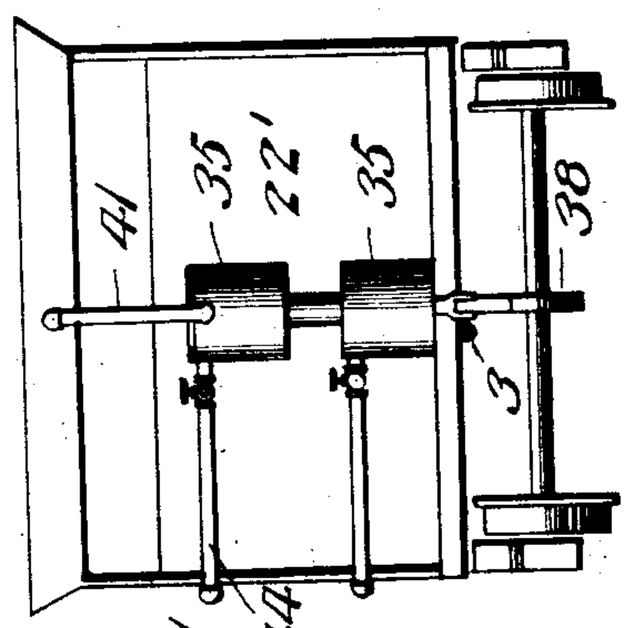


Fig. 4.

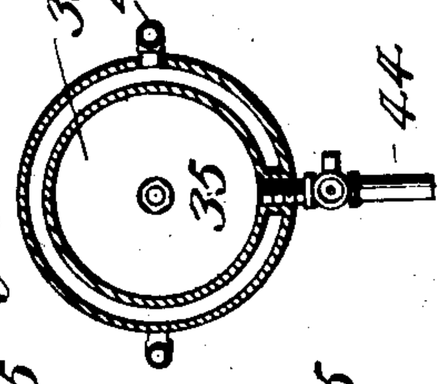


Fig. 5.

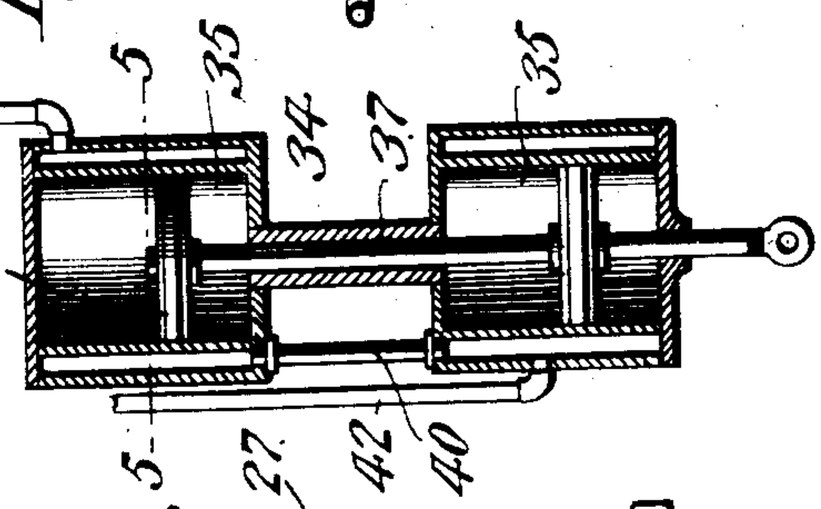
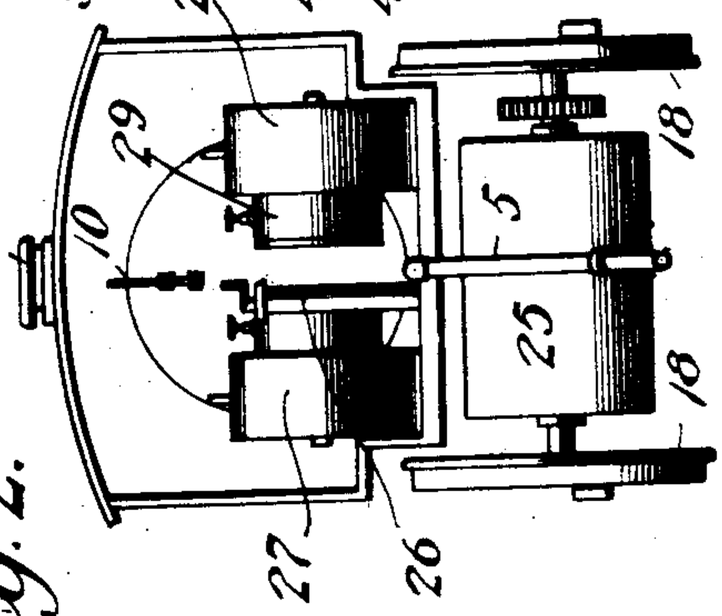


Fig. 2.



Witnesses

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MOTOR OR ENGINE.

No. 831,930. Specification of Letters Patent. Patented Sept. 25, 1906.

Application filed September 13, 1905. Serial No. 278,327.

To all whom it may concern:

Be it known that I, CHARLES C. CLARK, a citizen of the United States of America, residing at Corning, in the county of Steuben and State of New York, have invented new and useful Improvements in Motors or Engines, of which the following is a specification.

This invention relates to a combined air and electric motor or locomotive, the object of the invention being to provide a compressed-air-driven engine in which provision is made for driving the same by electric means when the air-supply is diminished or exhausted and for driving the engine by the united power of these agents when high power is required, as when the engine is ascending heavy grades or hauling heavy loads.

Another object is to provide means for storing air under pressure and generating and storing electric energy when the engine is descending grades, so that the additional power thereby obtained may be utilized to increase the hauling-power and range of travel of the engine.

With the above and other objects in view the invention consists of the novel construction and combination of parts hereinafter described and claimed, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of a locomotive and its tender embodying my invention. Fig. 2 is a rear elevational view of the locomotive. Fig. 3 is a front elevational view of the tender. Fig. 4 is a vertical section of the air-compressor, and Fig. 5 is a horizontal section through the same on line 5 5 of Fig. 4.

Referring now more particularly to the drawings, the letter A designates the engine or locomotive, and B its tender.

The tender B is provided with a storage-chamber 1 for air under pressure and a communicating inlet-nozzle or attachment 2, by which said chamber may be supplied with air from a suitable compressor at a roundhouse or station. Communicating with the chamber 1 is a supply-pipe 3, connected by the usual hose-coupling 4 with a pipe 5, leading to an air-storage chamber 6 in the body of the engine or locomotive. From the chamber 6 leads an outlet-pipe 7, controlled by a throttle-valve 8, adapted to be operated, through a connecting-rod 9, by a throttle-lever 10, disposed in the cab of the engine. The pipe 7 conveys air from the chest or chamber 6 to the valve-chest 11 of the air-cylinder 12, there being one such pipe, chest, and cylinder and their coöperating parts on each side of the engine. The driving mechanism may be of the ordinary construction employed in steam-locomotives, and, as herein shown, consists of a piston 13, disposed within the cylinder and provided with a rod 14, connected with the cross-head 15, movable in guides 16, said cross-head being attached to the usual connecting-rod 17, attached to the driving-wheels 18 of the engine. The supply and exhaust of air to and from the cylinder 12 is controlled by the usual slide-valve 19, connected with the governing-rod 20, which may be controlled by the usual type of eccentric mechanism, which I have not deemed it necessary to show, as these parts may be of any known construction. The air feeds from the storage-reservoir 1 on the tender to the storage-chamber 6 in the locomotive through the pipes 3 and 5 and hose connection 4, and thence through the pipes 7 to the cylinders, the supply of air to the cylinders being governed by the throttle-valve 8 to regulate the speed and power in the ordinary manner. The valves 3 and 5 are provided with valves 3^a and 5^a, respectively, which may be closed to prevent the escape of air from the reservoir 1 and chamber 6 when the locomotive is uncoupled from the tender.

The locomotive is provided with a compartment 21 for the reception of a storage battery 22, which may be initially charged at a roundhouse or station. The conductors 23 and 24 from the opposite poles of this battery connect with a motor 25, the armature-shafts of which are in gear with the axles of the driving-wheels 18. The conductor 23 extends into the cab of the locomotive and has arranged therein a controller 26, by which the flow of the current to the motor may be controlled. The electric driving means may be employed when the air-supply is diminished or exhausted or when it is desired to obtain high power for hauling heavy loads or ascending heavy grades, in which event both the pneumatic driving means and the electrical driving means may be employed for propelling the locomotive.

In order to increase the power and range of travel of the locomotive, I provide means for

utilizing the air-pressure for generating electricity to charge the battery 22, such means being preferably operated when the engine is descending grades, so as to prevent waste of the compressed air stored in the reservoir 1. To this end I arrange in the cab of the engine dynamos 27, from which charging-conductors 28 lead to the battery 22. Disposed alongside each dynamo-casing is a casing 29, containing a motor-wheel or turbine 30, mounted on the shaft of the dynamo and adapted to communicate motion thereto, each motor-casing being supplied with air under pressure to operate the wheel through a supply-pipe 31, communicating with the air-chamber 6 and provided with a controlling-valve 32. Each motor-casing is provided with an outlet-pipe 33 for the exhaust of the spent air. Upon opening the valves 32 air will be admitted to the motor-casing to drive the motor-wheels, and thereby drive the dynamos to generate a current which will pass to the battery 22 through the conductors 28. The battery 22 may in this manner be kept charged during the running of the locomotive. In order to compensate for the loss of air employed to drive the dynamos, means are provided for supplying air to the reservoir 1 when the locomotive is traveling downgrades. These means consist of a compressor 34, mounted on the tender B, said compressor having a pair of superposed compressor-cylinders 35, in which operate pistons 36, connected with a common piston-rod 37, driven by an eccentric 38 from one of the axles of the tender.

In order to maintain the compressor cool, each cylinder 35 is provided with a surrounding water-jacket 39, the two jackets being connected by a pipe 40 to permit of the free passage of the cooling-water from one to the other. The jackets of the upper and lower cylinders are respectively connected by supply and return pipes 41 and 42 with a chamber or compartment 43 upon the tender adapted to contain the supply of cool water which circulates therefrom and through the jackets back to said storage-chamber through the pipes just described. In practice a suitable clutch connection will be employed for throwing the air-compressor into and out of operation, so that said compressor may be driven when the engine is descending grades to force air into the air-reservoir 1 to permit of the operation of the dynamos without reduction of air-pressure. In this manner an amount of air sufficient for generating a current to keep the battery 22 charged may be supplied, so as to avoid the necessity of utilizing the air-pressure reserved for driving the engine through its ordinary pneumatically-operated driving mechanism. The air taken in by the compressor is discharged therefrom through pipes 44 into the storage-reservoir 1. If desired, the engine may be provided with an electric headlight 45, supplied with current by conductors 46 from the battery 22 and with a whistle 47, supplied with air from the chamber 6.

It will of course be understood that the compressor may be operated when the engine is descending grades to maintain a desired pressure in the storage-reservoir 1 in order to increase the range of travel of the engine.

The tender may be provided with a chamber or compartment 48 to contain an auxiliary storage battery 22′, which may be substituted for the battery 22 when the latter becomes inoperative from any cause. When maximum power is required, the auxiliary battery 22′ may also be arranged in circuit through suitable connections with the motor to supply current thereto. The auxiliary storage battery may also be substituted for the battery 22 when the latter is exhausted and it becomes impossible to recharge it by reason of injury to the turbine-motors.

The engine and its tender are preferably constructed, as shown, to simulate the appearance of the ordinary steam-locomotive and its tender; but they may be of any desired form and construction, and all of the operating elements may become wholly upon the locomotive or upon a motor-car, the tender thus being dispensed with. By providing the electrical driving means and the means for replenishing the storage-reservoir with air the power and range of travel of the engine are increased.

It will be seen that the construction of the driving mechanism is simple and that engines embodying the same may be built at a comparatively low cost.

Having thus described the invention, what is claimed as new is—

1. An engine or motor provided with pneumatic driving means, electrical driving means, and a generator adapted to be operated by air-pressure from the pneumatic driving means and to supply current to said electrical driving means.

2. An engine or motor provided with pneumatic driving means, electrical driving means, a generator adapted to be operated by air-pressure from the pneumatic driving means to supply a current to said electrical driving means, and means for supplying air to the storage source of the pneumatic driving means to compensate for the loss of that employed for operating the generator.

3. An engine or motor provided with pneumatic driving means, electrical driving means, a storage battery for supplying current to the electrical driving means, and means operated by compressed air from the storage source of the pneumatic driving means for recharging said battery.

4. An engine or motor provided with pneumatic driving means, electrical driving means, a storage battery for supplying cur-

rent to the electrical driving means, means operated by compressed air from the storage source of the pneumatic driving means for recharging said battery, and means for supplying air to said storage source to compensate for the loss of that employed for operating said recharging means.

5. An engine or motor provided with pneumatic driving means, electrical driving means, a storage battery for supplying current to the electrical driving means, and a pneumatically-driven dynamo for supplying current to recharge the battery.

6. An engine or motor provided with pneumatic driving means, electrical driving means, a storage battery for supplying current to the electrical driving means, and a dynamo provided with a motor-wheel for operating it, said wheel being driven by air from the storage source of the pneumatic driving means.

7. An engine or motor provided with pneumatic driving means, electrical driving means, a storage battery for supplying current to said electrical driving means, a dynamo for recharging the battery, said dynamo being provided with a motor-wheel operated by air-pressure from the pneumatic driving mechanism, and means for supplying air to said driving mechanism to compensate for the loss of that employed to operate said motor-wheel.

8. An engine or motor provided with a main air-storage compartment, an auxiliary air-storage compartment in communication therewith, driving means adapted to be supplied from said auxiliary compartment, electrical driving means, a storage battery for operating the same, a motor-wheel adapted to be driven by air from the auxiliary storage-compartment, a dynamo operated thereby for recharging said battery, and means for supplying air to the main storage-compartment to compensate for the loss of that employed to operate the motor-wheel.

9. An engine or motor provided with a storage-chamber for air under pressure, pneumatically-driven driving mechanism in communication therewith, electrically-driven driving mechanism, a storage battery for supplying said electrically-driven driving mechanism, and means for recharging said battery.

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

CHARLES C. CLARK.

Witnesses:
JOHN G. HALL,
N. J. REICHERT.