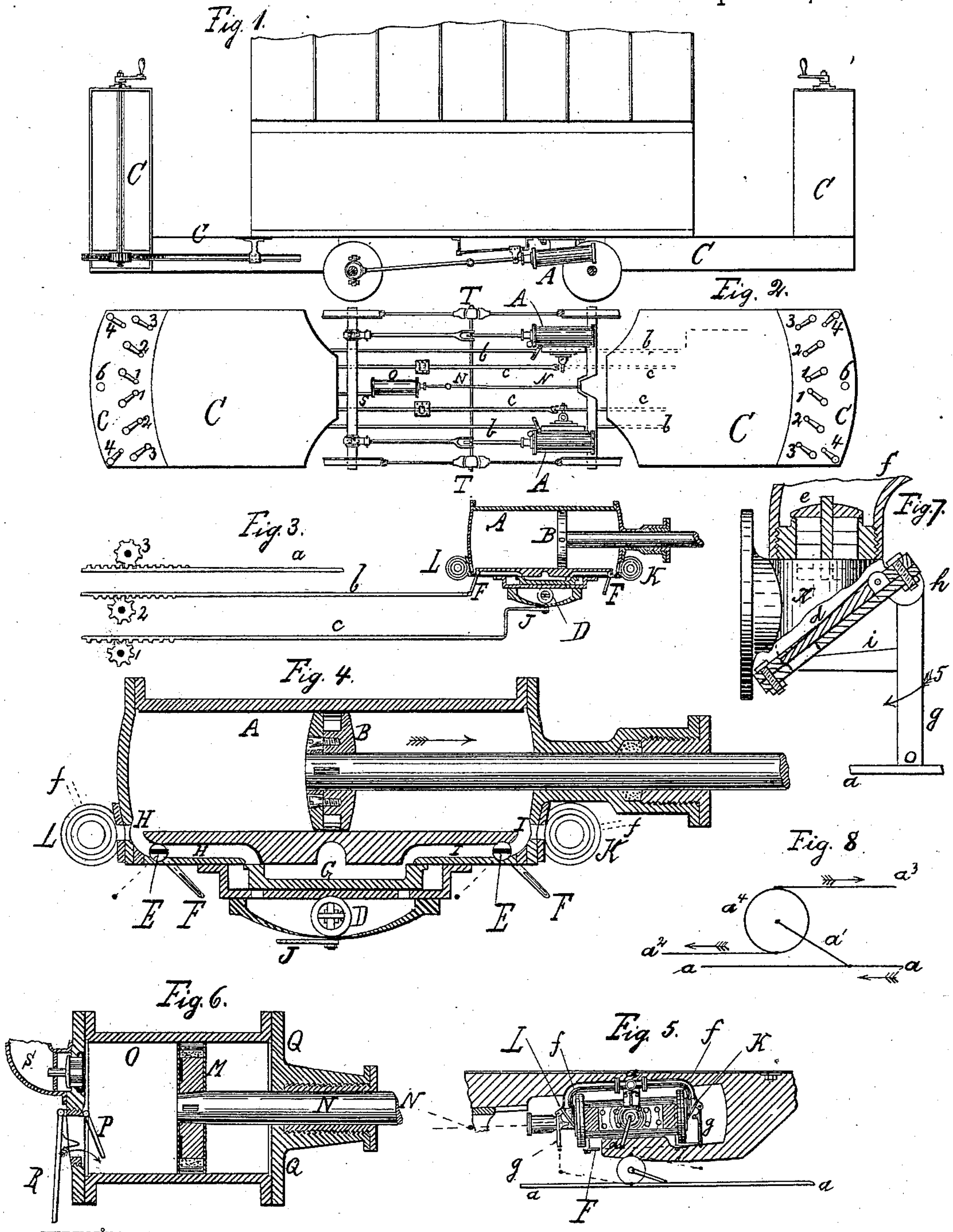
(No Model.)

C. D. VADERSEN.

MOTOR.

No. 306,039. Patented Sept. 30, 1884.



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MOTOR.

SPECIFICATION forming part of Letters Patent No. 306,039, dated September 30, 1884.

Application filed May 15, 1884. (No model.)

To all whom it may concern:

Be it known that I, CLAUS DANIEL VADERSEN, a citizen of Germany, residing at New York, in the county and State of New York, have invented new and useful Improvements in Motors, of which the following is a specification.

This invention consists in a novel construction of motor, whereby provision is made for storing up any surplus energy which may be generated.

The invention further consists in a novel arrangement of the inlet and outlet valves, so that said valves can be readily thrown into or out of operation, as required, either for operating or stopping the device, or for storing up surplus energy.

In the accompanying drawings, Figure 1 shows a side view of my motor applied to a vehicle or car, partly in section. Fig. 2 is a plan view of the same, the body of the vehicle or car being removed. Fig. 3 shows a manner of operating the valves, the cylinder A being shown in horizontal central section. Fig. 4 is a horizontal central section of a cylinder. The remaining figures represent details, and will be hereinafter referred to.

Similar letters indicate corresponding parts.

The letter C indicates a reservoir or tank, which is shown in the drawings as arranged in front of and underneath a car or vehicle, and which is adapted to be filled with compressed air or gas from some suitable reservoir, or by a forcing-pump, or in any other suitable manner. This tank or reservoir C is shown made in several parts or sections; but the sections should be in free communication with one another by tubes or passages.

An advantage of having the tank C made in several sections is, that if one section should leak or get out of order, it can be shut off, leaving the other sections still operative. It may also be well in constructing the tank C to make one side or part somewhat weaker than the rest, so that in case the tank should burst it will burst at the weak part, and thus diminish the liability of injury being done. Such weak part should, of course, not be made so weak as to interfere with the efficiency of the device. It may also be noticed that the tank C, if on a car or vehicle, may be filled either at the main station alone or at various way-stations along the route, as required; or a tube or series of tubes may be laid along the route of the car for conveying compressed air or gas, and from said tubes the tank C may be filled as occasion requires. From the tank C the compressed air flows through a delivery-valve, D, Figs. 3 and 4, into the cylinder A. By means of a sliding valve, G, operated by eccentrics or otherwise, the compressed air enters the cylinder A first through the port H, and then through the port I, communicating a reciprocating or backward and forward motion to the piston B. This part of the operation of the mechanism resembles the operation of cylinders and pistons in steam-engines, and need not be more specifically described.

When the vehicle is passing along a level, or up an incline, the communication between the tank C and the cylinder A is open, and the piston B revolves the driving-wheels; but on the vehicle descending a grade motive power for propelling the vehicle is not required, and the delivery-valve D is closed, as also the secondary delivery-valves E E, thus closing the ports H and I. The inlet-valves D E may respectively be operated through levers or arms J F F. The lever or arm J is shown as connected to an operating-rod, *c*, connected by a rack and pinion with the crank handle or wheel 1, Figs. 2 and 3. A similar operating-rod extends from the lever J to the other end of the car, and there connects with a similar crank handle or wheel, 1, so that the lever J can be operated from either end of the car or vehicle. The levers F are connected to a pair of operating-rods, *b*, extending one to one end of the vehicle and one to the other end and operated by crank handles or wheels 2. The two levers F may be joined together by a connecting-rod, so as to operate simultaneously.

The handles or wheels 1 and 2 are shown in duplicate at each end of the vehicle, and the cylinder A and operating devices are arranged in duplicate, one series on each side of the vehicle, and so constructed that one cylinder, A, may be in operation, and the other one out of operation—as, for example, when the vehicle is lightly loaded, thus avoiding the expenditure of superfluous energy. When the vehicle is passing down an incline or grade, as already stated, the delivery-valves D E are closed and the vehicle proceeds from its own weight.

To store up the energy or part of the energy generated by the descent of the vehicle, the following arrangement is provided: At the ends of the cylinder A are connected, respectively, two injection-valve casings, K L, each having two vent-valves, *d e*, and communicating with the interior of the cylinder. The two injection-valve casings are of like construction, and one is shown in the detached partial sectional view, Fig. 7. When the piston B moves in the direction of the arrow, Fig. 4, it forces the air in front of it into the injection-valve casing K, closing the vent-valve *d* on its seat and opening the vent-valve *e* of the casing K. The vent-valve *e* controls the communication of the casing with a pipe or channel, *f*, which leads into the tank C, so the air which is forced out of the cylinder A is forced or injected into the tank C and stored up for future use. The injection-valve casings K L are shown attached to the cylinder A in side view in Fig. 5. When the piston B passes in the direction of the arrow, Fig. 4, the vent-valve *d* in the injection-valve casing L, which corresponds to the vent-valve *d* in the injection-valve casing K, Fig. 7, is opened, allowing air to enter the interior of the cylinder A, while the vent-valve *e* of said injection-valve casing L is closed, preventing the air from the tank C escaping through the channel *f*, Fig. 5. On the return of the piston B in the direction opposed to that of the arrow, Fig. 4, the vent-valve *d* of the injection-valve casing K opens and the vent-valve *e* closes, while the vent *d* of the injection-valve casing L closes, the vent-valve *e* opens, and air is forced through the injection-valve casing L into the tank C. The downward passage of the car on a grade thus is utilized in continuously forcing air into the tank C, and storing up energy. When the vehicle arrives at a level or at an upgrade, the delivery-valves D E are opened and the energy in the tank C again operates the motor. When the downgrade on which the vehicle passes is not steep enough to allow of the piston B forcing air into the tank C, the injection-valve casings K L can be thrown out of operation by drawing the lever *g*, swinging on the fulcrum *h*, Fig. 7, in the direction of the arrow 5 until the arm *i* on the lever *g* forces the vent-valve *d* away from its seat and holds it thus removed, when the air will pass in and out of the interior of cylinder A through the vent *d*, which vent-valve is not now able to shut. These levers *g*, of which each discharge-valve casing K L has one, can be operated by a rod, *a*, extending to both ends of the vehicle, and actuated by the handles or wheels 3 in the same manner as the rods *b c* are actuated by the crank-handles or hand-wheels 2 and 1. (See Figs. 3, 5, and 7.)

In Fig. 5 the rod *a* is shown as connected to a disk or a crank which connects by rods or chains (shown in dotted lines in Fig. 5) with the levers *g*; or any other suitable connection may be employed to enable the rod *a* to actuate the levers *g*.

When the descent of the vehicle on a downgrade is not abrupt enough to force air through the valve-casings K and L into the tank C, provision is made to nevertheless store up the energy generated by providing a secondary injection-valve, which does not require so much power to operate it as the valves of the injection-valve casings K L. This secondary injection-valve is shown in detail in Fig. 6, and it has a cylinder, O, Figs. 2 and 6, in which moves a piston, M, operated by a piston-rod, N, to which motion will be communicated by a crank on one of the axles of the vehicle. The front or face Q of the injection-cylinder O is perforated, so as to allow air to pass readily into and out of the space between the piston M and cylinder-head Q. The space in the cylinder O behind the piston M is provided with an inlet vent-valve, P, and an outlet vent leading into the tube S, which communicates with the tank C.

As the injection-cylinder O may be made of small form it will not require much power to operate the piston M, when air will be drawn in through the inlet vent-valve P on the forward motion of the piston M, and said air will be forced through the tube S into the tank C on the return-stroke of the piston. By means of the lever R the vent-valve P can be forced away from its seat and so held away, when the air will pass in and out through the seat of the vent-valve P without entering the tube S, thus throwing the secondary injection apparatus out of operation. This lever R can be operated by a rod and hand-wheel, 6, in the same manner as the cranks 3 operate the rod *a*, levers *g*, and vent-valves *d* of the injection-valve casings K L.

The secondary injection-valve O may be thrown into operation at any suitable occasion—as, for example, when it is desired to retard the speed of the car on a level, as well as when the car is passing on a downgrade.

To stop the car, air-brakes T T, Fig. 2, may also be provided, which can be operated by valves actuated by levers 4 4, to allow the compressed air in the tank C to act on the brakes T. As the construction of these air-brakes T and their manner of application and operation may conform to those of air-brakes well known on railroad-trains operated by steam, such brakes need not be shown or described in detail.

In Fig. 8 is more specifically shown a manner in which the rod *a* may operate the lever *g* of the injection-valve casings K L. One lever *g* may be attached to the link or rod a^2, and the other one to link or rod a^3, said links or rods a^2 and a^3 being also connected to the periphery of a revolving disk, a^4. To the disk a^4 is also firmly connected an operating arm or lever, a', connected to the rod *a*, and when the rod *a* is moved in the direction of the arrow marked on it in Fig. 8, so as to revolve the disk a^4, the links or rods a^2 a^3 are moved in opposite directions, as shown by arrows, Fig.

8, and the levers g are moved away from the vent-valves d in the injection-valve casings K L. On moving the rod a in the direction opposed to that of the arrow shown on it in Fig. 8, the disk a^4 again revolves, and the links or rods a^2 a^3 are again moved in opposite directions, as before, but in directions opposed to the arrows shown in Fig. 8 on said links or rods a^2 a^3, and the levers g are moved toward the vent-valves d in the injection-valve casings K L. I may also note that when the tank C is in communication with the cylinder A and the energy in said tank C is operating the piston B, the pressure of air in the cylinder A forces shut the vent-valves d in the injection-valve casings K L, thus preventing escape of air and avoiding any waste, while the pressure in the tank C forces shut the vent-valves e in said injection-valve casings and holds the vent-valves e closed, since the piston B keeps continuously moving, thus continuously enlarging that space in the cylinder A into which the compressed air flows at any moment from the tank C, and tending to make the pressure from the interior of the cylinder A upon any one of the vent-valves e somewhat less than the pressure from the interior of the tank C upon the vent-valves e, thus preventing opening the vent-valves e.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a motor, the combination of the cylinder A, the piston B, the injection-valve casing K, communicating with the cylinder at one end and provided with the two vent-valves d e, a storage-tank, C, and a channel, f, for connecting the injection-valve casing with the tank and controlled by the vent-valve e, one of said vent-valves being closed and the other opened by the escape of air from the cylinder, substantially as described.

2. The combination, in a motor, of the cylinder A, the piston B, the injection-valve casings K L at the ends of the cylinder, respectively, and communicating therewith, each casing provided with the two vent-valves d e, a storage-tank, C, and the channels f, for connecting the injection-valve casings with the tank and controlled by the vent-valves e, one of the vent-valves of each valve-casing being closed and the other opened by the escape of air from the cylinder, substantially as described.

3. The combination, in a motor, of the cylinder A, the piston B, the vent-valve casing K, connected and communicating with one end of the cylinder and provided with two vent-valves, d e, the storage-tank C, the channel f, connecting the valve-casing with the tank and controlled by the vent-valve e, and a swinging lever for holding the vent-valve d from its seat to permit the free escape of air from the cylinder, substantially as described.

4. The combination, in a motor, of the cylinder A, piston B, the injection-valve casings K L, communicating, respectively, with the ends of the cylinder, and each provided with two vent-valves, d e, the storage-tank C, the channels f, connecting the valve-casings with the storage-tanks and controlled by the vent-valves e, and levers having arms for holding the vent-valves d from their seats to permit the free escape of air from the opposite ends of the cylinders, substantially as described.

5. The combination, in a motor, of the cylinder A, the piston B, the injection-valve casing K, communicating with one end thereof and provided with two vent-valves, d e, a storage-tank, C, a channel, f, connecting the valve-casing with the tank and controlled by the vent-valve e, the delivery-valve D, and the secondary delivery-valve E, for controlling the passage of air from the tank to the cylinder, substantially as described.

6. The combination, in a motor, of the cylinder A, the piston B, the injection-valve casing K, communicating with one end thereof and provided with two vent-valves, d e, a storage-tank, C, a channel, f, connecting the valve-casing with the tank and controlled by the vent-valve e, the slide-valve G, the delivery-valve D, and the secondary delivery-valves E, substantially as described.

7. The combination, in a motor, of the cylinder A, the piston B, the injection-valve casing K, provided with the vent-valves d e, with the secondary injection-valve, composed, essentially, of the cylinder O, vent-valve P, and a valved tube or channel, S, substantially as described.

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

CLAUS DANIEL VADERSEN. [L. S.]

Witnesses:
W. HAUFF,
WILLIAM C. HAUFF.