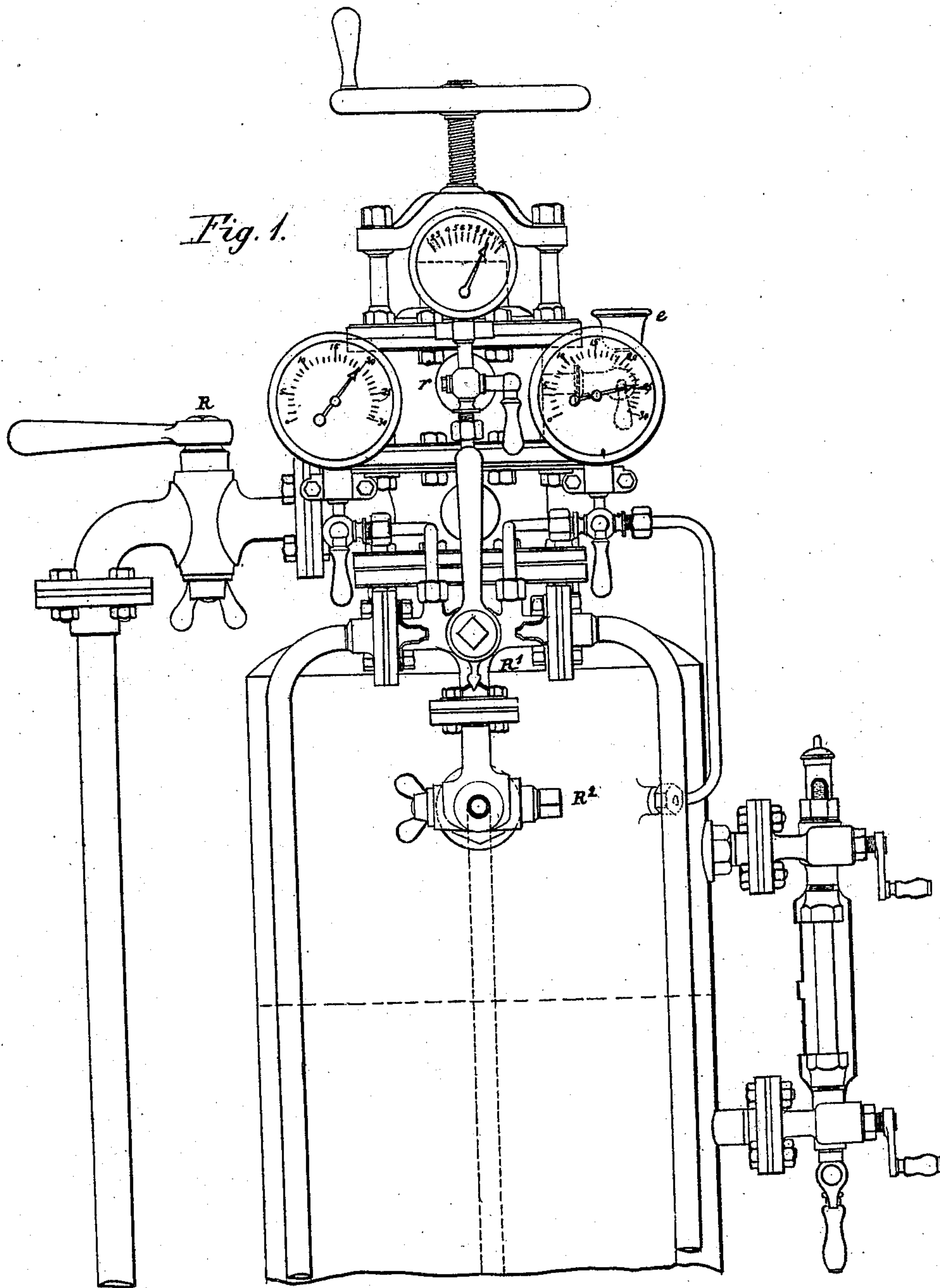


L. MEKARSKI.
DEVICE FOR USING COMPRESSED AIR FOR MOTIVE POWER.
No. 177,736. Patented May 23, 1876.



Witness:

R. M. H. H. H.

Jean Rolland

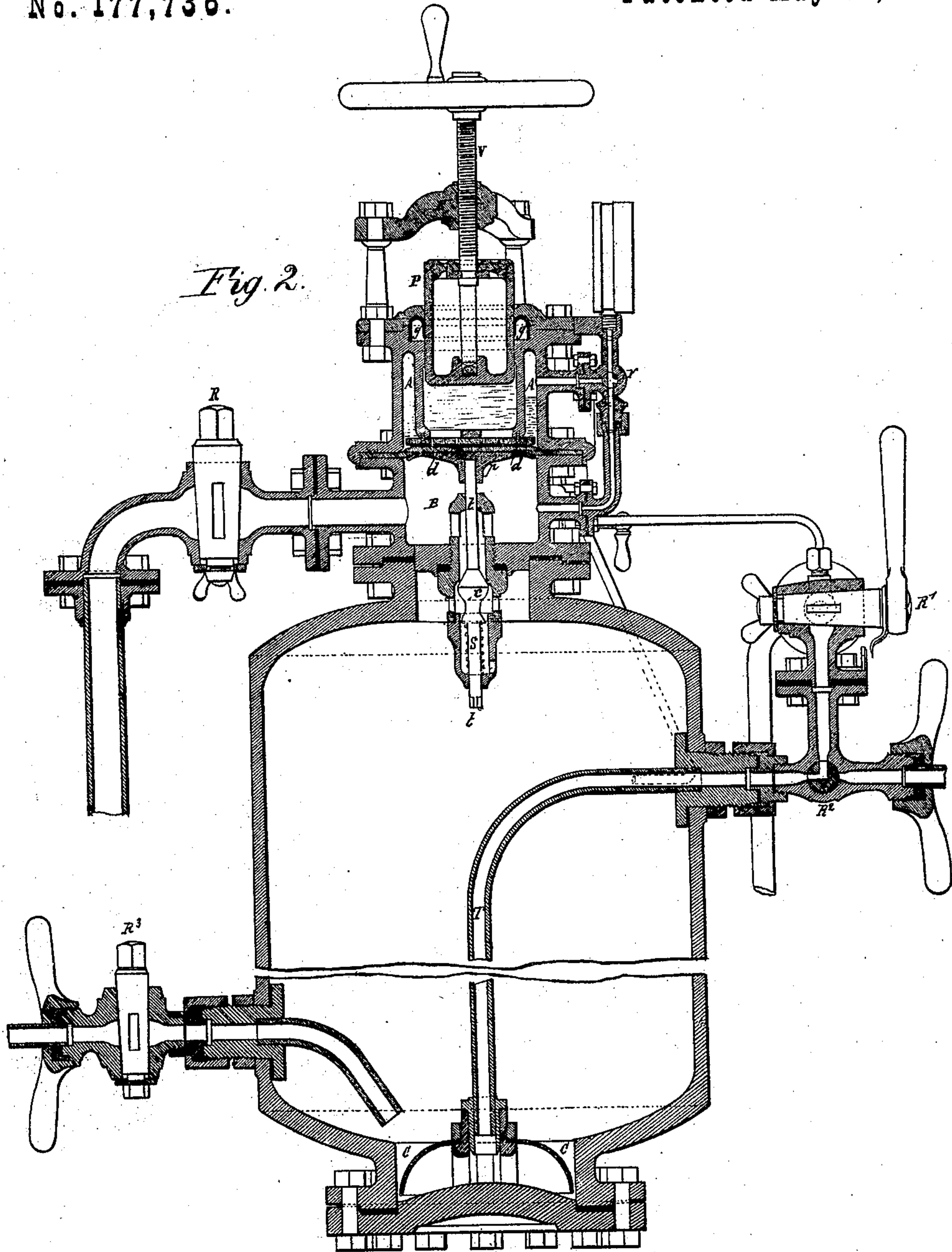
Inventor

Louis Mekarski

L. MEKARSKI.

DEVICE FOR USING COMPRESSED AIR FOR MOTIVE POWER.
No. 177,736.

Patented May 23, 1876.



Witnesses:

Chas. M. Hopper

Jean Rolland

Inventor

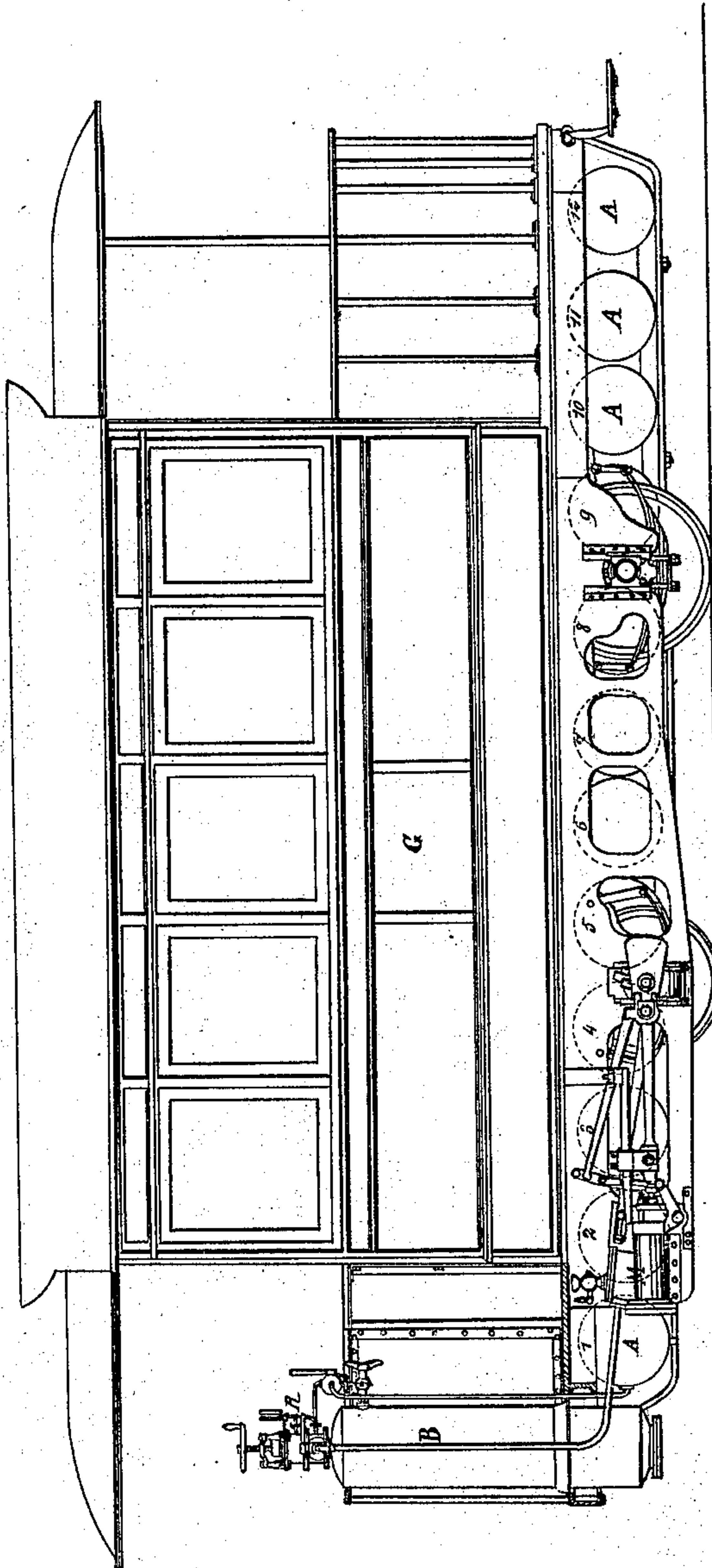
Louis Mekarski

L. MEKARSKI.

DEVICE FOR USING COMPRESSED AIR FOR MOTIVE POWER.
No. 177,736.

Patented May 23, 1876.

Fig. 3.



Witnesses:

Robert M. Harper

Jean Rolland

Inventor

Louis Mekarski

UNITED STATES PATENT OFFICE.

LOUIS MÉKARSKI, OF PARIS, FRANCE.

IMPROVEMENT IN DEVICES FOR USING COMPRESSED AIR FOR MOTIVE-POWERS.

Specification forming part of Letters Patent No. **177,736**, dated May 23, 1876; application filed December 10, 1875.

To all whom it may concern:

Be it known that I, LOUIS MÉKARSKI, of Paris, France, have invented an Improved Apparatus for Utilizing Compressed Air for Obtaining Motive Power; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed sheets of drawings, making a part of the same.

My invention relates to an improved apparatus for utilizing compressed air as a motive power; and it consists in the means employed for passing the compressed air through a body of heated water, and in the construction and arrangement of a pressure-regulator operating in connection therewith, as hereinafter more fully described.

Although capable of general application, this invention has chiefly for its object to render practicable the employment of compressed air for locomotives, and for other purposes, where it is necessary to utilize in the best manner possible a limited supply of air inclosed, under a high pressure, in a reservoir, and renewable only at certain intervals. For this purpose the said invention comprises an automatic distributing apparatus, which I term "a discharge-regulator," for dividing the air which flows from a reservoir, where the pressure changes in decreasing to a fixed point lower than that of the reservoir, but which can be caused to vary instantaneously within certain wide limits, so that I can proportion, at any moment, the power of the engine to the resistance it has to overcome.

The heating of the air and its mixing with the steam are effected by causing it to pass, in a suitable state of division, through a column of hot water, with which it becomes equal in temperature.

The heater may be a boiler heated continuously by any suitable means, or a cistern containing hot water obtained from a separate generator, and which cools in proportion to its work.

In the first case, the temperature of the water remains constant; therefore the air passes through under a constant pressure, so that the proportion of the steam or vapor brought with it is invariable. Therefore, the regulator should be placed between the air-

reservoir and the heater. In the second case, on the contrary, the regulator must be placed behind the heater, so that the pressure of the air diminishes in the latter as in the air-reservoir at the same time that the water is cooled.

In the accompanying drawing, the apparatus, represented by Figure 1 in elevation and by Fig. 2 in section, is of the latter kind, and is that which I have thought most suitable for a self-moving tramway-carriage. The water once cooled is renewed or reheated by a circulation of steam during the charging of the air-reservoir.

The air enters by the central tube, meeting the rose C, whereby it is divided into fine jets, which rise through the liquid and reunite in a steam-chamber formed in the upper part of the apparatus. It is afterward conducted to the cylinder by means of the regulator.

The two cocks R^1 R^2 are for establishing or intercepting the communication with the air-reservoir, which in this application of the said invention is divided into two distinct chambers, of which one serves as a reserve. They serve equally at the charging of the reservoir, the key of the cock R^2 being then turned outward. The cock R^3 placed below serves for the introduction of hot water or steam, as well as for the emptying.

The regulator shown in these drawings is of a form embodying the following general idea, viz: To regulate the section of the orifice by which the air flows by means of a suitable stopper, a valve, or slide, connected with a movable partition or piston, subjected on one side to the pressure of the discharges, and on the other to a spring whose tension is determined arbitrarily.

It will be readily understood that the apparatus works in a manner as to maintain an equilibrium between the two actions, the pressure of discharge remaining fixed, or varying like the tension of the spring.

The stopper is in this case the conical valve c guided in its travel by the rod t , at whose upper end is mounted the plate p . An air-spring—that is to say, a certain quantity of compressed air inclosed in a space, A , and whose pressure is regulated by the movement

of the piston P, exerts upon the plate *p* through the medium of the movable india-rubber diaphragm *d*, an action which tends to determine the flow or discharge on lowering the valve *c*, and to maintain also a corresponding pressure in the chamber B, which communicates with the motor-cylinder by the distributing-cock R. The valve follows automatically the variations of the discharge, closing completely the orifice as soon as the latter stops. The intermissions which result from the employment of the expansion have, therefore, no influence.

For insuring, during the filling of the heater, the closing of the valve, which does not then bear upon its seat with great pressure, as while working, I apply to it a small spiral spring, *s*, placed in a box through which the rod *t* passes.

Finally, to prevent the leakages which may be produced through the packing *g*, traversed by piston P, the said piston is only made to act indirectly upon the air-spring by means of an interposed cushion of water which it causes to flow in the annular chamber A. This water, which fills the central space wherein the piston moves when the latter is at the top of its stroke, is admitted by the funnel-cock *e*. The air itself is delivered into the chamber B by means of the three-way cock *v*, which permits, by a very simple movement, the filling of the space A with air already having a certain tension. A gage is mounted on this cock. The piston P is actuated by the pressure-screw V, which is controlled by a wheel, and which passes through a nut, E, attached to the apparatus by three iron standards.

By this invention I provide a motor which does not present any of the inconveniences accompanying the employment of steam, and that may be applied advantageously to a great number of operations, especially to the working of iron ways laid in towns, and upon roads for the interior service of mines, or traversing long tunnels in the form of compressed-air locomotives, hydraulic engines, and others in which there is used, as required, the force accumulated in fixed reservoirs.

It furnishes the means of diminishing the inconvenience of tramways to the circulation of traffic, by preventing the necessity of a separate engine, and having the motor fixed in the carriage, which is thus rendered self-moving. The capability of augmenting instantaneously the power of the engine in varying

either the pressure, the expansion, or both together, will render them vehicles capable of ascending the steepest gradients. The division of the reservoir into two parts, of which one forms the reserve, permits also the reservation of this available force to the last moment.

The most important result of this invention is the possibility of storing the air in carriages at a very high pressure, (twenty-five atmospheres or higher,) permitting a long journey without recharging the reservoirs; nevertheless, in certain cases where it is desirable to reduce the dead-weight in diminishing the number or size of the reservoirs, the charging may be effected more frequently by means of supplies of air arranged along the road at suitable distances, and attached to tubes or passages fed by the compressing-works.

For the illustration of the application of the preceding, I show in Fig. 3, as an example, the general arrangement of a type of self-moving carriage constructed according to this invention.

A A A are the reservoirs of air placed under the frame. Nos. 1 and 2 compose the reserve, the others the main store. B is the heater, whose details are shown in Figs. 1 and 2. This apparatus is placed at the front of the carriage upon the first platform. R is the regulator. M is the motor mechanism fixed laterally at each side of the frame upon sleepers of plate-iron, or other suitable metal, properly mounted and placed in front of the driving-axle, to effect an equilibrium to the load of the passengers gathered upon the rear platform. The body of the car is adapted to receive about sixteen passengers. The front platform is reserved exclusively to the engineer, and the rear one is for passengers to stand upon.

Having thus described my invention, what I claim as new is—

1. The regulator, consisting of the combination of the piston P, the casing, having annular air-chamber A, the diaphragm *d*, and the valve *c*, supported by spring *s*.

2. The combination, with the hot-water receptacle, of the regulator and the air-pipe T, terminating in a rose, C, substantially as and for the purpose described.

LOUIS MÉKARSKI.

Witnesses:

ROBT. M. HOOPER,
JEAN ROLLAND.