4 Sheets—Sheet 1.

C. E. BUELL.

MEANS FOR UTILIZING COMPRESSED AIR AS A MOTIVE POWER.

No. 300,443. Patented June 17, 1884.

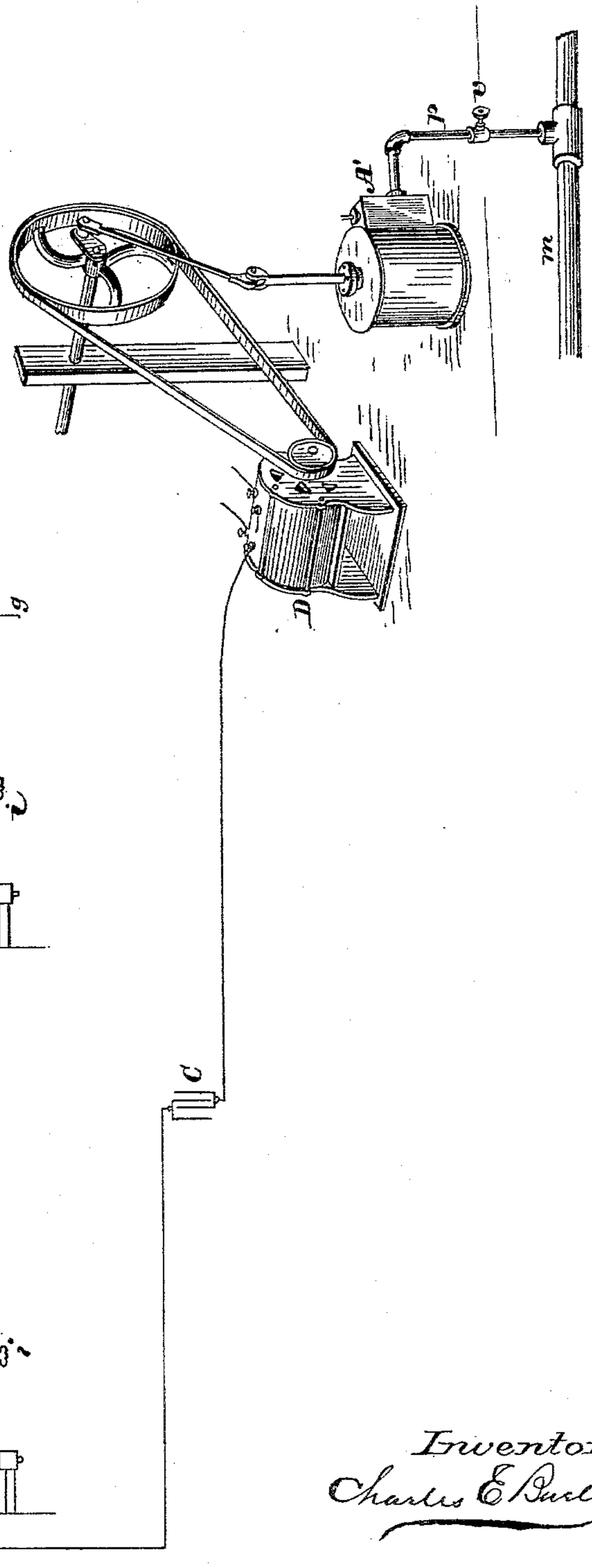

Fig. 1.

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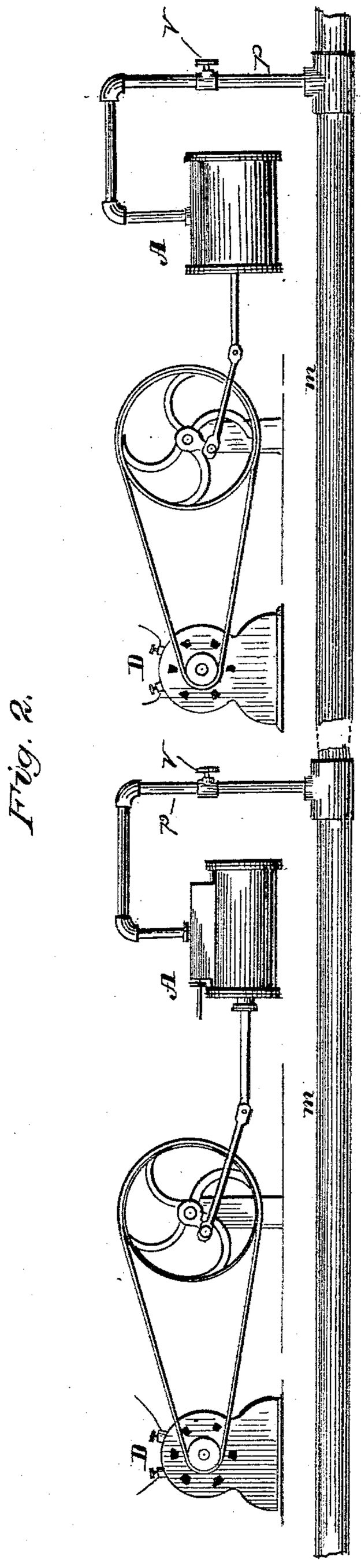

Fig. 2.

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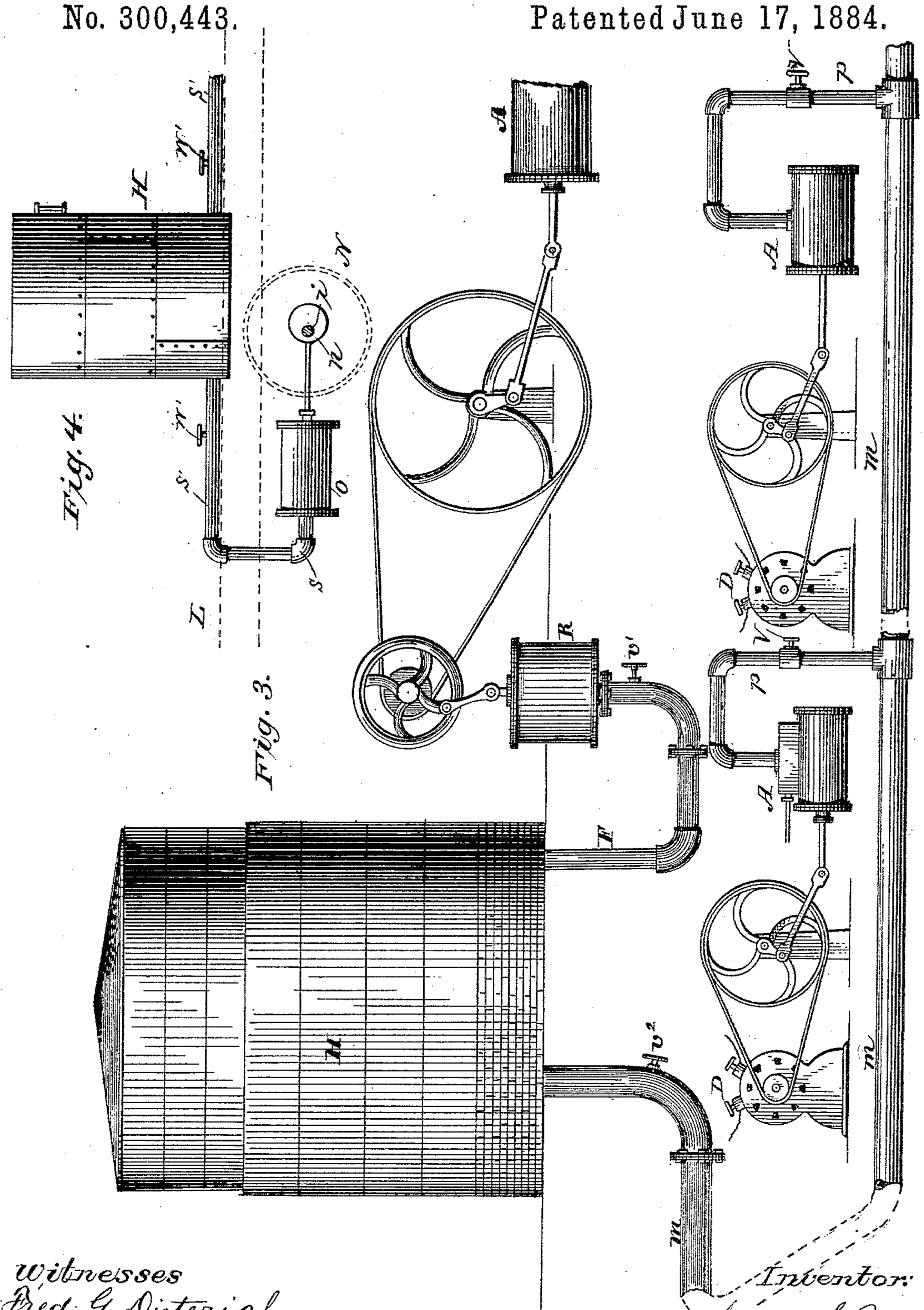

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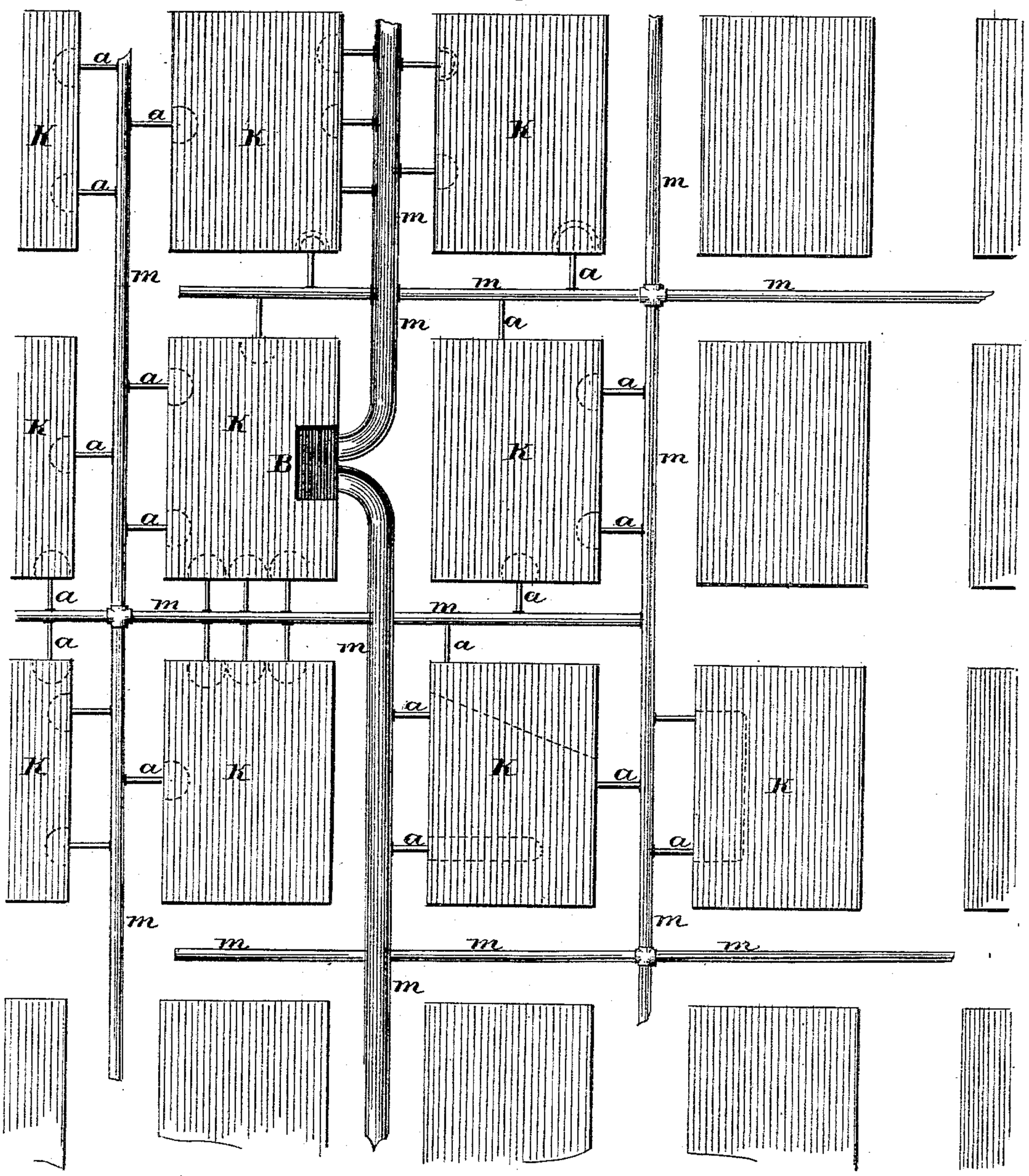
Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES E. BUELL, OF NEW HAVEN, CONNECTICUT.

MEANS FOR UTILIZING COMPRESSED AIR AS A MOTIVE POWER.

SPECIFICATION forming part of Letters Patent No. 300,443, dated June 17, 1884.

Application filed February 13, 1880.

To all whom it may concern:

Be it known that I, CHARLES E. BUELL, of New Haven, in the county of New Haven and State of Connecticut, have invented new and useful Improvements in Means for Utilizing Compressed Air as a Motive Power in the Arts, of which the following specification is a full, clear, and exact description.

My invention relates to means for generating power for industrial purposes; and its object is to furnish power by simple and economical mechanism which shall be inexpensive to maintain in operation and devoid of the element of risk common to the systems usually depended upon for such purposes.

My invention is applicable in all instances where light manufacturing power is desired, or where power for domestic purposes is required, and is advantageously employed in electric-lighting systems, whether such systems be employed for lighting cities or the dwellings thereof, in which case the power would be distributed from a central station, or for lighting steam-vessels and railway-cars.

Electric illumination between a central station and remote buildings is usually maintained by expensive systems of wires, conveying currents of great energy from powerful dynamo-electric machines to the several places to be lighted. Such systems necessarily operate with considerable waste of power in overcoming distances, and thus increase the difficulties which attend the economical division of the electric current. By my invention a motive power can be conveyed from a central station to the various places to be lighted, and there utilized to propel motors for operating dynamos or for charging batteries which supply the electric lighting system.

In applying my invention to electric-lighting systems I design using compact motors and generators. The compressed air for operating the motors may be condensed at the central station by a steam-engine, or, when practicable, by water-power, and it can be conveyed over long distances without perceptible loss and without protecting the pipes against freezing or insulating them, thus rendering it possible to convey the power at or above the surface of the ground or upon the roofs of houses.

In the accompanying drawings, forming part of this description, Figure 1 shows the motor, generator, and supply-pipes in perspective, and a side elevation of an electric-lighting system. Fig. 2 is a side elevation of the piping and a pair of motors and generators such as are employed at the outlying stations. Fig. 3 is a similar view of the apparatus designed for use at the central supply-station, showing among other features the expansible storage-reservoir, and also showing an extension of the main *m* to motors and generators at outlying stations. Fig. 4 shows the compressing and storage apparatus in a portable form mounted upon a railway-car and adapted for supplying power to operate generators for feeding an electric-lighting system; and Fig. 5 shows a plan of a system of pipes extending throughout a district from a central station located within said district, for supplying power for manufacturing, lighting, and other purposes.

Referring to the drawings, in which like letters represent the same parts in all the views, A′ is an air-engine supplied with compressed air from the main *m* through the branch pipe *p*. The drive-wheel of this engine is belted to the dynamo-electric machine D, which charges the lamps G G by the currents produced. Any form of lamp may be used, and the current may be intensified by the employment of a condenser, C, or other inductorium—as secondary batteries or induction-coils—to regulate and augment the primary currents. Each of the several lamps has a switch, *i i*, adapted to separately control the flow of currents therethrough. A cut-off valve, *v*, is shown for locally controlling the engine A′. The engine may have an attachment (not shown) for registering the revolutions of the wheel which drives the dynamo D. In Fig. 2 it will be noticed that each engine is separately supplied from the main *m*, and that either or both may be locally controlled at pleasure by means of the cut-off *v* in the branch pipe *p*.

The apparatus used at the central supply-station, Fig. 3, consists of a condensing-engine, A, which is belted to a pump, R, of any approved pattern, which pump compresses air into the expansible holder H, the pump

being connected to the holder by means of the pipe F, supplied with a cut-off, v', whereby communication between the pump and holder may be controlled at will. The holder H serves to maintain a uniform pressure within the mains *m* in a manner readily understood. The compressed air stored in holder H may be taken off through the main *m*, with which it is in communication, as it is desired for use. The cut-off v^2 is for the purpose of controlling the exit of compressed air from the holder H into the main *m*. By this arrangement air can be stored and compressed in the holder H by closing the cut-off v^2; or it may be pumped directly into the mains through the holder H by opening the cut-off v^2. It is also practicable to use the compressed air from the holder while the communication between the pump and holder is broken by the cut-off v'.

In Fig. 4 the compressing and storing apparatus is shown in a portable form mounted upon a railway-car. The car-truck is shown in dotted lines, and is lettered L, the wheels of the truck being shown at N and the axle at *l*. The axle carries an eccentric, *n*, to which is connected the piston-rod of the air-pump O, which pump may be of any approved type. Extending from the pump is the pipe *s*, which enters the air-holder H, and which is supplied with a cut-off, *w*, for an obvious purpose. Compressed air may be stored in the holder H by closing the cut-off w' in the distributing-pipe s', and retained therein by closing the cut-off *w* in the supply-pipe *s*, and used as occasion requires; or the pump may be allowed to compress the air directly into the mains through the holder, both cut-offs *w* and w' being opened when this is desired. It is to be understood that the supply-pipe s' communicates with the motor of an electric-lighting system whereby the cars of the train are lighted. A compact type of air-engine and generator of electricity should be employed in this instance. Other obvious methods of operating the compressing apparatus when carried by a moving object may be substituted for that here described.

The system of pipes shown in Fig. 5 receives compressed air from the central station, B, at which point is located the compressing and storing apparatus shown in Fig. 3. The mains *m* are tapped at suitable intervals by the branch pipes *a*, which supply the compressed air to the various buildings located upon the blocks *k* within the district traversed by the mains *m*. The power thus supplied may be utilized for operating air-engines for furnishing power for many obvious purposes, notably the driving of dynamos for charging the wires of electric-lighting systems. The dotted lines in Fig. 5 represent circuits adapted to be thus separately charged. The central supply-station may be located outside of the district, instead of being within it, as shown, and water or any other suitable or available power besides a steam-engine may be employed to compress the air for charging the mains *m*.

I reserve the right to claim in another application any invention shown in this application relating to the use of secondary batteries and not now claimed.

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

1. In a motive-power system, the combination of an air-compressing apparatus and an expansible air-holder located between said apparatus and the compressed air-mains, and serving to maintain a uniform pressure of air in said mains, with outlying stations, each provided with a motor arranged to be propelled by the compressed air from the mains, and cut-offs in the branch pipes extending from the mains, whereby all the motors may be separately controlled and the supply of compressed air regulated at will, substantially as shown and described.

2. The combination, with an air-compressing apparatus, of an air-holder provided with induction and eduction pipes, and means for controlling the flow of air through said pipes, whereby air may be stored under pressure in the holder for use when the compressing apparatus is not in operation, or compressed air can be forced through the holder into the supply-mains, substantially as shown and described.

3. The combination, with a railway-car, of an air-compressing apparatus located thereupon and suitably operated, an air-holder arranged to be charged by the air-compressing apparatus, and a supply-main for conveying the compressed air to the point or points of consumption, substantially as set forth.

4. The combination, with a railway-car, of an air-compressing apparatus located thereon and suitably operated, an air-holder arranged to be charged by the air-compressing apparatus through a suitable induction-pipe, an eduction-pipe from said air-holder to convey the compressed air to the point or points of consumption, and means for controlling the flow of air through said pipes, whereby air may be stored under pressure in the air-holder for use when the car has ceased to move, or compressed air can be forced through the holder to the point or points of consumption when the car is in motion.

I have hereunto subscribed my name, at the city of Brooklyn, Kings county, State of New York, in the presence of these witnesses, this 10th day of February, A. D. 1880.

CHARLES E. BUELL. [L. S.]

Witnesses:
G. F. ELLIOTT,
GEO. W. PINCKNEY.