No. 675,778. Patented June 4, 1901.

C. M. JOHNSON.

APPARATUS FOR GENERATING, STORING, AND TRANSMITTING POWER.

(Application filed Mar. 3, 1898.)

(No Model.) 5 Sheets—Sheet 1.

FIG. I.

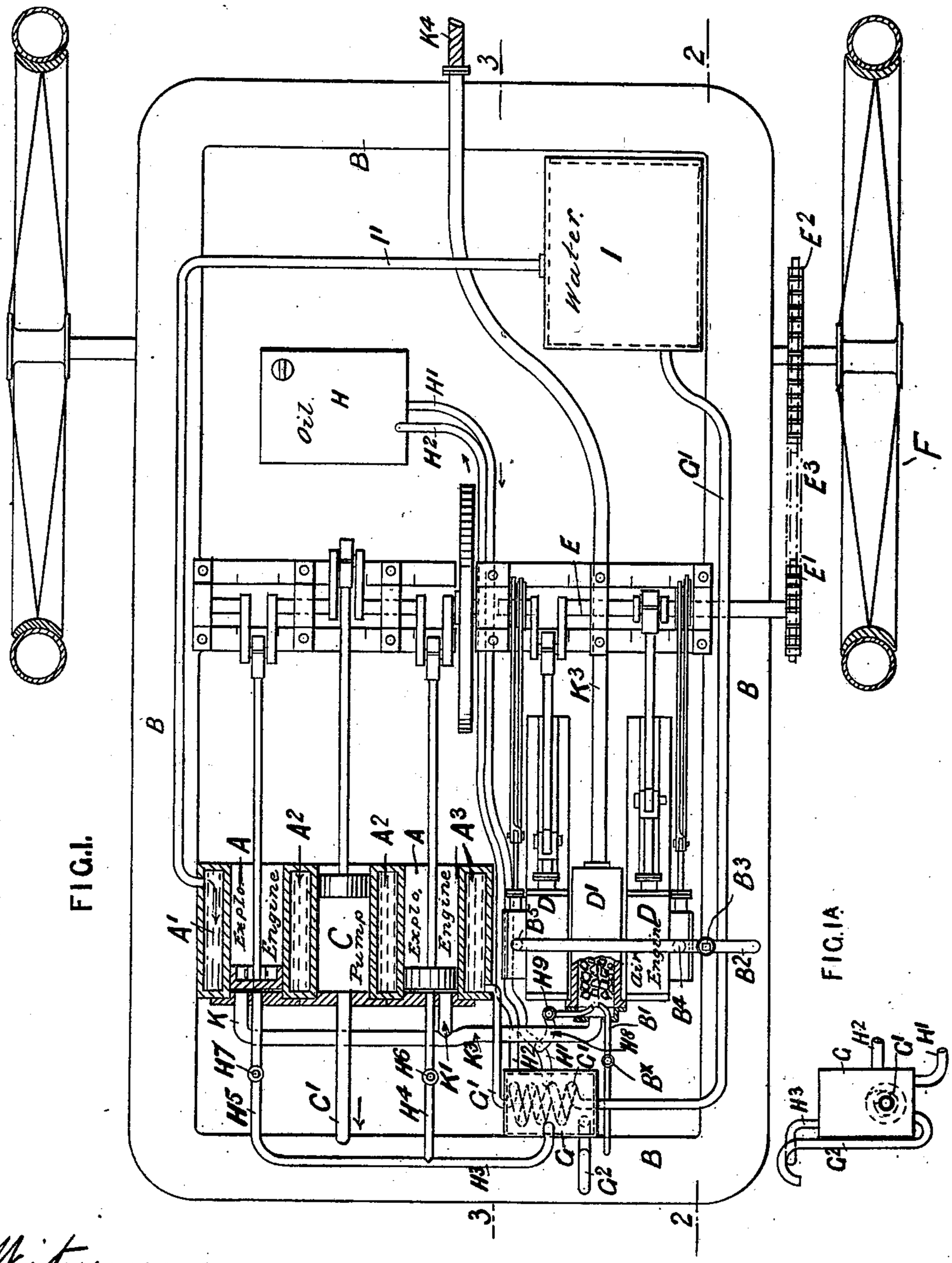

FIG. IA.

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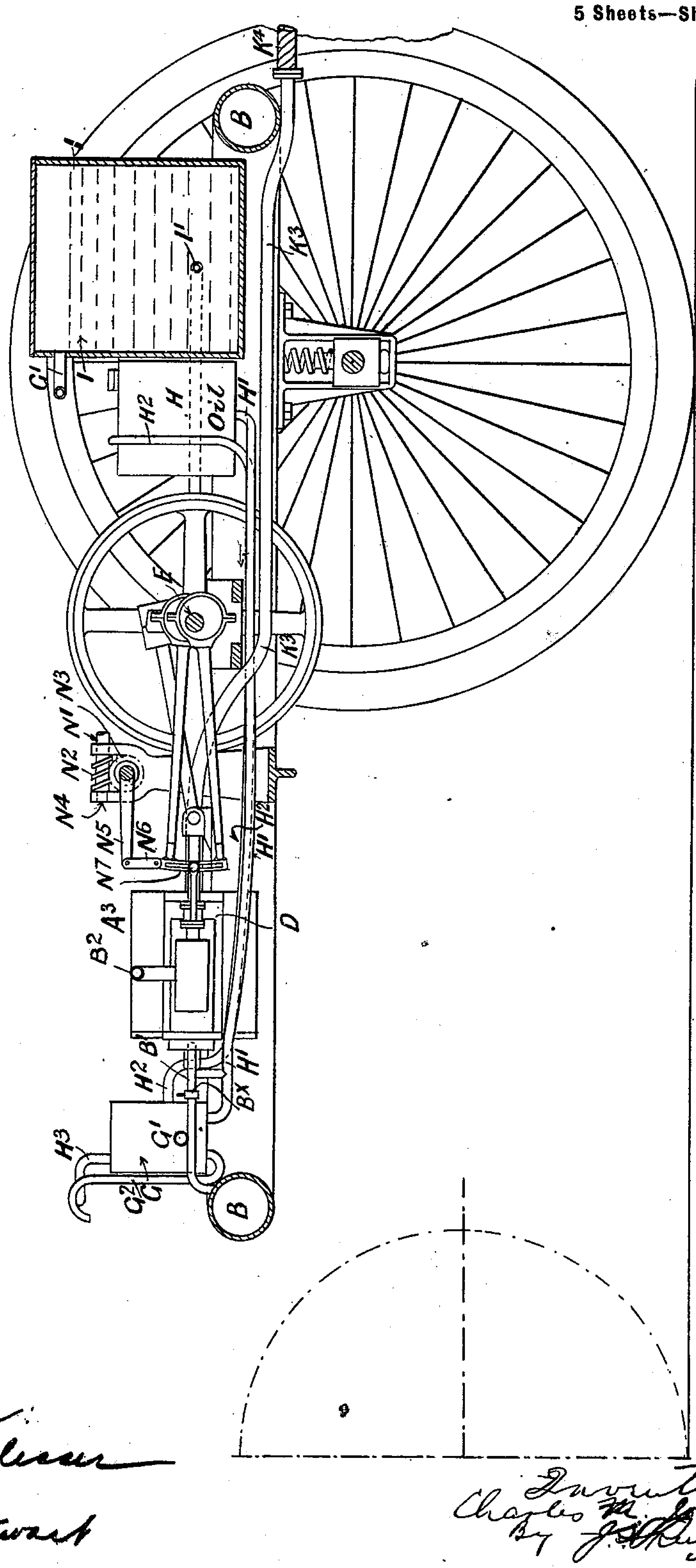
FIG. 2.



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(No Model.) 5 Sheets—Sheet 3.

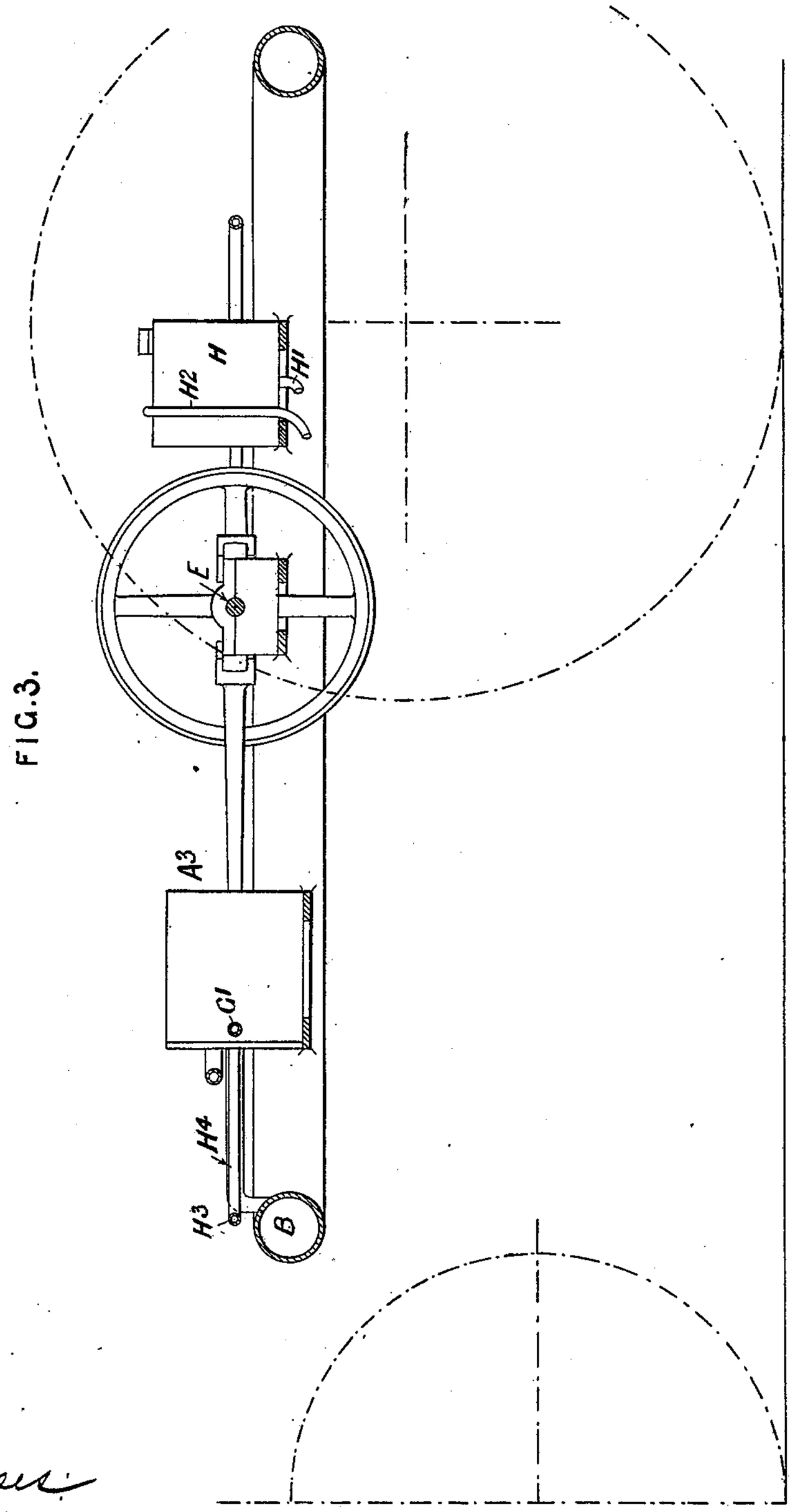

FIG. 3.

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(Application filed Mar. 3, 1898.)

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FIG. 4.

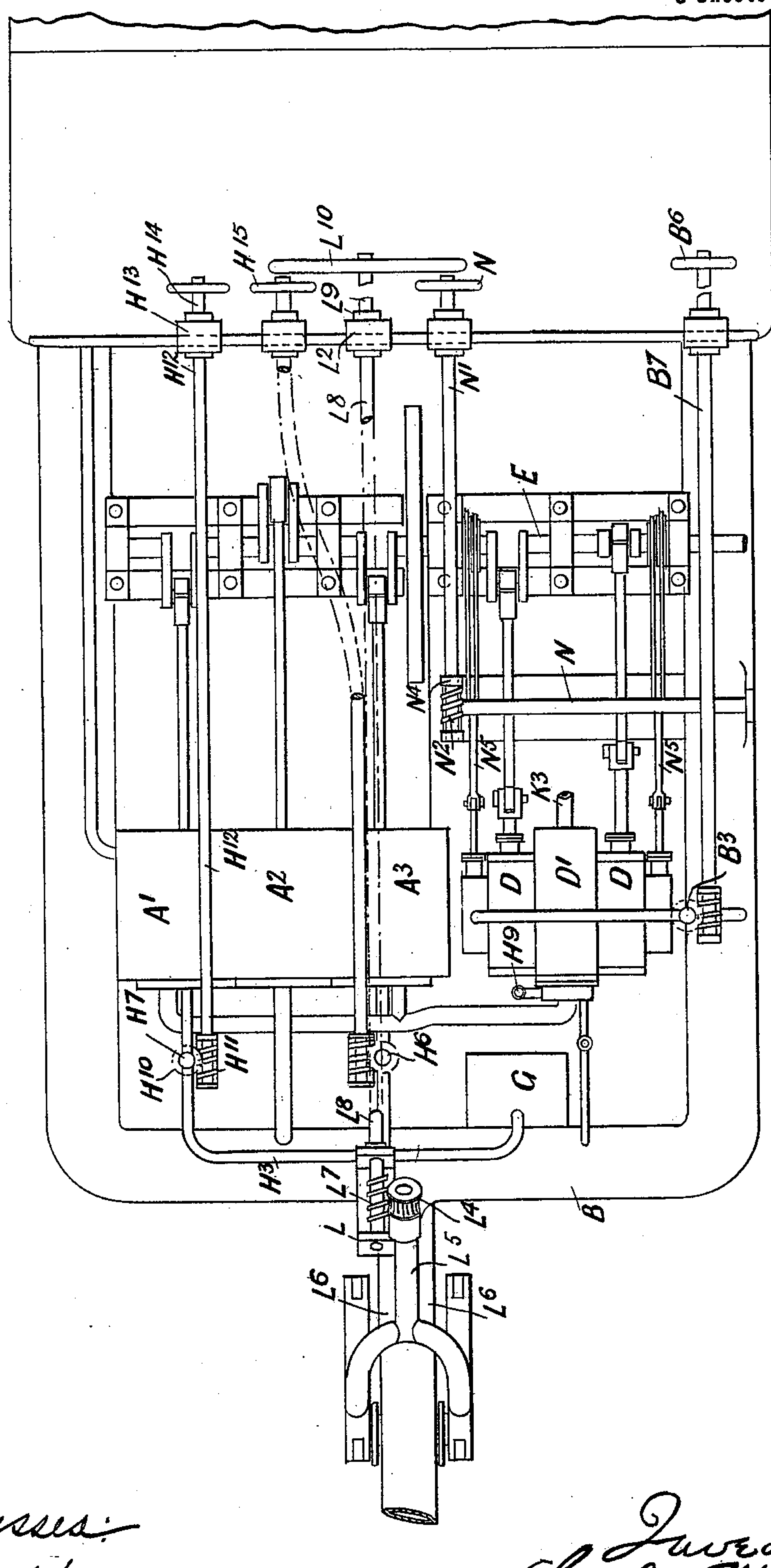

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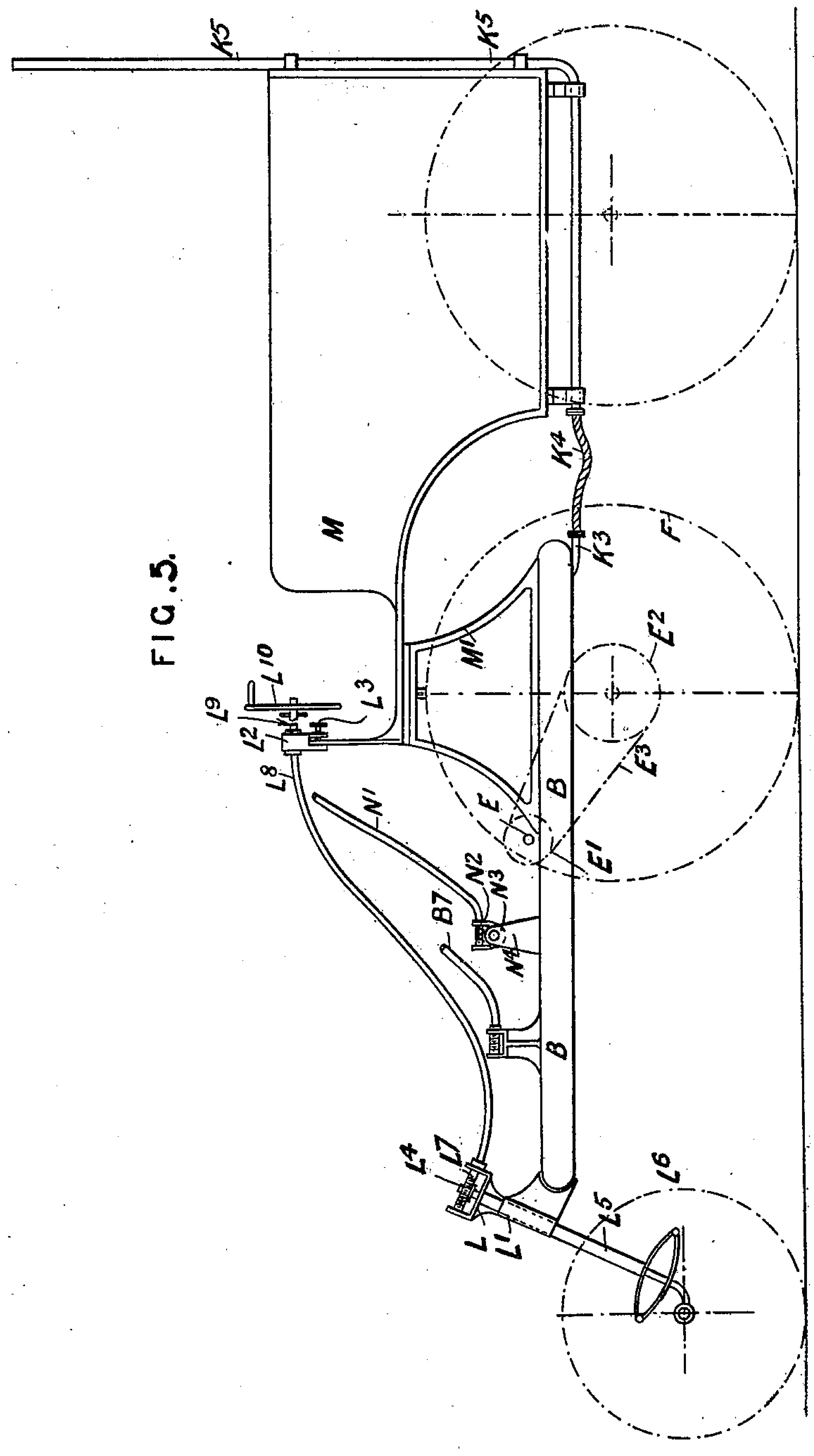
FIG. 5.



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UNITED STATES PATENT OFFICE.

CHARLES M. JOHNSON, OF LONDON, ENGLAND.

APPARATUS FOR GENERATING, STORING, AND TRANSMITTING POWER.

SPECIFICATION forming part of Letters Patent No. 675,778, dated June 4, 1901.

Application filed March 3, 1898. Serial No. 672,450. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. JOHNSON, engineer, a citizen of the United States of America, residing at No. 22 Laurence Pountney Lane, London, England, have invented an Apparatus for Generating, Storing, and Transmitting Power, of which the following is a specification.

My invention refers to a new and useful apparatus for generating, storing, and transmitting power, applicable generally in cases where the power is only required to be given off intermittently and where it is advantageous that the power should be more under the control of the engine-driver than is the case when, for instance, an oil-engine (or other motor normally giving off a practically-fixed amount of power) is used connected by transmission-gear direct onto the road-wheels of the vehicle or to other apparatus which it is intended to drive.

Under ordinary circumstances it is difficult to regulate a gas or explosive engine or other motor of the kind referred to and unless there be gearing which practically amounts to reducing the speed given off it is impossible to obtain more than a normal effect, or, in other words, to obtain more power at any given time. Besides which, when the engine is working without a load or, as it is called, is "running light," a certain amount of partially-consumed gases escapes with the products of combustion and causes an objectionable smell.

Now according to my invention I use an oil or other similar motor, which I will call the "primary engine," to constantly compress air or other fluid at every working stroke or at every stroke into a strong metal reservoir. This compressed air is used to drive an engine of any suitable construction from which the power is to be taken off, and this latter engine I will call the "secondary engine." Or instead of compressing air into a reservoir the primary engine may drive a dynamo which is constantly charging an accumulator or secondary battery or batteries, the current from which drives a secondary engine, such as an electric motor. I also utilize the heat of the exhaust-gases of the primary engine to warm the cylinders of the secondary engine to expand the motive fluid therein and also to prevent the same from becoming cold when expanding in the said secondary engine. A suitable way of utilizing the heat of the exhaust consists in causing the exhaust-pipe to pass through a jacket surrounding the cylinders of the secondary engine. The heat of the cooling-water which circulates through the jackets of the primary engines is preferably utilized to vaporize or heat and expand the explosive charge, or a part of same, by which the primary engine is driven. The exhaust-gases are also burned or sufficiently heated in order that the gas or gases, which would cause an unpleasant smell, may be consumed.

Figure 1 of the accompanying drawings is a diagrammatic plan view of a road-locomotive applicable for being attached to and for drawing a carriage or the like. Fig. 1^A is a detail view of the carbureter in elevation. Fig. 2 is a sectional elevation on the line 2 2, Fig. 1. Fig. 3 is a sectional elevation on the line 3 3, Fig. 1. Fig. 4 is another plan view showing the means for controlling the valves and other gear; and Fig. 5 is an elevation, to a smaller scale, showing one way in which the motor-vehicle may be connected to the road-vehicle it is intended to draw and the means for placing the various valves or regulating devices under the control of the driver.

Referring to Figs. 1 and 2, it will be seen that according to one modification I use a primary engine driven by oil or other explosive, with cylinders A A, to constantly compress air, water, or other fluid or liquid into a strong metal reservoir B by means of a pump C, and this compressed air is used to drive two secondary engines D D of any suitable construction, from the crank-shaft E of which the power is transmitted—say by sprocket-wheels E′ E^2 and chain E^3—to the road-wheels F. If the power is only required intermittently, it is evident that a comparatively small primary engine A A will be sufficient to keep up the necessary pressure in the reservoir to drive the secondary engine D D. The explosive charge is preferably made in a carbureter G, Figs. 1 and 1^A, which consists of an inclosed vessel containing oil which is fed thereto from an inclosed oil-tank H by means of a pipe H′. The pipe H′ connects the bottom of the oil-tank H with

the bottom of the carbureter G, and the pipe H^2 proceeds from at about the level of the oil in the carbureter to the top of the oil-tank to supply the latter with air and so allow oil to flow down by the pipe H′ as soon as the level of the oil in the carbureter discloses the opening of the pipe H^2 therein. The oil is vaporized by means of the heat imparted to a coiled pipe G′, which is connected to the jacket A^3 of one of the cylinders of the oil-engine A. The carbureter is supplied with air by a bent pipe G^2, which air has to pass through the oil in the bottom of the carbureter. From the drawings it will be seen that the cooling-water passes from the bottom of the water-tank I, by means of a pipe I′, all around the jacket A′ of one primary-engine cylinder, around the jacket A^2 of the air-pump C around the jacket A^3 of the other primary-engine cylinder, by the coiled pipe G′, through the carbureter G, and finally into the top of the water-tank I. The hydrocarbon vapor is supplied to the cylinders of the primary engines A A by means of a pipe H^3, having branches H^4 and H^5, leading, respectively, to the primary-engine cylinders A A. Each of the branch pipes H^4 and H^5 is provided with a valve, marked, respectively, H^6 and H^7. The exhaust from the primary-engine cylinders passes off by the branch pipes K and K′ to the pipe K^3, which leads into the jacket D′, surrounding the secondary-engine cylinders D. This jacket is filled with lumps D^2 of asbestos, fire-clay, or other refractory material, whereby the gases are to a great extent filtered or purified, and the lumps of asbestos D^2 further serve to make exhaust-gases take a devious course, so that the said jacket serves as a silencer, and may be used in the place of the usual inclosed box provided with baffle-plates or partitions.

In order to make sure that the exhaust-gases are burned sufficiently to prevent any unpleasant smell escaping into the outer air, there are provided a branch pipe H^8 from the oil-pipe H′, with a valve H^9, and a branch pipe B′, with a valve $B^\times$, from the air-reservoir B, so as to form a burner which when ignited will form a flame of sufficient intensity to burn the exhaust-gases in the jacket D′. The air-pump C pumps air into the reservoir B by way of the pipe C′, and there is a pipe B^2, with a valve B^3, to regulate the amount of air passing by the branch pipes B^4 and B^5 to the secondary engine D D.

Referring to Figs. 4 and 5, the spindle of the valve H^7 is shown provided with a worm-wheel H^{10}, which has gearing therewith a worm H^{11}, mounted in a bracket attached to the valve-casing, (not shown in order not to complicate the drawings,) very much like the bracket L, shown applied to the steering-socket L′ on Fig. 5. The worm H^{11} is attached to a flexible shaft H^{12}, the other end of which is attached to a short piece of shaft H^{14}, mounted in bearings in a clamp H^{13}, Fig. 4, similar to the bracket L^2, Fig. 5, which has a slot to take over the dashboard of the vehicle M and is provided with a set-screw L^3. The short piece of shaft H^{14} is provided with a hand-wheel to enable the driver from his seat on the vehicle (see Fig. 5) to regulate the amount of vapor passing to the cylinder of the primary engine. The other valve, H^6, is provided in exactly the same way with a worm-wheel, a worm, a flexible shaft, a short shaft, a bracket on the dashboard, and a hand-wheel H^{15}. The steering is effected, as before indicated, by means of a worm-wheel L^4, keyed to the top of the forks L^5 of the steering-wheel L^6, which worm-wheel gears with a worm L^7, mounted in the bracket L on the socket L′, attached to the tubular reservoir B, which also serves as the frame of the vehicle. The worm L^7 is connected to a flexible shaft L^8, the other end of which is connected to a short shaft L^9, mounted in bearings in the bracket-clamp L^2, and a hand-wheel L^{10}, keyed to said short shaft, serves to steer the front wheel, and consequently the motor-vehicle. The ordinary front wheels and lower part of the fore-carriage of a four-wheeled vehicle are removed therefrom, and the motor-vehicle is provided with a similar fore-carriage part M′, to which the upper part M^2 of the fore-carriage of the road-vehicle is pivoted.

The link or reversing motion of the secondary engine is conveniently operated by means of a similar hand-wheel N, flexible shaft N′, worm N^2, and worm-wheel N^3, the worm being mounted in bearings in a bracket N^4. The shaft of the worm-wheel has keyed thereto two levers N^5, which by connecting-rods N^6 are connected to the links N^7 of the eccentrics of the engine D D. The valve B^3 is also similarly operated by a hand-wheel B^6, flexible shaft B^7, and so on. The pistons of the primary engine preferably receive an impulse alternately in the case of engines working on the so-called "Otto" principle. By this means vibration is greatly reduced, and the air under pressure in the pump and reservoir always forms a cushion; but it is not, of course, essential that there should be only one impulse given to each piston during two revolutions, for the engine may also be arranged to work with an impulse with each revolution, and the engine may be provided with one piston or more than two, all as found necessary or convenient. The exhaust-gases pass away, as aforesaid, by the pipe K^3, and there is a flexible pipe K^4 (see Fig. 5) to the end of the road-vehicle M, so as to allow the said gases to be discharged up the pipe K^5 above the level of the heads of the passengers.

If desired, the heat of the cooling-water which has circulated around the cylinder of the primary engine may also be employed to keep the cylinders of the secondary engine warm or to assist in so doing. I prefer, however, to use the heat of the cooling-water in

all cases to vaporize or heat a part or the whole of the explosive charge, as this I consider safer than using the hot exhaust of the primary engine or than using a flame.

What I claim is—

1. In an apparatus for generating, storing, and transmitting power, the cylinder of an explosive-engine, an inclosure, an exhaust-pipe leading from said cylinder to said inclosure, a burner located in said inclosure, and means for conveying combustible material to said burner to produce a combustion independent of that produced by firing the unconsumed gases from the cylinder.

2. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, the cylinder of a secondary engine, a jacket covering the cylinder of the secondary engine, an exhaust-pipe leading from the cylinder of the explosive-engine to said jacket, and an igniting device located in said jacket.

3. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, the cylinder of a secondary engine, a jacket covering the cylinder of the secondary engine, an exhaust-pipe leading from the cylinder of the explosive-engine to said jacket, and refractory material in a divided form placed in said jacket.

4. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, an inclosure, an exhaust-pipe leading from said cylinder to said inclosure, refractory material in a divided form placed in said inclosure, a burner located in said inclosure, and means for conveying combustible material to said burner to produce a combustion independent of that produced by firing the unconsumed gases from the cylinder.

5. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, the cylinder of a secondary engine, a jacket covering the cylinder of the secondary engine, an exhaust-pipe leading from the cylinder of the explosive-engine to said jacket, refractory material in a divided form placed in said jacket, and an igniting device located in said jacket.

6. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, an inclosure, means operating independently of the unconsumed gases and products of combustion from the cylinder for heating and igniting the gases contained in said inclosure, and an exhaust-pipe leading from said cylinder to said inclosure.

7. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, an inclosure, means operating independently of the unconsumed gases from the cylinder for heating said inclosure, an exhaust-pipe leading from said cylinder to said inclosure, and refractory material in a divided form placed in said inclosure.

8. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, an inclosure, means operating independently of the unconsumed gases from the cylinder for heating and igniting the gases contained in said inclosure, an exhaust-pipe leading from said cylinder to said inclosure, and refractory material in a divided form placed in said inclosure.

9. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, a carbureter, a pipe leading from said carbureter to said cylinder, an inclosure, a pipe leading from said cylinder to said inclosure, and an igniting device located in said inclosure.

10. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, a carbureter, a pipe leading from said carbureter to said cylinder, an inclosure, a pipe leading from said cylinder to said inclosure, and refractory material in a divided form placed in said inclosure.

11. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, a carbureter, a pipe leading from said carbureter to said cylinder, an inclosure, a pipe leading from said cylinder to said inclosure, refractory material in a divided form placed in said inclosure, and an igniting device located in said inclosure.

12. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, a carbureter, a pipe leading from said carbureter to said cylinder, the cylinder of a secondary engine, a jacket covering the cylinder of the secondary engine, a pipe leading from the cylinder of the explosive-engine to said jacket, and an igniting device located in said jacket.

13. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, a carbureter, a pipe leading from said carbureter to said cylinder, the cylinder of a secondary engine, a jacket covering the cylinder of the secondary engine, a pipe leading from the cylinder of the explosive-engine to said jacket, and refractory material in a divided form placed in said jacket.

14. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, a carbureter, a pipe leading from said carbureter to said cylinder, the cylinder of a secondary engine, a jacket covering the cylinder of the secondary engine, a pipe leading from the cylinder of the explosive-engine to said jacket, refractory material in a divided form placed in said jacket, and an igniting device located in said jacket.

15. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, a jacket covering said cylinder, a supply-pipe for conducting water to said jacket, a carbureter, a pipe connecting said carbureter with the cylinder of the explosive-engine for conducting the explosive from one to the other, a pipe for conducting water from said jacket to said carbureter, the

cylinder of an air-engine, a jacket for the latter cylinder, an igniting device located in the jacket for the cylinder of the air-engine, a pipe leading from the cylinder of the explosive-engine to the jacket in which the igniting device is located for carrying the products of combustion from one to the other, and an escape-pipe leading from the jacket in which the igniting device is located.

16. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, a jacket covering said cylinder, a supply-pipe for conducting water to said jacket, a carbureter, a pipe connecting said carbureter with the cylinder of the explosive-engine for conducting the explosive from one to the other, a pipe for conducting water from said jacket to said carbureter, the cylinder of an air-engine, a jacket for the latter cylinder, refractory material in a divided form placed in the jacket for the cylinder of the air-engine, a pipe leading from the cylinder of the explosive-engine to the jacket in which the refractory material is placed for carrying the products of combustion from one to the other, and an escape-pipe leading from the jacket in which the refractory material is placed.

17. In an apparatus for generating, storing and transmitting power, the cylinder of an explosive-engine, a jacket covering said cylinder, a supply-pipe for conducting water to said jacket, a carbureter, a pipe connecting said carbureter with the cylinder of the explosive-engine for conducting the explosive from one to the other, a pipe for conducting water from said jacket to said carbureter, the cylinder of an air-engine, a jacket for the latter cylinder, refractory material in a divided form placed in the jacket for the cylinder of the air-engine, an igniting device located in the jacket for the cylinder of the air-engine, a pipe leading from the cylinder of the explosive-engine to the jacket in which the igniting device is located for carrying the products of combustion from one to the other, and an escape-pipe leading from the jacket in which the igniting device is located.

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