(No Model.) 3 Sheets—Sheet 1.

C. BENZ.

SELF PROPELLING VEHICLE.

No. 385,087. Patented June 26, 1888.

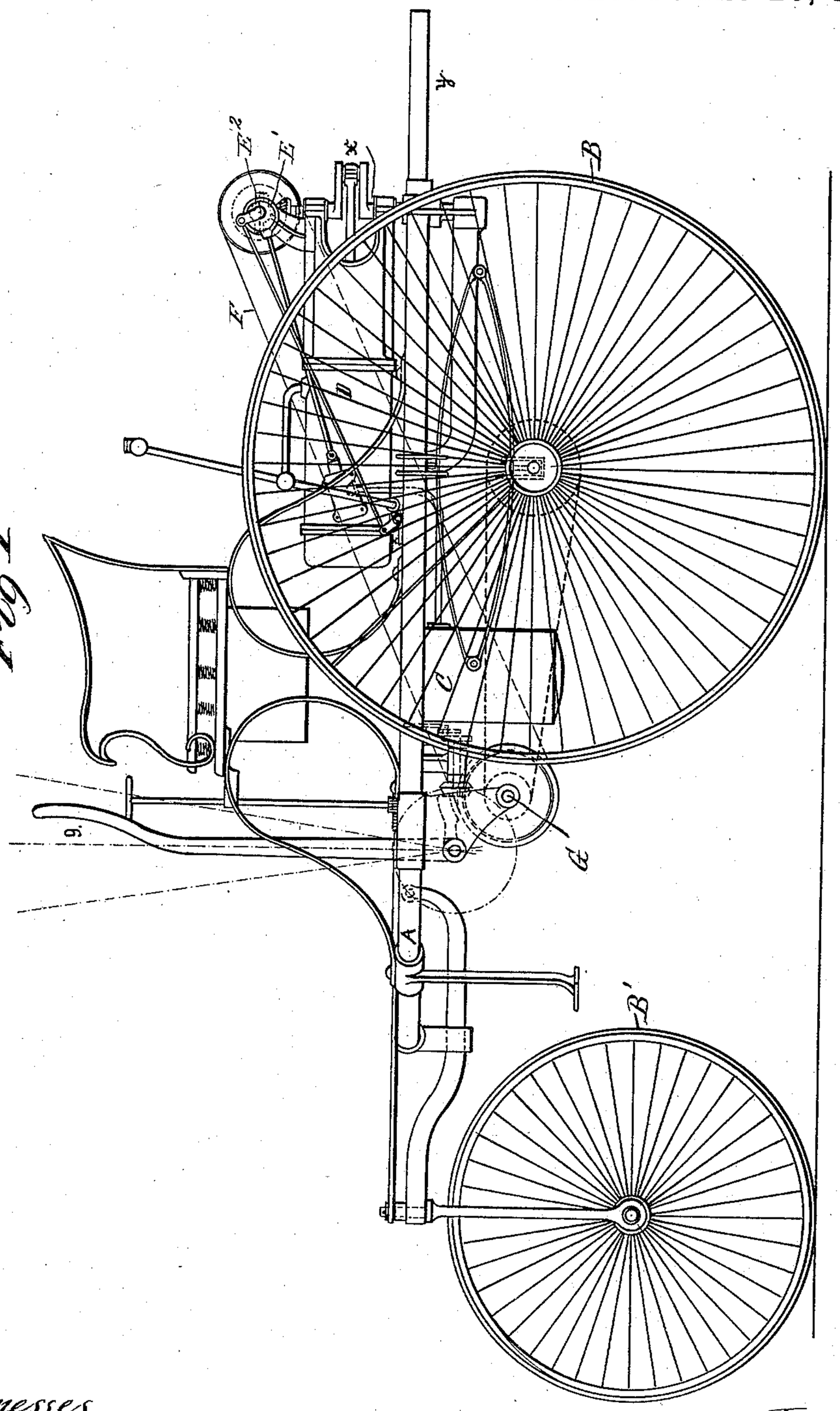

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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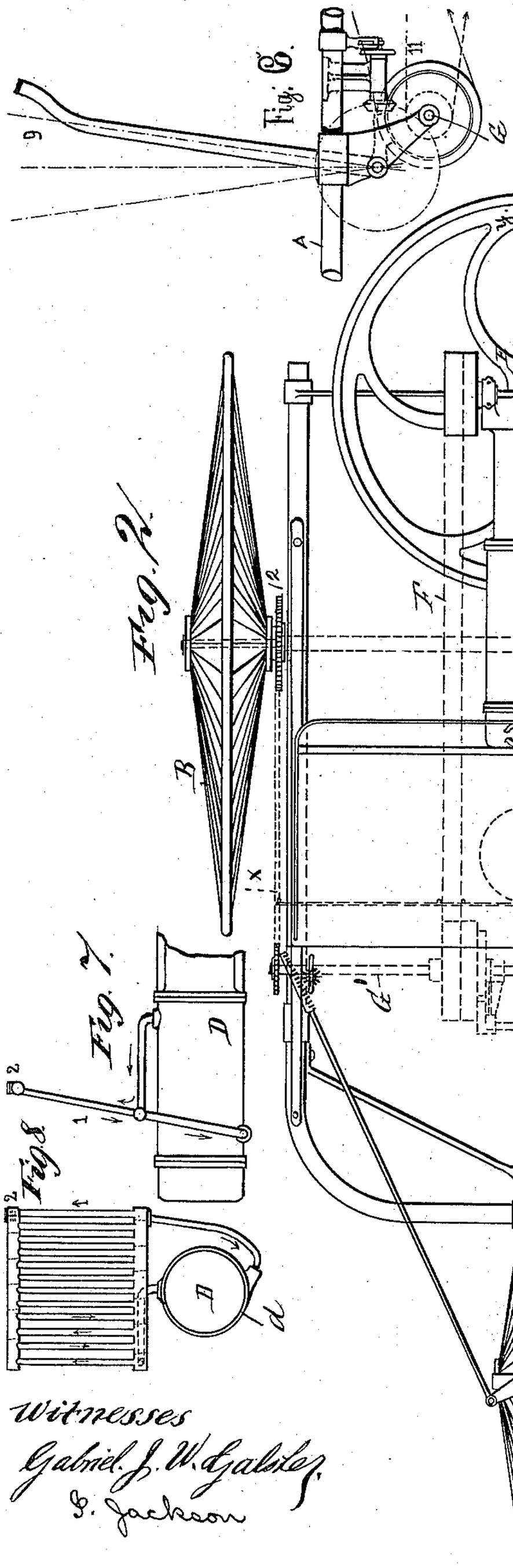

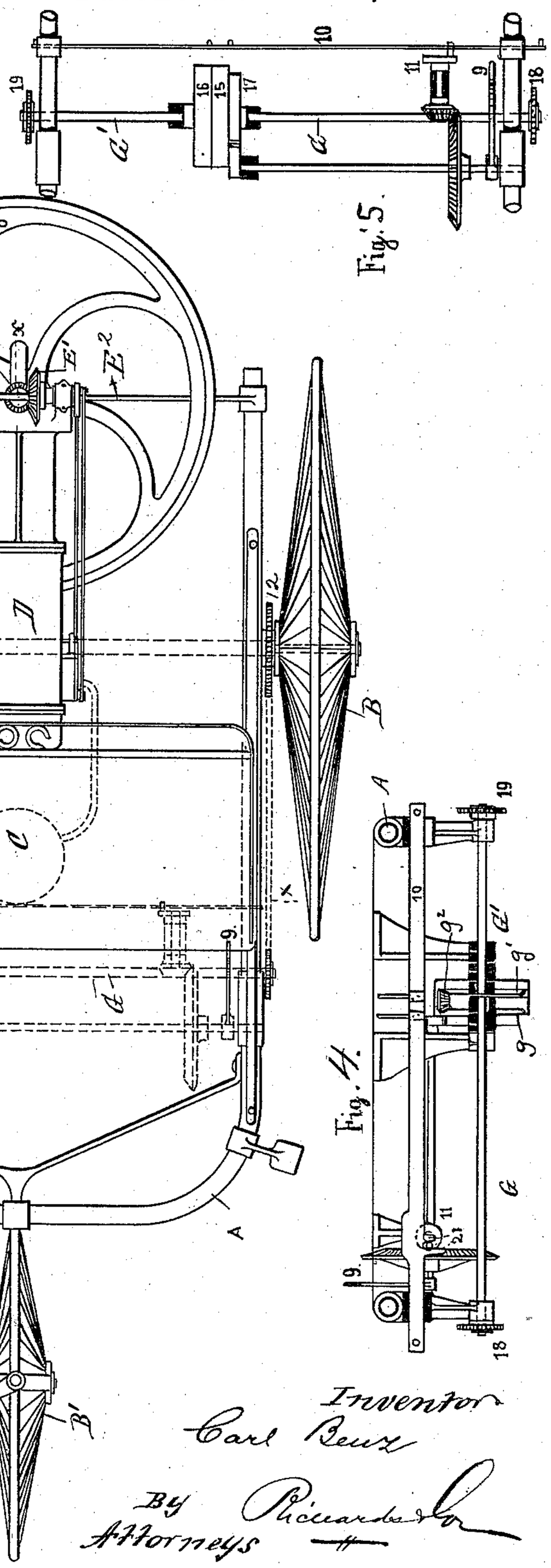

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(No Model.) 3 Sheets—Sheet 3.

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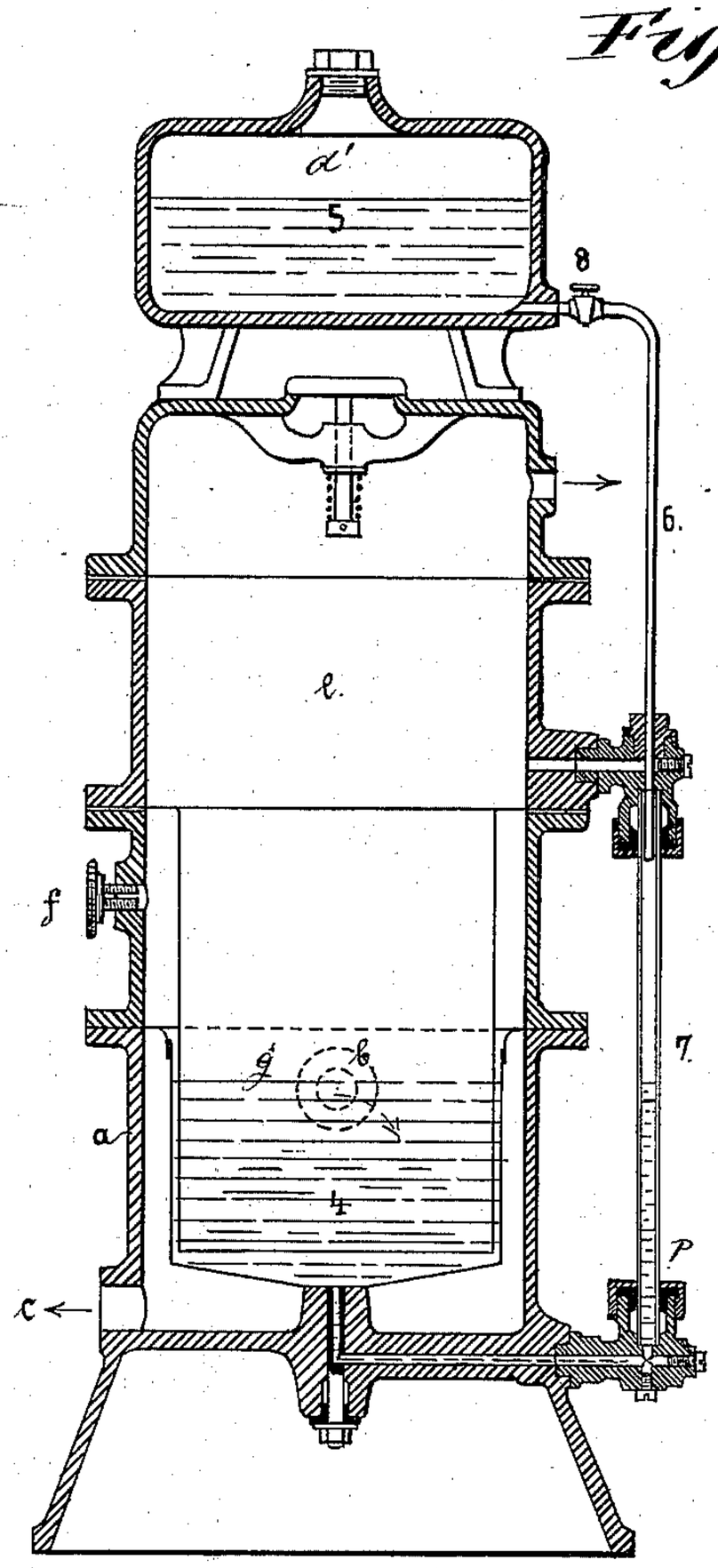
SELF PROPELLING VEHICLE.

No. 385,087. Patented June 26, 1888.

Fig. 3.



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UNITED STATES PATENT OFFICE.

CARL BENZ, OF MANNHEIM, BADEN, GERMANY.

SELF-PROPELLING VEHICLE.

SPECIFICATION forming part of Letters Patent No. 385,087, dated June 26, 1888.

Application filed July 27, 1886. Serial No. 209,265. (No model.) Patented in England April 28, 1886, No. 5,789.

To all whom it may concern:

Be it known that I, CARL BENZ, a subject of the Grand Duke of Baden, and a resident of Mannheim, Baden, in the Empire of Germany, have invented a new and useful Improvement in Apparatus for Propelling and Guiding Small Vehicles or Boats, (patented by me in England April 28, 1886, No. 5,789;) and I hereby declare the following to be a full and clear description thereof.

This invention relates to two general features of the apparatus, as follows, viz: first, to the construction of the fly-wheel, and, second, to the mechanism for starting and stopping the machine.

The invention will be readily understood by reference to the accompanying drawings, of which—

Figure 1 is a side elevation of a tricycle fitted with my said improvements. Fig. 2 is a general plan of the same. Fig. 3 is an enlarged sectional elevation of the generator-vessel for producing the gas for the motive power. Fig. 4 is a transverse sectional elevation, taken on the line *x x* of Fig. 2, looking rearwardly, and showing the starting and stopping mechanism. Fig. 5 is a detailed sectional plan of a portion of the machine, showing the starting and stopping mechanism. Fig. 6 is a sectional side elevation showing portions of the drawings and starting and stopping mechanism. Figs. 7 and 8 are a side elevation and a front or end elevation of the cylinder and cooler of the driving-engine.

To the construction of the cooler and to that of the gas-generator is laid no claim in this specification; but I have found it profitable to also explain and show the construction of these two devices to give a better understanding of the whole invention.

The machine has a suitable frame, A A, which in the drawings is shown made of metallic tubes, and the carriage-frame thus formed is mounted on two driving-wheels, B B, and a steering-wheel, B′. Suitably mounted on this frame A is a gas-generator, C, and a gas-engine, D. The gas used to supply the motor-engine is generated from naphtha or any similar or suitable light hydrocarbon. In motors hitherto used the fly-wheels have been attached to a horizontal shaft or axle, and have thus been made to revolve in a horizontal plane, since the horizontal shaft is best adapted to the transmission of power. If, however, in this case we should use a heavy rotating mass, corresponding to the power employed and revolving rapidly in a vertical plane, the power to manage the vehicle or boat would become very much lessened, as the fly-wheel continues to revolve in its plane. I therefore so design the apparatus that its crank-shaft *x* has a vertical position, and its fly-wheel *y* revolves in a horizontal plane, and the power is transmitted to the driving-wheels B through the bevel-gearing E E′, shaft E², belt F, counter-shafts G G′, the wheels 15, 16, 18, and 19, and the chain gearing 11 12. By this means the vehicle is not only easily controlled, but also the greatest safety is attained against capsizing.

The chilling of the working-cylinder is produced by cold water, which fills an annular space, *d*, around it. The water is evaporated around the cylinder. The steam passes through a series of tubes, No. 1. The greater part is there condensed and then drops down as water into the cylinder. That portion of the steam which is not condensed escapes through the valve 2. By this method it is possible to keep the cylinder sufficiently cool with only a small quantity of water carried in the apparatus.

The gas used in this machine is produced from any of the volatile oils—such as naphtha, gasoline, or other similar light hydrocarbons—and the apparatus for producing the gas consists of four principal parts, as shown clearly in Fig. 3. These are the warming-cylinder *a*, into which the gases pass through *b*, and are exhausted through *c*, the copper generator *d′*, in which the gasoline or other generating-fluid is put, the gas-holder *e*, in which the hydrocarbon vapors are mixed with atmospheric air at *f*, and the gasoline-receiver *g*. The heat abstracted from the gasoline in the act of volatilization is again replaced by the other gases.

In order to insure a uniform supply of gas, it is necessary that the quantity of gasoline in the copper holder 4 be kept constant, besides having a constant supply of air and a uniform temperature. For this purpose the receiver 5 is connected with the copper holder 4 by means of a small tube, 6, which leads to

a water-gage, P. Over this pipe is a small cock, 8, to regulate the supply at will. By means of this gage the quantity of gasoline or other hydrocarbon entering can be determined and its flow into the apparatus can be readily controlled; but to all these arrangements no claim is laid in this specification, as already told.

The counter-shafts G G′ are placed below the frame-work A and carried in suitable bearings attached to the said frame at some convenient distance in front of the driving-wheels B. The two shafts G G′ are placed end to end in a co-axial line, as shown in Fig. 4, and they are coupled together at their adjacent ends by the bevel cog-gearing $g\ g'\ g^2$, so that they may be revolved simultaneously, though in opposite directions. This construction gives flexibility to the machine. A fixed pulley, 15, is attached to one of these shafts, and a loose pulley, 14, is mounted beside it. The driving-belt F communicates motion to these shafts from the engine D, and chain belts 11 transmit this motion from the wheels 18 and 19, respectively attached to the outer ends of the said shafts G G′, to the driving-wheels B, as shown in Figs. 1 and 2. The said chains 11 gear onto small wheels 12, adapted to receive them, and attached to the inner ends of the hubs of the said driving-wheels, and it will be necessary to have one of the said driving-chains crossed, owing to the division of the counter-shaft G G′, so as to rotate both of the wheels B in the same direction.

The starting, stopping, and braking of the vehicle are accomplished by the lever 9. The motor is put into working order before entering the vehicle. The lever 9 will occupy a central position. If it is desired to put the vehicle in motion, the lever 9 is moved forward, which causes the belt F to slide from the loose to the driving pulley. To stop the vehicle, the lever is moved back to its central position, and if it is wished to apply the brakes the lever is moved back beyond its central position, when the belt remains in its position and only the brake is forced into action. In order to prevent the belt from slipping beyond the loose pulley while the lever 9 is being forced farther back the construction as shown in Fig. 4 is devised. The rod 10, which is permitted to slide in a longitudinal direction, is moved by a small crank, No. 20, whose stroke is equal to the width of the face of the pulley. Therefore, in order to slide the belt from the loose to the driving pulley, a half-revolution of the crank is necessary. The crank-pin which causes the sliding motion is grasped by two lugs, 21, of this sliding rod, one lug being somewhat shorter than the other. If now the belt is out of gear and the crank-pin is at its dead-center—so it will move back when the brake is applied in a reverse direction, but does not take the rod 10 with it, and the belt remains out of action during this period, so that a short movement at the point of 9 is only required—the crank is revolved by means of two gear-wheels properly proportioned for the purpose.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a vehicle—such as a tricycle—with a motor having its crank-shaft *x* placed in a vertical position and its fly-wheel *y* revolved in a horizontal plane, substantially as shown and described.

2. The lever 9, in combination with the devices 20 and 21, the shifter-bar 10, belt F, and fast and loose pulleys 15 16, the whole combined, constructed, and arranged so that by the simple manipulation of the one lever 9 the mechanism may be started, stopped, or the brake applied, substantially as described and set forth.

In witness whereof I have hereunto set my hand in presence of two witnesses.

CARL BENZ.

Witnesses:
MAX. ROSE,
FR. GROS.