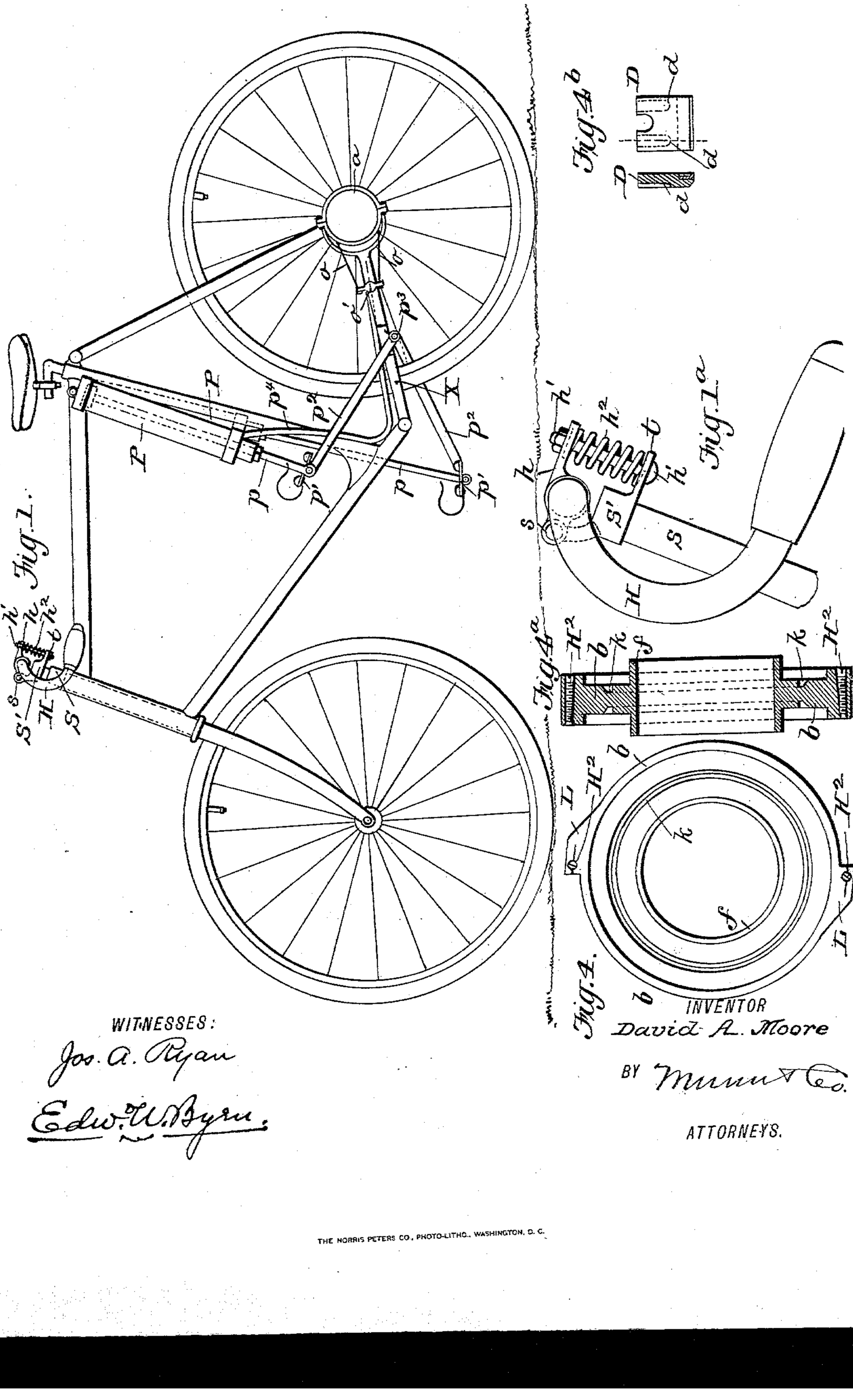
(No Model.) 2 Sheets—Sheet 1.

D. A. MOORE.

AIR PROPELLED BICYCLE.

No. 596,901. Patented Jan. 4, 1898.



WITNESSES:

Jos. A. Ryan

Edw. W. Byrn.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

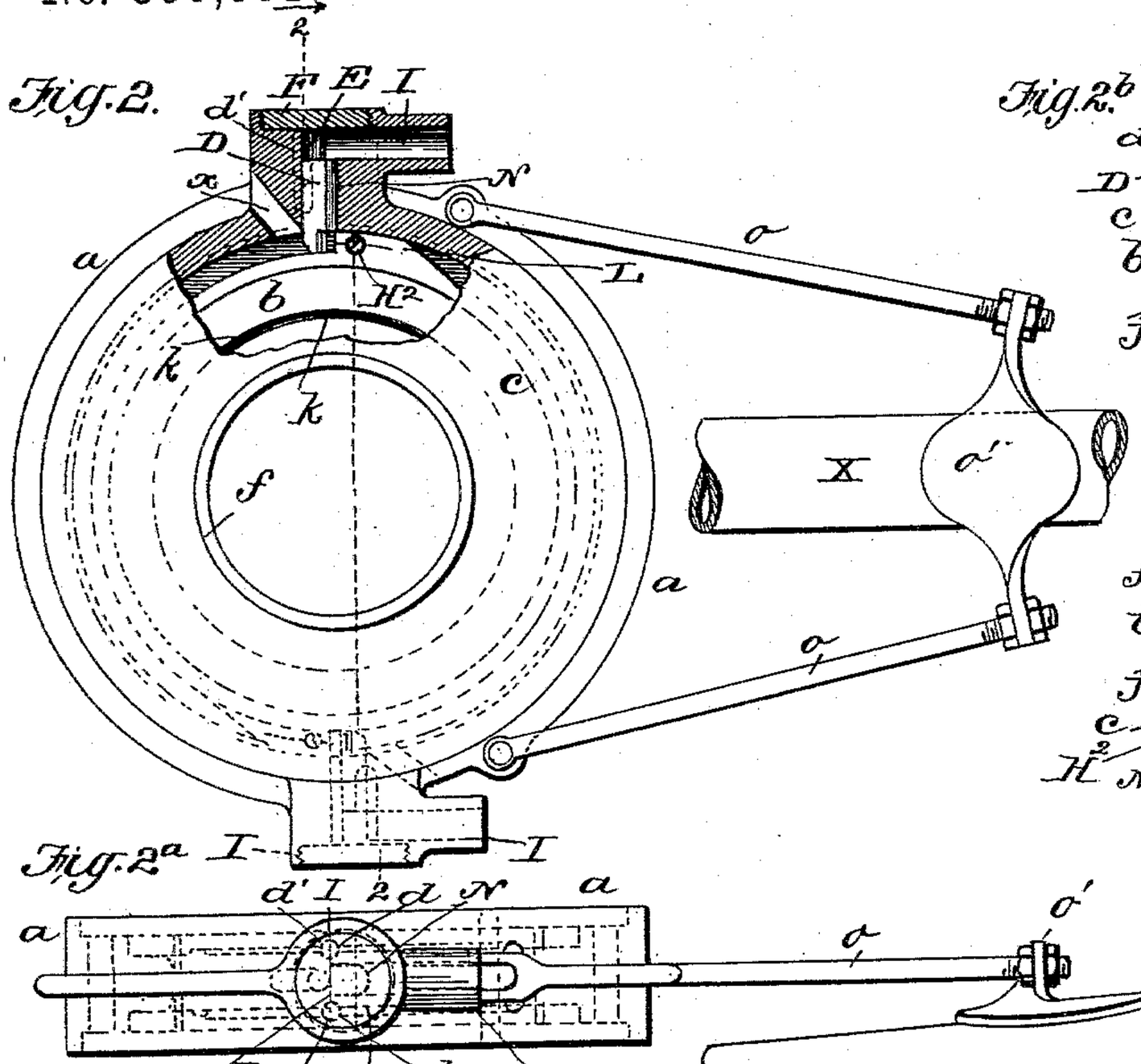


Fig. 2ª

Fig. 2ᵇ

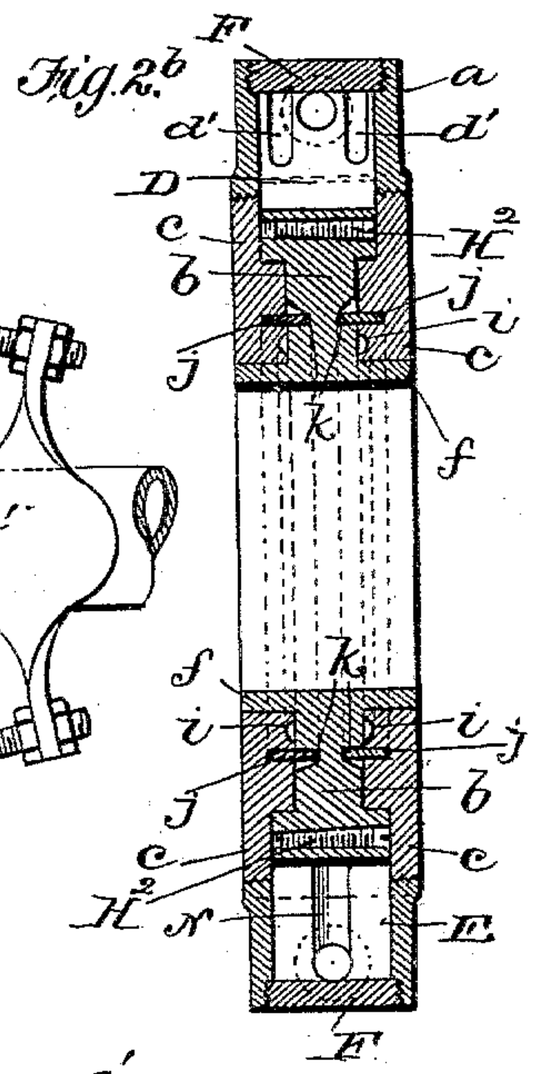


Fig. 3

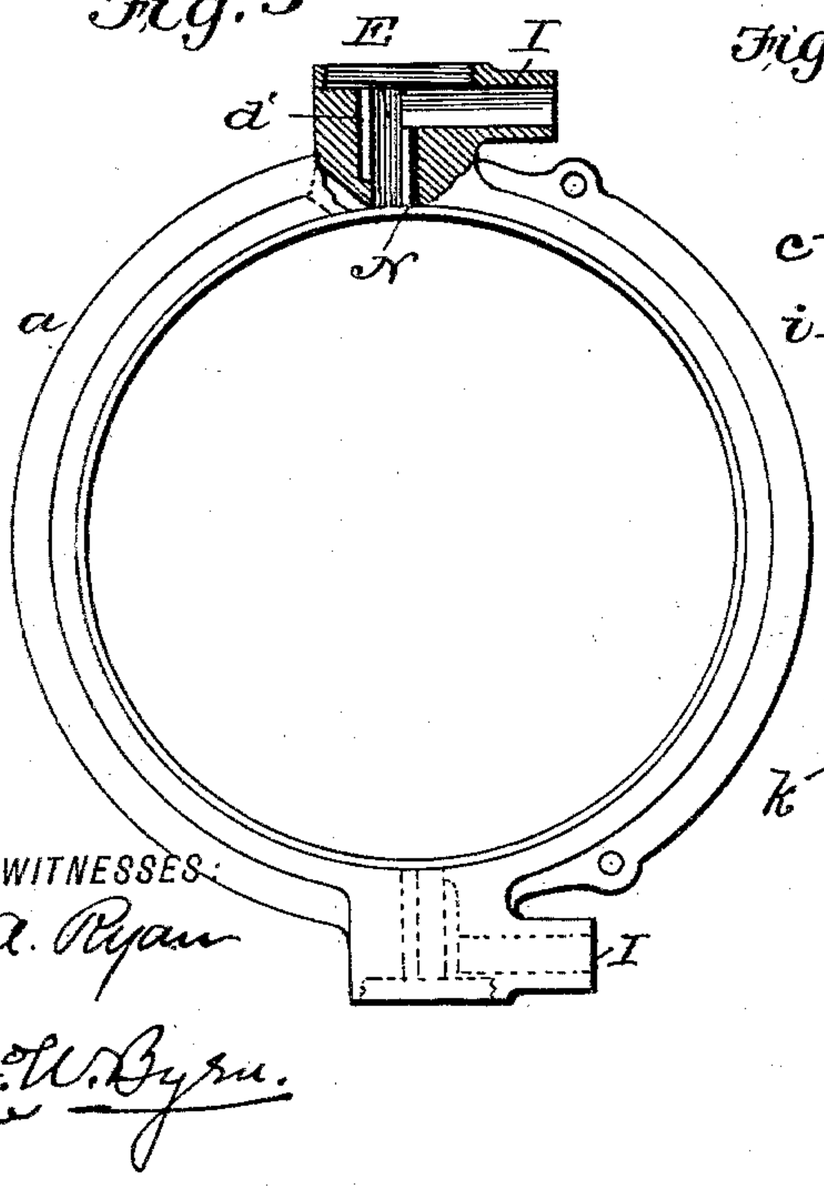
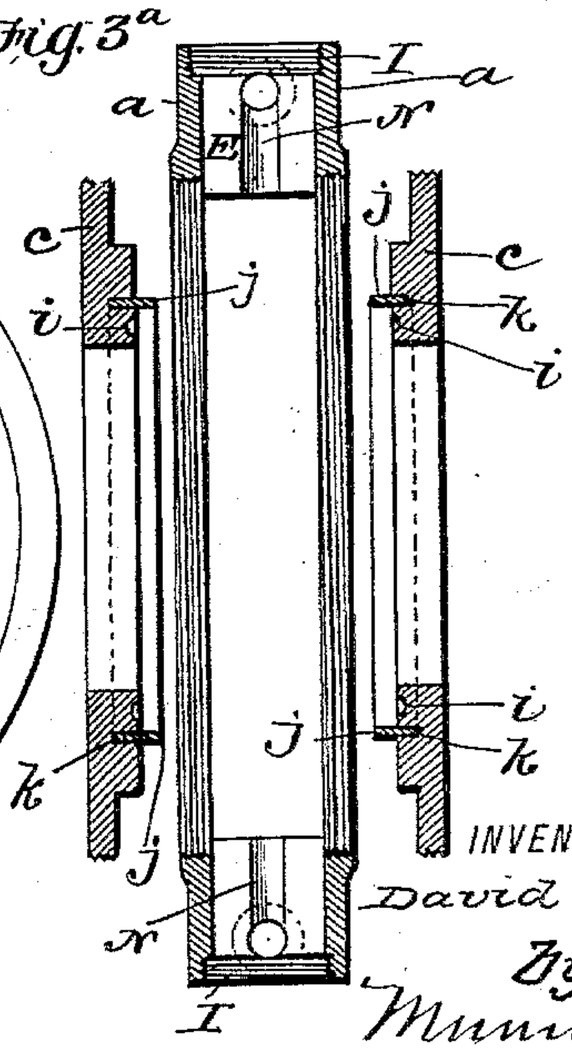


Fig. 3ª



WITNESSES:

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INVENTOR

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UNITED STATES PATENT OFFICE.

DAVID A. MOORE, OF HARVEY, ILLINOIS, ASSIGNOR OF ONE-THIRD TO OLIVER T. EADS, OF SAME PLACE.

AIR-PROPELLED BICYCLE.

SPECIFICATION forming part of Letters Patent No. 596,901, dated January 4, 1898.

Application filed November 28, 1896. Serial No. 613,745. (No model.)

To all whom it may concern:

Be it known that I, DAVID A. MOORE, of Harvey, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Air-Propelled Bicycles, of which the following is a specification.

My invention is in the nature of an improvement in that form of bicycle in which the pedals are used for compressing air by the agency of a pump and the compressed air then used for driving the rear wheel by a specially-constructed rotary engine arranged concentrically to the rear wheel; and it consists in the special features of novel construction and arrangement for securing a simple and effective means of propulsion, which I will now proceed to describe with reference to the drawings, in which—

Figure 1 is a side elevation of the entire machine. Fig. 1ª is an enlarged side view of the handle-bar. Fig. 2 is a side elevation of the motor and its attachments, shown partly in section. Fig. 2ª is a plan view of the same. Fig. 2ᵇ is a central section through the line 2 2 of Fig. 2, looking in the direction of the arrow. Fig. 3 is a side view of the outer casing of the motor, partly in section. Fig. 3ª is a sectional view of the same with its two sides detached and juxtaposed. Fig. 4 is a side view of the revolving piston. Fig. 4ª is a section of the same, and Fig. 4ᵇ are details of its valves.

Referring to Figs. 1 and 1ª, the ordinary diamond frame and front running-wheel are employed, except that the frame has not the usual bearing for the crank-shaft. The handle-bar H (see Fig. 1ª) is pivoted at *s* to an elevated offset from a thimble S′ on the front standard S, and said handle-bar has also a rearwardly-projecting arm or lug *h*. Between this arm *h* and a corresponding arm *t* of the thimble S′ there is arranged a helical spring h^2, wound about a bolt *h′*, passing through the two arms *h* and *t*. This makes the handle-bars yield in an elastic manner in downward direction against the pressure of the arms and relieves the jar, shock, and vibration upon the arms and the numbness that results therefrom on rough roads.

To each side of the frame, near the saddle, (see Fig. 1,) there is pivoted at its upper end a cylindrical pump P in an upright position. This pump contains a suitably-packed piston, whose piston-rod *p* emerges from its lower end and is jointed to a swinging arm p^2, which is pivoted to a coupling p^3, fixed to the frame. At the junction of the piston-rod *p* and arm p^2 there is the usual pedal *p′*, one on each side. From each of these pumps there descends a flexible tube p^4, which connects with a rotary motor arranged about the center of the rear wheel. When these pedals *p′* are worked up and down by the feet, the piston-rods, with their attached pistons, work up and down in the cylinders, and through suitable valves force compressed air to the rotary motor to turn the rear wheel and propel the bicycle. As the pedals move up and down alternately the arms p^2 vibrate about the rear coupling p^3, and the pump-cylinders P also swing about the pivotal connections which they have with the framework at their upper ends.

I will now describe the rotary motor of the rear wheel, which is illustrated in detail in Figs. 2 to 4ᵇ. The outer casing *a* is connected by rods *o o* to a clip *o′*, fastened to the main frame X, as in Figs. 2 and 2ª. The rods *o* are connected at one end to the casing by hinge-joints, and at the other ends they are connected to the clips *o′* by nuts on opposite sides of the clip. These are features of importance in giving freedom of motion to the casing, as will be explained farther along. This casing (see Figs. 3 and 3ª) has an inlet I on each side opening into a valve-chamber E, which is closed by a screw-cap F. This valve-chamber has a port N on its front side communicating with the inlet I, and two passage-ways *d′ d′* on its back side, which permits the valve to be balanced. D, Fig. 4ᵇ, is the valve which slides in a radial direction in the chamber E, it being understood that there is one on each side. This valve has passage-ways *d d* in its back which coincide with the passage-ways *d′ d′* in the valve-casing and admit compressed air to the back side of the valve to balance the pressure of compressed air on the front side of the valve as it passes in through the port N to the interior of the casing, thus making the valve work easily without being cramped.

The casing *a* has two detachable screw-threaded sides *c c*, (see Fig. 3ª,) which close

in the sides of the casing and retain the revolving piston *b*, as in Fig. 2ᵇ. This piston fits closely within the casing and against the sides and has circular grooves *k k* in its sides which receive circular packing-rings *j*, attached to the casing sides and making a tight-sliding circular joint. A circular groove *i* in the sides *c* serve to hold lubricant and reduce friction.

The piston *b* (see Fig. 4) has projecting wings L on its opposite sides to receive the air-pressure against them as they revolve, and these fit with a tight bearing against the inner face of the casing. To adjust these wings to a closer fit as they wear away, they have a slit through them, as seen in Fig. 4, and in this slit is arranged a tapered screw-hole, in which is fitted a tapered screw-plug H², Fig. 4ª, by turning which further in the split wing is expanded outwardly to a closer bearing against the inner face of the casing. Now when the piston *b* is within the casing and compressed air enters the inlet I and port N, when a wing L of the piston passes a valve D the latter from the pressure of air drops down behind the wing L and acts as an abutment for the air, which, passing down the port N in front of it, bears against the face of the wing L of the piston and turns it around, being discharged through an outlet port *x* just behind the next inlet.

The piston *b* has on each side flanges *f*, that protrude through the sides of the casing and form a connection for the wheel of the bicycle, and also relieve the wings L of undue friction and wear by furnishing an extended bearing.

The hanging of the casing of the motor on the rods *o* and supporting the latter at a remote point on frame X secure important results in that in the vertical vibration through the center of the wheel the casing is allowed to vibrate with the wheel, and this makes what may be termed a "self-contained" motor, in which the casing is not rigid with the frame as against vertical vibration, but hangs and adjusts itself automatically to the wear of the piston and central bearings, avoiding undue friction and wear at certain points and insuring both a tight fit between the moving parts and a greater longevity or endurance for the motor.

The manner of operating the bicycle is like that of the ordinary geared wheels—*i. e.*, the rider after imparting an initial movement to the machine mounts and rapidly operates the treadles with his feet to supply compressed air to the motor, which thus continues the forward movement. There being no direct gear to the machine the pedals may be operated as fast as the rider desires independently of the forward motion of the wheels, and thus for climbing hills there may be a rapid pedal action with a slow motion of the wheels, which gives greater climbing power.

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

1. The rotary motor consisting of a revolving piston *b* with wings L on its periphery and flanges *f f* on its sides, the casing *a* with radial valve-chambers E having in their front sides ports N and in the rear valve-balancing chambers and also exhaust-ports *x*, radial valves D arranged in said valve-chambers, screw-caps F closing the ends of the valve-chambers, and detachable side pieces *c* closing in the piston on the sides substantially as and for the purpose described.

2. The combination in a bicycle, of a rotary motor arranged concentrically to the rear wheel and having a revolving piston connected to said wheel, said motor having a casing connected to the framework and relatively stationary with reference to the piston but freely hanging from a remote point of support to render it automatically adjustable to the wear of the piston and motion of the wheel substantially as shown and described.

3. The combination in a bicycle, of a rotary motor arranged concentrically about the rear wheel, two pumps hinged at their upper ends to the frame and swinging freely at their lower ends, flexible tubes between the pumps and the motor, radially-swinging arms pivoted to the framework and to the piston-rods, and pedals arranged at the junction of the said arms and piston-rods as and for the purpose described.

DAVID A. MOORE.

Witnesses:
JOHN ANDERSON,
O. T. EADS.