

No. 644,113.

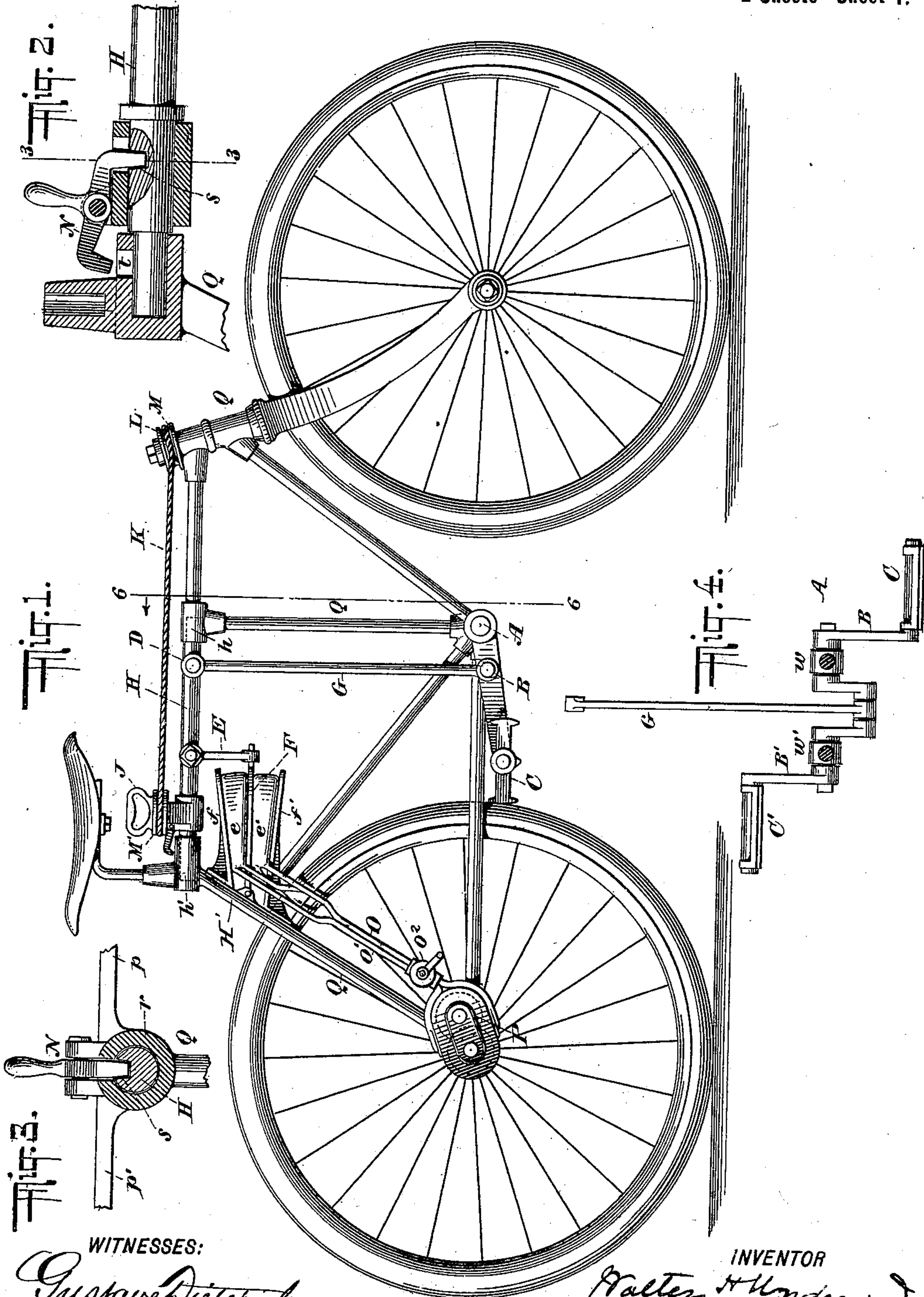
Patented Feb. 27, 1900.

W. H. UNDERWOOD.
PROPULSION OF VEHICLES.

(Application filed July 17, 1895.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:
Gustave Dietrich
John Kehlenbeck

INVENTOR
Walter H. Underwood
BY
Frederic W. Freeman,
ATTORNEYS.

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Fig. 5.

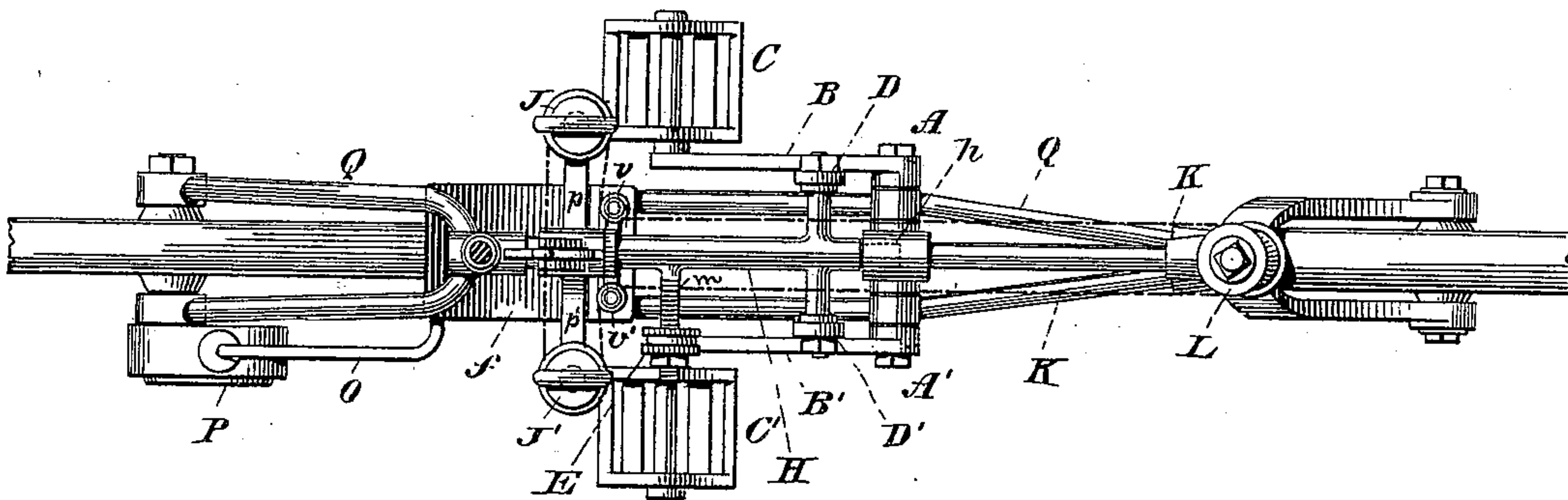


Fig. 6.

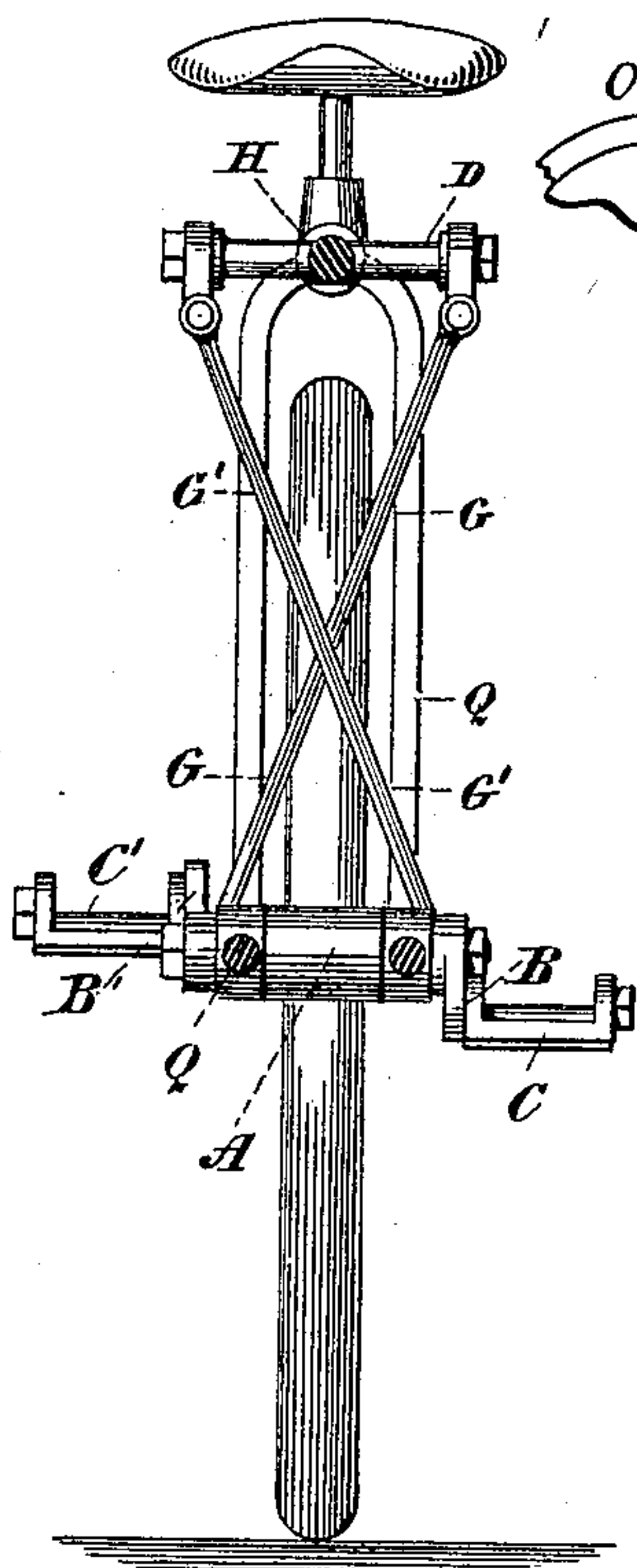


Fig. 10.

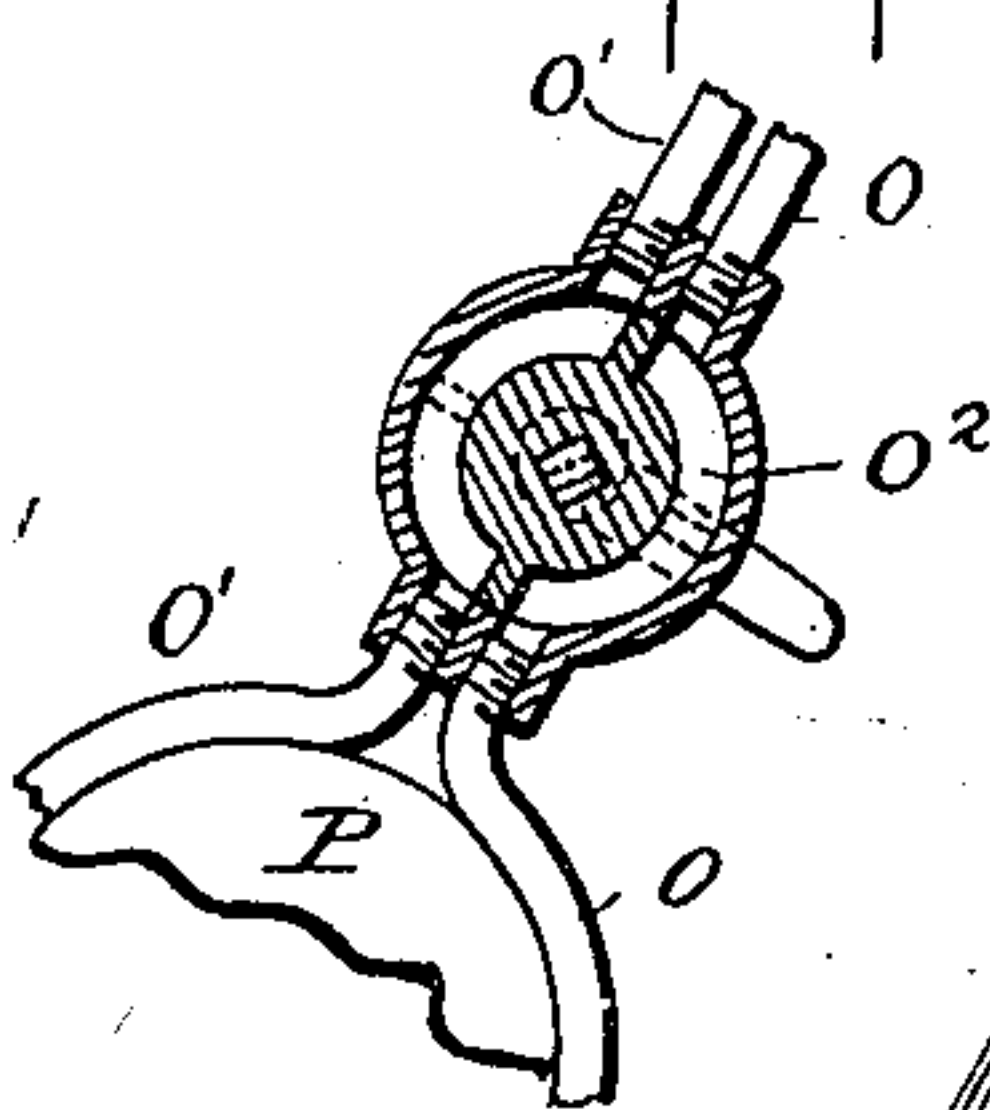


Fig. 7.

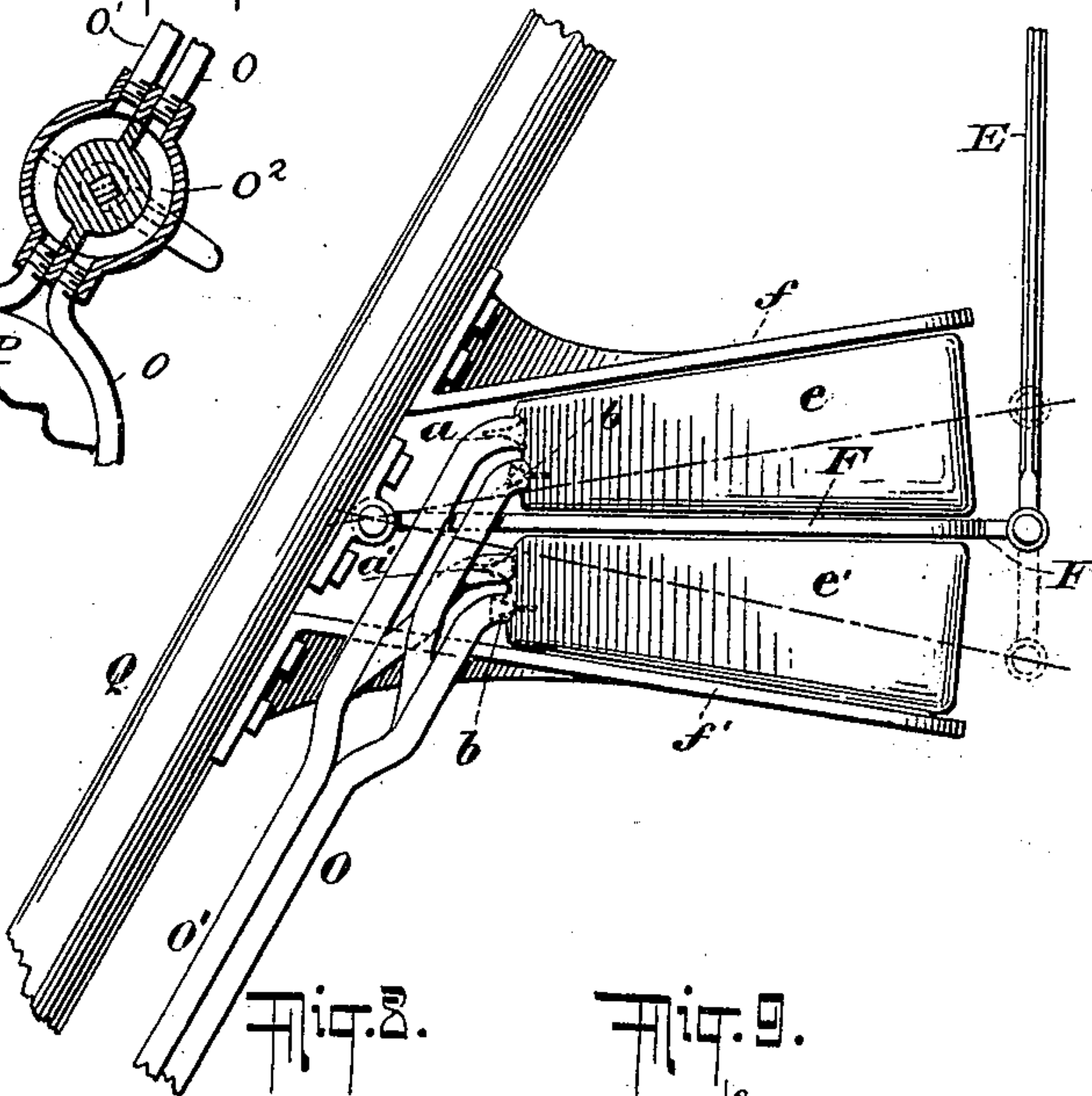


Fig. 8.

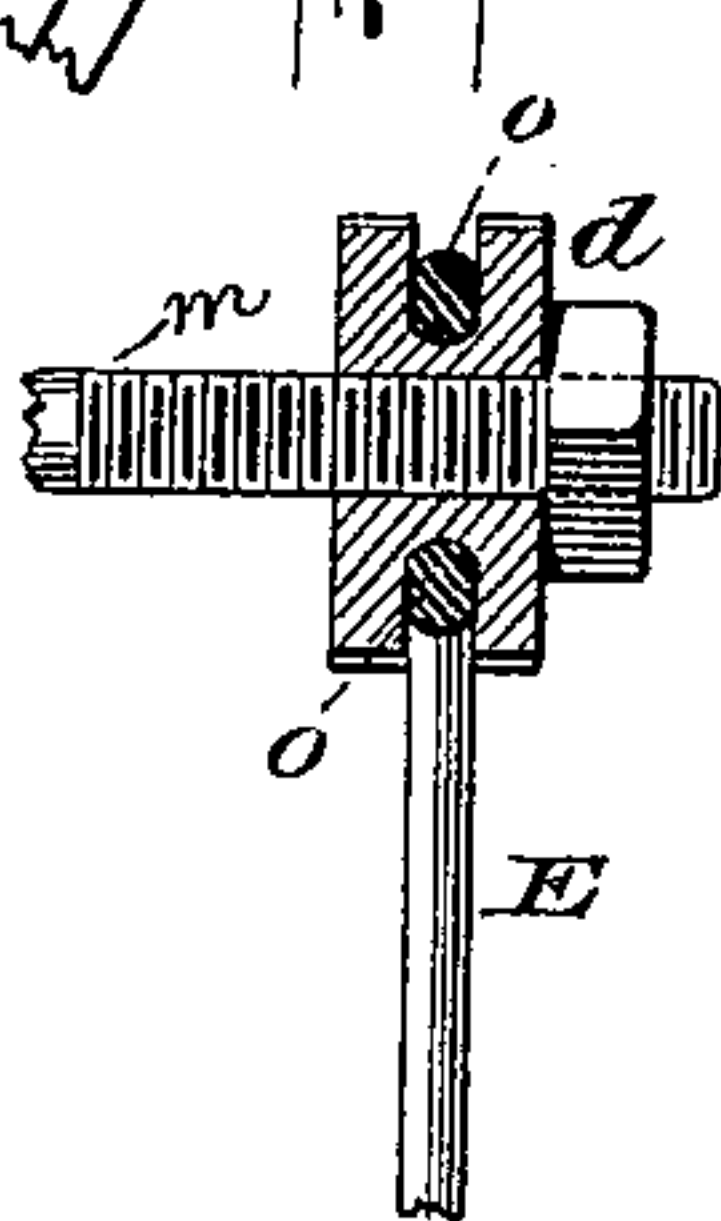
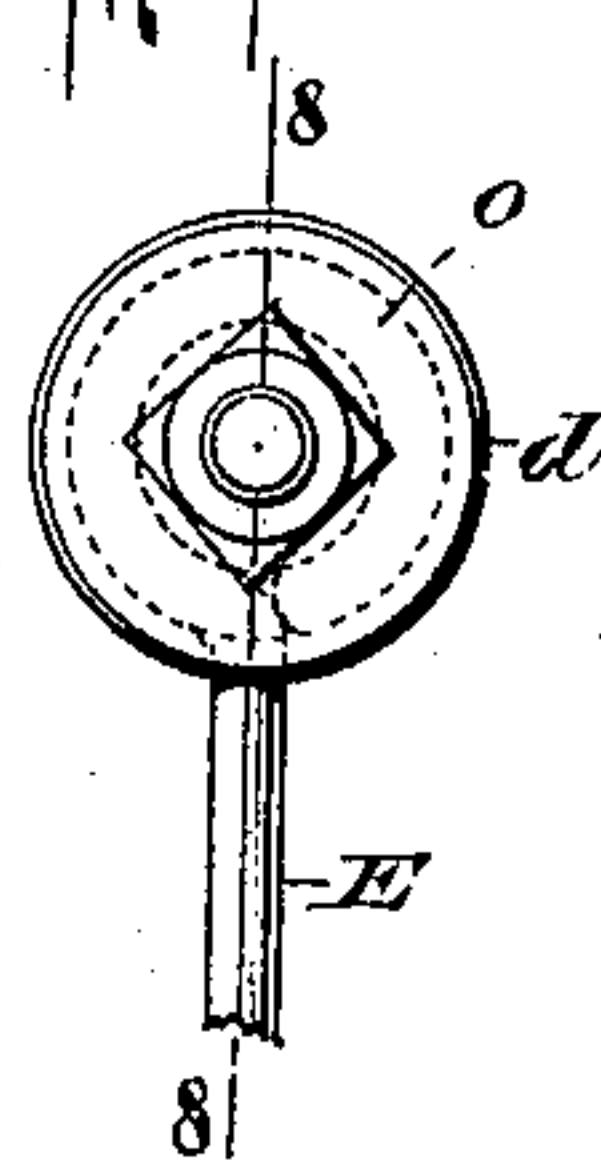


Fig. 9.



WITNESSES:

Gustave Friedrich
John Kehlenbeck

INVENTOR

Walter N. Underwood

BY

Foster & Freeman,
ATTORNEYS.

UNITED STATES PATENT OFFICE.

WALTER H. UNDERWOOD, OF NEW YORK, N. Y.

PROPULSION OF VEHICLES.

SPECIFICATION forming part of Letters Patent No. 644,113, dated February 27, 1900.

Application filed July 17, 1895. Serial No. 556,291. (No model.)

To all whom it may concern:

Be it known that I, WALTER H. UNDERWOOD, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in the Propulsion of Vehicles, of which the following is a specification.

This invention relates to an improvement in mechanism for propelling vehicles generally, and more particularly for the propulsion of bicycles and tricycles.

The objects of the invention are to provide a simple and efficient means for the propulsion of vehicles and to make provision for regulating such propelling mechanism in order to increase or diminish its force.

With these objects in view the invention consists, essentially, of a suitable motor supported upon or connected to the shaft of the driving-wheel of a vehicle and of means for supplying air, water, or other fluid under pressure to the motor to operate the same.

It consists, further, in mechanism for regulating the supply of fluid to the motor, to the end that its speed may be lessened or accelerated, as desired; and, finally, the invention consists of the novel construction and arrangement of the parts whereby the objects of the invention are attained.

In the accompanying drawings, forming a part of this specification, and in which like letters of reference indicate corresponding parts, Figure 1 is a side elevation of the invention as applied to a bicycle. Fig. 2 is a detail longitudinal sectional view of the clutch mechanism between the handle-bar and fluid-supplying mechanism. Fig. 3 is a cross-sectional view of the same on the line 3 3 of Fig. 2. Fig. 4 is a modification showing means of operating the rock-shaft from rotary pedals. Fig. 5 is a plan view of the invention, the seat being removed. Fig. 6 is a cross-sectional view thereof, taken on the line 6 6 of Fig. 5. Fig. 7 is a detail view of the fluid-compressing mechanism. Fig. 8 is a detail sectional view of the connecting devices between the rock-shaft and fluid-compressing mechanism, and Fig. 9 is a side elevation of the same. Fig. 10 is a detail sectional view showing the valve for directing the flow of fluid from the induction to the eduction tube without first passing through the motor.

Referring to the drawings, which illustrate my invention as applied to a safety-bicycle, Q is the frame of the bicycle, on which are mounted the front and rear wheels thereof. The frame consists of the usual front and rear forks and their connecting-braces.

B B' are the vertically-reciprocating levers carrying the pedals C C', said levers being journaled on the shaft A.

Supported at opposite ends in bearings of the rear brace and steering-head is a horizontal rock-shaft H, having arms D D' projecting from opposite sides thereof. Secured to the outer ends of these arms are downwardly-projecting connecting-rods G G', which are in turn connected to the levers B B', from which a rocking motion is imparted to the rock-shaft H. The rocking motion of the rock-shaft is designed to operate a suitable fluid-compressor H', supported on the frame Q and located adjacent to the rock-shaft H. In the present instance this compressor consists of two diverging plates *f f'* and an intermediate plate F, pivoted at one end to the frame Q. Arranged intermediate of the plates *f* and F and F' and *f'*, respectively, are receptacles *e e'*, of rubber or other flexible material. Connected to each of these receptacles *e e'* are induction-tubes O and eduction-tubes O', provided with outwardly and inwardly opening valves *b b* and *a a*, respectively. These induction and eduction tubes serve to connect the compressor H' with a motor for driving the bicycle. This motor will be presently referred to.

Connection between the fluid-compressor H' and rock-shaft is effected by means of a horizontal projecting screw-threaded arm *m* on the rock-shaft H, and a connecting-link E. This link is pivoted at its lower end to the plate F and is provided at its upper end with a ring *o*, which engages an annular groove *o'* in a nut *d*, allowing said nut to turn freely and independently of the link E. The nut *d* is adapted to be adjusted on the arm *m* toward and away from the rock-shaft H, and accordingly as the nut and connecting-link E are moved toward and away from the rock-shaft H is the movement of the connecting-link and its attached plate F lessened or increased.

A motor P is mounted upon the shaft of

the driving-shaft or it may be arranged adjacent to the shaft and geared to it, if desired. This motor may be of any suitable construction, and it may be either reciprocatory or rotary in its action. I prefer the latter, however, for the reason that it exerts a more constant and uniform force.

From the above-described mechanism it will be apparent that when power is exerted upon the pedals C C' their supporting-levers B B' and the connecting-rods G G' will be reciprocated and a rocking motion imparted to the rock-shaft H. A reciprocating movement is supplied to the pivoted plate F from the rock-shaft through the arm *m* and connecting-link E. This reciprocating movement causes the flexible receptacles *e e'* and the fluid contained therein to be alternately compressed. When the fluid is sufficiently compressed to open the valves *b b'* of the induction-tubes, it flows from the receptacle through these tubes to the motor, from which it is returned to the receptacles *e e'* through the eduction-tubes O' to be recompressed. Should it be desirable to run the motor at the maximum speed, the nut *d* and lever E are adjusted to the end of the arm *m*, thereby increasing the length of movement of the plate F and causing more fluid to be forced from the receptacles *e e'* to the motor. If, on the other hand, it is desirable to decrease the speed of the motor P, the nut *d* and link E are adjusted nearer the rock-shaft H, which causes the supply of fluid to the motor to be diminished.

In lieu of using a nut to adjust the position of the link E with relation to the rock-shaft H any suitable mechanism may be employed; but I prefer the present-described means for effecting this on account of its simplicity of construction and operation.

Means have been devised whereby the fluid-compressor H' may be operated by the arms of the rider, as well as by his legs, or both the arms and legs may be used simultaneously, if desired. This means consists of a collar *r*, loosely mounted upon the rock-shaft and adapted to be connected therewith by means of a clutch device N, consisting of an inverted-Y-shaped lever pivoted between lugs on the collar *r*. When it is desired to connect the collar with the rock-shaft H, one of the arms of the Y-shaped lever is thrown into engagement with a recess *s* of the rock-shaft H and the connection effected. The rock-shaft and collar are disconnected by lifting the engaging arm of the Y-shaped lever out of the recess *s* and throwing the opposite arm into a recess *t* in the frame Q, thereby holding the collar against movement. Attached to each side of the collar *r* and extending in a horizontal plane are the handle-bars *p p'*, upon the ends of which are pivoted grooved wheels M M', to which in turn are connected the handles J J'. Passing around the wheels M M', then around idlers *v v'*, mounted on the frame Q, and finally around a grooved wheel

L on the steering-post is a chain, band, or cord K. Through this chain K the steering-post is turned by the handles J J' and the course of the bicycle directed. When it is desired to operate the fluid-compressor by the arms, the clutch device N is adjusted to connect the collar *r* and rock-shaft H, and by moving the handle-bars alternately up and down a rocking motion is given to the rock-shaft, and from it the fluid-compressor is operated, as before described.

In Fig. 4 I have illustrated means for rocking the rock-shaft H by the ordinary rotary pedal motion now in vogue. This mechanism differs from that previously described in that instead of using two connecting-rods G G' and pivoting them to the levers B B' only one connecting-rod is used, and it is connected to a crank of the shaft A.

The fluid-compressor is represented herein as being horizontally arranged. It will be obvious, however, that it could be disposed vertically, and, if desired, it could be placed into closer proximity to the motor. It will be understood that instead of using flexible receptacles intermediate of the plates *f, F'*, and *f'* compressing-cylinders might be substituted, the piston-rods of which would of necessity be connected to the pivoted plate F'.

In coasting it is desirable that the operation of the motor P shall be suspended, and consequently I have provided the induction and eduction tubes O O' with a by-pass valve O², which directs the flow of fluid through the motor when it is desired to operate it or cuts off the supply thereto, permitting the fluid to flow directly from the induction into the eduction tube without first passing through the motor. This valve, as shown, is provided with a lever O³ for turning the valve, which lever may be operated by the foot of the operator; but, if desired, suitable devices for operating the valve may be employed and so located as to be within reach of the hand.

The advantages of the several parts of my improvement will be appreciated by those skilled in the art to which it appertains, and within the scope of the invention as defined in the following claims modifications may be made in the form, construction, and position of the parts and some features of the invention used without others, since

What I claim is—

1. In propelling mechanism for vehicles, the combination of the frame, pedals, levers and driving-axle, a motor connected to the driving-axle, a fluid-compressor, induction and eduction passages connecting the motor and fluid-compressor, a by-pass valve with which said passages communicate, said valve being arranged intermediate of the fluid-compressor and motor, and intermediate devices between the fluid-compressor and levers, whereby the former is operated by the movement of the latter, substantially as described.

2. In propelling mechanism for vehicles, the combination of the frame, pedals, levers

and driving-axle, a fluid-compressor having communication with the motor, a rock-shaft H having laterally-extending arms, rods connecting the said arms to the levers, an arm *m* projecting from the rock-shaft, and a link E pivotally connected at one end to the fluid-compressor and adjustably connected at its other end to the arm *m*, substantially as and for the purpose set forth.

10 3. In propelling mechanism for vehicles, the combination of the frame, pedals, levers and driving-axle, a fluid-compressor having direct communication with the motor, a rock-shaft H, connections between the levers and

rock-shaft whereby movement of the former 15 will rock the latter, and adjustable connections between the rock-shaft and the fluid-compressor whereby the latter may be variably operated to vary the speed of the motor without varying the action of the levers, substantially as set forth. 20

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WALTER H. UNDERWOOD.

Witnesses:

FREDERICK H. MILLS,
A. M. POOLE.