No. 624,417. Patented May 2, 1899.

N. R. WICKERSHAM & H. A. JAMISON.

PUMP FOR INFLATING PNEUMATIC TIRES.

(Application filed Oct. 5, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

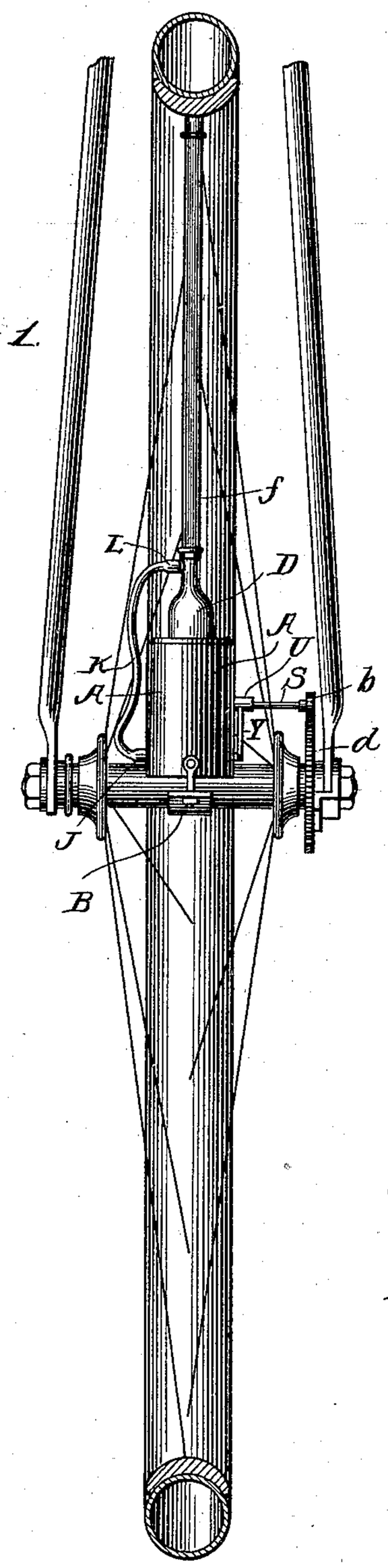

Fig. 2.

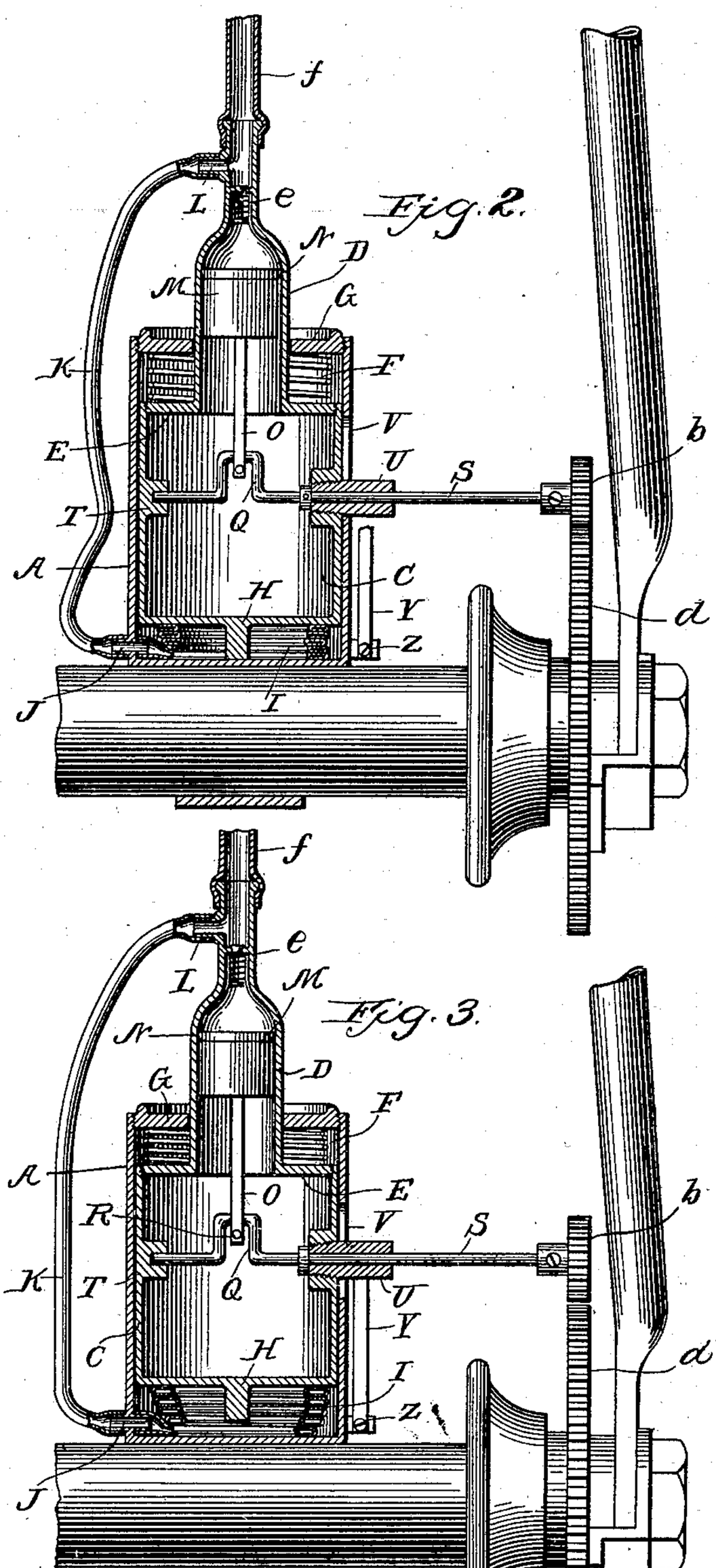

Fig. 3.

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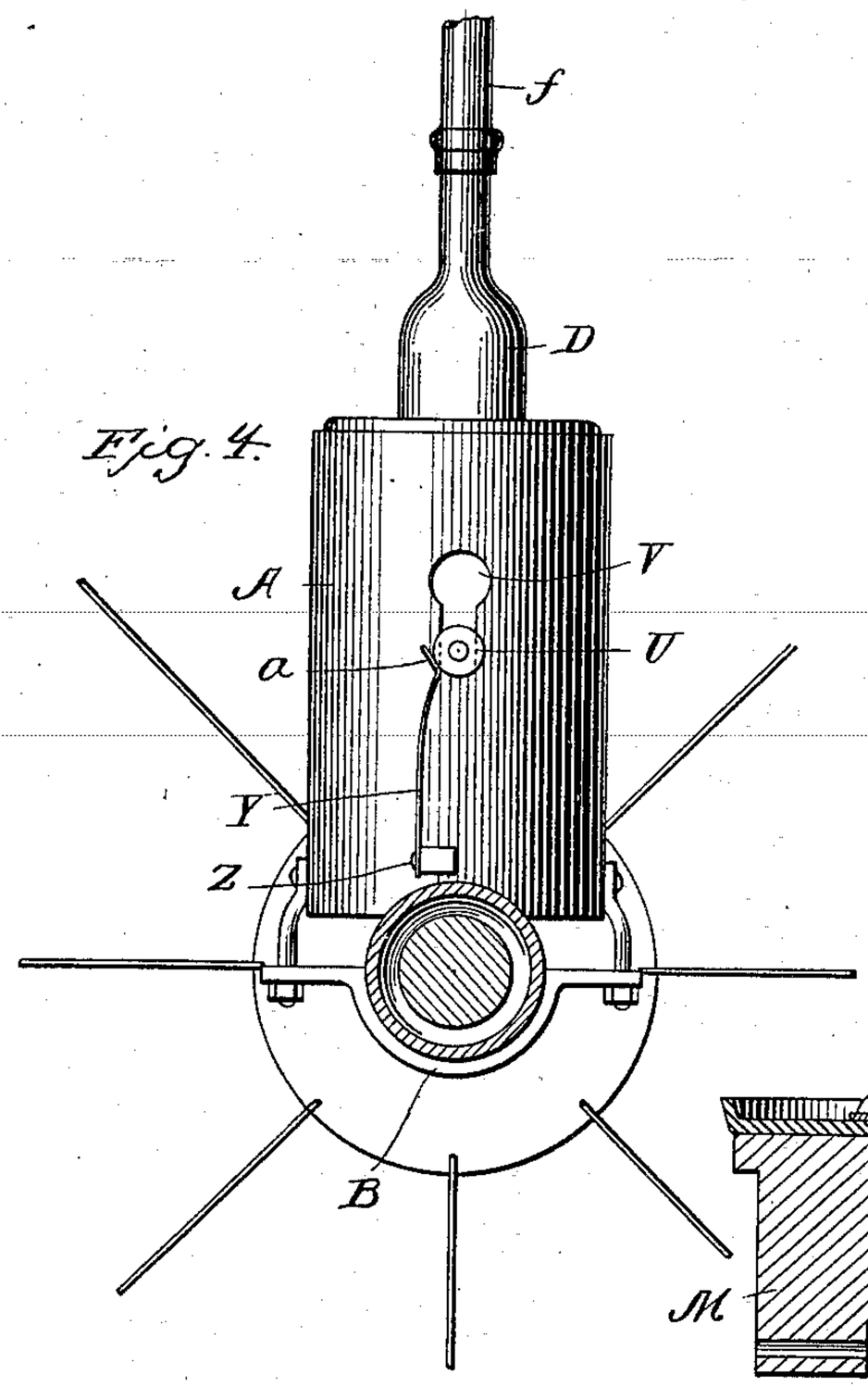

Fig. 4.

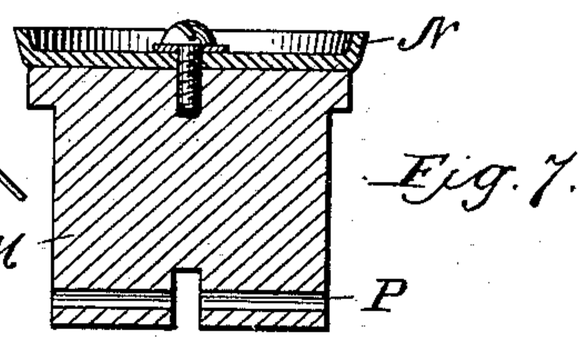

Fig. 7.

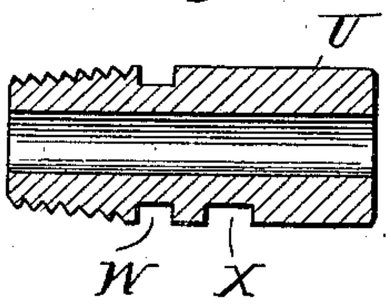

Fig. 5.

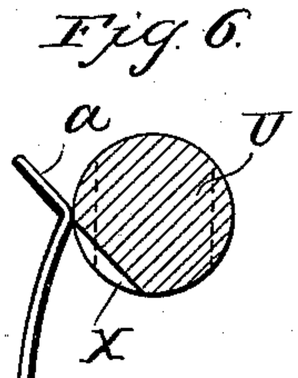

Fig. 6.

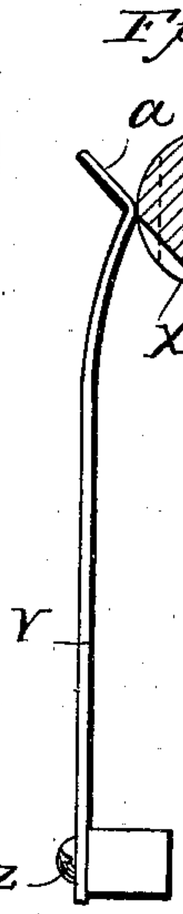

Fig. 9.

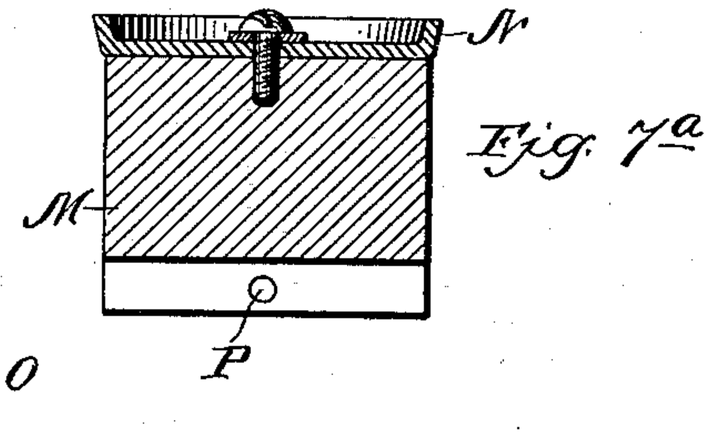

Fig. 7a.

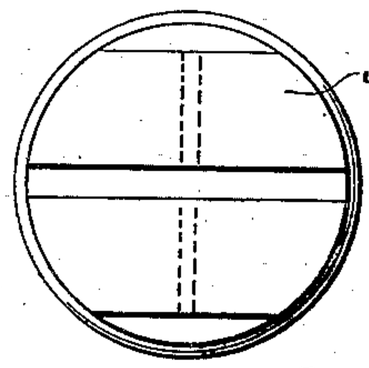

Fig. 8.

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UNITED STATES PATENT OFFICE.

NATHAN R. WICKERSHAM AND HARRY A. JAMISON, OF PHILADELPHIA, PENNSYLVANIA.

PUMP FOR INFLATING PNEUMATIC TIRES.

SPECIFICATION forming part of Letters Patent No. 624,417, dated May 2, 1899.

Application filed October 5, 1898. Serial No. 692,754. (No model.)

To all whom it may concern:

Be it known that we, NATHAN R. WICKERSHAM and HARRY A. JAMISON, citizens of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a certain new and useful Improvement in Pumps for Inflating Pneumatic Tires for Bicycles or other Vehicles, of which the following is a full, clear, and exact specification.

Our invention relates to a new and useful improvement in pumps for inflating pneumatic tires for bicycles and other vehicles, and has for its object to so improve upon the construction shown in Letters Patent No. 596,223, granted to us December 28, 1897, as to render the actions of the pump automatic and provide for its being thrown out of action when the desired pressure has been established within the tire.

With these ends in view this invention consists in the details of construction and combination of elements hereinafter set forth and then specifically designated by the claims.

In order that those skilled in the art to which this invention appertains may understand how to make and use the same, the construction and operation will now be described in detail, referring to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a section of a bicycle, showing our pump applied thereto; Fig. 2, an enlarged section of the pump, showing it in position upon the hub, the gears being in mesh, so as to cause the pump to act; Fig. 3, a similar view showing the gears out of mesh when the parts are in an inactive position; Fig. 4, an enlarged cross-section of a hub, showing a side view of the pump and illustrating the action of the throw-out spring; Fig. 5, an enlarged section of the plug-bearing for the crank-shaft; Fig. 6, a cross-section of this plug, showing the throw-out spring in relative position to the plug-bearing when the gears are in mesh; Fig. 7, an enlarged section of the pump-plunger; Fig. 7ª, a similar view taken at right angles to Fig. 7, showing the slot in which the connecting-rod is pivoted; Fig. 8, an end view thereof, and Fig. 9 a side view of the connecting-rod.

In carrying out our invention as here embodied, A represents the outer casing, which is adapted to be secured to the hub of a bicycle or other vehicle by the strap B, and within this casing is a movable casing C, having a limited sliding movement therein, the pump-barrel D being secured to this inner casing by the flange E thereof being threaded into the upper end of said casing.

A coil-spring F is interposed between the top of the inner casing and the adjustable head G of the outer casing, which head is threaded into said outer casing and may be used to adjust the tension of said spring, so as to cause it to bear with more or less force upon the inner casing. A lug H projects downward from the bottom of the inner casing, so as to limit the downward movement of said casing under the action of the spring F, and in the space thus formed between the bottoms of the two casings is coiled a flexible tube I, which may be of rubber, one end thereof being sealed, while the other end is attached to the nipple J. A flexible tube K is also connected with this nipple and leads upward, having its opposite end attached to the nipple L, for the purpose hereinafter set forth. If found desirable, a closed ring or bag may be used instead of the coil of flexible tubing, as the only object is to retain the air and permit it to force the inner casing upward.

A plunger M is fitted within the pump-barrel, having secured upon its upper end a packing-disk N, of leather or other suitable material, which is so flanged as to fit air-tight within the barrel when moved in one direction, but permit the inflow of air when moved in the reverse direction, as is well understood. A connecting-rod O is pivoted to the plunger at P, and the lower end thereof is attached to the crank Q, and for convenience this connecting-rod is slit, so as to be passed over the crank, and is then drawn together by the screw R, the object of which is that the crank may be made in one piece.

S represents the crank-shaft upon which the crank Q is formed, and this shaft has a bearing at its inner end in the boss T, formed with the inner casing, and also a long bearing in the plug U. One end of this plug is threaded into a boss formed upon the inner

casing, so that the shaft may be first passed through the threaded hole in the casing and the plug passed thereover and then around into place for convenience in assembling. The outer casing has formed therein a buttonhole-slot V, the enlarged portion of which is of sufficient size to permit the passage of the plug, while the contracted portion thereof is of less width than the diameter of the plug, and thereafter the plug is slotted, as at W, in order that it may be passed within this contracted portion of the slot, which prevents the turning of the plug upon its axis, which would tend to displace the same, and also prevents the turning of the inner casing upon its axis, as will be readily understood. A second slot X is formed in the plug at an angle, as clearly shown in Fig. 6, and is adapted to receive the upper end of the push-out spring Y, said spring being secured to a lug formed upon the outer casing by a screw C. The nose of this spring is bent at an angle, as shown at *a*, so as to have a cam action upon the inclined slot X. The outer end of the crank-shaft S has secured thereon a pinion *b*, which meshes with the stationary gear *d*, so that when the bicycle-wheel revolves the pinion being carried around the gear when in mesh therewith will revolve the shaft S, and consequently actuate the pump-plunger through the crank U, and this in turn will compress and force air through the spring-actuated valve *e* to the flexible tube *f*, the outer end of which is connected with the ordinary valve-tube of the pneumatic tire, it being noted that the valve in this last-named tube is omitted, since it is essential that the pressure created in the tire be likewise maintained in the tube K, and consequently in the coil-tube I, as will be made apparent from what follows.

In operation the turning of the wheel, as before stated, will put the pump in operation, and this will in turn force compressed air into the tire and also into the tube K and coil I, and when this operation of the pump has brought the pressure in the tire to the point desired, which has previously been determined by the adjustment of the spring L, the same pressure in the coil will expand the tube composing said coil and in so doing force the inner casing upward against the action of the spring F, and thereby carry the pinion out of mesh with the gear, which, as is obvious, will stop the rotation of the crank-shaft, and consequently the action of the pump. Now so long as this pressure is maintained the pump will remain out of action; but when from leakage or other cause the pressure in the tire reaches the minimum the pressure of the spring F will overbalance the pressure in the coil I and compress the latter by forcing the inner casing downward and in so doing again carry the pinion into mesh with its gear. This will again bring about the actuation of the pump, which in turn will reëstablish the proper pressure in the tire and the coil I to carry the pinion out of mesh.

In order that the movements for throwing the pinion into or out of mesh with the gear be accelerated and the pinion not be permitted to drag upon the gear, the spring Y is so arranged that its upper end or nose *a* bears upon the flat portion of the plug U when the pinion and gear are in mesh; but as soon as a pressure has been reached which tends to move the inner casing upward, as before described, the first slight movement of this casing carrying the plug would bring the nose of the spring into contact with the beveled portion of the slot X. This will cause said spring to force the plug upward after the manner of a cam and in so doing immediately throw the pinion clear of the gear and maintain it in this position until the pressure in the tire and coil has fallen sufficiently to permit the coil-spring F to not only compress the coil I, but to cam the spring Y outward to its original position, and when said spring has reached this position and the plug has been lowered the removal of the upward pressure of the push-out spring by its nose reaching the flat portion upon the plug will remove the tendency of the inner casing to move upward until the proper pressure has been reëstablished in the tire.

In assembling our improvement the plunger and connecting-rod are pivoted together, the connecting-rod attached to the crank prior to the pump-barrel and head G being screwed into place. These parts are passed into the inner casing in such manner that the outer end of the crank-shaft is passed through the threaded hole in the side of the inner casing and through the upper portion of the buttonhole-slot of the outer casing and then brought to a horizontal position, so that the inner end thereof is carried into the bearing formed in the boss T. After this the plug U is passed over the outer end of the shaft through the enlarged portion of the buttonhole-slot and threaded into place. The pump-barrel is next attached to the inner casing and the coil-spring F placed in position and the head G screwed into the outer casing, so as to adjust the tension of said spring, it of course being understood that the coil-tube I is place in the bottom of the outer casing prior to the insertion of the inner casing.

By the use of our improvement a constant pressure varying but slightly in degree is maintained within the tire and that without attention upon the part of the rider, since the pump and its mechanism are automatically thrown into or out of action as this pressure varies.

Our improvement is especially applicable to bicycles and like vehicles, but of course may be used in connection with a pneumatic tire for any purpose.

Having thus fully described our invention, what we claim as new and useful is—

1. An automatic pump for inflating pneumatic tires consisting of an outer casing carried by the hub, an inner casing fitted to slide within the first-named casing, a pump-barrel carried by the inner casing, a spring arranged to bear upon the inner casing so as to maintain it in its normal position, a plunger fitted in the pump-barrel, a crank-shaft journaled in the inner casing and connected with the plunger by a connecting-rod, means for revolving the crank-shaft, and means for transmitting the pressure of the tire to the under side of the inner casing whereby when the proper pressure has been attained in said tire the inner casing will be forced upward and the pump thrown out of action, as specified.

2. In combination, an outer casing carried by the hub of the wheel, an inner casing adapted to slide within the outer casing, a crank-shaft journaled in the inner casing, a pinion carried by the outer end of said shaft, a stationary gear carried by the frame of the machine with which said pinion meshes, a pump-barrel carried by the inner casing, a plunger fitted within said barrel, a rod connecting the plunger with the crank, a spring-actuating valve located above the pump-barrel, a tube leading from the pump-barrel to the tire, a second tube leading from the pump-barrel above the valve to the bottom of the outer casing, a coil of flexible tubing or the like connected with the last-named tube having one end thereof closed and so arranged beneath the inner casing as to elevate the same when sufficient air-pressure has been transmitted to said coil, a spring F arranged to bear upon the opposite end of the inner casing to act in conjunction with the coil, a head threaded into the outer casing for regulating the pressure of the spring F, and a push-out spring so arranged as to carry the pinion out of contact with the gear when an upward movement is imparted to the inner casing, as specified.

3. In combination with a pump of the character described, a plug-bearing in which the crank-shaft is journaled, said plug having an inclined slot formed therein, a push-out spring arranged to so act upon said inclined slot as to carry the pinion out of contact with the gear when an upward movement of the inner casing has been started, and means dependent upon the pressure in the tire for starting this upward movement of the inner casing, as specified.

4. A pump for automatically inflating pneumatic tires consisting of a suitable casing carried by the hub, a pump-barrel adapted to move within said casing, a plunger fitted within said barrel, means dependent upon the rotation of the wheel for actuating said plunger, a spring for maintaining the last-named mechanism in action, and means dependent upon the pressure in the tire for carrying this mechanism out of action, as specified.

In testimony whereof we have hereunto affixed our signatures in the presence of two subscribing witnesses.

NATHAN R. WICKERSHAM.
HARRY A. JAMISON.

Witnesses:
MARY E. HAMER,
SAMUEL STUART.