No. 636,249. Patented Nov. 7, 1899.

A. FISHER.

AUTOMATIC TIRE INFLATER.

(Application filed Apr. 17, 1899.)

(No Model.) 3 Sheets—Sheet 1.

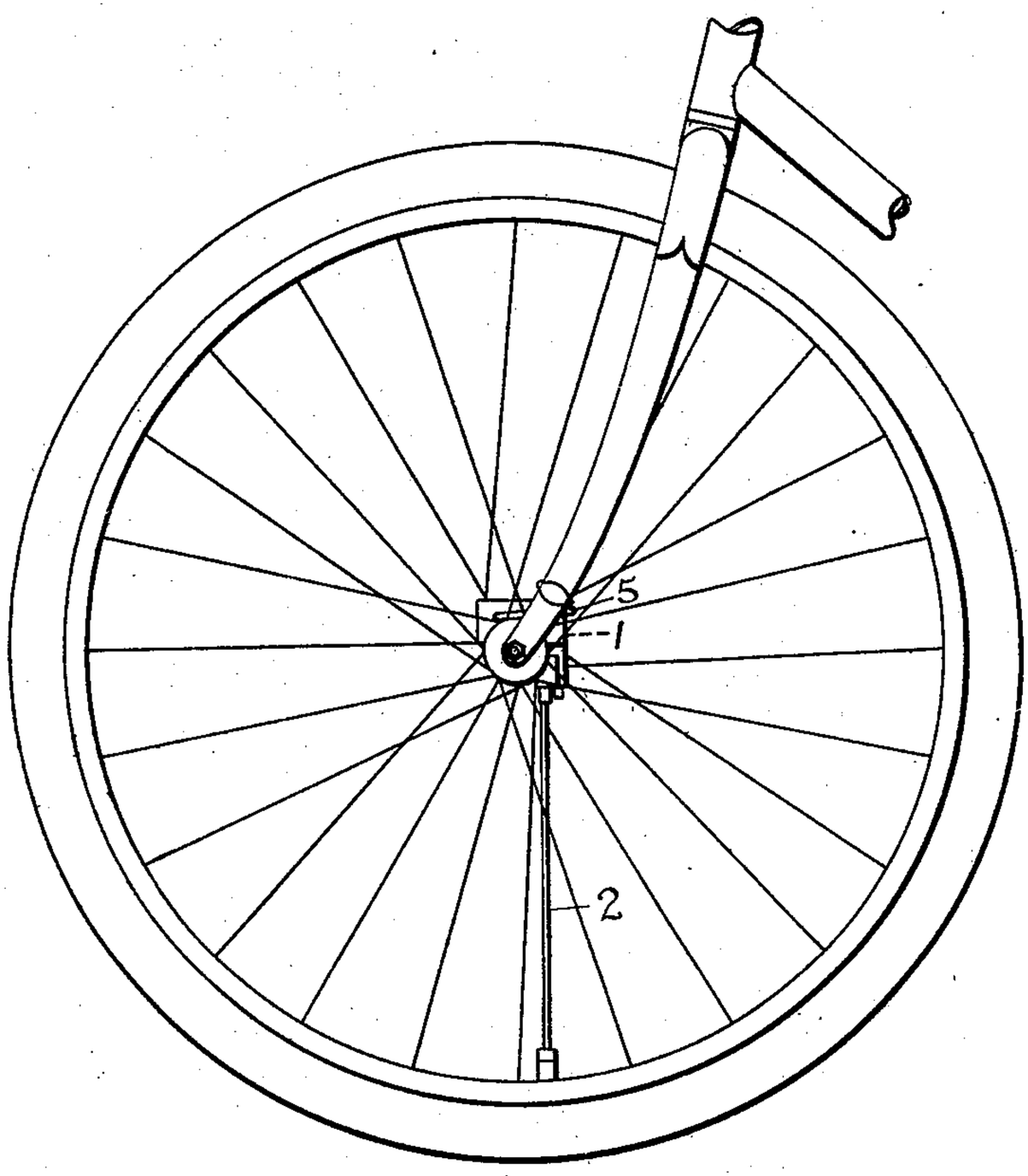
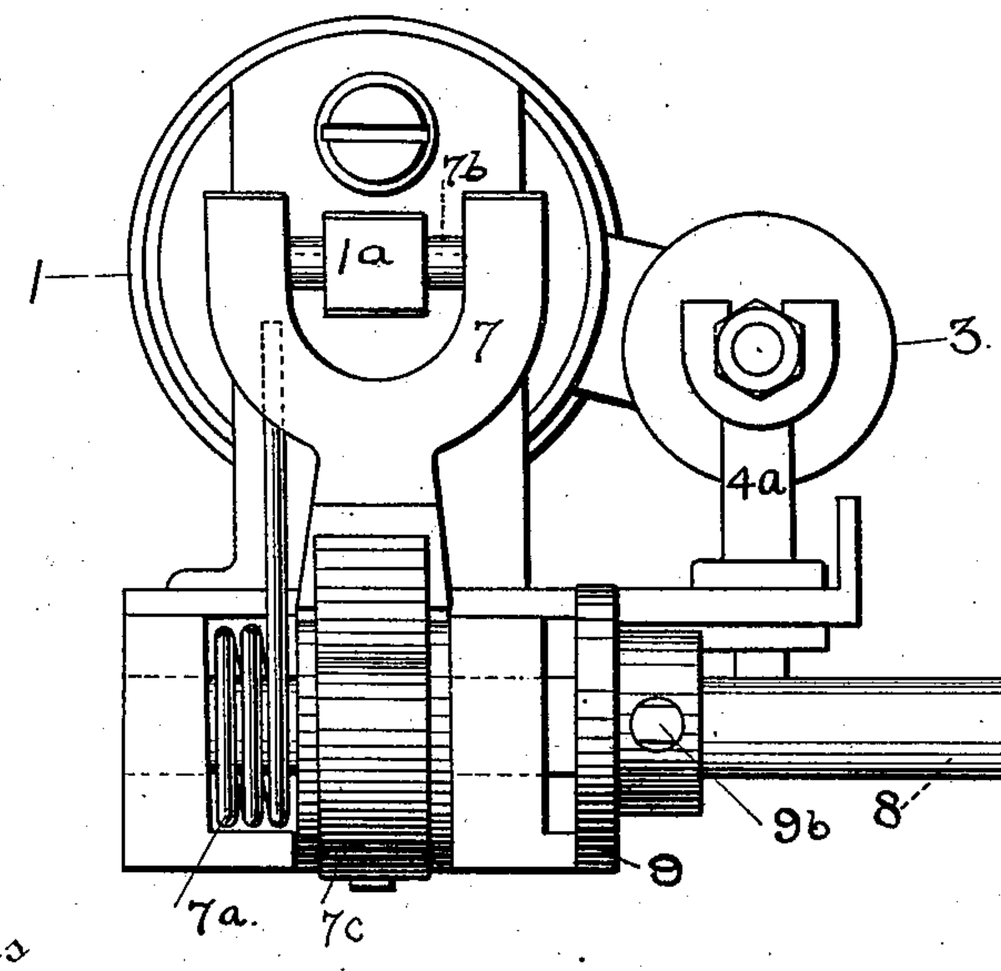


Fig 1.

Fig 2.



Witnesses
Fred P Beach.
M. H. Irwin

Inventor
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(No Model.) 3 Sheets—Sheet 2.

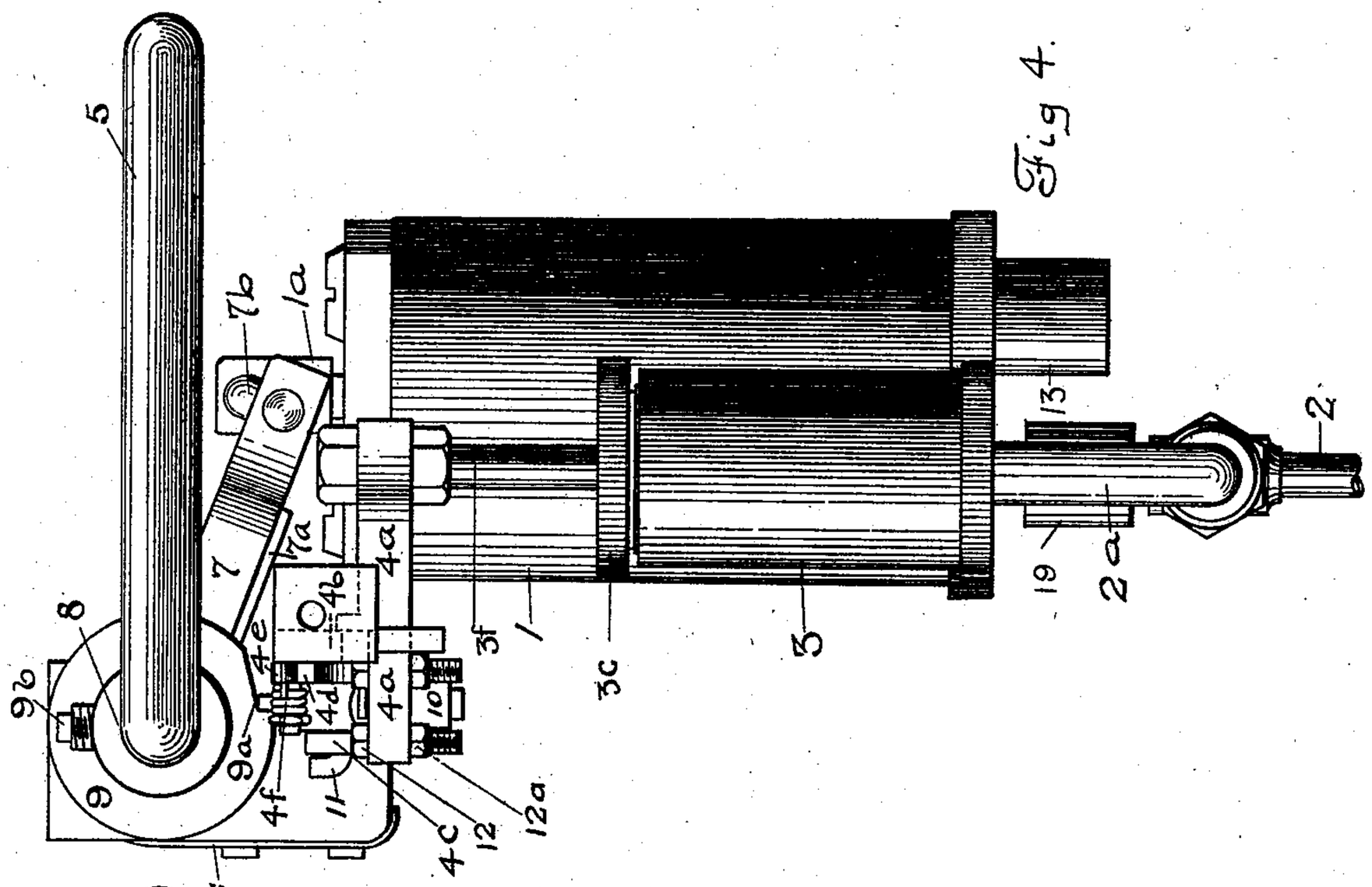

Fig 4.

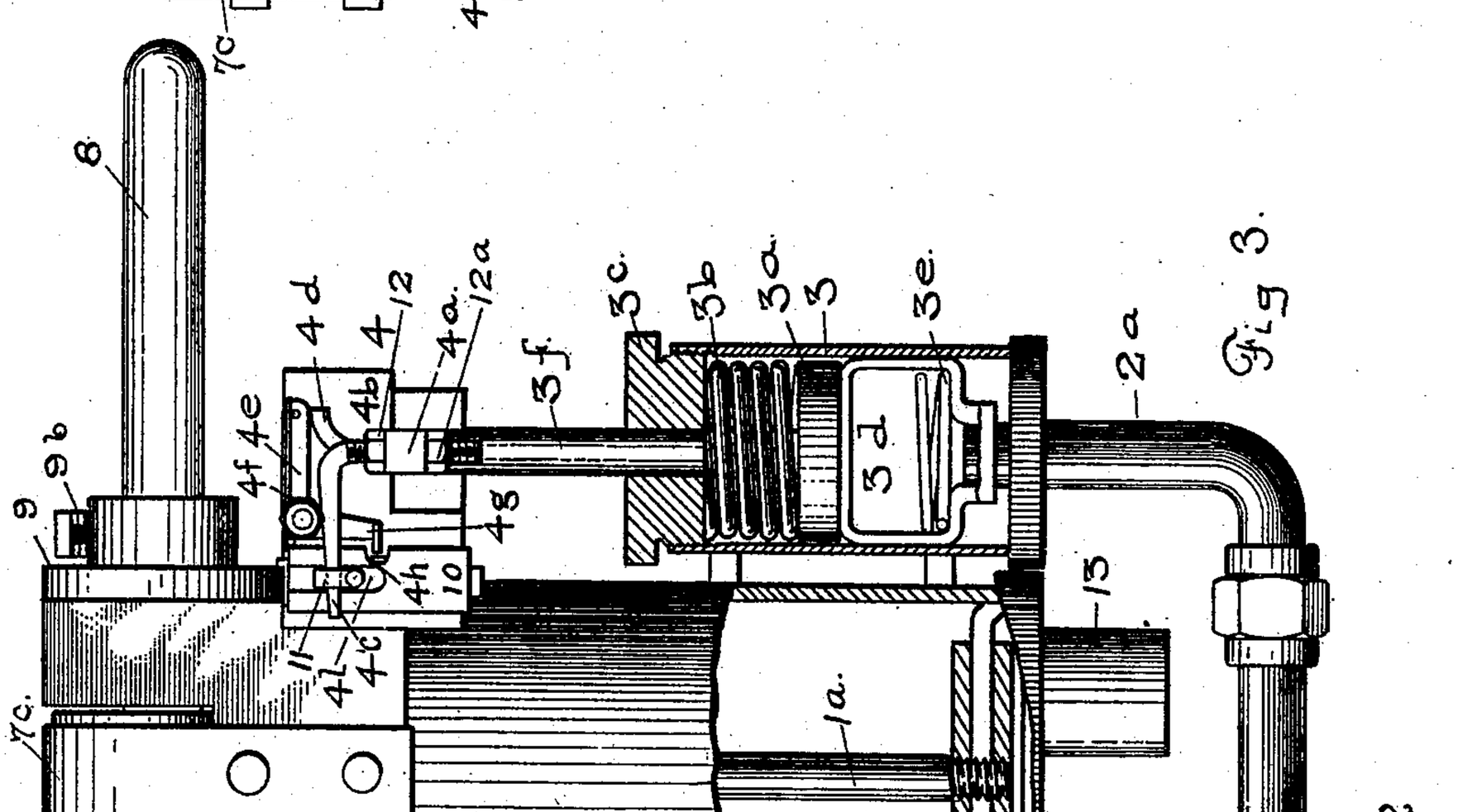

Fig 3.

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AUTOMATIC TIRE INFLATER.

(Application filed Apr. 17, 1899.)

(No Model.) 3 Sheets—Sheet 3.

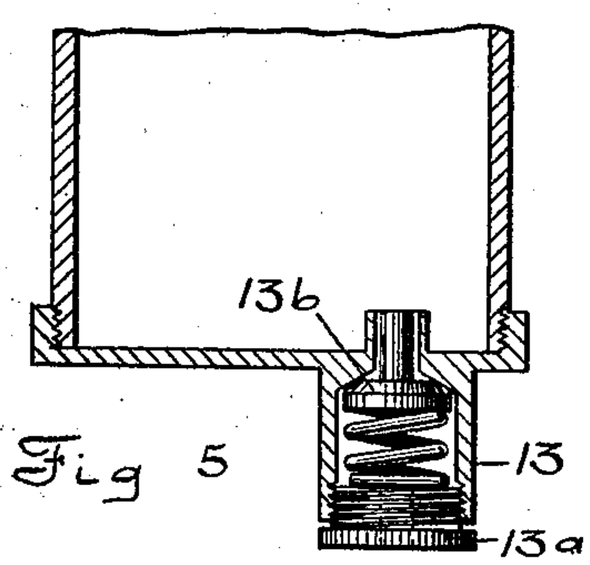

Fig 5

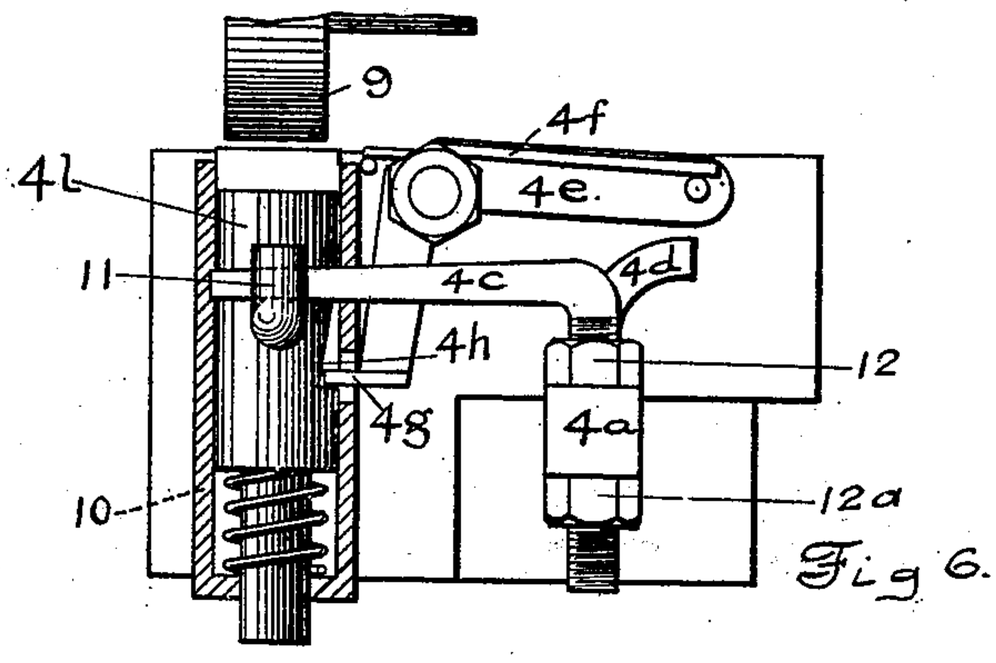

Fig 6.

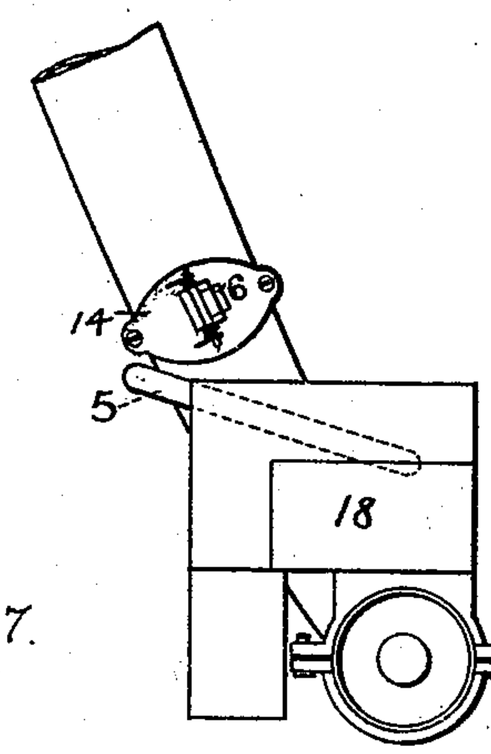

Fig. 7.

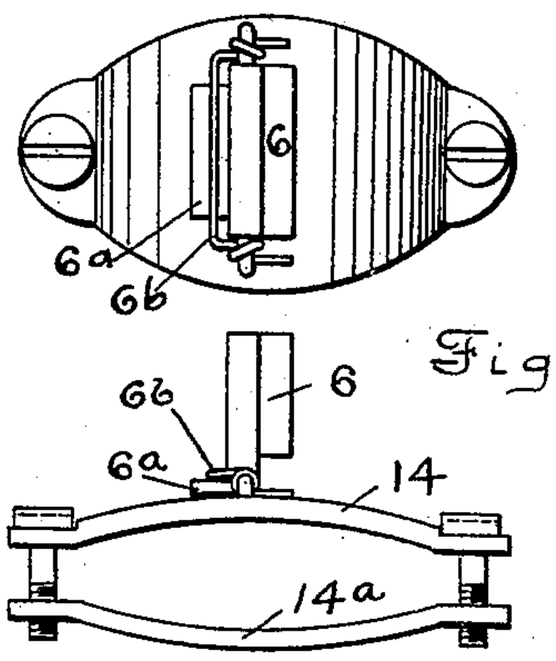

Fig 8.

Fig. 9

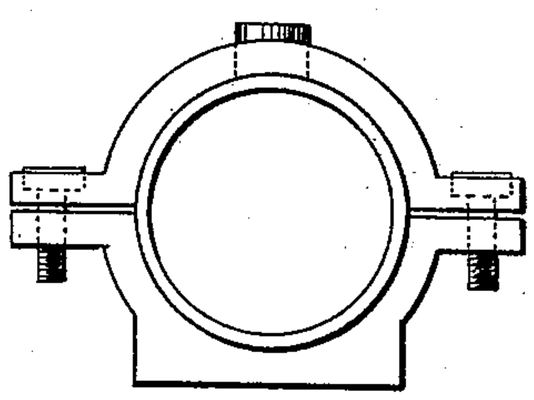

Fig 10.

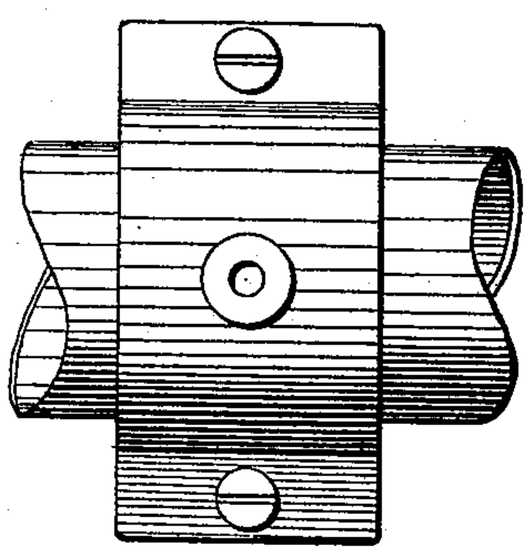

Fig 11.

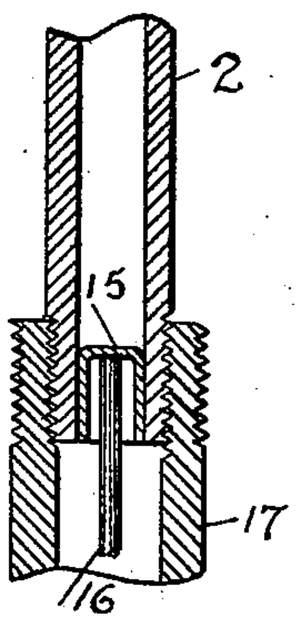

Fig 12.

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UNITED STATES PATENT OFFICE.

ALBERT FISHER, OF BAY CITY, MICHIGAN.

AUTOMATIC TIRE-INFLATER.

SPECIFICATION forming part of Letters Patent No. 636,249, dated November 7, 1899.

Application filed April 17, 1899. Serial No. 713,364. (No model.)

To all whom it may concern:

Be it known that I, ALBERT FISHER, a citizen of the United States, residing at Bay City, in the county of Bay and State of Michigan, have invented certain new and useful Improvements in Automatic Tire-Inflaters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to automatic tire-inflaters, and pertains more particularly to means for automatically inflating bicycle-tires while the bicycle is in motion.

The improvements consist in certain means and devices whereby I accomplish the objects of my invention, which are, first, to provide an automatic tire-inflater that is adapted to be attached to the hub of a vehicle-wheel and to revolve therewith and having communication with the interior of the tire; second, to provide means whereby the inflater is operated while the wheel rotates in a forward direction, but is inoperative when the wheel is moved backward; third, to provide an automatic tire-inflater that will operate when the pressure of air within the tire falls below the desired amount and will be inoperative when the desired pressure is attained; fourth, to provide means whereby the inflater may be set to produce any desired pressure in the tire; fifth, to provide means whereby the inflater may be set to commence operating when the pressure within the tire drops a stated amount below the maximum pressure carried; sixth, to provide a safety-valve that will prevent overinflation of the tire; seventh, to provide as an article of manufacture a tire-inflater that will be simple in construction, automatic in operation, and conveniently arranged for application to existing forms of wheels. I accomplish these objects by the means illustrated in the accompanying drawings, throughout the several views of which similar characters of reference designate similar parts and devices.

In the drawings, Figure 1 is a side view of the front wheel of a bicycle, showing the inflater attached. Fig. 2 is a top view of the inflater on an enlarged scale. Fig. 3 is a rear elevation of the inflater broken away in parts. Fig. 4 is a side view of the inflater. Fig. 5 is a sectional detail of the safety-valve. Fig. 6 is an enlarged detail of the releasing mechanism. Fig. 7 is a detail showing the inflater and wiper attached to the front fork of a bicycle. Fig. 8 is a side view of the wiper and the clamp for attaching it to the fork of a bicycle. Fig. 9 is a top view of the parts shown in Fig. 8. Fig. 10 is an end view of the clamp for securing the inflater to the hub of a bicycle. Fig. 11 is a top view of the parts shown in Fig. 10. Fig. 12 is a sectional detail of the outer end of the inflater-tube, showing its attachment to the valve of a bicycle-tire.

As is clearly shown in the drawings, the inflater consists, essentially, of an air-pump 1, attached to the hub of the wheel and rotatable therewith and communicating with the tire through a tube 2. A pressure-cylinder 3 communicates with the tube 2 and contains a spring-pressed plunger 3^a, which operates the releasing mechanism 4 for throwing the air-pump into or out of operation as the pressure in the tire diminishes or increases. The air-pump is operated by a bent lever 5, the end of which as the wheel revolves engages a wiper 6, attached to the frame of the bicycle, and is thereby depressed, thus depressing the plunger-arm 7 of the air-pump 1, said arm being fixed to the shaft 8 and moving with it and being connected by a crank-link 7^b to the head of the piston-rod 1^a. To render the pump inoperative when the desired pressure is attained, the lever 5 is held depressed, so as to pass under the wiper 6 without touching it. The means by which this is accomplished will be more fully described hereinafter.

When the lever 5 is in its operative position, rotation of the bicycle-wheel causes a depression of the air-pump plunger with each turn of the wheel, thus forcing air into the tire through the tube 2 while the bicycle is being propelled. A spring 7^c, attached at one end to the air-pump body, prevents undue vibration of the plunger-arm 7.

The means employed for throwing the air-pump out of operation when the tire is sufficiently inflated is as follows: The pressure-cylinder 3, which is in communication with the tube 2, contains the plunger 3^a, which is normally pressed downward by a coiled spring 3^b, the pressure of which can be regulated by turning the screw-cap 3^c of the cylinder 3.

Beneath the plunger is a rubber sac or cell 3^d, communicating with the interior of the tube 2 by a pipe 2^a or otherwise. The lower end of the cell 3^d is distended by a spring 3^e, contained therein. When the pressure of air within the tire is sufficient to overcome the pressure to which the spring 3^b is adjusted, the plunger-rod 3^f is raised and operates the releasing mechanism, thus throwing the pump out of operation.

By the use of the expansible rubber cell 3^d within the cylinder 3 leakage of air past the plunger 3^a is prevented. The distending-spring 3^e prevents collapse of the cell when the tire is deflated. Increase or decrease of pressure within the tire produces a proportionate rise or fall of the plunger-rod 3^f. To the upper end of the plunger-rod is attached a horizontal arm 4^a, that has vertical movement in a slotted guide 4^b, attached to the cylinder 1. Attached to the arm 4^a are two upwardly and outwardly extending arms 4^c and 4^d. The upper end of arm 4^d when near the top of its travel engages the horizontal member of a pivoted bell-crank lever 4^e, mounted on the guide 4^b. A spring 4^f, attached to the pivot of the bell-crank lever, holds the horizontal member of the latter pressed normally downward. The vertical member of the bell-crank lever has a projection 4^g, adapted to engage the notch 4^h of a vertical spring-pressed bolt 4^l, contained in a vertical cylindrical guide 10, and is arranged to be disengaged therefrom when the horizontal member of the bell-crank lever is pushed upward by the arm 4^d.

The upper end of the bolt 4^l is flattened to engage a notch 9^a in the periphery of a collar 9, which is attached to the shaft 8 by a set-screw 9^b or otherwise.

An upwardly-projecting hook 11 is fixed to the bolt 4^l and moves in a longitudinal slot of the cylinder 10. The hook 11 is arranged to engage the end of the arm 4^c, which thus restricts the upward movement of the bolt 4^l.

The operation of the releasing mechanism is as follows: As the pressure in the tire decreases by reason of a puncture or other cause the spring 3^b gradually lowers the plunger 3^a, its rod 3^f, and the horizontal arm 4^a, the arm being guided in its movement by the slotted guide 4^b. As the arm 4^a slowly descends the arm 4^c engages the hook 11, draws down the bolt 4^l, and disengages its top from the notch 9^a of the collar 9. Meanwhile the arm 4^d, which is attached to the horizontal arm 4^a and moves with it, has descended and allowed the horizontal member of the bell-crank lever 4^e to descend, thus engaging the projection 4^g of the vertical member of the lever in the notch 4^h of the spring-pressed bolt 4^l, securely holding the latter. The lever 5, being released by the disengagement of the bolt 4^l from the notch 9^a, is forced upward by the pressure of the spring 7^a, Fig. 4, and is thus brought into engagement with the wiper 6, Figs. 7, 8, and 9, thus putting the pump into operation.

The pump operates during the forward movement of the bicycle until sufficient air has been pumped into the tire to overcome the resistance of the spring 3^b, thus slowly raising the plunger-rod 3^f and the horizontal arm 4^a. By this means the arm 4^c, Fig. 6, is raised clear of the hook 11, while the projection 4^g of the bell-crank lever remains engaged in the notch 4^h of the spring-pressed bolt 4^l and prevents the latter from rising. A further upward movement of the arm 4^a brings the arm 4^d into contact with the horizontal member of the bell-crank lever 4^e, forcing it upward, and thus suddenly releasing the bolt 4^l and permitting it to engage the notch 9^a of the collar 9 during the next stroke of the pump. It is thus seen that decreasing the pressure of air within the tire sets the pump in operation and that the pump ceases operating when the pressure to which the spring 3^b is adjusted is reached.

By raising or lowering the arm 4^c relatively to the arm 4^a by means of the set-nuts 12 and 12^a upon its threaded vertical shank the depth to which the end of the bolt 4^l may engage the notch 9^a can be regulated. Raising the arm 4^c in the manner stated increases the distance the bolt 4^l must travel after it is suddenly released from the projection 4^g before the hook 11 engages the arm 4^c. Consequently when the air-pressure within the tire decreases the bolt must travel a longer distance downward before it is released from the notch 9^a. This means of increasing or decreasing the depth of engagement of the bolt 4^l with the notch 9^a forms an essential feature of my invention, as by it I am enabled to allow the pressure within the tire to drop any stated amount—say five pounds—before the spring 3^b has expanded sufficiently to release the bolt 4^l from the notch 9^a and throws the pump into action.

It is evident that by properly adjusting the spring 3^b and the height of the arm 4^c a tire may be inflated to any desired pressure—say fifty-five pounds—at which point the pump will cease to operate. After a puncture or other cause of leakage the pressure will drop, and upon reaching a pressure of, say, fifty pounds the pump will start automatically and continue to operate until the tire is inflated to its original pressure of fifty-five pounds, when the pump will again cease to operate.

A safety-valve, Fig. 5, consisting of a cylinder 13, screw-cap 13^a, and spring-pressed valve 13^b, is preferably provided on the cylinder 1 to prevent overinflation of the tire.

The wiper, Figs. 8 and 9, consists of two clamps 14 and 14^a, adapted to fit the frame of the bicycle, one of said clamps carrying a rubber-faced wiper 6, hinged to the clamp at its lower end and having a flat portion 6^a extending at right angles to the face 6 to pre-

vent overturning when the face of the wiper is struck by the pump-operating lever 5 during the forward motion of the wheel and to admit of folding down against the clamp 14 when the wheel is moved backward, thus preventing damage to the pump by forcing the lever 5 upward. A wire spring 6^b holds the wiper normally perpendicular to the clamp. A clamp suitable for securing the inflator to the bicycle-hub is shown in Figs. 10 and 11. The lower end of the tube 2 is preferably adapted to screw into the tire-valve and has a diametral pin or U-shaped wire 15 inserted in its end to hold the stem 16 of the tire-valve 17 depressed, as shown in Fig. 12, thus holding the valve open and permitting free communication between the interior of the tire and the air-cell 3^d within the pressure-chamber 3.

A suitable box of sheet metal (shown in Fig. 7) is used to incase the working parts of the inflater and to prevent injury to them by dust or an accidental blow. This box 18 is preferably secured to the inflater, as shown in Figs. 10 and 11, by screws or other suitable means.

A tire-valve 19 of any approved form is interposed in the tube 2 between the air-pump cylinder 1 and the outlet from pipe 2 to the compression-cylinder 3 to permit the air-pump to operate and at the same time to allow free communication between the cell 3^d and the tire.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an automatic tire-inflater for vehicle-wheels the combination of an air-pump fixed to the hub of the wheel and rotatable therewith; a radially-extending tube connecting the air-pump and the tire; of a pressure-cylinder containing a plunger which is pressed downward by an adjustable pressure-regulating spring, and an expansible air-cell below the plunger and communicating with the tire; of a pivoted lever supported by the air-pump cylinder and adapted to operate the air-pump piston; a second lever for imparting motion to the first lever; a wiper attached to the frame of the vehicle and arranged to engage the second lever; and means, substantially as described, for retaining the second lever in inoperative position when the pressure of air in the pressure-cylinder overcomes the resistance of the pressure-regulating spring; all arranged for the purpose described and substantially as set forth.

2. In an automatic inflater for vehicle-tires the combination with an air-pump attached to the hub of the vehicle-wheel and communicating with the tire, said pump being adapted to be operated by a pivoted lever; of a wiper attached to the vehicle-frame and adapted to engage the pump-lever; a pressure-chamber communicating with the tire, said chamber having a spring-pressed piston; a collar mounted on the pivot of the air-pump lever and having one or more notches in its periphery; a movable spring-pressed bolt adapted to engage said notches and to thereby withhold said lever from engagement with the wiper; a projecting hook fixed to said bolt; a horizontal arm carried by the rod of the spring-pressed piston and adapted to engage said hook; a bell-crank lever adapted to engage a notch in said spring-pressed bolt; an upwardly-projecting arm carried by the said piston-rod for operating the bell-crank lever, all arranged and operating in the manner described and for the purpose set forth.

3. The combination with an automatic tire-inflater a pressure-regulating chamber comprising a cylinder, a spring-pressed plunger within the cylinder, and a flexible air-tight sac below said plunger; said sac being in communication with the tire.

In testimony whereof I affix my signature in presence of two witnesses.

ALBERT FISHER.

Witnesses:
GEO. B. WILLCOX,
M. H. IRWIN.