No. 628,727. Patented July 11, 1899.

F. SCHUMACHER.

COMPRESSED AIR MECHANISM FOR VEHICLES.

(Application filed Sept. 6, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

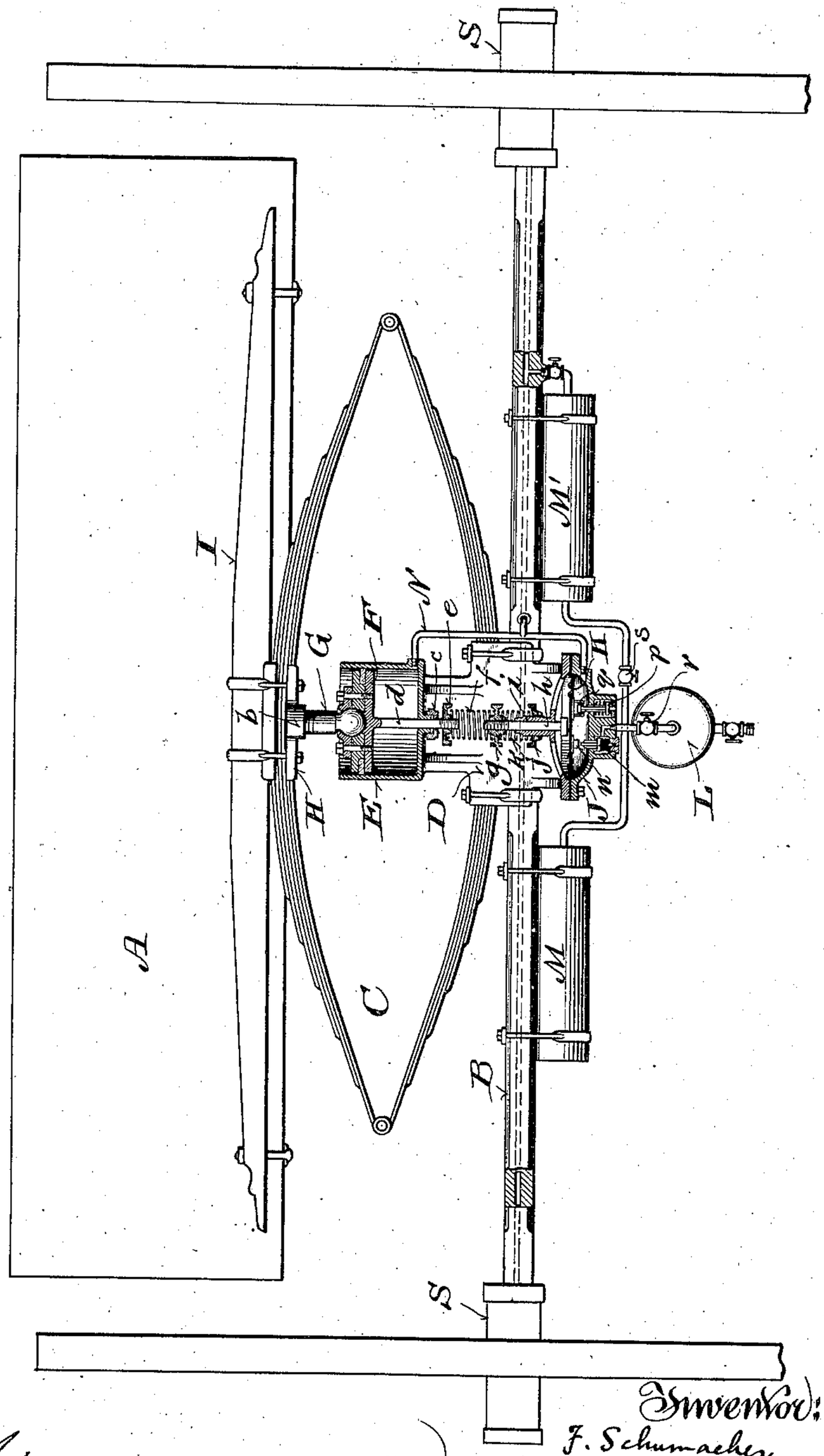

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Fig. 3.

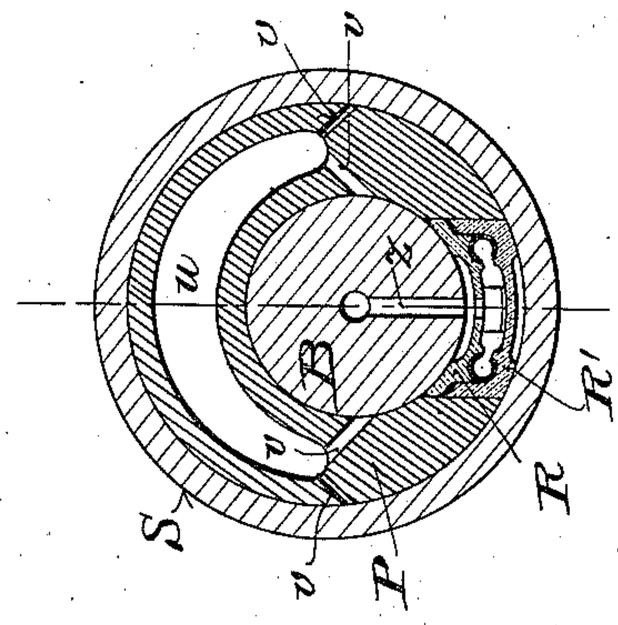


Fig. 4.

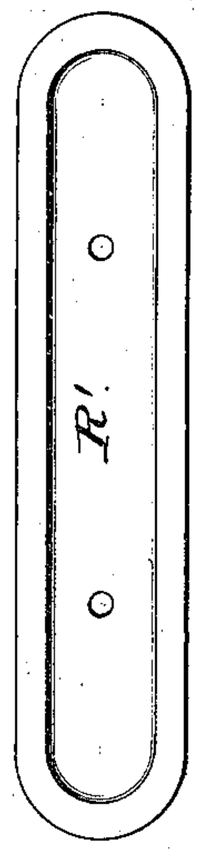
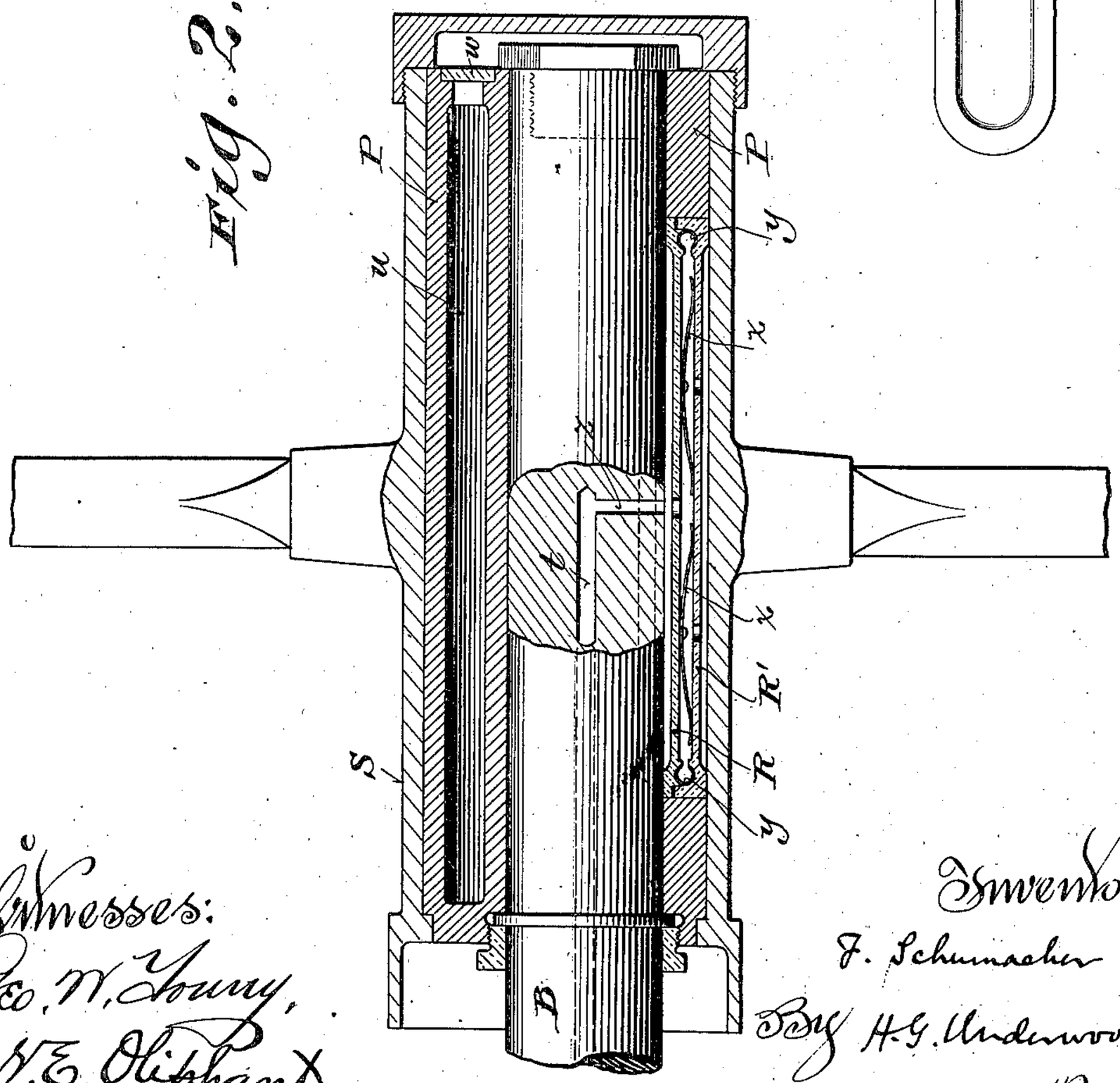


Fig. 2.



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UNITED STATES PATENT OFFICE.

FERDINAND SCHUMACHER, OF IRON RIDGE, WISCONSIN.

COMPRESSED-AIR MECHANISM FOR VEHICLES.

SPECIFICATION forming part of Letters Patent No. 628,727, dated July 11, 1899.

Application filed September 6, 1898. Serial No. 690,249. (No model.)

To all whom it may concern:

Be it known that I, FERDINAND SCHUMACHER, a citizen of the United States, and a resident of Iron Ridge, in the county of Dodge and State of Wisconsin, have invented certain new and useful Improvements in Compressed-Air Mechanism for Vehicles; and I do hereby declare that the following is a full, clear, and exact description thereof.

Referring to my United States Patent No. 601,285, issued March 29, 1898, the present improvements pertain to the utilization of compressed air as a means for reducing friction. Therefore said improvements consist in certain peculiarities of construction and combination of parts hereinafter set forth with reference to the accompanying drawings and subsequently claimed, special attention being given to road-vehicles.

Figure 1 of the drawings represents a sectional front elevation of my improvements in connection with a road-vehicle; Fig. 2, a detail sectional view illustrating a portion of a vehicle-axle, a wheel-hub thereon, and means for the application of compressed air to reduce friction; Fig. 3, a transverse section of the assemblage shown in the preceding figure, and Fig. 4 a plan view of an expansible bearing-block section inverted.

Referring by letter to the drawings, A represents a vehicle-body; B, an axle of its running-gear; C, an interposed elliptic spring, and D a casting that is clipped with the spring to the axle.

Constituting part of the casting D is a pot E, containing an air-tight piston F, and a rod G, in ball-and-socket-joint connection with the piston, has adjustable screw-thread connection with the central socket portion *b* of a stay-plate H, clipped with the spring C to a body-bar I of the vehicle. Depending from the piston through a stuffing-box *c*, central of the pot-bottom, is a screw-threaded stem *d*, and a flanged nut *e*, adjustable on this stem, is opposed to a spiral spring *f*, seated on another flanged nut *g*, adjustable on a screw-threaded plunger *h*, that extends down through an externally-screw-threaded sleeve *i*, rising from the center of the upper half of a casing J, containing an expansible diaphragm K, the sleeve being engaged by a nut *j*, that constitutes a seat for another spiral spring *k*, opposed by the nut *g* aforesaid, this latter spring being at all times of less tension than the one aforesaid.

The upper half of the diaphragm-casing constitutes part of the casting aforesaid, and the lower half of said casing, bolted in place, is provided with an inlet-port and an outlet-port governed by spring-controlled valves. The valve *m*, governing the inlet-port, opens downward against the spring surrounding its stem, and the latter is opposed by a boss *n*, depending from the expansible diaphragm. The valve *p*, governing the exhaust-port, has the upper end of its stem headed within a cup *q* on the under side of the diaphragm. Therefore lift of the diaphragm will unseat the latter valve against resistance of the spring surrounding its stem.

The inlet-port of the diaphragm-casing has pipe connection with a storage-reservoir L for a supply of compressed air, and this pipe connection is governed by a cock *r*, that serves to regulate or cut off the flow of said air to said casing.

Auxiliary air-chambers M M′, suspended from axle B, have pipe connection with each other, and by means of a cock *s* one of these chambers may be cut off from the other. The chamber M′ has cock-controlled pipe communication with an air-passage *t*, longitudinally of the axle B, and this air-passage is also in communication with a pipe N, connecting the lower portion of diaphragm-casing J with the pot E aforesaid.

Held loose on each end of the axle, eccentric thereto, is a cylindrical shell P, provided with a longitudinal lubricant-chamber *u*, having distributing-ports *v*, the inlet-port of this chamber being closed by a rotarily-adjustable slide *w*. (Shown in Fig. 2.) A recessed portion of shell P is engaged by an expansible bearing-block comprising intermatching sections R R′, interposed springs *x*, and yielding packing *y*, the latter serving to make the joints of said block air-tight. Externally the faces of the bearing-block sections are recessed to provide inner and outer air-spaces respectively adjacent to the axle and a wheel-hub S, loose on the shell P, said axle and wheel-hub being lubricated by material escaping through the ports *v* of said shell.

A port *z* leads from the air-passage in the

axle into the inner air-space between said axle and expansible bearing-block, and the sections of this block are apertured, so as to provide for flow of air between the same, as well as into the space between said block and the wheel-hub. The area between sections of the bearing-block being greater than that in the inner and outer spaces adjacent thereto, the pressure exerted will hold the sections of said block snug against the axle and wheel-hub when the compressed air is on, and the latter being off the springs *x*, under tension between the block-sections, compensate for wear. Therefore there is always air-tight opposition of said block to said axle and hub.

In practice the volume of compressed air in pot E and one or both auxiliary chambers M M′ in communication with said pot exerts pressure in the air-spaces in and about the expansible bearing-block above specified, this pressure being automatically governed in proportion to load in order to reduce friction intermediate of the axle and wheels.

Assuming that piston F is in the position shown in Fig. 1, under normal load, increase of load will cause descent of said piston to compress the air intermediate of this piston and the wheel-hubs, the compression being proportioned so that lifting pressure within the recesses of the expansible bearing-block sections R R′ will compensate for friction that would otherwise come upon the axle and said wheel-hubs, the rate of compression being regulated by adjustment of air-cock *s* and the piston-rod G in socket *b*, as well as by adjustment of nut *e* in some instances. The automatic air compression will take place, whether downward movement of piston F be fast or slow, without affecting valve *m*, controlling inlet from the reservoir L; but should the pressure become too low from any cause—such, for instance, as unavoidable leakage of air incidental to travel of the vehicle—the tension of spring *f* will overcome the combined force of the reduced pressure below diaphragm K and resistance of spring *k*, whereby plunger *h* will be exerted on said diaphragm to unseat said valve, thus permitting inflow of enough compressed air from said reservoir to obtain the proper degree of pressure in and about the expansible bearing-block.

If at any time air-pressure in and about the expansible bearing-block is too high, the nut *j* is run up to increase tension of spring *k*, and the latter, with the pressure below diaphragm K, will operate to overcome spring *f*, whereby said diaphragm will be lifted to elevate valve *p*, and thus permit escape of air until said pressure and tension of the former spring counterbalance with the tension of the other or stronger spring, whereupon the exhaust-valve is again seated.

The auxiliary chambers M M′ are only employed when it is not convenient to make the pot E of sufficient area for the necessary volume of air opposed to descent of piston G in said pot, as well as in and about the expansible bearing-block. Hence provision is had for cutting off one or all of said chambers from automatically-governed air-supply.

Owing to the air-spaces provided adjacent to the axle and wheel-hub the frictional area is proportionally lessened, and the pressure exerted by the air being proportioned to variations of load there is compensation for all the friction that would otherwise result.

Each shell P being eccentric to the axle upon which it is held, it will yield incidental to shock caused by obstructions in the path of the vehicle-wheel, to which it is relative, or to ascent and descent of road-grade, thereby causing the expansible bearing-block and air chamber or recess containing same to come directly opposite the line of pressure resultant between the draft and load; but the resistance being overcome said shell will by gravity automatically return to normal position.

In practice the upper recess or air-space in the expansible bearing-block is of such width that it does not get out of register with the port *z* in the axle incidental to the yield of shell P to shock or inclination of road upon which the vehicle travels.

While I have only shown my improvements in connection with the forward spring and axle of the vehicle, they are duplicated in connection with the rear spring and axle.

Ordinarily load-pressure will cause an axle to press against the inner lower surface of wheel-hubs thereon. Therefore rotation of these hubs results in considerable friction. To obviate this friction as a result of load-pressure, it will be understood from the foregoing that a volume of compressed air is interposed between the inner lower surface of each wheel-hub and its axle, the pressure of this compressed air being so regulated with respect to all load variations that it counteracts load-pressure on said axle without forcing the latter against the upper inner surface of the hub.

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

1. A vehicle having a cushion for load, longitudinally-recessed cylindrical shells loose on axle extremities of the vehicle running-gear, wheels having their hubs loose on the shells, an expansible bearing-block in the recess of each shell comprising a pair of apertured intermatching sections having air-tight joints and reduction of face to provide air-spaces adjacent to an axle and wheel-hub of less area than the air-space between said sections, a compressed-air storage-reservoir in communication with the recesses of said shells, and a governor mechanism operative in conjunction with increase load to regulate the pressure of air exerti e in and about the expansible bearing-blocks.

2. A vehicle having a cushion for load, longitudinally-recessed cylindrical shells in eccentric loose fit on axle extremities of the ve-

hicle running-gear, wheels having their hubs loose on the shells, an expansible bearing-block in the recess of each shell comprising a pair of apertured intermatching sections having air-tight joints and reduction of face to provide air-spaces adjacent to an axle and wheel-hub of less area than the air-space between said sections, a compressed-air storage-reservoir in communication with the recesses of said shells, and a governor mechanism operative in conjunction with increase of load to regulate the pressure of air exertive in and about the expansible bearing-blocks.

3. A vehicle having cushion for load, longitudinally-recessed cylindrical shells loose on axle extremities of the vehicle running-gear and provided with lubricant-chambers having distributing-ports, wheels having their hubs loose on the shells, an expansible bearing-block in the recess of each shell comprising a pair of apertured intermatching sections having air-tight joints and reduction of face to provide air-spaces adjacent to an axle and wheel-hub of less area than the air-space between said sections, a compressed-air storage-reservoir in communication with the recesses of said shells, and a governor mechanism operative in conjunction with increase of load to regulate the pressure of air exertive in and about the expansible bearing-blocks.

4. A vehicle having cushion for load, longitudinally-recessed cylindrical shells loose on axle extremities of the vehicle running-gear, an expansible bearing-block in the recess of each shell comprising a pair of apertured intermatching sections having air-tight joints and reduction of face to provide air-spaces adjacent to an axle and wheel-hub of less area than the air-space between said sections, a cock-controlled compressed-air storage-reservoir, a fixed pot and casing open to each other and said shell-chambers, a spring-valve governing an inlet-port of the casing connected to said reservoir, another spring-valve governing an exhaust-port of said casing, an expansible diaphragm arranged in the aforesaid casing to actuate said valves against resistance of their springs, a sleeve rising from the diaphragm-casing, a plunger in loose engagement with the sleeve, a nut having screw-thread adjustment on said sleeve, a spring seated on the nut, another nut adjustable on the plunger against the spring, another spring of greater tension than the one aforesaid seated on the latter nut, a piston in the pot provided with a depending stem having air-tight play through the pot-bottom, a nut adjustable on this stem against the latter spring, and a rod connecting the piston and body portion of the vehicle.

5. A vehicle having cushion for load, longitudinally-recessed shells loose on axle extremities of the vehicle running-gear, an expansible bearing-block in the recess of said shell comprising a pair of apertured intermatching sections having air-tight joints and reduction of face to provide air-spaces adjacent to an axle and wheel-hub of less area than the air-space between said sections, a cock-controlled compressed-air storage-reservoir, a fixed pot and casing having communication with each other and said shell-chambers, a plurality of auxiliary air-chambers having cock-controlled communication with each other and aforesaid shell-chambers, a spring-valve governing an inlet-port of the casing connected to said reservoir, another spring-valve governing an exhaust-port of said casing, an expansible diaphragm in the aforesaid casing to actuate said valves against resistance of their springs, a sleeve rising from the diaphragm-casing, a plunger in loose engagement with the sleeve, a nut having screw-thread adjustment on said sleeve, a spring seated on the nut, another nut adjustable on the plunger against the spring, another spring of greater tension than the one aforesaid seated on the latter nut, a piston in the pot provided with a depending stem having air-tight play through the pot-bottom, a nut adjustable on this stem against the latter spring, and a rod connecting the piston and body portion of the vehicle.

6. A rotative carrier, its load, an expansible bearing-block intermediate of the load and carrier having reduction of face to provide air-spaces adjacent to opposing surfaces, and means for establishing a volume of confined air having regulated pressure in and about said bearing-block.

7. A rotative carrier, its load, a spring-controlled expansible bearing-block intermediate of the load and carrier having reduction of face to provide air-spaces adjacent to opposing surfaces, and means for establishing a volume of confined air having regulated pressure in and about said bearing-block.

8. A rotative carrier, its load, a recessed cylindrical shell in eccentric loose fit on the carrier, an expansible bearing-block in the shell-recess having reduction of face to provide air-spaces adjacent to opposing surfaces, and means for establishing a volume of confined air having regulated pressure in and about said bearing-block.

In testimony that I claim the foregoing I have hereunto set my hand, at Iron Ridge, in the county of Dodge and State of Wisconsin, in the presence of two witnesses.

FERDINAND SCHUMACHER.

Witnesses:
A. P. WALTHER,
CHR. A. CHRISTIANSEN.