No. 625,853. Patented May 30, 1899.

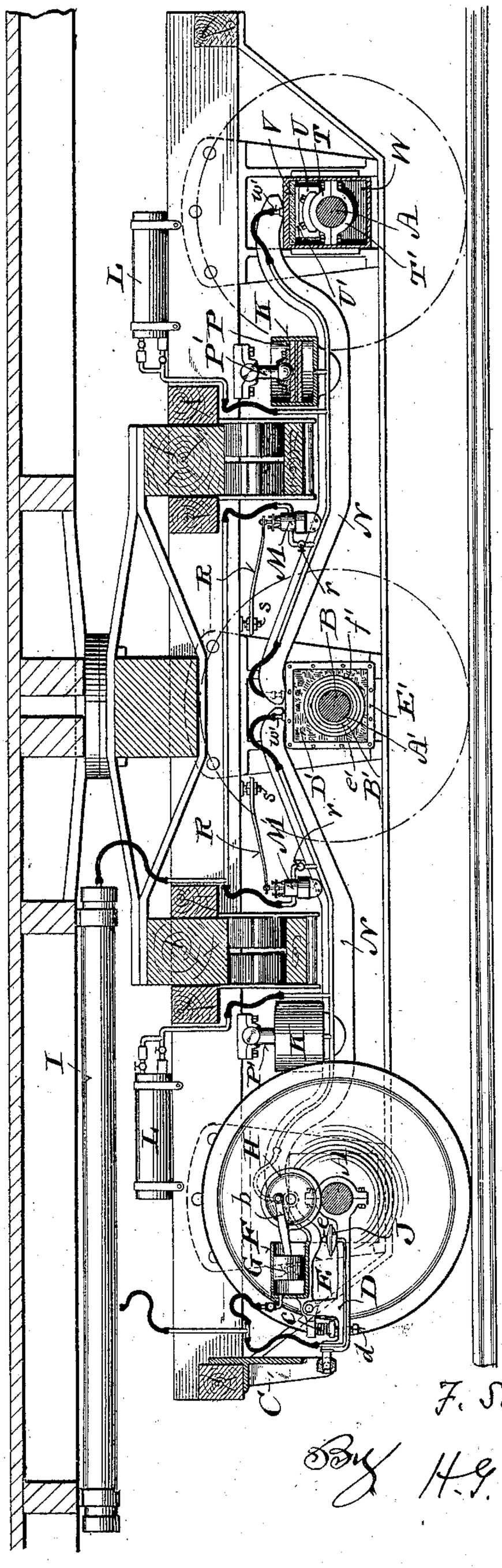
F. SCHUMACHER.

COMPRESSED AIR MECHANISM FOR RAILWAY ROLLING STOCK, &c.

(Application filed Aug. 4, 1898.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

Fig. 4.

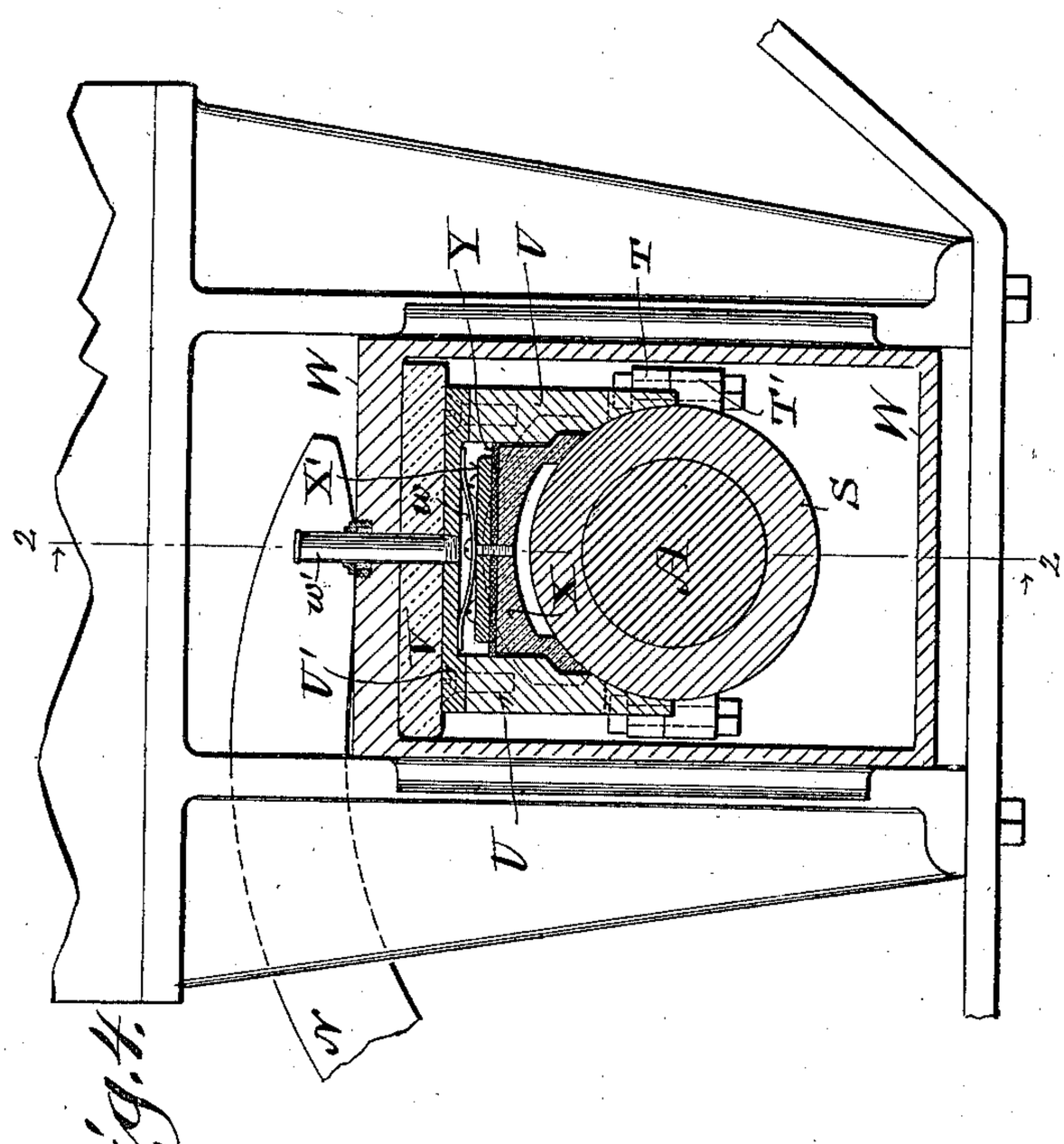


Fig. 5.

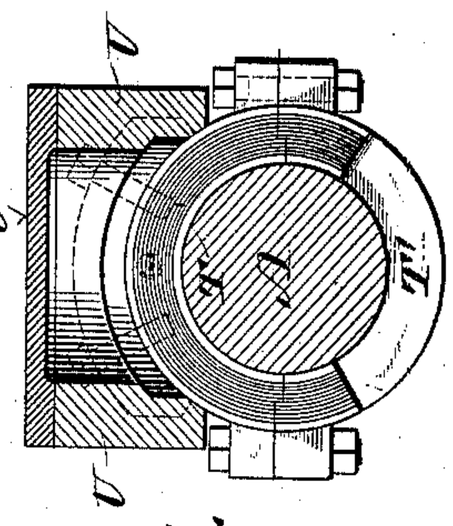


Fig. 2.

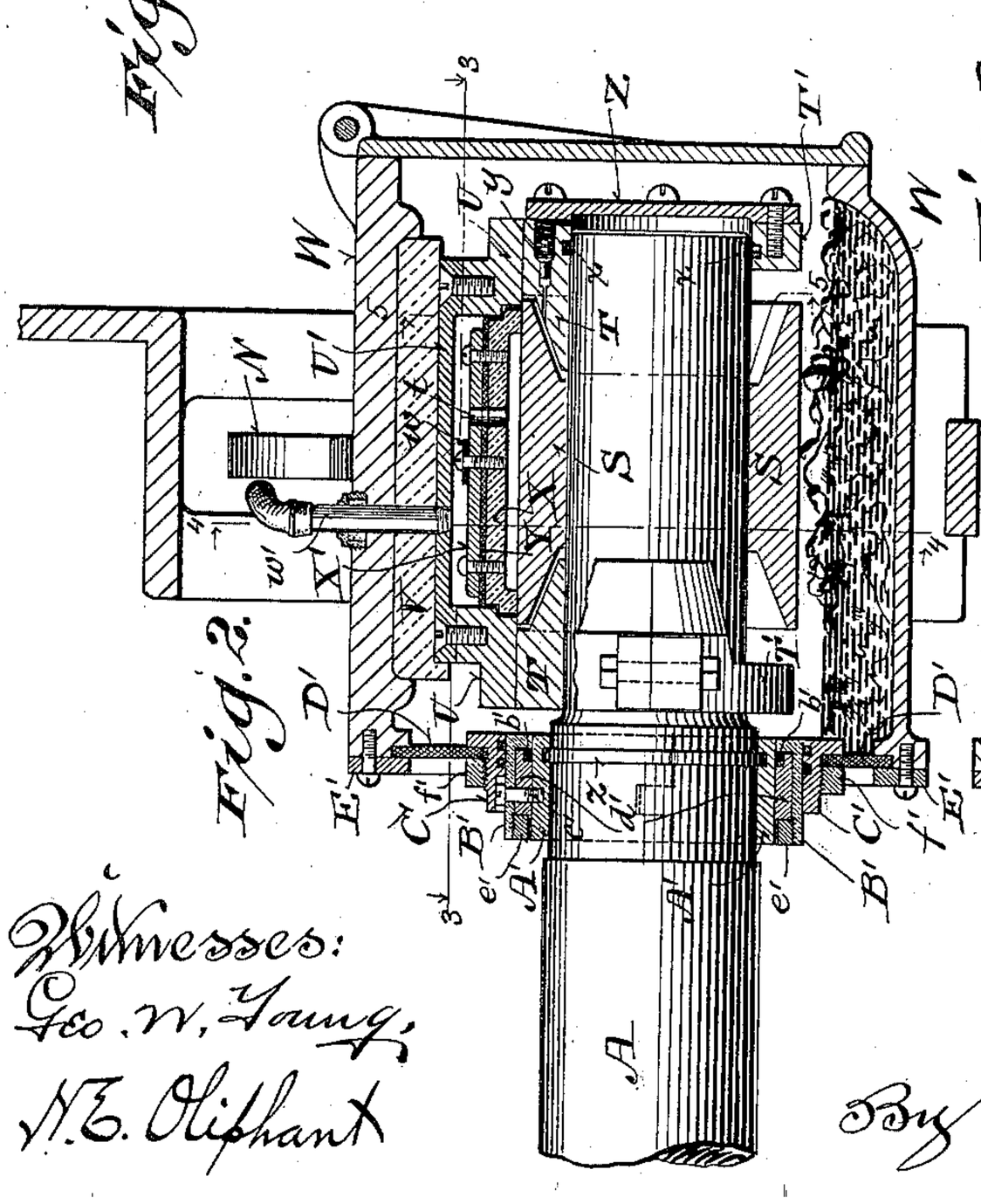
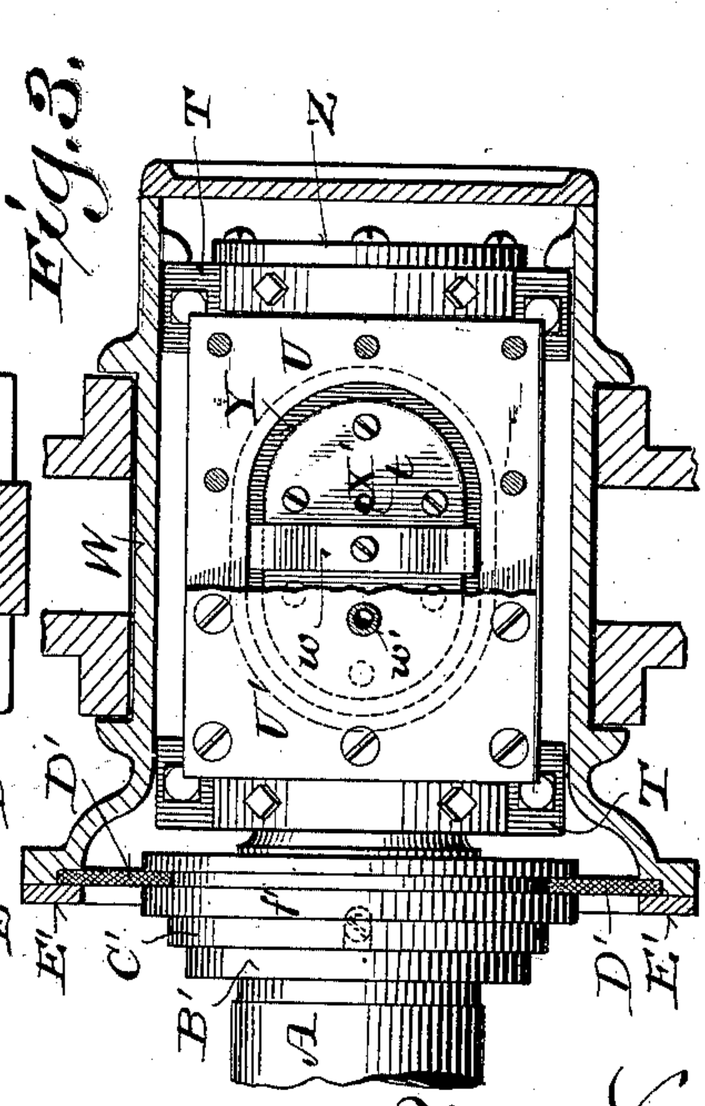


Fig. 3.



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(No Model.) 4 Sheets—Sheet 3.

Fig. 1.

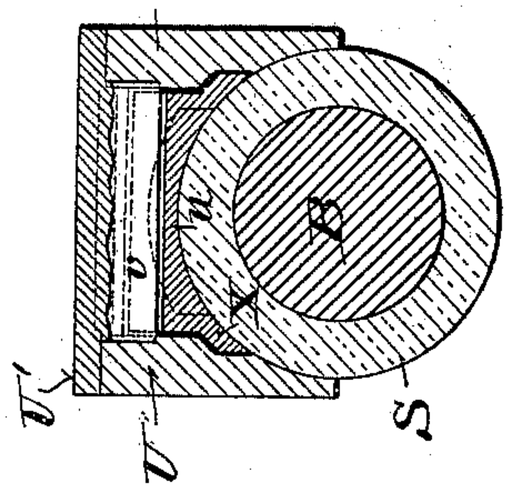
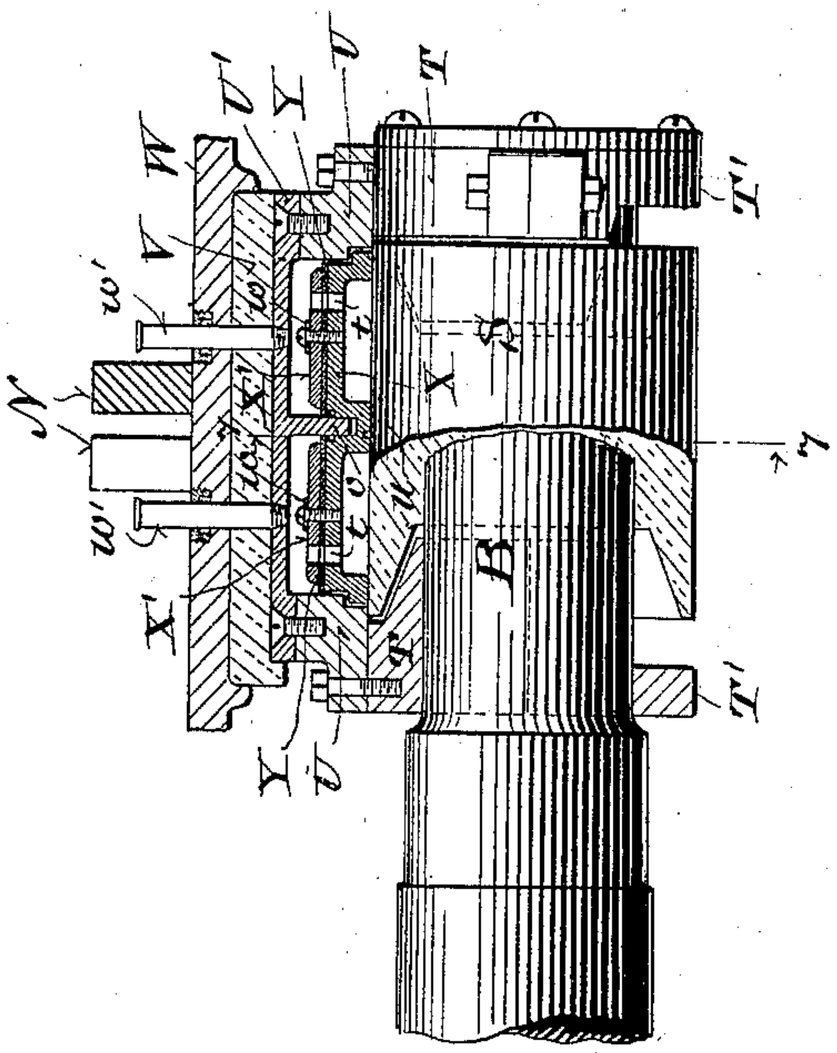


Fig. 6.



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(No Model.) 4 Sheets—Sheet 4.

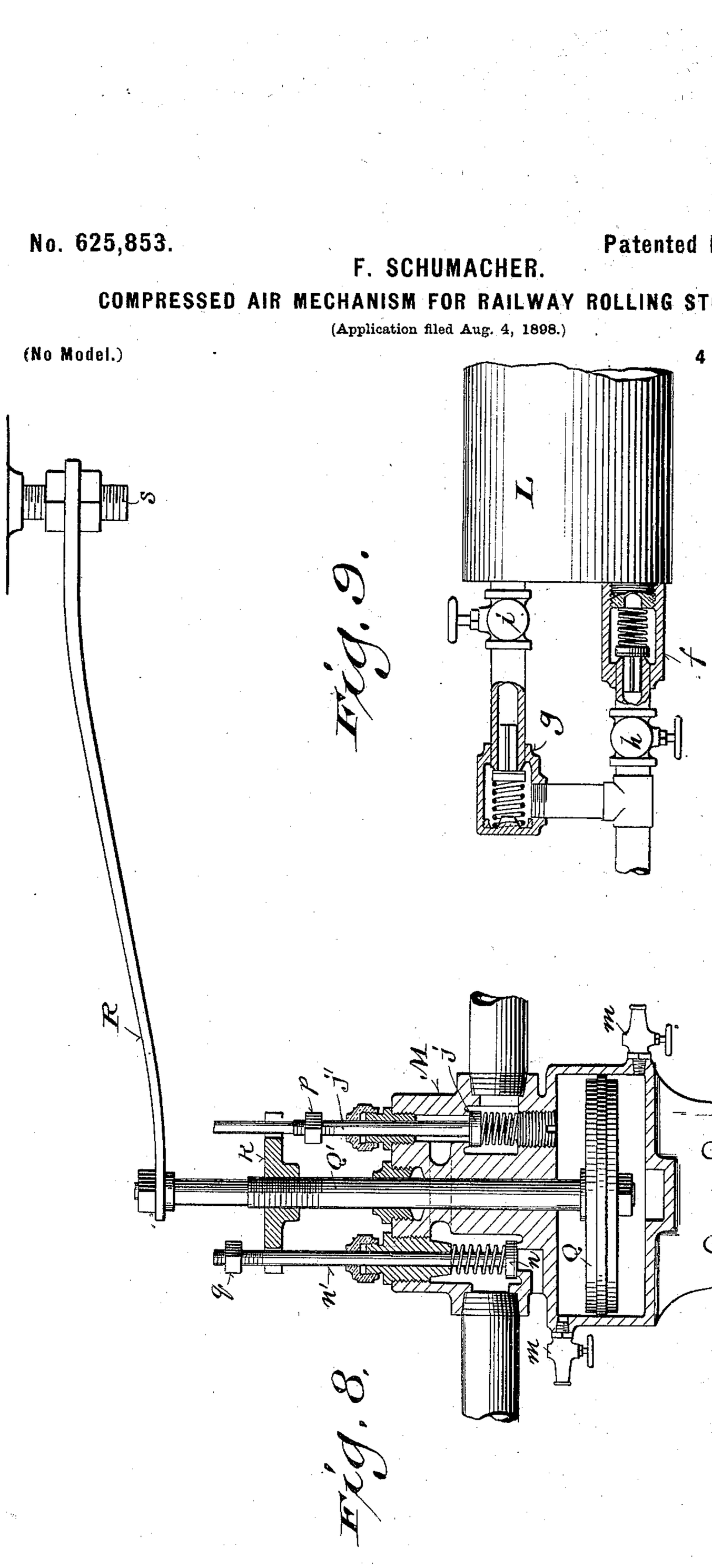

Fig. 9.

Fig. 8.

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UNITED STATES PATENT OFFICE.

FERDINAND SCHUMACHER, OF IRON RIDGE, WISCONSIN.

COMPRESSED-AIR MECHANISM FOR RAILWAY ROLLING-STOCK, &c.

SPECIFICATION forming part of Letters Patent No. 625,853, dated May 30, 1899.

Application filed August 4, 1898. Serial No. 687,697. (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 Railway Rolling-Stock and other Devices; 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 absorbing vibration and reducing friction. Therefore they consist in certain peculiarities of construction and combination of parts hereinafter set forth with reference to the accompanying drawings and subsequently claimed, especial attention being given to the application of said improvements in connection with railway rolling-stock.

Figure 1 of the drawings represents a longitudinal sectional view of a six-wheel railway-truck and a portion of a car thereon, together with a compressed-air mechanism according to my invention; Fig. 2, a detail sectional view on the plane indicated by line 2 2 in the fourth figure, illustrating the detail construction and arrangement of parts employed in connection with a car-axle and journal-box for the same; Fig. 3, a detail plan view, partly in horizontal section on the plane indicated by line 3 3 in the preceding figure; Figs. 4 and 5, detail transverse sections respectively indicated by lines 4 4 and 5 5 in the second figure; Fig. 6, a detail sectional view illustrating construction and arrangement of parts employed in connection with another car-axle and a journal-box for the same; Fig. 7, a transverse section indicated by line 7 7 in the preceding figure; Fig. 8, a sectional view of an air-governor embodied by my invention, and Fig. 9 a partly-sectional plan view of an auxiliary air-chamber that may constitute part of the mechanism herein set forth.

Referring by letter to the drawings, A designates each of the two outer axles, and B the middle axle, of a six-wheel railway-car truck. Depending from one of the end timbers of the truck is a bracket C, having an eye at its lower end engaged by an extremity of a bar D, the other extremity of this bar being in loose detachable connection with one of the axles A and clearly shown in Fig. 1, and fulcrumed on the bar is a lever E, that supports an air-pump cylinder F, the piston G contained in this cylinder being connected by a link *b* with a friction-wheel H, carried by the lever in opposition to said axle. That end of the lever farthest from the friction-wheel is opposed to a spring *c*, that sets in a cup-disk connected to an adjusting-screw *d*, engaging bar D, and the air-pump cylinder has adjustable valve-controlled flexible pipe connection with a reservoir I and a casing J, the latter containing an expansible diaphragm (not shown) having a central stem *e* in opposition to a lever E under the latter between its fulcrum and said friction-wheel.

From the foregoing it will be understood that spring *c* operates at times to tilt lever E, and thereby bring and hold friction-wheel H in forcible contact with the adjacent axle. There being revolution of the axle, the friction-wheel H, when in contact therewith, will cause reciprocation of air-pump piston G until accumulated air in reservoir I and casing J has a predetermined degree of pressure sufficient to cause lift of said lever by stem *e* against resistance of said spring.

Although the reservoir I is shown suspended from the bottom of a car in connection with the truck, it may be mounted on said truck, if found more convenient or desirable, and by means of a system of valve-controlled pipes, herein shown as having flexible sections, said reservoir is connected with cylindrical pots K, auxiliary air-chambers L, pressure-governors M, and casings for truck-axle bearing-blocks, hereinafter particularly specified. A pot K and a governor M are made fast to each equalizing-bar N of the truck, and the auxiliary air-chambers L are clamped on timbers of said truck. As herein shown, each pot K is supported by an equalizing-bar N at a point approximately one-third the length of said bar from an outer axle, and therefore approximately two-thirds the length of the aforesaid bar from the middle axle of the six-wheel truck.

Each of the pots K contains an air-tight piston P in ball-and-socket or otherwise flexible joint connection with the lower end of a

stem P′, and the upper end of this stem is trunnioned or otherwise flexibly joined to a truck-timber. Compressed air is admitted into each pot below the piston therein to cushion, load, and absorb vibration, the volume of this compressed air exertive against all the pistons being automatically regulated by the several governors to maintain the load at a predetermined elevation—such, for instance, as is herein shown.

The auxiliary air-chambers L are employed for the reason that it is not convenient to make the pots K of such dimensions as will at all times insure of a sufficient volume of the compressed air being exerted against the pistons that have their play in said pots, and each chamber is herein shown as having an inlet-nozzle *f* and an outlet-nozzle *g*, each containing a spring-controlled check-valve, the latter being shown in Fig. 9, and by means of cocks *h i* the passage of air through these nozzles may be readily regulated or prevented. There may be any number of the auxiliary air-chambers, as found most convenient or desirable, and any one of the same may be cut off from the air-pipe system to lessen the volume of compressed air exertive against the pistons aforesaid.

As shown by Fig. 8, each of the governors M embodies a shell having an inlet in direct pipe connection with the reserve-supply air-reservoir I, the admission of compressed air to said reservoir being controlled by a spring check-valve *j* within a vertical cell of the shell, and the stem *j′* of this valve is loose in a cross-arm *k*, herein shown as having screw-thread adjustable connection with the rod Q′ of a piston Q, having air-tight play in a lower chamber of the said shell, this chamber being provided with relief-cocks *m* above and below the piston. An exhaust-port of the shell is closed by a spring-controlled check-valve *n*, and the stem *n′* of this valve is also loose in the cross-arm *k*, nuts *p q*, adjustable on the valve-stems *j′ n′*, being opposed to said cross-arm, one above and the other below the same. The valve *n* is within another vertical cell of the shell aforesaid, and the latter cell communicates with a passage leading from the former cell in which the valve *j* has its seat. The cell-containing valve *n* has an outlet coupled to that portion of the air-pipe system in direct communication with one of the aforesaid pots and truck-axle bearing-block casings, the passage of air from said cell being regulated by adjustment of a cock *r*, the latter being indicated in Fig. 1.

The rod Q′ of each piston Q is connected to one end of a spring-arm R, and the other end of this arm is adjustable with nuts on a screw-threaded stem *s* depending from a truck-timber. The valve-stems *j′ n′* of each governor engage stuffing-boxes, and movement of the corresponding piston Q is cushioned by its compression of atmospheric air in the surrounding chamber. Incidental to gradual increase of load descent of the pistons Q, having their rods Q′ connected to the arms R, will cause the cross-arms *k* to operate on the nuts *p*, and thereby effect an unseating of the valves *j* to increase the volume of compressed air exertive against the pistons P in pots K in proportion to said increase of load. When the load is lightened, the pressure on pistons P would cause undue elevation of the remainder of said load were it not for the fact that there will be lift of the pistons Q, through the medium of the arms R, to cause the cross-arms *k* of the piston-rods Q′ to operate upon the nuts *q*, and thereby unseat valves *n*, thus permitting escape of surplus compressed air through exhaust-ports of the governors.

The position of the cross-arm *k* with respect to the nuts or other contacts on the stems of valves *j n* is such that said valves are not affected by momentary concussions of the load, these concussions being resisted and cushioned by the compressed air exertive against the pistons P in the pots K aforesaid.

As clearly shown in Figs. 2 and 4, it is proposed to provide each journal of an approximately standard truck-axle with a slip-collar S between split bearing-rings, the opposing surfaces of the collar and bearing-rings being preferably conical. The sections of the bearing-rings are preferably intermatching and are clamped together around an axle-journal, but do not grip the same, the slip-collar on said journal being held to rotation with the latter by means of air-pressure, as will be hereinafter more fully explained. To facilitate lubrication of each axle-journal, the lower section T′ of the bearing-ring thereon is cut away.

Fitting each collar S and upper section T of the corresponding bearing-rings is a shell U, made fast to said ring-sections by means of screws, as best shown in Fig. 6, and this shell is provided with a cover U′, detachably held in place by screws, as is herein clearly illustrated. The casing comprising the shell U and its cover is impinged by a key-plate V, shown between ribs depending from the top of box W, containing material for lubricating the adjacent axle-journal, and this casing contains a plate X, that fits the slip-collar on said journal, but is recessed upon its under side to form an air-space. Lift of plate X is limited by flanges thereof being opposed by inner shoulders of the aforesaid casing, and a web Y of air-tight packing covers said plate between the latter and another plate X′, detachably secured to the one aforesaid by means of screws. The packing Y impinges against the inner sides of aforesaid casing to divide the casing into a plurality of air-spaces, the outer one of which has the greater area, and a flat spring *w*, secured by a screw to said plate and the one X, is under tension against cover U′ of said casing to compensate for wear on the latter plate in frictional contact with a collar S, upon which it is fitted.

The united plates X X′ and interposed packing Y are provided with registering apertures

constituting an air-passage *t* between the spaces above and below this assemblage of parts, constituting what is hereinafter termed a "bearing-block," the latter, as thus far described, being particularly designed for use with an axle A; but, as shown in Fig. 6, each bearing-block for the middle axle B of a six-wheel truck may have a depending central rib *u*, constituting a partition dividing the lower air-space, and the upper air-space is also centrally divided by a partition *v*, depending from the cover U' of the casing containing this latter form of bearing-block, there being a passage *t* between the air-spaces on opposite sides of the central partitions. By means of the partitions *u v* the compressed air in the casings for the middle-axle bearing-blocks is divided, that in one-half of each casing being regulated and controlled independent of that in the other half, incidental to the arrangement of the above-described governors, it being desirable to have division of about one-third of each half of the load upon said middle axle and about two-thirds of the same half upon one of the other axles. Owing to the separation of air-space in the middle-axle bearing-block cases and the disposition of the governors variations of pressure on either side of the aforesaid partitions will in no way affect the pressure on the other side of same.

Leading into each air-space above the several bearing-blocks are branches *w'* of the pipe system for distribution of compressed air, and the latter finds its way through the passages *t* into spaces between said bearing-blocks and the journal-collars S, the exposed surface of these collars having antifriction rotation in said air that also acts in the upper spaces to exert pressure on the aforesaid bearing-blocks, whereby the latter are kept in air-tight contact with said collars.

Fitting grooves in the outer bearing-ring surrounding each axle-journal is a packing-ring *x*, as shown in Fig. 2, and a cap-plate Z, held to said bearing-ring by means of screws. As also shown in Fig. 2, the upper section of each outer bearing-ring may be provided with a passage governed by a spring check-valve *y*, and in case of side thrust on the part of the corresponding axle in one direction the atmospheric air intermediate of said bearing-ring and adjacent collar S (that is held to rotate with said axle by compressed-air pressure) will be drawn into the space between an axle-journal and a cap-plate Z to increase the air-cushion resistance to the aforesaid axle when the latter has thrust in the opposite direction toward said cap-plate.

It is of course practical to omit the slip-collars and bearing-rings above specified, and in that case the axle-journals will be preferably of increased diameter from that herein shown in order to obtain increase of area to compressed air in the casings containing the bearing-blocks having air-tight contact with opposing surface.

Each axle-journal may be provided with annular shoulders *z*, engaged by grooves in sections of a split collar A', these collar-sections being held together by a contraction-ring *b'* against an inturned flange of another ring B', made fast to said collar by means of a screw *c'*, the space intermediate of the latter ring and aforesaid collar being filled by a packing-ring *d'*, held in place by a screw-threaded washer *e'*, engaging the tapped outer end of the flanged ring. Fitting the flanged ring B' is another ring C', having inner grooves filled with packing material, and held against an outer flange at the inner end of the latter ring by a screw-washer *f'*, run on the same, is an annular web D', of rubber or other flexible material, this web being also clamped in a recess of the corresponding journal-box by a stay-ring E', held by screws to said journal-box. The ring C' is recessed to give play-room for the head of screw *c'*, and the general construction and arrangement of parts last specified constitutes an effective dust-guard that in no way interferes with side thrust of an axle in either direction.

While I have shown and described my improvements in connection with a six-wheel truck, certain features of the same are just as applicable in connection with a four or eight wheel truck, and in either case there exists the fundamental combination of a carrier, its load, and provision for an automatically-regulated volume of compressed air intermediate of the load and carrier to compensate for variable-load pressure, absorb vibration, and lessen friction, as generically set forth in the patent aforesaid. It also follows that there may be application of certain features of my improvements with a carrier employed as a rotary portion of a stationary machine or with other than railway-vehicles.

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

1. A carrier, its load, a reserve-supply reservoir for a volume of automatically-regulated compressed air intermediate of the carrier and load, a spring-controlled lever, an air-pump cylinder mounted on the lever and communicating with said reservoir, a casing also in communication with the air-pump cylinder, a stem extending from a flexible diaphragm within the casing to lift said lever against the resistance of its controlling-spring, a friction-wheel carried by that portion of the aforesaid lever farthest from said spring in opposition to a rotary device, and the air-pump piston linked to the friction-wheel.

2. A carrier, its load, an accumulator mechanism for compressed air, a carrier-supported pot having communication with said accumulator mechanism, a piston engaging the pot and connected to the load, an air-chamber in communication with the aforesaid accumulator mechanism and pot, spring check-valves controlling inlet and outlet nozzles of the air-chamber, cocks arranged to regulate and cut

off the passage of air through said nozzles, a governor mechanism for automatic regulation of the volume of compressed air exertive against the piston in proportion to gradual variations of opposing load-pressure, and means for automatic start and stop of the compressed-air-accumulator mechanism accordingly as pressure of said air becomes less or greater than a predetermined degree.

3. A carrier, its load, means for supplying a volume of compressed air, a carrier-supported pot, a piston engaging the pot and connected to the load, and a mechanism comprising a shell having pipe connection with the compressed-air supply and pot, a spring check-valve arranged to govern admission of the compressed air to the shell, another spring check-valve governing an exhaust-port of said shell, a piston having play in a shell-chamber against atmospheric air, a cross-arm having rod connection with the latter piston, contacts arranged on stems of the aforesaid valves to oppose said cross-arm in opposite directions, and an arm connecting the load and rod of said latter piston.

4. A carrier, its load, means for supplying a volume of compressed air, a carrier-supported pot, a piston having engagement with the pot and connection with the load, and a mechanism comprising a shell having pipe connection with the reservoir and pot, a spring check-valve arranged to govern admission of the compressed air to the shell, another spring check-valve governing an exhaust-port of said shell, a piston having play in a shell-chamber against atmospheric air, a rod extending from the latter piston, a cross-arm adjustable longitudinally of this piston-rod, contacts adjustable on stems of the aforesaid valves to oppose said cross-arm in opposite directions, an arm in connection with said piston-rod, and means for adjustably connecting this arm with the load.

5. A rotative carrier, its load, and provision for an automatically-regulated volume of compressed air intermediate of the carrier and load, a carrier-fitting casing having communication with said volume of compressed air, and a recessed apertured bearing-block provided with a packing dividing the casing into a plurality of communicating air-spaces, the outer one of which has the greater area.

6. A rotative carrier, its load, and provision for an automatically-regulated volume of compressed air intermediate of the carrier and load, a carrier-fitting casing having communication with said volume of compressed air, a recessed and apertured bearing-block provided with a packing dividing the casing into a plurality of communicating air-spaces, the outer one of which has the greater area, and a spring under tension between the bearing-block and casing-cover.

7. A rotative carrier, its load and provision for an automatically-regulated volume of compressed air intermediate of the carrier and load, a carrier-fitting casing having communication with said volume of compressed air, and a bearing-block in the casing comprising an apertured plate recessed upon its inner side to provide air-space, a web of packing surmounting said plate to have contact with the casing-walls, and another plate made fast to the one aforesaid against the packing, this packing and latter plate having apertures in register with each other and the aperture in the former plate.

8. A railway-truck having its axle-lubricating boxes provided with fixed air-tight casings, recessed and apertured axle bearing-blocks in the casings dividing each of the latter into a plurality of communicating air-spaces, the outer one of which has the greater area; pots supported on the running-gear of the truck, pot-engaging pistons in connection with the truck-frame, a compressed-air supply in communication with said casings and pots, and governors arranged to automatically regulate the volume of compressed air exertive against the pistons and within the aforesaid casings.

9. A railway-truck having its axle-journals provided with slip-collars, bearing-rings in loose fit upon the journals adjacent to the ends of said collars, air-tight casings fitting the collars and made fast to the bearing-rings, recessed and apertured bearing-blocks in the casings dividing each of the latter into a plurality of communicating air-spaces, the outer one of which has the greater area; pots supported on the running-gear of the truck, pot-engaging pistons in connection with the truck-frame, a compressed-air supply in communication with said casings and pots, and governors arranged to automatically regulate the volume of compressed air exertive against the pistons and within the aforesaid casings.

10. A railway-truck having its axle-journals provided with slip-collars, bearing-rings engaged by the journals and having conical engagement with the slip-collars, cap-plates fast to the outer bearing-rings, packing-rings encompassing said journals within said outer bearing-rings, check-valves controlling passages in the aforesaid outer bearing-rings, air-tight casings fitting said collars and made fast to said bearing-rings, recessed and apertured bearing-blocks in the casings dividing each of the latter into a plurality of communicating air-spaces, the outer one of which has the greater area; pots supported on the running-gear of the truck, pots engaging pistons in connection with the truck-frame, a compressed-air supply in communication with said casings and pots, and governors arranged to automatically regulate the volume of compressed-air exertive against the pistons and within the aforesaid casings.

11. A railway-truck having the frame thereof provided with depending pistons, pots on the running-gear of the truck engaged by the pistons, a compressed-air supply in commu-

nication with the pots below said pistons, governors arranged to regulate the volume of compressed air exertive against said pistons in proportion to gradual variations of load-pressure, casings in communication with the automatically-regulated volume of compressed air, and recessed apertured bearing-blocks dividing the casings into a plurality of communicating air-chambers, the outer ones of which have the greater area.

12. A six-wheel railway-truck having the frame provided with depending pistons, pots on the equalizing-bars of the truck engaged by the pistons, a compressed-air supply in communication with the pots below said pistons, governors arranged to regulate the volume of compressed air exertive against said pistons in proportion to gradual variations of load-pressure, casings in communication with the automatically-regulated volume of compressed air, recessed apertured bearing-blocks dividing the casings into a plurality of communicating air-chambers, the outer ones of which have the greater area, and partitions dividing the middle bearing-block casings with respect to the arrangement of pots and governors whereby there is fractional division of each half of the load with respect to the middle truck-axle and one of the outer truck-axles.

13. A railway-truck provided with means for the utilization of an automatically-regulated volume of compressed air as an anti-vibratory load-support, as well as a friction-reducer, and having each of its lubricating-boxes provided with an inner dust-guard that consists of a split collar encompassed by a contractive ring and having its sections provided with grooves fitting an annular axle-rib, a ring having an inturned flange opposing the split collar, a screw detachably connecting the ring and collar, packing held in the space intermediate of said ring and collar, another flanged ring having packing fit on the one aforesaid but provided with a clearance-recess for said screw, and a flexible dust-proof web held on the outer ring in a recess of the lubricating-box.

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

FERDINAND SCHUMACHER.

Witnesses:

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CHR. A. CHRISTIANSEN.