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RUNNING GEAR OF RAILWAY CARS.

APPLICATION FILED APR. 20, 1906.

903,654.

Patented Nov. 10, 1908.

5 SHEETS—SHEET 1.

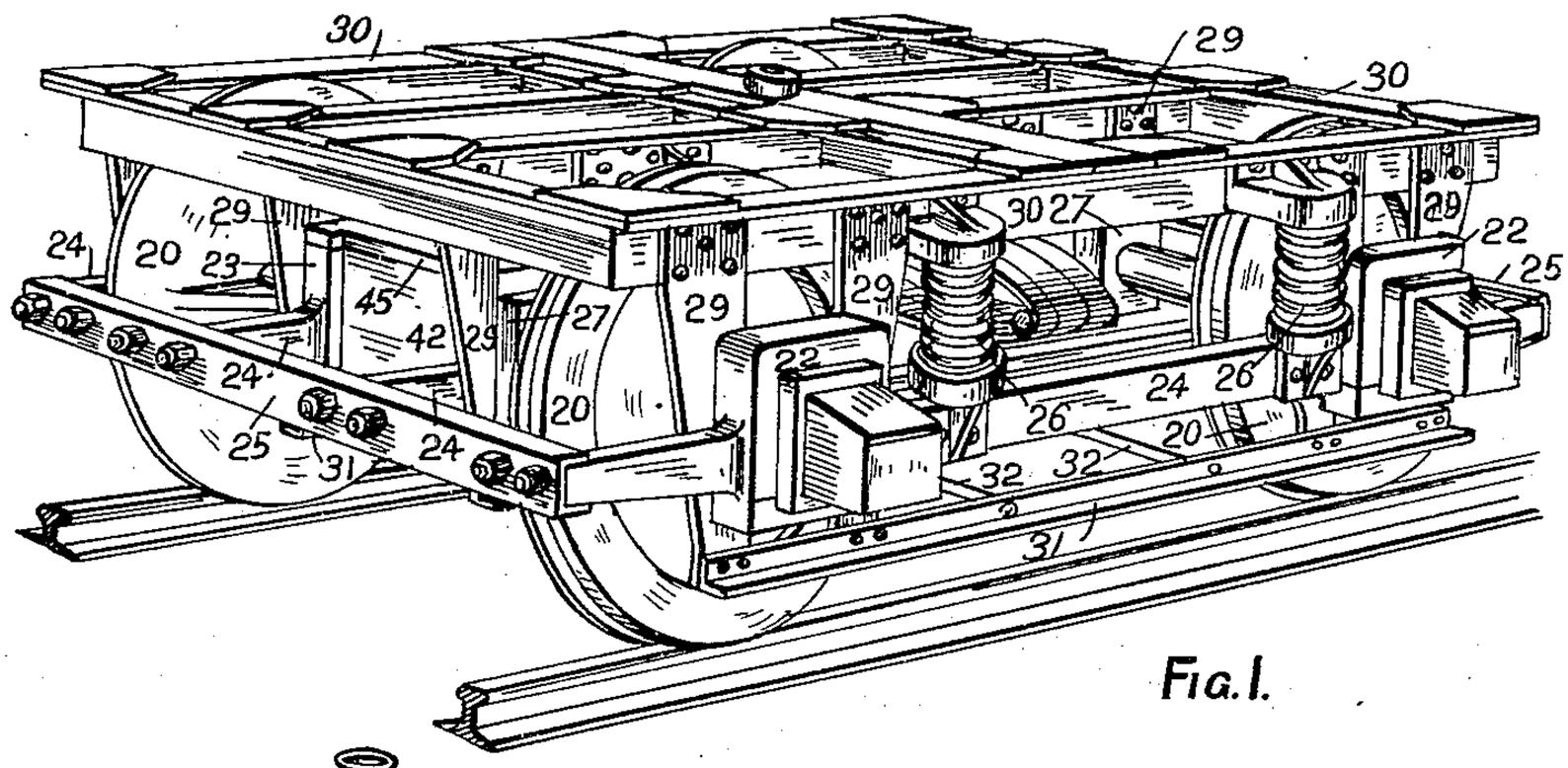


FIG. 1.

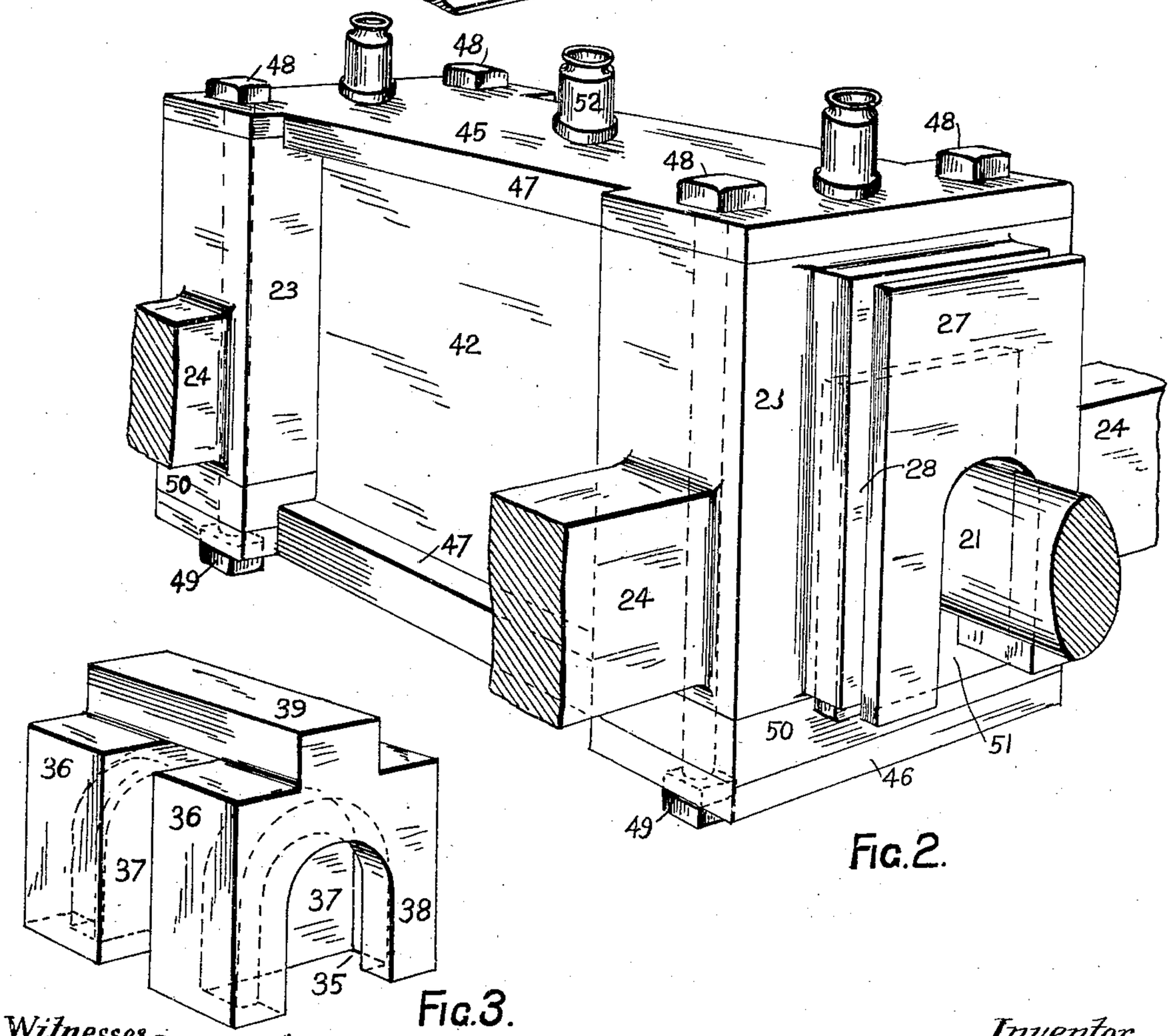


FIG. 2.

FIG. 3.

Witnesses

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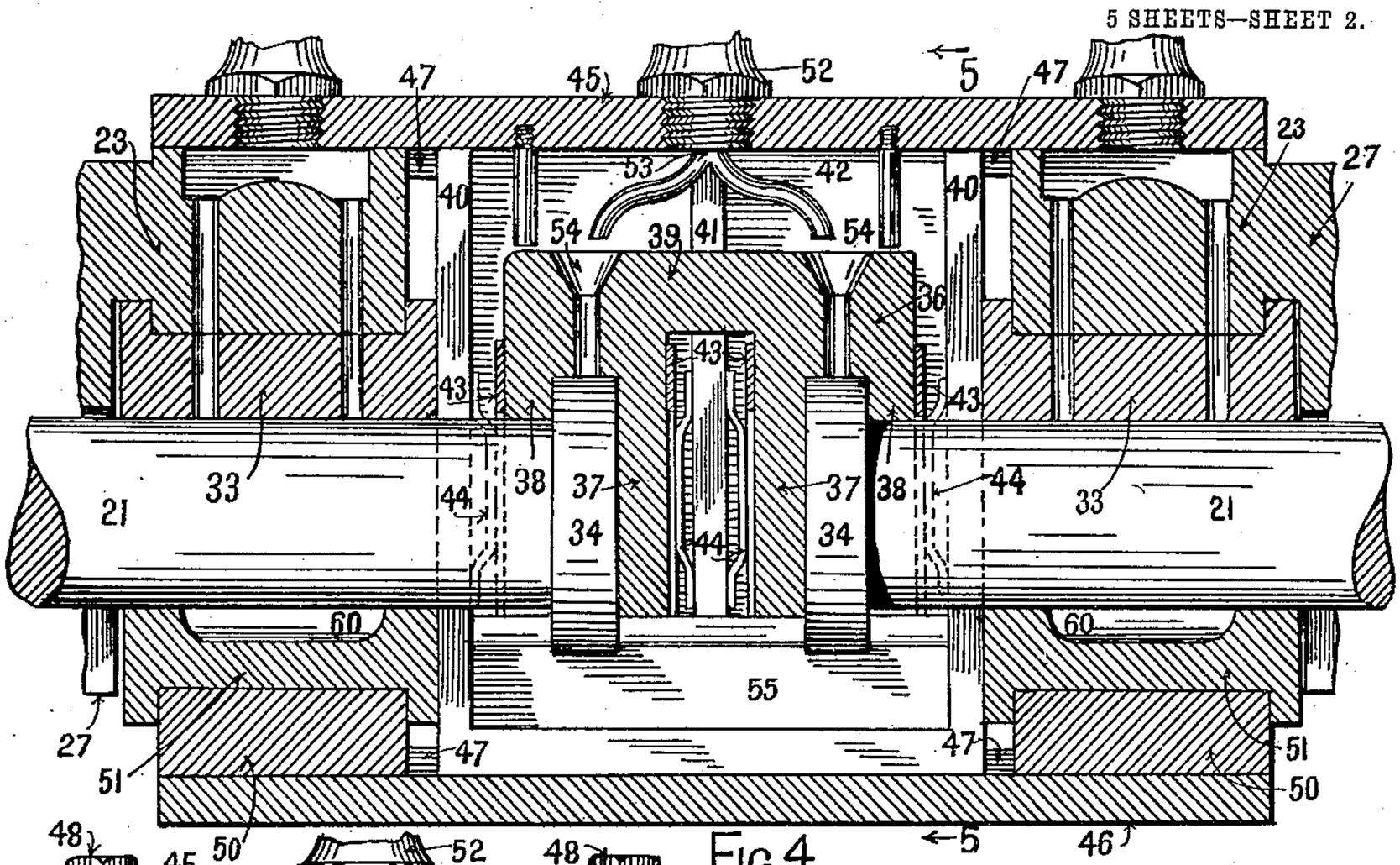


FIG. 4.

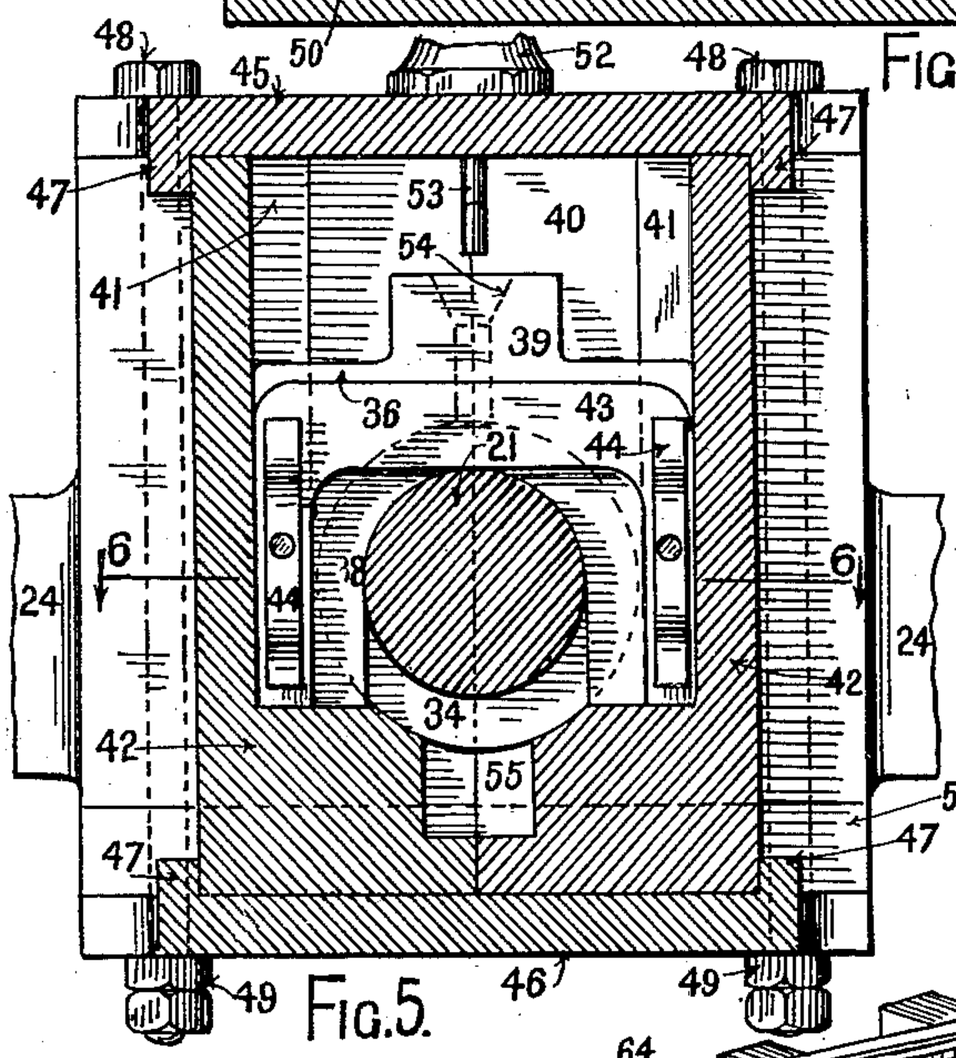


FIG. 5.

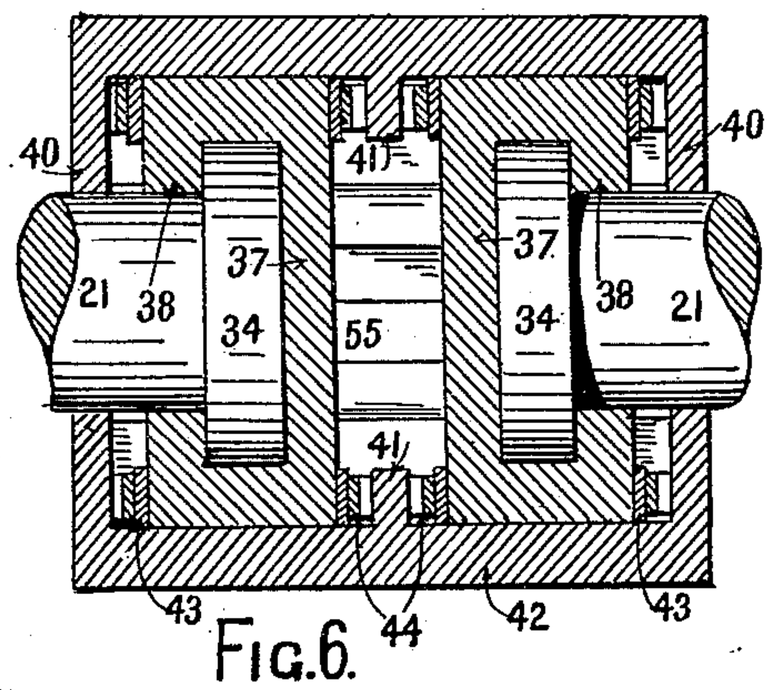


FIG. 6.

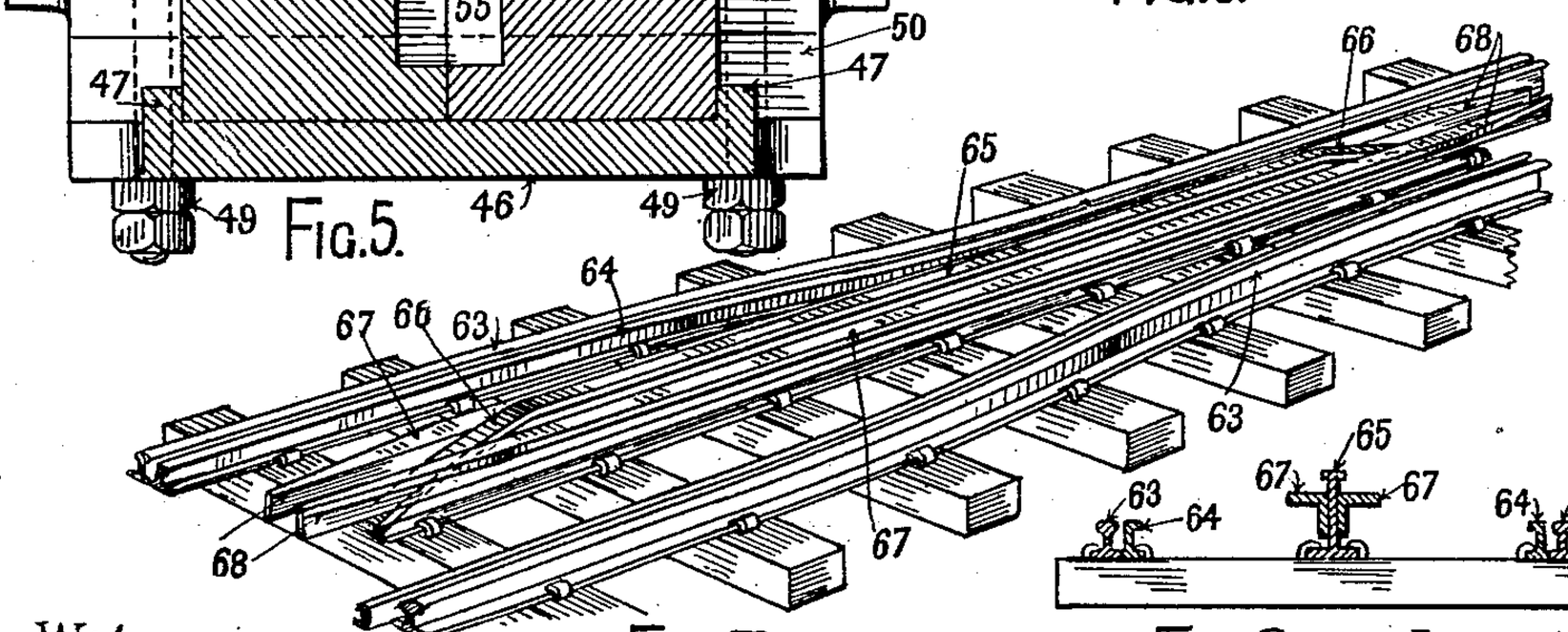


FIG. 7.

FIG. 8.

Witnesses

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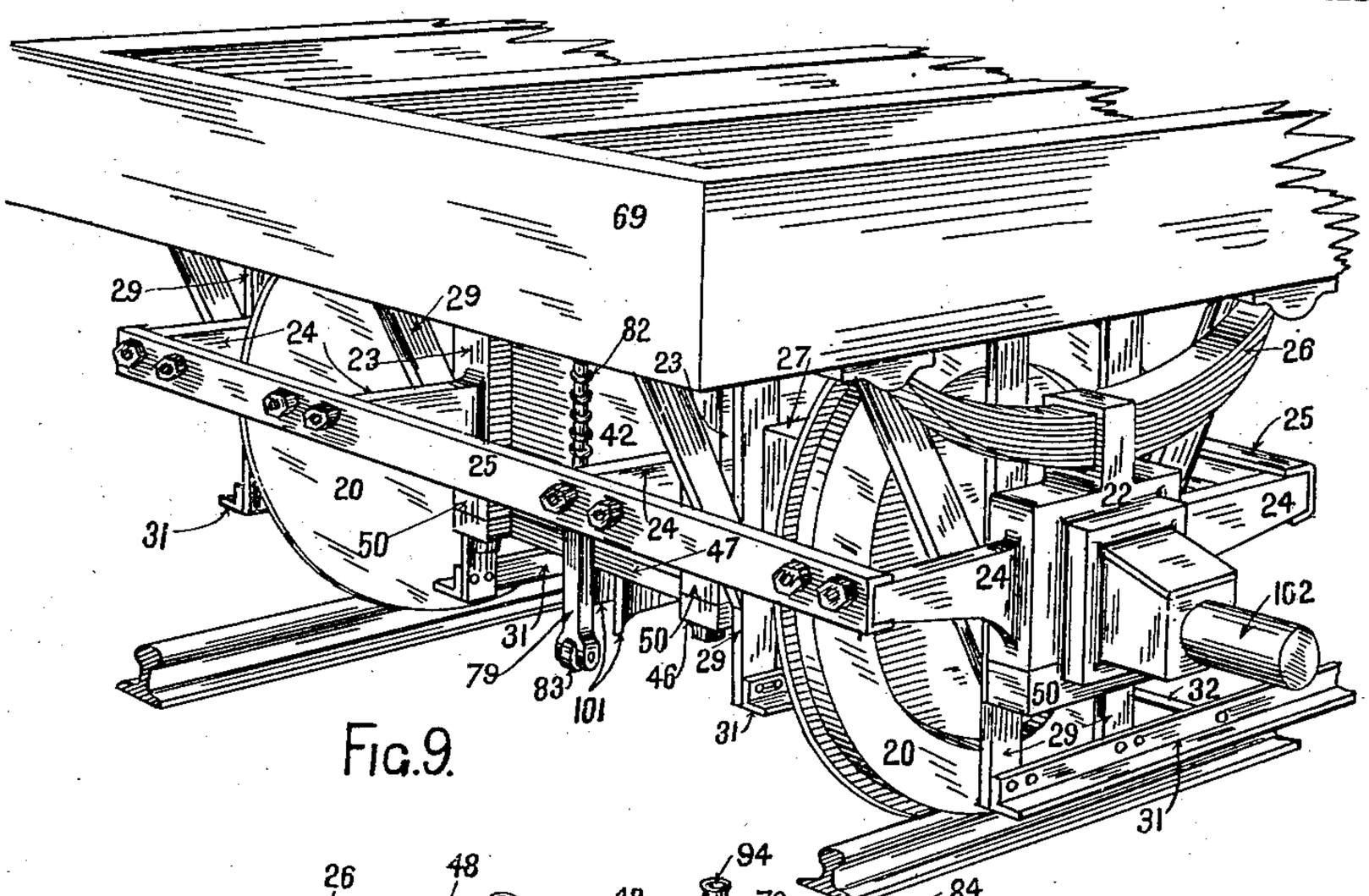


FIG. 9.

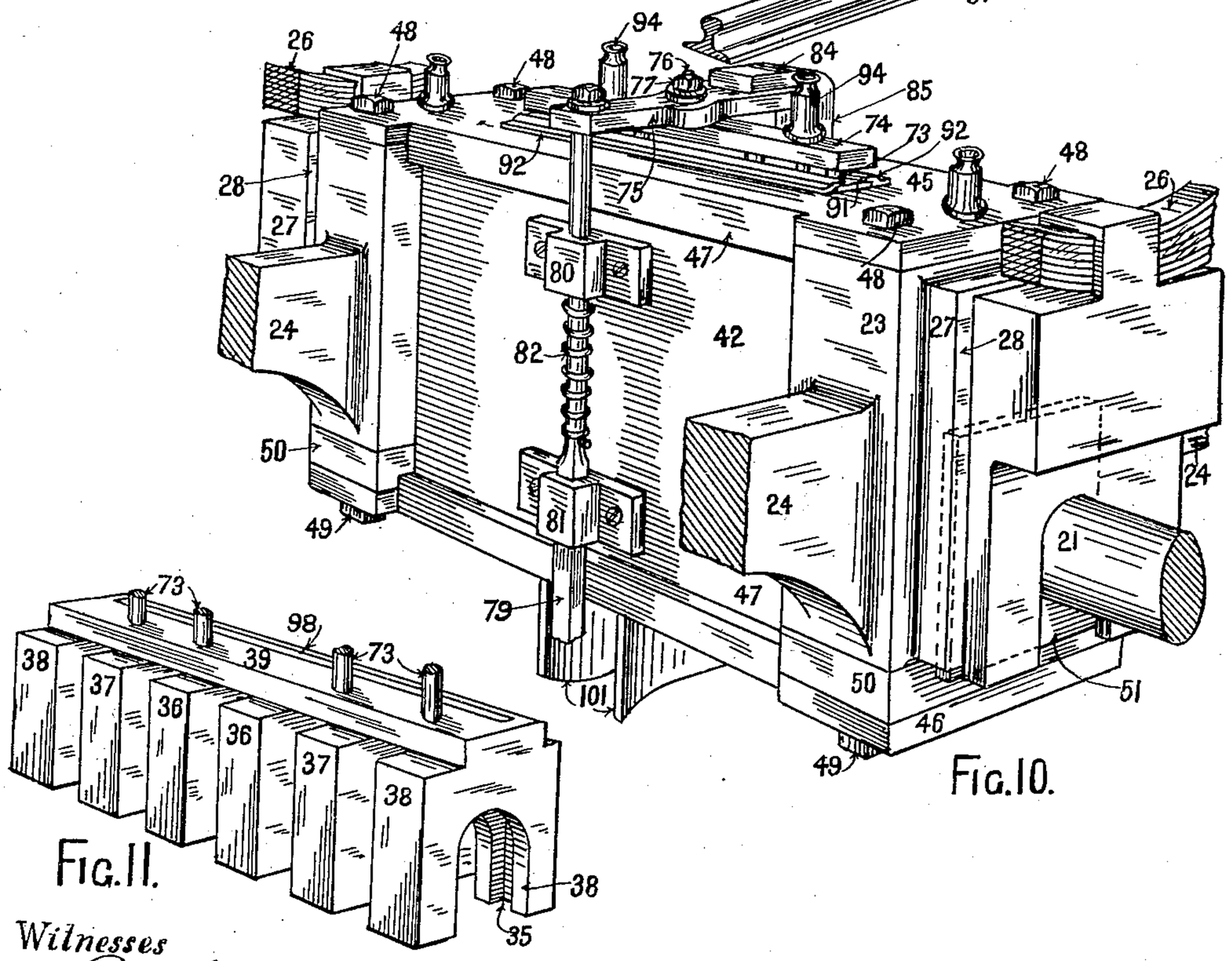


FIG. 10.

FIG. 11.

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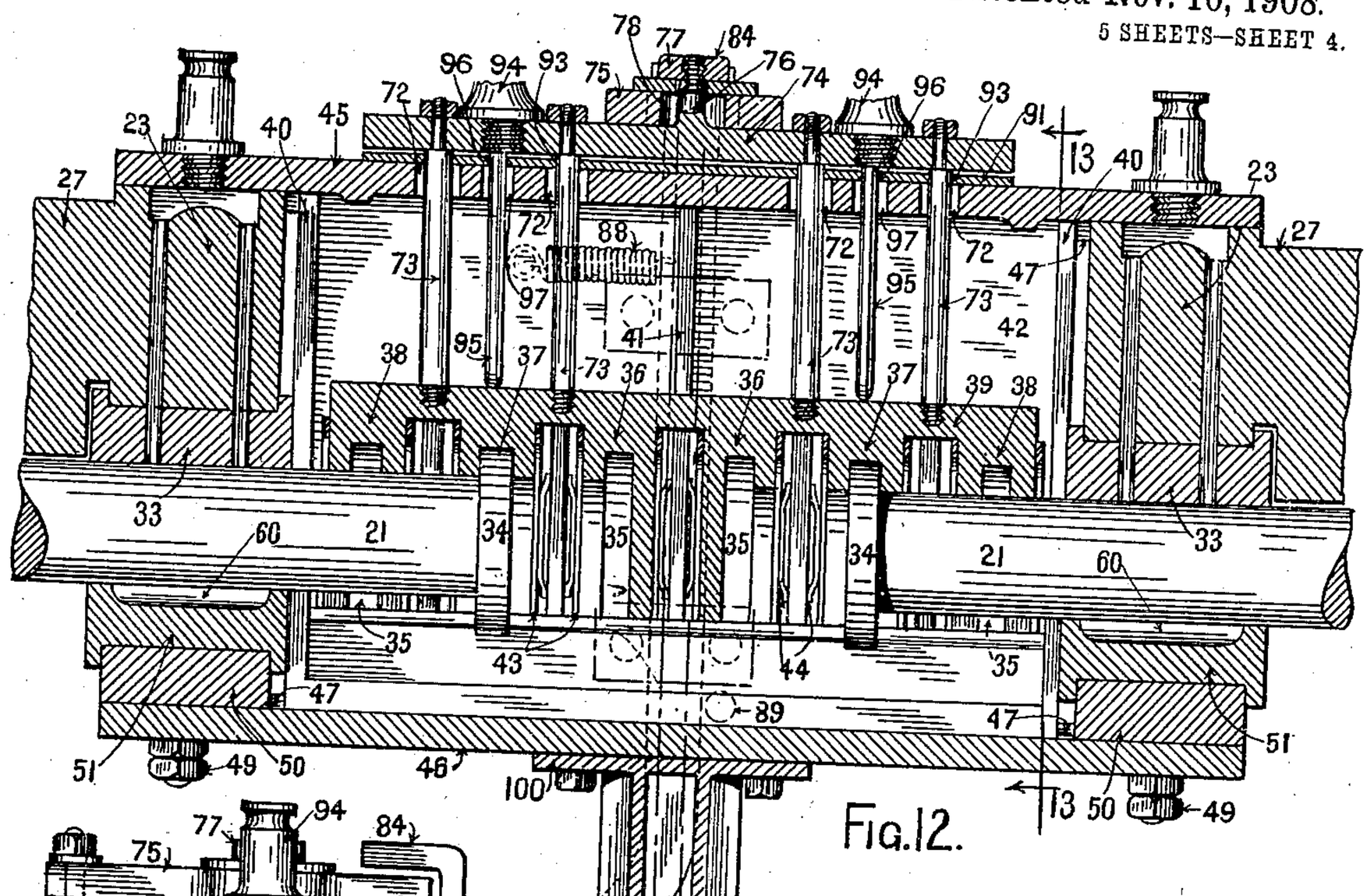

FIG. 12.

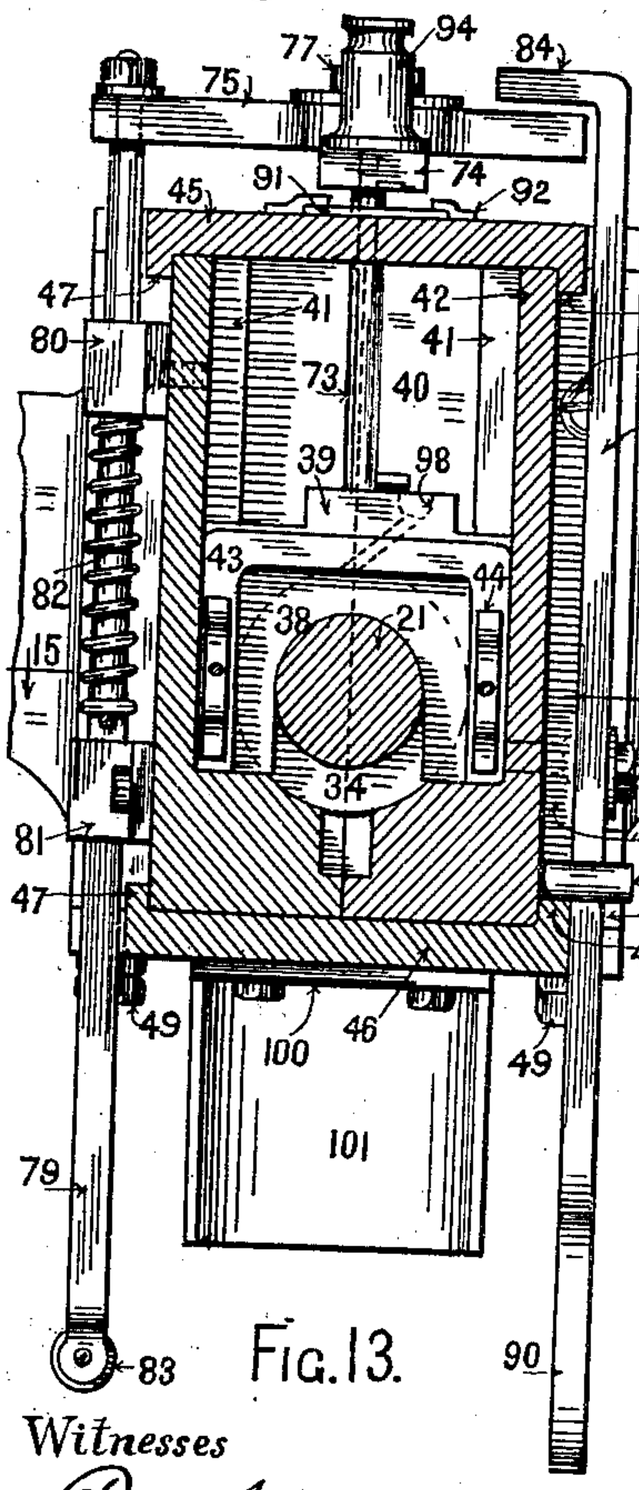

FIG. 13.

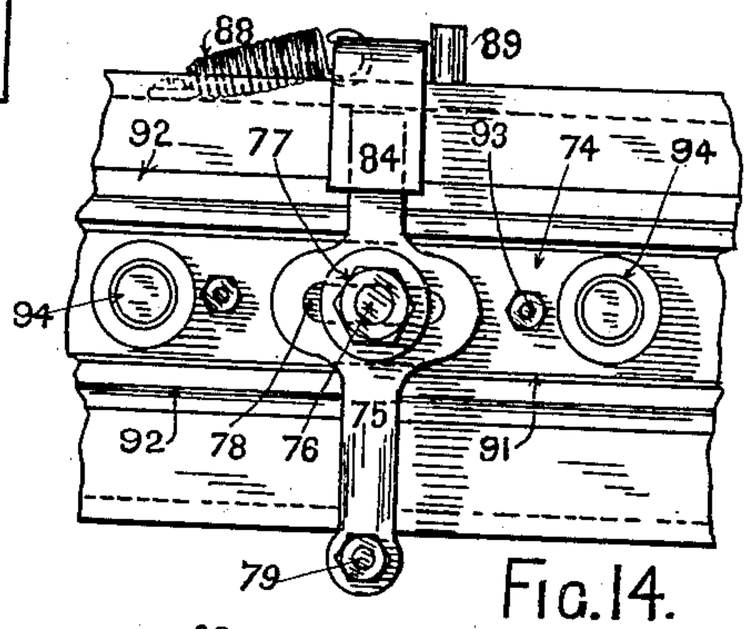

FIG. 14.

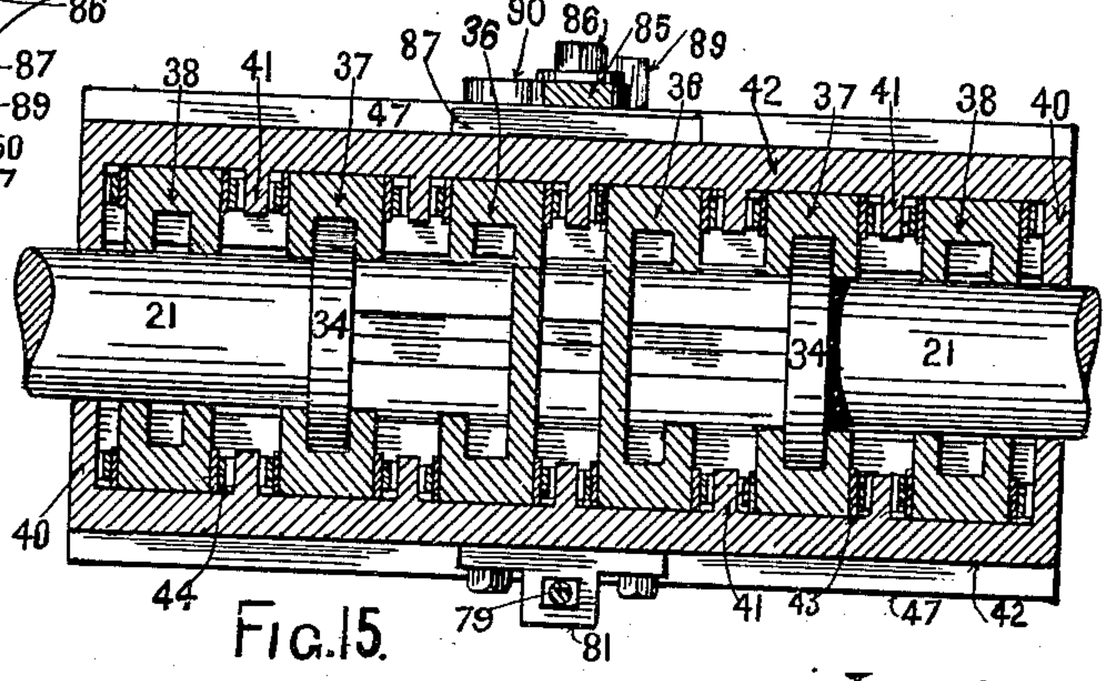

FIG. 15.

Witnesses

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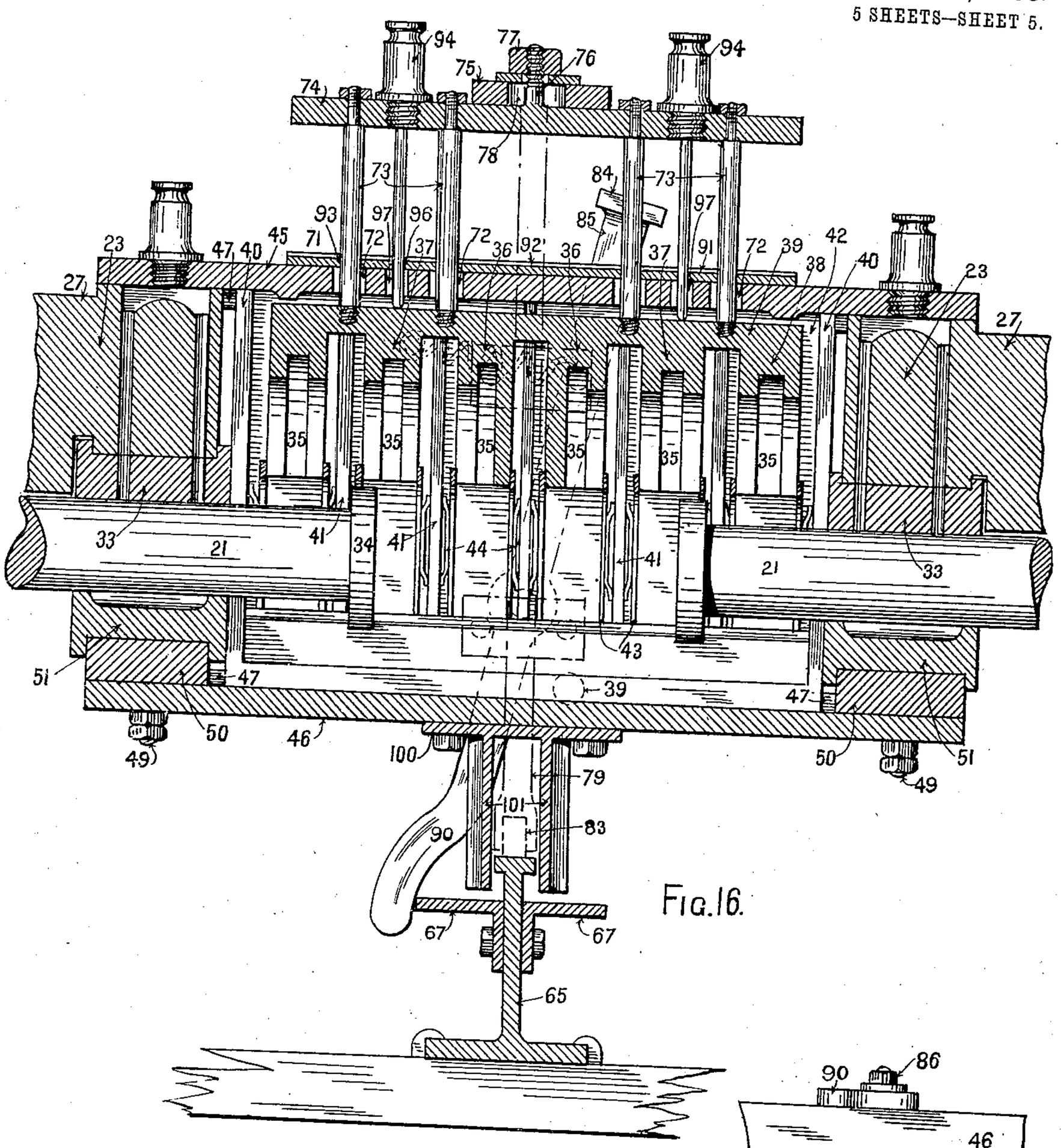


Fig. 16.

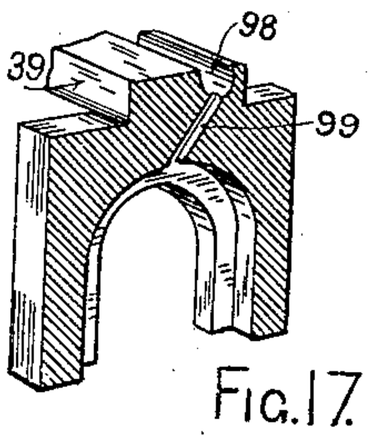


Fig. 17.

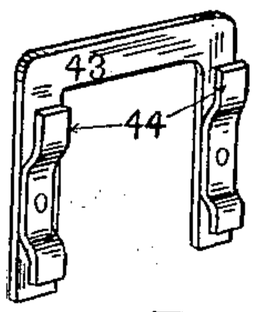


Fig. 18.

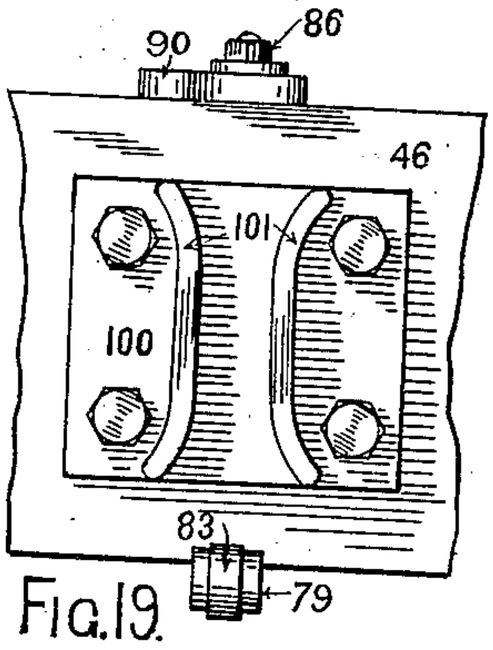


Fig. 19.

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# UNITED STATES PATENT OFFICE.

ARTHUR REGINALD ANGUS, OF NEUTRAL BAY, NEW SOUTH WALES, AUSTRALIA.

## RUNNING-GEAR OF RAILWAY-CARS.

No. 903,654. Specification of Letters Patent. Patented Nov. 10, 1908.

Application filed April 20, 1906. Serial No. 312,809.

*To all whom it may concern:*

Be it known that I, ARTHUR REGINALD ANGUS, of Barry street, Neutral Bay, in the State of New South Wales and Commonwealth of Australia, solicitor, have invented certain new and useful Improvements in the Running-Gear of Railway-Cars.

This invention refers to the running gear of railway cars, carriages, wagons, trucks and the like vehicles or rolling stock (herein referred to severally and collectively as cars or railway cars) and relates to devices to enable or permit each wheel of a pair of wheels to revolve independently of the other so that each can accommodate its rate of rotation to the distance over which it has to travel and also when desired to allow the car to run to and on and from one gage to another gage. The principal of such devices are first a divided axle or semi-axle for each wheel within independent bearings one on each side of its wheel and disposed so that the axes of the two corresponding semi-axles are in what is herein termed "axiality" or lie in the same straight line or practically so; and disposed in the case of a car adapted for changing gage a sufficient distance apart one from the other to allow transverse movement of the wheels in adjusting to a varying gage of rails; and secondly, a rigid connector or frame for holding or maintaining the bearings or bearing blocks of two corresponding semi-axles of a car in their proper positions relatively one to the other and preventing the axles within such bearings from being thrown out of axiality.

This invention has been specially devised to provide devices for firmly connecting the inner ends of the divided axles, for preserving the axial alinement of said divided axles while at the same time allowing each pair of semi-axles (together with their respective wheels rigidly affixed thereto) independent revolution, and further to provide devices whereby change of gage of the wheels in passing from one line of rails to another of different gage may be easily quickly and effectively achieved.

In carrying this invention into practical effect the internal ends of the divided axle or semi-axles nearly abut when the car is intended to run on one gage of rails only or when the wheels of the car are on the narrowest gage of rails on which car is adapted to run and each internal end of the divided axles has a collar turned thereon on which collars on the divided axles fit grooved keeps joined by a distance bar or bridge supported by said keeps. Each keep has on either end a facing plate taking on shoes in a groove or rib in or on a frame or keeps box affixed to or forming part of the under frame work or connector rigidly connecting the bearings of the semi-axles. The keeps retain the semi-axle in the set position as to gage while the springs of the shoes in the ribs of the keeps-box retain the keep shoes just in contact with the facings of the keeps and thus insure when changing gage that the keeps move straight up and down or nearly so the keeps being thus guided on to the collars on the divided axles. These said springs also take up any lateral strains imparted by the wheels to either collar on its respective semi-axle within slight limits until the strain is taken up by the distance bar or bridge of the keeps and the keeps thereof each keep holding on to its respective collar. When providing for varying the gage of the wheels the semi-axles are adapted to be spread apart or closed in and their collars to sit in other grooved keeps provided in the keeps box as required by the wider or narrower gage.

Instead of one collar on each semi-axle and sets of keeps for same at each gage, a recess or holder may be used or affixed on each semi-axle or two or more collars, recesses or holders may be used and the bridge keep adapted to extend over same subject to and as hereinafter explained.

This invention may be adapted so that the railway car may be capable of running on one uniform gage of rails only or on different gages of rails. If it is desired that the railway car should be capable of running on and to and from the widest and narrowest gage that length of keeps box will permit one collar only should be affixed on the inner end of each semi-axle. Again if it is desired that the railway car should be adapted to run on different gages of rails where the difference of gage is slight and the length of keeps box will permit two or more collars may be affixed on each semi-axle. Again if it is desired to adapt the railway car so that it is capable of running only on one uniform gage one or more collars, holders or recesses may be affixed or used on each semi-axle or (although I prefer to use the keeps bridge keeps with spring bearing shoes in conjunction with collars, recesses or holders on the divided axles) the collars, holders and re-

cesses likewise the spring bearing shoes may all be dispensed with and the device used for firmly holding the inner ends of divided axles consists in this case simply of each pair of semi-axles abutting; or a piece of gun-metal or other suitable material may be placed between the inner ends of each pair of semi-axles against which each semi-axle abuts as shown in the drawings herewith; they are thus prevented from approaching one another and they are prevented from departing from one another by the contact of flanges of wheels with rails, but in the last two mentioned cases keeps as ordinarily used on the journals at or about the outer end of the continuous axles should be used on or about the outer end of the divided axles.

When the railway car is intended to run on one uniform gage only I prefer that three collars, holders or recesses at least should be used on each semi-axle so as not only to assist in firmly connecting the inner ends of the divided axles but for the purpose of keeping the wheels to gage as each collar will check the other against lateral play of the wheels so far as the divided axles are concerned. It is essential that the rigid connector or frame should, in effect, as a whole be rigid, the frame is preferably constructed of pressed steel, and preferably made or constructed in the form or shape indicated in the drawings herewith. The bearings should be integral with and form part of the frame. The brasses (or other suitable material) in which the divided axles revolve in direct contact therewith preferably completely encircle the divided axles. The brasses are preferably made in exactly two equal halves or parts. It being essential that there should be an upper part of the brass and a lower part thereof for the purpose of assisting in restraining the movement of the divided axles upward or downward away from the axial alinement. Instead of brasses other suitable material may be used performing like functions such as the brass usually effects that is a good wearing surface so as to reduce friction, capacity to resist reasonable pressure *e. g.* gun metal white metal etc. And the bearings together with the foot plate shown in the drawings preferably completely encircle or surround the brasses (or other material aforesaid) in close contact therewith. It being essential that there should not be any looseness in the journals that is between the brasses (or other material aforesaid) and the divided axles likewise there should not be any looseness between the brasses (or other material aforesaid) and the bearings together with the foot plate. (I regard the foot plate—shown in the drawings—as a lower part of bearing of the frame, the foot plate and bearing being rigidly held together.) The keeps and keeps bridge may be made or constructed of any suitable material but it is essential that the keeps and keeps bridge should be rigid and of sufficient strength to resist the maximum strain to which same may be subjected. The keeps and keeps bridge in conjunction with the collars, recesses or holders, as case may be, affixed on the divided axles are intended to firmly connect the inner ends of the divided axles and thus retain the wheels to gage. I would prefer in order to obtain the best results, that the keeps and keeps bridge should be constructed of very hard steel and the parts thereof in contact with the collars, recesses or holders on the divided axles lined with some softer material or material having a better wearing surface than steel such as brass, white metal or the like which softer material preferably should not exceed one eighth of an inch in depth. This softer material or material having a good wearing surface should be renewed before it is quite worn down. All parts subject to friction should be kept well lubricated so as to reduce the wear thereof.

In order to provide for change of gage upon converging and diverging rails or a "verging shunt" set on the permanent way at the junction of two varying gage lines of rails it is necessary to lift the keeps free of the axle collars upon which they fit and to lower them again on to the collars of the altered gage. This is effected by means of a bolt or lifter in guides in or on the keeps-box extending centrally of such keeps and having a connecting bar to which stems from the keeps bridge are affixed preferably allowing a slight amount of lateral play. To prevent the entry of dust through the orifice in which the stems of the keeps pass upwardly in their lifting these orifices are covered by spring gates or doors either folding downwardly or sliding laterally. The stroke of this lifter is regulated by traveling over a ramp or up and down inclined rail centrally of the verging shunt. The lower end of this lifter has a friction wheel thereon. The lifter also preferably has a locking device which is released by a lever or foot operated by said ramp rail or edges thereof. The keeps-box having the resiliently lined grooves or ribs for the facings of the keeps is controlled during the change of gage in a central position relative to the rails by another foot working in a central groove in the aforesaid ramp rail or embracing said ramp rail.

In order to clearly explain how this present invention is carried into practical operation these improvements are illustrated in the drawings accompanying and forming part of this complete specification and the same and the working thereof will now be described with reference to such drawings.

Figure 1 is a perspective view of a bogie having divided axles and adapted for one gage of railway line only. Fig. 2 is an enlarged perspective view of the keeps box containing the two inner bearings of the semi-axles and their keeps. Fig. 3 is a perspective view of the bridged keeps. Fig. 4 a longitudinal central sectional elevation of Fig. 2. Fig. 5 is a cross-section on line 5—5 Fig. 4. Fig. 6 a sectional plan on line 6—6 Fig. 5. Fig. 7 is a perspective view showing the verging shunt and appurtenances connecting two different gages of railway lines. Fig. 8 is a cross section of Fig. 7. Fig. 9 is a partial perspective view of the under gear of a railway car having divided axles adapted to run on lines of varying gages. Fig. 10 is an enlarged perspective view of the keeps-box thereof with mechanism for effecting the change of gage (with the assistance of converging shunt in the rails). Fig. 11 is a perspective view of the bridged keeps within the keeps-box of Fig. 10. Fig. 12 is a longitudinal central sectional elevation of Fig. 10 with keeps in normal position. Fig. 13 is a cross section on line 13—13 Fig. 12. Fig. 14 is a partial plan of Fig. 12. Fig. 15 is a part sectional plan on line 15—15 Fig. 13. Fig. 16 is a longitudinal sectional elevation of Fig. 10 with keeps raised as during change of gage. Fig. 17 is a detail view of a keep. Fig. 18 is a detail view of the spring bearing shoes on the facings of the keeps. Fig. 19 is a reverse plan of the operative mechanism on the car for changing gage.

Referring to Figs. 1 to 6 these relate to railway cars for one gage of rails only but having divided axles. Each wheel 20 has an independent semi-axle 21 in bearings 22 and 23 on either side of the wheel. These bearings 22 and 23 are integral with the longitudinal bearers 24 secured to cross bearers 25 which form an under axle-frame or connector rigidly connecting the four bearings or bearing blocks together and supporting the body of the car with the intervention of springs 26 or the like. The longitudinal bearers 24 have guide blocks 27 with races 28 to take the horn plates 29 and allow them to slide therein. These horn plates 29 being rigidly affixed to rectangular frame 30 and being connected longitudinally by stays 31 and transversely by stay bolts 32 assist in keeping the wheels in their proper longitudinal relative positions underneath thereof. Each semi-axle 21 passes through the brasses 33 and 51 of bearings 22 or 23 and has on its inner end the collar 34 fitting into recess 35 in the keep 36 which has cheeks 37 and 38 the latter cheek 38 being bifurcated for the passage of the semi-axle 21. The keeps 36 are joined by the bridge 39 and they sit in beds formed by the ends 40 integral with the semi-casings 42 and the ribs 41 on same and they have shoes 43 of U-shape on which bear the springs 44 abutting on the ribs 41 and ends 40 and thus under lateral strain on the collars 34 on the semi-axles 21 would be compensated until the keeps bridge 39 and the keeps 36 take up the same. The semi-casings 42 are held together by top and bottom plates 45 and 46 having flanges or hooks 47 which secure said casings and the bearings 23 with brasses 33 rigidly together by the bolts 48 and nuts 49 and at the same time rigidly secure the foot piece 50 and bottom brasses 51 to the whole.

An essential feature of this device is that the brasses 33 and 51 (or other suitable material) in which the divided axles revolve in direct contact therewith are rigidly held by the bearings 22 and 23 and foot piece 50 in direct contact with the brasses which bearings 22 and 23 are integral with the rigid connector or frame 24 and 25. (Each pair of semi-axles is only capable of rotating in its bearings and of making the necessary longitudinal movements towards or away from one another.) I seek by this construction to prevent each pair of semi-axles from departing from the limits of the axial alinement, as I believe that if the semi-axles are allowed to move up or down away from the axial alinement the wheels which are rigidly affixed to the divided axles will oscillate in proportion to the upward or downward movement of the semi-axles away from the axial alinement and under certain working railway conditions if the wheel departs only a comparatively slight amount from its proper relative angle to the rail, the risk of derailment of the railway car will occur.

On the top plate 45 is an oil cup 52 having bifurcated tube 53 to conduct oil to the oil passages 54 in the keeps 36 for lubricating the collars 34. A receptacle 55 is placed in the well formed by the semi-casings 42 and bottom plate 46 and the oil therein reaches the collars 34 by which it is lifted up and passed around the semi-axles 21 finding its way to a surplus oil well 60 in lower brass 51.

It will be seen that the semi-axles 21 by means of collars 34 holding in the recesses 35 are prevented from closing or spreading apart and that by means of the framing formed by the semi-casings 42 and the top and bottom plates 45 and 46 and to the bearings 22 and 23 all being bolted together and being integral with the longitudinal bearers 24 forming part of the connector or under rigid axle-frame such semi-axles 21 are retained always in axiality or in one and the same straight line transversely across the vehicle: and further that strain on either of the semi-axles will be minimized by reason of the springs 44 on the shoes 43 bearing on the

cheeks 37 and 38 of the keeps 36 and will at the same time be distributed equally over both semi-axles 21 by the said bridged keeps while at the same time each wheel is allowed to revolve independently of the other.

One of the chief purposes which I seek to effect in the arrangement of the keeps bridge 39 joining the keeps 36 each keep holding on to its respective collar is the distributing of lateral strains or thrusts equally over two corresponding semi-axles and in confining the said strains or thrusts to the divided axles. The keeps-box being thus freed from being constructed to resist undue lateral strains or thrusts imparted by the wheels to the semi-axles the arrangement as herein described of the keeps-box with keeps bridge and keeps fitting over the collars on the divided axles also serves to retain the horn plates in their proper relative positions.

Referring to Figs. 7 and 8 these show the verging shunt for effecting the change of gage and also the mechanism for operating the locking and other gear on the car. The rails 63 converge or diverge into one another as shown and have cheek rails 64. The convergence or divergence should be very slight preferably not exceeding one inch in eight feet. Midway between these verging rails 63 is a ramp rail 65 extending just beyond the verging rails at either end and having ramp ends 66 (the grade of these ramp ends may be about one in ten) for lifting a bolt or stem (hereinafter described) on the car to free the semi-axles from the keeps and allow the wheels to spread apart or to close in as they run over the verging shunt. Bolted to the ramp rail 65 with its ramp ends 66 are flanges 67 projecting beyond its end for turning aside the lever 85 and unlocking the before mentioned lifting bolt or stem and these have tapered ends 68 for the easing of the impact therewith of the locking lever.

Referring now to Figs. 9 to 17 these relate to railway cars adapted to run on rails of varying gage. The construction of the bearings and frame are the same as those described in reference to Figs. 1 to 6 and parts of the same construction or having similar functions bear the same distinguishing number. In this instance the horn plates 29 are shown as secured to the underframe 69 of the vehicle and the keeps 36 differ somewhat. The semi-axles 21 pass through the brasses 33 and 51 of the bearings 22 and 23 and have on their end collars 34 fitting into recesses 35 of the keeps. There are three sets of pairs of keeps corresponding to three different gages of wheels. The pair of keeps 36 nearest the center govern the narrowest gage. The keeps 37 govern the medium gage and the keeps 38 govern the widest gage and also have their cheeks bifurcated for the semi-axles 21. The keeps 36 37 and 38 are integral by reason of bridge 39 and are adapted to slide up and down in the beds formed by the ends 40 and ribs 41 during change of gage and the shoes 43 are sufficiently high that when the keeps are raised to their highest position they are still in contact with said keeps. The springs 44 on the shoes 43 should be made of sufficient strength so as not to easily compress and thus insure that the keeps 36, 37 and 38 slide straight up and down or nearly so as herein described. During the raising the keeps are retained in proper vertical and axial relation by means of ribs 56 on the ends 40 working in grooves 57 in the end faces of said keeps and by the shoes 43. These grooves 57 should be sufficiently deep to allow sufficient lateral play of the keeps bridge 39 until any lateral strains imparted by the wheels to the semi-axles 21 are taken up by the keeps bridge 39 and keeps 36, 37 or 38 as case may be holding on to the collars 34 on the semi-axles 21.

Through the top plate 45 are oval orifices 72 for the stems or rods 73 connecting the bridge 39 of the keeps with an exterior connecting bar 74 which has a cross arm 75 secured thereto by the stud 76 with nut 77 passing through slot 78 so as to allow side play. This cross arm 75 is secured to the lifting stem or lifter 79 in bearings 80 and 81 on the casing and has helical depressing spring 82. This lifter 79 has as its lower extremity a roller 83 adapted to engage with the ramp rail of the verging shunt. The cross arm 75 extends to the other end of the casing and above it takes the hook end 84 of lever 85 fulcrumed at 86 in bracket 87 on said casing. This lever 85 has a helical spring 88 normally drawing said lever 85 to lock the lifter 79 in out of action position against a stud 89 and it also has curved end 90 adapted to engage with flanges 67 of the ramp rail 65. On the top plate 45 is a slide 91 (in guides 92) with orifices 93 of the diameter of the plungers 73 so as to form a dust proof cover adapting itself to side play. On the top of the connecting bar 74 are oil cups 94 with tubes 95 passing through orifices 96 in the slide 91 and oval orifices 97 in the top plate 45 for feeding oil into the channel 98 of the bridge 39. From the channel 98 the oil flows by ports 99 to the axles. Underneath the bottom plate 46 is a guide bracket 100 with its outer end having curved or semicircular or flaring mouth 101 and adapted to embrace the edges of the ramp rail 65 and retain the keeps box centrally of the structure. This guide bracket 100 insures that the lifter 79 will remain in the center when in contact with the ramp rail 65 and that the collars 34 will be longitudinally relatively in proper position to receive their respective keeps after the change of gage is complete. Sleeves or thimbles 102 are made integral with the outer axle boxes so as to protect the outer ends of semi-

axles 21 when they are spread apart with the wheels running on the wider gage of rails.

In operation when the car approaches the verging shunt the lever 85 with its curve 90 engages with one or other of the flanges 67 and thus frees the lifter 79 so that as it comes in contact with the ramp 66 of central rail 65 it will lift and raise the keeps from the collars 34. The outer ends 100 of the guide bracket 101 embracing the edges of the ramp rails 65 retain the keeps box centrally of the structure. The wheels as the car proceeds are then "gaged" by means of the rails 63 and check rails 64 of the verging shunt and when the "gaging" is complete the lifter 79 has reached the end of the ramp rail 65 and finds its normal position by the pressure of spring 82 and the keeps engage with the respective collars 34 of such set gage and thus secure the wheels until further change of gage is desired. The locking lever 85 by force of its spring 88 returns to normal position with its hook 84 taking above cross arm 75 of connector 74 and secure the keeps from further movement until so desired.

The narrowest gage on which car is adapted to run is determined by the collars 34 on the semi-axles 21 nearly abutting and the widest gage by the greatest length that keeps bridge 39 may be made and placed in the keeps box. The length of the keeps-box being determined by the length of space that may be used between the inner longitudinal bearers 24. These bearers 24 being placed as close as may be to the wheels of the car when on the narrowest gage. The number of gages of rails that the car may be adapted to run on is determined by the length of the keeps-bridge 39 and the number of the keeps such as 36, 37 and 38 that may be joined on to the keeps bridge 39 each keep being made of sufficient strength to resist all strains imparted by the wheels to the collars 34 on the semi-axles 21. The lifter 79 should be of sufficient length to lift the keeps 36, 37 and 38 free of the collars 34 allowance being made in the height of the keeps-box and length of lifter to compensate for the wearing of the treads of the wheels in contact with the rails. The height throughout of the ramp rail 65 may be about eight inches above the lowest part of the ramp ends 66. I prefer that the brasses 33 and 51 in actual working condition of the car should each not be allowed to wear on their surfaces in contact with the semi-axles 21 beyond a depth at any part throughout from said surfaces of about five thirty two parts of an inch so as to preserve the axial line within the limits of variation allowed by the wearing of the brasses 33 and 51 as aforesaid. The brasses 33 and 51 should be kept well lubricated so as to reduce the friction thereon to a minimum. I also prefer that the locking lever 85 should have a clearance of at least half an inch between the under surface of its hook 84 and the top surface of the cross arm 75 when the locking lever 85 is in normal position having its hook 84 above the cross arm 75.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed I declare that what I claim is:—

1. The combination with semi-axles 21 having collars 34 and in bearings 22 and 23 integral with rigid connector frame 24 and 25 of keeps 36 with cheeks 37 and 38 casings 42 plates 45 46 and 50 and bolts and nuts 48 and 49 and brasses 33 and 51 as and for the purposes set forth substantially as herein described and explained and as illustrated in the drawings.

2. The combination with the semi-axles 21 having collars 34 bearings 22 and 23 for said axles keeps 36 having cheeks 37 and 38 between which the collars 34 lie, a casing for the keeps and resilient shoes 43 and 44 located between the keeps 36 and a part of the casing.

3. The combination with semi-axles 21 having collars 34 and in bearings 22 and 23 integral with rigid connector frame 24 and 25 of a plurality of keeps 36 37 and 38 stems 73 covering plate 45 connecting bar 74 with cross arm 75 and lifter 79 having spring 82 and foot roller 83 as and for the purposes set forth substantially as herein described and explained and as illustrated in the drawings.

4. The combination and arrangement of mechanical parts forming a verging shunt in railway lines for assisting in changing gage that is rails 63 check rails 64 ramp rails 65 ramp ends 66 flanges of the ramp rail 67 with flange ends 68 as herein described and explained and as illustrated in Figs. 7 and 8 of the drawings.

5. The combination with the semi-axles having collars thereon bearings 22 and 23 for said axles a plurality of keeps for said axles with which the collars engage a lifter 79 for raising the keeps to release the axles and a locking device for said lifter consisting of a hooked lever 85 having a rounded end 90 and a spring 88 for throwing said lever into locking position.

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

ARTHUR REGINALD ANGUS.

Witnesses:

FRED WALSH,

PERCY NEWELL.