May 9, 1967 E. E. OVILLE 3,318,259

DEVICE FOR SHIFTING A SECTION OF RAILWAY TRACK LAID ON ITS BED OF BALLAST

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Fig. 1.

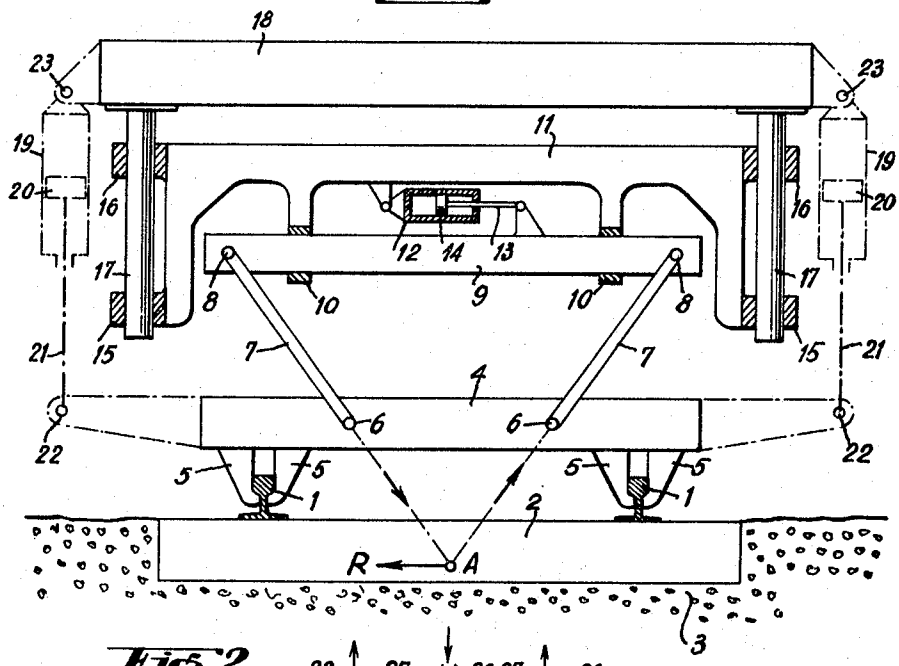

Fig. 2.

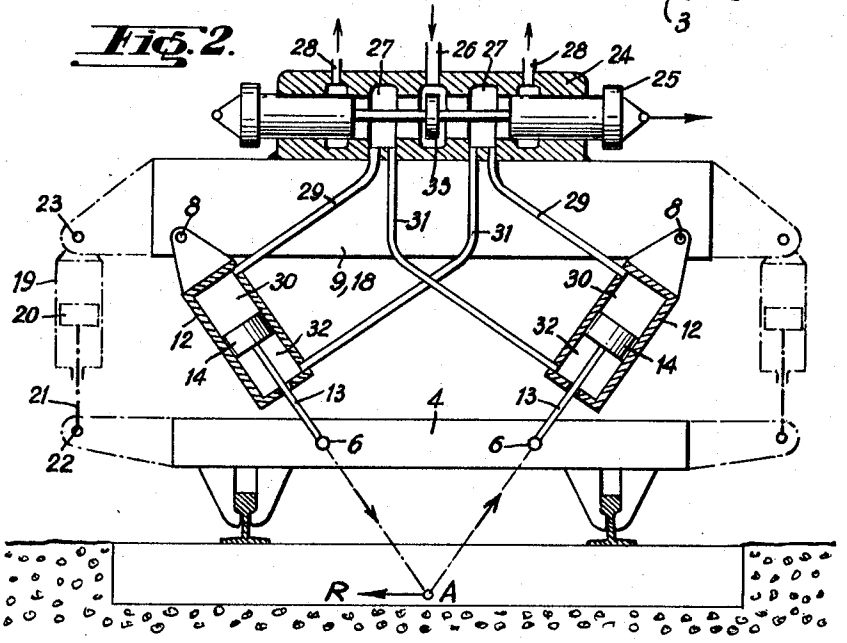

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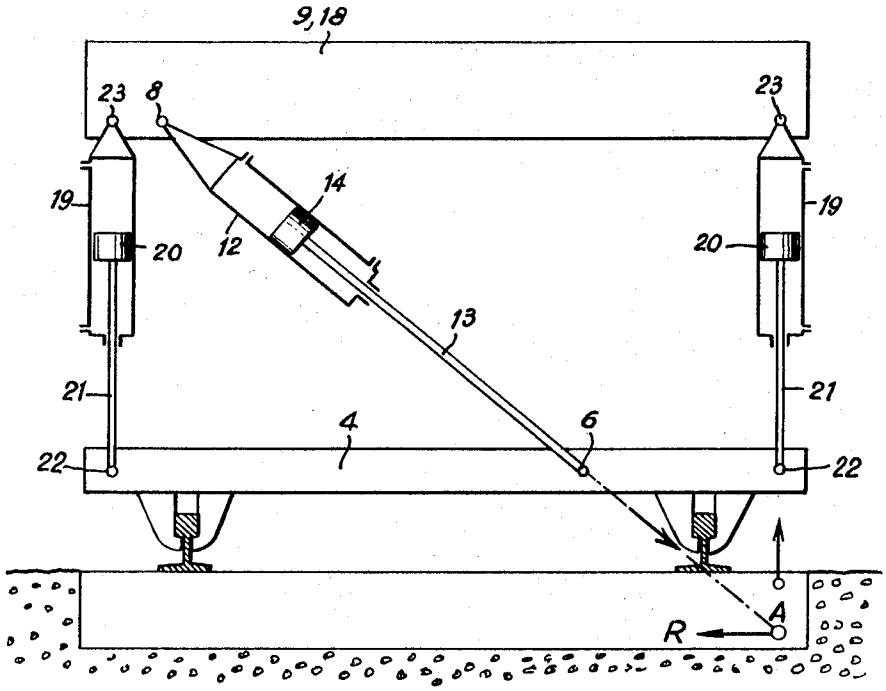
Fig. 3.



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3,318,259

DEVICE FOR SHIFTING A SECTION OF RAILWAY TRACK LAID ON ITS BED OF BALLAST

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9 Claims. (Cl. 104—2)

The present invention relates to devices for shifting a section of railway track which rests on its bed of ballast, and in particular to machines known under the names of shifters, squarers, lifters-shifters, levellers-squarers, etc.

The invention essentially proposes to effect this shifting by means of a mechanism actuated by a jack and hinged so that the shifting strain is applied on the section of track at a point situated on the level where the shifting resistance occurs. The track section may then pivot freely about this point which is at the level of the sleepers.

It is known that in order to displace transversely a railway track already laid, one shifts successive sections by means of devices of extremely varied kinds, movable along the track. This diversity is in great part explained by the desire to avoid the tendency of tilting of the track subjected to shifting. In fact, it is recalled that resistance to shifting results a little from the rigidity of the rails, more from the rail-sleeper assembly, and above all from the sleepers themselves in contact with the ballast, either by adherence, or by the faces which they present thereto, that is to say by which these sleepers act on the ballast during shifting. It follows that this resistance R is situated at a level near to the inner face of the sleepers when the latter rest on the ballast, or, to the upper face when they are raised. It is further noted that the amount of this shifting resistance is generally high.

Accordingly, all the shifters which merely apply a horizontal shifting force at the height of the rail heads produce at the same time a considerable tilting couple of the shifted track which therefore does not produce linear shifting.

Certain shifters reduce this couple by horizontally shouldering the rail by its foot, at the serious risk of damaging the same.

Other known machines secure the two lines of rails by grippers to a chassis which is shifted with the track, generally by means of jacks. The most improved devices attempt to neutralize any resulting tilting but introduce harmful stresses which either interfere with the shifting, or more or less prevent a rectification of the transverse levelling. The horizontality of the force applied is moreover difficult to ensure. This latter drawback is particularly important on the lifters-shifters the hoisting jacks of which uselessly resist the tilting couple. Such shifting produces levelling deviations which must be corrected by additional operations which is of great inconvenience since the correction of the leveling deviations influences in its turn the magnitude of shift.

On tamping-levelling-squaring machines of high precision which operate continuously and must leave behind them a perfectly rectified track, the interdependency between the shifting and the levelling, means that by correcting the undulations of the lay out, one produces an undulation in the levelling of each file of rails, and thus an abnormal undulation in the vertical cant.

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The present invention contemplates a new device for shifting a railway track laid on its bed of ballast, which avoids the drawbacks cited above. It has for an object to provide a device for shifting a section of railway track laid on its bed of ballast, including, on the one hand, a hinged frame constituted by a chassis carrying rail grippers, a supporting chassis and two connecting members, and on the other hand, at least one shifting jack. The device according to the invention is characterized by the fact that the frame has four hinges which are on two straight lines which intersect one another at a point located at the level of the sleepers, so that the track and the chassis which is connected thereto may freely pivot about this point when the shifting jack operates to effect the shifting.

FIGS. 1 to 3 of the accompanying drawing show, by way of example, three embodiments of the device according to the invention. Each figure shows diagrammatically a front view of one embodiment in partial sections, disposed transversely to the track.

In FIG. 1 which is for the greater part symmetrical, the same reference number has been employed for corresponding symmetrical elements so as to render the description more clear.

In the drawing is seen two files of rails **1** connected by a sleeper **2** resting on the ballast **3**.

The track is rendered integral with a horizontal chassis **4** by two rail grippers **5**. Connected to chassis **4** at hinges **6** are two slanting bars **7** themselves hinged at **8** to a second horizontal chassis **9**. The four hinges **6** and **8** of the frame thus formed are therefore at the angles of a trapezium of which the extension of the two nonparallel sides (**6–8**) defines a point of intersection A located between the upper and lower surfaces of the sleeper **2**.

The chassis **9** may slide horizontally in the two guides **10** of an auxiliary chassis **11** under the action of a shifting jack, the cylinder **12** of which is fixed to **11** while the rod **13** of the piston **14** thereof is fixed to chassis **9**. This auxiliary chassis **11** may itself slide freely in the vertical direction due to the sliding engagement of its two lower guides **15** and its two upper guides **16** on two columns **17** integral with the front girder **18** of a railway vehicle not shown.

The operation of this essential part of the device is the following:

In the position shown, if it is assumed that the shifting jack is not under pressure, it will be seen that the track section is entirely free relative to girder **18**. In fact, this section and the bridge **4** which is connected thereto may freely pivot about the instantaneous center of rotation A formed by the connecting rods **7**. The free horizontal sliding is ensured by guides **10**, while guides **15**, **16** and columns **17** ensure the freedom of vertical movement while preventing the tilting of the group **9–11**. Thus girder **18** does not transmit any strain to the track.

If a pressure fluid is supplied to the shifting jack, the latter extends and moves chassis **9** to the right in the drawing, and the right-hand connecting rod **7** is subjected to tensile stress and the left-hand connecting rod subjected to compression stress. These two forces are necessarily equal as required from the condition of vertical equilibrium of the group **9–11** sliding freely on columns **17**. As a result the two connecting rods exert on the track section a resultant horizontal force which balances the shifting resistance R as shown in the figure whereby track section is thus displaced towards the right.

If this shifting resistance R is now a little higher or a little lower, there is created a couple, but which remains of low amount since its lever arm is small. Practically, it becomes insignificant, which is one of the essential objects of the invention.

It is noted that pivoting of the track brings about a displacement of the point A relative to the latter, that is to say to the sleeper. Depending upon a judicious choice of the dimensions and taking into account the small variations of the slant possible in practice, this relative displacement is very reduced and in particular its vertical component—which alone is of importance—remains without appreciable influence.

Inversely, the shortening of the shifting jack produces a displacement of the track to the left in the drawing, and all takes place definitely as if girder **18** applied to the track a horizontal force and as if this track was hinged at A.

Applied on a shifter only, which does not have to lift the track, this device permits dragging the track transversely on the ballast tolerating if need be the pivoting imposed by the irregularities of the stones of the ballast. The shifting is thus facilitated in the most satisfactory manner and the levelling error is reduced to a minimum.

This fundamental property of the embodiment described is preserved when the track is raised from the ballast, for example by props placed in front and behind the section displaced which will thus assume its natural position.

Furthermore, girder **18** may rest directly on the ballast to ensure the support necessary for the shifting.

In FIG. 1, there has been further shown in dot and dash lines two hoisting jacks each constituted by a cylinder **19** with a piston **20** having a slidable rod **21**. Each jack pivots at **22** on **4** and at **23** on **18**.

These jacks permit not only of hoisting the track section, but also to fix the transverse slant thereof.

Their pendular mounting is such that they practically do not impede the shifting, and in its turn the latter is without influence on them since the track is to all intents and purposes hinged at A. One thus provides the independence of the hoisting and shifting stresses, which greatly facilitates the operations—already mentioned—on the hoisting-propping machines, but above all permits considerable improvement of the accuracy of the most improved levelling-squaring machines which employ automatic servo-motors.

In FIG. 2 has been shown with the same references those parts of the elements of FIG. 1 which are found again in the second embodiment.

In this example, the bars **7** are replaced by two hydraulic shifting jacks instead of one. Each one is hinged through its rod **13** at **6** and through its cylinder **12** at **8**. The auxiliary chassis **11** is eliminated and the chassis **9** merges into the girder **18** of the first example.

On girder **18** is fixed the body **24** of a slide distributor **25** of entirely symmetrical construction.

In the position shown, the oil pressure in the supply duct **26** is transmitted to the two chambers **27** of the distributor while communication of duct **26** with the two discharge ducts **28** is blocked by distributor **25**. Since each of chambers **27** is connected by a flexible conduit **29** to the chamber **30** of the shifting jacks and by a flexible duct **31** to the chamber **32** of these jacks, this pressure exists on either side of the pistons **14**. If one neglects the very small section of the rods **13**, the two jacks do not exert any external force.

It is noted that the track may also rise or fall and that it may pivot about A, since the jacks form two extensible connecting rods. Here again the vertical displacement of A relative to the sleeper may be considered as a negligible quantity.

If one now moves the slide distributor **25** towards the right in the drawing, the projection **33** of the slide maintains under pressure the chamber **30** on the left and the chamber **32** on the right. But the chamber **27** on the right, and thereby the two other chambers **30** and **32**, are at the same time connected to the discharge **28**. The left-hand jack thereby tends to lengthen, and the right-hand one tends to shorten with the same energy since these two jacks have the same sections. There again results in the development of a horizontal shifting force at A, which produces displacement of the track to the right until the slide **25** is brought back to the middle position. The movement in the opposite direction is effected by moving slide **25** to the left.

The operation of the hoisting jacks, marked in dot and dash lines in the drawing, remains unchanged and the same practical independence is preserved between hoisting and shifting.

FIG. 3 again shows, with the same reference characters, a part of the elements of FIG. 1.

In this example, the shifting jack **12, 14, 13** is hinged at **6** to chassis **4** and at **8** to girder **18**, so that it forms one of the extensible connecting rods of the deformable frame, the other connecting rod being the hoisting jack (**19, 20, 21**) to the right in the drawing. The four articulations **6, 8, 22** and **23** are arranged along two straight lines converging at A. The other hoisting jack, to the left of the figure is obviously free of any shifting stress.

In order to shift the track to the right of the drawing, the shifting jack must be lengthened which, acting under compression, provides at A a slanting force the horizontal component of which balances R, the vertical component being compensated by the right-hand hoisting jack only. This compensation may easily be effected by the usual means of hydraulics, such as an auxiliary jack, suitable control of the pressures in the chambers, etc.

Many other variants may be considered within the scope of the invention. A variant of FIG. 1, will be mentioned in which the shifting jack (**12, 13, 14**) could replace one of the bars **7**, the sliding at guide **10** being then eliminated.

What I claim is:

1. A device for shifting a part of a railway track having sleepers resting on a bed of ballast, said device comprising: an articulated frame constituted by two superposed transverse members and two connecting members which are hingeably connected to said transverse members, rail grippers carried by the lower of said transverse members, and at least one shifting jack for acting on said frame to shift said track, the articulation points of one connecting member defining a straight line which intersects a straight line passing through the articulation points of the second connecting member at a point located at the level of the railway track sleepers.

2. A device according to claim **1**, wherein said two connecting members are of fixed length, the upper transverse member being slidably supported for movement transverse to the railway track, said shifting jack being engaged with the upper member for shifting the same.

3. A device according to claim **1**, wherein said two connecting members are of variable length and the device further comprises control means for actuating said connecting members so that one connecting member is reduced in length while the length of the other connecting member increases.

4. A device according to claim **1**, comprising height adjusting means suspended from the upper transverse member in pendulum-like fashion transverse of the railway track for being articulated to said lower transverse member.

5. A device according to claim **1**, comprising a third articulated connecting member, two of which connecting members are disposed outwards of the railway track and perpendicular to the shifting direction thereof, while the third connecting member is disposed obliquely between the first and second connecting members in such a manner that the straight line running through the articulation points of the oblique connecting member intersects the straight line running through the articulation points of one of the two other connecting members at a point located at the level of the railway track sleepers.

6. A device according to claim 1, wherein said one shifting jack is axially coupled to one of said connecting members.

7. A device according to claim 3, wherein two shifting jacks are provided, each being axially coupled to a respective connecting member.

8. A device according to claim 3, wherein at least one of the connecting members is a rigid bar.

9. A device according to claim 3, wherein at least one

of the connecting members is variable in length and said shifting jack is axially coupled thereto.

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