March 23, 1954 L. A. J. BIENFAIT ET AL 2,672,694

APPARATUS FOR CHECKING THE GAUGE OF RAILWAY TRACKS

Filed Jan. 8, 1952

2 Sheets-Sheet 1

Fig. 1

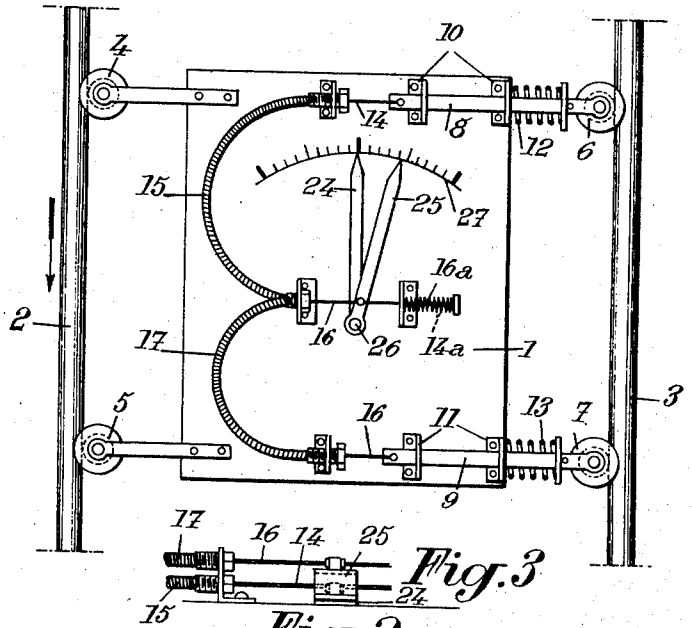
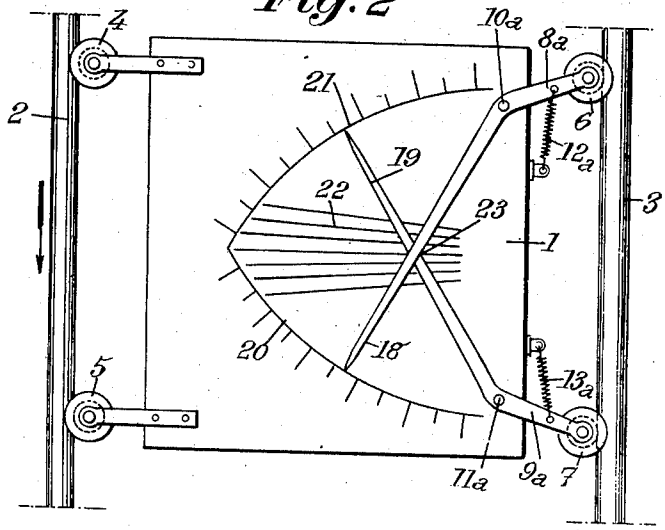


Fig. 3

Fig. 2



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Fig. 4.

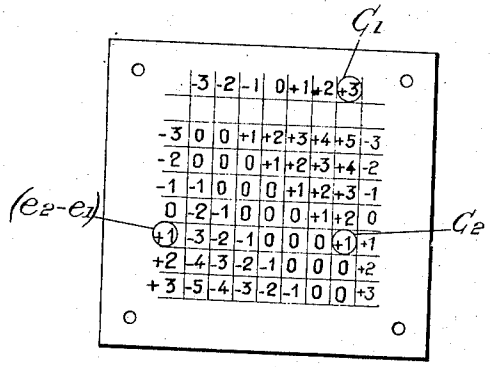
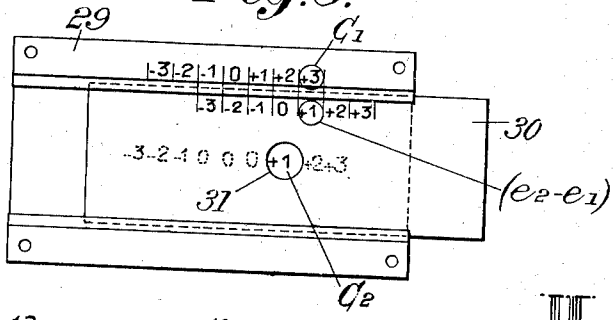


Fig. 5.



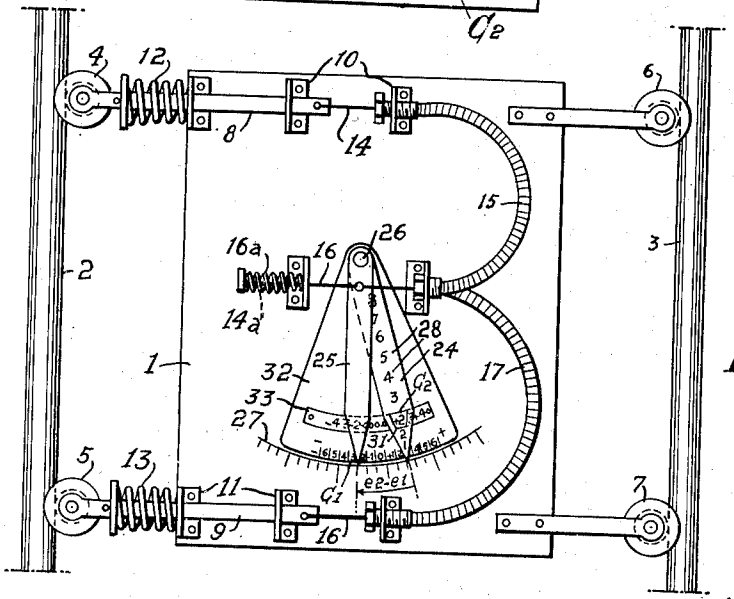


Fig. 6.

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APPARATUS FOR CHECKING THE GAUGE OF RAILWAY TRACKS

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Claims priority, application France January 19, 1951

6 Claims. (Cl. 33—146)

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The present invention relates to apparatus for checking the gauge of a railway track continuously along said track.

Its object is to provide an apparatus of this kind which is better adapted to meet the requirements of practice than those as may exist at the present time.

It consists essentially in a frame movable along the track, for instance by rolling thereon, and provided with means for constantly indicating both the values of the distance between the inside edges of the rails measured respectively at two points along the track located at a fixed or substantially fixed distance from each other and the difference between the two gauge values thus measured.

Other features of our invention will become apparent in the course of the following detailed description of some embodiments thereof with reference with the accompanying drawings, given merely by way of example, and in which:

Fig. 1 is a diagrammatic plan view of an apparatus made according to an embodiment of our invention;

Fig. 2 is a similar view corresponding to another embodiment of the invention;

Fig. 3 is an elevational view of a detail of Fig. 1;

Figs. 4 and 5 show, in plan view, additional features of an apparatus according to our invention;

Fig. 6 shows a modification of the apparatus of Fig. 1.

It should first be reminded that the gauge of a railway track, i. e. the distance between the inside edges of the rails thereof, must comply with two essential conditions, to wit: (*a*) this distance must remain within limits fixed by regulations; (*b*) its "longitudinal variation" (i. e. the difference between the values of said distance measured at two points located at a given distance from each other along the track) must also remain within given limits.

It is therefore necessary to measure, all along the track the values of this distance and its longitudinal variation so that, if, in some parts of the track, they are beyond the limits above referred to, this track may be adjusted to make the necessary corrections. Of course the adjustments must be reduced to a minimum.

The apparatus according to our invention, as illustrated by Figs. 1 and 2, includes a light car or lorry 1 rolling on rails 2 and 3 and guided along the inner edges of these rails by means of rollers 4, 5, 6 and 7 having their axes substantially

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vertical. These rollers may serve to support the weight of the car, in which case, as shown, they are provided with flanges resting on the top faces of the rails. But the weight of the car might be supported by other rollers or wheels, not shown, having horizontal axes. The two rollers 4 and 5 cooperating with one of the rails, to wit rail 2, have their respective axes of rotation fixed with respect to frame 1. The two other rollers, 6 and 7, disposed opposite rollers 4 and 5, respectively, and running along the other rail 3, have their respective axes of rotation movable with respect to frame 1 and these rollers 6 and 7 are elastically urged against said rail 3. Indicator means responsive to displacements of each of said rollers 6 and 7 with respect to frame 1 indicate the distance between rails 2 and 3 measured at the level of the pair of rollers 4—6 and at the level of the pair of rollers 5—7, respectively. Indicator means responsive to relative displacements of rollers 6 and 7 with respect to each other indicate the difference between the distances measured at 4—6 and 5—7 respectively.

In the embodiment of our invention illustrated by Fig. 1, the axes of rollers 6 and 7 are carried by rods 8 and 9 perpendicular to the axis of the track and slidable in slideways 10 and 11 carried by frame 1 and themselves perpendicular to said axis of the track. Springs 12 and 13 interposed between said rods 8 and 9 and frame 1 urge said rods outwardly, that is to say toward rail 3.

To the inner ends of rods 8 and 9 are fixed cables 14 and 16 passing through flexible sheaths 15 and 17 respectively, each of these sheaths having both of its ends fixed to frame 1 so as to act as a guide for the cable passing therethrough. The other ends of these cables are pulled by springs 14*a*, 16*a* so that the displacements of each rod 8 or 9 are reproduced (in the opposed direction) by the portions of each cable 14 or 16 adjacent to the corresponding spring 14*a* or 16*a*.

Two pointers 24 and 25 pivoted at 26 to frame 1 are driven respectively by cables 14 and 16, which are respectively fixed to said pointers at points thereof relatively close to their pivot axes. The ends of these pointers move along a common scale 27, each pointer indicating on said scale the width or gauge of the track (at the level of rollers 4—6 for pointer 24 and at the level of rollers 5—7 for pointer 25). The difference between these values of the track width or gauge, i. e. the "longitudinal variation" may be read on said scale 27 as the difference between the indications of pointers 25 and 24. It may also be

read directly on a third scale **28** (Fig. 6) traced on pointer **24** (located under pointer **25**) and cooperating with the side edge of pointer **25**.

According to the embodiment of Fig. 2, rollers **6** and **7** are carried by bent levers **8***a*—**18** and **9***a*—**19** pivoted on frame **1** respectively at **10***a* and **11***a*, these rollers **6** and **7** being urged by springs **12***a* and **13***a* interposed between their respective portions **8***a* and **9***a* and frame **1** so as to be constantly applied against rail **3**. The portions **18** and **19** of these bent levers constitute pointers moving along two scales **20** and **21** respectively. The track width or gauge at the level of rollers **4**—**6** is read on scale **20** and the width at the level of rollers **5**—**7** is read on scale **21**. As for the difference between these values of the width, it is read on a system of lines **22** each of which indicating a given value of this difference and being marked by the point of intersection **23** of pointers **18** and **19**.

The operation of the apparatus is very simple. The car **1** is moved along the track, for instance in the direction of the arrows of Figs. 1 and 2. Thus the operator immediately sees whether the gauge remains within the desired limits, this gauge being constantly marked on scale **21** or **27**.

At the same time, the "longitudinal variation" is read on scale **22** or **28**, to make sure that it remains within the given limits.

In the relatively rare case where the first condition (relating to the value of the gauge) is not complied with, the operator marks on the rails or the sleepers the sections where adjustments are to be made and the numerical values of these adjustments (as indicated by the position of the pointer on the corresponding scale).

In the much more frequent case where the first condition is complied with, but not the second, the operator marks the sections where adjustment is necessary and the numerical values of these adjustments, in accordance with the indications read on scale **22** or **28**.

If e_1 and e_2 are the values of the track gauge or width measured at levels **4**—**6** and **5**—**7** respectively, the condition is that the "longitudinal variation" should not exceed, in absolute value, a given limit t.

Supposing that an adjustment c_1 has already been found necessary at level **4**—**6**, the longitudinal variation V between levels **5**—**7** and **4**—**6**, after this adjustment, will be:

$$V=e_1+c_1-e_2=c_1-(e_2-e_1)$$

Now c_1 is known and e_2-e_1 is read on scale **22** or **28**. Therefore V is known.

If the absolute value of V is smaller than t, no adjustment is necessary at level **5**—**7**.

If the absolute value of V is greater than t, an adjustment c_2 is necessary at level **5**—**7**. But, of course, this adjustment will be made as small as possible, that is to say such that V will become V_a, of an absolute value equal to t.

Now:

$$V_a=e_1+c_1-(e_2+c_2)=c_1-(e_2-e_1)-c_2=V-c_2$$

and to say that the absolute value of V_a must be equal to t means that

if V is positive, $c_2=V-t$

and

if V is negative, $c_2=V+t$

To sum up, replacing V by its developed value, i. e. $c_1-(e_2-e_1)$, an adjustment of the width of the track at level **5**—**7** is necessary if the absolute value of $c_1-(e_2-e_1)$ is higher than t, and this adjustment must be

$c_2=c_1-(e_2-e_1)-t$, if c_1 is greater than e_2-e_1

and

$c_2=c_1-(e_2-e_1)+t$, if c_1 is smaller than e_2-e_1

In order to avoid having to make calculations, it is advantageous to make use of a table such as shown by Fig. 4, which is preferably carried by frame **1**. In this table, the lines correspond to different values of e_2-e_1, to wit -3, -2, -1, 0, $+1$, $+2$, $+3$, and the columns correspond to different values of c_1, to wit -3, -2, -1, 0, $+1$, $+2$, $+3$. The value of adjustment c_2 to be made at level **5**—**7** is given at the intersection of the line corresponding to the value of e_2-e_1 read on scale **22** or **28**, and of the column corresponding to the value of the adjustment found necessary at level **4**—**6**. For this table, the value of t is 1.

Fig. 5 shows a device to be mounted on frame **1**, to give without calculation the value of c_2 as a function of e_2-e_1 and c_1. The apparatus includes a plate **29**, bearing graduations corresponding to different values of c_1. A sliding plate **30** bears, opposite the above mentioned graduations, other graduations corresponding to different variations of e_2-e_1. The values of c_2 are read on a third line of graduations marked on plate **29** under plate **30**, through an aperture **31** provided in said plate **30**. The known values of c_1 and e_2-e_1 are placed opposite each other by sliding plate **30** and the corresponding value of c_2 is read through aperture **31**. In the example shown by the drawing, t is equal to 1.

Fig. 6 (which shows the same general arrangement as Fig. 1) discloses a device according to our invention for giving the value of c_2 corresponding to a point of the track. This device is arranged to cooperate with the two pointers **24** and **25** pivoted on frame **1** as above described with reference to Fig. 1. On the pivot **26** of these pointers there is mounted a sector **32** bearing two scales or rows of graduations C_1 and C_2, the graduations C_1 being provided along the circular edge of the sector, which is adjacent to scale **27**, above described. The other graduations C_2 are marked along a circular arc, as shown at **33**. Pointer **24** is provided with an aperture **31** through which one graduation of **33** is visible. As above described, the angular distance between the ends of pointers **24** and **25** is automatically proportional to e_2-e_1. Therefore, everything takes place as if the end of pointer **25** marked, on an imaginary scale rigid with pointer **24** and having its zero at the end of said pointer **24**, the value of e_2-e_1. Sector **32** is adjusted so that the graduation of scale C_1 which corresponds to the value of c_1 is made to coincide with the end of pointer **25**. Consequently, the value read on scale C_2 through the hole **31** of pointer **24** is the desired value of c_2.

Of course, scale C_2 in Figs. 5 and 6 depends upon the value of t. It will be noted that when t is equal to 1, scale C_2, every graduation of which is equal (linearly or angularly) to every graduation of scales C_1 and e_2-e_1, includes, in its central part, three graduations marked zero (i. e. one central zero graduation and one on either side thereof). If t were equal to 2, scale C_2 would include, in its central part, five graduations marked zero, i. e. one central zero graduation and two on either side thereof. If t were equal to 3

the number of zero graduations would be 7 (3+1+3) and so on.

When the apparatus is not used to measure adjustments c_2 but merely to ascertain whether such adjustments will be necessary, i. e. to know whether e_2-e_1 is always within limits $-t$ and $+t$, sector 32 is not required and may be retracted or removed.

In a general manner, while we have, in the above description, disclosed what we deem to be practical and efficient embodiments of our invention, it should be well understood that we do not wish to be limited thereto as there might be changes made in the arrangement, disposition and form of the parts without departing from the principle of the present invention as comprehended within the scope of the accompanying claims.

What we claim is:

1. An apparatus for checking the gauge of a railway track which comprises, in combination, a frame movable along said track, and means carried by said frame for constantly indicating both the values of said gauge measured at the front and at the rear of said frame and the difference between these two values.

2. An apparatus for checking the gauge of a railway track which comprises, in combination, a frame, movable along said track, two pairs of rollers carried by said frame, one at the front and the other at the rear of said frame, the two rollers of each pair being located along a line at right angles to the longitudinal direction of said frame and being adapted to run along the inner edges of the rails of the track respectively, one roller of each pair being movable toward and away from the other, elastic means for urging said movable roller outwardly, and means on said frame operatively connected with said movable rollers for amplifying and indicating the respective displacements of said movable rollers relatively to said frame and the difference between said respective displacements.

3. An apparatus for checking the gauge of a railway track which comprises, in combination, a frame movable along said track, two pairs of rollers carried by said frame, one at the front thereof and the other at the rear, the two rollers of each pair being located along a line at right angles to the longitudinal direction of said frame and being mounted to run along the inner edges of the rails of the track respectively, one roller of each pair being movable toward and away from the other, elastic means for urging said movable rollers outwardly, at least one set of graduations carried by said frame, amplifying means movably mounted on said frame and operatively connected with said movable rollers for indicating on said graduations the respective displacements of said movable rollers relatively to said frame, and means cooperating with said amplifying means for indicating the difference between said respective displacements.

4. An apparatus for checking the gauge of a railway track which comprises, in combination, a frame movable along said track, two pairs of rollers carried by said frame, one at the front thereof and the other at the rear, the two rollers of each pair being located along a line at right angles to the longitudinal direction of said frame and being mounted to run along the inner edges of the rails of the track respectively, one roller of each pair being movable toward and away from the other, elastic means for urging said movable rollers outwardly, a circular scale carried by said frame, two pointers pivoted to said frame about the center of said scale and operatively connected with said movable rollers respectively to indicate on said scale the respective displacements of said movable rollers relatively to said frame, and a scale carried by one of said pointers and adapted to cooperate with the other pointer for indicating the difference between said respective displacements.

5. An apparatus for checking the gauge of a railway track which comprises, in combination, a frame movable along said track, two pairs of rollers carried by said frame, one at the front thereof and the other at the rear, the two rollers of each pair being located along a line at right angles to the longitudinal direction of said frame and being mounted to run along the inner edges of the rails of the track respectively, one roller of each pair being movable toward and away from the other, elastic means for urging said movable rollers outwardly, two circular scales carried by said frame and having different centers, two levers for carrying said movable rollers pivoted to said frame about said centers, two pointers rigid with said levers respectively and having their ends movable along said two scales respectively, and a network of lines traced on said frame along the loci of the points of intersection of said pointers for different values of the difference between the respective displacements of said movable rollers relatively to said frame.

6. An apparatus according to claim 4 further including a sector movable under said two pointers and pivoted about their common axis, this sector carrying a first circular scale adjacent to the first mentioned circular scale and a second circular scale concentric with the first and adapted to cooperate with one of said pointers.

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