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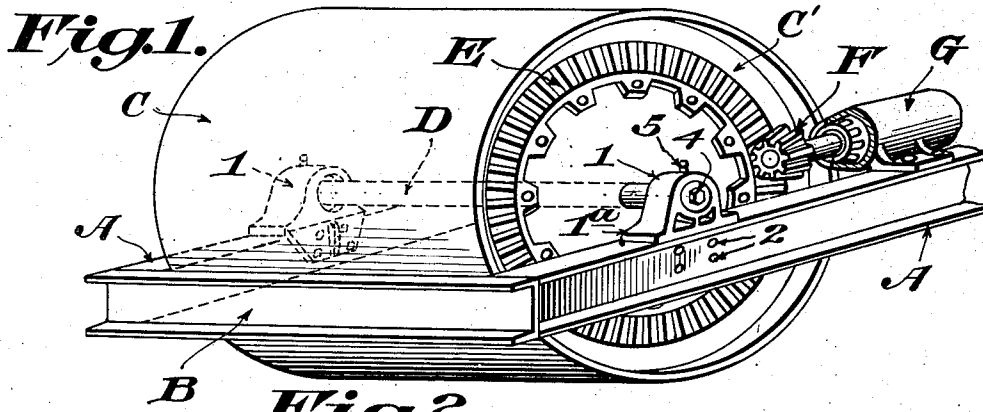
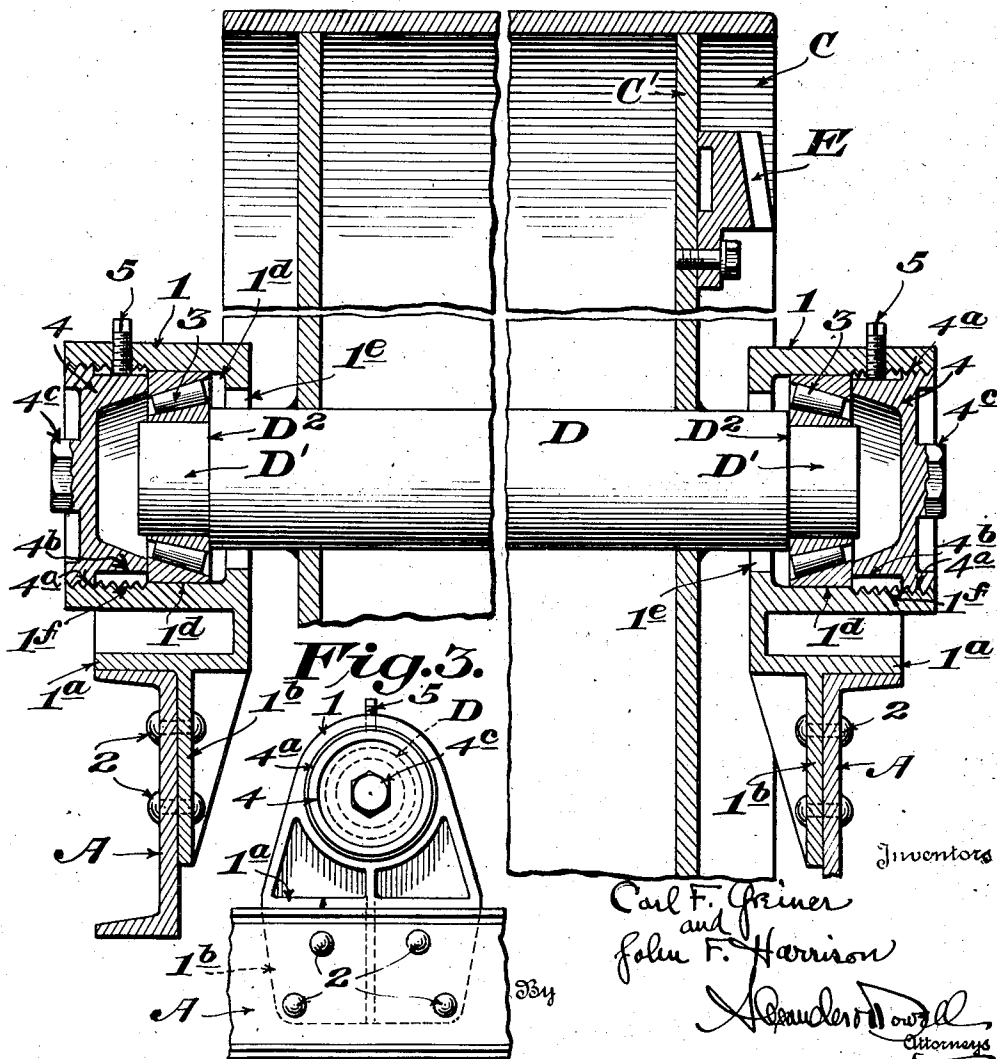
C. F. GREINER ET AL

**2,386,946**

## DRIVE ROLL ASSEMBLY

Filed June 15, 1942

3 Sheets-Sheet 1



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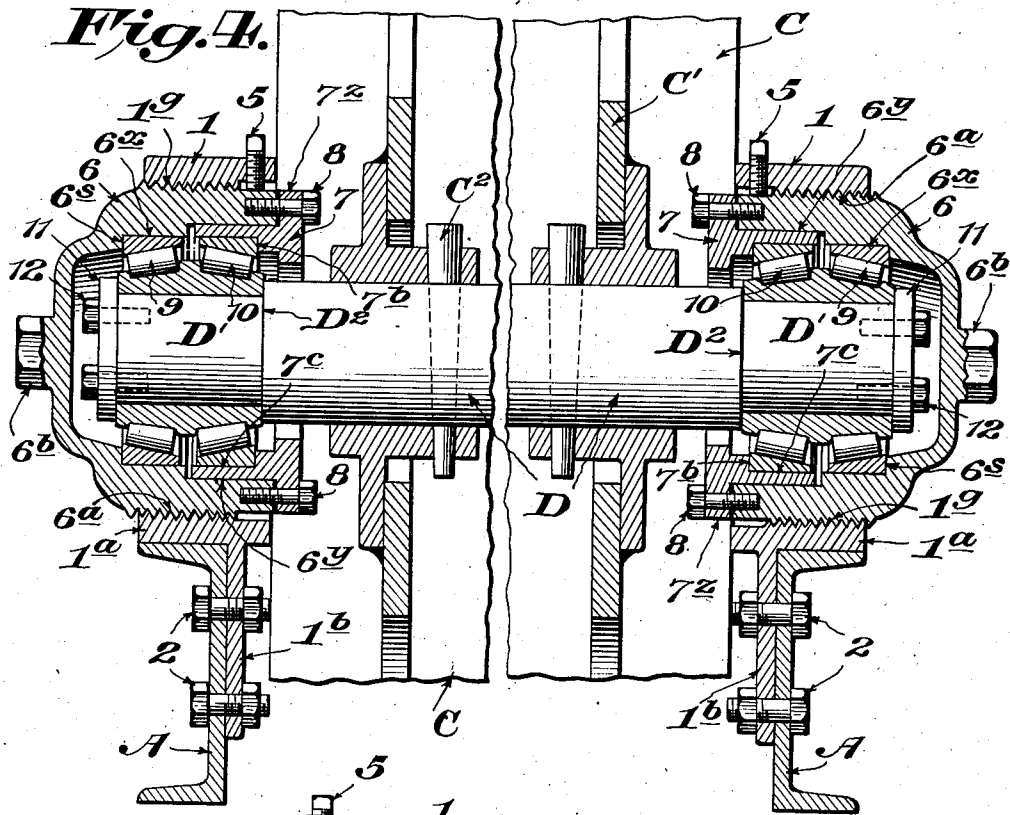
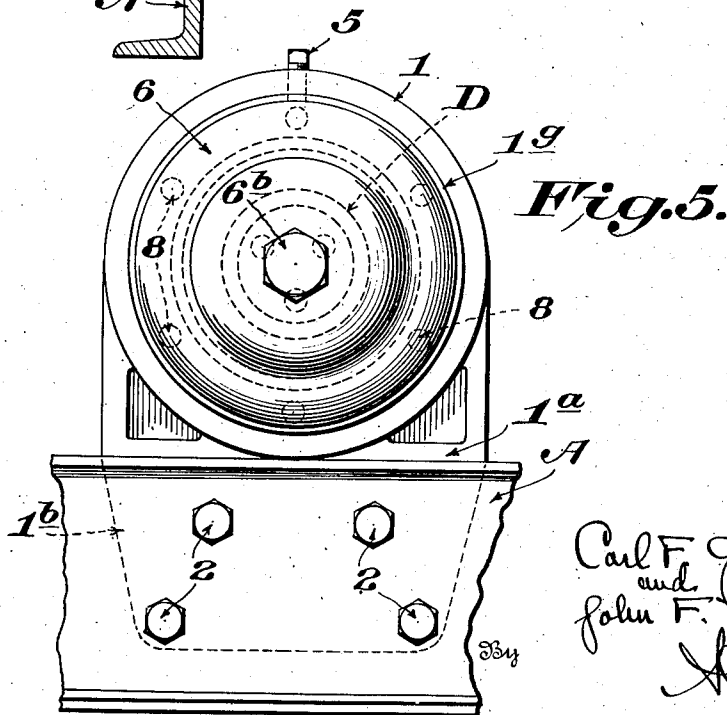
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DRIVE ROLL ASSEMBLY.

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3 Sheets-Sheet 2



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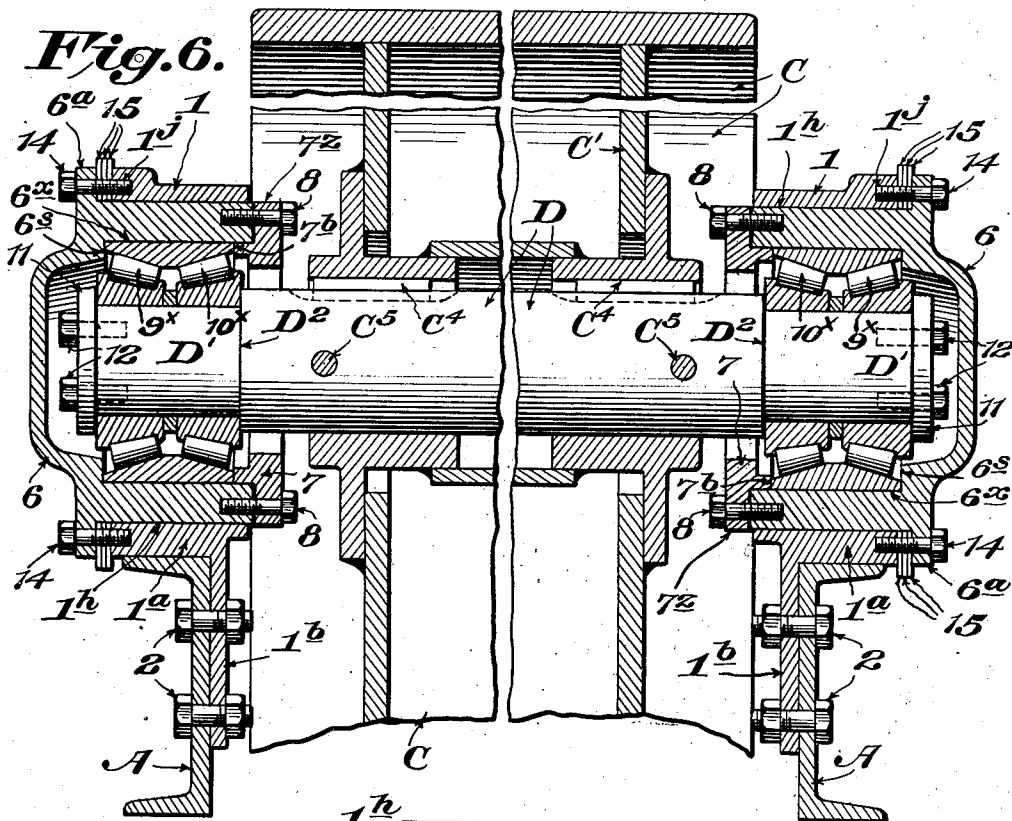
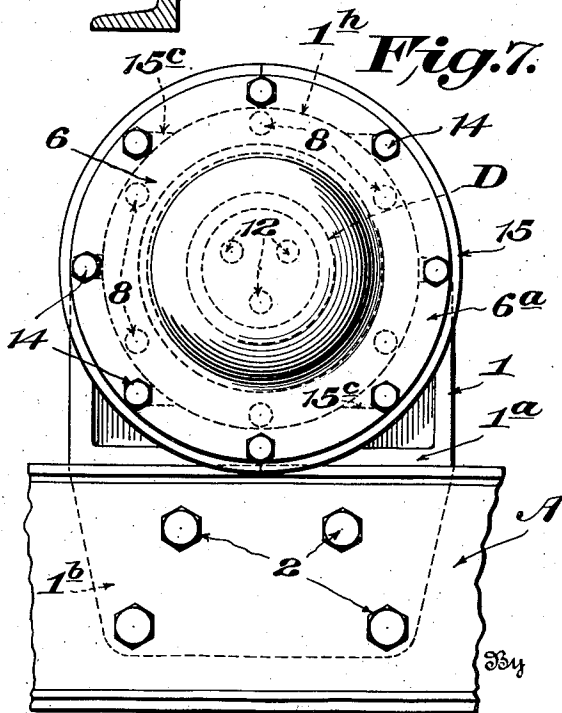
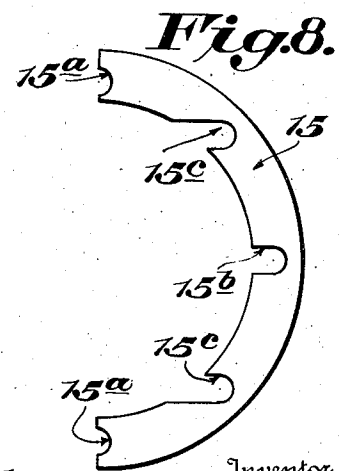
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## DRIVE ROLL ASSEMBLY

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3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,386,946

## DRIVE ROLL ASSEMBLY

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15 Claims. (Cl. 180—20)

This invention is a novel drive roll assembly, particularly adapted for use in connection with the drive rolls of tandem road rollers; and the principal object of the invention is to provide an assembly presenting certain advantages with respect to low cost, manufacturing simplicity, and operating performance.

The particular advantages in using a bevel gear drive for tandem road rollers reside in the elimination of spur gears and their inherent high cost, and also resides in the provision of a drive having the characteristics of utmost simplicity, the bevel gear drive permitting compensating adjustment due to wear of the gears by shifting the axle upon which the drive roll is fixedly mounted, towards or from the bevel driving pinion, thereby maintaining the original efficiency of the bevel gear drive. Furthermore, said adjustments may be utilized to accommodate manufacturing variations, thus facilitating production and assembly with a resultant reduction of cost.

Another object of our invention is to provide an adjustable bevel gear drive roll assembly permitting take-up for wear in the gear train in order to keep back lash down to a minimum, excessive back lash in the gear train being undesirable.

Other minor objects of the invention will be hereinafter set forth.

We will explain the invention with reference to the accompanying drawings which illustrate several practical embodiments thereof, to enable others familiar with the art to adopt and use the same; and will summarize in the claims, the novel features of construction, and novel combinations of parts, for which protection is desired.

In said drawings:

Fig. 1 is a perspective view showing the drive roll of a tandem type road roller, and showing the arrangement of ring gear and bevel driving pinion.

Fig. 2 is an enlarged longitudinal section, partly broken away, through the drive roll, showing the axle equipped with tapered roller bearings arranged to permit bearing adjustment, and having means for permitting axial shifting of the axle and drive roll carried thereby.

Fig. 3 is a front elevation of the bearing bracket shown in Fig. 2.

Fig. 4 is a longitudinal section, similar to Fig. 2, but showing a further modified arrangement in which bearing adjustment is permitted, and in which the axle may be adjusted axially.

Fig. 5 is a front elevation of the bearing bracket shown in Fig. 4.

Fig. 6 is a longitudinal section similar to Fig. 4 but showing a modified arrangement of bearings for the axle in which no bearing adjustment is permitted, but however having means for permitting axial shifting of the axle.

Fig. 7 is a front elevation of the bearing bracket shown in Fig. 6.

Fig. 8 is a plan view of one of the spacing shims used in the assembly shown in Fig. 6.

As shown in Fig. 1, the frame of the tandem road roller, or other vehicle, includes opposite side members A and an end member B, said members A and B being preferably heavy channel irons secured together at their ends in any desired manner to provide an open rigid frame. Between the side members A, A, is journaled a drive roll C, the same being fixedly mounted upon axle D journaled in axle bearing brackets 1 mounted upon the tops of side members A, A. On the end plate C' (Figs. 1 and 2) of roll C is a bevel ring gear E meshing with a bevel pinion F on the main drive shaft journaled in a housing G mounted upon the adjacent side member A, said pinion F being driven through suitable clutch and speed change gears from a motor or engine in the usual manner, the said housing G being fixedly mounted upon side member A.

As shown in Figs. 2 and 3 each axle bearing bracket 1 is provided with a flat base portion 1a adapted to seat directly upon the top of the side member A, and is provided with a depending flange 1b adapted to engage the web of the side member, flange 1b being provided with holes for the reception of rivets 2 or the like whereby brackets 1, 1 are fixedly secured in position.

In each bearing bracket 1 above base 1a is a relatively large outwardly opening circular recess 1d having a smaller opening 1e at its inner end into which extends the end of axle D upon which the roll C is welded, said axle D having a reduced end D' upon which is mounted a tapered roller bearing 3, such as a Timken bearing, the inner ring being seated directly upon the reduced extension D' with its inner end engaging the shoulder D2 formed between the portions D and D', and the outer ring slidably engaging the walls of the circular recess 1d. The outer portion of the circular recess 1d is internally threaded as at 1f and adapted to receive a cup-shaped cap 4 having external threads 4a adapted to engage the threads 1f, the inner end of the cap 4 being adapted to contact the outer face of the outer ring of the bearing 3 as shown in Fig. 2, and for this purpose the inner end of the cap 4 is provided with an annular recess 4b in its outer periphery.

Projecting from the outer face of cap 4 is a hexagonal or other non-circular nut portion 4c whereby cap 4 may be rotated within the bearing bracket 1; and in order to lock cap 4 in adjusted position a set screw 5 is preferably provided in a tapped bore in the bearing bracket 1 adjacent its outer end, said screw 5 being adapted to engage the recess 4b of the cap and lock the cap in adjusted position.

By the above construction the tapered roller bearing 3 is maintained in axial position within the annular recess 1d of bearing bracket 1, the same being confined between the shoulder D2 of axle D and the inner end of cap 4. Such assembly permits compensation for adjustment of wear of the gears E and F by shifting the axle D and the drive roll C mounted thereon to take up any wear, thus restoring the original efficiency which the bevel gear drive had when new. When it is desired to adjust the clearance between the gears E and F it is merely necessary to loosen the set screws 5 and rotate the caps 4 to shift the caps 4 at each end of the axle in the same direction, thereby moving the axle and drive roll towards or from the drive pinion F, and when the desired degree of clearance has been obtained the set screws 5 are again tightened, the length of the caps 4 permitting substantial adjustment. When the set screws 5 are screwed in place the caps 4 will be maintained in any position to which they are adjusted. Moreover, said means permits adjustments to accommodate manufacturing variations, thus facilitating production and assembly with the resultant reduction in cost.

If both caps 4 are shifted in their bearings the same amount and in the same direction, no change in the adjustment of tapered roller bearing 3 will be made. However, if desired to take up wear in the bearing 3 itself without shifting the axle D, it is merely necessary to rotate one of the caps 4 so as to shift same towards its related bearing 3; and thus take up for wear in the tapered roller bearing 3 may be readily accomplished. The above arrangement thus permits axial shift of the axle and roll C together with bearing adjustment; and the construction is simple and efficient.

In the modification shown in Figs. 4 and 5 each bracket 1 is similarly provided with a base 1a and the depending flange 1b which is secured by rivets or bolts 2 to the side member A. However, the bearing bracket 1 is provided with a relatively large threaded bore 1g extending entirely through the bracket and adapted to receive a cup-shaped bearing carrier 6 having threads 6a on its periphery engaging the threads 1g of bracket 1, carrier 6 also having on its outer end a hexagonal or non-circular nut 6b whereby the carrier may be rotated in its bracket 1.

Preferably the walls of carrier 6 are substantially coextensive with the length of the threaded bore 1g but the threads 6a are omitted at the inner end of the carrier 6 in way of the set screw 5. At the inner end of carrier 6 is a ring 7 of greater internal diameter than the diameter of axle D, said ring 7 being secured to the inner end of carrier 6 by means of screws 8 or the like passing through flange 7z and into the end of the carrier. Ring 7 is slidable within an outer bore 6y of carrier 6 and is provided with an internal annular recess 7c forming a continuation of an inner bore 6x in carrier 6. The axle D, upon which the drive roll C is pinned, by pins C2, extends into the carrier 6 through the ring 7, axle

D having its reduced portion D' disposed within the carrier.

Upon the reduced portion D', within the carrier 6, are opposed tapered roller bearings 9 and 10 similar to bearing 3 of Fig. 2, said bearings 9 and 10 having a common inner race maintained on the reduced portion D' by engagement of the inner end of the inner race with the shoulder D2 of axle D, and by engagement of the outer end of the inner race with a plate 11 secured to the end of axle D by means of a screws 12 passing through plate 11 and into tapped bores in the end of the axle. The outer race of outer bearing 9 engages a shoulder 6s in the bore 6x of cap 6 which receives the outer race of bearing 9, while the outer race of bearing 10 engages a shoulder 7b at the end of the internal annular recess 7c in the wall of the ring 7 within which recess the outer race of bearing 10 is received. The larger ends of the rollers of both roller bearings 9 and 10 are disposed adjacent each other as shown in Fig. 4. Thus the common inner race of bearings 9 and 10 is maintained in constant fixed relation upon the reduced portion D' of axle D, while the outer races of bearings 9 and 10 may be shifted towards each other upon adjustment of ring 7 by the screws or bolts 8; and as the outer race of bearing 9 will be shifted towards the larger ends of the rollers of bearing 9 and the outer race of the bearing 10 will be shifted towards the larger ends of the rollers of bearing 10, adjustment of the bearings 9 and 10 for wear may be readily effected by shifting collar 7 to compress the outer races between the shoulders 6s and 7b. Moreover, the axle D, together with the roll C, may be shifted axially by loosening set screws 5 and rotating the carriers 6 at opposite ends of the axle to shift same equal amounts in the same direction in their axle bearings 1, the set screws 5 being afterwards again tightened.

In Figs. 6, 7 and 8 a modification of the assembly is illustrated using opposed tapered roller bearings so arranged that no adjustment of the bearings is permissible (as in Figs. 2 and 4) although the axle and drive roll may be shifted to properly adjust the bevel gear drive. In this modification the drive roll C is keyed as at C4 between spacing pins C5 on axle D. The bore 1h in bearing 1 is cylindrical and smooth, instead of being threaded (as in Figs. 2 and 4), and the walls of the bearing carrier 6 are likewise smooth and slidably engage the bore 1h. The inner end of carrier 6 is provided with a ring 7 secured by bolts 8; and each ring 7 is provided with a shoulder 7b engaging the inner end of the common outer race of the opposed tapered roller bearings 9x and 10x which race is confined within the carrier 6 between the shoulder 7b of ring 7 and the end 6s of bore 6x of the carrier 6 whereby the common outer race of bearings 9x and 10x is maintained in fixed relation with respect to the carrier 6.

In this modification (Figs. 6, 7, 8), the smaller ends of the tapered rollers of bearings 9x and 10x are adjacent; and the separate inner races of the bearings are spaced by a collar interposed therebetween, the outer ends of the inner races respectively engaging the shoulder D2 of the axle and the plate 11 which is secured by bolts or screws 12 to the end of reduced portion D' of the axle. Thus the inner recess of bearings 9x and 10x are fixed upon the reduced portion D' of axle D while the common outer race of said bearings is fixed within the carrier 6, and hence no adjustment

of the bearings 9x and 10x is permitted in this modification.

In this modification (Figs. 6, 7, 8) the outer face of each bearing 1 is provided with a plurality of threaded bores 1j disposed in equally spaced relation around the bore 1h and the outer face of each carrier 6 is provided with an annular flange 6a overlying the bores 1j, said flange having spaced holes for the passage therethrough of securing bolts 14.

A plurality of pairs of arcuate shims 15 (Fig. 8) of 180° length each may be interposed in opposed relation between the outer face of bearing bracket 1 and the annular flange 6a of carrier 6, the combined thickness of the pairs of opposed shims 15 determining the adjustment of the carriers 6 in the bores 1h of bearing brackets 1, and hence determining the adjustment of the axle D and roll C in the frame of the road roller. Each arcuate shim 15 has a semi-circular recess 15a at each end to receive half the thickness of the diametrically opposite bolts 14 of the carrier 6, which bolts 14 are shown in Fig. 7 as being spaced 45° apart on a common pitch circle; also a central inwardly opening slot 15b to receive the corresponding bolt 14 and two intermediate inwardly opening slots 15c to receive the corresponding bolts 14, the slots 15a, 15b and 15c being so disposed that the shims 15 may be readily inserted and removed from the position between the flange 6a and bearing 1, notwithstanding the bolts 14 since all the slots 15b, 15c open in the same direction and their side walls are disposed normal to a line drawn through the axes of the two slots 15a. Thus two opposed shims 15 may be inserted horizontally from opposite directions between the flanges 6a and bearing 1 to form a circular washer without interference with the series of bolts 14, and the sides of the slots 15b, 15c being horizontal will prevent same from dropping down until the bolts 14 are tightened. Thus when inserting or removing a set of shims 15 it is not necessary to dismantle the assembly.

The assembly shown in Figs. 6, 7, 8 also permits axial shifting of axle D and drive roll C by adjusting the carriers 6 at the opposite ends of axle D equal amounts in the same direction, but no bearing adjustment of bearings 9x and 10x is permitted. Bearings such as 9 and 10 of Fig. 4 however might be used in the assembly shown in Figs. 6, 7, 8 which would permit bearing adjustment.

Suitable grease retaining means may be provided for preventing grease or lubricant from passing out of the assemblies along the axle D, such means being well known in the art.

Our novel drive roll assemblies each permits take up for wear in the bevel gear train E, F, whereby excessive and undesirable back lash may be kept to a minimum, or may be eliminated; and in Figs. 2-5 inclusive, adjustment of the tapered roller bearings 3, 9 and 10 may in addition be effected. Manufacturing variations can thus be accommodated, and our designs provide extremely quick economical and practical means for effecting the foregoing adjustment without having to dismantle the assemblies.

We do not limit our invention to the exact forms shown in the drawings, for obviously changes may be made therein within the scope of the claims.

We claim:

1. In combination with a road roller of the tandem type having side frames, and having a transmission driving a drive shaft disposed adjacent

one side frame, said drive shaft carrying a bevel drive pinion; bearing brackets carried by the side frames; an axle journaled in said brackets; a drive roll fixedly mounted on said axle; a bevel ring gear on the end of said roll meshing with said bevel drive pinion; and means for shifting the axle and roll carried thereon to adjust the clearance between said bevel ring gear and bevel pinion.

2. In a combination as set forth in claim 1, said brackets having bores extending therethrough, and said axle having reduced end portions disposed within the bores; tapered roller bearings on said reduced axle portions slidably engaging the bores; the inner races of the bearings contacting the shoulders at the inner ends of the reduced portions; the outer ends of the bores being threaded; and said shifting means comprising threaded caps in the threaded ends of the bores having their inner ends contacting the outer races of the roller bearings; and means for locking the caps in adjusted position in said bores.

3. In a combination as set forth in claim 1, said brackets having tapped bores extending therethrough; said shifting means comprising exteriorly threaded bearing carriers in said bores; said axle having reduced end portions within said carriers; a pair of opposed tapered roller bearings fixedly mounted on each said reduced end portion and fixedly mounted in its related carrier; and means for locking said carriers in adjusted positions in said bores.

4. In a combination as set forth in claim 1, said brackets having bores extending therethrough; said shifting means comprising bearing carriers slidably mounted in said bores, said carriers having external flanges overlying the outer faces of the brackets; an annular series of screws extending through the flanges into the brackets; said axle having reduced end portions within the carriers; a pair of opposed tapered roller bearings fixedly mounted on each said reduced axle portion and fixedly mounted in its related carrier; and spacers interposed between the flanges and outer faces of the brackets.

5. In combination with a road roller of the tandem type having side frames and having a transmission driving a drive shaft disposed adjacent one side frame, said drive shaft carrying a bevel drive pinion; bearing brackets carried by the side frames; an axle journaled in said brackets; a drive roll fixedly mounted on said axle; a bevel ring gear on the end of the roll meshing with the bevel drive pinion; said brackets having bores extending therethrough, said axle having reduced end portions disposed within the bores; tapered roller bearings on said reduced axle portions slidably engaging the bores; the inner races of the bearings contacting the shoulders at the inner ends of the reduced portions; the outer ends of the bores being threaded; threaded caps in the threaded ends of the bores having their inner ends contacting the outer races of the roller bearings; and means for locking the caps in adjusted position in said bores.

6. In a combination as set forth in claim 5, said locking means comprising set screws extending through the brackets and engaging the inner ends of said caps; the threads on said caps being omitted in way of said screws.

7. In a combination as set forth in claim 5, said locking means comprising set screws extending through the brackets and engaging the inner ends of said caps; the threads on said caps being omit-

ted in way of said screws; the outer ends of the caps being closed, and non-circular nut portions projecting axially therefrom.

8. In combination with a road roller of the tandem type having side frames and having a transmission driving a drive shaft disposed adjacent one side frame, said drive shaft carrying a bevel drive pinion; bearing brackets on the side frames; an axle journaled in said brackets; a drive roll fixedly mounted on said axle; a bevel ring gear on the end of the roll meshing with the bevel drive pinion; said brackets having tapped bores extending therethrough, exteriorly threaded bearing carriers in said bores; said axle having reduced end portions within said carriers; a pair of opposed tapered roller bearings fixedly mounted on each said reduced end portion and fixedly mounted in its related carrier; and means for locking said carriers in adjusted position in said bores.

9. In a combination as set forth in claim 8, said carriers each having a pair of stepped bores therein, a ring slidably mounted in the one stepped bore and having an internal annular recess forming a continuation of the other stepped bore; the outer races of the pair of bearings being mounted in said inner bore and annular recess respectively; means for shifting each ring to compress the outer races of the related pair of bearings together; and a member on the end of the axle positioning the inner races of the pair of bearings on the reduced end portion.

10. In a combination, as set forth in claim 8; said carriers each having a pair of stepped bores therein, a ring slidably mounted in the larger stepped bore and having an internal annular recess forming a continuation of the smaller stepped bore; the outer races of the pair of bearings being mounted in said smaller bore and annular recess respectively; said ring having an annular flange overlying a face of the carrier; bolts extending through the flange and into the carrier whereby when the bolts are tightened the outer races of the related pair of bearings will be compressed together; and a member on the end of the axle confining the inner races of the pair of bearings on the reduced end portion.

11. In a combination as set forth in claim 8, each of said carriers being closed at its outer end and having a non-circular nut portion projecting axially therefrom; each carrier having a pair of stepped bores therein, a ring slidably mounted in the larger stepped bore and having an internal annular recess forming a continuation of the smaller stepped bore; the outer races of the pair

of bearings being mounted in said smaller bore and annular recess respectively; said ring having an annular flange overlying a face of the carrier; bolts extending through the flange and into the carrier whereby when the bolts are tightened the outer races will be compressed together; and a member on the end of the axle confining the inner races of the bearings on the reduced end portion.

12. In a combination as set forth in claim 8, said locking means comprising set screws extending through the brackets and engaging the inner ends of said carriers; the threads on said carriers being omitted in way of said screws.

13. In a combination as set forth in claim 8, said locking means comprising set screws extending through the brackets and engaging the inner ends of said carriers; the threads on said carriers being omitted in way of said screws; the outer ends of the carriers being closed, and non-circular nut portions projecting axially therefrom.

14. In combination with a road roller of the tandem type having side frames and having a transmission driving a drive shaft disposed adjacent one side frame; said drive shaft carrying a bevel drive pinion; bearing brackets on the side frames; an axle journaled in said brackets; a drive roll fixedly mounted on said axle; a bevel ring gear on the end of the roll meshing with the bevel drive pinion; said brackets having bores extending therethrough, bearing carriers slidably mounted in said bores, said carriers having external flanges overlying the outer faces of the brackets; an annular series of screws extending through the flanges into the brackets; said axle having reduced end portions within the carriers; a pair of opposed tapered roller bearings fixedly mounted on each said reduced end portion and fixedly mounted in its related carrier; and spacers interposed between the flanges and outer faces of the brackets.

15. In a combination as set forth in claim 14, said spacers comprising shims consisting of a pair of arcuate shim sections adapted to abut in opposed relation on a line extending between two diametrically opposite screws of the series; semi-circular bolt receiving slots in the meeting ends of said sections; and other bolt receiving slots in said sections having their side walls disposed normal to the said diametrical line, the pair forming a circular washer when in opposed abutting relation.

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