March 9, 1948. J. F. HARRISON ET AL 2,437,524

SELF-PROPELLED TAMPING ROLLER

Filed Sept. 21, 1944 5 Sheets-Sheet 1

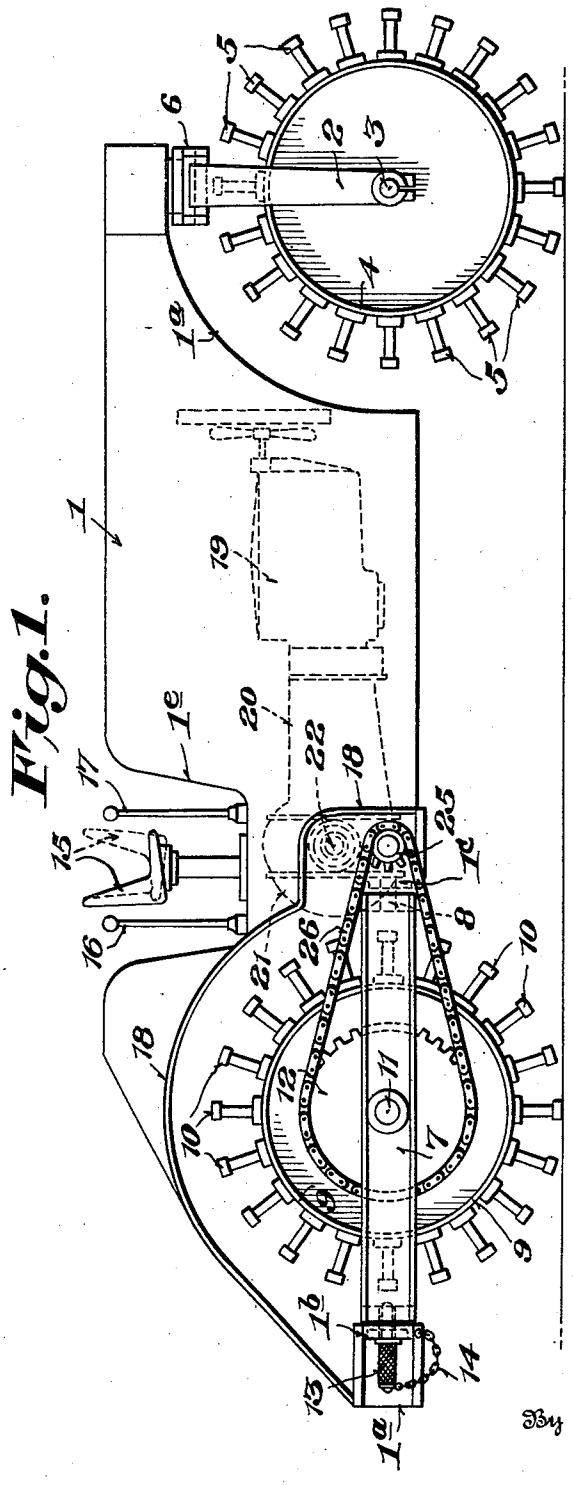


Fig. 1.

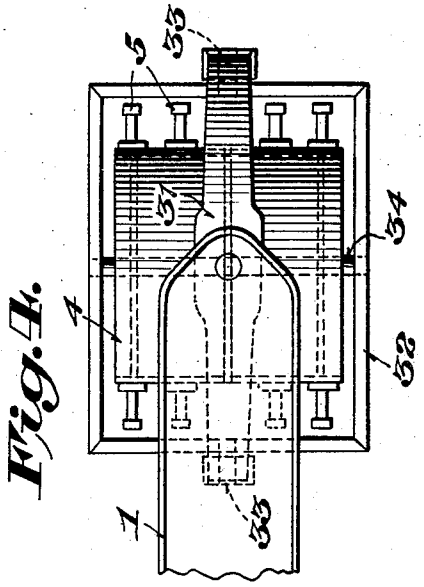


Fig. 4.

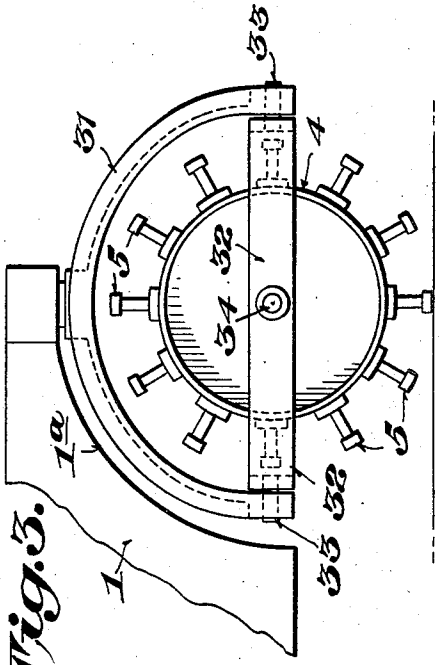


Fig. 3.

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SELF-PROPELLED TAMPING ROLLER

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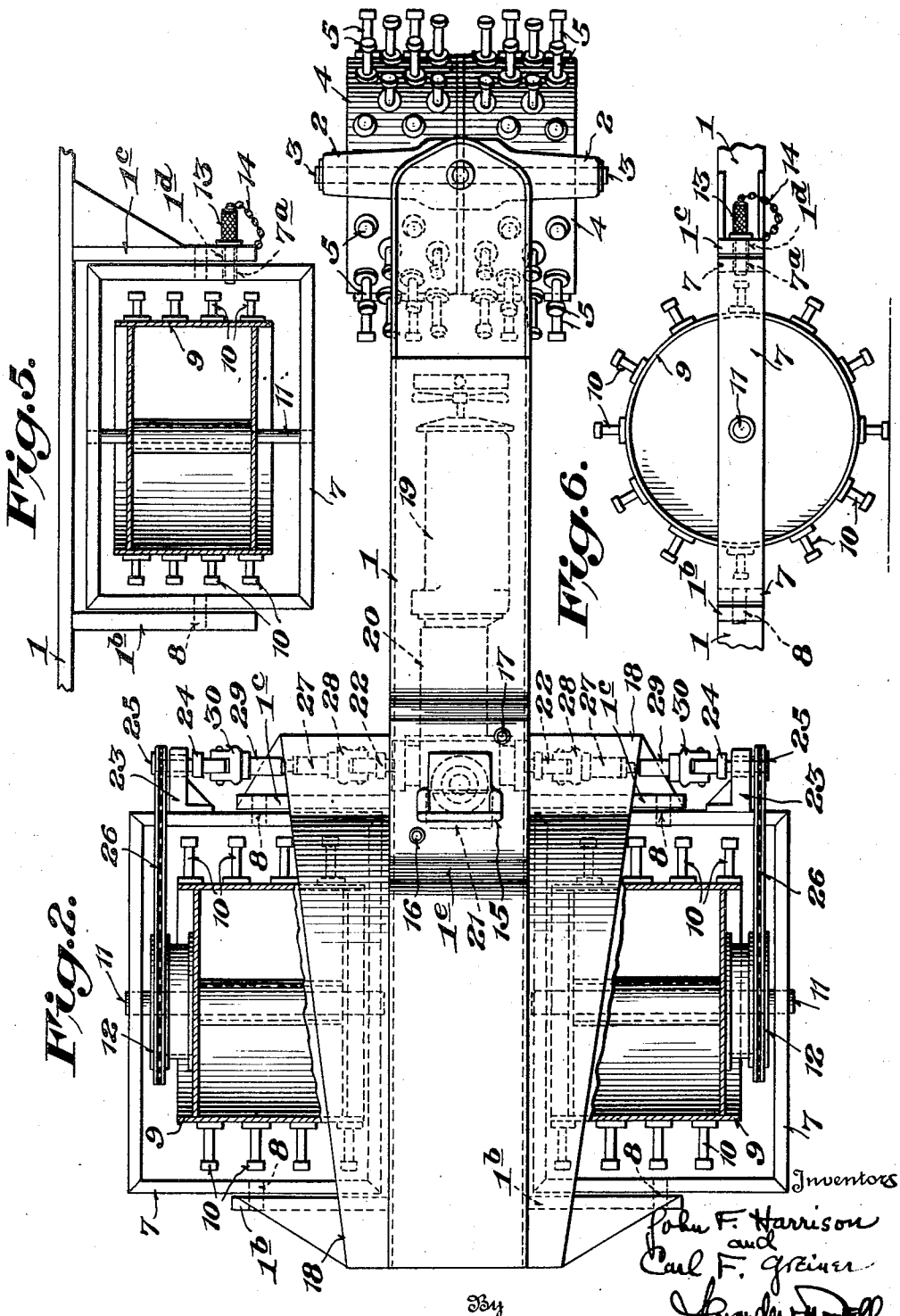


Fig. 5.

Fig. 6.

Fig. 2.

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SELF-PROPELLED TAMPING ROLLER

Filed Sept. 21, 1944 5 Sheets-Sheet 3

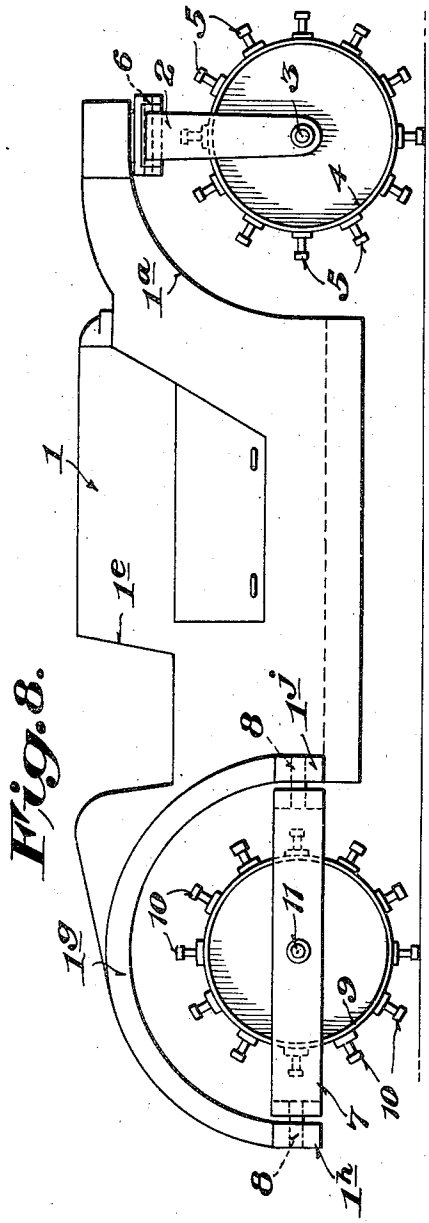


Fig. 8.

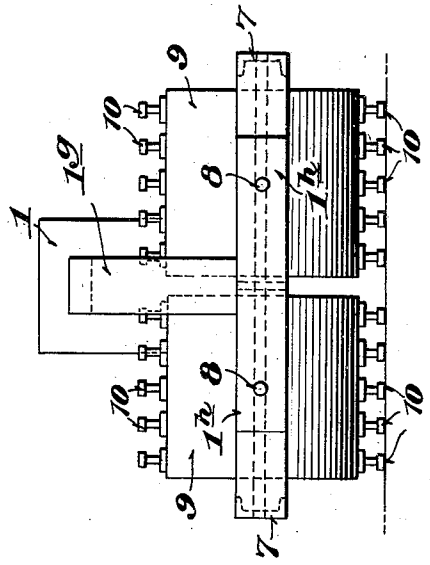


Fig. 9.

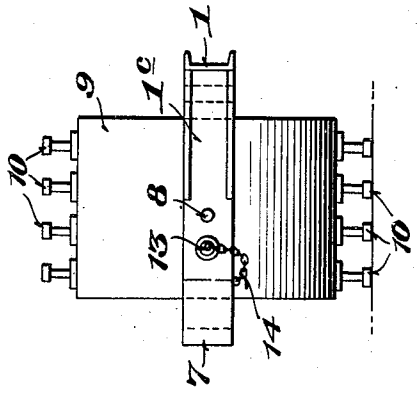


Fig. 7.

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SELF-PROPELLED TAMPING ROLLER

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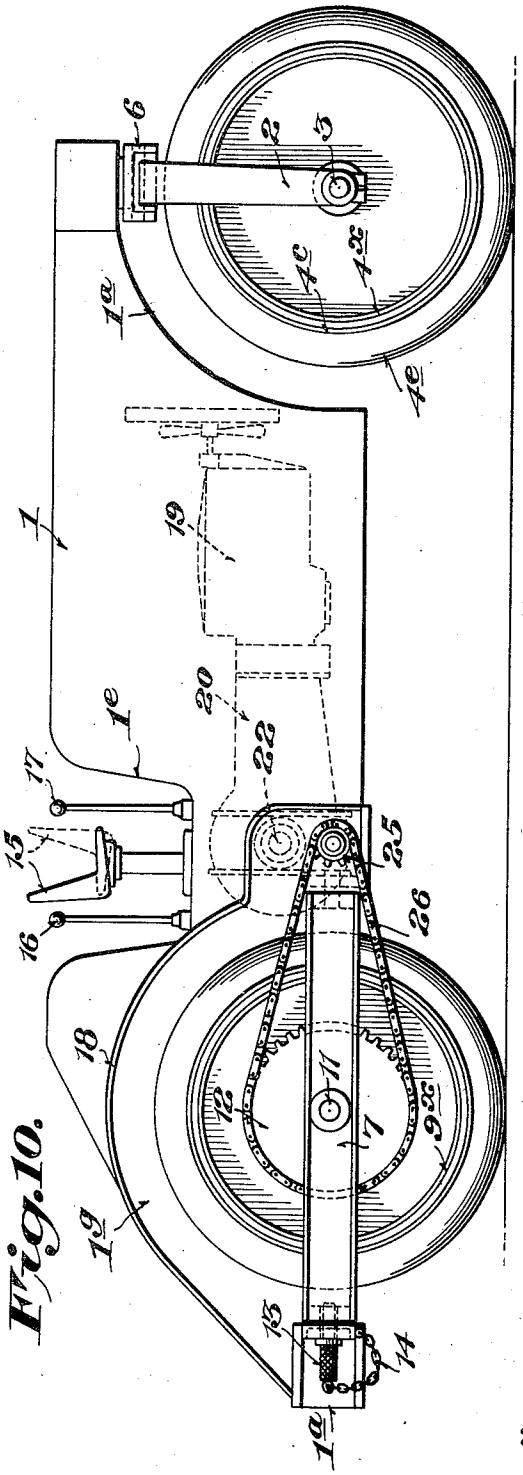


Fig. 10.

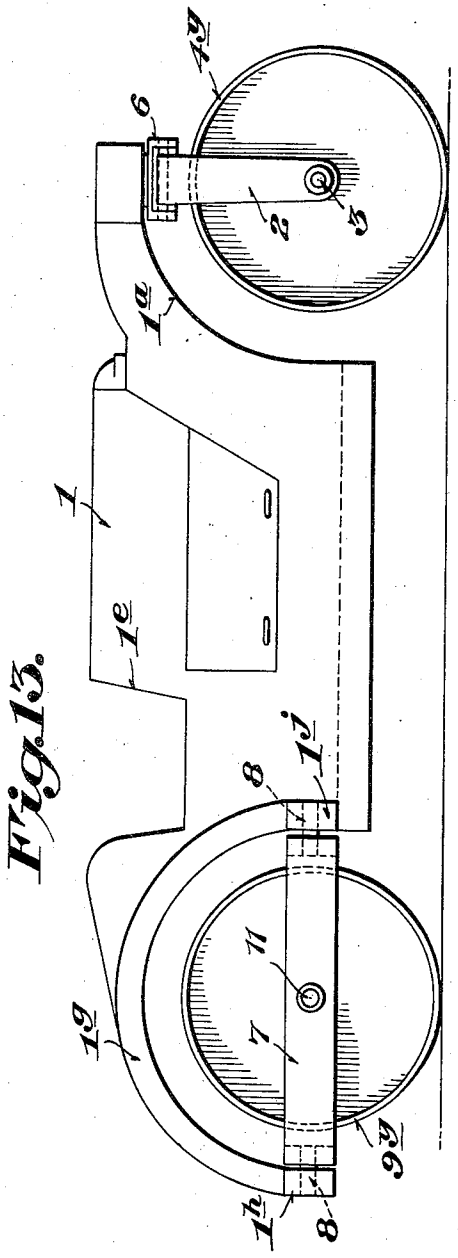


Fig. 13.

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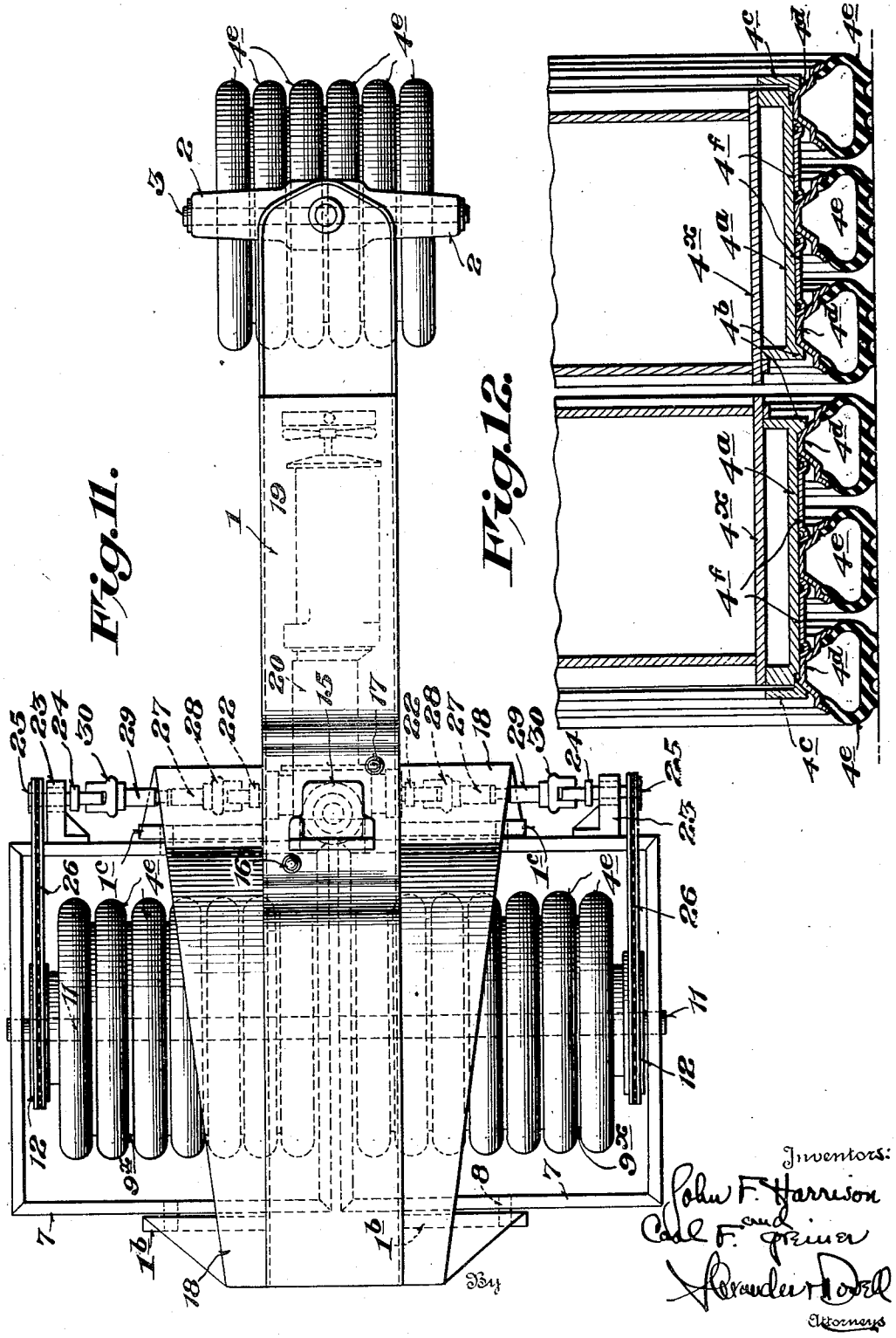


Fig. 11.

Fig. 12.

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UNITED STATES PATENT OFFICE

2,437,524

SELF-PROPELLED TAMPING ROLLER

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Application September 21, 1944, Serial No. 555,098

12 Claims. (Cl. 94—50)

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Our invention is a novel self-propelled tamping roller of three-wheel type, having a pair of axially aligned driving rolls arranged for pivotal movement on a horizontal axis at one end of the frame, and a single steering roll arranged for pivotal movement on a horizontal axis at the other end of the frame, said frame carrying a motor for driving the pair of drive rolls through a suitable transmission and differential, each of said rolls being smooth faced, or provided with "sheep-feet" tamping elements, or provided with series of closely adjacent pneumatic tires serving as tamping elements to achieve the desired density by movement to and fro over the earth fill. Our present invention is an improvement upon the earth tamper disclosed in United States Letters Patent No. 2,226,182, dated December 24, 1940.

The principal object of our invention is to provide a self-propelled tamping roller of the above type in which the steering roll is mounted to permit swinging both on the horizontal and vertical axes, and the two drive rolls are mounted in subframes swingable on horizontal axes, thus providing three-point suspension for the frame, means being provided for locking the subframes of the drive rolls against oscillation when desired, and in which drive shaft connections from the differential to the drive rolls respectively are provided with universal joints therein, whereby when the subframes of the drive rolls are oscillated the outer ends of the drive shafts which carry sprockets for the chain drives to the drive rolls will remain parallel with the axles of the drive rolls to maintain proper driving relationship between the drive shafts and the axles of the respective drive rolls.

Another object of the invention is to provide a self-propelled tamping roller of the above type, which can be steered and reversed, and in which the transmission has full reverse for all speeds so that it will not be necessary to turn the roller around to achieve practical operation, said roller having an operator's seat which can be rotated through 180° to permit the operator to face in either direction, dual control levers being provided adjacent the operator's seat in convenient reach of the operator in either position of the seat; said rolls being hollow cylinders closed at their ends and adapted to receive ballast such as water, when desired.

A further object of the invention is to provide a tamping roller of the above type in which the rolls are (1) plain faced; or are (2) provided with "sheep-foot" tamping elements, or are (3) provided with series of closely adjacent pneumatic

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tires, the above three types of rolls being interchangeable in the roller frame or subframe; the steering roll in all three types being made in longitudinal sections mounted on the same axle to permit steering without scuffing.

A still further object of the invention is to provide a tamping roller of the above type in which the main frame is arched over the drive rolls to permit the use of wider drive rolls which have their inner ends closely adjacent.

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

We will explain our 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 an elevation of a self-propelled tamping roller of the "sheep-foot" type according to our invention.

Fig. 2 is a top plan view thereof.

Fig. 3 is an elevation of a modified arrangement of the front steering yoke.

Fig. 4 is a top plan view of the modified steering yoke arrangement shown in Fig. 3.

Fig. 5 is a top plan view partly in section showing the locking means for the subframe of one of the drive rolls.

Fig. 6 is an elevation of the parts shown in Fig. 5.

Fig. 7 is an end elevation of the parts shown in Fig. 5.

Fig. 8 is an elevation showing a modified self-propelled tamping roller, the driving means for the drive rolls being omitted for convenience of illustration.

Fig. 9 is a rear elevation of the modified roller, shown in Fig. 8.

Fig. 10 is an elevation of a modified self-propelled tamping roller equipped with series of closely adjacent pneumatic tires.

Fig. 11 is a top plan view of the roller shown in Fig. 10.

Fig. 12 is an enlarged section through the rim of the steering roll shown in Fig. 11, showing the means for mounting the pneumatic tires thereon.

Fig. 13 is an elevation of a further modified self-propelled tamping roller similar to Fig. 8, having smooth or plain faced rolls mounted therein, the driving means for the drive rolls being omitted for convenience of illustration.

As shown in Figs. 1 to 7 inclusive, the tamping

roller comprises a relatively narrow deep frame 1, having a goose-neck front 1a in which is pivotally mounted on a vertical axis a steering yoke 2 carrying a horizontal shaft 3 on which is mounted the steering roll 4 which is preferably hollow and adapted to receive ballast, such as water, said roll 4 carrying a "sheep-feet" 5, yoke 2 being steered by conventional devices not shown. Yoke 2 is further provided with a horizontally disposed pivot 6, whereby the yoke may oscillate on a horizontal axis to accommodate the roll 4 to uneven surfaces of the dirt over which the roller is being driven.

At the opposite end of frame 1, at each side thereof, are spaced lateral projections 1b, 1c (Fig. 2) between which subframes 7 are disposed, which are identical in construction at opposite sides of the frame 1 and are pivoted on horizontal axial pivots 8 at their ends so as to oscillate in horizontal planes to accommodate the drive rolls to uneven surfaces of the dirt upon which the roller is being moved.

Journaled in each of the subframes 7 is a hollow ballast receiving drive roll 9 similar to steering roll 4, the same being provided with "sheep-feet" 10 on its periphery similar to the "sheep-feet" 5 on steering roll 4. Each roll 9 is mounted on an axle 11 journaled in the inner and outer side members of the subframe 7, and is prevented from axial movement on said axle 11 by any desired means. On the outer end of each roll 9 is a chain sprocket 12 or the like for the purpose hereinafter described.

Means are provided for preventing oscillation of each subframe 7 when desired, said means being shown more particularly in Figs. 5, 6 and 7, and consisting of pins 13 which are preferably secured to the arm 1c by flexible members 14, said pins having shanks passing through aligned perforations 7a and 1d (Fig. 6) in the frame 7 and arm 1c respectively when the subframe 7 is disposed in horizontal position, i. e., parallel with the arm 1c. When however the pins 13 are removed from said bores 7a, 1d the subframes 7 are free to oscillate about their horizontal pivots 8.

In the upper portion of frame 1 is a recess 1e to accommodate a seat 15 for the operator of the roller, which seat may be rotated through an arc of 180° to face either end of the roller frame as shown in full and dotted lines in Fig. 1; and dual control levers 16 and 17 are provided adjacent the seat in convenient and symmetrical positions with respect thereto, the lever 17 being operated by the operator when the seat 15 is in the full line position shown in Fig. 1, and the lever 16 being used when the seat is in the dotted line position shown in Fig. 1. At each side of frame 1 over the drive rolls 9 are fenders 18 which extend from the rear end of the frame upwardly and over the tops of rolls 9 and their sheep-feet 10, and downwardly to a point in advance of the arms 1c which support the front ends of subframes 7.

Mounted in frame 1 is a motor 19, preferably of internal combustion or Diesel type, having a drive shaft operating through a transmission having full reverse for all speeds, housed in casing 20, a differential housed in casing 21, said differential being of T-shape type and having lateral opposed drive shafts 22 extending from the sides thereof at a point somewhat in advance of arms 1c, the same being previously disposed within the front ends of the fenders 18 as shown more particularly in Fig. 2.

The front end of each subframe 7 carries a bracket 23 rigidly secured thereto for oscillation therewith, and in said bracket is journaled a stub shaft 24 carrying a sprocket aligned with the sprocket 12 before mentioned on the adjacent drive roll 9. A chain 26 runs over each pair of sprockets 25 and 12 for the purpose of driving the respective roll. The stub shaft 24 thus forms the driven means for the related roll 9. Between the shafts 22 and 24 are swingable shaft sections 27 connected by universal joints 28 to the differential shafts 22, said shaft 27 having splined thereon axially movable sleeves 29 connected to the stub shafts 24 by universal joints 30.

By the above construction, as the subframes 7 oscillate the pairs of sprockets 25 and 12 will be continually maintained in parallel relation so that the drive chains 26 will not be strained or injured regardless of the amount of oscillation of the subframes 7. The splined sections 27—29 connecting the shafts 24 and 22 not only permit the swinging motion of the drive between shafts 22 and 24 but also permit elongation or shortening of the drive due to oscillation of subframes 7 and serves as drive means for the stub shafts 24. Thus by the above arrangement the drive from the differential 21 to the drive rolls 9 will be unaffected by oscillation of the subframes, which is an important feature of our invention.

Instead of using the type of steering yoke shown in Figs. 1 and 2, a "Columbiana" type of steering yoke may be substituted, as shown in Figs. 3 and 4, wherein similar parts are similarly lettered. In this modification, the steering yoke 31 is disposed axially of frame 1 and fits over the steering roll 4 and over the sheep-feet 5 carried thereby. Pivoted by means of pivots 33 on a horizontal axis in the ends of the arms of yoke 31 is a subframe 32 whereby the subframe 32 may oscillate in the same manner as the subframes 7. Disposed transversely of the subframe 32 is an axle 34 carrying the steering roll 4, said axle being journaled in opposite sides of subframe 32, as clearly shown in Fig. 4. Thus the front roll 4 is permitted to swing on a vertical axis, for steering, and on a horizontal axis to accommodate itself to any unevenness on the ground or dirt which is being tamped.

In Figs. 8 and 9 a modification is shown in which the frame 1 is generally similar to that shown in the preceding figures, the frame having a goose-neck 1a at one end in which the front steering yoke 2 (or 31) is mounted in the same manner previously described, said yoke carrying the front steering roll 4 provided with sheep-feet 5. The rear end of the frame 1, however, is arched as at 1g to overlie the drive rolls 9 whereby the drive rolls may have their inner ends disposed closely adjacent, as shown more particularly in Fig. 9. At the rear end of the arched portion 1g are lateral extensions 1h, and at the front end of arched portion 1g are lateral extensions 1j, the subframes 7 being pivoted by means of horizontal pivots 8 between the pairs of extensions 1h, 1j, in a similar manner to that shown in Fig. 2. Said subframes 7 carry the axles 11 for the drive rolls 9 which carry "sheep-feet" 10, the rear rolls 9 being motor driven in the same manner as above described in connection with Figs. 1 to 7, and hence the drive has been omitted in Figs. 8 and 9. In this modification the rear rolls 9, as shown in Fig. 9, are slightly separated in order to permit the subframes 7 to oscillate a desired extent without interference, the above construction permitting the inner ends of the

drive rolls 9 to be disposed closely adjacent to provide maximum width of roll face. Means may also be provided similarly to pins 13 (Figs. 5, 6, 7) to prevent the subframes 7 from oscillating, when desired.

In the modification shown in Figs. 10, 11 and 12, the tamping roller is generally of substantially the same form as shown in the preceding figures, and similar parts are similarly lettered. However, the frame of the tamping roller is preferably of the arched type shown in Figs. 8 and 9, so that the adjacent ends of the drive roll 9*x* may be disposed closely adjacent and of maximum width forming in effect one articulated roll.

In this modification, in place of the steering roll 4 a substituted steering roll 4*x* is mounted on steering axle 3, said roll 4*x* being preferably sectionalized and adapted to contain ballast such as water introduced therein to increase weight. Each section of roll 4*x* is provided with an annular rim supporting surface 4*a* (Fig. 12) having a flange 4*b* at its inner end, and an annular clamping ring 4*c* at its outer end removably secured thereto by any desired means. On the portion 4*a* are a plurality of closely adjacent demountable rims 4*d* each carrying pneumatic tires 4*e*, which are disposed closely adjacent to each other by means of spacers 4*f*, as clearly illustrated in Fig. 12, whereby any tire 4*f* may be removed for replacement or repair, the series of closely adjacent tires serving the purpose of tamping the loose earth by traffic thereover in place of the "sheep-foot" units disclosed in the preceding figures. The sectionalized roll 4*x* prevents scuffing and undue wear on the tires 4*e* during steering operations which would otherwise be caused due to the breadth of the steering roll.

In place of the drive rolls 9 shown in the preceding figures, substituted rolls 9*x* are provided on the axle 11 of each subframe 7, which carry a series of closely adjacent pneumatic tires 4*e* mounted thereon in the same manner as above described in connection with steering roll 4*x*. As shown, each of the drive rolls 9*x* carry seven pneumatic tires 4*e* but the number may be varied as desired. By utilizing a frame having an arched portion 1*g* over the drive rolls 9*x* and their tires, much wider drive rolls 9 may be used, the inner ends of which lie closely adjacent to form in effect one single articulate roll, as indicated in Fig. 11. The rolls 9*x* are preferably in the form of hollow cylinders, adapted to receive liquid ballast, as above described in connection with the steering roll 4*x*.

In the modification shown in Fig. 13, the tamping roller is substantially of the same type shown in the preceding figures, particularly Fig. 8. In this modification however, the steering roll 4*y* and the drive rolls 9*y*, are plain faced or smooth. Since the rolls do not carry any tamping units the same may be of larger size than the rolls 4 and 9 shown in the preceding figures, the rolls 4*y* and 9*y* however being preferably hollow and adapted to contain ballast.

Our novel rolls thus may be plain faced, or provided with "sheep-foot" rolls, or provided with series of closely spaced pneumatic tires, the different types of rolls being interchangeable on their respective axles 3 and 11; and thus our roller may be adapted to any desired or specified type of tamping operation, the oscillatory mounting of the rolls permitting each of same to accommodate itself to the uneven surface of the earth fill.

We therefore 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. A self-propelled tamping roller comprising a frame; a steering roll at one end of the frame mounted for oscillation on horizontal and vertical axes; pairs of spaced lateral extensions at opposite sides of the other end of the frame respectively; subframes journaled in the pairs of extensions on horizontal pivots; drive rolls journaled in said subframes; a source of motive power in the frame actuating a differential having laterally disposed shaft sections; flexible and elongatable shafting extending from said differential shaft sections to serve as drive means and driven means actuated by the shaft sections for driving the respective drive rolls while permitting the said rolls to oscillate freely.

2. In a roller as set forth in claim 1, means for maintaining the drive rolls against oscillation.

3. In a roller as set forth in claim 1, removable pins adapted to enter registering offset bores in the extensions and subframes for preventing oscillation of said subframes.

4. In a roller as set forth in claim 1, the end portion of said frame being arched over said drive rolls, and the inner ends of the rolls being disposed closely adjacent.

5. In a roller as set forth in claim 1, an arched fender on said frame overlying the drive rolls and embracing said lateral extensions.

6. In a roller as set forth in claim 1, said driven means comprising transversely disposed stub shafts journaled in brackets carried by the frames opposite the differential shaft sections; aligned sprockets carried by the drive rolls and stub shaft respectively; chains running around the aligned sprockets for driving the respective drive rolls; and said flexible and elongatable shafting comprising splined sectional shafts connected at their ends by universal joints to the stub shafts and differential shaft sections respectively.

7. A self-propelled tamping roller, comprising a frame; a steering roll at one end of the frame mounted for oscillation on horizontal and vertical axes; a pair of drive rolls at the other end of the frame mounted in subframes carried by the frame, said subframes being mounted for free oscillation on horizontal axes parallel with the axis of the frame; a source of motive power in the frame actuating a differential having laterally disposed shaft sections; flexible and elongatable shafting extending from said differential shaft sections to serve as drive means; and driven means operated by the drive means for driving the respective drive rolls while permitting the said rolls to oscillate freely.

8. In a roller as set forth in claim 7, means for maintaining the drive rolls against oscillation.

9. In a roller as set forth in claim 7, said steering roll being journaled in a yoke swingable upon a horizontal axis.

10. In a roller as set forth in claim 7, said steering roll being journaled in a yoke normally disposed axially of the frame; and a subframe pivoted in said yoke on horizontal axially disposed pivots and carrying the said steering roll.

11. In a roller as set forth in claim 7, the end portion of said frame being arched over said drive rolls, and the inner ends of the rolls being disposed closely adjacent.

12. In a roller as set forth in claim 7, said

driven means comprising transversely disposed stub shafts journaled in brackets carried by the subframes opposite the differential shaft sections; aligned sprockets carried by the drive rolls and stub shafts respectively; chains running around the aligned sprockets for driving the respective drive rolls; and said flexible and elongatable shafting comprising splined sectional shafts connected at their ends by universal joints to the stub shafts and differential shaft sections respectively.

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