

July 8, 1924.

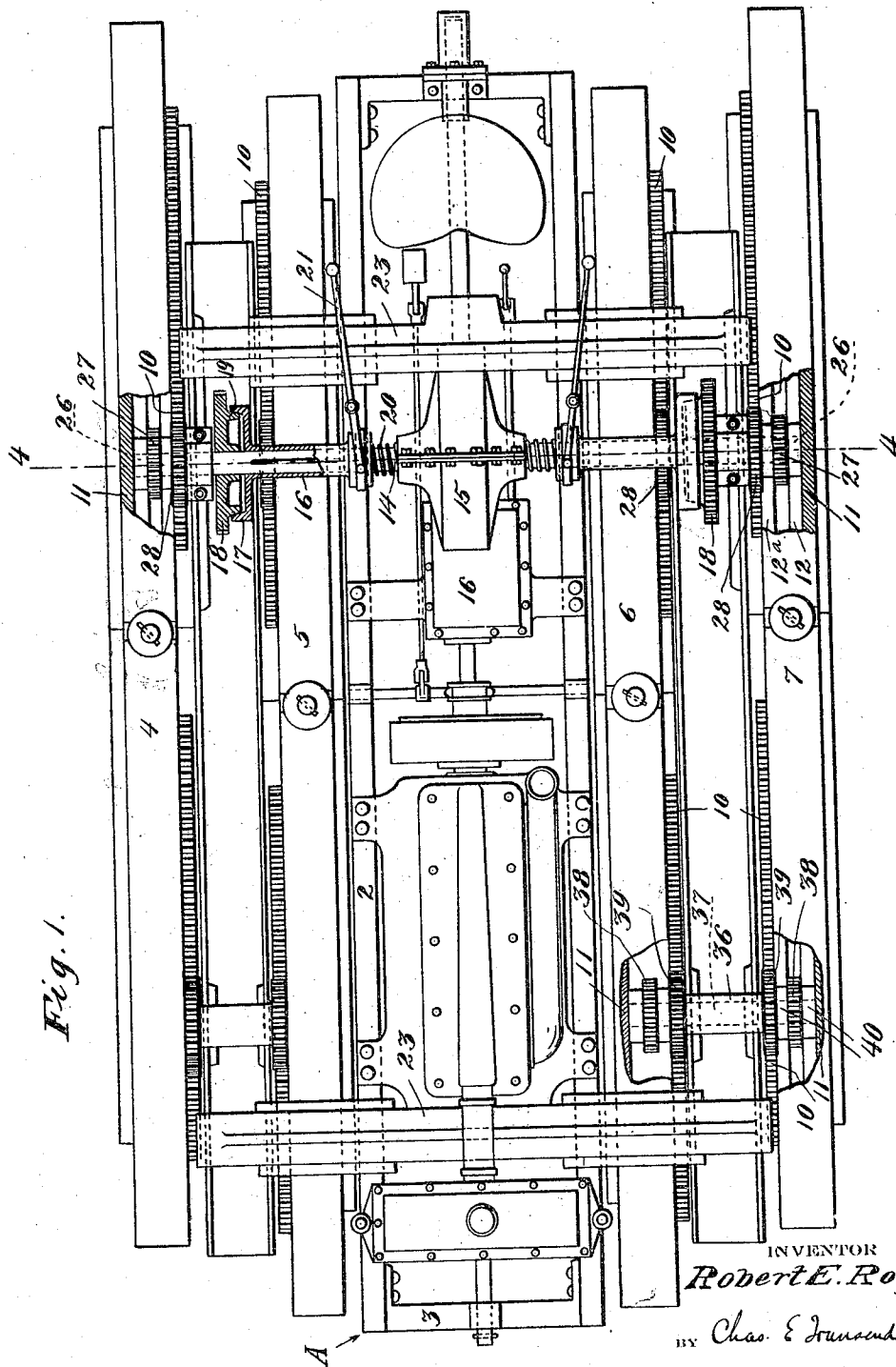
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R. E. ROY

TRACTOR

Filed May 24, 1920

4 Sheets-Sheet 1



July 8 , 1924.

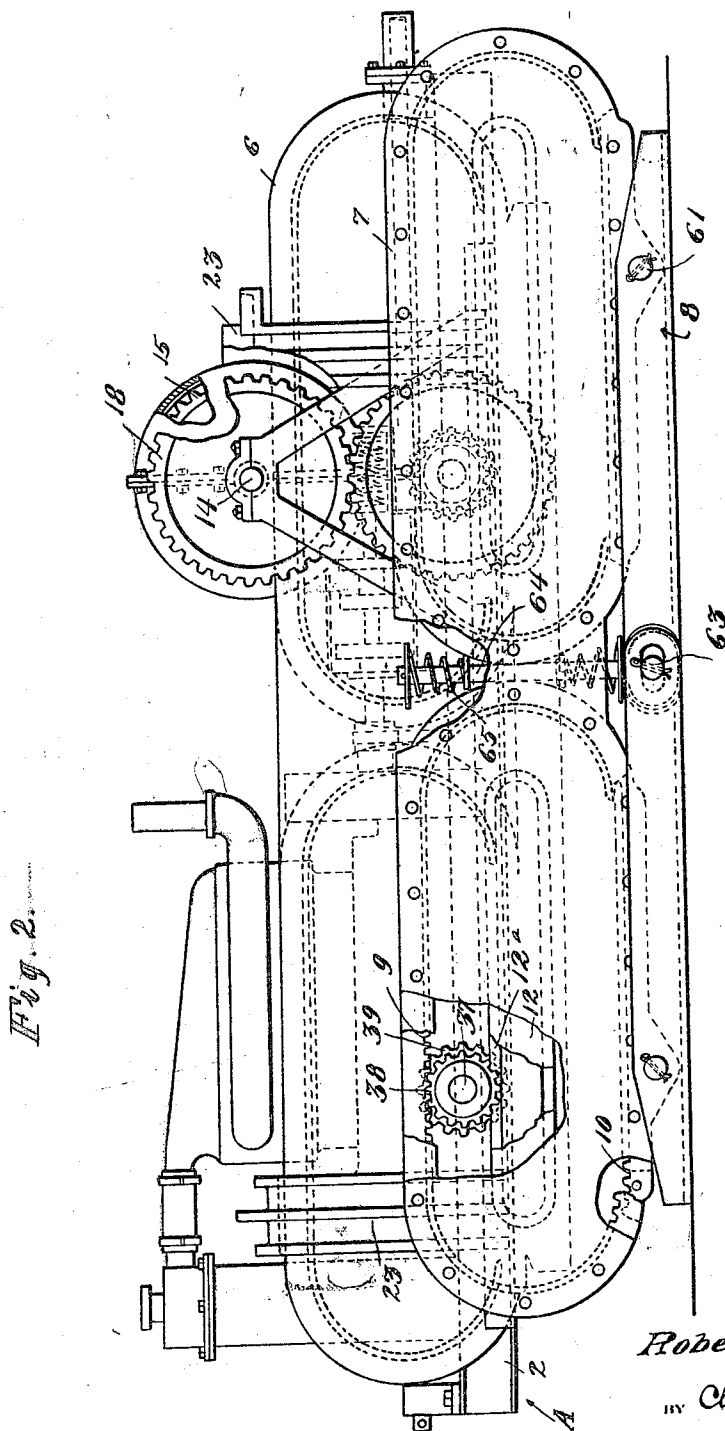
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4 Sheets-Sheet 2



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Fig. 3.

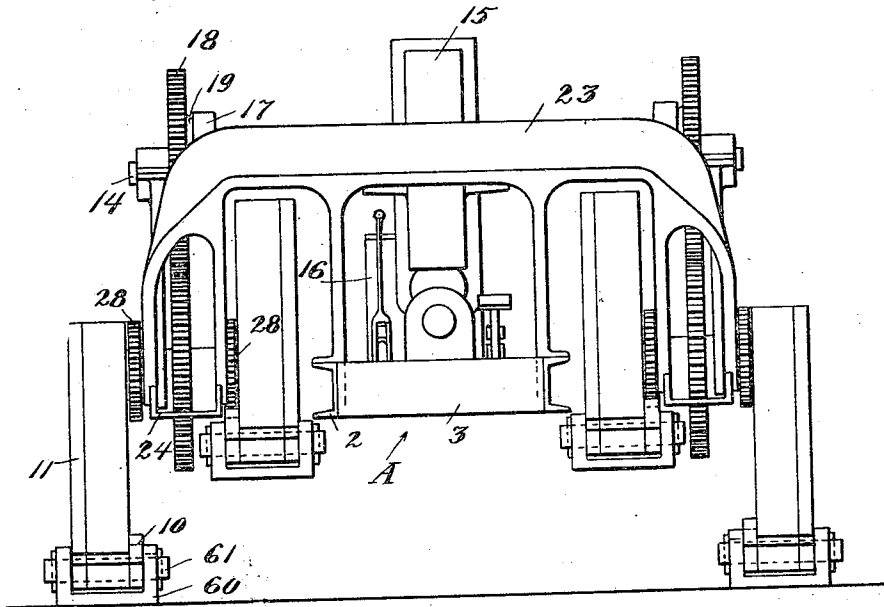
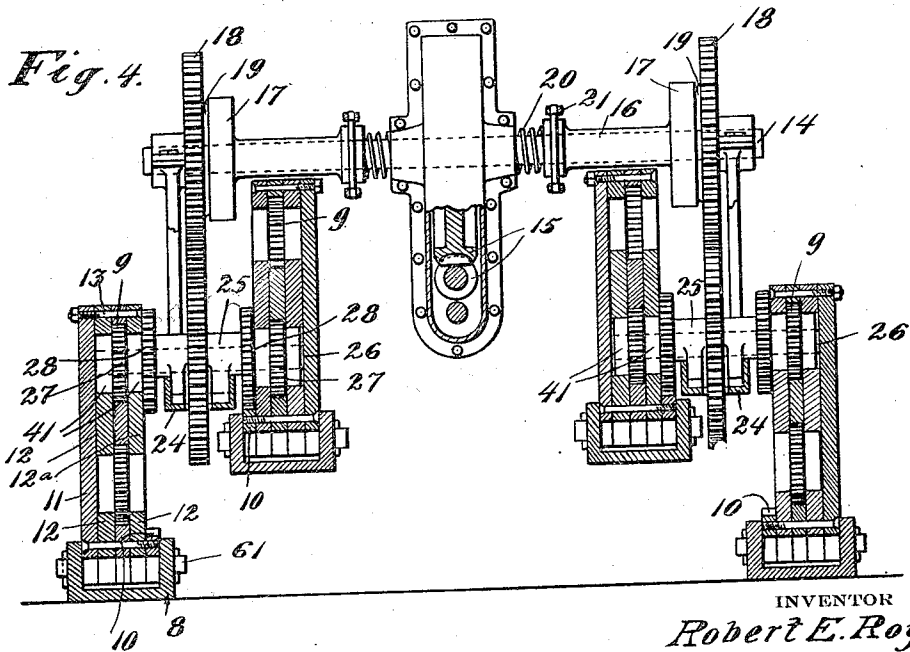


Fig. 4.



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Fig. 5.

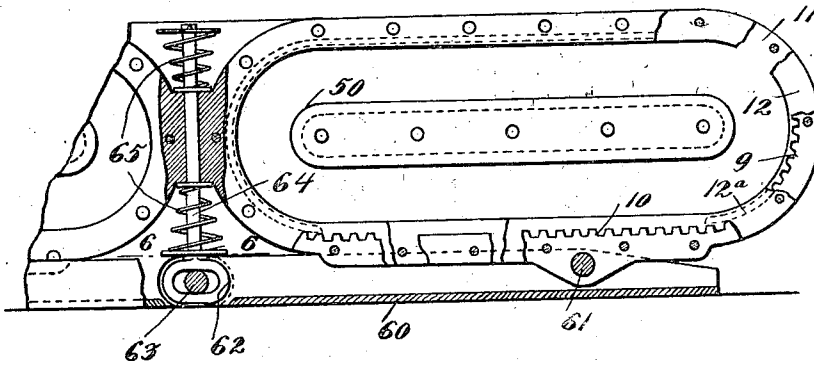
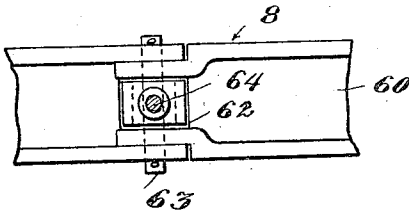


Fig. 6.



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UNITED STATES PATENT OFFICE.

ROBERT E. ROY, OF SANTA ROSA, CALIFORNIA.

TRACTOR.

Application filed, May 24, 1920. Serial No. 383,679.

To all whom it may concern:

Be it known that I, ROBERT E. ROY, a citizen of the United States, residing at Santa Rosa, in the county of Sonoma and State of California, have invented a new and useful Improvement in Tractors, of which the following is a specification.

This invention relates to tractors especially adapted for plowing, cultivating, hauling and for similar purposes; the object in view being to provide a practical tractor embodying a novel arrangement of steppers which form a traction means; and also a support for the tractor proper during operation.

The chief feature of the invention resides in the traction means and in the particular formation, mounting, operation and arrangement of the steppers whereby each stepper is driven rearwardly during its working or traction stroke at a predetermined speed and is returned or driven forward to the initial point of its working stroke at a relatively accelerated speed, thereby compensating for the time that would otherwise be lost in the elevation and depression of each stepper during the complete orbit of movement thereof.

Another object is to provide a structure whereby each stepper is moved forwardly to its initial point of operation and is started upon its working stroke before the companion stepper operating in rear thereof leaves the ground so that the frame is supported at opposite sides by at least one stepper all of the time, thus causing the machine to travel forwardly with the frame at uniform level and with uniform speed, and preventing any jarring action or vibration due to irregular operation of the steppers.

Another object of the invention is to provide a pair of driving members for each stepper, further a support whereby the steppers are engaged at two points when propelled and similarly engaged at two points when elevated, advanced and depressed.

Another object of the invention is to provide a rigid frame for supporting each pair of steppers and a rigid connection between said frame and the main frame of the tractor.

Further objects will hereinafter appear.

The invention consists of the parts and the construction, combination and arrangement of parts as hereinafter more fully de-

scribed and claimed, having reference to the accompanying drawings, in which—

Fig. 1 is a plan view of the tractor partly broken away and partly in section.

Fig. 2 is a side elevation of the same partly broken away and partly in section.

Fig. 3 is an end view of the tractor.

Fig. 4 is a central vertical cross section taken on line 4—4, Fig. 1.

Fig. 5 is an inside side elevation of one of the steppers partly broken away.

Fig. 6 is a detail section taken on line 6—6, Fig. 5.

Referring to the drawings in detail, A indicates the main frame of the tractor, including longitudinal and transverse frame members as shown at 2 and 3, said frame being supported by a plurality of sets of steppers, such as indicated at 4, 5, 6 and 7, each of which is provided with tread members 8 of suitable formation as will hereinafter be described.

As illustrated in the drawing two sets of steppers are employed and there are two steppers in each set, one set being located at each side of the longitudinal axis of the machine. The steppers operate alternately or one after the other so that while one stepper is being driven rearwardly to drive the machine ahead, the companion stepper is being carried forwardly at a relatively accelerated speed to take the place of the working stepper when the latter approaches the rearward limit of its movement and moves upwardly out of contact with the surface of the ground.

Each stepper is provided with a pair of rack members 9 and 10, said rack members being disposed on different planes one above the other and interspaced with relation to each other. These rack members are secured to a side plate 11 and are interspaced by means of guide tracks 12; the guide tracks 12 and the racks 9 and 10 being secured to the plate 11 by bolts 13 or any other suitable means. The steppers serve as track members over which the tractor proper travels when travelling and they are therefore alternately advanced or laid in front of the tractor to permit continuous forward movement of the same. This is accomplished in the following manner: Suitably supported on the main frame A is an engine of suitable construction and journalled crosswise in the frame is a shaft 14 to which power is transmitted from the en-

gine through a worm gear drive 15; a transmission 16 of suitable construction being interposed between the worm drive and the engine proper to permit the speed changes and the reverse movement to be transmitted when desired. The shaft 14 is journaled on and supported by the main frame A. Slidably mounted but keyed to the shaft on each end thereof is a sleeve 16, which terminates in a friction clutch 17, and turnably mounted on each end of the shaft is a gear 18, which is connected with a cooperating friction clutch 19. These clutches are normally held in engagement by springs 20 interposed between the worm gear housing and the sleeves 16, but they may be manually released whenever desired by operating levers such as shown at 21.

Supported by the main frame is a pair of cross frames 23, and hung from the outer ends of said frames or otherwise secured thereto are a pair of channel frames 24, one on each side of the main frame and running parallel therewith. Secured on each channel frame in alignment with the shaft 14 and directly below the same is a bearing member 25, and journaled in each bearing member is a shaft 26, on which is secured a pair of driving gears 27, and a pair of accelerating return gears 28. Suitably secured, or otherwise supported at the opposite ends of the respective channel frames are bearing members 36, and journaled therein are shafts 37, upon which are secured a pair of idling gears 38, and a pair of accelerating return gears 39. The gears 27 and 38, supported by the respective shafts 26 and 37, intermesh with the rack gears 9 of the respective steppers, while the accelerating return gears 28 and 38 engage the rack bars 10 of the respective steppers. Power is transmitted to the shafts 26 in the first place from the shaft 14 and the gears 18 carried thereby, and either gear 18 may be disconnected by releasing the adjacent friction clutch by means of the connected operating lever 21. This is of importance as it permits the power to be transmitted to one side, for instance when turning or partially turning to one side or another.

With power transmitted to the shafts, it can readily be seen that the respective driving gears 27 will engage their racks and will in this manner propel the tractor in a forward direction over the steppers or track members. The track members are arranged in pairs on each side and are adapted to operate alternately, for instance, the track members 4 and 7 may advance in unison while the track members 5 and 6 are driving or vice versa. It is therefore possible to transmit a continuous forward movement and simultaneously provide a substantial support for the tractor. This is due to the fact that the track members

are advanced with such speed that they are already in engagement with the ground and in position to support the tractor before the opposite track members have completed their operation. The gears 27 are held in engagement with their respective racks by means of rollers 40 and 41 and exterior and interior guide tracks 12 and 12^a. These tracks are also employed for the purpose of securing the steppers or track members against lateral movement with relation to the gears and respective shafts.

By referring to Figs. 1, 2 and 4, it will be seen that the driving gears are of smaller diameter than the return gears, similarly that the pitch of the teeth are proportional, the pitch being smaller on the smaller gears and racks and larger on the return gears and racks. This is of importance as both gears revolve at constant speed. The driving gears advance the tractor with relation to the steppers or track members and as they are of small diameter, it can be seen that the speed is relatively slow. The larger return gears are held out of engagement with their respective rack members during this movement and do not engage their racks until the driving gears travel out of engagement with the small pitched racks. However the moment the larger gears engage their racks, it should be obvious that the speed transmitted will be considerably accelerated and that the return movement of the track members will therefore take place in such a short time interval that they are replaced and in driving position when the opposite track members are just about reaching the end of their driving operation. The accelerated movement only takes place when the steppers are elevated and only during the horizontal movement of the same, the elevation of each stepper or track member, and depression of the same, being taken care of by the smaller pitched racks and driving gears are clearly illustrated in Fig. 5. The guide tracks maintained for the purpose of retaining the driving and return gears in mesh with their respective racks are both external and internal as shown, the ends being oblong and rounded as at 50 to insure a perfect operation of the track members or steppers when being raised or lowered. There are two rack members 9 and two rack members 10 employed on each stepper. This is of course due to the fact that two idling gears, one driving gear and one return gear, are employed in each instance. This is of importance as it first of all forms two driving connections between each track member and the tractor proper, secondly, two points of engagement when a track member is being raised or lowered, third, it insures a positive and uniform movement of each track member whether returning, driving or otherwise, and fourth,

it permits the construction of a track member of considerable length and the provision of tread plates therefor, such as shown at 60. The tread plates, two in number, are
 5 pivotally attached to each stepper as at 61 near their outer ends and their inner ends are slotted as at 62 and connected by a pin 63. These pins are engaged by a yoke 64 (see Figs. 5 and 6) and as this passes upwardly between the rack members, and is
 10 guided between the same, it is obvious that a resilient support may be formed by introducing springs such as shown at 65, and that pivotally and flexibly mounted tread
 15 plates are in this manner provided which materially increases the traction efficiency of the machine.

From the foregoing it can be seen that a comparatively simple efficient tractor has
 20 been provided which employs steppers or track layers presenting a large supporting and traction surface, said track layers being alternately elevated and advanced to permit the tractor proper to travel over the
 25 same. The advance movement of the track layers is accelerated and a pair of track members are therefore always in position for the reception and support of the tractor proper before the opposite pair have completed their rearward travel. A continuous
 30 forward movement is in this manner obtained and the speed of said forward movement may of course be varied by variation in engine speed, or by shifting the gears in the transmission 16.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In a tractor a main frame, a pair of
 40 steppers arranged on each side of the frame, a driving shaft extending crosswise of the frame, two pairs of gears on each end of the shaft, one gear of each pair being of larger diameter than the adjacent gear, a pair of
 45 rack members on each stepper, one rack engageable with the small gear of each pair, and one engageable with the large gear of each pair, said rack members being mutilated and one being arranged above the
 50 other.

2. In a tractor a main frame, a pair of
 55 steppers arranged on each side of the frame, a driving shaft extending crosswise of the frame, two pairs of gears on each end of the shaft, one gear of each pair being of larger diameter than the adjacent gear, a pair of rack members on each stepper, one rack engageable with the small gear of each pair, and one engageable with the large gear of
 60 each pair, said rack members being mutilated and interspaced, and one forming a continuation of the other, and means for maintaining the gears in mesh with their respective rack members when engaging the
 65 same.

3. In a tractor of the character described a plurality of steppers, a main frame supported thereby, driving means on the frame adapted to advance the frame with relation
 70 to the steppers and the steppers with relation to the frame, a pair of aligned shoes pivotally attached to each stepper at their outer ends, and similarly connected at their adjacent ends, and a yielding support for
 75 said adjacent ends.

4. In a tractor of the character described a plurality of steppers, a pair of aligned tread members for each stepper, said tread
 80 members being pivotally attached at opposite ends to said steppers, a connection between the abutting ends of each of said tread members and yielding supports for
 85 said ends.

5. A tractor embodying in combination a frame, two sets of steppers supporting
 90 said frame and arranged at opposite sides of the central fore and aft axis thereof, an engine on said frame, driving connections between said engine and steppers, operating to drive a stepper of each set rearwardly at
 95 a certain speed and forwardly at a relatively accelerated speed, said driving connections including two sets of rack members on each stepper, and two driving spur gears of different sizes meshing therewith.

6. A tractor embodying in combination a frame, two sets of steppers supporting said
 100 frame and arranged at opposite sides of the central fore and aft axis thereof, an engine on said frame, driving connections between said engine and steppers operating to drive a stepper of each set rearwardly at a certain speed and forwardly at a relatively accelerated speed, said driving connections including two sets of rack members on each
 105 stepper and two driving spur gears of different sizes meshing therewith, the major portions of said rack members being in spaced parallel relation to each other.

7. In a tractor a main frame, a plurality
 110 of steppers supporting the same, a pair of racks at each end of each stepper, a driving gear and a return gear alternately engageable with one pair of racks and a pair of idling gears alternately engageable with the
 115 other set of racks.

8. In a tractor of the character described a main frame, a pair of auxiliary frame
 120 members, one on each side of the main frame, a pair of cross frames, one at each end of the main frame and secured thereto, means securing the auxiliary frame members to the cross frames, a pair of steppers arranged one on each side of each auxiliary
 125 frame, a main driving shaft extending crosswise of the main frame, a gear on each end thereof, a driven shaft journaled on each auxiliary frame, a gear on each driven shaft intermeshing with the gears on the
 130 main driving shaft, means carried by each

driven shaft adapted to advance the tractor on the steppers, and also adapted to elevate and advance the steppers with relation to the tractor at an accelerated speed, said
5 driving means engaging one end of each stepper only, and guide means carried by the auxiliary frames and engaging the front end of each stepper only.

9. In a tractor of the character described
10 a stepper comprising a side plate, upper and lower rack members secured thereto, shoes carried by the said plate, a driving shaft

and a pair of gears on said shaft, one of said gears being smaller in diameter than the other and engaging the lower rack only, and
15 the other gear engaging the upper rack only.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ROBERT E. ROY.

Witnesses:

D. R. GALE,
THORN P. GALE.