C. L. BEST.

TRACTOR.

APPLICATION FILED APR. 6, 1914.

1,232,482.

Patented July 10, 1917.

5 SHEETS—SHEET 1.

Fig. 1

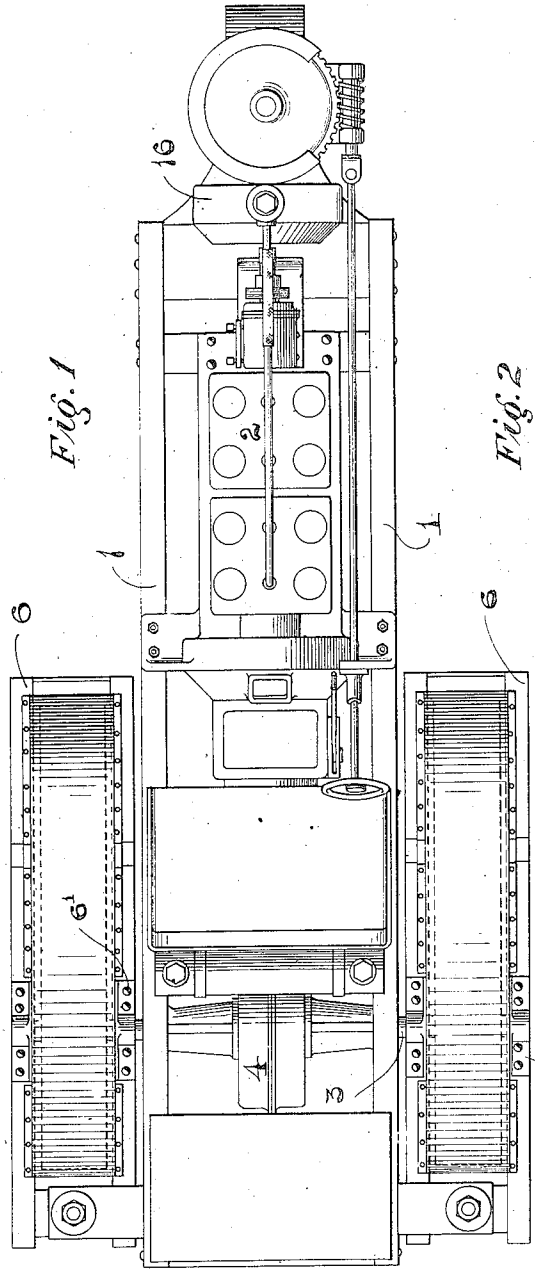
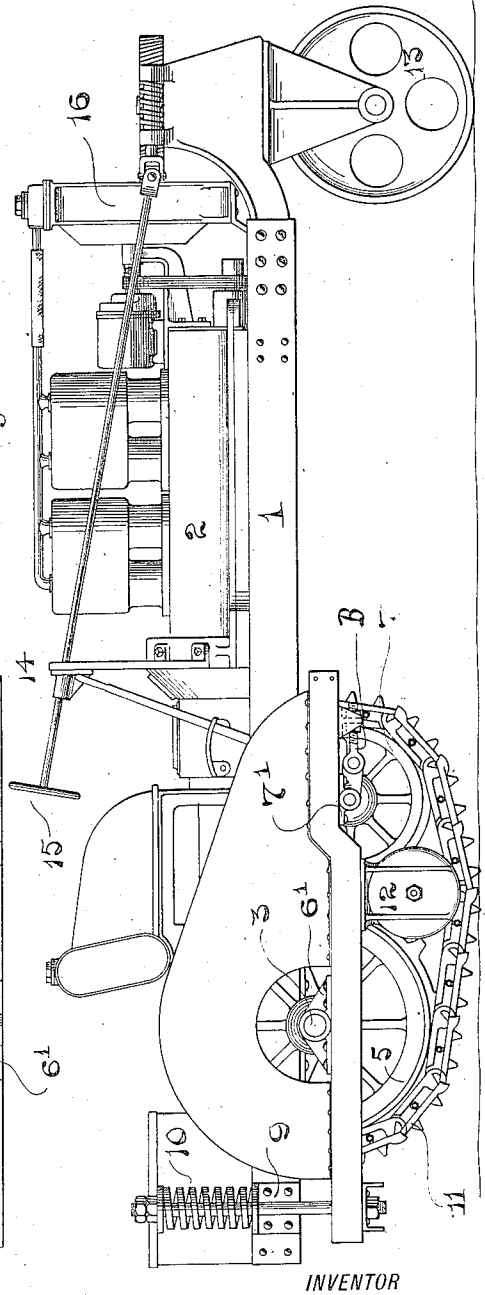


Fig. 2



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5 SHEETS—SHEET 2.

Fig. 3.

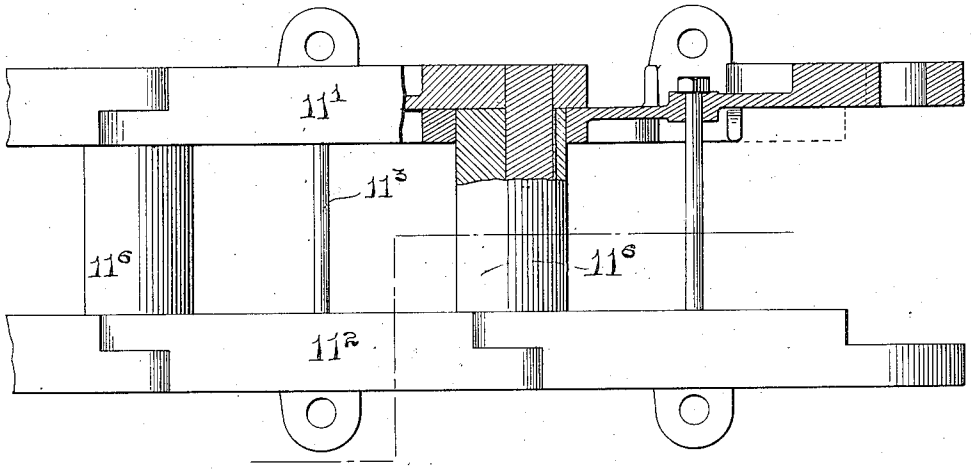
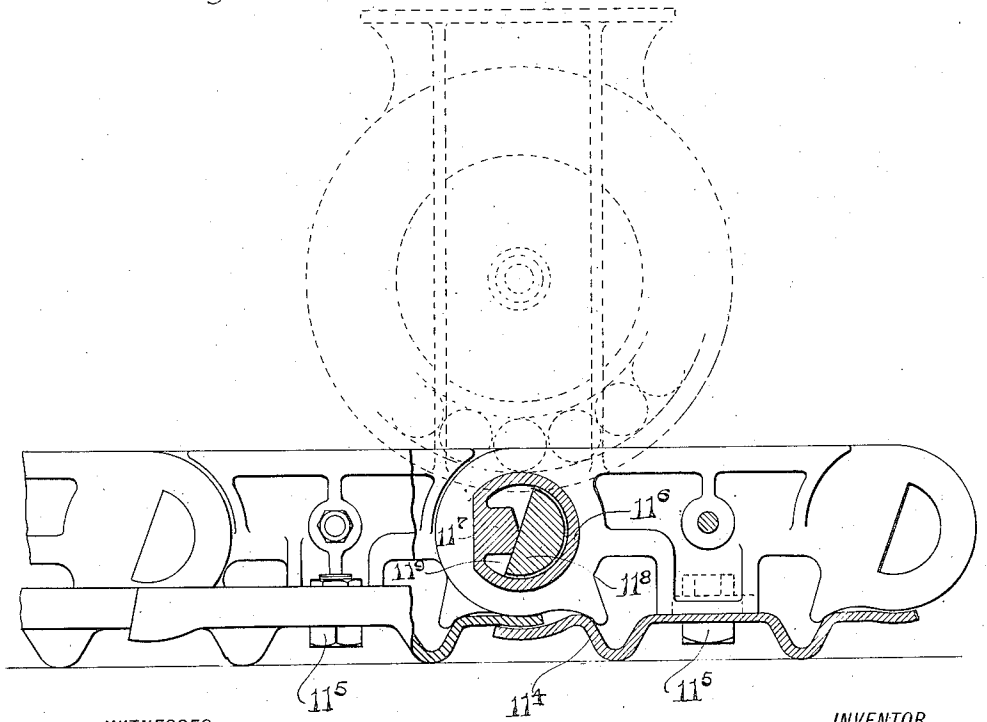


Fig. 4.



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5 SHEETS—SHEET 3.

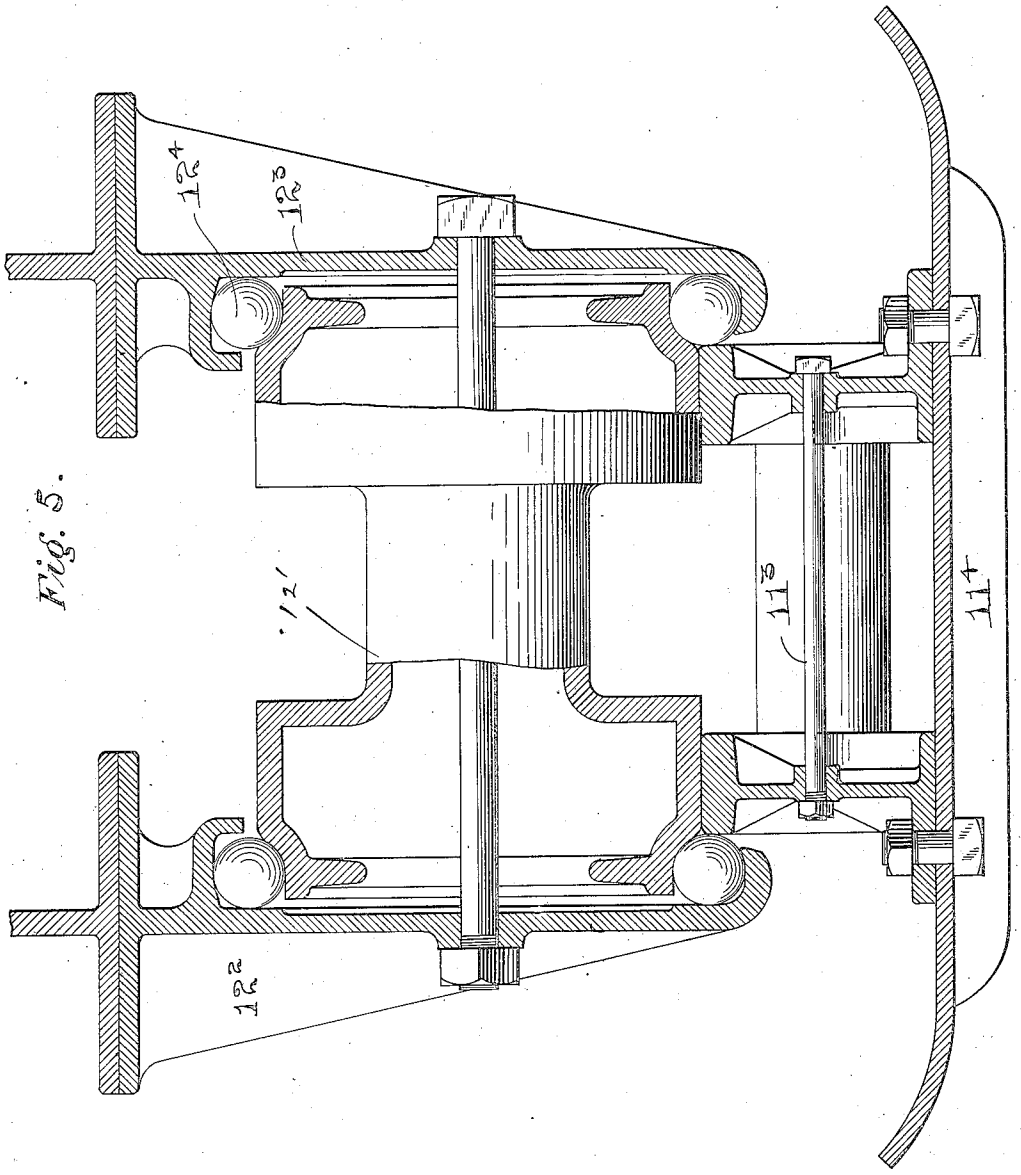


Fig. 5.

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5 SHEETS—SHEET 4.

Fig. 6.

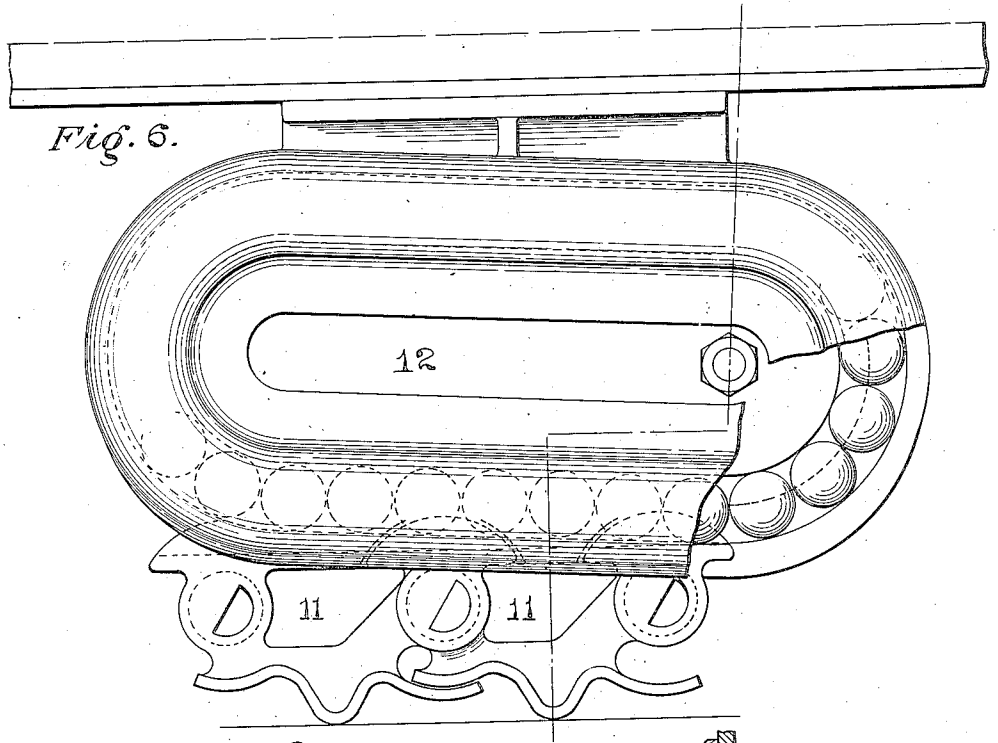
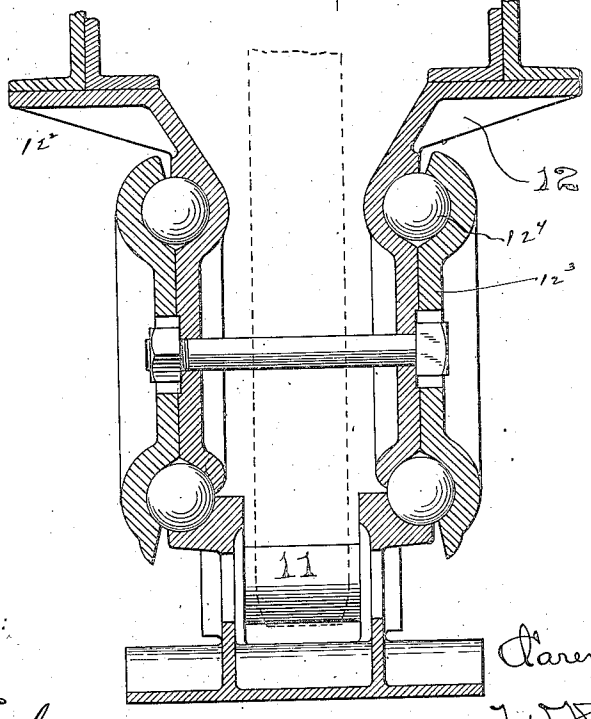


Fig. 7.



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5 SHEETS—SHEET 5.

Fig. 8.

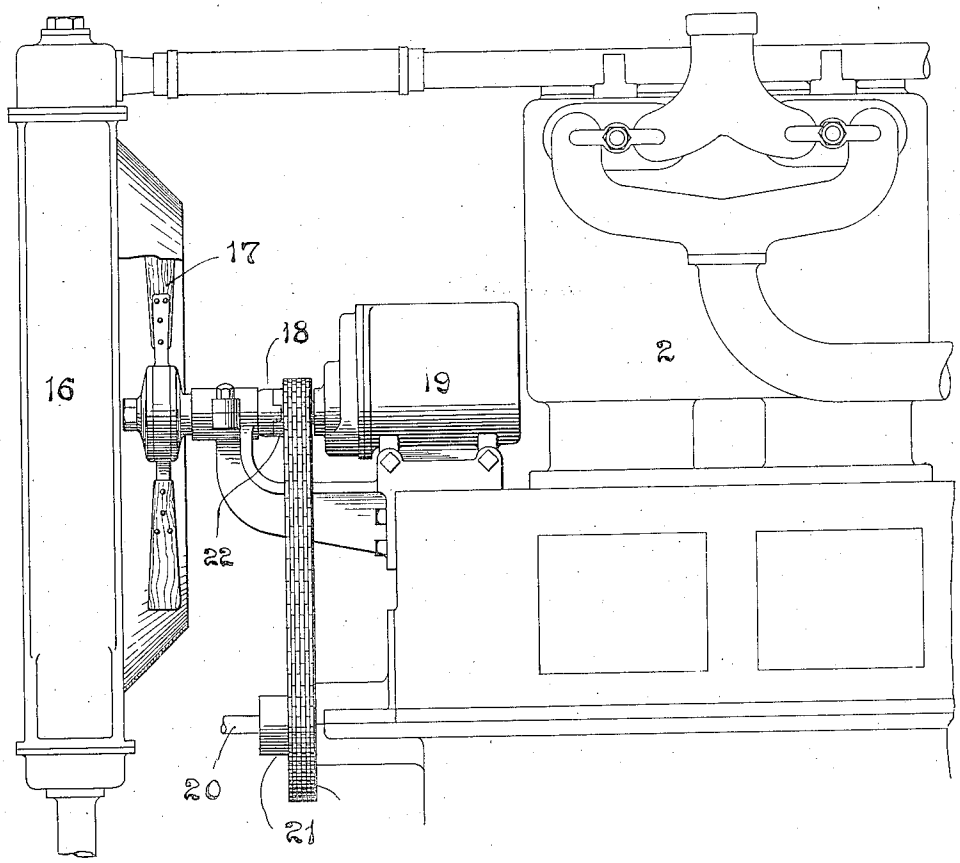


Fig. 9.

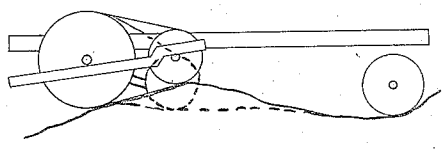
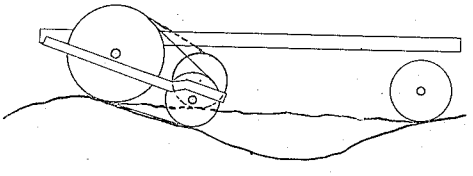


Fig. 10.



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UNITED STATES PATENT OFFICE.

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TRACTOR.

1,232,482. Specification of Letters Patent. Patented July 10, 1917.

Application filed April 6, 1914. Serial No. 829,848.

To all whom it may concern:

Be it known that I, CLARENCE LEO BEST, citizen of the United States, residing at Elmhurst, in the county of Alameda and State of California, have invented certain new and useful Improvements in Tractors, of which the following is a specification.

This invention relates to the general class of traction engines. At the present time there are in practice two types of tractors—the rail type, or locomotive, and the road type, or traction engine; both of these forms are designed to operate upon artificially prepared roads. The present invention relates to a new form of traction device, a natural ground surface type, or agricultural tractor primarily designed to operate upon rough, hummocky, sandy, non-tractive surfaces and tilled ground in its varieties, as met with under all conditions of cultivation and farm use.

The conditions of operation confronting this new type of tractor introduce problems practically non-existent in connection with rail or road engines, namely: (1) soil necessities; (2) varying texture of traction surface; (3) surface contour conditions in relation to steering; (4) practically prohibitive wear and breakage.

Heretofore the efforts of inventors in the tractor art have been directed to the problem of producing traction engines specifically designed for road service to be incidentally used for tillage when favorable conditions permit.

The present invention is designed specifically for farm traction with primary regard and reference to soil necessities for high tilth.

In view of the departure from accepted practice in the present invention and the importance of the results attained thereby, it is deemed necessary to a full disclosure and a proper understanding of the significance of the various mechanisms hereinafter described and which have successfully withstood the test of practice, to premise the description of these mechanisms by clearly indicating the nature of the problems involved.

In brief the problems solved and the objects accomplished by the mechanisms and combinations of devices hereinafter described relate to:

(1)—The agricultural necessities of the soil, these may be grouped under the unavoidable requirement of light weight of the structure, or its equivalent; small pressure per square inch of soil surface;

(2)—Traction under agricultural surface conditions involved in traveling over plowed or harrowed ground, friable or sandy soil, checked or ditched ground, wet or swampy ground, and otherwise unfavorable traction surfaces;

(3)—Undulating hummocky and rough contour conditions, including those problems relating to flexibility whereby both traction contact and guiding contact is maintained at all times regardless of the unevenness of the ground;

(4)—Upkeep, wear and tear, and breakage expense under the extremely adverse requirements confronting a tractor for farm work under present day conditions.

The first problem which confronts the builder of a road tractor has relation to the character of the surface upon which it has to travel. The first problem which confronts the inventor of an agricultural tractor has relation to the agricultural necessities of the soil.

Upon this basic diversity in problem and function rests an essential difference between a road engine and an agricultural tractor, and upon the clear perception of this diversity in concept of end or object sought rests the novel construction disclosed in the present invention. This concept of end and its physical realization in practice is for the first time hereinafter disclosed.

The railway locomotive is built in accordance with the fact that it is intended to run upon parallel and practically straight metallic rails. The road engine is built to travel upon the hard, smooth macadam of the highway. So long as the locomotive remains upon the track and the road engine upon the highway, tractive problems are practically solved by the normal constructions arranged to meet these specific conditions.

The first requirement of an agricultural tractor in order to successfully effect its ultimate purpose of ground cultivation is that it must be so constructed as to permit of its traveling over soil in proper condition of tilth and not crush eggs buried three inches beneath the surface of the loose top soil.

If, at variable and frequent intervals, the rails are removed from a road-bed and a locomotive compelled to travel upon the ties, at once conditions are introduced which

render the construction of the engine useless and abortive. So too with the road-engine; if the roadway is crossed by areas of sandy or loose soil sown with eggs which must not be broken, plowed land which must not be packed, and by hummocky ground substantially the same difficulties would face the road-engine, and it would be in the same pass as the locomotive on the ties; that is to say: it would be confronted with conditions which it was not designed to meet. The locomotive is designed for smooth metallic track service—the road engine is designed for smooth hard macadam road service. The fact that the locomotive could progress (after a fashion and most inefficiently) upon macadam roads, and the road engine in like manner upon, more or less, uneven surface, does not change the essential character and adaption of the two devices, nor their underlying concepts.

Practically speaking: there is, in this art—prior to the present invention—but one form of traction producing support, namely: "the wheel". Much effort has been expended in other directions, as for example the walking type in all its grotesque and futile shapes, and the track-layer or caterpillar traction-chain.

In their varied and more exaggerated forms, the problems solved by the present invention are those which confront both the round wheel as well as those which are peculiar to the track-laying type of tractors and others not encountered upon artificially prepared roads.

Notwithstanding the fact, that the track-laying engine is probably as old as the ordinary round-wheel road engines, and certainly as old as its practical commercial utilization, the cheapness, strength, simplicity and reliability of the round traction wheel has caused this form of traction driver to assume the position of an accepted standard, while the cost, inherent weakness, complications and liability to breakage, wear and dis-arrangement of the caterpillar endless traction-chain has relegated this form, more or less, into the category of "freak" devices in the traction engine art.

Certain inherently valuable characteristics of the track-laying tractor have—from time to time—incited efforts to overcome its seemingly insuperable mechanical difficulties, by optimistic and courageous mechanics with, heretofore, only very unsatisfactory practical results. The reason for these failures are seemingly inherent in this form of tractor and relate to certain main causes: 1st, the great multiplication of lubricant needing axles or pins necessitated by the chain joints and their location close to the traction surface as distinguished from the wheel axle of the ordinary round wheel tractor high above the ground; 2nd the large two dimensional traction contact surface, *i. e.*, the length and width of the chain track in contact with the ground as distinguished from the line contact of the round traction wheel.

After traction the next set of problems to be solved has to do with control of direction of travel. In the locomotive this difficulty is avoided and made substantially non-existent by the presence of tracks and involves merely flexibility of wheel-base to accommodate curvature in the tracks. With the round wheel-road engine also this problem is comparatively simple, due to the fact that the round wheel makes but line contact with a plane surface. The problem of steering in connection with the caterpillar tractor presents an altogether different aspect. On the face of it, there is presented a seeming impossibility, and one which heretofore has been a practically insuperable problem. This will be appreciated when the endless traveling chain character of its tractor device is considered. A round wheel traction engine is supported upon two longitudinally disposed supports, the driving wheels and the steering wheel or wheels. If now a third supporting and driving wheel be introduced between these supports, as the idler track wheel in the ordinary track-laying tractor, it is obvious that this third wheel renders the device if not practically inoperative, at least very difficult to steer and subject to highly destructive strains upon uneven or hummocky ground. For, at every hummock, the steering wheels or the driving wheels will be raised out of contact with the ground.

This is the present situation and problem of the caterpillar tractor, so far as concerns its capability to travel and steer on rough or hummocky ground, and added thereto is the practical incapability to work in loose soils or sandy or gritty surfaces on account of the multiplicity of lubrication needing joints in its traction chain.

To give a proper understanding of these various difficulties and problems and of the mechanical solution hereinafter set forth, it is necessary to recall briefly the developments in and the conditions surrounding power cultivation during the past twenty years and up to the present time in the far western portions of the United States, for it is to meet the requirements thus disclosed which is the ultimate object of the herein described invention.

At the beginning of this period the only traction engine was a steam engine. It was found then that to plow, harrow, etc., cheaper than it could be done with mules or horses, a machine of 60 H. P. or more was necessary for at that time it was possible to get but 40% at the draw-bar, or 50%—say from five to ten years ago. This steam traction engine of 60 H. P., or more, weighed

from 15 to 25 tons. With this engine it was necessary to have a water wagon, four horses and a man, an engineer, fireman and a plow-man. Upon the practical application of fuel oil these machines were largely made over into oil burners on account of being safer in the harvest field. The cost of running one of these machines was approximately $30.00 per day, and it would plow ordinary plowable farm land at the cost of about $1.00 per acre. It was found that the drive wheels must be of at least 24 inches wide and some 8 feet in diameter. With this width they could go on some farm land and do good work. But if, as is frequently the case, there was a sandy streak through the field it was necessary to uncouple these engines from their plows, run across this streak, drop a chain or cable behind and run the plow through, which, of course, cut down the number of acres per day and increased expenses.

With these engines the pressure per square inch was so great that it packed the land and formed what is commonly known as "plow-pan" about 5 inches from the top of the ground, this being the usual depth to which the ground is plowed. This "plow-pan" being packed hard and solid prevents the rain from sinking deeply, hence in the hot western summer this moisture is soon evaporated, leaving the plowed land dry. When foggy or cloudy after the rain, this tractor with its 24 inch face wheels could not go on this land to harrow it until the moisture had evaporated. For, if the plowed ground was at all moist, if inclined to stick on the wheels, the tractor would slip and do only a small percentage of what it was capable of on dry ground. Running this heavy tractor with its narrow wheels over the plowed ground so packed the soil that it very seriously lessened the crop of grain raised.

To overcome this it became necessary to make the wheels wider, and wider until we have gotten them up as high as 16 feet wide on the side. Then the machine was too wide, clumsy and awkward to handle. It could not make a short enough corner in turning. The additional weight of these big wheels consumed a lot of power. To offset this builders added more power which meant heavier gearing and heavier parts of structure. Then it required skilled operators, which in turn increased the cost of operation, more fuel, which again increased the cost, until it got to a stage where these engines were hardly more economical than mules; and meant a bigger investment in the machine than the number of mules capable of doing the same work. But the big objection was the fact that these machines packed the ground and the moisture could not get down deep. And after the rain these machines could not go on the land for they packed the ground worse than ever when it was moist. If the ground was wet on top, they could do nothing on account of slippage.

Thus was produced the urgent need of a traction engine of cheaper first cost, lighter per horse power, lighter per square inch of surface on the ground and cheaper to operate; hence the introduction of the round-wheel internal combustion tractor.

The present inventor was one of the first to produce a machine of this class. He built for the market all steel machines with the main idea of reducing the weight and getting the machines seemingly ridiculously strong. But, even with the gas round wheel tractor, which weighed but half as much as the steam tractor with the same amount of power, the old objection of packing the soil remained; hence, wider wheels were put on the gas tractor as much as 12 feet wide on the side making once more a machine awkward and clumsy to handle and excessively wasteful of power and of cost of construction and upkeep. Though this gas tractor reduced the cost of cultivation the packing of the land reduced the yield more and more every year, for a hard pan developed at the depth to which the ground was plowed.

It is very expensive to sub-soil land; it is out of the question to do it frequently. So the problem now pressing for solution is: an agricultural tractor capable of operating successfully upon all character of farm lands and exerting less than round wheel pressure upon the surface, so slight indeed as to pass operatively over eggs buried three inches below the surface of the ground without breaking the eggs. This means that the tractor has to be light enough that it will not unduly compress the ground to the depth at which the eggs are buried.

The self laying track engine, having an endless traveling platform, consisting of a chain with broad shoes or cleats on the face of it, suggests favorable possibilities in this direction. So there have been numerous attempts made to produce such an engine, with but very imperfect and inefficient results. It has been found that in these tractors the wear and tear on the multitude of hinge pins in the chain is too great. Besides in going over rough or uneven ground, they lack flexibility. To overcome both these objections looks like an impossible task.

Ranchers have gotten to the point where it is unprofitable to farm with mules or horses on account of high cost of feed and men's wages, and they cannot permit their land to be packed with the round wheel machine.

In the country lying west of the Rocky Mountains there is hardly a ranch that does not have a swampy place or a creek running

through it, which means a bed of sand or rough rocky places. Going across checks or little mounds, track-laying tractors prior to the present invention, (for the reasons already stated) rear up in front, with the result that besides the steering difficulty, this destructively jars the construction and causes an impracticable amount of breakage. The endless traveling platform consisting of links with a pin put through their ends as constructed prior to the present invention results in impractical power losses. It also produces wear and friction at this point so great that new tracks have to be put on in some places as often as every three or four months at a cost of from $400.00 to $500.00, and even so their range of operation is restricted by sandy or gritty soils. And this terrible expense must be borne to avoid packing the land. While it is found that this machine with its heavy upkeep expense would not beat the mule in cost per acre, they have continued in use where conditions are favorable because feed and man hire is getting ever scarcer and higher. In many places men cannot be gotten at any practical price.

The caterpillar machine, when conditions are favorable for its employment, can accomplish one object, namely: that the pressure per square inch is light, yet as heretofore constructed it has objections worse than the round wheel, for it cannot go over checks or hummocks. To go over such ground jars it to an extent that it breaks down and the wear on the chain track pins consumes such excessive amount of power as to make it in most cases too expensive for practical use. Its efficiency is also less than the round wheeler when the land is in condition for the round wheeler to run.

Thus it is seen that to be practically operative an agricultural tractor must combine elements to provide: (*a*) tractive power means exerting a less than round wheel ground surface pressure per square inch; (*b*) tractive means practically unaffected by sand or grit; (*c*) maximum tractive power per unit of weight; (*d*) absence of unyielding support between steering and tractive power wheel; (*e*) simplicity, economy and cheapness of construction.

It is the object of the present invention to provide simple cheap and effective devices to meet the requirements of each of these sets of problems and of such character that these devices combine and co-act with each other to produce the unitary result of meeting successfully the necessities of farm work and produce a practical and in practice successful all round agricultural tractor, an object not heretofore accomplished.

This desirable object has been accomplished in the present invention by means of the hereinafter described devices and mechanisms—reference being had to the accompanying drawings in which:

Figure 1 is a plan view showing the relation of the radius tractor trucks.

Fig. 2 is a side view showing pivotal attachment of tractor truck.

Fig. 3 shows a detail of a portion of the endless traction chain on a larger scale partly in section.

Fig. 4 shows the construction of Fig. 3 in elevation and partly in section, the relative position of the chain guide being shown in dotted lines.

Fig. 5 shows a detail upon an enlarged scale, of the endless traction chain and tread plates with antifriction guide in vertical section.

Fig. 6 shows an elongated modification of the antifriction ball race the cover being broken for clearness of illustration.

Fig. 7 shows a transverse sectional elevation of Fig. 6.

Fig. 8 shows upon an enlarged scale the arrangement of the engine and starting device.

Figs. 9 and 10 are diagrammatic views of the device traveling on hummocky ground showing the constant support of and by the three wheel or tripod base and showing the tractor trucks automatically accommodating themselves to broken and uneven ground surface.

1 is a frame upon which is supported suitable motor devices shown in the drawings as an internal combustion motor 2. Near the rear end of frame 1 and transversely thereto is a driving shaft 3 suitably connected to the motor 2 to be driven thereby. I make this shaft 3 in two parts connected and driven by suitable differential gears of ordinary form to permit of independent motion in each part, as shown in the diagrams Figs. 9 and 10. This construction is indicated by the differential gear case 4 in which the shaft is suitably journaled. The shaft 3 and its gear case 4 are suitably secured to the frame 1. It is shown as lying transversely across the frame 1 passing through the differential gear case 4 which latter is secured solidly to the frame 1. Upon each end of the divided shaft 3 which projects beyond the frame is secured a driving and supporting sprocket-wheel 5, which two sprocket wheels 5, 5, with a front steering support constitute a three wheeled or tripod base for the motor supporting frame.

A radius tractor truck 6 extends along each side of each wheel 5 and frame as shown in Fig. 1. The side members of tractor truck 6 extend beyond the axis of sprocket wheel 5 and in the space thus provided and between its sides is an idler wheel 7. The idler wheel is journaled in boxes 7′ one upon each of the side members of the tractor

truck 6. These journal boxes are preferably slidable and provided with suitable means to effect their adjustment with reference to the truck on which they are mounted, as shown by the adjustment screw B.

The two sides of the tractor truck 6 are joined at any suitable place along their length shown in Fig. 1 as a strut located at each end. A bracket 9 rigidly secured to the frame 1 extends transversely above the truck 6. Between this bracket and tractor truck 6, a spring 10 is provided forming a resilient cushion between the truck 6 and bracket 9. Extending around and engaging the sprocket-wheel 5 and idler wheel 7 is an endless traction chain 11 of peculiar construction (which will be more particularly described later) especially adapted to agricultural conditions.

Each of the radius tractor trucks 6. 6 is journaled at one end upon shaft 3, the other end of the truck being free to swing in a vertical arc with the center of shaft 3 as its axis of arc motion, in order to automatically, independently, and resiliently accommodate itself to varying ground contours without thereby bending, kinking, or otherwise affecting the working tension of the traction chain substantially as shown in Fig. 1 and Fig. 2 and in diagrammatic views Fig. 9 and Fig. 10, thus making the sprocket-wheels 5. 5.—with a forward steering support—into a tripod base fixed relatively to the varying position of the tractor trucks in their automatic motions accommodating themselves to the uneven or hummocky ground surface.

Intermediate of the wheels 5 and 7 is an antifriction chain guide 12 rigidly secured to the truck 6 and between it and the lower or traction fold of the chain 11 being thus movable with reference to the frame 1 but stationary with reference to a line joining the centers of the sprocket-wheel 5 and idler 7 and consequently stationary with reference to the normal path of the chain. This antifriction guide may be placed with reference to the lower fold of the chain to depress it slightly as shown in Fig. 2 or to permit of the chain being straight between the peripheries of the wheels as indicated in Figs. 9 and 10.

At the forward end of frame 1 is located a steering and supporting wheel 13 provided with a suitable operating attachment shown in the present instance as a worm and pinion and rearwardly extending shaft 14 with hand wheel 15. This steering support with sprocket-wheels 5. 5. constitute a constant tripod support for motor frame 1 independent of the movable radius tractor trucks 6. 6.

Associated with the motor 2 is a radiator 16 provided with a cooling fan 17 secured upon a shaft 18, said shaft directly connected with and being the armature shaft of a suitable electric motor 19. The shaft 18 is also connected with the driving shaft 20 of the motor 2 by suitable mechanical connections whereby shafts 18 and 20 are or may be each respectively driver and driven. This connection is shown in the present instance as chain sprocket 21 upon shaft 20 and chain pinion 22 upon shaft 18 and chain belt connecting the two sprocket-wheels 21 and 22 in driving association.

The chain 11 heretofore referred to is constructed as shown in the details Fig. 3 and Fig. 4 to consist of side plates 11^1—11^2 connected by a bolt 11^3 and also by tread plates 11^4 with their holding bolts 11^5 substantially as shown in the views referred to and also in Figs. 5, 6 and 7. To this extent the parts constitute a link chain not essentially differing from an ordinary two side membered link chain.

To meet and provide for the peculiarly exacting conditions, (not elsewhere met with) of traction chains in agricultural tractor service, a radical departure in tractor chain construction is introduced in the means employed of hinging the links, (made as already described) to each other. Between the side plates 11^1, 11^2 is provided at one end a fulcrum case 11^6 rigidly secured at each of its ends to the side members by any suitable means. Interiorly of case 11^6 is provided a longitudinally extending radially projecting rib or fulcrum 11^7 extending to the axis of the case. The inner surface of rib or fulcrum 11^7 is beveled radially from the plane of its longitudinal center on opposite sides of its central plane thus forming the outer end of this fulcrum into an obtuse angle, whose apex is the axis of the case. Between the sides 11^1, 11^2 at the opposite end of case 11^6 is provided a strut 11^8 of less diameter than the interior diameter of the case having a working surface 11^9 forming a plane extending longitudinally of the strut along its axis to rock or see-saw on the fulcrum. This strut is rigidly secured at each of its ends to the side members 11^1, 11^2 with its working plane 11^9 set at an angle with the longitudinally horizontal plane of the hinge axes of the said members. This angle preferably corresponds to one of the angular surfaces of fulcrum 11^7 of case 11^6 to lie in working contact therewith when the assembled chain is in working position, and rock or oscillate thereon when the chain is flexed. The case of the side members 11^1, 11^2 have an inward offset and the strut end of the same members have a corresponding outward offset, so that the links consisting of two side members 11^1, 11^2 may be assembled into a parallel-sided continuous chain hinged together by each strut 11^8 passing through its coacting fulcrum case.

The tread plates 11^4 of the links and chain thus described extend somewhat beyond the

hinge axis of the links of adjacent treads being suitably conformed to each other to overlap.

The antifriction chain guide 12 heretofore referred to, (for substantially the same reasons necessitating the peculiar construction of the traction chain just described though not so urgently in the case of the chain) is preferably made to avoid sliding frictional contact of working surfaces. In other words to remove the necessity of lubrication in these parts and the condition which has in the past rendered the renewal of the chain parts a practically prohibitive expense in track laying tractors when applied to agriculture. For this reason the antifriction chain guide in one of its forms consists of a hollow drum 12^1 in contact with the upper surface of the lower fold of chain 11 a pair of ball races 12^2, 12^3 one adjacent to each end of the drum 12^1. Each race is provided with balls 12^4 or other antifriction devices. The ball track is preferably arranged as shown to provide antifriction abutment for the roller 12^1 against upward and lateral movement. And in addition thereto the race 12^2 and 12^3 and balls 12^4 may be so disposed as shown in Fig. 5 to form lateral antifriction abutment and guide for chain 11. In the modification shown in Fig. 6, the ball race is made elongated to this modification also the roller or drum may be omitted entirely the balls serving as lateral and vertical abutments and guides as shown in Fig. 7.

By the herein described mechanism elements are combined which meet and provide for the previously stated conditions of agricultural tractor service, and combined mechanisms which have successfully withstood the test of actual practice:—

(*a*) The tractor chain support furnishes power means of less than round wheel ground surface pressure per square inch and will travel in working practice over soil in good tilth without breaking eggs placed a short distance below the surface.

(*b*) The tractive chain means is practically unaffected by sand and grit by the substitution therein of rolling contact for sliding frictional contact surfaces. That is to say, the substitution in the joints of the chains and attachments of rolling contact between the adjacent coacting surfaces. By this substitution need for lubrication is avoided and necessity of excluding sand and grit from the coacting surfaces working close to the ground. By this substitution also the abnormal and commercially prohibitory wear and breakage expense is practically eliminated and reduced to ordinary machine wear of favorable conditions.

(*c*) The tractive power per unit of weight is greatly increased by the elimination of the excessive waste heretofore a necessary accompaniment of the sliding fractional character of the numerous chain joints necessary in the track laying type of tractor device.

(*d*) A tripod base and yielding support between the steering and traction wheels is provided for by the freely pivotal attachment of each resilient ended traction truck upon the axis of its traction wheel. The two-part driving shafts permits of the independent rise and fall of each truck without kinking or changing the working tension of the traction chain as is illustrated in Figs. 9 and 10. By this arrangement hummocks or ditches may be encountered and traversed without affecting the steering wheel contact with the ground and consequently without affecting the tractive effect or the steering capability of the tractor upon the roughened surfaces.

(*e*) Cheapness and simplicity of construction, economy of operation are brought about and provided by the construction of the traction chain and traction chain antifriction guide, in which, owing to the substitution of rolling for sliding contact in certain working parts, cheap unmachined castings can be and have been substituted for expensive machine parts. The elimination of machine work which has heretofore made the chains so highly expensive a construction, besides bringing about a great reduction of first cost, adds greatly to the inherent strength and effective life of the chain by using the naturally hard chilled skin of the cast parts to be effectively utilized to resist normal wear of the rolling surfaces. Abnormal or unnecessary kinks and strains upon and consequent breakage of the chain are avoided by the stationary relation of the chain guide to the normal path of the chain between the peripheries of the driving sprocket wheel and its coacting idler wheel. Simplicity, economy and cheapness is also provided by the direct driving of the radiator fan upon the shaft of a dynamo as this latter may be and is employed by suitable devices to act as a starter for the tractor motor, a matter of high consequence and importance.

In view of the many and radical departures in the present invention from the normal practice and the important results secured thereby, I do not desire to confine myself to the particular forms, arrangements or details of construction herein set forth to illustrate my invention and I claim this invention broadly and all modifications thereof such as may be made to adapt the invention to particular uses of conditions of operation without departing from the spirit of the invention.

What I claim is:

1. In a tractor, and in combination a main frame, a tractor truck mechanism com-

prising a driving sprocket wheel, a truck frame pivotally mounted concentric with the axis of the driving sprocket wheel, a tractor chain, a curved idler surface, and a spring member normally tensioned for load carrying service and positioned at the rear of the said driving sprocket wheel.

2. In a tractor, and in combination a main frame, a tractor truck mechanism comprising a driving sprocket wheel, a truck frame pivotally mounted concentric with the axis of the driving sprocket wheel, a tractor chain, a curved idler surface, and a spring member normally positioned above the plane of the truck frame for resisting upward tilting movement of the forward end of the truck frame.

3. In a tractor, and in combination, a main frame, a tractor truck mechanism comprising a driving sprocket wheel, a truck frame pivotally mounted concentric with the axis of the sprocket wheel, a tractor chain, a curved idler surface, and spring mechanism to resist upward tilting movement of the forward end of the tractor truck, said spring mechanism being of a length substantially greater than the normal distance between the truck frame and the main frame.

4. In a tractor, and in combination a main frame, a tractor truck mechanism comprising a driving sprocket wheel, a truck frame pivotally mounted concentric with the axis of the sprocket wheel, said truck frame having a part extending rearwardly of the pivot of the truck frame, a tractor chain, a curved idler surface, and a spring member connected with the main frame and with the part of the truck frame extending rearwardly of the pivot of the truck frame for resisting upward tilting movement of the forward end of the truck frame.

5. In a tractor, and in combination a main frame, a tractor truck mechanism comprising a driving sprocket wheel, a truck frame pivotally mounted concentric with the axis of the sprocket wheel, said truck frame having a part extending rearwardly of its pivotal point, a tractor chain, a curved idler surface, and spring mechanism for resisting upward tilting movement of the forward part of the truck frame, said spring mechanism comprising a connecting member secured at one end to the part of the truck frame extending rearwardly of its pivot and having an abutment near the other end thereof, and a spring member interposed between the main frame and said abutment.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLARENCE LEO BEST.

Witnesses:
H. P. SMYTH,
WARREN CHENEY.