E. R. BARNES.

EXCAVATING AND GRADING MACHINE.

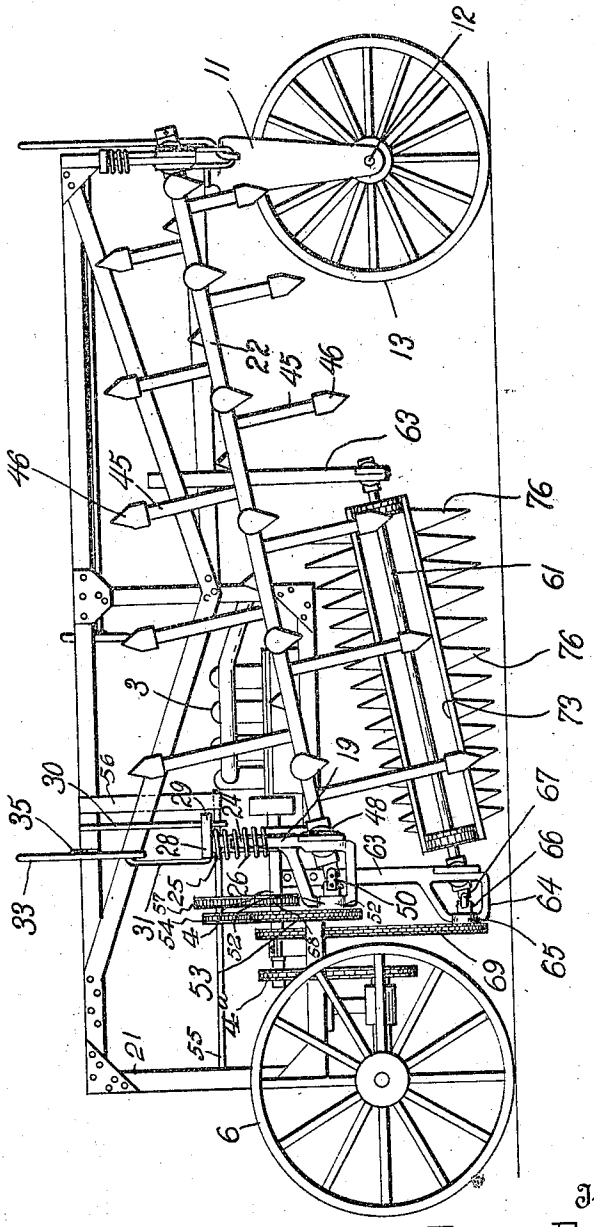
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1,379,845.

Patented May 31, 1921.

4 SHEETS—SHEET 1.

Fig. 1.



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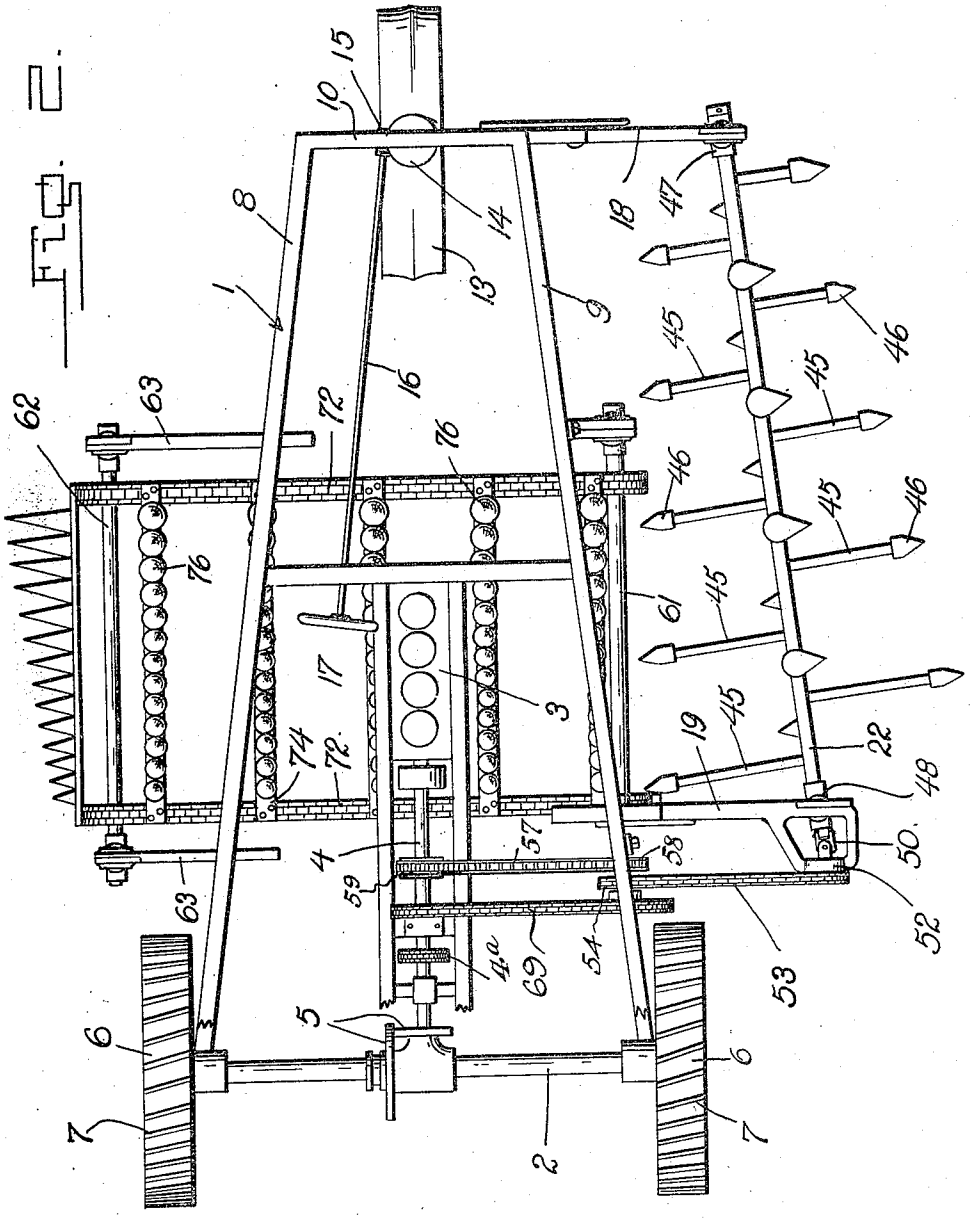
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

Fig. 3.

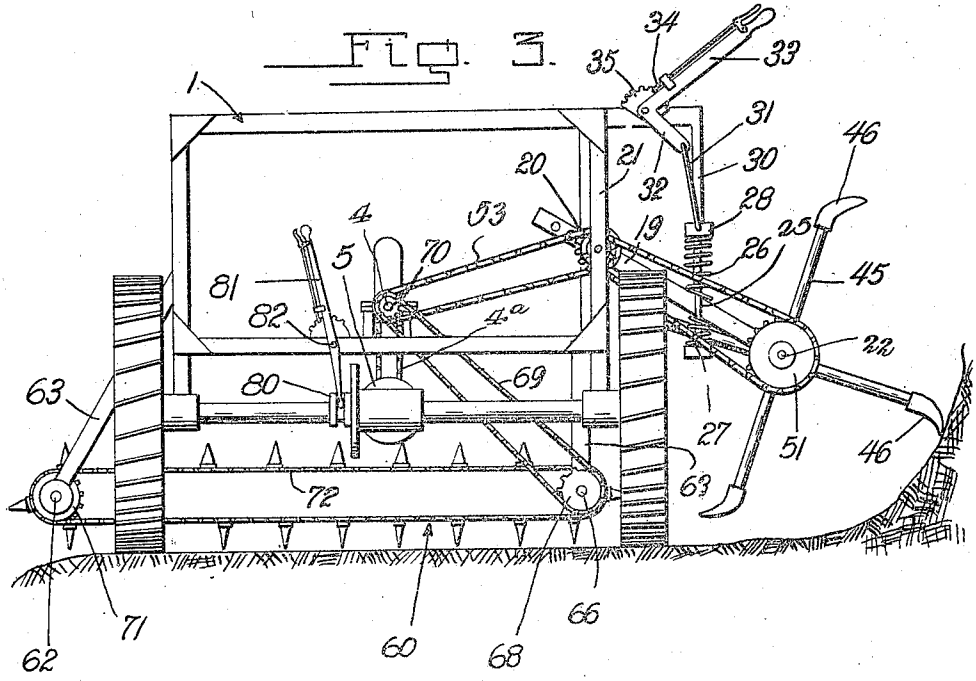
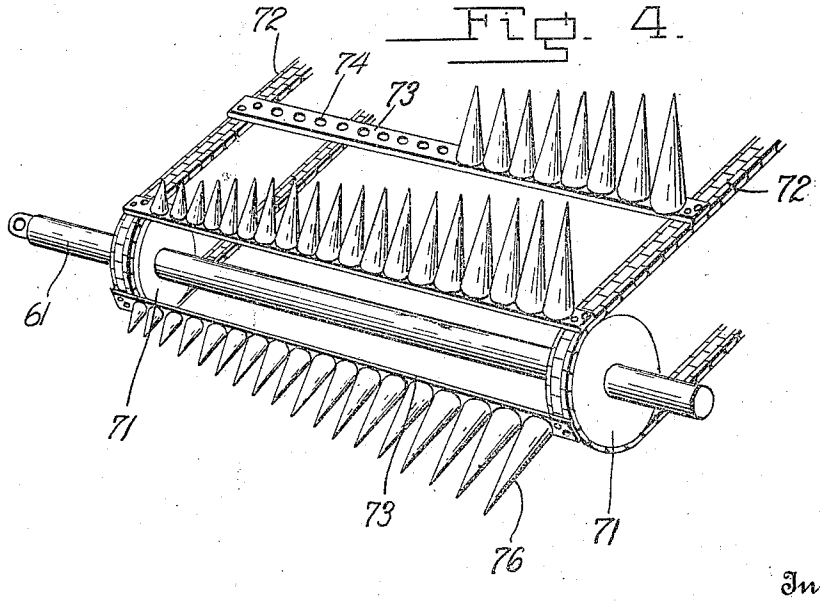


Fig. 4.



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4 SHEETS—SHEET 4.

Fig. 5.

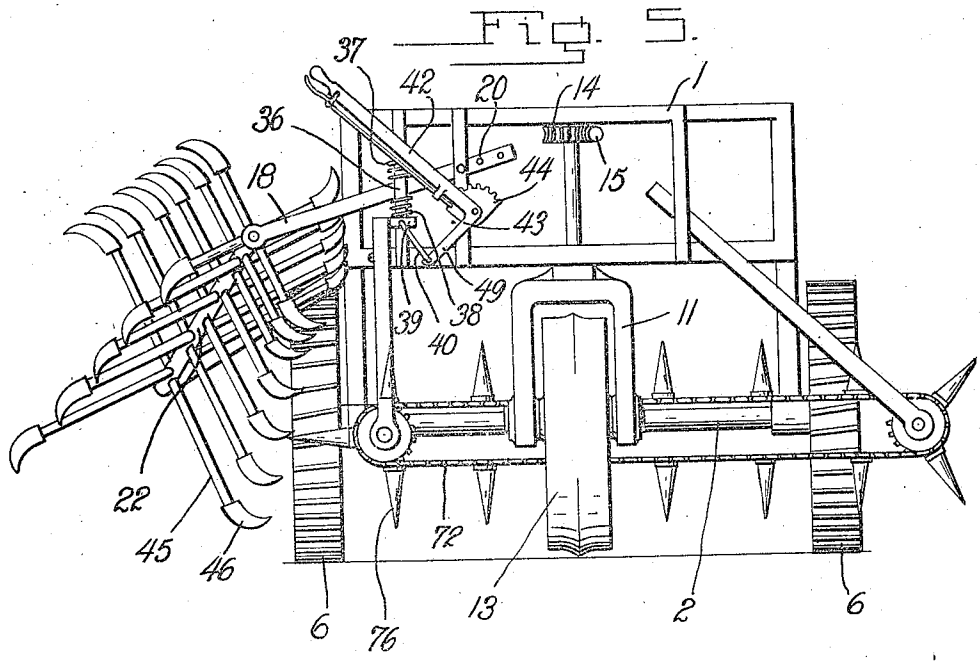


Fig. 6.

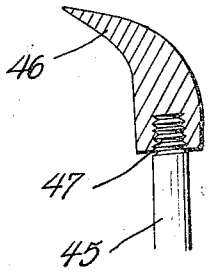
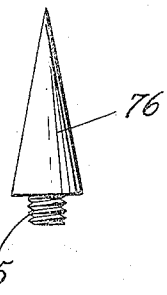


Fig. 7.



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UNITED STATES PATENT OFFICE.

ERVIN R. BARNES, OF SPOKANE, WASHINGTON.

EXCAVATING AND GRADING MACHINE.

1,379,845. Specification of Letters Patent. Patented May 31, 1921.

Application filed October 9, 1918. Serial No. 257,468.

To all whom it may concern:

Be it known that I, ERVIN R. BARNES, a citizen of the United States, and a resident of Spokane, in the county of Spokane and State of Washington, have invented certain new and useful Improvements in Excavating and Grading Machines, of which the following is a specification.

This invention relates to an excavating and grading machine and an object of the invention is to provide a device of this nature which is particularly adapted for building or reconstructing roads along hills or mountain sides.

It is a well known fact that roads, along mountain sides or hillsides are in many cases very narrow, and upon continued use become lower upon the outer edge, necessitating considerable work, when performed in the ordinary manner, with picks, shovels and graders, to properly level the roadway and widen the same and it is therefore an object of this invention to provide a power driven machine, which will excavate or cut away the side of the hill at the inner side of the road, and level the dirt thus cut away evenly over the roadbed, leveling the same, in one continuous operation, thereby materially reducing the cost of labor for repairing or rebuilding roads along hill or mountain sides.

More specifically, the invention comprehends the provision of a portable motor driven structure carrying a rotary pick or excavating mechanism at one side of the same which mechanism includes a rotary shaft having a plurality of radiating arms carried thereby and disposed in staggered relation which arms have picks detachably mounted upon their outer ends, and to gradually increase the lengths of the arms as they extend rearwardly from the forward end of the machine, to cause a gradual cutting away of the bank or a portion of the hill along the inner side of the roadway.

A further object of the invention is to provide a rake structure, comprising an endless conveyer or chain structure having a plurality of flights carried thereby at spaced distances, which flights carry raking teeth, that engage the soil removed by the excavating or rotary pick structure, efficiently spreading the same over the road surface and leveling the road and further to graduate the lengths of the raking teeth, having the longer teeth at the forward end of the rake, and the teeth gradually decreasing in length toward the rear end of the same, to insure the proper leveling of the roadbed.

Other objects of the invention will appear in the following detailed description, taken in connection with the accompanying drawings, forming a part of this specification, and in which drawings:

Figure 1 is a side elevation of the improved excavating and grading machine.

Fig. 2 is a top plan of the machine.

Fig. 3 is a rear elevation of the machine showing the application thereof.

Fig. 4 is a fragmentary perspective view of the leveling rake structure.

Fig. 5 is a front elevation of the excavating and grading machine.

Fig. 6 is a detail section through one of the pick heads, and

Fig. 7 is a detail side elevation of one of the teeth of the grading rake structure.

Referring more particularly to the drawings, 1 generically indicates the supporting structure of the excavating and grading machine, which structure supports a rear drive axle 2, at its rear end. The axle 2, is driven from a prime mover which may be any approved type of internal combustion engine indicated at 3, through the medium of the power shaft 4 of the engine and friction transmission mechanism 5, which is connected to the shaft 4 by a sprocket and chain power transmitting mechanism 4^a. It is to be understood that any approved type of transmission mechanism may be employed for transmitting the power from the engine 3 to the rear drive axle 2 without departing from the spirit of this invention. The axle 2 has supporting wheels 6 mounted upon its spindle end which wheels are provided with cleats 7 upon their peripheries to cause them to bite or grip into the ground to propel the excavator.

The side rails 8 and 9 of the supporting structure 1 incline inwardly toward the longitudinal center of the machine as they extend forwardly and their forward ends are connected by a cross bar 10 which rotatably supports, a suitable yoke 11, in such manner as to permit pivotal movement of the yoke about a vertical axis. The yoke 11 carries a front axle 12 upon which the front steering or guiding wheel 13 of the machine is mounted. Suitable means for guiding the direction of travel of the wheel 13 is provided, which includes a worm gear 14 with

which a worm 15 meshes. The worm 15 is carried by a steering post 16 which has a hand wheel 17 mounted upon its rear end.

Supporting bars 18 and 19 are pivotally and adjustably connected as shown at 20, to the standards 21 of the supporting frame 1 and these supporting arms rotatably support a shaft 22 at their outer ends.

The arm 19 is supported within a slot 24 formed in a bar 25. Spiral springs 26 and 27 are coiled about the bar 25 engaging upon the upper and lower edges of the bar 19 respectively, to yieldably support the bar for pivotal movement during operation. The bar 25 has a head 28 mounted upon its upper end which is provided with an opening 29 which slidably receives a depending arm 30. The depending arm 30 is supported from the supporting frame 1.

A rod 31 is connected to the head 28 and to the sharp angled end 32 of a pivotally mounted hand lever 33. The hand lever 33 carries a dog mechanism 34 which co-acts with a quadrant 35 for holding the lever and consequently the arm 19 in adjusted position. When raising the arm 19, the lower spring 27 is compressed, upon the initial action of the lever, after which the arm will be raised by further action or pivotal movement of the lever 33.

The bar 18 extends slidably through a slot formed in a vertical bar 36 and spiral springs 37 and 38 are coiled about the bar 36 and positioned upon the upper and lower edges respectively of the arm 18 for yieldably supporting this arm. A block 39 is slidably mounted upon the bar 36 beneath the spring 38 and it has a rod 40 connected thereto which is also connected to the short angled end 41 of a pivotally mounted hand lever 42. This hand lever 42 also carries a dog mechanism 43 which co-acts with a quadrant 44 for holding the lever and consequently the arm 18 in various adjusted positions. The springs 37 and 39 provide means for yieldably supporting the arm 18 to allow vibration thereof during the operation of the excavating structure. By the provision of the levers 33 and 42, the rear and forward ends of the shaft 22 may be adjusted, as to elevation, independently of each other if desired, or by operation of these levers, the shaft may be elevated sufficiently to move the excavating members carried thereby out of operative positions.

The shaft 22 has a plurality of radiating arms 45 attached thereto, and arranged in rows, the arms in one row being disposed staggeredly with respect to the arms in the remaining rows, as clearly shown in the drawings. These arms or handles 45 have pick heads 46 detachably connected to their outer ends as shown at 47 in Fig. 6 of the drawings. The pick heads 46 may be easily disconnected from the handles or arms 45 to resharpen them or to replace them by new heads when broken. It will be noted, by particular reference to the drawings, that the arms or handles 45 gradually increase in length along the length of the shaft 22, toward the rear end of the same, that is, the rearmost handle 45 is the longest, while the foremost handle is the shortest. By providing this particular variation in the lengths of the handles or arms 45, the pick heads will be projected or positioned various distances from the axis of their rotation and consequently will gradually cut away a bank or portion of a hill alongside of a road.

The shaft 22 is rotatably supported, by a suitable bearing 47 carried at the outer end of the arm 18 and by an analogous bearing 48 carried by the arm 19. The shaft 22 is connected, at its rear end, by means of a universal coupling 50 with a sprocket 51 and this sprocket is supported by a suitable bearing 42. A chain 53 connects the sprocket 51 with an analogous sprocket 54 mounted upon the shaft 55 carried by the standard 21 and support 56. A chain 57 connects a second sprocket 58 on the shaft 55 with a sprocket 59 carried by the shaft 4 for rotating the shaft 22 by the operation of the engine or prime mover 3. The soil or dirt after it is cut from the bank alongside of a road by the rotary pick or excavator structure, is engaged by a rake structure generically indicated by the numeral 60 which travels transversely to the direction of travel of the frame 1. The rake structure 60 comprises a pair of shafts 61 and 62 which are supported by suitable hangers 63 depending from the supporting frame 1. The shafts 61 and 62 are preferably supported at angles with respect to the horizontal, inclining downwardly from their forward ends toward their rear ends as clearly shown in Fig. 1 of the drawings. The hangers 63 which support the rear end of the shaft 61 have a boxing structure 64 formed thereon which forms a support for a bearing 65. This bearing rotatably supports a shaft 66 which is connected by means of a universal connection 67 to the shaft 61. The shaft 66 has a sprocket 68 mounted thereon about which a sprocket chain 69 travels. This sprocket chain 69 also travels about a sprocket 70 carried by the shaft 4 for rotating the shafts 66 and 61 by the operation of the engine or prime mover 3. The shafts 61 and 62 have sprockets 71 mounted thereon about which chains 72 travel. The chains 72 have a plurality of flights 73 attached thereto and extending from one chain to the other, at spaced intervals. The flights 73 are provided with screw-threaded openings 74 which receive the screw-threaded shanks 75 of the raking teeth 76. The raking teeth 76 are conical in shape, and each successive

tooth is slightly shorter and its face is slightly less in diameter than the tooth directly in front of the same as clearly shown in Figs. 1 and 4 of the drawings, so that the forward teeth will engage and move more of the soil loosened by the rotary excavator structure, than will the rearmost teeth, effecting a proper leveling of the road bed and the filling of any holes or ruts in the roadway.

A clutch mechanism indicated at 80 may be associated with the axle carried portion of the friction transmission 5 for controlling the rotation of the axle 2 by the operation of the engine and this clutch mechanism is operated by a hand lever 81 which is pivotally mounted as shown at 82, upon the supporting chain 1 and if it is desired, the clutch mechanism may be associated with the sprockets which control the operation of the rotary excavating structure and the rake structure, without departing from the spirit of this invention, so as to permit the machine to be propelled without operating these mechanisms.

Changes in details may be made without departing from the spirit of this invention; but,

I claim:

1. In an excavating and grading machine, the combination, of a supporting structure, an excavating structure supported at one side of said supporting structure and including an axle, a plurality of arms radiating from said axle, and pick heads mounted upon the outer ends of said arms.

2. In an excavating and grading machine, the combination, of a supporting frame, a pair of arms pivotally and adjustably carried by said supporting frame, a shaft rotatably supported at the outer ends of said arms, a plurality of arms carried by said shaft and arranged in rows, the arms in one row being disposed staggeredly to the arms of the remaining rows thereof, and pick heads carried by the outer ends of said arms.

3. In an excavating and grading machine, the combination, of a supporting frame, a pair of arms pivotally carried by said supporting frame, a shaft rotatably supported at the outer ends of said arms, a plurality of radiating arms carried by said shaft and arranged in rows, each of said arms being slightly longer than the arm forwardly thereof whereby the cutting stroke of said rotary excavating structure will be gradually increased as it extends toward the rear end of the excavating structure, and pick heads carried by the outer ends of said arms.

4. In an excavating and grading machine, the combination, of a supporting frame, a pair of arms pivotally carried by said supporting frame, a shaft rotatably supported at the outer ends of said arms, a plurality of radiating arms carried by said shaft and arranged in rows, each of said arms being slightly longer than the arm forwardly thereof whereby the cutting stroke of said rotary excavating structure will be gradually increased as it extends toward the rear end of the excavating structure, pick heads carried by the outer ends of said arms, means for yieldably supporting said arms to permit limited pivotal movement thereof, and means for adjusting the position of said arms.

5. In an excavating and grading machine, the combination, of a supporting frame, a pair of arms pivotally carried by said supporting frame, a shaft rotatably supported at the outer ends of said arms, a plurality of radiating arms carried by said shaft and arranged in rows, each of said arms being slightly longer than the arm forwardly thereof whereby the cutting stroke of said rotary excavating structure will be gradually increased as it extends toward the rear end of the excavating structure, pick heads carried by the outer ends of said arms, means for yieldably supporting said arms to permit limited pivotal movement thereof, means for adjusting the position of said arms, said last named means including pivotally mounted hand levers associated with said arms whereby the forward or rear end of the excavating structure may be elevated independently of the other end.

ERVIN R. BARNES.