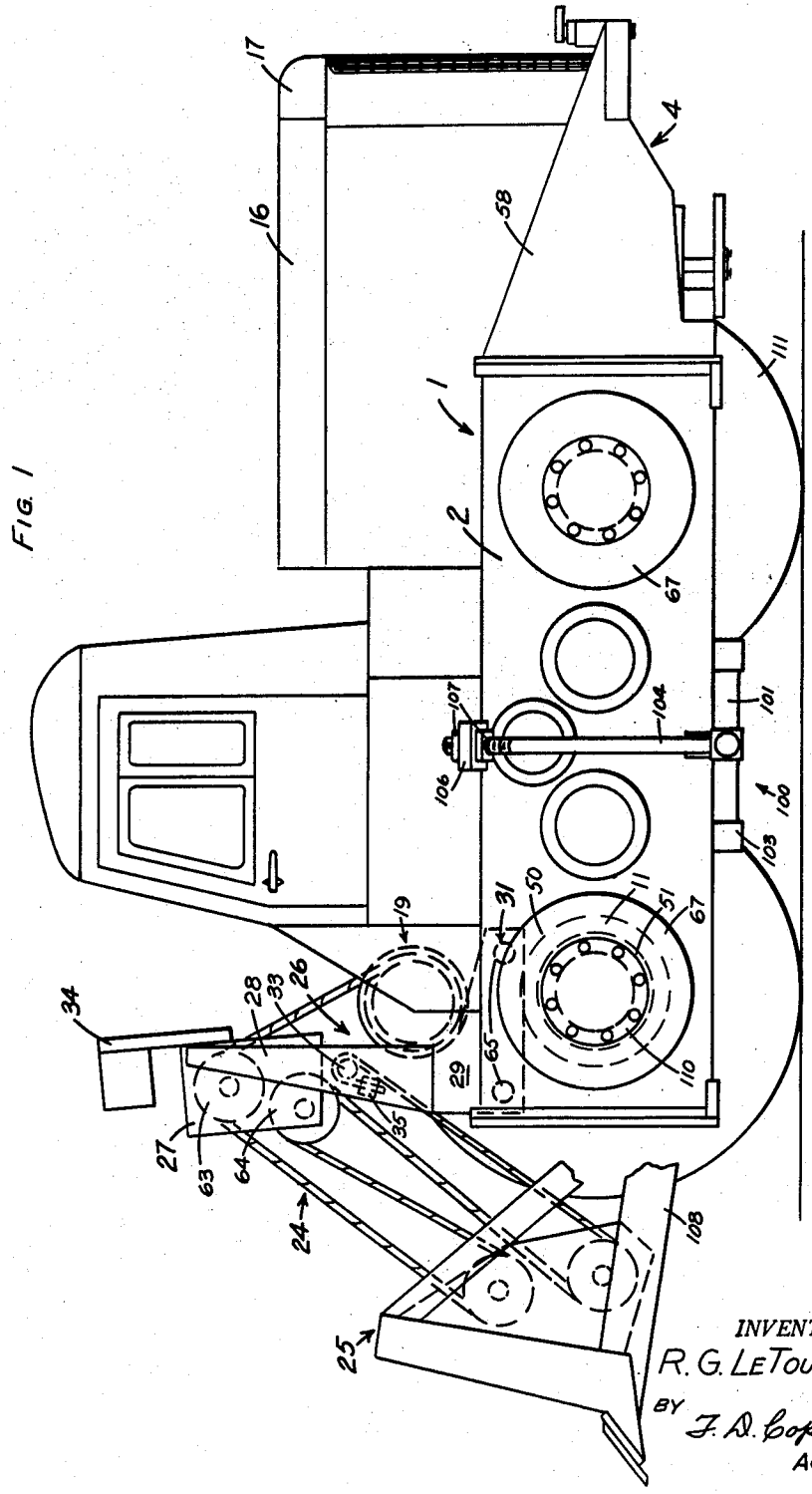
July 13, 1954 R. G. LE TOURNEAU 2,683,318

BULLDOZING TRACTOR

Filed June 4, 1949 5 Sheets-Sheet 1

FIG. 1



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Filed June 4, 1949 5 Sheets-Sheet 2

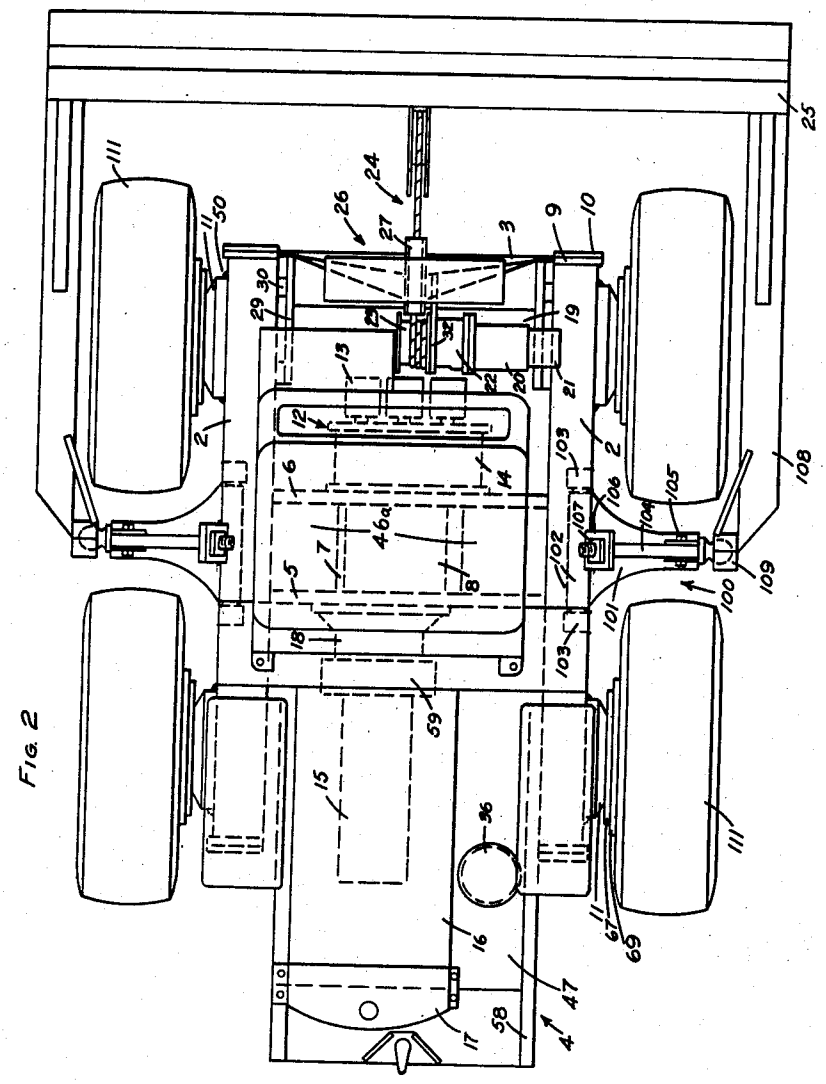

FIG. 2

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BULLDOZING TRACTOR

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FIG. 3

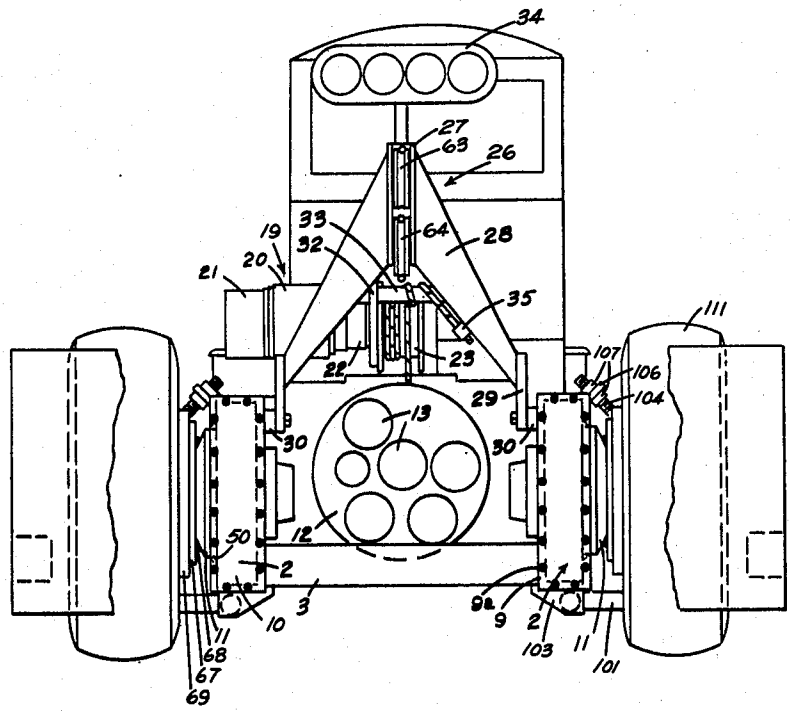

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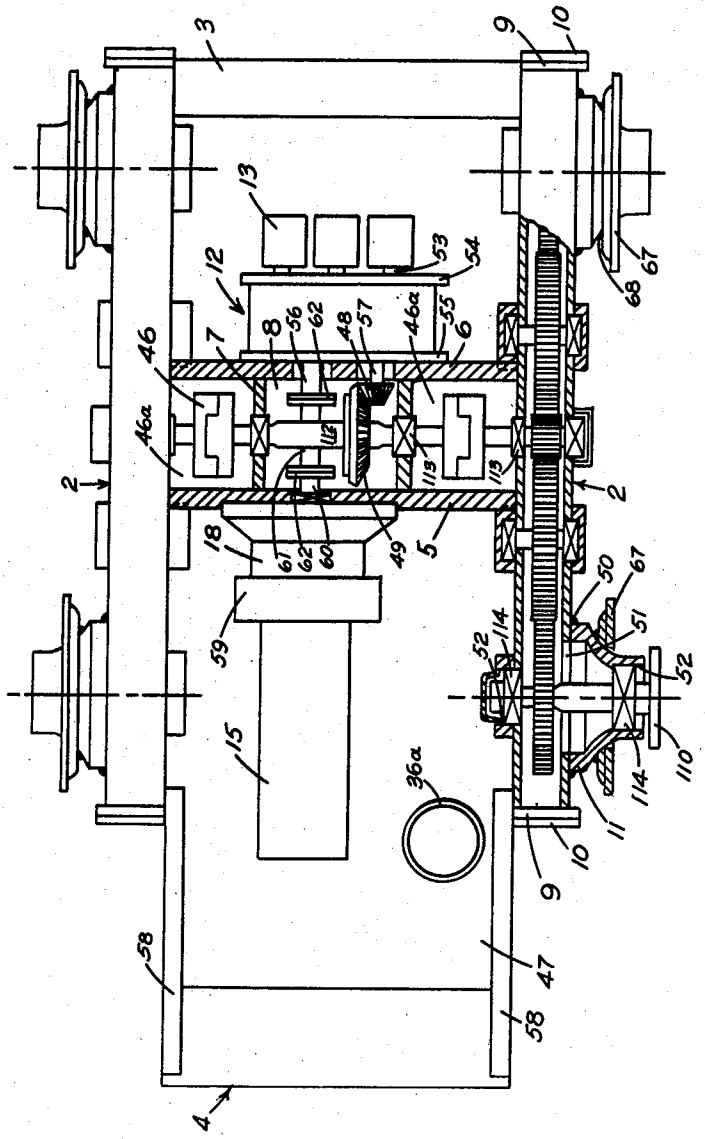
FIG. 4



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Filed June 4, 1949 5 Sheets-Sheet 5

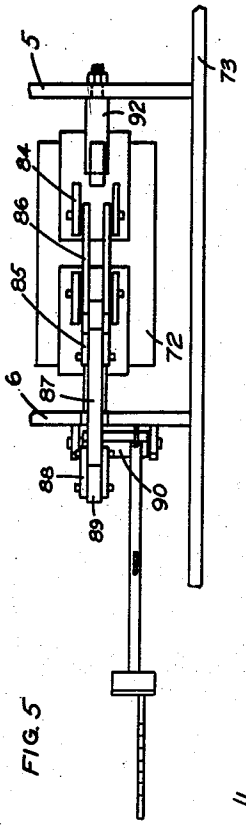

FIG. 5

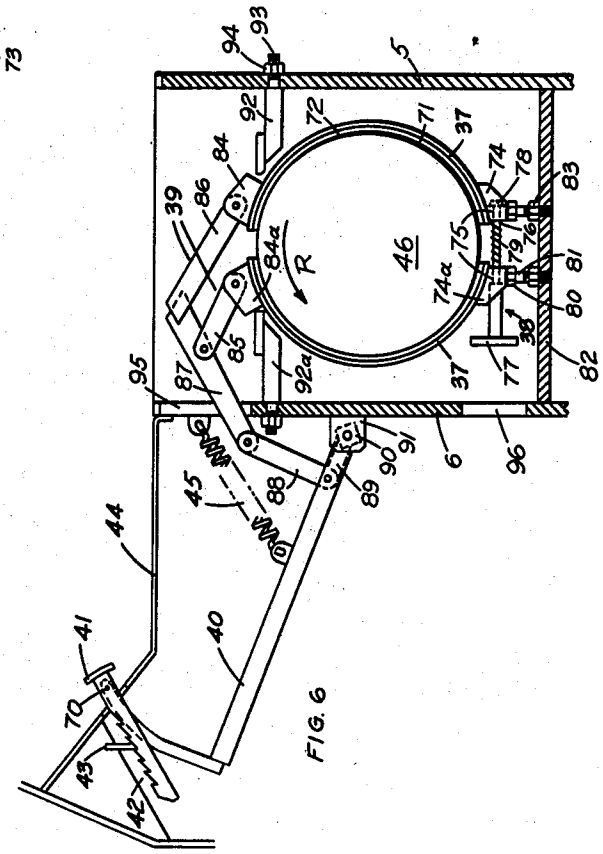

FIG. 6

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2,683,318

UNITED STATES PATENT OFFICE

2,683,318

BULLDOZING TRACTOR

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Application June 4, 1949, Serial No. 97,121

4 Claims. (Cl. 37—144)

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This invention pertains generally to mobile tractors of the type used in earth moving and material handling operations. It more specifically applies to an improved version of the invention shown in my co-pending application for patent filed February 11, 1947, Serial Number 727,804, now United States Patent No. 2,630,638, granted March 10, 1953.

The primary object of the present invention is, therefore, to produce a machine of this type in which numerous improved features are incorporated so that the machine as a whole has improved performance and maintenance characteristics.

One object is to produce a machine in which the wheel spindles are supported in spaced bearings in rigid housings attached to but extending beyond the side walls of the machine.

Another object is to produce a machine with an improved final case which is accurate and rigid and one in which the internal gears are inserted through a minimum of opening which in itself simplifies the construction of the case and the assembly of the finished product.

An additional object is to produce an improved machine which employs a self-contained bolted-on transmission in lieu of the former method of installing the complete transmission within the walls of the final case. This feature contributes greatly to the maintenance since if trouble develops, the entire transmission can be removed without removing bearings or disturbing the wheel drive connections.

A further object is to produce a tractor which contains its own electrical system, which includes a heavy duty generator mounted directly to and in line with the engine crankshaft, and an electric winch to utilize the output of the generator and be located at the point of power application, and a plurality of transformer-rectifier control systems in which the rectifiers are immersed in oil for cooling and to prevent corrosion; the rectifier housing here being an integral part of the tractor frame so that a very large heat radiation area is present.

A still further object is to provide a machine of this type which contains a detachable A-frame which is bolted to the final case in a novel manner and which may be removed to permit installation of other tools or accessories; for instance, a logging arch or a frame for supporting controls for a drawn scraper.

Yet another object is to produce a machine of this type which includes a two clutch control steering system and in which one of the clutches

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is utilized to provide an emergency or parking brake.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specifications and claims.

In the drawing similar characters of reference indicate corresponding parts in the several views;

Figure 1 is a side elevation of the complete machine, with the left side wheels removed, and the blade partially cut away.

Figure 2 is a plan view of the improved machine.

Figure 3 is an end view of the machine looking at the normally front end, with the blade and cable system partially cut away.

Figure 4 is a plan view, partly in schematic, of the final case detached except for transmission, generator, and engine.

Figure 5 is a detailed plan view of the emergency brake structure with floor board removed.

Figure 6 is a side elevation, partially in section, showing the brake installed within the steering clutch housing and under the floor board.

Referring now more particularly to the characters of reference on the drawing, this bulldozing tractor comprises a main frame 1, which consists of upstanding gear cases 2 spaced laterally from each other by means of front spacer 3, rear engine mount structure 4, and transverse walls 5 and 6 which together with top and bottom plates (not shown) form housings 46a for the steering clutches. The addition of internal walls 7 to the transverse walls 5 and 6 provides an oil case 8 in which the output pinion 48 from the transmission and the bevel ring gear 49 may operate to drive cross shaft 112 journalled at 113 and ultimately wheels 111.

The gear cases 2 are constructed in the form of a long rectangular box with open ends. The inside vertical dimension of this case is slightly larger than the final drive gears which operate therein. These gears are inserted through the open ends which are surrounded and reinforced by a gasket flange 9. When the gears are in place, cover plate or end wall 10 is installed and secured to flange 9 by capscrews 9a. This provides a removable section with a minimum opening through which the gears may be inserted. The size and location of the opening

here does not adversely affect the rigidity of the case. In the earlier mentioned application No. 727,804, the wheel hubs are larger than the gears and were bolted (by capscrews) to the main case after the gears were inserted through the large opening in the side walls of the case which the wheel hubs covered. This large opening had a tendency to weaken the side walls, and another more detrimental characteristic of permitting the alignment of outer and inner bearings of the stub axles of the wheels to be dependent upon to tension of the capscrews, the uniformity of the gasket between the wheel hub and the case side wall, the tolerance between the capscrew and hole, and other factors. In the present machine, this condition has been greatly improved by wheel hubs **11** which are welded as at **50** to the case around a relatively smaller opening **51**. The outer and inner bearing cages **52** are then machined at the same time and on the same machine so that they are in perfect alignment with each other. The hubs **11** also contain brake backing plates **67** welded thereto at **68** for association with the wheel brakes **69**. Bearings **114** are inserted in aligned cages **52**.

Another feature on this machine is the unitary transmission **12**. This transmission is constant mesh with exposed clutch units **13** and is of the same general type as that shown in copending application No. 735,484, filed March 18, 1947, now U. S. Patent 2,553,376 granted May 15, 1951. In that application, as in the previously referenced application No. 727,804, the gears were installed within a housing made by transverse walls in the vehicle frame and the clutch units were on shafts which projected through one of those walls. In the present instance the gear case is a compact circular housing **14** in which all the forward and reverse gears are installed in their proper mesh. Shafts **53** for the clutch units project through the outer wall **54** and the inner wall **55** has openings for the input shaft **56** and output shaft **57**. The inner wall also supports the bearings for the various shafts. The complete transmission is capable of being assembled separately, in another factory, if desired, and then installed on final case during assembly of this tractor.

An engine **15** with its protective hood **16** and radiator structure **17** are mounted on engine mount structure **4** including side members **58** which are welded to the inner side walls of gear cases **2** (Fig. 4). The engine crankshaft contains a flywheel in housing **59** which connects directly to the rotor of an in-line generator **18**. The shaft **60** of generator **18** in turn connects to an extension shaft **61** which projects through oil case **8** and connects to shaft **56** to provide the input power to transmission **12**. Both ends of extension shaft **61** include flanges **62** for attachment to similar flanges of shafts **56** and **60**.

Generator **18** provides the necessary electric current to operate the hoist winch **19**. This winch in its entirety consists of motor **20**, brake unit **21**, gear box **22**, and cable drum **23**. The drum pays out or reels in cable of the block and tackle system **24** which in turn raises or lowers blade **25**. A novel A-frame indicated generally as **26** supports two sheaves **63** and **64** of this block and tackle system. Figs. 1 and 3 show the particular configuration of this A-frame to consist of a sheave housing **27** supported by and between two oblique trapezoid-shaped supports **28** welded at their lower end to mounting plates **29**. These mounting plates contain longitudinally spaced bolt holes **65** for mounting to bolt blocks **30** of side cases **2**. By this spacing the back bolt **31***a* of bolts (capscrews) **31** will have a long leverage for resisting the forward tilting tendency of the upstanding portion of A-frame **26** due to the weight and direction of pull of block and tackle system **24**.

This A-frame **26** is an improvement over that shown in co-pending application No. 33,570, filed June 17, 1948 now United States Patent No. 2,624,961 granted January 13, 1953, which was welded to the machine case. This method of attaching (by welding) the uprights of the A-frame, while sufficient in itself to support the load, had a detrimental tendency to warp or buckle the case which is overcome by the spaced bolts of the present design. The present A-frame also is equipped with a winch mounting plate **32** and a dead end rod **33**. This mounting plate supports the power controls for operating the hoist cable and thus makes the A-frame a removable unitary structure and provides for rapid assembly or disassembly by simply removing bolts **31**, cable system **24**, and the electric wiring (not shown) to winch **19**. This is a valuable consideration in case the tractor were to be used for other operations besides bulldozing, in which case the A-frame would be completely removed and the new tool, i. e. logging arch, drawn scraper rigging, etc., installed by way of the same mounting blocks. To assist in night operations, a headlight assembly **34** has been installed above and upstanding from the A-frame. The dead end rod **33** previously referred to takes the stress out of the cable just prior to anchor **35**; this prevents the normal tendency of the cable to pull out of its anchor.

The electrical system of this machine employs a voltage regulating system such as that shown in my granted Patent 2,482,588 and also a battery charging circuit such as that shown in application No. 49,737, filed September 17, 1948, and now abandoned. On this machine, the rectifiers of both these circuits are contained in and supported by the same housing **36**. This housing is circular in shape including cylindrical side wall **36***a* and completely enclosed and is filled with oil to cool the rectifiers and protect them against corrosion. The bottom of this rectifier housing is integral with a bottom plate **47** which is part of the main frame, so that the heat absorbed by the oil may be radiated over a very large area.

The steering of this vehicle is similar to that shown in my copending application No. 764,185, filed July 28, 1947 now United States Patent No. 2,615,542 granted October 28, 1952, in which steering is accomplished by disengaging one of the air controlled steering clutches **46** so that no power is delivered to the wheels on that side.

Use is made of one of the steering clutches in this tractor to provide emergency braking means. This brake structure may be seen in Figs. 5 and 6 to consist of split brake bands **37** anchored at one end by adjustment screw **38** and connected at their other end to tightening linkage **39**. This linkage is connected to brake pedal linkage **40** which is pivoted to brake pedal **41** as at **70**. Ratchets **42** of this brake pedal slide by rigid post **43** of the floor board structure **44** when the brake pedal **41** is depressed in normal operating procedure. When the operator's foot is removed from the pedal, the ratchets thereon will lock against post **43** if a slight downward pressure is applied and the entire brake unit then acts as a parking brake. If a slight upward pressure is applied to pedal **41**, then the pedal and lever **40** return to their initial position due to the tension placed on spring **45**.

Examining the brake structure in more detail it will be seen that the bands 37 include a brake lining 71 which when actuated will grab the revolving external case 12 of the steering clutch 46 with which it is associated. The steering clutch itself is located closely adjacent transverse walls 5 and 6 and gear case 2, one wall 73 of which is shown in Fig. 5. Bands 37 are more or less "floating" in the manner of their installation. At their bottom, bands 37 include lugs 74 and 74a which include drilled openings 75 through which bolt 76 passes. A handle 77 engages the threaded end of bolt 76; the head 78 of bolt 76 being shouldered against lug 74. A spring 79 acts to keep lugs 74 and 74a apart, whereas the handle 77 may be tightened on bolt 78 to draw lugs 74 and 74a together and thereby effect an adjustment of the brake. The entire lower group of bands 37 and adjustment screw 38 are resting on the heads 80 of bolts 81 which are threaded into a bottom plate 82 which extends between walls 5 and 6 under clutch 46. A nut 83 is threaded onto bolt 81 and acts to lock the latter in a vertically adjustable position. At their upper ends bands 37 include ears 84 to which are pivoted links 85 and 86; link 85 is in turn pivoted to arm 87, whereas link 86 is rigid with arm 87. Arm 87 is then pivoted to link 88 which is pivoted in turn to piece 89 which is rigid with square bar 90 which is rigid with brake pedal linkage 40 but which is pivoted to bracket 91 attached to wall 6. On each side of ears 84 are stops 92 and 92a which are threaded at one end 93 which end extends through transverse walls 5 and 6 for engagement with nut 94. An upper opening 95 in wall 6 permits linkage 39 to extend therethrough, and a lower opening 96 provides access to handle 77 to adjust the brake bands. With clutch 46 rotating in the direction shown by arrow R, the ear 84a will be adjacent stop 92a and when brake pedal 41 is depressed the other ear 84 will travel toward 84a. When the direction of rotation (R) is reversed, the ear 84 will move toward stop 92 and linkage 40 and 39, then act to force ear 84a toward ear 84. But for either direction of rotation there has been provided a simple, efficient, easily adjustable brake which may also be locked in place to prevent the vehicle from rolling when parked. Most conventional steering clutches which include brake bands to assist steering will retard speed in either direction of rotation, but none are known which have been adapted specifically for a parking brake, and it is not believed they could be so adapted, since they do not employ stops for both directions of rotation as herein described.

Another feature of this tractor is the modification of the push beam mounts indicated generally at 100, and comprising a T-shaped mounting arm 101 disposed with the T head 102 thereof adjacent and extending horizontally lengthwise of the corresponding under-side of gear case 2 and is journalled at opposite ends in bosses or bearings 103 on the bottom of gear case 2. Each T-shaped arm 101 is thus mounted for limited vertical swinging adjustment and normally projects laterally outwardly in substantially centralized relation between the tires of the adjacent front and rear wheels.

Each T-shaped mounting arm 101 is normally maintained in rigid but vertically adjustable relation by an adjustment rod 104 which extends at an upwardly and inwardly incline from a pivotal connection 105 on the arm through a bracket 106 on the upper edge portion of the gear case 2. Adjustment nuts 107 are threaded on the upper end portion of each rod 104 on opposite sides of the bracket 106, whereby adjustment of such nuts effects longitudinal shifting of the rod 104 and corresponding vertical adjustment of the T-shaped mounting arm 101. The rear ends of the push beams 108 are coupled to the corresponding outer ends of the T-shaped mounting arms 101 by ball and socket units 109. This mounting will permit the arms 101, when disconnected from sockets 109 and when the main frame 1 is disconnected from the wheels 111 (as in Fig. 4) and adjustment rod 104, to be swung under the main frame so as not to project laterally outward from the gear cases 2 and beyond flanged wheel spindle 110 as would be apparent from Fig. 2. When swung under the main frame the package dimensions of the tractor are reduced and shipping is thus simplified.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of this bulldozing tractor, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined in the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A bulldozing tractor having a rigid main frame containing laterally spaced wheel drive gear cases and a blade pivotally supported on the frame for vertical movement comprising: transversely spaced push beams attached to the blade and extending rearwardly along and spaced from opposite sides of the frame, an A-frame removably fastened to spaced bolt blocks mounted on the inner walls of said gear cases, an electric winch mounted to and supported by said A-frame, and a cable control system connecting the electric winch and said bulldozer blade in operable relation.

2. In combination, a tractor having a rigid main frame, a bulldozer blade disposed transversely ahead of the frame, transversely spaced push beams attached to the blade and extending rearwardly along and spaced from opposite sides of the frame, the rear ends of said push beams being pivotally associated with the frame whereby said transverse blade may be moved in a vertical direction, an A-frame removably fastened to the main frame at its forward end, and power means operatively connecting said A-frame and said transverse blade to raise said blade in a vertical direction; said A-frame comprising laterally spaced longitudinally extending mounting plates, bolt holes in said plates spaced a substantial distance apart in a longitudinal direction, and bolts in said bolt holes removably attaching said A-frame to said main frame, upwardly inclined trapezoid shaped supports attached to said mounting plates, a sheave housing, between said supports at their upper end, sheaves in said sheave housing, a sheave housing on the rear side of said transverse blade, sheaves in said blade housing, a winch mount plate attached to and depending from the under side of one trapezoid support, a rod connected between said winch mount plate and the other trapezoid support and a cable anchor on said other trapezoid support; and an electric winch

supported from said winch mount plate, a cable power controlled by said winch and reeved between said support sheaves and said blade sheaves in such a manner as to form a block and tackle reeving, and said cable wound around said rod and secured in said anchor.

3. A unitary A-frame for attaching to a tractor frame comprising obliquely positioned supports, a mounting plate at the bottom of each support, longitudinally spaced bolt holes in said mounting plates to permit removable attachment to said tractor frame, a sheave housing attached to and connecting the upper ends of said supports, sheaves in said housing, a winch mount plate attached to one support, an electric winch supported by said winch mount plate, and a cable on said winch and operated thereby, said cable adapted to be reeved between said sheaves and a cable operated device, and means on said support to anchor the free end of said cable.

4. A bulldozing tractor having a rigid main frame and a blade pivotally supported on the frame for vertical movement comprising: an A-frame removably fastened to the main frame at its forward end; power means connected to the A-frame and adapted for raising and lowering the blade; said A-frame comprising laterally spaced longitudinally extending mounting plates, a pair of supports attached to the plates and extending upwardly and obliquely therefrom, and a sheave containing housing supported by and

connecting said supports at the apex of the A-frame; a sheave containing housing on the blade; a winch mount plate depending from one of said supports and having a winch thereon; a dead-end rod connecting the winch mount plate and the other support; a sheave in each of said sheave containing housings; a cable anchor on said other support; said power means comprising a winch controlled cable reeved between the sheaves on the supports and the sheaves on the blade for raising and lowering said blade, said cable being wound around said rod and secured in said anchor.

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