March 20, 1951 A. C. HOWARD 2,545,735

POWER DRIVEN CULTIVATOR

Filed Oct. 21, 1949 4 Sheets-Sheet 1

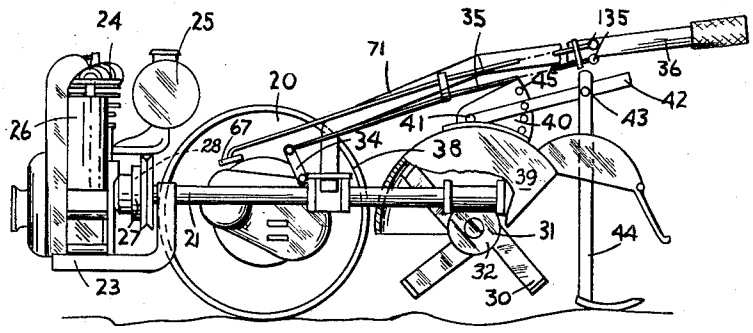


FIG. 1.

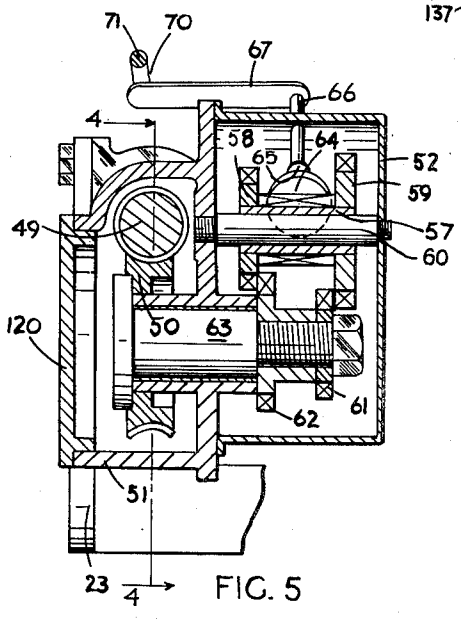


FIG. 5

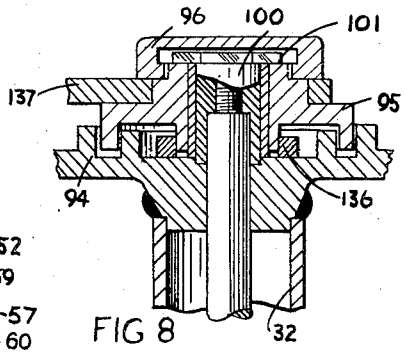


FIG 8

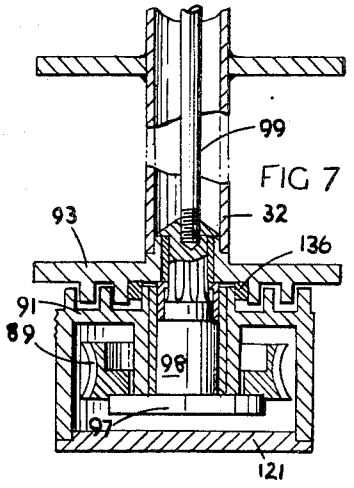


FIG 7

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POWER DRIVEN CULTIVATOR

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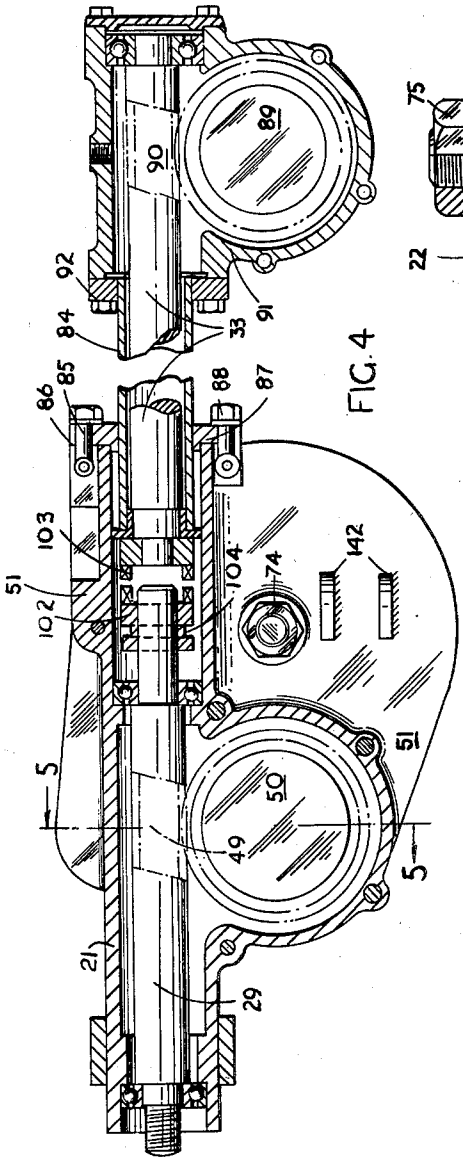


FIG. 4

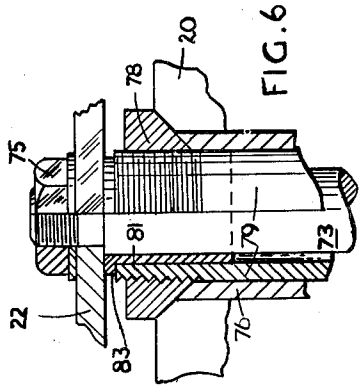


FIG. 6

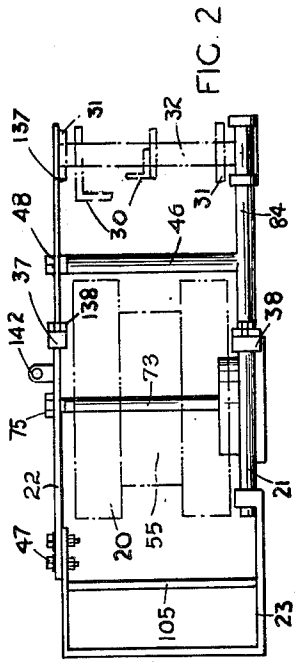


FIG. 2

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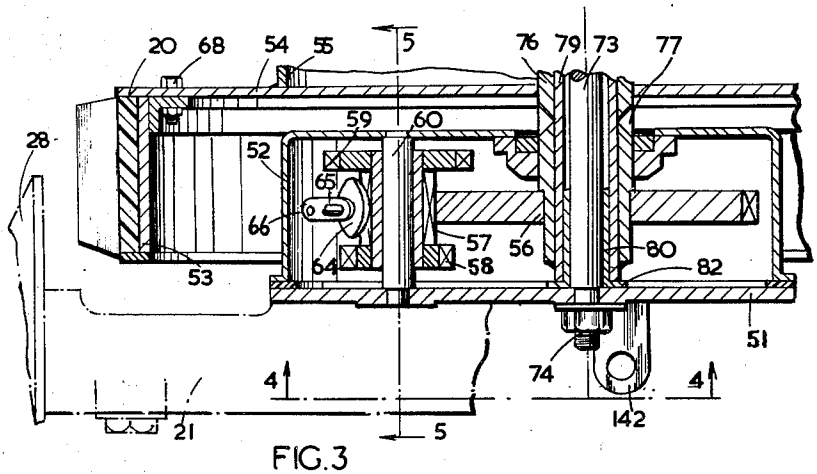


FIG.3

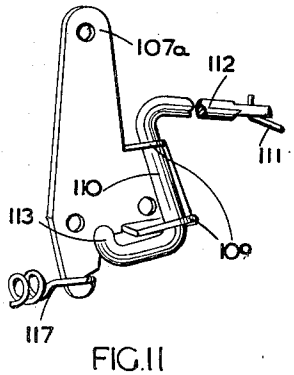


FIG.11

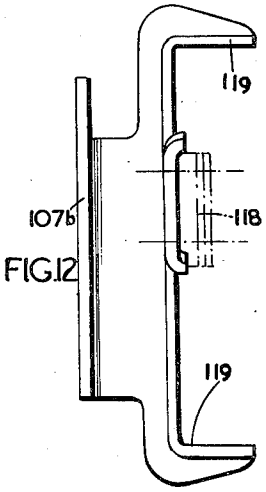


FIG.12

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POWER DRIVEN CULTIVATOR

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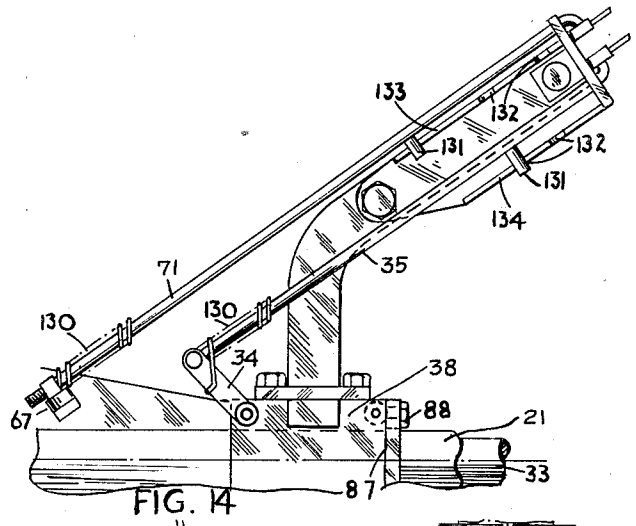


FIG. 14

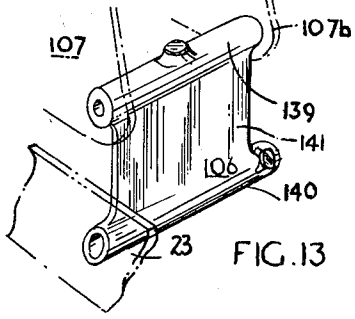


FIG. 13

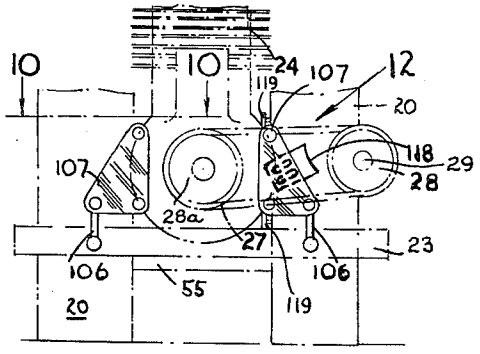


FIG. 9

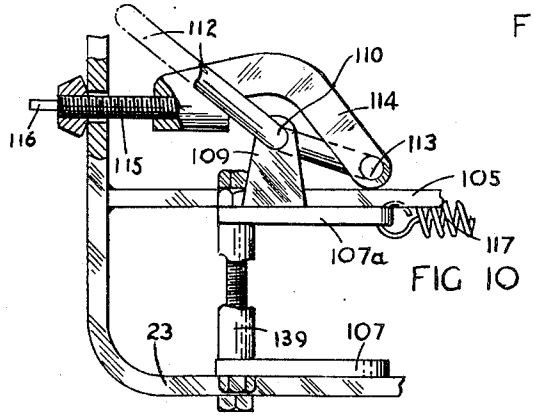


FIG 10

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POWER-DRIVEN CULTIVATOR

Arthur Clifford Howard, Upminster, England, assignor of one-half to Rotary Hoes Limited, East Horndon, Essex, England

Application October 21, 1949, Serial No. 122,741
In Great Britain October 28, 1948

6 Claims. (Cl. 180—19)

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The invention relates to a power-driven cultivator, and whilst not limited in this respect, particularly to one of the kind for use in gardens, and similarly confined spaces, and my object is to provide a construction of cultivator of which the overall width will not materially exceed the width of the strip of ground intended to be cultivated at each traverse.

According to the invention a power-driven cultivator includes a single ground-engaging traction cylinder (or wheel) rotatively supported at opposite ends between respective side frame members of a chassis, the latter having a pair of guiding handle-bars supported therefrom, one of the side frame members forming at least a part of a stationary casing for a driving shaft, driven from a power unit (which may have an automatic speed-governor) mounted on the chassis and connected to drive the said traction cylinder on an axis at right-angles to the said shaft, and at least a part of the other side frame member being detachable to permit the traction cylinder to be exchanged by sliding it axially out of engagement with the driving connection, the chassis also including a mounting for a cutlivating tool.

Preferably, the traction cylinder has at least one of its end walls spaced axially-inwardly of the adjacent end of the cylindrical surface and, in that way, a driving connection from the driving shaft can be accommodated mainly within the end-depression, thus formed, of the cylinder.

The power unit can be an internal combustion engine power plant which is preferably mounted at the forward end of the chassis and drives the driving shaft through a belt and pulley arrangement. For the latter purpose, the power unit can be supported by a cradle which is connected by parallel swinging links to the chassis, and means (preferably operable from the handle-bars) can be provided whereby to permit the cradle to be rocked, by a biassing spring means, towards the driven pulley whereby to slacken the belt for discontinuing the drive. Preferably there is, fast with the cradle, a brake block for co-action with the driven pulley for bringing the latter to rest when the drive is thus disconnected. In this way the tension in the belt, during driving, is applied against the said biassing spring means. Obviously, however, alternative ratios for the drive could be provided by using complementary pairs of coaxially fast driving pulleys.

In the accompanying drawings:

Figure 1 is a part-sectional side elevation of one form of the cultivator;

Figure 2 is a plan mainly of the chassis frame of the cultivator shown in Figure 1;

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Figure 3 is a generally horizontal broken section, drawn to a larger scale than that of Figures 1 and 2, of the driven end of the traction cylinder;

Figures 4 and 5 are sectional views, to the same larger scale, on the lines 4—4 and 5—5, respectively, of Figure 3, these section lines also being shown in others of the figures for convenience;

Figure 6 is a sectional plan, drawn to a still larger scale, of the support for the non-driven end of the traction cylinder;

Figure 7 is a sectional plan, to the larger scale of Figures 4 and 5, of the driven end of a rotary cultivator attachment;

Figure 8 is a sectional plan, drawn to twice the scale of Figure 7 and showing the non-driven end of the rotary cultivator attachment;

Figure 9 is a front view of the engine suspension;

Figure 10 is an enlarged section on the line 10—10 of Figure 9;

Figure 11 is a perspective view of a mounting plate shown in Figure 10;

Figure 12 is an enlarged view in the direction of the arrow 12 of Figure 9;

Figure 13 is an enlarged view of one of the engine suspension links, and

Figure 14 is a side view of the controls on the handle-bars.

Referring to Figures 1 and 2, the cultivator comprises a traction cylinder 20 which is supported, on a transverse horizontal axis, between a tubular side frame member 21 and a removable side frame member 22. The member 21, at the front, carries a downwardly cranked front frame 23, which is substantially of U-form in plan, and the latter carries an internal combustion engine 24 together with the associated fuel tank 25, silencer 26 and other necessary components. The engine shaft drives, through a pulley 28a and a V-sectioned belt 27, a pulley 28 fast with a shaft 29 which is within the tubular side frame member 21. As shown, the shafts may be provided with two pulleys so as to provide drives of two different ratios.

At the rear of the cultivator is shown a rotary hoeing attachment including earth working blades 30 mounted on discs 31 fast with a transverse tubular shaft 32. The latter is driven through a worm gear by a shaft 33 (Figure 4) which is coaxial with, and driven from the shaft 29 through a dog clutch hereinafter described. The dog clutch is operated, through a lever 34 (Figures 1 and 14), from a push-pull rod 35 mounted on handle-bars 36 which are supported from the frame members 21 and 22 by platforms 38, 37 respectively and bolts. The rotary hoeing

attachment has a cover 39 secured to the side frame members and, on top of the cover, there is a quadrant plate 40 to which is pivoted at 41 an operating handle 42. To the latter is pivoted at 43 the upper end of a depth control skid 44 which is suitably guided, and the handle has a pin for selective engagement in holes 45 of the quadrant plate.

The two side frame members 21, 22 are stayed together at 46, and the member 22 is bolted to the framework at 47 and 48 so as to be readily detachable.

Referring now to Figures 3 and 4, the traction cylinder 20 is driven from the driving shaft 29 (Figures 1 and 4) through a worm 49, a worm wheel 50, and a two-speed gearing, which are contained within a casing 51, 52 located in an adjacent end-depression of the traction cylinder.

The latter, as best seen in Figure 3, has the end depression defined by the inner periphery of a tire-bearing end rim 53 and by a radial plate 54 which supports the rim (e. g., by a radial flange of the latter and bolts and nuts 68) and is fast with the adjacent end of a plain cylindrical mid-portion 55.

The traction cylinder is connected as hereinafter described to be rotatively fast with a bull wheel 56 which is in constant mesh with the centre one 57 of three relatively-fast, coaxial gear wheels 57, 58, 59, of different diameters, which are slidably and rotatively mounted on a lay-shaft 60. The gear wheel 57 is of a sufficient axial length to permit of the axial sliding for alternatively meshing, with an intermediate neutral position, the outer ones of the three gear wheels with co-acting gear wheels 61, 62 (Figure 5), which are fast with the shaft 63 on which the worm wheel 50 is mounted, whilst maintaining the gear wheels 56, 57 in mesh.

For sliding the lay-shaft gear wheels there is a selector mechanism which conveniently comprises a roller 64 (see Figures 3 and 5) rotatively supported at the free end of an arm 65 of a shaft 66 which is journalled in the casing 52 (Figure 5) and has an external arm 67 having an articulated connection at 70 with a rod 71 which is operated from the handle-bars.

By axially sliding the rod 71, the roller 64 is made to bear on the axially inner face of one or other of the gear wheels 58, 59 for effecting the gear change.

The rods 35 and 71 are connected to the lever 34, and arm 67 respectively, so as to be able to turn axially to a limited extent against the influence of torsion springs 130 (see Figure 14) interconnecting the parts, these springs normally urging fingers 131 of the rods into selected co-acting notches 132, in respective gates 133, 134, for location purposes. Each rod, at the handle-bar end has a radial arm 135 by which it can be turned for disengaging the finger and by which it can be pushed or pulled for operating the controlled parts.

The traction cylinder is journalled on a stationary axle 73 (see Figures 3 and 6) having shoulders for engaging the inner faces of the side frame members 21, 22 and having screw-threaded extensions for projecting through the latter for coaction with locking nuts 74 and 75, respectively, for holding the axle in position. The traction cylinder is formed hollow and is fast with a concentric internal sleeve 76 by which it is journalled on the axle, the sleeve 76 and the bull wheel 56 having a dog-tooth engagement, indicated at 77 which is normally maintained by a locating nut 78 on the other end of the axle.

In the construction shown, the sleeve and bull wheel are not journalled directly on the axle 73, there being an intermediate tube 79 (on which the nut 78 is threaded) and end bearing liners 80, 81, the latter having flanges 82, 83, respectively, for spacing the ends of the tube 79 from the side frame members.

When it is desired to remove the traction cylinder, the detachable side frame member 22 is removed (after removing the handle-bars, the nuts at 47 and 48, and the locking nut 75) and, after removing the locating nut 78 (which preferably has a conical engagement with the sleeve as shown in Figure 6) the traction cylinder can be slid axially off the tube 79, the drive, being through the dog-teeth 77, permitting this.

The drive shaft 33 (see Figure 4) is supported in end bearings within a detachable tubular extension 84 of the side frame member 21, the extension 84 spigoting into the latter and being held in position by swing bolts 85, pivoted to the casing 51 and entering slots 86 of a flange 87 of the extension, and bearing nuts 88. The side frame member 22 has a rearward extension 137 with a flange by which it is held in position by similar swing bolts 138 supported from the member 22.

The transverse tubular shaft 32 which forms the rotor of the rotary hoeing attachment (see Figures 7 and 8) is fast, as hereinafter described, with a worm wheel 89 which is driven from a worm 90 fast with the shaft 33, the worm and worm wheel being within a casing 91 which is made to be detachably fast, at 92, Figure 4, with the extension 84.

The shaft 32 has welded thereto end plates 93, 94 (Figures 7 and 8) effecting labyrinthine seals, respectively, with the casing 91 and with a member 95, the latter having a screw-threaded extension engaged by a cap nut 96 for locating it on the extension 137 of the side frame member 22. The worm wheel 89 is fast with a flange 97 of a plug 98 which is splined into the end plate 93 and has a screw-threaded engagement with one end of a tension rod 99, of which the other end has a screw-threaded engagement with a similar plug 100 which has a hexagon head 101 by which the assembly can be locked together. Oil seals 136 are preferably provided in the labyrinths.

At the rearward end of the driving shaft 29 (see Figure 4) is a splined sleeve 102 having dogs for coaction with dogs 103 fast with the driven shaft 33. In this way, with the splined sleeve retracted, the cultivating tool can be fixed in position (e. g., by bolting the extension 84 to the rear of the side frame member 21), without any necessity for carefully engaging a splined connection of the two shafts, and the splined sleeve can thereafter be moved, by a fork engaging the groove 104 of the sleeve and operable by the rod 35, and lever 34, to engage the dog-clutch.

For removing the cultivating tool, when it is not desired also to remove the traction cylinder, it is only necessary to detach the extensions 84 and 137 from the side frame members.

The engine 24 is supported from the front of the front frame 23, and from a cross-member 105 thereof, by two swinging links 106 (Figures 9 and 13), pivoted at the top to two pairs of mounting plates 107 which are fast with the engine crank case. Each link consists of two parallel bearing

tubes 139, 140 united by a web 141 and the bearing tube 139 is journalled on a bearing rod fast with the respective pairs of plates 107.

The rear mounting plate of the pair at the left of Figure 9, being indicated by 107a (Figure 10), has lugs 109 in which is pivoted a crank member 110 (Figure 11) which can be turned by reciprocating an actuating rod 111 pivoted to the arm 112 of the crank member. The other crank arm has an up-turned end 113 which is pivoted in a link 114 (Figure 10). The link has a screw-threaded member 115 held relatively and adjustably to the adjacent side of the frame 23 by a wing nut 116, of which the underside is chamfered to permit swinging, in the plane of Figure 10, of the assembly about the wing nut. The latter is held in engagement with the frame by a tension spring 117.

The spring 117 biasses the links 106 to the right (Figure 9) so that a brake block 118 (see Figure 9), adjustably mounted by bolt and slot connections on the right-hand rear mounting plate 107b (see Figures 12 and 13), will engage the driven pulley 26, the driving belt 27 thus being slackened. This mounting plate also has arms 119 between which the two runs of the belt 27 are confined.

Operation of the rod 111 connects the drive to the pulley 28, against the influence of the spring 117, by rocking the engine in the direction to tighten the belt, the pivots of the crank member 110 and the link 114 then reaching a position in which they become overset to hold the drive connected.

Detachable cover caps can be provided where desired and, in fact, there is one, indicated at 120 in Figure 5, for the casing 51, and another, indicated at 121 in Figure 7, for the casing 91.

The framework can have one or more attachment points (e. g., a pair of lugs 142 with aligned holes at each side—see Figures 2, 3 and 4) for a non-driven cultivating tool (e. g., it can support a tool bar for a harrow, rake or the like), or, instead of a rotary hoeing attachment, a lawn mower, rotary brush or the like could be arranged to be driven from the shaft 33.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. A power-driven cultivator comprising a chassis of which one side frame member is detachable and the other side frame member is hollow, a ground-engaging traction cylinder rotatively supported from and between said side frame members with its axis transversely of the chassis, said traction cylinder at the end adjacent said hollow side frame member having an end wall spaced axially-inwardly of the adjacent end of the cylindrical surface whereby to form an end-depression, a power unit mounted on said chassis, a drive transmission shaft within said hollow side frame member, a driving connection between said power unit and said transmission shaft, a second driving connection between said transmission shaft and said traction cylinder and accommodated mainly within said end-depression, said second driving connection including a dog clutch which is automatically disengageable when said traction cylinder is removed after the removal of said detachable side frame member, guiding handle-bars supported from said chassis, and a mounting on said chassis for a cultivating tool.

2. A power-driven cultivator comprising a chassis of which one side frame member is detachable and the other side frame member is hollow,

a ground-engaging traction cylinder rotatively supported from and between said side frame members with its axis transversely of the chassis, a power unit, swinging links mounting said power unit on said chassis, a drive transmission shaft within said hollow side frame member, a belt and pulley driving connection between said power unit and said transmission shaft, spring means biassing said swinging links towards the driven pulley whereby to slacken said belt for discontinuing the drive, means for rocking said swinging links away from said driven pulley whereby to tighten said belt for establishing the drive, a second driving connection between said transmission shaft and said traction cylinder, said second driving connection being automatically disengageable when said traction cylinder is removed after the removal of said detachable side frame member, guiding handle-bars supported from said chassis, and a mounting on said chassis for a cultivating tool.

3. A power-driven cultivator comprising a chassis of which one side frame member is detachable and the other side frame member is hollow, a ground-engaging traction cylinder rotatively supported from and between said side frame members with its axis transversely of the chassis, said traction cylinder at the end adjacent said hollow side frame member having an end wall spaced axially-inwardly of the adjacent end of the cylindrical surface whereby to form an end-depression, a power unit, swinging links mounting said power unit on said chassis, a drive transmission shaft within said hollow side frame member, a belt and pulley driving connection between said power unit and said transmission shaft, spring means biassing said swinging links towards the driven pulley whereby to slacken said belt for discontinuing the drive, means for rocking said swinging links away from said driven pulley whereby to tighten said belt for establishing the drive, a second driving connection between said transmission shaft and said traction cylinder and accommodated mainly within said end-depression, said second driving connection including a dog clutch which is automatically disengageable when said traction cylinder is removed after the removal of said detachable side frame member, guiding handle-bars supported from said chassis, and a mounting on said chassis for a cultivating tool.

4. A power-driven cultivator, according to claim 3, having, fast with said power unit, a brake block for coaction with said driven pulley for bringing the latter to rest when the drive is discontinued.

5. A power-driven cultivator comprising a chassis of which one side frame member is detachable and the other side frame member is hollow, a ground-engaging traction cylinder rotatively supported from and between said side frame members with its axis transversely of the chassis, an axial depression in that end of said traction cylinder which is adjacent said hollow side frame member, a power unit mounted on said chassis, a drive transmission shaft within said hollow side frame member, a driving connection between said power unit and one end of said transmission shaft, a worm and worm wheel driving connection including a change-speed gearing between said transmission shaft and said traction cylinder, said driving connection for said traction cylinder being accommodated mainly within said axial depression and being disengageable when said traction cylinder is removed

after the removal of said detachable side frame member, a hollow coaxial rearward extension detachably secured to hollow side frame member, a second drive transmission arranged within said extension to be coaxial with the first said drive transmission shaft and at the end of the latter which is remote from said power unit, a dog clutch operable to transmit drive from the first said drive transmission shaft to said second drive transmission shaft, a transverse rotor shaft, a driving connection between that end of said second drive transmission shaft which is remote from said dog clutch and said rotor shaft, and guiding handle-bars supported from said chassis.

6. A power-driven cultivator comprising a chassis of which one side frame member is detachable and the other side frame member is hollow, a stationary shaft supported by its opposite ends between said side frame members with its axis transversely of the chassis, a ground-engaging traction cylinder rotatively supported on said stationary shaft, an axial depression in that end of said traction cylinder which is adjacent said hollow side frame member, a driven gear wheel rotatively supported on said stationary shaft intermediate said hollow side frame member and the radial wall of said traction cylinder which forms the inner end of said axial depression, a dog clutch engagement between said driven gear wheel and said traction cylinder, a layshaft, three coaxially fast gears of different diameters rotatively and slidably mounted on said layshaft, one of said layshaft gear wheels being permanently meshed with said driven gear wheel, a rotatively supported stub shaft, two driving gear wheels fast on said stub shaft and for alternatively being meshed by the remaining two gears of the layshaft, for driving said traction cylinder at two alternative ratios, said driven gear wheel, dog clutch, layshaft and stub shaft being mainly accommodated within said axial depression, a power unit mounted on said chassis, a drive transmission shaft within said hollow side frame member, a driving connection between said power unit and said transmission shaft, a worm on said transmission shaft meshing a worm wheel fast with said stub shaft, said dog clutch engagement permitting said traction cylinder to be removed after the removal of said detachable side frame member, guiding handle-bars supported from said chassis, and a mounting on said chassis for a cultivating tool.

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