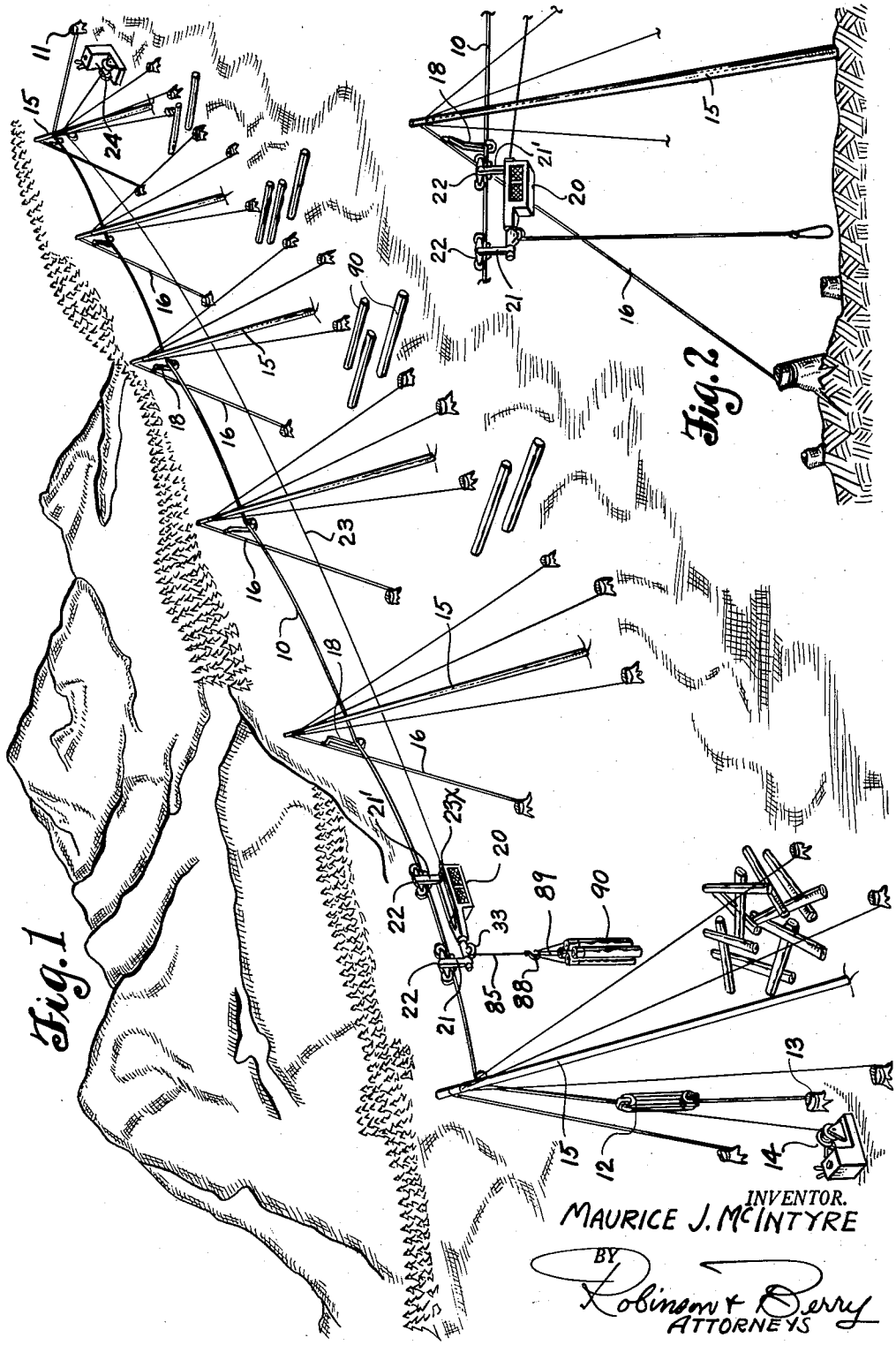
Feb. 27, 1962 M. J. McINTYRE 3,022,747

SKYLINE YARDER WITH RADIO CONTROLS

Filed Jan. 26, 1959 7 Sheets-Sheet 1



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SKYLINE YARDER WITH RADIO CONTROLS

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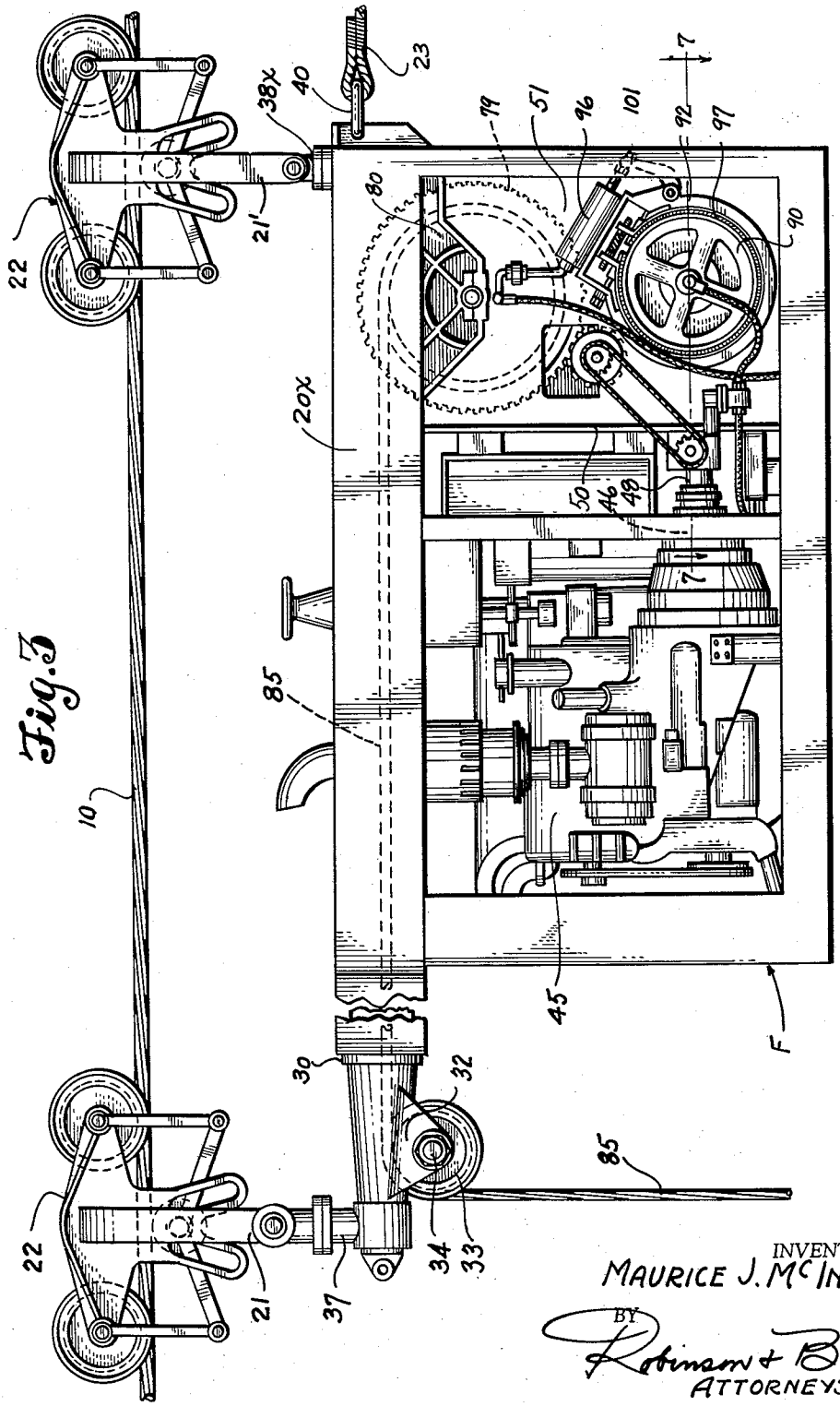


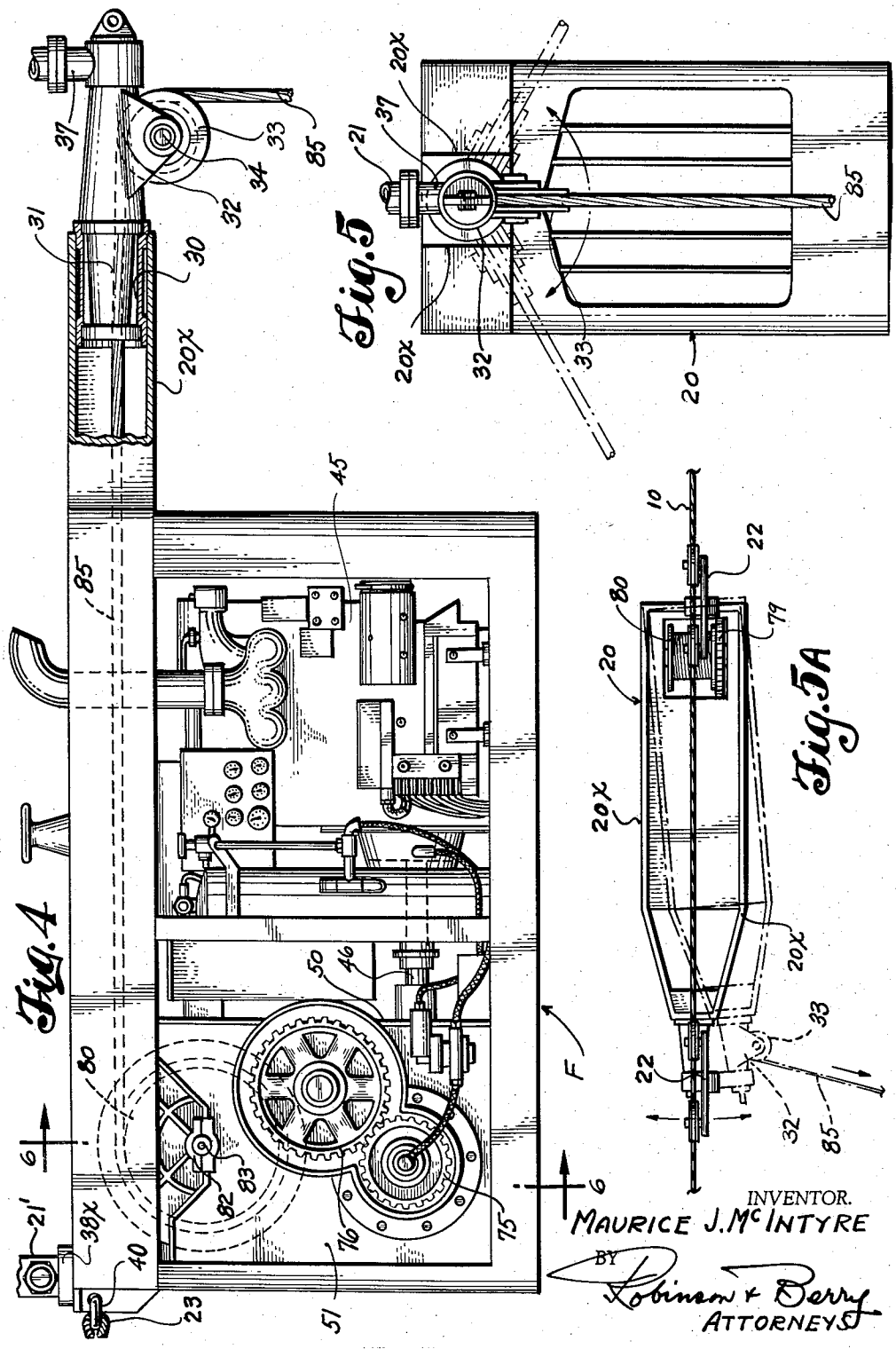
Fig. 3

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SKYLINE YARDER WITH RADIO CONTROLS

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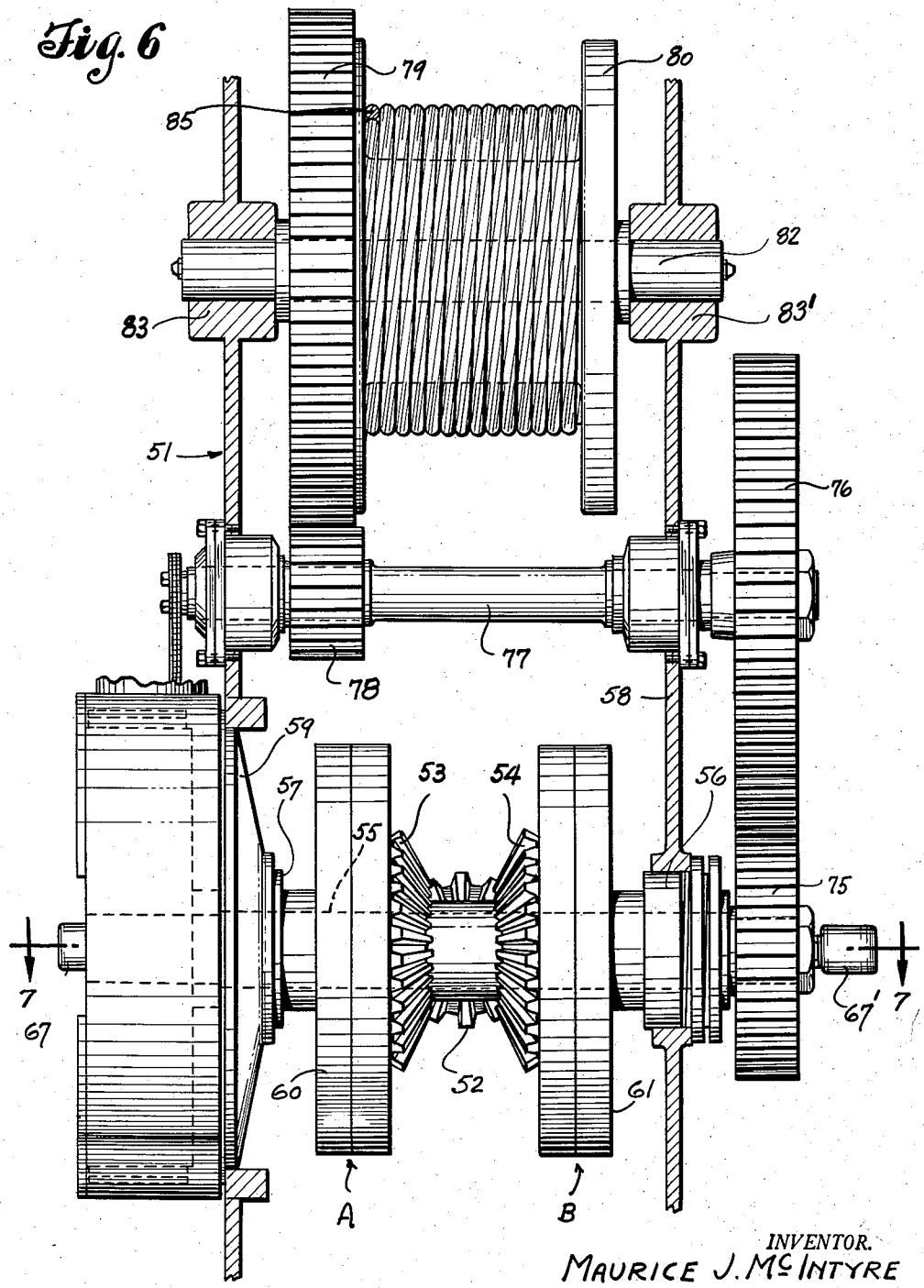


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SKYLINE YARDER WITH RADIO CONTROLS

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Fig. 6



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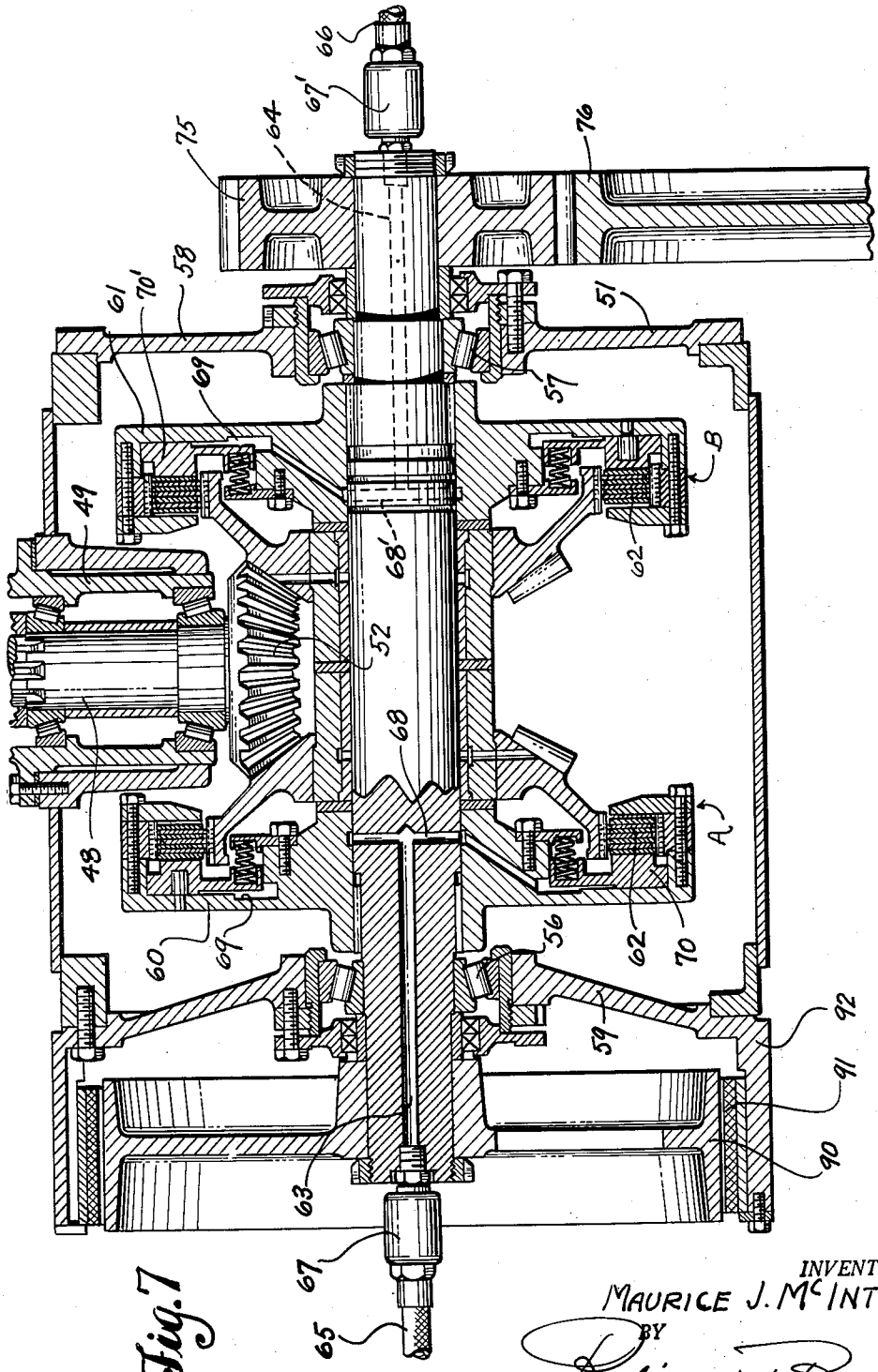


Fig. 7

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Fig. 8

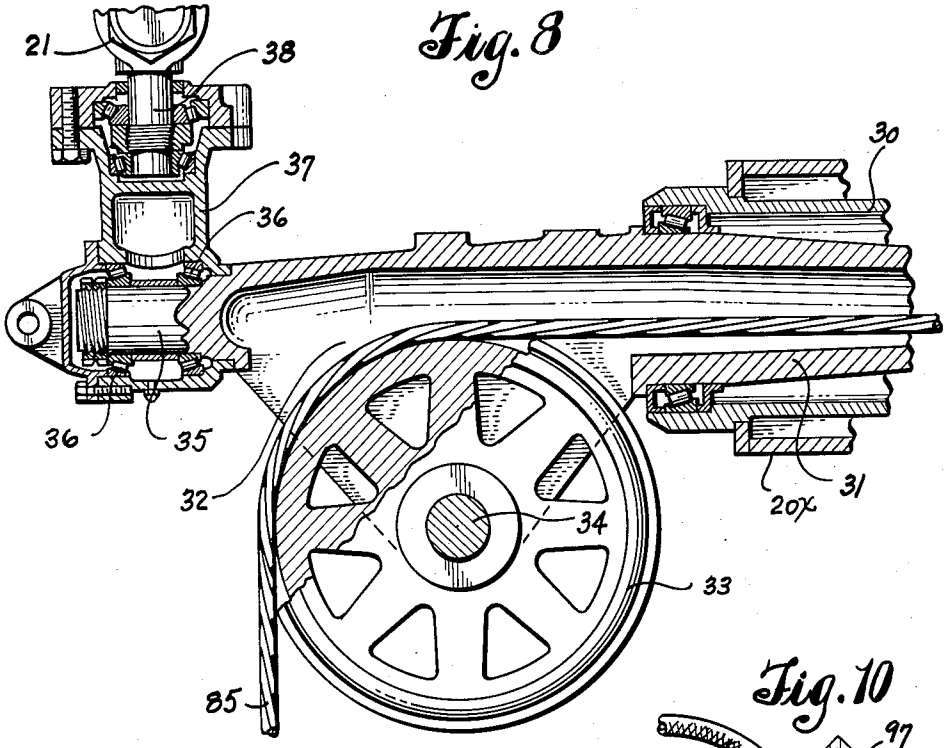


Fig. 10

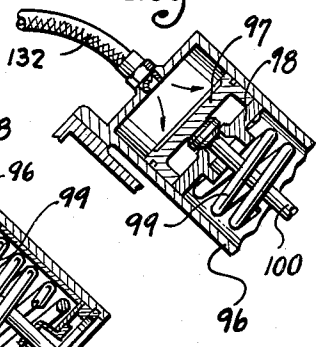
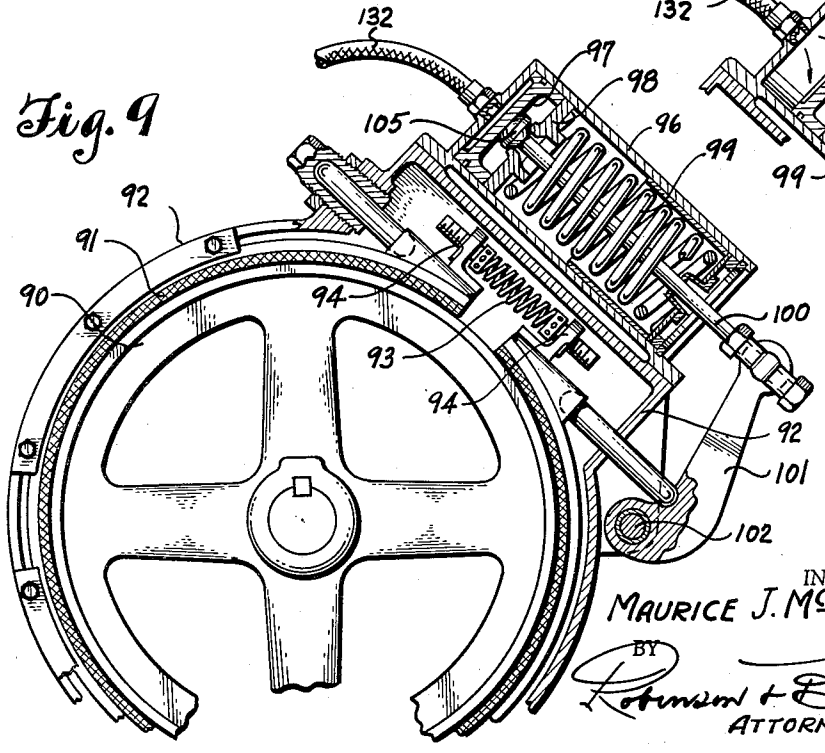


Fig. 9



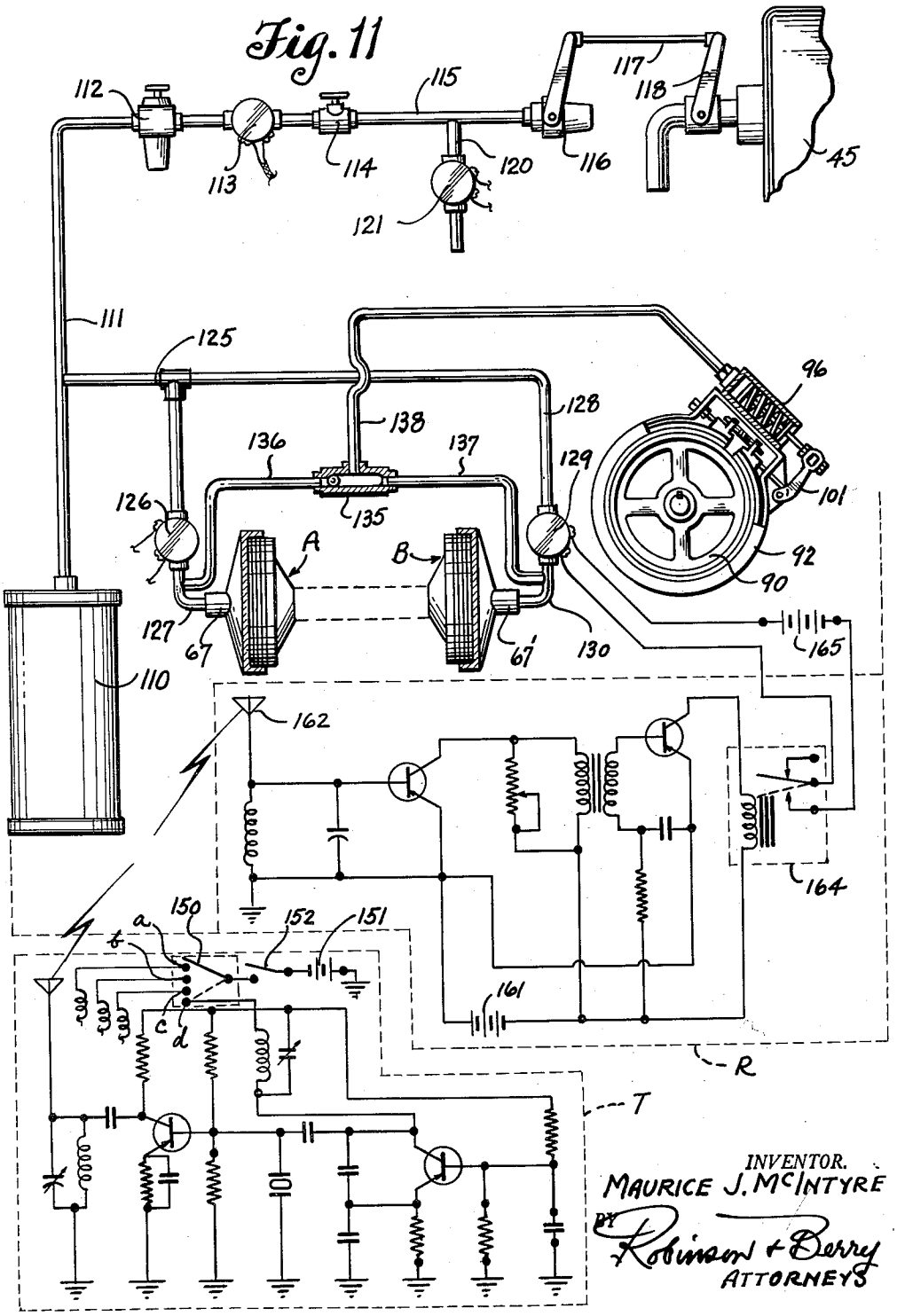
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SKYLINE YARDER WITH RADIO CONTROLS

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Fig. 11



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United States Patent Office 3,022,747
Patented Feb. 27, 1962

3,022,747

SKYLINE YARDER WITH RADIO CONTROLS

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Filed Jan. 26, 1959, Ser. No. 788,938
8 Claims. (Cl. 104—178)

This invention relates to logging and it has reference more particularly to improvements in a system of and apparatus for "skyline" logging operations.

It is a principal object of this invention to provide an economical and practical cable system of logging that is characterized by the use of an improved form of yarder, equipped for its suspension from and travel along a skyline and which yarder includes, as a part of its equipment, a cable winding drum and a yarding cable that may be drawn out therefrom for drawing in the cut logs to beneath the skyline, then lifting and transporting them, by travel of the yarder along the skyline, to a landing or loading area.

Another of the primary objects of the present invention resides in the provision of a cable logging system of the above stated character employing a traveling yarder and wherein the yarder engine, the drum driving clutches and holding brake are operable under radio control.

It is also an object of the present invention to provide for the suspension and travel of a yarder along a skyline and to provide the yarder with novel means for guiding the yarding cable to and from the cable winding drum that prevents lateral pull of the yarding cable, as in the dragging in of a log to the yarder, changing the normal position of suspension of the yarder.

Still another object of the invention is to provide the yarder engine with radio controlled throttle, clutches and brake and to provide that the speed and various operations of the engine and cable winding drum may be controlled by use of transmitters carried by the "hookers."

Still further objects and advantages of the present invention reside in the details of construction and combination of the various parts associated with the yarder and in the provision of certain swivel connections whereby the yarder is suspended for travel along the skyline, as will hereinafter be fully described.

In accomplishing the above mentioned and various other objects of the invention hereinafter disclosed, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein:

FIG. 1 is a perspective view illustrating the present logging system including the improved yarder as suspended for travel along the skyline cable.

FIG. 2 is a view showing the means for suspending the skyline cable from a guy line of the adjacent cable supporting spar.

FIG. 3 is a side view of the traveling yarder and the carriages from which it is suspended for travel along the skyline cable.

FIG. 4 is a side view of the yarder, opposite that which is shown in FIG. 3.

FIG. 5 is an enlarged cross-section, taken on line 5—5 in FIG. 4 and illustrating therein the swivel action of the cable guiding sheave block.

FIG. 5A is a top or plan view of the yarder as suspended from the skyline, diagrammatically illustrating the lateral swiveling of the yarder cable guiding block under lateral pull on the yarding cable.

FIG. 6 is an enlarged cross-section, taken on line 6—6 in FIG. 4, showing the relationship of clutches, brake, cable drum and drum driving gearing.

FIG. 7 is a horizontal section, taken on line 7—7 in FIG. 3 and FIG. 6.

FIG. 8 is an enlarged sectional view of one of the yarder suspending swivels and the swivel mounting of the yarder cable guiding block to which the suspending swivel is connected.

FIG. 9 is a sectional view of the brake operating air cylinder as applied to the braking mechanism.

FIG. 10 is a section detail of a part of the brake control air cylinder.

FIG. 11 is a schematic illustration of the clutch, brake and throttle controls, also showing the wiring diagram for the radio control of the engine from the ground.

Referring more in detail to the drawings, and particularly to FIG. 1: The present system, as therein shown, is designed for down-hill logging operations, although not restricted thereto. In the illustration, **10** designates what is herein referred to as the skyline. This line is anchored, at its up-hill end as for example, to a stump **11** or to other suitable anchor, and at its down-hill end, it is anchored, through use of a multiple block and tackle system, designated at **12**, to a stump **13**. As herein indicated, tightening of the skyline can be effected by a yarder engine **14** having a drum on which the tackle cable is wound.

For a better understanding of the present invention, it will here be noted that in systems embodied thereby and now being used in the State of Washington, the skyline **10** is a wire strand rope 1¼ inches in diameter and approximately 5000 feet long, supported between its anchored ends, at intervals of approximately 1000 feet by spars, herein designated by numeral **15**. These spars are approximately 90 feet high and are suitably and substantially guyed; one of the guy lines of each spar, such as those designated by numeral **16** in FIGS. 1 and 2, being a ¾ inch wire cable. Hangers **18** are attached to the spar guying cables **16**, near the upper ends of the corresponding spars and these hangers are equipped to suspend the skyline therefrom. Preferably, the hangers **18** are like or similar to those described and illustrated in United States Patent No. 2,600.066, issued on June 10, 1952, to Sidney S. McIntyre. The skyline is sufficiently taut that it will be held at least forty feet above the ground at all points.

Suspended from the skyline, for travel therealong to the full distance between the up-hill and down-hill end spars **15**, is the present traveling yarder which in FIGS. 1 and 2 has been designated in its entirety by reference numeral **20**. It is suspended by hangers or links **21—21'** attached to its opposite ends; each hanger being attached at its upper end to a wheel equipped carriage **22** that travels on the skyline cable **10**. Preferably the carriage **22** herein employed is like or similar to those which form the subject matter of United States Patent No. 2,600.066, previously mentioned.

When the system, as here shown, is designed for down-hill logging, the upgrade angle of the skyline in many instances is 30 to 60 degrees. As here indicated, the yarder **20**, travels down-grade by gravity and is controlled in its travel by a tow cable **23** attached to its up-hill end as at **23x**. This cable extends to the yarder from the cable winding drum of a well anchored yarder **24** that is located at the up-hill end of the skyline. The yarder **24**, through its drum end cable, is the means for pulling the yarder **20** to the uphill end of the skyline and for controlling its down-hill travel.

The present yarder **20**, as shown best in FIGS. 3 and 4 comprises a rigid frame structure F of rectangular, box-like form. The frame, of yarders presently being used, is approximately ten feet long, five feet high and three feet wide. The upper, opposite side beams, **20x**, extend beyond the down-hill end of the frame body and

are inclined toward each other, as best shown in FIG. 5A, and at their ends are joined and rigidly mount a tubular bearing housing 30 horizontally between them. This is located in the central longitudinal plane of the frame structure. Mounted within and coaxially of the bearing housing 30 is the tubular journal 31 of a pulley block 32. This block mounts a cable guiding sheave wheel 33 therein on a supporting axle 34. At its outer end, the pulley block, as best shown in FIG. 8, is equipped with a journal 35. This is mounted for axial rotation in bearings 36—36 in the lower end of a vertical connector member 37 which, at its upper end, is fixed for swiveling action on the lower end 38 of the down-hill yarder suspending link 21.

By reference particularly to FIG. 8, it will be observed that the tubular journal 31 at the inner end of the pulley block 32 is axially aligned with journal 35 at its outer end and that the swivel axis of the end 38 of the suspending link 21 intersects the axial line of the journals 31 and 35 at a right angle.

At its up-hill end, the frame structure of the traveling yarder is fixed to the lower end of the yarder suspending link 21' by a swivel mounting designated by numeral 38x. This is like that shown at the lower end of link 21 at the opposite end of the frame. The yarder frame also is equipped at its up-hill end with a ring or clevis 40 to which the previously mentioned tow cable 23 is attached.

Mounted in the yarder frame F at what is herein seen to be the down-hill end of the yarder, is a diesel engine of conventional type, designated in its entirety by reference numeral 45. This engine is so mounted that its drive shaft, 46 extends horizontally and normally parallel with the skyline 10. It is connected directly with and drives a stub shaft 48 mounted in a bearing 49 that is fixed to an end wall 50 of a gear case 51; that being fixedly mounted in the uphill end of the frame structure. This stub shaft 48, as noted in FIG. 7, is equipped at its inner end with a beveled pinion gear 52 that is in driving mesh with two beveled gears 53 and 54 that are mounted for rotation in opposite directions on a horizontal cross-shaft 55. Shaft 55 is rotatably mounted, near its opposite ends, in bearings 56 and 57 carried by opposite side plates 58 and 59 of the gear case 51.

The bevel gears 53 and 54 are of the same diameter and constitute the inner or driving members of disk clutches that, in FIG. 6, are designated in their entireties by reference characters A and B, respectively. The outer members of these clutches are designated by numerals 60 and 61 and the disks of the clutches are designated at 62. Normally, the clutch disks are disengaged. Driving through the clutches is selectively effected by application of air under pressure thereto. For this purpose, opposite end portions of the cross-shaft 55 are bored with channels as at 63 and 64, and air supply lines as presently described are connected therewith through swivel fittings 67—67', as shown in FIG. 7.

The bores of the shaft 35 communicate at their inner ends, respectively, with radial bores 68—68' that, at their outer ends, communicate with air cylinders 69 formed coaxially in the outer clutch members, 60—61 and in which ring-type pistons 70—70' are fitted. These pistons press against the clutch-disks 62 and will operate, under the influence of air admitted under pressure selectively to the cylinders, to set the selected clutch to cause the driving of shaft 55.

Shaft 55 is equipped at one end with a pinion gear 75, as shown in FIG. 6, and this is in driving mesh with a large gear 76 keyed on a cross-shaft 77. Cross-shaft 77 which is revolubly mounted in the gear case 51, likewise, is equipped with a pinion gear 78 which meshes with a larger gear wheel 79 that is fixed coaxially to a cable winding drum 80. This drum 80 is revolubly supported on a cross-shaft 82 supported at its opposite ends in bearings 83—83' mounted in the opposite side plates of the gear housing 51. Thus, the cable winding drum can be driven selectively either to pay out or wind in a yarding cable thereon; the yarding cable being designated by numeral 85.

The yarding cable extends from the drum 80, between the top beams 20x—20x of the frame structure, and passes through the tubular journal 31 of sheave block 32, and over the sheave wheel 33, and depends therefrom. At its lower end it is equipped with conventional means, such as the hook 88 shown in FIG. 1, for the connection thereto of one or more chocker lines 89 by which the logs 90 may be drawn in. Keyed to that end of cross-shaft 55 that extends through and beyond the end plate 59 of gear case 51, is a brake drum 90 about which a brake band 91 is applied as in FIG. 9. The ends of the band are supported and anchored in a brake housing 92 that is fixed to the gear case 51.

A coiled spring 93 is disposed between and acts against the lugs 94—94' fixed on the opposite ends of the brake band to continually apply releasing force to the band.

For setting or applying the brake, I provide an air cylinder 96 that is fixed, as shown in FIG. 9, to the brake housing. Contained in the cylinder is a piston 97, and seated against one end thereof is a disk 98. A coil spring 99 is confined in the cylinder under compression and bears against the disk 98 and normally presses it and the piston against one end of the cylinder. Extended through the disk, and also coaxially through the coil spring, and from that end of the cylinder 96 against which the spring bears, is a brake rod 100. This rod is operatively connected, at its outer end, to a brake applying lever 101 that is pivoted on the brake housing 92 by a pivot bolt 102. At its inner end, the rod 100 is equipped with a head 105 that seats against the disk 98 and also against the piston. The force of spring 99, acting through rod 100 and lever 101 applies the necessary braking force to the brake band to normally hold the brake set and the shaft 55 against rotation.

It will be understood that as long as the brake drum is held against rotation, by the spring 99, the cable winding drum can not turn and the log yarding cable 85 will be held against being payed out or wound in. To wind the cable in on the drum or to pay it out requires that the brake band be released and that the drum 80 be driven while one of the clutches is engaged and the other disengaged. In the present instance the brake cylinder 96 is connected at its piston containing end with a source of air under pressure through a conduit 132, as presently explained, and it is a feature of this invention that provision has been made for causing the brake to be released incident to the application of air for the selective setting of either of the normally disengaged clutches. The application of operating air for this purpose is through solenoid valves as shown schematically in FIG. 11.

In FIG. 11, 110 designates a storage tank for air under pressure and 111 designates a conduit that leads from the storage tank and connects through a reducing valve 112 with a solenoid operated valve 113 through which air can be admitted to an adjustable needle valve 114 and thence through a pipe 115 to an engine throttle actuator 116; this being connected by a link 117 with the throttle lever 118 of the engine 45 for engine speed control.

Leading from pipe 115 is a conduit 120 that connects to a solenoid valve 121 which may be opened to dump the air under pressure from the air system beyond the valve 113.

Also connected with the air supply line 111 by means of a pipe line 125 is normally closed solenoid valve 126. From valve 126, a conduit 127 leads to the swivel fitting 67, shown in FIG. 7 whereby it is connected with the air cylinder of clutch A. Also, an air line 128 connects the air supply line 125 with a solenoid valve 129 from which an air line 130 leads to the swivel fitting 67' and through it to the air cylinder of clutch B.

It is also shown in FIG. 11 that a two-way ball check valve 135 has its inlets connected, respectively, by conduits

136 and 137 with the conduits 127 and 130 that lead respectively to the clutch A and the clutch B, and has its outlet connected by a conduit 138 with the inlet end of the brake cylinder 96. Thus, when air is applied to either clutch, it is simultaneously applied to the brake cylinder 96 so that the brake is released with the setting of the clutch.

The throttle lever of the engine is so adjusted that when not influenced by the actuator 116 it is positioned at engine idling position.

It is further to be explained that when solenoid valve 113 is opened, air is admitted through needle valve 114, to the throttle regulator to gradually advance it at a rate determined by the setting of the needle valve. Thus, the engine speed will be determined by the period of time that valve 113 is held open. To return the engine to idling speed, air is exhausted from the throttle control device 116 and this is accomplished by opening solenoid valve 121 under remote control as presently described.

One of the most advantageous features of this invention resides in the provision for remote control of the traveling yarder 20. This is effected through radio control of the several solenoid valves carried thereon; valves 113 and 121 providing engine control and valves 126 and 129 providing control of the clutches and brake associated with the cable winding drum 80 driven by the engine.

The radio control to which applicant makes no claim per se, is shown schematically in FIG. 11 to comprise a transmitter, which is represented by that equipment contained within the dash line enclosure T, and the receiver which is represented by the equipment within the dash line enclosure R. The receiver R is located adjacent the engine and moves with the yarder. Its position relative thereto is shown in FIG. 4. It is capable of receiving signals from a plurality of remotely located transmitters carried by ground workers.

A transmitter, for the present use, would preferably be an easily portable type and capable of transmitting a plurality of signals of different frequences to selectively control the several solenoid valves. The selection of a desired frequency is made by use of an easily adjustable switch herein designated by numeral 150.

Electrical current for the transmitter is supplied by a battery 151, and the operating circuit is closed and opened by a switch designated at 152. This switch may be pressed to close position and opens automatically when closing pressure is released therefrom.

The apparatus here illustrated in FIG. 11 shows only the parts essential for transmitting on one frequency. This frequency is selected by engaging the switch arm 150, as indicated in dash lines, with the lowest of the four switch contacts indicated at *a, b, c* and *d*. For the transmitting on any one of the other frequencies, the switch arm 150 would be selectively engaged with the other contacts, each of which is associated with a suitable means whereby to produce the desired frequency; such means would correspond to that herein shown.

After the selector switch 150 has been adjusted to engage a contact for the transmitting of a certain frequency for the energizing of a particular solenoid valve, the switch 152 is then pressed to closed position. The transmitter equipment then operates through the equipment as here shown to send out the predetermined signal.

The receiver R, here shown to be powered by a battery 161, picks up the transmitted signal on antenna 162. The signal is amplified by the means herein shown, and operates to cause closing of the switch of a relay 164 whereby the electric circuit of the selected solenoid is caused to be closed, thus to open the valve. The valve circuit, controlled by relay 164, is here shown to be powered by a battery 165.

In FIG. 11, I have shown only solenoid valve 129 as being connected for control. However, it is to be understood that other relays, corresponding to relay 164, are similarly associated with the three other valves 113, 121 and 126 each to be selectively energized by the transmission of a signal of a predetermined frequency differing from the others.

The opening of valve 129 admits air under pressure from supply tank 110 to the clutch B and causes it to be set for driving the cable winding drum. Coincident with this, air is also supplied through pipe lines 137 and 138 to the brake cylinder 96 to release the drum holding brake.

Likewise, if the valve 126 should be opened to admit operating air to clutch A to cause the drum to be driven in the other direction, air would simultaneously be admitted to the brake cylinder to release the brake. The setting of either clutch releases the brake, and the closing of either valve automatically exhausts air from the corresponding clutch and the brake cylinder 96.

Assuming that the traveling yarder is so constructed and equipped, and is mounted for travel on the skyline cable 10 in the manner disclosed, its use is normally as follows: The operator controlling the yarder 24 causes the yarder 20 to be moved along the skyline 10 to the desired location. The engine 85 is operating at idling speed. The "down" clutch A is then caused to be engaged and engine speed increased to lower cable 85 to the ground. It is then pulled out to the fallen logs, laterally of the skyline. The clutch A is then disengaged and connection made with one or more logs in the usual way. After the cable has been connected with the log, the "up clutch" B is set and the engine speed increased to drive the drum to wind in the cable to pull in and then lift the log for suspended travel to the unloading point. The up clutch B is then disengaged and the brake is set to hold the log in suspension.

Assuming that the log load has been elevated for travel, and the brake has been set, the operator of the yarder 24 then pays out the cable 23 and the yarder 20 travels down hill until stopped at an unloading point; speed of travel being controlled by braking the drum of yarder 24 from which cable 23 is payed out.

It will be understood that a ground worker in the woods, herein referred to as the "hooker" equipped with a transmitter as previously described, can easily control the cable winding drum 80 and the engine 45. Likewise, a man at the uphill end of the skyline 10 and one at the down hill end can likewise control the engine for the necessary operations to be performed at those points.

One of the important features of the yarder construction resides in its manner and means of suspension; it being noted that the structure 20 is suspended at its opposite ends by the swivel connections 21—21' that permit the passing of the carriages 22 over the hangers 18 without undue strain on the structure or suspending means.

Also, it is of importance that the sheave block 32 is swiveled in the mounting 30, thus to permit the sheave wheel to swing to one side or the other in accordance with the direction of cable pull in dragging in the logs, without causing the frame structure to be swung from a normal vertically suspended position which would be detrimental to engine operation.

The present means for and method of down hill yarding eliminates the great expense of building roads in mountainous country; speeds operations; reduces the number of workmen required and makes it possible to profitably log in areas where ordinary methods cannot be profitably used.

What I claim as new is:

1. In a logging system including a skyline cable and a log yarder equipped with means whereby it is suspended from and is adapted for travel along said skyline; said yarder comprising a rigid frame structure, a cable winding drum mounted thereon, a log yarding cable wound on said drum and adapted to be paid out therefrom and extended from the yarder for the pulling in of logs from

the area served by the skyline cable and for holding them suspended from said frame for transportation along the skyline, an engine mounted in said frame structure for driving the drum and means associated therewith to control the paying out and winding in of the cable; said yarder frame structure having a sheave wheel mounted at one end and passing the logging cable thereover to the log, and said sheave wheel being rotatable in a block that is mounted for lateral oscillation thus to accommodate the position of said sheave wheel to the direction of pull on the cable as extended thereover to the log.

2. The combination set out in claim 1 wherein said sheave wheel is mounted for axial rotation in a block having a tubular mounting hub offset therefrom that extends parallel to the direction of the skyline and which hub is mounted for axial rotation in said frame structure and wherein said logging cable extends through said hub and hub mounting in passing between the drum and sheave wheel.

3. The logging system recited in claim 2 wherein said frame structure extends along and below the skyline and wherein its suspending means comprises wheel equipped carriage mounted on the skyline at opposite ends of the yarder, and suspending links are attached at their upper ends to the carriages and at their lower ends are attached to the ends of the frame through means of connecting swivels.

4. A system of claim 3 wherein one of said connecting swivels is secured to the outer ends of said sheave wheel mounting block.

5. A skyline yarder system comprising a skyline cable, a yarder suspended from and adapted for travel along said skyline, said yarder comprising a rigid frame structure, a power means and an interconnected cable winding means mounted in said frame structure, a yarding

cable associated with said cable winding means and adapted to be paid out therefrom and extended from the yarder, means associated with the power means to control the operation thereof and the paying out of the cable, a sheave wheel mounting block secured to said frame structure remote from said cable winding means, said block including a rotatable hub and a sheave wheel rotatably mounted on said hub.

6. A combination as in claim 5 wherein said power means is a gasoline engine.

7. A combination as in claim 5 including carriage supporting and suspending means secured to opposite ends of said frame and adapted to ride upon said skyline cable.

8. A skyline yarder system as in claim 5 wherein the skyline cable is so supported as to cause travel of the yarder therealong in one direction under the influence of gravity, a cable winding drum positioned at the higher end of the skyline and a cable extended therefrom to the yarder for pulling the yarder along the skyline cable in moving the yarder in the uphill direction.

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