United States Patent

[11] 3,540,770

[72] Inventor **John H. Mitchell**
400 W. Curtis St., Aberdeen, Washington 98520

[21] Appl. No. **783,015**
[22] Filed **Dec. 11, 1968**
[45] Patented **Nov. 17, 1970**

[54] **REMOTE CONTROL GRAPPLE CARRIAGE**
11 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **294/111,** 294/106, 212/84, 212/87
[51] **Int. Cl.** **B66c 1/00**
[50] **Field of Search** 212/84, 87, 89, 94, 96, 97, 90, 96; 294/112, 106, 110, 111

[56] **References Cited**

UNITED STATES PATENTS

3,083,839	4/1963	McIntyre	212/87
3,245,712	4/1966	Mitchell	294/112
3,407,942	10/1968	McIntyre et al.	212/84

Primary Examiner—Andres H. Nielsen
Attorney—Clarence A. O'Brien and Harvey B. Jacobson

ABSTRACT: A grapple carriage riding on a skyline capable of being slackened and tightened, and having a grapple supported therefrom with means for opening and closing the grapple for gripping and releasing a log. The means includes a remote control so that an operator may cause opening or closing of the grapple from a remote point. A haulback line is connected with the carriage for moving it along the skyline for positioning the grapple during a logging operation.

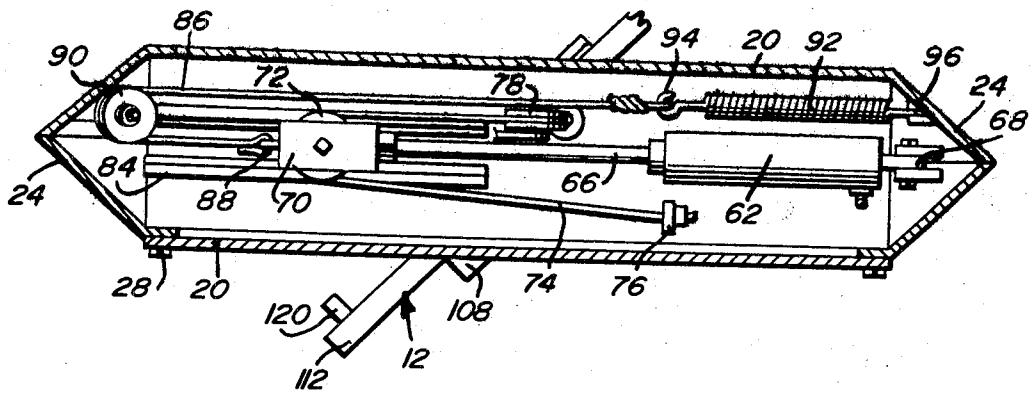


Fig. 1

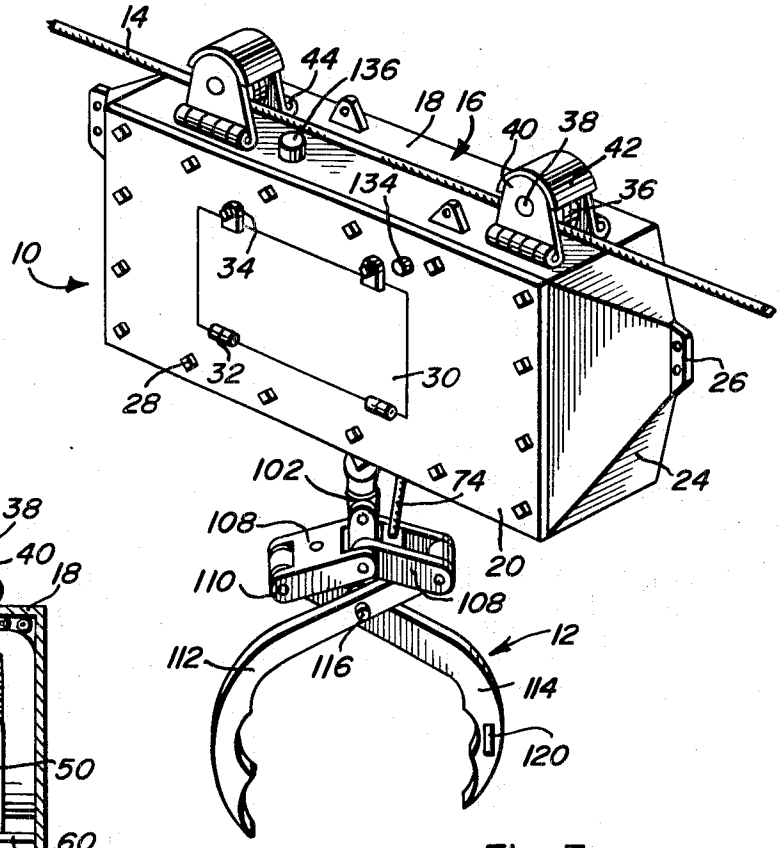


Fig. 4

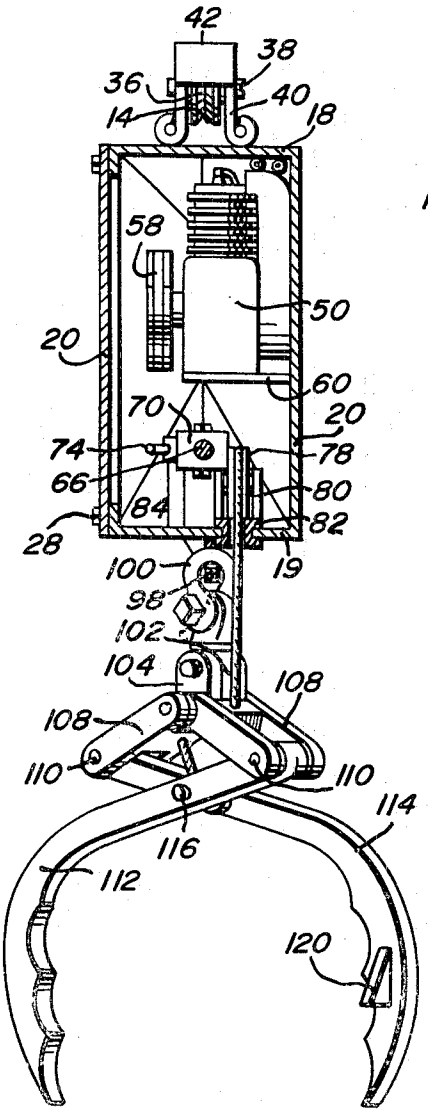
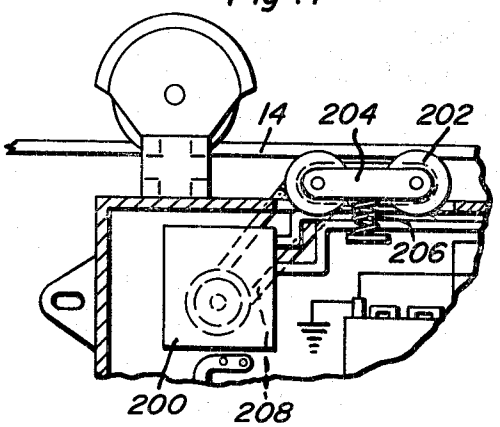


Fig. 7



John H. Mitchell

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

Fig. 2

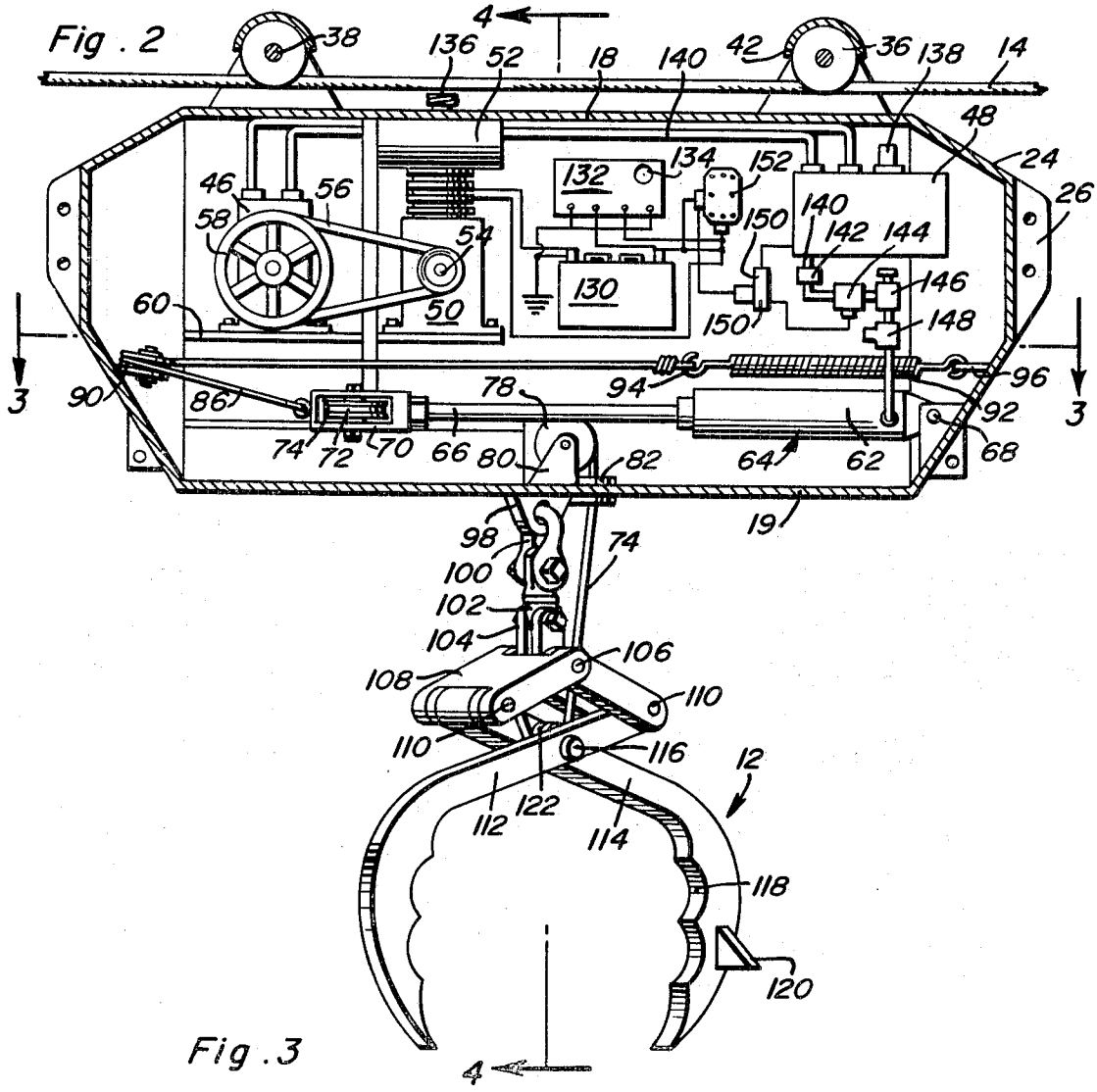
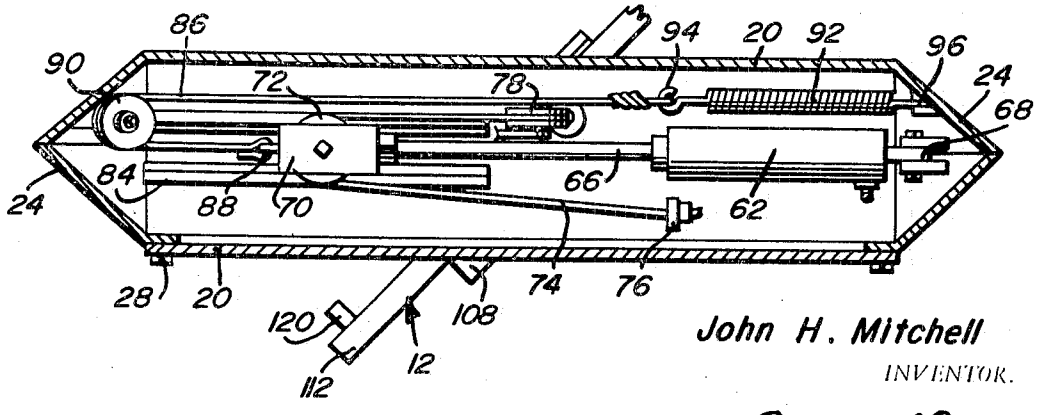


Fig. 3



John H. Mitchell

INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson

Attorneys

Fig. 5

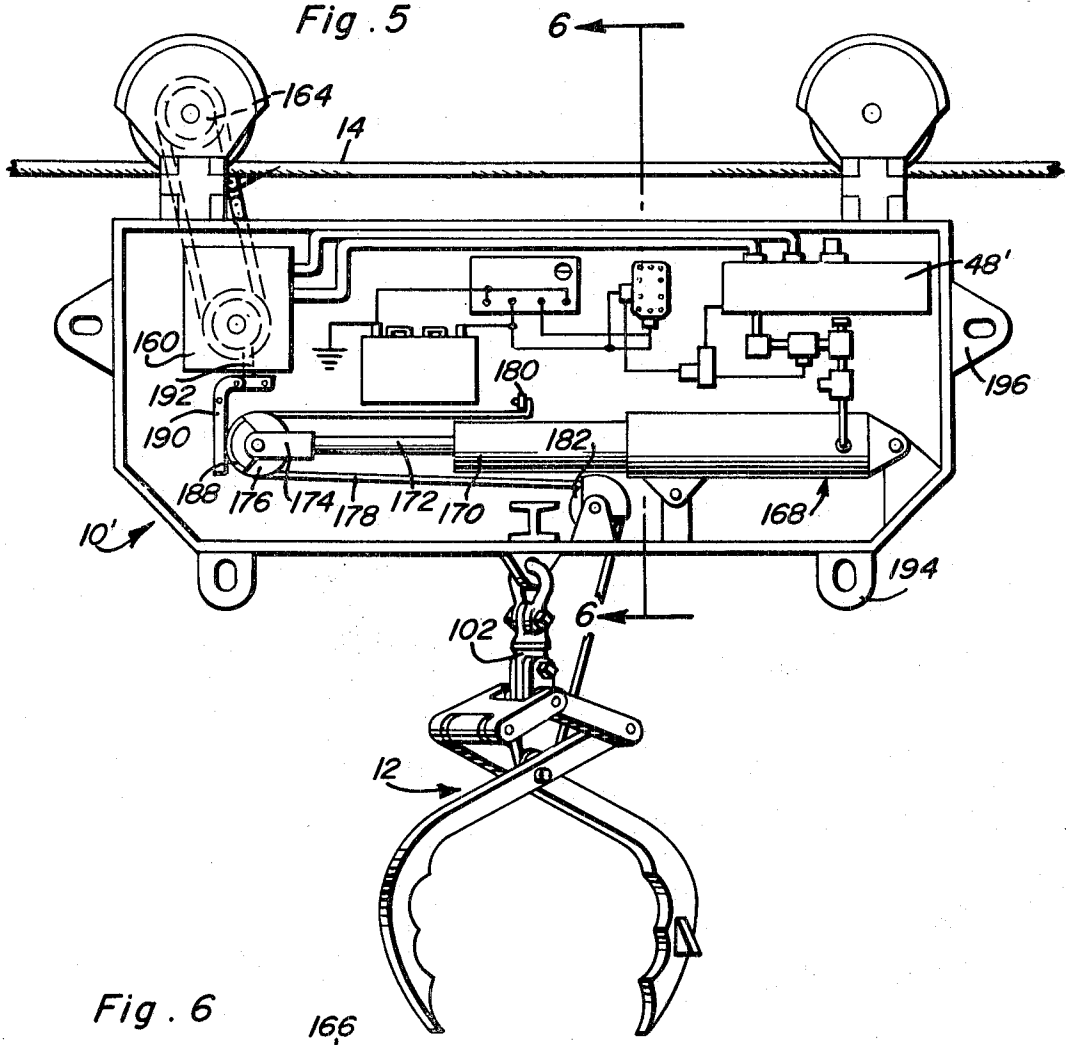
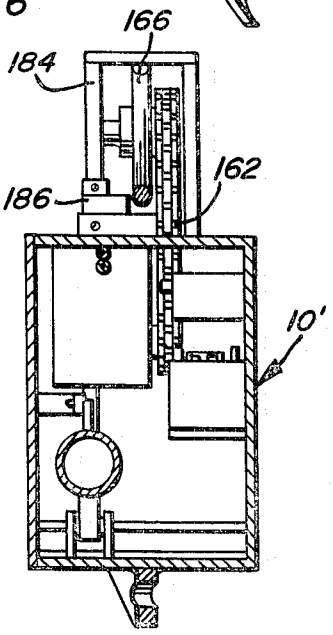


Fig. 6



John H. Mitchell
INVENTOR.

BY Clarence A. O'Brien and Harvey B. Jacobson
Attorneys

REMOTE CONTROL GRAPPLE CARRIAGE

Carriages with grapples thereon which may be employed in various logging operations are generally well known. While such devices operate, one of the problems existent in the field is operation of the grapple on the carriage to effectively pick up the log, convey it to another desired location and then release it. Accordingly, it is an object of the present invention to provide a grapple carriage having a grapple supported therefrom together with means carried by the carriage for operating the grapple.

A further object of the present invention is to provide a grapple carriage in accordance with the preceding object incorporating remote control means to enable operation of the grapple from a remote position.

Still another object of the present invention is to provide a grapple carriage including an auxiliary power means mounted thereon in the form of an internal combustion engine for supplying power for operating the grapple with the engine driving a compressor for supplying power for operating the grapple.

Yet another object of the present invention is to provide a grapple carriage having an air compressor mounted thereon for supplying power for operating the grapple together with a drive arrangement engaged with the skyline so that as the carriage is moved along the skyline, the air compressor will be actuated for supplying power to operate the grapple.

Yet another object of the present invention is to provide a grapple carriage which is relatively simple in construction, dependable and effective in operation and relatively inexpensive to manufacture, operate and maintain.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a perspective view of the grapple carriage of the present invention;

FIG. 2 is a side elevational view with the side plate of the housing removed illustrating the structural features and orientation of the components of the invention;

FIG. 3 is a plan, sectional view taken substantially upon a plane passing along section line 3–3 of FIG. 2 illustrating further structural details of the invention;

FIG. 4 is a vertical, sectional view taken substantially upon a plane passing along section line 4–4 of FIG. 2 illustrating further structural details of the invention;

FIG. 5 is a side elevational view similar to FIG. 2 but illustrating a modified form of the invention;

FIG. 6 is a vertical, sectional view taken substantially upon a plane passing along section line 6–6 of FIG. 5 illustrating further structural details of this embodiment of the invention; and

FIG. 7 is a fragmental elevational view with the housing in section illustrating another embodiment of the invention similar to that illustrated in FIGS. 5 and 6.

Referring now specifically to the drawings, the grapple carriage of the present invention is generally designated by the numeral 10 and suspends a grapple tong generally designated by the numeral 12 from a skyline 14. The grapple tong 12 illustrated is the same as that disclosed in prior U.S. Pat. No. 3,245,712, issued Apr. 12, 1966. The skyline 14 is connected to suitable apparatus by which it may be slackened or tightened. For example, one end of the skyline may be anchored to a stump, spar or the like and the other end connected with a suitable device having a winch associated therewith such as a logger with this procedure being well known in the high lead logging art. Thus, by slackening or tightening the skyline 14, the grapple carriage 10 and the grapple tong 12 associated therewith may be lowered to a position immediately above a log to be grabbed and elevated back to an elevated position by tightening the skyline 14 after the grapple tong 12 has grabbed a log. The carriage 10 is then moved longitudinally of the skyline 14 either by gravity or a haulback line or main line depending upon the direction in which the carriage 10 is to be moved. For example, if the logs are to be conveyed to a higher elevation, the loaded grapple tong and carriage will be pulled upwardly along the skyline 14 by a main line or haulback line and gravity may be employed to return the carriage to a desired location for another pickup of logs.

As illustrated, the carriage 10 includes a housing 16 which may be of any suitable configuration but is preferably rectangular in configuration and provided with a top wall 18, a bottom 20, side walls 22 and end walls 24 which may have brackets 26 thereon for connection with the haulback line or main line. One of the side walls 20 is in the form of a removable plate secured in place by a plurality of bolt-type fasteners 28 or the like and an access door 30 may also be provided in the side wall 20 with the door 30 being hinged along its bottom edge by hinges 32 and secured in closed position by fastening lugs 34.

The top wall 16 is provided with a pair of spaced pulleys or grooved rollers 36 which rollingly engage the upper surface of the skyline 14 which is in the form of a cable or the like. Each pulley 36 is journaled by an axle 38 supported by brackets 40 for rotation. An arcuate shield 42 is provided across the top edge of the mounting brackets 40 to protect the pulleys 36. The brackets 40 are pivotally supported from the top wall 18 by a hinge structure 44 by which one side of the pulley assembly may be pivoted downwardly to enable entry of the skyline 14 into underlying engagement with the pulley 36. Any suitable means may be provided for releasably retaining the supporting brackets 40 in upstanding parallel relation and to selectively enable either of the brackets 40 to pivot downwardly to provide access to the pulley 36 by the skyline 14.

Disposed within the housing 16, there is provided an air compressor 46 communicated with an air reservoir tank 48 for supplying compressed air thereto and being driven by a small internal combustion engine 50 which may be of an air-cooled type having a fuel tank 52 associated therewith along with an output shaft and pulley 54 driving a belt 56 which drives an input pulley 58 of the air compressor 46. The components may be supported in any convenient manner from the housing such as by the use of a supporting partition plate 60 disposed horizontally below the top wall 18. The air reservoir tank is communicated with one end of a cylinder 62 of a piston and cylinder assembly 64 mounted horizontally below the plate 60 with the piston and cylinder assembly 64 also including a piston rod 66 reciprocally disposed in relation to the cylinder 62 so that as air is admitted into the end of the cylinder 62 adjacent to its point of supporting connection with the end wall 24 as indicated at 68, the piston rod 66 will be moved outwardly from the cylinder 62 in a well-known manner.

Mounted on the outer end of the piston rod 66 is a closed loop mounting block 70 which rotatably supports a pulley or sheave 72 which has a cable 74 entrained thereover with one end of the cable being anchored to the housing by a bracket 76. The other end of the cable 74 extends generally parallel to and alongside of the piston rod 66 and over a pulley or sheave 78 rotatably supported on the bottom wall 19 by a yoke or brackets 80. The cable 74 then extends down through a grommet or adapter 82 in the bottom wall 19 and is connected with the grapple tong 12 in a manner described hereinafter. The pulley mounting block 72 is slidingly supported on guide rails 84 which extend longitudinally along the bottom portion of the housing 16. For maintaining tension on the cable 74, a flexible cable 86 is anchored to the pulley mounting block 70 as indicated at 88 and is entrained over a pulley 90 supported by a suitable bracket on the end portion 24 of the housing 16 and then extends longitudinally of the housing 16 with the terminal end of the cable 86 being engaged with a tension spring 92 as indicated at 94 with the other end of the spring 92 being anchored to the opposite end wall 24 from the pulley 90 as indicated at 96 so that a constant tension is provided for the opening cable 74 for the grapple tongs 12. With this construction, when air is admitted to the cylinder 62, the pulley 72 will

be moved outwardly thus moving the opening cable **74** in a linear manner to open the grapple tong **12** in a manner described hereinafter.

As stated previously, the details of construction of the grapple tong is disclosed in prior U.S. Pat. No. 3,245,712 but is described briefly to set forth the operation of the present invention with the grapple tong **12** being supported from the housing by a lug **98** on the undersurface of the bottom wall of the housing **16** with a U-shaped clevis **100** engaged with the lug and supporting a link **102** for universal movement with the link **102** pivotally supporting a pair of lugs **104** engaged with a pivot bolt **106** which supportingly engage a pair of oppositely extending links **108** which have their respective outer ends pivotally attached by pivot bolts or pins **110** to the upper ends respectively of a pair of crossed gripping jaws **112** and **114** which are pivotally interconnected by a bolt or pin **116** at their point of intersection so that the links **108**, the pivot points **106** and **116** and the pivot points **110** serve as a parallelogram linkage. The portions of the jaws **112** and **114** below the pivot pin **116** are curved inwardly with their inner faces being provided with recesses **118** and each jaw is provided with a lateral generally triangular projection **120** on the side surface thereof. The opening cable **74** extends downwardly through a guide ferrule on one of the links **108** and then under a pulley **122** and thus upwardly to an anchor plate on the other of the links **108** so that when tension is exerted on the cable **74** so that it is moved, this will cause the pivot pin **116** to move toward the pivot pin **106** thus opening the jaws **112** and **114**. When force on the cable **74** is released, the normal load of the jaws and the fact that they are supported from the pivot point **106** will cause the jaws **112** and **114** to move inwardly due to normal force of gravity. The specific details and construction of the grapple tong **12** is more specifically disclosed in U.S. Pat. No. 3,245,712. Also, it is pointed out that the lug **98** and, of course, the corresponding structure of the grapple tong is disposed at an angle to the longitudinal axis of the housing **16** as perhaps best illustrated in FIG. **3** with the plane of the jaws **112** and **114** being substantially at a 45° angle to the longitudinal axis of the housing **16**.

For operating the internal combustion engine **50**, a storage battery **130** is provided together with a FM radio receiver-decoder **132** which is a commercially available item and will detect signals from a transmitter. A manual switch **134** is provided on the receiver **132** by which the receiver may be actuated manually. The operating button for the switch **134** may be exposed through the wall of the housing to enable access thereto for turning on the receiver **132** when a logging operation is to commence. Also, the internal combustion engine **50** may be started by the operator at the beginning of a logging operation and he will at that time also normally fill the fuel tank through a filler cap **136** which also is accessible through the wall of the housing **16**. If desired, an automatic starting device may be provided for the internal combustion engine **50** but since the radio receiver which is electrically connected to the battery **130** must also be turned on, the engine **50** could be started at the same time with, of course, the electrical ignition system of the engine **50** being connected with the storage battery **130** in a conventional manner.

The air tank **48** is provided with a safety valve **138** to prevent excess pressure buildup by operation of the compressor thus preventing any possible damage to the air lines **140** or any other component of the system. Communicated with the air tank is a discharge line air line **140** having a flow control valve **142** therein which may be a pressure reduction valve, check valve to control the flow from the air tank **48** to a normally closed three-way solenoid operated valve **144**. From the valve **144**, the air passes through a lubricator and filter assembly **146** and then through a momentary valve which locks the ram or piston and cylinder assembly in extended position for eliminating drain on the solenoid and battery. A pilot valve **150** is associated with the solenoid three-way valve **144** and a ratchet relay **152** is connected with the pilot valve, battery, radio receiver and engine for proper operation thereof.

The embodiment of the invention illustrated in FIGS. **5** and **6** operates in substantially the same manner as the embodiment illustrated in FIGS. **1—4** except that the compressor **160** is driven by a chain drive **162** extending up through the top of the housing and is driven by a sprocket gear **164** fixedly associated with a pulley **166** which rides on and is driven by the skyline **14** during movement of the grapple carriage **10'** therealong. Thus, as the grapple carriage **10'** is moved along the skyline **14**, the pulley **166** will be rotated due to its supporting engagement with the skyline **14** thus driving the compressor **160** and providing compressed air to the compressed air tank **48'**. The remainder of the control structure as to the battery, receiver, ratchet relay, pilot valve, control valve, three-way valve, lubricator and filter and momentary valve all are the same as employed in the embodiment of the invention illustrated in FIGS. **1—4** and the same reference numerals are employed therewith.

A multiple stage piston and cylinder assembly **168** is supported in the bottom of the housing and includes telescopic pistons **170** and **172** with the piston **172** having a pulley supporting block **174** on the outer end thereof for rotatably supporting a pulley **176** thereon. The pulley **176** receives a tension cable **178** having the free end thereof anchored to an anchor bracket **180** and the other end thereof extending downwardly over a pulley **182**, through the bottom of the housing and into associated relationship to the grapple tong **12** which is identical to the grapple tong disclosed in connection with the embodiment illustrated in FIGS. **1—4**. Thus, by expanding the piston and cylinder assembly **168**, the cable **174** may be moved thus serving to open the grapple tongs **12** and when air is discharged from the piston and cylinder assembly **168**, the weight of the jaws will cause the tongs to return to a closed and log-gripping position.

The pulley **166** is supported by a framework **184** which has a removable section **186** to enable the skyline **14** to be placed into engagement with the pulley **166** when assembling the carriage **10'** with the skyline **14**.

The pulley mounting block or yoke **174** is provided with an arcuate plate member **188** which serves to retain the cable **178** in place and also serves as a brake actuator which engages a brake lever **190** which actuates a brake **192** which will assure that the carriage is retained in a stationary position when the grapple tong **12** is open.

The housing is provided with anchor lugs **194** at each end thereof which may provide a choker cable support if a choker cable is to be employed for connection with the carriage or the grapple tong may be supported therefrom as an emergency standby arrangement. Also, brackets **196** are provided on each end for the haulback line or main line. The end configuration of the housing may be varied but by tapering the end of the housing as illustrated in FIGS. **1—4**, if it engages any obstructions, it will cam itself past such obstructions without stopping movement of the carriage.

FIG. **7** illustrates another slightly modified form of the invention in which the compressor **200** is driven from a pair of pulleys or wheels **202** supported from a vertically movable frame member **204** carried by the housing with a compression coil spring **206** biasing the frame **204** and the pulleys or wheels **202** into frictional engagement with the skyline **14** so that as the carriage moves along the skyline **14**, the compressor **20** will be driven through a drive chain **208** which may be in the form of a steel roller chain, driving belt or the like which also is an alternative which may be employed in the embodiment illustrated in FIGS. **5** and **6**. The two pulleys or wheels **202** are preferably rubber covered to increase the frictional engagement with the skyline **14**.

While pneumatic piston and cylinder assemblies have been illustrated, it is also clearly possible to employ hydraulic piston and cylinder assemblies with a hydraulic pump being employed rather than an air compressor to provide for the storage of energy in the carriage for operating the grapple tong. Any type of internal combustion engine may be employed such as a diesel engine, gasoline engine or the like and

either a solenoid momentary valve or a ratchet relay may be employed for retaining the piston and cylinder assembly in extended position without unnecessary drain on the battery.

The present invention is employed in a normal high lead yarding operation and the skyline is attached to any suitable support at one end and is connected to a yarder at the other end so that it can be slackened or loosened and tightened with the grapple carriage riding on the skyline so that it can be raised and lowered by the slackening and tightening of the skyline. The haulback line or main line is fastened to the carriage and serves as the yarding line for causing transitory movement of the carriage on the skyline. The radio receiver opens and closes the grapple in a manner so that each subsequent signal causes the grapple tong to sequentially open and close, that is, when one signal is received, the grapple will close and the next signal will open the grapple with this sequence being continuous.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention.

I claim:

1. A grapple carriage comprising a housing, means movably supporting said housing from a skyline, a grapple tong supported from said housing, means connected with said tong for opening same, means carried by said housing for remote control of said tong opening means, said grapple tong including a pair of crossed jaws, said means for opening said tong including an opening cable which will open the jaws of the tong when the cable is moved toward the housing, and power means operating said opening cable, said power means including an expandable and contractible piston and cylinder assembly connected with said housing, said opening cable having one end anchored with respect to the housing, said piston and cylinder assembly having a pulley thereon engaging a midline portion of the opening cable whereby expansion and contraction of the piston and cylinder assembly will cause movement of the pulley thus causing linear movement of the opening cable for opening the tongs.

2. The structure as defined in claim 1 wherein said piston and cylinder assembly is a pneumatic piston and cylinder assembly, an air compressor carried by said housing and including an air reservoir communicated with said piston and cylinder assembly, and means driving said air compressor.

3. The structure as defined in claim 2. wherein said means driving the air compressor includes an internal combustion engine drivingly connected with the air compressor.

4. The structure as defined in claim 2. wherein said means for driving the compressor includes a pulley in rolling frictional contact with the skyline for rotation during movement of the housing along the skyline, and means drivingly interconnecting the pulley and the compressor for driving the compressor in response to movement of the housing along the skyline.

5. The structure as defined in claim 4. in which said pulley for driving the compressor also forms at least a part of said means movably supporting the housing from the skyline.

6. The structure as defined in claim 4. wherein said pulley is resiliently supported from the housing and resiliently urged into engagement with the skyline for drivingly engaging the skyline during movement of the housing therealong.

7. The structure as defined in claim 2. wherein said piston and cylinder assembly for moving the opening cable includes brake means thereon for stopping the compressor and the drive means therefor when the tong opening cable is actuated.

8. The structure as defined in claim 1 wherein said remotely controlled means includes a radio receiver carried by said housing for controlling operation of the tong opening means in response to a signal received from a remote transmitter.

9. In combination with a skyline capable of being slackened and tightened, a grapple carriage comprising a housing, means movably supporting said housing for linear movement on said skyline, a grapple tong fixedly depending from said housing and supported therefrom, means carried by the carriage and connected with said tong for opening said tong when the skyline is slackened and the grapple carriage lowered for engaging a log, said tong being closed and gripping the log when the tong opening means is rendered inoperative and the skyline is tightened and the carriage elevated, said means for opening the tong including a fluid pressure operated piston and cylinder assembly, means operatively interconnecting the piston and cylinder assembly and the tong for opening the tong, and means carried by said housing for supplying power to actuate said piston and cylinder assembly.

10. The combination as defined in claim 9. wherein said means for supplying power to the piston and cylinder assembly includes an air compressor driven from a wheel in frictional engagement with the skyline.

11. The structure as defined in claim 9. wherein said grapple tongs includes a pair of crossed jaws, said means for opening said tong including an opening cable operatively associated with the point of intersection of the crossed jaws for opening the jaws of the tong when the opening cable is moved toward the housing, said piston and cylinder assembly having one end connected with the housing, the other end of the piston and cylinder assembly including a pulley engaged with the opening cable, said opening cable having one end attached to the housing whereby expansion and contraction of the piston and cylinder assembly will move the point of intersection of the crossed jaws toward the housing in one direction of movement of the piston and cylinder assembly and provide slack in the opening cable when the piston and cylinder assembly is moved in the other direction, said air compressor being communicated with an air reservoir tank, valve means communicating the air tank with a piston and cylinder assembly, and remotely controlled means controlling said valve for controlling operation of the piston and cylinder assembly thereby controlling opening of the tong from a remote point, said piston and cylinder assembly having the longitudinal axis thereof generally paralleling the skyline to enable vertical height of the housing to be maintained at a minimum.