Sept. 4, 1956 L. R. ISERMAN 2,761,569

REMOTE CONTROL UNIT FOR A TRUCK-MOUNTED CRANE

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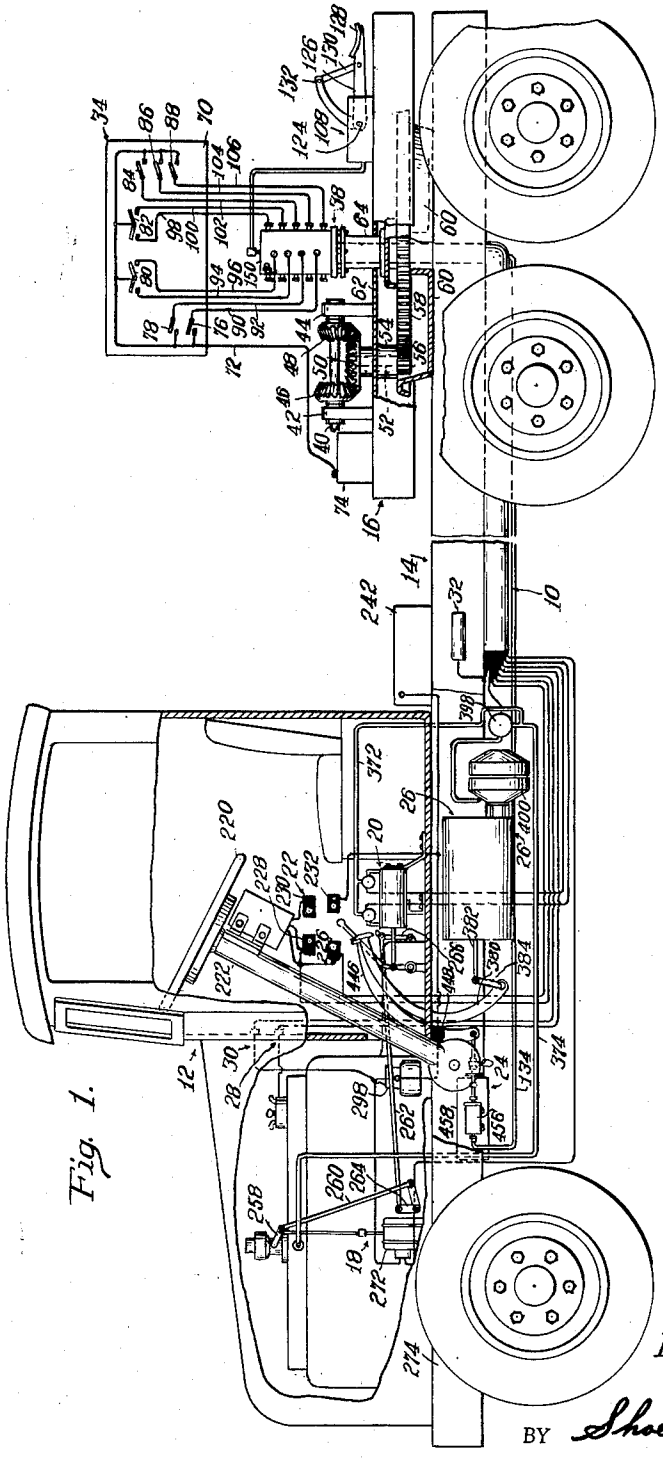


Fig. 1.

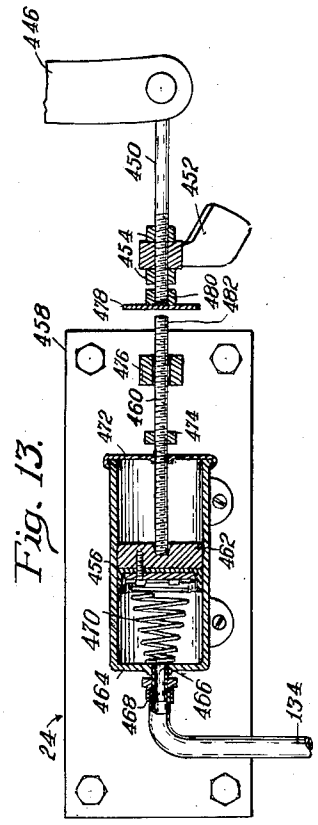


Fig. 13.

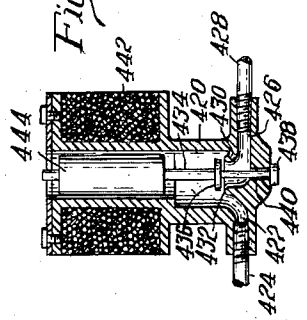


Fig. 11.

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Fig. 2.

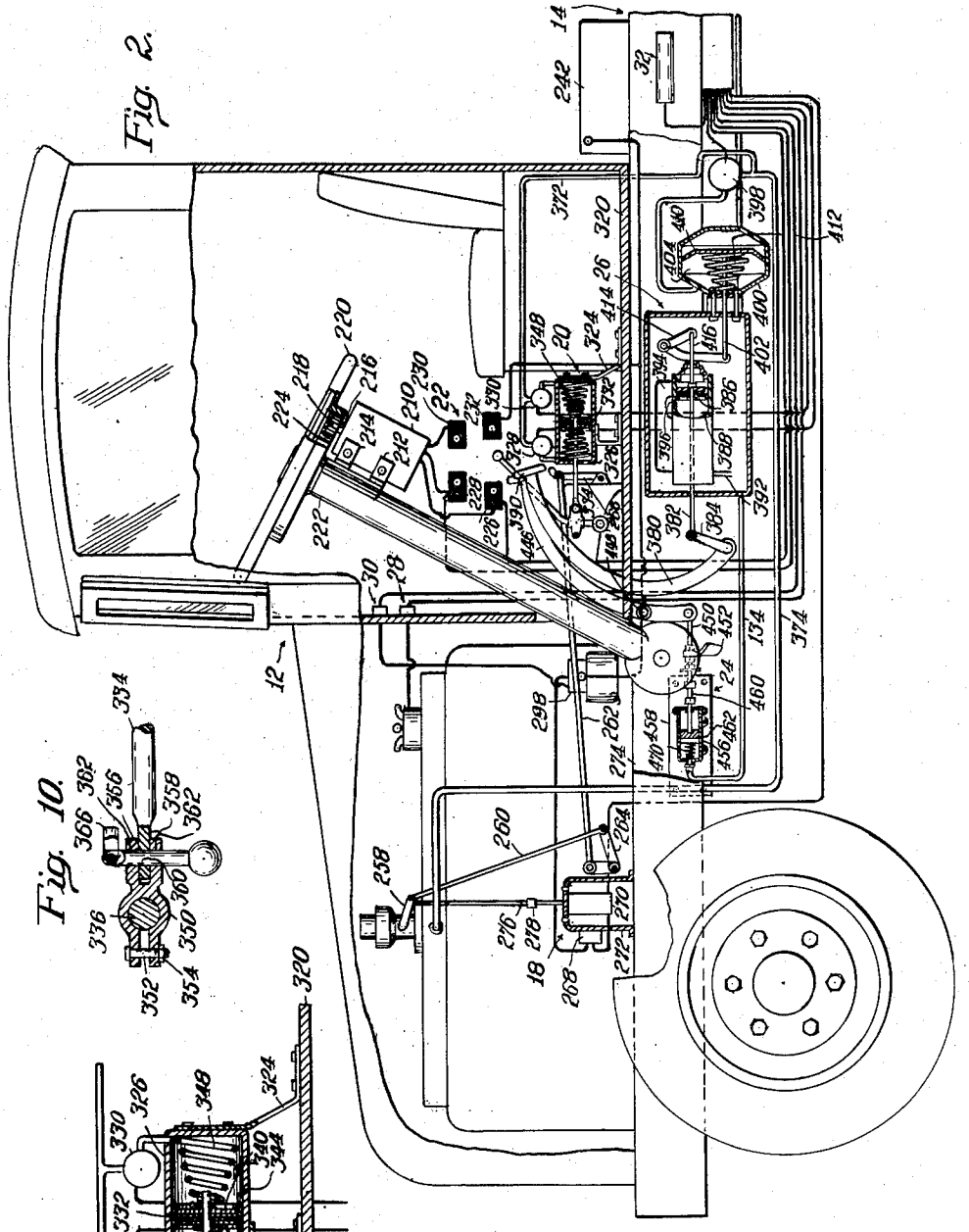
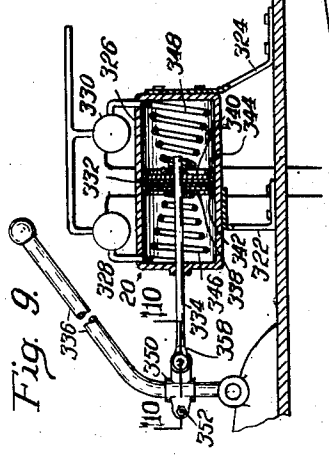


Fig. 10.

Fig. 9.



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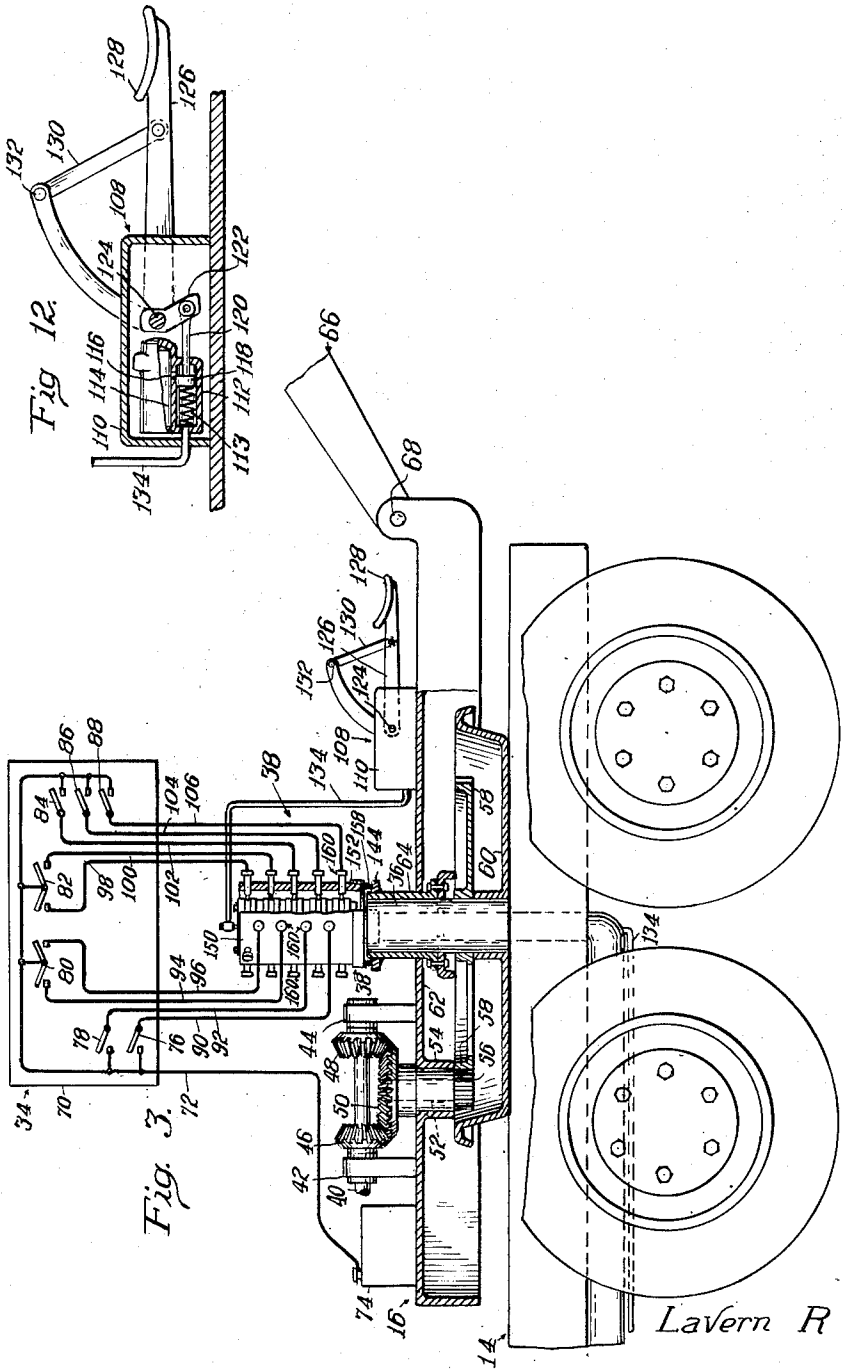


Fig. 12.

Fig. 3.

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REMOTE CONTROL UNIT FOR A TRUCK-MOUNTED CRANE

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Fig. 4.

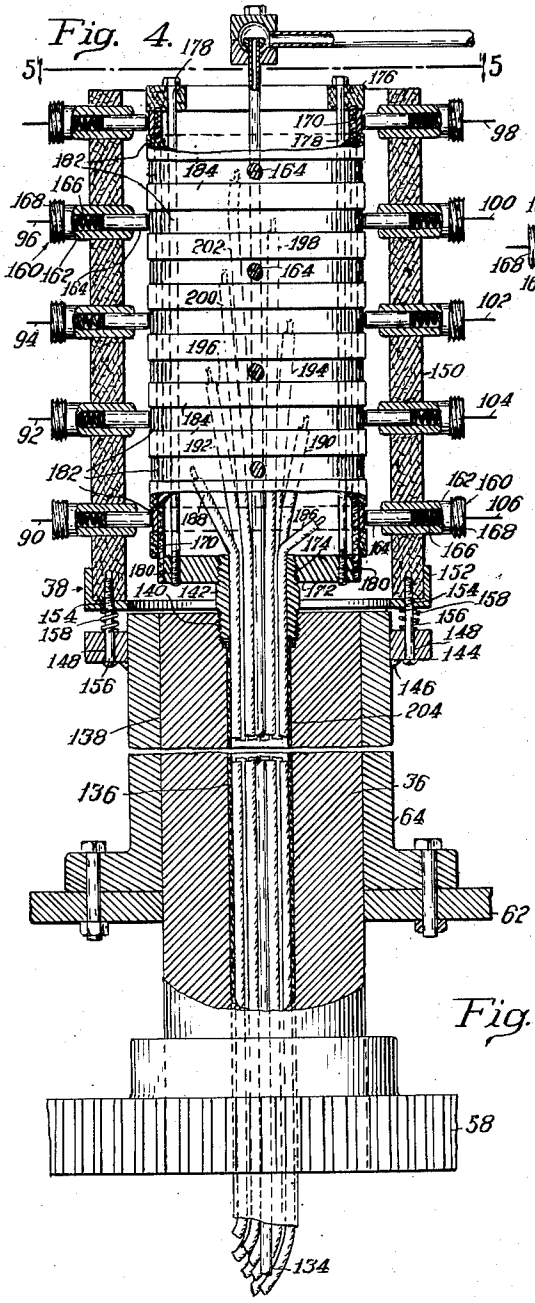


Fig. 5.

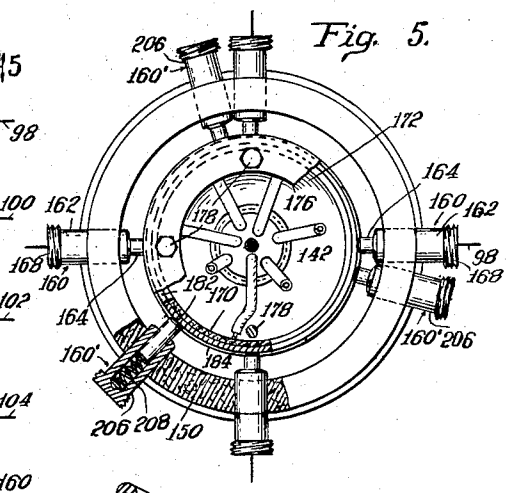


Fig. 7.

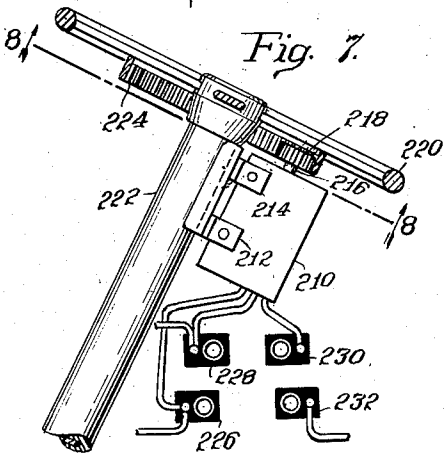
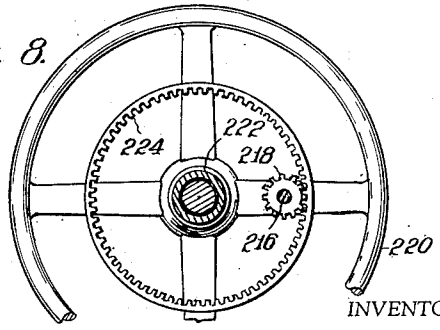


Fig. 8.



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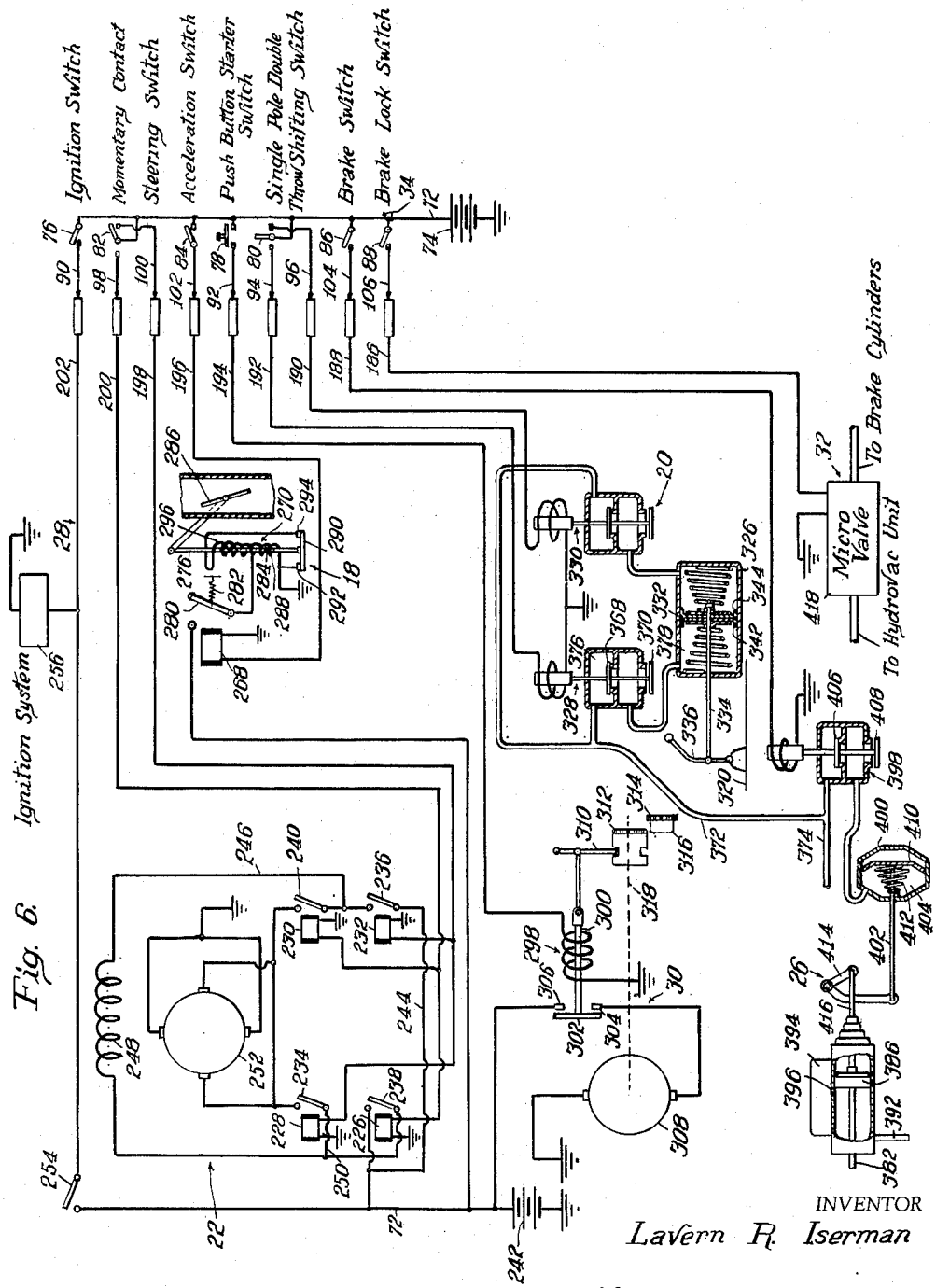


Fig. 6.

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2,761,569

REMOTE CONTROL UNIT FOR A TRUCK-MOUNTED CRANE

Lavern R. Iserman, Waverly, Iowa

Application June 6, 1952, Serial No. 292,219
3 Claims. (Cl. 212—38)

The present invention relates to improvements in remote control systems and more particularly to an improved system for remotely controlling a truck of the type having a swing platform crane cab from the crane cab.

Heretofore, in performing such operations as hoeing, dragline, tilling, logging and backfilling, it has been necessary for either an operator to be present in the truck cab for effecting movement of the truck or for the crane operator to leave the crane cab and to get into the truck cab for driving the same as the operation required. In operations of the type referred to, the movement of the truck with the crane cab mounted thereon is required at frequent intervals because of the nature of the operations. Although ordinarily two men were utilized, one to drive the truck and the other to operate the crane, one of the two men remained idle while the other drove the truck or operated the crane, as the case may be, thereby unnecessarily increasing the expense of any of these operations as well as increasing the amount of time required for performing a job where the crane operator must also be the truck operator.

It is, therefore, an object of the present invention to provide a remote control system such that operation of the truck can be performed by the crane operator in the crane cab.

Another object of the present invention is to provide a remote control system adapted to be applied to truck-mounted cranes wherein the cranes are of the swing platform type, the system being such as to enable the crane operator to control operation of the truck in either a forward or a rearward direction.

A further object of the present invention is to provide such means as to enable the crane operator to operate the essential driving mechanisms of the truck so that as required by the particular operation being performed, the crane operator can move the truck without leaving his cab.

Still another object of the present invention is to provide an arrangement of remote control means such that the essential driving mechanisms of the truck have individual operators therefor and individual controls in the crane cab for respective operators, with the operative interconnection between the controls and operators being such as to offer substantially no interference to operation of the crane and so that the swing platform of the crane is free to be rotated as desired.

Other objects of the present invention are to provide a remote control system that is of simple construction and arrangement and that can be easily installed on conventional truck-mounted cranes.

The means by which the truck can be remotely controlled from within the swing platform crane cab is comprised of a plurality of individual operators for the essential driving mechanisms of the truck, controls located in the crane cab for actuating the individual operators, and means associated with the center pin about which the swing platform is rotatably mounted operatively interconnecting the controls with the operators for remote control. The means associated with the center pin comprises a pair of concentric sleeves, one of which is fixed relative to the center pin and the other of which is resiliently mounted on and non-rotatable relative to the swing platform. The one sleeve has a plurality of collecting rings carried thereby, each of which rings is electrically interconnected with one of the operators by means of a conductor passing through a centrally formed bore in the center pin. The other sleeve is provided with a plurality of brushes electrically contacting the rings and having conductors connecting the same to the controls mounted on a panel in the crane cab. The resilient mounting of the other sleeve is such that the axis thereof may move relative to the axis of the one sleeve as a result of forces arising from impacts due to jolting of the swing platform on the truck when passing over heavy terrain. In order to limit the amount of relative movement between the sleeves, a plurality of idler brushes are provided adjacent the upper ends of the two sleeves.

In addition to the aforesaid means associated with the center pin, there is provided a fluid conduit which is connected to a foot-operated fluid pressure delivering control at one end while the other end is connected to a fluid pressure operator for operation of the clutch of the truck. At the center pin, a portion of the conductor passes through the bore formed therein along with the conductors previously referred to and a swivel connection is provided in the conduit to permit relative movement between portions of the conduit.

It has been found desirable to employ fluid pressure means for the clutch operator inasmuch as vacuum control of that operator would be ineffective should the engine stall. It will be apparent that should the engine stall while in gear, it would be necessary for the operator to remove himself to the truck cab in order to shift to "neutral" before again starting the truck engine. Fluid pressure means are unnecessary for others of the operators inasmuch as vacuum from the truck engine can be utilized for effecting operation thereof. Insofar as the acceleration, starting and steering operating mechanisms are concerned, it has been found that electrical controls and operators are most suitable therefor. Furthermore, it has been found that electrical controls for the vacuum operators of the shifting and braking operators are best adapted to the remote control system since the connections between the remote control and the operators can be made by electrical conductors operatively associated with the center pin about which the swing platform for the crane rotates.

Various other objects and advantages will become apparent from the detailed description to follow. The best embodiment in which I have contemplated applying my invention is illustrated in the accompanying drawings. It will be realized, however, that various mechanical substitutions and modifications can be made without departing from the real spirit and scope of my invention.

In the drawings:

Fig. 1 is a side elevational view of a truck-mounted swing type crane, parts being broken away and parts being shown diagrammatically and disclosing the remote control system in its entirety as applied to the vehicle;

Fig. 2 is an enlarged side elevational view of the truck cab, parts being broken away and parts in section to show certain details of the operating mechanisms for the conventional driving mechanisms of the truck;

Fig. 3 is an enlarged side elevational view of the rear end of the truck chassis with the swing platform of the crane mounted thereon, parts being broken away to show details of the remote control system;

Fig. 4 is an enlarged side elevational view with parts in section showing details of the means for electrically interconnecting the remote controls with the operating mechanisms as associated with the center pin of the swing platform;

Fig. 5 is a horizontal sectional view taken substantially along the line 5—5 of Fig. 4, parts being broken away;

Fig. 6 is a diagrammatic view of substantially the entire remote control system with the exception of the means for controlling the clutch operator;

Fig. 7 is a side elevational view of a portion of the steering wheel and post and showing the operating means associated therewith;

Fig. 8 is a sectional view taken substantially along the plane of line 8—8 of Fig. 7;

Fig. 9 is an enlarged detailed view, partly in section, showing the operating means for shifting;

Fig. 10 is a horizontal view taken substantially along the plane of line 10—10 of Fig. 9;

Fig. 11 is an enlarged vertical sectional view through one of the solenoid valves which is utilized in the braking and shifting operators;

Fig. 12 is an enlarged detailed view, partly in section, showing the control means for supplying fluid pressure to the clutch operator;

Fig. 13 is an enlarged detailed view partly in section showing the operating means for the truck clutch mechanism.

Referring more particularly to the drawings wherein like numerals designate like parts throughout, and with particular attention being given to Fig. 1, it will be seen that there is disclosed a truck-mounted swing type crane designated generally by the numeral **10** which includes a truck cab **12** and chassis **14** and a swing platform **16** for the crane cab (not shown) mounted on the chassis **14**. In the truck cab (Fig. 2) there are provided a plurality of operating mechanisms adapted to operate the essential driving mechanisms of the truck. Of these operating mechanisms, there is included an acceleration operator designated generally by the numeral **18**, a shifting operator designated generally by the numeral **20**, a steering operator designated generally by the numeral **22**, a clutching operator designated generally by the numeral **24** and a braking operator designated generally by the numeral **26**. There is also provided a parallel ignition circuit designated generally by the numeral **28** for effecting ignition of the truck electrical system, a starter operator designated generally by the numeral **30** and a brake locking means designated generally by the numeral **32**.

Figs. 1 and 3 show the general arrangement of the portions of the remote control system associated with the swing platform on the rear end of the truck chassis. At this end, the remote control system includes control means on a panel designated generally by the numeral **34** from which extend a plurality of conductors. Associated with the center pin **36**, about which the swing platform **16** rotates, is a means designated generally by the numeral **38** which operatively interconnects the control means **34** with the individual operating mechanisms **18**, **20**, **22**, **26**, **28**, **30** and **32**.

As is well known in the art, the swing platform **16** has mounted thereon an internal combustion engine which is connected with the shaft **40**, which is, in turn, rotatably journaled in the bearing supports **42** and **44** mounted on the swing platform **16**. The shaft **40** has a pair of beveled gears **46** and **48** fixedly secured thereto. Mounted below the beveled gears **46** and **48** is another beveled gear **50** on a shaft **52** which is vertically rotatably mounted on the swing platform in the bearing **54**. The lower end of the shaft **52** has a pinion **56** fixedly secured thereto and which is so disposed as to operatively engage the bull gear **58** which is fixed within the turntable base **60** mounted on the chassis **14**. The center pin **36** extends axially upwardly from the bull gear and is stationary relative thereto. The floor plate **62** of the swing platform **16** has fixedly secured thereto an upstanding sleeve **64** which rotatably receives the center pin **36** therein. As is conventional in this type of crane, a boom **66** is pivotally mounted on the swing platform **16** by means of the pin **68**, operating means (not shown) being provided for manipulating the boom for any of the usual operations such as trench hoeing, drag-lining, logging and backfilling.

It will thus be realized by one skilled in the art that serious problems are encountered in attempting to provide a remote control system in cranes of the present type in view of the fact that the swing platform is rotatable relative to the chassis of the truck. It is necessary that individual operators be provided for the essential driving mechanisms of the truck and that individual controls be provided in the crane cab for control of the operators. However, to operatively interconnect the two, it is impractical to employ any sort of system that requires the laying of loose cables or conduits from the crane cab to the truck cab such as for example out through the window of the crane cab. If such an arrangement were employed, the swinging operation of the crane cab would be hampered, entanglements would occur and conductors and conduits would be broken. I have found that it is most practical to utilize electrical controls for substantially all of the operating mechanisms with the exception of the clutch control for the reason more fully stated hereinbefore. I have further found that by utilizing electrical conductors and providing a small bore through the center pin of the bull gear, the conductors may be passed through the bore for connection with the operating mechanisms. In order to permit relative rotation between the swing platform and the chassis, I have provided a connection between the controls and the conductors passing through the center pin such that free rotation is maintained therebetween.

Remote controls

Looking now at Figs. 1, 3 and 6, the remote controls **34** will be seen to comprise a plurality of electrical switches mounted on a panel **70**. A lead wire **72** extends over the control panel and is connected to the battery **74** mounted on the swing platform **16**. The other lead from the battery is of course grounded. On the panel **70** is provided an ignition switch **76**, a push-button starter switch **78**, a single-pole, double-throw shift switch **80**, a single-pole, double-throw momentary-contact steering switch **82**, acceleration switch **84**, brake switch **86** and brake locking switch **88**. A plurality of conductors **90**, **92**, **94**, **96**, **98**, **100**, **102**, **104** and **106** interconnect the switch contacts with the means **38** which will be described in detail hereinafter.

The control means **108** for the clutch is best shown in Fig. 12 as including a casing **110** in which is mounted a pressure cylinder **112** having a fluid reservoir **114** integrally formed therewith and in communication with the interior of the cylinder **112** by means of the bleed opening **116**. A piston **118** is reciprocally mounted in the cylinder **112** and has a shaft **120** extending therefrom for pivotal connection with the lower end of the lever **122**. The lever **122** is pivotally mounted about the pin **124** extending transversely of the housing **110** and has its upper end arcuately extending outwardly of the housing. A foot operable lever **126** having a pedal **128** secured to its outer end is also pivotally mounted about the pin **124** and has a link **130** interconnecting an intermediate portion thereof with the free end of the lever **122** by means of the pivot pin **132**. It will thus be seen that upon depression of the foot pedal **128**, the piston **118** will be axially moved within the fluid pressure cylinder **112** delivering fluid pressure through the conduit **134**.

Means for operatively interconnecting the control means with the operating means

Having particular attention to Fig. 4 of the drawings, the manner in which the control means are operated interconnected with the operating means of the truck will now be described in detail. The center pin **36** is

formed with an axial bore 136 which is countersunk at 138 and internally threaded at 140. An externally threaded sleeve 142 is engaged in the countersunk threaded portion. The sleeve 64 has an annular ring 144 integrally secured thereto as by weld at 146. The ring 144 has a plurality of openings 148 formed therein and having their axes in substantially parallel relationship with the axis of the center pin 36. A first sleeve 150 formed of non-conductive material, preferably fibrous in nature, has an annular flange 152 encircling its lower end and through which is formed a plurality of threaded openings 154. A plurality of screws 156 are threadably engaged through the openings 154 and into the fibrous sleeve 150, shank portions thereof being loosely received in the openings 148. Each of the screws 156 has a coil spring 158 encircling the same and interposed between the flange 152 and the ring 144 for resiliently supporting the fibrous sleeve 150 relative to the bearing sleeve 64 for the center pin.

The first sleeve 150 has a plurality of pairs of brush means 160 mounted thereon and adapted for electrical contact with collecting rings formed on the second sleeve to be described hereinafter in detail. Each of the brush means 160 includes a brush holding element or sleeve 162 which is radially mounted within the sleeve 150 and has a brush 164 extending inwardly therefrom. A coil spring 166 is received within each sleeve 162 for urging the brush element radially inwardly. The sleeve 162 is also formed with an externally threaded portion 168 adapted to have an electrical coupling attached thereto. It will thus be seen that each of the conductors 90—106 is connected with a pair of brushes in the manner shown in Fig. 3.

The second sleeve 170 is concentrically received within the first sleeve 150 and has a bottom closure plate 172 fixedly secured thereto. The plate 172 is centrally threadedly apertured at 174 for engagement on the sleeve 142 to maintain the fibrous sleeve 170 in substantially fixed relation to the center pin 36. An annular retaining ring 176 encircles the upper edge portion of the sleeve 170 and is held in abutting relation thereto by means of a plurality of elongated lugs 178 which have their lower ends threadably engaged in bores 180 formed in the bottom plate 172. The sleeve 170 has nine electrical collecting rings 182 encircling the same and longitudinally spaced from each other by means of fibrous non-conductive spacer rings 184. Each of the collector rings 182 has one of the conductors 186, 188, 190, 192, 194, 196, 198, 200 or 202 connected thereto and interiorly of the sleeve 170. The conductors 186—202 all extend downwardly through the sleeve 142 and bore 136. Preferably, a sheathing 204 is provided for the plurality of cables for holding the same together when passing from the center pin to the truck cab whereat the individual conductors are connected to their respective operating mechanisms.

As seen in Fig. 5, the pair of brushes for alternate collecting rings lie in substantially the same plane whereas the alternate set of brushes lie in a plane substantially perpendicular to the first plane, the latter group of brushes being designated by the numeral 160'. Adjacent the upper end of the first sleeve 150 are provided three idler brushes 206 which are staggered relative to the electrical brushes. This set of brushes is engaged with the uppermost ring and, if desired, the springs 208 may be of a higher spring constant than the springs 166 for the electrical brushes. The idler brushes 206 are provided for resiliently retaining the first sleeve 150 in substantially concentric relationship with the second sleeve 170 although permitting relative movement therebetween.

Operating means for the steering mechanism

Attention is directed to Figs. 2, 7 and 8 wherein the relationship between the steering operator 22 and the steering wheel and post is shown and Fig. 6 wherein the electrical diagram therefor is disclosed. A reversible electrical motor 210 is bracketed to the steering post by means of the brackets 212 and 214 and the shaft 216 of the motor has a pinion 218 fixedly secured thereto. The steering wheel 220 mounted on the steering post 222 has an internal gear 224 fixedly carried at the under side thereof and operatively engaged with the pinion 218 so that, upon reversible operation of the motor 210, steering of the truck either to the right or to the left can be effected. A plurality of relays 226, 228, 230 and 232 are mounted on the side panel of the interior of the truck cab at any convenient place.

Having reference now to Fig. 6, it will be seen that upon throwing the momentary-contact switch 82, so as to close either of the circuits for the conductors 198 or 200, either the set of relays 228 and 232 or the set of relays 226 and 230 will be actuated. Assuming that the relays 228 and 232 are actuated, it will be seen that the switches 234 and 236 will be closed while the switches 238 and 240 will be open. Thus the circuit from the truck battery 242 will be through the conductor 244, switch 236, conductor 246, through the field coil 248, conductor 250, switch 234 to the armature 252 and ground thereby driving the reversible motor in a first direction. When the steering wheels have been turned a sufficient amount in the desired direction the momentary contact switch is opened. If it be desired to turn the wheels in an opposite direction, the momentary contact steering switch is thrown to complete the circuit for the conductor 200 which actuates the relays 226 and 230 closing the switches 238 and 240, the switches 234 and 236 being open. The direction of flow of current through the field 248 will thereby be reversed causing reversal of the direction in which the motor rotates and accompanying reversed turning of the steering wheels.

Ignition system

As in conventional, a switch 254 is provided in the truck cab for closing the circuit between the truck battery 242 and the ignition system 256. In order to provide for remote control of the ignition system, a separate switch 76 is provided on the remote control panel 70. Thus, the ignition system 256 can be operated off of the swing platform battery 74.

Acceleration operating mechanism

Figs. 1 and 2 show the manner in which the acceleration operating mechanism is associated with the carburetor of the truck engine and Fig. 6 shows diagrammatically the operation of the mechanism. The conventional linkage for operating the butterfly valve lever 258 includes a pair of links 260 and 262 interconnected by the bell crank 264 whereby depression of the accelerator pedal 266 effects operation of the butterfly valve.

The operating mechanism 18 includes a first relay 268 and a second relay 270 mounted on the common support 272 which, in turn, is mounted on the frame element 274. As will be presently understood, upon actuation of the first relay 268, power is supplied to the second relay 270 whereby the plunger 276 is upwardly urged thereby effecting operation of the butterfly valve lever 258. The plunger 276 has an adjustable connection at 278 whereby the acceleration can be adjusted within limitation.

Looking now at Fig. 6, it will be seen that, upon closing the acceleration switch 84, power will be supplied from the crane cab battery 74 to the relay 268 whereby the switch 280 will be closed in opposition to the spring 282. The circuit from the truck battery 242 to the coil 284 will thereby be closed thus effecting upward movement of the plunger 276 whereby control of the butterfly valve 286 is effected. The relay 270 is preferably of the two-stage type wherein when the switch 280 is closed, the lower portion of the coil 288 is energized lifting the

plunger 276 until the head 290 contacts the points 292 and 294 whereupon current will pass through the upper portion of the coil 296.

Starter operating mechanism

Figs. 1 and 2 show the general relationship between the starter operating mechanism and the truck engine and Fig. 6 shows diagrammatically the operation thereof. Upon closing the push-button starter switch 78 on the remote control panel, the relay 298 will be energized causing the plunger 300 to axially move so that the head 302 thereof engages the contacts 304 and 306 closing the circuit from the truck battery 242 to the starter motor 308. Immediately preceding the closure of the circuit for the starter 308, the plunger 300 effects movement of the Bendix kick arm 310 which axially moves the starter gear 312 into engagement with the ring gear 314 of the flywheel 316. The starter gear 312 and the starter motor 308 having a common shaft 318, starting of the engine can be effected.

Shift operating mechanism

Figs. 2, 9 and 10 show the relative arrangement between the operator for the shifting mechanism of the truck and Fig. 6 shows the means diagrammatically. Mounted on the floor board 320 of the truck cab are a pair of brackets 322 and 324 which support the double acting cylinder 326. A pair of solenoid valves 328 and 330 are provided for communicating opposite sides of the piston 332 with a source of vacuum whereby the plunger 334 connected to the gear shift lever 336 effects shifting into either "forward" or "reverse" from "neutral." The piston 332 is comprised of a pair of discs 338 and 340 clampingly securing therebetween a pair of leather discs 342 and 344. On opposite sides of the piston 332 are positioned a pair of springs 346 and 348 for normally retaining the piston in its "neutral" position. The connection between the plunger 334 and the gear shift lever 336 is best shown in Fig. 10 as including a clamp element 350 held on the gear shift lever 336 by means of the nut and bolt 352 and 354. The clamp element 350 is bifurcated at 356 so as to receive the flattened end 358 of the plunger 334 therebetween. Aligned openings 360 and 362 are formed in the flattened end 358 and bifurcated portion 356 respectively. A latching element 364 is adapted to be engaged through the openings 360 and 362 and has a pivotal end portion 366 carried by one end thereof for normally retaining the same in its connected relationship.

Looking now at Fig. 6, it will be seen that, upon throwing the shift switch 80 so as to close either of the circuits through conductors 190 or 192, one of the solenoid operated valves 328 or 330 will be actuated. Assuming that current passes from the crane cab battery 74 through the conductor 192, it will be seen that the solenoid valve 328 will be actuated whereby the valve disc 368 will have lifted from its seat while the valve disc 370 will be engaged against its seat. The vacuum line 372, which is communicated with the vacuum manifold of the truck engine by means of the line 374, is in open communication with the upper chamber 376 of the solenoid valve 328. Thus, when the valve disc 368 is lifted from its seat the piston chamber 378 of the cylinder 326 will be connected to vacuum and will cause the piston 332 to move to the left shifting the lever 336 to its "reverse" position. Upon reopening the switch 80, the solenoid valve 328 will be deactuated and the valve disc 368 will return to its closed position while the valve disc 370 opens communicating the chamber 378 of the cylinder with the atmosphere thereby permitting the piston 332 to return to "neutral" position. It will thus be seen that shifting of the lever 336 to "low" can be effected by throwing the switch 80 so as to energize the solenoid valve 330.

Brake operating mechanism

The brake operating mechanism is shown in its operative relationship beneath the truck cab in Fig. 2 and is shown diagrammatically in Fig. 6. In the conventional brake system for the truck, the brake pedal lever 380 effects reciprocation of the plunger 382 by means of the link 384. The plunger 382 has the piston 386 of the master cylinder 388 secured thereto whereby upon depression of the foot pedal 390, fluid pressure is delivered from the cylinder 388 by means of the conduit 392 to the hydrovac unit and the wheel cylinders. As is conventional, a reservoir 394 is provided atop the master cylinder 388 for communication therewith through the bleed passage 396. The remotely controlled operating means for the master cylinder includes the solenoid operated valve 398 which communicates the diaphragm operator 400 with a source of vacuum in order to reciprocate the plunger 402. The solenoid valve 398 is similar in construction to either of the solenoid valves 328 or 330 and a more detailed discription thereof will be made hereinafter. The solenoid valve 398 is communicated with the conduit 374 whereby vacuum from the manifold can be supplied to the chamber 404 of the diaphragm casing 400 upon actuation of the solenoid valve 398. Thus, when the brake switch 86 is actuated, current will pass from the crane cab battery 74 through the conductor 188 to the solenoid valve 398 lifting the disc 406 from its seat and closing the disc 408 on its seat whereby vacuum from the conduit 374 urges the diaphragm 410 in opposition to the spring 412 moving the plunger 402 so as to pivot the lever 414 thereby moving the plunger element 416 into engagement with the master cylinder piston 386 so as to force fluid pressure from the cylinder 388 to the hydrovac unit and the wheel cylinders. Inasmuch as there is no positive connection between the plunger 416 and the piston 386, the conventional operation of the brake system will not in any way be hampered.

Brake lock operating mechanism

As is conventional in trucks of the present type, a micro-valve 418 is provided which, upon actuation, locks the pressure to the brake cylinders. In order to provide for remote control thereof, a brake lock switch 88 is provided on the remote control panel 70. Upon closure of the switch 88, current passes through the conductor 186 to the micro-valve unit actuating the same so as to lock the brakes.

Clutch operating mechanism

Details of the clutch operating mechanism are best shown in Figs. 2 and 13, reference being made to Fig. 12 to show the manner in which fluid pressure is served from the remote control to the operating mechanism.

In the conventional clutch operation, depression of the clutch pedal 446, pivoting about the pivot 448 occurs thereby effecting movement of the conventional clutch linkage rod 450. The clutch operating fork 452 is adjustably mounted on the externally threaded rod 450 by means of the pair of nuts 454. The operative connection between the clutch fork and the clutch is conventional as will be understood by one skilled in the art.

In order to effect remote control of the movement of the clutch fork 452, without utilizing a positive mechanical connection, there is provided a single action cylinder 456 carried by the bracket plate 458 which in turn is suitably secured to the frame so as to align the plunger 460 of the piston 462 with the rod 450 of the conventional linkage. The end plate 464 of the cylinder is provided with an opening 466 and nipple 468 to which the fluid pressure conduit 134 is connected for supplying fluid pressure upon depression of the pedal 128 (see Fig. 12). A light stopper spring 470 is disposed within the cylinder between the piston 462 and the end 464 to resiliently limit the piston movement. A stop nut 474 is adjustably mounted on the plunger 460 for engagement with the stop 476 fixedly carried by the bracket for limiting the movement of the plunger. The conventional rod 450 has

a push plate 478 threadably carried by the end 480 adjacent the end 482 of the rod 460.

It will thus be seen that clutch release can be accomplished by depression of the pedal 128 on the swing platform which supplies fluid pressure to the cylinder 456 whereby the plunger 460 engages the push plate 478 effecting movement of the rod 450 and clutch fork 452 connected thereto. Upon release of the pedal 128 the spring 113 effects return of the pistons to their initial positions. Of course normal clutch release by an operator in the truck cab is unhampered.

Having reference now to Fig. 11, it will be seen that a solenoid valve of the type particularly adapted to be employed in the shifting and braking mechanisms has been provided. The valve includes a casing 420 which has an inlet opening at 422 adapted to be connected to a source of vacuum by means of a conduit 424. The casing is also provided with an opening at 426 which is adapted to be connected with any element that is to be communicated with the vacuum by means of the conduit 428. Inbetween the end connections of the valve casing is formed a partition wall 430 which provides a valve seat at 432. A valve plunger 434 is reciprocably mounted within the casing 420 and has a valve disc 436 fixedly secured thereto so as to be engageable against the valve seat 432. A second valve disc 438 is secured to the lower end of the plunger 434 so as to close the bleed opening 440 formed in the casing whenever the solenoid coil 442 is actuated. The plunger 434 has a core 444 formed therein which, upon actuation of the solenoid 442, effects reciprocation of the plunger 434. When the valve is actuated, the disc 438 is in its closed position and the disc 436 is in its open position so that vacuum is supplied from the conduit 424 to the conduit 428. Upon deactuation of the valve, the disc 436 returns to its closed position and the disc 438 provides for open communication through the bleed opening 440 whereby the vacuum in the line 428 is open to atmosphere.

In view of the foregoing, it will be seen that I have provided a remote control system which will accomplish all of the objects hereinbefore set forth. Furthermore, in view of the description and operation of the individual components of the system, a detailed description of the entire operation is deemed unnecessary.

If in performing any of the operations usually performed by truck-mounted cranes of the type disclosed, it is necessary to move the truck and crane mounted thereon, the crane operator merely by operation of the electrical switches and clutch pedal, can start the truck engine and drive either forwardly or rearwardly, turning of the steering wheels being remotely accomplished as desired. The brakes of the truck can be remotely applied and locked when necessary. Acceleration is also possible.

It is to be particularly noted that, in general, the remotely controlled operating mechanisms for the various driving mechanisms of the truck are so related thereto as to offer little or no resistance to conventional operation of the truck. It is also to be noted that but one connection or disconnection, as the case may be, is necessary to switch from remote control to conventional control or vice versa. Reference is made to the shifting mechanism that is connected to the gear shift lever of the truck. A simple arrangement is provided for easy connection and disconnection.

It will, of course, be understood that various mechanical modifications and substitutions of equivalents can be made without departing from the real spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A remote control system for earth handling and working machines of the type including a truck cab and a swing platform crane cab mounted on the chassis of the truck, said system comprising control means adapted to be mounted in the crane cab, preselected driving mechanisms for the truck including starting, steering, acceleration, gear shift, clutch operating and brake mechanisms each having an operating means adapted to be associated therewith for effecting operation thereof, means for actuating each of said mechanisms from the truck cab, and means adapted to be associated with the center pin of the swing platform for operatively interconnecting said control means with the operating means so that operation of the preselected driving mechanisms can be controlled by an operator in the crane cab, said acceleration mechanism operating means including a reciprocable link adapted to be connected to the lever for operating the butterfly valve of the carburetor of the truck, a first relay, a second relay for effecting control of the reciprocable link, and said control means including electrical switch means for controlling said first relay whereby upon actuation thereof, the second relay is actuated and the reciprocable link is moved to effect pivoting of the lever to control the positioning of the butterfly valve for acceleration.

2. In an earth working machine of the character described having a wheel supported automotive type vehicle frame and operator's cab and a crane mounting and cab pivotally supported thereon for rotation, an internal combustion engine on the frame, a clutch mechanism and gear shifting mechanism accessible from the operator's cab and acceleration mechanism for the engine on the frame, the acceleration mechanism including a fuel controlling butterfly valve, means extending through the pivotal axis of the crane mounting operable from the crane cab for actuating the gear shifting mechanism, means extending through the pivotal axis of the crane mounting operable from the crane cab for opening the butterfly valve for selectively actuating the accelerator mechanism to increase the speed of the engine, and means extending through the pivotal axis of the crane mounting operable from the crane cab for controllably releasing and engaging the clutch while actuating the accelerator mechanism.

3. In an earth moving machine of the character described having a wheel supported automotive type vehicle frame and operator's cab and a crane mounting and cab pivotally supported thereon for rotation, an internal combustion engine on the frame, a clutch mechanism and gear shifting mechanism accessible from the operator's cab and acceleration mechanism for the engine on the frame, the acceleration mechanism including a fuel controlling butterfly valve, means extending through the pivotal axis of the crane mounting operable from the crane cab and actuating the gear shifting mechanism, electrical means extending through the pivotal axis of the crane mounting operable from the crane cab for opening the butterfly valve for selectively actuating the accelerator mechanism to increase the speed of the engine, and means extending through the pivotal axis of the crane mounting operable from the crane cab for controllably releasing and engaging the clutch while actuating the accelerator mechanism.

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