Oct. 7, 1952 A. R. MAIER ET AL 2,613,059

WELL DRILLING RIG

Filed June 5, 1946 6 Sheets-Sheet 1

Fig. 1.

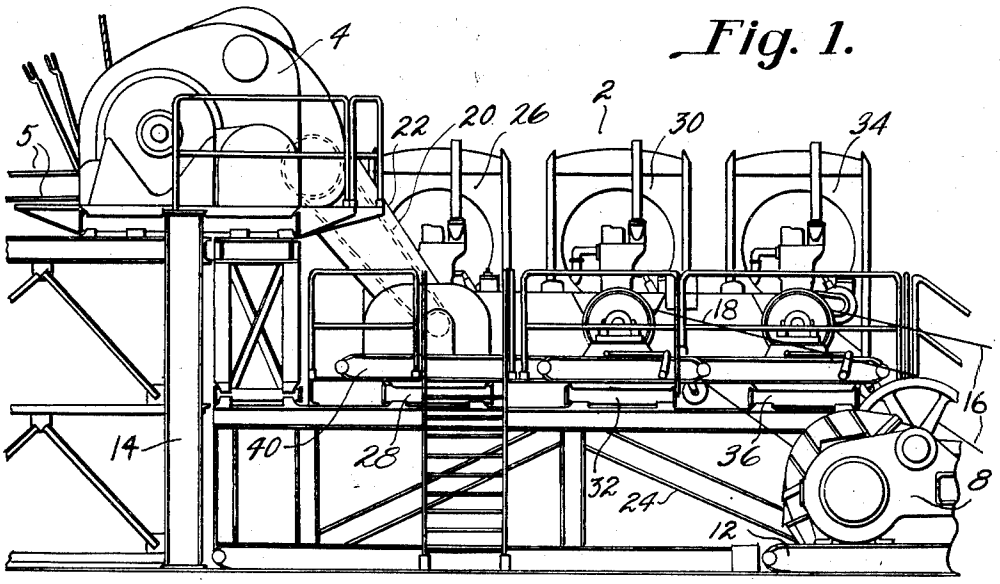
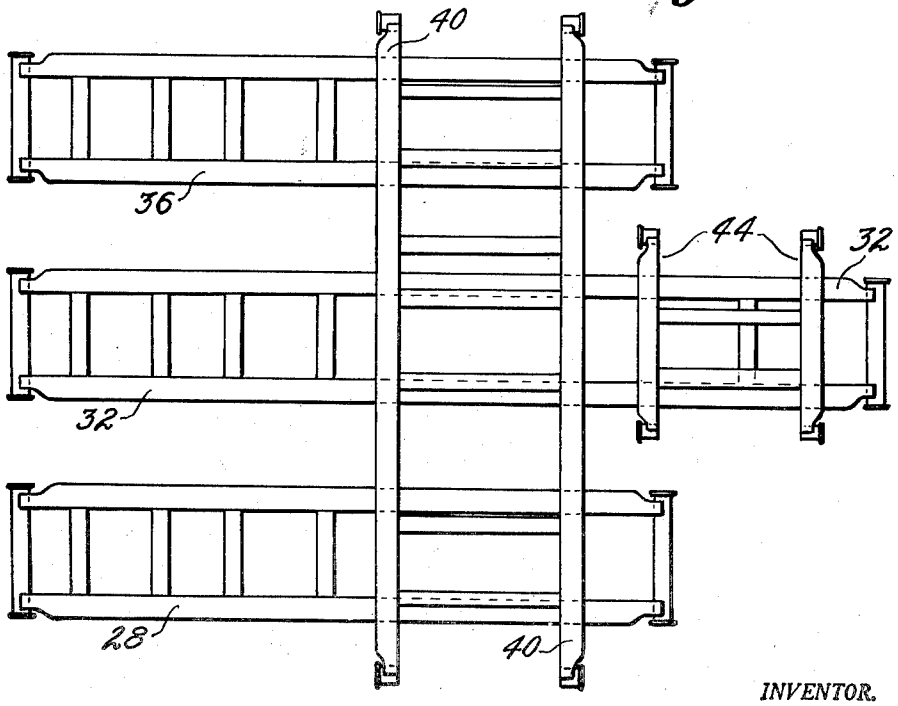


Fig. 3.



INVENTOR.
John W. Jacoby
August R. Maier
BY Donald G. Dalton
THEIR ATTORNEY

Oct. 7, 1952 A. R. MAIER ET AL 2,613,059

WELL DRILLING RIG

Filed June 5, 1946 6 Sheets-Sheet 2

Fig. 2.

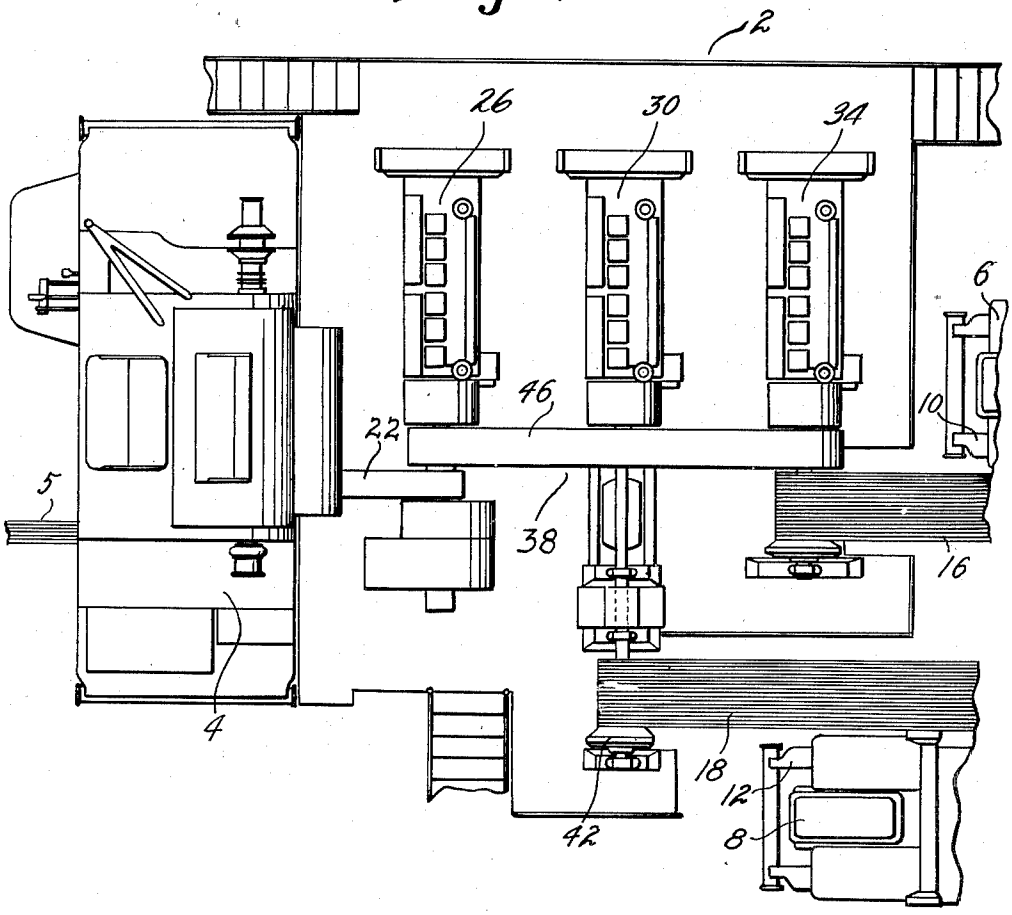
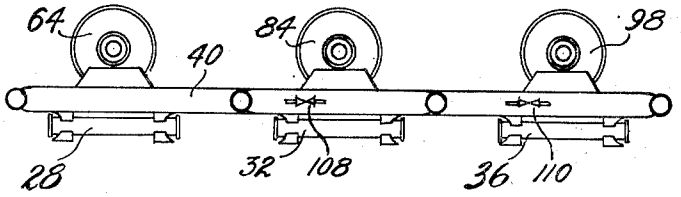


Fig. 5.



INVENTOR.
John W. Jacoby
August R. Maier
BY Donald G. Dalton
THEIR ATTORNEY

Oct. 7, 1952 A. R. MAIER ET AL 2,613,059

WELL DRILLING RIG

Filed June 5, 1946 6 Sheets-Sheet 3

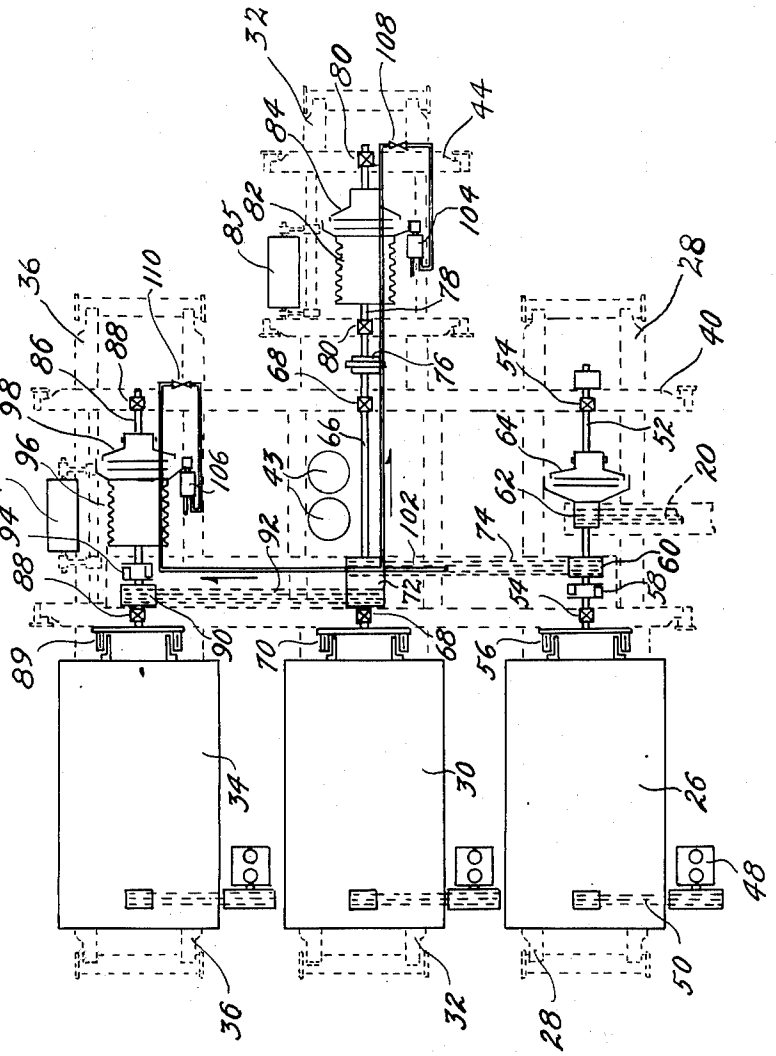


Fig. 4.

INVENTOR.
John W. Jacoby
August R. Maier
BY Donald G. Dalton
THEIR ATTORNEY

Oct. 7, 1952 A. R. MAIER ET AL 2,613,059

WELL DRILLING RIG

Filed June 5, 1946 6 Sheets-Sheet 4

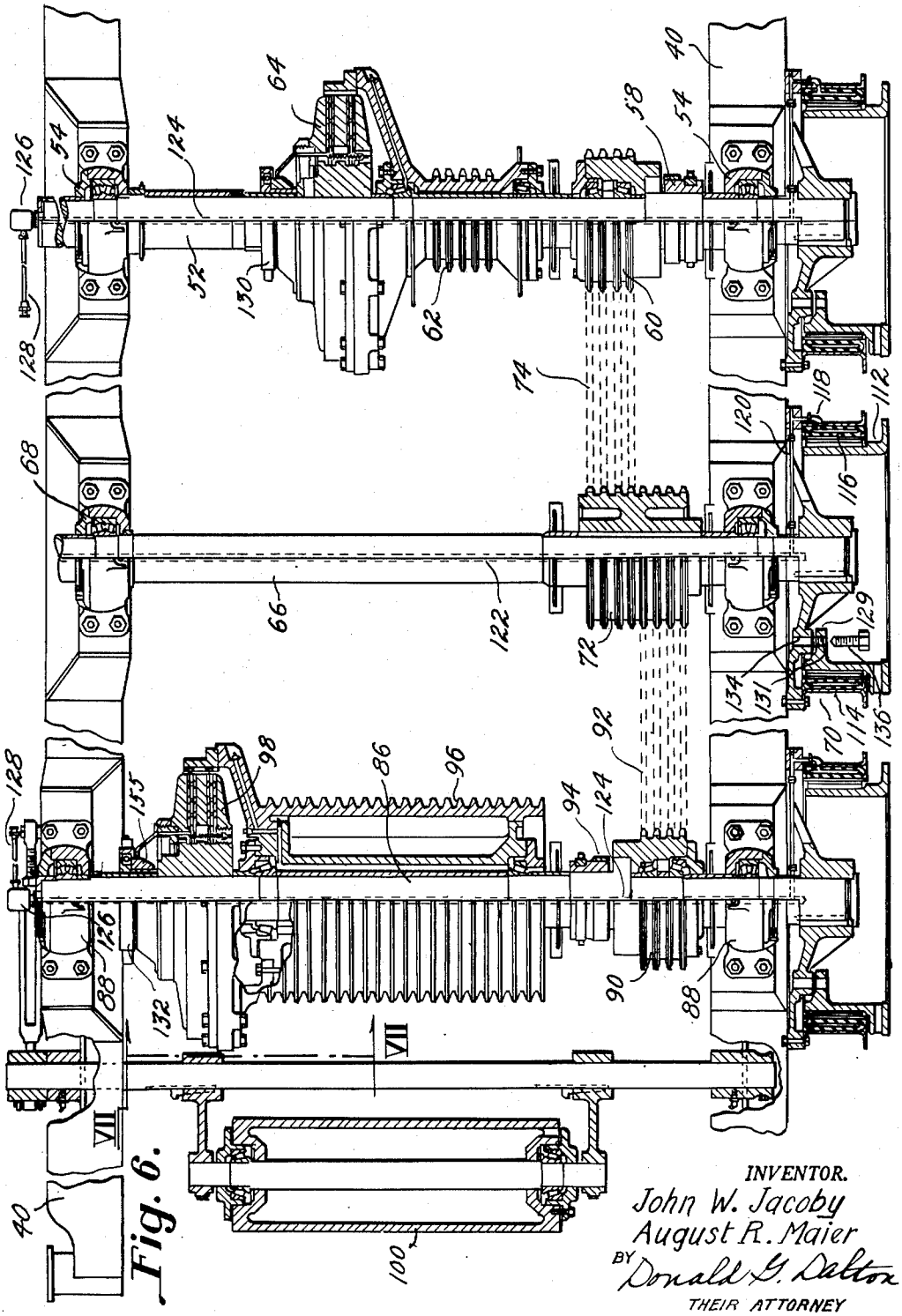


Fig. 6.

INVENTOR.
John W. Jacoby
August R. Maier
BY Donald G. Dalton
THEIR ATTORNEY

Oct. 7, 1952 A. R. MAIER ET AL 2,613,059

WELL DRILLING RIG

Filed June 5, 1946 6 Sheets-Sheet 5

Fig. 6a.

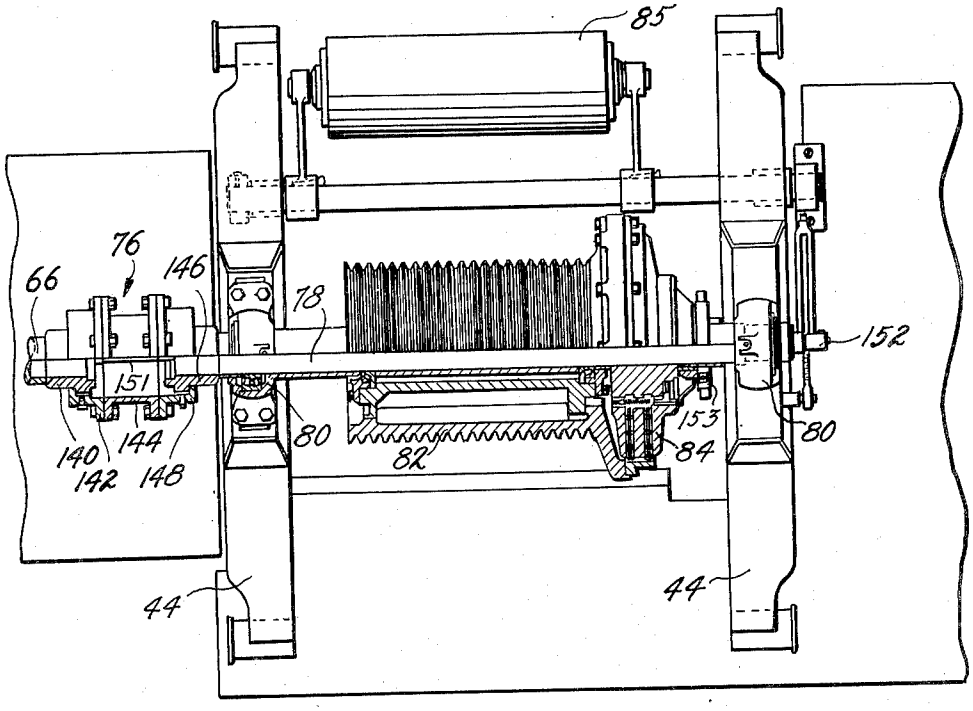
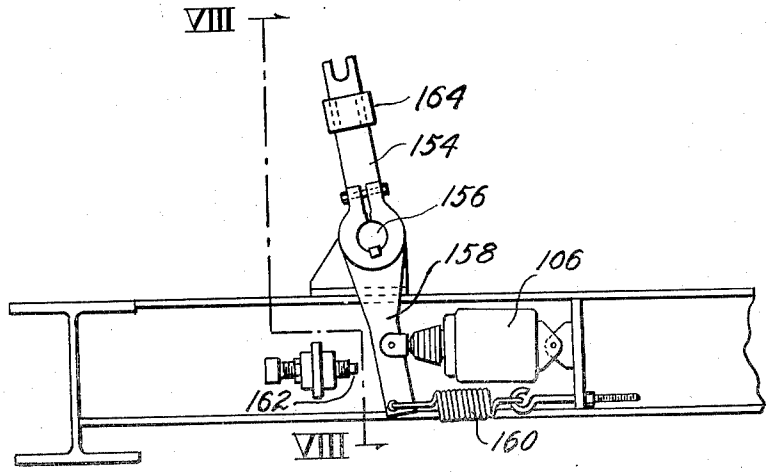


Fig. 7.



INVENTOR.
John W. Jacoby
August R. Maier
BY Donald G. Dalton
THEIR ATTORNEY

Oct. 7, 1952 A. R. MAIER ET AL 2,613,059

WELL DRILLING RIG

Filed June 5, 1946 6 Sheets-Sheet 6

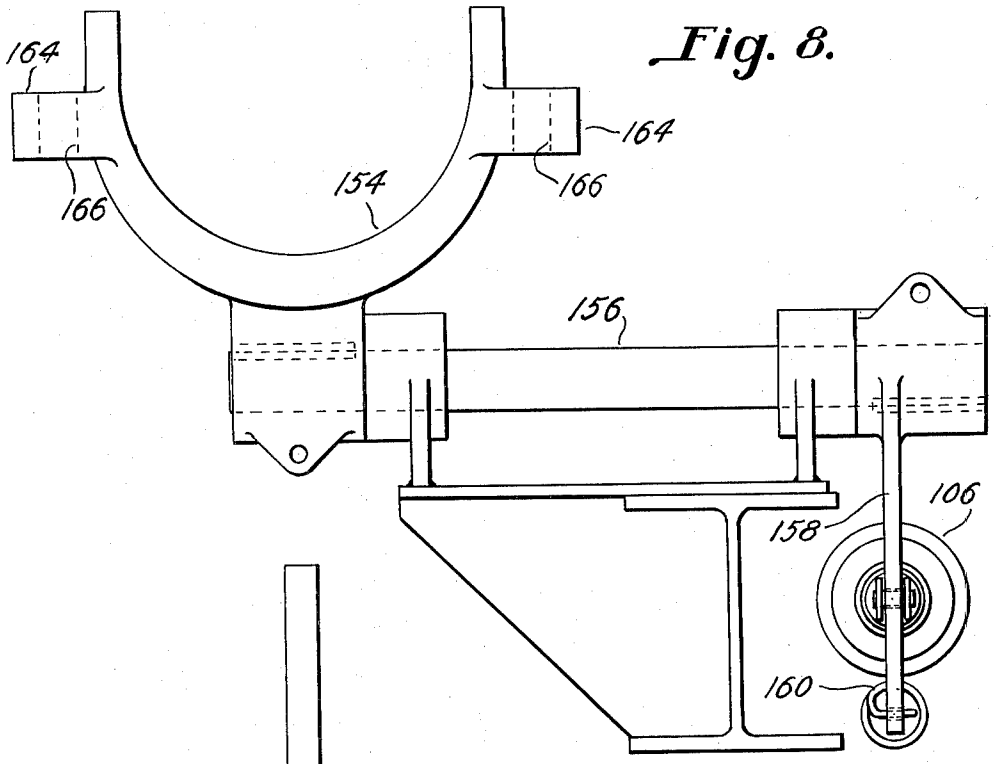


Fig. 8.

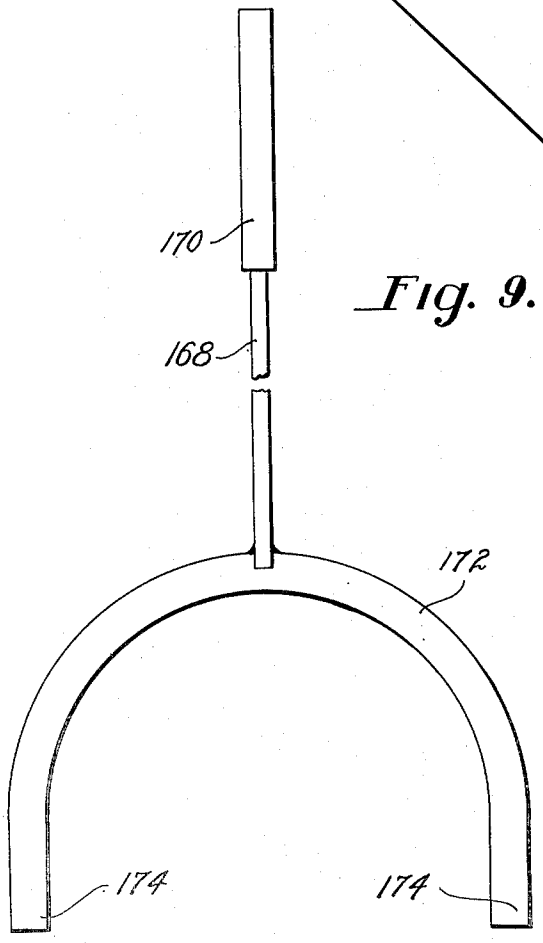


Fig. 9.

INVENTOR.
John W. Jacoby
August R. Maier
BY Donald G. Dalton
THEIR ATTORNEY

Patented Oct. 7, 1952

2,613,059

UNITED STATES PATENT OFFICE

2,613,059

WELL DRILLING RIG

August R. Maier and John W. Jacoby, Oil City, Pa., assignors to United States Steel Company, a corporation of New Jersey

Application June 5, 1946, Serial No. 674,612

5 Claims. (Cl. 255—19)

1

This invention relates to a well drilling rig of the rotary drilling type and more particularly to a multiple engine drive for such rig.

The invention has among its objects the provision of a well drilling rig with a multiple engine drive, such drive being characterized by its simplicity, its compact arrangement, and its flexibility of operation and control.

A further object of the invention lies in the provision of a multiple engine drive capable of easy disassembly into a small number of easily transportable units, the design being such that it is unnecessary to disconnect chain drives within the driving unit in effecting such disassembly. The driving unit is so constructed as to allow simple removal of the engines, the removal of some of the engines not interfering with the operation of the driving unit.

A still further object of the invention is the provision of safety controls for the pump clutches of the drilling rig driving unit whereby operation of such clutches from the central control station is prevented before actuation of safety controls positioned at the clutches.

These and further objects of the invention will be more readily apparent in the following description of a preferred embodiment of the invention.

In the preferred embodiment described and illustrated a driving unit employing three engines is disclosed. It will be understood, however, that the invention may be employed with any number of engines from and including two or more, the number chosen depending upon the power requirements of the drilling rig.

In a multiple engine drive, of which the triple engine drive disclosed is typical, for driving the drawworks, one or more slush pumps, and if desired, the rotary of a drilling rig, it is desirable to have the assembly completely unitized and of compact construction. It is of particuluar importance to have the drive unit arranged so that it can be easily disassembled in moving from one location to another without having to take apart too many sub-assemblies or exposing any vital parts to damage or dirt. It is also desirable to have a compact arrangement so that the unit occupies a minimum of space on the drilling rig, and so that the drive has no shafts, clutches, or chains which have to be removed when moving from one location to another except for the one chain or driving means between the drive unit and the drawworks. It is also very desirable, in order to provide utmost flexibility, that, if necessary, one or more of the engines may be disconnected from

2

the driving unit so as to permit work thereon while operation of the rig is continued by the remaining engines.

The multiple engine driving unit for the drilling rig of the present invention complies with the above requirements by the provision of a novel construction permitting the disassembly of the drive unit, in the case of a three engine drive, into four major sub-assemblies. Such four sub-assemblies consist of the three engines, each mounted on its own skid, and the compound drive assembly on its skid type base which lies across the rear ends of the engine skids. When an auxiliary slush pump is employed, one of the engine skids may be made longer than the other two to allow the mounting of an auxiliary pump drive on the rear thereof, such pump drive being driven through a further engine extension shaft connected to the corresponding engine and the compounding drive.

The invention will be more readily understood by reference to the accompanying drawings, in which:

Figure 1 is a view in end elevation of an oil well drilling rig provided with a drive unit in accordance with the present invention;

Figure 2 is a view in plan of the drive unit and associated elements of the drilling rig shown in Figure 1;

Figure 3 is a view in plan of the engine skids, the compound drive skids, and the auxiliary pump drive skids in assembled position;

Figure 4 is a schematic view in plan of the driving mechanism of the drive unit and the safety controls for the pump clutches;

Figure 5 is a schematic view in end elevation of the structure shown in Figure 4, further showing the position of the safety controls for the pump clutches;

Figure 6 is a view in plan of the engine extension shafts and the compounding drive, certain parts being shown in section;

Figure 6A is a view in plan of the auxiliary pump drive off the extension shaft of the center engine, certain parts being shown in cross section;

Figure 7 is a view in elevation of the pump clutch control mechanism for one such clutch, the view being taken from the plane VII—VII in Figure 6;

Figure 8 is a view in elevation of the clutch control mechanism shown in Figure 7, the view being taken along the line VIII—VIII in Figure 7; and

Figure 9 is a view in side elevation of an auxil-

iary manual clutch cotrol lever which may be employed in an alternative mode of control of the pump drive clutches.

The multiple engine driving unit of the present invention, designated generally by the reference character 2, is designed to drive the drawworks 4 of an oil well drilling rig, as shown in Figures 1 and 2. In the modification shown the rotary of the unit (not shown) is driven off the drawworks through the medium of the chain 5. Also driven by the driving unit is the main slush pump 6 mounted on its own skids 10, pump 6 being driven from the extension shaft of the engine 34, Figures 1 and 2, through the medium of multiple belts 16 in a manner more fully to be described. In the design shown, a second, auxiliary, slush pump 8 mounted on its skids 12 is also driven by the unit through the medium of multiple belts 18, the drive for such second pump being provided by the auxiliary pump drive 42 connected to the rear end of the extension shaft of the center engine. As shown in Figure 1, the driving unit is supported by a structure 24 providing an elevated platform, and the drawworks is supported partially on such platform and partially on a further supporting structure 14 which may likewise support the rotary (not shown). Driving of the drawworks is effected through the chain 20, shown in Figure 1, which is enclosed in the oil bath guard 22. When the driving unit is disassembled for transportation it is necessary to disconnect chain 20 and guard 22 to permit separation of the drawworks from the driving unit.

The driving unit is provided with three internal combustion engines 26, 30, and 34, each of which is provided with its own supporting skids 28, 32, and 36, respectively. As more clearly shown in Figure 3, the compounding drive 38, which permits the selective connection of the engines together to drive one or more of the driven units such as the drawworks, pumps, and rotary, is provided with its supporting skids 40 which rest across and are secured to the rear ends of the engine skids as shown in Figure 3. In the particular design illustrated, as above explained, two slush pumps are employed. The drive 42 for the auxiliary slush pump 8 is mounted upon skids 44 which rest upon the rear end of the center engine skids 32 as shown in Figure 3, such center engine skids being longer than the skids of the two outer engines.

Figure 4 shows schematically the lay-out of the major elements of the driving unit. As shown, each engine drives an air compressor so as to provide compressed air at the rig for operation of the various clutches and for various pieces of auxiliary air driven equipment. The air compressor driven by engine 26 through the medium of multiple belts 50 is designated 48. Each of the three air compressors feeds into air tanks 43 (Figure 4) from which it is distributed to various parts of the rig through pipes not shown.

Engine 26 is provided with an extension shaft 52 supported in main bearings 54 in the form of pillow blocks which in turn are supported on suitable supporting members connected to the compounding drive skids 40. Connection between engine 26 and shaft 52 is effected by means of the selectively operable flexible coupling 56 which will be more fully described below. Beyond coupling 56 there is positioned on shaft 52 the selectively operable mechanical clutch 58 which when engaged secures the compounding sheave 60 for rotation with shaft 52, and when disengaged allows the sheave to rotate freely with respect to the shaft. Also mounted on shaft 52 is the drawworks driving sheave 62 which is selectively secured for rotation with the shaft and freed therefrom by engagement and disengagement, respectively, of the air operated friction clutch 64.

The center engine 30 is provided with an extension shaft 66 journaled in main bearings 68 likewise supported on skids 40. Engine 30 is connected to shaft 66 through the flexible coupling 70 similar to the coupling 56 which is employed with engine 26. Shaft 66 is provided with a multiple compounding sheave 72, one end of which is connected to sheave 60 on shaft 52 by the multiple compounding chain 74. The center engine drives the auxiliary pump drive 42 by means of the second extension shaft 78 journaled in bearings 80 supported from the auxiliary pump drive skids 44, shaft 78 being positioned coaxial of extension shaft 66 and being connected thereto by means of the removable flexible coupling 76, the construction of which will be more fully explained in the discussion of Figure 6A. Positioned on shaft 78 is the multiple sheave 82 which receives the multiple belts 18 for driving auxiliary slush pump 8. The auxiliary pump drive is provided with an adjustable belt tightener pulley 85, whereby the tension of belts 18 may be suitably adjusted.

The third engine 34 is provided with an extension shaft 86 supported in bearings 88 attached to skids 40. The connection between the engine and the extension shaft is provided by flexible coupling 89 which is similar to those employed with the two other engines. Shaft 86 is provided with a compounding drive sheave 90 over which and the left hand portion of sheave 72 on shaft 66 (Figure 4) run the multiple compounding chains 92. Sheave 90 may be selectively clutched to and disengaged from shaft 86 by the operation of the compounding drive clutch 94. Also positioned on shaft 86 is the main pump drive sheave 96 which may be driven by or disengaged from shaft 86 by operation of the air operated clutch 98. The main slush pump 6 is driven by multiple belts 16 running over sheave 96, such belts being suitably tightened by the adjustable belt tightener pulley 100.

As above explained, the pump drive clutches 94 and 98 are engaged and disengaged by means of pneumatic controls. Such controls, which will be more fully explained in connection with Figures 6, 7, and 8, incorporate pneumatic servomotors, shown schematically in Figure 4 at 104 and 106, respectively. The air for operating such motors is supplied through pipe 102. In normal operation air is delivered to such pipe by the operation of suitable control valves (not shown) positioned at the central control station. The servomotors and their connection to the clutch operating means are such that the clutches are engaged when air is delivered from tanks 43 through pipe 102, which are connected to said tanks, to said motors and are disengaged when air is shut off therefrom. Because the driving unit and associated elements of the drilling rig are quite large and the slush pumps thus cannot readily be seen from the central control station, safety means are provided in the clutch control system so that the slush pumps cannot be operated from such central portion while anyone is working on the pumps. Such safety controls consist of shut-offs 108 and 110 positioned in the delivery pipes to servomotors 104 and 106, respectively, in the positions shown in Figures 4

and 5. Whenever repairs or adjustments must be made to either or both of the slush pumps, the appropriate one or both of the shut-offs 108 and 110 are closed. Operation of the pump drive clutches is therefore prevented by operation of the controls at the central station until the safety shut-offs adjacent the clutches are again opened.

The structure of the compounding drive, the three-engine extension shafts, and the drives for the two slush pumps is shown more clearly in Figures 6 and 6A. The construction of the flexible couplings 56, 70, and 89 will be better understood by the following description of such coupling 70 provided between the central engine and its extension shaft. The particular flexible coupling shown is one known as the Fawick Airflex clutch, which is made by the Fawick Airflex Company. Such coupling consists of an inner drum 112 bolted to the end face of the flywheel of the engine, the flywheel not being shown in the figure, such inner drum cooperating with the outer drum 114 which is keyed to the forward end of shaft 66. The outer drum carries on its inner peripheral surface an inflatable friction element 116 which is generally in the nature of a flattened automobile tire. The sizes and spacing of parts 112, 114, and 116 are such that when the inflatable element is deflated it is free from contact with the inner drum and thus there is no driving connection between the engine and extension shaft. A particular engine therefore may be worked upon while idle, while the rig is driven by the other engines, merely by disconnecting the Airflex clutch for that particular engine. Furthermore, an engine may be removed altogether from the unit simply by being slid axially away from the extension shaft, after being disconnected from its skids, upon deflation of element 116.

Air for the inflation of the element 116 is provided through inlet pipe 118 connected to the radial pipe 120 leading to the central bore 122 extending axially through the engine extension shaft 66. Each of the other flexible couplings 56 and 89 has a similar construction, in both cases air for the inflatable element being supplied through the axial bore 124 in the engine extension shafts 52 and 86. Air from a suitable compressed air source such as the tanks 43 and controlled by suitable means, not shown, at the central control station, is supplied to the Airflex clutches through means such as flexible conduits 128 and connecting means 126 which preserve a fluid tight joint when the engine extension shafts rotate and the conduits 128 remain stationary. Because of the connection of the auxiliary slush pump driving means to the end of the central engine extension shaft 66, the means for supplying air to the central bore 122 is somewhat modified. Such construction will be explained in connection with Figure 6A.

In some instances it is desired to drive an engine extension shaft from the motor when there has been a failure in the air supply system. In such case connection of the engine and the shaft by the usual operation of the Airflex clutch coupling is not possible. For this reason it is preferred to equip each Airflex clutch with a mechanical auxiliary driving means as shown in Figure 6 in connection with coupling 70. The inner drum 112 of the coupling is provided with a radially extending ear 129 having a tapped hole 131 therethrough. There is provided a hole 134 in the radial web of the inner drum 114, such hole being aligned with the hole 131. Upon failure of the air supply system, a driving connection between the engine and the extension shaft may be effected by the insertion of the stud 136 through the holes 131 and 134, thereby locking drums 112 and 114 together for rotation.

The auxiliary pump drive 42 is driven, as above explained, off the rear end of extension shaft 66 of the central engine. In order to permit the ready removal of the compounding drive 38 mounted on skids 40 without the necessity of disturbing the auxiliary pump drive 42, there is provided the flexible coupling 76 between the shaft 66 and the shaft 78 of the auxiliary pump drive. As shown in Figure 6A there is permanently affixed on the outer end of shaft 66 beyond the outer bearing or pillow block 68 a sleeve hub 140. A similar hub 146 is affixed to the forward end of the shaft 78 beyond the bearing or pillow block 80 of the auxiliary pump drive. The hubs 140 and 146 are secured to the ends of their respective shafts in any conventional manner, for example by welding. An end housing 142 of the coupling engages the hub 140 and a similar end housing 148 engages hub 146 through the medium of loosely engaging radial teeth upon the hubs and housings. A double flanged outer cylindrical spacer 144 bolted as shown between the end housings completes the coupling. Because of the manner of engagement between the hubs and the end housings the coupling affords some degree of flexibility to compensate for slight misalignment of the shafts 66 and 78. Compressed air for operating the Airflex clutch 70 is transmitted through the rotary connection 152, which is similar to members 126, through an axial bore in the shaft 78 (not shown) and through the bore 122 in shaft 66, connection between the bore in shaft 78 and the bore 122 being effected by the tube 151 within coupling 76. Tube 151 may be threaded into the bore in each such shaft, or it may be mounted in stuffing boxes positioned axially at the end of each shaft. The compounding drive may be removed from the driving unit by deflating the couplings 56, 70, and 89, taking the spacer 144 out of flexible coupling 76, and sliding the compounding drive away from the engines.

The means for operating the pump drive clutches 84 and 98 are the same and will be explained in connection with the control of the main pump driving clutch 98. Clutches 84 and 98 are conventional commercially available clutches. As shown in Figure 6, such clutch has an operating collar 132 carrying on the inner face thereof a generally conical cam 155, such cam having a tapered, somewhat rounded, forward end and a generally cylindrical rear end adjacent collar 132. The thrusting of the collar toward the clutch housing causes the forward end of the cam 155 to engage bell crank levers, not shown, and thus gradually to cause engagement of the clutch as the ends of such levers ride further up on the cam. When the clutch is fully engaged, the ends of the clutch operating levers engage the rearward cylindrical portion of the cam so that the collar and cam, when thus thrust completely forward, have a tendency to remain stably in that position.

The collar 132 is provided with oppositely extending trunnions for engagement by the upper forked arms of the clutch actuating lever 154 shown in Figures 7 and 8. The fork lever 154 is affixed to one end of the rock shaft 156 as shown in Figure 8, the other end of the shaft being provided with the depending lever 158 likewise keyed

thereto. Movement of lever 154 in a clockwise direction in Figure 7 thrusts collar 132 toward the clutch housing to engage the clutch 98, and counterclockwise motion of the lever retracts the collar 132 to disengage the clutch. Connected to the lever 158 is the servomotor 106 to the rear end of which is connected the air supply pipe 102. Likewise connected to lever 158 is the tension spring 160 which urges lever 154 toward the clutch disengaging position. When air is admitted to motor 106, lever 158 and consequently lever 154 are urged clockwise (Figure 7) toward the clutch engaging position, the limit of movement in this direction being determined by means of the adjustable stop 162, which consists of a stud threaded through a fixed portion of the supporting structure, the forward end of the stud being engaged by the rear side of lever 158.

In some instances, such as the failure of the air supply discussed above in connection with the alternative mode of operation of the Airflex couplings, it may be necessary to control the pump drive clutches manually. To permit such manual operation of the clutches the upper forked ends of each clutch operating lever, as typified by lever 154, are provided with oppositely extending horizontal ears 164, each of which is provided with a vertical hole 166. Such ears are designed to receive the parallel prongs 174 of the manual clutch operating lever 168 shown in Figure 9, such lever being provided with a handle 170 at its upper end.

In the event that the pump clutches are to be controlled manually the tension spring 160 on lever 158 is disconnected. Thereupon, lever 168 is inserted with the ends 174 through the holes 166 so that the lever 154 may be shifted by use of the lever 168 to engage or disengage the clutch. The structure of the clutch is such, as explained above that, with the spring 160 disconnected, cam 155 will stay stably in either the clutch engaging or disengaging position when moved thereto.

Whereas we have shown and described a particular modification of the drive unit for the rotary drilling rig of our invention, it is to be understood that the invention is capable of considerable variation, and that the scope of the invention is defined by the following claims. We desire to claim as new the following.

We claim:

1. In a rotary drilling apparatus including a drawworks, a main slush pump, and an auxiliary slush pump, the combination of a multiple engine drive unit comprising a plurality of parallel engines having driving shafts at their rear ends, a compounding drive unit positioned across the rear ends of the engines at right angles to the engine shafts, said compounding drive unit including an extension shaft for each engine, selectively engageable coupling means between each engine shaft and its extension shaft, means on said extension shafts to connect the extension shafts selectively to drive the drawworks, means on one of said extension shafts selectively to drive the main slush pump, and an auxiliary drive means connected to another of said extension shafts selectively to drive the auxiliary slush pump, said auxiliary drive means comprising a support fixed relatively to the compounding drive unit, a driven shaft supported thereby and positioned in line with the last named extension shaft, a removable coupling including a spacer element between the last named extension shaft and the driven shaft of the auxiliary driving means, and means on the driven shaft selectively to drive the auxiliary slush pump, the compounding driving unit being removable from the engines as a unit when the couplings between the engines and the extension shafts are disengaged and the spacer element is removed.

2. In a rotary drilling apparatus including a drawworks, a main slush pump, and an auxiliary slush pump, the combination of a multiple engine drive unit comprising a plurality of parallel engine skids, a driving engine mounted on the forward end of each skid, the engines being positioned parallel to each other and having driving shafts at their rear ends, a skid lying on the engine skids and fastened thereto at right angles to the engine shafts, a compounding drive unit mounted on said last named skid and including an extension shaft for each engine, selectively engageable coupling means between each engine shaft and its extension shaft, means on said extension shafts selectively to connect the extension shafts driving together, means on a first one of the extension shafts selectively to drive the drawworks, means on a second extension shaft selectively to drive the main slush pump, and an auxiliary drive unit driven by a third extension shaft, said auxiliary drive unit comprising skids mounted across the rear end of the skids carrying the engine driving the third extention shaft, a driven shaft supported by the auxiliary drive means skids in line with the third extension shaft, a coupling including a removable spacer element connecting said driven shaft to the third extension shaft, and means on the driven shaft of the auxiliary drive means selectively to drive the auxiliary slush pump, the compounding drive unit being removable from the engines as a unit when the couplings between the engines and the extension shafts are disengaged and the spacer element is removed.

3. In a rotary drilling apparatus including a drawworks, a main slush pump, and an auxiliary slush pump, the combination of a multiple engine drive unit comprising a plurality of parallel engines having driving shafts at their rear ends, a compounding drive unit positioned across the rear ends of the engines at right angles to the engine shafts, said compounding drive unit including an extension shaft for each engine and means selectively to connect the extension shafts drivingly together, selectively engageable coupling means between each engine shaft and its extension shaft, said coupling means comprising a driven drum connected to the engine shaft, a drum telescoping therewith on the engine extension shaft, and inflatable friction means mounted between the drums to provide a driving connection between them when inflated, means on said extension shafts selectively to connect the extension shafts selectively to drive the drawworks, means on one of said extension shafts selectively to drive the main slush pump, an auxiliary drive means connected to another of said extension shafts selectively to drive the auxiliary slush pump, said auxiliary drive means comprising a support fixed relatively to the compounding drive unit, a driven shaft supported thereby and positioned in line with the last named extension shaft, a coupling including a removable spacer element between the last named extension shaft and the driven shaft of the auxiliary driving means, said spacer element having a length somewhat exceeding the distance of telescope of the two drums of the coupling means between each engine shaft and its exten-

sion shaft, and means on the driven shaft selectively to drive the auxiliary slush pump, the compounding driving unit being removable from the engines as a unit when the couplings between the engines and the extension shafts are disengaged and the spacer element is removed.

4. In a rotary drilling apparatus including a drawworks, a main slush pump and an auxiliary slush pump, the combination of a multiple engine drive unit comprising a plurality of parallel engines having driving shafts at their rear ends, a compounding drive unit positioned across the rear ends of the engines at right angles to the engine shafts, said compounding drive unit including an extension shaft for each engine, selectively engageable coupling means between each engine shaft and its extension shaft, means on said extension shafts selectively to connect the extension shafts selectively to drive the drawworks, means on one of said extension shafts selectively to drive the main slush pump, an auxiliary drive means connected to another of said extension shafts selectively to drive the auxiliary slush pump, said auxiliary drive means comprising a support fixed relatively to the compounding drive unit, a driven shaft supported thereby and positioned in line with the last named extension shaft, a coupling including a removable spacer element between the last named extension shaft and the driven shaft of the auxiliary driving means, and means on the driven shaft selectively to drive the auxiliary slush pump, the compounding driving unit being removable from the engines as a unit when the couplings between the engines and the extension shafts are disengaged and the spacer element is removed, the means for driving each of the slush pumps including a selectively engageable clutch, fluid operated means for shifting such clutch from a central control station including a fluid supply line from the control station to the fluid operated means in the vicinity of each clutch, and a safety means for preventing undesired engagement of each clutch from the central control station, said safety means including a manual shut-off in the supply line to the clutch operating fluid operated means in the vicinity of each clutch.

5. In a rotary drilling apparatus including a drawworks and a slush pump, the combination of a multiple engine drive unit comprising a plurality of parallel engine skids, a driving engine mounted on the forward end of each skid, the engines being positioned parallel to each other and having driving shafts at their rear ends, a skid lying on the engine skids and fastened thereto in a position at right angles to the engine shafts, a compounding drive unit supported by the last mentioned skid and located at right angles to the engine shafts, said compounding drive unit including an extension shaft for each engine, selectively engageable coupling means between each engine shaft and its extension shaft, means on said extension shaft selectively to connect the extension shafts drivingly together, means on one of the extension shafts selectively to drive the drawworks, and means on another of the extension shafts selectively to drive the slush pump, the compounding drive unit being removable from the engines as a unit when the couplings are disengaged, said pump driving means including a selectively engageable clutch, a lever for shifting said clutch, and a fluid operated means connected to said lever for operating the lever, the clutch shifting lever having means thereon permitting connection of a manual clutch operating lever permitting shifting of the clutch in the event of the failure of the fluid supply to the fluid operated clutch shifting means.

AUGUST R. MAIER.
JOHN W. JACOBY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,360,394	Gordon	Nov. 30, 1920
1,990,810	Young	Feb. 12, 1935
2,026,709	Sheldon	Jan. 7, 1936
2,071,778	Walne	Feb. 23, 1937
2,096,150	Walne	Oct. 19, 1937
2,171,994	Riise	Sept. 5, 1939
2,237,864	Fawick	Apr. 8, 1941
2,243,156	Howe et al.	May 27, 1941
2,246,478	Guier	June 17, 1941
2,251,443	Fawick	Aug. 5, 1941
2,251,445	Fawick	Aug. 5, 1941
2,331,180	Gasser	Oct. 5, 1943
2,351,851	Young	June 20, 1944
2,354,174	Schmitter	July 18, 1944
2,405,546	Archer	Aug. 13, 1946
2,462,944	Cardwell et al.	Mar. 1, 1949
2,536,483	Young	Jan. 2, 1951
2,576,872	Young	Nov. 27, 1951