

**TECHNICAL MANUAL
OPERATOR, ORGANIZATIONAL, DIRECT
SUPPORT AND GENERAL SUPPORT**

MAINTENANCE MANUAL

FOR

**DRILLING MACHINE, WELL,
1500 FT. COMBINATION ROTARY**

**AND PERCUSSION, DED,
SEMI-TRAILER MOUNTED (CCE)**

GEORGE E. FAILING CO.

MODEL CF-15-S

NSN 3820-01-075-4974

TECHNICAL MANUAL

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 26 September 1983

No.5-3820-243-14&P

**OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT
AND
GENERAL SUPPORT MAINTENANCE MANUAL
FOR

DRILLING MACHINE, WELL, 1500 FT.

COMBINATION ROTARY AND PERCUSSION,

DED, SEMITRAILER MOUNTED (CCE)
GEORGE E. FAILING CO.
MODEL CF-15-S

NSN 3820-01-075-4974**

REPORTING OF ERRORS
You can help improve this manual. Let us know if you find any mistakes, or if you know of a way to improve the procedures. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 20282, located in the back of this manual, direct to: Commander US Army Tank-Automotive Command, ATTN: DRSTA-MBP, Warren MI, 48090. A reply will be furnished direct to you.

This technical manual is authentication of the manufacturer's commercial literature and does not conform with the format and content specified in AR 310-3, Military Publications. This technical manual does, however, contain available information that is essential to the operation and maintenance of the equipment.

		Page
SECTION I.	GENERAL INFORMATION AND OPERATION	
	1-1 General	1-1
	1-2 Description	1-1
	1-3 Controls and Indicators	1-1
	1-4 Preparation for Operation	1-23
	1-5 Reeving	1-24
	1-6 Positioning Controls Prior to Starting the Engine.....	1-24
	1-7 Starting the Engine	1-26
	1-8 Engine Operation.....	1-28
	1-9 Stopping the Engine	1-28
	1-10 Positioning and Leveling the Machine	1-28
	1-11 Raising the Mast.....	1-30

	Page
1-12 Lowering the Mast.....	1-31
1-13 Air Compressor Operation	1-31
1-14 Mud Pump Operation.....	1-32
1-15 Changing from Mud to Air Operation.....	1-32
1-16 Changing from Air to Mud Operation.....	1-33
1-17 Water Injection System Operation	1-33
1-18 Force Feed Lubrication Operation.....	1-34
1-19 Foam Injection Operation	1-34
1-20 Hoisting and Auxiliary Drum Operation	1-34
1-21 Third Drum Operation	1-34
1-22 Cathead Operation.	1-35
1-23 Rotary Table Operation.....	1-35
1-24 Pulldown Operation	1-36
1-25 Holdback Operation	1-36
1-26 Air Line Lubricator Operation	1-36
1-27 Mud Mixer Operation	1-37
1-28 Down-the-Hole Operation	1-37
1-29 Elevators Operation.....	1-38
1-30 Cold Weather Shutdown	1-38
1-31 Vacating the Drill Site	1-39
SECTION II. LUBRICATION AND SERVICE	
2-1 Scope	2-1
2-2 General	2-1
2-3 Engine Lubrication.....	2-1
2-4 Fuel Filters	2-3
2-5 Engine Cooling System	2-4
2-6 Battery and Alternator.....	2-6
2-7 Engine Air Cleaner	2-7
2-8 Engine Tune-Up.	2-9
2-9 Air Compressor.....	2-17
2-10 Daily Inspection and Maintenance.....	2-17
2-11 Weekly Inspection and Maintenance.....	2-18
2-12 Monthly Inspection and Maintenance	2-21
2-13 Six-Month Inspection and Maintenance.....	2-24
2-14 Mud Pump Lubrication and Storage Procedures	2-28
2-15 Lubrication of the Drawworks and Drive Assembly.....	2-29
2-16 Lubrication of Transfer Case.....	2-30
2-17 Lubrication of Subdrive Assembly.....	2-30
2-18 Servicing the Rotary Table Assembly	2-32
2-19 Lubrication of Mud Pump Drive Assembly	2-34
2-20 Replacing Mud Pump Valve Inserts and Seats.....	2-34
2-21 Lubrication of Auxila Transmission	2-36
2-22 Lubrication of Pulldown Transmission	2-37
2-23 Lubrication of Cathead Transmission	2-37
2-24 Lubrication of Rotary Transmission.....	2-38
2-25 Lubricating Wheel Hubs.....	2-38
2-26 Servicing Hydraulic Reservoir and Return Line Filter	2-39
2-27 Servicing and Adjustment of Force Feed Lubricator.....	2-42
2-28 Servicing Air Line Conditioner Unit	2-44
2-29 Foam Injection Pump Servicing	2-48
2-30 Troubleshooting.....	2-56
SECTION III. MAINTENANCE	
3-1 Introduction.....	3-1
3-2 Air Compressor Controls.....	3-1
3-3 Air Compressor Intercooler	3-4
3-4 Air Compressor Fan Drive	3-4

	Page
3-5 Compressor Cylinder Assemblies	3-4
3-6 Air Compressor Piston and Connecting Rod	3-4
3-7 Air Compressor Oil Pump	3-8
3-8 Air Compressor Crankcase	3-10
3-9 Air Compressor Crankshaft and Pulley	3-10
3-10 Reassembly of Air Compressor.....	3-10
3-11 Air Compressor Drive	3-17
3-12 Air Compressor Drive Clutch	3-26
3-13 Water Injection Pump	3-26
3-14 Water Injection Motor	3-23
3-15 Water Injection Relief Valve	3-23
3-16 Water Injection Control Valve	3-23
3-17 Mud Pump Drive.....	3-27
3-18 Mud Pump.....	3-29
3-19 Draw Works and Drive Assemnby.....	3-33
3-20 Draw Works Drive and Third Drum Clutch Assemblies.....	3-37
3-21 Hoisting and Auxiliary Drum Brake Controls.....	3-37
3-22 Third Drum Brake Control.	3-40
3-23 Third Drum Assemnby	3-43
3-24 Cathead Drive Assemnby.	3-45
3-25 Cathead Drive Motor.....	3-45
3-26 Cathead Transmission	3-49
3-27 Rotary Table Sliding Base	3-52
3-28 Rotary Table Transfer Cylinder	3-52
3-29 Rotary Table Clutch	3-55
3-30 Rotary Table.....	3-56
3-31 Rotary Table Transmission	3-56
3-32 Sub Drive	3-61
3-33 Double Pump.....	3-63
3-34 Vane Pump.....	3-63
3-35 Transfer Case.....	3-63
3-36 Auxiliary Transmission.....	3-67
3-37 Chain Feed Drive Assemnby with Transmission.....	3-69
3-38 Chain Feed Drive Motor	3-71
3-39 Pulldown Transmission.	3-73
3-40 Radiator and Fan Shroud.....	3-75
3-41 Battery Charging Alternator.....	3-77
3-42 Engine Starting Motor	3-80
3-43 Engine Fan Group	3-84
3-44 Fuel Lines and Filters.	3-86
3-45 Fresh Water Pump	3-86
3-46 Exhaust Manifold.....	3-89
3-47 Air Inlet.....	3-89
3-48 Engine Oil Filter.....	3-92
3-49 Engine Oil Cooler	3-92
3-50 Fuel Injection Pump.....	3-95
3-51 Mechanical Governor.....	3-97
3-52 Engine Blower Assemnby and Drive Shaft.....	3-101
3-53 Rocker Cover Group.....	3-104
3-54 Fuel Injector.....	3-106
3-55 Water Connections Group	3-108
3-56 Thermostat and Water By-Pass Group	3-109
3-57 Cylinder Head, Valves, and Valve Operating Mechanism	3-110
3-58 Oil Pan and Drain Hose	3-116
3-59 Oil Pressure Regulator and Relief Valve.....	3-117
3-60 Oil Distribution System	3-118

	Page
3-61 Engine Oil Pump	3-118
3-62 Power Take-Off	3-121
3-63 Engine Replacement.	3-123
3-64 Flywheel 2nd Flywheel Housing	3-124
3-65 Engine Ventilation.....	3-124
3-66 Balance Weight Cover	3-126
3-67 Crankshaft, Connecting Rods and Pistons.	3-128
3-68 Camshaft and Gear Train	3-131
3-69 Engine Cylinder Block.....	3-133
3-70 Main Hydraulic Pump.....	3-135
3-71 Mast Raising Cylinder.	3-138
3-72 Force-Feed Lubricator	3-140
3-73 Landing Gear Assemnbly.....	3-143
3-74 Dolly Axle Assemnbly	3-145
3-75 Hydraulic Leveling Jacks	3-147
3-76 Trailer Axle Assembly, with Brakes.....	3-147
3-77 Brake Chamber	3-150
3-78 Brake Relay Valve	3-152
3-79 Breakout Cylinder	3-154
3-80 Universal Joint and Driveshaft Assembly	3-154
3-81 Throttle Actuator	3-157
3-82 Hydraulic Valve	3-158
3-83 Hydraulic Valve	3-162
3-84 Hydraulic Cooling Motor	3-164
3-85 Swivel Joint	3-166
3-86 Pulldown Swivel.....	3-168
3-87 Trailer Suspension System	3-168
3-88 Dolly Suspension System	3-171
3-89 Air Percussion Drill	3-171
 SECTION IV. EQUIPMENT TRANSPORT INSTRUCTIONS	
4-1 Component Removal for Transporting CF-15-S Drilling Machine Aboard	
C-130 Aircraft	4-1
4-2 Transporting Instructions Schematic Diagrams	4-14
 APPENDIX.	
A PARTS LIST	A01
B Federal Supply Code for Manufacturers (FSCM)	B1
C Maintenance Allocation Chart.....	C1
D Basic Issue Items List (CCE).....	D1
E Initial Recommendation Prescribed Load List (PLL) and Authorized Stockage List (ASL)	E1
F Well Completion Equipment	F1
G Parts kit to be overpacked on each Well Drilling Machine	G1
H Operating Equipment for Each Drilling Machine	H1
I Accessories Furnished With Each Drilling Machine.....	I1
J Common and Bulk Items List.	J1
K Tools Furnished with Each Drilling Machine	K1
L Accessories for Down-The Hole (Percussion) Drilling.....	L1
M Preventive Maintenance Checks and Services	M1
N Hydro-Weight Master Indicator System.	N1
O Submersible Turbine.....	O1
P Field Testing of Drilling Muds	P1
 INDEX.	Index

SECTION I

GENERAL INFORMATION AND OPERATION

1-1. GENERAL. This manual contains operation, service, and repair instructions for the Rotary Well Drilling Machine, Model CF-15-S, manufactured by George E. Failing Company, Division of Azcon Corporation, Enid, Oklahoma.

1-2. DESCRIPTION. The model CF-15-S Drilling Machine is a compact, mobile drilling unit equipped to handle all types of exploration drilling. The drilling machine is powered by an eight cylinder, 2-cycle, diesel engine coupled to a power take-off. Other major components include an air compressor, air compressor drive, transfer case, auxiliary transmission, mud pump, mud pump drive, subdrive assembly, rotary table transmission, rotary table, and a 3-drum drawworks. A hydraulic system is installed and operates the hydraulic leveling jacks, mast raising cylinder, pulldown and hold-back assemblies, rotary table cylinder, and breakout cylinder. The complete drilling machine is mounted on a semi-trailer for mobility. Two lifting slings are welded to the frame. The sling lifting eyes are located adjacent to the four leveling jacks. The slings are provided as a means of hoisting the entire drilling machine if it is being transported aboard a surface carrier. The machine is equipped with a detachable mast to enable loading the machine aboard an air carrier. The machine has the capability for drilling to a depth of 1500 feet.

1-3. CONTROLS AND INDICATORS. The controls and indicators necessary to operate the machine are conveniently located and visible from the driller's platform. Other controls and indicators that affect operation of the machine, but are not available from the driller's or helper's platforms, are also included in this section. The locations of the controls and indicators are shown in Figure 1-1, and the name and function of each are listed in Table 1-1. The identification numbers in the figure correspond to the index numbers in the table.

DRILLING MACHINE:

Manufacturer..... George E. Failing Co.
Manufacturer's Model CF-15-S
Type..... Mobile, combination rotary and
down-the-hole percussion

Overall Dimensions:

Length..... 45 Feet, 2 Inches
Width 8 Feet, 4 Inches
Height (With Mast Lowered) 12 Feet, 4 Inches
Height (With Mast Raised) 45 Feet, 4-3/4 Inches
Shipping Cubage..... 4,549 Cubic Feet
Shipping Weight..... 47,270 Pounds

Capacities:

Fuel Tank..... 100 Gallons
Hydraulic Reservoir..... 48 Gallons
Water Injection Tank..... 100 Gallons
Air Tank 7.5 Cubic Feet

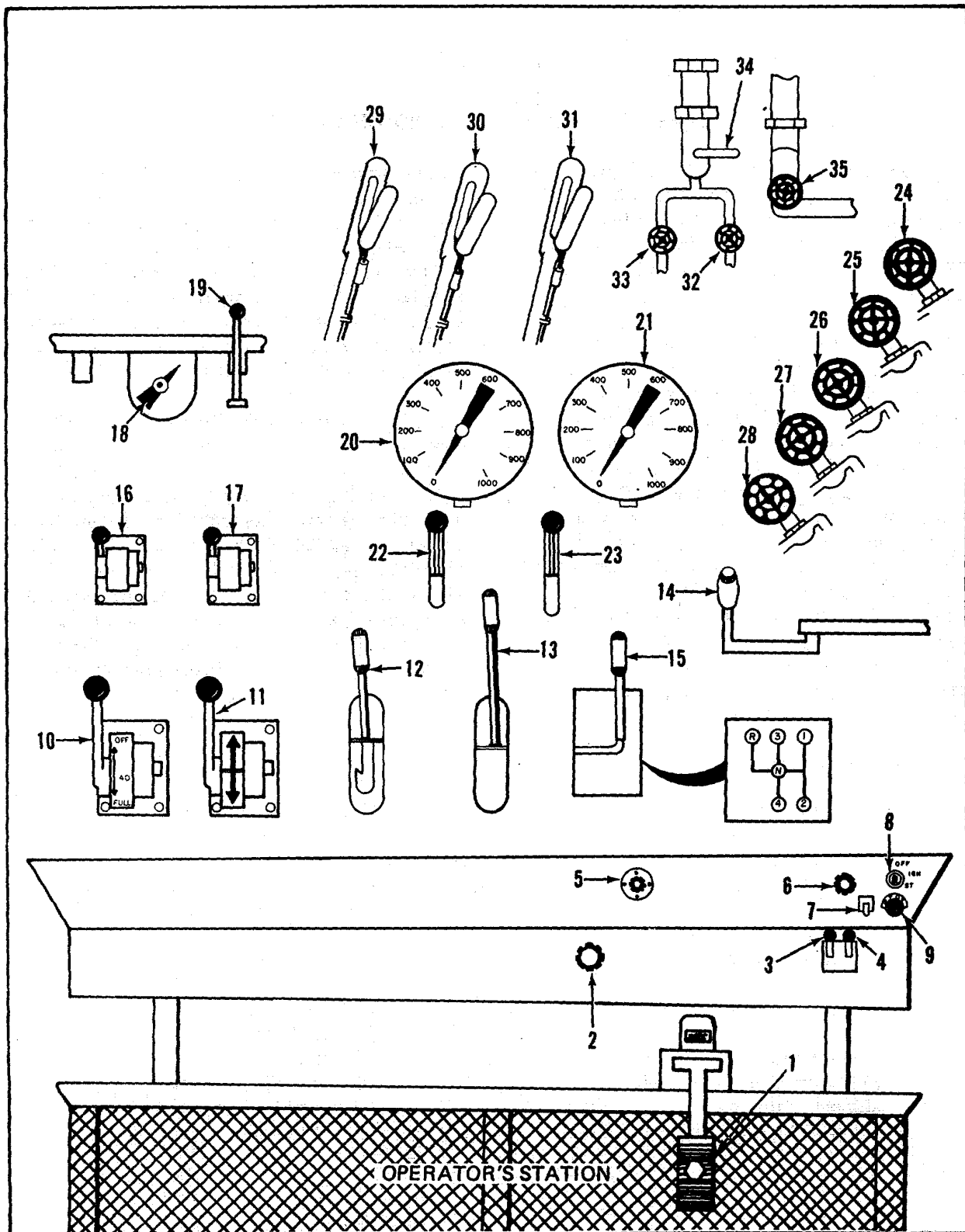


Figure 1-1. Controls and Indicators (Sheet 1 of 6)