

10M 2-27-31
41/2 x 6

W. C. Gretzinger
(Personal)

M. W. 62-5

THE PENNSYLVANIA RAILROAD

MANUAL OF INSTRUCTION MAINTENANCE OF WAY EQUIPMENT

MANUAL OF INSTRUCTIONS

MAINTENANCE OF WAY EQUIPMENT.

1. This manual is issued for the benefit of Operators, Foremen, Master Carpenters, Supervisors, Division Engineers and others interested in the operation, performance and maintenance of machinery used in Maintenance of Way service.

2. The primary object is to give such information as is needed to obtain the maximum output of each machine without interference with traffic, damage to the machine or personal injuries. All operators and others working on or about machines must be governed by the Book of Rules, the Safety Rules and all published instructions pertaining to the safe operation of machines. To enter or remain in service is an assurance of willingness to obey the rules.

3. SAFETY is the first and most important consideration. In all cases of doubt and uncertainty, the safe course must be taken and no risks run.

4. A machine must not foul or obstruct any track without obtaining proper permission and providing proper protection as prescribed by Rules 99, 100 and 101-A. Violation of these rules or carelessness as to the safety of one's self or others is sufficient cause for discipline.

5. The Chief Engineer of the System exercises general supervision over all Maintenance of Way machinery

on the System. The Chief Engineer of Maintenance of Way of each Region exercises general supervision over all Maintenance of Way machinery on his Region. The Engineer of Maintenance of Way of a General Division exercises general supervision over all Maintenance of Way machinery on his General Division. The Division Engineer will exercise direct supervision of all Maintenance of Way machinery on his Division and see that all concerned are governed by the rules and regulations for safe and efficient operation of machines. The Supervisor of Signals, Master Carpenter, Master Plumber, Master Mason and Supervisor of Track represent the Division Engineer in their assigned territory or department.

6. Before starting a machine, the operator must familiarize himself with all parts, detail adjustments and lubrication of the machine to which he is assigned. It is not the purpose of these instructions to give complete details as to procedure required in all emergencies and difficulties that may arise, but to give in general the course that should insure continuous and satisfactory operation. A manufacturer's instruction book and parts list should be furnished each operator, who must study such instructions until thoroughly familiar with them. If the book is not available, someone familiar with the machine should instruct the operator in the safe handling and maintenance of it, and provision should be made to secure "Instruction Book" and "Repair Parts List" promptly so that necessary repair parts may be properly described, numbered and charged. Instruction books should accompany machines when transferred from one

operator to another. Instruction books and parts books applying to each particular machine must be kept with the machine at all times for the guidance and instruction of those concerned with its operation. These books must be kept in suitable holders provided in cab of machine for this purpose.

7. The first duty of every man in charge of or operating a machine is to keep it clean. When an operator fails to observe this rule, he usually neglects general maintenance of the machine. It is essential to have the machine clean to permit proper inspection, lubrication and adjustment. A dirty machine increases the personal injury hazard of people working on or about it. Under no conditions should waste or linty rags be used when cleaning gas engines or air compressors, as the use of such material involves the possibility of lint or other form of material being introduced into the fuel lines or oil lines, ultimately causing failure of the equipment. Gasoline should not be used for cleaning machinery on account of fire hazards. Kerosene should be used for this purpose.

8. Before an operator starts to run a machine he must familiarize himself with the entire lubricating system, provide himself with all necessary lubricants and with proper equipment for handling and applying them. Lubricants used must comply with those specified on lubricating charts recommended in these instructions. P. R. R. Standard lubricants, as furnished by the Altoona Oil Mixing Plant or according to P. R. R. specifications, must be used. Operator must be reasonably familiar

with the various lubricants shown on lubricating chart to safeguard against improper substitution of lubricant which will result in damage to machinery. These features should be given very careful attention, as neglecting to keep the machines clean and well lubricated indicates carelessness on the part of the operator and reduces the output of the machines.

9. It has been determined that 80% of all trouble experienced with machinery is the result of lack of knowledge and inexperience of the operator. Therefore, repairs and adjustments must not be attempted except by one familiar with what is to be done and how to do it. If extensive repairs are required, the operator must consult with the Repairman M. W. Equipment or Supervisor to determine whether repairs should be made in the field or the machine sent to the shop. When through using the machine the operator or one using the machine must lubricate and clean it and know that it is in good running condition before transferring it to other gangs. The receipt of a machine in dirty, unoled, or poor running condition must be reported promptly to the proper officer. Failure to do so implies that machine is received in good working condition and that the one who has it is responsible for such defects as may be found.

GASOLINE ENGINES.

10. As most machines are driven by gasoline engines, the operator should follow a procedure in handling them that will, first, avoid injury to all people near it, and, secondly, avoid damage to the machine. He should

familiarize himself with his particular motor and become familiar with the "hum" when operating smoothly, so that when strange noises arise he will recognize them and make investigation. Unnecessary tinkering with equipment will not be permitted.

11. He should study the engine and its diagram as given in the instruction book accompanying the machine and learn to leave it alone as long as it is working satisfactorily. Frequent examinations should be made to ascertain that all nuts and bolts are tight and that the grease cups and places that need lubricating have had proper care.

12. The operator should not tamper with carburetor, magneto, primer, lubricating system or distributor unless he is absolutely positive these need attention and is competent to make the adjustments required. Too much tampering and tinkering ruins a large number of engines.

13. When filling the gasoline tank, approved cans should be used. The nozzle of the gasoline hose or pipe must touch the tank to prevent sparks from static electricity. Smoking is prohibited and lights and fires must be kept away. The engine must be stopped when filling the gasoline tank.

14. The three essentials for proper operation are, in order of importance:

1. Oil.
2. Water (if not an air-cooled engine).
3. Gasoline.

15. Running out of gasoline results in a short delay. Running out of water or oil results in long expensive delays in shops for re-grinding cylinders, fitting new pistons and rings, and other costly work.

16. Before starting the engine it is essential to see that all lubrication has been provided, and that the cooling system is ready to function properly. In case of two-cycle engines, lubricating oil is to be mixed with the gasoline; the mixture should be a proportion of one-half pint of Specification 161-A heavy oil (Reference 29-60) to one gallon of gasoline, except in new engines or engines with reground cylinders the quantity of oil should be increased 50% during the first thirty days of operation. In new four-cycle engines or when cylinders have been rebored or new rings applied, one-half pint of Specification 161-A light oil (Reference 29-56) or one-half pint of Specification 209-A neutral oil (Reference 29-63) should be mixed with each gallon of gasoline during the first 100 hours of operation, after which no oil need be added to the gasoline. Care should be exercised to avoid excessive use of overhead lubrication through gasoline system on account of same affecting carburetion. In adding the oil to the gasoline, the oil should be measured rather than depending on the color of the mixture to obtain the proper amount of lubricant. The oil must be mixed thoroughly with the gasoline by stirring with a wooden stick before placing in the gasoline tank and no attempt made to mix in gasoline tank.

17. In some of the engines, the timing of the spark is automatically controlled, but there are other engines

in service on which spark timing is manually controlled. When starting an engine of the latter type, the spark must be retarded to avoid injury to the man cranking the engine. After the engine has started, the spark must be advanced as far as possible without causing loss of power or spark knock. Many engines have been damaged by operating them when the spark was not advanced far enough. In starting engines, care must be taken in warming them up to see that the oil is flowing freely before applying the load. When applying the load, the throttle must be opened slowly. Avoid racing the engine. When idling, cut the speed down as low as possible. Unnecessary idling is prohibited. When starting, do not speed the engine—racing induces high bearing pressures and excessive vibration. In cold weather serious damage may be caused by putting the engine to work before lubricating oil has warmed up and had a chance to distribute properly. Before engaging main clutch, all machinery should be out of gear so far as possible and the load applied gradually. When starting engine by hand, in addition to precautionary measures relative to retardation of spark, starting crank handle should be grasped with the thumb on the side of handle with fingers, and the body kept as far away as possible so that in the event of accidental back-fire there will be no danger of breaking the wrist or inflicting injuries.

The proper proceeding in starting a free-running gas engine is as follows:

- (a) With ignition off, operate choke and turn motor over several times;

- (b) Retard spark and turn on ignition,
- (c) Give crank quarter-turn by pulling.

18. When engines are equipped with starting motors and storage batteries, operator must inspect the battery every week to make sure that all cells are filled with fluid to proper level and that the specific gravity of the liquid is correct. If filling is required, nothing but distilled water should be used. In cold weather the battery must be kept well charged for two reasons: First, the battery will freeze if not well charged; and, second, because more power is required to start the engine in cold weather. Battery charging ammeter must be kept in proper working condition at all times and battery not overcharged.

19. In the lubrication of a gasoline engine it is of prime importance to keep a supply of good oil in the crankcase. With a new engine, the crankcase should be drained after every 20 hours of operation for the first 100 hours, and then after every 50 hours of operation. The best time to drain the crankcase is just after a run when the engine and oil are hot and the sediment is in suspension in the oil. It is essential that the proper amount of oil be maintained in the crankcase; insufficient oil will cause serious damage to engine by burned-out bearings, scored cylinders or frozen pistons. Surplus oil is also detrimental, causing excessive carbon deposits on cylinders, spark plugs, valves, etc. Carbon causes damage by cutting valves, valve seats and cylinders. Some of the carbon finds its way into the crankcase, mixes with the lubricating oil and causes excessive

wear on the bearings. Oil pressure gauges must be kept in working order at all times and engines shall not be operated with oil pressure below minimum set for the particular engine. Low oil pressure is indicative of either insufficient oil, improper working oil pump, damaged bearings, or excessively diluted or thinned oil. All engines equipped with oil filters should have same cleaned every 500 hours or new filtering element installed where filter is of non-cleanable type. Air cleaners should be inspected at each and every oil change and must be kept in good operating condition at all times.

20. The crankcase must not be flushed with kerosene oil. Kerosene adhering to the interior of the engine will tend to dilute the crankcase oil. Engines with crankcases which do not drain thoroughly should be flushed with a small amount of new oil, then close drain and add the proper amount of new engine oil. Air compressor oil, Specification No. 186 (Reference No. 29-87) or light gas engine oil, Specification No. 161-A (Reference No. 29-56) are excellent for flushing the crankcase.

21. Care must be exercised to avoid excessive use of choke, or too rich mixtures of gasoline, as the surplus gasoline washes the lubrication off the walls of the cylinders and dilutes the crankcase oil, fouls the spark plug, accelerates carbon formation, and may result in scored cylinders.

If the ignition switch does not function in stopping the engine the choke must not be used for that purpose. The engine may be stopped by removing wire from switch and grounding it on frame or cylinder block. Improper

functioning of ignition switch should be corrected at once.

22. The cooling system is extremely important. Frequent inspection should be made to be sure that the radiator is full and not leaking. Under no conditions should proprietary radiator no-leak solutions or other compounds be introduced into the cooling system for purpose of plugging leaks. Pump gland should be kept sufficiently tightened to prevent water leakage, but not drawn up hard enough to cause scoring of pump shaft.

Cooling system should be treated at least four times per year or oftener, if conditions so warrant, as follows:

Fill cooling system with mixture of soda ash and water in proportions one pound soda ash to five gallons of water; run the engine with the radiator covered or shutters closed until solution is brought to boiling point; then shut down engine and drain; after engine has thoroughly cooled (requiring a period of one to two hours), flush with clean water before refilling. The above procedure should always be followed before adding anti-freeze solution and again in the Spring when changing from anti-freeze solution to water.

23. Damage to engines freezing usually occurs at the first frost and is largely due to unpreparedness. Therefore, in the Fall greater care should be exercised. When in doubt as to weather conditions, and anti-freeze solution is not available, the radiator and cooling system must be drained. (This also applies to cooling system on air compressors.) In draining cooling systems all drain valves should be opened. The approved anti-

freeze solution should be obtained and supplied, mixed in proper proportion with water, to the cooling systems at a sufficiently early date to insure safety.

Completely denatured alcohol, 188 proof, Formula No. 5, obtained through the Purchasing Department, is to be used in the radiators and cooling systems of all automotive equipment. The alcohol is to be mixed with water. Mixtures of alcohol and water will have the following characteristics:

Parts by Volume		Freezing Point	Specific Gravity at 60° F.
Alcohol	Water		
20	80	20° F.	.976
30	70	10° F.	.9654
40	60	— 2° F.	.9518
50	50	—18° F.	.9343

Careful inspection should be made to see that leaks are corrected so there will be no unnecessary waste of material. Any losses due to unforeseen leaks are to be made up with the proper mixture, and losses due to evaporation are to be made up with undiluted alcohol.

Kerosene must not be used as an anti-freeze solution: First, on account of fire hazard; and, second, on account of dissolving pump grease carried over into cooling system and allowing grease contaminated with rust, sediment or scale to settle over upper openings in radiator, plugging the radiator.

24. During cold weather, with engines cooled by radiators, a higher temperature of the cooling mixture (water and alcohol) will avoid condensation in the

crankcase and maintain the normal efficiency of the engine. The higher temperature may be obtained by covering the lower portion of radiator with a thin piece of wood or cardboard.

25. If the engine develops a knock it is important that the cause be investigated and corrected at once. If not corrected, the knock becomes more pronounced, causing lack of power and serious damage to motor.

26. Common causes for knocks are:

- (a) Excess carbon in cylinders due to over-rich mixtures or excess oil.
- (b) Spark advanced too far.
- (c) Loose connecting rod bearings.
- (d) Loose crankshaft bearings.
- (e) Loose-fitting pistons or broken rings.
- (f) Loose wrist pin.
- (g) Improper adjustment of valves.

27. If the engine is hard to start there is something wrong and the trouble should be found and remedied.

Causes for engine starting hard are:

- (a) Weak battery.
- (b) Gasoline tank empty.
- (c) Gasoline line to carburetor obstructed or shut off.
- (d) Loose or defective wiring.
- (e) Spark plug points corroded or not set properly.
- (f) Corroded magneto points.
- (g) Intake manifold leaking.

- (h) Defective spark coil.
- (i) Magneto brushes sticking.
- (j) Ignition timed too late.
- (k) Too lean or too rich a mixture.
- (l) Defective magneto.
- (m) Water in gasoline.
- (n) Sticking valves.

28. Operator should be able to correct causes (a), (b), (c), (d), (e), (g), (h), (i), (k), (m), and in case of (f), (j), (l), or (n) the Repairman M. W. Equipment should be notified.

29. For engine missing (i. e., any cylinder failing to fire regularly) a defective spark plug or loose wire is usually the cause. If plugs are in good condition look over wiring carefully and if the trouble is not found it is due either to faulty valves or valve tappets, priming cups leaking, cylinder head gasket leaking, or other causes.

30. Gas tanks must be inspected frequently to insure against leaks. When a leak occurs it may be repaired in field by soldering, using a hot soldering iron, being sure that tank is entirely empty, fumes diffused, and the closing cap removed. A flame must never be applied to a gas tank.

31. When necessary to ship machines, the gasoline tank and the cooling system of engines must be thoroughly drained.

32. Magnetos must be carefully oiled (see Lubrication Chart); but not more than specified in manufac-

turer's instruction books, which is usually not more than one or two drops a week.

33. Engines must not be operated in closed small buildings, such as toolhouses, where carbon monoxide gas may be accumulated, as this gas is fatal.

TRACK MOTOR-CARS.

34. Rules and instructions previously given in this book pertaining to machines and gas engines apply to motor-cars.

35. Track motor-cars must be operated in accordance with Rule 80, Book of Rules, and time-table instructions.

36. Only employes, qualified after examination as to train rules and safety rules governing the operation of track cars on the railroad, are permitted to operate a track motor-car.

37. Cars will operate on main tracks only by permission obtained as prescribed by the Superintendent.

38. The Foreman of the gang using a car must assign to each member of the gang his regular place on the car and his part in putting the car on or off the track.

39. All cars must be inspected daily to determine if wheels, axles, brakes, engines, transmission, etc., are in safe working condition; also that the car is properly lubricated and sufficient gasoline is in the tank; that no leaks are in the fuel line.

40. No adjustments are to be made to car in motion.

41. Brakes must be tested immediately after starting car.

42. With free-running types of cars all riders must be on car and properly seated before car is started.

43. With engine directly connected to axle, making it necessary to push the car to start engine, one or two men should be assigned to this work and should do the pushing from behind and jump on the car from the rear, never from the side.

44. When descending grades, the engine should be kept in gear.

45. Unauthorized persons are not permitted to ride on motor-cars.

46. All occupants of motor-cars must remain seated on car while it is in motion.

47. A motor-car must not be put on or taken off the track with engine running.

48. Operation of cars at stations, through road crossings and all other operations, must be in accordance with the Book of Rules, Safety Rules, Time-table Instructions and other instructions issued by the Superintendent.

49. Care must be used in running motor-cars through interlocking plants, through all turnouts and on approach to switches operated by remote control to avoid accident as result of conflicting route being set up unexpectedly.

50. Trailers must always be pulled. Hand cars must not be attached to motor-cars.

51. Motor-cars, trailer-cars or push-cars must not be overloaded or loaded in such manner that there is a possibility of material or tools falling off.

52. When not in service cars must be protected as well as possible from the weather, and when left in the open must be locked.

53. In maintaining and operating cars the Foreman or Operator should follow the general rules already given in regard to machines and gas engines in general, paying special attention to the following:

- (a) Keep car clean.
- (b) Keep car well lubricated.
- (c) Do not overload with excessive tools.
- (d) Do not be continually tampering with and adjusting motor. If it is not right call the Repairman M. W. Equipment.
- (e) Do not experiment or attempt to adjust parts with which he is not familiar.
- (f) Read and follow carefully instructions issued by manufacturer.
- (g) Devices and attachments that have not been approved for use must not be applied to motor-cars.
- (h) The seating arrangement must not be altered.
- (i) Remember a motor-car is a tool assigned to make work easier for gangs and is of minor importance compared to regular assigned work of track, signal, bridge or building maintenance; and when not working properly, even after following the prescribed rules and suggestions, the trouble should be reported if not corrected and another car requested.

LUBRICANT RECOMMENDED—BUDA

PLACE LUBRICATED	MODEL OF CAR	
	519	319
ENGINE	P. R. R. Spec. 161-A Gas Eng. Oil Heavy, 29-60 Medium, 29-59	P. R. R. Spec. 161-A Gas Eng. Oil Heavy, 29-60 Medium, 29-59
Summer: Winter:		
MAGNETO	Same as in Engine	Same as in Engine
CHAIN DRIVE	P. R. R. Gear Compound No. 1, 29-121	P. R. R. Gear Compound No. 1, 29-121
AXLE BEARINGS	Same as in Engine	Same as in Engine
PEDESTAL GUIDES, PINS, CLEAVES AND OIL CUPS	Same as in Engine	Same as in Engine
ALL GREASE CUPS	P. R. R. Ball Bearing Grease, 29-179	P. R. R. Ball Bearing Grease, 29-179

PLACE LUBRICATED	MODEL OF CAR		
	219	19 and 19L	119 and 119H
ENGINE	P. R. R. Spec. 161-A Gas Eng. Oil Heavy, 29-60 Medium, 29-59	P. R. R. Spec. 161-A Gas Eng. Oil Heavy, 29-60 Medium, 29-59	P. R. R. Spec. 161-A Gas Eng. Oil Heavy, 29-60 Medium, 29-59
Summer: Winter:			
MAGNETO	Same as in Engine	Same as in Engine	Same as in Engine
CHAIN DRIVE	P. R. R. Gear Compound No. 1, 29-121	P. R. R. Gear Compound No. 1, 29-121	P. R. R. Gear Compound No. 1, 29-121
AXLE BEARINGS	Same as in Engine	Same as in Engine	Same as in Engine
PEDESTAL GUIDES, PINS, CLEAVES AND OIL CUPS	Same as in Engine	Same as in Engine	Same as in Engine
ALL GREASE CUPS	P. R. R. Ball Bearing Grease, 29-179	P. R. R. Ball Bearing Grease, 29-179	P. R. R. Ball Bearing Grease, 29-179

**LUBRICANT RECOMMENDED—FAIRBANKS—MORSE—
(SHEFFIELD CARS)**

PLACE LUBRICATED	MODEL OF CAR		
	41	40 & 40B, 44, 45	32 and 33
ENGINE	P. R. R. Spec. No. 161-A Gas Engine Oil Heavy, 29-60	P. R. R. Spec. No. 161-A Gas Engine Oil Medium, 29-59	P. R. R. Spec. No. 161-A Gas Engine Oil Heavy, 29-60
MAGNETO		Same as in Engine	
CHAIN DRIVE OR GEAR DRIVE	P. R. R. Gear Compound No. 1, 29-121	P. R. R. Gear Compound No. 1, 29-121	
AXLE BEARINGS	Same as in Engine	Same as in Engine	P. R. R. Ball Bearing Grease 29-179
PINS AND CLEVISES	Same as in Engine	Same as in Engine	Same as in Engine
ALL GREASE CUPS	P. R. R. Ball Bearing Grease, 29-179	P. R. R. Ball Bearing Grease, 29-179	P. R. R. Ball Bearing Grease, 29-179

LUBRICANT RECOMMENDED—FAIRMONT

PLACE LUBRICATED	MODEL OF CAR		
	MM9	MM19 and SM2	SMT2
ENGINE	P. R. R. Spec. 161-A Med. Gas Eng. Oil, 29-59	P. R. R. Spec. 161-A Med. Gas Eng. Oil, 29-59	P. R. R. Spec. 161-A Med. Gas Eng. Oil, 29-59
MAGNETO	Same as in Engine	Same as in Engine	Same as in Engine
WATER PUMP			
TRANSMISSION	P. R. R. Differ- ential Grease, 29-35		P. R. R. Differ- ential Grease, 29-35
AXLE BEARINGS*	Same as in Engine	Same as in Engine	Same as in Engine
OIL CUPS, PINS AND CLEVISES	Same as in Engine	Same as in Engine	Same as in Engine
AIR COMPRESSOR			
ALL GREASE CUPS, EXCEPT WATER PUMP			

* Axle bearings are to be packed with P. R. R. ball bearing grease whenever they are taken down. Running lubrication, however, is with oil, as indicated.

(Continued on next page)

LUBRICANT RECOMMENDED—FAIRMONT—Concluded

PLACE LUBRI- CATED	MODEL OF CAR			
	A5	M24 Mower	M27 Weed Burner	M25 Discer
ENGINE	P. R. R. Spec. 161-A Med. Gas Eng. Oil, 29-59	P. R. R. Spec. 161-A Med. Gas Eng. Oil, 29-59	P. R. R. Spec. 161-A Med. Gas Eng. Oil 29-59	
MAGNETO	Same as in Engine	Same as in Engine	Same as in Engine	
WATER PUMP	P. R. R. Cup Grease No. 5, 29-100		P. R. R. Cup Grease No. 5, 29-100	
TRANS- MISSION	P. R. R. Dif- ferential Grease, 29-35		P. R. R. Dif- ferential Grease, 29-35	
AXLE BEARINGS*	Same as in Engine	Same as in Engine	Same as in Engine	
OIL CUPS, PINS AND CLEVISES	Same as in Engine	Same as in Engine	Same as in Engine	P. R. R. Spec. 161-A Gas Eng. Oil, Med., 29-59
AIR COMPRESSOR				
ALL GREASE CUPS, EXCEPT WATER PUMP	P. R. R. Cup Grease No. 3, 29-98	P. R. R. Cup Grease No. 3, 29-98	P. R. R. Cup Grease No. 3, 29-98	

* Axle bearings are to be packed with P. R. R. ball bearing grease whenever they are taken down. Running lubrication, however, is with oil, as indicated.

LUBRICANT RECOMMENDED—KALAMAZOO

PLACE LUBRICATED	MODEL OF CAR		
	216	216-L	22
ENGINE	P. R. R. Spec. No. 161-A Gas Eng. Oil	P. R. R. Spec. No. 161-A Gas Eng. Oil	P. R. R. Spec. No. 161-A Gas Eng. Oil
Summer:	Medium, 29-59	Medium, 29-59	Medium, 29-59
Winter:	Medium, 29-59	Medium, 29-59	Light, 29-56
MAGNETO	Same as in Engine	Same as in Engine	Same as in Engine
TRANSMISSION			P. R. R. Dif- ferential Grease, 29-35
DRIVING CHAIN	P. R. R. Gear Compound No. 1, 29-121	P. R. R. Gear Compound No. 1, 29-121	P. R. R. Gear Compound No. 1, 29-121
AXLE BEARINGS	P. R. R. Cup Grease No. 3, 29-98	P. R. R. Cup Grease No. 3, 29-98	Same as in Engine
PEDESTAL GUIDES, PINS, CLEAVES	Same as in Engine	Same as in Engine	Same as in Engine
GREASE CUPS	P. R. R. Cup Grease No. 3, 29-98	P. R. R. Cup Grease No. 3, 29-98	P. R. R. Cup Grease No. 3, 29-98

(Continued on next page)

LUBRICANT RECOMMENDED—KALAMAZOO—Concluded

PLACE LUBRICATED	MODEL OF CAR		
	23	25 and 25-A	16, 16-L and 17
ENGINE	P. R. R. Spec. No. 161-A Gas Eng. Oil Medium, 29-59 Light, 29-56	P. R. R. Spec. No. 161-A Gas Eng. Oil Medium, 29-59 Light, 29-56	P. R. R. Spec. No. 161-A Gas Eng. Oil Medium, 29-59 Medium, 29-59
Summer: Winter:			
MAGNETO	Same as in Engine	Same as in Engine	Same as in Engine
TRANSMISSION			.
DRIVING CHAIN	P. R. R. Gear Compound No. 1, 29-121	P. R. R. Gear Compound No. 1, 29-121	P. R. R. Gear Compound No. 1, 29-121
AXLE BEARINGS	Same as in Engine	Same as in Engine	Same as in Engine
PEDESTAL GUIDES, PINS, CLEVISSES	Same as in Engine	Same as in Engine	Same as in Engine
GREASE CUPS	P. R. R. Cup Grease No. 3, 29-98	P. R. R. Cup Grease No. 3, 29-98	P. R. R. Cup Grease No. 3, 29-98

LUBRICANT RECOMMENDED—MUDGE

PLACE LUBRICATED	MODEL OF CAR
	WS1, WS2 and GS4
ENGINE	P. R. R. Spec. 161-A Gas Engine Oil—Heavy, 29-60
MAGNETO	Same as in Engine
AXLE BEARINGS	P. R. R. Ball Bearing Grease, 29-179
PINS, CLEVISES AND OIL CUPS	Same as in Engine

LUBRICANT RECOMMENDED—NORTHWESTERN (CASEY JONES)

PLACE LUBRICATED	MODEL OF CAR		
	531	521, 523	551, 561
ENGINE	P. R. R. Spec. No. 161-A Gas Engine Oil	P. R. R. Spec. No. 161-A Gas Engine Oil	P. R. R. Spec. No. 161-A Gas Engine Oil
Summer:	Medium, 29-59	Medium, 29-59	Medium, 29-59
Winter:	Medium, 29-59	Medium, 29-59	Light, 29-56
ENGINE BEARINGS	P. R. R. Ball Bearing Grease, 29-179	P. R. R. Ball Bearing Grease, 29-179	
REVERSE GEAR			P. R. R. Differential Grease, 29-35
AXLE BEARINGS	P. R. R. Ball Bearing Grease, 29-179	P. R. R. Ball Bearing Grease, 29-179	P. R. R. Ball Bearing Grease, 29-179
PEDESTAL GUIDES, PINS, CLEVISES	Same as in Engine	Same as in Engine	Same as in Engine
CHAIN DRIVE			P. R. R. Gear Compound No. 1, 29-121

LUBRICANT RECOMMENDED—
SYNTRON

ENGINE:

Crankcase	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Magneto	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Governor	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Water Pump	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearing	P. R. R. Ball Bearing Grease, 29-179.

GENERATORS:

Main	P. R. R. Ball Bearing Grease, 29-179.
High Frequency	P. R. R. Ball Bearing Grease, 29-179.

FAN MOTOR IN CONTROL BOX..P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.

DRIVING MOTOR

P. R. R. Ball Bearing Grease, 29-179.

CHAIN DRIVE

P. R. R. Gear Compound No. 1, 29-121.

AXLE BEARINGS

P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
--

PINS, CLEVISES, PEDESTALS,

GUIDES

P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
--

CRANES, DITCHERS, RAIL LOADERS AND LIKE MACHINES.

54. Previous rules and instructions pertaining to operation of machines apply to machines of this type.

55. Cranes, ditchers, rail loaders and similar equipment must discontinue work when trains are approaching or passing on adjacent tracks.

56. Swinging portions of cranes must be locked or mechanically fastened with the boom of cranes parallel to the center line of track during the approach and passing of trains on adjacent tracks.

57. If the work to be done involves the fouling of adjacent tracks, either by cab or boom or any part of the equipment or load being handled, adjacent tracks must be protected as provided by Rule 101-A, Book of Rules.

58. Where limit stops are provided on such equipment-limiting the swing so that adjacent tracks are not fouled, and the work to be performed can be done within such limits, the stops are to be set at all times.

59. Where no limit stops are provided or the work involved necessitates a swing of the crane beyond that permitted by the use of limit stops on cranes so equipped, the adjacent tracks must be protected as provided by Rule 101-A, Book of Rules.

60. It is the operator's duty to see that no one rides on the crane or on the cars occupied by the crane, except when necessary in the discharge of duty, and then he is required to see that all precautions are taken to prevent injury.

61. The crane operator is required to ride in the crane when being moved over the road in worktrain service. It is his duty to see that the center line of the crane is kept over the center line of the car when running over the road, with boom properly anchored.

62. When the crane is to be shipped in a revenue train, it must be loaded and rotating parts secured to meet the requirements of the American Railway Association loading rules. If the boom is dropped on a carrier or the floor of the car, the rear end of the crane must be supported by suitable blocking to avoid damage to center pin and rollers.

63. Frequent inspections of all machinery, cables, etc., must be made by the operator so that repairs, replacements and adjustments can be made before some part breaks or slips, creating a hazardous condition. All machinery should be kept thoroughly lubricated and adjusted.

64. Loads heavier than those indicated for various radii by the badge plate on the machine must not be attempted.

65. Two part lines should be used for handling heavy loads. The cables and sheaves over which they pass must be kept well lubricated to prolong the life of the cable. Special care must be taken to avoid kinks in the cables.

66. When adjusting clutches and brakes, care should be taken to avoid making them too tight, as this makes extra work for the operator in handling the machine, frequently wears out the lining and wastes power.

67. There is a liability of booms being dropped due to boom hoist and clutches and boom hoist brakes slipping, usually caused by a collection of moisture on the friction faces. In order to avoid such occurrences the

clutches and brakes should be dried by rotating the machinery with the motor, slipping the clutches and brakes for several revolutions before attempting to handle a load.

68. Never apply rosin, belt dressing or similar compounds to brake or clutch bands, as it will create an extremely hazardous condition. One drop of lubricating oil applied to the band lining occasionally is about all the dressing that is required.

69. When brake and clutch linings become saturated with oil, it is necessary to remove and clean them by soaking in gasoline.

70. Under no circumstances should more than one line be operated from a single drum.

71. Before handling a heavy load where damage or personal injury may result from brakes or clutches slipping, they must be tested against each other to make sure they will carry the load.

72. The operator must keep all safety guards in place when crane is working.

73. Cranes should be equipped with warning whistles which must be kept in working condition.

CRAWLER CRANES.

74. The Book of Rules, Safety Rules and instructions previously given in this book pertaining to machines, gasoline engines and cranes must be observed in the operation of crawler cranes.

75. The operator is responsible for the safe handling and operation of the crane on the ground, on cars and when being loaded or unloaded. When handled by a large crane, he must see that no hitches are applied in a way that is likely to damage the crane.

76. The crane must be securely fastened to avoid rotation when moved in any train on any track. Crane should be anchored securely to car body by means of suitable anchorages provided at crawlers, rear end of upper works and at boom. The operator must see that in addition to the slewing lock being in position that suitable boom shackles are fastened to the car, or that the boom is dropped on a recessed carrier and the boom hoist cables left slack. He is responsible for having boom shackles replaced immediately when the regular equipment is lost or broken. As far as possible the boom must be hauled in trailing position. Boom shackles must be released before attempting to raise the boom to prevent damage to the boom.

77. Pipes or valves are not permitted in drain connection at bottom of gasoline tanks. Plugs must be used in drain holes.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Water Pump	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearing	P. R. R. Cup Grease No. 3, 29-98.
Magneto, Starting Motor,	
Generator	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
MAGNET GENERATORS:	
Anti-Friction Bearing Type	P. R. R. Ball Bearing Grease, 29-179.
Plain Bearing Type	P. R. R. Spec. No. 188 Turbine Oil, 29-109.
TRANSMISSION	P. R. R. Differential Grease, 29-35.
HOISTING MACHINERY:	
Grease Cups	P. R. R. Cup Grease No. 3, 29-98.
Gears, enclosed or not enclosed, except in transmission	P. R. R. Gear Compound No. 1, 29-121.
Ball and Roller Bearings....	P. R. R. Ball Bearing Grease, 29-179.
Silent Chain Drive	P. R. R. Differential Grease, 29-35.
Cables	P. R. R. Gear Compound No. 1, 29-121.
Sheaves and Blocks.....	P. R. R. Cup Grease No. 3, 29-98.
CRAWLERS:	
Mechanism	P. R. R. Cup Grease No. 3, 29-98.
CONTROL LEVERS, PINS AND	
CLEVISES	Crankcase Drainage.

CRANES (LOCOMOTIVE) AND DITCHERS—GASOLINE.

78. The general instructions pertaining to machines, gas engines and cranes apply to these machines.

79. When heavy lifts are to be made the operator must assure himself that the crane is properly blocked and that the brakes are set.

80. Many locomotive cranes are not provided with mechanical locks to prevent rotation. Therefore, it is particularly important in this type of machine to see that adequate boom shackles are provided and used. Neglecting this rule may result in a serious accident.

81. Booms may be damaged by attempting to raise them before the boom shackles have been released. The operator is responsible for seeing that proper set-off blocking is provided for cranes equipped with transverse wheels before moving the crane off the track.

GASOLINE-OPERATED CRANES—LOCOMOTIVE TYPE.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Water Pump	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearing	P. R. R. Cup Grease No. 3, 29-98.
Magneto, Starting Motor, Generator	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.

MAGNET GENERATOR:

- (a) Anti-friction Bearing
Type P. R. R. Ball Bearing Grease,
29-179.
- (b) Plain Bearing Type P. R. R. Spec No. 188 Turbine
Oil, 29-109.

LUBRICANT RECOMMENDED

TRANSMISSION P. R. R. Differential Grease, 29-35.

HOISTING MACHINERY:

Grease Cups P. R. R. Cup Grease No. 3, 29-98.

Gears, enclosed or not enclosed, except in transmission P. R. R. Gear Compound No. 1, 29-121.

Ball and Roller Bearings.... P. R. R. Ball Bearing Grease, 29-179.

Silent Chain Drive P. R. R. Differential Grease, 29-35.

Cables P. R. R. Gear Compound No. 1, 29-121.

Sheaves and Blocks..... P. R. R. Cup Grease No. 3, 29-98.

TRUCKS:

Center Plate P. R. R. Center Plate Grease, 29-30.

Side Bearing P. R. R. Center Plate Grease, 29-30.

Journals P. R. R. Coach Engine Oil, 29-91.

BRAKE EQUIPMENT:

Pins, Levers, Clevises..... Crankcase Drainage.

GASOLINE-OPERATED CRANES—BURRO RAIL LAYING 180° TYPE.

ENGINE:

LUBRICANT RECOMMENDED

Crankcase (a) Summer P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.

(b) Winter P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.

Water Pump P. R. R. Cup Grease No. 5, 29-100.

Fan Shaft Bearing P. R. R. Cup Grease No. 3, 29-98.

Magneto, Starting Motor,

Generator Same as used in engine crankcase.

LUBRICANT RECOMMENDED

TRANSMISSIONP. R. R. Differential Grease, 29-35.

HOISTING MACHINERY:

Grease CupsP. R. R. Cup Grease No. 3, 29-98.

Gears, enclosed or not enclosed, except in transmissionP. R. R. Gear Compound No. 1, 29-121.

Ball and Roller Bearings....P. R. R. Ball Bearing Grease, 29-179.

Silent Chain DriveP. R. R. Differential Grease, 29-35.

CablesP. R. R. Gear Compound No. 1, 29-121.

Sheaves and Blocks.....P. R. R. Cup Grease No. 3, 29-98.

TRUCKS:

JournalsP. R. R. Coach Engine Oil, 29-91.

BRAKE EQUIPMENT:

Pins, Levers, Clevises.....Crankcase Drainage.

GASOLINE-OPERATED CRANES—BURRO FULL-REVOLVING TYPE.

ENGINE:

LUBRICANT RECOMMENDED

CrankcaseP. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.

Water PumpP. R. R. Cup Grease No. 5, 29-100.

Fan Shaft BearingP. R. R. Cup Grease No. 3, 29-98.

Magneto, Starting Motor, GeneratorP. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.

TRANSMISSIONP. R. R. Differential Grease, 29-35.

HOISTING MACHINERY:

Grease CupsP. R. R. Cup Grease No. 3, 29-98.

LUBRICANT RECOMMENDED

Gears, enclosed or not enclosed, except in transmission	P. R. R. Gear Compound No. 1, 29-121.
Ball and Roller Bearings....	P. R. R. Ball Bearing Grease, 29-179.
Silent Chain Drive	P. R. R. Differential Grease, 29-35.
Cables	P. R. R. Gear Compound No. 1, 29-121.
Sheaves and Blocks.....	P. R. R. Cup Grease No. 3, 29-98.

TRUCKS:

Journals	P. R. R. Coach Engine Oil, 29-91.
----------------	-----------------------------------

BRAKE EQUIPMENT:

Pins, Levers, Clevises.....	Crankcase Drainage.
-----------------------------	---------------------

GASOLINE-OPERATED CRANES—FOUR-WHEEL ASH-PIT TYPE.

ENGINE:

LUBRICANT RECOMMENDED

Crankcase	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Water Pump	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearing	P. R. R. Cup Grease No. 3, 29-98.
Magneto, Starting Motor, Generator	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.

TRANSMISSION	P. R. R. Differential Grease, 29-35.
--------------------	--------------------------------------

HOISTING MACHINERY:

Grease Cups	P. R. R. Cup Grease No. 3, 29-98.
Gears, enclosed or not enclosed, except in transmission	P. R. R. Gear Compound No. 1, 29-121.

LUBRICANT RECOMMENDED

Ball and Roller Bearings....P. R. R. Ball Bearing Grease,
29-179.

Silent Chain Drives.....P. R. R. Differential Grease, 29-35.

CablesP. R. R. Gear Compound No. 1,
29-121.

Sheaves and Blocks.....P. R. R. Cup Grease No. 3, 29-98.

TRUCKS:

JournalsP. R. R. Coach Engine Oil, 29-91.

BRAKE EQUIPMENT:

Pins, Levers, Clevises.....Crankcase Drainage.

CRANES (LOCOMOTIVE) AND DITCHERS—STEAM.

82. The general instructions pertaining to machines and cranes apply to these machines. In addition, the operator must be familiar with the boiler code in the States in which the machine works. It is his duty to see that current inspection and boiler wash certificates are always posted in the crane and preserved in legible condition between inspections.

83. A steam boiler shall not be operated when overdue for inspection or boiler wash, except by authority from the Superintendent of the Division on which the machine is working.

84. It is the operator's duty to see that ample advance notice be given to the man in charge of the work when boiler inspections, etc., are due.

STEAM CRANES--LOCOMOTIVE TYPE.

ENGINE: LUBRICANT RECOMMENDED

Valves and Cylinders.....P. R. R. Cylinder Oil No. 1, 29-66.

MachineryP. R. R. Cup Grease No. 3, 29-98.

AIR PUMP:

Steam Cylinder P. R. R. Spec. No. 211—530° Flash
Test Oil, 29-49.

Elect. Generator Bearing...P. R. R. Spec. No. 188 Turbine
Oil, 29-109.

HOISTING MACHINERY:

Grease CupsP. R. R. Cup Grease No. 3, 29-98.

GearsP. R. R. Gear Compound No. 1,
29-121.

Ball and Roller Bearings....P. R. R. Ball Bearing Grease,
29-179.

Worm DriveP. R. R. Differential Grease, 29-35.

CablesP. R. R. Gear Compound No. 1,
29-121.

Sheaves and Blocks.....P. R. R. Cup Grease No. 3, 29-98.

TRUCKS:

Center PlateP. R. R. Center Plate Grease,
29-30.

Side BearingsP. R. R. Center Plate Grease,
29-30.

JournalsP. R. R. Coach Engine Oil, 29-91.

BRAKE EQUIPMENT:

Pins, Levers, Clevises.....P. R. R. Coach Engine Oil, 29-91.

STEAM CRANES—WRECKING TYPE.

ENGINE:

LUBRICANT RECOMMENDED

Valves and Cylinders.....P. R. R. Cylinder Oil No. 1, 29-66.
Machinery—Grease Cups...P. R. R. Cup Grease No. 3, 29-98.
Oil Cups.....P. R. R. Cylinder Oil No. 1, 29-66.

AIR PUMP:

Steam and Air Cylinders... P. R. R. Cylinder Oil No. 1, 29-66.

GENERATOR:

Steam CylinderP. R. R. Spec. No. 211—530° Flash
Test Oil, 29-49.
Elect. Generator Bearing...P. R. R. Spec. No. 188 Turbine
Oil, 29-109.

HOISTING MACHINERY:

Grease CupsP. R. R. Cup Grease No. 3, 29-98.
GearsP. R. R. Gear Compound No. 1,
29-121.
Ball and Roller Bearings...P. R. R. Ball Bearing Grease,
29-179.
Worm DriveP. R. R. Differential Grease, 29-35.
CablesP. R. R. Gear Compound No. 1,
29-121.
Sheaves and Blocks.....P. R. R. Cup Grease No. 3, 29-98.

TRUCKS:

Center PlateP. R. R. Center Plate Grease,
29-30.
Side BearingsP. R. R. Center Plate Grease,
29-30.
JournalsP. R. R. Coach Engine Oil, 29-91.

BRAKE EQUIPMENT:

Pins, Levers, Clevises.....P. R. R. Coach Engine Oil, 29-91.

STEAM DITCHERS—ERIE AND AMERICAN.

ENGINE:

LUBRICANT RECOMMENDED

Valves and Cylinders.....P. R. R. Cylinder Oil No. 1, 29-66.

MachineryP. R. R. Cup Grease No. 3, 29-98.

AIR PUMP:

Steam and Air Cylinders... P. R. R. Cylinder Oil No. 1, 29-66.

GENERATOR:

Steam CylinderP. R. R. Spec. No. 211—530° Flash
Test Oil, 29-49.

Elect. Generator Bearing...P. R. R. Spec. No. 188 Turbine
Oil, 29-109.

HOISTING MACHINERY:

Grease CupsP. R. R. Cup Grease No. 3, 29-98.

GearsP. R. R. Gear Compound No. 1,
29-121.

Ball and Roller Bearings....P. R. R. Ball Bearing Grease,
29-179.

Worm DriveP. R. R. Differential Grease, 29-35.

CablesP. R. R. Gear Compound No. 1,
29-121.

Sheaves and Blocks.....P. R. R. Cup Grease No. 3, 29-98.

TRUCKS:

Center PlateP. R. R. Center Plate Grease,
29-30.

Side BearingsP. R. R. Center Plate Grease,
29-30.

JournalsP. R. R. Coach Engine Oil, 29-91.

BRAKE EQUIPMENT:

Pins, Levers, Clevises.....P. R. R. Coach Engine Oil, 29-91.

DERRICKS AND PILE DRIVERS.

85. Instructions for Cranes apply.

PILE DRIVERS—DROP AND STEAM HAMMER TYPE.

ENGINE:	LUBRICANT RECOMMENDED
Valves and Cylinders.....	P. R. R. Cylinder Oil No. 1, 29-66.
Machinery	P. R. R. Cup Grease No. 3, 29-98.

AIR PUMP:

Steam and Air Cylinders.... P. R. R. Cylinder Oil No. 1, 29-66.

GENERATOR:

- (a) Steam Cylinder P. R. R. Spec. No. 211—530° Flash
Test Oil, 29-49.
- (b) Elect. Generator Brg... P. R. R. Spec. No. 188 Turbine
Oil, 29-109.

HOISTING MACHINERY:

- Grease Cups P. R. R. Cup Grease No. 3, 29-98.
- Gears P. R. R. Gear Compound No. 1,
29-121.
- Ball and Roller Bearings.... P. R. R. Ball Bearing Grease,
29-179.
- Worm Drive P. R. R. Differential Grease, 29-35.
- Cables P. R. R. Gear Compound No. 1,
29-121.
- Sheaves and Blocks..... P. R. R. Cup Grease No. 3, 29-98.

TRUCKS:

- Center Plate P. R. R. Center Plate Grease,
29-30.
- Side Bearings P. R. R. Center Plate Grease,
29-30.
- Journals P. R. R. Coach Engine Oil, 29-91.

BRAKE EQUIPMENT:

- Pins, Levers, Clevises..... P. R. R. Coach Engine Oil, 29-91.

STEAM HAMMER P. R. R. Cylinder Oil No. 1, 29-66.

DROP HAMMER P. R. R. Cylinder Oil No. 1, 29-66.

MADDEN RAIL LAYERS.

86. The general instructions pertaining to machines with gas engines apply to these machines. They are equipped with two-cycle gas engines that require mixing oil with gasoline and special attention should be given to instructions pertaining to proper method of mixing.

87. The rollers, wheels, chain hoist and other movable parts must be kept clean and well lubricated.

88. Adjustments must not be made to wires or engine while the engine is operating.

89. The machine must not be put on or off the track with engine running.

90. When moving the machine on track it must not be pulled by a motor-car.

91. In laying rail the operator must be alert to the operation, and raise the rail a sufficient height to drop it in place, using care not to raise it above that height.

92. When handling machine with crane, care must be used in making hitch so as not to damage the machine.

93. The machine must be protected from the weather when not in use.

LUBRICANT RECOMMENDED

ENGINE	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Magneto	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
HOISTING MACHINERY, SHEAVES, BLOCKS, ETC.:	
Grease Cups	P. R. R. Cup Grease No. 3, 29-98.
Cables	P. R. R. Gear Compound No. 1, 29-121.
Sheaves and Blocks	P. R. R. Cup Grease No. 3, 29-98.
Gears, enclosed or not enclosed	P. R. R. Gear Compound No. 1, 29-121.
Wheel Bearings, Pins, Clevises, Levers, etc.	Crankcase Drainage.

TIE TAMPER EQUIPMENT—AIR.

94. The general instructions pertaining to machines with gas engines apply to these machines.

95. The operator is responsible for the safe handling and operation of air compressor on the ground or on cars, and when being loaded and unloaded.

96. When the compressor is to be shipped in a train it must be properly located in the car and securely blocked.

97. When an air compressor is to be moved from one location to another on its own wheels on a track, the use of the track or tracks that will be obstructed must be obtained and the necessary flag protection provided.

98. When setting up the compressor for operation, it must be firmly supported on blocking in a level position, with the wheels clear of the ground.

99. When side panels are removed from air compressors, they must be secured to prevent being picked up by the following draft of passing trains.

100. A pressure of at least 80 lbs. shall be carried at the compressor.

101. Once a week the safety valve in the air storage tank must be tested by the gauge and record the pressures on daily work report at which the valve opens and closes.

102. The pressure gauge must bear a stamp showing the name of shop at which it was last inspected, with the date of inspection, which must not be more than six months past.

103. All air reservoirs must be given hydrostatic test after five years' service, and once each year thereafter.

104. Once a day the drain valve on the air storage tank must be opened and the water blown out.

105. At night or when shutting down for the day, the air pressure must be blown off the storage tank and pipe lines, and the valve in the gas line from the tank to the carburetor closed.

106. When leaving the machine at the end of the day's work, all tools and spare parts must be put away where they will not be stolen, and the side panels placed on the machine and securely locked.

AIR COMPRESSORS—INGERSOLL RAND AND CHICAGO PNEUMATIC TOOL.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Water Pump	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearings	P. R. R. Cup Grease No. 3, 29-98.
Magneto	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
AIR COMPRESSOR	P. R. R. Spec. No. 186 Air Compressor Oil, 29-87.
WHEEL BEARINGS	P. R. R. Ball Bearing Grease, 29-179.
GREASE CUPS (Except Water Pump)	P. R. R. Ball Bearing Grease, 29-179.
OIL CUPS, PINS AND CLEVISES..	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.

AIR COMPRESSOR—METALWELD-WORTHINGTON.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Water Pump	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearings	P. R. R. Cup Grease No. 3, 29-98.
Magneto, Starting Motor and Generator	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
AIR COMPRESSOR	P. R. R. Spec. No. 186 Air Compressor Oil, 29-87.
WHEEL BEARINGS	P. R. R. Ball Bearing Grease, 29-179.
GREASE CUPS (Except Water Pump)	P. R. R. Ball Bearing Grease, 29-179.
OIL CUPS, PINS AND CLEVISES..	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.

AIR COMPRESSORS—SULLIVAN.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Water Pump	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearings	P. R. R. Cup Grease No. 3, 29-98.
Magneto	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
AIR COMPRESSOR	P. R. R. Spec. No. 186 Air Compressor Oil, 29-87.
WHEEL BEARINGS	P. R. R. Ball Bearing Grease, 29-179.
GREASE CUPS (Except Water Pump)	P. R. R. Ball Bearing Grease, 29-179.
OIL CUPS, PINS AND CLEVISES..	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.

PIPE LINES.

107. Pipe lines should be installed in accordance with standard instructions and plans, and when on irregular ground the joints and intermediate points supported.

108. Pipe lines should be inspected daily by the operator, and the sound of air leaks noted and prompt repairs made. Manifolds and hose should be examined during the noon hour when the tamper tools are not in use, so that air leaks may be readily detected.

109. A daily test should be made to detect leaks in the pipe lines and possible leaking valves in the compressor. Shut down the machine after pumping up 100 pounds of air and note how rapidly the air pressure falls. If a loss of more than two or three pounds per

minute exists, the air valve between the air tank and pipe line should be closed and the test repeated. This will give the leakage of the compressor discharge valves separately from the air line leakage.

110. When shipping pipe lines the threads should be protected by applying old pipe fittings.

AIR TAMPER GUNS.

111. Tamper guns should be oiled before using and every two hours of service, disconnecting the air hose from the gun for this purpose. P. R. R. Specification No. 161-A, light engine oil (Reference No. 29-56) should be used.

112. The operator shall inspect all nuts on the air tamper guns daily and see that they are tight.

113. If the compressor does not idle occasionally, it is an indication that air is being wasted. If the pipe and hose lines are tight, an investigation should be made and the air consumption of the tamper guns checked.

114. If a gun uses more than $23\frac{1}{2}$ cubic feet of air per minute at 90 pounds pressure, it should be sent in for repairs.

115. When not in use the tamping guns must be properly protected against theft and weather.

116. When desirable to operate tie tamping outfits, during freezing weather, alcohol should be mixed with the air at the air reservoir by a device designed for that purpose.

WOLFE TAMPERS.

117. General instructions pertaining to gasoline engines and other machines apply. The proper air pressure for tamping ties with this machine is 3 lbs. 12 oz. It is important that this pressure should not vary. Once each month, the Division Maintainer must check the pressure delivered with a suitable mercury pressure gauge, as recommended by the manufacturer.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Water Pump.....	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearing.....	P. R. R. Cup Grease No. 3, 29-98.
Magneto, Starting Motor,	
Generator	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.

BLOWER:

- (a) Anti-friction Bearing
Type P. R. R. Ball Bearing Grease, 29-179.
- (b) Plain Bearing Type..... P. R. R. Spec. No. 188 Turbine Oil, 29-109.

TIE TAMPER EQUIPMENT—ELECTRIC.

118. The general instructions pertaining to machines and gas engines apply to these machines.

119. The operator is responsible for the safe handling and operation of the tie tamper outfit on the ground or on cars, and when being loaded and unloaded. When the tamper outfit is to be shipped in a train, it must be properly located in the car and securely blocked.

120. When setting up the generator for operation, it must be firmly supported in a level position. When side panels are removed, they must be secured to prevent being picked up by the following draft of passing trains.

121. Rectifiers and controller box must be kept dry.

122. Belts should be kept reasonably tight at all times, and commutators and brushes polished.

123. Never adjust or repair power plant while engine is running.

124. Keep contacts tight and bright on cables. Avoid kinking and stretching cables.

125. When leaving the machine at the end of the day's work, all tools and spare parts must be put away where they will not be stolen, and the side panels placed on the machine and securely locked.

ENGINE:

LUBRICANT RECOMMENDED

Crankcase P. R. R. Spec. No. 161-A Medium
Gas Engine Oil, 29-59.

Magneto P. R. R. Spec. No. 161-A Medium
Gas Engine Oil, 29-59.

Governor P. R. R. Spec. No. 161-A Medium
Gas Engine Oil, 29-59.

Water Pump P. R. R. Cup Grease No. 5, 29-100.

Fan Shaft Bearing P. R. R. Ball Bearing Grease,
29-179.

GENERATORS:

Main P. R. R. Ball Bearing Grease,
29-179.

High Frequency P. R. R. Ball Bearing Grease,
29-179.

FAN MOTOR IN CONTROL BOX..	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
DRIVING MOTOR	P. R. R. Ball Bearing Grease, 29-179.
CHAIN DRIVE	P. R. R. Gear Compound No. 1, 29-121.
AXLE BEARINGS	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
PINS, CLEAVISES, PEDESTALS, GUIDES	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.

ELECTRIC TAMPER TOOLS.

126. When in use, oil tampers every day in morning and at noon with clean engine oil, P. R. R. Specification No. 161-A Medium Gas Engine Oil, 29-59.

127. When not in use, the tamping guns must be properly protected against theft and weather.

TRACK TOOLS.

LUBRICANT RECOMMENDED

TIE TAMPER	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
RAIL SAW	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
ELECTRIC HAMMER	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
SPIKE DRIVER	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
RAIL DRILL	P. R. R. Ball Bearing Grease, 29-179.
NUT TIGHTENER	P. R. R. Ball Bearing Grease, 29-179.
PORTABLE ELECTRIC DRILL.....	P. R. R. Ball Bearing Grease, 29-179.
PORTABLE WOOD SAW.....	P. R. R. Ball Bearing Grease, 29-179.

POWER TOOLS IN ELECTRIFIED TERRITORY.

128. Electric power must be taken from the special sockets located part way down on poles, and under no circumstances must any connection be made with any other high tension or train propulsion wires. Portable transformers, 2,300 volts primary, 110 volts secondary, are to be used with pole connection to the sockets above described. From the low voltage side of the transformer cables are run to the tools to be used. Only 110-volt machines are to be employed.

SPREADER EQUIPMENT.

129. The general instructions pertaining to machines apply to these machines.

130. The operator of a spreader must have in his possession and thoroughly understand the book of instructions issued by the makers of the machine he is operating.

131. Spreaders are to be operated only by qualified operators. Unauthorized persons are not permitted on the machine.

132. When it is necessary to work around the wings, braces or front plow in the open or down position, first place them in the desired position. Then either allow the wings to go down until they rest on the ground or else block them securely so that there is no possible chance for them to drop or swing in.

133. Never allow any air in any cylinder supporting a part that will move while working about the machine.

134. With Type "A" spreaders equipped with hydraulic locks, care must be used in filling with oil to prevent air being entrapped in the ram, which may be done by slowly pouring the oil into the ram and entirely filling the ram before replacing plug. All connections and joints of the hydraulic system must be tight.

135. When the machine is traveling over the road, even for short distances, the pins supporting the main wings and the front plow must be in holes and safety chains at the rear of the plow side wings must be pulled tight to prevent the above parts from dropping.

136. Operator must see that proper tools, spare parts and rerailing frogs are provided and be responsible for their safe-keeping; also see that they are in safe and suitable condition for service. Operator's cabin must be locked when not being used.

137. Operator must see that the signal whistle is kept in proper condition for use at all times.

138. On Type "A" spreader, before locking the wing in any position the bank builder arm must be placed one-half way between the vertical and horizontal position.

AIR-MECHANICAL-OPERATED SPREADER—JORDAN.

LUBRICANT RECOMMENDED

SPREADER AND PLOW

MECHANISMP. R. R. Cup Grease No. 3, 29-98.

TRUCKS:

Center PlateP. R. R. Center Plate Grease,
29-30.

Side BearingsP. R. R. Center Plate Grease,
29-30.

JournalsP. R. R. Coach Engine Oil, 29-91.

BRAKE EQUIPMENT:

Pins, Levers and Clevises...P. R. R. Coach Engine Oil, 29-91.

AIR-HYDRAULIC-OPERATED SPREADER—JORDAN.

LUBRICANT RECOMMENDED

SPREADER AND PLOW

MECHANISMP. R. R. Cup Grease No. 3, 29-98.

Hydraulic Locks (Cylinder

Fluid)P. R. R. Spec. No. 209-A Neutral
Oil, 29-63.

TRUCKS:

Center PlateP. R. R. Center Plate Grease,
29-30.

Side BearingsP. R. R. Center Plate Grease,
29-30.

JournalsP. R. R. Coach Engine Oil, 29-91.

BRAKE EQUIPMENT:

Pins, Levers and Clevises...P. R. R. Coach Engine Oil, 29-91.

BALLAST CLEANING EQUIPMENT.

INDUSTRIAL BROWNHOIST MACHINE.

139. The general instructions pertaining to machines, gas engines and cranes apply to these machines.

140. Upon arrival at the point where work is to begin, the Conductor must see that proper flag protection is provided and that a satisfactory understanding is had with the Flagmen and Foreman. No work shall

be done without first obtaining permission to foul the adjoining track and providing proper flag protection.

141. In order to facilitate the operation, the following code of signals should be used:

142. The Conductor, after receiving permission from the Block Operator to obstruct the adjoining track, will signal with a white flag or white lantern, according to visibility, giving a signal raised and lowered vertically, to proceed with the work, which signal shall be acknowledged by the Foreman in charge of the train by two long blasts of the whistle on the Brownhoist ballast cleaning machine. This signal must be acknowledged by each Flagman with a white flag or white lantern, according to visibility, giving a signal raised and lowered in vertical position.

143. When the Block Operator informs the Conductor that a train is approaching on the obstructed track, the Conductor will signal with a red flag or a red lantern to the Foreman, giving the signal swung across the track, which means to stop work and clear up the obstructed track. The Foreman will see that the machine is stopped with the grab buckets in a clear position, and then signal with one long blast of the whistle on the Brownhoist ballast cleaning machine. Each of the Flagmen will acknowledge the Foreman's signal with a red lantern or a red flag, according to the visibility, swung across the track in the stop position.

144. Before moving the machine to a new location, or at the end of the day's work, the Foreman must

see that the buckets are secured, the plow and ballast chute are raised and secured, and advise the Conductor that the train is ready to move.

145. The Foreman must see that the proper complement of tools and spare parts are on hand with the machine at all times and maintained in a safe and suitable condition for service. He must also see that all of the machinery is kept lubricated in accordance with the "Lubrication Chart" posted on the machine.

146. The Foreman is responsible for the safety of the men employed on or about the machine and must be especially careful to warn all concerned when trains are approaching on the adjoining tracks.

INDUSTRIAL BROWNHOIST BALLAST CLEANING MACHINE.

LUBRICANT RECOMMENDED

MAIN ENGINE (Winton 6 Cyl.
8" x 10"):

Engine OilP. R. R. Spec. No. 161-A Heavy
Gas Engine Oil, 29-60.

AUXILIARY LIGHTING PLANT:

Engine OilP. R. R. Spec. No. 161-A Heavy
Gas Engine Oil, 29-60.

MAGNETOS OR DISTRIBUTORS....P. R. R. Spec. No. 161-A Light
Gas Engine Oil, 29-56.

MAIN GENERATOR OUTBOARD

BEARING (ROLLER)P. R. R. Ball Bearing Grease,
29-179.

AUXILIARY LIGHTING PLANT

GENERATORP. R. R. Ball Bearing Grease,
29-179.

WATER PUMPSP. R. R. Cup Grease No. 5, 29-100.

LUBRICANT RECOMMENDED

GASOLINE PUMP (MOTOR).....Vaseline.

RADIATOR FAN MOTOR.....P. R. R. Ball Bearing Grease,
29-179.

FLIGHT CONVEYOR (DIRT)

MOTORP. R. R. Ball Bearing Grease,
29-179.

Machinery BearingsP. R. R. Cup Grease No. 3, 29-98.

Chain DriveP. R. R. Spec. No. 161-A Heavy
Gas Engine Oil or Crankcase
Drainage.

Reduction GearP. R. R. Differential Grease, 29-35.

MAIN HAULAGE ENGINE

(MOTOR)P. R. R. Spec. No. 161-A Light
Gas Engine Oil, 29-56.

Machinery BearingsP. R. R. Cup Grease No. 3, 29-98.

Gearing (Spur Gear).....P. R. R. Gear Grease No. 1, 29-31.

CablesP. R. R. Gear Compound No. 1,
29-121.

"A" CONVEYOR:

MotorP. R. R. Spec. No. 161-A Light
Gas Engine Oil, 29-56.

Reduction GearsP. R. R. Differential Grease, 29-35.

Reduction Gears and Con-
veyor Machy. Bearings...P. R. R. Cup Grease No. 3, 29-98.

"B" CONVEYOR:

MotorP. R. R. Ball Bearing Grease,
29-179.

Reduction GearsP. R. R. Differential Grease, 29-35.

Reduction Gears and Con-
veyor Machy. Bearings...P. R. R. Cup Grease No. 3, 29-98.

"C" CONVEYOR:

MotorP. R. R. Ball Bearing Grease,
29-179.

Reduction GearsP. R. R. Differential Grease, 29-35.

LUBRICANT RECOMMENDED

Chain DriveP. R. R. Differential Grease, 29-35.
Reduction Gear and Con-
veyor Machy. Bearings...P. R. R. Cup Grease No. 3, 29-98.

BUCKET MECHANISM:

Bucket Guide MotorP. R. R. Ball Bearing Grease,
29-179.

Bucket Guide Reduction
GearP. R. R. Differential Grease, 29-35.

Bucket Guide and Machinery
BearingsP. R. R. Cup Grease No. 3, 29-98.

Bucket Links and PinsCrankcase Drainage.

Closing and Holding Line
MotorsP. R. R. Spec. No. 161-A Light
Gas Engine Oil, 29-56.

Closing and Holding Line
Reduction GearP. R. R. Differential Grease, 29-35.

Closing and Holding Line
Machinery BearingsP. R. R. Cup Grease No. 3, 29-98.

Closing and Holding Line
SheavesP. R. R. Cup Grease No. 3, 29-98.

CablesP. R. R. Gear Compound No. 1,
29-121.

PLOW-OPERATING MACHINERY:

Plow Move MotorP. R. R. Ball Bearing Grease,
29-179.

Plow Move WormP. R. R. Differential Grease, 29-35.

Plow Move Sprocket Chain..P. R. R. Differential Grease, 29-35.

Plow Move Machy. Bearings.P. R. R. Cup Grease No. 3, 29-98.

Plow Hoist MotorP. R. R. Ball Bearing Grease,
29-179.

Plow Gear Rack and Guides.P. R. R. Differential Grease, 29-35.

DIRT CAR CONVEYOR BOOM:

MotorP. R. R. Ball Bearing Grease,
29-179.

SheaveP. R. R. Cup Grease No. 3, 29-98.

Reduction GearP. R. R. Differential Grease, 29-35.

LUBRICANT RECOMMENDED

Reduction Gear, Machinery	
Bearings	P. R. R. Cup Grease No. 3, 29-98.
Pintle Bearings	P. R. R. Cup Grease No. 3, 29-98.
HUMMER SCREEN:	
Motor Set (A. C. & D. C.)..	P. R. R. Spec. No. 161-A Light Gas Engine Oil, 29-56.
Hoist Block	P. R. R. Spec. No. 161-A Light Gas Engine Oil, 29-56.
BALLAST RETURN MACHINERY:	
Motor	P. R. R. Ball Bearing Grease, 29-179.
Machinery Bearings	P. R. R. Cup Grease No. 3, 29-98.
Gear Rack and Chute Guide..	P. R. R. Gear Grease No. 1, 29-31.
Reduction Gear	P. R. R. Spec. No. 161-A Light Gas Engine Oil, 29-56.
AIR COMPRESSOR (No. 2 CAR)..	P. R. R. Spec. No. 186 Air Compressor Oil, 29-87.
ALL GEARS (NOT RUNNING IN OIL)	P. R. R. Gear Grease No. 1, 29-31.
ALL CABLES	P. R. R. Gear Compound No. 1, 29-121.
CONVEYOR CHAINS AND PINS..	Crankcase Drainage.
AIR BRAKE PINS, BRAKE LEVERS AND BOLSTER GUIDES	Crankcase Drainage.
CENTER PLATES AND SIDE BEARINGS	
	P. R. R. Center Plate Grease, 29-30.
CHAFING BLOCK AND DRAW BAR	
	P. R. R. Center Plate Grease, 29-30.
CONTROLLER CONTACT FINGER..	Vaseline.

SHAKER SCREEN OUTFIT.

147. The instructions pertaining to Industrial Brown-hoist Machine apply to these outfits.

STEAM AND GASOLINE DITCHERS WITH GRAVITY AND HUMMER SCREENS.

148. The instructions pertaining to Industrial Brown-hoist Machine apply to these outfits.

MOLE BALLAST CLEANERS.

149. The general instructions pertaining to machines and gas engines apply to these machines.

150. The operator of a Mole must have in his possession and thoroughly understand the book of instructions issued by the makers of the machine he is operating.

151. Moles are to be operated by qualified operators only. The operator must see that the mole is properly set to clear trains and special care must be exercised when machine is working on curves to take care of the differences in the elevation of the two tracks.

152. The operator must see that the proper digging points are used in the proper place as called for by the width of center ditch. When machine starts to raise at front end the digging points are worn too short or their springs are not in proper adjustment.

153. The mole should be thoroughly cleaned each night and run idle for a sufficient time to clean the belt

and rear conveyor screw of dirt, and mole covered with tarpaulin provided.

154. Drive chains should be frequently oiled.

155. The operator must see that the lubricating instructions, as shown in the Book of Instructions and lubricating charts, are strictly followed.

156. The operator is responsible for having the proper tools and keeping them in serviceable condition.

157. So far as possible, moles should be operated up-grade to permit water to drain away from the mole.

158. When necessary for the operator to clear approaching trains, he must throttle the motor down to idling speed.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Water Pump	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearings	P. R. R. Cup Grease No. 3, 29-98.
Magneto, Starting Motor....	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
TRANSMISSION:	P. R. R. Differential Grease, 29-35.
HEAD MECHANISM (Bronze Worm Drive)	P. R. R. Differential Grease, 29-35.
GREASE CUPS (Except Water Pump)	P. R. R. Cup Grease No. 3, 29-98.
PINS, CLEAVISES, ETC.	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
CHAINS, OPEN GEARING, ETC. ..	P. R. R. Gear Compound No. 1, 29-121.

AIR COMPRESSORS—MASTER CARPENTER.

159. The instructions pertaining to Tie Tamper Compressors apply to these machines.

TIE ADZERS AND SCORERS.

160. The instructions pertaining to machines and gas engines apply to these machines.

161. When a tie adzer or scorer is to be moved from one location to another on its own wheels on a track, the instructions pertaining to the movement of motor-cars apply.

162. Before starting the work of scoring or adzing ties, the ballast under the rail and for twelve inches (12") each side of the center line thereof must be removed to a sufficient depth below the top of the ties, in order to prevent the revolving cutters from striking stones. After the rail has been thrown out and the old tie plates removed, the tie should be swept clean to remove as much sand and dirt as possible. Broken spikes must then be located and driven down far enough to clear the cutters.

163. Care should be taken to see that the cutting tools are firmly clamped in position so that they will not back away from the work.

164. Safety guards must be in place and act effectively to prevent throwing chips and broken pieces of tie. Operators must wear goggles and shin guards.

165. Cutter heads on adzing machines should be carefully adjusted so as to have the adzed surfaces on ties

in the proper plane. Readjustment of the heads is required whenever there is any change in height of the rails on which the machines are operated while adzing ties. The guide rollers on adzing machines must be properly set to gauge the adzed surfaces so that the same margin appears on each side of the new tie plates after track is gauged and rails spiked. This is particularly important on curves. The guide rollers must be raised before running over crossings, switches and guard rails.

166. Transmission belts on adzing machines should be kept tight enough to prevent undue slipping. Endless belts must not be cut and spliced.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase, Summer	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Winter	P. R. R. Spec. No. 161-A Light Gas Engine Oil, 29-56.
Magneto	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Governor	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Water Pump.....	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearing.....	P. R. R. Ball Bearing Grease, 29-179.
AXLE BEARINGS	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
PINS, CLEAVISES, PEDESTALS,	
GUIDES	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
GREASE CUPS	P. R. R. Cup Grease No. 3, 29-98.

PAINT SPRAYERS.

167. The general instructions pertaining to machines, gas engines, air compressors and motor-cars apply to these machines.

168. The instructions issued by the manufacturer for each type of sprayer and pressure paint tanks and attachments thereto must be followed.

169. Spray guns must have the movable parts oiled daily.

170. Spray guns must be cleaned at the completion of a job and at the end of the day's work. Take apart the necessary parts, rinse or suspend them in cleaning solvent suitable for the material used. Before using again blow out with compressed air.

171. Do not use caustic soda or other alkali solution for cleaning aluminum parts.

172. Use good gaskets on paint tanks and draw lid clamps down tightly and uniformly to prevent air leakage.

173. Strain ordinary paint through a 20-mesh screen and other paints as required.

174. Introduce air into the paint tank slowly. Sudden application of full pressure scatters paint on interior of lid with a probable clogging of passages through the lid.

175. Always release air pressure on tank during periods of idleness. Do not allow safety valve to become dirty or coated with paint.

176. The life of the hose depends upon the care given it. Do not allow kinks or short loops in hose. After use, always clean the fluid hose thoroughly. Take the lid off the paint container, lift out the paint can, and put in a clean can with about 1½ pints of P. R. R. Specification No. 169 Turpentine Substitute 30-2486. Put on the lid again and operate the gun for four or five minutes. This will clean out the hose and gun and leave them in good condition for use next day.

177. State regulations governing the operation of paint sprayers must be observed.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Magneto	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Water Pump.....	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearing.....	P. R. R. Ball Bearing Grease, 29-179.
AXLE BEARINGS	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
PINS, CLEAVISES, PEDESTALS, GUIDES	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
GREASE CUPS	P. R. R. Cup Grease No. 3, 29-98.
AIR COMPRESSOR	P. R. R. Spec. No. 186 Air Compressor Oil, 29-87.

AUTOMOBILES, TRUCKS AND TRACTORS.

178. The general instructions pertaining to machines and gas engines apply to these machines.

179. Driver or operator must be qualified and, where required, licensed under the laws of the States in which they operate.

180. All traffic rules and regulations must be strictly observed. Stops must be made at all railroad crossings and the driver must know that it is safe to cross before proceeding. When two men are on the truck one must flag over the crossing on the ground.

181. The Safety Rules of the Railroad must be observed.

182. No unauthorized person is permitted at any time to ride on trucks or automobiles. Violation of this rule is sufficient cause for discipline.

183. Trucks must not be used for transportation of other than Company material or men, except as authorized.

184. The driver must obtain and observe the instructions issued by the manufacturer of the particular type of automobile or truck to which he is assigned, paying particular attention to the lubrication chart and instructions. Operator must see that lubricating instructions as covered by lubricating charts are strictly followed.

185. No truck shall be operated on the public highways without the prescribed license plates attached and displayed in the proper manner.

186. The license plates must at all times be kept clean.

187. The chassis must be kept clean, especially around joints and bearing surfaces. When necessary, and at least once a month, the chassis and running gear must be gone over with a kerosene rag to remove any accumulation of oil and dirt. The bolts holding the body, power plant, fenders, etc., must be kept tight. Troublesome squeaks develop in the chassis that can be remedied by engine oil around the fastenings.

188. Care should be used in washing automobiles and trucks, as the high finish is ruined by improper or careless washing. If soap is necessary plenty of water should be used to rinse the body thoroughly.

189. Mud, grease and oil must never be allowed to remain on the truck longer than absolutely necessary.

190. Mud must be soaked off with plenty of water without rubbing.

191. A common rubber hose without nozzle such as is used in garages is the best method of cleaning, but when used against the body the stream should be without force.

192. After washing, dry the body immediately with a clean chamois skin, otherwise the finish may become cloudy and streaked. All grit and mud should be removed before using the chamois skin.

193. It is most important that tires be kept properly inflated. The pressure must be tested at least once a week with a reliable pressure gauge and not permitted to fall more than 10% below the pressure recommended by the manufacturer.

194. In the case of tire trouble on the road, the truck must not be run on a flat tire farther than necessary to stop and clear the road for traffic. Even 100 feet will break the body of tire between the rim and road, injuring both the casing and inner tube.

195. Care must be used in driving over rough roads that are hard on tires, and speed reduced accordingly.

196. Tire chains must be put on loosely so that they may gradually shift around the tire, equalizing the chain wear on the tires.

197. When using chains they must be applied to both rear wheels. When used on one wheel the other wheel skids, causing undue wear.

198. Automobiles and trucks must not be driven in car tracks, as the rails will damage the tires.

199. Safe operation requires that the brakes must be used carefully and kept properly adjusted so that the braking strain will be evenly distributed between the tires.

200. The tires must be protected as much as possible from oil or grease, which should be removed with a cloth soaked in gasoline.

201. The truck must not be loaded beyond its rated capacity.

202. Spare tires must be covered to prevent damage by hot sun, and rotated in service each three months.

HEAVY DUTY TRUCKS, TRACTORS AND CATERPILLARS.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase, Summer.....	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Winter.....	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.

MEDIUM AND LIGHT DUTY TRUCKS (EXCEPT FORD MODEL T AND TT), AND ALL TYPES OF BUSINESS CARS (EXCEPT FORD MODEL T)

ENGINE:	
Crankcase, Summer	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Winter	P. R. R. Spec. No. 161-A Light Gas Engine Oil, 29-56.

FORD MODEL T AND TT.

ENGINE	P. R. R. Spec. No. 161-A Light Gas Engine Oil, 29-56.
Water Pump.....	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearing.....	P. R. R. Cup Grease No. 3, 29-98.
Magneto, Starting Motor, Generator	Same as used in engine crankcase.
TRANSMISSION (except Fords)	P. R. R. Differential Grease, 29-35.
FORD TRANSMISSION	Same as used in engine crankcase.
REAR AXLE, METAL UNIVERSAL JOINTS, OIL LUBRICATED	P. R. R. Differential Grease, 29-35.
METAL UNIVERSAL JOINTS, GREASE LUBRICATED	P. R. R. Ball Bearing Grease, 29-179.
BALL OR ROLLER BEARINGS, ex- cept when mounted to run in oil	P. R. R. Ball Bearing Grease, 29-179.

GREASE LUBRICATED PINS, BEARINGS, ETC.	P. R. R. Cup Grease No. 3, 29-98.
OIL LUBRICATED PINS, BEARINGS, ETC.	Same as in engine.
SPRINGS	Crankcase drainage.

CONCRETE MIXERS.

203. The general instructions pertaining to machines and gas engines apply to these machines.

204. In setting up mixers for operation, it is essential that the machine be level and properly blocked.

205. The mixing drum must be kept clean and portions of former mixes not allowed to accumulate. This can be done by washing out the drum with water at the end of each run.

206. Concrete must not be allowed to accumulate on the frame, wheels or other parts of the machines. Concrete accumulation should be washed off or knocked off at the end of each day's service.

207. Road materials, or other bituminous or oily mixes must be made only in mixers that have been assigned to that service.

208. The loading skip must not be beaten by sledges, picks or other tools.

209. The lifting cables of skip must be kept lubricated and not permitted to kink.

210. The rotating mechanism must be kept in proper adjustment, clean and well lubricated.

211. The water tank must be drained in freezing weather and when shipping or not in use.

CONCRETE MIXERS—ALL TYPES.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59, except units equipped with Universal Motor, which takes P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Water Pump (if applied)...	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearings (if used)	P. R. R. Cup Grease No. 3, 29-98.
Magneto	Same Oil as used in Engine.

GEARS:

Exposed or partially enclosed type	P. R. R. Gear Compound No. 1, 29-121.
Enclosed in oil tight compartments	P. R. R. Differential Grease, 29-35.

PINS, CLEVISES, OIL CUPS.....Same Oil as used in Engine.

GREASE CUPS (Except Water

Pump Cup)	P. R. R. Cup Grease No. 3, 29-98
-----------------	----------------------------------

JACKSON POWER BALLASTER.

212. The general instructions pertaining to machines, gas engines and motor-cars apply to these machines.

213. When using or fouling tracks, the use of track must be procured and required protection provided.

214. The machine must be operated only by qualified operators.

215. In raising track care must be used not to raise above the grade established.

216. All spare parts must be kept with the machine.

217. The cab must be kept locked when machine is not in use.

218. The machine is to be operated with tamping shoes ahead, otherwise heavy portion of machine on untamped track will settle track from grade.

219. When traveling be sure oil cups to clutch bearings are turned on and kept supplied with oil.

220. When traveling or not in use, and at all times except when tamping, the tamping cross-head must be securely locked at top of stroke by cross-head latch.

221. Before operating tamping level, the propelling lever should be in neutral position and foot-brake applied.

222. Before operating propelling lever, the tamping lever should be in neutral position and the foot-brake released.

223. Adjustments must be made to cross-head portions of machine only when cross-head is locked by cross-head latch, or when the tamping shoes and cross-head are resting on ground and engine gear is in neutral.

224. Block and lock wheels of machine securely when on set-off to prevent movement with the possibility of fouling track.

225. Check all bolts and tighten loose ones on tamping head and tamping shoes every two hours. Check all

bolts on machine daily and keep cross-head slide nuts on outside of machine tight at all times.

ENGINE:

LUBRICANT RECOMMENDED

CrankcaseP. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.

Magneto, Starting Motor,
Generator, FanSame as used in engine crankcase.

MOTOR DRIVE CHAINSame as used in engine crankcase.

SIGHT FEED LUBRICATORSame as used in engine crankcase.

TRANSMISSIONP. R. R. Differential Grease, 29-35.

PROPELLING MACHINERY:

Grease CupsP. R. R. Cup Grease No. 3, 29-98.

Chain Drive (enclosed)P. R. R. Differential Grease, 29-35.

Chain Drive (open)P. R. R. Gear Compound No. 1,
29-121.

JournalsP. R. R. Ball Bearing Grease,
29-179.

CONTROL LEVERS, PINS AND

CLEVISESCrankcase Drainage.

NORDBERG TRACK MACHINES.

NORDBERG POWER JACKS.

226. The general instructions pertaining to machines, gas engines and motor-cars apply to these machines.

227. The instructions published by the manufacturer must be followed.

228. The machines must be operated only by qualified operators.

229. In throwing or raising track care must be used not to raise track above the grade established.

230. All spare parts must be kept with the machine.

ENGINE:

LUBRICANT RECOMMENDED

Crankcase, Summer.....P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.

Winter.....P. R. R. Spec. No. 161-A Light Gas Engine Oil, 29-56.

Water Pump.....P. R. R. Cup Grease No. 5, 29-100.

SPEED SCREW, REVERSE CLUTCH. P. R. R. Cup Grease No. 3, 29-98.

Magneto, Starting Motor,

Generator, FanSame as used in engine crankcase.

TRANSMISSIONP. R. R. Differential Grease, 29-35.

PROPELLING MACHINERY:

Grease CupsP. R. R. Cup Grease No. 3, 29-98.

Chain Drive (enclosed).....P. R. R. Differential Grease, 29-35.
(open).....P. R. R. Gear Compound No. 1,
29-121.

JournalsP. R. R. Ball Bearing Grease,
29-179.

CONTROL LEVERS, PINS AND

CLEAVESCrankcase Drainage.

POWER RAIL DRILLS.

POWER BONDING DRILLS.

231. The general instructions pertaining to machines and gas engines apply to these machines.

232. The instructions issued by the manufacturer must be followed.

233. Some of these machines are operated by single cylinder, two-cycle engines, and the instructions per-

taining to proper method of lubrication and mixing the oil with gasoline must be observed.

234. Care must be used not to break the drill bit. The bit must be firmly fastened in the chuck. The feeding pressure against the rail should be reduced just as the bit point penetrates the opposite side of rail. Loose bits and improper feeding are the chief causes of broken bits.

235. Dull bits must not be used.

236. Bits must not be changed while engine is running.

237. When through using the machine the operator or one using the machine must lubricate and clean it and know that it is in good running condition before transferring it to other gangs.

238. The receipt of a machine in dirty, unoled, or poor running condition must be reported promptly to the proper officer. Failure to do so implies that machine is received in good working condition and that the one who has it is responsible for such defects as may be found.

LUBRICANT RECOMMENDED	
ENGINE	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Magneto	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
MACHINERY:	
Grease Cups	P. R. R. Cup Grease No. 3, 29-98.
Gears, enclosed or not enclosed	P. R. R. Gear Compound No. 1, 29-121.
Wheel Bearings, Pins, Clevises, Levers, etc.....	Crankcase Drainage.

HILLIARD PORTABLE MILLING MACHINES.

239. The general instructions pertaining to other machines apply to these machines.

240. The instructions issued by the manufacturer must be followed.

241. This machine is operated clamped to the rail and the use of track must be procured.

242. The machine must be so clamped to rail that it may be quickly removed.

243. Care must be used in feeding cutters to rail so as not to damage or unnecessarily dull the cutters. Overflow metal to be chipped off the head of the rail at the starting point in order that the cutter may not have to start in this hard cold-rolled material.

244. The proper cutting compound should be used, applied in a continual flow. Order "Altoona Cutting Compound Soluble," Specification 148-b, 29-111. Mix one part by volume of compound to 18 parts of water.

LUBRICANT RECOMMENDED

Electric Motor, Air Motor, Grease Cup, Main Shaft Bearing	P. R. R. Ball Bearing Grease, 29-179.
Air Motor Drip Oiler, Pro- pelling Screw, Guide Plate and Crosshead, Feed and Adjusting Screw	P. R. R. Specification No. 186 Air Compressor Oil, 29-87.

DISCERS WITH POWER OPERATED ARMS.

POWER LAWN MOWERS.

POWER MOWING MACHINES.

POWER TRACK MOWING MACHINES.

POWER GRINDERS.

POWER SAWS.

POWER SPIKE DRIVERS.

POWER SPIKE PULLERS.

POWER WRENCHES.

TRACK OILERS.

OTHER POWER MACHINES.

245. The general instructions pertaining to machines, motor-cars and gas engines apply to these machines.

246. The instructions issued by the manufacturer must be followed.

247. In order to secure the proper kinds of lubricants the lubricating chart for a like machine may be followed. However, in case of doubt inquiry should be made as to the lubricant best adapted for each purpose.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase, Summer.....	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Winter.....	P. R. R. Spec. No. 161-A Light Gas Engine Oil, 29-56.
Water Pump.....	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearings.....	P. R. R. Cup Grease No. 3, 29-98.
Magneto, Starting Motor, Generator	Same as used in engine crankcase.
TRANSMISSION	P. R. R. Differential Grease, 29-35.

LUBRICANT RECOMMENDED

AIR COMPRESSOR P. R. R. Spec. No. 186 Air Com-
pressor Oil, 29-87.

PROPELLING MACHINERY:

Grease Cups P. R. R. Cup Grease No. 3, 29-98.

Chain Drive (enclosed).... P. R. R. Differential Grease, 29-35.
(open)..... P. R. R. Gear Compound No. 1,
29-121.

Journals P. R. R. Ball Bearing Grease,
29-179.

CONTROL LEVERS, PINS AND

CLEAVISES Crankcase Drainage.

Oiling Flexible Shafts.—Cores should be drawn out and examined at least once a day and oiled if necessary, using unsalted tallow or lard oil, or P. R. R. Cylinder Oil No. 1, 29-66. To do this unscrew hand piece at its junction with the ferrule, at the end of the case, then draw core entirely out and oil thoroughly. In returning core to case turn core until flat portion matches correspondingly flat place in the sleeve. When shafts are not in use they should be kept in horizontal position. Keep cores clean and free from dirt. Avoid sharp bends. When shaft begins to buckle, it is either being worked beyond its capacity or something is the matter. Stop and investigate. Flexible shafts are a bearing their whole length and must be kept well lubricated at all times.

AIR OPERATED EXTENSION SIDE-DUMP CARS.

248. No special operator is required for this type of equipment.

249. The Supervisor to whom cars are assigned is responsible for keeping the cars clean and in good working order and see that Car Inspectors maintain air lines and lubrication.

250. In dumping cars, the instructions issued by the car builders must be observed.

251. The cars must not be loaded beyond the rated capacity.

252. Care must be used not to drop heavy loads into cars from such heights as to damage floor or sides.

253. Hot material must not be loaded in the cars.

254. With cars equipped with locking mechanisms, all latches must be released before attempting to dump.

255. When dumping cars with locomotive not equipped with separate air supply line, before the air brake line is disconnected from the locomotive the cars must be secured with hand brakes, after which the air brake line should be connected with the supply line on car adjacent to locomotive. The brake valve on locomotive should then be placed in full release position to obtain at least 100 pounds pressure before dumping cars.

256. Push poles must not be used in dumping or righting cars.

257. A safety chain should be available for holding trucks to track if car is loaded in such manner that it is liable to lift the wheels off rails in discharging the load.

258. When a car fails to right itself after dumping, turn the air pressure back in the dumping cylinders and clear the car of all lading, being sure that the door is clear. When everything is clear of the lading, exhaust the air from the dumping cylinders and the car body will return to normal position by gravity.

259. With cars equipped with locking mechanisms, such as the Clark, all latches must be in place over pins after dumping and before being handled in train.

260. In freezing weather, drain storage reservoir frequently.

261. All defects in cars must be reported promptly to the Motive Power Department.

ELECTRIC ARC WELDING OUTFITS.

262. The Book of Rules, Safety Rules, and instructions previously given in this book pertaining to machines and gas engines must be observed in the operation of these outfits.

263. The instructions furnished by the manufacturers must be closely followed.

264. Welding generator must be set up as nearly level as possible, and when in operation, must be kept clean, dry and free from dirt.

265. When the side panels are removed from the generator, they must be secured to prevent being picked up by the following draft of passing trains. When leaving the machine at the end of the day's work, the side

panels must be placed on the machine and securely locked.

266. Lubricating oil in engine crankcase must be drained and replaced with fresh oil after every twenty hours of operation for the first 100 hours and then after every 50 hours of operation.

267. Care must be taken that welders properly use the welding screens, not only to protect the eyes and skin from the ultra-violet rays generated by the arc, but to protect the eyes from the minute pieces of slag which fly from the surface of the weld while cooling. Hand screens must be kept in perfect condition and the use of screens with cracked lenses, fibre or otherwise defective will not be tolerated. Welders should not wear low shoes, and should at all times use the gauntlet gloves, leggings and armlets provided. No part of the body which is not thoroughly covered should be exposed to the arc, otherwise painful burns similar to bad case of sun-burn are likely to result.

268. The public and others should be warned not to watch the arc, as painful injuries may result from doing so without the use of proper screens.

269. The generators should only be oiled once a week and such oiling should be done when engine is not running.

270. When the generator is to be moved from one location to another on its own wheels on a track, the use of the track or tracks that will be obstructed must be obtained and the necessary flag protection provided.

271. Proper flag protection shall be provided for the track grinders and workmen.

272. Track grinding machines must be carefully handled off and on the track, in order not to distort the guides for grinders.

273. Grinding wheels must be applied and operated in accordance with the instructions printed on the labels.

274. When operating power grinding wheels, gauntlet gloves and protective glasses must be worn. The guard must be maintained in the most suitable position for the protection of the operator, and care should be taken when changing wheels not to over-tighten retaining nut.

275. Over-lubrication should be guarded against in the grinding motors, where excess oil will gather particles of abrasive material and steel, and cause excessive amount of wear in the bearings.

276. All cables and connections must be carefully maintained; imperfectly insulated cable or connections must not be used.

ENGINE:	LUBRICANT RECOMMENDED
Crankcase, Summer.....	P. R. R. Spec. No. 161-A Heavy Gas Engine Oil, 29-60.
Winter.....	P. R. R. Spec. No. 161-A Medium Gas Engine Oil, 29-59.
Water Pump.....	P. R. R. Cup Grease No. 5, 29-100.
Fan Shaft Bearings.....	P. R. R. Cup Grease No. 3, 29-98.
Magneto, Starting Motor, Generator	Same as used in engine crankcase.

GENERATORS:

Main P. R. R. Ball Bearing Grease,
29-179.

MACHINERY:

Grease Cups P. R. R. Cup Grease No. 3, 29-98.

Journals P. R. R. Ball Bearing Grease,
29-179.

AXLE BEARINGS P. R. R. Spec. No. 161-A Medium
Gas Engine Oil, 29-59.

PINS, CLEVISES, PEDESTALS,

GUIDES P. R. R. Spec. No. 161-A Medium
Gas Engine Oil, 29-59.

INDEX

Numbers refer to paragraphs unless otherwise noted

A

Adding oil to gasoline.....	16
Advancing spark	17
Adzers, tie	160
Alcohol	23, 116
Ammeter	18
Anti-freeze solution	23
Approved gasoline cans.....	13
Arc welding	262
Automobiles	178
Air cleaners	19
Air compressors	95, 159
Air consumption of guns.....	114
Air dump cars	248
Air leaks	108, 109
Air pipe lines	107
Air reservoirs, testing	103
Air tamper guns	111

B

Back-fire	17
Ballast cleaning	139, 147, 148, 149
Ballaster, Jackson power.....	212
Battery	18
Boiler inspections	84
Boiler wash certificates	82

Bonding drills	231
Book of Rules.....	2, 35, 48, 262
Boom shackles	80, 81
Brakes, testing	41, 66
Brownhoist cranes, page.....	24
Brownhoist machine	139
Browning cranes, page.....	24
Bucyrus-Erie cranes, page.....	24
Buda motor cars, page.....	14, 17
Burro cranes, page.....	24, 31, 32

C

Cables	124, 276
Cans, gasoline	13
Carbon	19
Carbon monoxide	33
Carburetor	12
Cars, track motor.....	34
Casey Jones motor cars, page.....	14, 23
Chains, tire	196
Changing oil	19
Charging repair parts.....	6
Chicago Pneumatic Tool compressor, page	40, 42
Chief Engineer, Maintenance of Way.....	5
Chief Engineer, System	5
Choke	17, 21
Clark cars	248
Clean machines	7
Cleaner, air	19
Clutches, crane	66
Cold weather	17
Cooling system	22, 31
Compressors, tie tamper.....	95, 109

Concrete mixers	203
Cranes	54, 74, 82
Cranking	17
Crawler cranes	74
Cutter heads	165
Cutting compound	244
Cylinders, rebores	16

D

Denatured alcohol	23
De-nutters	245
Derricks	85
Discers	245
Distributor	12
Ditchers	54, 78, 82
Division engineers	1, 5
Draining crankcase	19
Draining radiator	31
Drills, bonding	231
Drills, rail	231
Drivers, spike	245
Dump cars, air.....	248

E

Electric tie tampers.....	118, 126
Electric welding	262
Electrified territory	128
Engineer, Maintenance of Way.....	5
Engines, gasoline	10
Everitt power drill.....	245
Extension side dump cars.....	248

F

Fairbanks-Morse cars, page.....	14, 18
Fairmont discer	245
Fairmont motor cars, page.....	14, 19, 20
Filling gasoline tank.....	13
Filter, oil	19
Flag protection	140, 270
Flexible shafts	247
Flushing crankcase	20
Flushing radiator	22
Foremen	1
Fouling tracks	4, 57, 213
Four-cycle engines	16
Freezing, anti-, solution.....	23

G

Gasoline engines	10
Gas tanks	30
General instructions	1
Gravity screens	148
Grinders, power	245, 271

H

Hand cars	50, 51
Hard-starting engines	27
Hilliard milling machine.....	239
Hose	176
Hummer screen	148
Hydrostatic test	103

I

Idling engine	17
Ignition switch	21
Industrial Brownhoist	139

Industrial cranes, page.....	24
Ingersoll-Rand compressor, page.....	40, 42
Inspecting motor cars.....	39
Instruction Book	6

J

Jackson power ballaster.....	212
Jackson spike driver.....	245
Jordan spreader	129
Jordan track oiler	245

K

Kalamazoo cars, page.....	14, 21, 22
Kerosene	25
Keystone grinder	245
Knocks in engine.....	25

L

Leaks, air	108, 109
Leaks in radiators.....	22, 23
Lima cranes, page.....	24
Limit stops	58
List of repair parts.....	6
Locomotive cranes	78, 82
Loose bearings	26
Lubrication charts—53, 77, 81, 84, 85, 93, 106, 117, 125, 126, 127, 138, 146, 158, 166, 177, 202, 211, 225, 230, 238, 244, 247, 276	
Lubricating system	8, 12

M

Madden rail layers.....	86
Magneto	12, 27, 32
Magneto points	27
Mall grinder	245

Master carpenters	1, 5
Master masons	5
Master plumbers	5
McMyler cranes, page.....	24
Metalweld-Worthington compressors, page.....	40, 42
Milling machine, Hilliard.....	239
Missing, engine	29
Mixers, concrete	203
Mixing lubricating oil.....	16
Moles, ballast cleaning.....	149
Motor cars, track	34
Mowers, lawn	245
Mowing machines	245
Mudge motor cars, page.....	14, 23

N

New engines	16
New rings	16
Nordberg drills	245
Nordberg grinder	245
Nordberg power jacks	226
Nordberg spike pullers	245
Nordberg tie adzers	160
Nordberg track machine	226
Northwest cranes, page.....	24
Northwestern motor cars, page.....	14, 23
Nutters	245

O

Ohio cranes, page.....	24
Oilers, track	245
Oil filter	19
Operators of machines.....	1, 6, 7
Orton & Steinbrenner cranes, page.....	24

P

Paint sprayers	167
Parts list	6
Pawling & Harnischfeger cranes, page.....	24
Pile drivers	85
Pipe lines	107, 110
Power tools	128
Pressure gauge, air.....	102
Primer	12
Pullers, spike	245
Push cars	51

R

Racine saws	245
Radiator	22, 31
Rail drills, power.....	231
Rail layers, Madden.....	86
Rail loaders	54
Rawls mowers	245
Reground cylinders	16
Repairman	9
Repair part list.....	6
Reservoir, air, testing.....	103
Retarding spark	17
Rings, new, applied.....	16
Rules 99, 100, 101-A.....	4, 36
Rules, safety	2, 3

S

Safety	3
Safety rules	2, 48, 181, 262
Safety valves	101, 175
Saws, power	245
Scorers, tie	160

Screens	147, 148
Shafts, flexible	247
Shaker screen	147
Sheffield motor cars, page.....	14, 18
Smoking	13
Soldering radiator leaks.....	30
Spark plugs	27
Spark timing	17, 26
Spike drivers	245
Spike pullers	245
Spray guns	169
Spreaders	129
Starting engine	17
Steam cranes	82
Stow grinders	245
Sullivan air compressor, page.....	40, 43
Supervisors	1, 5
Supervisors of Signals.....	5
Syntron motor cars, page.....	14, 24
Syntron tools	127

T

Tampers, air	94
Tampers, electric	118
Tie adzers	160
Tie scorers	160
Tie tampers, air	94
Tie tampers, electric	118
Tie tampers, guns	111
Time-table instructions	35, 48
Timing spark	17
Tire chains.....	196
Tires	193, 202
Track motor cars.....	34

Track mowing machines.....	245
Track oilers	245
Tractors	178
Trailers	50, 51
Train rules	36
Trucks	178
Two cycle engines	16, 86, 233

U

Use of track.....	4, 37, 55, 97, 270
-------------------	--------------------

W

Warming up engine.....	17
Washing out cooling system.....	22
Welding, electric	262
Wolfe tie tampers.....	117
Wollery nutter	245
Wrenches, power	245

Key

THE PENNSYLVANIA RAILROAD

SUPPLEMENT NO. 1 TO
LETTER OF GENERAL PRACTICE NO. 199-B

Phila., April 30, 1957.

Subject: Manual of Instruction - Maintenance of Way Equipment,
Form M.W. 52-(b).

Mr. G. LeBoutillier,
Mr. R. C. Morse,
Mr. E. W. Smith,
Mr. H. E. Newcomet,
Vice President.
Mr. C. E. Walsh,
General Purchasing Agent.
Mr. C. B. Hall,
Stores Manager.

Pending revision of Form M.W. 52, 'Manual of Instruction -
Maintenance of Way Equipment', Paragraph 180, Page 62, should read
as follows:

180. "All traffic rules and regulations must be
strictly observed. Stop must be made at all railroad
crossings, and driver must know that it is safe to cross
before proceeding."

Approved:

Robt. Faries

Asst. Chief Engineer-
Maintenance.

Approved:

W. D. Wiggins

Chief Engineer.

Wilmington, January 17, 1936.

Mr. M. Lipman,
Mr. Spencer Danby,
Mr. J. E. Vandling,
Division Engineer.

The P.R.R. Differential Grease, Ref. 29-35, specified for transmission and head mechanism in MW 52b for Mole Ballast Cleaning moles has not proven entirely satisfactory.

The Manufacturing Laboratory, Altoona, are in position to furnish a grease that it is thought will give better service. This grease will be designated "Mole Gear Case Lubricant", ref. 37-138, and it is expected to be serviceable throughout the entire "Mole" season. It will be furnished in standard containers holding 35 lbs.

Please arrange to give this grease a thorough trial during the coming "Mole" season and advise whether it answers the purpose intended, and, also, how it compares with P.R.R. Differential grease, ref. 29-35.

If after using this grease it is found that a lighter or heavier grease is desirable, please advise and we will arrange to have the grease furnished that will best meet our requirements.

W.E.G.
Acting Engineer N.E.

LUBRICATION OF MOTOR TRUCKS, TRACTORS, CATERPILLAR
AND AUTOMOBILES (FORD MODELS "T" AND "TT" EXCEPTED)

(a) Engine:

(1) Crankcase -

When Manufacturer recommends that oil with
properties equivalent to -

AE 20-	Use	PRR Spec.161-A	light gas engine oil,	29-5
AE 30-	"	"	161-A " " " "	29-5
AE 40-	"	"	161-A medium " " "	29-5
AE 50-	"	"	161-A heavy " " "	29-6
AE 60-	"	"	161-A " " " "	29-6
AE 70-	"	"	Filtered Cylinder Oil,Spec.92-A,	29-6

(2) Fan Shaft Bearing -

(a) Anti-friction bearings -Grease
lubricated - PRR ball bearing grease, 29-179.

Anti-friction bearings - Oil lubricat
Same oil as used in engine crankcase.

(b) Plain bearings-Grease lubricated- PRR
Cup Grease No.3, 29-98.

Plain bearings-Oil lubricated- Same o
as used in engine crankcase.

(3) Water pump-Grease lubricated-PRR cup greas
No.5, 29-100.

Water pump-Oil lubricated-Same oil as used
in engine crankcase.

(4) Starting motor generator - Same oil as use
in engine crankcase.

(5) Distributor drive shaft - PRR cup grease
No.3, 29-98.

(b) Clutch -

- 2 -

(1) - Throwout bearing-Oil lubricated-Same oil as used in engine crankcase.

Throwout bearing-Grease lubricated-PRR ball bearing grease, 29-179.

(2) - Pilot bearing - PRR ball bearing grease, 29-179.

(c) Free wheeling unit - (See Transmission).

(d) Transmission -

When Manufacturer recommends a grease with properties similar to -

SAE 80 - Use PRR medium gas engine oil, Spec. 161-A, Account & Reference No. 29-59.

SAE 90 - Use PRR heavy gas engine oil, Spec. No. 161-A, Account & Reference No. 29-60.

SAE 110 - Use a mixture of three (3) parts of PRR differential grease, Account & Reference No. 29-35, and one (1) part of medium gas engine oil, Account & Reference No. 29-59.

SAE 160 - Use PRR differential grease, Account & Reference No. 29-35.

SAE 250 -Use PRR heavy differential grease, Account & Reference No. 29-37.

*Extreme Pressure (E.P.) Lubricant-Use PRR differential grease, Account & Reference No. 29-35.

When grade of grease is not specified, use PRR differential grease.

* (SEE CHIEF OF MOTIVE POWER DESK NO. 9
LETTER OF 4-13-34).

(e) Metal Universal Joints -

(1) Oil lubricated-PRR differential grease,
29-179.

(2) Grease lubricated-PRR ball bearing grease
29-179.

(f) Rear Axle - (See Transmission).

(g) Steering Gear - (See Transmission).

(h) Ball and roller bearings, except when mounted,
to run in oil-PRR ball bearing grease, 29-179

(i) Oil lubricated pins, bushings, etc. - Same oil
as used in engine crankcase.

(j) Grease lubricated pins, bushings, etc.-PRR cup
grease No. 3, 29-98.

(k) Springs - Engine crankcase drainage.

(l) Automatic or "One Shot" chassis lubrication
system - Winter grade coach engine oil, 29-91

Altoona, Pa., M.E. Office,
November 21, 1933.