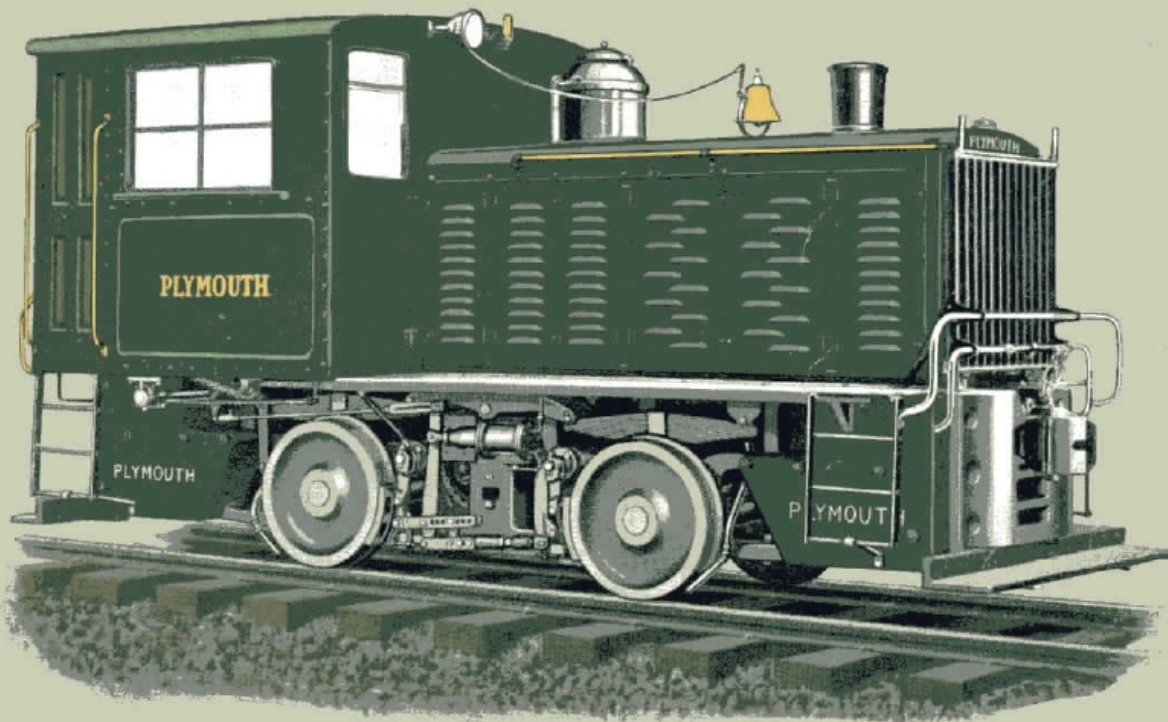


MM 548-2

PLYMOUTH

Gasoline Locomotives



MODEL ML6, 25 and 30~TON
and ML8, 30~TON

35



Bulletin ML

PLYMOUTH

Gasoline Locomotives

MODEL ML6, 20, 25 and 30-TON
and ML8, 30-TON



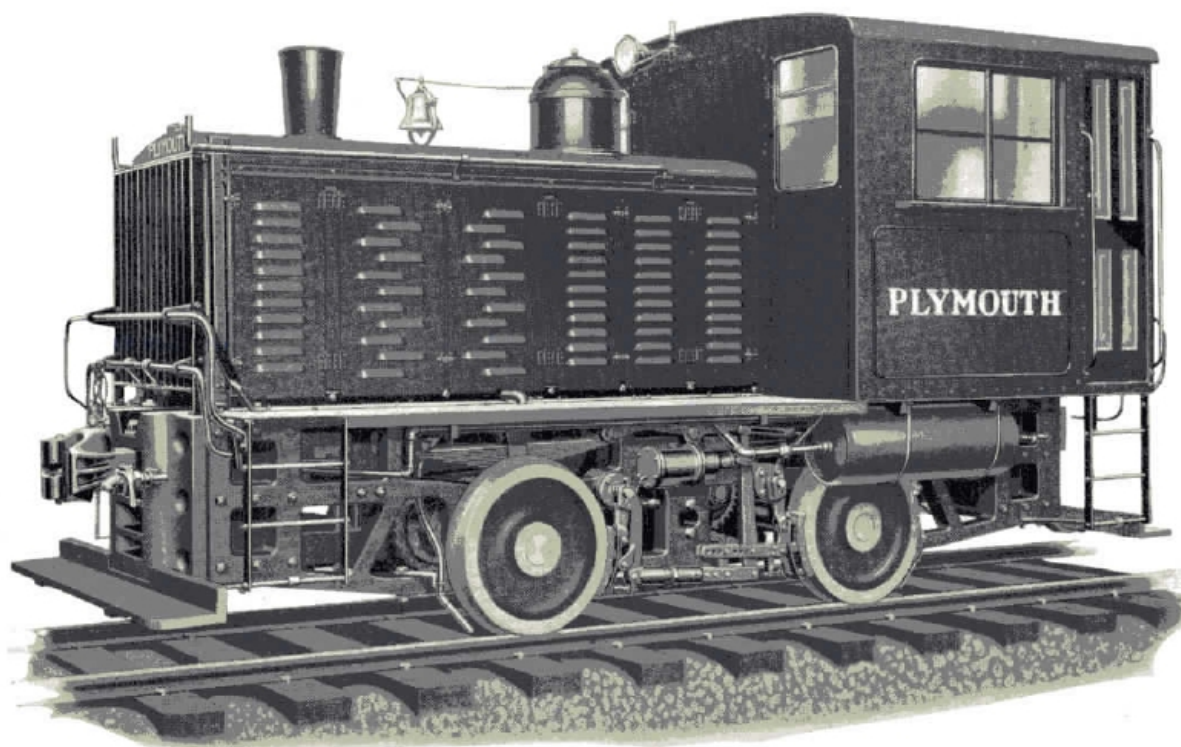
BULLETIN ML

Manufactured by
THE FATE-ROOT-HEATH CO.
Plymouth Locomotive Works
PLYMOUTH, OHIO, U. S. A.



Plymouth Gasoline Locomotive

Model ML6, Type 2, 20 and 25 Ton



View of 56½ inch (Standard) Gauge

THE Model ML6 20, 25 and 30-Ton and Model ML8 30-Ton Gasoline Locomotives are an outstanding achievement in industrial locomotive development. They embody many new and special features and mark a distinct advance in locomotive design and construction.

One of the outstanding features of these locomotives is that they are equipped with both *side* and *cross* equalizers, giving a true 3-point spring suspension. No matter how rough the track, these Locomotives will ride them with ease. The Springs are also exceptionally long and flexible, being 48" long by 4½" wide.

A new Frame, a three-bar steel type of special construction; new and larger clutch that is removable without moving the engine

or transmission; direct-driven air compressor and improved manifolding are a few of the many other improvements giving greater efficiency, accessibility and durability.

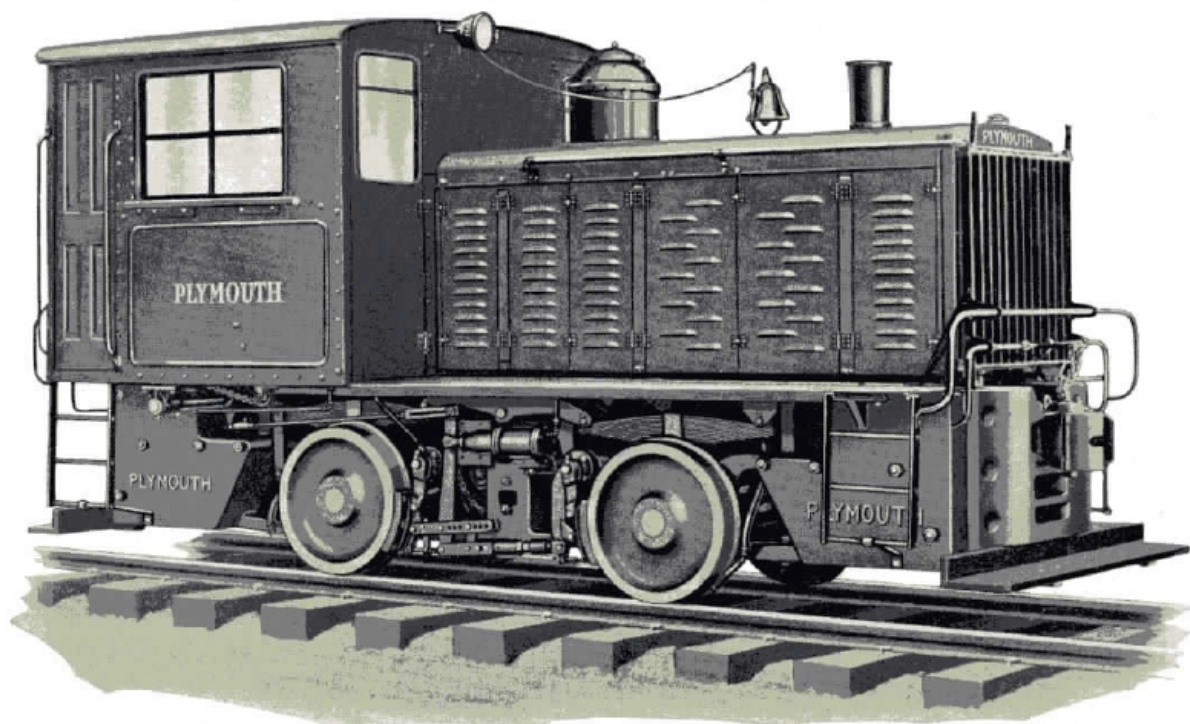
Another new and unusual feature is the *two* powerful 12-volt starters used on the engine, insuring easy starting even during the coldest weather.

These Models are especially adapted for railroad switching, heavy construction work, quarries, sand, gravel and clay plants, logging, mining and for general industrial haulage.

The ML8 30-Ton, equipped with LeRoi 8-cylinder "V" type 250 H.P. engine is an exceptionally powerful locomotive where speed, as well as heavy loads, is an important factor.

Plymouth Gasoline Locomotives

Models ML6, 30 Ton and ML8, 30 Ton



View of 56½ inch (Standard) Gauge

Wheels The Wheels are rolled steel, 33" diameter, 1920 A. R. A. road service tread and flange. Tread is 4½" wide, flange 1½" high and over-all width 5½".

The tread is 2½" thick, thus providing stock so the wheels can be trued several times should they become grooved or flat.

Steel Tired Wheels can be furnished at additional cost.

Brakes Two air brake cylinders, one on each side. Lever type of brake rigging, detachable brake shoes covering treads and flanges of all wheels. Hand wheel brake for emergencies.

Westinghouse straight air, standard equipment. Westinghouse AMM system of straight and automatic air using one combined brake valve, or Westinghouse 14 EL system of straight and automatic air using two brake valves, furnished at additional cost.

Sanders A large sand dome, wood lined to prevent sweating, is mounted so the heat from the engine keeps the sand dry.

Air operated sand traps convey the sand from the dome to large steep-pitched pipes that deliver the sand to the rail close to the wheels.

Couplers Steel bumpers having four coupler pockets for link and pin couplers are regularly provided. The centers of these pockets are 18½", 24", 28½" and 32½" above top of the rail. We can furnish ¾ or full size A.R.A. couplers or any type of special couplers at any desired height.

Lubrication Lubrication of all bearings, aside from those on the engine and transmission, is provided by the Alemite System. This insures proper lubrication and guards against neglect of this highly important feature.



View of 36 inch Gauge

Cooling Modine sectional core single thickness and 30" six blade fan used to cool 6 cylinder engine. Capacity of cooling system 25 gallons. Modine sectional core double thickness and 36" eight blade fan used to cool 8 cylinder engine. Capacity of cooling system 30 gallons. Any of the cores can be removed without interfering with the others. The upper and lower tanks are cast separately of gray iron and carefully machined so that any part can be renewed. The radiator is protected against injury by a heavy steel guard in front.

Winter fronts for the radiator with the shutters operated by a lever in the cab, also a thermometer showing the engine temperature, furnished as special equipment.

Fuel An ample supply of fuel is provided for, through the 75 gallon supply tank. Gravity feed for the 6 cylinder engine. Pump for the 8 cylinder engine. Special screens are provided for preventing dirt or water from finding its way into the carburetor.

For using alcohol efficiently as fuel a special high compression cylinder head should

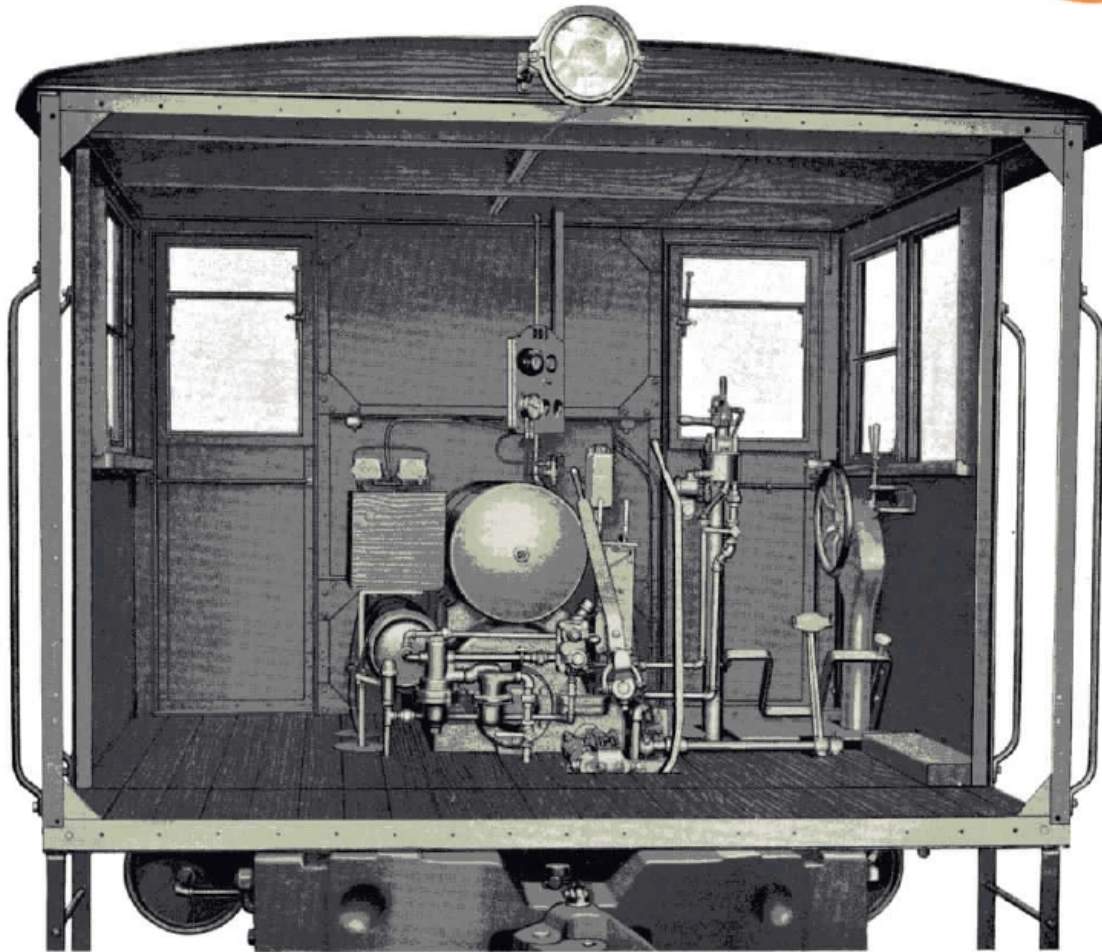
be used, carburetor changed, and timing advanced; 10% gasoline should be mixed with the fuel to prevent corrosion of the valves and cylinder walls.

Instrument Board Mounted so as to be easily seen by the operator. Located on this board are the ignition and lighting switches, ammeter, air gauge, primer, oil gauge, and a suitable lamp for lighting the gauges.

Equipment Electrical equipment consists of a large generator with voltage regulator, two powerful starters on the engine and a large storage battery. Regular equipment includes a front headlight, rear headlight, cab light, switch board light and trouble lamp and cord.

Special equipment to meet I.C.C. requirements including classification and marker lamps and head light dimmers can be furnished.

A splendid outfit of tools is furnished in a metal box which can be locked. Keys in duplicate for the cab door, tool chest, and ignition are sent by mail following shipment of Locomotive. Instruction books and repair lists are shipped in the tool box.



Interior View of Cab, Showing its Roominess and the Convenient Grouping of the Levers and Controls

Cab The large, roomy cab of steel construction is exceptionally well lighted by nine windows framed in steel sash. Five of these windows can be opened, and as the cab has four doors, excellent protection and ventilation can be had at any season. The large number of windows provide unobstructed vision in all directions.

Cabs are built wide to permit the operator to see alongside of cars, and in keeping with standard railroad practice the operator is seated at the right hand side. The seat is well upholstered and is designed so it can be quickly dropped so the operator can stand while running the Locomotive. The comfort of the operator has been carefully considered and all levers are conveniently placed and easily operated.

A cushioned arm rest is placed in the window beside the driver. Grab irons are

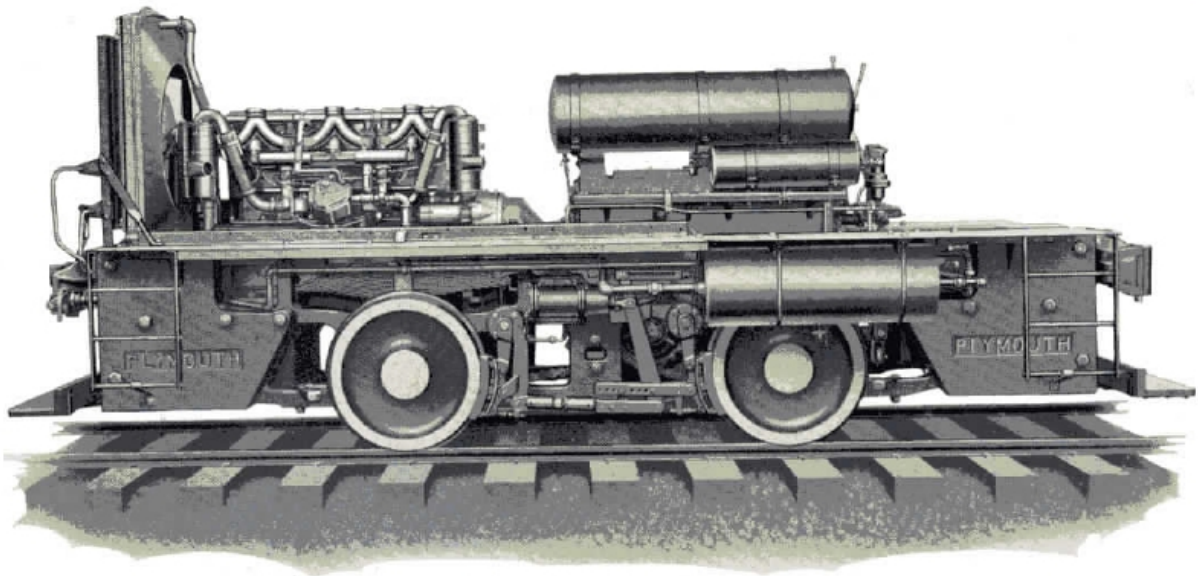
liberally used to provide safety. All doors and windows can be bolted or locked. A cab width of 9' 8" is standard for 56½" gauge, and 8' 0" is standard for 36" gauge, altho other sizes are built to meet special requirements.

Canopy The canopy enclosing the engine and part of the transmission is of all steel construction of ample strength. The top is in two sections: the rear section on which is mounted the sand dome and bell, and the front section which is easily removed when it is necessary to work on the engine. Each side consists of six hinged doors; these doors have louvers stamped in them to provide ventilation for the engine. The doors are also securely hinged, fastened by hinged hasps, and when opened provide easy access to all parts inside of the canopy.

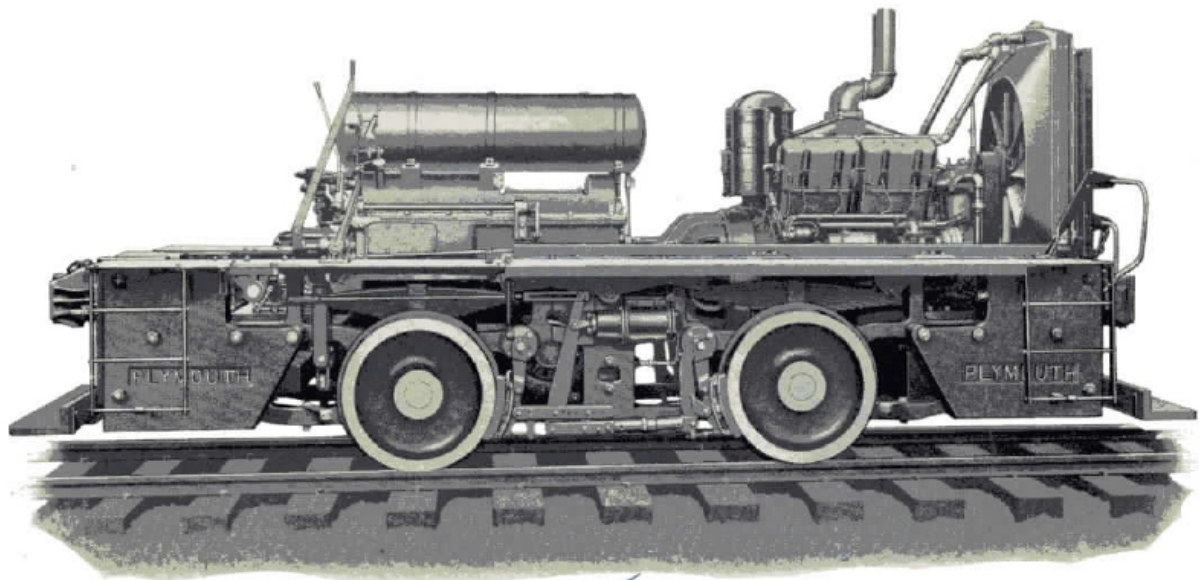


Partially Assembled Views

Showing Accessibility of Various Parts

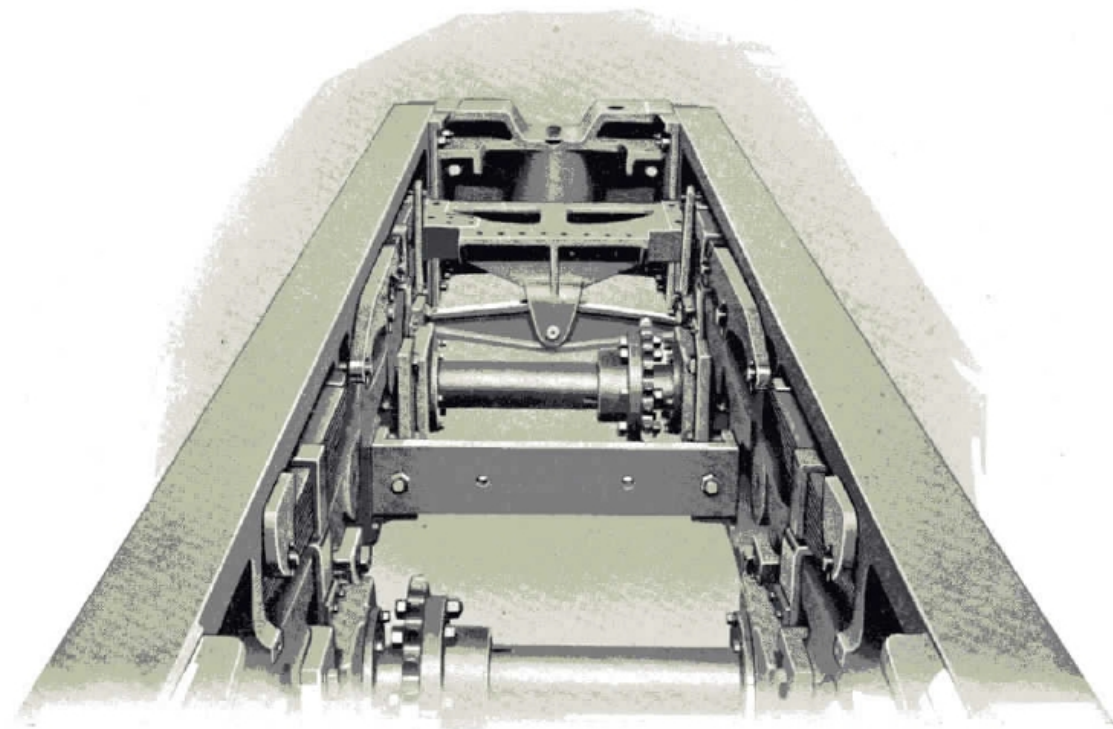


Model ML6, 25 and 30 Ton



Model ML8, 30 Ton 35 Ton

Side and Cross Equalization— a True 3-Point Spring Suspension



View of Chassis Showing Spring Suspension and Side and Cross Equalization

Springs Long flexible semi-elliptic springs, 48" long, 4½" wide, made of special alloy spring steel and oil tempered. These springs are mounted over each axle boxing and are connected with side equalizers and rear cross equalizer. This type of construction makes a true three-point spring suspension and assures very smooth riding of the Locomotive over rough and uneven track, reducing the chances of derailment to a minimum.

Axles The axles are of alloy steel, 6½" diameter, heat treated, with wheels and sprocket hubs pressed on. Axles are mounted on double Timken Tapered Roller Bearings.

Axle Boxings Each boxing is equipped with two large Timken Tapered Roller Bearings which are housed in a grease-tight, dirt-proof housing. These bearings take all end thrust and radial loads and will last the life of the Locomotive if greased occasionally.

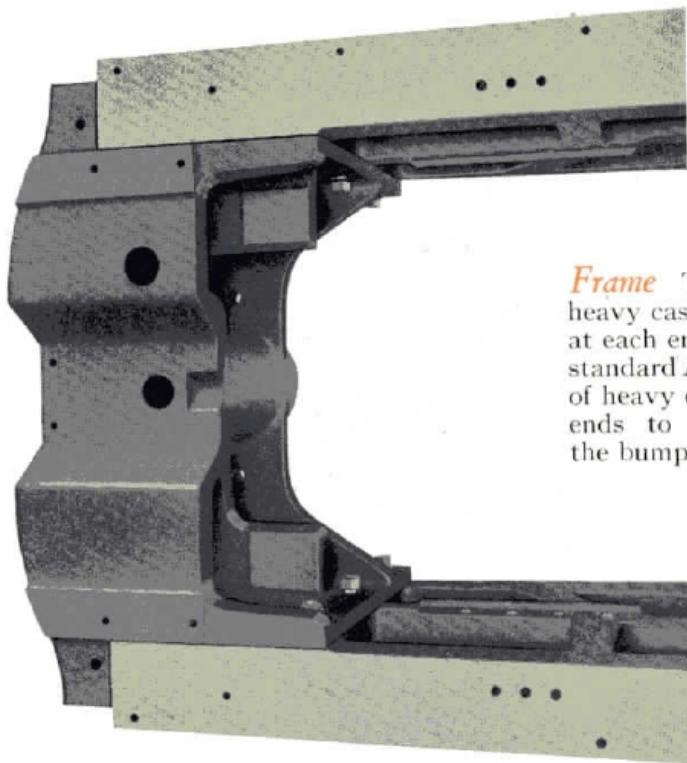
The boxings are retained in their proper position by chilled iron slides which are held to the frame by large bolts in slotted holes and backed by shims, thus providing easy and positive chain adjustment.

Sprockets Are of large diameter with cut teeth. Driving sprockets on the transmission are solid type. Driven sprockets are split plate type bolted to the sprocket hubs.

This design permits sprocket renewals without removing axles or wheels.



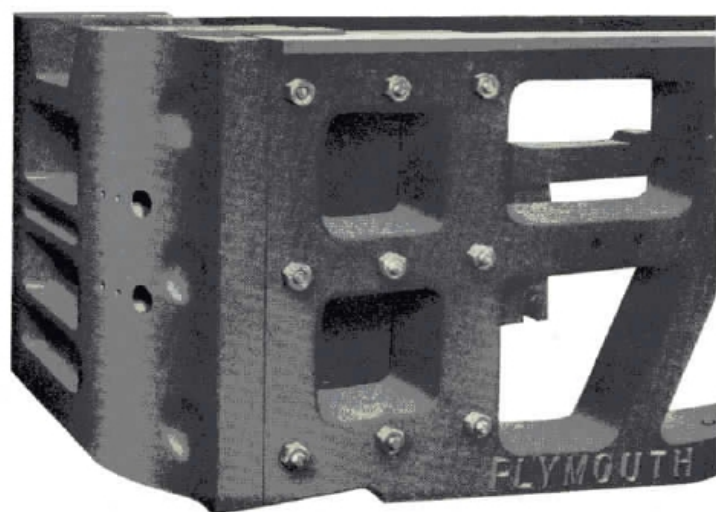
Plymouth Locomotives are Built on a Solid Frame



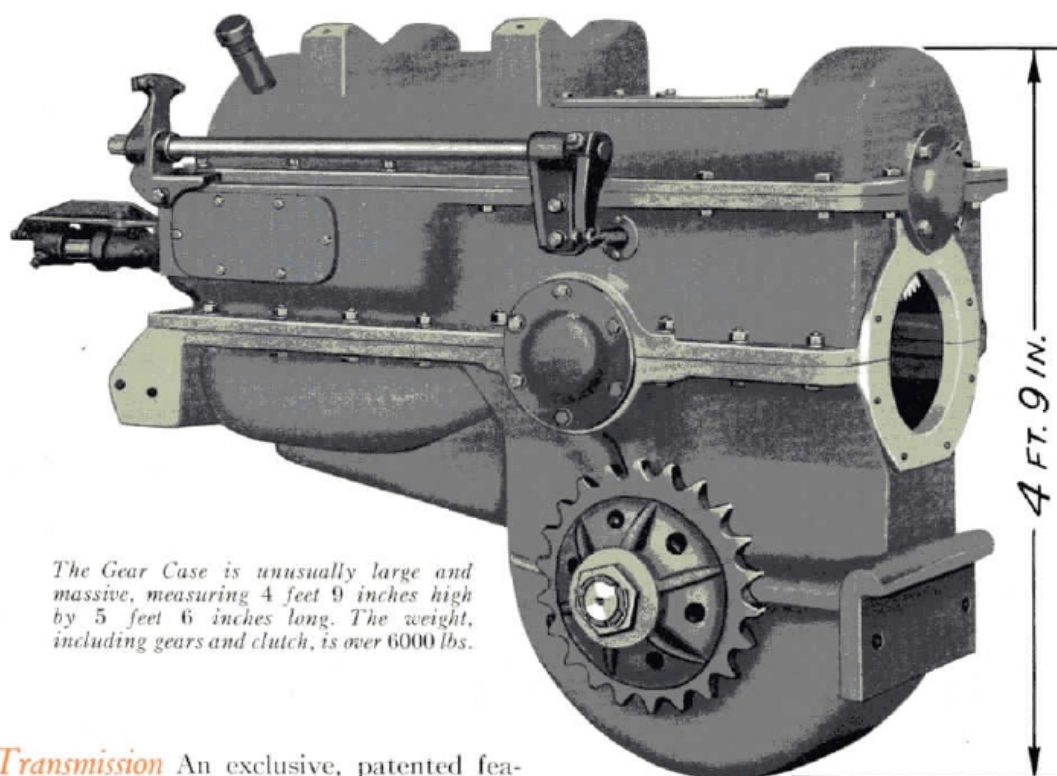
Frame The Frame is built up with four heavy cast-steel main sections. The bumpers at each end are recessed for coupler links and standard A. R. A. couplers; and the side frames of heavy open three-bar type, finished at the ends to bear against machined flanges on the bumpers.

Bumpers and Side Frames

The Bumpers and Side Frames are fastened together with drive-fitted bolts, and being held tightly against the flanges on the bumpers, all loads and shocks are taken by the frame as a whole, instead of the bolts which tie it together. The open bar type frame permits ready accessibility to all parts underneath the Locomotive.



Completely Assembled Patented Transmission



The Gear Case is unusually large and massive, measuring 4 feet 9 inches high by 5 feet 6 inches long. The weight, including gears and clutch, is over 6000 lbs.

Transmission An exclusive, patented feature of this transmission is the double reduction drive in the upper section of the gear case which provides for a wide range of speed between low and high, using gears of the best proportion.

A special feature is the reversing mechanism and final drive.

Forward and reverse is obtained by driving two large bevel gears with one pinion which rotates these gears in opposite directions. Between these large bevel gears and on the same shaft is a sliding pinion which can be moved sideways to engage internal teeth in one or the other of the large bevel gears, and as the sliding pinion meshes with the final driving gear, the direction of rotation of this gear is changed by sliding the pinion to one side or the other.

The use of the large final driving gear provides a suitable gear reduction, well proportioned gears and large driving sprockets, and places the final driving shaft near the same plane of the axles.

The gears throughout the transmission are of very wide face and large diameter, made of alloy steel, with cut and hardened teeth.

The sliding gears are made in pairs giving them long hubs which slide easily on the splined shafts.

The shafting is of high grade alloy steel, of ample size, and well supported by ball and roller bearings.

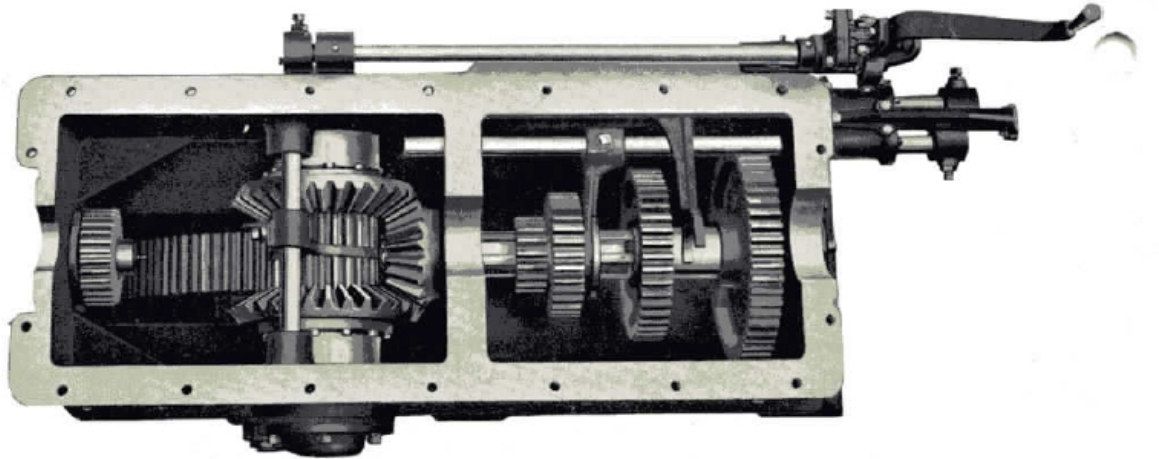
Lubrication for gears, bearings and shafting is provided for by running the gears in oil which is splashed to all interior parts of the transmission.

Chain Drive The driving sprockets on the transmission are mounted between the axles, and in the same plane as the axle centers. Chains are short, of heavy roller type. Large diameter sprockets, with very little variation in chain length, assures long chain life.



Partially Assembled Transmission

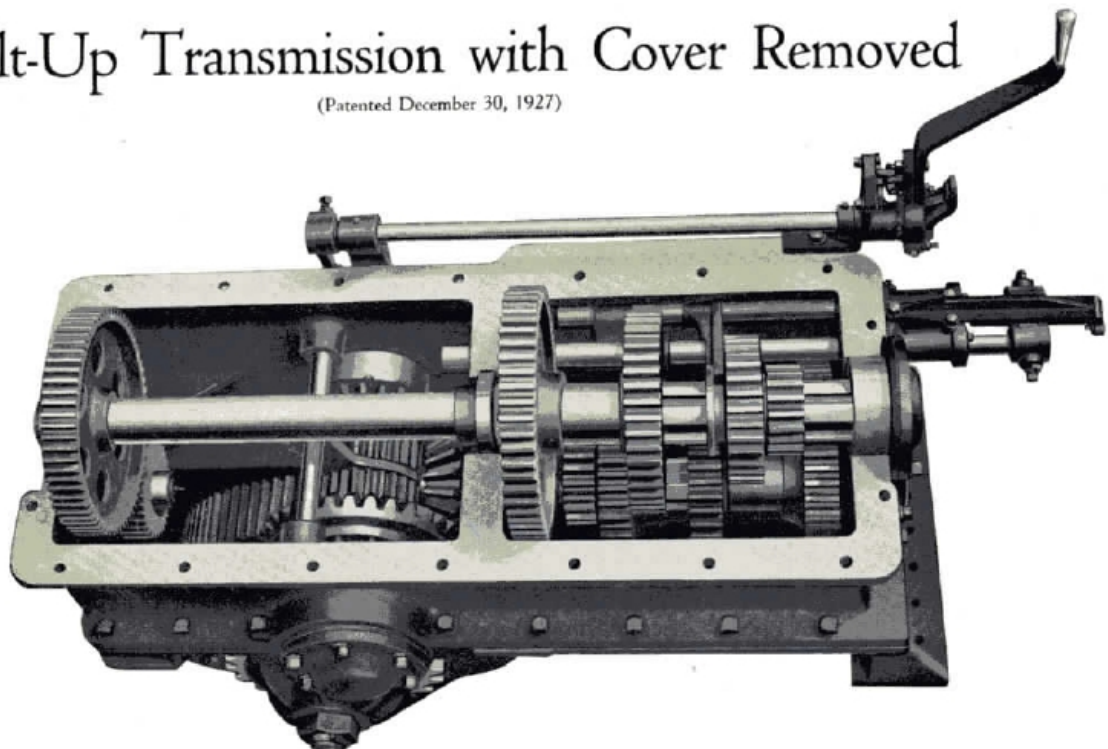
(Patented December 30, 1927)



*A portion of the massive final driving gear may be seen at the left.
This gear is $28\frac{1}{2}$ inches in diameter by 5 inch face.*

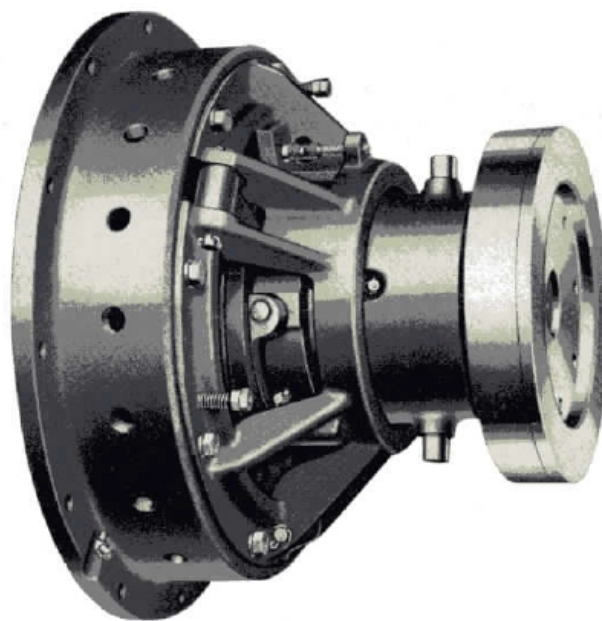
Built-Up Transmission with Cover Removed

(Patented December 30, 1927)



The gears in this transmission are $2\frac{1}{2}$ inch to 5 inch face and of large diameter.

Clutch Assembly Complete



Plymouth Clutch, 16 inches in diameter. 6 facings used for 6 cylinder engine; 8 facings for 8 cylinder. Clutch is removable without moving engine or transmission.

Clutch The Plymouth Clutch has been designed especially for locomotive service. It is built up in one compact unit, and may easily be removed for relining without disturbing any other part of the Locomotive.

The clutch is driven through special metal plates, each having eighteen driving teeth which engage with teeth in the driving drum on the engine flywheel. Between each of the driving plates are the steel driven plates, to which are riveted long wearing composition friction facings. Pressure for engaging the clutch is furnished by a heavy central spring and multiplied through three balanced levers, which bear against the adjusting ring and through that to the clutch plates.

Adjustments to take up wear in the plates or friction facings, is obtained by rotation of the threaded adjusting ring. This moves

in the outer threaded clutch plate, bringing the plates closer together. The adjusting ring is held in adjustment by a thumb operated indexing screw. The constant pressure of the long central spring automatically takes up clutch wear, making adjustment of the clutch seldom necessary.

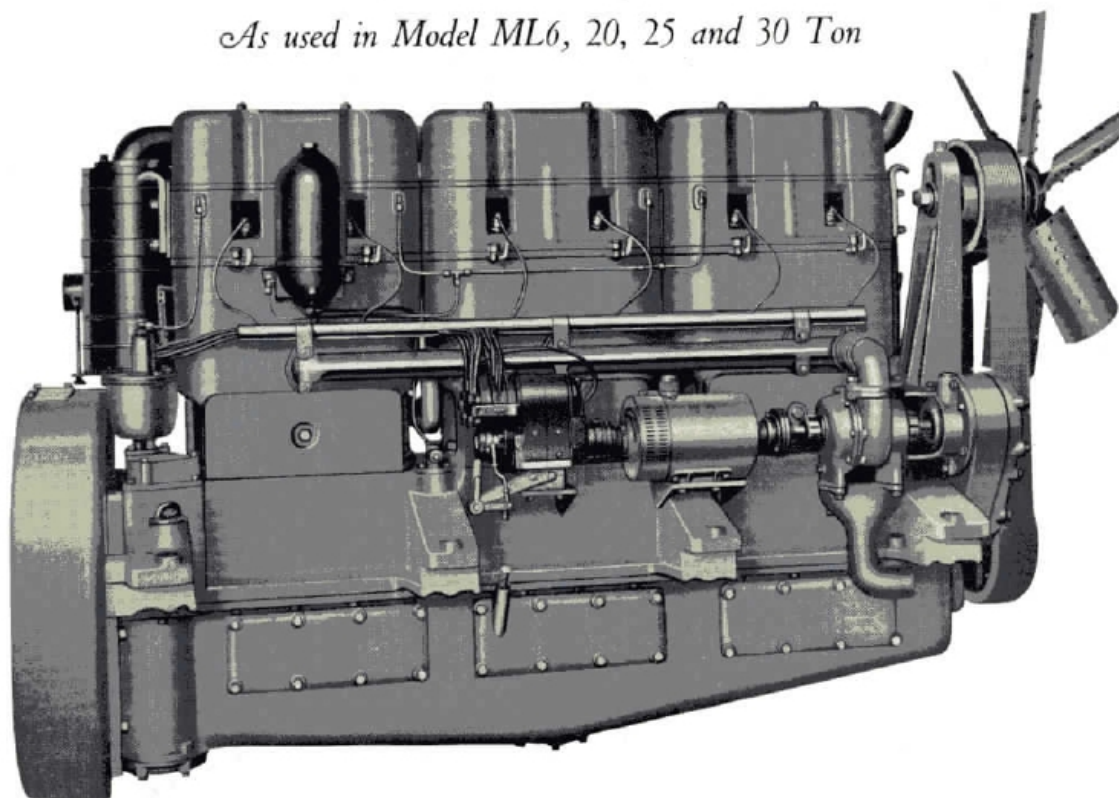
Positive cooling of the clutch plates is provided by air holes through the driven plates near the clutch hub, and there are holes drilled between each of the teeth in the driving drum.

This provides a strong circulation of air through the entire clutch, which removes heat and dust, insuring long life. Provision is made for lubricating the clutch pilot-bearing by a hole drilled through the clutch driving drum.



Le Roi Six Cylinder Engine Power Plant

As used in Model ML6, 20, 25 and 30 Ton



GENERAL INFORMATION

No. of cylinders	6
Bore and stroke	6 $\frac{3}{4}$ " x 7"
Max. H.P. at 1200 R.P.M.	183
Rated H.P. at 1000 R.P.M.	175
Piston displacement (cu. in.)	1500
Engine suspension	8 point

CYLINDERS — DETACHABLE

Cast	In pairs
Material	Chrome nickel iron
Heads	Detachable

VALVES

Diameter	2 $\frac{13}{16}$ "
Lift	1 $\frac{3}{32}$ "

CAMSHAFT

Location	In crank case
Bearings	Bronze
Drive	Helical gear, front end crank case
Cam follower	Roller type

PISTON

Material	Alloy
Length	8 $\frac{1}{2}$ "
Pin diameter and length	1 $\frac{3}{4}$ " x 6 $\frac{1}{4}$ "
Bearing diameter and length	1 $\frac{3}{4}$ " x 3"
No. rings per piston	4

CONNECTING RODS

Material	Duralumin
Bearing diameter and length	3 $\frac{1}{2}$ " x 3 $\frac{3}{4}$ "

CRANKSHAFT — DROP FORGING

Material	Chrome nickel steel						
Main bearings	4						
Type	Babbitt, bronze backed						
Diameter	3 $\frac{3}{4}$ "						
Lengths	<table><tr><td>Front</td><td>5$\frac{1}{4}$"</td></tr><tr><td>Center</td><td>3$\frac{3}{4}$"</td></tr><tr><td>Rear</td><td>5$\frac{1}{4}$"</td></tr></table>	Front	5 $\frac{1}{4}$ "	Center	3 $\frac{3}{4}$ "	Rear	5 $\frac{1}{4}$ "
Front	5 $\frac{1}{4}$ "						
Center	3 $\frac{3}{4}$ "						
Rear	5 $\frac{1}{4}$ "						

OILING SYSTEM

Purolator Oil Filter	
Pressure to crankshaft bearings, connecting rod bearings, and rocker arms.	
Pump	Gear type
Location	Oil sump
Sump capacity	.8 gal.

COOLING — CENTRIFUGAL PUMP

Water capacity	25 gal.
Fan	30" — 6 blade belt driven

CARBURETOR

2 — Stromberg UT4

IGNITION

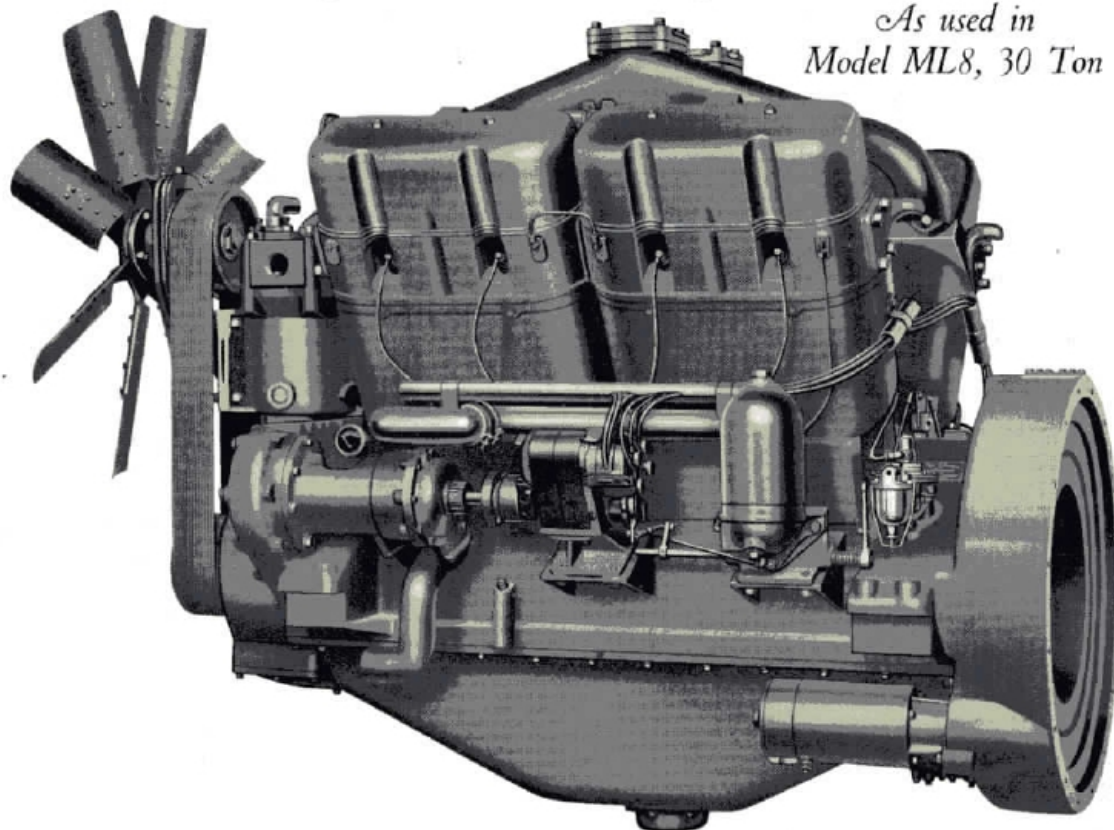
Robert Bosch twin spark magneto

GOVERNOR — BUILT-IN FLY BALL

Maximum governed speed 1000 R.P.M.

Le Roi Eight Cylinder Engine Power Plant

*As used in
Model ML8, 30 Ton*



GENERAL INFORMATION

No. of cylinders	8
Bore and stroke	6 $\frac{3}{4}$ " x 7"
Max. H.P. at 1200 R.P.M.	265
Rated H.P. at 1000 R.P.M.	250
Piston displacement (cu. in.)	2004
Engine suspension	4 point

CYLINDERS — DETACHABLE

Cast	In pairs
Material	Chrome nickel iron
Heads	Detachable

VALVES

Diameter	2 $\frac{13}{16}$ "
Lift	1 $\frac{3}{32}$ "

CAMSHAFT

Location	In crank case
Bearings	Bronze
Drive	Helical gear, front end crank case
Cam follower	Roller type

PISTON

Material	Ray Day Alloy
Length	8 $\frac{3}{8}$ "
Pin diameter and length	1 $\frac{3}{4}$ " x 6 $\frac{1}{4}$ "
Bearing diameter and length	1 $\frac{3}{4}$ " x 3"
No. rings per piston	4

CONNECTING RODS

Material	Chrome nickel steel
Bearing diameter and length	3 $\frac{1}{2}$ " x 3 $\frac{3}{4}$ "

CRANKSHAFT — DROP FORGING

Material	Chrome nickel steel						
Main bearings	4						
Type	Babbit, bronze backed						
Diameter	3 $\frac{3}{4}$ "						
Lengths	<table> <tr> <td>Front</td><td>5$\frac{1}{4}$"</td></tr> <tr> <td>Center</td><td>3$\frac{3}{4}$"</td></tr> <tr> <td>Rear</td><td>5$\frac{1}{4}$"</td></tr> </table>	Front	5 $\frac{1}{4}$ "	Center	3 $\frac{3}{4}$ "	Rear	5 $\frac{1}{4}$ "
Front	5 $\frac{1}{4}$ "						
Center	3 $\frac{3}{4}$ "						
Rear	5 $\frac{1}{4}$ "						

OILING SYSTEM

Purolator Oil Filter	
Pressure to crankshaft bearings, connecting rod bearings and rocker arms	
Pump	Gear type
Location	Oil Sump
Sump capacity	8 gal.

COOLING — CENTRIFUGAL PUMP

Water capacity	30 gal.
Fan	36" — 8 blade belt driven

CARBURETOR

One Stromberg UT7

IGNITION

Two Robert Bosch twin spark magnetos

GOVERNOR — BUILT-IN FLY BALL

Maximum governed speed 1000 R.P.M.



Condensed Specifications

Model ML6 20 Ton, ML6 25 Ton, ML6 30 Ton and ML8 30 Ton Gasoline Locomotives

Speeds — *Standard* — 2.6, 5.6, 9.7 and 15.6 M.P.H.
Engine Speed 1,000 R.P.M.

Special — 2.6, 5.6, 10.9 and 23.4 M.P.H.
Engine Speed 1,000 R.P.M.

Tractive Force — All ML6, 20,192 lbs. ML8,
28,821 lbs. at 2.6 M.P.H.

Draw Bar Pull — In pounds.

Model	Standard Speeds			
	ML6-20	ML6-25	ML6-30	ML8-30
2.6 M.P.H. on dry rail	10,000	12,500	15,000	15,000
2.6 M.P.H. sanded rail	13,333	16,666	20,000	20,000
5.6 M.P.H.	9,373	9,373	9,373	13,387
9.7 M.P.H.	5,412	5,412	5,412	7,728
15.6 M.P.H.	3,365	3,365	3,365	4,807

Model	Special 3rd and 4th Speeds			
	ML6-20	ML6-25	ML6-30	ML8-30
10.9 M.P.H.	4,816	4,816	4,816	6,882
23.4 M.P.H.	2,244	2,244	2,244	3,205

Gauge — 36" to 56½" inclusive. Wheels outside
of frame for 56½" gauge, inside of frame for
other gauges.

Wheel Base — 83½".

Length — Over bumpers 19' 0". With full size
A.R.A. couplers, coupled length 21' 1".

Height — 10' 6".

Width — 9' 7" for 56½" gauge. 8' 0" for 36" gauge.

Couplers — Center of link and pin pockets in
bumper 18½", 24", 28½" and 33½" above top
of rail. Full size A.R.A. couplers 33½" above
top of rail. ¾ size A.R.A. coupler heights to
order.

Frame — Three-Bar steel type of special design for
mounting and equalizing semi-elliptic springs.
Bumpers are of steel castings, very strong and
rigidly attached to side frames.

Engine — LeRoi RXIS 6 cylinder, 6¾" bore, 7"
stroke, 175 H.P. at 1,000 R.P.M. used on ML6-
20 Ton, ML6-25 Ton, ML6-30 Ton Locomotives.
LeRoi RXVI 8 cylinder, V type, 6¾" bore, 7"
stroke, 250 H.P. at 1,000 R.P.M. used on ML8-
30 Ton Locomotive.

Ignition — For the 6 cylinder engine, dual spark
Robert Bosch high tension magneto. For the 8
cylinder engine two dual spark Robert Bosch
magnetos are used. 64 Cu. Ft. displacement air
compressors are built into each engine.

Starters — Two powerful Leece-Neville 12-volt
starters are used on each engine.

Generator — 6" diameter 12-volt Leece-Neville
generator used on the 6 cylinder engine. 7"
diameter Leece-Neville on the 8 cylinder engine.
Voltage regulation on both.

Battery — Willard GHLR30, 140 Amp. hour with
threaded rubber insulation.

Carburetor — Two Stromberg UT4 used on the
6 cylinder engine. One Stromberg UT7 on the
8 cylinder engine.

Air Cleaners — Two oil wetted air cleaners used
on each engine.

Governor — Built in flyball type.

Cooling — Modine sectional core single thickness
and 30" six blade fan used to cool 6 cylinder
engine. Capacity of cooling system 25 gallons.
Modine sectional core double thickness and 36"

eight blade fan used to cool 8 cylinder engine.
Capacity of cooling system 30 gallons.

Clutch — Plymouth dry plate, 6 facings, 16"
diameter, spring actuated used for the 6 cylinder
engine.

A clutch with 8 facings 16" diameter of similar
design is used for the 8 cylinder engine. Clutch
is removable without moving engine or trans-
mission.

Transmission — Plymouth patented, double
reduction, 4 speed forward and reverse, 1 to 1
ratio drive by roller chain to each axle. Gears of
alloy steel cut and hardened with faces 2½" to
5" wide and 6½" to 28½" diameter. All bearings
either ball or Timken.

Gear Ratio — Between engine and axles. Standard
speeds 37.7 to 1, 17.6 to 1, 10 to 1 and 6.3 to 1.
Special speeds have the 3rd and 4th gear ratio
9 to 1 and 4.2 to 1.

Sprockets — Driving, 22 teeth made in one piece;
driven, 22 teeth of split-plate type bolted to hubs
on axles. 1045 S.A.E. steel, cut teeth.

Chains — Roller chain 2½" pitch of extra strong
design.

Axles — Alloy steel, 6½" diameter, heat treated.
Timken roller bearings in dust proof grease tight
boxings.

Wheels — Rolled steel 33" diameter A.R.A. 1920
flange and tread. Tread 4½" wide, overall
width 5½". Steel Tired Wheels can be furnished
at extra cost.

Brakes — Two air brake cylinders, one on each side.
Lever type of brake rigging, detachable brake
shoes covering treads and flanges of all wheels.
Hand wheel brake for emergencies. Westinghouse
straight air, standard equipment. Westinghouse
AMM system of straight and automatic air using
one combined brake valve, or Westinghouse 14
EL system of straight and automatic air using
two brake valves, furnished at extra cost.

Sanders — Sand to each wheel through air-
operated sand valves under sand dome mounted
on canopy roof.

Springs — Semi-elliptic 48" long, 4½" wide, side
and cross equalized.

Fuel Tank — 75 gallon capacity. Gravity feed for
the 6 cylinder engine. Pump for the 8 cylinder
engine.

Fuel Consumption — Depends entirely upon the
work to be done. Estimates will be made when
working conditions are known.

Lubrication — All bearings outside of engine and
gear case are equipped with Alemite fittings.

Lights — 2 head lights, one at each end, instru-
ment board lights, cab light, and trouble lamp
and cord. Where required to meet I.C.C. require-
ments, classification lamps, marker lamps and
head light dimmers are supplied.

Signals — Air whistle and bell.

Tools — A metal box with necessary wrenches and
tools are furnished.

Haulage Capacity Tables

Model ML6, 20, 25 and 30 Ton

Engine — LeRoi, Model RXIS, 6 cylinder, 6 $\frac{3}{4}$ " bore, 7" stroke, 175 H.P. at 1000 R.P.M.

Tractive Force — Engine power applied to rails, at 80% efficiency = 20192 lbs. at 2.6 M.P.H.

Model ML6, 20-Ton, Hauling Capacity in Tons of 2000 lbs. in addition to weight of locomotive, with standard speeds, without sand.

Frictional Resistance per ton	Level	Percent of Grade									
		1/2%		1%		1 1/2%		2%		2 1/2%	
		1/2%		1%		1 1/2%		2%		2 1/2%	
		2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.
10 lbs.	1000 937 541 337	490 459 299 158	320 299 167 99	235 219 120 60	184 171 92 51	150 140 74 39	126 117 60 31	93 86 42 20	73 67 31 12	57 53 24 10	44 40 19 8
15 lbs.	667 625 361 224	392 367 200 127	274 250 143 85	206 165 107 61	167 156 84 47	140 129 68 36	117 109 56 29	88 82 40 19	70 64 30 12	55 51 23 11	43 39 18 7
20 lbs.	500 469 271 168	327 306 174 106	240 224 125 74	188 175 96 55	155 143 77 43	129 120 63 34	110 102 51 27	84 78 38 18	67 61 28 11	52 48 22 10	40 36 16 7
30 lbs.	333 313 180 112	245 229 130 79	192 179 100 59	157 146 80 45	132 122 66 37	113 105 55 30	98 91 47 24	74 67 31 12	60 55 25 11	47 43 20 9	36 32 14 6
40 lbs.	250 234 135 84	196 184 104 63	160 150 84 49	134 125 69 40	115 107 58 32	100 93 49 26	88 82 43 23	70 65 32 15	57 53 24 10	44 40 19 8	34 30 13 5

Model ML6, 25-Ton, Hauling Capacity in Tons of 2000 lbs. in addition to weight of locomotive, with standard speeds, without sand.

Frictional Resistance per ton	Level	Percent of Grade									
		1/2%		1%		1 1/2%		2%		2 1/2%	
		1/2%		1%		1 1/2%		2%		2 1/2%	
		2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.
10 lbs.	1250 937 541 337	613 456 258 156	400 365 206 125	343 324 140 82	261 192 104 58	210 152 80 43	173 125 64 33	147 105 52 25	117 82 38 15	91 62 27 11	70 49 21 8
15 lbs.	833 625 361 224	400 365 206 125	343 324 140 82	261 192 104 58	210 152 80 43	173 125 64 33	147 105 52 25	117 82 38 15	91 62 27 11	70 49 21 8	55 40 18 6
20 lbs.	628 469 271 168	408 364 175 104	300 272 123 72	235 179 93 52	192 140 74 39	161 116 59 30	138 98 49 23	117 84 40 17	95 67 31 12	74 53 24 10	58 43 19 7
30 lbs.	417 313 180 112	306 228 129 78	240 174 98 57	196 144 78 44	164 120 63 34	141 102 52 26	122 87 43 21	95 67 31 12	74 53 24 10	58 43 19 7	44 32 14 6
40 lbs.	313 234 135 84	245 183 103 62	200 148 82 46	168 123 67 37	144 105 55 30	125 90 46 24	110 79 39 19	88 61 28 11	71 49 21 8	55 40 18 6	42 30 13 5

Model ML6, 30-Ton, Hauling Capacity in Tons of 2000 lbs. in addition to weight of locomotive, with standard speeds, without sand.

Frictional Resistance per ton	Level	Percent of Grade									
		1/2%		1%		1 1/2%		2%		2 1/2%	
		1/2%		1%		1 1/2%		2%		2 1/2%	
		2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.	2.6 M. P. H.	5.0 M. P. H.
10 lbs.	1500 937 541 337	735 454 256 153	480 293 160 92	353 212 113 62	270 164 84 43	225 131 65 31	189 108 52 22	140 77 33 11	109 58 22 8	86 46 12 5	67 37 15 7
15 lbs.	1000 625 361 224	508 363 204 123	311 251 138 79	311 188 100 55	251 149 76 39	208 121 60 29	170 101 48 21	133 75 32 10	104 55 21 3	81 40 16 6	62 32 13 4
20 lbs.	750 469 271 168	490 303 170 102	300 219 120 69	282 170 90 49	203 136 70 36	193 113 56 27	165 95 45 20	126 70 30 10	100 53 20 3	78 40 16 6	60 32 13 4
30 lbs.	500 313 180 112	368 227 128 77	288 176 96 55	235 141 75 41	197 117 60 31	189 98 49 23	147 84 40 17	115 63 27 11	92 49 19 3	73 37 15 7	56 32 13 4
40 lbs.	375 234 135 84	294 182 102 61	240 146 80 46	201 121 64 35	173 102 53 27	150 88 43 21	132 76 36 16	105 58 25 8	86 46 12 5	67 37 15 7	51 30 12 4

Model ML6, 20, 25 and 30-Ton, Hauling Capacity in Tons of 2000 lbs. in addition to weight of locomotive, with special speeds in third and fourth gear.

Frictional Resistance Per Ton	10.0 M. P. H.		23.4 M. P. H.		10.9 M. P. H.		23.4 M. P. H.		10.9 M. P. H.		23.4 M. P. H.		10.9 M. P. H.		23.4 M. P. H.	
	10.0 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.
10 lbs.	482	224	226	97	141	55	98	34	72	21	55	12	43	6	27	17
15 lbs.	321	150	181	78	120	50	87	30	66	19	51	11	40	6	16	16
20 lbs.	241	112	151	65	105	41	78	27	60	17	47	10	38	5	15	15
30 lbs.	161	75	113	49	84	33	65	22	52	15	41	9	34	5	14	14
40 lbs.	120	56	90	39	70	27	56	19	45	13	37	8	30	4	13	13



Haulage Capacity Tables

LOCO
SERIAL No 3924

ML8, 30 Ton

Engine — LeRoi, Model RXVI, 8 cylinder, 6 $\frac{3}{4}$ " bore, 7" stroke, 250 H.P. at 1000 R.P.M.

Tractive Force — Engine power applied to rails, at 80% efficiency = 28821 lbs. at 2.6 M.P.H.

Model ML8, 30 Ton, Hauling Capacity in Tons of 2000 lbs. in addition to weight of locomotive, with standard speeds, without sand.

Frictional Resistance per ton	Level				Percent of Grade															
					1 $\frac{1}{2}$ %		1%		1 $\frac{1}{2}$ %		2%		2 $\frac{1}{2}$ %		3%		4%		5%	
	2.6 M. P. H.	3.6 M. P. H.	4.7 M. P. H.	5.6 M. P. H.	2.6 M. P. H.	3.6 M. P. H.	4.7 M. P. H.	5.6 M. P. H.	2.6 M. P. H.	3.6 M. P. H.	4.7 M. P. H.	5.6 M. P. H.	2.6 M. P. H.	3.6 M. P. H.	4.7 M. P. H.	5.6 M. P. H.	2.6 M. P. H.	3.6 M. P. H.	4.7 M. P. H.	5.6 M. P. H.
10 lbs.	1500	1339	773	481	735	654	371	225	180	126	238	140	353	312	171	98	276	244	131	72
15 lbs.	1000	892	515	320	588	523	297	180	411	365	204	120	311	278	152	87	251	222	119	66
20 lbs.	750	669	386	240	490	436	248	150	360	310	178	105	282	250	137	78	230	203	109	60
30 lbs.	500	446	258	160	338	327	186	113	288	256	143	84	235	208	114	65	197	174	93	52
40 lbs.	375	335	193	120	294	262	149	90	240	213	119	70	201	178	98	56	173	152	82	45

Hauling Capacity in Tons of 2000 lbs. in addition to weight of locomotive, with special speeds in third and fourth gear.

Frictional Resistance per ton	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.	10.9 M. P. H.	23.4 M. P. H.
10 lbs.	682	320	326	145	207	87	148	58	113	40	89	28	72	20	49	18	47	15	35	12
15 lbs.	455	213	261	116	178	74	132	51	102	36	82	26	67	19	44	14	37	12	33	10
20 lbs.	341	160	217	97	156	65	119	46	91	33	76	24	63	18	40	13	32	11	30	9
30 lbs.	227	107	163	73	125	52	99	38	80	29	67	21	56	16	37	11	29	10	27	8
40 lbs.	171	80	131	58	104	42	85	33	70	25	59	19	50	14	37	10	27	9	26	7

FRICTIONAL RESISTANCES may be based on the following conditions:

- Use 10 lbs. per ton, with extra good cars and track, no curves.
- Use 15 lbs. per ton, with good cars and track, and no curves.
- Use 20 lbs. per ton, with fair cars and track, and easy curves.
- Use 30 lbs. with hard running cars, fair track, and curves.
- Use 40 lbs. per ton for very poor cars and track, sharp curves.

Approximate Weight of Common Materials

Materials	Lbs. per Cu. Yd.	Tons per Cu. Yd.	Materials	Lbs. per Cu. Yd.	Tons per Cu. Yd.
CEMENT	2565	1.28	FIRE CLAY	3500	1.75
CLAY—DRY	1700	.85	GRAVEL—DRY	2400	1.2
CLAY—WET	2900	1.45	GRAVEL—WET	3100	1.55
CRUSHED STONE	2700	1.35	SAND—DRY	2600	1.3
EARTH—DRY & LOOSE	2000	1.00	SAND—WET	3300	1.65

Average Weight of Contractors' Cars

Capacity Yards	Dump	Gauge	Type	Weight	Capacity Yards	Dump	Gauge	Type	Weight
10	HAND	56 $\frac{1}{2}$	Wood & Steel	14,500	2	HAND	30	All Wood	2,800
8	HAND	36	Wood & Steel	17,000	1 $\frac{1}{2}$	HAND	24	All Wood	2,000
6	HAND	56 $\frac{1}{2}$	Wood & Steel	11,900	1 $\frac{1}{2}$	HAND	24	All Steel	2,700
5	HAND	36	Wood & Steel	6,900	1	HAND	24	All Steel	1,700
4	HAND	36	Wood & Steel	6,700	18 cu. ft.	ROCKER	18	All Steel	975
4	HAND	36	All Steel	6,900	27 cu. ft.	ROCKER	24	All Steel	1,100
4	HAND	36	All Wood	6,000	40 cu. ft.	ROCKER	30	All Steel	1,645
3	HAND	36	All Wood	4,900					



Model ML6, 25-Ton, Standard Gauge Plymouth Locomotive at the Plant of Christ-Craft Corporation, Builders of Speed Boats, Algonac, Mich.

This Company writes: "Our 25-Ton Plymouth has given perfect performance, and we might say the same about our smaller locomotive which we purchased from you two or three years ago.

"If your entire production has as little service problems as these two locomotives have given us you certainly are in an enviable position."



One of the Two Model ML6, 25-Ton, 36-inch Gauge, Plymouth Locomotives at No. 4 Quarry of Wagner Quarries Company, Sandusky, Ohio

This Company also owns an ML6, 30-ton, standard gauge Plymouth. They write: "Our two 25-ton Plymouths replaced three 21-ton Steam Locomotives and produce one-fifth more tonnage. The repairs on track are also much less because of the easier riding qualities of the Plymouths."



Printed in U.S.A.