SERVICE HANDBOOK

OF THE

155-MM. GUN MOTOR CARRIAGE

MODEL OF 1920

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WASHINGTON, *April 1, 1921.*

The following publication, entitled "Handbook of the 155-MM. Gun Motor Carriage, Model of 1920," is published for the information and guidance of all concerned.

[062.1 A. G. O.]

BY ORDER OF THE SECRETARY OF WAR:

PEYTON C. MARCH,
Major General, Chief of Staff.

OFFICIAL:
P. C. HARRIS,
The Adjutant General.

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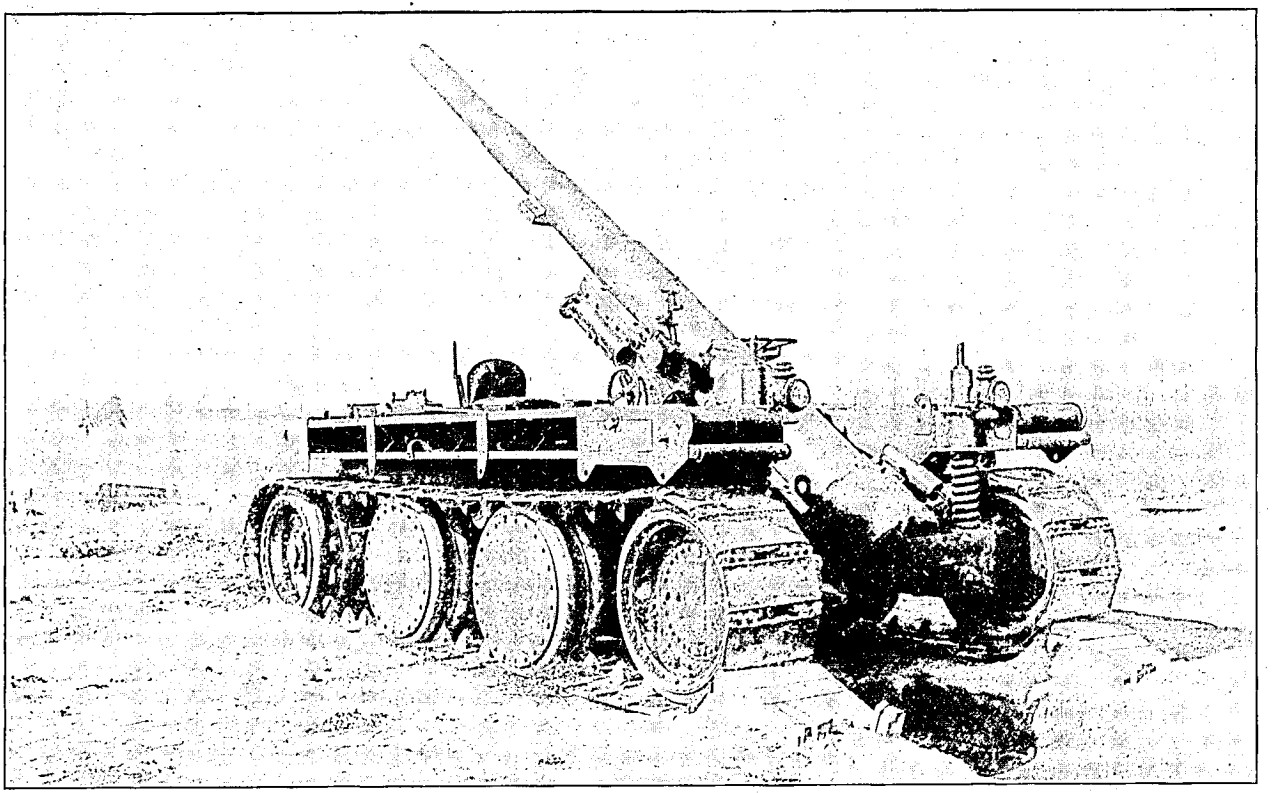
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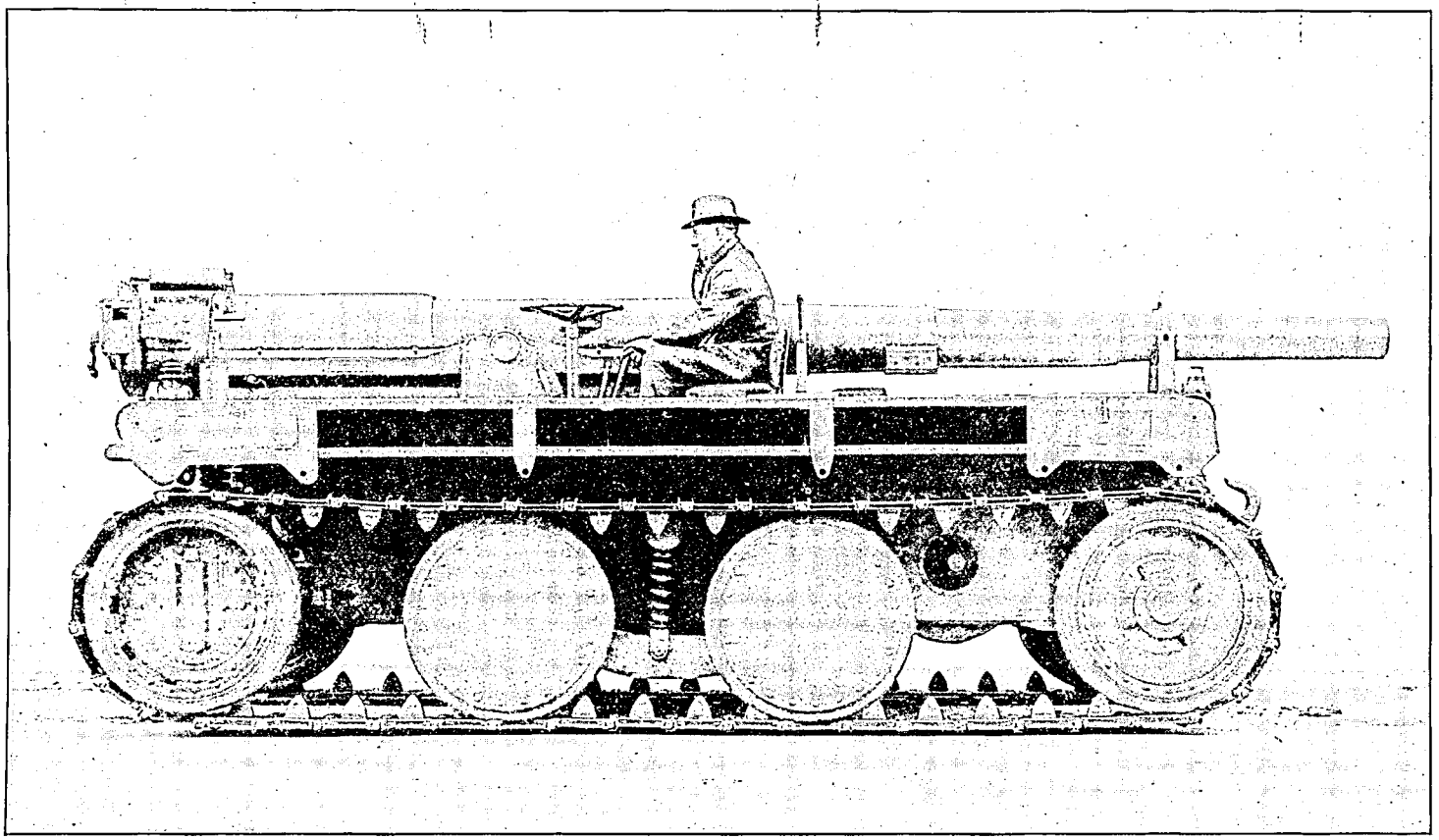
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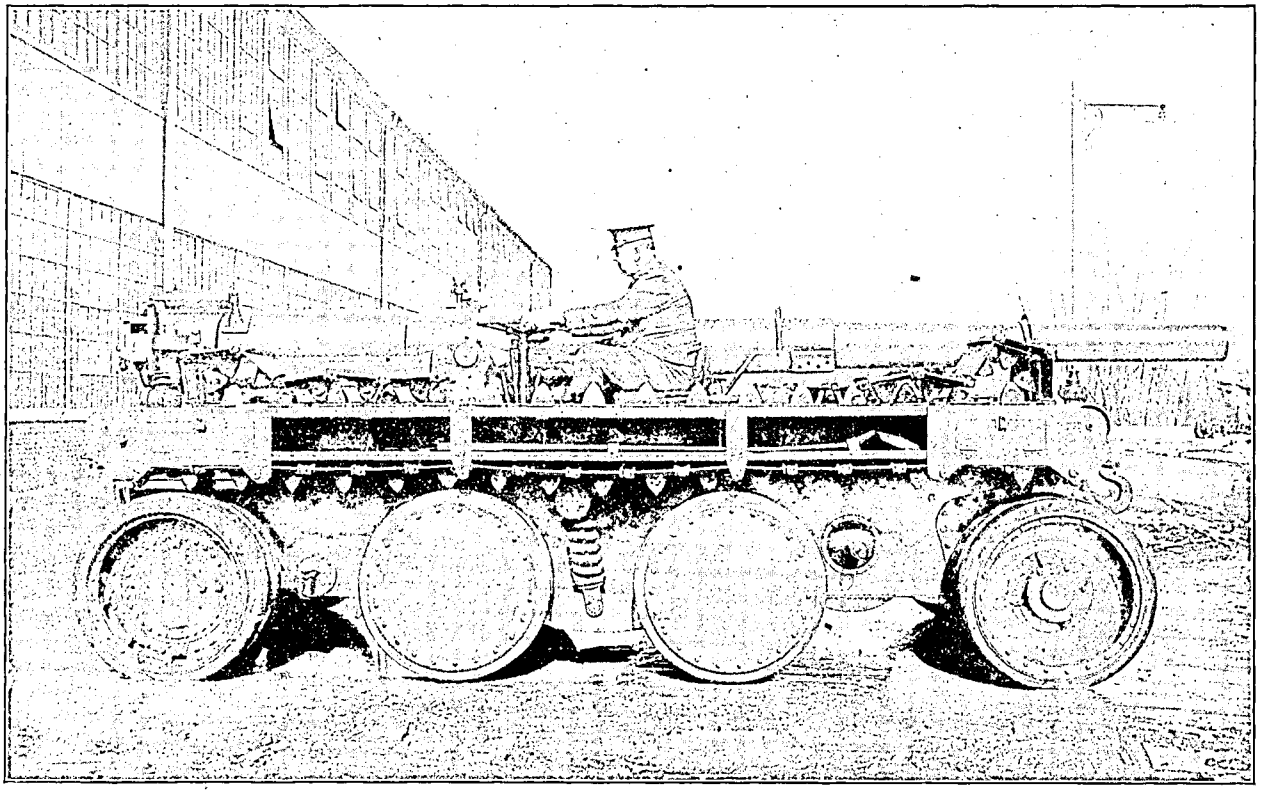
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Side view ,with track, in firing position.

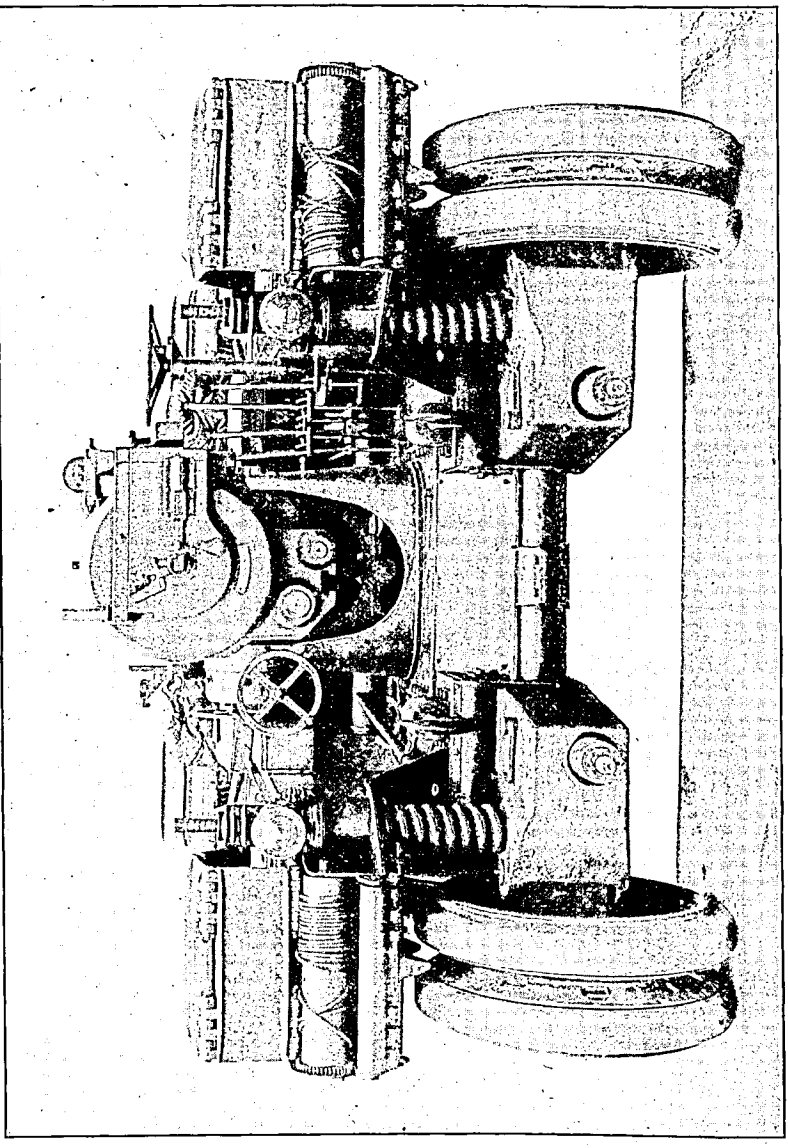


Side view, with track, in traveling position.



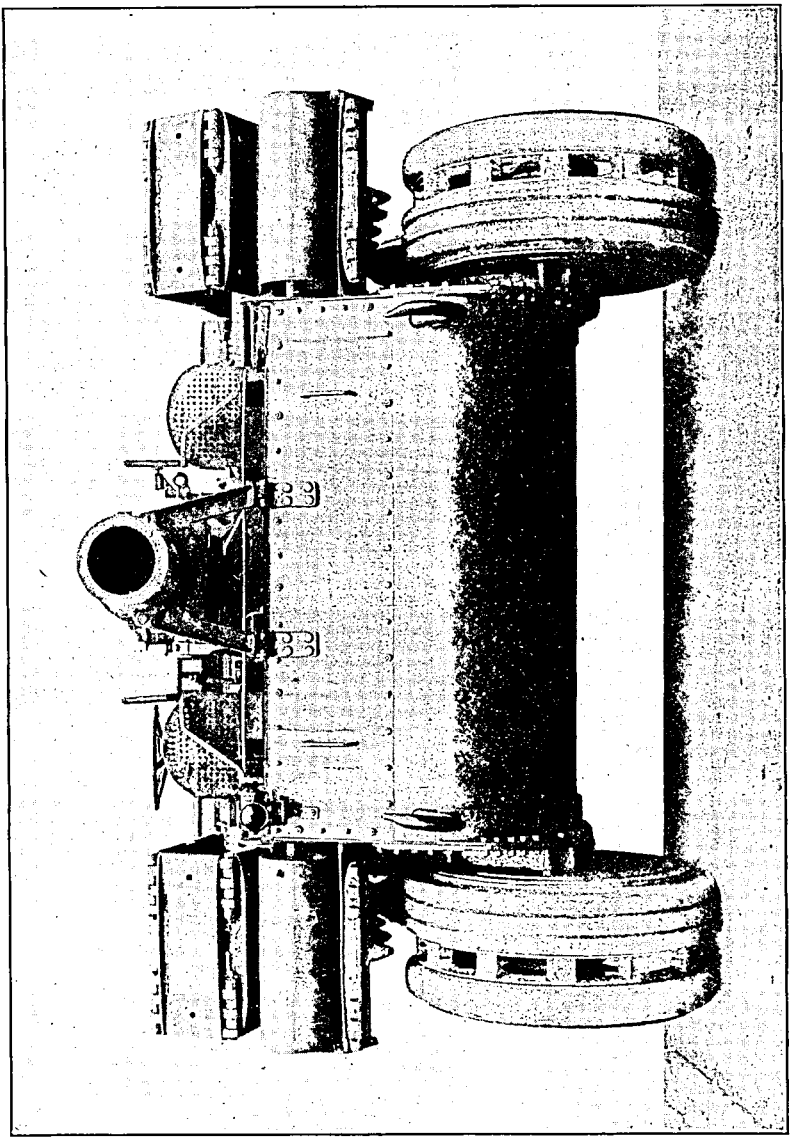
Side view, without track, in traveling position.

Plate 4.



End view, front, without tracks.

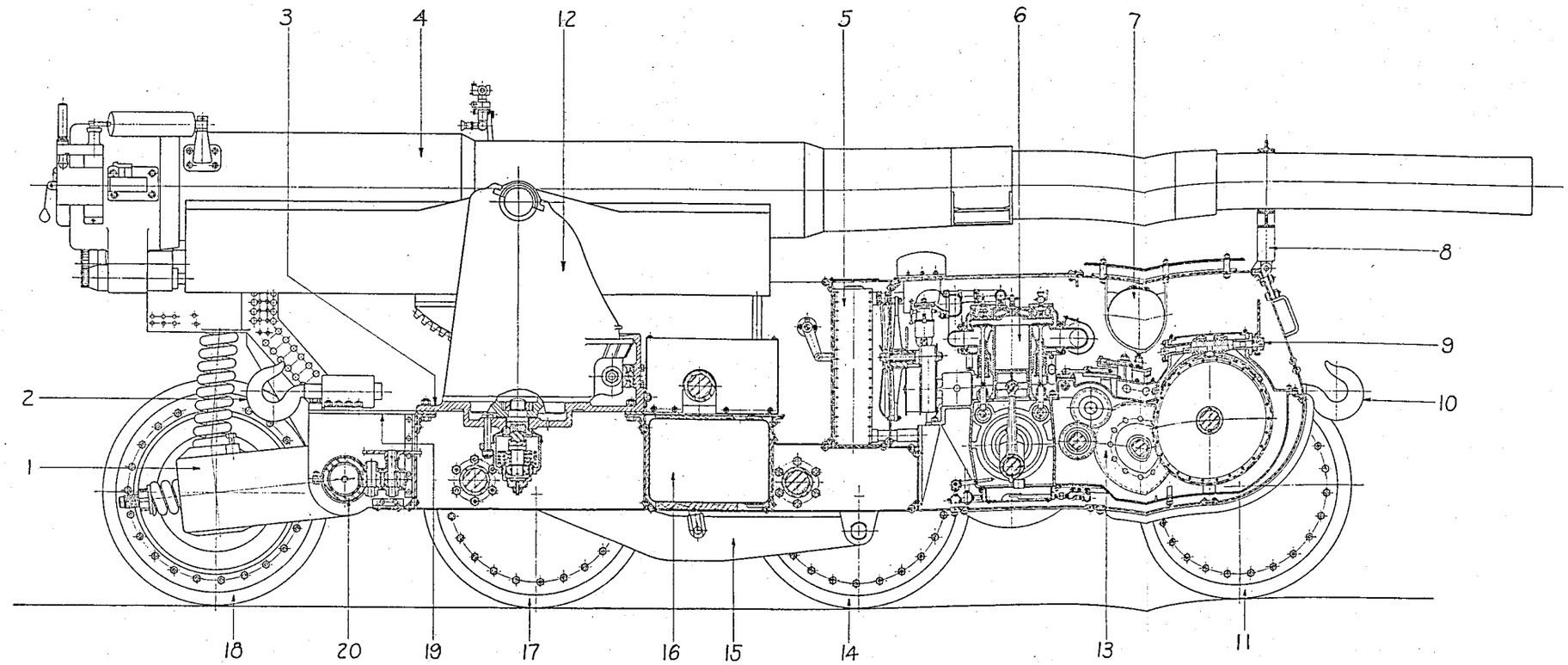
Plate 5.



End view, rear, without tracks.

LONGITUDINAL SECTION, WITHOUT TRACK. (Plate 6.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	KM97A	Steering wheel pivot bracket.	11	.....	Drive wheel.
2	.....	Pintle assembly, front.	12	.....	Gun mount or top carriage.
3	32A	Gun-base plate.	13	.....	Transmission assembly.
4	.....	155-mm. gun, model of 1918, M1 (Filloux).	14	.....	Center wheel.
5	NM125A	Radiator.	15	FF161A	Equalizer bar.
6	.....	Power unit.	16	WM47A	Fuel tank.
7	WM46A	Reserve oil supply tank.	17	.....	Center wheel.
8	.....	Traveling lock assembly.	18	.....	Steering wheel.
9	.....	Brake mechanism.	19	13L	Gun-base support plate.
10	.....	Pintle assembly, rear.	20	HM116G	Steering wheel axle.



Longitudinal section, without tracks.

62198—22. (Face page 14.)

HANDBOOK OF THE 155-MM. GUN MOTOR CARRIAGE, MODEL OF 1920.

CHAPTER 1.

GENERAL DESCRIPTION AND INSTRUCTIONS, WEIGHTS, DIMENSIONS, AND SPECIFICATIONS.

Weight complete with full equipment	pounds	39,800
Weight of gun, including breech mechanism	do	8,750
Weight on front wheels	do	21,250
Weight on rear wheels	do	18,450
Total length of gun	inches	236
Maximum range	yards	17,717
Maximum elevation	degrees	35
Maximum traverse:		
Right	do	7
Left	do	6
Maximum over-all length with gun	inches	236
Maximum over-all length without gun, with track	do	204
Maximum over-all length without gun, without track	do	200
Maximum over-all height	do	80.5
Maximum over-all width	do	116.75
Center line of trunnions above ground	do	66.945
Road clearance	do	12.75
Type of drive, combination wheeled and tracklaying.		
Track:		
Weight of each track	pounds	2,050
Center to center of tracks	inches	89.25
Width of track shoes (46 to each track)	do	21.5
Length of track shoes (46 to each track)	do	9.75
Ground pressure, hard surface (both tracks)	pounds per square inch	7.216
Ground pressure, soft surface (both tracks)	do	5.63
Wheels:		
Drive wheels, double-tired:		
Inside	inches	36 by 3
Outside	do	36 by 7
Center wheels, double tired	do	36 by 3.5
Steering wheels, double-tired	do	36 by 5
Type of engine:		
Christie, T-head, gasoline	horse power	120
Number of cylinders		6
Bore	inches	5.5
Stroke	do	7
Horsepower per gross ton		6
Road speeds at motor speed of 1,500 revolutions per minute:		
Forward (breech end first)		
First speed	miles per hour	1.65
Second speed	do	3.5
Third speed	do	6.82
Fourth speed	do	11.5

Road speeds at motor speed of 1,500 revolutions per minute—Continued.		
Reverse (muzzle end first)		
First speed	miles per hour	1.39
Second speed	do	2.89
Third speed	do	5.69
Fourth speed	do	9.61
Capacity of fuel tank	gallons	55
Capacity of oil tank	do	13
Capacity of cooling system	do	25
Gasoline feed		Vacuum.
Ignition		Bosch magneto.
Carburetor		Zenith.
Radiator		Cellular.

GENERAL DESCRIPTION.

(See Plate 6.)

This vehicle is capable of traveling in either direction, but must always be operated breech end forward when traveling for any distance on the tracks.

The vehicle is a combination self-propelled type in which the power is transmitted directly to the ground through the drive wheels (11) as in the usual type of truck construction or through flexible endless chains or tracks, composed of steel shoes connected by hardened steel pins, which pass over the wheels.

The vehicle has been designed and constructed to mount the 155-mm. gun (4) and associated mechanism and to withstand its firing stresses. Although not primarily a towing type of vehicle it is provided with four pintles, two in the front (2) and two in the rear (10), for hauling when necessary.

The various units composing the vehicle are assembled on the chassis or main frame which is of the built-up structural type and consists of two outside web plates tied together by three vertical plates, two horizontal plates and an axle.

The vertical plates are located at the rear end of the web plates and form boxes, one of which houses the engine and transmission units (6, 13) and the other the radiator unit (5).

The horizontal plates are attached to the web plates near the lower edge and to the front of the vertical plates. The gun-base plate (3) which supports the gun mount (12) is bolted to the gun-base support plate (19).

The axle (20), which is hollow, is located in the front and near the bottom edge of the web plates and supports the two steering wheel pivot brackets (1) which carry the steering wheels (18).

The driving wheels of the vehicle (11), either as a wheeled or as a track-laying vehicle, are the rear wheels. When the track is used, traveling breech first, the track is under tension on the ground side.

The speeds are slightly higher when the vehicle is traveling forward or breech end first, than they are when it travels reversed or muzzle end first.

The vehicle is provided on each side with four solid rubber-tired wheels, viz, driving (11), two center (14, 17), and steering (18). The two center wheels (14, 17) are mounted on an equalizer bar (15).

When used as a wheeled vehicle the center wheels are raised clear of the ground and do not operate; they are lowered to take part of the weight of the vehicle when the tracks are used.

The power unit (6) is mounted transversely at the rear end of the vehicle beneath the muzzle end of the gun. It consists of a 6-cylinder T-head internal combustion engine with its fuel and carburetion, ignition, lubrication, and cooling systems.

The power developed is transmitted to the drive wheels through the following system. The steering clutches control the application of power between the engine and transmission units containing the selective gears by which the speed and direction of travel are controlled. From the transmission units the power is transmitted directly through the final-drive pinions to the internal-drive gears attached to the drive wheels. The final-drive pinion shafts are each provided with a brake (9) of the external contraction band type.

OPERATING INSTRUCTIONS.

PLACING THE CARRIAGE IN SERVICE.

INSPECTION.

Regardless of the condition under which the carriage is received, the first duty of anyone charged with its care and operation is to give it a systematic and detailed inspection.

The initial inspection must cover all possible shortages of the easily removable parts, including accessories and tools, such defects as loose parts and any damage that may have been caused in shipment, or at the hands of the previous operator, and any other conditions that would affect its proper operation.

REPAIRS AND REPLACEMENTS.

Such repairs and replacements as are necessary to the proper operation of the carriage, must be given attention immediately. If permanent repairs can not be made at once, temporary repairs should be made until such time as it is convenient to make the repairs permanent.

GENERAL LUBRICATION.

Thoroughly clean the entire carriage with kerosene, removing grease and slush coat applied for protection in shipment. The length of time that the carriage will give first-class service depends more upon proper lubrication than any other feature of its care. This is particularly true of a new machine, and no precaution should be overlooked to make certain that every lubricated part has a full

supply of lubricant. As a precautionary measure carriages are shipped by manufacturers fully lubricated, with the exception of the engine. However, when placing carriage in service this fact should be completely ignored and every lubricated part given careful attention as indicated in the section on "Lubricating Instructions."

FILLING THE COOLING SYSTEM.

(See Plate 6.)

Fill the radiator (5) and water circulating system with clean, soft water. Water containing lime and other impurities should not be used. Rain water is ideal for the purpose. If the temperature is below freezing (32° F.) proceed as outlined under "Cooling System" in chapter 11.

FILLING FUEL TANK.

(See Plate 6.)

Fill the gasoline tank (16), the capacity of which is 55 gallons. Where possible, it is recommended that the gasoline be strained through a chamois skin to remove any water that may be in it.

FILLING OIL SUPPLY TANK.

(See Plate 6.)

Fill the oil supply tank (7), the capacity of which is approximately 13 gallons. Use medium cylinder oil, specification No. 3502.

PREPARING THE RUNNING LAMPS FOR SERVICE.

Fill the side lamps and tail lamp with kerosene. Light and trim the wicks so that immediate service can be depended upon.

PRELIMINARY TO STARTING ENGINE.

(See Plate 10.)

ESTABLISHING OIL FILM IN CYLINDERS.

If the engine has been inoperative for more than three days, especially after undergoing the conditions to which it would be subjected in shipping, it is necessary to remove the spark plugs (6) and with the aid of an oil can inject about one-fourth pint of lubricating oil into each of the cylinders. Revolving the clutches by means of the hand starter will distribute the oil between piston rings and cylinder walls and reestablish compression.

PRIMING A COLD ENGINE.

(See Plate 34.)

If the engine is cold, or if it has been inoperative for some time, its starting will be greatly facilitated by priming with the hand priming pump (1), located on the radiator ventilator plate.

TO START ENGINE.

(See Plate 48.)

Pull steering clutch levers (4, 6) to rear, thereby setting the brakes and disengaging the clutches. Put the gear-shift lever (5) and reversing lever (3) in neutral position. Open throttle (2) one-third and retard spark (1) halfway. Turn ignition switch (7) to battery position. Crank engine (from either side) by means of the hand starting crank. If engine fails to start, use hand priming pump (1 Plate 34) and crank again.

AFTER ENGINE IS STARTED.

(See Plate 48.)

Advance the spark (1), turn switch (7) to magneto position and retard throttle lever (2), allowing engine to idle.

TO START THE CARRIAGE.

(See Plate 48.)

Move the reversing lever (3) to the forward position and shift the gear shift lever (5) to first speed. Open throttle (2) slowly, thereby increasing the engine speed and engage the steering clutches by pushing the steering clutch levers (4, 6) forward. (As the steering clutches are engaged the brakes are released.)

GEAR CHANGES TO HIGHER SPEEDS.

(See Plate 48.)

As the momentum of the carriage increases, pull back the steering clutch levers (4, 6), disengaging the steering clutches; retard the throttle (2), shift to second speed, engage the steering clutches and open throttle (2). Repeat operations to obtain third and fourth speeds, respectively, after which the speed can be controlled by the throttle (2).

The gears on the left side mesh ahead of the gears on the right; any difficulty encountered in shifting gears can be avoided by momentarily engaging the right clutch.

GEAR CHANGES TO LOWER SPEEDS.

(See Plate 48.)

In changing to lower speeds, disengage steering clutches by pulling the steering clutch levers (4,6) back, do not retard throttle (2) instantly shift to lower gear, engage clutches, and open throttle (2) to speed up engine.

TO REVERSE CARRIAGE.

(See Plate 48.)

Do not attempt to reverse the carriage until it has come to a complete stop.

There are the same number of speeds in reverse as there are forward, the former being slightly lower than the latter.

Reduce the engine speed, pull back the steering clutch levers, thereby releasing the steering clutches. (Releasing the steering clutches applies the brakes.) After carriage has stopped, shift the reversing lever (3), and after shifting the gear shift lever (5) to the proper position, engage the steering clutches.

TO STOP THE CARRIAGE.

(See Plate 48.)

Reduce engine speed, and release the steering clutches by pulling back the steering clutch levers (4, 6). (The brakes are applied when the steering clutches are released.)

TO STOP THE ENGINE.

(See Plate 48.)

Turn off ignition switch (7) while the engine is still running, advance throttle lever (2) slightly to supply initial charge for restarting the engine.

GENERAL DRIVING INSTRUCTIONS.

(See Plate 48.)

The spark-control lever (1) should be maintained in as advanced position as possible without causing the engine to knock. It must be retarded under loads severe enough to cause a knock.

The throttle lever (2) controls the throttle opening of the carburetor. If the engine should be excessively stiff, investigate before attempting to crank it to ascertain whether the water and oil pumps are functioning properly. In cold weather should the water pump be frozen it will be necessary to thaw out the cooling system before attempting to start the engine.

Never travel muzzle forward except for short distances or in fourth speed when operating on tracks.

Shift gears when necessary to prevent needless forcing of the engine. If when climbing a hill it is necessary to retard the spark, be sure to advance it again after the hill has been negotiated. When the spark is retarded it causes the engine to overheat. When traveling over uneven and broken ground the track is used, and it is not necessary to speed up to get over obstructions, as the track will climb over the ridges and out of the depressions. When approaching very deep depressions it is best to shift to low gear beforehand.

The above instructions are applicable when the carriage is traveling over soft roads, sand, or snow. It is best under these conditions to shift to lower speeds rather than to force the engine, and thereby cause it to overheat or stall.

PREPARATION OF CARRIAGE FOR FIRING.

(See Plate I.)

For firing, the tracks must be in place as for running on the track. The gun should not be fired when the carriage is on the wheels without the tracks.

Raise the center wheels enough to allow the drive and steering wheels to take part of the weight of the vehicle. Place the chock

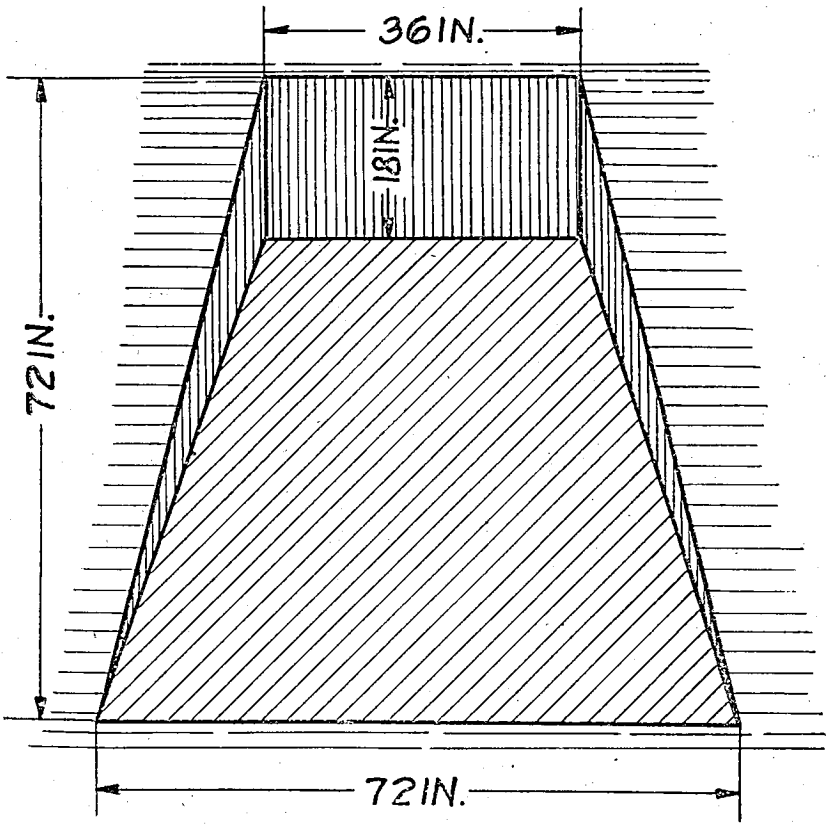


FIGURE 1

Diagram of pit to clear gun in recoil.

blocks in position behind the steering wheels and, if necessary, stake them in place. Dig a pit in the rear of the vehicle to provide ground clearance for the gun when recoiling at high angles of elevation. (See Fig. 1.) Set brakes, release traveling lock, and place sights in

position. Screw down lock bolts (5, 7, plate 33) until they are solid against pivot bracket spring (1, 11, plate 33) bolts. The lock bolts must be released for traveling. Their use when firing gives added stability to the carriage.

LUBRICATING INSTRUCTIONS.

Each place on the carriage where lubricant is required must be given attention regularly. These places are pointed out on the lubricating chart with the lubricant to be used and the frequency of renewal.

LUBRICANTS.

No. 3502, is cylinder oil, furnished in light, heavy, and medium.
No. 3506, is medium cup grease.

LUBRICATING CHART.

(See Plate 7.)

(Based on a 10-hour day, average speed of 6 miles per hour.)

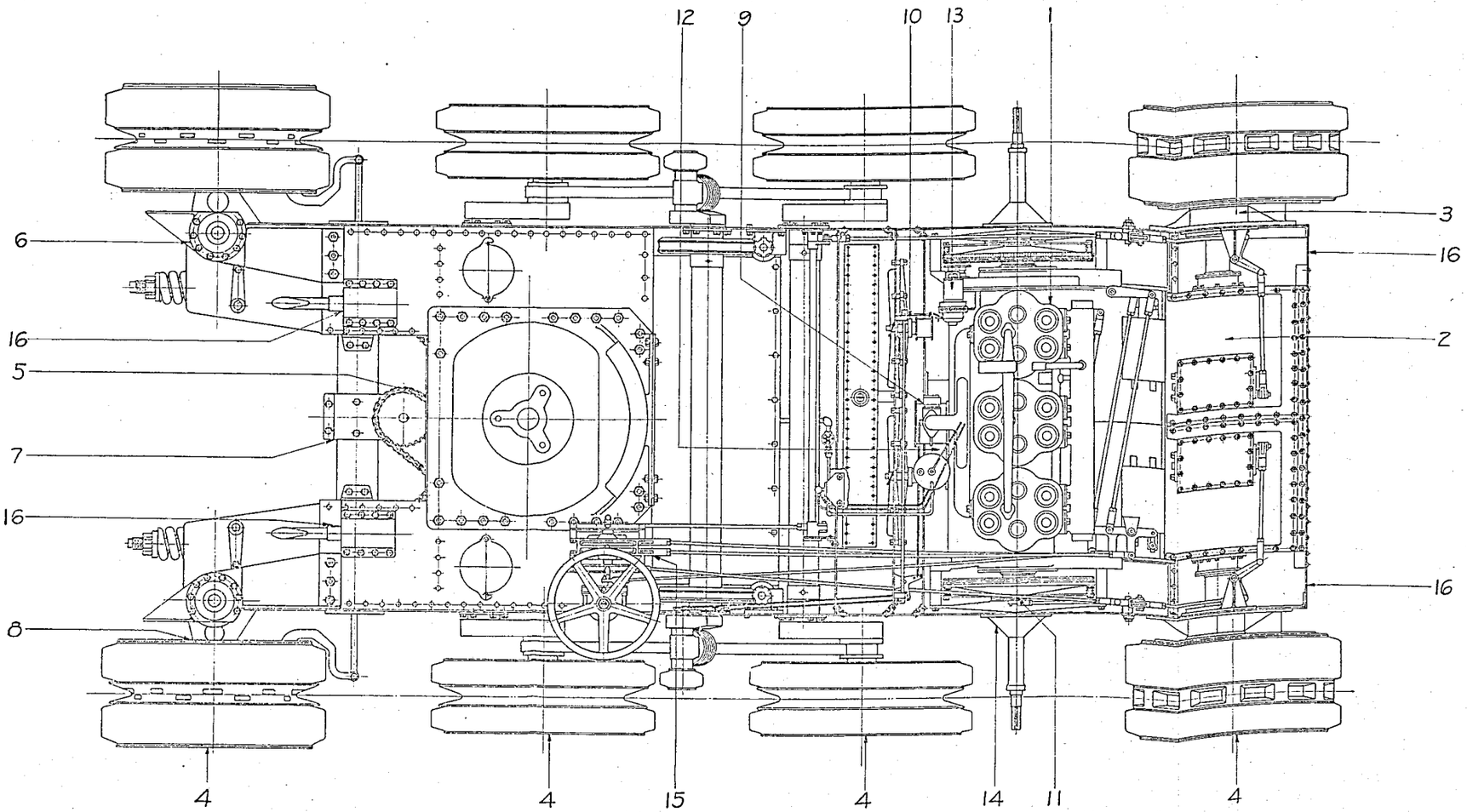
Ref. No.	Part.	Lubricant.	How applied.	How often.
1	Engine (timing gears, crank shaft, cylinders, and piston-rod bearings).	No. 3502, medium	Splash and jet system.	Supply replenished from oil tank.
2	Transmission gears	No. 3502	Splash system	Supply replenished as needed.
3	Final-drive pinion and internal gears.	No. 3506	When assembled	Every 1,000 miles.
4	Wheels (steering, driving, and center).	No. 3506	do	Do.
5	Steering assembly	No. 3506	Grease	Every 50 miles.
6	Steering-wheel pivot brackets.	No. 3502	Oil holes	Daily.
7	Steering-wheel gear racks	No. 3502	do	Do.
8	Steering-wheel knuckle-pin bearings.	No. 3502	do	Do.
9	Fan-gear housing	No. 3506	Pack case when assembling.	Every 100 miles.
10	Fan-shaft roller bearings.	No. 3506	do	Do.
11	Clutch-ball thrust bearings.	No. 3506	Pack when assembling	Do.
12	Water-pump housing	No. 3506	Grease cup	Turn down daily.
13	Magneto	Three-in-one or other mineral oil.	Oil can	1 drop every 15 days for main bearing, circuit breaker roller, and circuit breaker pin.
14	Hand starting crank	No. 3502	In oil holes	Daily.
15	Control units, rods, etc.	No. 3502	Oil can	Once a week.
16	Pintles	No. 3506	Pack case when assembling.	Once a month.
17	Track pins	No. 3506	Pack when assembling	Every 100 miles.

MAINTENANCE ROUTINE.

It is essential for the proper care and maintenance of the vehicle that the following maintenance routine schedule be adhered to.

Inspections must be systematic and detailed, and made at regular intervals, daily, weekly, and monthly.

Daily inspections must cover a general search for loose nuts and connections, all shortages of parts, all defects or conditions that would interfere with the proper operation of the vehicle.



Lubricating chart.

Weekly inspections must cover an examination of the compression, valve adjustment, condition of the ignition system, clutch adjustments, and any other adjustments that are necessary, due to ordinary wear and tear.

Monthly inspections must be detailed in their nature and, assuming that daily and weekly inspections have been conscientiously made, must cover an examination of all bearings, wear and tear on working parts, and deterioration.

The following items refer only to inspection and adjustments. Repairs or replacements necessary must be made at the earliest opportunity.

DAILY MAINTENANCE ROUTINE.

ENGINE.

Examine all wiring terminals for tightness.
Clean magneto externally.
Test oil flow.
Inspect radiator water supply.
Inspect fuel supply.
Inspect all pipe lines and connections for leaks.
Inspect spark plugs.

CONTROLS.

Inspect controls to see that they are functioning properly.

GENERAL.

Inspect and clean track parts and exterior of carriage. See that all tools and accessories are in their proper place.

WEEKLY MAINTENANCE ROUTINE.

Inspect all wiring for damages.

Thoroughly clean the external parts of the engine.

Inspect oiling system for leaks, and ascertain if oil pump is working properly.

Inspect cooling system for leaks and proper operation.

Inspect engine for carbon deposits. Inject a tablespoon of kerosene into each cylinder through the spark plug holes. The kerosene should be inserted when the motor is hot and when the mount will be let standing over night.

Clean all spark plugs and examine for damages.

Remove the magneto distributor cover and clean the distributor with gasoline.

Run engine at a slow speed. Inspect the spark for length and heat for each spark plug wire.

Drain water and dirt from vacuum tank in the gasoline supply system.

Inspect carburetor control connection.

Do not alter adjustment of carburetor unless it is shown necessary when the mount is in operation.

Inspect drain plugs and drain cocks for loss of oil.

Test main and connecting rod bearings for looseness.

BRAKES.

Clean all brake connections and inspect for proper adjustment.

CLUTCHES.

Inspect steering clutches for wear and proper operation and adjustment.

MONTHLY MAINTENANCE ROUTINE.

STEERING CLUTCHES.

Inspect thoroughly from levers to clutches.

TRANSMISSION.

Clean externally and inspect for leaks, especially where final drive shaft passes out of the gear cases.

STEERING.

Examine wheel steering linkage, especially the chain part of the gear.

Examine the steering wheel arm locking pin to see that it is in operating condition. The proper tension must be maintained on the steering wheel arm tension springs.

Examine the steering gear rack, idler gear, pinion, axle, kunckle, and steering sprocket to see that they are functioning properly.

TRACK.

Examine track shoes and pins for wear and breakages.

Clean off all deposits of dirt and grit from the tracks.

IGNITION.

Clean magneto collector rings, polish and adjust breaker points.

Inspect spark lever as to proper advance.

ENGINE.

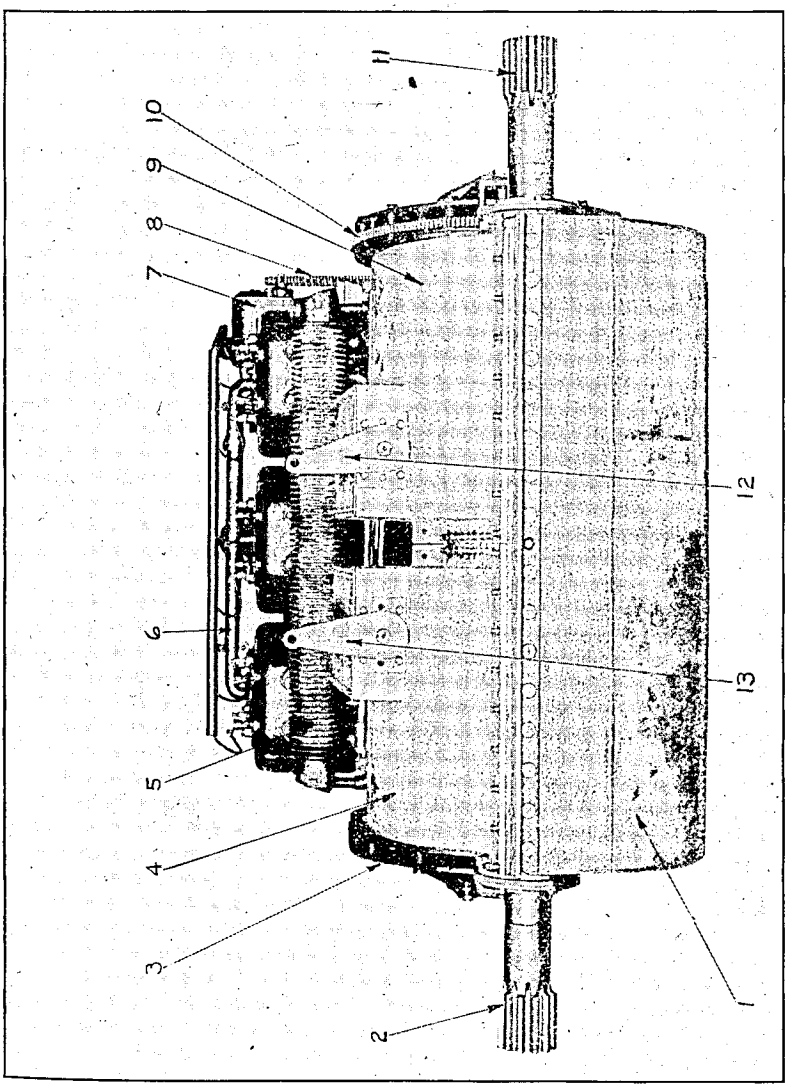
Inspect cylinders for carbon and grind valves if necessary.

See that oil level indicator pipe line is open, and that oil is circulating properly.

COOLING SYSTEM.

Inspect cooling system as to leaks and proper functioning.

Plate 8.

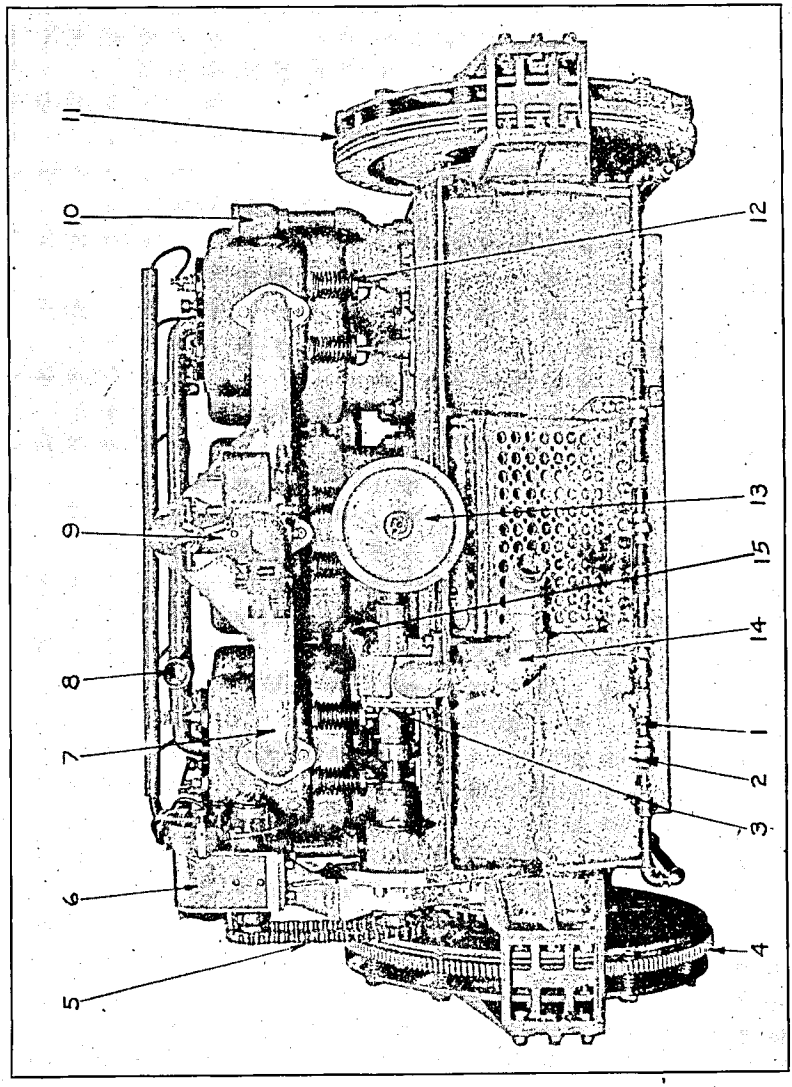


Engine, exhaust side view.

ENGINE, EXHAUST SIDE VIEW. (Plate 8.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	AM235A....	Transmission case. (Integral with crank case.)	7	AK115A....	Magneto.
2	AM222H....	Final drive pinion (integral with final drive shaft).	8	AK114B....	Magneto drive chain.
3	.....	Clutch assembly.	9	AM226A....	Transmission case cover, right hand.
4	AM217A....	Transmission case cover, left hand.	10	.....	Clutch assembly.
5	CP11A.....	Exhaust manifold.	11	AM222G....	Final drive pinion (integral with final drive shaft).
6	AK118A....	Outlet manifold (water).	12	LM45K.....	Brake operating lever.
			13	LM45K.....	Brake operating lever.

Plate 9.

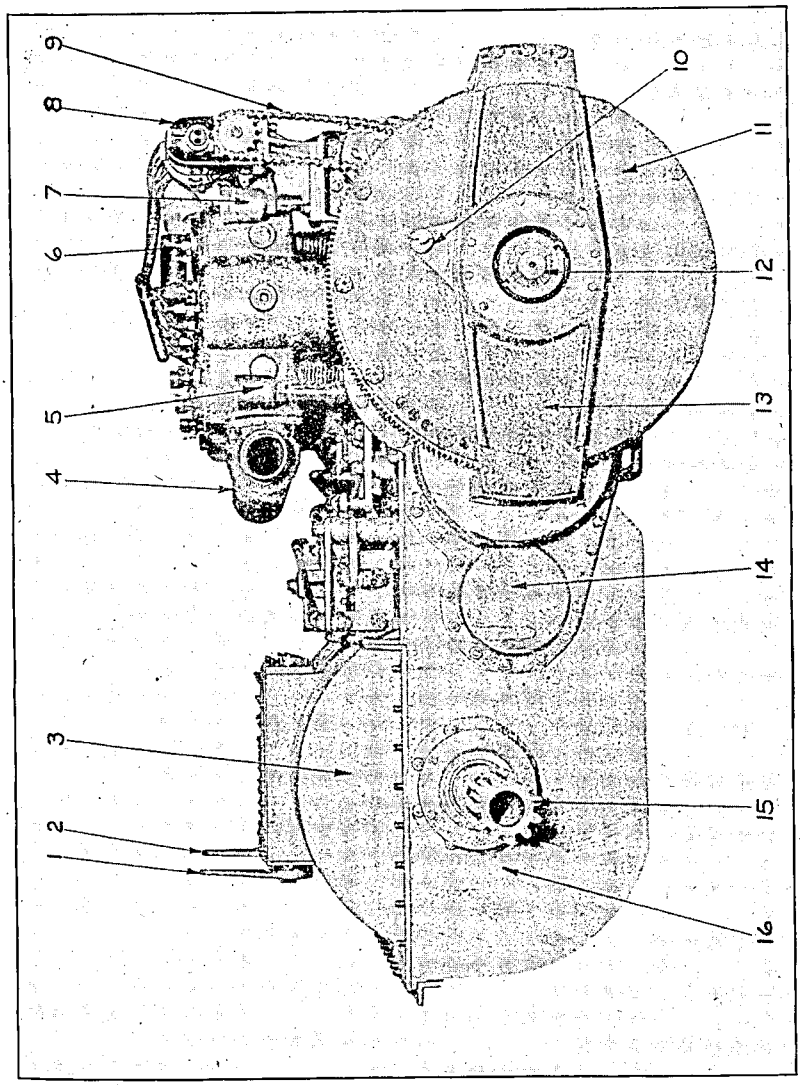


Engine, inlet side view.

ENGINE, INLET SIDE VIEW. (Plate 9.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	.....	Oil jet supply pipe.	9	AK113A....	Carburetor.
2	AM235A....	Crank case (integral with transmission case).	10	AK116F....	Breather.
3	.....	Water pump.	11	.....	Clutch assembly.
4	.....	Clutch assembly.	12	AK112B....	Valve spring.
5	AK114B....	Magneto drive chain.	13	NM124A....	Fan pulley.
6	AK115A....	Magneto.	14	.....	Water pump inlet pipe.
7	AK116D....	Inlet manifold.	15	NM128F....	Hose (water pump to inlet manifold).
8	AK118A....	Outlet manifold (water).			

Plate 10.



Engine, magneto end view.

ENGINE, MAGNETO END VIEW. (Plate 10.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	LM45K.....	Brake operating lever.	10	TM39A.....	Clutch cam, right.
2	LM45K.....	Brake operating lever.	11	.....	Clutch assembly.
3	AM226A....	Transmission case cover, right hand.	12	AKS3C.....	Crank shaft ratchet.
4	CP11A.....	Exhaust manifold.	13	TM40B.....	Clutch pressure plate.
5	AK116F....	Breather.	14	AM230A....	Transmission case side cover, right hand.
6	AK110B....	Spark plug.	15	AM222G....	Final drive pinion (integral with final drive shaft).
7	AK116F....	Breather.	16	AM235A....	Transmission case (integral with crank case).
8	AK115A....	Magneto.			
9	AK114B....	Magneto drive chain.			

CHAPTER II.

ENGINE GROUP.

(See Plates 8, 9, 10.)

GENERAL SPECIFICATIONS.

Engine:
- Type ..... four cycle, T head.
- Brake horsepower ..... 120 at 1,500 r. p. m.

Cylinders:
- Number ..... six, cast in pairs.
- Bore ..... 5½ inches.
- Stroke ..... 7 inches.
- Material ..... gray iron.

Pistons:
- Length ..... 7 inches.
- Clearance at top land ..... 0.013 inch.
- Clearance at 2d land ..... 0.008 inch.
- Clearance at 3d land ..... 0.008 inch.
- Clearance at 4th land ..... 0.008 inch.
- Clearance at skirt, below oil ring ..... $\frac{3}{32}$ inch.
- Clearance at skirt, above oil ring ..... 0.008 inch.
- Displacement ..... 997.5 cubic inches.
- Material ..... gray iron.

Piston pin:
- Diameter ..... 1.125 inches.
- Length ..... 5.25 inches.
- Material ..... chrome vanadium steel.

Rings:
- Type ..... cast-iron single spring.
- Compression ..... four.
- Skirt ..... one.

Connecting rod:
- Length ..... $13\frac{15}{16}$ inches.
- Upper rod bearing ..... 1.125 inches.
- Lower rod bearing ..... 2.875 inches.
- Material ..... chrome vanadium steel forging.
- (Connecting rod has bronze bush wrist pin and Babbitt lined bronze main bearing.)

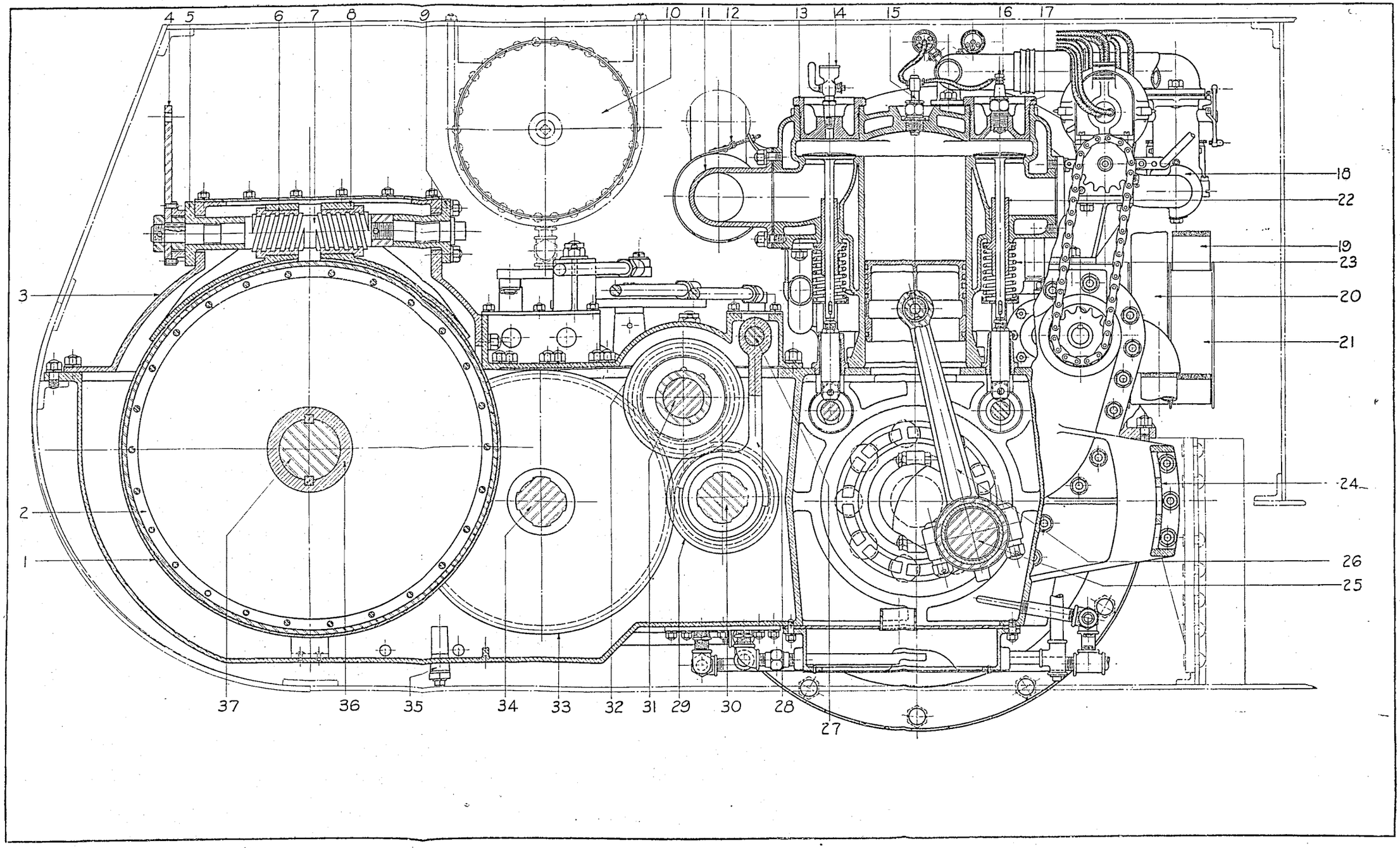
Cam shaft:
- Material ..... chrome nickel steel, hardened and ground.
- Bearings ..... cast iron.

Crank shaft:
- Material ..... chrome nickel steel, forging balance.
- Bearings ..... ball bearings.

Valves:
- Type ..... poppet.
- Diameter ..... $2\frac{7}{8}$ inches.
- Stems ..... 0.5 inch diameter.
- Material ..... tungsten steel.

Oiling system ..... splash, and jet.

Water circulation ..... gear pump.



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Engine, transverse section.

Carburetor.....Zenith, Model L-8.
Gasoline feed.....vacuum, Stewart Warner, No. 147B.
Radiator.....cellular.
Ignition.....double spark, 2 plugs connected in series.
Magneto.....Bosch, DU-6.
Coil.....Bosch, dual ignition.

ENGINE, LONGITUDINAL SECTION. (Plate 11.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	AK87B	Crank shaft.	21	.....	Cam shaft drive gear (integral with crank shaft extension).
2	AK107K	Connecting rod cap.			
3	AK107D	Connecting rod.	22	AM230A	Transmission case side cover, right hand.
4	AK108E	Wrist pin.			
5	AK104A	Cylinder block.	23	AK87C	Crank case bearing, outer (crank shaft extension).
6	AK108A, B	Piston rings.			
7	AK108D	Piston.	24	AM235A	Transmission case.
8	AK110B, F	Spark plugs.	25	WM44A	Oil pan.
9	AK114C	Ignition wire conduit.	26	WM44B	Bottom plate.
10	AK112C	Valve.	27	WM44C	Sediment plate.
11	AK110E	Priming cup.	28	WM50B	Oil nozzle.
12	AK112C	Valve.	29	WM44D	Sediment plate drain pipe.
13	.....	Exhaust port.	30	AK109E	Crank shaft bearing, inner.
14	AK116F	Breather.	31	AK106B	Inlet cam shaft.
15	AK115A	Magneto.	32	AK111G	Valve tappet.
16	AK114B	Magneto drive chain.	33	AK109B	Bearing clamp.
17	AK106C	Cam shaft bearing, right end.	34	AM229A	Transmission case side cover, left hand.
18	AK109A	Cam shaft gear.			
19	AM213C	Main driving gear, right hand.	35	AK87C	Crank shaft bearing, outer.
			36	AK106D	Cam shaft bearing, left end.
20	AK87A	Crank shaft extension.			

ENGINE, TRANSVERSE SECTION. (Plate 12.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	LM48A	Brake band.	20	NM128C	Fan belt.
2	LM47A	Brake drum.	21	NM124A	Fan drive pulley.
3	AM226A	Transmission case cover.	22	AK112A	Valve guide.
4	LM45K	Brake operating lever.	23	AK112B	Valve spring.
5	LM45A	Brake screw bushing.	24	TM40F	Pressure plate spacer.
6	LM45H	Brake screw nut.	25	AK87B	Crank shaft.
7	LM45D	Brake screw.	26	AK107D	Connecting rod.
8	LM48B	Brake band lug.	27	AM221C	Reverse shifting shaft.
9	LM45A	Brake screw bushing.	28	AM231C	Reverse speed lever.
10	WM46A	Oil tank.	29	AM214K	Shifting gear.
11	CP11A	Exhaust manifold.	30	AM222D	Driving shaft, right hand (timing gear).
12	AK124B	Hot stove strap.			
13	AK108C	Exhaust valve plug.	31	AM223A	Reversing gear shaft.
14	AK110E	Priming cup.	32	AM214L	Reversing gear.
15	AK110F	Spark plug, series.	33	AM213E	Countershaft gear.
16	AK110B	Spark plug.	34	AM222F	Sliding gear shaft.
17	AK110F	Intake valve plug.	35	WM50T	Oil drain plug.
18	AK124A	Carburetor hot stove.	36	LM47B	Brake drum hub.
19	NM128B	Fan belt.	37	AM222G	Final drive shaft.

ENGINE.

(See Plate 11.)

GENERAL DESCRIPTION.

The engine is a 6-cylinder, T-head, 4-stroke cycle motor with a $5\frac{1}{2}$-inch bore and 7-inch stroke, developing 120 horsepower at 1,500 revolutions per minute. The cylinders (5) are cast in pairs. The firing order is 1, 5, 3, 6, 2, and 4. Cylinder No. 1 is located at the timing gear end of the motor.

The crank case (24) and transmission case (24) are an integral bronze casting, to the lower side of which is bolted the oil pan or sump.

The cam shafts (31) are gear driven from the crank shaft (1). The water pump, magneto (15), and the gears for the fan pulley are driven by a single shaft, which in turn is geared to the crank shaft (1).

The gear-driven oil pumps (5, 7, Plate 17) are located in the bottom of the transmission case, near the wall which divides the crank case and transmission case, and are driven by the first-drive shaft gears.

Four breathers (14) are located in the top of the crank case section of the crank case and transmission unit, two in each end.

The ignition is of the double-spark type, two plugs (8) being connected in series.

The fuel supply is from a main tank (8, Plate 20) to a vacuum tank (2, Plate 20), thence to a Zenith L–8 carburetor (13, Plate 20).

The lubrication system is of the splash and jet type, the oil being circulated by the gear-driven oil pumps (5, 7, Plate 17) through six oil nozzles (28) located in the crank case opposite the bearings holding the connecting rods (3) on the crank shaft (1).

The water in the cooling system is kept in circulation by a gear pump operated by a shaft which is geared with one of the cam shaft gears.

CYLINDERS.

(See Plate 11.)

The cylinders (5) are made of gray iron, are cast in pairs with the water jackets integral. They are of the T-head pattern. Each pair of cylinders is attached to the crank case by six studs.

PISTONS.

(See Plate 13.)

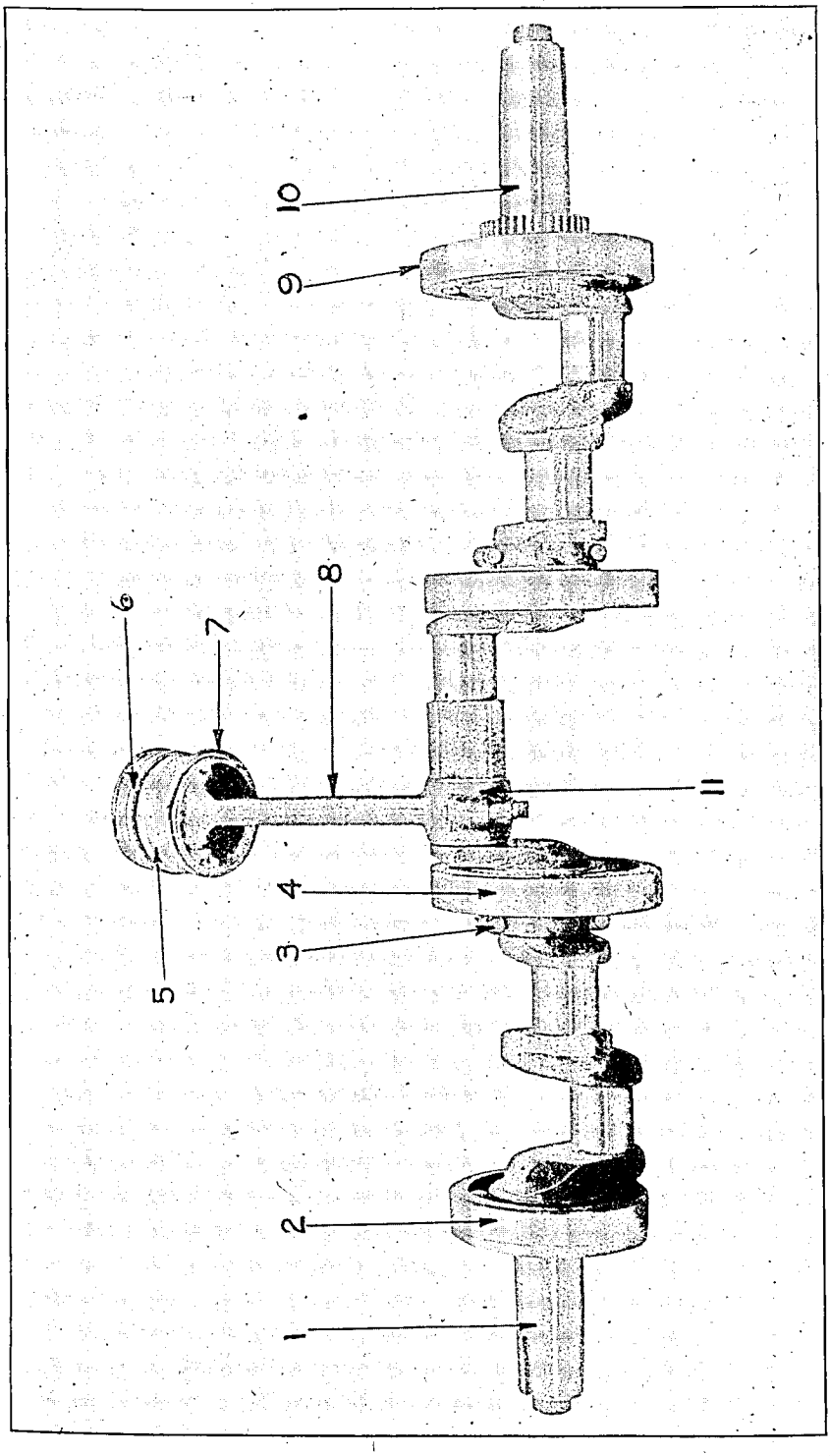
The six pistons (5) are of gray iron and each have five rings (6, 7), four above and one below the wrist pin. There is a slight difference in diameter of the top and bottom of the piston. This is necessary because all the heat to which the piston is subjected is applied at the top, causing it to expand more than the bottom. The bottom of the piston is chamfered.

PISTON, MAIN BEARINGS, CONNECTING ROD AND BEARING, AND CRANK SHAFT ASSEMBLY.

(Plate 13.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	AK87B.....	Crank shaft.	7	AK108B....	Piston ring, lower.
2	AK87D.....	Crank shaft bearing, outer.	8	AK107D....	Connecting rod.
3	AK109B....	Bearing clamp.	9	AK87C.....	Crank shaft bearing, outer.
4	AK109E....	Crank shaft bearing, inner.	10	AK87A.....	Crank shaft extension.
5	AK108D....	Piston.	11	AK107K....	Connecting rod bearing cap.
6	AK108A....	Piston ring, upper.			

Plate 13.



Piston, main bearings, connecting rod and bearing and crankshaft assembly.

PISTON CLEARANCE.

The proper clearance between cylinder and piston at the top land is 0.013 inch; at the second, third, and fourth lands, 0.008 inch; and at the skirt, 0.008 inch above and 0.093 ($\frac{3}{32}$) inch below the oil ring.

PISTON RINGS.

(See Plate 13.)

There are five piston rings for each piston. Four top rings (6) and one lower (7). They are of cast iron, 0.25 inch wide, square in section. Each ring is split diagonally at an angle of 30 degrees with a gap of 0.020 inch. The piston rings, fitting in the grooves in the piston (5) and bearing against the walls of the cylinder, prevent the gases from leaking down into the crank case. The piston ring (7) at the lower end of the piston prevents the oil from working up into the combustion chamber.

WRIST PINS.

(See Plate 13.)

The wrist pins (4, Plate 11) are hollow and are made of chrome vanadium steel. The upper connecting rod bearing oscillates on the wrist pin which is held in place in the piston (5) by a set screw, located in one of the bosses in the piston. The set screw passes half way through the wrist pin. A locking wire passes through the boss, pin, and set screw.

CONNECTING RODS.

(See Plate 13.)

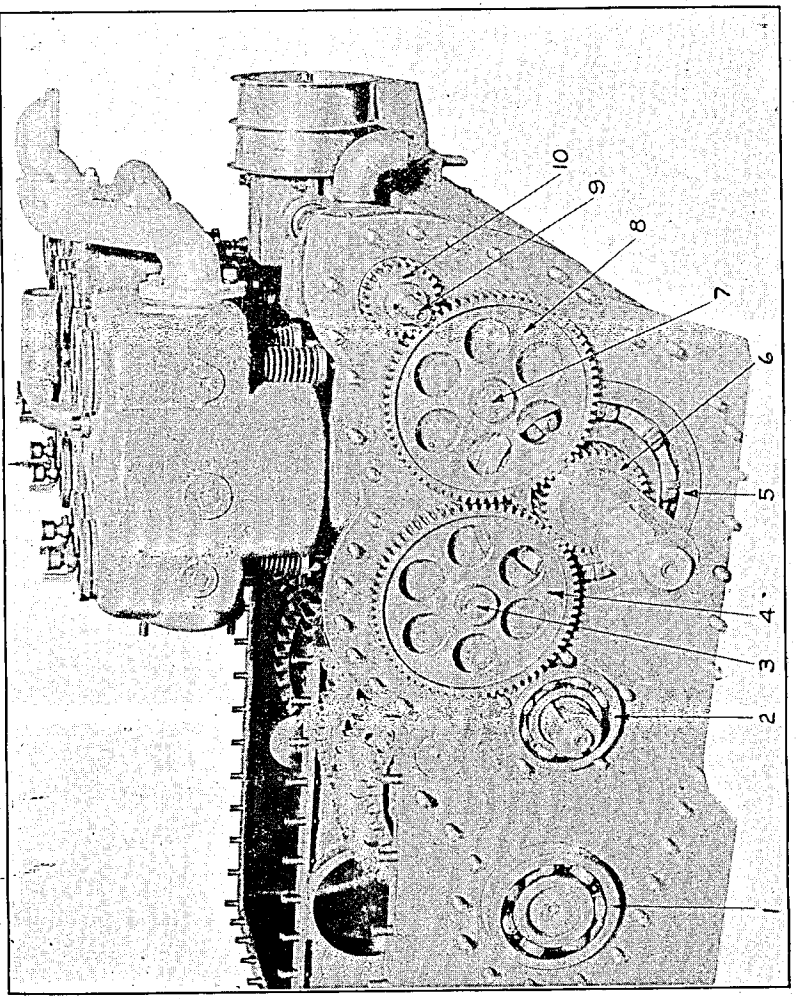
The connecting rod (8), so called because it connects the wrist pin of the piston (5) and the crank pin of the crank shaft (1), is a chrome vanadium steel forging. It is 12.625 inches long from center to center of wrist pin and crank pin.

CONNECTING ROD BEARINGS.

(See Plate 13.)

The upper bearing is solid and contains the bronze bushing for the wrist pin. The lower bearing is split and contains the babbitt-faced bronze bushing for the crank pin.

Plate 14.

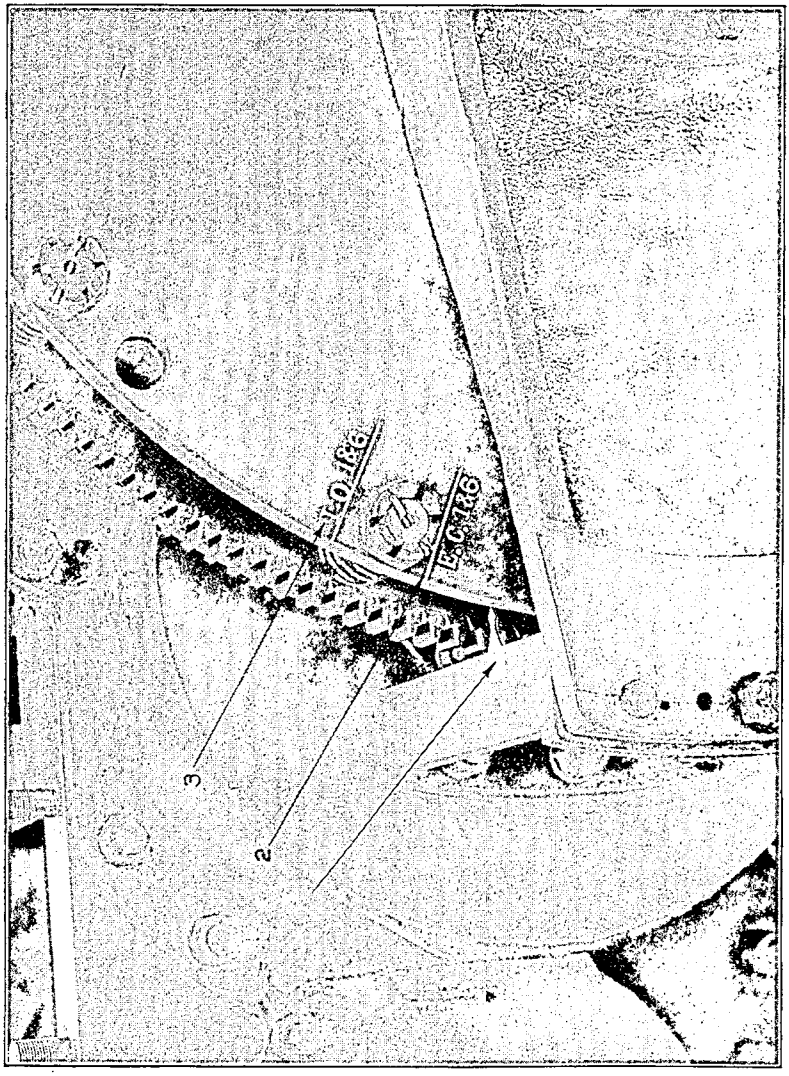


Timing gears assembled.

TIMING GEARS ASSEMBLED. (Plate 14.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	AM214F	Transmission shaft bearing.	6	AK87A	Driving pinion (integral with crank shaft extension).
2	AM214E	Transmission shaft bearing.	7	AK106B	Inlet cam shaft.
3	AK106A	Exhaust cam shaft.	8	AK109A	Cam shaft gear.
4	AK109A	Cam shaft gear.	9	NM121A	Fan and pump driving shaft.
5	AK87C	Outer bearing, crank shaft extension.	10	NM122F	Pump driving gear.

Plate 15.



Timing markings on clutch assembly.

TIMING MARKINGS ON CLUTCH ASSEMBLY. (Plate 15)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	.....	Indicating arrow.	3	.....	Inlet valve open, cylinders 1 and 6.
2	.....	Exhaust valve closed, cylinders 1 and 6.			

CRANK SHAFT.

(See Plate 13.)

The crank shaft (1), a chrome nickel steel forging, consists of two parts, the crank shaft (1) and the crank shaft extension (10). One end of the crank shaft is threaded to take the crank shaft extension (10), which, when in position on the crank shaft (1) is pinned rigidly in place, making them integral.

A gear is cut integral with the crank shaft extension which is the driving pinion for the timing gears.

CRANK SHAFT BEARINGS.

(See Plate 11.)

The crank shaft (1) is mounted in four ball bearings (23, 30), two outer and two center, the outer races of which have a force fit in the crank case. The inner races of the outer bearings have a force fit on the crank shaft (1). The inner race of the center bearings are large enough to permit assembly on the crank shaft from either end. This necessitates the use of split bushings (33) for mounting the center bearings, the split bushings being held in place on the crank shaft (1) by a clamp (33).

CRANK CASE.

(See Plate 11.)

The crank case (24) and transmission case (24) are integral and are made of bronze. The oil pan (25) or sump and the sediment plate (27) are bolted to the underside of the crank case. The oil pan (25) consists of a copper bottom plate (26) riveted to a bronze frame. The sediment plate (27) is of sheet steel.

CAM SHAFTS.

(See Plate 14.)

There are two cam shafts (3, 7) actuating all intake and exhaust valves. The cam shafts (3, 7) are driven by means of spur gears (4, 8) from the crank shaft extension pinion (6). The crank shaft extension pinion is cut integral with the crank shaft extension. The cam shafts (3, 7) are made of chrome nickel steel and are hardened and ground with the cams integral with the shafts.

TIMING GEARS.

(See Plate 14.)

The timing gears (4, 8) are contained in the case on the right end of the motor. There are three gears in the set, the two cam-shaft gears (4, 8) mounted on the cam shafts (3, 7) and the driving pinion (6), which is cut integral with the crank shaft extension.

The driving pinion (6) meshes directly with the cam shaft gears (4, 8). The inlet cam-shaft gear (8) meshes with the pump driving gear (10) on the fan and pump driving shaft (9), on which is mounted the fan-shaft gear and the water pump and magneto drive gears.

The cam-shaft gears (4, 8) are of chrome nickel steel with 8-inch pitch and 9-inch pitch diameter. The crank-shaft extension or driving pinion (6) has 36 teeth; cam-shaft gears (4, 8) 72 teeth; and magneto gear 24 teeth.

VALVES.

(See Plate 11.)

There are two valves (10, 12) of the poppet type in each cylinder, an intake valve and an outlet valve. The valves and valve stems are integral and are made of tungsten steel. The guides for the valves are of cast iron and are assembled with a force fit in the cylinder blocks.

VALVE SPRINGS.

(See Plate 11.)

The valve springs are of the coil-spring type and are assembled under a load of 90 pounds. They are assembled on the valve stems, the lower end bearing against the valve-spring cup and the upper end against the cylinder casting.

MUFFLERS AND EXHAUST PIPING. (Plate 16.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	CP10A.....	Muffler.	7	CP11D.....	Exhaust pipe elbow.
2	CP10D.....	Muffler tee plug.	8	CP11B.....	Exhaust pipe.
3	CP10C.....	Muffler tee.	9	CP10C.....	Muffler tee.
4	CP11C.....	Exhaust pipe.	10	CP10D.....	Muffler tee plug.
5	CP11D.....	Exhaust pipe elbow.	11	CP10A.....	Muffler.
6	CP11A.....	Exhaust manifold.			

VALVE TAPPET.

(See Plate 11.)

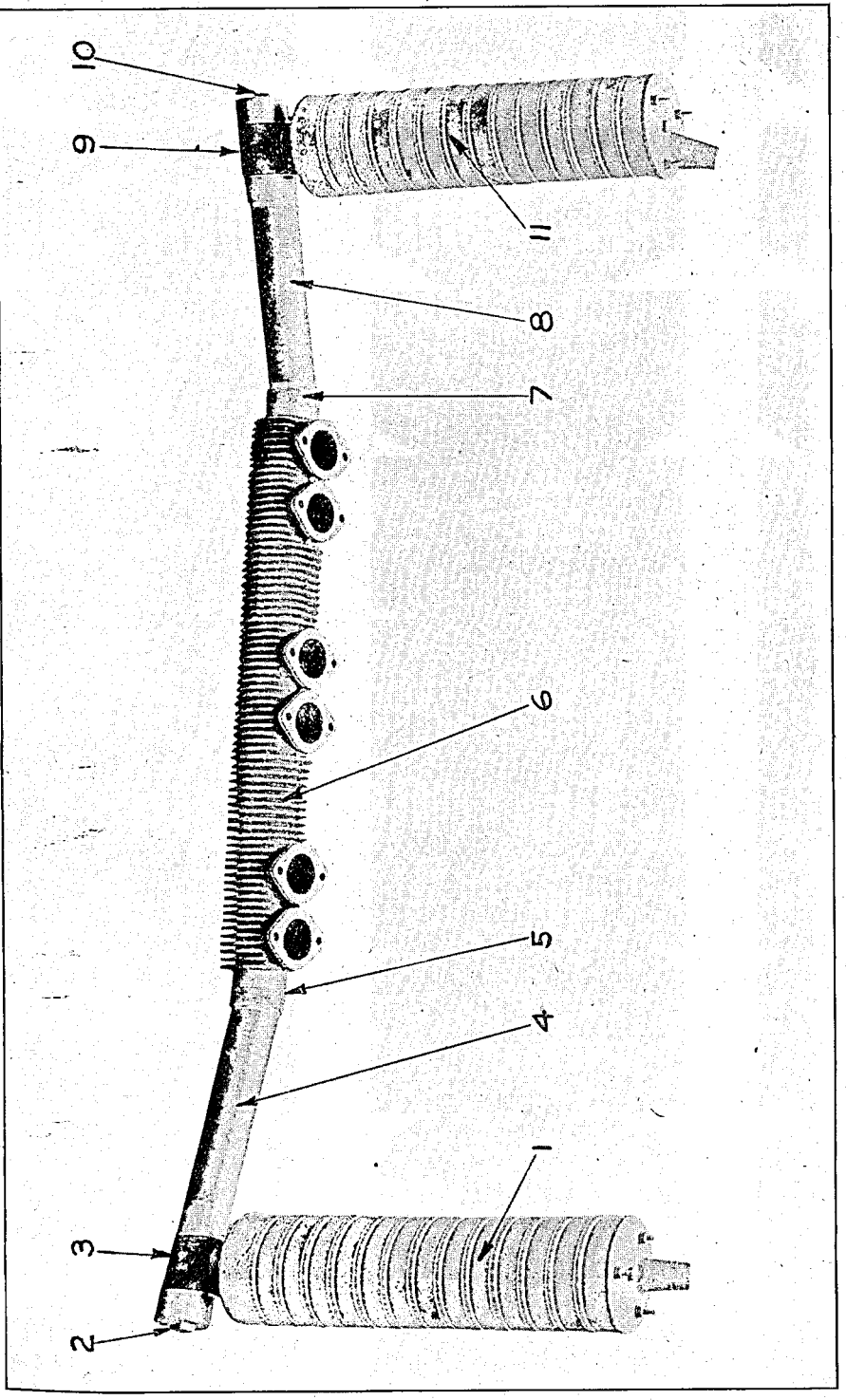
Each valve is actuated by a tappet, the hardened roller of which rides on a cam on the cam shaft. The valve tappets are made of steel and are provided with an adjustment for length. The guides for the valve tappets are of bronze and are bolted to the crank case.

FLYWHEELS.

(See Plate 27.)

The driving members of the steering clutches (21, 22) are keyed to the crank shaft and serve as a flywheel.

Plate 16.



Mufflers and exhaust piping.

ENGINE MANIFOLDS.

There are two manifolds, the intake (7, Plate 9) and the exhaust (5, Plate 8).

INTAKE MANIFOLD.

(See Plate 9.)

The intake manifold (7) is made of cast aluminum and is provided with four openings, three which line up with intake passages in the cylinder blocks and one which is connected to the carburetor (9) by the carburetor connection.

The intake manifold conveys the mixture of gasoline and air from the carburetor to the cylinders. The intake manifold is held in position on the cylinder blocks by studs.

EXHAUST MANIFOLD.

(See Plate 16.)

The exhaust manifold (6) is made of cast iron and is provided with six openings which line up with the exhaust passages in the cylinder blocks. The exhaust manifold conveys the burned and exhausted gases to the mufflers (1, 11) to which it is connected by suitable pipings (4, 8). The construction of the exhaust manifold is such that the entire surface is covered with fins which, due to their enormous surface area, produce rapid radiation of the heat generated by the exhausting gases.

The exhaust manifold is held in position on the cylinder blocks by studs.

MUFFLERS.

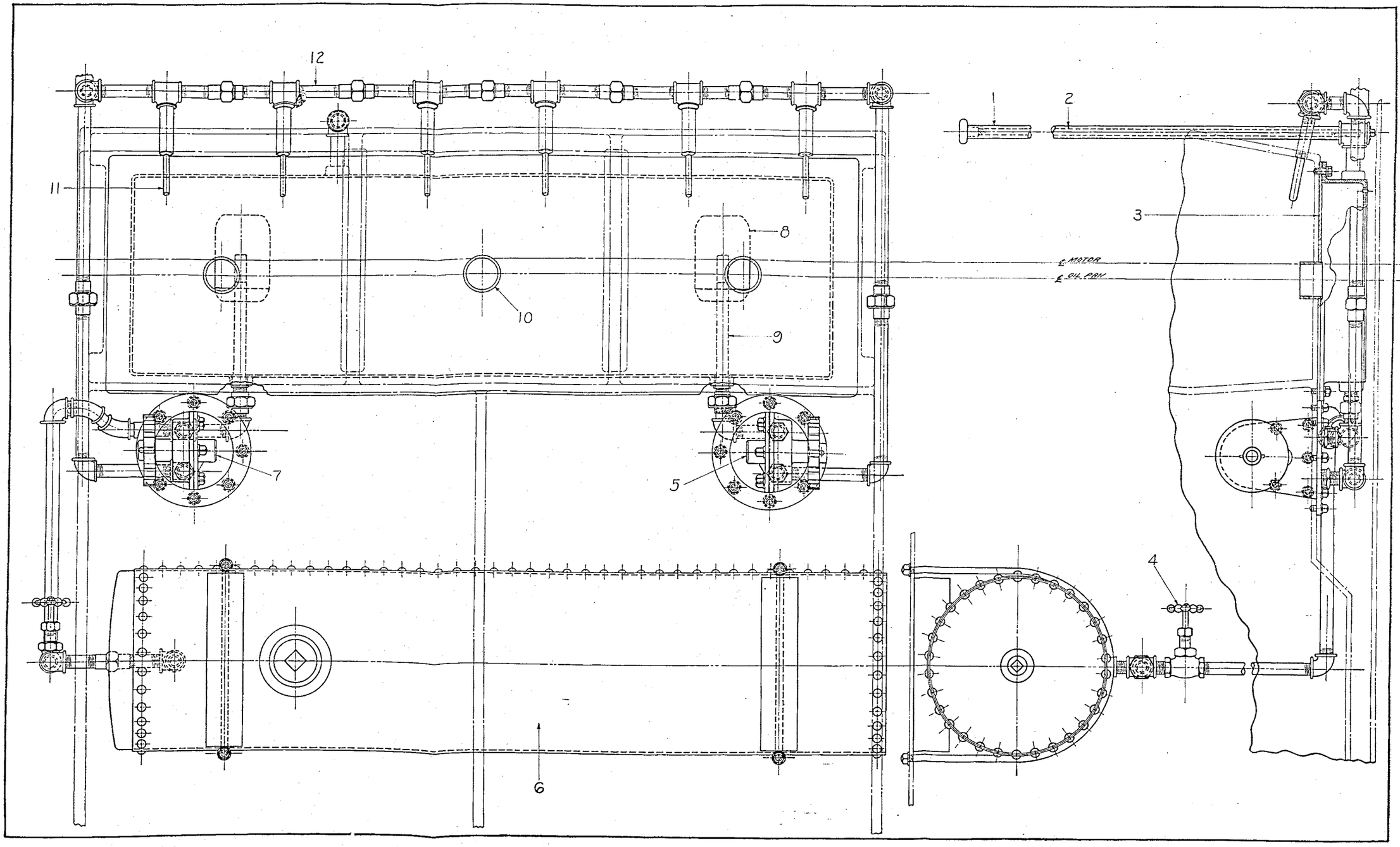
(See Plate 16.)

There are two mufflers (1, 11) of the standard commercial type which are connected by piping (4, 8) to the exhaust manifold (6). These mufflers are located between the top and bottom plates of the platform assemblies on which the tracks are carried. The mufflers offer minimum resistance to the passage of the gases and means are provided for not only breaking the entering streams into smaller streams but the capacity of each muffler is sufficiently large to permit the expansion of the gases to nearly atmospheric pressure before they are discharged into the air.

HOT STOVE.

(See Plate 20.)

The hot stove (5) is made of seamless copper tubing, one end of which is connected to the air intake of the carburetor and the other



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Oil circulation system.

end is held in position on the fins of the exhaust manifold by a steel strap. The function of the hot stove is to preheat the air before it enters the carburetor.

LUBRICATION SYSTEM.

(See Plate 17.)

Lubrication of the engine is by a combined jet and splash system. Gear pumps (5, 7) located in the bottom of the transmission case pump the oil under pressure to a pipe (12) extending the length of the engine crank case. This pipe supplies jets (11) located in the crank case opposite the connecting rods which direct jets of oil upon the dippers on the connecting rod caps as the crank shaft rotates. These dippers on the connecting rod caps are drilled, allowing oil to be forced up into the bearings of the connecting rods.

The overflow of oil collects in the sump formed by the drain sediment plate (3), located between the crank case and the oil pan. Three sediment plate drain pipes (10) are provided to allow the escape of oil to the oil sump or pan below. These drain pipes also serve to maintain the oil at a level high enough to provide splash.

OIL CIRCULATION SYSTEM. (Plate 17.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	WM97A	Oil gauge pipe.	7	.....	Oil pump.
2	WM97G	Oil gauge rod.	8	WM98B	Oil suction strainer.
3	WM44C	Sediment plate.	9	WM98A	Oil suction tube.
4	WM50A	Globe valve.	10	WM44D	Sediment plate drain pipe.
5	.....	Oil pump.	11	WM50B	Oil nozzle.
6	WM46A	Oil tank.	12	.....	Oil jet piping.

In the oil sump or pan are located the intake pipes (9) of the oil pumps, suitably screened, through which the oil is drawn and again circulated through the system.

The timing gears and the cam shafts are lubricated by splashing of the oil in the engine crank case as the crank shaft and connecting rods rotate, and the seepage of oil through the end ball bearings of the crank shaft.

OIL-FLOW INDICATOR.

A pet cock, located in front of the diaphragm plate near the operator's seat is connected by piping to the piping from the oil pump to the oil jets. If oil flows when the pet cock is opened, provided the clutches are in, it indicates that the oil is circulating properly.

OIL GAUGE.

(See Plate 17.)

An oil-gauge pipe (1) is connected by suitable piping to the oil pan located on the bottom of the crank case. This pipe contains a removable oil-gauge rod (2) by which the oil level in the crank case can be ascertained. Never permit the oil to reach a point below the low mark on the oil-gauge rod.

OIL PUMPS.

(See Plate 17.)

The oil pumps (5, 7), located in the bottom of the transmission case, are of the gear type and are driven from the first shafts of the right and left transmissions. They draw oil from the oil sump and force it to jets (11) located in the crank case.

The oil pumps do not operate when the clutches are out.

When the motor is idling at least one oil pump should be kept in gear at all times. This is accomplished by putting the gear-shift lever in neutral position and engaging one of the clutches.

FIELD REPAIRS TO ENGINE.

TO REMOVE THE ENGINE AND TRANSMISSION.

Disconnect the oil line from the reserve tank to the engine and remove top plate. Disconnect the clutch and brake, and gear shift controls, fuel lines, ignition wires, and radiator connections. Remove outer clutch cams and fan belts. Drive out taper pins in spacer sleeves on final-drive shafts between the chassis and transmission case bearings. Jack up the rear end of mount and remove the drive wheels and pull the pinion shafts out. Remove the holding-down bolts. This permits the removal of the engine and transmission group from the mount.

TO REMOVE PISTONS.

It is necessary to remove the cylinder blocks before the pistons can be removed.

TO ALIGN PISTONS AT RIGHT ANGLES TO CRANK SHAFT.

With the cylinder blocks removed and the connecting rod and piston in position a level may be used to ascertain parallelism between top of the piston and top of the crank case, which is parallel to the center lines of the crank shaft. Or a pair of calipers may be used to determine uniformity of distance between the top of crank case and the underside of a piston ring on all sides of the piston. Or with a straightedge laid across the top of the piston lengthwise of the engine, the distance to the crank case may be measured at its ends.

CLEANING THE PISTONS.

The piston-ring slots should be scraped clean of all carbon deposits and washed with kerosene. It is useless to fit a piston-ring unless the slots are clean, because deposits of carbon will interfere with accurate fitting. Scrape the piston-ring slot clean with a flat metal scraper. If it is not possible to remove all the carbon, use No. 000 sandpaper under a flat stick, bearing on it lightly while cleaning the slot. *Never use a file or emery cloth for cleaning piston-ring slots.* Rinse the slots with kerosene, and wipe dry with a cloth.

FITTING THE PISTON RINGS.

The piston rings should be placed in the cylinders and fitted for the proper gap (0.020 inch) between the ends of the ring before being placed on the piston. When placed on the pistons the rings should be rotated in the grooves to insure proper sidewise clearance, which is about 0.001 inch. The rings should be placed in the grooves over skids made of three or four pieces of tin or very thin sheet iron about 5 or 6 inches long by $\frac{3}{8}$ inch wide, the rings being pushed down evenly all around to prevent any distortion, thereby eliminating any uneven bearing on the cylinder wall, when piston is assembled in the cylinder.

PISTON-RING TROUBLES.

In fitting the piston into the cylinder caution should be exercised not to push the piston too high in the cylinder. If this is done, the top ring will expand out into the combustion chamber and the piston can not be pulled down again. If this should happen, the valve caps should be removed and the piston ring compressed with the aid of screw drivers or similar tools until the piston can be pulled down. In case it is found to be impossible to compress the ring sufficiently to permit the removal of the piston the ring may be broken and the pieces removed.

Great care must be exercised so that loose piston rings are not allowed to wear the square faces of the piston-ring grooves. If these square edges are worn to a bevel, it will be impossible to prevent the passage of the gases above, behind, and below the piston ring and the edges of the grooves. The compression will be lost and carbon will collect behind the rings. The bottom edge of the piston rings must be very sharp and square so as to bear against the cylinder wall as the piston operates.

TO LOCATE WEAR IN PISTON-PIN BEARING.

If the pistons are in place in the cylinders, remove the oil pan or sump at the bottom of the crank case and the valve caps on the top of the cylinders. Turn the engine over so that one of the pistons is

on top dead center; insert a screw driver through the valve-cap pocket and pry down on top of the piston; insert a bar through the oil-pan opening until it bears against the underside of the piston; then by alternately moving the piston up and down any play between the piston pin and the bearing will be detected.

In case the piston and connecting rod have been removed from the engine place the connecting rod in a vise and hold the piston in the same position in which it has always worked on the pin; then by trying to rock the piston in the direction of the length of the pin any wear will be detected.

TO ADJUST CONNECTING-ROD BEARINGS.

In replacing connecting-rod bearings it is best to place the crank shaft in a vise and adjust the bearing to the shaft while in this position, as the work can be accomplished more readily.

The sides of the bearing liner next to the shaft should be filed or scraped down for a distance of about $\frac{1}{4}$ to $\frac{3}{8}$ of an inch to prevent contact with the crank shaft and to prevent side pressure, also to aid lubrication.

After the connecting rod has been fitted the piston should be lined up with the top of the crank case. When the bearing has been scraped in and bears well all over, it should be adjusted so tight that the piston and rod, when same are at an angle of 45 degrees to the vertical, will just maintain their position and a slight pressure down will cause them to fall.

The tightness of the bearings is controlled by the thickness of the shims, which the caps are drawn up against after a bearing has been properly scraped. Every nut must be drawn up tightly against the cap but must never be strained. If after drawing a nut up tight it is found that the slot in the nut and the split-pin hole in the bolt do not line up, the nut should be removed and a light cut taken off the face of the nut with a file. This will permit the alignment of the slot in the nut and the split-pin hole in the bolt.

TO REMOVE THE CRANK SHAFT.

It is necessary to remove the entire power and transmission unit from the carriage in order to remove the crank shaft. Remove the clutches, bearings, transmission side case covers, cylinder blocks, timing gears, driving gears, and oil sump. Disconnect the connecting rods from the crank shaft, remove the end ball bearings. The crank shaft together with the center ball bearings can now be removed.

TO REMOVE THE CAM SHAFTS.

It is necessary to remove the entire power and transmission unit from the mount in order to remove the cam shafts. Remove the

screws holding the cam shaft center bearings in position, clutches, bearings, and timing gear case. Remove crank shaft nuts and raise the valve tappets. Pull the cam shafts, together with the timing gears and the cam shaft right end bearings, out through the timing gear end of the engine base.

TO REMOVE THE TIMING GEARS.

The crank-shaft gear is integral with the crank-shaft extension. The cam-shaft gears are removed by driving out the taper pin that holds them on the shafts. The magneto sprocket is removed by driving out the taper pin that holds it on the fan and pump driving shaft.

TO REMOVE THE VALVES.

Remove the intake and exhaust valve plugs. Holding the valves firmly down on their seats, compress the springs sufficiently by means of a spring compressor to allow the key cup to clear the key. After removing the keys the valves can be withdrawn through the intake and exhaust valve plug openings.

TESTING VALVE SEAT.

With a soft lead pencil make six or eight marks at regular intervals around the valve seat, drawing the pencil from the inner edge of the valve seat to the outer edge in a straight line. Place valve on seat and rotate in a circular motion several times. If the valve and seat are evenly ground, all the lead pencil marks will be removed. If part of the lines remain it indicates that the valve does not seat properly in the valve seat.

TO GRIND AND FACE VALVES.

Remove the intake and exhaust valve plugs from the cylinder heads and release the spring tension on the valves. Screw down the valve tappets, insuring sufficient clearance to prevent the valve stems from touching. Apply the valve-grinding compound to the valve seat and then rotate the valve back and forth about one-quarter turn by means of a valve-grinding tool. Raise the valve and after reseating in a new position in the valve seat continue the operation until both the valve and seat have been ground bright. After grinding has been completed, wash off all grinding compound with gasoline.

Test the valve seat as previously indicated.

In case the valves are badly pitted or grooves have been worn in the valve faces, they should be faced off.

VALVE TIMING.

(See Plates 14 and 15.)

The rotation of the cam shafts is timed with reference to the crank shaft by the manner in which the gears connecting them are meshed. The manner in which the teeth must mesh for proper timing is indicated by markings on the gears and one of the clutch assemblies.

VALVE TAPPET CLEARANCE.

The proper clearance between valve stem and the tappet is 0.031 ($\frac{1}{32}$) inch for the intake valves and 0.046 ($\frac{3}{63}$) inch for the exhaust valves. It is important that the tappets have this clearance in order that the valves may seat properly. These clearances are made when the engine is cold.

COOLING SYSTEM.

(See Plate 18.)

The cooling system is of the forced water circulation type and consists of the water pump, radiator, intake and outlet manifolds, fans, and hose connections.

WATER CIRCULATION.

The water is forced through the jackets of the cylinders, the manifolds, and the radiator by the water pump. It travels from the radiator through the pump to the inlet manifold to the water jackets of the cylinders thence to the outlet manifold to the radiator.

WATER PUMP.

(See Plate 9.)

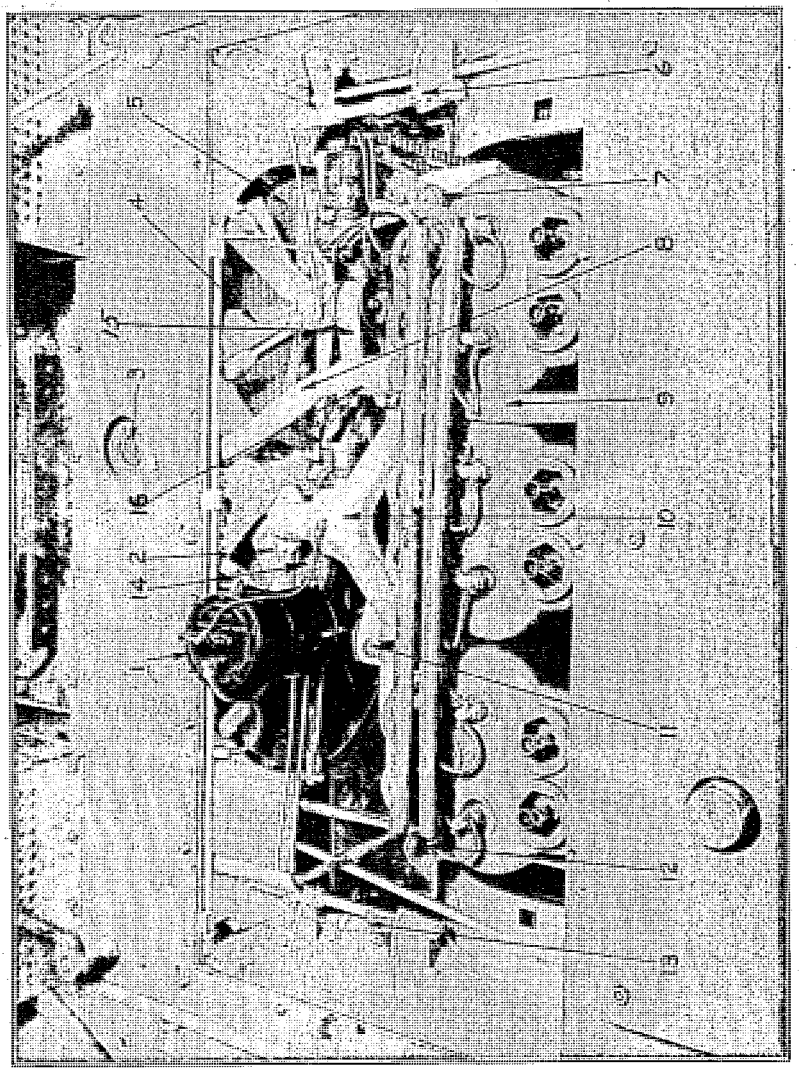
The water pump (3) is of the gear type and is located on the crank case on the inlet side of the engine and is driven by the same shaft that drives the magneto and fans. The pump (3) is made of 10 pitch, 2-inch pitch diameter, 2¼-inch face gears. The pump cover is made of brass and is held in place by $\frac{5}{16}$-inch studs. A shellacked paper gasket is used to make a water-tight joint at the cover.

RADIATOR.

(See Plate 18.)

The radiator (5) is of the cellular type and is made up of 6,000 $\frac{3}{8}$-inch copper tubes, 5 inches long, soldered into brass plates. It is 50 inches wide, 29 inches high, and is mounted forward of the engine in a compartment formed by the radiator ventilator plate (14, Plate 19) and the fan housing plate (4, Plate 19), its top being on a line with the top of the plates. The radiator is held in position by wooden blocks. It is provided with two overflow pipes. A pet cock, located in the lower radiator connections provides means of draining the radiator.

Plate 18.

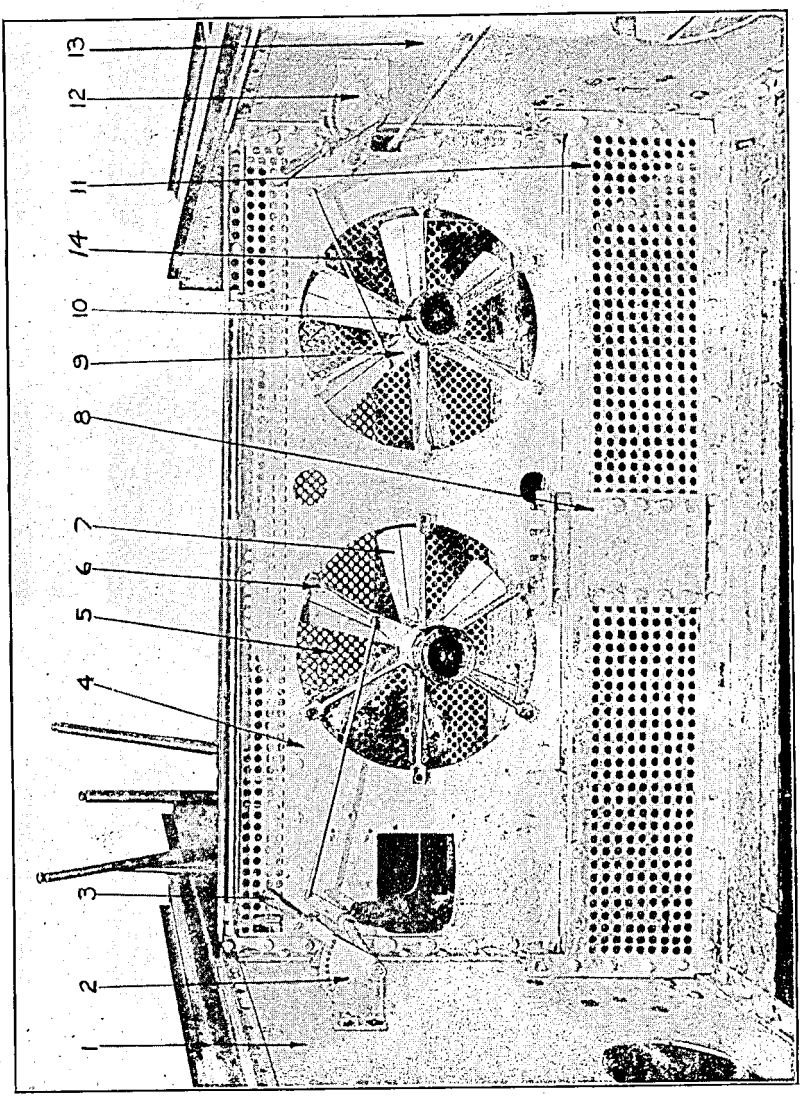


Radiator and fans in position.

RADIATOR AND FANS IN POSITION. (Plate 18.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	WM45A....	Vacuum tank.	9	AK124A....	Carburetor hot stove.
2	.....	Fan assembly, left hand.	10	AK116D....	Inlet manifold.
3	NM125B....	Radiator filling cap.	11	WM97G....	Oil gauge rod.
4	.....	Fan assembly, right hand.	12	AK116F....	Breather.
5	NM125A....	Radiator.	13	.....	Fan control mechanism.
6	.....	Fan control mechanism.	14	AK113A....	Carburetor.
7	AK116F....	Breather.	15	.....	Fan belt.
8	NM133A....	Water outlet pipe.	16	NM128G....	Water hose.

Plate 19.



Fans and adjusting mechanism.

FANS AND ADJUSTING MECHANISM. (Plate 19.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	12B.....	Chassis side plate, left.	9	NM126A....	Fan eccentric.
2	NM129A....	Fan control mechanism.	10	NM126E....	Fan pulley.
3	NM130A....	Fan control handle.	11	15D.....	Motor support gusset plate.
4	14D.....	Fan housing plate.	12	NM129A....	Fan control mechanism.
5	14G.....	Radiator ventilator plate.	13	12A.....	Chassis side plate, right.
6	NM127C....	Fan spider.	14	14G.....	Radiator ventilator plate.
7	NM127E....	Fan blade.			
8	FF170A....	Transmission case support bracket.			

OUTLET MANIFOLD.

(See Plate 8.)

The outlet manifold (6) is a bronze casting bolted to openings on top of the cylinders. It is connected to the top of the radiator by means of a pipe (8, Plate 18). The outlet manifold conducts the water from the cylinders to the top of the radiator.

INLET MANIFOLD.

(See Plate 31.)

The inlet manifold (10) is a bronze casting bolted to openings in the cylinders on the exhaust side of the engine. The water pump (3, Plate 9) takes the water from the bottom of the radiator and forces it through the inlet manifold into the water jackets of the cylinders.

FANS.

(See Plate 19.)

There are two belt-driven, 6-blade, 19-inch diameter fans (7). They are driven from a double pulley (13, Plate 9) which is mounted on the crank case at right angles to the water pump shaft. The double pulley is driven from the pump shaft by bevel gears. The double pulley is 6 inches in diameter; the fan pulleys (10) are 3 inches in diameter.

FAN BELTS.

(See Plate 18.)

The two fan belts (15) are flat, made of waterproof double belting, 2 inches wide. One belt is 36 inches long and the other is 49½ inches.

WATER CIRCULATING SYSTEM CONNECTIONS.

(See Plate 18.)

The radiator, inlet and outlet manifolds are joined together by flexible connections.

The hose (15, Plate 9) connecting the water pump and the inlet manifold is 10½ inches long, 1¾ inches inside diameter, and the wall is 4-ply thick.

The water outlet pipe (8) between the outlet manifold and the top of the radiator is a copper tube, 15 inches long and 1¾ inches outside diameter. It is joined with the radiator and outlet manifold by hose connections (16), 3½ inches long and 1¾ inches inside diameter and the wall is 4-ply thick.

The hose connecting the bottom of the radiator and the water pump is 3½ inches long, 1¾ inches inside diameter and the wall is 4-ply thick.

All the hose connections are held rigidly in position by hose clamps.

FIELD REPAIRS TO COOLING SYSTEM.

TO DRAIN COOLING SYSTEM.

The cooling system is drained by opening the pet cock, located in the lower radiator connections.

TO FLUSH THE COOLING SYSTEM.

If scale is present in the circulation system it should be treated with common washing soda, as follows: Dissolve 6 pounds of common washing soda in 5 gallons of boiling water. Fill the radiator and let the solution circulate under full load for one full day and then the entire system should be drained and flushed. If convenient to a pressure system, the connections from the water pump to the radiator and the inlet manifold should be removed and a stream of water turned into the radiator through the bottom opening. The water will flow upwards through the radiator, through the manifolds in the reverse order to the normal flow of the water in the circulating system, thus flushing out all loose sediment or scale.

TO PACK WATER PUMP GLANDS.

The water pump glands or stuffing boxes should be packed with a good grade of waterproof asbestos or compounded packing. If asbestos loose twisted rope packing is available, untwist one strand, soak it thoroughly in cylinder oil, and cover with as much fine graphite as it will retain.

Always coil the packing around the shaft in the direction of rotation of the packing nut so that it will not tend to unwind when the packing nut is screwed on.

If only square packing of too large a size is available, cut off a piece of the desired length, place it between the jaws of a bench vise, squeeze out flat, and then cut off a strip of the desired length and width.

The packing nut should not be tightened any more than necessary to prevent leakage of the water.

TO THAW FROZEN PUMP.

In cold weather, if the engine has been stopped for any length of time that would permit the water in the cooling system to freeze, the engine should not be started until it is ascertained that the water in the pump has not frozen. If the water has frozen in the pump, it may be warmed with a gasoline torch or hot water, or cloths soaked with gasoline may be applied to the pump and lighted, to thaw the ice.

TO AVOID FREEZING WATER IN COOLING SYSTEM.

To avoid freezing in winter, drain when not in use or use an antifreezing solution.

To avoid freezing of the radiator when mount is in operation and no antifreezing solution is being used, cover the lower half of the radiator.

TO REMOVE RADIATOR.

Drain and disconnect the hoses joining the radiator with the rest of the circulating system. Remove the blocks that hold the radiator in position. The blocks act as wedges.

REPAIRS TO RADIATOR.

The copper tubes are soldered into brass plates. Before soldering copper and brass the parts must be cleaned until bright and then coated with soldering flux "Cut Acid," made by dissolving zinc in muriatic acid, or special soldering parts may be used. Satisfactory soldering can only be done when the parts are thoroughly cleaned and tinned before soldering. When applying new tubes, it is importan to tie the ends of the tubes on the outside before putting them in place in the plates. After the tube is in place and the outside of the plate properly tinned, the solder may be run on by means of a blow torch or a soldering iron. If the soldering iron is used, it should be filed bright, then tinned with solder, after being cleaned with sal ammoniac. If this is unavailable, "Cut Acid" will work fairly well. Always have the soldering iron hot enough to heat the work, but never permit it to get red hot, since that will cause the solder to attack the copper, producing hard solder which only melts at a red heat, and it is useless for soldering purposes. The best solder is known as half-and-half, being composed of equal parts of tin and lead.

TEMPORARY REPAIRS TO RADIATOR.

In case of a small leak in the radiator, locate the tube which is leaking and plug up same at both ends with wooden plugs or other suitable material.

For large leaks such as can not be easily plugged up it is necessary to cut out patches of some semiflexible waterproofing material, which after being placed in position are held by bolts. The bolts must be of such a diameter as to be inserted in the radiator tubes and long enough to pass through both thicknesses of the waterproofing material and the radiator core.

These are only means of making temporary repairs; permanent repairs must be made as soon as possible.

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FAN-BELT ADJUSTMENT.

(See Plate 19.)

The tension on the belts is maintained by means of the eccentric adjusting hubs (9) in the fan brackets. The eccentric adjusting hubs are connected with quadrants (2, 12), on which means is provided for the varying of the tension. The tension on the belts can be released entirely so that the fans will be inoperative when the carriage is going through water.

TO LACE FAN BELT.

A fan belt can be laced by punching three small holes in each end of the belt (directly opposite each other) and lacing with a rawhide lace or shoe string if necessary. The joints should be laced double in case a single row of lacing will not hold.

FAN-BELT TROUBLES.

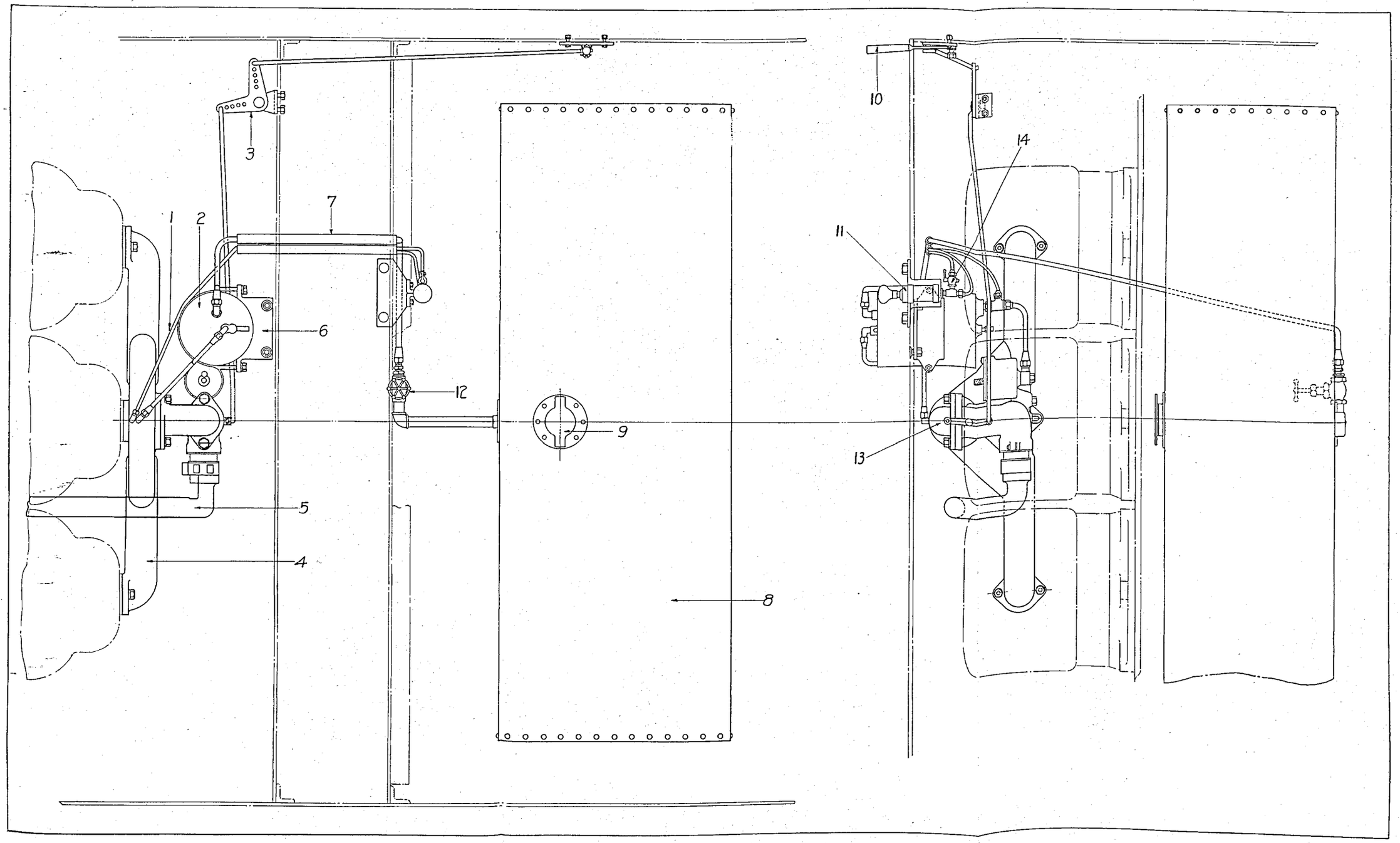
The fan belts will jump off the pulleys if they are too loose, if two pulleys are not parallel with each other, or if the ends of the belts are not cut squarely, thus causing the belts to be curved.

FUEL SYSTEM. (Plate 20.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	WM99E	Tubing priming line.	8	WM47A	Gasoline tank.
2	WM45A	Vacuum tank.	9	WM47B	Filler cap (gasoline tank).
3	HM4D	Bell-crank bracket.	10	HM6D	Throttle lever.
4	AK116D	Inlet manifold.	11	WM99A	Priming pump.
5	AK124A	Carburetor hot stove.	12	WM50A	Globe valve.
6	WM45C	Vacuum-tank bracket.	13	AK113A	Carburetor.
7	WM51N	Fuel conduit.	14	WM99F	Stop cock.

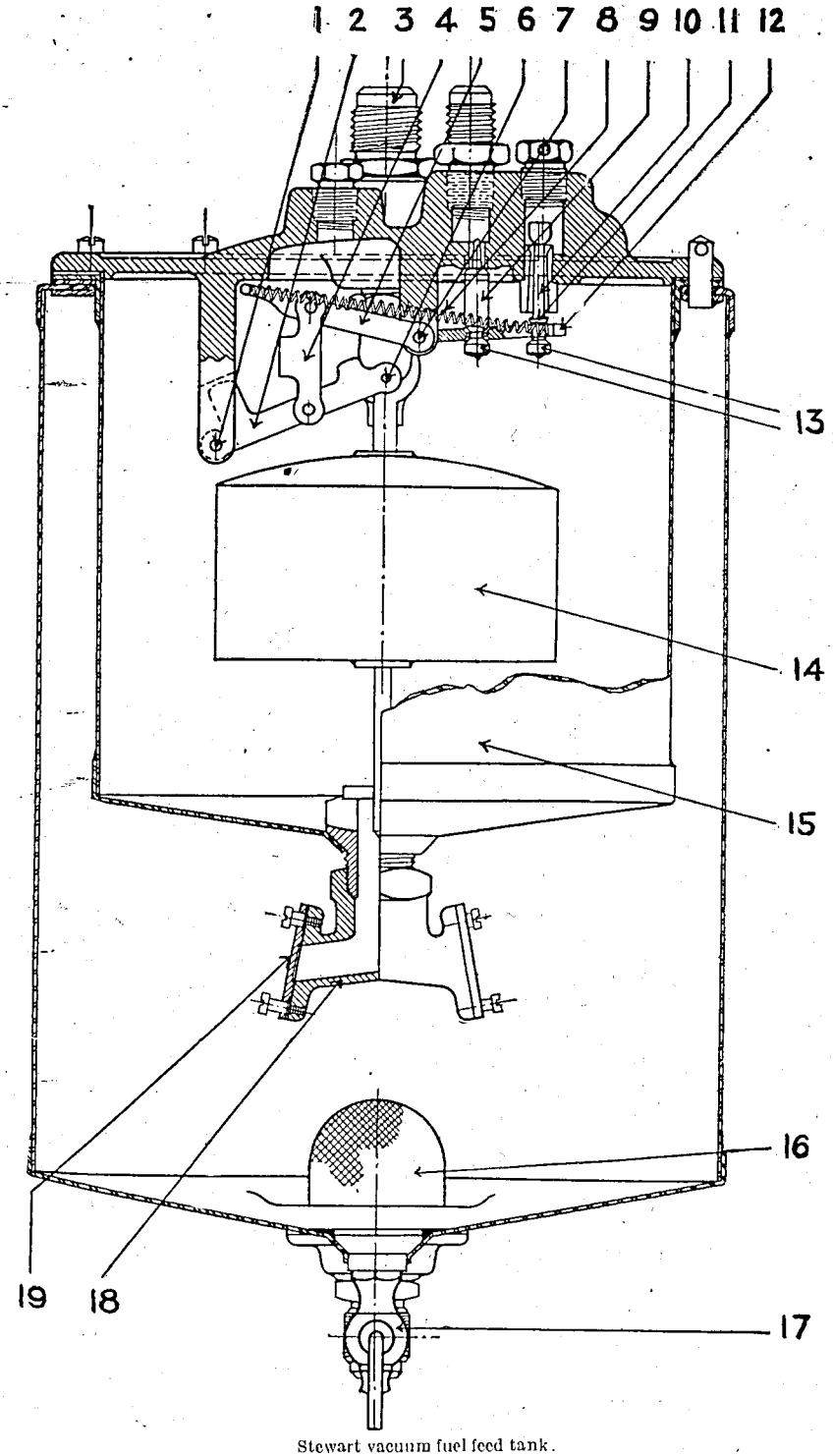
STEWART VACUUM FUEL FEED TANK. (Plate 21.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	.....	Float lever pin.	11	.....	Valve stem sleeves.
2	.....	Float lever.	12	.....	Valve stem lever.
3	.....	Tube fitting.	13	.....	Valve stem nuts.
4	.....	Lever connection link.	14	.....	Float.
5	.....	Spring lever.	15	.....	Inner shell assembly.
6	.....	Float lever pin.	16	.....	Strainer and outlet assembly.
7	.....	Valve stem lever pin.	17	.....	Pet cock.
8	.....	Valve tension springs.	18	.....	Flapper valve.
9	.....	Vacuum lever stem.	19	.....	Flappers.
10	.....	Atmospheric valve stem.	20	.....	Outer shell.



Fuel system.

Plate 21.



Stewart vacuum fuel feed tank.

FUEL SYSTEM.

(See Plate 20.)

The gasoline or fuel-supply system consists of a main supply tank (8) located between the top and bottom floor plates, to the rear of the gun-base plate. The fuel is supplied through a feed line (7) to the vacuum tank (2) located about midway on the fan-housing plate (4, Plate 19). The flow from the vacuum tank to the carburetor (13) is by gravity.

FUEL TANK.

(See Plate 20.)

The gasoline tank (8) is of terne metal, of 55 gallons capacity, and is held in position by blocks. The interior of the tank is provided with two baffle plates to prevent too free a movement of the fuel.

VACUUM SYSTEM.

(See Plate 21.)

The vacuum tank is a Stewart model 147B. The vacuum system makes use of a small tank (2, Plate 20) which is connected by pipes to the intake manifold (4, Plate 20) of the engine; also to the fuel-supply tank (8, Plate 20) and to the carburetor (2, Plate 20). The partial vacuum created by the engine in the intake manifold is transmitted to the vacuum tank and this vacuum is utilized in lifting the fuel from the tank to the upper chamber (15) of the vacuum tank, which consists of two chambers, an upper or filling (15) and a lower or emptying (20). Between the two chambers is a partition, attached to and below which is a flapper valve (18). The partial vacuum in the intake manifold on the intake stroke of the piston of the engine creates a vacuum in the upper chamber (15) of the vacuum tank and this vacuum closes the flapper valve (18) and also sucks or pumps fuel from the supply tank into this chamber. The fuel in entering the upper chamber raises the float (14). When this float (14) rises to a predetermined height it actuates a float lever (2), which shuts off the suction and at the same time opens an atmospheric valve (10).

The entrance of the outside air releases the vacuum suction, causing the valve (19) leading into the lower chamber to open and the fuel flows through this valve to the lower or empyting chamber (20), which is always open to the atmosphere, so that fuel is supplied to the carburetor by gravity.

A screen or strainer (16) is combined with the outlet member and is located inside the lower tank (20) and attached to it is a pet cock (17) for draining water or other foreign matter.

PRIMING SYSTEM.

(See Plate 20.)

As an auxiliary aid in starting the engine a priming pump (11) is provided. It is connected directly to the gasoline pipe which goes from the vacuum tank (2) to the carburetor (13) and also directly connected to the intake manifold (4).

The pump (11) is located on the radiator ventilator plate in front of the radiator and is in reach of the operator.

In operation the pump works as follows: The stopcock (14) in the piping beneath the pump (11) is opened and the pump handle raised, gasoline is drawn up into the pump (11) from the feed pipe joining the vacuum tank (2) and the carburetor (13), the handle is forced down and the raw gasoline is forced through another pipe direct to the intake manifold (4). A check valve keeps the gasoline from returning to the piping joining the vacuum tank (2) and the carburetor (13).

After the engine is started the valve is closed and the normal flow of the gasoline from the vacuum tank (2) to the carburetor (13) is resumed.

When working the engine hard more gas can be drawn into the the manifold by opening the stopcock (14) in the line and allowing the gas to pass through the priming pump line.

FIELD REPAIRS TO FUEL SYSTEM.

TESTING VACUUM SYSTEM.

(See Plate 21.)

If the engine does not operate properly and the fault seems to be in the vacuum system, the following method of testing should be followed: Remove the inner vacuum tank (15), leave only the outer tank (20), which then serves as an auxiliary tank. Partially fill the outer tank (20) with gasoline and crank the engine.

If the engine fails to start it indicates that the vacuum system is not at fault. If the engine starts it indicates that the trouble is in the vacuum system.

When the vacuum system fails to operate the trouble is usually due to some of the following causes: Flapper (19) fitting too tight on its seat, tank inoperative, leaking float (14), intermittent operation, or dirt in the system.

FLAPPER VALVE.

(See Plate 21.)

When new, the flapper valve (19) may seat so tightly on the flapper valve (18) that fuel will not pass to the lower chamber. If it sticks, the flapper should be freed.

TANK.

(See Plate 21.)

The vacuum tank will not operate if dirt lodges beneath the flapper valve (19). To test if dirt is lodged beneath the flapper valve, remove the tubing from the bottom of the tank, connect it with the carburetor and start the engine. Place finger over air vent and another over the opening at the bottom of the tank; continuous suction indicates that there is either a leak in the connection between the tank and the main gasoline supply or that the flapper valve is open. Other causes for the tank not operating are loose manifold connection, plugged piping, or clogged gasoline strainer (16).

By striking the side of the tank with the flat of the hand, any dirt beneath the valve can usually be dislodged. If not, it will be necessary to remove the cover and lift out the inside tank.

The top of the tank can be removed by removing the screws and running the blade of a knife around its top between the cover and the body of the tank, so as to separate the gasket without damaging it. In replacing a gasket it should be shellacked to insure an air-tight joint. Perfectly tight joints are essential to the successful operation of the vacuum supply system, and all connnections between the main fuel tank as well as those at the main and vacuum tanks must be kept tight.

JOINTS.

All joints must be kept tight, as any leaks will destroy the effect of the partial vacuum by which the system operates.

FLOAT.

(See Plate 21.)

To test the float (14) for leaks, remove from tank and immerse it in a pan of water. If a leak is present it will be indicated by bubbles. Enlarge the leak slightly by drilling, then drill another hole in the top or bottom of the float and drain it of all gasoline or water. Solder the holes, using as small amount of solder as possible so as to not appreciably increase the weight of the float.

Care should be taken when working on the float so as not to bend the float guide. A bent float guide acts the same as a leaking float,

that is, the float will not rise and close the vacuum valve, and the gasoline is drawn into the intake manifold, choking the engine.

When traveling, or for temporary repairs, the effect of a leaky float may be overcome by removing the plug on the top of the tank. Ordinarily enough suction remains to drive gasoline into the vacuum tank, but if not, the plug should be replaced until the tank is full and then removed. Repeat the operation each time the tank empties. The machine will run from ¼ to ½ mile for each filling of the tank. Make permanent repairs as soon as possible.

INTERMITTENT OPERATION.

The engine often runs for a few minutes, then backfires and stops. After a few minutes it will easily start again, then backfire and stop as before. The cause is usually found to be that the bushing over the atmospheric valve is screwed down too far, preventing the atmospheric valve from operating. This retards the feed of the gasoline to the carburetor when the engine is running. To remedy the trouble, all that is necessary is to turn back the bushing until the atmospheric valve can open.

REPAIRS TO PIPING AND TANKS.

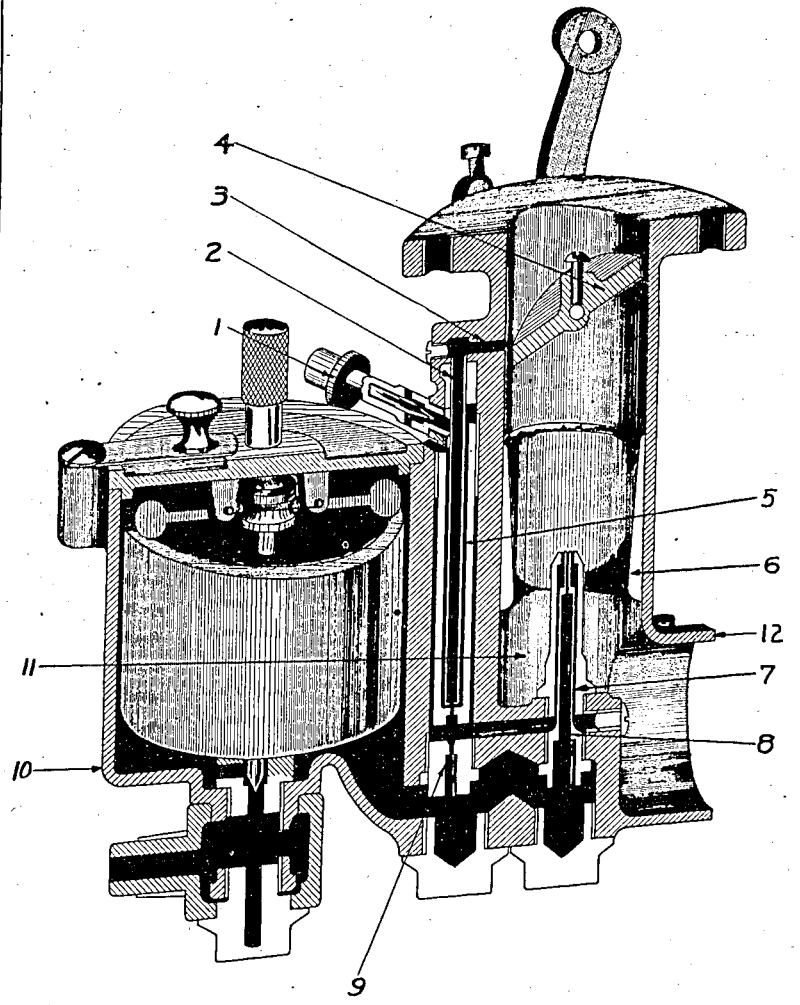
Care should be taken to avoid the possibility of undue vibration of the piping.

If the piping becomes broken a temporary repair can be made by utilizing a short section of rubber tubing of inside diameter less than outside diameter of the piping. Using the rubber tube for a connection, slip it over the ends of the fuel pipe and place several small strips of flat wood, equally spaced, around the rubber tube and bind with tape or string. The wooden members will provide a splint which will prevent movement of the tube and breaking down of the rubber between the ends of the pipe. One end of the pipe can be reamed or enlarged, the other end slipped in, and the joint covered with hard soap; place several small strips of wood around the joint and tape tightly.

When it is found necessary to replace damaged piping, avoid sharp bends as they are apt to retard the flow of the fuel.

In replacing unions care should be taken to have the sections align before attempting to catch the threads; care should be taken that the threads are properly caught before using a wrench. If properly aligned, the nut can be started and several turns made with the fingers.

Small leaks in the tanks can be temporarily repaired with hard soap, chewing gum, or wooden pegs. Hard soap or shellac can be utilized where connections leak and where the threads have been damaged.



SECTIONAL VIEW OF CARBURETOR. (Plate 22.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	.....	Regulating screw.	7	.....	Cap jet.
2	.....	Priming tube.	8	.....	Main jet.
3	.....	Priming hole.	9	.....	Compensator.
4	.....	Throttle valve.	10	.....	Float chamber.
5	.....	Secondary well.	11	.....	Carburetting chamber.
6	.....	Choke.	12	.....	Air intake.

CARBURETION SYSTEM.

The function of the carburetion system is to vaporize the fuel and mix the vapor with air, forming a mixture that is burned in the cylinders.

CARBURETOR.

(See Plate 22.)

The carburetor is a Zenith, model L–8, of the compound nozzle type and is bolted to the intake manifold.

It consists of a float chamber (10), a carburetor chamber (11), a system of nozzle and air passages (7, 8, 9), an idling device (2), and a hot-air sleeve and regulator.

Gasoline from the vacuum tank enters the strainer body of the carburetor, passes through the filter screen and enters the float chamber (10) through the needle valve seat, lifting the float. As soon as the gasoline reaches a predetermined height in the float chamber, the float, acting through a series of levers, closes the needle valve. From the float chamber the gasoline flows through three different channels, in various quantities and proportions, according to the size of the nozzle, speed of the motor, and to the degree of the throttle opening, into a well where it is mixed or atomized before it goes into the intake manifold of the motor.

CARBURETOR IDLING DEVICE.

(See Plate 22.)

At low speed, when the butterfly throttle valve (4) is nearly closed, the main and cap jets (7, 8) give very little or no gasoline, but as there is considerable suction at the edge of the butterfly valve, the gasoline is drawn up through an opening (2, 3) located in the wall of the atomizing chamber near the edge of the butterfly valve.

This opening connects with an auxiliary tube which in turn connects with one of the gasoline supply channels. The gasoline passing through the opening in the wall mixes with the air passing by the butterfly valve and forms the idling mixture.

CARBURETOR AIR SLEEVE.

(See Plate 22.)

The air sleeve is attached to the air intake (12) opening of the carburetor. It is provided with an air strangler and temperature regulator. The two large rectangular holes can be entirely or partially closed by a brass band held together by a knurled headed screw.

The air strangler shutter is actuated by a lever having a coil d spring, the function of which is to bring the shutter back to the open position.

The carburetor hot stove (5, Plate 20) is attached to the air sleeve to supply the carburetor with air that has been heated by contact with the exhaust manifold.

CARE AND ADJUSTMENT OF THE CARBURETOR.

CARE OF THE CARBURETOR.

The gasoline tank or line may give off a scale, the result of oxidation. These impurities may clog the filter and cause the motor to miss and pop. Dirt and water also cause trouble. Clean the pipe and carburetor thoroughly. The carburetor may be taken apart for cleaning and put together again without fear of disturbing the adjustment. If the necessity for cleaning arises, be sure to have the float cover well seated, the needle valve seat and the various jets screwed down tight, and the butterfly throttle fastened properly on the shaft, so that it may open fully. When closed the lower edge of the butterfly throttle should cover the idling hole.

To see if there is any gasoline in the carburetor, remove the needle valve cap; if the needle valve can be depressed with the finger there is no gasoline in the carburetor.

ADJUSTMENTS.

(See Plate 22.)

The choke (6), main jet (8), compensator (9), and secondary well (5), need not, as a rule, be disturbed. These adjustments consist in finding, once for all, the different sizes or "setting" of air and gasoline passages suitable for the motor. These passages never vary and, once right, stay right.

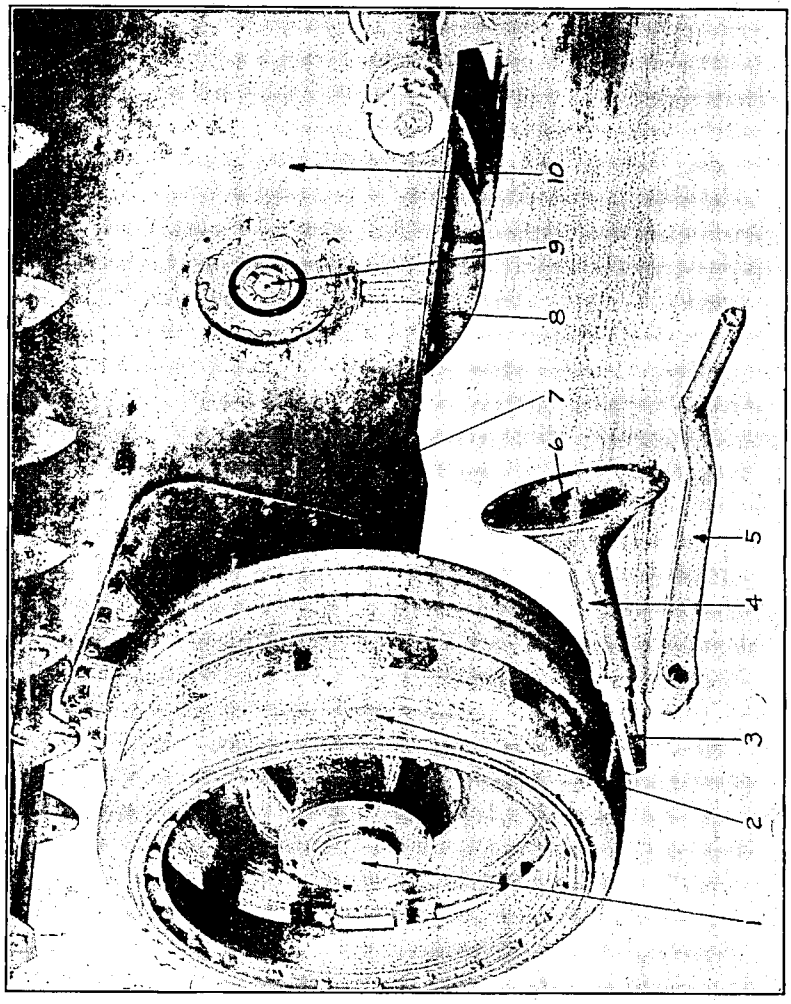
The only adjustment that may be useful is the slow speed adjustment. The strength of the suction in the idling tube can be diminished by "turning out" the idling screw (1), thus admitting more air. "Turning in" the idling screw (1) increases the effect of the suction and causes the jet to flow more gasoline, making a richer mixture. It should be remembered that this adjustment varies the idling mixture only and has no effect upon the high speed action.

HAND STARTER.

(See Plate 23.)

The hand starter assemblies are of the ratchet type, are bolted on the outside of the side plates (10) opposite either end of the engine in a direct line with the crank shaft ratchets (9).

Plate 23.



HAND STARTER (Plate 23.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	KM89D....	Drive wheel hub cap.	6	AK83A.....	Starting ratchet.
2	.....	Drive wheel assembly.	7	KM88A.....	Drivewheel bracket.
3	AK83H.....	Starting bracket shaft.	8	FF169C.....	Flywheel cover, right.
4	AK83E.....	Starting bracket.	9	AK83C.....	Crankshaft ratchet.
5	.....	Starting crank.	10	12A.....	Chassis side plate, right.

The starting ratchets (6), which are located on the starting bracket shafts (3), are held out of mesh from the crank shaft ratchets (9) by the bracket springs, located in the starting brackets (4). A removable starting crank (5) is provided, which fits on the end of the starting bracket shafts (3), protruding from the starting brackets (4).

OPERATION OF THE HAND STARTER.

In operating the hand starting mechanism, place the starting crank (5) on the starting bracket shaft (3) protruding from the starting bracket (4) and shove in on the crank until the starting ratchet (6) engages with the crank shaft ratchet (9). Pull up quickly on the crank, thereby turning the engine over so as to start it. When the engine starts it will rotate in the same direction as the starting crank and the starting ratchet will be thrown out of mesh with the crank shaft ratchet.

The engine can be started from either side of the carriage.

IGNITION SYSTEM.

(See Plate 24.)

The ignition system consists of a Bosch magneto of the DU6 type, and a Bosch synchronous coil, connected with a 6-volt battery or a series of batteries totaling 6 volts. The coil is of the cartridge type, the switch of which forms an integral part.

The battery is used only in starting the engine, after which the switch on the coil is thrown to the magneto position.

COIL, SWITCH, AND PUSH BUTTON STARTER.

(See Plate 34.)

The spark coil, switch, and push button starter are combined in one assembly (7).

The coil is of the nontrembler type, so far as its operation is concerned while the motor is running, but it has a trembler interrupter to be used in starting the motor on spark without cranking.

If for any reason the engine comes to a stop with the pistons near the end of their strokes, the battery interrupter will be closed, and pressure on the button will not induce a vibrator spark, because the battery circuit will already be complete.

The connections of the push button are such that on the releasing of the button the circuit through the battery interrupter will be momentarily broken, and this will, of course, result in the production of a single contact spark. With this arrangement it is possible to secure a starting spark at any point in the rotation of the crank shaft, regardless of whether the battery interrupter is opened or closed.

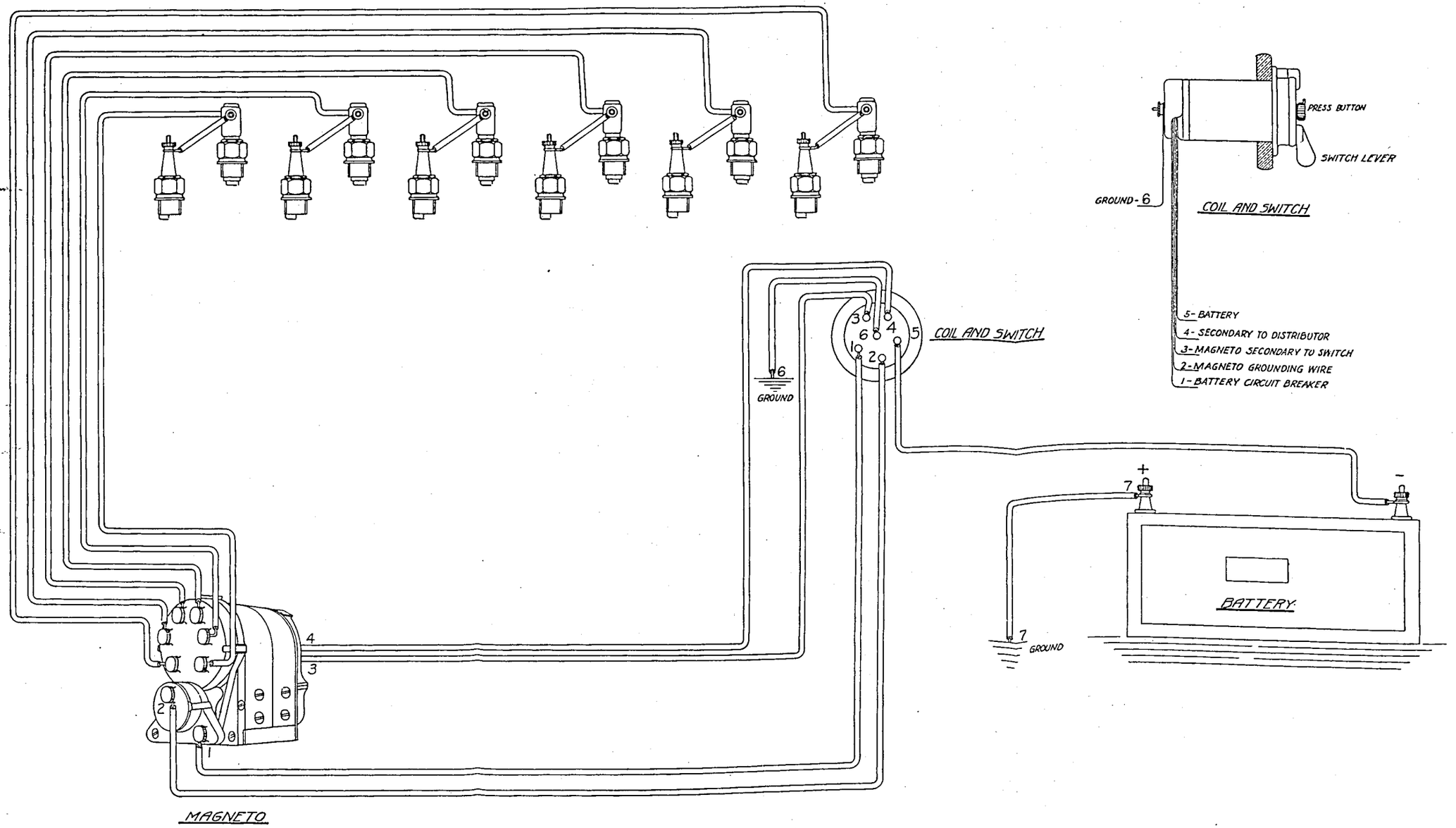
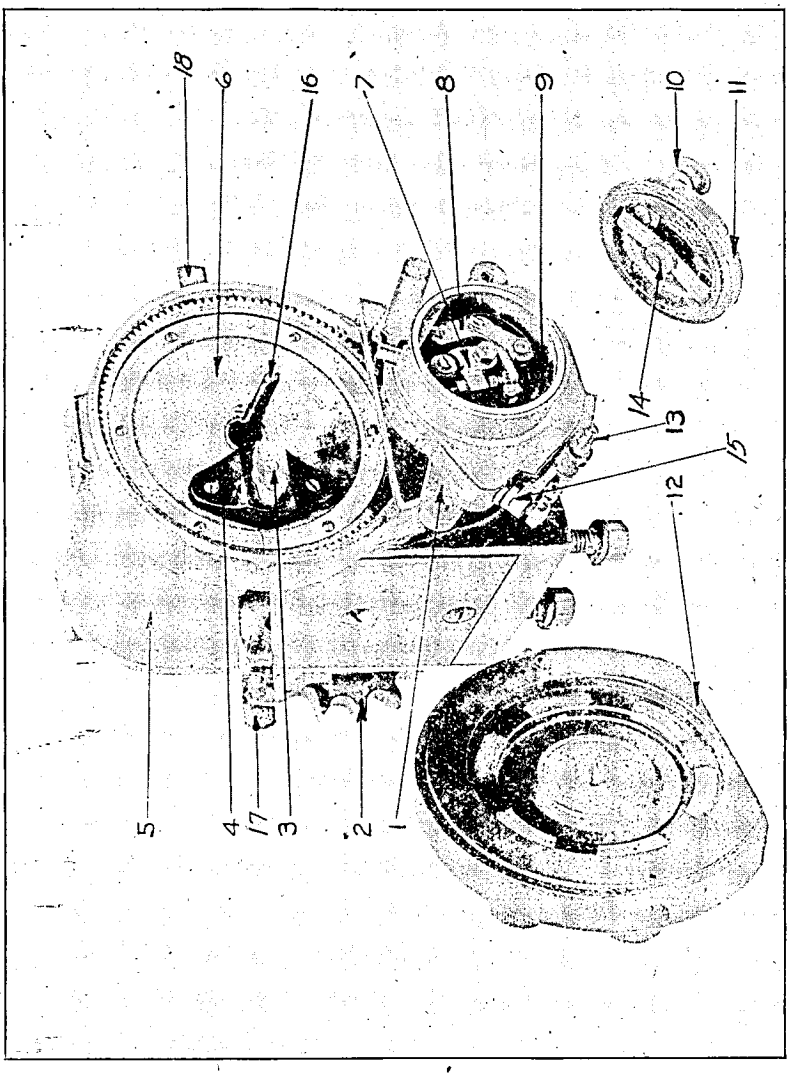


Diagram of ignition system.

Plate 25.



Magneto disassembled.

MAGNETO DISASSEMBLED. (Plate 25.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	.....	Interrupter housing.	10	.....	Ground terminal.
2	AK114D....	Magneto sprocket.	11	.....	Interrupter cover.
3	.....	Contact brush.	12	.....	Distributor head.
4	.....	Brush holder.	13	.....	Stud for battery terminal plate.
5	AK115A....	Magneto.			
6	.....	Distributor gear.	14	.....	Collecting bar brush.
7	.....	Contact block.	15	.....	Battery interrupter.
8	.....	Magneto interrupter lever.	16	.....	Center distributor terminal.
9	.....	Cam segments (integral with interrupter housing).	17	.....	Spring (distributor head).
			18	.....	Spring (distributor head).

When the switch is in battery position, the battery circuit is closed at the coil, and the high-tension terminal (4, Plate 24) of the transformer coil is connected to the central terminal (16, Plate 25) of the distributor of the magneto. The short-circuiting terminal (6, Plate 24) of the magneto is also connected to the ground through the switch so as to prevent the induction of high pressure in the magneto armature, and the high-tension terminal of the magneto (3, Plate 24) is on open circuit at the switch. Under this condition the magneto is electrically inactive, although its parts move mechanically in the usual manner. The battery timer (15, Plate 25) interrupts the battery current, which flows through the primary winding of the spark coil, thus inducing high-tension current in the secondary of the spark coil, which current flows to the distributor brush of the magneto and is distributed to the spark plugs.

When the switch is in the magneto position, the battery circuit and the high-tension circuit of the spark coil are both open at the switch, thus making the battery circuit inoperative.

The short-circuiting circuit is open at the switch, and the high-tension terminal of the magneto is connected, through the switch, to the distributor terminal of the magneto. The magneto then generates and delivers high-tension current to the spark plugs. The battery timer is electrically inoperative under this condition, but moves mechanically in the usual manner.

MAGNETO.

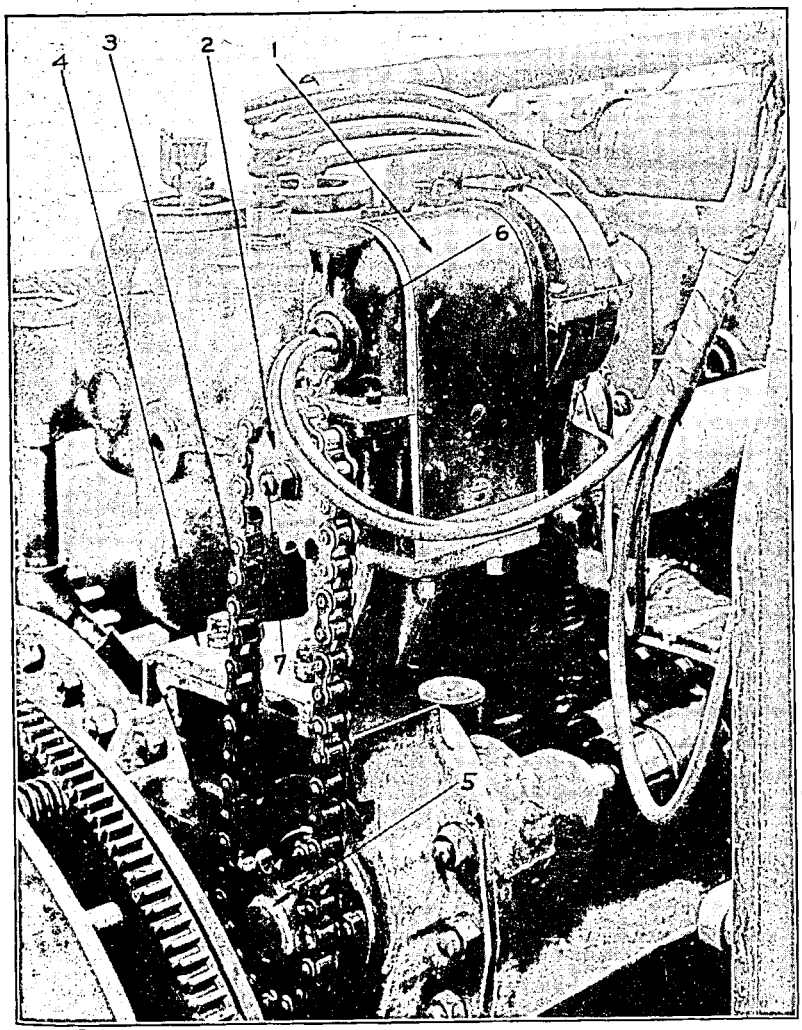
(See Plate 25.)

The magneto is of the standard Bosch dual DU–6 type, and produces its own sparking current, which is timed by the revolving interrupter (7, 8). The parts of this interrupter are carried on a small disk that is attached to the armature and revolves with it, the segments (9) that serve as cams are integral with the interrupter housing (1).

In addition, the magneto is provided with a steel cam having two projections, which is built into the interrupter disk. This cam acts on a lever that is supported on the interrupter housing (1), the lever being so connected in the battery circuit that it serves as a battery interrupter (15, Plate 25) to control the flow of the battery current through the coil.

The sparking current from the battery and from the magneto are never led to the spark plugs at the same time. The collecting bar bush (14) of the magneto circuit is connected to the switch by lead (2, Plate 24) which connects it to a second wire (3, Plate 24) leading from the switch to the center terminal (16) of the distributor (12).

Plate 26.



MAGNETO AND DRIVE ASSEMBLED. (Plate 26)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	AK115A....	Magneto.	5	AK114A....	Pump drive shaft sprocket.
2	AK114D....	Magneto shaft sprocket.	6	.....	Bonnet.
3	AK114B....	Roller chain.	7	.....	Armature shaft.
4	AK117A....	Magneto bracket.			

When running on the magneto, the sparking current that is inducted thus, flows to the distributor (12) by way of the switch contact.

When running on battery, the primary circuit of the magneto is grounded, and there is, therefore, no production of sparking current by the magneto; it is then the sparking current from the coil that flows to the distributor connection (13).

It will thus be seen that of the magneto and battery circuits, the only parts used in common are the distributor (12) and the spark plugs.

SETTING THE MAGNETO.

(See Plate 26.)

The magneto is so arranged that the battery interrupter (15, Plate 25) breaks its circuit approximately 10 degrees later than the magneto interrupter (7, 8, Plate 25); this feature gives the full timing range of the magneto. With the timing lever fully retarded and the switch in the battery position, the battery spark will occur after the piston has passed dead center and is moving down on the power stroke. The possibility of a kick back is thus eliminated.

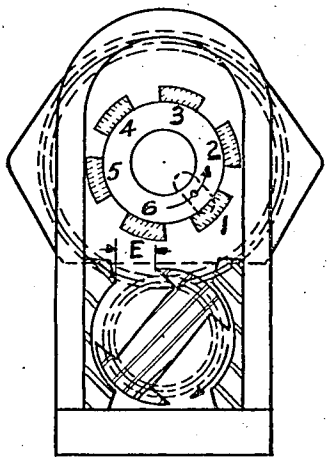


FIGURE 2

When timing the magneto (1) it is necessary to first disconnect the roller chain (3), as the magneto shaft sprocket (2) is keyed to the armature shaft (7). Remove the bonnet (6) and the dust cover, which is an aluminum plate located under the arch of the magnet. The operation should be attended with the greatest possible care in order to guard against the possibility of injuring the armature winding; also to prevent foreign matter from falling into the armature tunnel while the dust cover and bonnet are off.

The engine should be cranked until one of the pistons, preferably that of cylinder No. 1, is at the top of the compression stroke.

With the engine in this position the armature is rotated by hand in its normal direction of rotation until it is approximately in the position illustrated in Fig. 2.

The setting of the armature is determined by the dimension E, Fig. 2, which should be approximately 0.687 ($\frac{11}{16}$) of an inch.

With the armature held in this position, the magneto drive chain (3) should be connected with the magneto shaft sprocket (2), which must be rotated in either direction that will allow the chain to engage

the sprocket teeth in the position closest to that prescribed above. (Dimension E, Fig. 2.) The dust cover and bonnet (6) should then be reassembled.

MAKING THE MAGNETO CONNECTIONS.

(See Plate 25.)

Releasing the two flat springs (17, 18) permits the removal of the distributor head (12).

Cylinder No. 1 having completed compression, the distributor contact in the distributor head (12) on which the distributor brush (3) would rest when the distributor head is in position should be connected to the spark plug of this cylinder. The spark plug of the second cylinder to fire should then be connected to the distributor terminal that will next be brought into the circuit by the movement of the distributor brush (3). It should be borne in mind that the distributor brush rotates in the direction opposite to the rotation of the armature.

The remaining cylinders should be connected to the distributor terminals according to their firing order. (The firing order is 1, 5, 3, 6, 2, and 4, cylinder No. 1 being at the timing-gear end of the motor.)

Replace the distributor head (12) in position; see that the flat springs (17, 18) are in proper position.

GENERAL CARE.

The magneto should be lubricated with a few drops of oil once every four weeks or every 1,000 miles. The injurious effects of an excess of oil should be guarded against.

The platinum points of the magneto interrupter should be kept clean and smooth and so adjusted that they are open about 0.35 mm. (0.137 inch), or the thickness of the gauge attached to the adjusting wrench, when the magneto interrupting lever is wide open on one of the rollers or segments. It should not be necessary to clean or to adjust these points oftener than once a season, and it is not advisable to readjust them until their condition and the missing of the engine show it to be absolutely necessary.

Each coil is stamped with the voltage of the battery current for which it is wound, and if this voltage is not exceeded the platinum contacts of the battery interrupter will not require attention for long periods. When the battery interrupter lever is being operated by the rollers or segments, the platinum points should be slightly wider open than the contact points of the magneto interrupter, the proper distance being about 0.4 mm. (0.157 inch), or the thickness of the gauge attached to the adjusting wrench.

BATTERY.

(See Plate 24.)

The standard Bosch coils are wound for a battery current of 6 volts, and either a storage battery or dry cells may be used. Good results may be obtained with a 6-volt, 60-ampere hour storage battery, and when dry cells are used it is advisable to install 12 for 6-cylinder engines, connected in multiple series. The cells should be divided into two groups of six cells each, the cells of each group being connected in series, or, in other words, the carbon of one cell being connected to the zinc of the next. This will leave one carbon and one zinc terminal of each group free, and the two groups should be connected by leading a wire from the carbon of one group to the carbon of the other, and a second wire from the zinc of one group to the zinc of the other.

The wire from the carbon terminals should be grounded and the wire from the zinc terminals connected to the proper switch contact.

KNOCKS AND THEIR IDENTIFICATION.

(A) **Carbon.**

A carbon knock can not be noticed when the engine is cold as it is entirely the result of carbon in the cylinders becoming heated to a temperature which will ignite the compressed charge prior to the occurrence of the ignition spark.

(B) **Broken piston rings.**

Broken piston rings will result in a lack of compression and permit oil to work up into the combustion chamber. A light click at closed position of the throttle will be noticed.

(C) **Loose wrist pins.**

The knock produced by loose wrist pins is lighter than that of a crank shaft or connecting rod knock, and like a connecting rod knock is most noticeable when the engine is idling with a nearly closed throttle. This knock is not as indicative of danger as loose connecting rod or crank-shaft bearing knocks. There is very little danger of bearings being rendered unserviceable by reasonable further use. Replacement of pin is necessary.

(D) **Loose connecting rod.**

The knock produced by a loose connecting rod, a rather heavy pound, is most noticeable at low engine speed with a closed throttle, but if the play is excessive this knock can be noticed at all speeds and loads. It is the most common and the easiest to identify. It should be remedied immediately.

(E) **Loose crank-shaft bearing.**

A loose crank-shaft bearing will knock most noticeably when the engine is working under a heavy load. If the front crank-shaft bearing is very loose it may be detected by the excessive noise in the timing gear case due to improper meshing of the timing gears.

(F) **Loose flywheel.**

If the engine is speeded up suddenly and the throttle closed quickly, a knock resulting at the instant the throttle is closed will usually indicate a loose flywheel.

(G) **Early spark.**

The spark knock is a result of too early ignition, the spark being timed or advanced too far. It can be corrected by retarding the spark. It sounds like a carbon knock.

(H) **Overheated engine.**

Preignition caused by overheated engine cylinders will result in lack of power, a heavy knock and excessive vibration.

(I) **Excessive valve tappet clearance.**

A knock caused by excessive valve tappet clearance is very light, being more like a click than a knock.

(J) **Chipped cam or tappet roller.**

A chipped cam or tappet roller may be detected by placing a finger on the valve tappet while the engine is running, to determine if the tappet movement is smooth.

(K) **Crank shaft end play.**

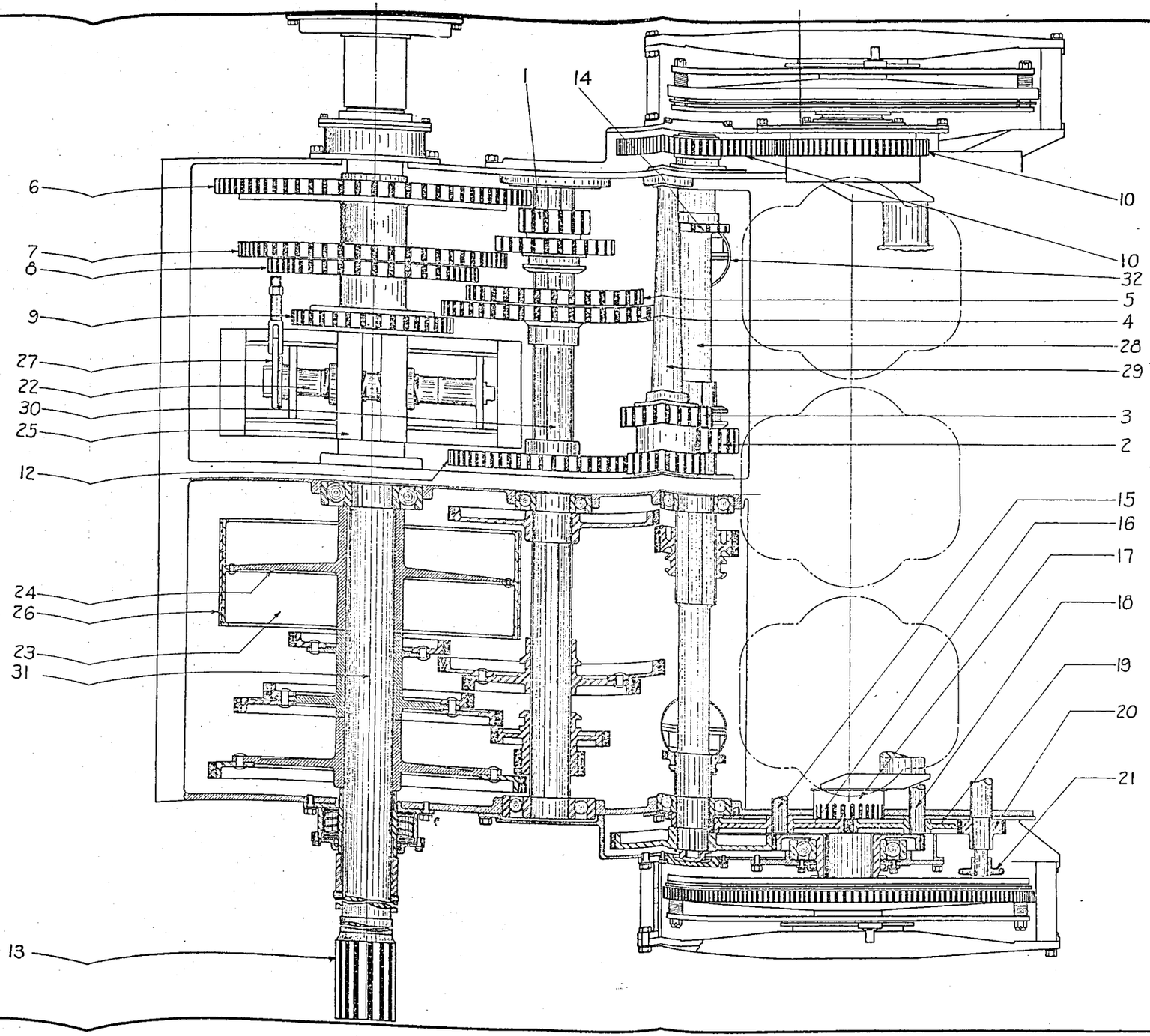
After the crank-shaft bearings have been worn by the thrust of the clutches being released, the crank shaft will move lengthwise through the bearings, producing a knock as the limit of travel is reached. This knock may be located by engaging the clutches.

(L) **Cam shaft end play.**

A cam shaft moving endwise will produce a knock somewhat similar to a light connecting rod knock. As the engine speed is increased, the camshaft is held in one position by the additional power required to drive it and the knock usually ceases. The transmission side case cover may be removed and pressure exerted on the end of the shaft, thereby determining if end play is producing the knock.

(M) **Burr or chip in gear teeth.**

A burr or chip in the gear teeth will give a periodic knock.



Transmission, diagrammatic.

CHAPTER III.

TRANSMISSION GROUP.

(See Plate 28.)

The transmission gear set has four forward and four reverse reductions. It is of the selective-gear type, the only driving gears in mesh being those used in transmitting power at the time. The reversing-gear mechanism (3) is in continuous operation, due to one of its gears being always in mesh with the countershaft gear (12) on the sliding-gear shaft.

When in the forward motion the reversing gear (3) idles, the power being transmitted directly through the shifting gear (2) to the countershaft gear (12) on the sliding-gear shaft.

When in the reverse motion, the power is transmitted through the shifting gear (2) to the reversing gear (3), thence to the countershaft gear (12) on the sliding-gear shaft.

As one of the gears of the reversing-gear mechanism (3) is always in mesh with the countershaft gear (12) on the sliding-gear shaft, and the shifting gear (2) is also in mesh with the countershaft gear (12) when the motion is forward, it is necessary to make the two gears of the reversing mechanism (3) of different sizes so that the shifting gear (2), when shifted, will mesh properly with the corresponding gear of the reversing-gear mechanism (3).

The forward speeds are slightly greater than the reverse speeds due to the difference in the gears of the reversing-gear mechanism (3).

The transmission-gear case is of bronze and consists of two sections, each containing four shafts, viz, driving shaft (28), reversing-gear shaft (29), sliding-gear shaft (30), and final-drive shaft (31). The shafts are made of chrome vanadium steel and are mounted on ball bearings with the exception of the reversing-gear shaft (29), which is fixed, the reversing gear (3) being mounted on roller bearings.

The gear pitch is of the 3–4 Fellows stub tooth type.

TRANSMISSION, DIAGRAMMATIC. (Plate 28.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	AM214A....	First and second speed shifting gear.	16	AK109A....	Cam shaft gear.
2	AM214K....	Shifting gear.	17	AK87A.....	Crank shaft extension.
3	AM214L....	Reversing gear.	18	AK106A....	Exhaust cam shaft.
4	AM215A....	Fourth speed shifting gear.	19	AK109A....	Cam shaft gear.
5	AM215D....	Third speed shifting gear.	20	NM122F....	Pump driving gear.
6	AM215C....	First speed gear.	21	AK114A....	Pump drive shaft sprocket.
7	AM216A....	Second speed gear.	22	LM45D.....	Brake screw.
8	AM216B....	Third speed gear.	23	LM47A.....	Brake drum.
9	AM216D....	Fourth speed gear.	24	LM47B.....	Brake drum hub.
10	AM213A....	Main driving gear, left-hand.	25	LM48B.....	Brake band lug.
11	AM233C....	Driven gear, left-hand.	26	LM48A.....	Brake band.
12	AM213E....	Countershaft gear.	27	LM45K.....	Brake operating lever.
13	AM222G....	Pinion, right hand (integral with final drive shaft).	28	AM222A....	Driving shaft, L. H.
14	AM223F....	Oil pump gear.	29	AM223A....	Reversing gear shaft.
15	AK108B....	Inlet cam shaft.	30	AM222F....	Sliding gear shaft.
			31	AM222H....	Final drive shaft, L. H.
			32	.....	Oil pump assembly.

SPEEDS.

At engine speed of 1,500 revolutions per minute the following speeds of the carriage are obtained, with or without the track.

FORWARD. (Breech end forward.)		REVERSE. (Muzzle end forward.)	
First speed.....	1. 65 miles per hour.	First speed.....	1. 39 miles per hour.
Second speed....	3. 5 miles per hour.	Second speed.....	2. 89 miles per hour.
Third speed.....	6. 82 miles per hour.	Third speed.....	5. 69 miles per hour.
Fourth speed....	11. 5 miles per hour.	Fourth speed.....	9. 61 miles per hour.

FORWARD MOTION.

FIRST SPEED.

(See Plate 28.)

Power is transmitted from the 22-tooth shifting gear (2) to the 56-tooth fixed gear (12) on the sliding-gear shaft, then to the 13-tooth sliding gear (1) meshed with the 64-tooth gear (6) on the final-drive shaft, then to the 11-tooth final-drive pinion (13) on the final-drive shaft, through which the power is transmitted to the wheel through the 77-tooth internal gear.

SECOND SPEED.

(See Plate 28.)

The power is transmitted from the 22-tooth shifting gear (2) to the 56-tooth fixed gear (12) on the sliding-gear shaft, then to the 23-tooth sliding gear (1) meshed with the 54-tooth gear (7) on the final-drive shaft, then to the 11-tooth final-drive pinion (13) on the final-drive shaft, through which the power is transmitted to the wheel through the 77-tooth internal gear.

THIRD SPEED.

(See Plate 28.)

The power is transmitted from the 22-tooth shifting gear (2) to the 56-tooth fixed gear (12) on the sliding-gear shaft, then to the 35-tooth sliding gear (5) meshed with the 42-tooth gear (8) on the final-drive shaft, then to the 11-tooth final-drive pinion (13) on the final-drive shaft, through which the power is transmitted to the wheel through the 77-tooth internal gear.

FOURTH SPEED.

(See Plate 28.)

The power is transmitted from the 22-tooth shifting gear (2) to the 56-tooth fixed gear (12) on the sliding-gear shaft, then to the 45-tooth sliding gear (4) meshed with the 32-tooth gear (9) on the final-

drive shaft, then to the 11-tooth final-drive pinion (13) on the final-drive shaft, through which the power is transmitted to the wheel through the 77-tooth internal gear.

REVERSE MOTION.

(See Plate 28.)

The reversal of the motion is accomplished by the use of a reversing mechanism (3), consisting of two integral gears, one 20-tooth and the other 24-tooth.

The 20-tooth gear is always in mesh with the 56-tooth fixed gear (12) on the sliding-gear shaft, causing the reversing mechanism to idle when the motion is forward.

When the motion is reversed, the 22-tooth shifting gear (2) is shifted out of mesh with the 56-tooth fixed gear (12) and meshed with the 24-tooth gear of the reversing mechanism (3). Thus the power is transmitted from the 22-tooth shifting gear (2) to the 24-tooth gear of the reversing mechanism (3), then from the 20-tooth gear of the reversing mechanism (3) to the 56-tooth fixed gear (12) on the sliding-gear shaft, thence the transmission of the power is identical with that of the various forward speeds, except that the direction of rotation is reversed.

Due to the difference in the number of teeth in the two gears of the reversing mechanism (3), it follows that the reverse speeds are slightly lower than their corresponding forward speeds.

DRIVING SHAFT.

(See Plate 28.)

The main driving shafts, one right, one left (28), are made of chrome vanadium steel, are mounted in annular ball bearings, located in the right and left sections of the transmission case, respectively. These shafts transmit the power from the engine to the gear sets. They carry the shifting gears (2) through which the direction of the motion of the carriage is controlled.

SLIDING-GEAR SHAFT.

(See Plate 28.)

The two sliding-gear shafts (30) are made of chrome vanadium steel, are mounted in annular ball bearings, located in the right and left sections of the transmission case, respectively. To one end of these shafts the countershaft gears (12) are rigidly attached. The other four gears (1, 5, 4) mounted on each of these shafts are arranged as compound gears and slide freely on the shafts for the purpose of meshing with their corresponding gears on the final-drive shafts (31).

In the reverse position the countershaft gears (12) are driven through the reverse-gear mechanisms (3) instead of through the shifting gears (2).

FINAL-DRIVE SHAFT.

(See Plate 28.)

The two final-drive shafts (31) are of chrome vanadium steel, are mounted in annular ball bearings located in the right and left sections of the transmission case, respectively. The final-drive pinions (13) are integral with the shafts (31). The four gears (6, 7, 8, 9), located on each of the final-drive shafts, are attached rigidly in position. Proper meshing with the corresponding gears on the sliding-gear shafts is accomplished by shifting the gears on the sliding-gear shafts.

REVERSING-GEAR SHAFT.

(See Plate 28.)

The two reversing-gear shafts (29) are of chrome vanadium steel and are rigidly mounted in position in the right and left sections of the transmission case, respectively. The compound gear of the reversing mechanism (3) is mounted on roller bearings, which in turn are mounted on the reversing-gear shaft.

TRANSMISSION GEARS.

(See Plate 28.)

There are 13 gears in each section of the transmission case. Two (2, 14) are mounted on each of the driving shafts (28), two (3) on each of the reversing shafts (29), five (1, 4, 5, 12) on each of the sliding-gear shafts (30), and four (6, 7, 8, 9) on each of the final-drive shafts (31).

The power from the engine is transmitted to the transmission gears through gears (11), which are rigidly mounted on each of the driving shafts (28) and which in turn mesh with the driving members (10) of the clutches.

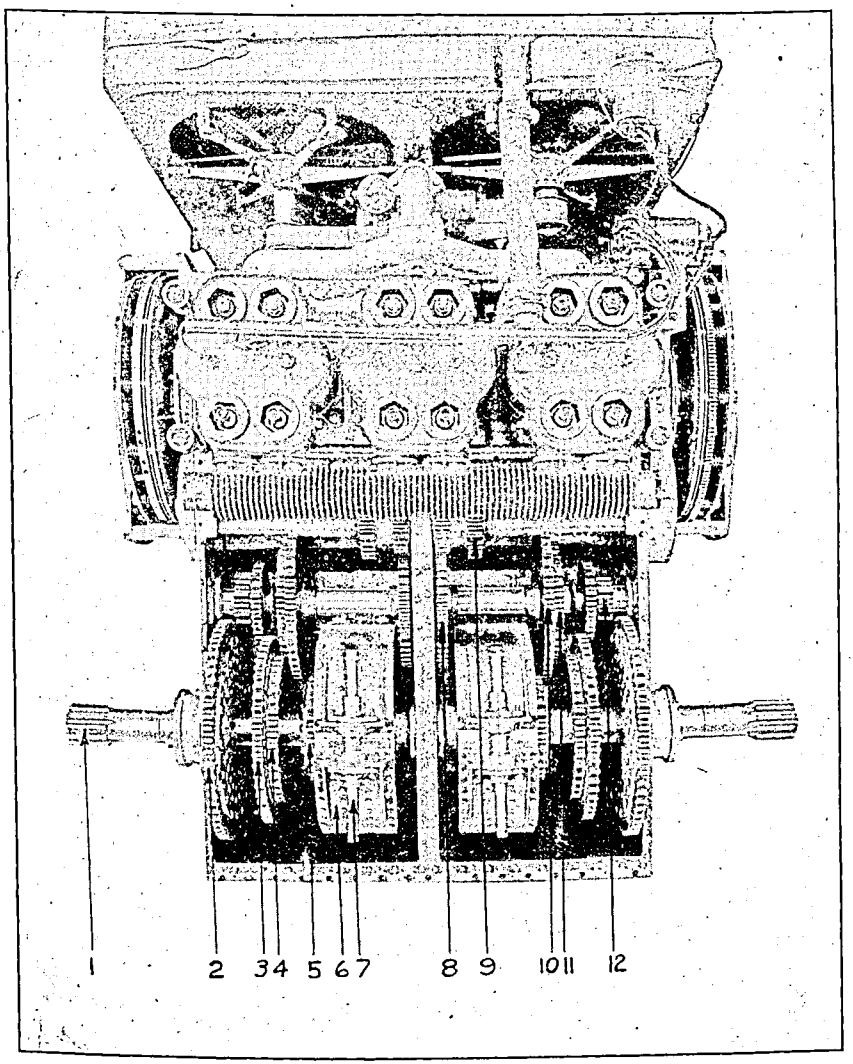
The power from the final-drive shafts (31) is transmitted to the wheels of the mount through the final-drive pinions (13), which are integral with the final-drive shafts.

GEARS.

(See Plate 28.)

The shifting gear (2) on the driving shaft has 22 teeth. The oil pump gears (14) on the driving shafts has 16 teeth. The compound gear of the reversing mechanism (3) has 20 and 24 teeth, respectively. The five gears on the sliding-gear shaft have 56 (12), 45 (4), 35 (5), 23 (1), and 13 (1) teeth, respectively. The four gears on the final-drive shaft have 32 (9), 42 (8), 54 (7), and 64 (6) teeth, respectively.

Plate 29.



TRANSMISSION, PLAN VIEW, COVERS REMOVED. (Plate 29.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	AM222G....	Pinion, right hand (integral with final-drive shaft).	7	LM45D.....	Brake screw.
2	AM215C....	First speed gear.	8	AM213E....	Countershaft gear.
3	AM216A....	Second speed gear.	9	AM214L....	Reversing gear.
4	AM216B....	Third speed gear.	10	AM215A....	Fourth speed shifting gear.
5	AM216D....	Fourth speed gear.	11	AM215D....	Third speed shifting gear.
6	LM48B.....	Brake band lug.	12	AM214A....	First and second speed shifting gear.

The gear (11) which is rigidly mounted on the driving shaft (28), meshing with the driving member (10) of the clutch, has 66 teeth. The final-drive pinion (13), integral with the final-drive shaft (31), has 11 teeth. All of the gears are made of chrome vanadium steel.

LUBRICATION OF TRANSMISSION.

(See Plate 28.)

Although the transmission and engine crank cases are integral the lubrication of the transmission is separate from that of the engine.

Lubrication of the transmission is effected by the splash system, various gears being partly immersed in the oil at all times.

Approximately 7.5 gallons of oil are required in the transmission case to insure proper lubrication of the transmission gears and is applied by removing one of the brake screw-housing covers (4, 5, Plate 27) on the transmission case and pouring in the oil.

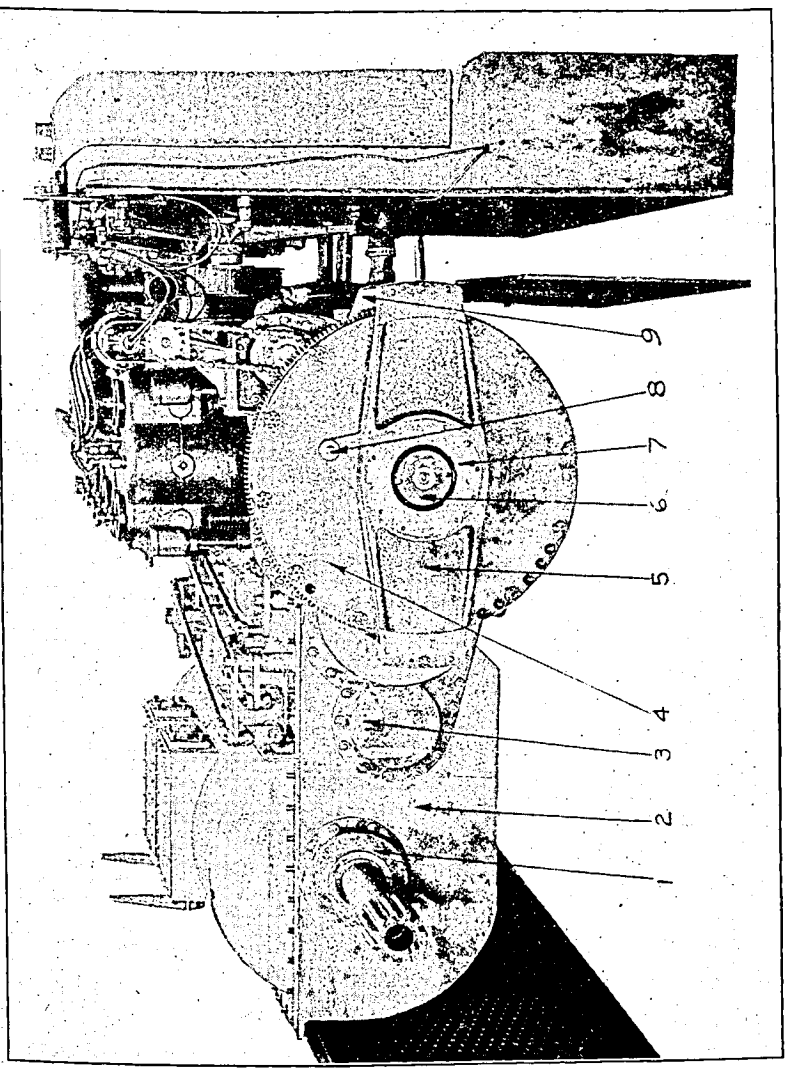
The pumps (32) which circulate the oil in the engine crank case are located in the bottom of the transmission case and are driven by the oil pump gear (14) located on the driving shaft (28). Due to the construction and location of the pumps the oil in the crank case works into the transmission case causing an accumulation of oil in excess of the amount needed for transmission lubrication.

An oil plug (35, Plate 12) is provided in the bottom of the transmission case, the design of which is such that by the removal of a pipe plug the oil can be drawn off until a predetermined level is reached. This oil, provided it is suitable for future use, can be transferred to the reserve oil supply tank.

To drain all the oil from the transmission case it is necessary to remove the oil drain plug complete (35, Plate 12).

The oil used in the transmission case is No. 3502 medium and is the same as that used in the engine crank case.

Plate 30.

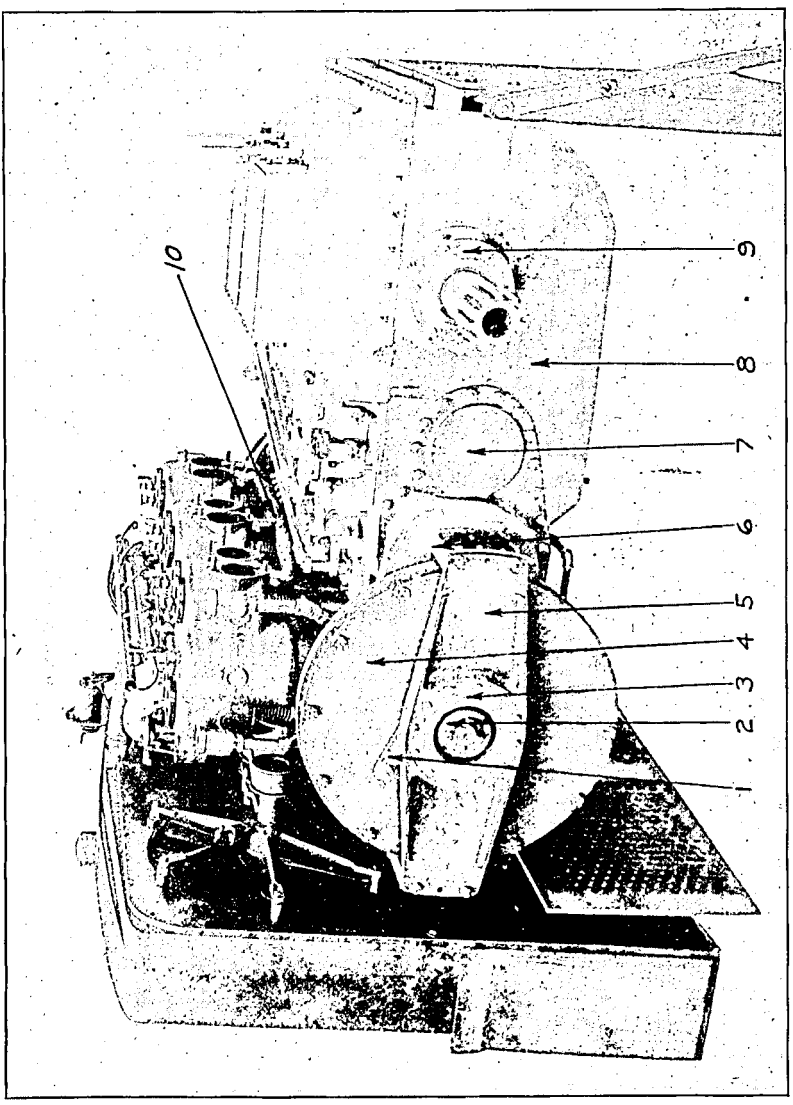


Power and transmission unit assembly, right side view.

POWER AND TRANSMISSION UNIT ASSEMBLY, RIGHT-SIDE VIEW. (Plate 30.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	AM224F	Dust cap.	5	TM40B	Clutch pressure plate.
2	AM235A	Transmission case.	6	AK83C	Crank-shaft ratchet, right.
3	AM230A	Transmission case side cover, right hand.	7	TM39F	Clutch cam, right.
			8	TM39A	Do.
4	TM41C	Clutch plate.	9	FM40F	Pressure plate spacer, right.

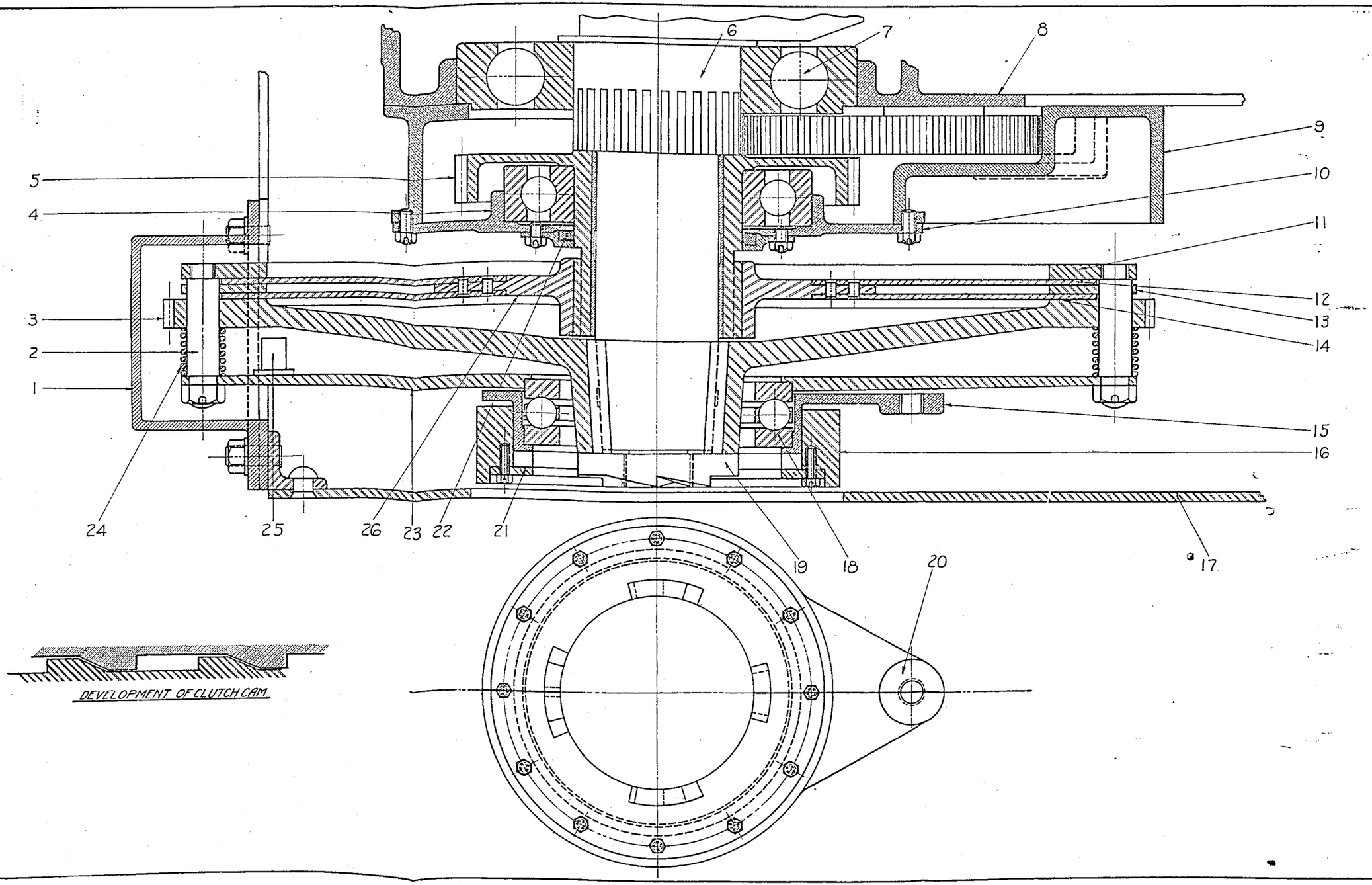
Plate 31.



Power and transmission unit assembly, left side view.

POWER AND TRANSMISSION UNIT ASSEMBLY, LEFT-SIDE VIEW. (Plate 31.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	TM39B.....	Clutch cam, left.	7	AM229A....	Transmission case side cover, left hand.
2	AK83D.....	Crank-shaft ratchet, left.	8	AM235A....	Transmission case.
3	TM39G.....	Clutch cam, left.	9	AM224F....	Dust cap.
4	TM41C.....	Clutch plate.	10	AK118B....	Inlet manifold, water.
5	TM40B.....	Clutch-pressure plate.			
6	TM40G.....	Pressure-plate spacer, left hand.			



62198—12. (Face page 77.)

Sectional view of clutch assembly.

CHAPTER IV.

STEERING CLUTCHES AND BRAKES.

STEERING CLUTCHES.

(See Plate 32.)

The clutches (21, 22, Plate 27) are of the dry disk type, located at either end of the crank shaft, and act independent of each other.

When the clutch lever is thrown in, the power is transmitted from the crank shaft (6) to the flywheel (3) which is keyed thereto; thence to the clutch plates (12, 14), which are riveted to the hub clutch plate (26) and which in turn is keyed to the main driving gear (5). The clutch plates (12, 13) are held in position against the flywheel (3) by means of the clutch plates (11, 13, 23) and the clutch springs (24), which are each assembled under a load of 100 pounds.

When the clutch lever is thrown out the actuation of the clutch cams (15, 21) causes the springs (24) to be compressed, thereby releasing the pressure which holds the clutch plates. Thus the flywheel (3) and its accompanying parts rotate without carrying the clutch plates, the latter remaining stationary.

The construction of the steering clutches is such that they perform the function of the flywheel.

LUBRICATION.

The only lubrication necessary for the clutch is that required for the ball thrust bearings mounted in the clutch cams. These bearings are packed with cup grease when assembled and should be repacked when necessary.

BRAKES.

(See Plate 28.)

The brakes are of the contraction band type and operate on the brake drums (23) keyed on the final-drive shafts (31) in the transmission case. Both the brake drums (23) and the brake bands (26) are made of chrome-vanadium steel. The brakes act independent of each other.

SECTIONAL VIEW OF CLUTCH ASSEMBLY. (Plate 32.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	FF169C.....	Flywheel cover.	13	TM41B.....	Clutch plate.
2	TM39K.....	Clutch stud.	14	TM41D.....	Do.
3	TM41A.....	Flywheel.	15	TM39A.....	Clutch cam.
4	AM224A....	Bearing cap.	16	TM40B.....	Clutch pressure plate.
5	AM213C....	Main driving gear, right hand.	17	AM224A....	Bearing cap.
6	AK87B.....	Crank shaft.	18	TM40H.....	Clutch bearing.
7	AK87C.....	Crank-shaft bearing.	19	AK83C.....	Crank-shaft ratchet.
8	AM235A....	Transmission case.	20	TM39A.....	Clutch cam.
9	AM230A....	Transmission case side cover, right hand.	21	TM39F.....	Clutch cam.
10	AM224A....	Bearing cap.	22	AM224C....	Dust cap.
11	TM40D.....	Clutch plate.	23	TM41C.....	Clutch plate.
12	TM41D.....	Do.	24	TM39H.....	Clutch spring.
			25	TM39C.....	Clutch stop pin.
			26	TM40A.....	Clutch plate hub.

Each brake is connected with its corresponding clutch lever by linkage the operation of the brake and clutch being simultaneous; applying the clutch releases, the corresponding brake and vice versa.

The band brakes are expanded or contracted by quick-acting brake screws (22).

The brake screws (22) are quick-acting right and left hand screws, operating in right and left hand nuts which are located in the lugs (25) attached to each end of the brake bands (26).

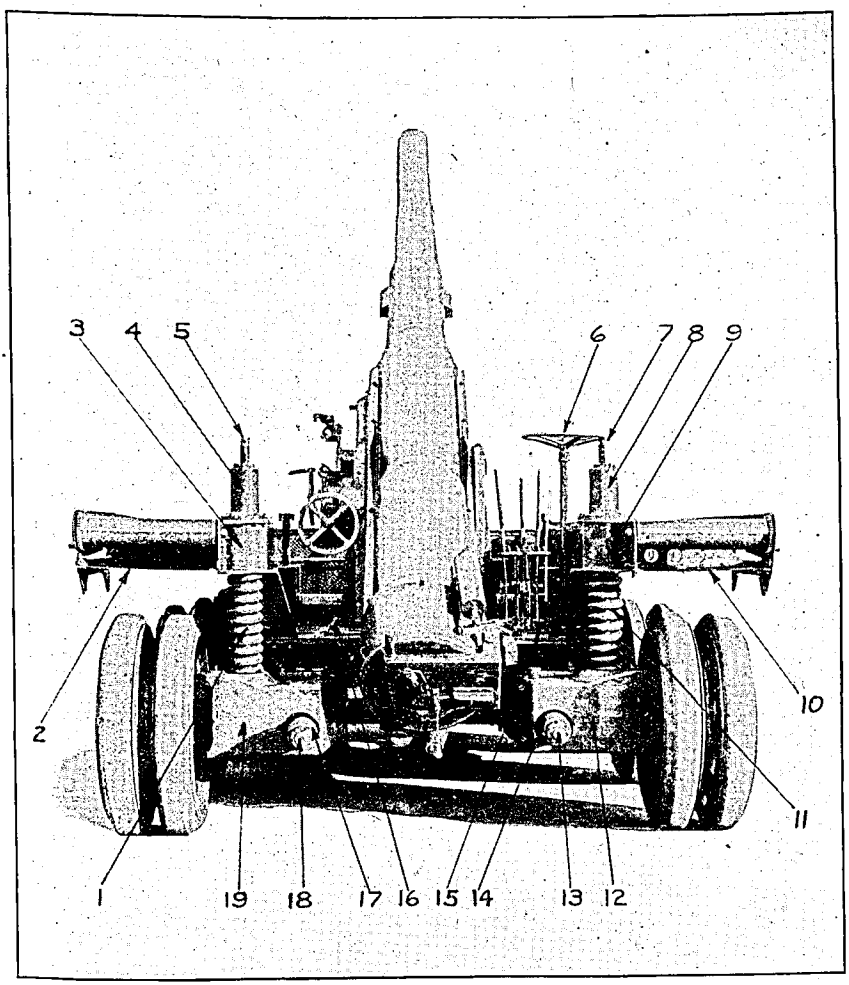
The levers (3, 6, Plate 27) operating the brake screws (22) are provided with adjusting ratchet collars which fit on the ratchets attached to the brake screws (22). This ratchet arrangement provides means of adjustment for wear of the brake drums and bands.

ADJUSTMENT.

(See Plate 27.)

To adjust the brakes, remove the brake-operating lever pins from the brake-control tie-rods (9, 10, Plate 49) which connect to the clutch levers, drive out taper pins in holding nuts on the brake screws, and remove the holding nuts. Withdraw the brake-operating levers (3, 6) until the teeth on the ratchet collars are clear of the adjusting ratchets, reseat the brake-operating levers (3, 6) in a new position on the adjusting ratchets, replace the holding nuts, taper pins, and connections to the clutch levers.

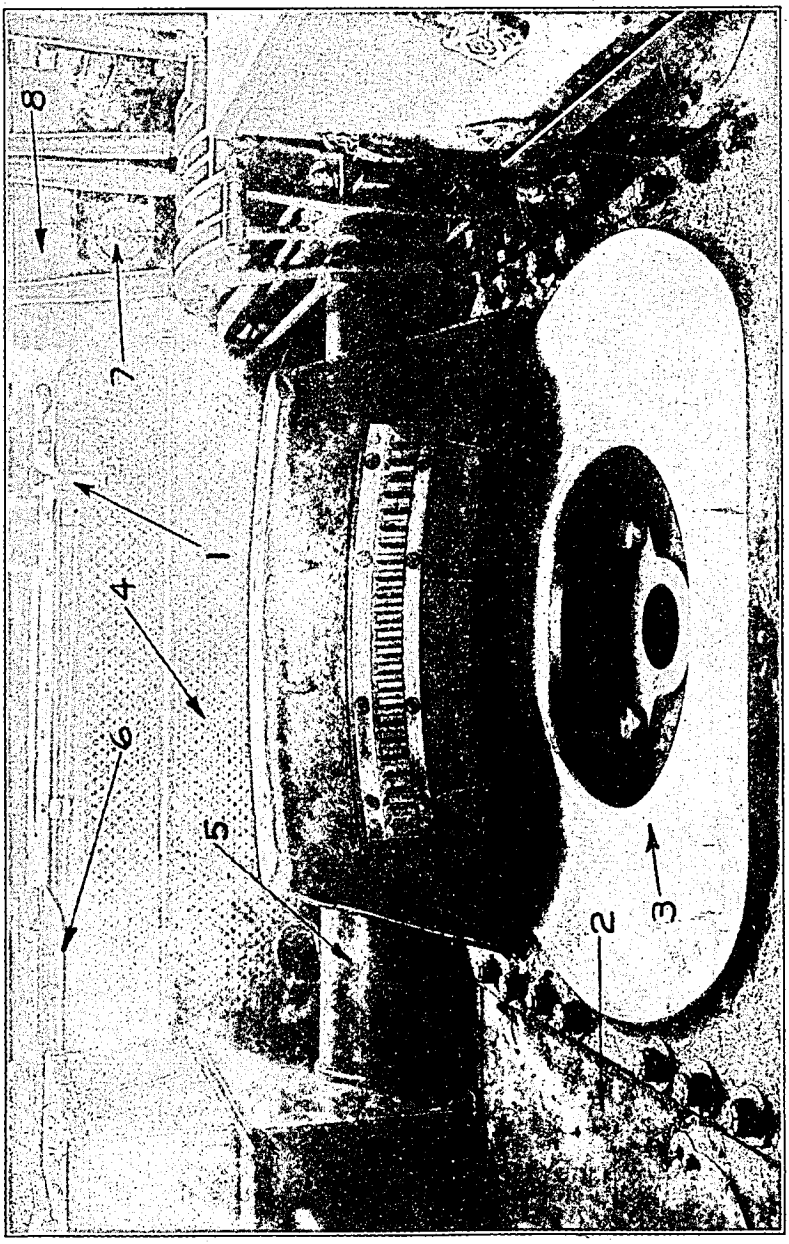
Plate 33.



FRONT VIEW OF CARRIAGE, TRACK REMOVED. (Plate 33.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	FF166A	Pivot bracket spring.	11	FF166A	Pivot bracket spring.
2		Track platform assembly, right-hand.	12	KM97A	Steering wheel pivot bracket.
3	FF168A	Spring housing.	13	KM100A	Track tension spring bolt.
4	FF167B	Spring housing cap.	14	KM100C	Track tension spring.
5	FF167A	Lock bolt.	15	13L	Gun base support plate, left-hand.
6		Steering post assembly.	16	32A	Gun base plate.
7	FF167A	Lock bolt.	17	KM100C	Track tension spring.
8	FF167B	Spring housing cap.	18	KM100A	Track tension spring bolt.
9	FF168B	Spring housing.	19	KM97A	Steering wheel pivot bracket.
10		Track platform assembly, left-hand.			

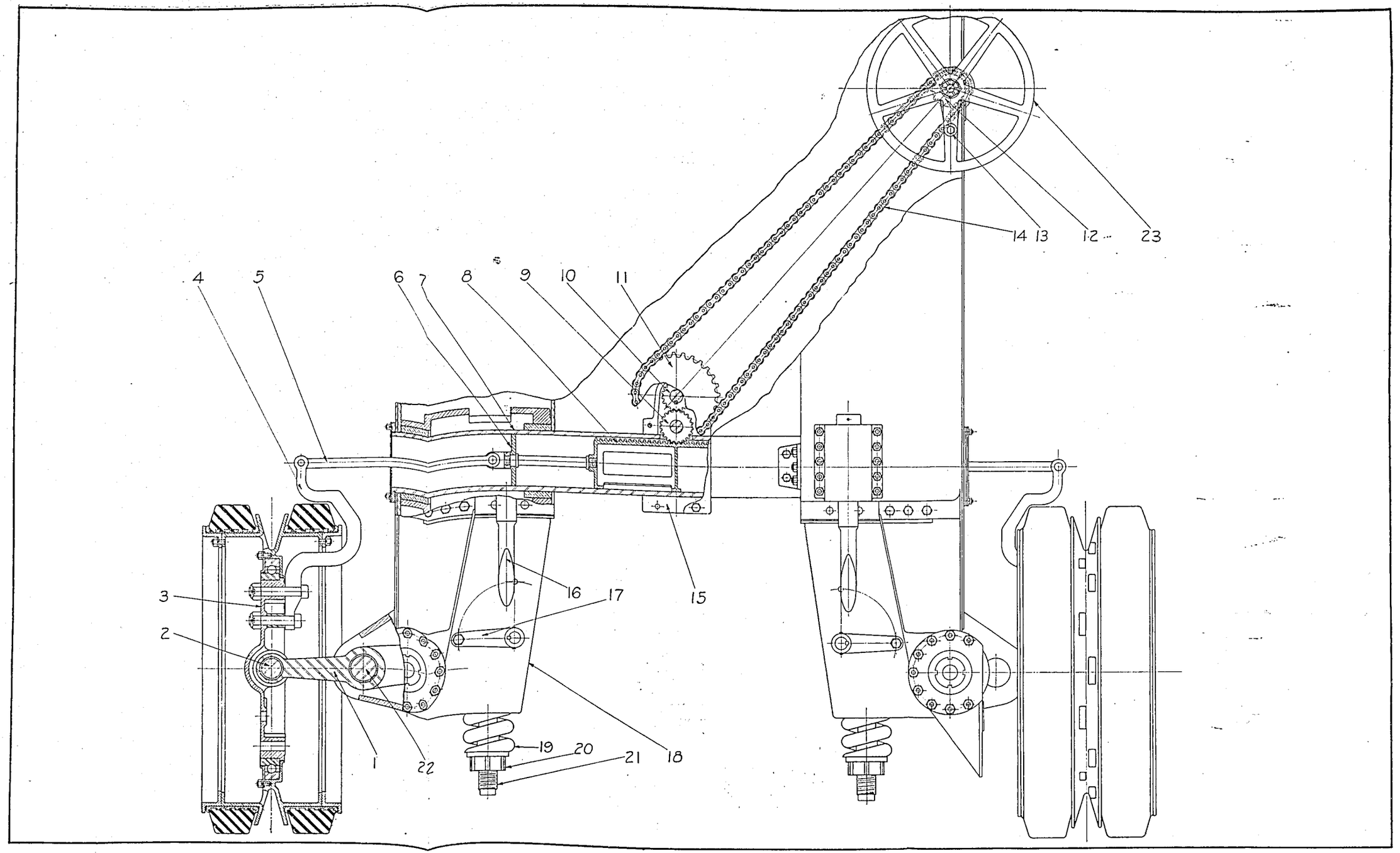
Plate 34.



Plan view of carriage, gun and top carriage removed.

PLAN VIEW OF CARRIAGE, GUN AND TOP CARRIAGE REMOVED. (Plate 34.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	WM99A	Priming pump.	6		Seat assembly, right-hand (observer's), without cushion.
2	13K	Gun base support plate.			
3	32A	Gun base plate.			
4	14G	Radiator ventilator plate.	7	AK115B	Dual ignition coil and switch.
5	FF162B	Worm gear shaft tube.	8		Seat assembly, left-hand (driver's), with cushion.



62198—22. (Face page 81.)

Steering mechanism assembly, wheeled carriage.

CHAPTER V.

SUPPORTING ASSEMBLIES.

GENERAL DESCRIPTION.

(See Plate 33.)

The various groups composing the carriage are assembled on the chassis, a built-up body of commercial steel plates and angles, which not only supports the units, but holds them in proper relation to each other.

CHASSIS.

(See Plate 6.)

The chassis is of a boxlike construction of commercial steel plates and angles, consisting of two main side plates, top and bottom plates, end plate, and various cross web plates, which are rigidly riveted and bolted together.

The rear end of the chassis contains the power (6) and transmission (13) units. The central portion contains the cooling system (5) and gasoline supply tank (16). In the forward end is mounted the gun base plate (3) which supports the gun mount (12).

On each side of the top, running the full length of the chassis, are track platforms (2, 10, Plate 33) on which the tracks are carried when the carriage is run as a wheeled vehicle. The construction of the track platforms is such that ample space is provided for the storage of tools and various of the accessories carried with the carriage.

The chassis is supported by the drive (11), center (14, 17), and steering (20) wheel units.

Four pintles (2, 10) are provided, two in the front and two in the rear of the chassis.

STEERING WHEELS AND STEERING MECHANISM.

(See Plate 35.)

The steering wheels consist of a cast-steel frame on which is mounted dual solid rubber tires 36 by 5, which in turn are held in position by cast-steel tire clamps.

STEERING MECHANISM ASSEMBLY, WHEELED CARRIAGE. (Plate 35.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	KM90D	Front wheel swivel arm, left.	13	HM11B	Locking screw.
2	KM90A	Front wheel pin.	14	HM119D	Roller chain.
3	KM91A	Steering wheel center.	15	HM116C	Steering pinion bracket, lower.
4	HM109C	Steering knuckle.			
5	HM109A	Steering link.	16	38F	Pintle.
6	HM110C	Steering link guide.	17	KM99B	Swivel arm stop lever.
7	HM116G	Steering wheel axle.	18	KM97A	Steering wheel pivot bracket.
8	HM110D	Steering rack.	19	KM100C	Track tension spring.
9	HM117D	Steering idler gear.	20	KM100D	Spring nut.
10	HM117C	Steering pinion.	21	KM100A	Track tension spring bolt.
11	HM116F	Steering sprocket.	22	KM90E	Swivel arm pin.
12	HM119C	Do.	23	HM119A	Steering handwheel.

LOCKING AND TRACK TENSION MECHANISMS. (Plate 36.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	KM90D	Front wheel swivel arm, left.	14	FF167A	Lock bolt.
2	KM90E	Swivel arm pin.	15	FF167D	Lock nut.
3	HM109C	Steering knuckle.	16	KM99B	Swivel arm stop lever.
4	HM109A	Steering link.	17	38F	Pintle.
5	HM110C	Steering link guide.	18	38D	Pintle spring.
6	KM97D	Bracket bushing.	19	38C	Pintle spring housing.
7	KM97C	Do.	20	HM116C	Steering wheel axle.
8	HM110D	Steering rack.	21	KM99A	Swivel arm stop.
9	HM117D	Steering idler gear.	22	KM97A	Steering wheel pivot bracket.
10	HM117C	Steering pinion.	23	KM100C	Track tension spring.
11	HM116F	Steering sprocket	24	KM100D	Spring nut.
12	38G	Pintle nut.	25	KM100A	Track tension spring bolt.
13		Steering wheel assembly.	26	HM110A	Steering rod.

(See Plate 35.)

Each steering wheel is mounted on one end of a nickel-steel swivel arm (1), which is pivoted in the cast-steel steering wheel pivot bracket (18). The other end of the swivel arm (1) bears against a spring (19) mounted on the track tension bolt (21) which is mounted in the steering wheel pivot bracket (18).

The steering wheel pivot bracket (18) is mounted on the steering wheel axle (7), a hollow steel tube which is rigidly fixed in the side plates of the chassis. The steering wheel pivot brackets (18) are free to rotate vertically on the steering wheel axle (7).

The steering knuckles (4) are firmly attached to the frames (3) of the steering wheels and are connected by linkage to the steering rack (8) which is assembled in the hollow steel axle (7).

Housed in a bracket (15) which fits over the axle (7) and is bolted to the chassis are two pinions (9, 10); one acts as an idler (9) between the steering rack (8) and the steering pinion (10), the other (the steering pinion (10)) being keyed to the steering pinion shaft on which the steering sprocket (11) is keyed.

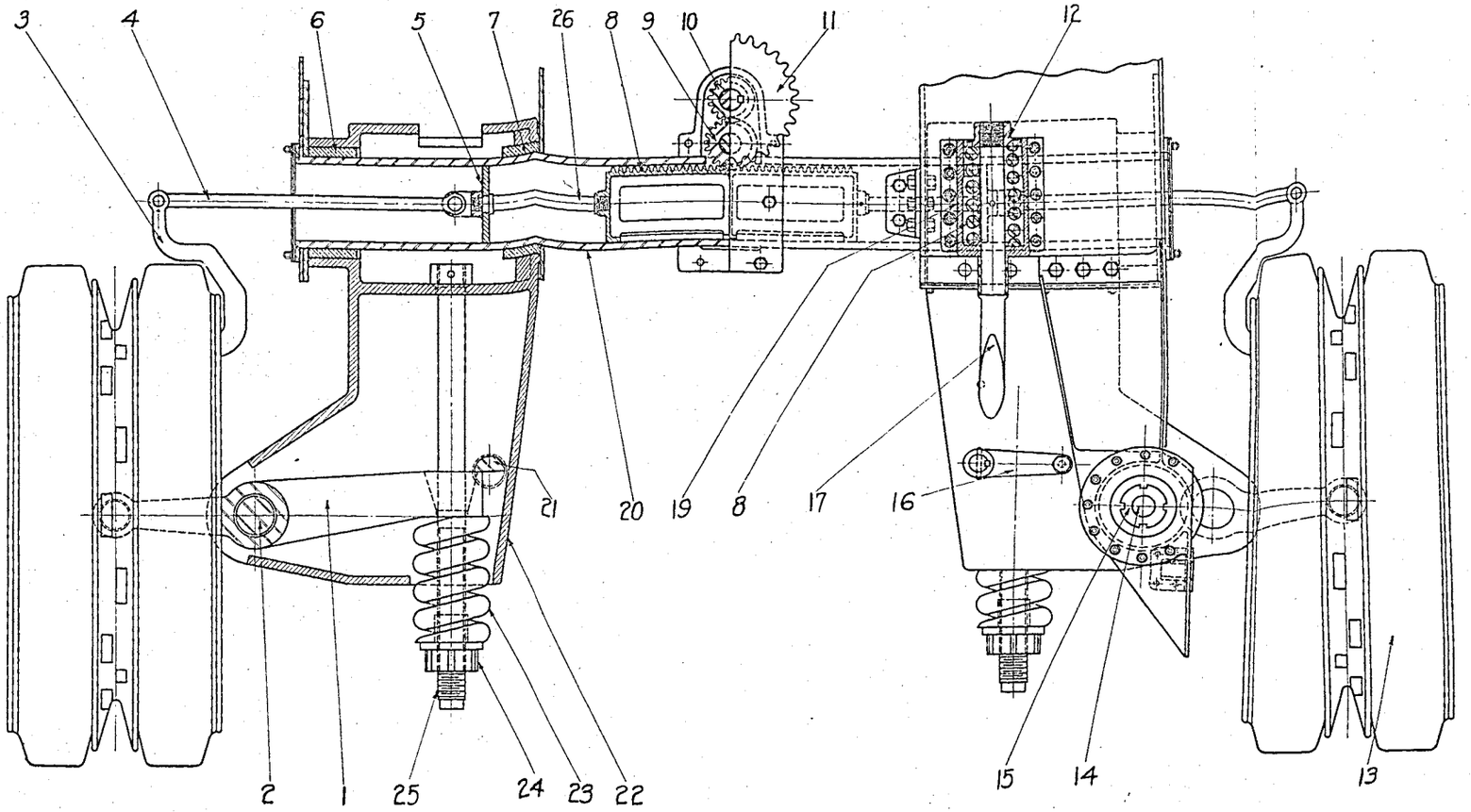
A roller chain (14) connects this sprocket (11) with the sprocket (12) mounted on the lower end of the handwheel shaft in the steering column.

The steering column is rigidly attached to the chassis, forward of the driver's seat. A steering handwheel (23), 18 inches in diameter, is keyed to the upper end of the handwheel shaft.

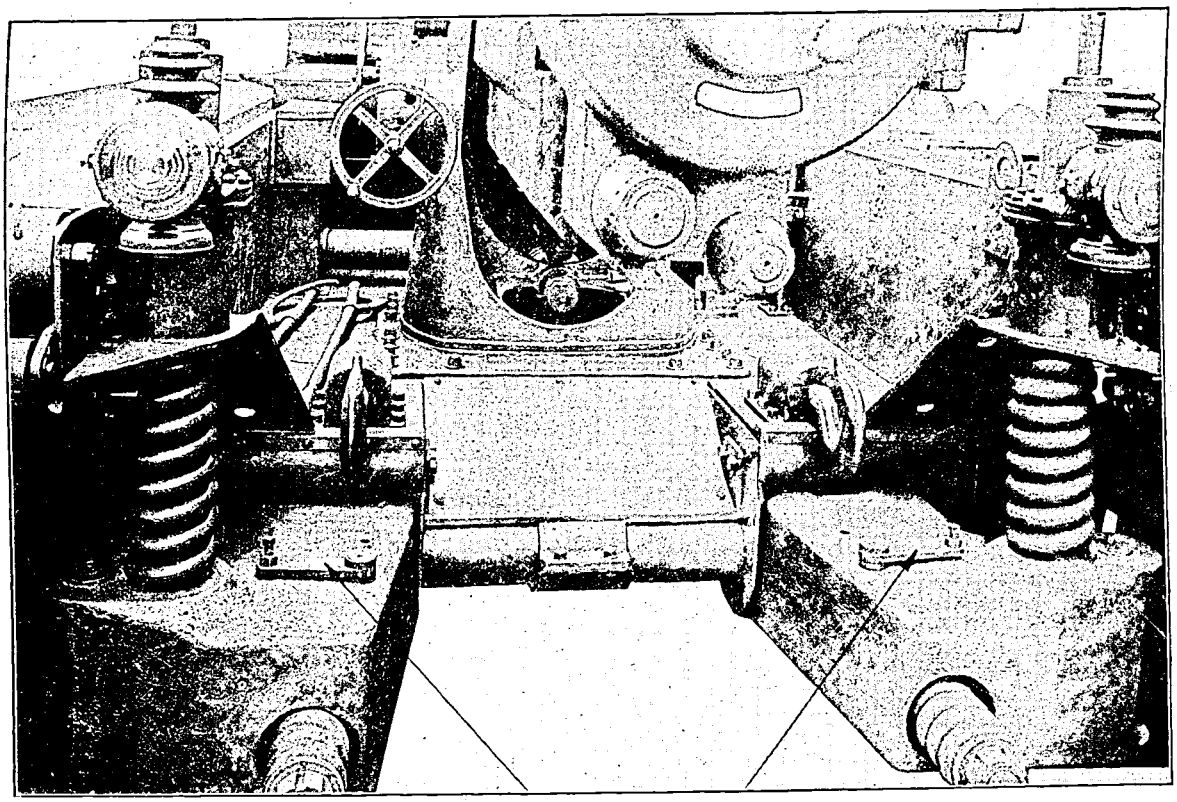
The steering handwheel (23) is provided with a boss in which a locking screw (13) is fitted. By means of this locking screw the handwheel can be locked to the steering wheel locking bracket, preventing operation of the steering mechanism.

Each steering wheel bracket is provided with a swivel stop (17) by which the front wheel swivel arm (1) can be held.

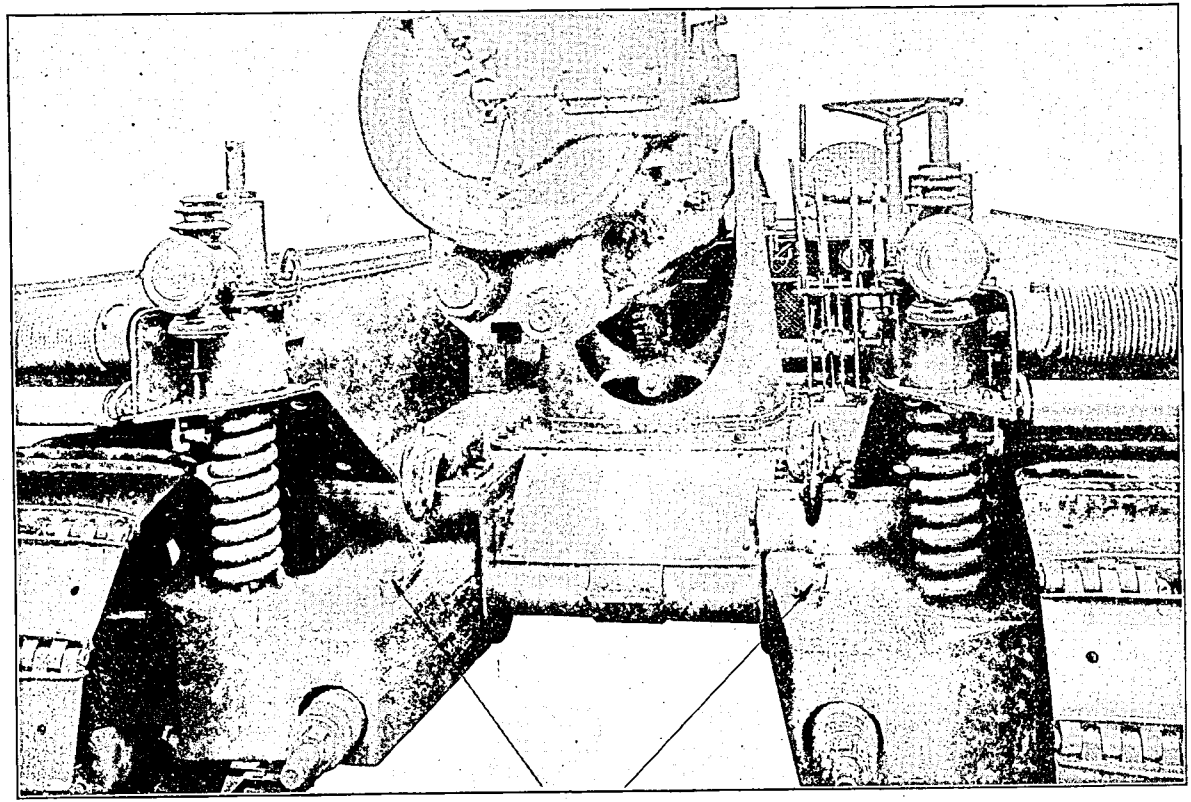
When the carriage is operated with the tracks on, the handwheel (23) is locked in position to the steering wheel locking bracket by the



Locking and track tension mechanisms.

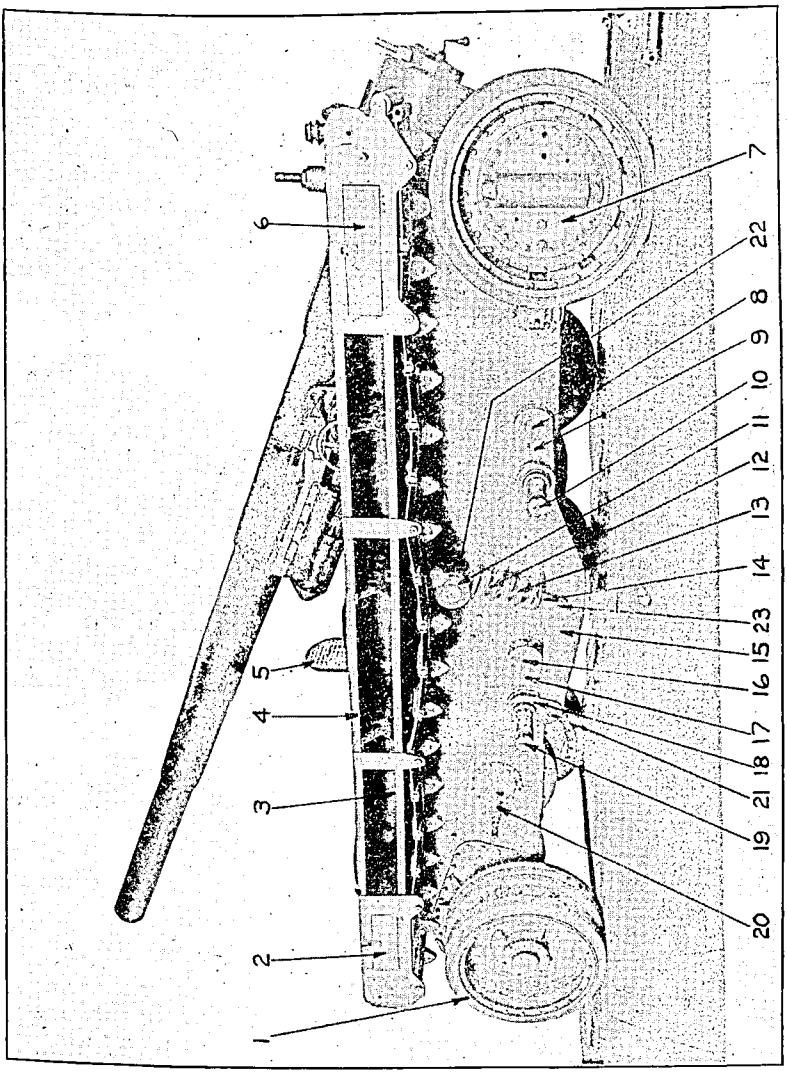


Position of swivel arm lever stops when carriage is run without tracks.



Position of swivel arm lever stops when carriage is run in tracks.

Plate 39.



Side view of carriage, center wheels removed.

SIDE VIEW OF CARRIAGE, CENTER WHEELS REMOVED. (Plate 39.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	.....	Drive wheel assembly.	12	FF163C.....	Equalizer spring guide.
2	.....	Tool compartment.	13	FF164D.....	Equalizer spring.
3	CP10A.....	Muffler.	14	FF163B.....	Equalizer spring lever cap.
4	.....	Track platform assembly, right hand.	15	FF164A.....	Equalizer bar.
5	.....	Seat assembly, right hand (observer).	16	KM101A.....	Center wheel shaft.
6	.....	Tool compartment.	17	KM101C.....	Center wheel crank.
7	.....	Steering wheel assembly.	18	FF164E.....	Equalizer bar clip.
8	KM101A.....	Center wheel shaft.	19	KM98F.....	Center wheel axle.
9	KM101C.....	Center wheel crank.	20	.....	Hand starter assembly.
10	KM98F.....	Center wheel axle.	21	FF165G.....	Equalizer bar pin.
11	FF165B.....	Track idler roller.	22	FF163A.....	Equalizer spring cap, upper.
			23	FF165D.....	Equalizer bar pin.

locking screw (13) located in the handwheel, and the swivel arm stop levers are swung to their rear position (see Plate 38), releasing the front wheel swivel arms. Steering is accomplished by operation of the clutch levers.

When the carriage is operated without tracks, the locking screw (13) is released which holds the steering handwheel (23) in position to the steering wheel locking bracket. The swivel arm stop levers are swung to their forward position (see Plate 37), holding the front wheel swivel arms. Steering is accomplished with the steering handwheel (23) in the same manner as that of the ordinary commercial truck.

CENTER WHEELS AND EQUALIZER MECHANISM.

(See Plate 39.)

The center wheels (see Plates 2 and 3) consist of a cast-steel frame, on which is mounted dual solid rubber tires 36 by 3.5, which in turn are held in position by the center wheel cover plates.

There are two pairs of center wheels (see Plates 2 and 3), the mounting of which is such that they can be raised, thereby carrying no load, or lowered and carrying the greater part if not all the load of the mount. The center wheels are used when the mount is run with the tracks on.

The center wheels are mounted on ball bearings on the center wheel axles (10, 19), which are rigidly mounted in one end of the center wheel cranks (9, 17). In the other end of the center wheel cranks (9, 17) are rigidly mounted the center wheel shafts (8, 16), which in turn rotate in the bearings formed by the center wheel shaft bearings and the center wheel shaft tubes. The center wheel shaft bearings are bolted to the side plates of the chassis.

The equalizer bars (15), together with the equalizer bar clips (18), form links between the center wheel cranks (9, 17).

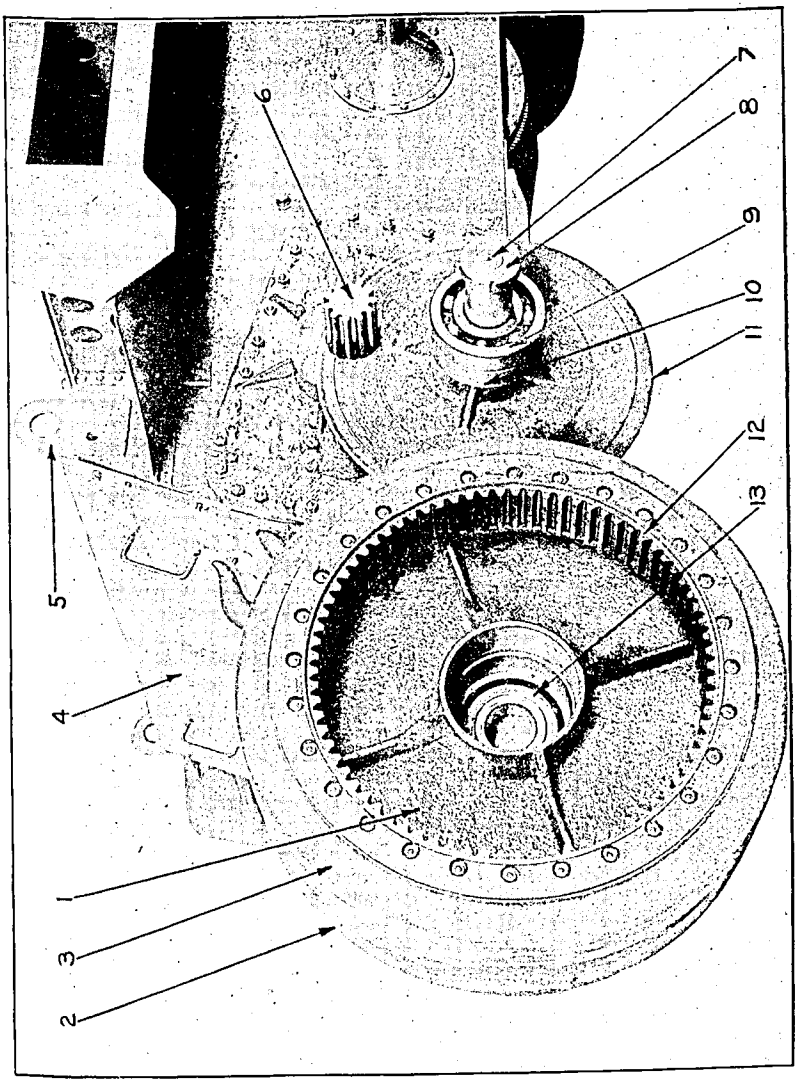
Mounted in the chassis similarly to the center wheel shafts are the worm-gear shafts. A worm gear is mounted on each of the worm-gear shafts within the chassis body, which mesh with worms located in brackets bolted to the side plates of the chassis. These worms are keyed to the lower ends of the worm shafts (14, Plate 48) and ratchet nuts (15, Plate 48) are keyed and pinned to the other ends.

Connecting the crank arms of the worm-gear shafts and the equalizer bars are equalizer spring assemblies (12, 13, 14, 22).

On the outer ends of the crank arms of the worm-gear shafts, track idler (11) assemblies are mounted.

Each pair of center wheels on the carriage operate independently of each other.

Plate 40.



Drive wheel and internal gear.

DRIVE WHEEL AND INTERNAL GEAR. (Plate 40.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	KM94A.....	Driving wheel.	8	KM98C.....	Drive wheel axle nut.
2	KM102A.....	Outer tire.	9	KM94B.....	Drive wheel bearing.
3	KM96A.....	Drive wheel tire.	10	KM94B.....	Do.
4	17F.....	Engine rear end plate.	11	KM88A.....	Drive wheel bracket, right.
5	43C.....	Hoisting plate, right.	12	KM87A.....	Final drive gear.
6	AM222G.....	Final drive shaft.	13	KM94B.....	Drive wheel bearing.
7	KM98A.....	Drive wheel axle.			

Ratchet wrenches (6, Plate 46) are provided with the accessories for the mount which operate the ratchet nuts (15, Plate 48), causing the wheel assemblies to be either raised or lowered.

When the carriage is run with the tracks on, the center wheels are lowered until they have raised both the drive and steering wheels clear from the ground for a distance of approximately 3 inches.

The construction of the wheels is such that they act as guides for the track teeth.

The track idler rollers act as guides for the tracks as they travel.

When the tracks are off, the center wheels should never be lowered so far as to raise the drive wheels off the ground, as no means are provided for controlling the carriage except the brakes on the final drive shafts.

DRIVE WHEELS AND FINAL DRIVE GEARS.

(See Plate 40.)

The drive wheels (1) consist of cast-steel frames on which are mounted dual solid rubber tires (2, 3), one of which is 36 by 7, the other 36 by 3.

The outside tires are held in position by cast-steel tire clamps. The inside tires are held in position by the final drive gears (12), the construction of which is such that they act as tire clamps.

TRAVELING LOCK. (Plate 41.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	33C.....	Traveling lock hinge.	6	33F.....	Traveling lock eyebolt.
2	33G.....	Hinge bolt.	7	.....	Traveling lock eyebolt nut.
3	33A.....	Traveling lock base.	8	33G.....	Hinge bolt.
4	33G.....	Hinge bolt.	9	33G.....	Hinge bolt.
5	33D.....	Traveling lock cap.	10	33C.....	Traveling lock hinge.

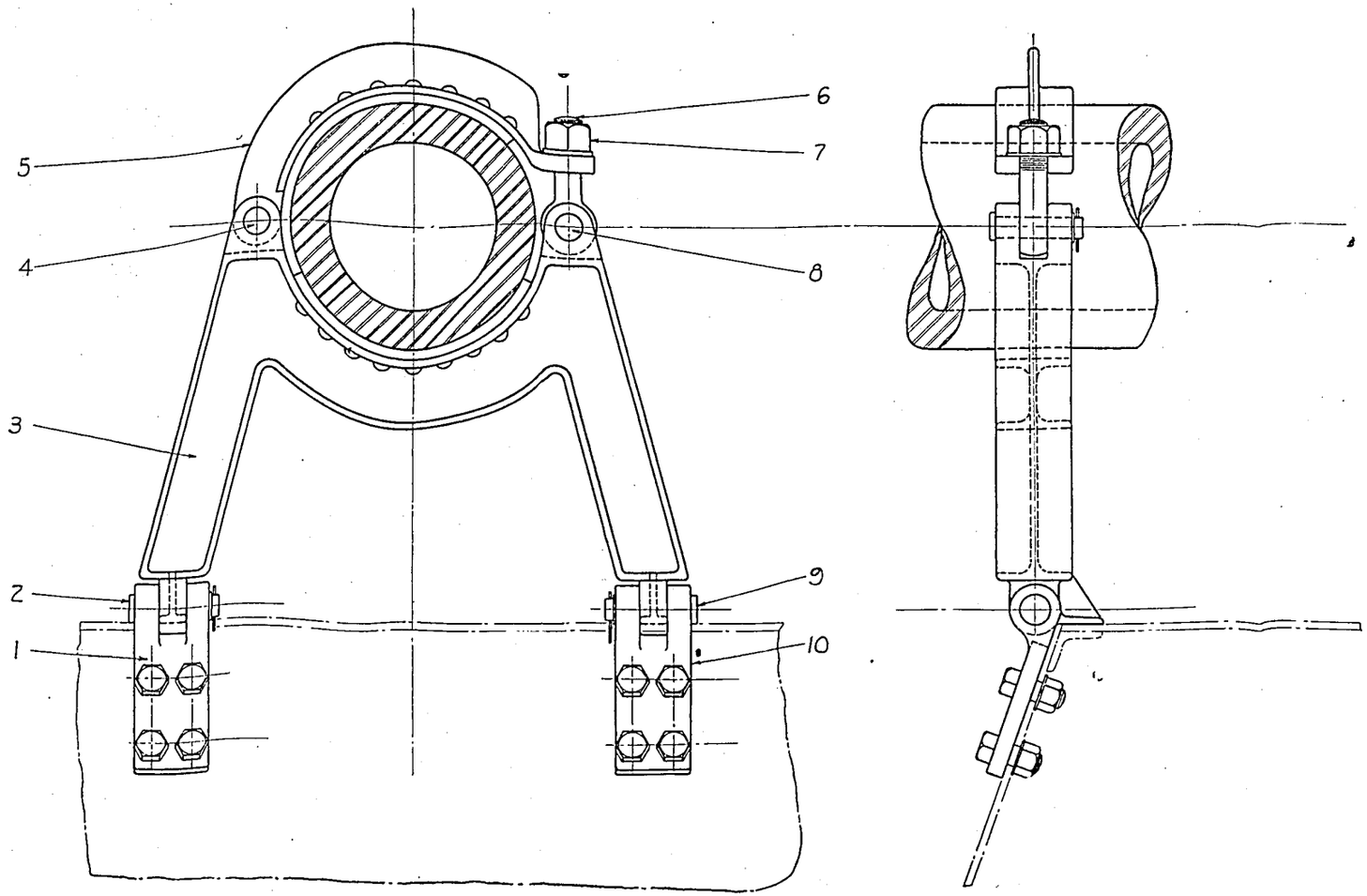
The drive wheels are mounted on ball bearings (9, 10) on drive wheel axles (7), which in turn are rigidly mounted in drive wheel brackets (11). The drive wheel brackets (11) are bolted to the side plates at the rear end of the mount.

The pinions (6) of the final drive shafts (6) mesh with the final drive gears (12), which are internal gears.

The drive wheel brackets (11) also form housings for the roller bearings which support the final drive shafts near their outer ends.

LUBRICATION OF THE WHEELS.

The wheel bearings are packed with grease when assembled. The grease should be renewed every 1,000 miles.



Traveling lock.

62198—22. (Face page 88.)

SPEEDOMETER.

The carriage is equipped with a standard speedometer, conveniently located so that the driver may note the speed and mileage of the vehicle.

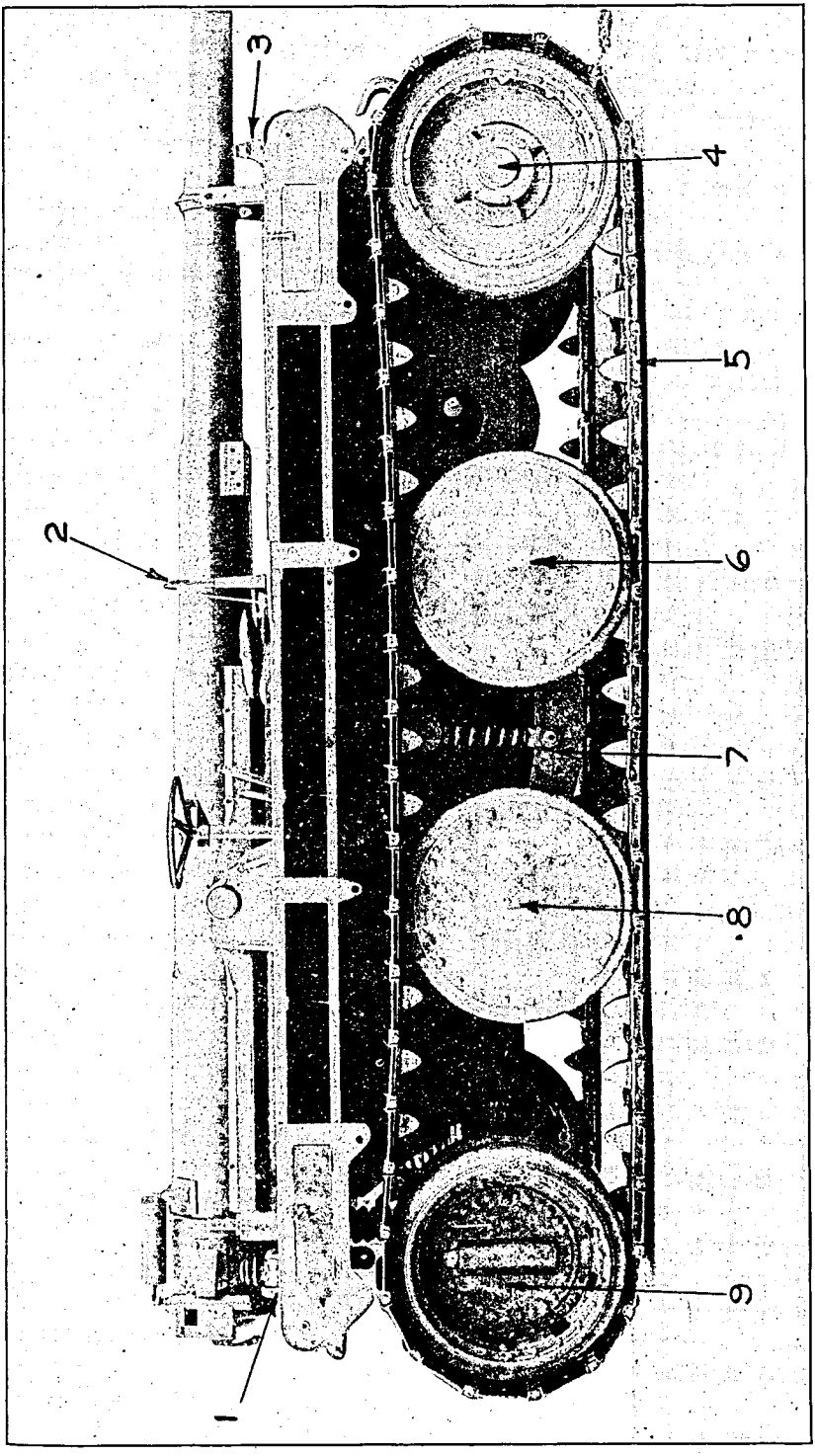
SIDE VIEW OF CARRIAGE, TRACK ASSEMBLED. (Plate 42.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	MC51A	Headlight.	6	.....	Center wheel assembly.
2	U733A	Hand-starter crank.	7	.....	Equalizer assembly.
3	MC15AB	Tail light.	8	.....	Center wheel assembly.
4	.....	Drive wheel assembly.	9	.....	Steering wheel assembly.
5	.....	Track assembly.			

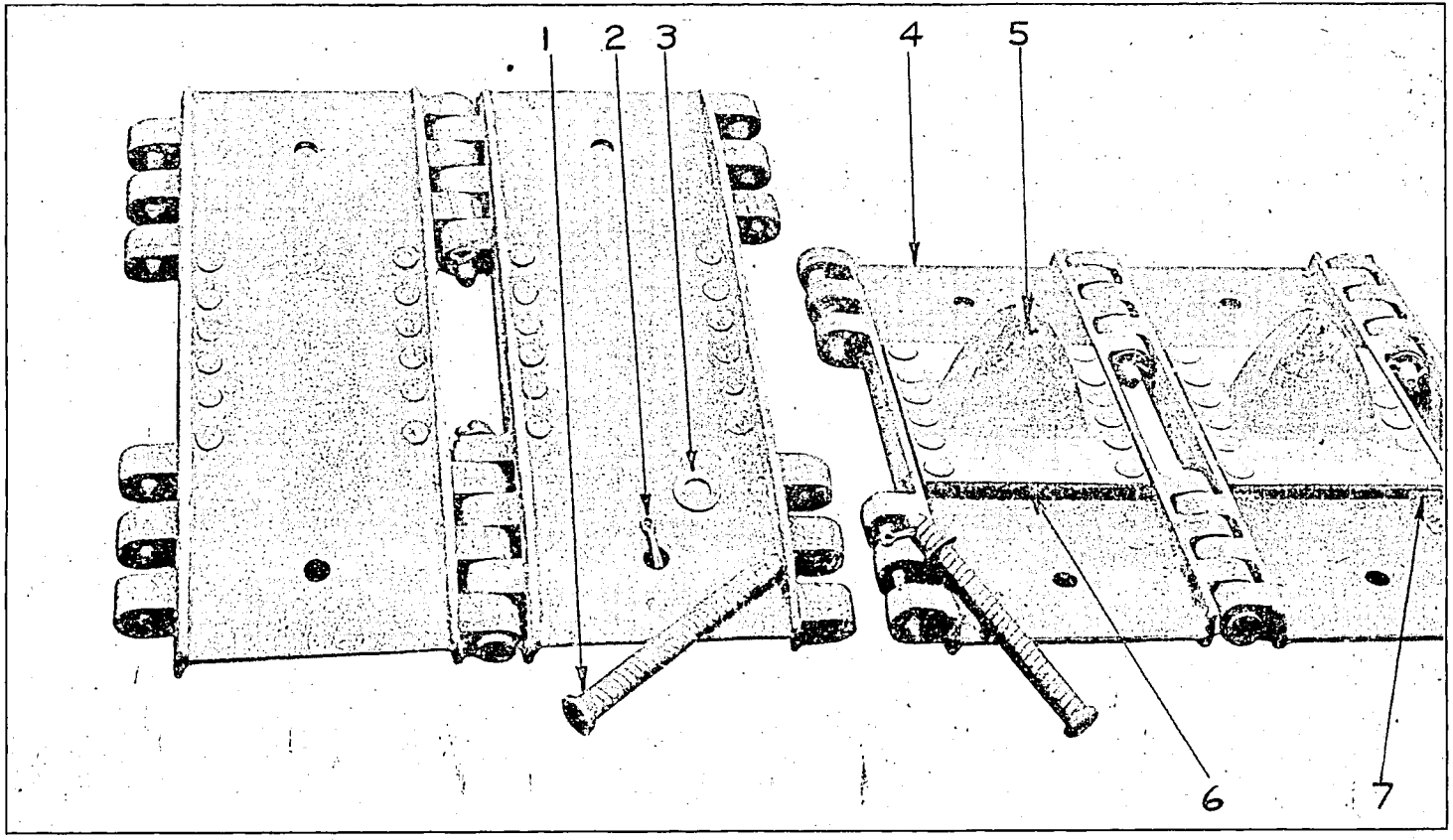
TRACK PARTS. (Plate 43.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	WK83E	Track pin.	5	WK83A	Track tooth.
2	.....	Split pin.	6	WK83D	Tooth spacer (wood).
3	WK83F	Washer.	7	WK83C	Tooth spacer (aluminum).
4	WK83B	Track link.			

Plate 42.



Side view of carriage, track assembled.



Track parts.

CHAPTER VI.

TRACK GROUP.

GENERAL DESCRIPTION.

(See Plate 42.)

Never travel muzzle forward for any distance or in fourth speed when operating on tracks.

The tracks are flexible endless steel chains composed of track links and pins. Each track consists of 46 links and 92 pins.

TRACK LINKS.

(See Plate 43.)

The track link (4) is of the built-up type, consisting of five parts—link (4), tooth (5), tooth spacer, wood (6), and two tooth spacers, aluminum (7)—all riveted together.

The links (4) have a projecting surface on the front and rear in contact with the ground, which gives a slight grouser action.

TRACK PINS.

(See Plate 43.)

The track pins (1) are made of hardened steel, one end is upset and the opposite end is drilled to receive a keeper pin (2). The pins join the hinges of the links (14) together and are prevented from working loose by the keeper pins (2) and the washers (3).

Grooves are cut in the pins which act as retainers for the track lubricant.

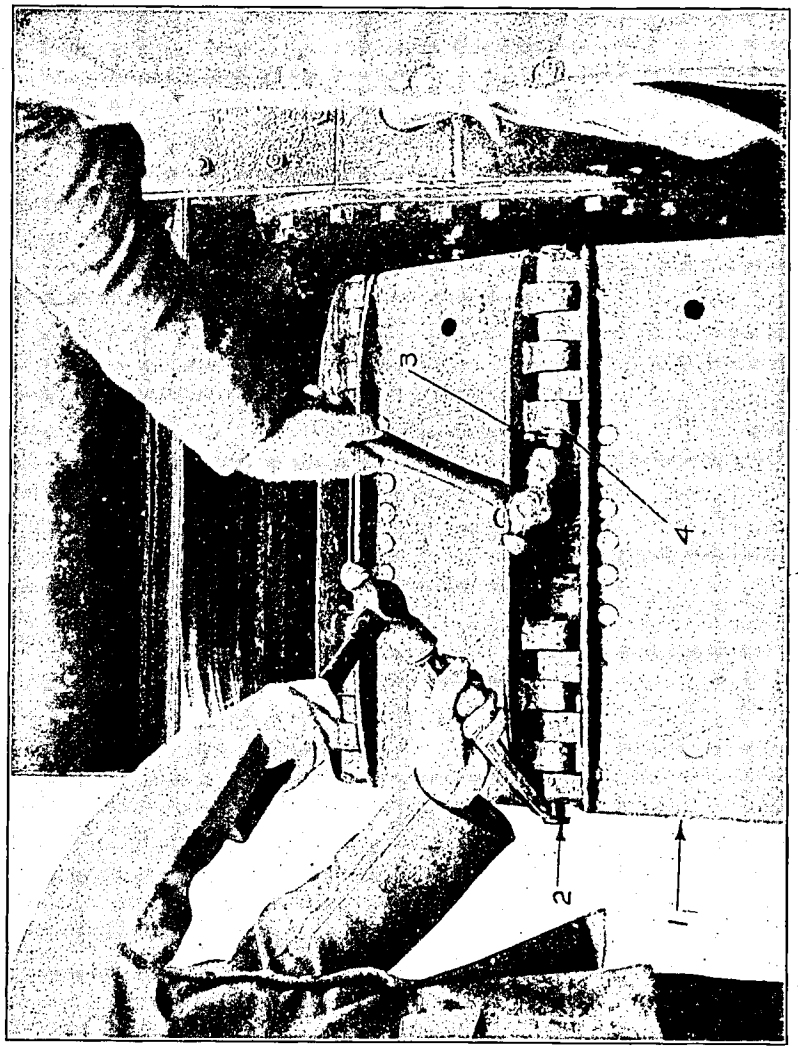
TRACK TENSION.

(See Plate 35.)

The method of mounting the steering wheels provides for the proper tension on the tracks at all times and also gives them a certain amount of resiliency when rough or uneven ground is traversed.

The steering wheels are mounted on swivel arms (1) which in turn are mounted in the steering wheel pivot brackets (18), which oscillate about the steering wheel axle (7). The outer ends of the steering wheel swivel arms (1) hold the steering wheels, while the inner ends bear against the track tension springs (19). By adjustment of the track tension spring nuts (20) proper tension is kept on the tracks, the compression of these springs gives a certain amount of resiliency. The track tension spring nuts (20) are operated by means of the ratchet wrench (5, Plate 47).

Plate 44.

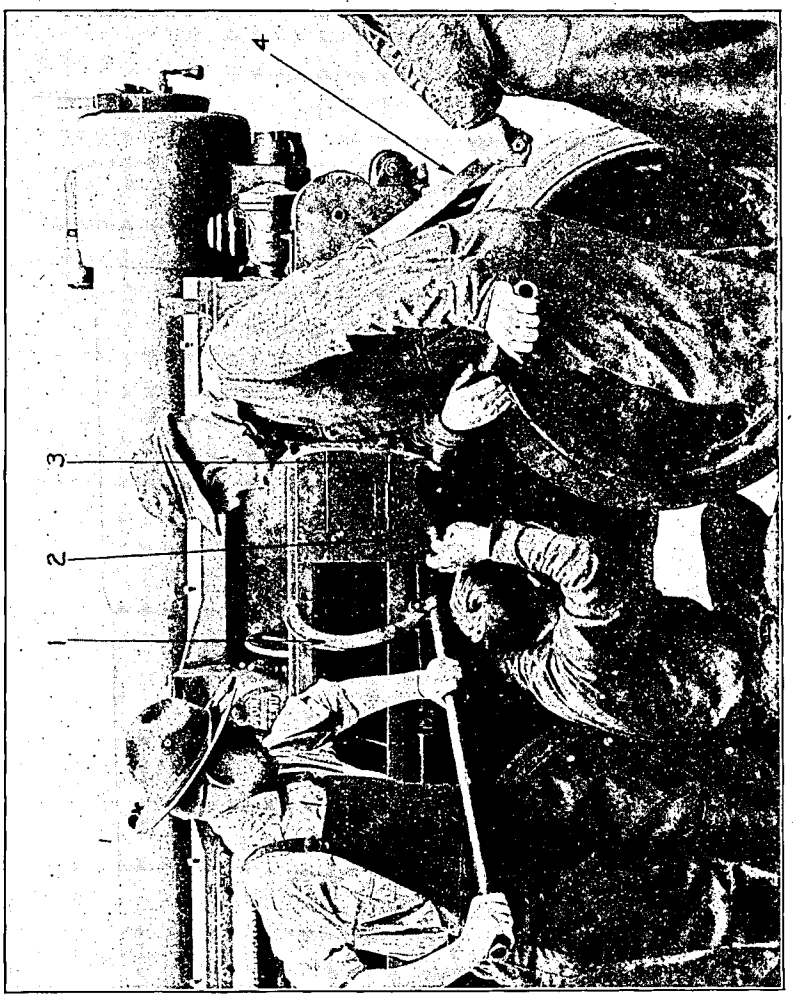


Method of cutting track.

METHOD OF CUTTING TRACK. (Plate 44.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	WK83B....	Track link.	3	.....	Split pin.
2	WK83E....	Track pin.	4	WK83F....	Washer.

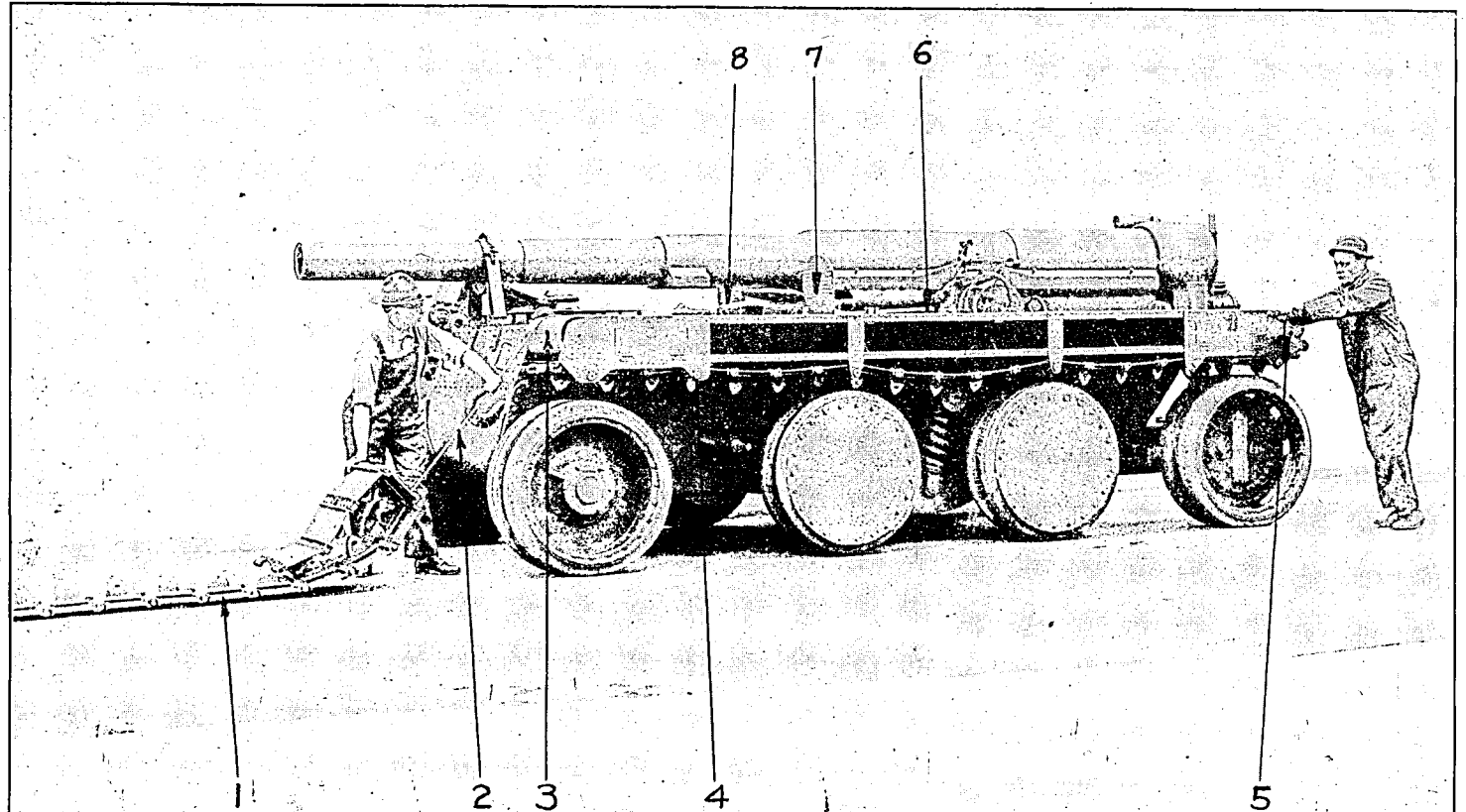
Plate 45.



Method of fastening track to underside of track platform.

METHOD OF FASTENING TRACK TO UNDERSIDE OF TRACK PLATFORM. (Plate 45.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	.....	Cant hook.	3	.....	Cant hook.
2	26C.....	Track support shaft.	4	U733A.....	Hand starter crank.



Method of placing track on top of track platform.

METHOD OF PLACING TRACK ON TOP OF TRACK PLATFORM. (Plate 46.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	.....	Track assembly.	6	.....	Ratchet wrench.
2	27D.....	Track cable.	7	.....	Seat assembly, right.
3	24E.....	Track platform drum.	8	.....	Seat assembly, left.
4	26C.....	Track support shaft.			
5	U733A.....	Hand starter crank (operates track winding gear).			

TRACK ADJUSTMENT.

(See Plates 44 and 47.)

When the tracks have been run for a length of time, the wear on the links and pins may have become so great that proper tension can not be obtained even when the limit of adjustment of the track tension springs has been reached. It is then necessary to remove a track link. This is accomplished in the following manner:

Back off the nuts holding the track tension springs by means of the ratchet wrench (5, Plate 47) until they are free. There will be enough slack in the track to permit the removal of a track link and allow the rejoining of the shortened track. (See Plates 44 and 47.) Then tighten up on the nuts until the proper tension on the track is obtained.

The track tension mechanism allows a movement of 5 inches before it is necessary to remove a track link. Both tracks should be kept under as near the same tension as possible.

TO REMOVE TRACKS.

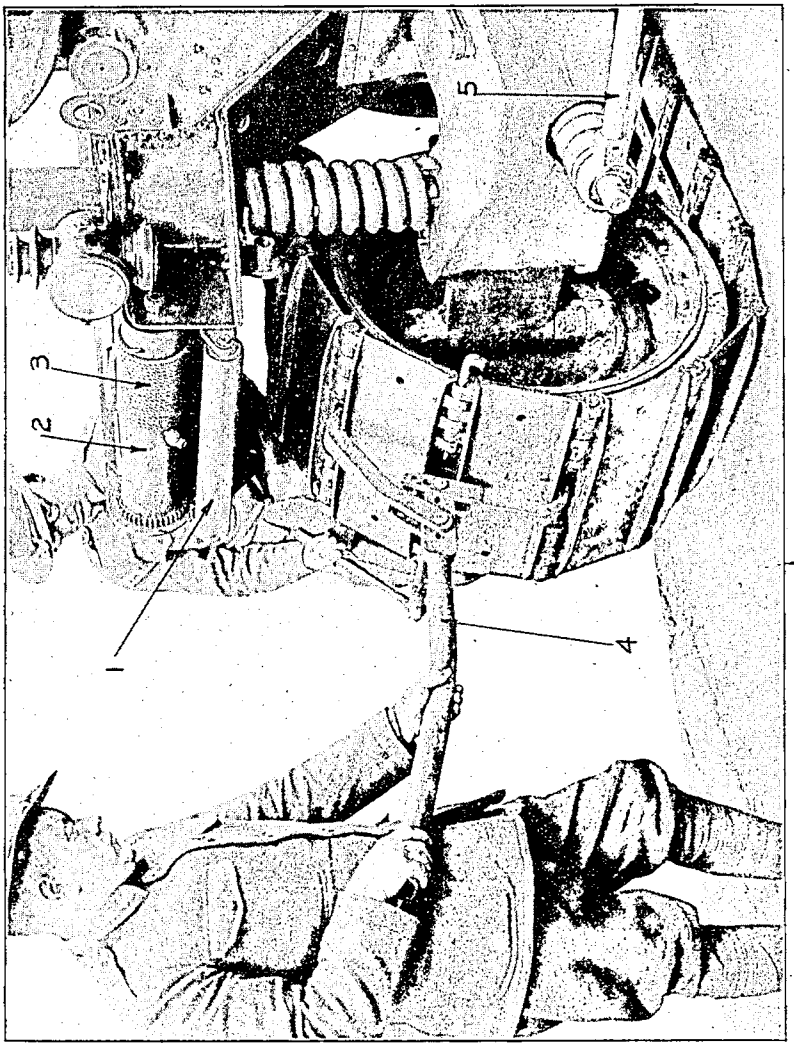
(See Plate 46.)

Slack off the nuts on the track tension spring bolts by means of the ratchet wrench (5, Plate 47). Cut tracks (see Plate 44) in two places in such a manner that sections of 19 links can be fastened to the underside of the track platforms with the track support shafts (4).

Raise the center wheels, by means of the ratchet wrench which operates the ratchet nuts (15, Plate 48) of the equalizer mechanisms, until they clear the ground.

Turn the swivel arm lever stops to the forward position. (See Plate 37.) Tighten up on the track tension springs (23, Plate 36) until they force the inner ends of the swivel arms (1, Plate 36) against the swivel arm stops (21, Plate 36).

Plate 47.



Method of assembling track.

METHOD OF ASSEMBLING TRACK. (Plate 47.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	28A.....	Track drum.	4	.....	Track tool.
2	24B.....	Track winding drum.	5	.....	Ratchet wrench.
3	27D.....	Track cable.			

Release the locking screw (13, Plate 35) in the steering handwheel (23, Plate 35) and run the vehicle clear off of the remaining track sections. By means of the track winding drum mechanisms located in the forward ends of the track platforms, the remaining sections of tracks are placed on top of the track platforms and are held in position by bolts which are assembled in the holes in the track links and the track platforms.

TO ATTACH TRACKS.

(See Plate 47.)

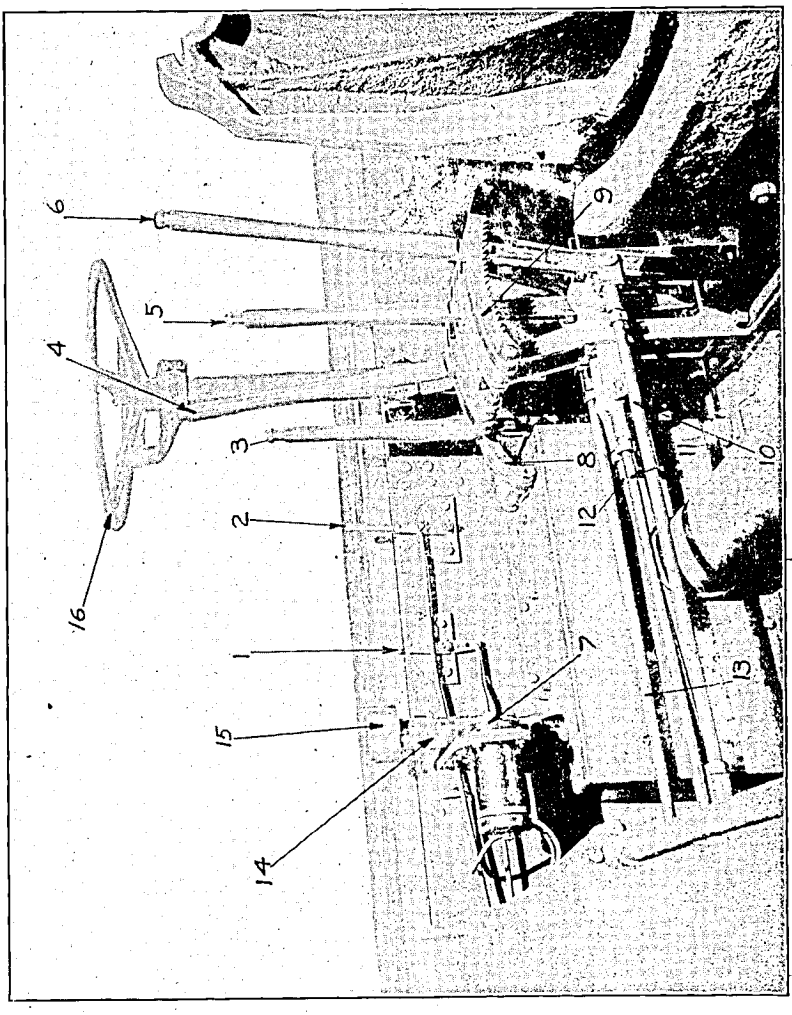
Remove the sections of the tracks from the top of the track platforms and place them on the ground in line with the wheels of the carriage. Run the carriage onto the tracks and then drop the remaining sections of the tracks from the underside of the track platforms onto the top of the wheels.

Slack off the nuts on the track tension bolts and move the swivel arm lever stops to the rear position (see Plate 38). With the track tool pull the ends of the tracks together and insert the track link bolts (see Plate 47).

Tighten up on the tension spring bolt nuts until the proper tension required on the tracks is obtained. Lower the center wheels until the cranks are vertical, using the ratchet wrench provided for this purpose.

Engage the locking screw (13, Plate 35) so that the handwheel (23, Plate 35) is held rigidly in position.

Plate 48.

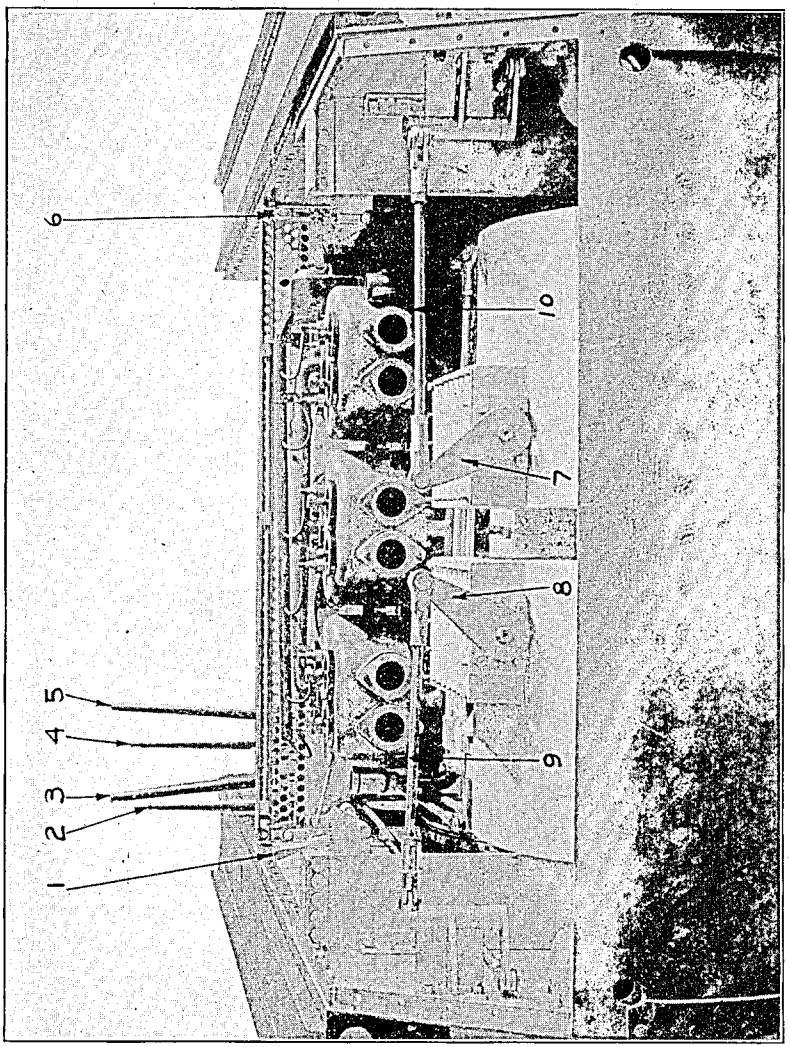


Left side view, showing controls.

LEFT SIDE VIEW, SHOWING CONTROLS. (Plate 48.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	HM6F.....	Spark control lever.	10	HM108L....	Clutch and brake control tie-rod.
2	HM6D.....	Throttle lever.	11	HM108P....	Gear shift tie-rod.
3	.....	Reversing lever.	12	HM108R....	Do.
4	.....	Clutch lever, left.	13	HM108M...	Clutch and brake control tie-rod.
5	.....	Gear shift lever.	14	FF160A....	Worm shaft.
6	.....	Clutch lever, right.	15	FF160D....	Ratchet nut.
7	AK115A....	Dual ignition coil and switch.	16	HM119A....	Steering handwheel.
8	.....	Reverse gear sector assembly.			
9	.....	Gear shift bracket assembly.			

Plate 49.



Rear view showing controls.

REAR VIEW SHOWING CONTROLS. (Plate 49.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	.....	Fan control assembly, left.	7	LM45K.....	Brake operating lever.
2	.....	Reversing lever.	8	LM45K.....	Do.
3	.....	Clutch lever, left.	9	HM108H....	Brake control tie-rod.
4	.....	Gear shift lever.	10	HM108G....	Do.
5	.....	Clutch lever, right.			
6	.....	Fan control assembly, right hand.			

CHAPTER VII.

CONTROL GROUP.

GENERAL DESCRIPTION.

(See Plate 48.)

The control system of the mount is somewhat different from the conventional truck or tractor control, due to the difference in the construction of the transmission. There is no master clutch, the two steering clutches serving to transmit the power from the engine to the transmission. The levers (4, 6) controlling the clutches also operate the brakes in such a manner that when the clutches are engaged the brakes are released and vice versa. There are no foot pedals in the control system. The spark control (1) and the throttle control (2) are hand levers and are located on the web plate near the driver's seat, the spark control lever (1) being nearest the driver's seat.

The gear shift lever (5) and the two brake and clutch control levers (4 and 6) are mounted in the same quadrant. The reverse lever (3) is mounted in a separate quadrant.

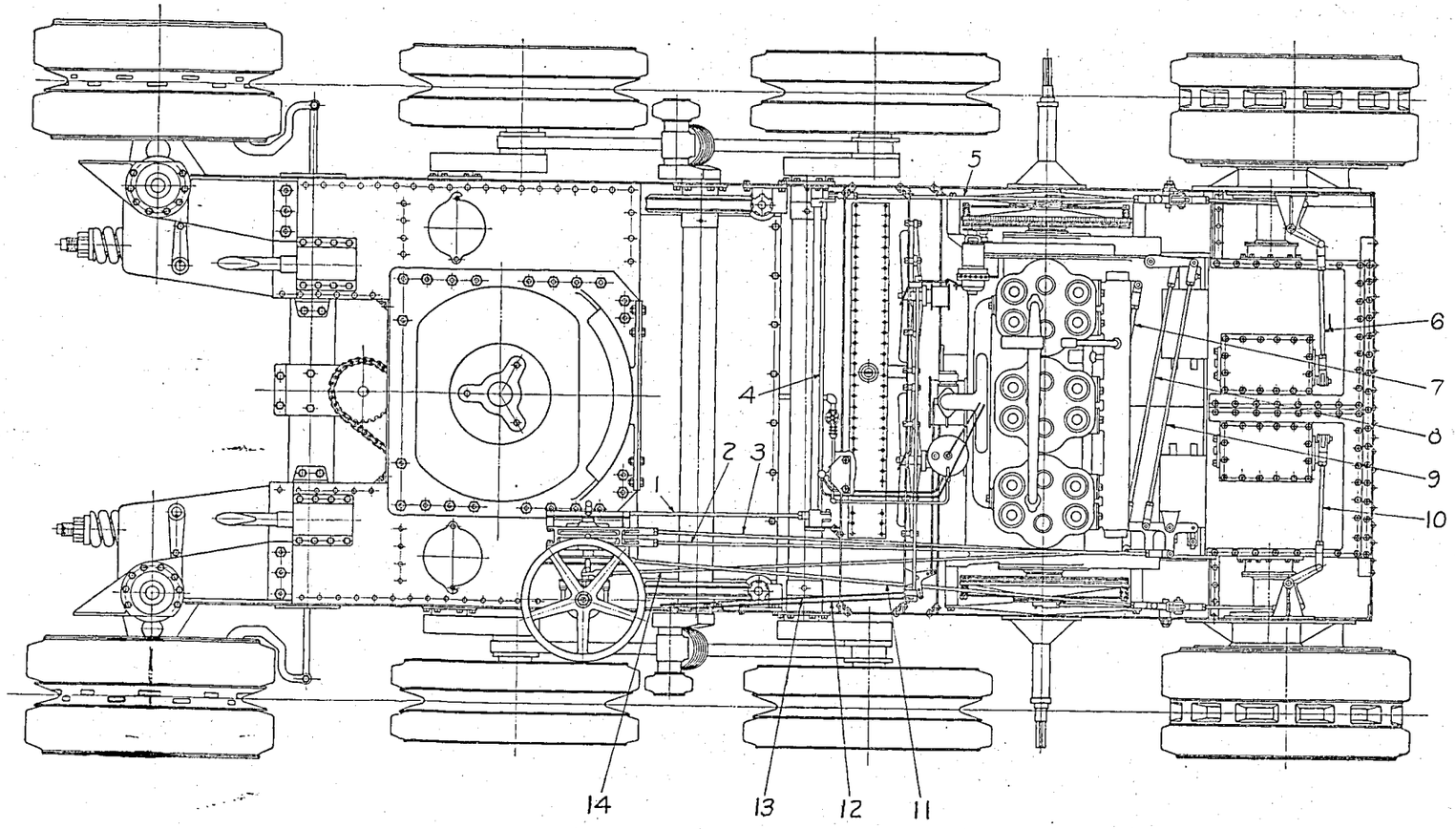
BRAKE AND CLUTCH CONTROL LEVERS.

(See Plate 48.)

One brake and clutch control lever (6) controls the right-hand section of the transmission, and the other (4) the left-hand section. Each is independent of the other in its action. When one of these levers is pushed forward it disengages the clutch and at the same time applies its corresponding brake on the brake drum located on the final-drive shaft.

When the vehicle is run with the tracks on these brake and clutch control levers (4, 6) are used for steering purposes. When both are used simultaneously the vehicle will travel either forward or backward, according to the position of the reverse lever (3). For turning, to the right, place right clutch and brake lever (6) in the forward position, thereby disengaging the clutch and applying the brake. Place left clutch and brake lever (4) in the rear position, thereby engaging the corresponding clutch and releasing the brake. This causes the vehicle to move in a circular path to the right.

For turning to the left, reverse the preceding operations.



62198—22. (Face page 103.)

Plan view showing controls.

PLAN VIEW SHOWING CONTROLS. (Plate 50.)

Reference No.	Part No.	Name of part.	Reference No.	Part No.	Name of part.
1	HM108L....	Clutch and brake control tie-rod.	8	AM220F....	First and second transmission tie-rod.
2	HM108R...	Gear shift tie-rod.	9	AM220F....	Third and fourth transmission tie-rod.
3	HM108P....	Gear shift tie-rod.	10	HM108H...	Brake control tie-rod.
4	HM120D...	Clutch and brake control shaft.	11	HM108M...	Clutch and brake control tie-rod.
5	HM108N...	Clutch and brake control tie-rod.	12	HM5E.....	Magneto control rod.
6	HM108G....	Brake control tie-rod.	13	HM4C.....	Carburetor control rod.
7	AM220E....	Reversing transmission tie-rod.	14	HM108K...	Reverse tie-rod.

When the vehicle is run without tracks, steering is accomplished through the steering handwheel (16) and steering gear as in the ordinary truck drive. When driving without the track both brake and clutch control levers (4, 6) must be used simultaneously, either in engaging or disengaging the clutches.

The brake and clutch control levers (4, 6) are each connected with their corresponding clutches and brake operating mechanisms by suitable rods and linkages. (See Plate 50.)

The quadrant (9) which holds the brake and clutch control levers also holds the gear shifting lever and is located on the floor plate of the mount near the driver's seat.

GEAR SHIFT LEVER.

(See Plate 48.)

The gear shift lever (5) is located between and in the same quadrant (9) as the brake and clutch control levers (4, 6). It has four positions in the quadrant, all of which are suitably marked.

In order to shift gears, it is first necessary to disengage both clutches. After shifting the gear shift lever (5) to the desired speed the clutches are again engaged.

REVERSE LEVER.

(See Plate 48.)

The reverse lever (3) is mounted in a reverse gear sector assembly (8) fastened to the web plate, almost in line with the quadrant (9) which holds the brake and clutch control, and gear shift levers. It has three positions, forward, neutral, and reverse, and is connected with the shifters of the sliding driving pinions on the main drive shafts by the necessary linkage.

The reverse lever must never be shifted until the clutches are disengaged.

THROTTLE CONTROL.

(See Plate 48.)

The throttle is operated by a hand-control lever (2), mounted on a quadrant located on the web plate near the driver's seat. Means are provided so that it can be held in any desired position. It is connected through linkage to the carburetor.

SPARK LEVER.

(See Plate 48.)

The spark lever (1) is a hand-control lever, mounted on a quadrant located on the web plate, to the rear of the throttle control quadrant. It is connected through linkage to the breaker box of the magneto.

CHAPTER VIII.

PINTLES.

GENERAL DESCRIPTION.

(See Plates 4 and 5.)

There are four pintle assemblies, two bolted to the web plates at the muzzle end (10, Plate 6) and two bolted to floor plate at the breech end of the mount (2, Plate 6).

The pintle assembly consists of the housing, pintle, spring, spacer, pintle nut, and taper pin.

The spacer is placed on the shaft of the pintle, the shaft is inserted in the opening provided in the housing and the spring and pintle nut assembled on the shaft of the pintle. The nut is held by a taper pin.

The spring bears against the housing and pintle nut. In operation, any sudden shock or load is transmitted through the pintle to the pintle nut and is taken up by the compression of the spring.

DISASSEMBLING THE PINTLE.

Remove the taper pin in the pintle nut. Back off the pintle nut and remove the spring, draw the pintle out from the housing. Remove housing by removing bolts holding it to the web or bottom plates.

LUBRICATION OF PINTLE.

The pintle housings are packed with cup grease when the pintles are assembled. This grease should be renewed as often as necessary.

CHAPTER IX.

GUN GROUP.

GENERAL DESCRITPION.

(See Plates 1 to 6, inclusive.)

WEIGHTS, DIMENSIONS, BALLISTICS, ETC., OF MOUNT.

Total length of gun to rear of breech ring	5,915 mm. (236 in.)
Length of bore in calibers	36.4
Number of grooves	48
Length of rifled portion	4,623 mm. (182 in.)
Twist, uniform, right hand, one turn in 2.989 calibers, inclination	6 degrees
Volume of chamber	21,992 c.c. (1,342 cu in.)
Weight of gun and breech	3,969 kg. (8,750 lb.)
Weight of recoil mechanism	1,418 kg. (3,125 lb.)
Weight of tipping parts, including gun	5,432 kg. (11,975 lb.)
Weight of projectile	42.9 kg. (95 lb.)
Weight of powder charge	11.5 kg. (25.25 lb.)
Total weight of one round	54.4 kg. (120 lb.)
Travel of projectile in gun	4,699 mm. (185 in.)
Maximum pressure	2,200 kg. sq. cm. (31,294 lbs. sq. in.)
Muzzle velocity	707.7 m. sec. (2,322 ft. sec.)
Muzzle energy	983,028 m. kg. (3,555 ft. tons.)
Maximum range	16,200 meters (17,717 yds.)
Maximum range (with wind shield)	17,500 meters (19,138 yds.)
Weight of gun mount, including bottom carriage	14,450 kg. (31,856 lb.)

DESCRIPTION OF THE MOUNT.

(See Plate 6.)

The 155-mm. gun mount, mounted on the 155-mm. Gun Motor Carriage, Model of 1920, is of the hydropneumatic variable recoil type. The gun-base plate (3) is secured to the chassis and upon its upper surface is mounted the top carriage (12), which in turn supports the cradle and gun (4). The gun and cradle, including the recoil mechanism, which constitute the tipping parts of the carriage, rest on the top carriage and are retained in place by means of the trunnion bearings. The tipping parts move in relation to the top carriage, when the gun is elevated or depressed.

The principal parts are the gun-base plate (3), top carriage (12), elevating mechanism, traversing mechanism, and cradle (including recoil mechanism), and the sighting equipment.

The gun is mounted in the cradle and is connected therewith by the recoil and recuperator piston rods, which are secured to a lug on the breech end of the gun. The gun is guided during recoil by longitudinal clips on the gun which slide through slots in the cradle.

The piece is controlled during recoil by the functioning of the various parts within the recoil and recuperator cylinders, which throughout the recoil movement absorb the shock of recoil and store up sufficient energy within the recuperator cylinders to return the piece to battery. The length of long recoil of gun in cradle is 1,800 millimeters (70.86 inches), and length of short recoil is 1,100 millimeters (43.3 inches).

DESCRIPTION OF 155-MM. GUN MODEL OF 1918 MI. (FILLOUX).

The gun is of the built-up construction type and consists of a tube strengthened by a breech ring, jacket, and four hoops, including a clip hoop. The breech ring is retained on the rear end of the tube and accommodates the breech mechanism. The gun is equipped with clips on each side which engage in corresponding slides in the cradle when the gun is in recoil or at rest.

The breech mechanism consists of the breechblock; the block carrier, including operating lever, hinge pin, and rack; the obturating mechanism; the firing mechanism; and the counterbalance.

The breechblock is of the interrupted screw type, having four plain sectors and four threaded sectors which can be locked in one-eighth of a turn. The rear end is threaded and screws into the block carrier. The block carrier rotates about a pin secured in the lugs on the right side of the breech ring.

The operating lever is retained in place by a pin in the lugs on the right side of the block carrier. The rack slides in the block carrier and its teeth mesh with the gear segment on the breechblock.

The obturating system consists of an obturator and a movable mushroom head. The obturator consists of a gas check pad held in a canvas cover and protected by split rings in the front and rear.

The pressure of the powder gases is transmitted through the movable mushroom shaped head of the obturator spindle to the obturator. When the gun is fired the pressure caused by the expansion of the powder gases is transmitted through the mushroom head to the gas check pad, causing it to expand and press against the inner walls of the powder chamber, thereby preventing the escape of the gases past the breechblock. After the projectile leaves the bore the pressure ceases on the mushroom head, thereby allowing the gas check pad to resume its former shape, permitting the obturator to be freely drawn from its seat when the breech is opened.

The gun, when elevated to 35 degrees, containing a propelling charge of 25 pounds, will fire a projectile weighing 95 pounds to a distance of approximately 16,200 meters (17,717 yards).

Additional information and complete description of the gun and instructions for the care, maintenance, lubrication, and inspection will be found in Ordnance Handbook No. 1818.

AMMUNITION.

Separate loading ammunition is used in the 155-mm. gun (Filloux) which is made up of either shrapnel or high explosive common steel shell. The types of projectile differ slightly in length, the shells being longer. Each shell is issued with the projectile filled, but unfuzed, with the fuze hole closed with a suitable plug. The weight of the projectile is 95 pounds. The total weight of each round is 120 pounds. The components of each round are the primer, the powder charge, projectile, and fuze. Complete descriptions, method of packing, and shipment of ammunition may be found in Ordnance Handbook No. 1818.

CRADLE (RECOIL AND RECUPERATOR MECHANISM).

The cradle is a machined steel forging provided with trunnions which are supported and pivot in the trunnion bearings of the top carriage. The cradle houses the recoil and recuperator mechanism through which the recoil and counter-recoil movement of the gun is controlled. Slots are provided in the cradle on its upper side to accommodate the gun clips, which guide the gun during recoil or counter-recoil. An elevating rack, secured to the cradle at the underside, controls the elevating of the cradle. The elevating rack meshes with the elevating worm in the top carriage. The initial pressure in the recuperator is 1,420 pounds per square inch and the maximum pressure (long recoil) is 2,219 pounds per square inch.

Further information and complete description of the cradle (recoil and counter-recoil mechanisms) also instructions for its care, maintenance, lubrication, and inspection will be found in Ordnance Handbook No. 1818.

TOP CARRIAGE.

(See Plate 6.)

The top carriage (12) is a steel casting mounted on the gun-base plate (3). On it are mounted the handwheels, together with the driving gears and shafting of the elevating and traversing mechanisms. The gun and cradle are supported and pivoted, through the cradle trunnions, in two bearings of the top carriage. The azimuth movement of the piece with one turn of the traversing handwheel is 43.2 minutes. The range movement of the piece with one turn of the elevating handwheel is 28.72 minutes.

The bottom face of the top carriage (12) is a large elliptical bearing surface which, when the gun is fired, bears upon the corresponding surface on the gun-base plate (3), thus transmitting the firing stresses and the shock of recoil through the bottom carriage to the caterpillar frame. In order to facilitate traversing of the top carriage the weight of the gun, tipping parts, and top carriage is borne on a small

spring-supported bearing and not on the bearing surfaces of the top and bottom carriages. A traverse of 7 degrees to the right and 6 degrees to the left, and a maximum range movement from 0 degree to 35 degrees are permitted.

Further information and complete description of the top carriage, also directions for its care, maintenance, lubrication, and inspection, will be found in Ordnance Handbook, No. 1818.

GUN-BASE PLATE.

(See Plate 6.)

The gun-base plate (3) is a steel casting bolted to the chassis of the carriage and is machined to accommodate the top carriage (12). The top carriage (12) is traversed on the gun-base plate (3) by a worm actuated by a handwheel and shaft on the top carriage, which engages a rack bolted to the front inner face of the gun-base plate. A projection on the gun-base plate above the rack serves as a clip in retaining the top carriage in position. A spring box, provided with a very small surface area, is located at the center of the gun-base plate, on which the top carriage rotates in azimuth when being traversed. In this way the full bearing surface of the gun-base plate is not engaged, thereby permitting easy movement of the top carriage on its bearings. The stresses, due to firing, tend to compress the springs and the full bearing surface is engaged, thereby transmitting the thrust to the gun-base plate and thence to the chassis.

The spring box at the central portion of the gun-base plate should be kept filled with graphite grease at all times. Bearing surface and rack to be cleaned and greased when occasion demands.

SIGHTS.

The following sight equipment is carried with the 155 mm. gun motor carriage, Model of 1920.

QUADRANT SIGHT.

The quadrant sight, Model of 1918 (Schneider), is mounted on the left trunnion of the mount when in action; when traveling it should be removed and carried in the sight chest. The principal features of the quadrant sight are the cross-leveling mechanism, the elevating mechanism, and the angle-of-site mechanism.

PANORAMIC SIGHT MODEL OF 1917.

The panoramic sight is a vertical telescope so fitted with an optical system of reflecting prisms and lenses that the gunner can bring into his field any point in a plane perpendicular to the axis of the telescope. The optical characteristics of the instrument are as follows: Power, 4; field of view, 10 degrees.

PEEP SIGHT.

The peep sight is an open sight consisting of a peep-sight support, cross wires, and an eyepiece or peep sight. The lower end of the support is shaped into a shank which fits into the socket in the top of the quadrant sight shank.

GUNNER'S QUADRANT.

The gunner's quadrant, model of 1918, is a vertical angle measuring instrument graduated in mils. The principal parts of the quadrant are the frame, index arm, sliding level, and index arm head. It is used on all kinds of guns and howitzers, either to give the elevation directly or to verify the angles obtained by the sights.

DIRECTIONS FOR READING PRESSURES.

TO ATTACH THE JACKSCREW TO THE RECUPERATOR.

See that the nut on the jackscrew is run up on the thread until it touches the head. Remove the cover from the counter-recoil cylinder located in the front of the recuperator. In its place screw up tight the nut of the jackscrew. Place ratchet wrench provided for this purpose on square end of the jackscrew. Screw down jackscrew until same comes in contact with counter-recoil piston head.

TO ATTACH THE PRESSURE GAUGE TO RECUPERATOR.

Remove the filling plug located at right-hand side of recuperator (rear). In its place screw up tight the central tube of gauge connection. See that the end of push rod is flush with end of central tube. See that all connections are drawn up tight to prevent leaks. Establish reading connection by screwing in the push rod, using wrench provided for this purpose.

TO MEASURE PRESSURE.

Move the counter-recoil piston to the rear by slowly turning the jackscrew. Give screw 10 turns, then read pressure. Give screw 5 turns more in same direction and then 5 turns in opposite direction, bringing piston back to the point of first reading. Read this pressure. The mean of the first and second readings will be the air pressure. Tap face of gauge gently with the finger at each reading to make sure gauge is not sticking.

When reading pressure the recuperator should be kept as nearly as possible at a constant temperature.

CHAPTER X.

EQUIPMENT.

EQUIPMENT FOR 155-MM. GUN MOTOR CARRIAGE, MODEL OF 1920.

Name of part.	Number per mount.	Piece mark.	Drawing number.	Where carried.
Axe	1	U51D1	15-5-51	In right track platform assemb.
Block, 5-ton, Yale and Towne Triplex.	(*)		Commercial	*Where convenient 2 per battery.
Box, motor vehicle tool, model of 1918, containing tools and accessories as follows:	1		76-15-75	In frame attached to side plate and floor plate, forward right side of mount.
1 breaker, magneto, assembled				
1 book, "Audel's Auto Guide"				
2 batteries, extra, for flashlight, tungsten, American Eveready Co., No. 793.			14-4-7	
1 bulb, extra, for flashlight, Mazda, American Eveready Co., No. 1197.				
1 chain, towing, 15 feet long			15-21-12	
1 chisel, cold, 0.5 by 6				
1 chisel, cold, 0.75 by 8		U127B	15-5-127	
1 chisel, cold, 0.375 by 6				
1 chisel, cold, 0.375 by 6, diamond point.				
1 cover, canvas for Ordnance Handbook.			38-9-17	
1 cover, canvas for Audel's Auto Guide.			38-9-11	
1 drift, copper, 0.375 by 4				
1 drift, copper, 0.625 by 6				
1 drift, solid, 0.187 (3/16) point, 5.6		U111G	15-5-111	
1 file, flat bastard, double cut, 10		U69U	15-5-69	
1 file, half-round bastard, 10				
1 file, square bastard, 0.312 (5/16), double cut, 10.				
1 file, 3/8 round bastard, 10				
1 file, 3 cornered, 0.625 taper, single cut, second cut.			15-5-174	
2 files, magneto, Disstons				
1 flashlight, American Eveready, No. 1991, with rubber hood.			14-4-17	
1 gauge, thickness, or feeler, Starrett .No. 72.				
1 gun, grease and oil, with 2 nozzles			15-5-404	
12 gaskets, spark plug				
1 hammer, ball pein, 12 oz., standard handle, Maydole or equal.				
1 hammer, ball pein, 24 oz., standard handle, Maydole or equal.				
1 hammer, soft babbitt		U180C	15-5-180	
2 oilers, dome type		U46J	15-5-46	
1 puller and spreader, cotter pin, 0.375 by 6.5, Bay State.				
1 box, pins, cotter, assorted				
1 pliers, pair, 8, combination gas				
1 pliers, pair, 6, round nose				
1 pliers, pair, 8, wire cutting		U234A	15-5-234	
1 pinchbar, 27		U384A	15-5-384	
1 punch, center 4.5 long, Bay State				
4 plugs, spark				
1 rule, folding, steel, 12 long, Starrett No. 450 M. & E.				
2 shackles, standard, round pin, drop-forged steel, anchor style, size 0.625 H. Channon Co. No. 213.				
1 scrapers, carbon, set of 3				
1 screwdriver, 3-in. blade		U100E	15-5-100	
1 screwdriver, all steel, 9, Channon.				
1 screwdriver, offset, 6 in., straight handle, Channon.				

EQUIPMENT FOR 155-MM. GUN MOTOR CARRIAGE, MODEL OF 1920—Continued.

Name of part.	Number per mount.	Piece mark.	Drawing number.	Where carried.
Box, motor vehicle tool, etc.—Con.				
1 sledge, model of 1907			15-5-53	
2 rolls tape, friction, 0.75, 0.5 pound.				
1 wrench, monkey, 6 long, steel handle Trimo.			Commercial.	
1 wrench, monkey, 15 long, steel handle Trimo.			Commercial.	
1 wrench, pipe, 6 steel handle Trimo.			Commercial.	
1 wrench, pipe, 10 steel handle Trimo.			Commercial.	
1 wrench, adjustable S 6 Wescott pattern.			Commercial.	
1 wrench, adjustable S 10 Wescott pattern.			Commercial.	
1 wrench, double end, 0.312 (5/16) and 0.375 milled openings, Williams No. 721, semifinished.				
2 wrenches, double end, 0.406 (13/32) and 0.5 milled openings, Williams No. 23, semifinished.				
2 wrenches, double end, 0.437 (7/16) and 0.562 (9/16) milled openings, Williams No. 72, 5A, semifinished.				
2 wrenches, double end, 0.593 (19/32) and 0.687 (11/16) milled openings, Williams No. 27, semifinished.				
1 wrench, double end, 0.625 and 0.75 milled openings, Williams No. 729, semifinished.				
1 wrench, double end, 0.812 (13/16) and 0.875 milled openings, Williams No. 731-B, semifinished.				
1 wrench, double end, 0.781 (25/32) and 0.968 (31/32) milled openings, Williams No. 32 semifinished.				
1 wrench, double end, 0.937 (15/16) and 1-inch milled openings, Williams No. 330 semifinished.				
1 wrench, double end, 1.125 and 1.25 milled openings, Williams No. 737 semifinished.				
1 wrench, double end, 1.062 (1 1/16) and 1.437 (1 7/16) milled openings, Williams No. 38 semifinished.				
1 pound waste, white cotton				
1 spool wire, copper, No. 16 B B. & S.				
1 spool wire, soft steel, No. 16 B. & S.				
10 washers, lock S. A. E. heavy, 0.25.		Q18LA	30-2-18	
10 washers, lock S. A. E. heavy, 0.312 (5/16).		Q18MA	30-2-18	
10 washers, lock S. A. E. heavy, 0.375.		Q18Na	30-2-18	
10 washers, lock S. A. E. heavy, 0.437 (7/16).		Q18PA	30-2-18	
10 washers, lock S. A. E. heavy, 0.5.		Q18QA	30-2-18	
10 washers, lock S. A. E. heavy, 0.562 (9/16).		Q18RA	30-2-18	
10 washers, lock S. A. E. heavy, 0.625.		Q18SA	30-2-18	
Buckets	2		15-5-50	In bracket attached to chassis.
Can, safety, 1-gallon	1	MC8B	15-21-8	In lantern bracket attached to seat.
Clevis, complete with pin and cotter pin.	1	AB56A	15-2KA-56	In tool box in end of track platform assembly.
Crowbar	1	U56C	15-5-56	In fastenings within platform assembly.
Cushion, back seat	2	U785C	15-5-785	Attached to back of seat.
Cushion, seat, right	1	U785A	15-5-785	Located on seat.
Cushiou, seat, left	1	U785B	15-5-785	Do.

EQUIPMENT FOR 155-MM. GUN MOTOR CARRIAGE, MODEL OF 1920—Continued.

Name of part.	Number per mount.	Piece mark.	Drawing number.	Where carried.
Extinguisher, fire, complete with bracket, Fyr-Fyter, Pyrene, or equal.	1	MC8A...	15-21-8.....	In bracket attached to chassis.
Hatchet	1	U51B...	15-5-51.....	In fastenings within platform assembly.
Jack, 15-ton hydraulic	*	.....	.....	*Where convenient, 2 per battery.
Lantern	1	.....	15-5-8.....	In bracket attached to rear of observer's seat.
Lamp, front	2	MC51A..	15-21-51....	In brackets attached to chassis.
Lamp, tail	1	MC15AB	15-21-15....	Do.
Pick mattock	1	U52C....	15-5-52.....	In fastenings within platform assembly.
Oiler, railroad, 1-quart	1	MC109C.	15-21-109....	In tool box in end of platform assembly.
Pad, lantern bracket	1	U106A ..	15-5-106.....	In lantern bracket.
Paulin, 12 feet by 12 feet	1	.....	38-7-16.....	Where convenient.
Rope, soft, 1 1/2 inches diameter, manila.	1	.....	Commercial.	Do.
Shovel, short handled	1	U51C....	15-5-51.....	In fastenings within platform assembly.
Spanner, wheel nut	1	U740A ..	15-5-740....	In tool box in end of platform assembly.
Spanner, equalizer bearing nut	1	U740B ..	15-5-740....	Do.
Spanner, water-pump gland nut	1	U740C...	15-5-740....	Do.
Strap, 15 long, style AV, 7 holes (shovel).	1	.....	15-21-7.....	In strap fasteners.
Strap, 15 long, style AVS, 7 holes (pick mattock).	1	.....	15-21-7.....	Do.
Strap, 22.75 long, style AV, 7 holes (water bucket).	1	.....	15-21-7.....	Do.
Strap, lantern	1	U8D....	15-5-8.....	Do.
Strap, paulin, style ATK, 6 holes, 70 long.	1	.....	15-21-7.....	Do.
Hand starter crank	1	.....	15-5-733....	Fits on lug attached to top of engine cover.
Ratchet wrench	2	.....	15-5-734....	Carried on ratchet nuts of the equalizers.
Track tool	1	.....	15-5-737....	In fastenings within platform assembly.
Cant hooks	2	.....	15-5-739....	In fastenings on chassis.
Chock blocks	2	.....	15-5-741....	Where convenient.

CHAPTER XI.

NOMENCLATURE.

The pages following set forth the name, drawing number, and piece mark of the necessary parts for one complete 155-MM. gun motor carriage, model of 1920.

NOMENCLATURE INDEX.

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The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
MOTOR.			
2-bearing, cam shaft, right end	2	31-OD-106	AK106C
2-bearing cam shaft, left end	2	31-OD-106	AK106D
4-bearing, cam shaft, center	4	31-OD-109	AK109F
1-screw, c'sunk, .375 x .875	4	31-OD-109	AK109G
1-bracket, magneto	1	31-OD-117	AK117A
4-bolt, .375 x .875	4	31-OD-117	AK117B
2-nut, S. A. E., .5	2	31-OD-117	.....
2-stud, S. A. E., .5 x 1.375	2	31-OD-117	KM91B
4-washer, lock, .375	4	31-OD-117	.....
2-washer, lock, .5	2	31-OD-117	.....
4-breather, crank case	4	31-OD-116	AK116F
1-cap, breather	4	31-OD-116	AK116L
2-elbow, pipe, .75 std. 45°	8	31-OD-116	AK116G
2-pipe, .75 std. x 2	8	31-OD-116	AK116H
1-pipe, .75 std. x 3.75	4	31-OD-116	AK116K
1 cam shaft, exhaust	1	31-OD-106	AK106A
1 cam shaft, inlet	1	31-OD-106	AK106B
1 carburetor	1	31-OD-113	AK113A
1 connection, carburetor	1	31-OD-116	AK116A
2-bolt, .437 ($\frac{7}{16}$) x 1	2	31-OD-116	AK116C
3-nut, .437 ($\frac{7}{16}$) S. A. E.	3	31-OD-116	.....
3-stud, S. A. E., .437 ($\frac{7}{16}$) x 1.5	3	31-OD-116	AK116B
5-washer, lock, .437 ($\frac{7}{16}$)	5	31-OD-116	.....
1 crank shaft, complete	.....	31-OD-87	.....
1-bearing, crank shaft extension, ball	1	31-OD-87	AK87C
1-bearing, crank shaft, ball	1	31-OD-87	AK87D
2-bearing, crank shaft, ball	2	31-OD-109	AK109E
2-bushing, crank shaft	2	31-OD-109	AK109D
2-clamp, bearing	2	31-OD-109	AK109B
2-bolt, S. A. E., .437 ($\frac{7}{16}$) x 1.625	4	31-OD-109	AK109C
2-nut, S. A. E., Castle, .437 ($\frac{7}{16}$)	4	31-OD-109	.....
1-crank shaft	1	31-OD-87	AK87B
1-extension, crank shaft	1	31-OD-87	AK87A
1-pin, taper, #10 x 5.5	1	31-OD-87	FF160F

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
MOTOR—continued.			
6-cup, priming	6	31-OD-110	AK110E
12-cup, valve spring	12	31-OD-112	AK112E
3-cylinder block	3	31-OD-104	AK104A
6-nut, S. A. E., .625	18	31-OD-104	
2-plug, pipe, .5	6	31-OD-104	AK104B
4-plug, pipe, .75	12	31-OD-104	AK104C
2-plug, pipe, 1	6	31-OD-104	AK104D
6-stud, S. A. E., .625 x 2.5	18	31-OD-104	AK104E
6-washer, lock, .625	18	31-OD-104	
3-gasket, cylinder	3	31-OD-110	AK110A
6-gasket, exhaust	6	31-OD-110	AK110D
6-gasket, water manifold	6	31-OD-110	AK110C
12-gasket, valve plug	12	31-OD-118	AK118C
2-gear, cam shaft	2	31-OD-109	AK109A
1-key, .25 x 1.375 sq	2	31-OD-109	HM119G
1-pin, taper, #4 x 2	2	31-OD-109	AM221E
12-guide, valve tappet	12	31-OD-111	AK111A
2-nut, S. A. E., .375	24	31-OD-111	
2-stud, S. A. E., .375 x 1.25	24	31-OD-111	AK111B
2-washer, lock, .375	24	31-OD-111	
12-guide, valve	12	31-OD-112	AK112A
1-hot stove, carburetor	1	31-OD-124	AK124A
1-strap, hot stove	1	31-OD-124	AK124B
1-bolt, .187 ($\frac{3}{16}$) x 1.5	1	31-OD-124	AK124C
1-nut, .187 ($\frac{3}{16}$)	1	31-OD-124	
12-key, valve cup	12	31-OD-112	AK112D
12-lock nut	12	31-OD-111	AK111F
1-magneto	1	31-OD-115	AK115A
1-manifold, water outlet	1	31-OD-118	AK118A
6-nut, S. A. E., .437 ($\frac{7}{16}$)	6	31-OD-118	
6-stud, S. A E., .437 ($\frac{7}{16}$) x1.5	6	31-OD-118	AK116B
6-washer, lock, .437 ($\frac{7}{16}$)	6	31-OD-118	
1 -manifold, water inlet	1	31-OD-118	AK118B
6-nut, S. A. E., .437 ($\frac{7}{16}$)	6	31-OD-118	
6-stud, S. A. E., .437 ($\frac{7}{16}$) x 1.5	6	31-OD-118	AK116B
6-washer, lock, .437 ($\frac{7}{16}$)	6	31-OD-118	
1-manifold, intake	1	31-OD-116	AK116D
6-nut, S. A. E., .437($\frac{7}{16}$)	6	31-OD-116	
6-stud, S. A. E., .437 ($\frac{7}{16}$) x 1.5	6	31-OD-116	AK116B
6-washer, lock, .437 ($\frac{7}{16}$)	6	31-OD-116	
2-nut, cam shaft	2	31-OD-106	AK106E
12-pin, roller	12	31-OD-111	AK111D
6-piston, complete		31-OD-108	
1-pin, wrist	6	31-OD-108	AK108E
1-piston	6	31-OD-108	AK108D
3-ring piston (upper)	18	31-OD-108	AK108A
2-ring, piston (lower)	12	31-OD-108	AK108B
1-screw, wrist pin	6	31-OD-107	AK107B
6-plug, exhaust valve	6	31-OD-108	AK108C
6-plug, intake valve	6	31-OD-108	AK108F
6-plug, spark	6	31-OD-110	AK110B
6-plug, spark series	6	31-OD-110	AK110F
1-rachet, crank shaft	1	31-OD-83	AK83C
1-rachet, crank shaft	1	31-OD-83	AK83D
6-rod, connecting, complete		31-OD-107	
2-nut, connecting rod	12	31-OD-107	AK107C
1-pin, split, .093 ($\frac{3}{32}$) x 1	12	31-OD-107	
1-rod, connecting	6	31-OD-107	AK107D
1-bushing	6	31-OD-107	AK107E
2-bushing, half	12	31-OD-107	AK107F
4-pin, .25 x .75	24	31-OD-107	AK107G
4-pin, .25 x .5	24	31-OD-107	AK107H
2-stud, connecting rod	12	31-OD-107	AK107A
12-roller, cam	12	31-OD-111	AK111C
12-screw, valve tappet	12	31-OD-111	AK111E
12-spring, valve	12	31-OD-112	AK112B
1-sprocket, pump drive shaft	1	31-OD-114	AK114A
1-key, .25 x 1.125 sq	1	31-OD-114	AK114H
1-pin, taper #4 x 2	1	31-OD-114	AM221E
1-roller chain	1	31-OD-114	AK114B
1-sprocket, magneto shaft	1	31-OD-114	AK114D
1-key, Woodruff # 5	1	31-OD-114	AK114E
12-tappet, valve	12	31-OD-111	AK111G
12-valve	12	31-OD-112	AK112C

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
FUEL SYSTEM.			
1-fuel line, manifold to vacuum tank (complete)	.....	31-OS-52	.....
2-ell, flared tube, brass	2	31-OS-51	WM51A
1-tube, flared, copper .25	1	31-OS-51	WM51H
2-union, flared tube, brass	2	31-OS-51	WM51C
1-fuel line, supply to vacuum tank (complete)	.....	31-OS-52	.....
1-bushing, pipe, brass .375 x .25	1	31-OS-51	WM51Q
2-conduit, fuel, fiber	1	31-OS-51	WM51N
1-elbow, pipe, brass .375 std	1	31-OS-50	WM50C
1-ell, flared tuber, brass	1	31-OS-51	WM51B
1-pipe, fuel, brass .375 std. x 1.5	1	31-OS-50	WM50G
1-pipe, fuel, brass .375 std. x 7.5	1	31-OS-50	WM50S
1-tube, flared, copper .312($\frac{5}{16}$)	1	31-OS-51	WM51L
2-union, flared tube, brass	2	31-OS-51	WM51D
1-union, flared tube, brass	1	31-OS-51	WM51E
1-valve, globe, bronze .375 std	1	31-OS-50	WM50A
1-fuel line, vacuum tank to carburetor (complete)	.....	31-OS-52	.....
1-tee, reducing, pipe .25 x .25 x .125	1	31-OS-99	WM99D
1-tube, flared, copper .312($\frac{5}{16}$)	1	31-OS-51	WM51K
2-union, flared tube, brass	2	31-OS-51	WM51D
2-union, flared tube, brass	2	31-OS-51	WM51E
1-pump, priming, complete	.....	31-OS-99	.....
2-clamp, priming pump	2	31-OS-99	WM99M
1-bolt, .125 x 1	1	31-OS-99	WM99L
1-nut, .125	1	31-OS-99	.....
1-cock, priming line stop, .187($\frac{3}{16}$)	1	31-OS-99	WM99F
1-conduit, fuel, fiber	1	31-OS-51	WM51N
1-coupling, .125 pipe x .187($\frac{3}{16}$)	1	31-OS-99	WM99C
1-elbow, priming line, .125 pipe x .187 ($\frac{3}{16}$)	1	31-OS-99	WM99B
1-holder, priming pump bracket	1	31-OS-99	WM99K
4-bolt, .125 x 1	4	31-OS-99	WM99L
4-nut, .125	4	31-OS-99	.....
1-pump, priming	1	31-OS-99	WM99A
1-tee, priming line, .187 ($\frac{3}{16}$)	1	31-OS-99	WM99N
1-tubing, priming line, copper .187 ($\frac{3}{16}$)	1	31-OS-99	WM99G
1-tubing, priming line, copper .187 ($\frac{3}{16}$)	1	31-OS-99	WM99E
4-union, brass, .187 ($\frac{3}{16}$)	4	31-OS-99	WM99H
1-tank, gasoline	1	31-OS-47	WM47A
1-cap, filler	1	31-OS-47	WM47B
1-gasket	1	31-OS-47	WM47D
1-inlet, gasoline	1	31-OS-47	WM47C
8-nut, #8-32	8	31-OS-47	.....
8-screw, #8-32 x .375	8	31-OS-47	WM47G
1-outlet, gasoline	1	31-OS-47	WM47E
1-strainer, #70 wire gauze	1	31-OS-47	WM47F
1-tank, vacuum	1	31-OS-45	WM45A
1-bracket, vacuum tank	1	31-OS-45	WM45C
2-bolt, c'sunk .5 x 1.5	2	31-OS-45	WM45D
2-nut, .5	2	31-OS-45	.....
2-washer, lock, .5	2	31-OS-45	.....
1-strap, vacuum tank	1	31-OS-45	WM45B
2-nut, S. A. E., .375	2	31-OS-45	.....
2-washer, lock, .375	2	31-OS-45	.....
IGNITION.			
1-box, battery	1	31-OD-123	AK123B
2-bolt, S. A. E., .5 x 1.5	2	31-OD-123	HM115L
1-lining, rubber	1	31-OD-123	AK123C
2-nut, S. A. E., .5	2	31-OD-123	.....
8-rivet, button head, .125 x .375	8	31-OD-123	.....
2-washer, lock, .5	2	31-OD-123	.....
1-bracket, coil	1	31-OD-115	AK115C
2-bolt, S. A. E., .437 ($\frac{7}{16}$) x 1.25	2	31-OD-115	AK115E
2-nut, S. A. E., .437 ($\frac{7}{16}$)	2	31-OD-115	.....
4-nut, #10 (.190)-24	4	31-OD-115	.....
4-screw, #10 (.190)-24 x .75	4	31-OD-115	AK115D
2-washer, lock, .437 ($\frac{7}{16}$)	2	31-OD-115	.....
1- cable, high tension ignition	1	31-OD-117	AK117E
2-loop, terminal	2	31-OD-117	AK117C
1-cable, high tension ignition	1	31-OD-117	AK117F
2-loop, terminal	2	31-OD-117	AK117C
1-cable, high tension ignition	1	31-OD-117	AK117G
2-loop, terminal	2	31-OD-117	AK117C
1-cable, high tension ignition	1	31-OD-117	AK117D
2-loop, terminal	2	31-OD-117	AK117C
1-cable, high tension ignition	1	31-OD-117	AK117K
2-loop, terminal	2	31-OD-117	AK117C

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
IGNITION—continued.			
1-cable, high tension ignition	1	31-OD-117	AK117L
2-loop, terminal	2	31-OD-117	AK117C
2-cable, high tension ignition	2	31-OD-117	AK117M
1-loop, terminal	2	31-OD-117	AK117C
1-cable, high tension ignition	1	31-OD-117	AK117N
2-loop, terminal	2	31-OD-117	AK117C
6-cable, high tension ignition	6	31-OD-117	AK117P
2-loop, terminal	12	31-OD-117	AK117C
2-cable, low tension ignition	1	31-OD-117	AK117Q
2-loop, terminal	4	31-OD-117	AK117C
1-cable, low tension iguition	1	31-OD-117	AK117S
2-loop, terminal	2	31-OD-117	AK117C
1-cable, low tension ignition	1	31-OD-117	AK117T
2-loop, terminal	2	31-OD-117	AK117C
12-cell, battery	12	31-OD-117	AK117U
1-connector, battery	12	31-OD-117	AK117W
4-clamp, conduit	4	31-OD-114	AK114F
2-nut, #10 (.190)-24	8	31-OD-114	
2-screw, #10 (.190)-24 x 1	8	31-OD-114	AK114G
2-clamp, conduit tube	2	31-OD-123	AK123D
1-coil, dual ignition	1	31-OD-115	AK115B
1-conduit, ignition wire	1	31-OD-114	AK114C
1-conduit, coil wire	1	31-OD-116	AK116M
1-conduit, coil wire	1	31-OD-118	AK118D
1-cover, battery box	1	31-OD-123	AK123A
4-rivet, button head, .125 x .375	4	31-OD-123	
1-tube, conduit	1	31-OD-123	AK123E
1-tube, conduit	1	31-OD-123	AK123F
OILING SYSTEM.			
2-block, oil tank	2	31-OS-46	WM46C
1-cock, oil test, complete		31-OS-53	
1-bushing, pipe, brass .375 x .25	1	31-OS-51	WM51Q
1-clamp, oil tube	1	31-OS-97	WM97D
1-nut, .25	1	31-OS-97	
1-screw, round head, .25 x .75	1	31-OS-97	WM97C
1-washer, lock, .25	1	31-OS-97	
1-cock, test, brass .25 std	1	31-OS-97	WM9,E
1-conduit, oil, fibre	1	31-OS-51	WM51P
1-coupling, pipe, brass .25 std	1	31-OS-97	WM97F
1-Ell, flared tube, brass	1	31-OS-51	WM51B
1-tube, flared, std. .312 ($\frac{5}{16}$) copper	1	31-OS-51	WM51M
2-union, flared tube, brass	2	31-OS-51	WM51D
1-union, flared tube, brass	1	31-OS-51	WM51E
1-gage, oil, complete		31-OS-53	
1-handle, rod	1	31-OS-97	WM97D
1-pipe, oil, brass .325 std. x 2.25	1	31-OS-50	WM50K
1-pipe, oil gage, brass, .375 std. x 30.125	1	31-OS-97	WM97A
1-rod, oil gage	1	31-OS-97	WM97G
1-tee, pipe, brass .375 std	1	31-OS-50	WM50F
1-oil line, feed, tank to pump, complete		31-OS-49	
1-bushing, pipe, .5 x .375	1	31-OS-46	WM46D
4-elbow, pipe, brass .375 std	4	31-OS-50	WM50C
2-elbow, pipe, brass .375 std. 45°	2	31-OS-51	WM51F
5-nipple, pipe, brass .375 std	5	31-OS-51	WM51G
1-pipe, oil, brass .375 std. x 17.75	1	31-OS-50	WM50H
2-pipe, oil, brass .375 std. x 2.25	2	31-OS-50	WM50K
1-pipe, oil, brass .375 std. x 1.5	1	31-OS-50	WM50G
1-pipe, oil, brass .375 std. x 10.875	1	31-OS-50	WM50L
2-union, pipe, brass .375 std	2	31-OS-50	WM50D
1-valve, globe, .375	1	31-OS-50	WM50A
1-oill ine, pressure, complete		31-OS-49	
2-bushing, pipe, .5 x .375	2	31-OS-46	WM46D
7-elbow, pipe, brass .375 std	7	31-OS-50	WM50C
2-nipple, pipe, brass .375 std	2	31-OS-51	WM51G
6-nozzle, oil pressure	6	31-OS-50	WM50B
2-pipe, oil, brass .375 x 1.5	2	31-OS-50	WM50G
6-pipe, oil, brass .375 x 2.25	6	31-OS-50	WM50K
4-pipe, oil, brass .375 x 2.875	4	31-OS-50	WM50M
1-pipe, oil, brass .375 x 3.25	1	31-OS-50	WM50N
1-pipe, oil, brass .375 x 3.5	1	31-OS-50	WM50P
2-pipe, oil, brass .375 x 4.75	2	31-OS-50	WM50Q
4-pipe, oil, brass .375 x 9.5	4	31-OS-50	WM50R
7-tee, pipe, brass .375 std	7	31-OS-50	WM50F
7-union, pipe, brass .375 std	7	31-OS-50	WM50D

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
OILING SYSTEM—continued.			
2-oil line, suction (1 right, 1 left) complete		31-OS-49	
1-bushing, pipe, .5 x .375	2	31-OS-46	WM46D
1-elbow, pipe, brass .375 std., left	2	31-OS-50	WM50C
2-elbow, pipe, brass .375 std., right	4	31-OS-50	WM50C
2-nipple, pipe, brass .375 std	4	31-OS-51	WM51G
1-pipe, oil, brass .375 std. x 2.25	2	31-OS-50	WM50K
1-tee, pipe, brass .375 std., left	2	31-OS-50	WM50F
1-tube, oil suction	2	31-OS-98	WM98A
1-strainer, oil suction	2	31-OS-98	WM98B
1-union, pipe, brass .375 x 1.25	2	31-OS-50	WM50E
1-pan, oil	1	31-OS-44	WM44A
3-pipe, sediment plate drain, 1.5 std	3	31-OS-44	WM44D
1-plate, oil pan bottom	1	31-OS-44	WM44B
94-rivet, round head copper, .156 ($\frac{5}{32}$) x .25	94	31-OS-44	
1-plate, oil pan sediment	1	31-OS-44	WM44C
44-nut, S. A. E., .312 ($\frac{5}{16}$)	44	31-OS-44	
44-stud, S. A. E., .312 ($\frac{5}{16}$) x 1.125	44	31-OS-44	AM224G
44-washer, lock, .312 ($\frac{5}{16}$)	44	31-OS-44	
1-plug, transmission oil drain	1	31-OS-50	WM50T
1-plug, pipe, .375	1	31-OS-50	KM92G
2-pump, oil (1 right, 1 left), complete		31-OP-116	
1-body, oil pump, right	1	31-OP-117	NM117D
16-nut, S. A. E., .312 ($\frac{5}{16}$)	32	31-OP-117	
2-pin, taper, #3 x .625	4	31-OP-117	NM117F
16-stud, S. A. E., .312 ($\frac{5}{16}$) x 1	32	31-OP-117	AM227E
16-washer, lock, .312 ($\frac{5}{16}$)	32	31-OP-117	
1-body, pump, left	1	31-OP-117	NM117E
16-nut, S. A. E., .312 ($\frac{5}{16}$)	32	31-OP-117	
2-pin, taper, #3 x .625	4	31-OP-117	NM117F
16-stud, S. A. E., .312 ($\frac{5}{16}$) x 1	32	31-OP-117	AM227E
16-washer, lock, .312 ($\frac{5}{16}$)	32	31-OP-117	
3-cap, pump	6	31-OP-118	NM118C
1-cover, pump, right	1	31-OP-117	NM117B
1-cover, pump, left	1	31-OP-117	NM117C
1-gear, pump driving	2	31-OP-117	NM117A
1-pin, taper, #4 x 2	2	31-OP-117	AM221E
1-gear, oil pump	2	31-OP-118	NM118A
1-gear, pump	2	31-OP-118	NM118B
2-strap, oil tank	2	31-OS-46	WM46B
2-nut, S. A. E., .375	4	31-OS-46	
2-washer, lock, .375	4	31-OS-46	
1-tank, oil	1	31-OS-46	WM46A
1-cap	1	31-OS-46	WM46E
1-plug, pipe, 2	1	31-OS-46	WM46F
1-plug, pipe, .5	1	31-OS-46	WM44E
COOLING SYSTEM.			
1-connection, water, pump to manifold		31-OP-134	
2-clamp, hose, brass 1.5 std	2	31-OP-128	NM128N
2-hose, water, 1.75 rubber	1	31-OP-128	NM128F
1-connection, water, radiator to manifold		31-OP-134	
4-clamp, hose, brass 1.5 std	4	31-OP-128	NM128N
2-hose, water, 1.75 rubber	2	31-OP-128	NM128G
1-nipple, 1.5 x 1.5 pipe	1	31-OP-128	NM128Q
1-pipe, water outlet	1	31-OP-133	NM133A
1-connection, water, radiator to pump		31-OP-134	
2-clamp, hose, brass 1.5 std	2	31-OP-128	NM128N
1-elbow, pipe, 45°, 1.5	1	31-OP-128	NM128K
2-elbow, pipe, 1.5 std	2	31-OP-128	NM128H
1-hose, water, 1.75 rubber	1	31-OP-128	NM128G
3-nipple, pipe, 1.5 x 2.5	3	31-OP-128	NM128L
1-nipple, pipe, 1.5 x 4	1	31-OP-128	NM128M
2-fan assembly (1 right, 1 left), complete		{31-OP-131 {31-OP-132	
2-bearing, hub ball	4	31-OP-126	NM126C
1-belt, fan, right	1	31-OP-128	NM128B
24-belt hook, #4	24	31-OP-128	NM128E
1-pin, rawhide, 2	1	31-OP-128	NM128D
1-belt, fan, left	1	31-OP-128	NM128C
24-belt hook, #4	24	31-OP-128	NM128E
1-pin, rawhide, 2	1	31-OP-128	NM128D
6-blade, fan	12	31-OP-127	NM127E
4-rivet, button head, .25 x 1	48	31-OP-127	

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
COOLING SYSTEM—continued.			
2-fan assembly (1 right, 1 left), complete—Continued.			
1-bracket, control shaft	2	31-OP-129	NM129B
2-bolt, S. A. E., .5 x 1.25	4	31-OP-129	HM118G
2-nut, S. A. E., .5	4	31-OP-129	.....
2-washer, lock, .5	4	31-OP-129	.....
6-collar, spider spacer	12	31-OP-127	NM127F
1-eccentric, fan, right	1	31-OP-126	NM126A
1-eccentric, fan, left	1	31-OP-126	NM126B
1-handle, fan control	2	31-OP-130	NM130A
1-hub, fan	2	31-OP-126	NM126D
1-pin, taper, #4 x 2	2	31-OP-126	AM221E
1-lever, fan control	2	31-OP-129	NM129C
1-lever, lock	2	31-OP-130	NM130B
1-nut, fan eccentric	2	31-OP-126	NM126F
1-screw, headless, .25 x .375	2	31-OP-126	NM122G
1-pin, pivot	2	31-OP-130	NM130F
1-pin, split, .093 ($\frac{3}{32}$) x 1	2	31-OP-130	.....
1-pin, spring	2	31-OP-130	NM130G
1-pulley, fan	2	31-OP-126	NM126E
1-key, .187 ($\frac{3}{16}$) x 1.5 sq	2	31-OP-126	NM126H
1-rod, fan control, right	1	31-OP-133	NM133B
1-pin, split, .093 ($\frac{3}{32}$) x 1.5	2	31-OP-133	.....
1-rod, fan control, left	1	31-OP-133	NM133C
1-pin, split, .093 ($\frac{3}{32}$) x 1.5	2	31-OP-133	.....
1-sector, fan control	2	31-OP-129	NM129A
2-bolt, S. A. E., .5 x 1.25	4	31-OP-129	HM118G
2-nut, S. A. E., .5	4	31-OP-129	.....
2-washer, lock, .5	4	31-OP-129	.....
1-shaft, fan, right	1	31-OP-127	NM127A
1-nut, castle, S. A. E., .625	2	31-OP-127	.....
1-shaft, fan, left	1	31-OP-127	NM127B
1-nut, castle, S. A. E., .625	2	31-OP-127	.....
1-shaft, fan control, right	1	31-OP-129	NM129E
1-pin, taper, #3 x 1.25	1	31-OP-129	NM129F
1-shaft, fan control, left	1	31-OP-130	NM130D
1-pin, taper, #3 x 1.25	1	31-OP-130	NM129F
1-spider, fan	2	31-OP-127	NM127C
6-bolt, S. A. E., .312 ($\frac{5}{16}$) x 1.75	12	31-OP-127	NM127D
6-nut, S. A. E., .312 ($\frac{5}{16}$)	12	31-OP-127	.....
6-washer, lock, .312 ($\frac{5}{16}$)	12	31-OP-127	.....
1-spring, lock lever	2	31-OP-130	NM130C
1-stud, lever	2	31-OP-129	NM129D
1-stud, lock	2	31-OP-130	NM130E
1-nut, S. A. E., .312 ($\frac{5}{16}$)	2	31-OP-130	.....
1-fan and pump drive assembly, complete	.....	31-OP-119	.....
2-bearing, pump drive shaft ball	2	31-OP-122	NM122B
3-bearing, fan housing ball	3	31-OP-122	NM122C
1-body, water pump	1	31-OP-120	NM120A
2-nut, S. A. E., .5	2	31-OP-120	.....
2-stud, S. A. E., .5 x 1.5	2	31-OP-120	KM86D
2-washer, lock, .5	2	31-OP-120	.....
1-bushing, fan gear housing	1	31-OP-124	NM124C
1-washer, felt	1	31-OP-122	NM122K
1-cap, bearing	1	31-OP-122	NM122A
4-screw, round head, #10-32 x .375	4	31-OP-122	NM122H
1-cap, dust	1	31-OP-122	NM122E
4-nut, S. A. E., .312 ($\frac{5}{16}$)	4	31-OP-122	.....
4-stud, S. A. E., .312 ($\frac{5}{16}$) x 1.125	4	31-OP-122	AM224G
4-washer, lock, .312 ($\frac{5}{16}$)	4	31-OP-122	.....
2-cap, water pump	2	31-OP-120	NM120C
1-collar, coupling	1	31-OP-121	NM121C
1-countershaft, water pump	1	31-OP-121	NM121E
1-cover, water pump	1	31-OP-120	NM120B
11-nut, S. A. E., .312 ($\frac{5}{16}$)	11	31-OP-120	.....
2-pin, taper, #3 x .625	2	31-OP-120	NM117F
11-stud, S. A. E., .312 ($\frac{5}{16}$) x 1	11	31-OP-120	AM227E
11-washer, lock, .312 ($\frac{5}{16}$)	11	31-OP-120	.....
1-gear, fan pulley, mitre	1	31-OP-124	NM124B
1-nut, castle, S. A. E., .625	1	31-OP-124	.....
1-gear, fan drive, mitre	1	31-OP-124	NM124D
1-key, .25 x 1.875 sq	1	31-OP-124	NM124E
1-gear, pump countershaft	1	31-OP-128	NM128A
1-gear, pump driving	1	31-OP-122	NM122F
1-key, .25 x 1.875 sq	1	31-OP-122	NM124E
1-screw, headless, .25 x .375	1	31-OP-122	NM122G

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
COOLING SYSTEM—continued.			
1-fan and pump drive assembly, complete—Continued.			
1-gear, water pump	1	31-OP-123	NM123D
1-key, .25 x 2 sq	1	31-OP-123	NM123F
1-pin, taper, #4 x 2	1	31-OP-123	AM221E
2-gland	2	31-OP-123	NM123E
1-housing, fan gear, lower half	1	31-OP-123	NM231C
4-nut, S. A. E., 5	4	31-OP-123	
4-stud, S. A. E., 5 x 1.5	4	31-OP-123	KM86D
4-washer, lock, .5	4	31-OP-123	
1-housing, fan gear, upper half	1	31-OP-123	NM123G
5-nut, S. A. E., .437($\frac{7}{16}$)	5	31-OP-123	NM123G
2-pin, taper, 3 x .625	2	31-OP-123	NM117F
1-plug, pipe, .5	1	31-OP-123	NM123G
4-stud, S. A. E., .437($\frac{7}{16}$) x 1.125	4	31-OP-123	AM224B
1-stud, S. A. E., .437($\frac{7}{16}$) x 3.5	1	31-OP-123	NM123C
5-washer, lock, .437($\frac{7}{16}$)	5	31-OP-123	
1-nut, gland	1	31-OP-120	NM120D
1-nut, gland	1	31-OP-120	NM120E
1-pulley, fan drive	1	31-OP-124	NM124A
1-key, .25 x 1.875 sq	1	31-OP-124	NM124E
1-shaft, fan & pump	1	31-OP-121	NM121D
1-shaft, fan & pump driving	1	31-OP-121	NM121A
1-screw, headless, .375 x .75	1	31-OP-121	NM121B
1-spacer, dust cap	1	31-OP-122	NM122D
1-spacer, fan drive pulley	1	31-OP-128	NM128D
1-radiator	1	31-OP-125	NM125A
1-cap, filler	1	31-OP-125	NM125B
EXHAUST AND MUFFLER.			
2-elbow, exhaust pipe	2	31-OU-11	CP11D
1-manifold, exhaust	1	31-OU-11	CP11A
12-nut, S. A. E., .437($\frac{7}{16}$)	12	31-OU-11	
12-stud, S. A. E., .437($\frac{7}{16}$) x 1.5	12	31-OU-11	AK116B
12-washer, lock, .437($\frac{7}{16}$)	12	31-OU-11	
2-muffler	2	31-OU-10	CP10A
1-bolt, S. A. E., .312 ($\frac{5}{16}$) x 2	2	31-OU-10	CP10B
1-nut, S. A. E., .312($\frac{5}{16}$)	2	31-OU-10	
1-washer, lock, .312 ($\frac{5}{16}$)	2	31-OU-10	
1-pipe, exhaust	1	31-OU-11	CP11C
1-pipe, exhaust	1	31-OU-11	CP11B
2-plug, muffler tee	2	31-OU-10	CP10D
4-rod, muffler clamp	4	31-OU-10	CP10E
2-nut, S. A. E., .375	8	31-OU-10	
2-washer, lock, .375	8	31-OU-10	
2-tee, muffler	2	31-OU-10	CP10C
HAND STARTER.			
2-hand starter (1 right, 1 left) complete		31-OD-84	
1-bracket, starting	2	31-OD-83	AK83E
12-nut, S. A. E., .375	24	31-OD-83	
12-stud, S. A. E., .375 x 1.25	24	31-OD-83	AK111B
12-washer, lock, .375	24	31-OD-83	
1-collar, bracket shaft	2	31-OD-83	AK83F
1-ratchet, starting, right	1	31-OD-83	AK83A
1-ratchet, starting, left	1	31-OD-83	AK83B
1-shaft, starting, bracket	2	31-OD-83	AK83H
1-pin, taper, #7 x 2.25	2	31-OD-83	AK83K
1-pin, taper, #4 x 2	2	31-OD-83	AM221E
1-spring, bracket	2	31-OD-83	AK83G
1-washer, 1.5 x 2. x .25, left side only	1	31-OD-83	AK83L
TRANSMISSION.			
4-angle, brake	4	31-OF-233	AM233D
1-cap, bearing	1	31-OF-224	AM224A
16-nut, S. A. E., .437($\frac{7}{16}$)	16	31-OF-224	
5-pin, dowel, .312($\frac{5}{16}$) x .75	5	31-OF-224	AM224L
16-stud, S. A. E., .437($\frac{7}{16}$) x 1.125	16	31-OF-224	AM224B
16-washer, lock, .437($\frac{7}{16}$)	16	31-OF-224	
2-cap, dust	2	31-OF-224	AM224C
8-nut, S. A. E., .312($\frac{5}{16}$)	16	31-OF-224	
8-stud, S. A. E., .312($\frac{5}{16}$) x .875	16	31-OP-224	AM224D
8-washer, lock, .312($\frac{5}{16}$)	16	31-OF-224	
1-washer, felt	2	31-OF-224	AM224M

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
TRANSMISSION—continued.			
1-cap, dust	1	31-OF-224	AM224E
12-nut, S. A. E., .312($\frac{5}{16}$)	12	31-OF-224	.....
3-pin, dowel, .312($\frac{5}{16}$) x .75	3	31-OF-224	AM224C
12-stud, S. A. E., .312($\frac{5}{16}$) x .875	12	31-OF-224	AM224D
12-washer, lock, .312($\frac{5}{16}$)	12	31-OF-224	.....
1-case, transmission	1	31-OF-235	AM235A
1-cup, grease, .25	1	31-OF-235	.....
2-cover, brake screw housing	2	31-OF-227	AM227B
16-nut, S. A. E., .312($\frac{5}{16}$)	32	31-OF-217	.....
16-stud, S. A. E., .312($\frac{5}{16}$) x .75	32	31-OF-217	AM217B
16-washer, lock, .312($\frac{5}{16}$)	32	31-OF-217	.....
1-cover, transmission case, left	1	31-OF-217	AM217A
25-nut, S. A. E., .5	25	31-OF-217	.....
25-stud, S. A. E., .5 x 1.5	25	31-OF-217	KM86D
25-washer, lock, .5	25	31-OF-217	.....
1-cover, transmission case, right	1	31-OF-226	AM226A
25-nut, S. A. E., 5	25	31-OF-226	.....
25-stud, S. A. E., .5 x 1.5	25	31-OF-226	KM86D
25-washer, lock, .5	25	31-OF-226	.....
1-cover, transmission case, side, left	1	31-OF-229	AM229A
33-nut, S. A. E., .5	33	31-OF-229	.....
33-stud, S. A. E., .5 x 1.5	33	31-OF-229	KM86D
33-washer, lock, .5	33	31-OF-229	.....
1-cover, transmission case, side, right	1	31-OF-230	AM230A
43-nut, S. A. E., .5	43	31-OF-230	.....
2-pin, taper, #5 x 2	2	31-OF-230	HM110E
43-stud, S. A. E., .5 x 1.5	43	31-OF-230	KM86D
43-washer, lock, .5	43	31-OF-230	.....
2-cover, trans. front (1 right, 1 left) complete	.....	31-OF-232	.....
1-bell crank, reverse speed, left	1	31-OF-218	AM218C
3-collar, shifting shaft	6	31-OF-221	AM221D
1-pin, taper, #4 x 2	6	31-OF-221	AM221E
1-cover, shifting bolt housing, left	1	31-OF-227	AM227A
11-nut, S. A. E., .312($\frac{5}{16}$)	22	31-OF-227	.....
11-stud, S. A. E., .312($\frac{5}{16}$) x 1	22	31-OF-227	AM227E
11-washer, lock, .312($\frac{5}{16}$)	22	31-OF-227	.....
1-cover, shifting bolt housing, right	1	31-OF-227	AM227D
12-nut, S. A. E., .312($\frac{5}{16}$)	24	31-OF-227	.....
12-stud, S. A. E., .312($\frac{5}{16}$) x 1	24	31-OF-227	AM227E
12-washer, lock, .312($\frac{5}{16}$)	24	31-OF-227	.....
1-cover, transmission case, left	1	31-OF-228	AM228A
2-bolt, S. A. E., .5 x 1.625	4	31-OF-228	TM40E
16-nut, S. A. E., .5	32	31-OF-228	.....
2-pin, taper, #2 x 1.75	4	31-OF-228	LM45E
14-stud, S. A. E., .5 x 1.5	28	31-OF-228	KM86D
16-washer, lock, .5	32	31-OF-228	.....
1-cover, transmission case, right	1	31-OF-228	AM228B
2-bolt, S. A. E., .5 x 1.625	4	31-OF-228	TM40E
16-nut, S. A. E., .5	32	31-OF-228	.....
2-pin, Taper, #2 x 1.75	4	31-OF-228	LM45E
14-stud, S. A. E., .5 x 1.625	28	31-OF-228	KM86D
16-washer, lock, .5	32	31-OF-228	.....
2-crank, left	2	31-OF-218	AM218A
1-crank, 3rd & 4th speed, right	1	31-OF-218	AM218D
1-eye bolt, reverse speed, left	1	31-OF-220	AM220D
2-eye bolt, transmission, right	2	31-OF-220	AM220G
1-eye bolt, transmission, left	1	31-OF-220	AM220H
1-eye bolt, transmission, right	1	31-OF-220	AM220K
1-eye bolt, transmission, left	1	31-OF-220	AM220L
1-lever, reverse speed, right	1	31-OF-218	AM218B
1-lever, 1st & 2nd speed, right	1	31-OF-219	AM219H
1-lever, 3rd & 4th speed shifting	2	31-OF-231	AM231A
1-lever, 1st & 2nd speed shifting	2	31-OF-231	AM231B
1-lever, reverse speed, right	1	31-OF-231	AM231C
1-lever, reverse speed, left	1	31-OF-231	AM231D
2-link, shifting, right	2	31-OF-220	AM220A
2-link, shifting, left	2	31-OF-220	AM220B
1-link, reverse shifting	2	31-OF-220	AM220C
1-plate, reverse speed housing cover	2	31-OF-231	AM231E
6-nut, S. A. E., .312 ($\frac{5}{16}$)	12	31-OF-231	.....
6-stud, S. A. E., .312($\frac{5}{16}$) x .875	12	31-OF-231	AM224D
6-washer, lock, .312($\frac{5}{16}$)	12	31-OF-231	.....
1-nut, stud, left	1	31-OF-219	AM219K
1-pin, taper, #2 x 1.25	2	31-OF-219	AM219M
1-shaft, 1st & 2nd speed shifting	2	31-OF-221	AM221A
1-nut, castle, S. A. E., .75	2	31-OF-221	.....

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
TRANSMISSION—continued.			
2-cover, trans. front (1 right, 1 left), complete—Continued.			
1-shaft, 3rd & 4th speed shifting	2	31-OF-221	AM221B
1-nut, castle, S. A. E., .75	2	31-OF-221	
1-shaft, reverse shifting	2	31-OF-221	AM221C
1-nut, castle, S. A. E., .75	2	31-OF-221	
1-stud, reverse speed, left	1	31-OF-219	AM219A
1-stud, 3rd & 4th speed pivot, left	1	31-OF-219	AM219B
1 stud, 3rd & 4th speed pivot, right	1	31-OF-219	AM219C
1-stud, pivot, left	2	31-OF-219	AM219D
1-nut, pivot stud	2	31-OF-219	AM219E
1-pin, split, .125 x 1.25	2	31-OF-219	
1-stud, pivot	2	31-OF-219	AM219D
1-nut, pivot stud	2	31-OF-219	AM219E
1-pin, split, .125 x 1.25	2	31-OF-219	
2-stud, right	2	31-OF-219	AM219G
1-stud, reverse, right	1	31-OF-220	AM220M
1-stud, link, right	2	31-OF-220	AM220N
7-stud, link, left	14	31-OF-220	AM220N
1-washer, stud, right	1	31-OF-219	AM219L
1-gear, main driving, right	1	31-OF-213	AM213C
1-bushing, right	1	31-OF-213	AM213D
1-gear, main driving, left	1	31-OF-213	AM213A
1-bushing, left	1	31-OF-213	AM213B
2-gear, reverse, assembly, complete		31-OF-212	
2-bearing, reverse gear roller	4	31-OF-214	AM214H
1-collar, thrust	2	31-OF-223	AM223C
1-gear, reversing	2	31-OF-214	AM214L
1-shaft, reversing gear	2	31-OF-223	AM223A
1-screw, headless, S. A. E., .437($\frac{7}{16}$) x .75	2	31-OF-223	AM223H
1-spacer, reverse gear bearing	2	31-OF-214	AM214D
1-washer, thrust	2	31-OF-223	AM223B
2-shaft, driving (1 right, 1 left) complete		31-OF-234	
2-bearing, transmission shaft	4	31-OF-214	AM214E
1-cap, driven gear oil, right	1	31-OF-233	AM233B
5-nut, castle, S. A. E., .437($\frac{7}{16}$)	5	31-OF-233	
5-stud, S. A. E., .437($\frac{7}{16}$) x 1.125	5	31-OF-233	AM224B
5-washer lock, .437($\frac{7}{16}$)	5	31-OF-233	
1-washer, felt	1	31-OF-233	AM233G
1-cap, driven gear oil, left	1	31-OF-233	AM233A
5-nut, castle, S. A. E., .437($\frac{7}{16}$)	5	31-OF-233	
5-stud, S. A. E., .437($\frac{7}{16}$) x 1.125	5	31-OF-233	AM224B
5-washer, lock, .437($\frac{7}{16}$)	5	31-OF-233	
1-washer, felt	1	31-OF-233	AM233F
1-cap, thrust, right	1	31-OF-225	AM225D
4-nut, S. A. E., .312($\frac{5}{16}$)	4	31-OF-225	
4-stud, S. A. E., .312($\frac{5}{16}$) x 1	4	31-OF-225	AM227E
4-washer, lock, .312($\frac{5}{16}$)	4	31-OF-225	
1-cap, thrust, left	1	31-OF-225	AM225B
4-nut, S. A. E., .312($\frac{5}{16}$)	4	31-OF-225	
4-stud, S. A. E., .312($\frac{5}{16}$) x 1	4	31-OF-225	AM227E
4-washer, lock, .312($\frac{5}{16}$)	4	31-OF-225	
1-gear, driven, right	1	31-OF-213	AM213F
2-key, .437($\frac{7}{16}$) x 1.5 SQ.	2	31-OF-213	AM233E
1-gear, driven, left	1	31-OF-233	AM233C
2-key, .437($\frac{7}{16}$) x 1.5 SQ.	2	31-OF-233	AM233E
1-gear, oil pump	2	31-OF-223	AM223F
1-pin, taper, #6 x 3.375	2	31-OF-223	AM223G
1-gear, shifting	2	31-OF-214	AM214K
1-shaft, driving, right	1	31-OF-222	AM222D
1-nut, shaft	1	31-OF-222	AM222E
1-washer, spacer	1	31-OF-222	AM222C
1-shaft, driving, left	1	31-OF-222	AM222A
1-nut, shaft	1	31-OF-222	AM222B
2-shaft, final drive (1 right, 1 left), complete		31-OF-234	
2-bearing, drive wheel ball	4	31-OL-94	KM94B
1-bearing, final drive shaft	2	31-OF-214	AM214G
1-bearing, transmission case	2	31-OF-214	AM214M
1-cap, bearing	2	31-OF-224	AM224H
1-cap, bearing	2	31-OF-225	AM225A
12-nut, S. A. E., .312($\frac{5}{16}$)	24	31-OF-225	
12-stud, S. A. E., .312($\frac{5}{16}$) x 1	24	31-OF-225	AM227E
12-washer, lock, .312($\frac{5}{16}$)	24	31-OF-225	
1-cap, dust	2	31-OF-224	AM224F
6-nut, S. A. E., .312($\frac{5}{16}$)	12	31-OF-224	
6-stud, S. A. E., .312($\frac{5}{16}$) x 1.125	12	31-OF-224	AM224G
6-washer, lock, .312($\frac{5}{16}$)	12	31-OF-224	
2-washer, felt	4	31-OF-224	AM224N

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
TRANSMISSION—continued.			
2-shaft, final drive (1 right, 1 left), complete—Continued.	2	31-OF-215	AM215C
1-gear, 1st speed	36	31-OF-215	.....
18-rivet, button head c'sunk .5 x 1.25	2	31-OF-216	AM216A
1-gear, 2nd speed	24	31-OF-216	.....
12-rivet, c'sunk head, .5 x 1.5	2	31-OF-216	AM216B
1-gear, 3rd speed	2	31-OF-216	AM216D
1-gear, 4th speed	20	31-OF-216	.....
10-rivet, button head c'sunk, .5 x 1.25	2	31-OF-227	AM227C
1-housing, roller bearing	16	31-OF-227	.....
8-nut, S. A. E., .5	16	31-OF-227	KM86D
8-stud, S. A. E., .5 x 1.5	16	31-OF-227	.....
8-washer, lock, .5	2	31-OF-215	AM215B
1-hub, 1st speed gear	4	31-OF-215	AM215E
2-key, .5 x 4.625 SQ	2	31-OF-216	AM216C
1-hub, 2nd, 3rd & 4th speed gear	4	31-OF-216	AM216E
2-key, .5 x 5.875 SQ	1	31-OF-222	AM222G
1-shaft, final drive, right	1	31-OF-222	AM222K
1-pin taper #9 x 4.75	1	31-OF-222	AM222H
1-shaft, final drive, left	1	31-OF-222	AM222K
1-pin, taper #9 x 4.75	1	31-OF-214	AM214B
1-sleeve, final drive shaft, right	1	31-OF-214	AM214C
1-sleeve, final drive shaft, left	2	31-OF-225	AM225C
1-sleeve, roller bearing	.....	31-OF-234	.....
2-shaft, sliding gear, complete	2	31-OF-214	AM214E
1-bearing, trans. shaft	2	31-OF-214	AM214F
1-bearing, trans. shaft	2	31-OF-213	AM213E
1-gear, countershaft	2	31-OF-214	AM214A
1-gear, 1st & 2nd speed shifting	2	31-OF-215	AM215A
1-gear, 4th speed shifting	24	31-OF-215	.....
12-rivet, c'sunk head, .5 x 1.25	2	31-OF-215	AM215D
1-gear, 3rd speed shifting	2	31-OF-222	AM222F
1-shaft, sliding gear	2	31-OF-230	AM230B
1-washer, thrust	1	31-OF-220	AM220E
1-tie-rod, transmission	2	31-OF-220	.....
2-nut, S. A. E., .625	2	31-OF-107	HM107A
2-socket, offset rod end	2	31-OF-220	AM220F
2-tie-rod, transmission	4	31-OF-220	.....
2-nut, S. A. E., .625	4	31-OF-107	HM107A
2-socket, offset rod end	12	31-OF-219	AM219F
12-washer	12	31-OF-219	.....
12-pin, split, .125 x 1	2	31-OF-223	AM223D
2-washer, bearing spacer	1	31-OF-223	AM223E
1-washer, bearing spacer			
CHASSIS.			
1-bracket, drive wheel, right, 7.5 x 31 x 33.375	1	31-OL-88	KM88A
32-bolt, S. A. E., .625 x 1.75	32	31-OL-88	KN88B
32-nut, S. A. E., .625	32	31-OL-88	.....
32-washer, lock, .625	32	31-OL-88	.....
1-bracket, drive wheel, left, 7.5 x 31 x 33.375	1	31-OL-88	KM88C
32-bolt, S. A. E., .625 x 1.75	32	31-OL-88	KM88B
32-nut, S. A. E., .625	32	31-OL-88	.....
32-washer, lock, .625	32	31-OL-88	.....
1-housing, spring, right	1	31-O-168	FF168A
27-rivet, button head, .5 x 1.5	27	31-O-168	.....
1-housing, spring, left	1	31-O-168	FF168B
27-rivet, button head, .5 x 1.5	27	31-O-168	.....
2-plate, side chassis (1 right, 1 left), complete	.....	31-80-12	.....
1-angle, 2 x 2 x .375 x 11.5	2	31-80-12	12E
5-rivet, button head c'sunk, .5 x 1.125	10	31-80-12	.....
1-angle, 2 x 2 x .375 x 13.125	2	31-80-12	12F
6-rivet, button head c'sunk, .5 x 1.125	12	31-80-12	.....
1-angle, right, 2 x 2 x .375 x 50	1	31-80-12	12G
18-rivet, button head c'sunk, .5 x 1.125	18	31-80-12	.....
1-angle, left, 2 x 2 x .375 x 50	1	31-80-12	12H
18-rivet, button head c'sunk, .5 x 1.125	18	31-80-12	.....
1-angle, 2.5 x 2.5 x .375 x 11.75	2	31-80-12	12K
9-rivet, button head c'sunk, .5 x 1.125	18	31-80-12	.....
1-angle, 1.25 x 1.25 x 16.5 x .187($\frac{3}{16}$)	2	31-80-12	12L
5-rivet, button head c'sunk, .312($\frac{5}{16}$) x 1	10	31-80-12	.....
2-angle, 3 x 1.5 x .375 x 11.5	4	31-80-12	12M
5-rivet, button head c'sunk, .5 x 1.125	20	31-80-12	.....
1-angle, right, 1.5 x 1.5 x .375 x 129.75	1	31-80-12	12N
47-rivet, button head c'sunk, .5 x 1.125	47	31-80-12	.....

The personnel is directed to use the following nomenclature, giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
CHASSIS—continued.			
2-plate, side chassis (1 right, 1 left), complete—Continued.			
1-angle, left, 1.5 x 1.5 x .375 x 129.75	1	31-80-12	12P
47-rivet, button head c'sunk, .5 x 1.125	47	31-80-12	
1-angle, right, 1.5 x 1.5 x .375 x 53.125	1	31-80-12	12Q
22-rivet, button head c'sunk, .5 x 1.125	22	31-80-12	
1-angle, left, 1.5 x 1.5 x .375 x 53.125	1	31-80-12	12R
22-rivet, button head c'sunk, .5 x 1.125	22	31-80-12	
1-angle, right, 1.5 x 1.5 x .375 x 32	1	31-80-12	12S
6-rivet, button head c'sunk, .5 x 1.125	6	31-80-12	
1-angle, left, 1.5 x 1.5 x .375 x 32	1	31-80-12	12T
6-rivet, button head c'sunk, .5 x 1.125	6	31-80-12	
1-angle, right, 1.5 x 1.5 x .375 x 27	1	31-80-12	12U
3-bolt, S. A. E., .375 x 1.5	3	31-80-12	HM118F
3-nut, S. A. E., .375	3	31-80-12	
1-angle, left, 1.5 x 1.5 x .375 x 27	1	31-80-12	12W
3-bolt, S. A. E., .375 x 1.5	3	31-80-12	HM118F
3-nut, S. A. E., .375	3	31-80-12	
1-angle, right, 1.5 x 1.5 x .375 x 24.375	1	31-80-12	12X
6-rivet, button head c'sunk, .5 x 1.125	6	31-80-12	
1-angle, left, 1.5 x 1.5 x .375 x 24.375	1	31-80-12	12Z
6-rivet, button head c'sunk, .5 x 1.125	6	31-80-12	
1-angle, right, 1.5 x 1.5 x .375 x 24,375	1	31-80-12	12AA
6-rivet, button head c'sunk, .5 x 1.125	6	31-80-12	
1-angle, left, 1.5 x 1.5 x .375 x 24.375	1	31-80-12	12BA
6-rivet, button head c'sunk, .5 x 1.125	6	31-80-12	
1-angle, right, 1.5 x 1.5 x .375 x 10.625	1	31-80-12	12CA
4-rivet, button head c'sunk, .5 x 1.125	4	31-80-12	
1-angle, left, 1.5 x 1.5 x .375 x 10.625	1	31-80-12	12DA
4- rivet, button head c'sunk, .5 x 1.125	4	31-80-12	
1-angle, right, 1.5 x 1.5 x .375 x 10.75	1	31-80-12	12EA
2-rivet, button head c'sunk, .5 x 1.125	4	31-80-12	
1-angle, left, 1.5 x 1.5 x .375 x 10.75	1	31-80-12	12FA
2-rivet, button head c'sunk, .5 x 1.125	4	31-80-12	
1-angle, right, 1.5 x 1.5 x .375 x 6.125	1	31-80-12	12GA
2-rivet, button head c'sunk, .5 x 1.125	4	31-80-12	
1-angle, left, 1.5 x 1.5 x .375 x 6.125	1	31-80 12	12HA
2-rivet, button head c'sunk, .5 x 1.125	4	31-80-12	
1-angle, right, 1.5 x 1.5 x .187($\frac{3}{16}$) x 12.5	1	31-80-12	12KA
3-rivet, button head c'sunk, .312($\frac{5}{16}$) x 1	3	31-80-12	
1-angle, left, 1.5 x 1.5 x .187($\frac{3}{16}$) x 12.5	1	31-80-12	12LA
3-rivet, button head c'sunk, .312($\frac{5}{16}$) x 1	3	31-80-12	
1-angle, right, 1.25 x 1.25 x .187($\frac{3}{16}$) x 27.875	1	31-80-12	12MA
9-rivet, button head c'sunk, .312($\frac{5}{16}$) x 1	9	31-80-12	
1-angle, left, 1.25 x 1.25 x .187($\frac{3}{16}$) x 27.875	1	31-80-12	12NA
9-rivet, button head c'sunk, .312($\frac{5}{16}$) x 1	9	31-80-12	
1-angle, right, 1.25 x 1.25 x .187($\frac{3}{16}$) x 38.5	1	31-80-12	12PA
4-rivet, button head, .312($\frac{5}{16}$) x 1.5	4	31-80-12	
6-rivet, button head c'sunk, .312($\frac{5}{16}$) x 1	6	31-80-12	
1-angle, left 1.25 x 1.25 x ($\frac{3}{16}$) x 38.5	1	31-80-12	12QA
4-rivet button head, .312 ($\frac{5}{16}$) x 1.5	4	31-80-12	
6-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	6	31-80-12	
1-angle, right, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 16.5	1	31-80-12	12RA
5-rivet button head, .312 ($\frac{5}{16}$) x 1.5	5	31-80-12	
1-angle, left, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 16.5	1	31-80-12	12SA
5-rivet button head, .312 ($\frac{5}{16}$) x 1.5	5	31-80-12	
1-angle, right, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 8.875	1	31-80-12	12TA
2-rivet button head, .312 ($\frac{5}{16}$) x 1.5	2	31-80-12	
1-angle, left, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 8.875	1	31-80-12	12UA
2-rivet button head, .312 ($\frac{5}{16}$) x 1.5	2	31-80-12	
1-angle, right, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 27.875	1	31-80-12	12WA
8-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	8	31-80-12	
1-angle, left, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 27.875	1	31-80-12	12XA
8-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	8	31-80-12	
1-angle, right, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 29.5	1	31-80-12	12ZA
9-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	9	31-80-12	
1-angle, left, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 29.5	1	31-80-12	12AB
7-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	7	31-80-12	
1-angle, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 29.5	2	31-80-12	12BB
9-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	9	31-80-12	
1-angle, right, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 29.5	1	31-80-12	12CB
8-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1.5	8	31-80-12	
1-rivet button head, .312 ($\frac{5}{16}$) x 1.5	1	31-80-12	
1-angle, left, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 29.5	1	31-80-12	12DB
8-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	8	31-80-12	
1-rivet button head, .312 ($\frac{5}{16}$) x 1.5	1	31-80-12	

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
CHASSIS—continued.			
2-plate, side chassis (1 right, 1 left), complete—Continued.			
1-angle, right, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 29.5	1	31-80-12	12EB
4-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	4	31-80-12	.....
4-rivet button head, .312 ($\frac{5}{16}$) x 1.5	4	31-80-12	.....
1-angle, left, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 29.5	1	31-80-12	12FB
4-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	4	31-80-12	.....
4-rivet button head, .312 ($\frac{5}{16}$) x 1.5	4	31-80-12	.....
1-angle, right, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 38.5	1	31-80-12	12GB
11-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	11	31-80-12	.....
1-angle, left, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 38.5	1	31-80-12	12HB
11-rivet button head c'sunk, .312 ($\frac{5}{16}$) x 1	11	31-80-12	.....
1-plate, right, .375 x 13.75 x 14.5	1	31-80-12	12C
11-rivet button head c'sunk, .5 x 1.125	11	31-80-12	.....
1-plate, left, .375 x 13.75 x 14.5	1	31-80-12	12D
11-rivet button head c'sunk, .5 x 1.125	11	31-80-12	.....
1-plate, right, .25 x 36 x 171.625	1	31-80-12	12A
1-plate, left, .25 x 36 x 171.625	1	31-80-12	12B
1-plate, front gusset, complete	.....	30-80-13	.....
1-angle, 3 x 3 x 375 x 58.75	1	30-80-13	13A
31-rivet, button head c'sunk, .5 x 1.25	31	30-80-13	.....
1-angle, 1.5 x 1.5 x .375 x 58.75	1	30-80-13	13B
18-rivet, button head c'sunk, .5 x 1.25	18	30-80-13	.....
1-plate, .5 x 3.375 x 27	1	30-80-13	13C
5-rivet, button head c'sunk, .5 x 1.25	5	30-80-13	.....
1-plate, .375 x 14.75 x 62	1	30-80-13	13D
18-rivet, button head, .5 x 2.25	18	30-80-13	.....
2-plate gun base web, complete	.....	31-80-13	.....
1-angle, 3 x 3 x .375 x 58.75	1	31-80-13	13G
33-rivet, button head c'sunk, .5 x 1.25	33	31-80-13	.....
1-angle, 1.5 x 1.5 x .375 x 58.75	1	31-80-13	13H
18-rivet, button head c'sunk, .5 x 1.25	18	31-80-13	.....
1-plate, .25 x 19 x 62	1	31-80-13	13E
18-rivet, button head, .5 x 2.25	18	31-80-13	.....
1-plate, .5 x 3 x 27	1	31-80-13	13F
5-rivet, button head c'sunk, .5 x 1.25	5	31-80-13	.....
2-plate, gun base support (1-R, 1-L) complete	.....	31-80-13	.....
1-angle, right, 3 x 3 x .375 x 29.75	1	31-80-13	13M
5-rivet, button head c'sunk, .5 x 1.25	5	31-80-13	.....
1-angle, left, 3 x 3 x .375 x 29.75	1	31-80-13	13N
5-rivet, button head c'sunk, .5 x 1.25	5	31-80-13	.....
1-plate, right, .5 x 17.5 x 53.375	1	31-80-13	13K
32-rivet, button head c'sunk, .5 x 1.25	32	31-80-13	.....
1-plate, left, .5 x 17.5 x 53.375	1	31-80-13	13L
32-rivet, button head c'sunk, .5 x 1.25	32	31-80-13	.....
2-plate, guide (1 right, 1 left), complete	.....	31-80-13	.....
1-angle, right, 1.5 x 1.5 x .375 x 13.125	1	31-80-13	13R
1-rivet, button head, .5 x 2.25	1	31-80-13	.....
4-rivet, button head c'sunk, .5 x 1.25	4	31-80-13	.....
4-rivet, button head, .5 x 1.75	4	31-80-13	.....
1-angle, left, 1.5 x 1.5 x .375 x 13.125	1	31-80-13	13S
1-rivet, button head, .5 x 2.25	1	31-80-13	.....
4-rivet, button head c'sunk, .5 x 1.25	4	31-80-13	.....
4-rivet, button head, .5 x 1.75	4	31-80-13	.....
1-angle, right, 1.5 x 1. 5 x .375 x 4.875	1	31-80-13	13T
2-rivet, button head c'sunk, .5 x 1.25	2	31-80-13	.....
1-angle, left, 1.5 x 1.5 x .375 x 4.875	1	31-80-13	13U
2-rivet, button head c'sunk, .5 x 1.25	2	31-80-13	.....
1-angle, right, 1.5 x 1.5 x .375 x 16.75	1	31-80-13	13W
5-rivet, button head c'sunk, .5 x 1.25	5	31-80-13	.....
1-angle, left, 1.5 x 1.5 x .375 x 16.75	1	31-80-13	13X
5-rivet, button head c'sunk, .5 x 1.25	5	31-80-13	.....
1-plate, right, .375 x 16 x 16.75	1	31-80-13	13P
1-plate, left, .375 x 16 x 16.75	1	31-80-13	13Q
1-plate, rear gusset, complete	.....	31-80-14	.....
1-angle, 1.5 x 1.5 x .375 x 58.75	1	31-80-14	14B
16-rivet, button head c'sunk, .5 x 1.125	16	31-80-14	.....
1-angle, 1.5 x 1.5 x .375 x 52	1	31-80-14	14C
12-rivet, button head c'sunk, .5 x 1.125	12	31-80-14	.....
1-plate, .25 x 14.75 x 62	1	31-80-14	14A
10-rivet, button head c'sunk, .5 x 1.125	10	31-80-14	.....
1-plate, fan housing, complete	.....	31-80-14	.....
1-angle, 1.5 x 1.5 x .375 x 62	1	31-80-14	14E
14-rivet, button head c'sunk, .5 x 1.125	14	31-80-14	.....
1-angle, 1.5 x 1.5 x .375 x 58.75	1	31-80-14	14F
15-rivet, button head c'sunk, .5 x 1.125	14	31-80-14	.....

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
CHASSIS—continued.			
1-plate, fan housing, complete—Continued.			
1-plate, .25 x 26 x 62	1	31-80-14	14D
14-rivet, button head c'sunk, .5 x 1.125	14	31-80-14	.....
2-rivet, button head, .5 x 2.25	2	31-80-14	.....
6-rivet, button head c'sunk, .312 ($\frac{5}{16}$) x 1	6	31-80-14	.....
1-plate, radiator ventilator, complete	.....	31-80-14	.....
1-angle, 1.5 x 1.5 x .375 x 62	1	31-80-14	14H
15-rivet, button head c'sunk, .5 x 1.125	15	31-80-14	.....
1-angle, 1.5 x 1.5 x .375 x 62	1	31-80-14	14K
15-rivet, button head c'sunk, .5 x 1.125	15	31-80-14	.....
1-angle, 1 x 1 x 25 x 22.5	1	31-80-14	14L
14-rivet, button head c'sunk, .312 ($\frac{5}{16}$) x 1	15	31-80-14	.....
1-plate, .25 x 26 x 62	1	31-80-14	14G
14-rivet, button head c'sunk, .5 x 1.125	14	31-80-14	.....
6-rivet, button head c'sunk, .312 ($\frac{5}{16}$) x 1	6	31-80-14	.....
1-plate, radiator support, .25 x 15.5 x 62	1	31-80-14	14M
44-rivet, button head c'sunk, .5 x 1.125	44	31-80-14	.....
1-plate, gasoline tank cover, complete	.....	31-80-15	.....
1-angle, 1.5 x 1.5 x .187 ($\frac{3}{16}$) x 22.875	1	31-80-15	15B
5-rivet, button head, c'sunk .25 x .75	5	31-80-15	.....
1-angle, 1.5 x 1.5 x .187 ($\frac{3}{16}$) x 22.875	1	31-80-15	15C
5-rivet, button head c'sunk .25 x .75	5	31-80-15	.....
1-plate, .125 x 22.875 x 52	1	31-80-15	15A
10-nut, S. A. E., .5	10	31-80-15	.....
10-stud, S. A. E., .5 x 1.25	10	31-80-15	KN86B
10-washer, lock .5	10	31-80-15	.....
1-plate, motor support gusset, complete	.....	31-80-15	.....
1-angle, 1.5 x 1.5 x .375 x 58.75	1	31-80-15	15E
13-rivet, button head c'sunk, .5 x 1.125	13	31-80-15	.....
1-angle, 1.5 x 1.5 x .375 x 56.75	1	31-80-15	15F
13-rivet, button head c'sunk, .5 x 1.125	13	31-80-15	.....
1-plate, .25 x 13.375 x 62	1	31-80-15	15D
18-rivet, button head c'sunk, .5 x 1.125	13	31-80-15	.....
1-plate, engine floor, complete	.....	31-80-15	.....
2-angle, 3 x 2 x .375 x 10	2	31-80-15	15L
5-rivet, button head c'sunk, .5 x 1.125	10	31-80-15	.....
1-plate, .25 x 19.625 x 62.5	1	31-80-15	15G
1-plate, .25 x 3. x 58.5	1	31-80-15	15N
14-rivet, button head c'sunk, .5 x 1.125	14	31-80-15	.....
1-plate, .25 x 3. x 58.25	1	31-80-15	15K
2-rivet, button head, .5 x 1.75	2	31-80-15	.....
12-rivet, button head c'sunk, .5 x 1.125	12	31-80-15	.....
1-plate, oil pan floor, .25 x 21.75 x 47.25	1	31-80-15	15M
16-nut, S. A. E., .5	16	31-80-15	.....
16-stud, S. A. E., .5 x 1.25	16	31-80-15	KM86B
16-washer, lock, .5	16	31-80-15	.....
1-plate, front bottom, complete	.....	31-80-16	.....
1-angle, 1.5 x 1.5 x.375 x 10.5	1	31-80-16	16B
3-rivet, button head c'sunk, .5 x 1.125	3	31-80-16	.....
1-plate, .187 ($\frac{3}{16}$) x 62.5 x 92.75	1	31-80-16	16A
132-rivet, .5 x 1.125, button head c'sunk	132	31-80-16	.....
1-plate, .25 x 3. x 58.5	1	31-80-16	15H
14-rivet, .5 x 1.125 button head c'sunk	14	31-80-16	.....
1-plate, rear end, complete	.....	31-80-17	.....
1-angle, right 4 x 1.5 x .375 x 43.625	1	31-80-17	17D
17-rivet, button head, .5 x 1.75	17	31-80-17	.....
15-rivet, button head c'sunk, .5 x 1.125	15	31-80-17	.....
1-angle, left 4. x 1.5 x .375 x 43.625	1	31-80-17	17E
17-rivet, button head, .5 x 1.75	17	31-80-17	.....
15-rivet, button head c'sunk, .5 x 1.125	15	31-80-17	.....
1-angle, 1.5 x 1.5 x .375 x 57.75	1	31-80-17	17C
18-rivet, button head c'sunk, .5 x 1.125	18	31-80-17	.....
1-plate, .312 ($\frac{5}{16}$) x 30. x 62	1	31-80-17	17A
4-rivet, button head c'sunk, .5 x 1.125	4	31-80-17	.....
1-plate, .25 x 3. x 57.75	1	31-80-17	17B
9-rivet, button head c'sunk, .5 x 1.125	1	31-80-17	.....
1-plate, engine rear end, .25 x 16. x 62	1	31-80-17	17F
28-nut, S. A. E., .5	28	31-80-17	.....
28-stud, S. . E., .5 x 1.25	28	31-80-17	KM86B
28-washer lock, .5	28	31-80-17	.....
1-plate, brake rod support, .25 x 5.25 x 22.5	1	31-80-17	17G
15-rivet, button head c'sunk, .312 ($\frac{5}{16}$) x 1	15	31-80-17	.....

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
CHASSIS—continued.			
1-plate, engine ventilator, complete		31-80-18	
1-angle, 1.5 x 1.5 x .375 x 58	1	31-80-18	18D
15-rivet, button head c'sunk, .5 x 1.125	15	31-80-18	
2-angle, .625 x .5 x .125 x 24.5	2	31-80-18	18B
8-rivet, button head c'sunk, .187 ($\frac{3}{16}$) x .75	16	31-80-18	
2-angle, .625 x .5 x .125 x 47	2	31-80-18	18C
16-rivet, button head c'sunk, .187 ($\frac{3}{16}$) x .75	32	31-80-18	
1-angle, 1.5 x 1.5 x .375 x 58.5	1	31-80-18	18F
15-rivet, button head c'sunk, .5 x 1.125	15	31-80-18	
3-hinge, ventilator plate, .125 x 2.5 x 4	3	31-80-18	18H
3-rivet, button head, .375 x 1.5	9	31-80-18	
1-plate, .25 x 32 x 62.5	1	31-80-18	18A
20-nut, S. A. E., .5	20	31-80-18	
12-pin, dowel, .5 x 2.5	12	31-80-18	18P
20-stud, S. A. E., .5 x 1.25	20	31-80-18	KM86B
20-washer, lock, .5	20	31-80-18	
1-plate, .25 x 1.125 x 62.5	1	31-80-18	18E
16-rivet, c'sunk head, .375 x 1.375	16	31-80-18	
1-plate, hinge filler, .437 x 1.25 x 4	6	31-80-18	18L
1-plate ventilator cover, .125 x 26.5 x 49	1	31-80-18	18G
9-nut, S. A. E., .5	9	31-80-18	
9-washer, lock .5	9	31-80-18	
9-spool support, 1 dia. x 3.5	9	31-80-18	18M
1-nut, S. A. E., .5	9	31-80-18	
1-washer, lock, .5	9	31-80-18	
2-plate, rear gusset (1 right, 1 left), complete		31-80-19	
2-angle, right, 2 x 2 x .375 x 7	2	31-80-19	19C
5-rivet, button head, .5 x 2.25	10	31-80-19	
2-angle, left, 2 x 2 x .375 x 7	2	31-80-19	19D
1-plate, right, .5 x 7 x 36	1	31-80-19	19A
2-bolt, S. A. E., .5 x 1.5	2	31-80-19	HM115L
4-bolt, S. A. E., .625 x 1.5	4	31-80-19	HM116D
2-nut, S. A. E., .5	2	31-80-19	
4-nut, S. A. E., .625	4	31-80-19	
2-washer, lock, .5	2	31-80-19	
4-washer, lock, .625	4	31-80-19	
1-plate, left, .5 x 7 x 36	1	31-80-19	19B
2-bolt, S. A. E., .5 x 1.5	2	31-80-19	HM115L
4-bolt, S. A. E., .625 x 1.5	4	31-80-19	HM116D
2-nut, S. A. E., .5	2	31-80-19	
4-nut, S. A. E., .625	4	31-80-19	
2-washer, lock, .5	2	31-80-19	
4-washer, lock, .625	4	31-80-19	
1-plate, radiator cover, complete		31-80-18	
6-hinge	6	31-80-18	18H
3-rivet, button head, .375 x 1.5	18	31-80-18	
1-plate, .25 x 12.5 x 62.5	1	31-80-19	19E
8-nut, S. A. E., .5	8	31-80-19	
8-screw, flat head, .5 x .625	8	31-80-19	19G
8-stud, S. A. E., .5 x 1.25	8	31-80-19	KM86B
8-washer, lock, .5	8	31-80-19	
1-plate, .25 x 1.125 x 62.5	1	31-80-19	19F
15-rivet, c'sunk head, .375 x 1.375	15	31-80-19	
3-plate, hinge filler	3	31-80-18	18L
1-plate, motor door, complete		31-80-18	
6-hinge, inspection door, .125 x 2.5 x 4	6	31-80-18	18K
1-pin, hinge	6	31-80-18	18N
1-pin, split, .125 x 1	6	31-80-18	
1-washer, .312 ($\frac{5}{16}$)	6	31-80-18	
3-rivet, button head, .375 x 1	18	31-80-18	
1-plate, .187 ($\frac{3}{16}$) x 29.25 x 62.5	1	31-80-19	19H
1-plate, 9.625 x 9.625 x .062 ($\frac{1}{16}$)	1	31-80-19	19K
7-rivet, butt. h'd c'sunk, .25 x .75	7	31-80-19	
2-plate filler, .5 x 1.75 x 27	2	31-80-19	19L
6-rivet, butt. h'd c'sunk, .5 x 1.375	12	31-80-19	
1-plate, radiator, partition, complete		31-80-20	
2-angle, 1 x 1 x .25 x 9.25	2	31-80-20	20D
4-rivet, butt. h'd c'sunk, .312 ($\frac{5}{16}$) x 1	8	31-80-20	
1-angle, 1 x 1 x .25 x 10.5	1	31-80-20	20E
4-rivet, butt. h'd c'sunk, .312 ($\frac{5}{16}$) x 1	4	31-80-20	
1-angle, 1 x 1 x .25 x 8.875	1	31-80-20	20H
4-rivet, butt. h'd c'sunk, .312 ($\frac{5}{16}$) x 1	4	31-80-20	
1-pad, .187 ($\frac{3}{16}$) x 7 x 23.875	1	31-80-20	20F
12-rivet, butt. h'd c'sunk, .25 x .75	12	31-80-20	
1-plate, .125 x 9 x 24.25	1	31-80-20	20G

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
CHASSIS—continued.			
1-plate, radiator, partition, complete—Continued.			
1-plate, gun base	1	31-80-32	32A
28-bolt, .75 x 2.5	28	31-80-32	32B
28-nut, .75	28		
4-pin, taper, No. 10 x 2	4		32C
4-pin, taper, No. 8 x 2.5	4		32D
28-washer, lock, .75	28		
2-spacer, spring housing	2	31-0-168	FF168D
3-bolt, S. A. E., .75 x 3	6	31-0-168	FF168E
3-nut, S. A. E., .75	6	31-0-168	
2-rivet, button head c'sunk, .5 x 2.125	4	31-0-168	
3-washer, lock, .75	6	31-0-168	
TRACK PLATFORM.			
2-angle, shaft bracket	2	31-80-43	43N
4-nut, S. A. E. .437 ($\frac{7}{16}$)	8	31-80-43	
4-stud, S. A. E. .437 ($\frac{7}{16}$) x 1.25	8	31-80-43	26F
4-washer, lock .437 ($\frac{7}{16}$)	8	31-80-43	
2-axle drum	2	31-80-26	26A
1-nut, I. S. A. E. castle	2	31-80-26	
2-axle drum	2	31-80-27	27A
1-bracket, drum shaft, right	1	31-80-43	43L
6-rivet, butt. head c'sunk, .312 ($\frac{5}{16}$) x 1.25	6	31-80-43	
1-bracket, drum shaft, left	1	31-80-43	43M
6-rivet, butt. head c'sunk, .312 ($\frac{5}{16}$) x 1.25	6	31-80-43	
1-bracket, drum shaft	1	31-80-28	28C
6-rivet, butt. head c'sunk, .312 ($\frac{5}{16}$) x 1.5	6	31-80-28	
1-bracket, drum shaft	1	31-80-28	28D
6-rivet, butt, head c'sunk, .312 ($\frac{5}{16}$) x 1.5	6	31-80-28	
2-bracket, pinion	2	31-80-25	25D
4-nuts, S. A. E. .437 ($\frac{7}{16}$)	8	31-80-25	
4-studs, S. A. E. .437 ($\frac{7}{16}$) x 1.125	8	31-80-25	AM224B
4-washer, lock .437 ($\frac{7}{16}$)	8	31-80-25	
2-bracket, platform	2	31-80-24	24A
14-rivet butt. head c'sunk, .312 ($\frac{5}{16}$) x 1.5	28	31-80-24	
4-bracket, platform	4	31-80-24	24A
14-rivet, butt. head c'sunk, .312 ($\frac{5}{16}$) x 1.125	56	31-80-24	
2-bracket, platform	2	31-80-24	24A
8-rivet, butt. head c'sunk, .312 ($\frac{5}{16}$) x 1.125	16	31-80-24	
2-rivet, butt. head c'sunk, .312 ($\frac{5}{16}$) x 1.5	4	31-80-24	
4-bracket, platform	4	31-80-24	24A
12-rivet, butt. head c'sunk, .312 ($\frac{5}{16}$) x 1.125	48	31-80-24	
2-rivet, butt. head c'sunk, .312 ($\frac{5}{16}$) x 1.5	8	31-80-24	
10-bracket, shaft support	10	31-80-26	26B
4-nut, S. A. E. .437 ($\frac{7}{16}$)	40	31-80-26	
4-stud, S. A. E. .437 ($\frac{7}{16}$) x 1.125	40	31-80-26	AM224B
4-washer, lock .437 ($\frac{7}{16}$)	40	31-80-26	
2-bracket, shaft support	2	31-80-26	26E
4-nut, S. A. E. .437 ($\frac{7}{16}$)	8	31-80-26	
4-stud, S. A. E. .437 ($\frac{7}{16}$) x 1.25	8	31-80-26	26F
4-washer, lock .437 ($\frac{7}{16}$)	8	31-80-26	
2-cable, track complete		31-80-27	
1-cable	2	31-80-27	27D
1-terminal, track cable	2	31-80-27	27B
1-bolt, S. A. E. .312 ($\frac{5}{16}$) x 1	2	31-80-27	HM4E
1-nut, S. A. E. .312 ($\frac{5}{16}$)	2	31-80-27	
1-washer, lock .312 ($\frac{5}{16}$)	2	31-80-27	
1-terminal, track cable	2	31-80-27	27C
2-collar, drum spacing	2	31-80-26	26D
1-pin, taper, 4 x 2	2	31-80-26	AM221E
2-door, tool compartment, complete		31-80-29	
1-eye hasp	2	31-80-29	29K
4-rivet, button head, .25 x .75	8	31-80-29	
1-hasp, hinge	2	31-80-29	29H
3-rivet, button head, .25 x .75	6	31-80-29	
2-hinge door, .125 x 2.125 x 3	4	31-80-29	29C
6-rivet, button head, .25 x .75	24	31-80-29	
1-plate, .125 x 5.5 x 20	2	31-80-29	29E
2-door, tool compartment, complete		31-80-29	
1-eye hasp	2	31-80-29	29K
4-rivet, button head, .25 x .75	8	31-80-29	
1-hasp, hinge, $\frac{1}{8}$ x 1.5 x 4.75	2	31-80-29	29H
3-rivet, button head, .25 x .75	6	31-80-29	
2-hinge, door, .125 x 3 x 2.125	4	31-80-29	29C
6-rivet, button head, .25 x .75	24	31-80-29	
1-plate, .125 x 5.5 x 16	2	31-80-29	29D

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
TRACK PLATFORM—continued.			
2-drum, track	2	31-80-28	28A
8-screw, flathead #10 (.190) x 24 x .75	16	31-80-28	AK115D
2-drum, track winding	2	31-80-24	24B
8-rivet, butt. head c'sunk, .312 ($\frac{5}{16}$) x .875	16	31-80-24	
2-drum, track platform	2	31-80-24	24E
12-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	24	31-80-24	
2-gear, track winding	2	31-80-25	25A
1-bushing, gear	2	31-80-25	25E
2-hub, drum	2	31-80-25	25C
4-hub, drum	2	31-80-28	28E
2-hub, drum	2	31-80-24	24C
2-pinion, track winding	2	31-80-25	25B
1-plate, front track bolt support, .25 x 13.5 x 33	1	31-80-29	29F
15-rivet, c'sunk head, .312 ($\frac{5}{16}$) x 1	15	31-80-29	
1-plate, front track bolt support, .25 x 13.5 x 33	1	31-80-29	29G
15-rivet, c'sunk head, .312 ($\frac{5}{16}$) x 1	15	31-80-29	
1-plate, rear track bolt support, .25 x 13.5 x 33	1	31-80-29	29A
15-rivet, c'sunk head, .312 ($\frac{5}{16}$) x 1	15	31-80-29	
1-plate, rear track bolt support, .25 x 13.5 x 33	1	31-80-29	29B
15-rivet, c'sunk head, .312 ($\frac{5}{16}$) x 1	15	31-80-29	
2-plate, track platform top (1–R, 1–L), complete		31-80-23	
1-angle, right, 1.5 x 1.5 x .187 ($\frac{3}{16}$) x 169	1	31-80-23	23C
41-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	41	31-80-23	
1-angle, left, 1.5 x 1.5 x .187 ($\frac{3}{16}$) x 169	1	31-80-23	23D
41-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	41	31-80-23	
1-angle, right, 1.5 x 1.5 x .187 ($\frac{3}{16}$) x 159	1	31-80-23	23E
39-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	39	31-80-23	
1-angle, left, 1.5 x 1.5 x .187 ($\frac{3}{16}$) x 159	1	31-80-23	23F
39-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	39	31-80-23	
1-angle, right, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 8	1	31-80-23	23G
3-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	3	31-80-23	
2-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x 1	2	31-80-23	
1-angle, left, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 8	1	31-80-23	23H
3-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	3	31-80-23	
2-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x 1	2	31-80-23	
1-plate, right, .125 x 24 x 169	1	31-80-23	23A
84-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	84	31-80-23	
24-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x 1	24	31-80-23	
1-plate, left, .125 x 24 x 169	1	31-80-23	23B
84-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	84	31-80-23	
24-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x 1	24	31-80-23	
2-plates, track platform bottom (1–R, 1–L), complete		31-80-23	
1-angle, right, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 183.75	1	31-80-23	23P
46-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	46	31-80-23	
1-angle, left, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 183.75	1	31-80-23	23Q
46-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	46	31-80-23	
1-angle, right, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 14	1	31-80-23	23R
4-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	4	41-80-23	
1-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x 1.125	1	31-80-23	
1-angle, left, 1.25 x 1.25 x .187 ($\frac{3}{16}$) x 14	1	31-80-23	23S
4-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	4	31-80-23	
1-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x 1.125	1	31-80-23	
1-plate, right, .062 ($\frac{1}{16}$) x 24 x 183.75	1	31-80-23	23K
112-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	112	31-80-23	
12-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x 1	12	31-80-23	
1-plate, left, .062 ($\frac{1}{16}$) x 24 x 183.75	1	31-80-23	23L
112-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	112	31-80-23	
12-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x 1	12	31-80-23	
1-strap, right, .187 ($\frac{3}{16}$) x 1. x 19.5	1	41-80-23	23M
4-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	4	31-80-23	
1-strap, left, .187 ($\frac{3}{16}$) x 1. x 19.5	1	31-80-23	23N
4-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	4	31-80-23	
1-strap, right, .187 ($\frac{3}{16}$) x 1. x 21.5	1	31-80-23	23T
4-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	4	31-80-23	
1-strap, left, .187 ($\frac{3}{16}$) x 1. x 21.5	1	31-80-23	23U
4-rivet, butt. hd. c'sunk, .312 ($\frac{5}{16}$) x .875	4	31-80-23	
4-plates, tool comp. side (R) .125 x 6.937 ($6\frac{15}{16}$) x 23.75	4	31-80-44	44A
1-plate, tool comp. side (forw.) R., .125 x 7.437 ($7\frac{7}{16}$) x 24.25	1	31-80-44	44B
4-rivet, butt. hd., .312 ($\frac{5}{16}$) x 1	4	31-80-44	
1-plate, tool comp. side (forw.) L., .125 x 6.937 ($6\frac{15}{16}$) x 24.25	1	31-80-44	44C
4-rivet, butt. hd., .312 ($\frac{5}{16}$) x 1	4	31-80-44	
1-plate, tool comp. side (forw.) right, .125 x 7.437 ($7\frac{7}{16}$) x 22.187	1	31-80-44	44E
4-rivet, butt. hd., .312 ($\frac{5}{16}$) x 1	4	31-80-44	

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
TRACK PLATFORM—continued.			
1-plate, tool comp. side (forw.) left, .125 x 7.437 ($7\frac{7}{16}$) x 22.187	1	31-80-44	44D
4-rivet, butt. hd., .312 ($\frac{5}{16}$) x 1	4	31-80-44	
4-plate, track shaft support, .25 x 3.75 x 13.25	4	31-80-27	27E
6-rivet, c'sunk head, .312 ($\frac{5}{16}$) x 1	24	31-80-27	
2-handle, plate	2	31-80-44	44F
10-shaft, track support	10	31-80-26	26C
1-pin, split, .187 ($\frac{3}{16}$) x 2.5	10	31-80-26	
2-shaft, track support	2	31-80-24	24D
1-pin, .187 ($\frac{3}{16}$) x 2.5 sp it	2	31-80-24	
2-shaft, drum	2	31-80-28	28B
2-pin, split, .093 ($\frac{3}{32}$) x 1.5	4	31-80-28	
2-washers, .75	4	31-80-28	
WHEELS.			
2-axle, center wheel, complete		31-80-S	
2-axle, center wheel	4	31-OL-98	KM98F
1-nut, axle	4	31-OL-98	KM98E
1-pin, taper, #3 x 4.5	4	31-OL-98	KM98D
1-spacer, bearing	4	31-OL-98	KM98G
2-bearing, center wheel shaft	4	31-OL-101	KM101E
6-bolt, S. A. E., 625 x 1.5	24	31-OL-101	HM116D
6-nut, S. A. E., .625	24	31-OL-101	
6-washer, lock, .625	24	31-OL-101	
2-crank, center wheel	4	31-OL-101	KM101C
2-shaft, center wheel	4	31-OL-101	KM101A
1-collar	4	31-OL-101	KM101B
1-pin, taper, #10 x 5.5	4	31-OL-101	FF16OF
2-spacer, center wheel	4	31-OL-98	KM98K
1-tube, center wheel shaft	2	31-OL-101	KM101D
2-spacer, center wheel axle	4	31-OL-98	KM98K
1-axle, drive wheel	2	31-OL-98	KM98A
1-nut, axle	2	31-OL-98	KM98C
1-pin, taper, #8 x 4.5	2	31-OL-98	KM98D
1-spacer, bearing	2	31-OL-98	KM98B
2-Bracket steering wheel pivot (1-R, 1L) complete		31-80-9	
1-arm, front wheel swivel, right	1	31-OL-90	KM90C
2-bushing, swivel arm	2	31-OL-90	KM90H
2-bushing, swivel arm	2	31-OL-90	KM90K
1-arm, front wheel swivel, left	1	31-OL-90	KM90-D
2-bushing, swivel arm	2	31-OL-90	KN90H
2-bushing, swivel arm	2	31-OL-90	KM90K
2-washer, thrust	4	31-OL-90	KM90L
1-bolt, track tension spring	2	31-OL-100	KM100A
1-brackct, steering wheel pivot, right	1	31-OL-97	KM97A
1-bushing, bracket	1	31-OL-97	KM97C
1-bushing, bracket	1	31-OL-97	KM97D
1-bracket, steering wheel pivot, left	1	31-OL-97	KM97B
1-bushing, bracket	1	31-OL-97	KM97C
1-bushing, bracket	1	31-OL-97	KM97D
1-lever, swivel arm stop	2	31-OL-99	KM99B
1-bolt, lock	2	31-OL-99	KM99C
1-key, .375 x 1.5 sq	2	31-OL-99	HM117F
1-nut, .75	2	31-OL-99	
1-pin, taper, #4 x 2.75	2	31-OL-99	FF165F
1-nut, spring	2	31-OL-100	KM100D
1-nut, spring bolt	2	31-OL-100	KM100E
1-pin, taper #10 x 9	2	31-OL-100	KM100F
1-pin, front wheel	2	31-OL-90	KM90A
1-pin, swivel arm	2	31-OL-90	KM90E
1-screw, cap, S. A. E., .5 x .75	2	31-OL-90	KM90G
1-washer, pin	2	31-OL-90	KM90F
1-spring track tension	2	31-OL-99	KM100C
1-stop, swivel arm	2	31-OL-99	KM99A
4-washer, pin spacing	8	31-OL-90	KM90B
1-washer, thrust	2	31-OL-100	KM100B
4-wheel, center, complete		31-OL-85	
1-bearing, center wheel	4	31-OL-86	KM86E
1-bearing, center wheel	4	31-OL-86	KM86G
1-cap, hub	4	31-OL-86	KM86F
6-nut, S. A. E., .5	24	31-OL-86	
6-stud, S. A. E., 5 x 1.5	24	31-OL-86	KM86D
6-washer, lock, .5	24	31-OL-86	
1-plate, center wheel cover	4	31-OL-89	KM89A
1-plate, center wheel cover	4	31-OL-89	KM89C

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
WHEELS—continued.			
4-wheel, center, complete—Continued.			
1-retainer, bearing	4	31-OL-86	KM86C
6-nut, S. A. E., .5	24	31-OL-86	.....
6-stud, S. A. E., .5 x 1.5	24	31-OL-86	KM86D
6-washer, lock, .5	24	31-OL-86	.....
2-tire, center wheel	8	31-OL-96	KM96B
1-wheel, center	4	31-OL-86	KM86A
46-nut, S. A. E., .5	184	31-OL-86	.....
46-stud, S. A. E., .5 x 1.25	184	31-OL-86	KM86B
46-washer, Lock, .5	184	31-OL-86	.....
2-wheel, drive, complete	.....	.....	.....
3-bearing, drive wheel	6	31-OL-94	KM94B
1-cap, drive wheel hub	2	31-OL-89	KM89D
6-nut, S. A. E., .5	12	31-OL-89	.....
6-Stud, S. A. E., .5 x 1.5	12	31-OL-89	KM86D
6-washer, lock, .5	12	31-OL-89	.....
1-clamp, tire	2	31-OL-87	KM87B
1-gear, final drive	2	31-OL-87	KM87A
28-nut, S. A. E., .5	56	31-OL-87	.....
28-stud, S. A. E., .5 x 4.625	56	31-OL-87	KM87C
28-washer, lock, .5	56	31-OL-87	.....
1-tire, drive wheel	2	31-OL-96	KM96A
1-tire, outer	2	31-OL-102	KM102A
1-wheel driving	2	31-OL-94	KM94A
23-nut, S. A. E., .5	46	31-OL-94	.....
23-stud, S. A. E., .5 x 1.5	46	31-OL-94	KM86D
23-washer, lock, .5	46	31-OL-94	.....
2-wheel, steering, complete	.....	31-OL-84	.....
34-ball, 1	68	31-OL-92	KM92F
1-ball race, steering wheel inner	2	31-OL-92	KM92E
1-ball race, steering wheel outer	2	31-OL-92	KM92B
1-center, steering wheel	2	31-OL-91	KM91A
26-nut, S. A. E., .5	52	31-OL-91	.....
2-screw, set, .5 x 1	4	31-OL-91	KM91C
26-stud, S. A. E., .5 x 1.375	52	31-OL-91	KM91B
26 washer, .5	52	31-OL-91	.....
1-clamp, ball race	2	31-OL-92	KM92A
3-plug, pipe, 375	6	31-OL-92	KM92G
8-clamp, ball retainer	16	31-OL-92	KM92D
2-clamp, steering wheel tire	4	31-OL-95	KM95B
1-retainer, ball	2	31-OL-92	KM92C
2-tire, steering wheel	4	31-OL-95	KM95A
1-wheel, steering	2	31-OL-93	KM93A
70-nut, S. A. E., .5	140	31-OL-93	.....
70-stud, S. A. E., .5 x 1.5	140	31-OL-93	KM86D
70-washer, lock, .5	140	31-OL-93	.....
EQUALIZER.			
2-bar, equalizer	2	31-0-164	FF164A
1-bushing	2	31-0-164	FF164B
1-bushing	2	31-0-164	FF164C
2-bearing, track idler roller	2	31-0-165	FF165C
2-bearing, worm gear shaft	2	31-0-161	FF161A
6-bolt, c'sunk, .625 x 1.25	12	31-0-161	FF161B
6-nut, .625	12	31-0-161	.....
6-washer, lock, .625	12	31-0-161	.....
2-bolt, equalizer spring	2	31-0-163	FF163D
1-pin, .312 ($\frac{5}{16}$) x 4	2	31-0-163	FF163E
2-bracket, wormshaft	2	31-80-46	46A
2-bolt, S. A. E., .5 x 1.25	4	31-80-46	HM118G
2-nut, S. A. E. .5	4	31-80-46	.....
2-washer, lock, 5	4	31-80-46	.....
1-bracket, wormshaft, right	1	31-0-161	FF161D
6-bolt, S. A. E. .625 x 1.75	6	31-0-161	KM88B
6 nut, S. A. E. .625	6	31-0-161	.....
6-washer, lock, .625	6	31-0-161	.....
1-bracket, wormshaft, left	1	31-0-161	FF161C
6-bolt, S. A. E. .625 x 1.75	6	31-0-161	KM88B
6-nut, S. A. E. .625	6	31-0-161	.....
6-washer, lock, .625	6	31-0-161	.....
2-cap, bearing	2	31-0-165	FF165A
1-plug, oil .125	2	31-0-165	.....
2-cap, equalizer spring upper	2	31-0-163	FF163A
1-plug, pipe .375	2	31-0-163	KM92G
2-cap, equalizer spring lower	2	31-0-163	FF163B

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Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
EQUALIZER—continued.			
4 clip, equalizer bar	4	31-0-164	FF164E
1-bushing	4	31-0-164	FF164F
2-gear, worm	2	31-0-160	FF160C
2-key, .437 ($\frac{7}{16}$) x 3.55SQ	4	31-0-160	FF160H
1-pin, taper 10 x 5.5	2	31-0-160	FF160F
2-guide, equalizer spring	2	31-0-163	FF163C
2-nut, pin	2	31-0-165	FF165E
1-pin, taper #4 x 2.75	2	31-0-165	FF165F
2-nut, worm gear shaft	2	31-0-161	FF161E
1-pin, taper #4 x 3.75	2	31-0-161	FF161F
2-nut, ratchet	2	31-0-160	FF160D
1-key, .437 ($\frac{7}{16}$) x 1.75SQ	2	31-0-160	FF160K
1-pin, taper #6 x 3.375	2	31-0-160	AM223G
2-nut, pin	2	31-0-165	FF165H
1-pin, taper #4 x 2.75	2	31-0-165	FF165F
2-pin, equalizer bar	2	31-0-165	FF165G
1-plug, pipe, .25	2	31-0-165	FF165G
2-pin, equalizer bar	2	31-0-165	FF165D
1-plug, pipe, .25	2	31-0-165	.....
2-roller, track idler	2	31-0-165	FF165B
2-shaft, worm gear	2	31-0-162	FF162A
2-shaft, worm	2	31-0-160	FF160A
1-nut, castle S. A. E. 1	2	31-0-160	.....
2-spacer, clip	2	31-0-164	FF164C
2-spring, equalizer	2	31-0-164	FF164D
1-tube, worm gear shaft	1	31-0-162	FF162B
2-washer, worm shaft	2	31-0-161	FF161C
2-washer, worm shaft	2	31-0-161	FF161H
2-washer, worm shaft	2	31-0-160	FF160E
2-worm	2	31-0-160	FF160B
1-key, .437 ($\frac{7}{16}$) x 35SQ	2	31-0-160	FF160H
TRACK.			
92-link, track, complete	.....	31-OE-82	.....
1-link, track	92	31-OE-83	WK83B
2-pin, track	184	31-OE-83	WK83E
1-pin, split, .25 x 1.5	184	31-OE-83	.....
1-washer, .812 ($\frac{13}{16}$) x 1.375 x .25	184	31-OE-83	WK83F
2-spacer, tooth	184	31-OE-83	WK83C
1-spacer, tooth	92	31-OE-83	WK83D
1-tooth track	92	31-OE-83	WK83A
12-rivet c'sunk head, .5 x 1	1104	31-OE-83	.....
CONTROLS.			
1-bracket, gear shift, complete	.....	31-OK-3	.....
2-bar, gear shift	2	31-OK-114	HM114F
3-bushing, spring	3	31-OK-112	HM112E
1-button, plunger operating	1	31-OK-113	HM113D
2-cover, spring housing	2	31-OK-113	HM113A
2-screw, .312 ($\frac{5}{16}$) x .5 flathead	4	31-OK-113	HM113H
2-handle, brake lever	2	31-OK-112	HM112B
1-handle, gear shift lever	1	31-OK-112	HM112C
1-lever, gear shift	1	31-OK-112	HM112A
2-lever, brake control	2	31-OK-112	HM112D
1-pawl, locking	1	31-OK-113	HM113E
2-pawl, brake control locking	2	31-OK-113	HM113F
3-plunger, spring	3	31-OK-112	HM112F
2-plunger, gear shift	2	31-OK-113	HM113B
1-quadrant, gear shift	1	31-OK-111	HM111A
4-nut, S. A. E., 625	4	31-OK-111	.....
1-pin, taper, #1 x 2	1	31-OK-111	AM221E
4-stud, S. A. E., 625 x 2	4	31-OK-111	HM111B
4-washer, lock, .625	4	31-OK-111	.....
4-sector, brake control	4	31-OK-114	HM114A
1-shaft, gear shift rocker	1	31-OK-113	HM113G
2-nut, castle, S. A. E., .5	2	31-OK-113	.....
2-washer, .5	2	31-OK-113	.....
4-spacer, sector	4	31-OK-114	HM114C
2-spacer, brake lever	2	31-OK-114	HM114E
3-spring, plunger	3	31-OK-112	HM112H
2-spring, plunger	2	31-OK-112	HM112G
4-stud, gear shift	4	31-OK-114	HM114D
2-nut, castle, S. A. E., .5	8	31-OK-114	.....
2-washer, thrust	2	31-OK-113	HM113C
2-socket, rod end	2	31-OK-114	HM114B
2-brake (1 right, 1 left), complete	.....	31-OD-86	.....

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
CONTROLS—continued.			
1-bracket, gear shift, complete—Continued.			
1-band, brake	2	31-OM-48	LM48A
1-bolt, brake screw	2	31-OM-46	LM46C
2-bushing, brake screw	4	31-OM-45	LM45A
4-nut, S. A. E., .5	16	31-OM-45	.....
2-pin, dowel, .5 x .15	8	31-OM-45	LM45L
4-stud, S. A. E., .5 x 1.625	16	31-OM-45	LM45B
4-washer, lock, .5	16	31-OM-45	.....
1-collar, ratchet	2	31-OM-46	LM46B
1-drum, brake	2	31-OM-47	LM47A
26-rivet, buttonhead, 312 ($\frac{3}{16}$) x 1	52	31-OM-47	.....
1-hub, brake drum	2	31-OM-47	LM47B
2-key, .5 x 8.25 SQ	4	31-OM-47	LM47C
1-lever, brake operating	2	31-OM-45	LM45K
6-rivet, buttonhead C'sunk, .25 x 1	12	31-OM-45	.....
2-lug, brake band	4	31-OM-48	LM48B
2-nut, castle, S. A. E., .5	8	31-OM-48	.....
32-rivet, buttonhead C'sunk, .312 ($\frac{5}{16}$) x 1	8	31-OM-48	.....
2-stud, S. A. E., .5 x 1.5	8	31-OM-48	KM36D
1-nut, brake screw right	2	31-OM-45	LM45G
1-nut, brake screw left	2	31-OM-45	LM45H
1-nut, holding	2	31-OM-46	LM46D
1-ratchet, adjusting	2	31-OM-46	LM46A
1-key, .25 x .75 SQ	2	31-OM-46	LM46E
1-screw, brake, left	1	31-OM-45	LM45D
1-pin, taper, #2 x 1.75	2	31-OM-45	LM45E
1-pin, taper, #3 x 2.125	2	31-OM-45	LM45F
1-screw, brake, right	1	31-OM-45	LM45C
1-pin, taper, #2 x 1.75	2	31-OM-45	LM45E
1-pin, taper, #3 x 2.125	2	31-OM-45	LM45F
2-clutch assembly (1 right, 1 left) complete	.....	31-OR-37 31-OR-38	.....
1-bearing, clutch	2	31-OR-40	TM40H
3-bushing, clutch spring	6	31-OR-39	TM39E
1-cam, clutch, right	1	31-OR-39	TM39A
1-cam, clutch, left	1	31-OR-39	TM39B
1-cam, clutch, right	1	31-OR-39	TM39F
1-cam, clutch, left	1	31-OR-39	TM39G
1-flywheel, right	1	31-OR-41	TM41A
2-key, .5 x 2.875	2	31-OR-41	TM41F
1-flywheel, left	1	31-OR-41	TM41E
2-key, .5 x 2.875	2	31-OR-41	TM41F
1-hub, clutch plate	2	31-OR-40	TM40A
3-pin, clutch stop	6	31-OR-39	TM39C
1-plate, clutch pressure	2	31-OR-40	TM40B
5-bolt, S. A. E., .5 x 1.625	12	31-OR-40	TM40E
6-nut, S. A. E., .5	12	31-OR-40	.....
12-screw, cap, S. A. E., 312 ($\frac{5}{16}$) x .75	24	31-OR-40	TM40C
12-washer, lock, .312 ($\frac{5}{16}$)	24	31-OR-40	.....
6-washer, lock, .5	12	31-OR-40	.....
1-plate, clutch	2	31-OR-40	TM40D
1-plate, clutch	2	31-OR-41	TM41B
1-plate, clutch	2	31-OR-41	TM41C
2-plate, clutch	4	31-OR-41	TM41D
16-rivet, C'sunkhead, .437 ($\frac{7}{16}$) x 1	64	31-OR-41	.....
2-spacer, pressure plate, right	2	31-OR-40	TM40F
3-nut, S. A. E., .5	6	31-OR-40	.....
3-stud, S. A. E., .5 x 1.375	6	31-OR-40	KM91B
3-washer, lock, .5	6	31-OR-40	.....
2-spacer, pressure plate, left	2	31-OR-40	TM40G
3-nut, S. A. E., .5	6	31-OR-40	.....
3-stud, S. A. E., .5 x 1.375	6	31-OR-40	KM91B
3-washer, lock, .5	6	31-OR-40	.....
3-spring, clutch	6	31-OR-39	TM39D
12-spring, clutch	24	31-OR-39	TM39H
1 stud, clutch cam	2	31-OR-39	TM39L
1-pin, split, .093 ($\frac{3}{32}$) x 1	2	31-OR-39	.....
1-washer	2	31-OR-39	AM219F
12-stud, clutch	24	31-OR-39	TM39K
1-nut, castle, S. A. E., .75 face off to .437 ($\frac{7}{16}$)	24	31-OR-39	TM39M
1-control, carburetor, complete	.....	31-OS-52	.....
1-bracket, bell crank	1	31-OK-4	HM4D
2-bolt, S. A. E., .312 ($\frac{5}{16}$) x 1	2	31-OK-4	HM4E
2-nut, S. A. E., .312 ($\frac{5}{16}$)	2	31-OK-4	.....
2-washer, lock .312 ($\frac{5}{16}$)	2	31-OK-4	.....
1-crank, bell, carburetor control	1	31-OK-4	HM4B
1-lever, throttle	1	31-OK-6	HM6D
1-pawl, throttle lever	1	31-OK-6	HM6G

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
CONTROLS—continued.			
1-control, carburetor, complete—Continued.			
1-quadrant, control	1	31-OK-6	HM6A
2-bolt, S. A. E., .25 x 1	1	31-OK-6	HM6B
2-nut, S. A. E., .25	2	31-OK-6	.....
2-washer, lock .25	2	31-OK-6	.....
1-rod, carburetor	1	31-OK-4	HM4A
2-pin, split .062 ($\frac{1}{16}$) x .5	2	31-OK-4	.....
1-rod, carburetor control	1	31-OK-4	HM4C
1-pin, split, .062 ($\frac{1}{16}$) x .5	1	31-OK-4	.....
1-spring, control lever	1	31-OK-6	HM6H
1-stud, bell crank	1	31-OK-4	HM4F
1-nut, S. A. E., .375	1	31-OK-4	.....
1-washer, .375	1	31-OK-4	.....
1-washer, .5	1	31-OK-4	.....
1-stud, control quadrant	1	31-OK-6	HM6C
1-nut, castle, S. A. E., .375	1	31-OK-6	.....
1-washer, .375	1	31-OK-6	.....
1-stud, throttle lever	1	31-OK-6	HM6E
1-pin, split .093 ($\frac{3}{32}$) x 1.5	.....	.....	.....
2-control, clutch & brake (1 right, 1 left) complete	.....	31-OK-121	.....
2-bearing, brake control shaft	2	31-OK-120	HM120E
2-bolt, S. A. E., .312 ($\frac{5}{16}$) x .75	4	31-OK-120	HM120F
4-nut, S. A. E., .312 ($\frac{5}{16}$)	8	31-OK-120	.....
2-stud, S. A. E., .312 ($\frac{5}{16}$) x 1	4	31-OK-120	AM227E
4-washer, lock, .312 ($\frac{5}{16}$)	8	31-OK-120	.....
1-bracket, brake control	2	31-OK-120	HM120A
4-nut, castle, S. A. E., 5	8	31-OK-120	.....
4-stud, S. A. E., 5 x 1.25	8	31-OK-120	KM86B
6-clevis, brake control, right	6	31-OK-107	HM107C
5-clevis, brake control, left	5	31-OK-107	HM107C
1-clevis, brake control, double	2	31-OK-107	HM107E
2-lever, brake control, right	2	31-OK-120	HM120B
1-lever, brake control	2	31-OK-108	HM108C
1-pin, taper, #4 x 2	2	31-OK-108	AM221E
1-lever brake control	2	31-OK-108	HM108D
1-pin, taper #4 x 2	2	31-OK-108	AM221E
1-lever, clutch & brake	2	31-OK-108	HM108E
1-pin, brake control, right	1	31-OK-108	HM108A
1-pin, split, .125 x 1	1	31-OK-108	.....
1-washer	1	31-OK-108	AM219F
4-pin, brake control	8	31-OK-108	HM108A
1-pin, split, .125 x 1	8	31-OK-108	.....
1-washer	8	31-OK-108	AM219F
1-pin, brake control	2	31-OK-108	HM108B
1-pin, split, .125 x 1	2	31-OK-108	.....
1-washer	2	31-OK-108	AM219F
1-pin, brake control	2	31-OK-108	HM108T
1-pin, split, .125 x 1	2	31-OK-108	.....
1-washer	2	31-OK-108	AM219F
1-rod, brake control	2	31-OK-120	HM120C
1-rod end, brake control, right	1	31-OK-107	HM107D
1-shaft, brake control bracket	2	31-OK-108	HM108S
2-key, .25 x 1. SQ	2	31-OK-108	HM120K
1-shaft, clutch & brake control, right	1	31-OK-120	HM120D
2-key, .25 x 1 sq	2	31-OK-120	HM120K
1-socket, offset rod end	2	31-OK-107	HM107A
1-stud, brake control lever, right	1	31-OK-107	HM107B
1-pin, split, .125 x 1	2	31-OK-107	.....
1-washer, .625	2	31-OK-107	.....
1-stud, clutch control pivot, right	1	31-OK-120	HM120L
2-nut, castle, S. A. E., .75	2	31-OK-120	.....
2-washer, .75	2	31-OK-120	.....
1-stud, clutch control pivot, left	1	31-OK-120	HM120H
2-nut, castle, S. A. E., .75	2	31-OK-120	.....
2-washer, .75	2	31-OK-120	.....
1-tie rod, clutch & brake control, right	1	31-OK-108	HM108L
2-nut, S. A. E., .625	2	31-OK-108	.....
1-tie rod, clutch & brake control, left	1	31-OK-108	HM108M
2-nut, S. A. E., .625	2	31-OK-108	.....
1-tie rod, clutch & brake control, right	1	31-OK-108	HM108N
2-nut S. A. E., .625	2	31-OK-108	.....
2-tie rod, clutch control	2	31-OK-108	HM108F
2-nut, S. A. E., .625	4	31-OK-108	.....
1-tie rod, brake control, right	1	31-OK-108	HM108G
2-nut, S. A. E., .625	2	31-OK-108	.....
1-tie rod, brake control, left	1	31-OK-108	HM108H
2-nut, S. A. E., .625	2	31-OK-108	.....

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
CONTROLS—continued.			
1-control, magneto, complete		31-OD-122	
1-bar, magneto extension	1	31-OK-5	HM5G
2-rivet, button head, .125 x .5	2	31-OK-5	
3-bracket, control shaft	3	31-OK-5	HM5C
2-screw, flathead, .25 x .5	6	31-OK-5	HM5D
2-lever, control shaft	2	31-OK-5	HM5B
1-pin, taper #2 x 1.25	2	31-OK-5	AM219M
1-lever, spark control	1	31-OK-6	HM6F
1-pawl, spark control	1	31-OK-6	HM6G
1-quadrant, control	1	31-OK-6	HM6A
2-bolt, S. A. E., .25 x 1	2	31-OK-6	HM6B
2-nut, S. A. E., .25	2	31-OK-6	
2-washer, lock, .25	2	31-OK-6	
1-rod, magneto control	1	31-OK-5	HM5E
2-pin, split, .062 ($\frac{1}{16}$) x .5	2	31-OK-5	
1-rod, magneto extension	1	31-OK-5	HM5F
2-pin, split, .062 ($\frac{1}{16}$) x .5	2	31-OK-5	
1-shaft, magneto control	1	31-OK-5	HM5A
1-spring, control lever	1	31-OK-6	HM6H
1-stud, control quadrant	1	31-OK-6	HM6C
1-nut, castle, S. A. E., .375	1	31-OK-6	
1-washer, .375	1	31-OK-6	
1-control, steering complete		31-80-9	
1-axle, steering, wheel	1	31-OK-116	HM116G
2-block, spacer	2	31-OK-109	HM109B
2-bolt, steering knuckle	2	31-OK-109	HM109G
1-nut, castle, S. A. E., 1	2	31-OK-109	
1-washer 1	2	31-OK-109	
2-bolt, steering knuckle	2	31-OK-109	HM109H
1-nut, castle, S. A. E., 1	2	31-OK-109	
1-washer 1	2	31-OK-109	
2-bolt, steering knuckle	2	31-OK-109	HM109K
1-nut, castle, S. A. E., .75	2	31-OK-109	
1-washer, .75	2	31-OK-109	
2-bolt, steering link	2	31-OK-110	HM110F
1-nut, castle, S. A. E., .75	2	31-OK-110	
1-bracket, steering pinion upper	1	31-OK-116	HM116A
2-bolt, S. A. E., .625 x 1	2	31-OK-116	HM116B
1-plug, pipe .375	1	31-OK-116	KM92G
1-bracket, steering pinion lower	1	31-OK-116	HM116C
2-bolt, S. A. E., .625 x 1.5	2	31-OK-116	HM116D
2-bolt, S. A. E., .625 x 4.25	2	31-OK-116	HM116E
4-nut, S. A. E., .625	4	31-OK-116	
4-washer, lock, .625	2	31-OK-116	
2-cap, dust	2	31-OK-109	HM109D
1-gear, steering idler	1	31-OK-117	HM117D
2-guide, steering link	2	31-OK-110	HM110C
2-knuckle, steering	2	31-OK-109	HM109C
2-link, steering	2	31-OK-109	HM109A
2-nut, front axle	2	31-OK-109	HM109F
6-nut, S. A. E., .312 ($\frac{5}{16}$)	12	31-OK-109	
6-stud, S. A. E., .312 ($\frac{5}{16}$) x 1	12	31-OK-109	AM227E
2-nut, steering rod	2	31-OK-110	HM110G
1-pin, taper, #5 x 2	2	31-OK-110	HM110E
1-pinion, steering	1	31-OK-117	HM117C
1-rack, steering	1	31-OK-110	HM110D
2-pin, taper, #5 x 2	2	31-OK-110	HM110E
2-retainer, dust cap	2	31-OK-109	HM109E
2-rod, steering	2	31-OK-110	HM110A
1-shaft, steering pinion	1	31-OK-117	HM117A
1-key, number work 3 75 x 2.5 sq	1	31-OK-117	HM117E
1-key, .375 x 1.5 sq	1	31-OK-117	HM117F
1-shaft, steering idler gear	1	31-OK-117	HM117B
1-sprocket, steering	1	31-OK-116	HM116F
1-pin, taper #4 x 2.75	1	31-OK-116	FF165F
4-washer, spacer	4	31-OK-110	HM110J
2-washer	2	31-OK-110	HM110H
1-lever, reverse gear shift, complete		31-80-10	
1-bracket, pivot stud	1	31-OK-115	HM115K
2-bolt, S. A. E., .5 x 1.5	2	31-OK-115	HM115L
2-nut, S. A. E., .5	2	31-OK-115	
2-washer, lock, .5	2	31-OK-115	
1-bushing, spring	1	31-OK-112	HM112E
1-handle, reverse gear shift lever	1	31-OK-112	HM112C
1-lever, reverse gear shifting	1	31-OK-115	HM115D

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
CONTROLS—continued.			
1-lever, reverse gear shift, complete—Continued.			
1-pawl, locking	1	31-OK-115	HM115B
1-plunger, spring	1	31-OK-112	HM112F
1-rod, locking pawl	1	31-OK-115	HM115G
2-sector, reverse gear	2	31-OK-115	HM115A
2-spacer, sector	2	31-OK-114	HM114C
1-spring, plunger	1	31-OK-112	HM112H
1-stud, pivot	1	31-OK-115	HM115C
1-nut, castle, S. A. E., .5	1	31-OK-115	.....
1-washer, .5	1	31-OK-115	.....
2-stud, reverse gear sector	2	31-OK-115	HM115M
2-nut, S. A. E., .5	4	31-OK-115	.....
2-washer, lock, .5	4	31-OK-115	.....
1-stud, reverse lever	1	31-OK-115	HM115N
1-nut, S. A. E., .625	1	31-OK-115	.....
1-pin, split, .093 ($\frac{3}{32}$) x 1	1	31-OK-115	.....
1-washer, .625	1	31-OK-115	.....
1-washer, lock, .625	1	31-OK-115	.....
2-rod, locking pawl	2	31-OK-115	HM115E
1-rod, locking pawl	1	31-OK-115	HM115F
4-pins, .125 x .562($\frac{9}{16}$)	4	31-OK-115	HM115H
1-post, steering, complete	.....	31-OK-2	.....
1-bearing, handwheel shaft	1	31-OK-118	HM118D
4-bolt, S. A. E., .375 x 1.5	4	31-OK-118	HM118F
4-nut, S. A. E., .375	4	31-OK-118	.....
4-washer, lock, .375	4	31-OK-118	.....
1-bracket, steering post	1	31-OK-118	HM118B
2-bolt, S. A. E., .5 x 1.25	2	31-OK-118	HM118G
2-nut, S. A. E., .5	2	31-OK-118	.....
1-screw, std. set, .25	1	31-OK-118	HM118C
2-washer, lock, .5	2	31-OK-118	.....
1-bracket, steering wheel locking	1	31-OK-11	HM11A
2-bolt, S. A. E., .5 x 1.25	2	31-OK-11	HM118G
2-nut, S. A. E., .5	2	31-OK-11	.....
2-washer, lock, .5	2	31-OK-11	.....
1-bushing, steering post	1	31-OK-118	HM118E
1-chain	1	31-OK-119	HM119D
1-handwheel, steering	1	31-OK-119	HM119A
1-nut, handwheel shaft	1	31-OK-119	HM119E
1-pin, taper #3 x 2.125	1	31-OK-119	LM45F
1-post, steering	1	31-OK-118	HM118A
1-screw, locking	1	31-OK-11	HM11B
1-washer, lock, .5	1	31-OK-11	.....
1-shaft, handwheel	1	31-OK-119	HM119B
1-key, .25 x 1.75 sq	1	31-OK-119	HM119F
1-key, .25 x 1.375 sq	1	31-OK-119	HM119G
1-nut, castle, S. A. E., .875	1	31-OK-119	.....
1-washer, .875	1	31-OK-119	.....
1-sprocket, steering	1	31-OK-119	HM119C
1-tie rod, reverse gear control, complete	.....	31-80-10	.....
1 rod end	1	31-OK-107	HM107D
1-socket, offset rod end	1	31-OK-107	HM107A
1-tie rod, reverse gear control	1	31-OK-108	HM108K
2-nut, S. A. E., .625	2	31-OK-108	.....
1-washer	1	31-OF-219	AM219F
1-pin, split, .125 x 1	1	31-OF-219	.....
1-tie rod, 1st & 2nd speed control, complete	.....	31-OK-3	.....
1-clevis	1	31-OK-107	HM107C
1-pin	1	31-OK-108	HM108A
1-pin, split, .125 x 1	1	31-OK-108	.....
1-washer	1	31-OK-108	AM219F
1-socket, offset rod end	1	31-OK-107	HM107A
1-tie rod, 1st & 2nd speed control	1	31-OK-108	HM108P
2-nut, S. A. E., .625	2	31-OK-108	.....
1-washer	1	31-OF-219	AM219F
1-pin, split, .125 x 1	1	31-OF-219	.....
1-tie rod, 3rd & 4th speed control, complete	.....	31-OK-3	.....
1-clevis	1	31-OK-107	HM107C
1-pin	1	31-OK-108	HM108A
1-pin, split, .125 x 1	1	31-OK-108	.....
1-washer	1	31-OK-108	AM219F
1-socket, offset rod end	1	31-OK-107	HM107A
1-tie rod, 3rd & 4th speed control	1	31-OK-108	HM108R
2-nut, S. A. E., .625	2	31-OK-108	.....
1-washer	1	31-OF-219	AM219F
1-pin, split, .125 x 1	1	31-OF-219	.....

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
MISCELLANEOUS.			
1-block, radiator rest	1	31-80-20	20C
2-bolt, lock	2	31-O-167	FF167A
2-bolt, pivot bracket spring	2	31-O-166	FF166B
1-bolt, sponge & rammer	1	31-80-40	40P
2-nut, .625	2	31-80-40	.....
1-washer .625	1	31-80-40	.....
2-bracket, axle	2	31-O-169	FF169A
2-bolt, S. A. E., .5 x 1	4	31-O-169	FF169B
3-bolt, S. A. E., .5 x 1.625	6	31-O-169	TM40
5-nut, S. A. E. .5	10	31-O-169	.....
5-washer, lock, .5	10	31-O-169	.....
1-bracket, lantern 1.25 x 4 x 6.75	1	31-80-40	40M
4-rivet, button head, .375 x 1	4	31-80-40	.....
1-bracket, tail lamp	1	31-80-43	43E
2-nut, S. A. E., .5	2	31-80-43	.....
2-stud, S. A. E., .5 x 1.25	2	31-80-43	KM86B
2-washer, lock, .5	2	31-80-43	.....
1-bracket, transmission case support	1	31-O-170	FF170A
4-nut, S. A. E., .5	4	31-O-170	.....
19-rivet, button head c'sunk, .5 x 1.75	19	31-O-170	.....
4-stud, S. A. E., .5 x 1.75	4	31-O-170	FF170B
4-washer, lock, .5	4	31-O-170	.....
2-bracket, side lamp	2	31-80-43	43F
2-bracket, side lamp	2	31-80-43	43G
2-cap, spring housing	2	31-O-167	FF167B
9-bolt, S. A. E., .5 x 2	18	31-O-167	FF167C
9-nut, S. A. E., .5	18	31-O-167	.....
9-washer, lock, .5	18	31-O-167	.....
1-clip, cant hook	1	31-80-40	40A
2-rivet, button head, .312($\frac{5}{16}$) x 1	2	31-80-40	.....
2-clip, cant hook	2	31-80-40	40B
2-rivet, button head, .312($\frac{5}{16}$) x 1	4	31-80-40	.....
2-clip, rammer	2	31-80-40	40N
1-pin, split, .187($\frac{3}{16}$) x 3	2	31-80-40	.....
1-rivet, button head, .312($\frac{5}{16}$) x 1	2	31-80-40	.....
1-cover, hand hole, .062($\frac{1}{16}$) x 7.5 x 7.5	1	31-80-43	43N
1-rivet, button head c'sunk, .375 x .5	1	31-80-43	.....
1-rivet, button head, .25 x 1	1	31-80-43	.....
1-screw, RD. HD., .25 x .375	1	31-80-43	43K
3-cover, hand hole, .062($\frac{1}{16}$) x 9.625 x 9.625	3	31-80-45	45B
1-rivet, button head c'sunk, .375 x .5	3	31-80-45	.....
1-rivet, button head, .25 x 1	3	31-80-45	.....
1-screw, RD. HD., .25 x .625	3	31-80-45	45C
1-cover, flywheel, right	1	31-O-169	FF169C
6-nut, S. A. E., .5	6	31-O-169	.....
6-stud, S. A. E., .5 x 1.375	6	31-O-169	KM91B
6-washer, lock, .5	6	31-O-169	.....
1-cover, flywheel, left	1	31-O-169	FF169D
6-nut, S. A. E., .5	6	31-O-169	.....
6-stud, S. A. E., .5 x 1.375	6	31-O-169	KM91B
6-washer, lock, .5	6	31-O-169	.....
1-cover, steering control, .062($\frac{1}{16}$) x 16 .375 x 26.5	1	31-80-45	45A
5-nut, S. A. E., .312($\frac{5}{16}$)	5	31-80-45	.....
5-stud, S. A. E., .312($\frac{5}{16}$) x .875	5	31-80-45	AM224D
5-washer, lock, .312($\frac{5}{16}$)	5	31-80-45	.....
2-cover, steering bracket, .125 x 9.75 x 17.5	2	31-80-45	45D
1-cover, steering sprocket	1	31-80-46	46B
4-nut S. A. E., .312($\frac{5}{16}$)	4	31-80-46	.....
4-stud S. A. E., .312($\frac{5}{16}$) x .875	4	31-80-46	AM224D
4-washer lock, .312($\frac{5}{16}$)	4	31-80-46	.....
1-cover, vacuum tank	1	31-0-169	FF169E
6-nut, S. A. E., .312 ($\frac{5}{16}$)	6	31-0-169	.....
6-stud, .312 ($\frac{5}{16}$) x 1	6	31-0-169	AM227E
6-washer, lock, .312 ($\frac{5}{16}$)	6	31-0-169	.....
1-cover, worm gear, right	1	31-80-46	46C
6-nut, S. A. E., .312 ($\frac{5}{16}$)	6	31-80-46	.....
2-rivet, button head, .25 x .5	2	31-80-46	.....
6-stud, S. A. E., .312 ($\frac{5}{16}$) x .875	6	31-80-46	AM224D
6-washer, lock, .312 ($\frac{5}{16}$)	6	31-80-46	.....
1-cover, worm gear, left	1	31-80-46	46D
6-nut, S. A. E., .312 ($\frac{5}{16}$)	6	31-80-46	.....
2-rivet, button head, .25 x .5	2	31-80-46	.....
6-stud, S. A. E., .312 ($\frac{5}{16}$) x .875	6	31-80-46	AM224D
6-washer, lock, .312 ($\frac{5}{16}$)	6	31-80-46	.....

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
MISCELLANEOUS—continued.			
2-guard, clutch (1 right, 1 left), complete	.....	31-80-21	.....
1-angle, right, 1 x .625 x .125 x 38.75	1	31-80-21	21C
5-bolt, S. A. E., .25 x 1.25	5	31-80-21	21G
5-nut, S. A. E., .25	5	31-80-21	.....
9-rivet, button head c'sunk, .187 ($\frac{3}{16}$) x .75	9	31-80-21	.....
1-angle, left, 1 x .625 x .125 x 38.75	1	31-80-21	21D
5-bolt, S. A. E., .25 x 1.25	5	31-80-21	21G
5-nut, S. A. E., .25	5	31-80-21	.....
9-rivet, button head c'sunk, .187 ($\frac{3}{16}$) x .75	9	31-80-21	.....
1-angle, 1 x .625 x .125 x 36.625	2	31-80-21	21E
10-rivet, button head c'sunk, .187 ($\frac{3}{16}$) x .75	10	.....	.....
1-plate, right, .062 ($\frac{1}{16}$) x 6 x 36.625	1	31-80-21	21A
1-plate, left, .062 ($\frac{1}{16}$) x 6 x 36.625	1	31-80-21	21B
2-handle, plate	2	31-80-44	44F
1-leg, tool box support, .187 ($\frac{3}{16}$) x 1.25 x 8.25	1	31-80-41	41D
1-bolt, c'sunk head, .375 x .875	1	31-80-41	AK109G
1-nut, .375	1	31-80-41	.....
1-lock, traveling, complete	.....	31-80-34	.....
1-base, traveling lock	1	31-80-33	33A
1-lining, leather	1	31-80-33	33B
18-rivet, belt, 10 x 1	18	31-80-33	33H
1-cap, traveling lock	1	31-80-33	33D
1-lining, leather	1	31-80-33	33E
14-rivet, belt, 10 x 1	14	31-80-33	.....
1-eye bolt, traveling lock	1	31-80-33	33F
1-nut, 1	1	31-80-33	.....
1-washer, 1	1	31-80-33	.....
2-hinge, traveling lock	2	31-80-33	33C
4-bolt, S. A. E., .625 x 1.75	8	31-80-33	KM88B
4-nut, S. A. E., .625	8	31-80-33	.....
4-washer, lock, .625	8	31-80-33	.....
4-pin, hinge	4	31-80-33	33G
1-pin, split, .125 x 1.5	4	31-80-33	.....
1-washer, .75	4	31-80-33	.....
2-nut, lock	2	31-0-167	FF167D
2-nut, pivot bolt	2	31-0-166	FF166C
1-pin, taper, 4 x 3.375	2	31-0-166	AM223G
1-odometer	1	.....	.....
1-pad, radiator	1	31-80-20	20K
4-bolt, c'sunk, .25 x 2.25	4	31-80-20	20L
4-nut, .25	4	31-80-20	.....
4-washer, .25	4	31-80-20	.....
1-pad, radiator	1	31-80-20	20M
4-bolt, c'sunk, .25 x 2.25	4	31-80-20	20L
4-nut, .25	4	31-80-20	.....
4-washer, .25	4	31-80-20	.....
1-pad, radiator	1	31-80-20	20N
4-rivet, button head, c'sunk, .25 x .875	4	31-80-20	.....
1-pad, radiator	1	31-80-20	20P
4-rivet, button head, c'sunk, .25 x .875	4	31-80-20	.....
2-pin, pivot	2	31-0-166	FF166D
2-pintle, front, complete	.....	31-80-9	.....
1-housing, pintle spring	2	31-80-38	38C
10-bolt, S. A. E., .625 x 1.75	20	31-80-38	KM88B
10-nut, S. A. E., .625	20	31-80-38	.....
10-washer, lock, .625	20	31-80-38	.....
1-nut, pintle	20	31-80-38	38G
1-pin, taper, 4 x 2.75	2	31-80-38	FF165F
1-pintle	2	31-80-38	38F
1-spacer, pintle	2	31-80-38	38E
1-spring, pintle	2	31-80-38	38D
2-pintle, rear (1 right, 1 left), complete	.....	31-80-39	.....
1-housing, pintle spring, right	1	31-80-38	38A
8-bolt, S. A. E., .625 x 2.5	8	31-80-38	38H
8-nut, S. A. E., .625	8	31-80-38	.....
8-washer, lock, .625	8	31-80-38	.....
1-housing, pintle spring, left	1	31-80-38	38B
8-bolt, S. A. E., .625 x 2.5	8	31-80-38	38H
8-nut, S. A. E., .625	8	31-80-38	.....
8-washer, lock, .625	8	31-80-38	.....
1-nut, pintle	1	31-80-38	38G
1-pin, taper, 4 x 2.75	1	31-80-38	FF165F
1-pintle	1	31-80-38	38F
1-spacer, pintle	1	31-80-38	38E
1-spring, pintle	1	31-80-38	38D

The personnel is directed to use the following nomenclature; giving piece marks and drawing numbers when referring to parts in reports, correspondence, etc.—Contd.

Nomenclature.	Number per one assembly.	Drawing No.	Piece mark.
MISCELLANEOUS—continued.			
1-plate, hoisting	1	31-80-43	43A
5-rivet, button head, c'sunk, .5 x 1.5	5	31-80-43	.....
1-plate, hoisting	1	31-80-43	43B
5-rivet, button head, c'sunk, .5 x 1.5	5	31-80-43	.....
1-plate, hoisting	1	31-80-43	43C
5-rivet, button head, c'sunk, .5 x 1.5	5	31-80-43	.....
1-plate, hoisting	1	31-80-43	43D
5-rivet, button head, c'sunk, .5 x 1.5	5	31-80-43	.....
1-plate, name	1	31-80-43	43P
2-screw, rd. hd., 8-32 x .375	2	31-80-43	WM47G
2-plate, spring housing	2	31-0-168	FF168C
2-seat, (1 right, 1 left) complete	.....	31-80-37	.....
1-angle, seat, right 1.5 x 1.5 x .187 ($\frac{3}{16}$) x 16	1	31-80-35	35C
4-bolt, S. A. E., .5 x 1.625	4	31-80-35	TM40E
4-nut, S. A. E., .5	4	31-80-35	.....
4-washer, lock, .5	4	31-80-35	.....
1-angle, seat, left 1.5 x 1.5 x .187 ($\frac{3}{16}$) x 16	1	31-80-35	35D
4-bolt, S. A. E., .5 x 1.625	4	31-80-35	TM40E
4-nut, S. A. E., .5	4	31-80-35	.....
4-washer, lock, .5	4	31-80-35	.....
1-back, seat .125 x 16. x 16	2	31-80-35	35A
4-rivet, button head c'sunk, .312 ($\frac{5}{16}$) x .875	4	31-80-35	.....
1-cap, tubular rivet, .125	4	31-80-36	.....
1-rivet, tubular, .125 x .25	4	31-80-36	.....
1-plate, seat bottom, right .125 x 16. x 16	1	31-80-35	35E
4-rivet, button head c'sunk .312 ($\frac{5}{16}$) x .75	4	31-80-35	.....
1-plate, seat bottom, left .125 x 16. x 16	1	31-80-35	35F
4-rivet, button head c'sunk .312 ($\frac{5}{16}$) x .75	4	31-80-35	.....
1-rod, seat support	2	31-80-35	35B
2-bolt, S. A. E., .312 ($\frac{5}{16}$) x 1	4	31-80-35	HM4E
2-nut, S. A. E., .312 ($\frac{5}{16}$)	4	31-80-35	.....
2-washer, lock, .312 ($\frac{5}{16}$)	4	31-80-35	.....
1-shelf, safety can, .187 ($\frac{3}{16}$) x 7. x 10.5	1	31-80-41	41A
6-rivet, button head, .25 x 1.375	6	31-80-41	.....
2-spacer, radiator	2	31-80-20	20A
2-spacer, radiator	2	31-80-20	20B
1-spacer, shifting bracket	1	31-0-169	FF169F
1-speedometer	.....	.....	.....
2-spring, pivot bracket	2	31-0-166	FF166A
2-strap, cover, .187 ($\frac{3}{16}$) x 1. x 17.5	2	31-80-45	45E
5-nut, S. A. E., .312 ($\frac{5}{16}$)	10	31-80-45	.....
5-stud, S. A. E., .312 ($\frac{5}{16}$) x 1.125	10	31-80-45	AM224G
5-washer, lock, .312 ($\frac{5}{16}$)	10	31-80-45	.....
2-strap, implement fastening	2	31-80-40	40E
2-clip, strap, .062 ($\frac{1}{16}$) x 1.75 x 4	4	31-80-40	40L
2-nut, thumb, .375	4	31-80-40	40K
2-screw, rd. hd., .375 x 1.5	4	31-80-40	40H
1-strap, implement fastening	1	31-80-40	40F
2-clip, strap, .062 ($\frac{1}{16}$) x 1.75 x 4	2	31-80-40	40L
2-nut, thumb, .375	2	31-80-40	40K
2-screw, rd. hd., .375 x 1.5	2	31-80-40	40H
1-strap, implement fastening	1	31-80-40	40G
2-clip, strap, .062 ($\frac{1}{16}$) x 1.75 x 4	2	31-80-40	40L
2-nut, thumb, .375	2	31-80-40	40K
2-screw, rd. hd., .375 x 1.5	2	31-80-40	40H
1-strap, implement fastening	1	31-80-40	40C
2-clip, strap, .062 ($\frac{1}{16}$) x 1.75 x 4	2	31-80-40	40L
2-nut, thumb, .375	2	31-80-40	40K
2-screw, rd. hd. .375 x 1.5	2	31-80-40	40H
1-strap, implement fastening	1	31-80-40	40D
2-clip, strap, .062 ($\frac{1}{16}$) x 1.75 x 4	2	31-80-40	40L
2-nut, thumb, .375	2	31-80-40	40K
2-screw, rd. hd., .375 x 1.5	2	31-80-40	40H
1-strap, safety can	1	31-80-41	41C
2-stud, hand starter crank	2	31-80-44	44G
1-support, tool box, 1.25 x 1.25 x .25 x 57.5	1	31-80-41	41B
2-rivet, button head, .375 x 1	2	31-80-41	.....
2-washer, stop	2	31-0-167	FF167E

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