TM5-1006

WAR DEPARTMENT

MAINTENANCE MANUAL AND PARTS CATALOG

BUCKET LOADER

MODEL 82-A

BARBER-GREENE COMPANY
AURORA, ILLINOIS
November 2, 1942

TM5-1006

WAR DEPARTMENT

TM5-1006, Maintenance Manual and Parts Catalog, Bucket Loader Model 82-A, published by the Barber-Greene Company, is furnished for the information and guidance of all concerned.

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Barber-Greene

Model 82-A

BUCKET LOADER

Page

War Dep't Purchase Orders

55645

56634

C-3502

BARBER-GREENE COMPANY, Aurora, Illinois

The material in this book is restricted to the Barber-Greene Model 82-A Bucket Loader only and does not cover the other machines which are used in conjunction with this Bucket Loader, nor the general operation of the entire plant in which the Bucket Loader is used.

Reference should be made to the following books:

TM5-1002 ASPHALT MIXER Barber-Greene Model 848

TM5-1004 AGGREGATE DRYER Barber-Greene Model 833

TM5-1008 ASPHALT FINISHER Barber-Greene Model 879-A

TM5-1010 BELT CONVEYOR Barber-Greene Style N

TM5-1012 ASPHALT PUMP Littleford US-3C

TM5-1014 STEAM BOILER Cleaver-Brooks Model 3-Car
(Has Model Z Engine; applies to War Dept. Purchase Orders 55645 and 56634)

TM5-1046 STEAM BOILER Cleaver-Brooks Model 3-Car
(Same as TM5-1014 but has Model ZZ Engine; applies to War Dept. Purchase Order C-3502)

TM5-1016 ASPHALT PLANT ERECTION AND OPERATION

MATERIALS AND METHODS FOR MILITARY AIRPORT CONSTRUCTION (Published by Barber-Greene Company)

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OPERATOR'S MANUAL

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BARBER-GREENE COMPANY, Aurora, Illinois

Barber-Greene 82-A Paving Loader

GENERAL DIMENSIONS

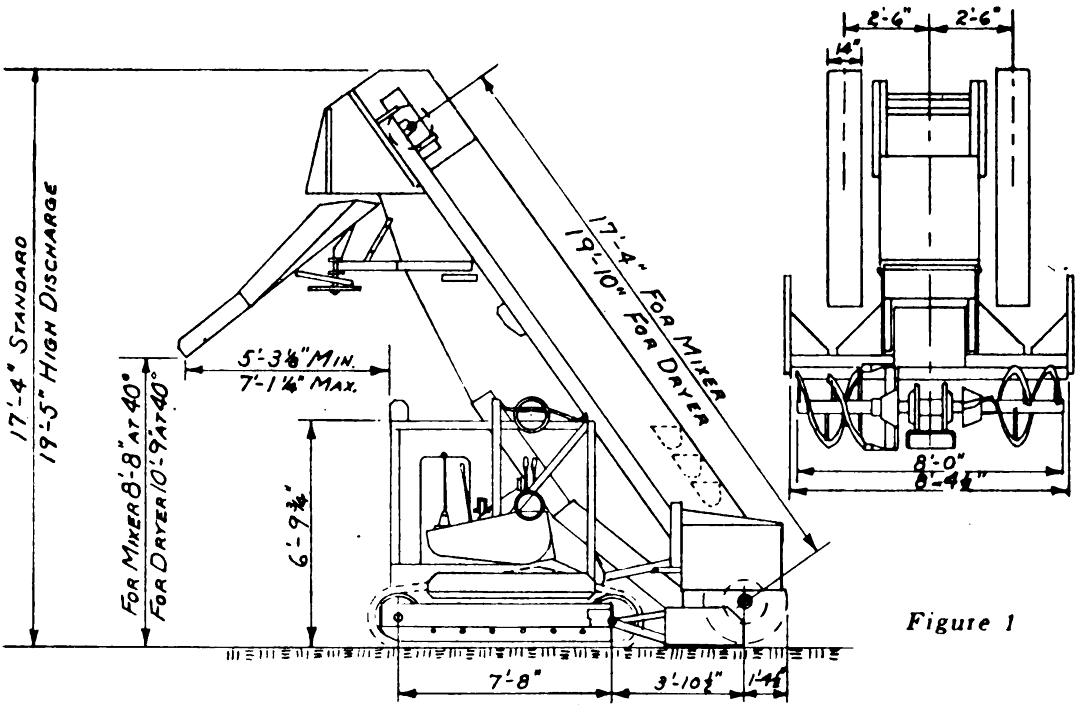


Figure 1

General Information

Application

These units are used as loading mediums for the Barber-Greene Model 848 Mixers and Model 833 Double Drum Dryers when used as travel plants. Note that the Dryer application requires a longer boom.
In either case, the loaders may be converted for general loading applications.

Capacity

Up to 3 cubic yards per minute.

Overall Dimensions

	OPERATING		SHIPPING	
	Mixer Loader	Dryer Loader	Mixer Loader	Dryer Loader
Length	**17'10"**	**19'7"**	**20'8"**	**23'2"**
Width	**9'8"**	**9'8"**	**8'5"**	**8'5"**
Height	**17'4"**	**19'5"**	**11'6"**	**11'6"**

Type of Mounting

Full crawler mounting 14" width shoes, 7'8" centers.
Gross bearing area—2576 square inches.

Operating Weights

Total Empty—19,855 Lbs.—Mixer Loader
20,975 Lbs.—Dryer Loader
Total Loaded—20,405 Lbs.—Mixer Loader
21,635 Lbs.—Dryer Loader

Shipping Data

Cubage—Not Boxed
Knocked Down—1995 cu. ft.—Mixer Loader
2149 cu. ft.—Dryer Loader
Assembled—2975 cu. ft.—Mixer Loader
3615 cu. ft.—Dryer Loader

Boxed for Export
Two crates—1,383 cu. ft. Total—Mixer Loader
1,447 cu. ft. Total—Dryer Loader
#1 Crate—838 cu. ft. 18,500 Lbs.—Mixer and Dryer Loader
#2 Crate—545 cu. ft. 10,000 Lbs.—Mixer Loader
609 cu. ft. 12,000 Lbs.—Dryer Loader

Rail Shipment
Two machines per flat car

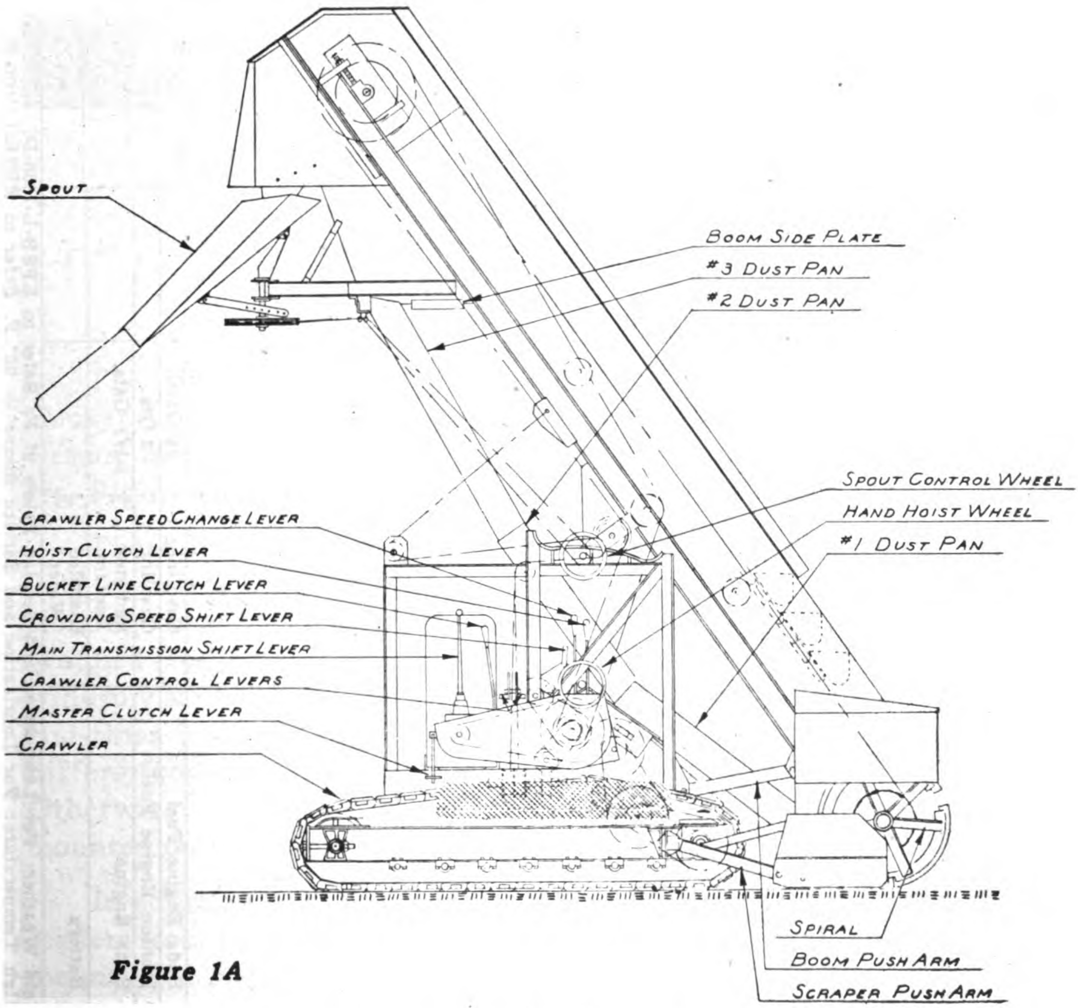


Figure 1A

CAPACITIES and CONSUMPTION TABLE:

Where Used	Description	Capacity	Temperature Fahrenheit	Grade	Consumption per 100 Operating Hrs.
Buda Engine Crankcase	Motor Oil	6 Qts.	Above + 32° + 32° to 0°	OE SAE 30 OE SAE 10	25 Qts.
Johnson Engine Crankcase	Motor Oil	¾ Pt.		Same As Buda Crankcase	2 Qts.
Buda Air Cleaner	Motor Oil	1 Qt.		Same As Buda Crankcase	10 Qts.
Johnson Air Cleaner	Motor Oil	¼ Pt.		Same As Buda Crankcase	2 Qts.
Main Transmission	Transmission Lubricant	8 Qts.	Above + 32° + 32° to 0°	GO SAE 90 GO SAE 80	8 Qts.
Hoist	Worm Gear Lubricant	1 Qt.	Above + 32° + 32° to 0°	GO SAE 90 GO SAE 80	1 Qt.
Machinery	High Pressure Grease		Above + 32° + 32° to 0°	CG No. 1 CG No. 0	50 Lbs.
Gears	Open Gear Lubricant		Above + 32° + 32° to 0°	CW Grade 2 CW Grade 2	2 Lbs.
Buda Engine Fuel	Gasoline	25 Gals.			500 Gallons
Johnson Engine Fuel	Gasoline	3 Qts.			20 Gallons
Buda Engine	Radiator Coolant	5-1/3 Gals.			
Battery	Distilled Water				

Cold Weather: For Lubrication and Service Below 0° F, Refer to EFSB-L-1000-D.
High Temperature: For Lubrication and Service Above + 90° F, Refer to EFSB-L-1000-E.

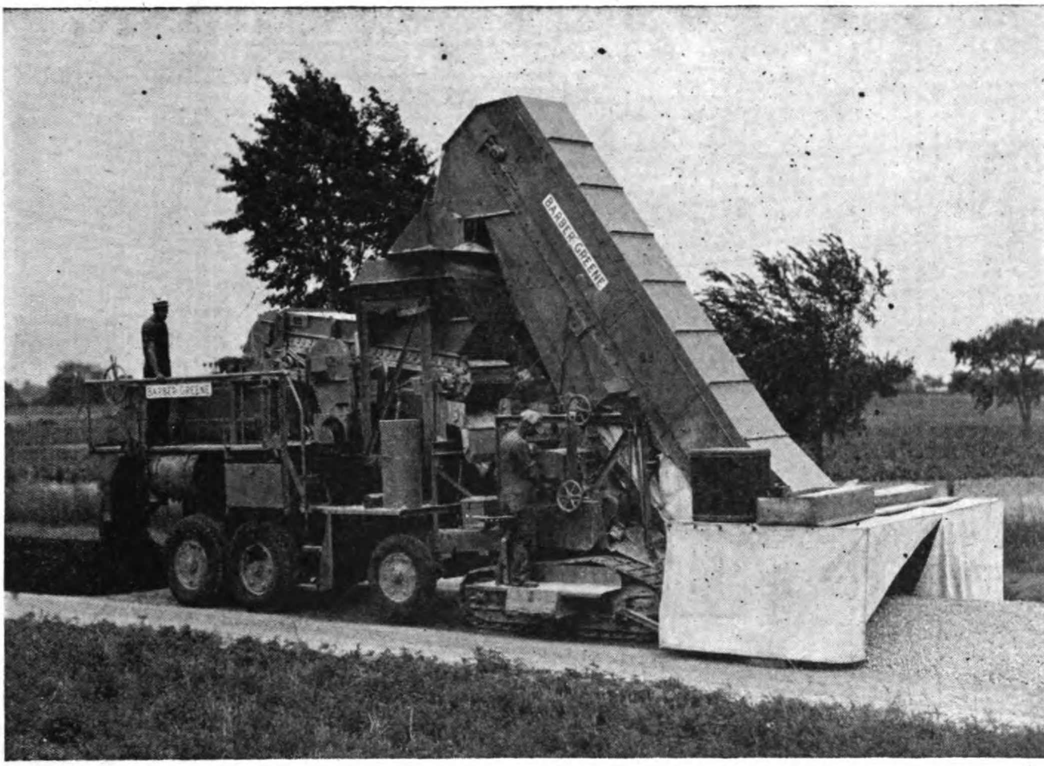


Figure 2. Barber-Greene Paving Loader and Heavy Duty Mixer in Travel Plant Operation.

Introduction

The Barber-Greene Model 82-A Paving Loaders are Standard Bucket Loaders adapted to be used in combination with the Barber-Greene Model 848 Mixers, Figure 2, and Model 833 Double Drum Dryers, Figure 3, when these units are to be operated as "travel plants."

These loaders have special features built into them such as extra long crawlers for supporting the front end of the mixer or dryer; a floating three piece scraper for clean pickup; a wide range of closely grouped feeding speeds for synchronizing forward travel with different windrow sizes; and an enclosed feeding end, etc., to keep down the dust and fines from the aggregates being handled. The loader for the Dryer differs from the loader for the mixer in that the boom is 30″ longer. Otherwise the loaders are identical. Individual lighting plants are mounted on these loaders for night operation.

In addition to the Dryer and Mixer Travel Plant application, these loaders can be readily converted to standard loader applications by mounting a swivel spout at the discharge.

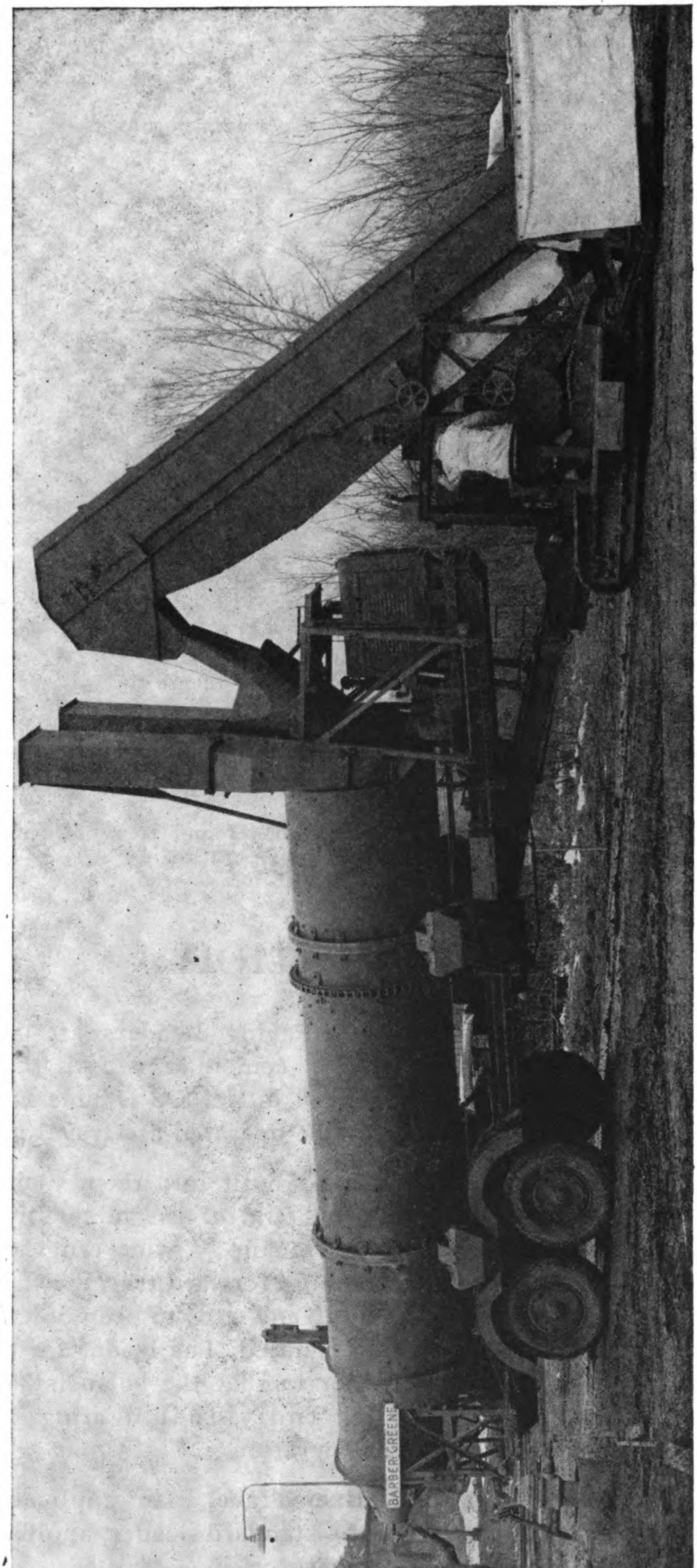


Figure 3. **Barber-Greene Paving Loader Being Used in Conjunction with B-G Dual Drum Dryer in Travel Dryer Operation.**

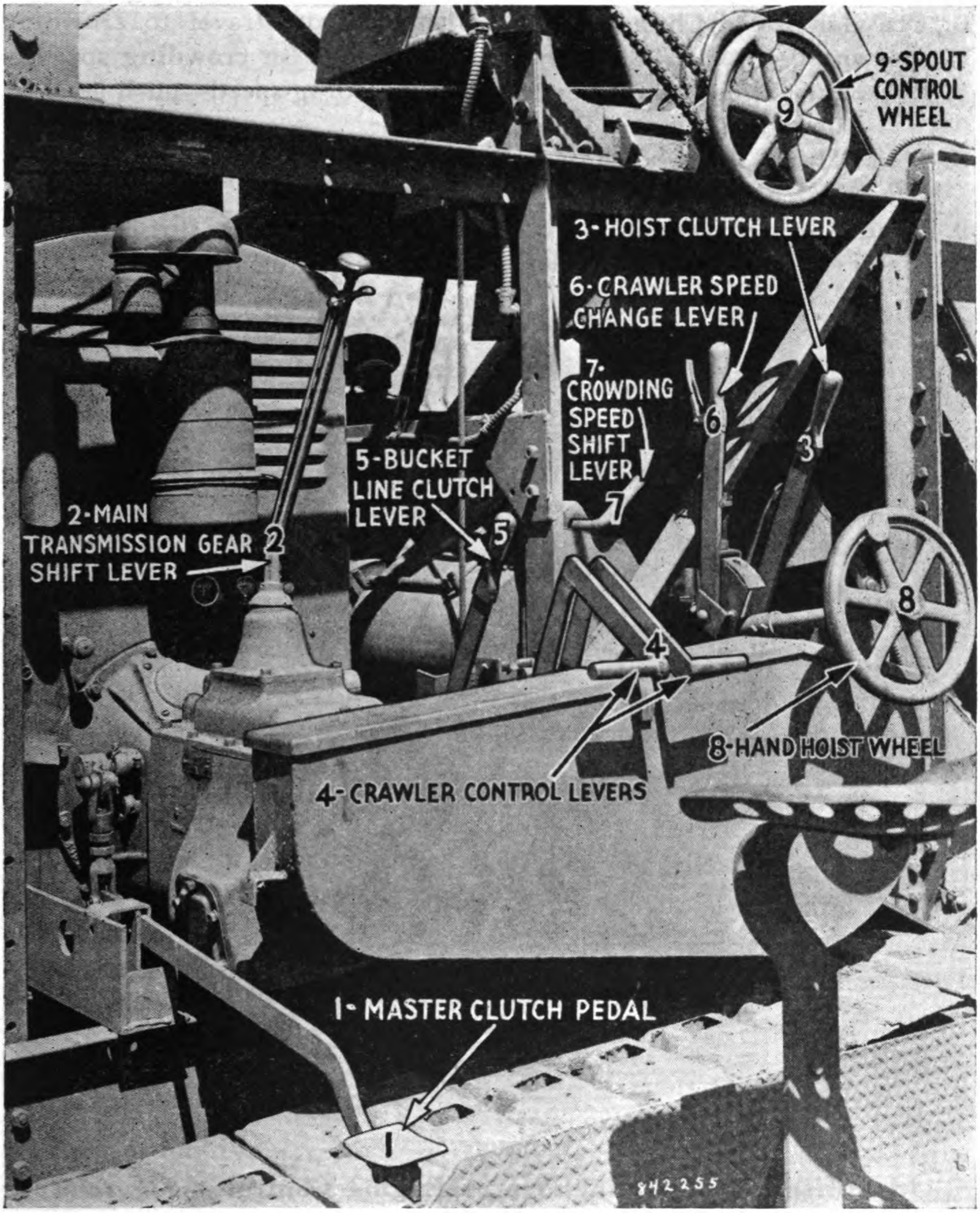


Figure 4

Identification and Function of Loader Controls—Figure 4

1. **Master Clutch Pedal:** Controls power to main transmission. Press down to disengage. Release to engage.
2. **Main Transmission Gear Shift Lever:** Controls selection of various gear ratios in main transmission.
3. **Hoist Clutch Lever:** Controls power to boom hoist.
4. **Steering Levers:** Control power and brakes for each crawler. Engaged when up. Braked when down.
5. **Bucket Line Clutch Lever:** Controls power to bucket line. Push in to engage. Pull out to disengage.

6. **Crawler Speed Change Lever:** Changes from travel to crowding speed. Push in for travel speed. Pull out for crowding speed.
7. **Crowding Speed Shift Lever:** High crowding speed—push lever in. Low crowding speed—pull lever out.
8. **Hoist Hand Wheel:** Controls Boom. Turn wheel clockwise to lower. Must use power to raise.
9. **Spout Control Wheel:** Turns spout right or left by turning wheel. Push in to engage. Releases and locks automatically.

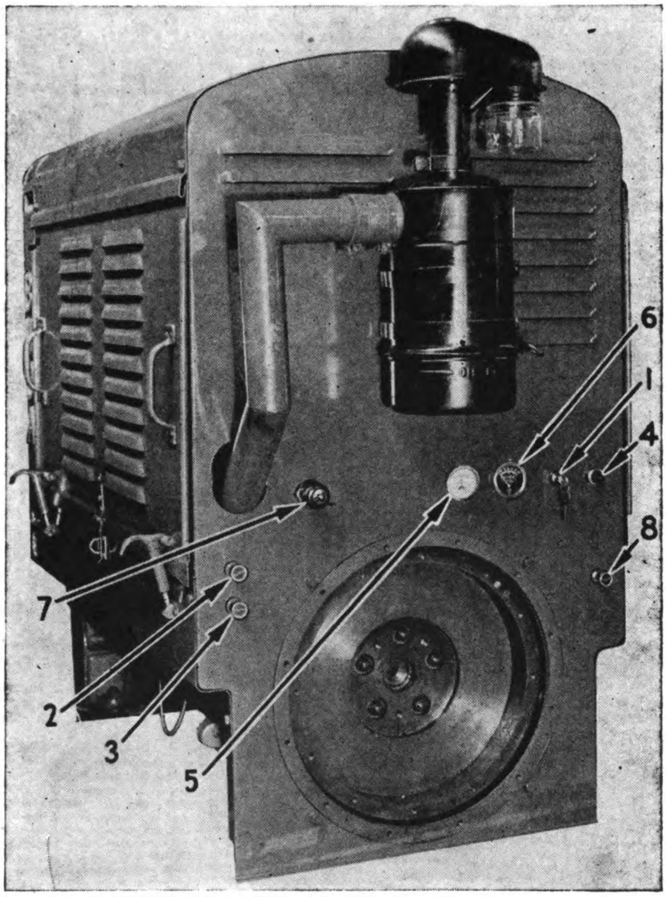


Figure 5

Identification and Functions of Engine Controls—Figure 5

Ignition (1): Key switch. Right—on. Vertical—off.
Throttle (2): Controls engine speed from idling to operating range. Full throttle when "In."
Choke Rod (3): Supplies rich mixture for starting.
Starter Button (4): Push to turn motor.
Ammeter (5): Indicates rate of charge or discharge of battery.
Oil Gauge (6): Indicates Oil pressure.
Governor Control (7): Controls engine speeds within operating range, from 20% above to 20% below normal operating speed. "In" for low operating speed; halfway out for normal; out for high operating speed. Can be set at any position between "In" and "Out."
Spark (8): Out to retard. For starting in cold weather.

General Operation

STARTING ENGINE:

Before starting, check lubrication, fuel and cooling system. Be sure main transmission lever (2) Figure 4, is in neutral.

Ignition—Turn key switch to right to turn on, (1) Figure 5.

Throttle—Push throttle in. Governor controls speed, (2).

Choke Rod—Pull out choke all the way, (3).

With Power:

Starter—Turn motor with starter. Push choke in half way. Press starter button (4) until motor starts. Adjust choke so motor runs without missing. As soon as motor warms up, push choke rod in. Choke rod should be all the way in while running.

Ammeter—After motor starts, check ammeter to see that battery is charging, (5). Charge rate will be low if battery is well charged.

Oil Gauge—After motor starts check oil gauge (6) to see that oil pressure shows about 30 pounds.

Spark—Pull out to retard—for starting in cold weather (8).

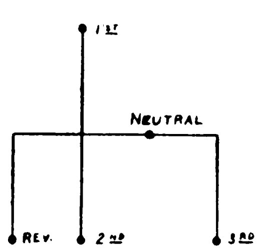
MASTER CLUTCH: (1) Figure 4:

Depress pedal (1) to disengage motor. Release to engage. The action is similar to that of an ordinary automobile clutch. The clutch pedal should be released slowly to prevent undue strain on the driving machinery. *When in Doubt, Always Disengage the Master Clutch* as this cuts out transmission of power to all moving parts of the machine.

MAIN TRANSMISSION GEAR SHIFT (2) Figure 4:

The main transmission is of the truck type with three forward speeds and one reverse speed. Master clutch must be disengaged to shift gears. To shift to reverse, pull up on small lever on gear shift knob and move shift lever all the way to the left and back. Shift is not standard.

SHIFT PLAN



Travel Speeds	F.P.M.
1st	58
2nd	183
3rd	251
Reverse	47

Use Only First Speed When Operating Bucket Line. Use Second and Third Speed for Traveling Only.

RAISING OR LOWERING BOOM:

With Power:

Hoist Clutch Lever (3) Figure 4: Power is transmitted to the power hoist through a friction cone clutch. Push clutch lever forward to engage. Lever must be held in until boom is at desired position.

To Raise Boom shift master transmission to first and engage master clutch before engaging hoist clutch.

To Lower Boom shift master transmission to reverse and engage master clutch before engaging hoist clutch.

CAUTION: Do not operate hoist clutch when main transmission is in second or third speed. Keep free of hand hoist wheel when raising and lowering boom with power hoist.

By Hand:

Hand Hoist Wheel (8) Figure 4: The boom can be lowered by turning the hand hoist wheel clockwise. The boom must be raised by power.

BOOM CONTROL:

If it is desired to raise the boom above the upper limit of the normal operating range, it will be necessary to break the bucket line drive chain, disconnect the push arms and remove the cross brace from the chassis main frame upright angles. Failure to do this may result in breaking hoist cables, or excessive heating of bucket line drive sprocket from increased tension on bucket line drive chain.

When lowering the boom, the hoist should not be operated after the foot end of the boom is in contact with the ground, as this will allow the cables to unwind from the hoist drum and become fouled. Check hoist drums periodically to make sure that hoist cables are wound on drums properly.

As the boom is raised or lowered, the flanged wheels on the boom pivot shaft ride up and down the saddles at the top of the chassis superstructure. With the loader in operating position, the limit of raising the boom is reached when the flanged wheel comes to the upper end of the saddle. Likewise, the limit on lowering the boom is reached when the flanged roller is at the lower end of the saddle. This rarely occurs, however, as the spiral and scraper would be several inches below ground level if the lower limit of the boom travel were reached.

STEERING LEVERS (4) Figure 4:

The crawlers are separately controlled. Right lever controls right crawler. Left lever controls left crawler. Clutches are engaged when levers are up. Brakes are applied when levers are DOWN. Midway between these positions the clutches are disengaged and the brakes are off. Either crawler may be engaged or braked independently of the other.

CAUTION: Do not attempt to lock one crawler and cause it to pivot the footing is soft or when the boom is in operating position with material on either side of it. If operator is inexperienced he should practice steering and turning before attempting to operate on a job.

BUCKET LINE CLUTCH LEVER (5) Figure 4:

The bucket line is engaged by means of a jaw clutch. Push forward to engage and back to disengage. When lever is disengaged it should be behind stop to prevent slipping ahead.

CAUTION: Do not engage Bucket Line Clutch unless Master Clutch is disengaged. Always disengage Bucket Line Clutch before operating loader in reverse. Failure may result in shearing jaws off of the clutch. Do not operate bucket line with boom above normal position.

CRAWLER SPEED CHANGE LEVER (6) Figure 4:

The function of the speed change lever is to change the crawler speed from traveling range to crowding range. In traveling speed the power from the main jack shaft is transmitted directly to the crawler clutch shaft. When in crowding speed, the power is transferred through the auxiliary crowding transmission where speed reduction takes place before being transmitted to the crawler clutch shaft.

The speed change clutch consists of a combination sliding spur gear and double jaw clutch. The speed change lever is pushed forward to change to traveling range and back to engage crowding range. Be sure the lever is moved far enough so that the lever lock pin will engage the holes in the speed change quadrant. The lever will shift easier if crawler clutches are first disengaged. It is then necessary to turn main jack shaft over slowly until the jaws are in position to fall in mesh.

FEEDING SPEED SHIFT LEVER (7) Figure 4:

When the speed change lever is shifted into crowding range there is a choice of two crowding speeds available by shifting the crowding speed shift lever. The high crowding speed is available by pushing the lever all the way in. Low crowding speed is available by pulling the lever all the way out.

There are twelve different feeding speeds available, from 2.6 ft. per minute to 19.24 ft. per minute. These speeds are made available by changing gears on the side of the auxiliary feeding transmission and by shifting gears within the auxiliary transmission.

Six sizes of change gears are furnished with each loader, consisting of 13T, 17T, 21T, 24T, 28T, and 32T. These gears are installed in combinations as follows:

13T and 32T: 17T and 28T: 21T and 24T: 24T and 21T: 28T and 17T: 32T and 13T.

Each combination permits the instant selection of two different speeds by shifting gears in the auxiliary transmission. For instance, with the 13T and 32T combination installed, the forward speed of the loader is 2.6 ft. per minute with the auxiliary transmission gear shift in low or "Lever Out" position. By shifting the auxiliary transmission

gear shift to high speed or "Lever In" position, the forward speed is increased to 3.18 ft. per minute. Each of these speeds can be increased or decreased 20% by governor adjustment.
CAUTION: Always disengage the crawler clutch levers before shifting this lever. To change to a higher or lower range of crowding speeds, use the following chart for gear combinations.

Feeding Speeds—Ft. Per Min.*

Change Gears	Lever Out	Lever In
13-32	2.60	3.18
17-28	3.88	4.75
21-24	5.60	6.84
24-21	7.31	8.93
28-17	10.53	12.87
32-13	15.75	19.24

*Engine at normal operating speed.

The figures on the left in the Change Gear column apply to the number of teeth on the gear to be placed on the lower left shaft at (2). Figures on the right in the Change Gear column apply to the number of teeth in the gear to be placed on the upper right shaft at (4). "Lever

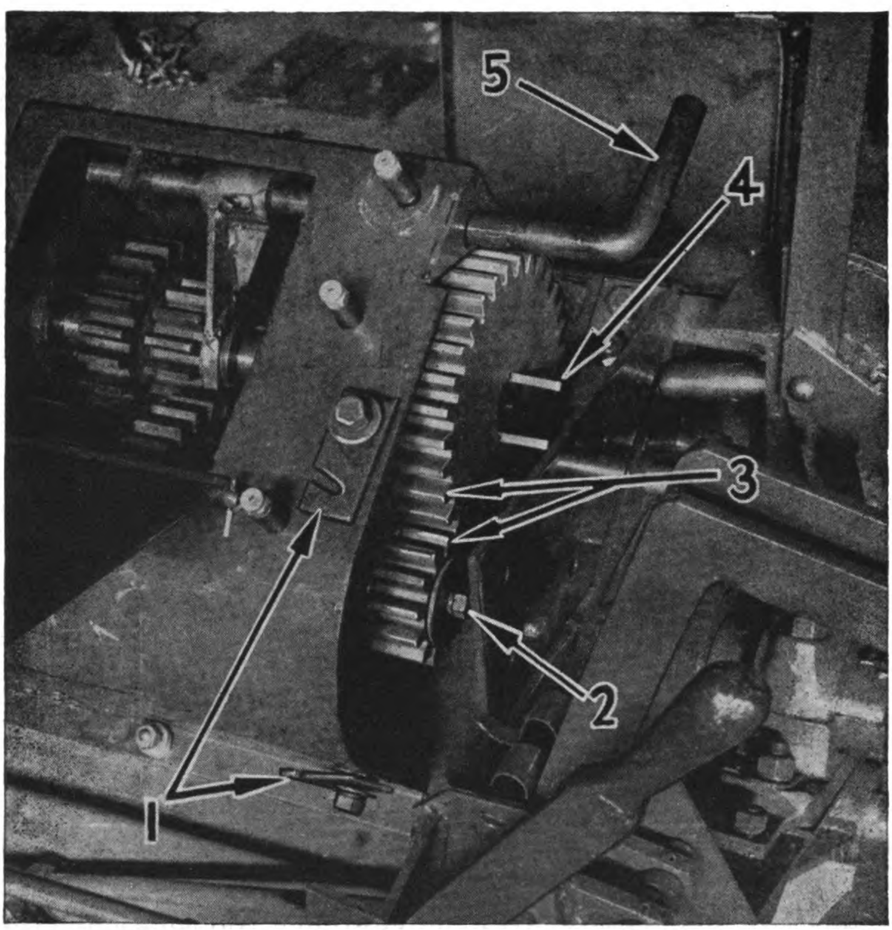


Figure 6

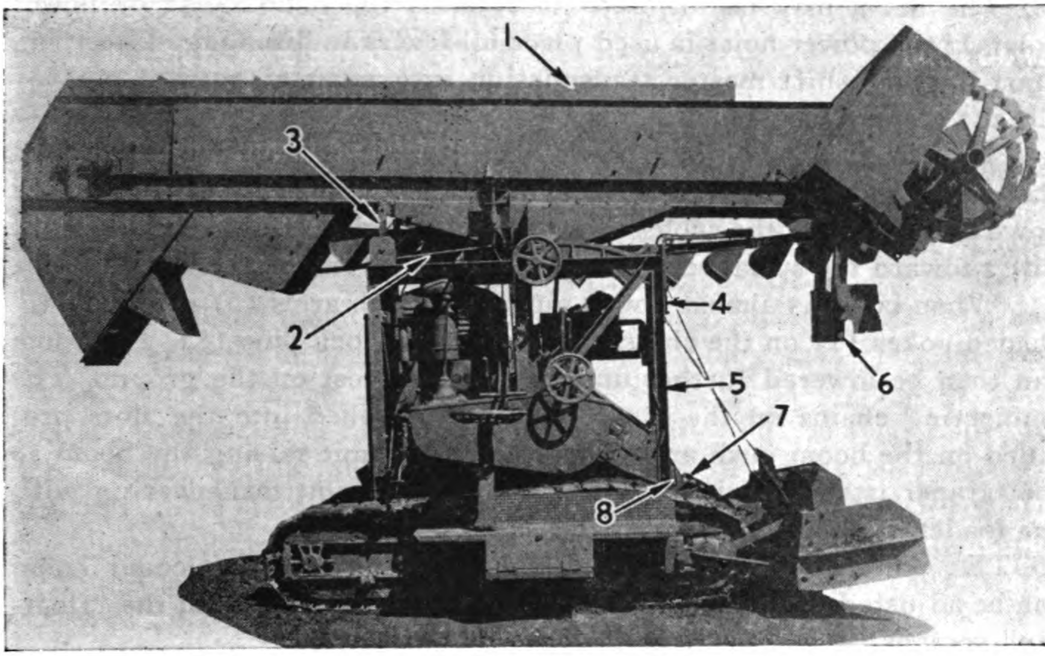


Figure 7

Out" column gives feet per minute of forward travel with auxiliary transmission in low speed. "Lever In" column gives feet per minute of forward travel with auxiliary transmission in high speed.

TO CHANGE GEARS—Figure 6:

Unlatch cover fasteners (1) and remove gear cover.

Remove cap screw and washers (2) from each shaft.

Slide gears off shaft (3). CAUTION: Do not lose keys.

Install correct gears before keys (4) are put in place.

Insert keys. Keys should be a slip fit to make future gear changes easier.

Shift lever (5) is in for high and out for low.

SPOUT CONTROL WHEEL (9) Figure 4:

The spout can be turned right or left by turning the spout control wheel. The wheel must be pushed in before it can be turned. The wheel locks in position automatically by spring tension when released.

NOTE: This is used only when machine is set up for material loading as per instructions for "Installing Swivel Spout".

LOADER ASSEMBLED FOR TRAVEL MIXER:

Lowering Boom

Paving Loaders are usually shipped or trailed with the boom layed back in a horizontal position, Figure 7.

To prepare for lowering of the boom (1), be sure hoist cables, (2) are taut.

The safety straps (3) holding the boom in place should be removed.

The cross brace (4) between the upright angles (5) on the front of the chassis superstructure should be removed.

The boom may be lowered either with the hand hoist or power hoist. If the power hoist is used place all levers in disengaged position. Start engine; shift master transmission into reverse; engage master clutch; then engage hoist clutch.

To start the boom down, it will be necessary to run the hoist until there is a slight amount of slack in the cables, then pull the spiral end down by hand until the cables tighten. Repeat this until the boom weight shifts toward the spiral end enough to lower by its own weight.

When boom is almost down, guide the push arms (6) into the "U" shaped yokes (7) on the chassis and insert the lock pins (8). The boom can then be lowered further until the spirals rest on the ground. The connecting chains on the scraper are then hooked into the slots provided on the boom push arm. These chains permit raising the boom so the scraper is raised with it a few inches to permit maneuvering with the loader.

NOTE: Connect these chains with enough slack so the loader boom can be adjusted to the ground level without interfering with the "floating" scraper.

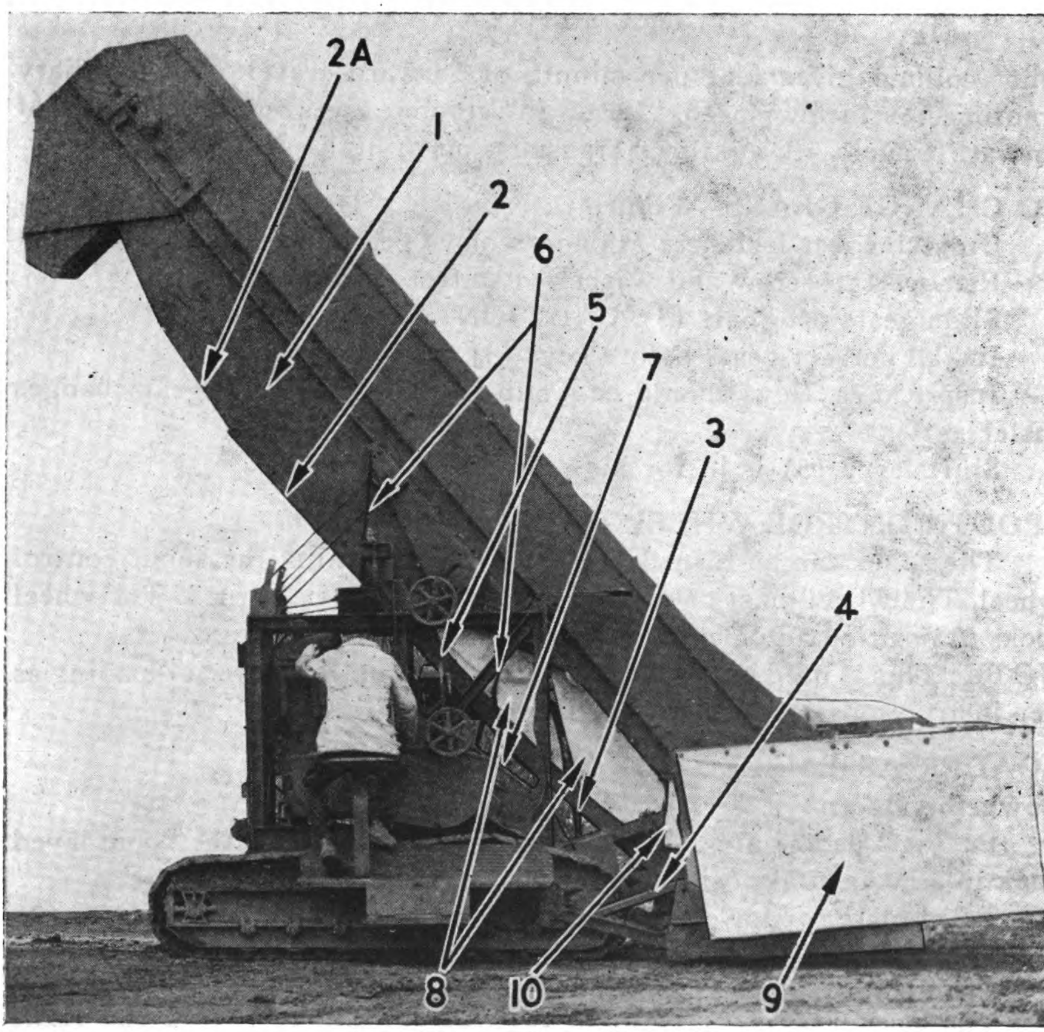


Figure 8

The cross brace (4) between the upright angles (5) on the scraper end of the chassis should be replaced.

DUST CHUTES—Figure 8:

The Dust Chutes (1, 2, 5 and 3) Figure 8, are always removed for hoisting the boom into a horizontal position for transporting. Clearance will not permit leaving them in place.

To install these dust chutes, the side plates (1) are installed first. These plates are right and left, but no difficulty will be encountered if it is remembered that the flanged side of these plates goes to the outside. After the side plates are in place, the dust return chutes are installed.

It is advisable to lay the dust return chutes out on the ground before installing. The top section (2) or (2-A) has the corners cut off. On the Travel Dryer Loader, the 30″ longer boom necessitates an extra top dust chute section (2-A) which also has the corners cut, but is shorter than (2). The lower section (3) is tapered and rests in the recessed portion of the scraper at (4). With these two sections fixed the middle section (5) (or two sections (2) and (5) on the travel dryer loader) can be fitted in place.

First bolt the top section (2) or (2-A) in place. Bolt the bottom section (3) to middle section (5) [or (2) and (5) on the Dryer Loader] and maneuver them down into position through the chassis frame. These sections are then bolted to the top section. The dust chute is then set so that it clears the bucket line and transmission housing by hooking up the support chains (6) provided on the boom housing. The chutes are usually set about two inches above the transmission housing at (7). The length of the dust chute support chains can be altered by removing the trace repair link and inserting it in the desired link.

DUST HOUSINGS—Figure 8:

The boom of the 82-A Paving Loader is completely covered over the upward travel of the buckets with a metal housing. The side of the boom is enclosed with a canvas housing (8). The feeding spiral is covered with a canvas housing (9), the center of which is split to allow each flap to drape over the side of the windrow. These housings reduce the amount of dust around the loader when in operation.

Two small sections of canvas housing (10) are attached to the rear of the spiral shield and are held down over the back of the scraper by weights provided.

Installation of Dust Housing Over Spirals

The dust housing over the spirals is assembled from the following list of parts:

No. Req.	Description	Ref. No. on Diagram	
4	2″ x 2″ x $\frac{3}{16}$″ angle 4′8⅜″ long	(1) & (2),	Fig. 8A
1	2″ x 2″ x $\frac{3}{16}$″ angle 8′6″ long	(3)	Fig. 8A
2	10 gauge plate 1′6″ x 4′0″	(4)	Fig. 8A
2	1½″ x 1½″ x $\frac{3}{16}$″ angles 2′11¾″ long	(8)	Fig. 8B

3	1" x 8" board 8'5⅞" long	(5)	Fig. 8A
1	Canvas Housing	(6)	Fig. 8A
2	Canvas flaps 1'4" x 3'0¼"	(9)	Fig. 8B
1	Set of bolts, nuts and washers for installing.		

The housing is installed as follows:

1. Install the four housing support angles (1) and (2) as shown. These angles bolt to the underside of the spiral platform. The outer angles (1) bolt to the inside of the platform side plates. The inner angles (2) bolt to the underside of the platform deck. Bolts are inserted from the inside. Angles (2) can be bolted tight, but angles (1) can not be bolted as the canvas must be placed over the bolts before the nuts are put on.
2. Place the long angle (3) in position as shown with the top leg of the angle resting on the outer ends of the angles just installed. Insert bolts from above to hold angle in place, but do not put the nuts on.
3. Bolt side plate (4) in place as shown.
4. Lay the canvas housing (6) over the framework. Holes are punched in the canvas to match holes in the framework. Insert bolts from the inside at all points where holes in the canvas and framework match except those as mentioned later. The bolts used to hold angle (3) in place are removed, and bolts inserted from beneath, extending up

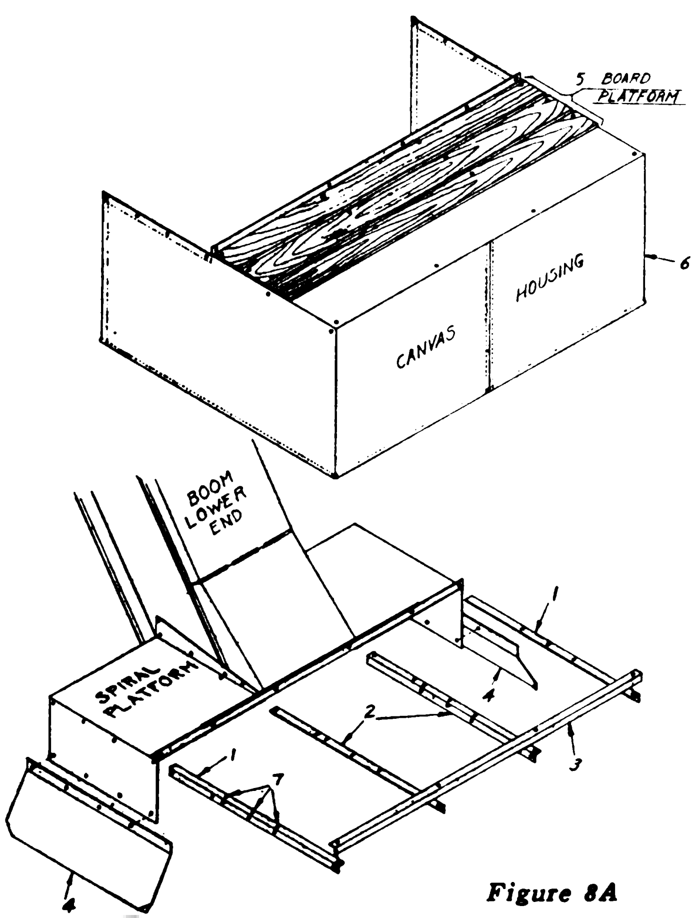


Figure 8A

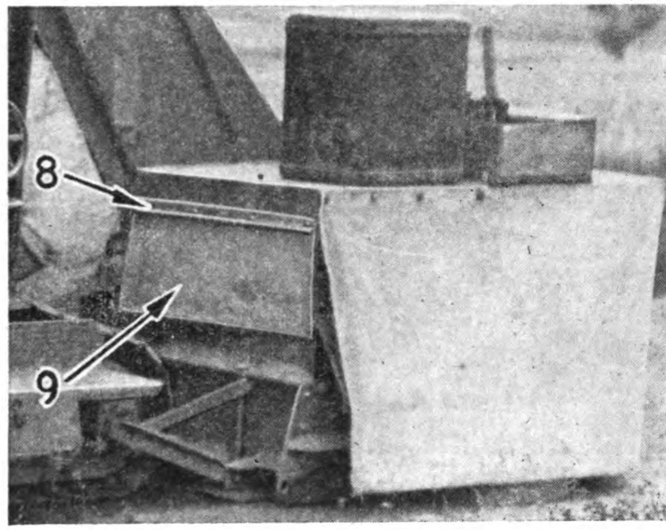


Figure 8B

thru both angles and the canvas. Do not insert bolts in the three holes (7) in each of the support angles (1) and (2).

5. With the canvas in place and secured by bolts, lay the three boards comprising the board platform (5) in place as shown. Insert carriage bolts from above, extending thru the board, canvas and engaging the proper holes (7) in the support angles. Put nuts on from below and tighten.
6. The two canvas flaps (9), Figure 8B are installed on each side of the boom, attaching to the rear end of the spiral platform, directly above the back side of the scraper. Insert the bolts from the inside, place

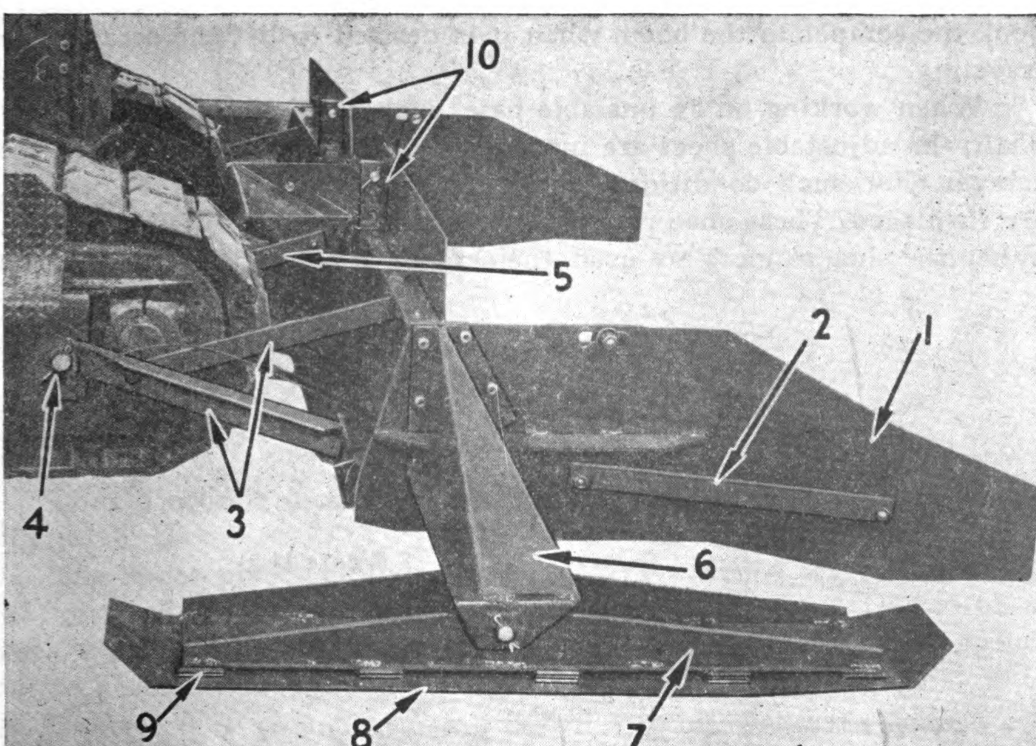


Figure 9

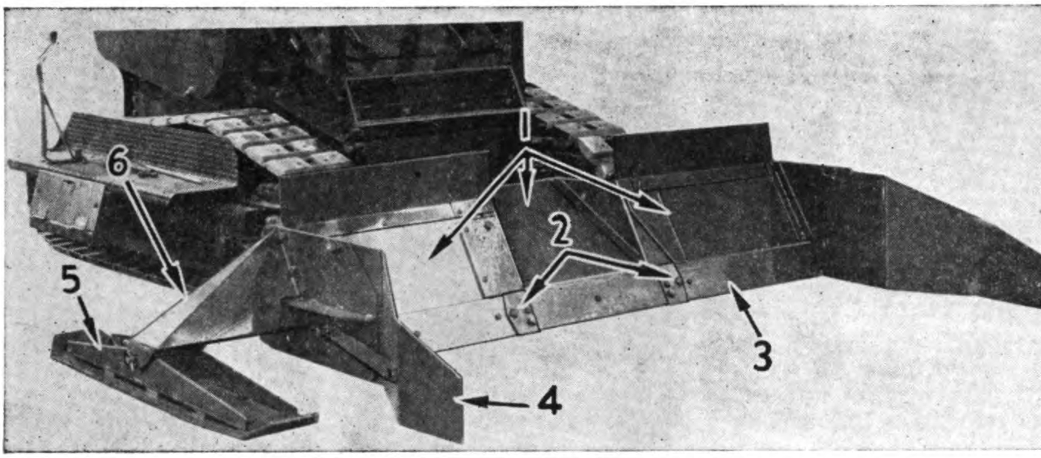


Figure 10

canvas flap in position with the holes in the flap fitting over bolts inserted. Install angle (8) with holes matching the bolts and bolt in place.

SCRAPER:

The Paving Loader is equipped with an adjustable floating cleanup scraper. (Figure 9 and 10). The scraper is made up in three sections (1), Figure 10, hinged together at (2), making possible clean pickup of materials on roads with varying crown. The scraper rides on four adjustable shoes, Figure 11, by which accurate control of the pickup of materials, is obtained. For average travel plant operation, the scraper is independent of the boom. Connecting chains are furnished, however, to hook the scraper to the boom when it is desired to lift the scraper for traveling.

When working on an unstable base, such as when mixing sand asphalt, the adjustable shoes are inadequate to support the weight of the scraper. For such conditions, outrigger shoe runners (5) Figure 10, are furnished. These shoe runners bolt to the outer end of the scraper. When the shoe runners are used, the scraper is set at desired crown by

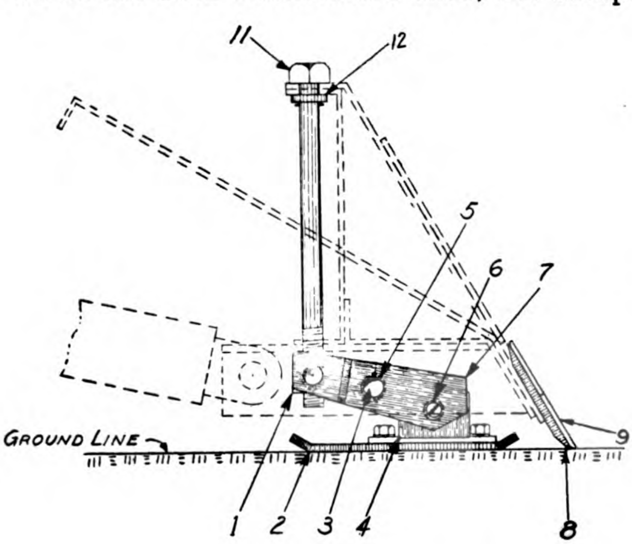


Figure 11

inserting the proper amount of shims, at (1) Figure 9, between the angle clips at the hinge point of the scraper, and then bolting up rigid. Desired crown is then correctly and automatically maintained.

The width of the scraper proper is 8′4½″. When the scraper wings are attached, the total pickup width is 9′7½″.

When the outrigger shoes are not required, and the cleanup scraper is to be used, the adjustment of the scraper shoes should be checked. Lower boom until scraper is on the ground and the lift chains are slack. Disconnect lift chains and raise boom so the spiral is clear of the ground. Remove the bolts and shims at (1) Figure 9, from the angle clips that fasten the hinged sections of the scraper together. The scraper section is now free to conform to the crown of the road. To raise scraper, force shoes (1) Figure 11, downward by turning adjusting bolts (2) to right. Reverse procedure to lower scraper.

ADJUSTABLE DISCHARGE SPOUT:

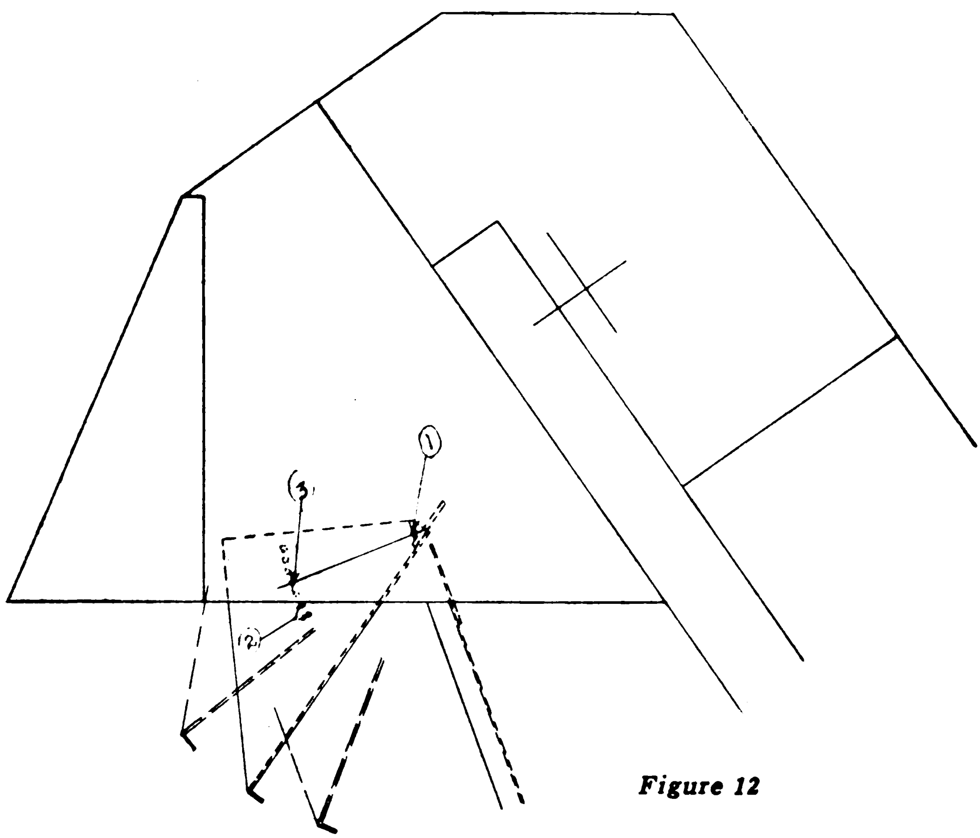


Figure 12

The adjustable discharge spout feeds into the mixer hopper. See Figure 12.

The spout pivots or hinges on point (1). There are seven holes, (2), on each side of the spout. By matching different pairs of these holes, with the holes (3) provided in the housing, the pitch of the spout can be changed.

The spout is assembled using the fourth hole from the bottom on the spout. If the material does not flow freely over the spout, the fifth or sixth hole from the bottom may be used. The pitch produced by using

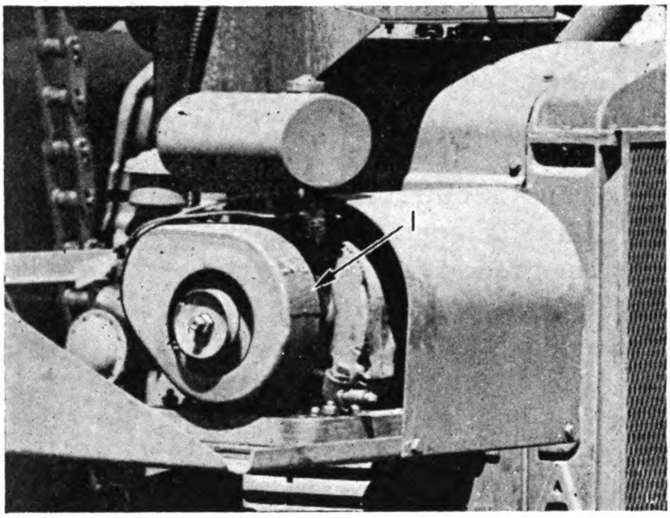


Figure 13

the seventh holes from the bottom would seldom, if ever, be required.

LIGHTING SYSTEM:

The loader is equipped with a complete lighting system to supply adequate light for night operation. (When used with travel dryer, lights are also furnished for the dryer from the loader). The system consists of a gasoline engine driven generator (1) Figure 13, wiring, fuse and outlet boxes, light brackets, lights, and with water-proof sockets. The engine and generator unit is mounted on the loader main frame on the side opposite the operator.

The generating plant develops 110 volt, 60 cycle, alternating current. The maximum output capacity is 500 watts.

Lights

The Loader is equipped with four lights, one 100 watt adjustable flood light is attached to a bracket on the upper right front corner of the chassis and serves as a head light.

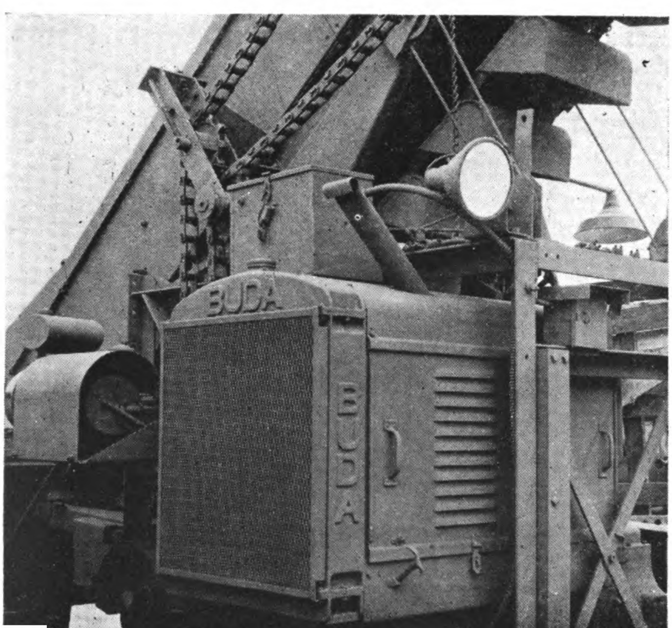


Figure 14. Showing lighting plant, left, floodlight and, through framework, light over operator's platform.

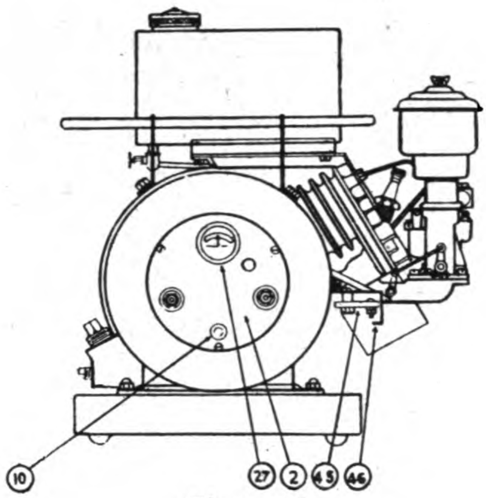


Figure 15

One 50 watt light attached to the middle section of the scraper to illuminate the scraper cleanup.

One 100 watt light over the operator's platform.

One 100 watt adjustable floodlight attached to the upper left rear corner of the chassis frame.

On the upper left rear of the chassis frame is a plug box to which the 50-watt trouble light and extension can be attached.

Between the generator and engine is a fuse box, using two 6 amp. fuses.

Operation:

The operation of the lighting system is very simple. When lights are required it is necessary only to start the engine and the lights will function immediately without the necessity of turning on switches.

The generator is driven by a single cylinder, 4 cycle, air cooled gasoline engine. The engine is equipped with set timing and set governor speed control which eliminates the necessity for spark and throttle levers. The governor control is set at the factory to maintain an engine speed of 1800 to 1900 R.P.M., which is the proper speed for the generator unit.

Starting the Engine—Figure 15:

The procedure for starting the engine is as follows:

1. Check oil level of crankcase. Oil should be at the point of overflowing out of the oil filler plug hole.
2. Fill gas tank with regular grade gasoline only. (Do not use high test gasoline).
3. Pull out on choke knob. Do not choke if engine is already warm.
4. Press starter button on end of generator. Push in choke and the engine fires.
5. If for any reason the starter does not function, the engine can be started by wrapping the starting rope around the starting pulley. A pull on the rope starts the engine.
6. To stop the engine, press stop button and hold until engine stops turning. See Accessory Section.

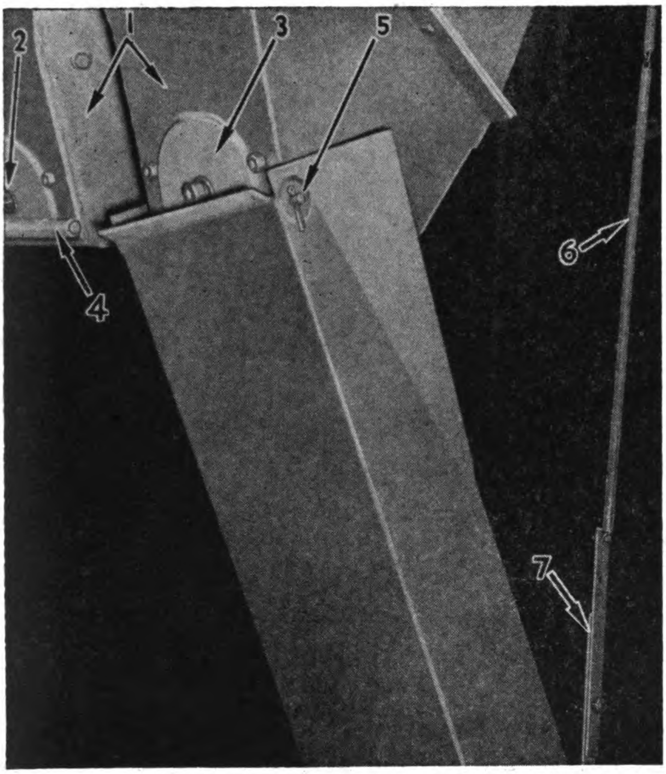


Figure 16

LOADER ASSEMBLED FOR TRAVEL DRYER:

The assembly and operation of the travel dryer loader (30″ longer boom) is the same as the travel mixer loader except the aggregate is discharged into divided spouts.

Twin Discharge Spouts—Figure 16:

The first section of the divided spout (1) is bolted to the boom housing and is shipped in place.

A separate spout is attached to each side of the divided spout, one for each dryer. These spouts are attached by inserting a short bolt (2) in the hole provided in the bottom center of the divided spout. A spreader bushing is placed around the bolt and the circular pivot plate (3) is bolted on. The spreader bushing allows the plate to pivot without binding on the spout. There is a pipe hinge (4) on the bottom edge of the pivot plate. A rod (5) is run through the holes in the sides of the spout and through the pipe hinge. Cotter pins are run through the rod on the outside of the spout. This assembly allows the spout to hinge up and down and the swivel plate allows the spout to move sideways.

The lower end of the spout is partially supported by two lengths of coil spring (6). There are two lengths of perforated strap iron (7). One section is attached to the spout and the other section to the coil spring. The spring is attached to the upper front corner of the boom housing. By matching up different holes in the perforated strap irons and bolting them together the tension on the spring can be changed. This spring support on the outer side of the spouts partially supports the spouts which rest on the dryer hopper spouts.

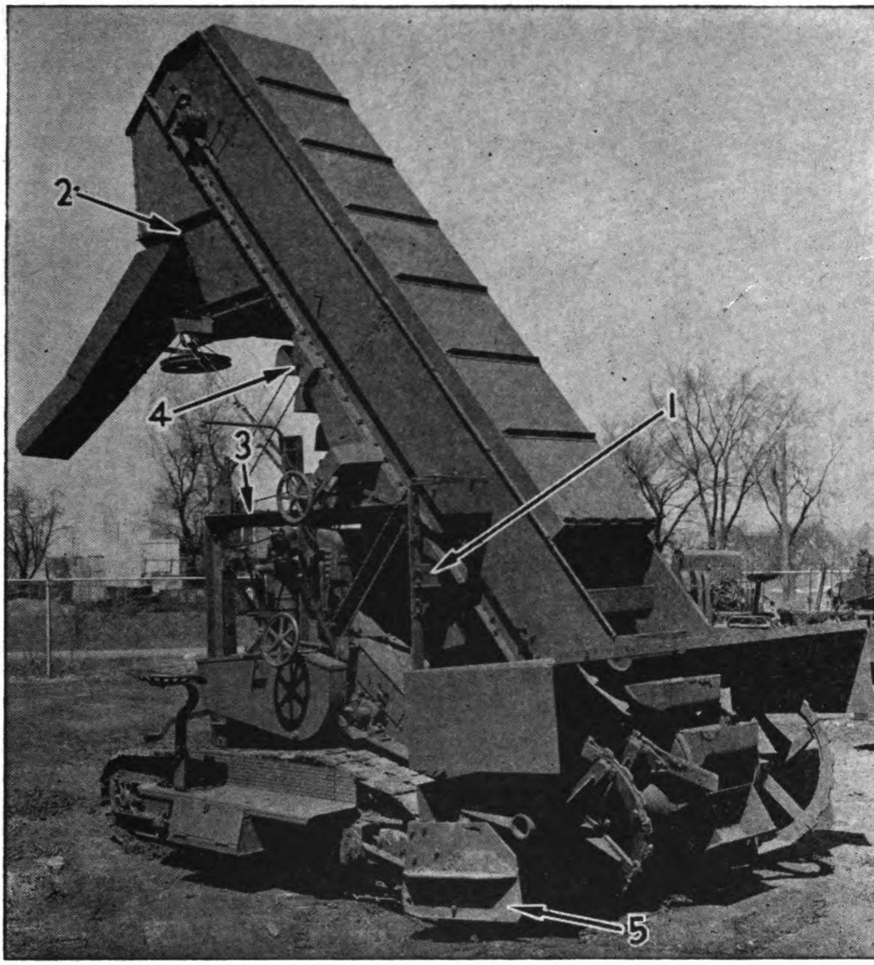


Figure 17

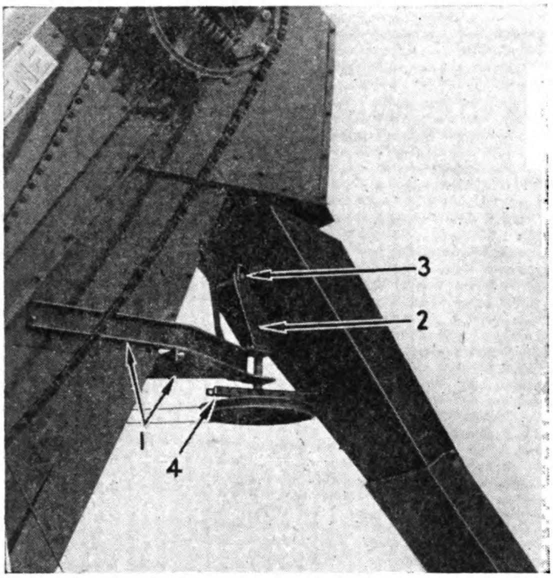
CONVERSION OF PAVING LOADER TO BUCKET LOADER:

Installing Swivel Spout—Figure 18:

To convert the paving loader to a bucket loader, it is first necessary to remove the divided spout on the dryer loader, or the discharge spout on the mixer loader, then install the swivel spout attachment as follows:

The channel frame spout support assembly (1) is bolted to the boom housing. There are lugs welded onto the bottom of the spout which match up with the holes in the spout support bracket (2). A rod is run through the holes in the lugs and through the bracket support and it is secured by cotter pins. This forms a hinge (3). The angle of the discharge spout is selected by bolting the two perforated flat strap iron braces (4) to the lugs provided on the bottom of the spout. The straps run back to the shaft just above the cable wheel. There is a hole through the shaft just above the cable wheel, and by selecting different pairs of holes in the brace straps and bolting to the shaft, the slope of the spout can be changed. Bolt support straps (5), Figure 18A, as shown.

The cable should be run back thru pulleys (6), the ends attaching to roller chain, which wraps around the sprocket on the spout control wheel. Adjust turnbuckle until cable is taut.



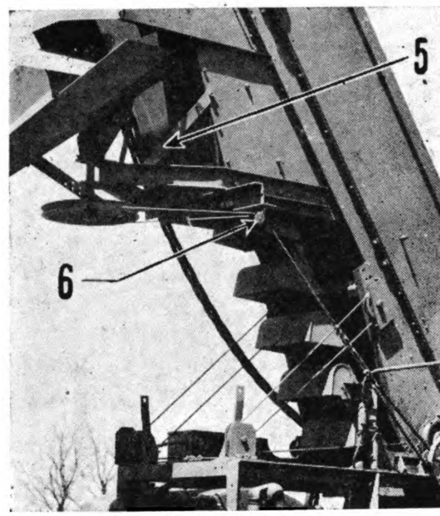


Figure 18A

Figure 18

Feeding Adjustments—Figure 19:

If the scraper is not bolted up rigidly the shims and bolts (1) holding the tops of the hinged scraper sections together should be installed.

For bucket loader operations, the boom and scraper are usually linked together rigidly by adjustable links, (see Figure 19) one on each side of the boom.

One end of the link fits into slot (2), and is secured by pin (3). The hole (4) in the other end of the link fits over pin (5) on the boom.

The shims (6) in these links determine the height of the spirals above or below the cutting edge of the scraper.

Remove canvas housing.

Remove outrigger shoe attachments if they have been used in previous operations.

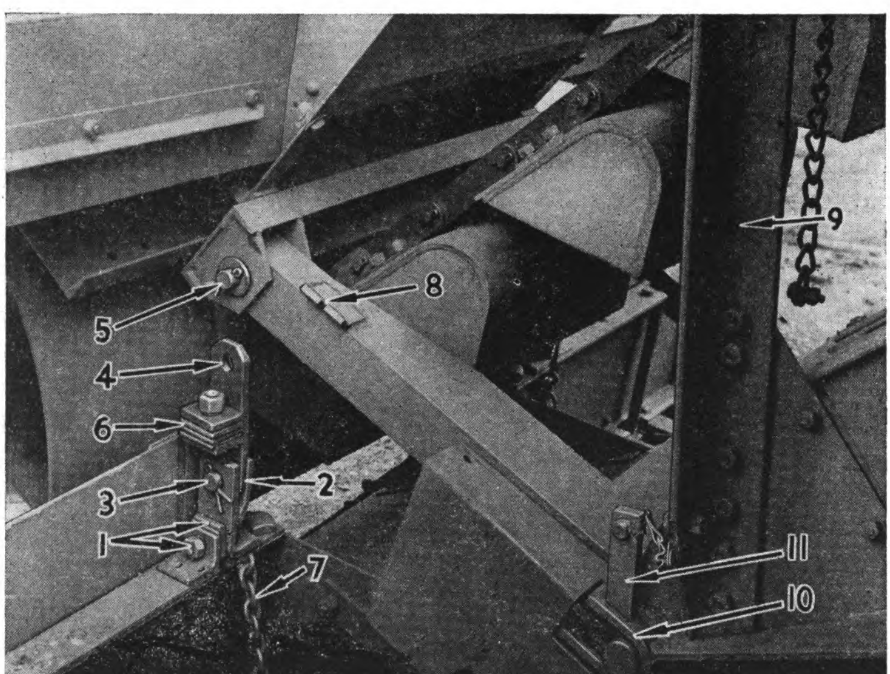


Figure 19

The side plates which bolt to the ends of the cleanup scraper must be removed, since they should not be forced into the material to be loaded. When operating on pit or stockpile loading, it may be desirable to remove the steel platform over the feed spirals.

OPERATION OF BUCKET LOADER:

General Hints

For operation in stockpile work, the spirals should be set about ¼" above the scraper blade.

For fine grading or in cases where it is necessary to break up or loosen the material ahead of the scraper, the spiral is set about ¼" below the scraper cutting edge.

On hard surfaces for cleanup work, the spirals are set above the scraper cutting edge. On cleanup of small volumes of loose material on a hard surface, better performance will be obtained by using the scraper floating instead of rigid.

When operating in stockpiles or gravel pits where the material has a high angle of repose, the loader should never be allowed to under-cut a pile or bank, or serious caveins may result.

It is advisable to cave the bank as the loader cuts into the pile. In case the bank does cave, it is advisable to back the loader out and remove any excess load from the top of the spiral shield.

Do not take too deep a cut into a pile so the sides cave in and foul the crawlers.

Much better working conditions are maintained if the stockpiled materials are picked up clean, and a comparatively level footing is provided for the loader and trucks.

Do not attempt to turn or steer the loader after the spirals and scraper have entered the pile or bank of material being loaded. To do so, will set up an excessive strain on the boom frame and the rest of the machine, and the crawlers will spin and mire down the loader and foul the crawler drive chains and sprockets.

In case a machine becomes mired and towing assistance is not available, positive traction can be obtained by running a bolt through a hole in the tractor tread and attaching a cable. Spin the crawler until bolt is on the bottom of crawler. Then by attaching the cable to a tree or solid object, the loader will pull itself out.

Do not allow crawlers to bury themselves on soft footing or sand. To do so will allow aggregate to foul drive sprocket and chain. See Figure 42. This may allow aggregate to lodge between the chain and the sprocket teeth causing the drive chain to break.

When it is desired to trail loaders, the overhead clearances along the route must be checked in order to determine how much knocking down of the machine is necessary. This will determine the size of trailer necessary.

When roading the loader on its own crawlers, disconnect the bucket line chain and throw in the bucket line clutch. This will prevent wear

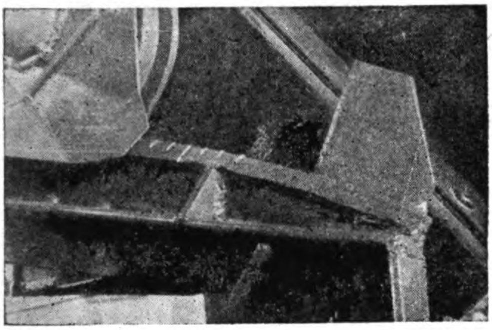


Figure 20

on the elevator drive sprocket bushings. NOTE: It is not advisable to road a loader for any great distance on its own crawlers as this will cause undue wear on the crawlers and driving machinery. A trailer should be used for distances greater than one mile.

Grade Indicator—Figure 20:

For fine grading, stripping, or excavation, the grade indicator is used. The relation of the height of the scraper blade to the crawlers determines the grade. On the chassis frame, about level with the operator's eye, are graduations. By keeping the guide plate on the long line, the loader will grade at the plane in which the crawlers are traveling. By raising or lowering the boom, the grade can be raised or lowered. Each notch represents one inch change in grade. By extending an arm from the spiral shield and attaching an indicating bob hanging down to a chalk line set to grade, the loader can be held accurately at any desired grade.

Feeding Speeds:

When operating the loader for stripping or cleanup of material in a windrow the loader crowding speed should be set to that speed which will provide best capacity and cleanup or stripping performance. Coordinate the feeding speed to the work to be performed at all times. Wherever possible, the loader should not move into the material faster than it can be handled by the feed spirals and buckets.

For stockpile or bank loading, a low feeding speed should be used and the steering levers thrown in and out intermittently to provide the proper amount of feed. Normally not much feeding is necessary in this class of work as the pile caves down and provides yardage without moving the loader.

Figure 21

General Applications of Bucket Loader

Stockpile Loading—Figure 21:

The bucket loader furnishes one of the cheapest, most flexible, and fastest method of reclaiming sand, gravel, crushed rock, slag, dirt, cinders, coal, etc., from stockpiles. A typical application is shown in Figure 21.

Clean-Up and Grading—Figures 22, 23, 28 and 29:

The loader may be used for clean-up application or for cutting to a grade. The grade indicator enables the operator to grade to a line and the rigid scraper is used for this purpose.

Stripping—Figures 22 and 24:

The loader may be used for stripping, but due to the wider scraper

Figure 22

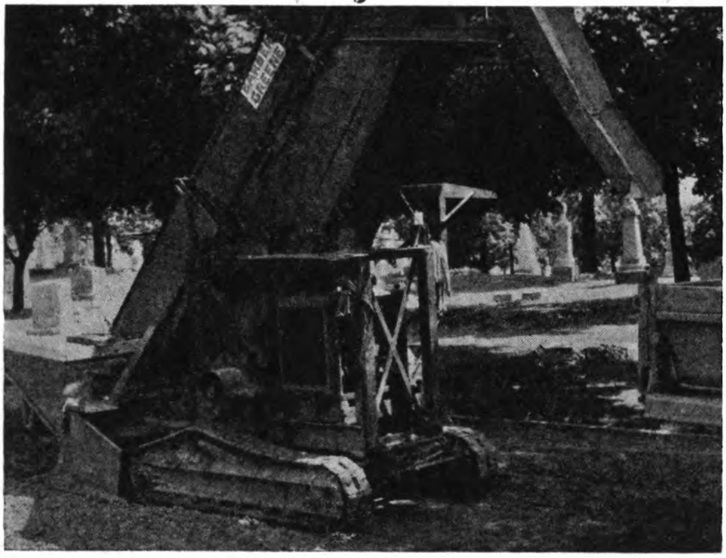


Figure 23

required on the paving loader, it is necessary to scarify the material to be loaded. Figure 24 shows the loader in use stripping black dirt.

Unloading Hopper Bottom Cars—Figures 25 and 26:

Hopper bottom cars may be unloaded by excavating a trench wide enough to allow the loader to run up to the car with the materials flowing into an improvised pit.

Unloading from Flat Cars—Figure 27:

Where a ramp is available and the end of the cars can be dropped or removed, the loader can be operated on the car bottom.

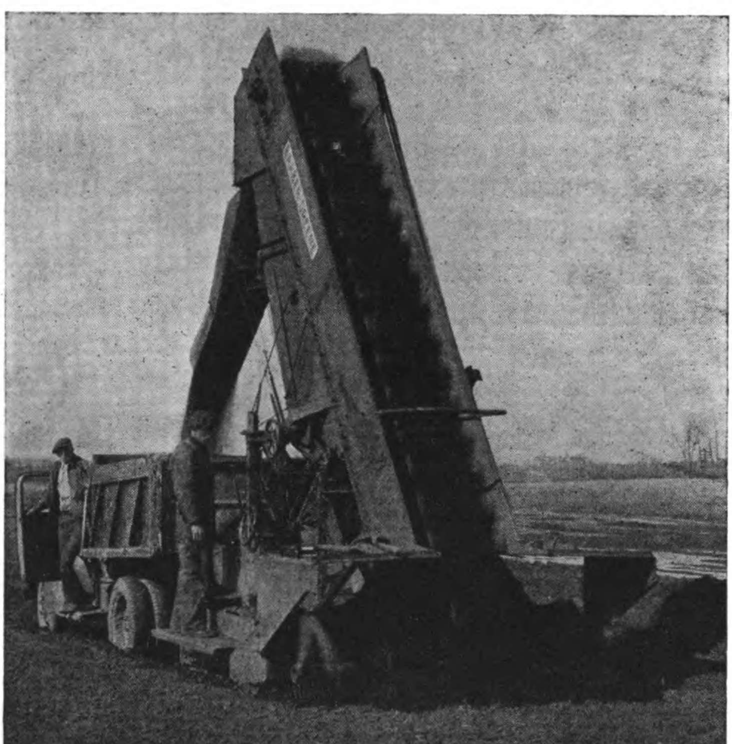


Figure 24

Unloading hopper-bottom railroad cars showing ramp excavated by loader, below, and closeup detail of bulkhead, right.

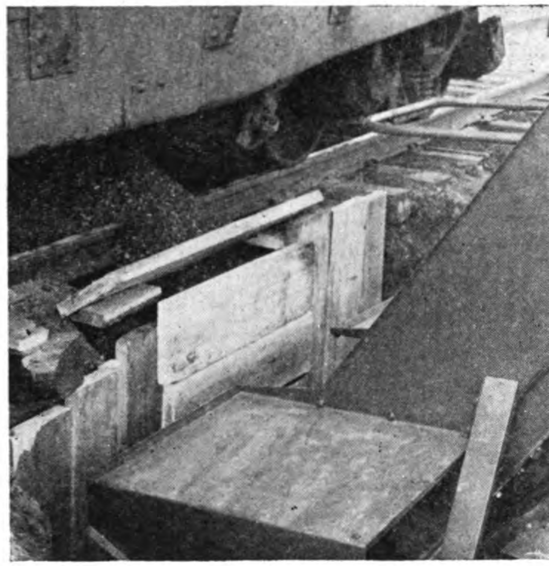


Figure 25

Figure 26

Figure 27

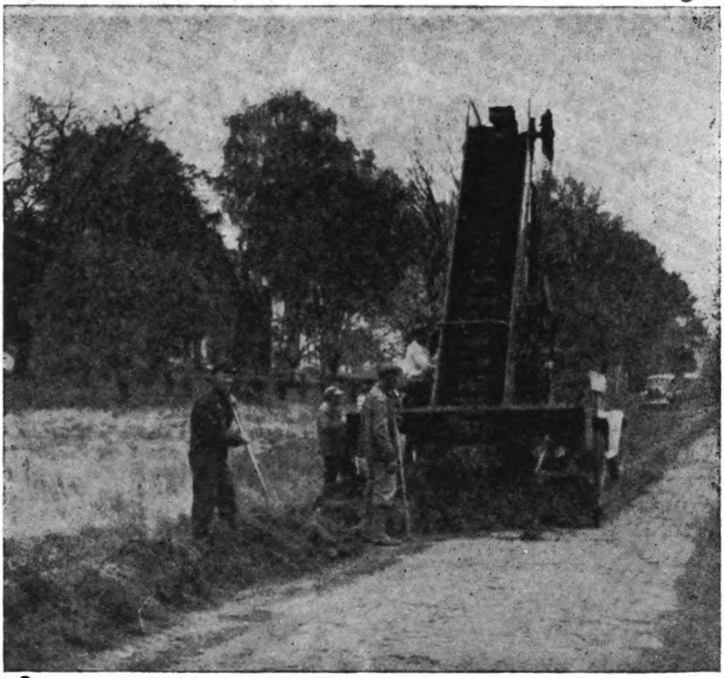


Figure 28. Cleaning drainage ditches along the roadside. A blade grader pulled the material from the ditch to the shoulder. The swivel discharge spout places the material evenly in the trucks.

Figure 29. Preparing the sub-base between two existing concrete strips. The scarified dirt and stones were loaded continuously into trucks without halting traffic.

Lubrication

LUBRICANTS

Nothing can add to the life of the machine more than thorough lubrication of the moving parts, properly executed at the correct intervals. When time and availability of the machine are at a premium, it is absolutely inexcuseable to have a breakdown resulting from improper lubrication, since this can so easily be avoided. A machine which cannot be used in an emergency because it requires repairing loses all of its value and, instead, becomes a handicap. Therefore, it is very important to maintain the machine carefully, following the instructions which have been prepared.

LUBRICATION INSTRUCTION:

1. **Buda Engine—Points to lubricate:**

   a. Crankcase
   b. Air Cleaner
   c. Oil Filter
   d. Water Pump
   e. Generator
   f. Starter
   g. Governor
   h. Fan
   i. Distributor

   Refer to Engine Section for detailed instructions.

2. **Master Transmission:**
   Check lubricant level every eight hours. Drain and refill after two hundred hours of operation. Use 8 quarts of transmission lubricant.

3. **Master Clutch Throw-Out Collar:**
   One alemite on the outside of bell housing. Grease every 8 hours. Do not give cup more than two turns as excessive grease may get into clutch discs causing slippage. Use high pressure grease.

4. **High Speed Chain Guard:**
   Maintain lubricant level so that chain is about half covered at its lowest point. Check every 8 hours. Drain and refill every two hundred hours with 2 quarts of transmission lubricant.

5. **Crawler Idler Wheel:**
   One alemite for each idler wheel and one wheel for each crawler. Grease every eight hours with high pressure grease.

6. **Gear Box Drive Shaft:**
   Three alemites—one inside case between gears. Grease every four hours with one or two strokes of gun. Apply open gear lubricant to gears every 50 hours.

7. **Gear Box Idler Shaft:**
   Three alemites—Alemites extend through gear box housing. Grease every four hours with two strokes of gun. Apply open gear lubricant to gears every 50 hours.

(Continued on Page 36)

82-A Paving Loader

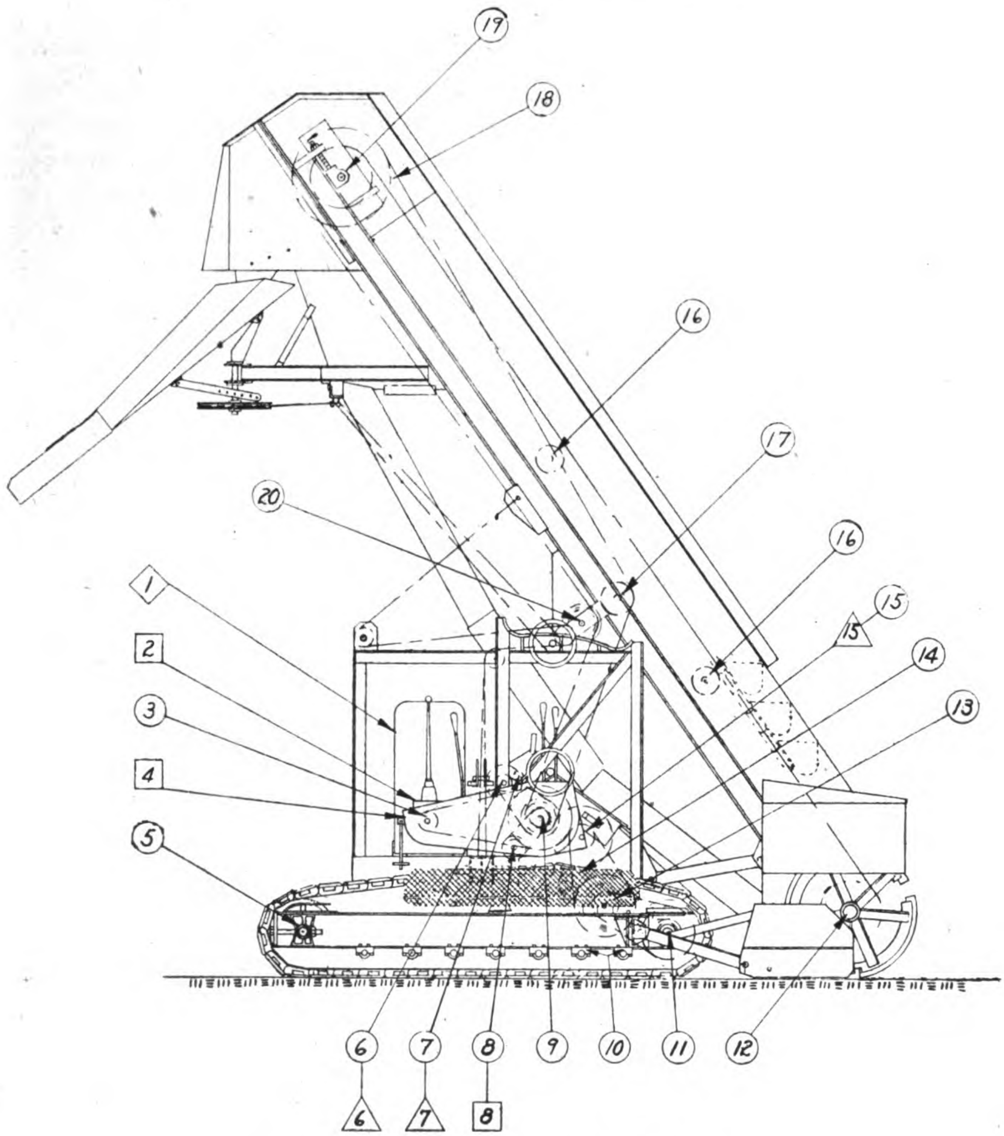


Figure 30. **Points of Lubrication.**

LUBRICATION INTERVALS

Every 4 hours—No. 6, 7, 9, 11, 12, 13, 15, 16, 17, 19, 20.
Every 8 hours—No. 1, 2, 3, 4, 5, 8, 10, 11, 14, 18, 21.
Every 50 hours—No. 1, 6, 7, 15, 21, 22.
Every 100 hours—No. 1.
Every 200 hours—No. 2, 4.
Every 400 hours—No. 8.

Lubrication Chart Key

Numbers appear inside symbols on the lubrication chart at every important lubrication point. The symbol indicates type of lubricant as shown below. The number indicates the paragraph giving detailed instructions on following pages.

HIGH PRESSURE GREASE

Operating Temp. °Fahrenheit	Commercial Grade and/or Trade Name	Nearest U. S. Army Equivalent
Below 0°	Stazon (Light Oil—300S /100°F. Viscosity — lime soap base)	#0 General Purpose Chassis Grease
0° to 32°	Marfak #0	#0 General Purpose Chassis Grease
32° to 200°	Marfak #2; Superla 2X or their equivalents	#1 General Purpose Chassis Grease #2 General Purpose Chassis Grease

MOTOR OILS

Below 0°	SAE-10	U. S. Army Spec. No. 2-104-A of corresponding viscosity. Blend when correct viscosity is not available.
0° to 32°	SAE-20	
32° to 90°	SAE-30	
Above 90°	SAE-40	

TRANSMISSION LUBRICANT

Below 0°	SAE-80	Federal VV-L-761 SAE-80
0° to 32°	SAE-90	Federal VV-L-761 SAE-90
Over 32°	SAE-140	Federal VV-L-761 SAE-90; or SAE-80-140*

*SAE 80-140 can be used at —20°F and above if other lubricants are not available.

OPEN GEAR LUBRICANTS

Below 32°	Crater Compound #00	(Follow High Pressure Grease recommendations if Crater Compound is not available).
32° to 90°	Crater Compound #1	
Over 90°	Crater Compound #2	

(Lubrication Instructions Continued from Page 33)

8. Hoist:
Five alemites—all alemites are piped out to side of machine and located near the oil level petcock of hoist. Grease alemites with two strokes of gun every eight hours. Keep hoist filled to level cock with a mild, hypoid type transmission lubricant. Drain and refill every 400 hours.

9. Main Jack Shaft:
Ten alemites. Grease the following every four hours: hoist clutch —one stroke of gun, two shifting collars, three bearings, one bucket line sprocket, one clutch shaft driving gear, and one pinion drive gear. For convenience, there are two alemites on gear box drive gear; grease either one. Six of the above ten alemites are located inside the transmission housing. Two bearings, one shifting collar and the bucket line drive sprocket are located outside the housing. Four strokes of gun. Use high pressure grease.

10. Crawler Track Rollers:
One alemite for each roller and six rollers for each crawler. Grease every eight hours with four strokes of gun. Use high pressure grease.

11. Crawler Drive Shaft:
Two alemites for each crawler drive shaft. There is one shaft for each crawler. Grease every eight hours. Four hours if maneuvered. Use high pressure grease.

12. Bucket Line Foot Shaft:
Two alemites—one for each bearing. Grease every four hours. The bucket line must be stopped and master clutch should be disengaged before these fittings are greased. Six to eight strokes of gun. Use high pressure grease.

13. Oscillating Shaft:
Four alemites. Two to each sprocket hub. Only one alemite on each hub need be greased. The alemites are located inside and near the bottom of the transmission housing and are rather difficult to see. Therefore, care should be taken not to overlook these alemites. Grease every four hours with three strokes of gun. Use high pressure grease.

14. Crawler Spring Take-Up Wheel:
One alemite for each take-up wheel and one wheel for each crawler. Grease every eight hours.

15. Crawler Clutch Shaft:
Eight alemites—grease every four hours. Two bearings, two shifting collars and two crawler drive sprockets. There are two alemites on each drive sprocket—grease either one. All but the two bearing alemites are located inside the transmission housing. Two strokes of gun. Apply open gear lubricant to gears every 50 hours.

16. Bucket Line Idler Rolls:
Two alemites for each roller assembly — two roller assemblies. Grease every four hours with four strokes of gun for each roller. The alemites for these rollers extend through holes in the sides of boom. Use high pressure grease.

17. Bucket Line Drive Take-Up Idler:
One alemite—grease every four hours with high pressure grease.

18. Overload Release Sprocket:
Three alemites—one on sprocket hub and one for each roller. Grease every eight hours. Stop bucket line before climbing up to grease these fittings. Use high pressure grease.

19. Bucket Line Head Shaft:
Two alemites—one for each bearing. Grease every four hours. It is necessary to climb up loader boom to grease these bearings. Four to six strokes of gun. Use high pressure grease.

20. Bucket Line Drive Pivot Shaft Idler:
One alemite. Grease every four hours with high pressure grease.

21. Johnson Engine—(Lighting System) Points to Lubricate:
a. Crankcase.
b. Air cleaner. See "Lighting System" in Accessory Section for details.

22. Drive Chains:
Lubricate with motor oil every 50 hours. Keep free of dirt and grit with gasoline. NOTE: Do not lubricate the bucket line chain.

23. Hoist Hand Wheel: (Not shown)
Two Alemites, one to each of two bearings. Grease every eight hours. Use high pressure grease.

Operator's Adjustments

Master Clutch:

The Lipe Clutch is used on machines having serial number 82-8-37 and above.

The Fuller Clutch is used on machines with serial number 82-7-37 and below.

Serial number plate and key to serial number system is shown at the end of this section.

Adjustment of Lipe Clutch (Model Z32-S):

This is a spring loaded, friction type clutch, which functions by clamping a driven friction disc, splined to the transmission drive shaft, between the face of the engine flywheel and the clutch pressure plate. NEVER wait for this clutch to slip before adjusting, as slip in any clutch of this type results in excessive wear to the friction facings. Need for adjustment can be determined by a reduction of the foot pedal "lash," or free movement, which reduces as the clutch wears, due to a reduction of clearance between the release bearing and clutch sleeve as the facings wear. When the "lash", or free movement of the clutch pedal reduces to only $\frac{3}{4}''$, the clutch should be adjusted immediately. In proper adjustment the lash in the foot pedal on this clutch is approximately $1\frac{1}{2}''$. To adjust clutch, proceed as follows:

Fig. 31. Using gauge, as illustrated, check clearance "A" between face of sleeve and flywheel ring. Clearance "A" for this clutch should be NOT LESS THAN $1\frac{1}{16}''$ AND NOT OVER $1\frac{1}{8}''$. If clutch needs adjusting this dimension will be over $1\frac{1}{8}''$ and to adjust it will be necessary to remove shims under each adjusting nut. Removing one shim under each nut reduces "A" 7/64".

Block the clutch pedal down in released position to avoid bending adjusting straps and studs or stripping stud threads.

Fig. 32. Back off all adjusting nuts (C) five full turns while clutch is being held in released position. There are four adjusting strap nuts.

Fig. 33. Remove the clutch pedal blocks to engage clutch. Adjusting plate then backs away from shims at (D).

Fig. 34. To remove shim, apply sharp nosed pliers to lip of shim "A", or insert cotter pin puller in hole "B" of shim. Remove one shim from under each of the adjusting straps with a pair of sharp-nosed pliers, or insert cotter pin puller in small hole of shim. Be sure no portion of the shim is left between the adjusting plate and flywheel ring; also that the same number of shims are removed from under each strap. A good practice is to recheck after adjustment to be sure that the same number of shims are left under each strap. To determine the number of shims that should be removed, refer to "A".

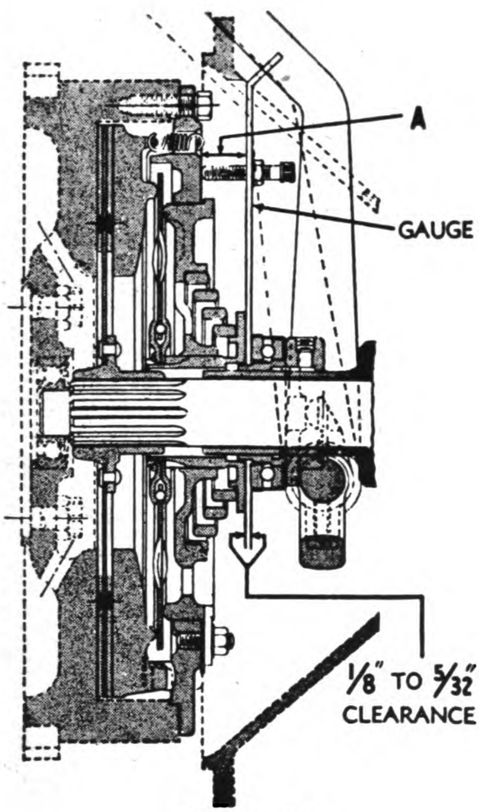


Figure 31

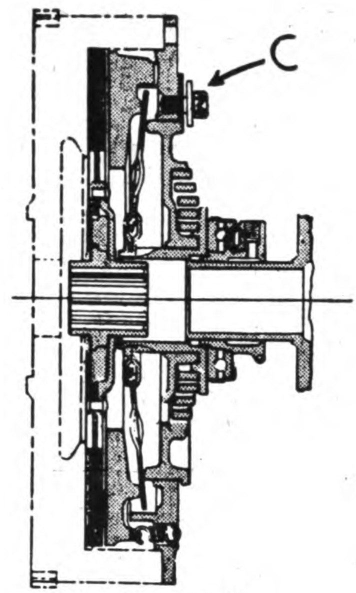


Figure 32

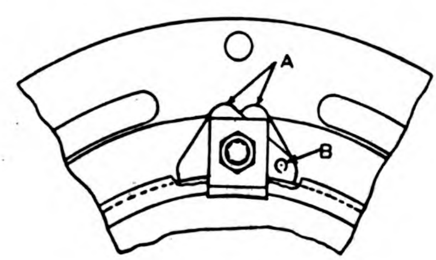


Figure 34

Shim

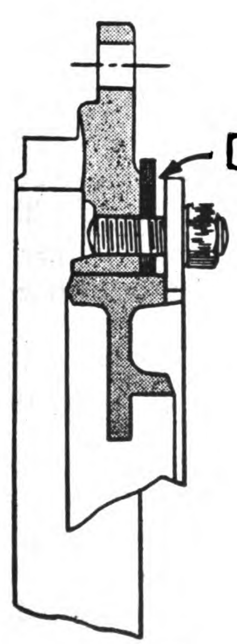


Figure 33

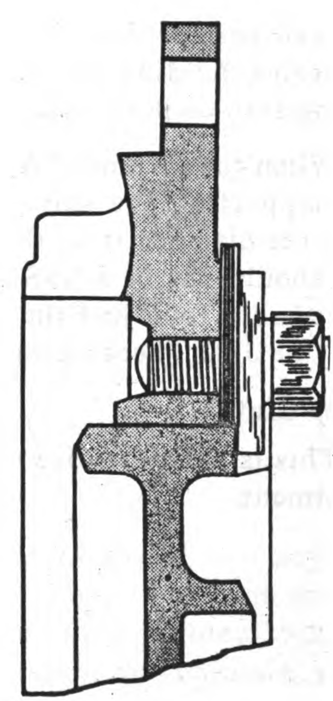


Figure 35

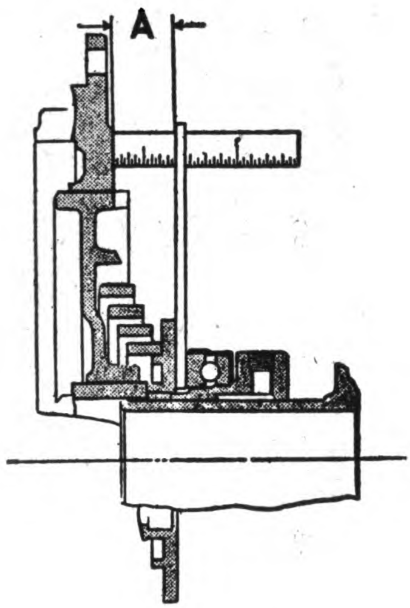


Figure 36

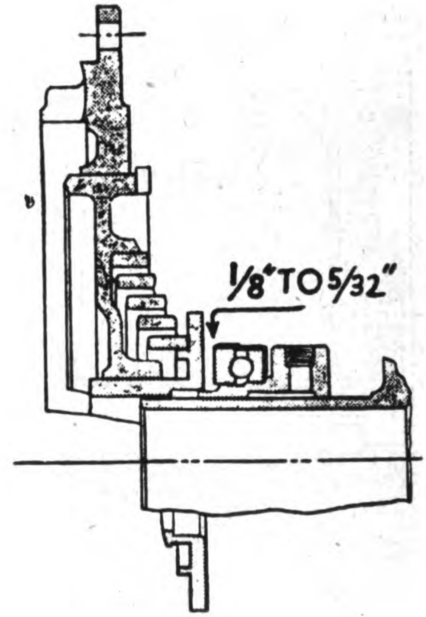


Figure 37

Block Pedal in release position. This moves adjusting plate into contact with shims. Tighten each adjusting strap nut firmly.

Fig. 36. See "A" for adjustments. Hold straight edge firmly between clutch sleeve and release bearing, so it will not drop into transmission case, when taking measurement. Clutch engaged for this operation.

Measure the distance from machined surface which supports the shims to face of clutch sleeve, against which the release bearing acts. This can best be done by means of a straight edge and scale, or with two scales, holding the straight edge in place by pushing the release bearing into contact with the straight edge.

When the distance "A" (see Fig. 36 above) from the machined surface supporting the shims to the face of the clutch sleeve is correct, check the distance from the release bearing to the clutch sleeve, Fig. 37. This should not be LESS than 1/8" and not MORE than 5/32". It may be necessary to adjust the pedal linkage to obtain the proper clearance of 1/8" or 5/32", because of wear or improper initial adjustment.

Fuller Clutch

This is multiple disc spring loaded friction clutch and requires no adjustment.

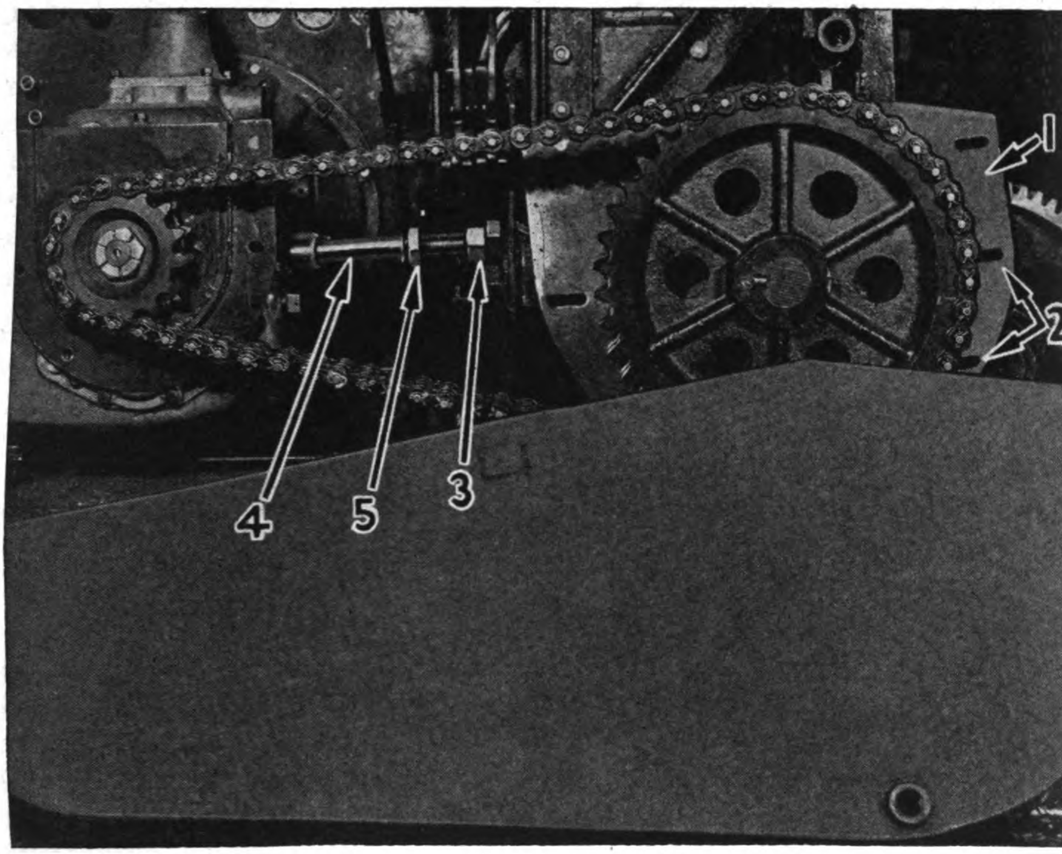


Figure 38

HIGH SPEED MAIN DRIVE CHAIN—Figure 38:

The adjustment is accomplished by moving the engine.

This chain may need adjusting after preliminary stretch is removed. To tighten chain, loosen bolts that hold patch plate, (1) to chain guard around main jack shaft. Slotted holes, (2) in patch plate allow housing to slide. Loosen bolts holding engine to chassis frame. Remove stop plate on chassis frame at radiator end of engine. Loosen lock nut, (3). Take up on transmission thrust takeup bolt, (4) until the sag on the top run of the chain is not less than ¼" or more than ¾". Turn takeup bolt by putting wrench on nut, (5). Lock nut on thrust take-up bolt; then move radiator end of engine over the same amount as transmission end was moved to square up chain and sprockets. Tighten down engine bolts, replace stop plates and tighten bolts on patch plates.

CAUTION: Be sure bolts on patch plate are loosened enough so gasket will not be damaged.

BUCKET LINE CHAIN

Take-up of this chain is accomplished by means of two adjusting bolts at the boom headshaft. To tighten chain, loosen lock nuts and take up on bolts till chain is in proper adjustment. Then tighten lock nuts. Each bolt should be taken up an equal amount to maintain proper sprocket and chain alignment. This chain is properly adjusted when the

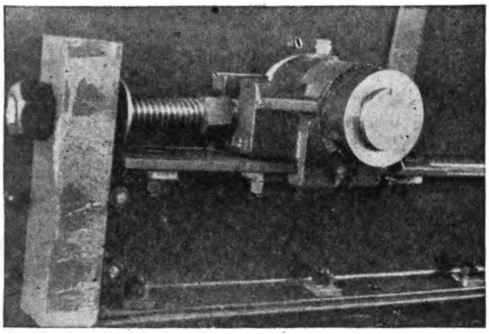


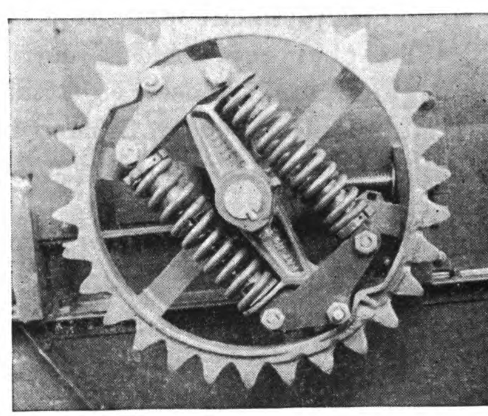
Figure 39. Bucket Line chain take-up showing adjusting bolts on boom headshaft.

clearance between the return bucket line chain and the cross brace on the chassis superstructure is from 4″ to 6″. See Maintenance Section. CAUTION: When the bucket line chain is tightened, the bucket line drive chain is also tightened. This should be checked for proper tension after bucket line is adjusted.

SPRING RELEASE SPROCKET

The tension of the springs in the release sprocket governs the point at which the sprocket will release. These springs are adjusted properly for ordinary working conditions at the factory. Ordinarily, when loading sand or gravel, the sprocket will release when the buckets are fully loaded and the spiral is half to two-thirds covered. Should the sprocket release with bucket line full, but with only a small amount of material in the spirals, the tension on the springs should be increased. At no time, however, should the spring tension be such that the engine will pull down to a stall without the sprocket releasing. This adjustment consists of removing the locks from the spanner nuts and turning nuts to right to increase tension. Be sure locks are replaced or the adjusting nuts are apt to unscrew, thereby losing proper tension. See Maintenance Section for adjustments.

Figure 40. Spring Release Sprocket.



BUCKET LINE DRIVE CHAIN—Figure 41:

This chain (1), Figure 41 is in proper adjustment when the amount of sag in the chain from the take-up sprocket to the headshaft sprocket is not less than 1″ or more than 3″.

The adjustment of this chain is accomplished by lifting the lock plates (2) away from the heads of the adjusting bolts. Takeup on the bolts (3) until the chain is in proper adjustment. Each bolt should be taken up an equal amount to maintain proper sprocket and chain alignment. Replace lock plates.

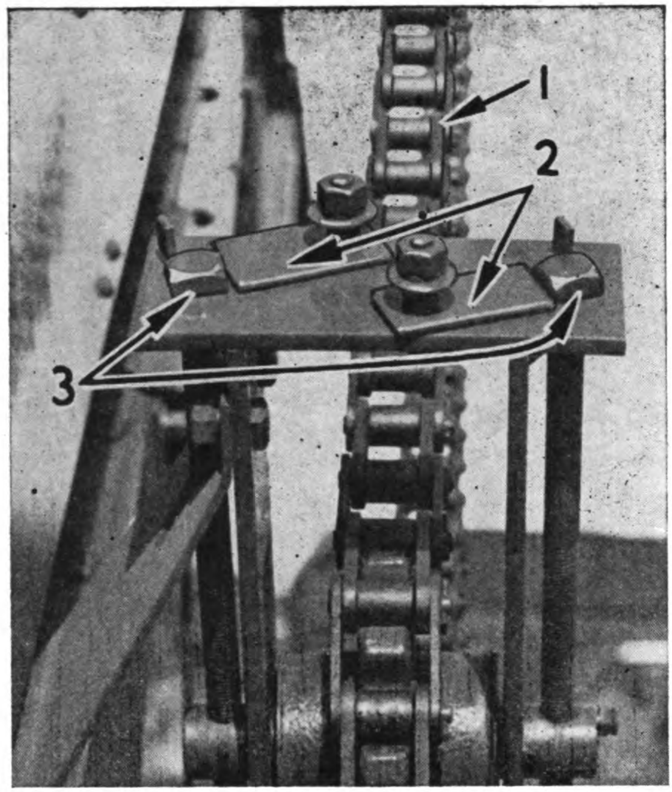


Figure 41. Take-up for Bucket Line drive chain showing lock plates and take-up bolts.

CRAWLER FINAL DRIVE CHAIN

The chain (1), Figure 42 is tightened by moving the entire crawler assembly toward the spiral end of the loader. Loosen the four bolts (1), Figure 43 that secure the crawler bearing to the crawler main frame. When the inside pair of bolts are loosened the keeper plates, (2) can be turned around revealing the shim plates, (3) on both sides of the bearing. To tighten drive chain remove shims from side of bearing near-

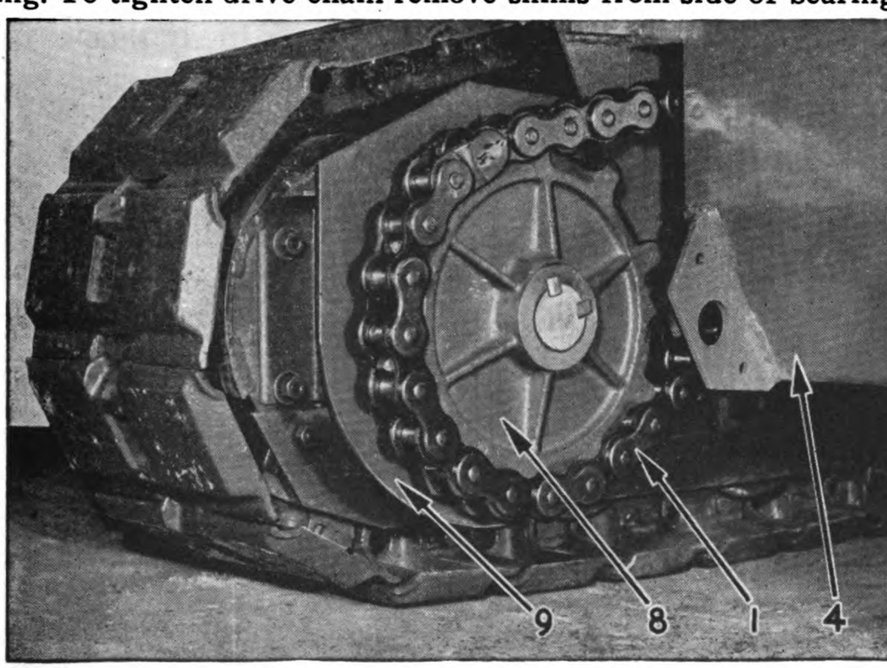


Figure 42

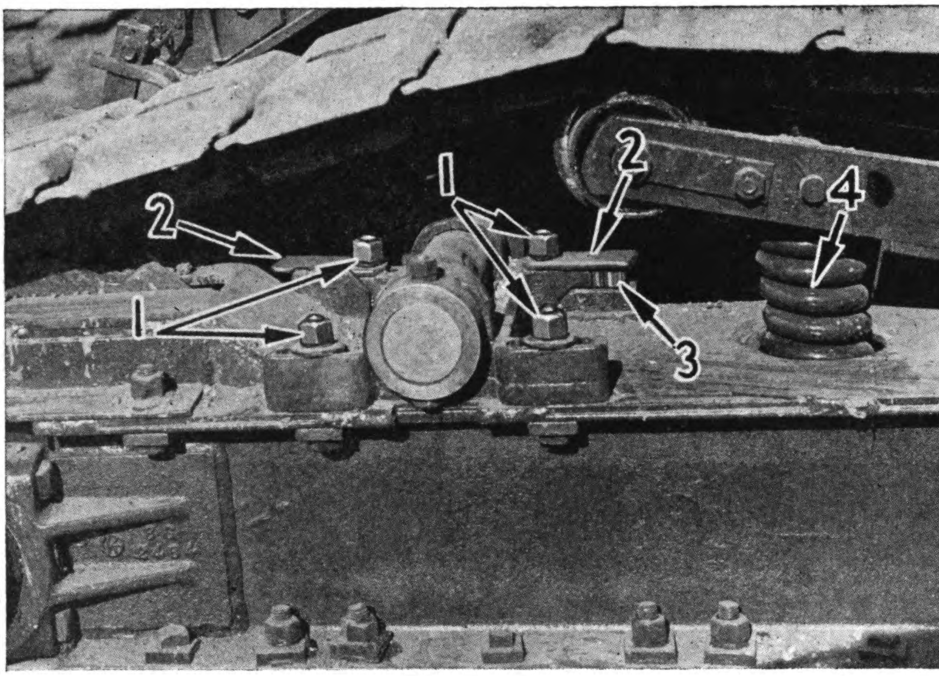


Figure 43

est to idler take up spring, (4) and force them into position on the opposite side of the bearing until chain is in proper adjustment. When adjustment is complete, replace shim keeper plates and tighten bolts.

CRAWLER TREADS

When the sag in the crawler treads from the spring take-up idler to the front idler wheel exceeds three inches the crawler tread should be tightened.

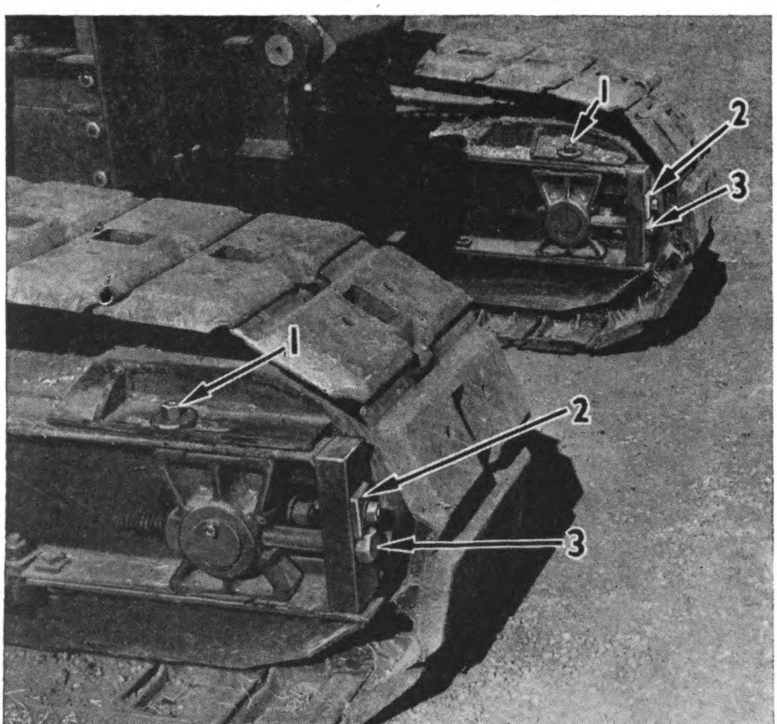


Figure 44

To do this, loosen the two bolts, (1), Figure 44, holding takeup guard plates and clean out slots so the guard plates can slide freely. Remove lock plates, (2) from head of takeup bolt. Takeup on bolts, (3) until there is no sag in the tread and the spring on the spring takeup idler begins to compress. The tread will then be in proper adjustment. It is important to takeup on each bolt an equal amount to insure proper alignment of idler wheel and crawler tread.

CRAWLER BRAKES AND CRAWLER CLUTCHES

The crawler brakes and clutches are operated by the same levers, making it necessary to check both brake and clutch adjustments at the same time. When the levers are up, the clutches are engaged. When the levers are pressed down the brakes are applied. Unless the increment between these two positions is properly adjusted the brakes may drag when the clutch is engaged, wearing the brakes and clutches excessively. If there is a definite drag when the clutches are disengaged, and the loader tends to move forward, the clutches are too tight. If the crawlers do not take hold positively when the clutches are engaged and the brakes properly adjusted, the clutches are too loose. If levers disengage themselves, the clutches need tightening. It is useless to attempt to adjust the brakes unless the clutches are checked and in proper adjustment first.

The crawler clutches are of split band, external contracting type. There is a clutch for each crawler, located on the crawler clutch shaft. Essentially each clutch consists of two clutch bands that compress on a drum when the clutch lever is engaged.

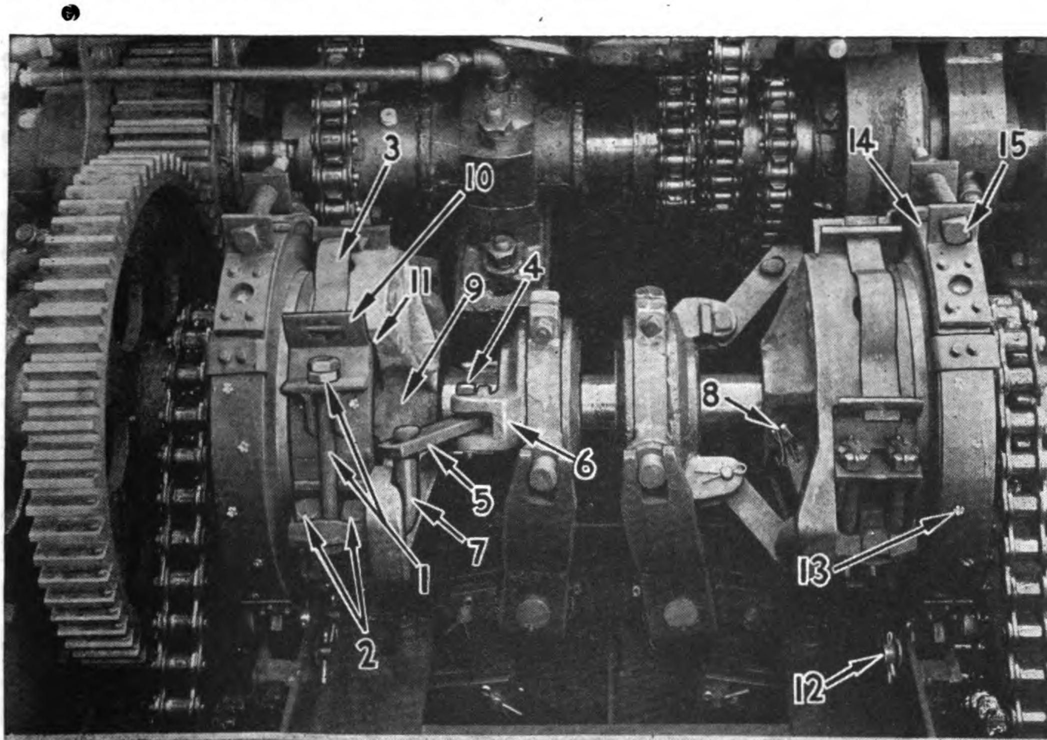


Figure 45

When the clutches are in proper adjustment, the clutch levers engage with a distinct snap as the shifter yoke throws past center.

CAUTION: Always be sure before making an adjustment of the clutches that the lack of effectiveness is not due to slippage due to grease on the band. If the band is greasy wash with gasoline.

Clutch Adjustment—Figure 45:

To tighten clutch, loosen half nut on adjusting bolt and turn inside nut down ¼ to ½ turn, (1). Then turn clutch half way around and repeat procedure on opposite take-up bolt. *Be sure to take up an equal amount on both bolts.* If this is not done, the ends of both clutch bands nearest to the bolt taken up the most will drag resulting in damage to the clutch. To determine if both bolts have been taken up an even amount proceed as follows:

(a) Turn clutch over until the clutch band half, having no shims between the spring clip and clutch carrier at (11) is accessible.

(b) Disengage clutch.

(c) Grasp firmly with fingers, both clips, (10), that hold the spring (3), in position. If clutch band is free on the drum, the takeup bolts have been tightened properly. If band cannot be moved, the bolts are not evenly adjusted and the clutch will drag. To correct proceed as follows:

(d) Check the clearance between the spring clip (10) and carrier (9) at (11) and the clearance between the clip and carrier at the other end of spring (3). You will find there is no clearance at one end and possibly ¼" at the other. Therefore, the bolt at the end having ¼" clearance must be loosened and the opposite takeup bolt tightened until the clutch band has been centered having equal clearance between clips (10) and carrier (9) at point (11), and then continue to tighten bolts evenly until the clutch is in proper adjustment. A new clutch may require several adjustments until friction bands wear in.

When the clutch is properly adjusted, the clutch band must be free on the drum as described under "C".

BRAKE ADJUSTMENT—Figure 45:

With the clutches properly adjusted, proceed with the brake adjustment. After the clutch adjustment, operate the loader to see if the brakes need adjusting. Be sure the brake bands are free of grease.

The actual adjustment of the crawler brakes is a very easy and simple operation. However, these adjustments require periodical checking particularly when the loader is new.

To tighten either brake, loosen half nut on adjusting bolt, (11) and turn inside nut down ½ to ¾ turn. If this should not be sufficient, continue to turn nut ½ turn until proper braking is obtained. Never tighten brakes more than is necessary to brake each crawler when turning on level ground.

To loosen either brake, reverse above procedure.

After the brakes have been adjusted several times, remove the inspection cover from the loader housing and check the various parts of braking mechanism. After this final check-up and adjustment is made the brakes should need little adjustment for a long period. If adjustment is necessary it will usually be the clutch that needs adjusting. Parts and alignment to inspect and maintain are as follows:

Check the brake bands to make sure they are free of grease. Should bands become greasy, they may slip although they are already sufficiently tight. In such case, wash with gasoline.

If, when applying the brakes, the levers should hit the drive chain gear case, so that proper braking cannot be obtained, it will be necessary to shim the linkage of the brakes. See Figure 45A. These shims are placed between the linkage, and the support angles, and held in place by bolts. Always insert an equal amount of shims on both sides. This is necessary to maintain proper alignment of the steering levers.

CAUTION: Be sure that when the clutches are engaged, the brake bands are free on the drums and with brakes set the clutch bands are free as per instruction "C" in "Clutch Adjustment." The brakes may be set up too tight so they engage before the clutches completely disengage, resulting in a condition where clutch and brakes are working against each other.

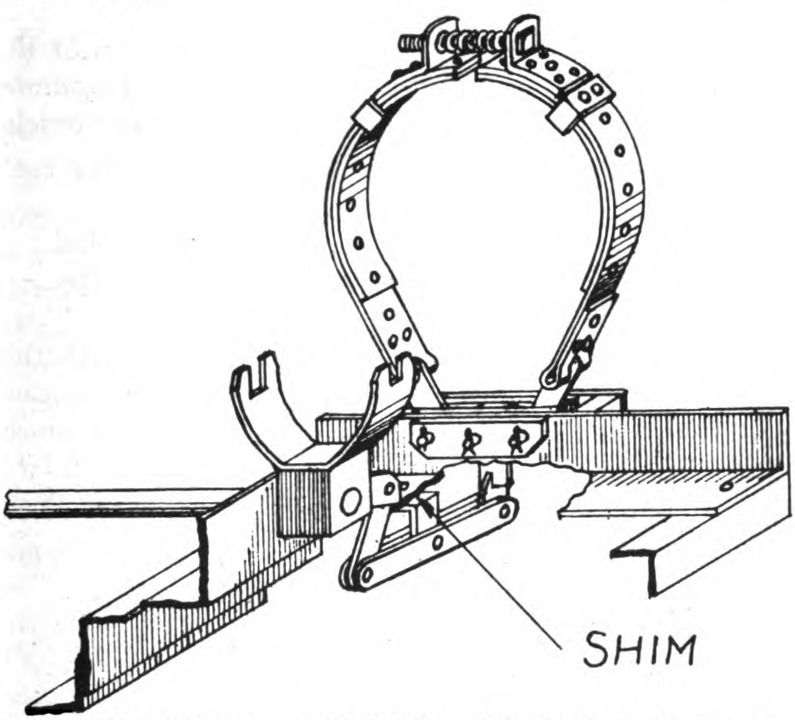


Figure 45A. Showing adjustment of clutch and brake lever linkage by inserting shims. For general view of steering lever assembly, see Parts Section.

UNLOADING METHODS

By Crane:

The best method to use to unload this machine is to pick it up with an overhead crane and set it down where desired. The crane should have a capacity of 22,000 lbs. The boom should be left in a horizontal position. Care should be taken that the lift chains are fastened to the proper points securely. Four lift chains are necessary: Pass the chains around and underneath the chassis frame and hook together. On the

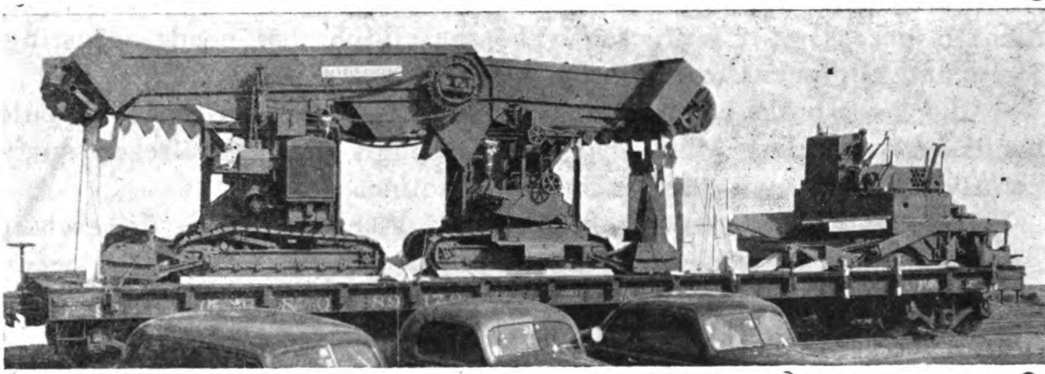


Figure 46. Method of transporting two loaders and a B-G Finisher on a standard 53′ flatcar.

head end—the chains can be passed through just ahead of the crawler bearing. The chains on the rear end of the chassis should be placed right against the hooks on the bottom corner of the chassis frame.

If the boom is to be removed separately be sure all chains, safety straps and cables are free of the chassis. One chain should be hitched to the foot shaft on each side of the boom. The top end of the boom is lifted by passing a chain around the boom and fastening underneath at the narrow section of the boom just ahead of the pivot brackets.

The hitches for the chassis are the same as used for the complete machine:

Chassis weight ....13,000 lbs.
Boom weight .... 9,000 lbs.

To Platform:

The next best thing to a crane is a platform to which the machine may be run over short planks. A 4″ x 12″ oak timber under each crawler is sufficient if the platform is near the car, but if it is more than six feet away, heavier supports must be provided.

CAUTION: Be sure the platform will hold a weight of 23,000 lbs. before running the machine onto it.

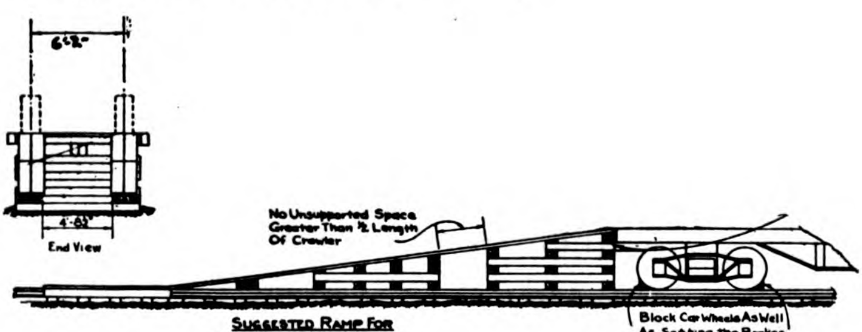


Figure 47

By Ramp:

If neither crane nor platform is available a ramp must be built down which to run the machine. It should be planned and built carefully.

The ramp should be built at the end of the car if possible. It should be about thirty feet in length, the runways being built of eight 3" x 12" x 16'0" planks. These planks should be cribbed up underneath with ties and small blockings so that at no place is there an unsupported length of planking greater than half the crawler length. About 5 lbs. of 60 penny spikes are necessary to put the ramp together solidly. About 32 ties will be necessary for cribbing the ramp.

CAUTION: If planks are not available and the ramp is made entirely of ties, be sure that they are dry ties that have not been creosoted as the creosote maks them slippery and dangerous. Sanding ties that have been creosoted keeps the crawlers from slipping to a certain extent, but the use of any but dry ties is to be avoided whenever possible.

Block the car so that it cannot move either way as the machine is being run off, and set the car brakes to insure safety.

Running Machine Down Ramp:

Lower the boom as described in section on "Loader Assembled for Travel Mixer", page 15. Be sure to attach and key push arms. Lower boom so the scraper clears the car floor by about an inch. Run machine off with spirals ahead.

Line up the machine carefully so steering will not be necessary while going down ramp. Disengage main transmission. Place change gears in low crowding speed. Engage crawler clutches. When ready to start, shift main transmission into first. This will move loader at a slow speed. Use of the crawler clutch steering levers may throw the loader out of alignment. If it is necessary to stop the machine while going down the ramp, disengage master clutch.

The critical point is when the loader rocks forward from the car floor level to the angle of the ramp.

The ramp must be well designed and carefully built.

Ordering Parts

The Serial Number, shown and described below, is the means by which Barber-Greene identifies the bills of materials used in manufacturing any particular machine and must be given when ordering parts. This Serial Number provides an accurate method of indicating in the sequence of serial numbers any design changes that have been made.

Serial Number Plate

The Serial Number Plate appears on the frame above the operator's platform. Always give the serial number of your machine, part number, and description when ordering parts.

Key to Serial Number System

82A-8-37

The first number (82A) indicates the machine model. The last number (37) indicates the schedule of manufacture in which the machine was built. The middle number (8) indicates the number or place of the machine in that schedule of manufacture. The machine above is Model 82A and is the 8th machine manufactured in the 37th schedule. The next machine built will have serial number 82A-9-37. The next schedule will be 38 and the serial number of the first machine will be 82A-1-38.

MAINTENANCE MANUAL

CONTENTS

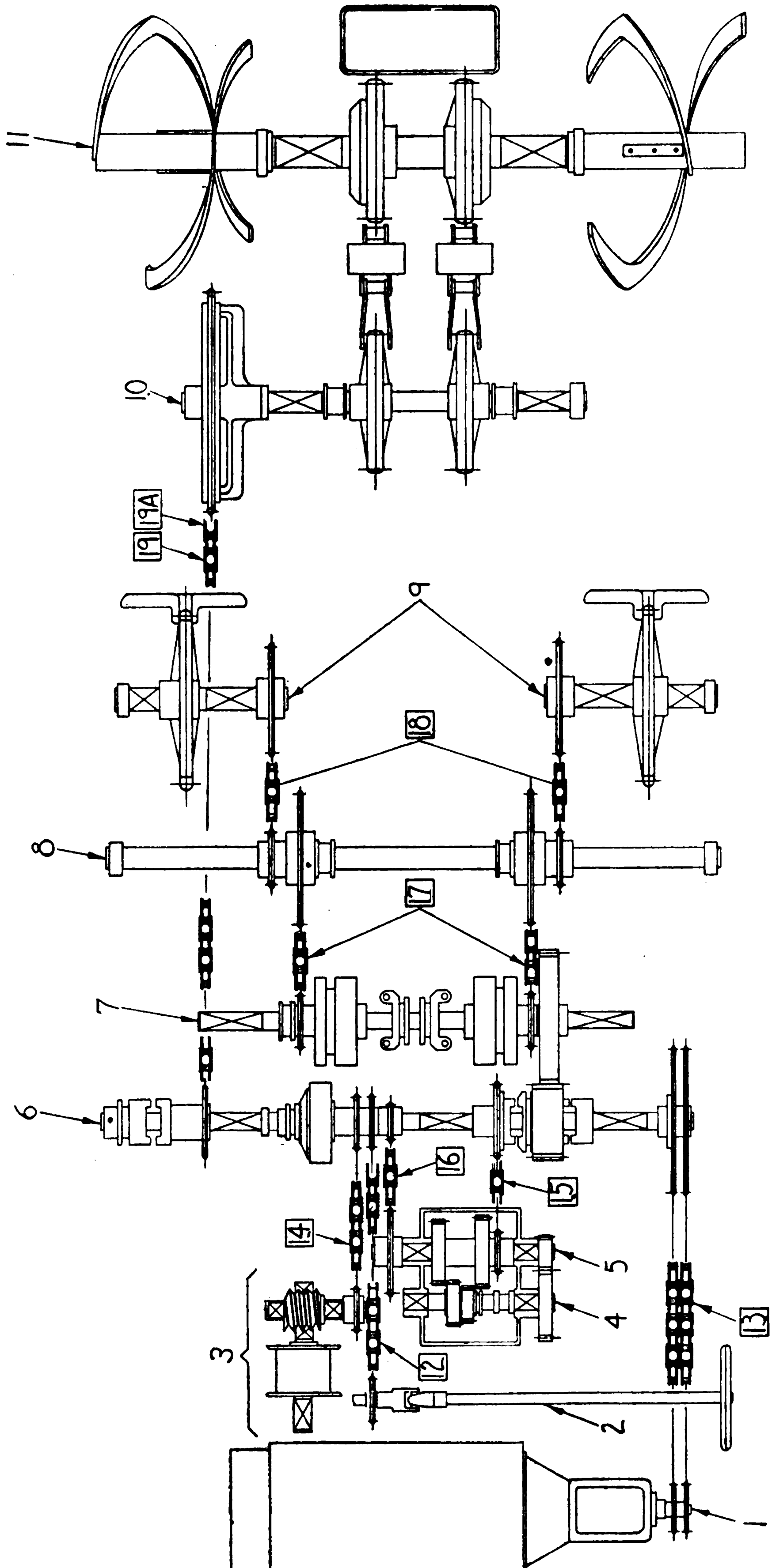


Figure 100

POWER TRANSMISSION CHART

Shafting Identification and Speeds

		R.P.M.		
	Engine		1400	
		1st	2nd	3rd
1.	Transmission Shaft	350	700	1400
2.	Hoist Hand Wheel Shaft		Varies	
3.	Hoist Drum Shaft			
	Hoist Drive Shaft			
4.	Gear Box Idler Shaft			
5.	Gear Box Drive Shaft			
		1st	2nd	3rd
6.	Main Jack Shaft	140	280	560
7.	Crawler Clutch Shaft		Varies	
8.	Crawler Oscillating Shaft			
9.	Crawler Drive Shaft			
10.	Boom Headshaft		42.0	
11.	Boom Foot Shaft and Spiral		42.0	
	Bucket Line Speed		168.0 F.P.M.	
	Crawler Speed (See "Crawler Speed" in Operating Section)			

Drive Chain Identification

12.	Hoist Hand Wheel Chain
13.	Main Jack Shaft Drive Chain
14.	Hoist Drive Chain
15.	Jackshaft Pinion Drive Chain
16.	Gear Box Drive Chain
17.	Oscillating Shaft Drive Chain
18.	Crawler Drive Chain
19.	Bucket Line Drive Chain

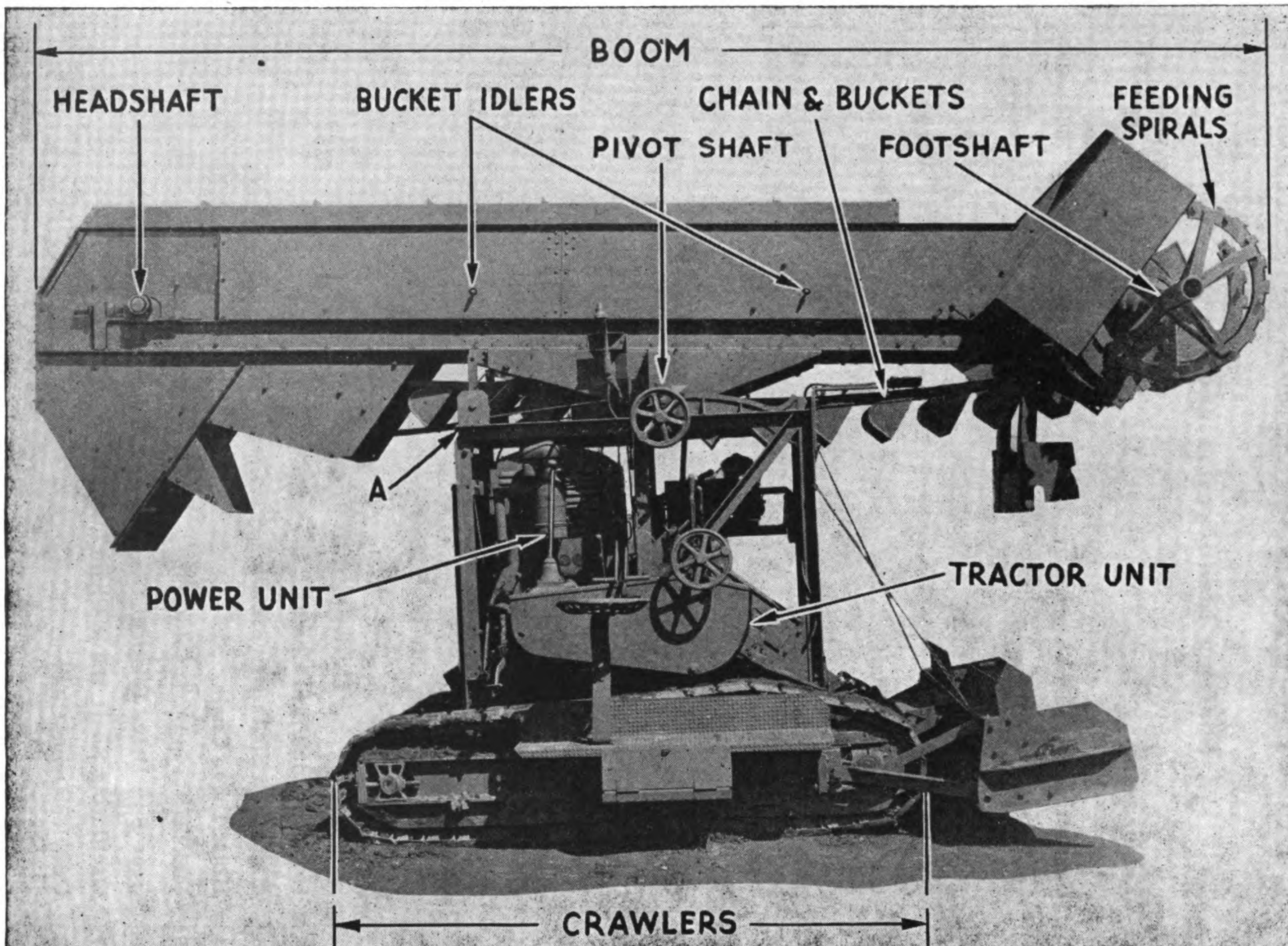


Figure 101. **Barber-Greene Model 82-A Bucket Loader with boom laid back in traveling or shipping position. The floating scraper at right is here held off the ground by supporting wires for transporting.**

BUCKET LOADER BOOM UNIT

General

The Boom of the Model 82A Paving Loader is here treated as a separate unit of the machine, since it may be removed, as a unit, when the loader is being overhauled. It is not necessary to have the Boom separate from the Tractor Unit for the purpose of making repair replacements on the Boom, since removal is usually made only to facilitate work on the Tractor Unit, and if desirable, work on all Boom parts hereinafter discussed may be performed with the Boom in place.

Headshaft (No. 10 on Figure 100)

This shaft is mounted in two babbitted sliding take-up bearings (4), which are adjustable for bucket chain take-up, by means of screws (1). Collars, (3) are mounted against the bearing hubs both inside and outside. See Figure 102.

The two bucket chain sprockets (5), Figure 103 are of the split type, keyed and set screwed to the shaft, and it is not necessary to remove the shaft to replace these sprockets. Center to center distance of sprockets is 10″. To remove sprockets it is necessary to have the boom in its horizontal position, with the dust housing over the buckets removed at the head end, and the bucket line uncoupled.

To remove the headshaft it is necessary to uncouple the bucket drive chain, remove head end dust housing, remove the Spring Release Sprocket (6), Figure 103 (see instructions below) and the two split bucket line sprockets (5), keys, and loosen set collars (3). The shaft will now slide out.

Bearings (4), Figure 102 may be dismantled by removing the three bolts (8) in guide bar (9), and take-up screws (1).

Spring Release Sprocket

The Spring Release Sprocket may be removed, after uncoupling the bucket drive chain, by proceeding as follows:

(a) Take out wires through adjusting nuts (10), Figure 104 at (13), then turn adjusting nuts back to relieve tension on springs (9).

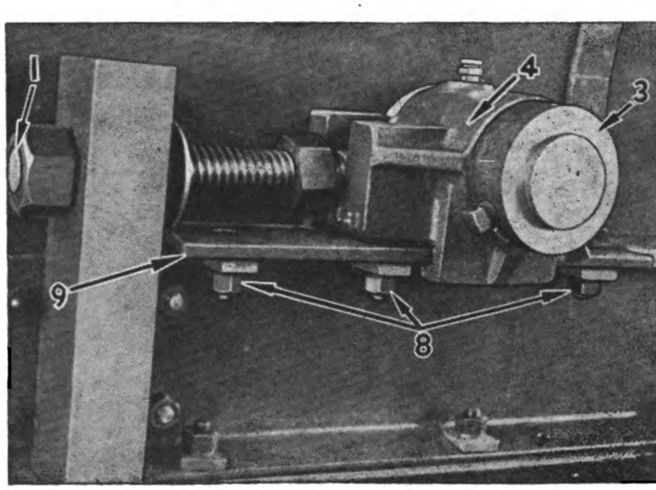


Figure 102. Bucket line chain take-up, operating on the boom head shaft, has Acme screw thread.

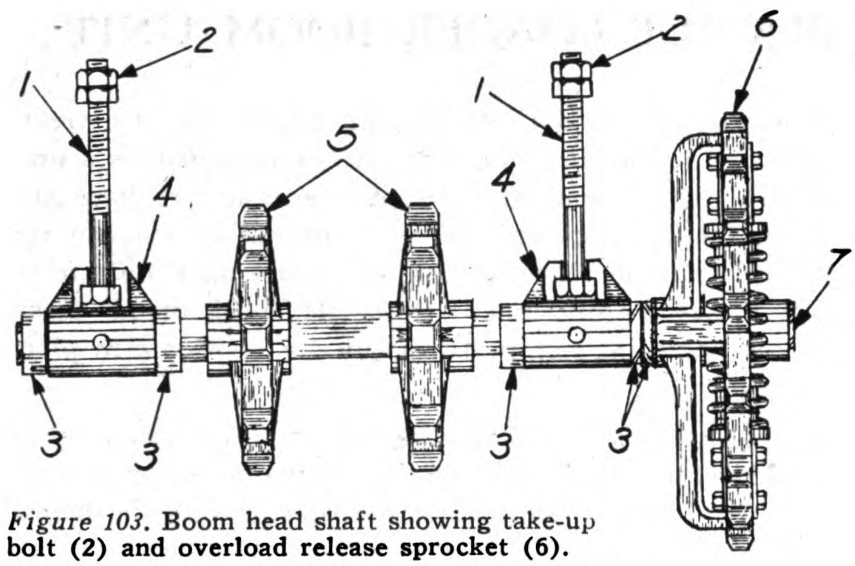


Figure 103. Boom head shaft showing take-up bolt (2) and overload release sprocket (6).

(b) Loosen set screws in carrier hub (8) and slide carrier and spring assembly off the shaft.

(c) Sprocket (14) may now be removed from shaft.

To dismantle the carrier and spring assembly, after removal from shaft, follow the steps listed below:

(a) Remove pivot pins (4), roller plate assembly (11) and springs (5) will come off the carrier. The springs are now free for replacement, if required.

(b) Roller plate assembly may be taken apart by removal of roller pin (3) and pins which hold eyebolt (9) between plates (11).

(c) Adjusting nut (10) threads on to eyebolt (9). Driving cams (1) rivet to recess in sprocket flange rim.

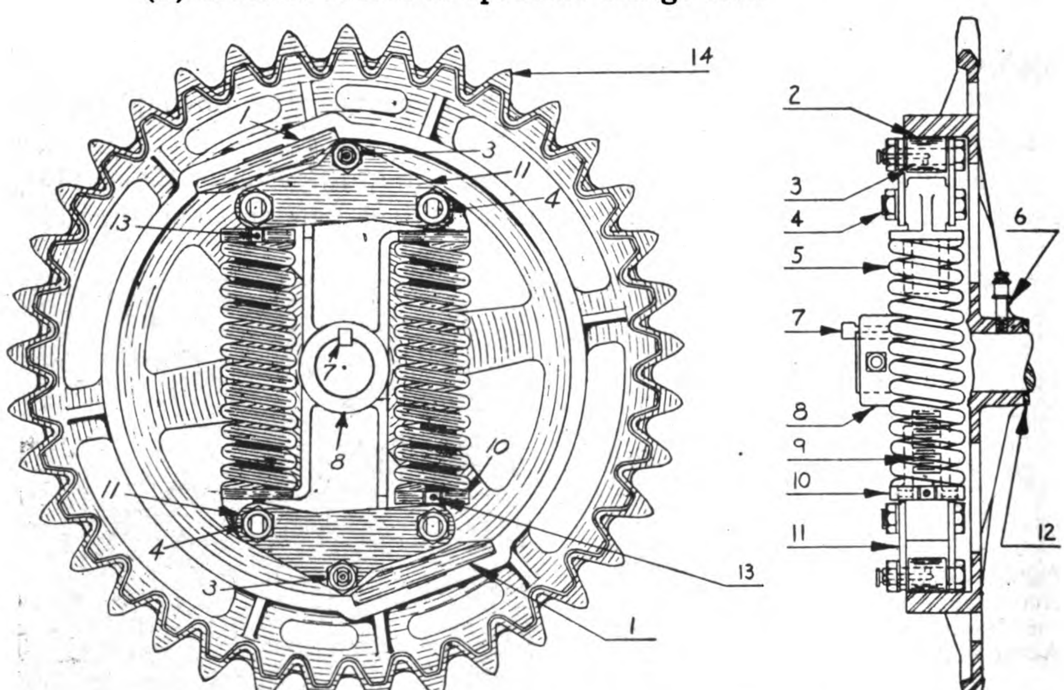


Figure 104. Details of spring release sprocket.

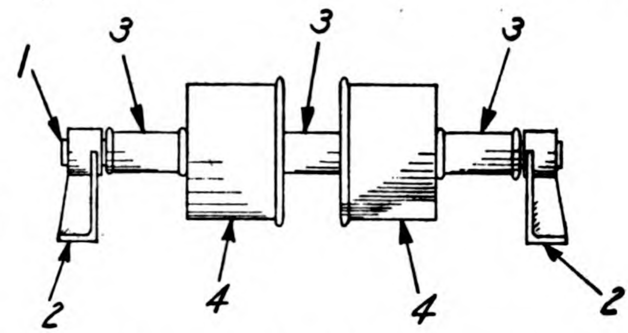


Figure 105. **One of the two bucket line idler shafts. The bucket line chain rides on the idlers (4).**

NOTE: In reassembly of this unit on the headshaft, do not set adjusting nuts (10) so that the springs are under compression. Turn the nuts down so that the springs are snug, and set up tension further by testing the loader on material. These springs should be set up equally, to the point at which the bucket line will handle its maximum load of material without the springs releasing rollers from the cams (1) inside the sprocket rim. If set up too tight the loader loses its protection from damage due to overload. *Never* set the springs so tight that the engine will kill when the machine is overloaded.

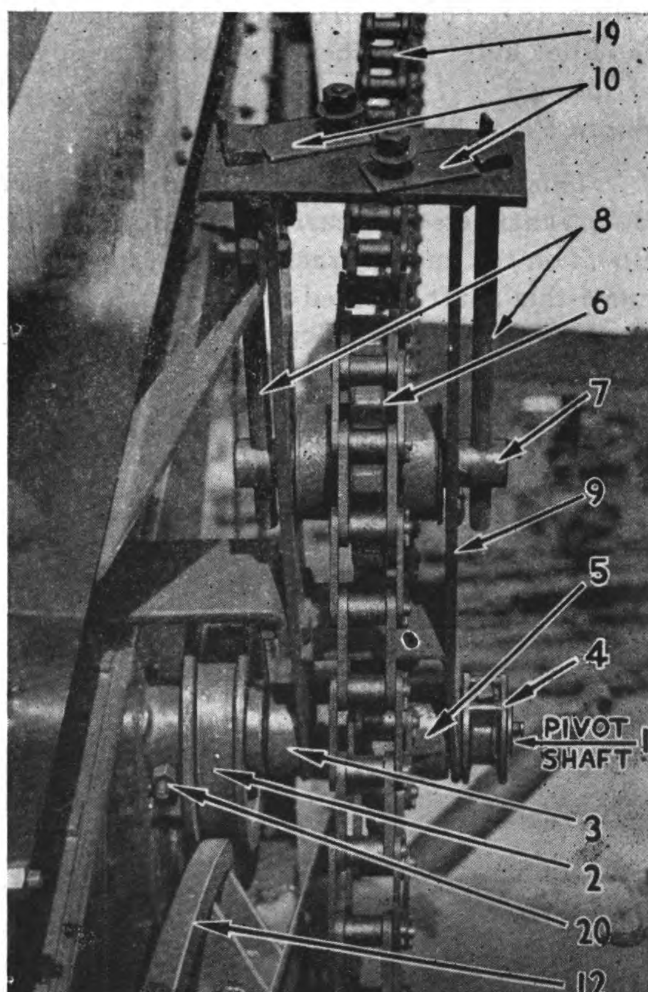
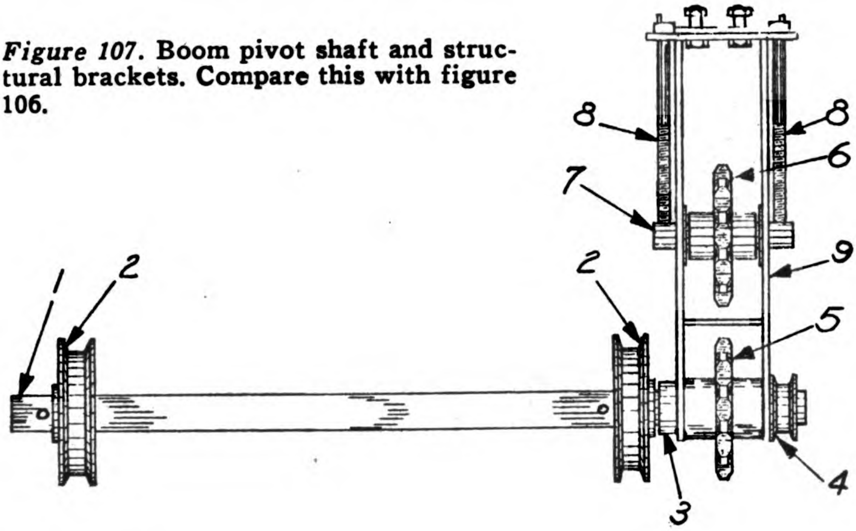


Figure 106. **Bracket on side of boom showing pivot shaft, and bucket line drive chain sprocket.**

Figure 107. Boom pivot shaft and structural brackets. Compare this with figure 106.



Bucket Line Idlers

There are two shafts (1), Figure 105 carrying the idlers (4) for the bucket chain, mounted within the Boom housing, in brackets (2) which bolt to the top flange of the Boom channels. The idlers are free on the shaft and are spaced in their proper position by three cast iron collars (3). These collars are all the same length, one mounting between the idler hubs, the other two between the bracket hubs and outside hubs of idlers.

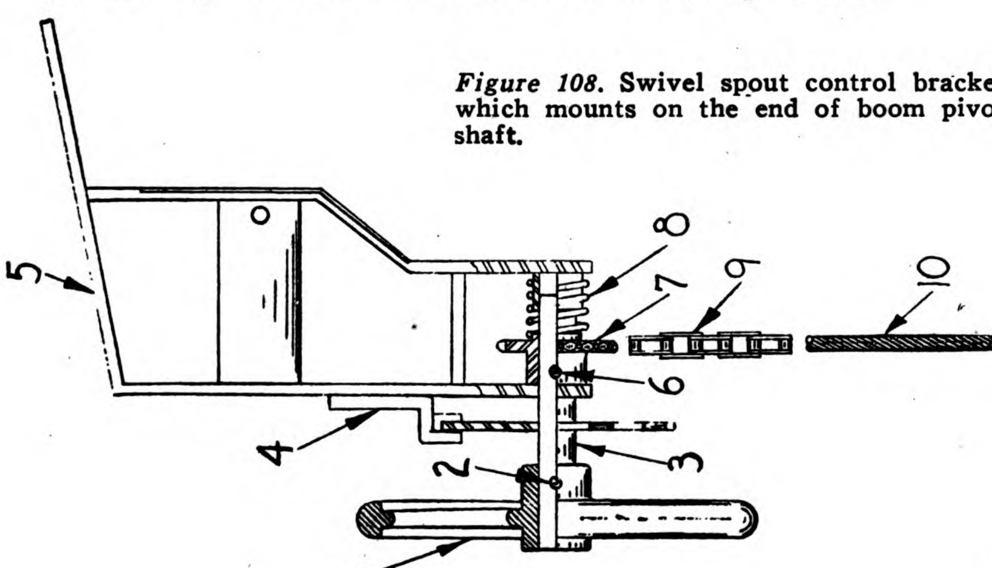
Boom Pivot Shaft

This shaft mounts in a structural bracket on the under side of the Boom channels and carries two double flanged rollers which support Boom on the curved tracks at the top of the Tractor Unit frame. To remove this shaft proceed as follows:

(a) Lower spiral feed end of Boom to rest on 8″ high blocking on the ground and provide slack in hoist cables.

(b) Uncouple bucket line drive chain (19), Figure 106.

Figure 108. Swivel spout control bracket which mounts on the end of boom pivot shaft.



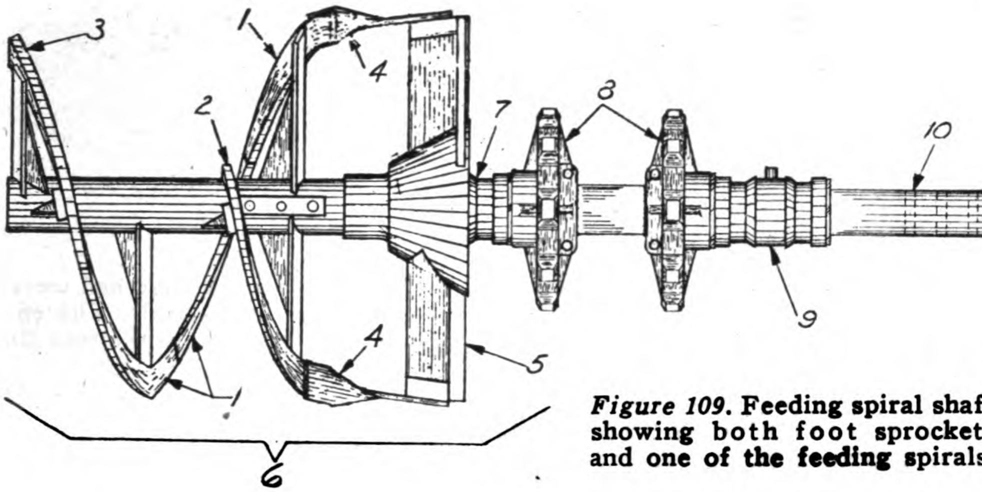


Figure 109. **Feeding spiral shaft showing both foot sprockets and one of the feeding spirals.**

(c) Secure hoist sling around end housing at (2), Figure 114 and hoist the head end up until the boom rollers (2) are clear of the curved track (12), on the Tractor Unit frame. The Boom is now supported on the spiral end and by the hoist at the head end and the Pivot Shaft (1) is free for removal.

(d) Remove set collar (4), Figure 107 and swivel spout control bracket, Figure 108.

(e) Chain adjusting bracket (9), Figure 107 with sprocket (5) which slides over shaft, and bolts to Boom, may be removed at this point, if desired, although the shaft will slide out with this in place.

(f) Remove bolt (20), Figure 106 in hub of structural boom bracket and shaft will slide out, releasing boom rollers (2), collar (3) and bushed sprocket (5).

(g) Sprocket (6) is bushed, with washer against each hub and is held in slots of bracket (9) by takeup bolts (8) threaded in each end.

Swivel Spout Control

The swivel spout control bracket which mounts on the end of Boom Pivot Shaft is made up of hand wheel (1), Figure 108 pinned to shaft (3) by pin (2) with catch (4) bolted to bracket (5). Sprocket (6) is held to shaft with pin (6) and spring (8) provides release for the catch.

Feed Spirals (No. 11 on Figure 100)

The alloy steel wearing strips are easily replaceable, being held in place, by ⅝" flat head cap screws, to spiral welded unit. Strips (1), Figure 109 are made up right and left hand, but are interchangeable on the side of the machine to which they apply. End strips (2) and (3) may be identified and bolted in place by matching with holes in spiral welded unit. Scraper bars (4) may be readily bolted in their proper position along with scraper bars (5).

The entire spiral assembly (6) is bolted to the footshaft and may be taken off as a unit by removing bolts.

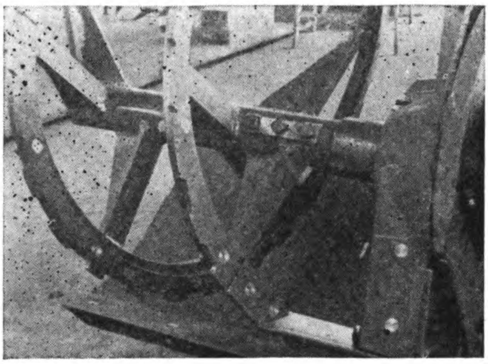


Figure 110. Replaceable, notched wearing strips on the feeding spirals. The entire spiral assembly is bolted to the foot shaft.

Footshaft (No. 11 on Figure 100)

This is mounted in two ball and socket bearings (9), Figure 109 which are held to the lower end of the Boom structure by means of bolts through the bearing caps. The Feed Spirals (6) must be taken off in order to work on the bearings, or remove Footshaft (10). It is not necessary to remove the bearings from their mounted position to take out this shaft. The foot sprockets (8) are the split type. There is a bronze washer on the outside hub of the bearings (9) and a bronze washer which fits into the recessed end of the bearing hubs next to the sprockets. These washers can be replaced to eliminate end play.

Bucket Line Drive Chain (No. 19 on Figure 100)

This drive chain runs from sprocket with clutch on the Main Jack-shaft, over sprockets (5) and (6), Figure 106 on the Pivot Shaft, and idler sprocket on boom, to the Spring Release Sprocket on the Head-shaft.

Take-up bolts (8), Figure 106 are provided on the shaft for sprocket (6) on Pivot Shaft to adjust chain tension. Bolts should be adjusted equally. When chain stretches beyond the limits of the takeup bolts, re-move links from the chain. Note locks (10) to secure the position of the chain takeup bolts. This chain is affected by adjustment of bucket line chain and should be checked for tension after such adjustments.

Chain and Buckets

Welded steel 19″ x 8″ x 9¾″ buckets (5), Figure 112 are mounted every second link on two strands of No. A-2842 Rex Chabelco steel roller chain on K-22 attachments (2) with four ½″ bolts per attachment, or eight bolts per bucket.

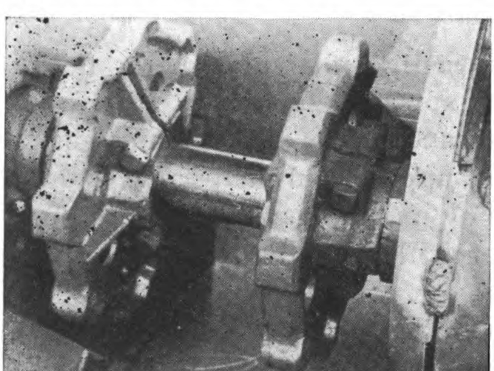


Figure 111. Bucket chain sprockets on both head and foot shaft are of split type to permit fast, easy replacement.

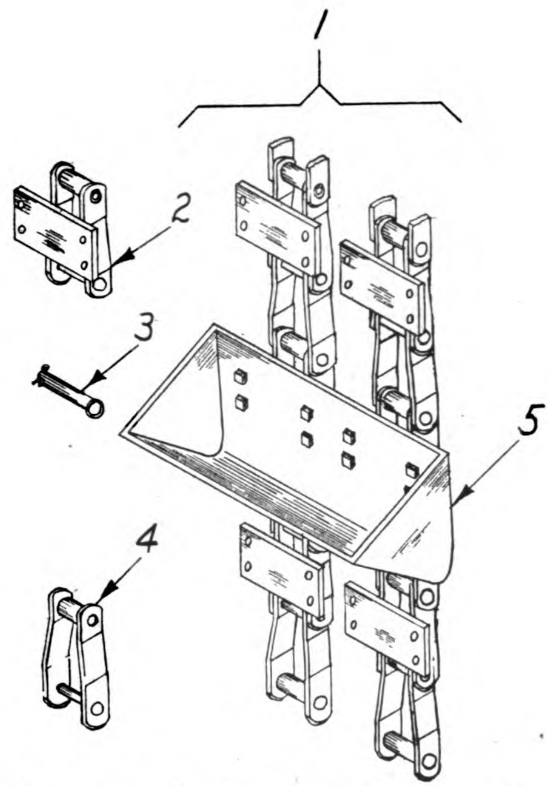


Figure 112. **Bucket and bucket line chain.**

Removal of Bucket Boom

To facilitate extensive work on the Tractor Unit it may be desirable to remove the Bucket Boom. This may be accomplished, by following the procedure outlined below:

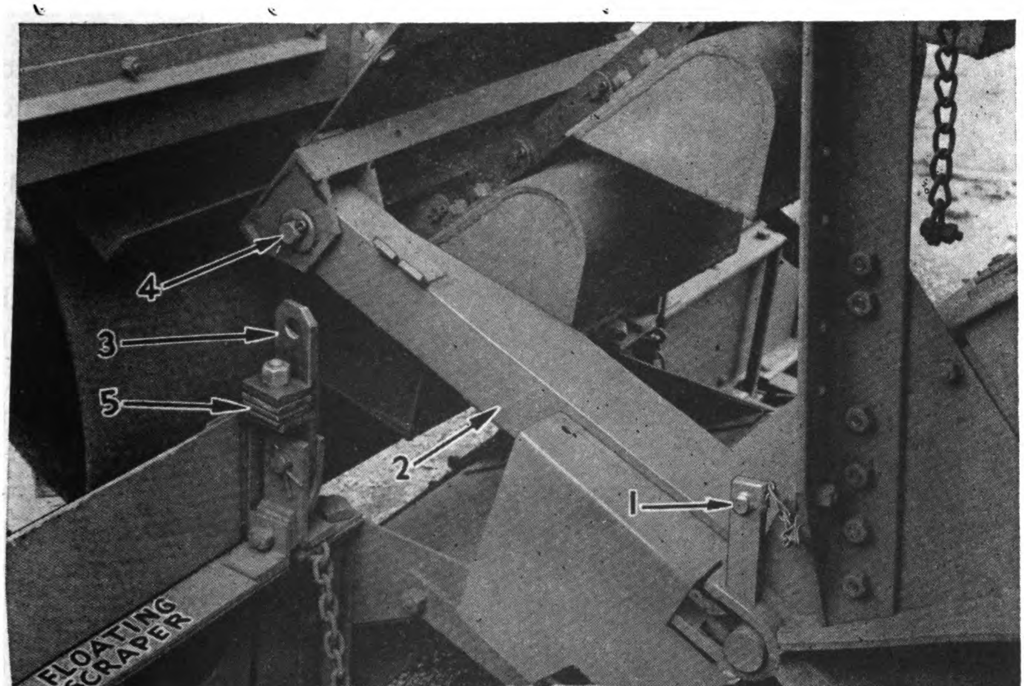


Figure 113. **Detail of floating scraper and boom push arm.**

Figure 114. Loader in normal operating position. For ordinary loading operations, Plate 5 is removed from scraper.

(a) Follow the instructions (a), (b) and (c) (see Boom Pivot Shaft) for the removal of the Boom Pivot Shaft, but do not remove the shaft.

(b) Uncouple the ends of the hoist cable on the tractor unit, at (3), Figure 114, and remove the cable from the sheaves (4) on the Boom.

(c) Be certain that the floating scraper is free of the boom at the spiral end, (3) and (4) as shown, Figure 113, and remove pins (1) securing push arms (2) in sockets.

(d) Now start the engine, and with master clutch disengaged shift the transmission to reverse. Shift the gear box to low speed and engage both crawler levers. With engine warmed up, set throttle to idling position. Engage the master clutch and the tractor unit may be run out and away from the Boom. (See Operating Instructions.)

CAUTION: Be sure that the Boom has been hoisted high enough at the Pivot Shaft so that rollers and chute control bracket will clear.

POWER UNIT

Fuller Transmission

This unit is mounted on a bell housing (1), Figure 115 which bolts to the Buda engine. For removal, with bell housing, the following steps are necessary:

(a) Remove spring (4) and cover (2) on chain guard (3). Drain and flush oil out of guard. This guard is held to a plate (9), Figure 116 on the transmission and another plate (10) on the main jackshaft end by 3/8" cap screws. Use care in taking this off to avoid damage to gaskets. The chain guard will drop down to rest on the crawler shoes after removal of the cap screws.

(b) Uncouple and remove the double roller chain drive, and the guard can be completely taken away.

(c) Double roller chain sprocket (11) on the transmission is secured to the splined shaft by means of a slotted nut, with cotter, and may be removed, if desirable. The plate (9) on which the chain guard mounts may then be removed.

(d) Remove the thrust bolt (12) located just back of the chain

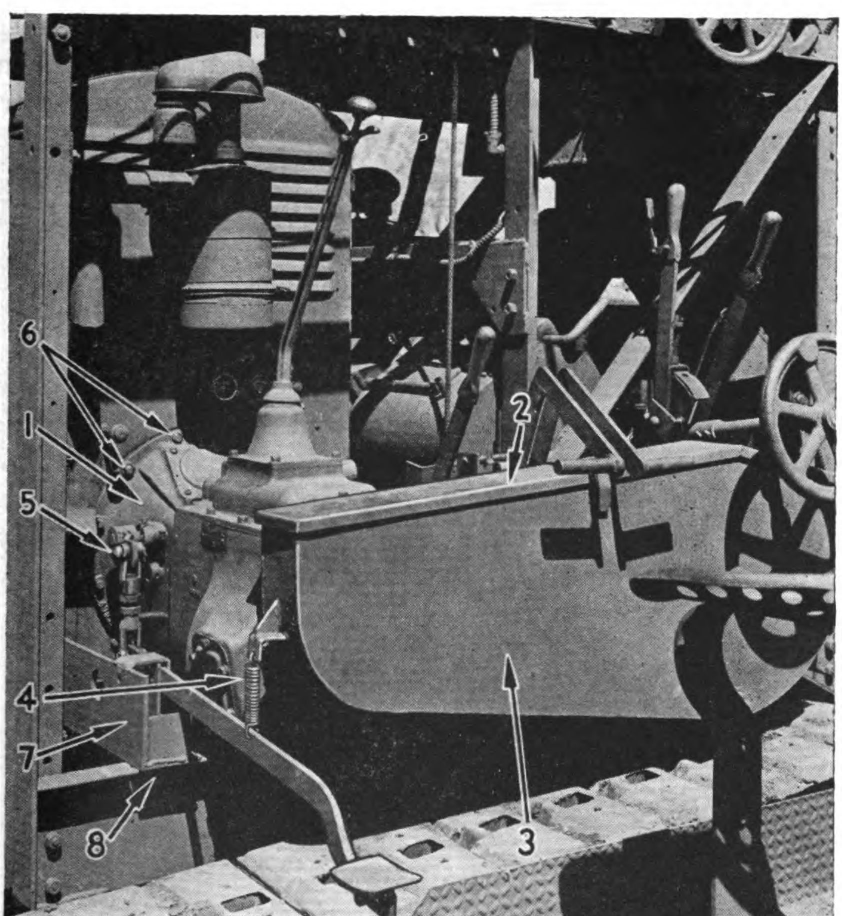


Figure 115. Operator's view of power unit.

guard. This braces the transmission and chain guard against the chain pull when the loader is operating, and also provides chain adjustment.

(e) Take out the cottered clevis pin (5), Figure 115 so that the transmission is free of the master clutch lever linkage.

(f) The transmission may now be taken off the engine by taking out all cap screws (6) around the bell housing.

NOTE: For details on Fuller Transmission Maintenance, see Accessory Section.

Master Clutch

This is a Fuller clutch on loaders up to and including Serial No. 82A-7-37 and mounts on a splined shaft on the Fuller transmission and to the flywheel on the Buda engine. On loaders from Serial No. 82A-8-37 a Lipe clutch is furnished. See Accessory Section for data on these clutches.

Buda Engine

This may be taken off the tractor unit frame with the transmission either on or off the engine. If removal of the engine is desired proceed as follows:

(a) Follow steps (a) to (d) inclusive under Fuller Transmission, above, if it is desirable to take out transmission and engine as one unit. If not, add steps (e) and (f) and remove transmission.

(b) The engine is secured to two structural angles (7), Figure 115 which bolt to channel frame at (8). Remove bolts at (8) and stop plate on top of channel frame at radiator end.

(c) Uncouple battery cables and gasoline line and engine is free to be moved out, in the direction of the radiator end.

(d) Crib up alongside the loader with timbers, in line with the engine at the radiator end, to receive the engine as it comes off the loader frame. Pipe rollers may be used under the structural angles (7) to facilitate moving the engine. In order to secure a good base for cribbing, the crawler tracks may be uncoupled at the point under the radiator, and the top of the crawler frame may be used for blocking support at this point.

NOTE: For details on Buda Engine Maintenance, see Accessory Section.

TRACTOR UNIT

To work on the machinery within the housing of this unit, the boom should be raised to its horizontal position as illustrated on Figure 101. In the event a general overhaul of the entire loader is required, it may be desirable to remove the boom completely, in which case the instructions on Page 211 should be followed. Instructions below cover all machinery in the tractor unit.

Transmission Chain Drive (No. 13 on Figure 100)

Removal of the chain guard and drive chain is covered by instructions and Figures 115 and 116, under Fuller Transmission, steps (a) to (d), inclusive.

To adjust the tension of this drive chain, thrust bolt (12), Figure 116 is used. With guard in place, cap screws in plate (10) are loosened and the four bolts (8) in the engine angles (7) are to be loosened. Remove stop plate at top of frame at radiator end of engine. Slotted holes in plate (10) and structural frame under engine permit takeup of chain slack.

Main Jackshaft (No. 6 on Figure 100)

This shaft is driven by the transmission drive chain and transmits

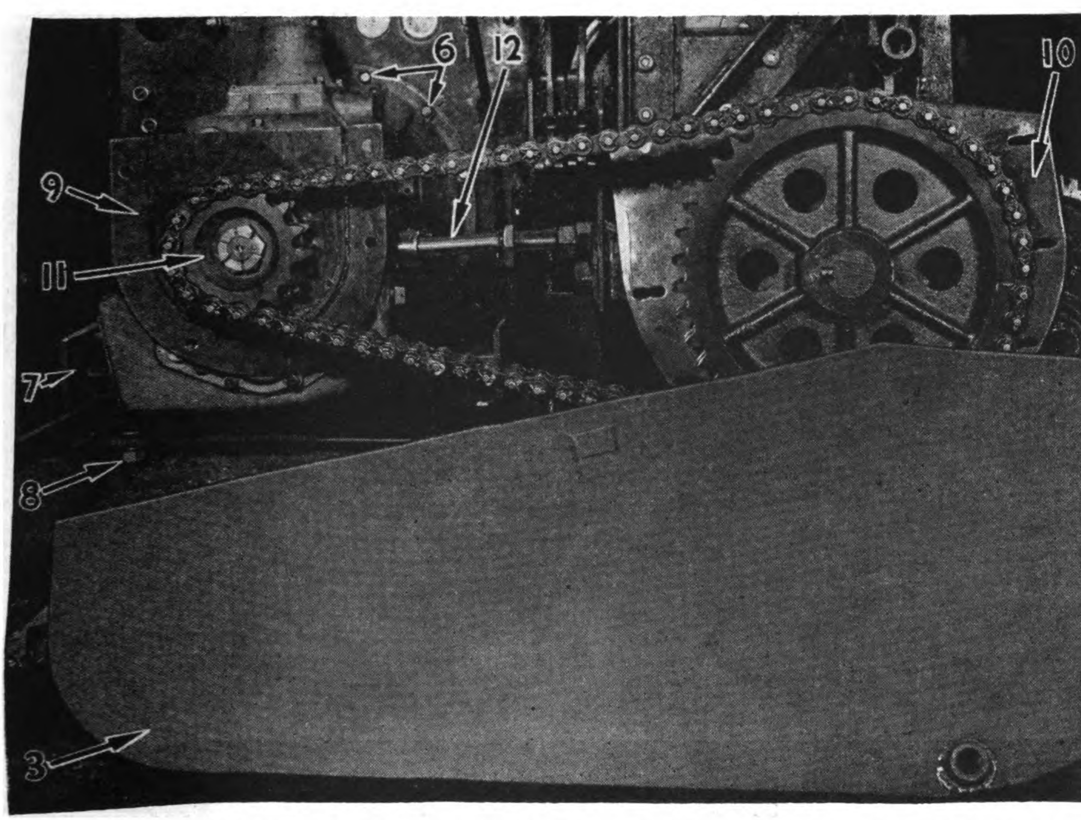


Figure 116. Chain guard removed revealing transmission drive chain from power unit at left to main jack shaft at right.

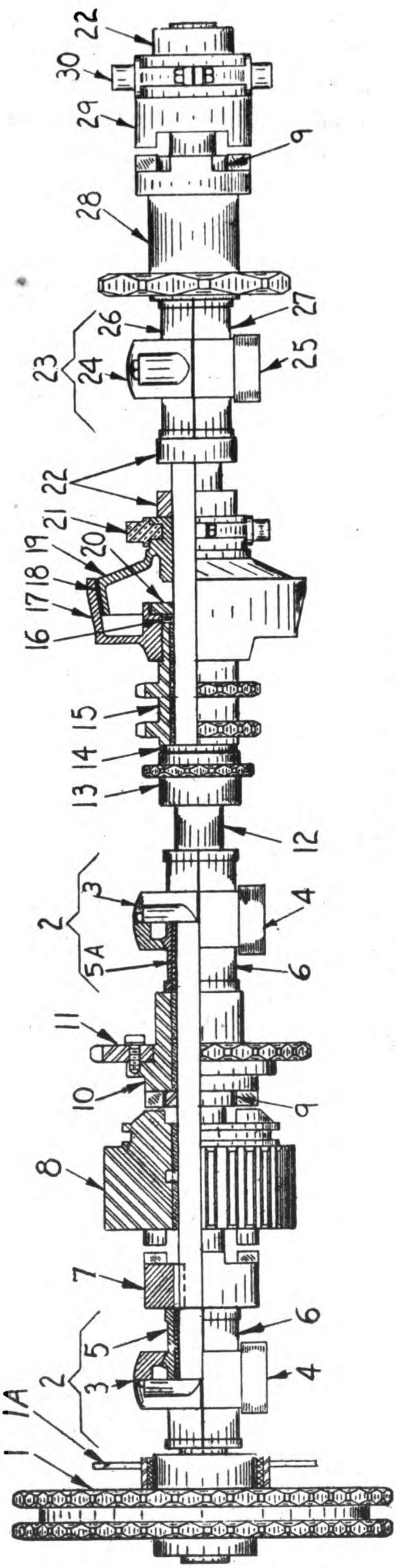


Figure 117. **Main Jack Shaft.**

power to bucket line, crawlers, and hoist. To accomplish removal of this item the procedure outlined below should be followed:

(a) Remove transmission drive chain and guard (see above) and sprocket (1), Figure 117 which is keyed and set screwed to the end of the shaft and carries the plate (1A) to which the chain guard bolts. Also uncouple Bucket Line Drive Chain.

(b) If the boom is not removed it should be secured in its horizontal position, and the bolted cover with hinged doors on top of the tractor unit machinery housing removed, thus exposing the machinery within for easy access.

(c) Strip the bucket line drive end of the shaft by removing clutch lever yoke (not shown), collar (22), Figure 117 jaw clutch (29), clutch collar (9) and sprocket (28) with clutch hub, in the order named.

(d) Uncouple chain (32), Figure 118 which transmits manual power to hoist from hand wheel, take out bolts (14) to remove hoist hand wheel and shaft. Take out the two bolts in bearings (15) and cotter on inside end of shaft (16). Pull out shaft (16) and idler shaft (17) with bearings, and sprocket will be free.

(e) Take out hoist clutch shifter (18) hoist lever link (29), sliding shifter (30), alemite piping (31), and bolted plates (28), on both sides.

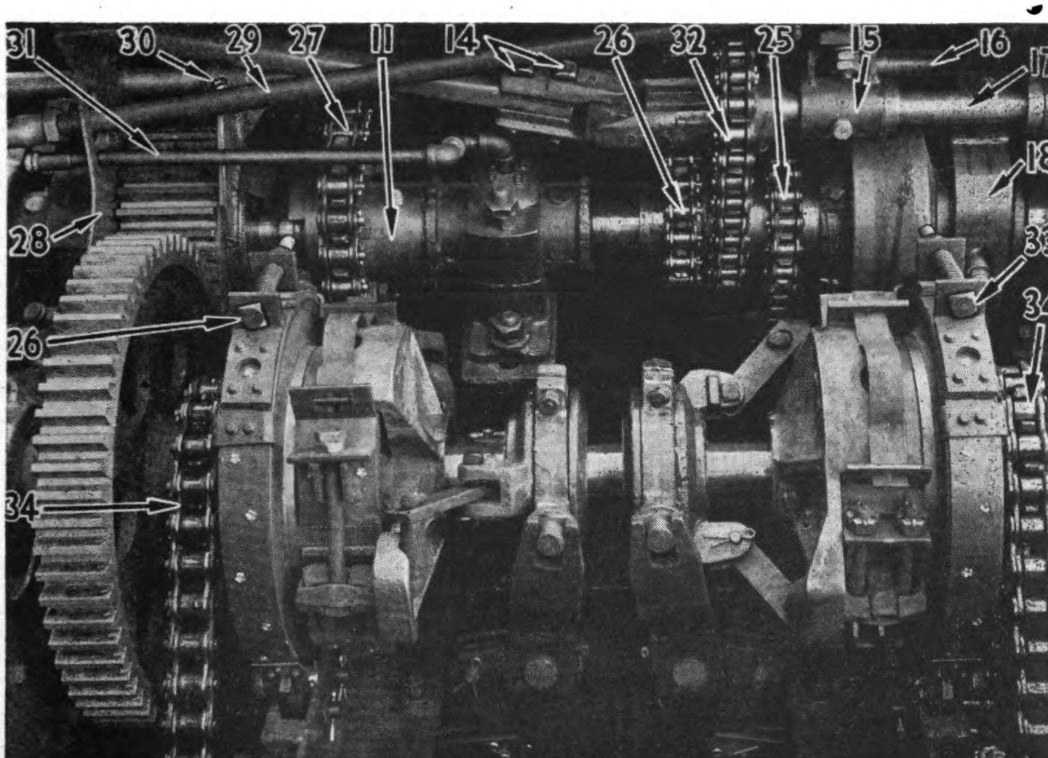


Figure 118. **Interior of tractor unit housing showing main jack shaft above and crawler clutch shaft below.**

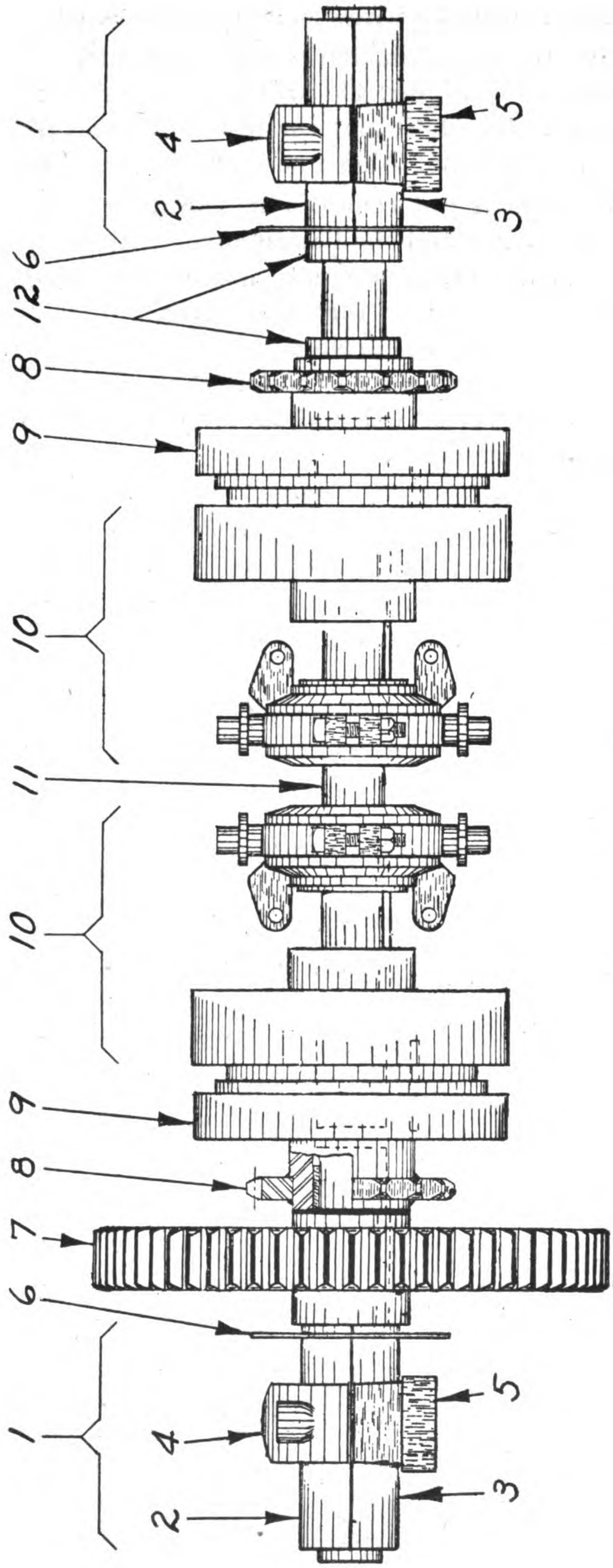


Figure 119. **Crawler Clutch Shaft.**

(f) Uncouple chains (27), (26) and (25), then take off bearing caps (3) and (24), Figure 117 and the main jackshaft is free for removal. In taking the shaft out it must be pulled up and to the side at the end opposite the operators side of the loader.

(g) The remainder of the parts may now be stripped from the shaft. Bearings (2) and (23) will slide off each end, then collars (22), hoist clutch male half (19) with feather key, collar (20) inside hoist clutch, felt washer (16), female hoist clutch half (17) with double sprockets (15), and sprocket (13) which is keyed and set screwed to the shaft. Bearing (2) will now slide off the shaft, then jaw clutch hub (7) which is keyed and set screwed, sliding gear (8), collar (9) and sprocket (11) with clutch hub (10).

CAUTION: In reassembly be sure that clutch hub (7) is *securely* set screwed in place.

Crawler Clutch Shaft (No. 7 on Figure 100)

This shaft carries the two 8" Barber-Greene friction clutches (10), Figure 119 which control power to the loader crawlers. This shaft may be taken out of the machine independent of any of the operations required for removal of the main jackshaft, other than taking off the cover bolted in place above it. The steps outlined below should be followed for the removal and stripping of this shaft:

(a) Release crawler clutches and take out adjusting bolts (33), Figure 118 on the brake bands so they may be laid back out of the way. Now uncouple crawler intermediate chains (34) and remove the bearing caps. It is not necessary to remove side plates (28), as for the main jackshaft since there are separate patch plates (6), Figure 119 provided over each bearing (1) on this shaft. With these plates taken off, the shaft assembly is free to be lifted out of the housing.

(b) To strip the shaft completely, slide off bearings (2), with patch plates (6), then gear (7) which is keyed and set screwed to the shaft, and collars (12) should be removed. Clutch hubs with sprocket (9) will now slide off the shaft. Clutch assemblies (10) are keyed and set screwed to the shaft and will slide off as a unit with clutch bands and shifter yoke.

NOTE: In mounting this shaft back into position be careful to get the gear (7), Figure 119 in proper mesh with gear (8), Figure 117 on the main jackshaft. Run a sheet of paper between the gears to check the setting. The gear teeth should make a sharp imprint upon the paper, without cutting it, the imprints should be uniform across the teeth, and the marks at the ends of the teeth should be in a straight line.

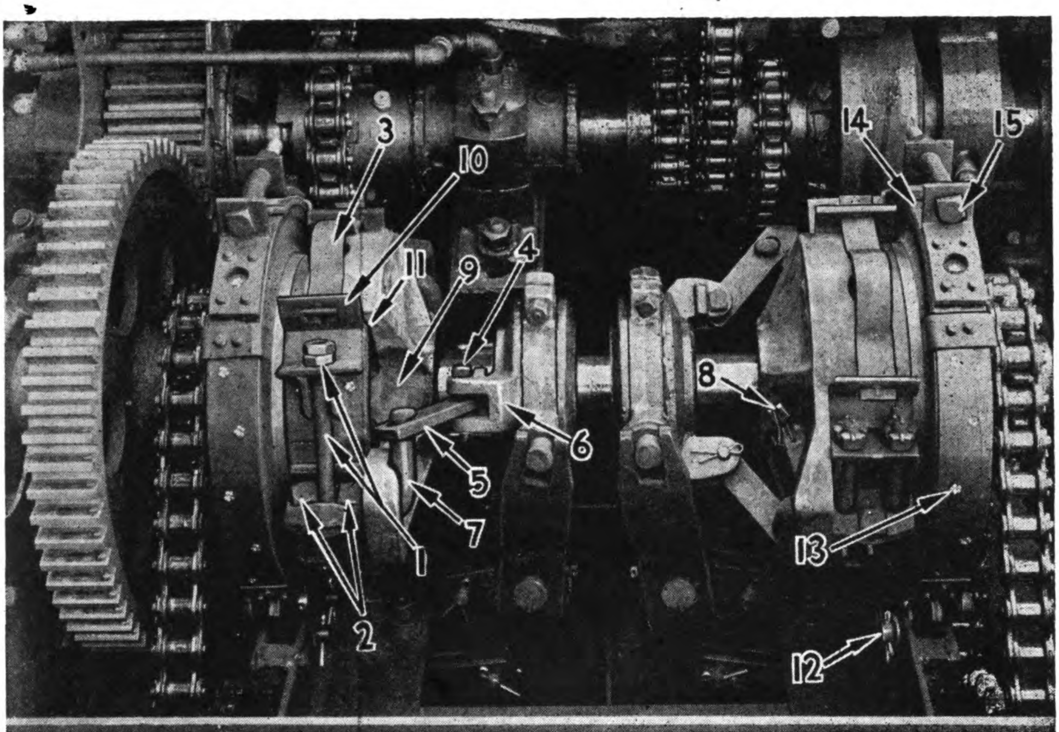


Figure 120. Replacing clutch bands and linings.

How to Remove and Replace Clutch Bands and Linings

The clutch bands are removed and replaced by performing the following steps.

(a) Remove both adjusting bolts (1), Figure 120.

(b) Remove all four bolts (2). The slotted nuts on these bolts are held in place by cotter pins.

(c) Remove both spring bands (3).

(d) Remove the toggle pin (4) that secures the toggle link (5) to shifter collar (6).

(e) Remove the main clutch lever (7).

(f) Loosen both set screws (8) in the clutch carrier (9) and slide the clutch carrier back on shaft away from the clutch drum and remove bands. When sliding the carrier back be sure that the clutch bands remain in position on clutch drum as this will simplify their removal.

CAUTION: Note the positions of the bands on the drum so they may be replaced in this same position. Do not remove the shims found on one clutch band as they can be used as a guide in reassembly. The purpose of these shims is to prevent either main clutch lever from bending in the holes provided in the carrier through which they extend. The amount of shims used is entirely dependent on the amount of shims required to prevent these main clutch levers from binding. Never insert sufficient shims to cause clutch band to bind between the spring band clips (10) and the carrier with clutch disengaged. If the band should bind before the main clutch lever is free, remove lever and grind down the edge that binds in carrier hole. Shim one band only.

(g) Pry the old lining from the shell of clutch band half and remove the brass rivets with a chisel. Install new lining. This is done by placing the linings in place on the clutch band half so the holes in the lining and shell are aligned. Secure with the brass rivets provided making sure the rivet heads are imbedded in the linings so that rivet head will not drag on the clutch drum.

(h) Place the relined bands in original positions on the drum and slide the carrier back in place. Turn down set screws in carrier and wire.

(i) Insert the main clutch lever through the hole in carrier.

(j) Insert the four bolts in place and put the slotted nuts on bolts only as far as is necessary to keep nuts on bolts.

(k) Insert the take up bolts and start one half nut on bolt.

(l) Secure toggle link to shifter collar with toggle pin.

(m) Engage clutch.

(n) Turn down the same amount, the nuts on both adjusting bolts so they will be good and snug.

(o) Turn down the same amount the slotted nuts on the remaining four bolts until the bolts are tight enough so they can not be moved with the fingers. Line up the slotted holes in nut with the hole in bolts and insert a cotter pin.

(p) See Operator's Section for final clutch adjustment.

How to Remove and Replace Brake Bands and Linings

The brake bands are removed and replaced by performing the following steps.

(a) Remove the adjusting bolt (15), Figure 120 from brake bands.

(b) Remove the anchor pin (12) from each brake band, remove bands.

(c) Pry the old lining from the shell of brake bands and remove the brass rivets (13) with a chisel. Install new lining. This is done by placing the linings on the clutch band so the holes in the lining and shell are aligned. Secure with the brass rivets provided making sure the rivet heads are embedded in the linings so that the rivet heads will not drag on the brake drum (14).

CAUTION: Do not bend the brake band while removing and replacing lining. The curvature of the band must correspond with that of the drum to maintain proper surface contact when the brakes are applied.

See Operator's Section for Brake Adjustment.

Hoist Drive Chains (No. 12 and 14 on Figure 100)

Shim under Main Jackshaft bearings (4) and (25), Figure 117, to tighten chain (25), Figure 118.

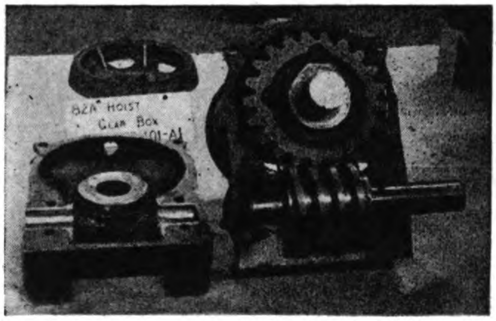


Figure 121. Interior of power boom hoist. Boom is raised and lowered by power, with minor adjustments made by hand wheel.

Tighten chain (32) at the same time by drawing up bolts in bearings (15) on shaft (17), Figure 118.

NOTE: After shimming bearings to tighten these chains be sure that alignment of gears is correct.

Gear Box Drive Chains (No. 15 and 16 on Figure 100)

These chains are tightened simultaneously by shimming under the Gear Box.

Crawler Intermediate Drive Chains (No. 17 on Figure 100)

To tighten these use shims under bearings on Crawler Clutch Shaft.

NOTE: Be sure that alignment of gears is correct after this operation.

Power Hoist

This self-locking worm gear unit is located in the lower corner of the tractor unit machinery housing and to work on this it will be nec-

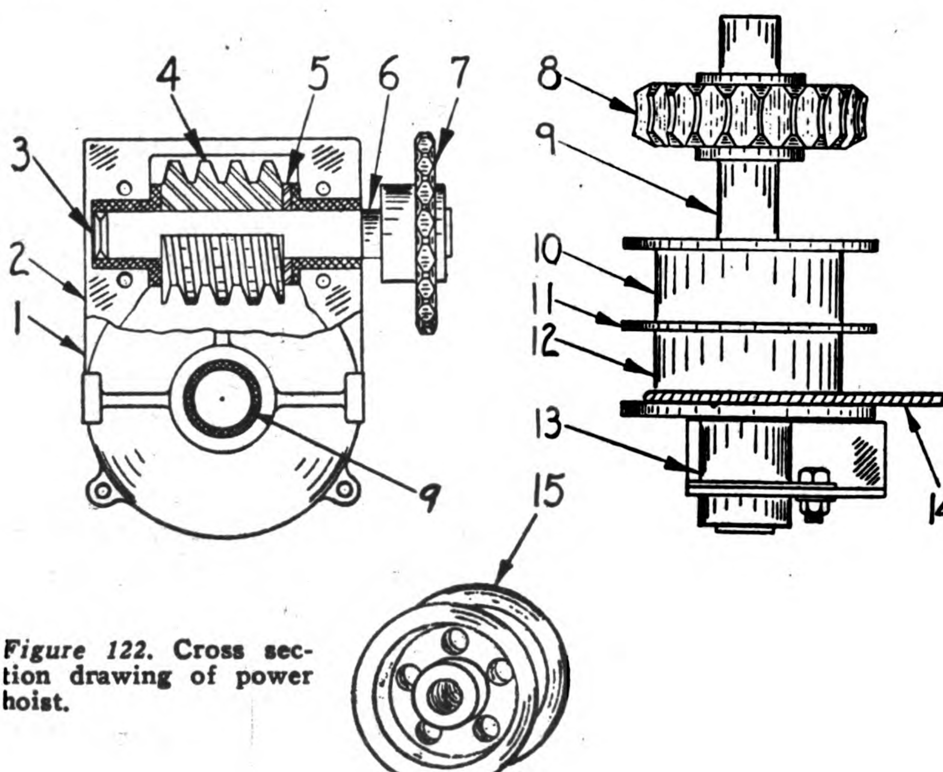


Figure 122. Cross section drawing of power hoist.

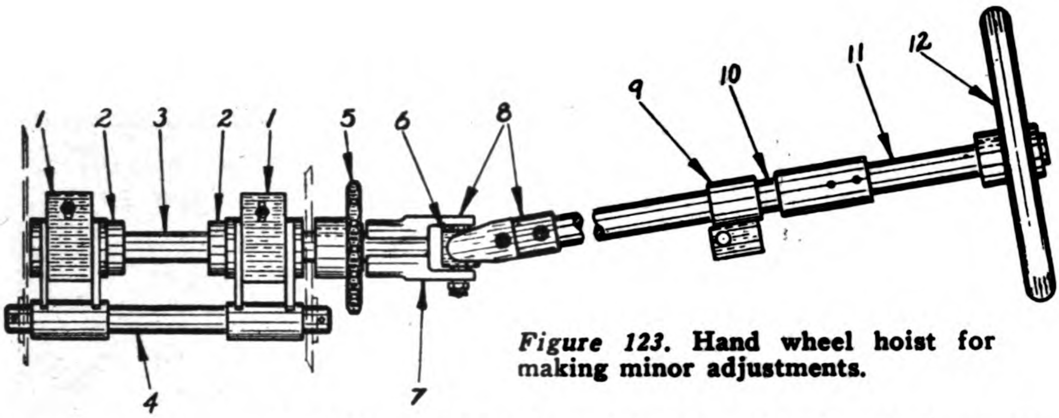


Figure 123. **Hand wheel hoist for making minor adjustments.**

essary to remove the Main Jackshaft and the Crawler Clutch Shaft. To take the hoist out for dismantling, proceed as follows:

(a) After removal of the Main Jackshaft and Crawler Clutch Shaft, take off the bearing (13), Figure 122 and cable drum (10), (11), (12), on the outside of the tractor unit housing alongside the engine. Take out the bolts holding the hoist in place and the hoist assembly may be removed.

(b) The hoist housing is bolted together in two halves and may be taken apart as shown, Figure 121.

(c) Sprocket (7), Figure 122 is keyed and set screwed to shaft (6), worm (4) is keyed and set screwed in place with thrust washer (5) against hub and thrust button (3) in housing at end of shaft.

Worm gear (8) is keyed and set screwed to shaft (9) as are drums (10) and (12), with plate (11) mounted between.

Hoist Hand Wheel Shaft

Assembly is shown on Figure 123. Bearing brackets (1) mount on idler shaft (3), secured in position by collars (2). Sprocket (5) is keyed and set screwed to shaft (3) with universal fork half (8) bolted on end of shaft and coupled to (8) on end of shaft (10) by means of connector (6). Bracket bearing (9) holds shaft (10) in position with (11) coupled to it by bolts. Hand wheel (12) is keyed and set screwed in place.

Installing Hoist Cables

The double cable drum for the Hoist is mounted between the engine and the front of the Tractor Unit housing. The cable for the loader is furnished in one strand and is mounted in the following manner, with the Boom lowered to operating position:

(a) Run one end of the cable through the hole next to the inner flange (1) in the hoist drum, then through inside the drum and out hole (2) next to the outer flange. Pull the cable across to sheave (3) on the Tractor Unit frame on the side opposite the drum and run the cable under this sheave.

(b) Grasp cable near hole (2) and loop it over and around drum so that it leads from the top of drum to sheave (3). Run other

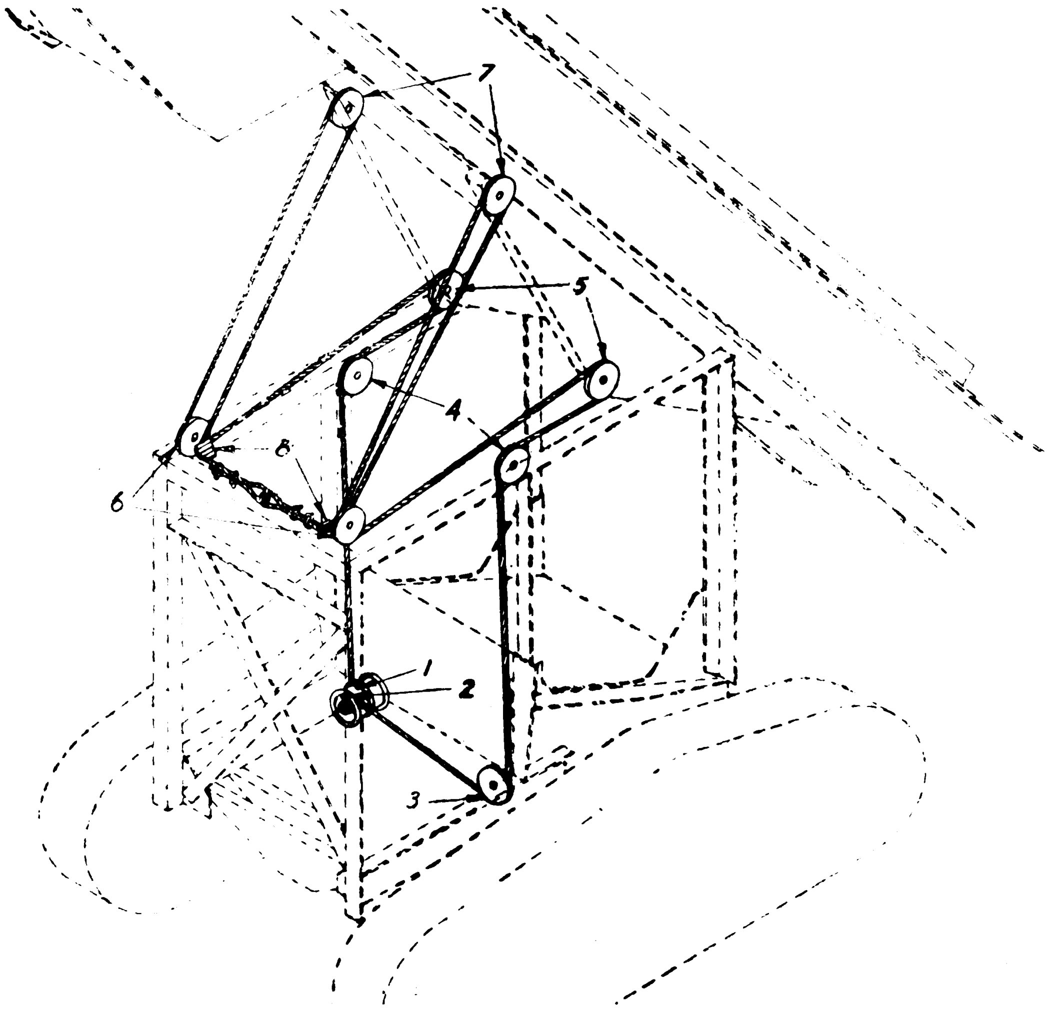


Figure 124. **Cable diagram for installing cable.**

end of cable so that it runs from hole (1) around the drum to be run up from the under side of the drum over sheave (4) on the Tractor Unit frame above the drum. Run other cable end up from sheave (3) and over sheave (4). Now pull the ends of cable out from sheave (4) so that there is an equal amount of cable for each side of Boom.

(c) Each cable end is now reeved in the same manner on its respective side, from sheave (4), under and around sheave (5) on boom pivot bracket, under and up from sheave (6) on the top front of the Tractor Unit frame, over and down from sheave (7) on the loader Boom, through holes at (8) along side sheave (6) and across the frame so that the ends meet and overlap about eighteen inches. Clamp ends securely together with two clamps (9).

(d) Now guide the cables, manually, so that they run evenly onto the drums, to remove the slack, as the hoist is operated. Adjust cable ends with clamps, as required, so that the cable to each side pulls the Boom up evenly.

Gear Box (Shafting 4 and 5 on Figure 100)

This mounts on top of the tractor unit machinery housing, providing the twelve loader feeding speeds, and may be removed as a unit and dissembled in the following manner:

(a) Uncouple the chains (6) and (7), which run to and from the gear box. The bolts which hold the gear box in place may be easily removed, along with the guards over the change gears and the sprocket, and the entire unit taken off the machine.

(b) To dismantle, change gears (3) and (9), Figure 125, are taken off. These gears are held in place on the ends of the shafts by a cap screw (1) and washer (2). Each gear is double keyed. Loosen shifter yoke and slide out shifter shaft (14). This is held for positions by ball (15) and spring (16). Remove sprocket (7) on side of box opposite the change gears.

To take out shaft (12) carrying change gears (11) loosen the two set collars (10) on this shaft, and loosen the set screw on the under

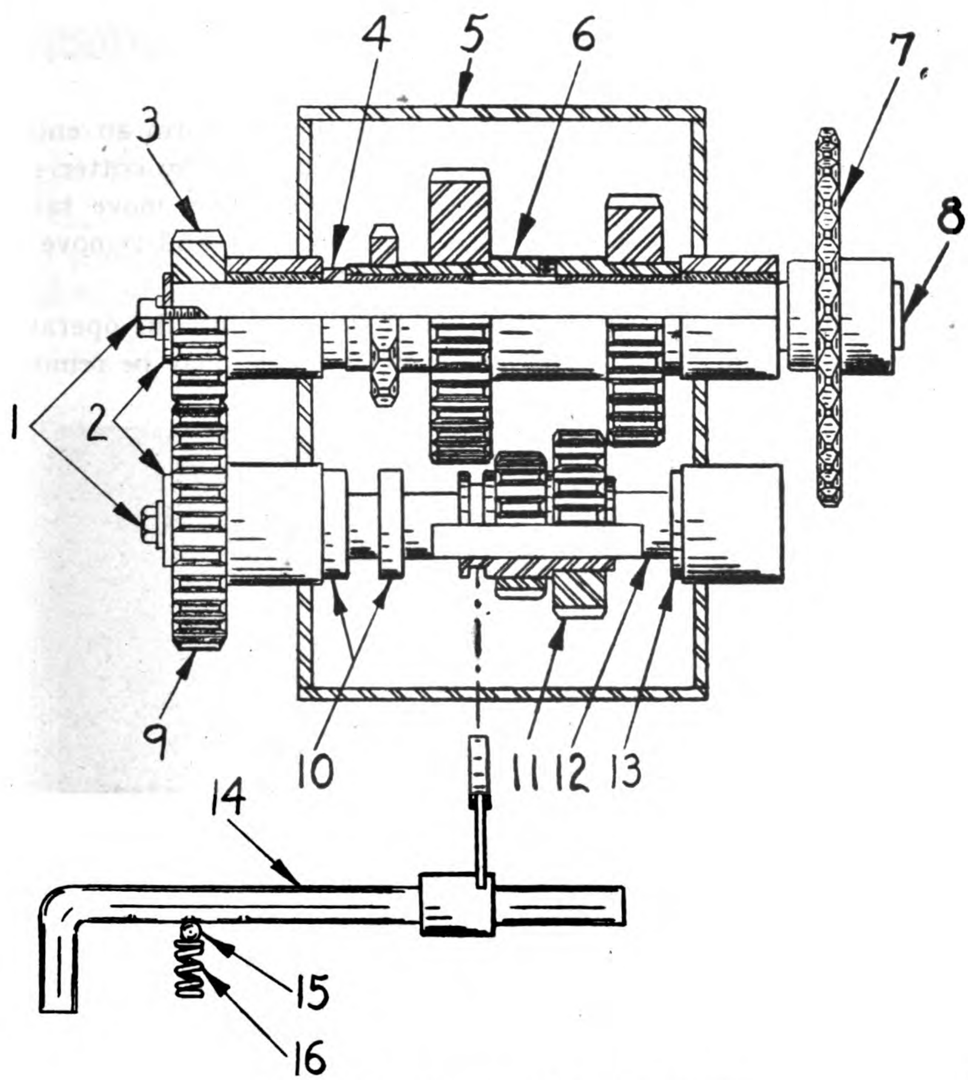


Figure 125. **Cross section of gear box.**

side of the bearing just back of gear (9). This set screw holds the bushing in the gear box bearing in place. The shaft must be pulled out in the direction of change gear, (9) the collars (10) are keyseated to allow the double feather key for sliding gears (11) to pass, and the bushing on the change gear side must slide out in order to allow the keys clearance to pass through the bearing hub.

To take out shaft carrying change gear 1, loosen the collar (4) on this shaft and it will slide out.

Crawlers

General

The crawlers on this machine are two complete units, and their care and maintenance is treated separately, in view of the fact that their working function is distinct from that of other major unit parts of the loader. The following descriptions cover all parts making up the crawler assembly.

Crawler Tracks

The crawler tread links are coupled together to form an endless track by means of T-head pins which are held in place by cotter pins. To uncouple the tread links, or remove a crawler shoe, move takeup shaft (11), Figure 129 back with takeup screws (12) and remove pin in crawlers, above spring idler (10), Figure 127.

When working on the operator's side of the machine, the operator's platform which bolts to the top of the crawler frame, may be removed.

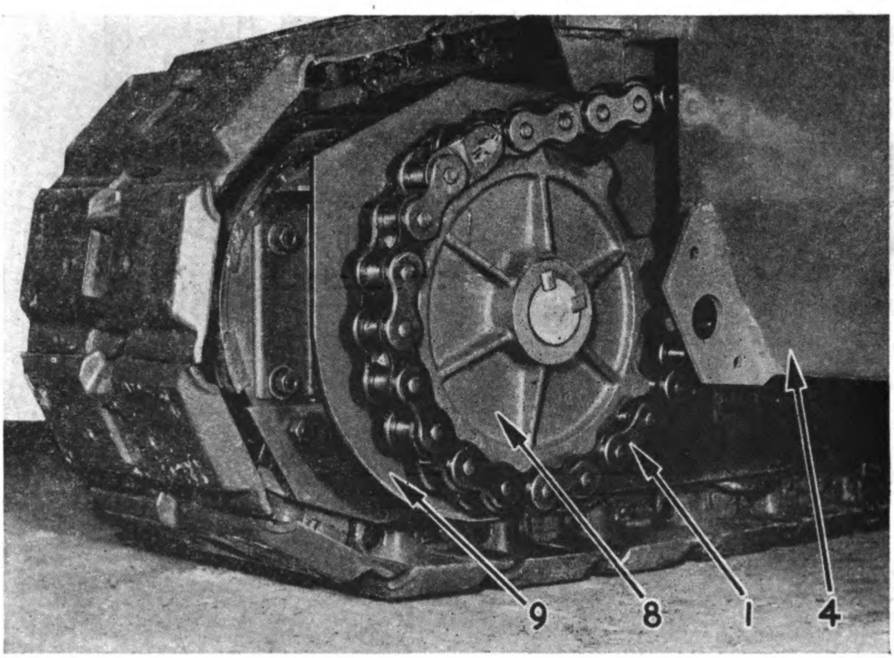


Figure 126. Inward side of crawlers showing crawler drive chain.

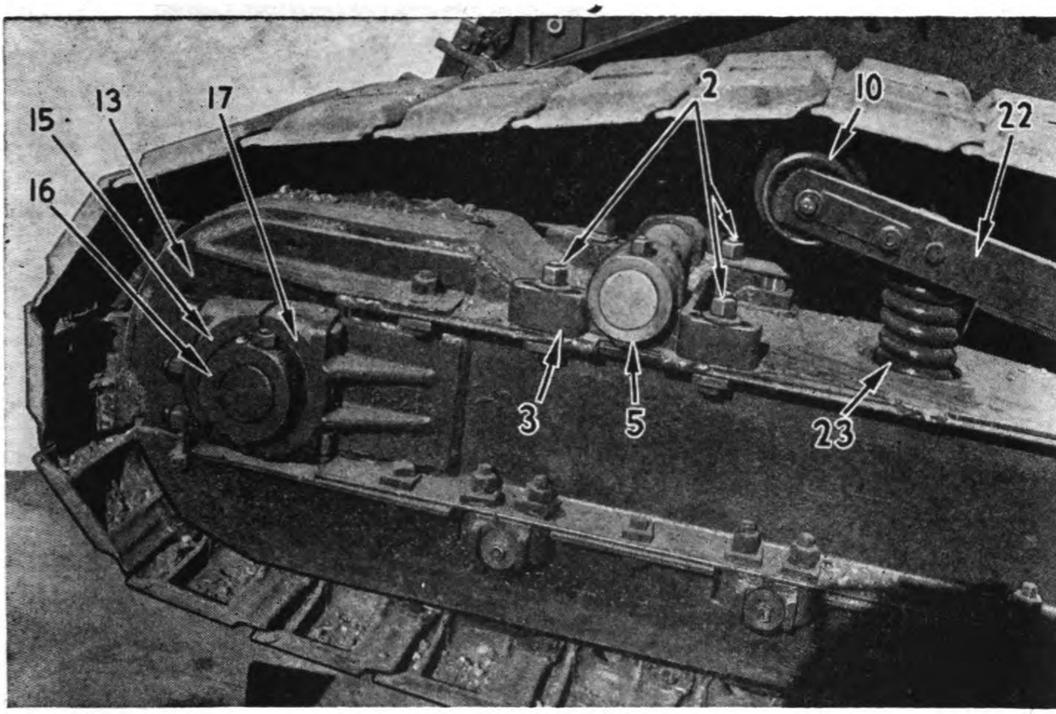
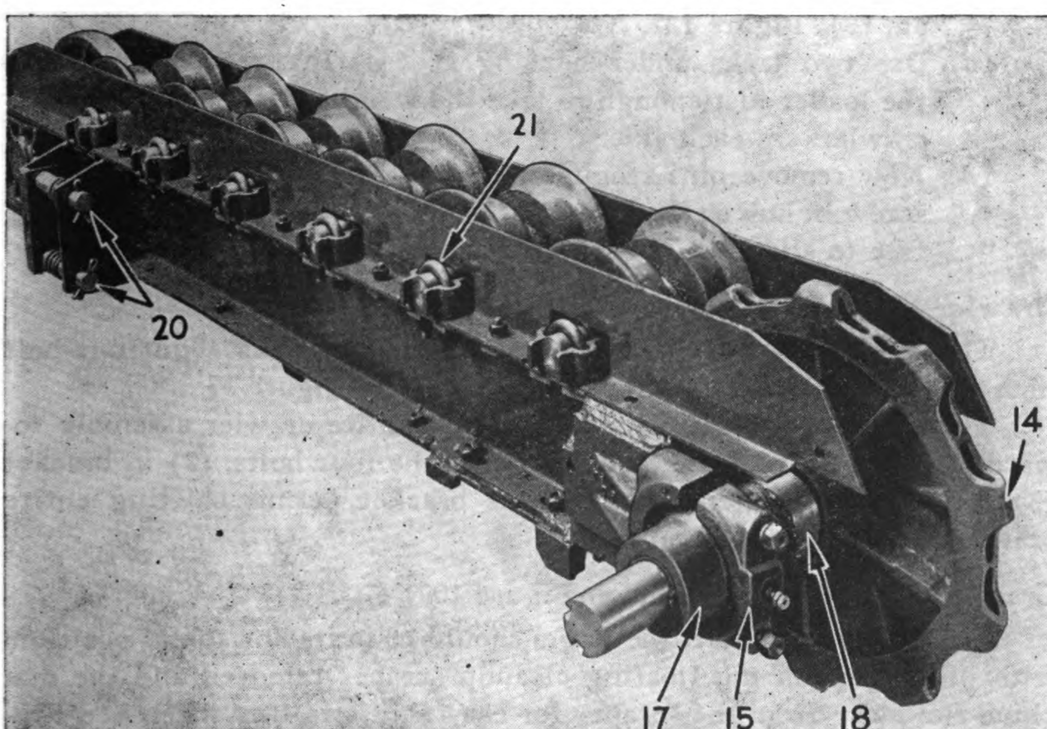


Figure 127. **Outward side of crawler.**

Crawler Treads

When the sag in the crawler treads from the spring take-up idler to the front idler wheel exceeds three inches the crawler tread should be tightened by means of takeup bolts.

Figure 128. **Bottom of crawler before track has been installed.**



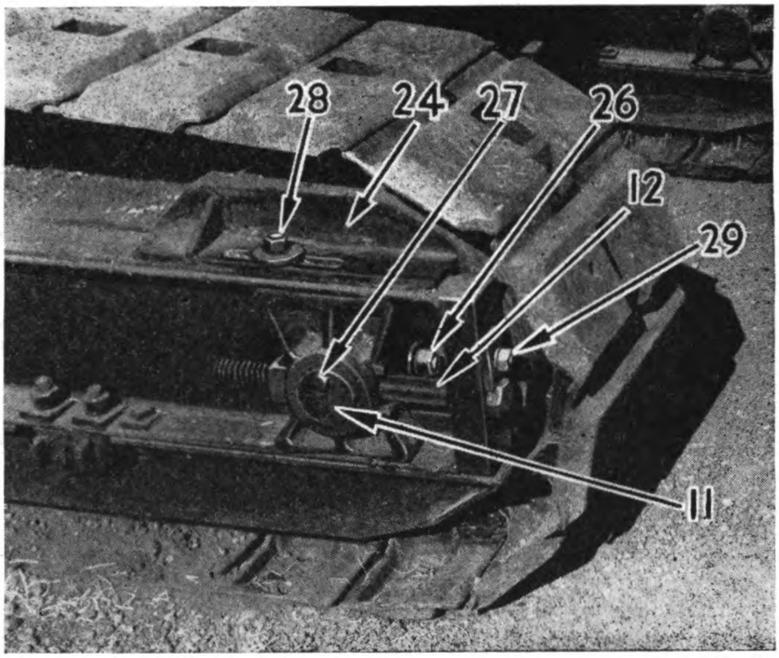


Figure 129. Take-up on crawler.

Crawler Oscillating Shaft (No. 8 on Figure 100)

This shaft (2), Figure 130 carries the loader weight to the drive end of crawlers and provides the pivot for crawler oscillation. Removal may be accomplished as follows:

(a) See instructions (c) and (d), page 212 and run loader away from cleanup scraper.

(b) Uncouple chains (34), Figure 118 and chains (1), Figure 126. Now remove the four bolts in each of the crawler pivot brackets (3), Figure 127.

(c) Use two jacks under housing at (4), Figure 126, and raise the loader just enough to take the weight of the loader off the crawlers on each side.

(d) Now remove pins from collars (1), Figure 130 and loosen set screw in hub on Tractor Unit, and collar (6). The shaft is now free to slide out releasing the bushed sprockets (5).

Crawler Drive Chains (No. 18 on Figure 100)

This chain is in proper adjustment when there is about one-half inch sag in the slack side of the chain. See (1), Figure 13.

The chain is tightened by moving the entire crawler assembly toward the spiral end of the loader. Loosen the four bolts, (2) in bracket (3) Figure 127. Slotted holes in this bracket permit shifting entire crawler assembly to tighten chain.

Crawler Drive Shaft (No. 9 on Figure 100)

To work on this shaft the Boom should be in its horizontal position, with pivot pins on the floating cleanup scraper removed and the machine run away from the scraper for easy access to this shaft. See Fig-

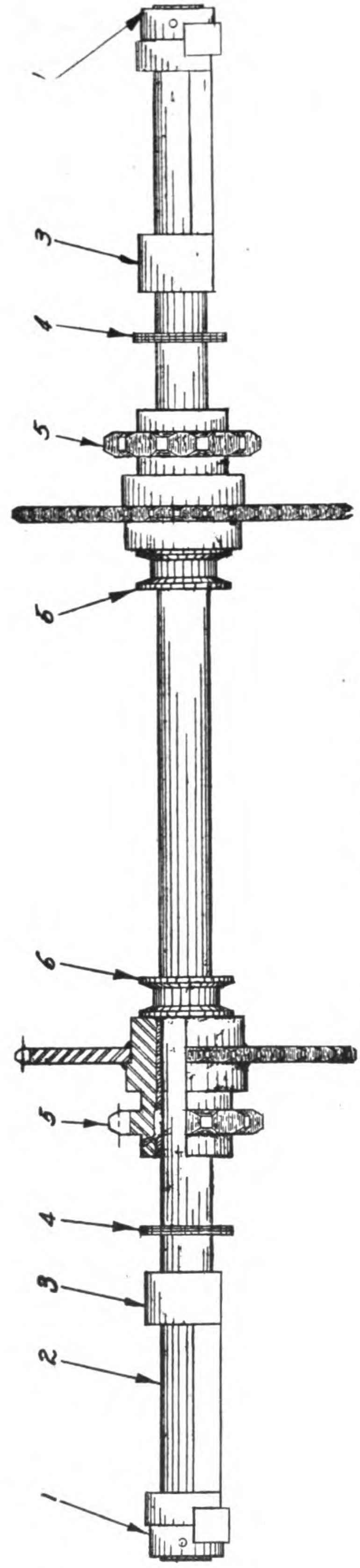


Figure 130. **Crawler Oscillating Shaft.**

ure 133, and page 212 for data on Cleanup Scraper. After getting the machine clear of the scraper, proceed as follows:

(a) Uncouple chain (1), Figure 126 and remove sprocket (8) which is double keyed and set screwed to the shaft, along with shield (9).

(b) Follow instructions under Crawler Shoes and lay treads back away from the crawler sprocket on this shaft. Use jack at (4), Figure 126, to take the weight of the machine and raise crawler sprocket (14), Figure 128, clear of the track shoes at the bottom.

(c) Remove covers (13), Figure 127 and bearing caps (15). This shaft may now be taken out of the crawler frame.

(d) To dismantle shaft, take off collar (16), slide off bearings (17) and remove the two collars which fit against the inside bearing hubs. Note that the longer of these two collars (18), Figure 128, fits in place against the hub of the inside bearing. Sprocket (14) is double keyed and set screwed to the shaft.

Crawler Takeup Shaft

To remove this shaft, proceed as follows:

(a) Follow instructions under Crawler Tracks and lay treads away from the traction wheel on this shaft. Use jacks at (19), Figure 131, to take the weight of the loader off this shaft.

(b) Remove covers (24), Figure 129, takeup bolts (12), pin bolts (26), and the shaft is free to slide out of the takeup hubs and bushed traction wheel.

NOTE: When reassembling this shaft, be sure that alemite (27) is at the top.

Removal of Crawler Assembly

To accomplish this operation, proceed as follows:

(a) Follow instructions (a) under Crawler Drive Shaft. Remove

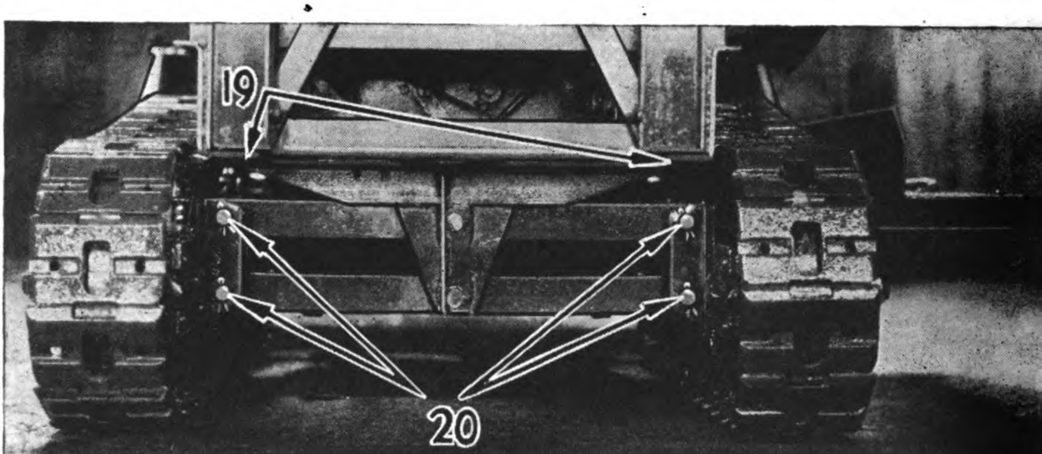


Figure 131. Crawlers remain parallel over uneven ground through use of the Barber-Greene oscillating type of axle.

operator's platform over crawler on operator's side.

(b) Jack up the entire loader with jacks at points (4), Figure 126, and at (19), Figure 131. The crawler treads may be removed separately, to reduce the total crawler unit weight, if so desired, as per instructions under Crawler Treads. As the weight of the loader falls on jacks at (19), remove pins (20) in oscillating axle.

(c) The crawlers are now free of the Tractor Unit and may be skidded to one side.

Crawler Rollers

The crawlers must be taken off the Tractor Unit in order to remove these bushed rollers. They are held in place by U-bolts (21), Figure 128.

Spring Tension Idler

These are provided to maintain tension in the crawler treads, and mount in a pivoted bar steel arm (22), Figure 127 and are activated by springs (23). For removal, follow instructions under Crawler Treads to permit easy access to this item.

SCRAPER UNIT

Floating Cleanup Scraper

This unit follows the feed spirals, when the loader is operating, and is designed to provide clean pick-up of material on roadwork or truck loading.

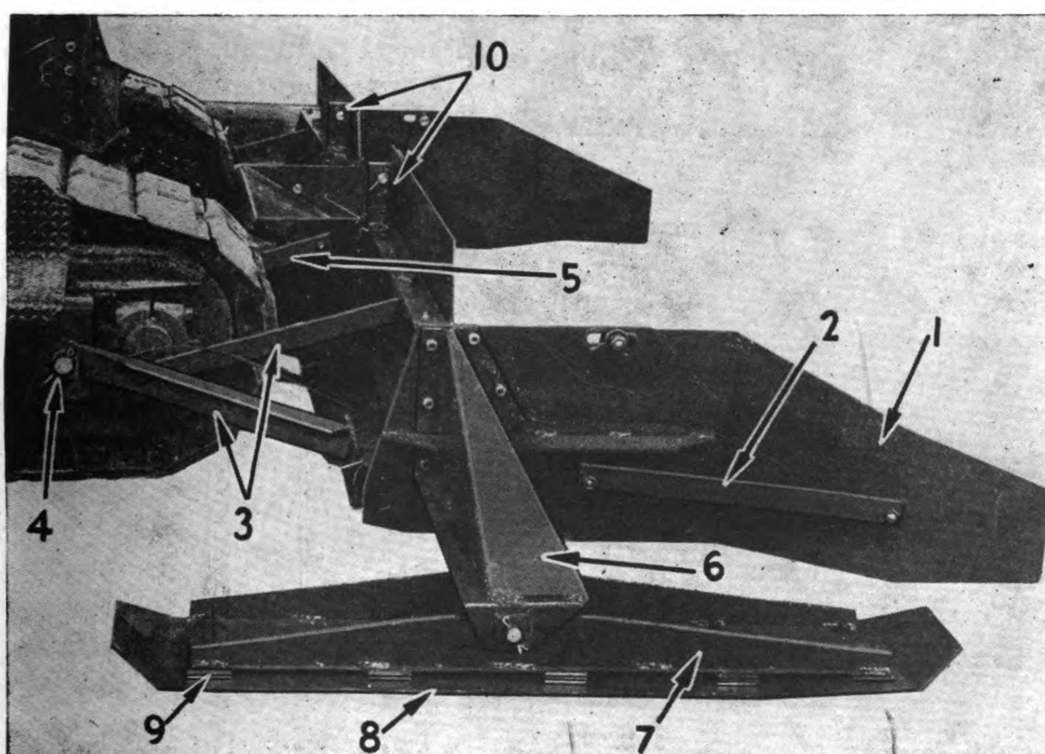


Figure 132. Floating cleanup scraper with guide wings attached.

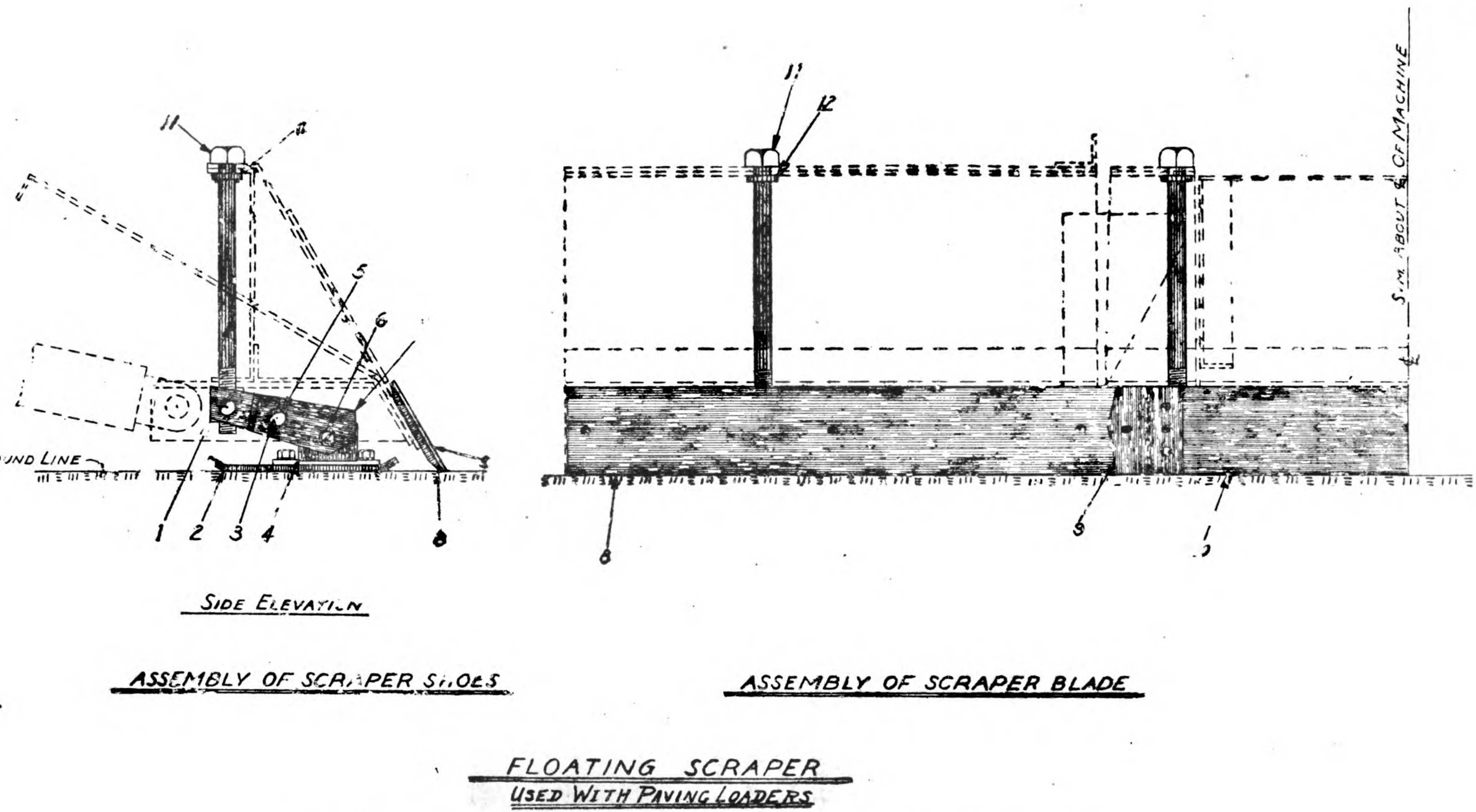


Figure 133. Floating scraper assembly showing scraper shoes and scraper blades.

To assemble this unit for road operation, mount side wings (1), Figure 132 with braces (2) as shown. If the scraper proper is not mounted, outside braces (3) attach to the scraper as shown, and to pivot pin (4). Between the crawlers on the tractor unit frame are slotted clips which receive a pivot shaft for inside braces (5). There is a pipe spacer which fits over this pivot shaft between the clips. A keeper plate bolts over the slotted clips to hold the pivot shaft in position, and cotters in the ends prevent the shaft from shifting.

When operating on a base which is unstable and will not support the weight of the scraper, outriggers (6) with shoes (7) are provided to carry the scraper so that it will not dig into the base. Shoe plates (8) bolt to the shoe frame, with shims (9) provided to vary the scraper clearance. Mount the shoes with the long end toward the feed spirals, as shown.

To operate the machine for loading only, the scraper should be fastened rigidly to the boom. Fasten bar (3) over pin (4), Figure 113. Remove side wings (1), Figure 132, brace (2), outrigger (6) and shoes (7). When operating for truck loading only, the canvas dust housing and frame over the feed spirals must also be removed, and the swivel spout mounted. Shims (5), Figure 113 are provided to adjust the distance between the feed spiral outer edge and the edge of the cleanup scraper. For the average operation, the cleanup scraper should be set ¼″ below the lower cutting edge of the feed spirals when the boom is in operating position.

Scraper Blade Assembly

This is mounted to frame by bolting the two side blades (8), Figure 133 in position indicated on each side, with center blades (10) bolted in place with hinge plate (9) at the joint on each side.

Scraper Shoe Assembly

These four units mount just back of the scraper blade with bolts (11) in frame held by washer (12) with cotter. Side plates (7) are held together with cottered pins (3) and cottered in place on nut (1) at end of bolts (11) and held to bracket (4) by flat head cap screws, with spacer (6) located each side. Shoes (2) bolt to bracket (4) with plow bolts.

Ordering Parts

The Serial Number, shown and described below, is the means by which Barber-Greene identifies the bills of materials used in manufacturing any particular machine and must be given when ordering parts. This Serial Number provides an accurate method of indicating in the sequence of serial numbers any design changes that have been made.

Serial Number Plate

The Serial Number Plate appears on the frame above the operator's platform. Always give the serial number of your machine, part number, and description when ordering parts.

Key to Serial Number System

82A-8-37

The first number (82A) indicates the machine model. The last number (37) indicates the schedule of manufacture in which the machine was built. The middle number (8) indicates the number or place of the machine in that schedule of manufacture. The machine above is Model 82A and is the 8th machine manufactured in the 37th schedule. The next machine built will have serial number 82A-9-37. The next schedule will be 38 and the serial number of the first machine will be 82A-1-38.

PARTS LIST

Barber-Greene
Model 82A
Bucket Loader

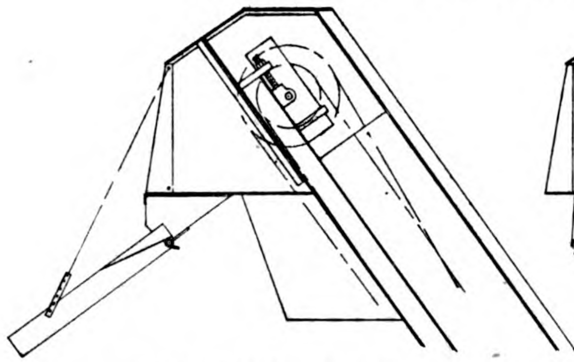
(For Accessory Parts, See Accessory Section)

(For Engine Parts, See Engine Section)

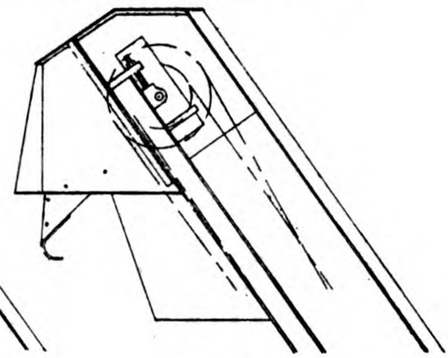
BARBER-GREENE COMPANY, Aurora, Illinois

GRAPHIC INDEX

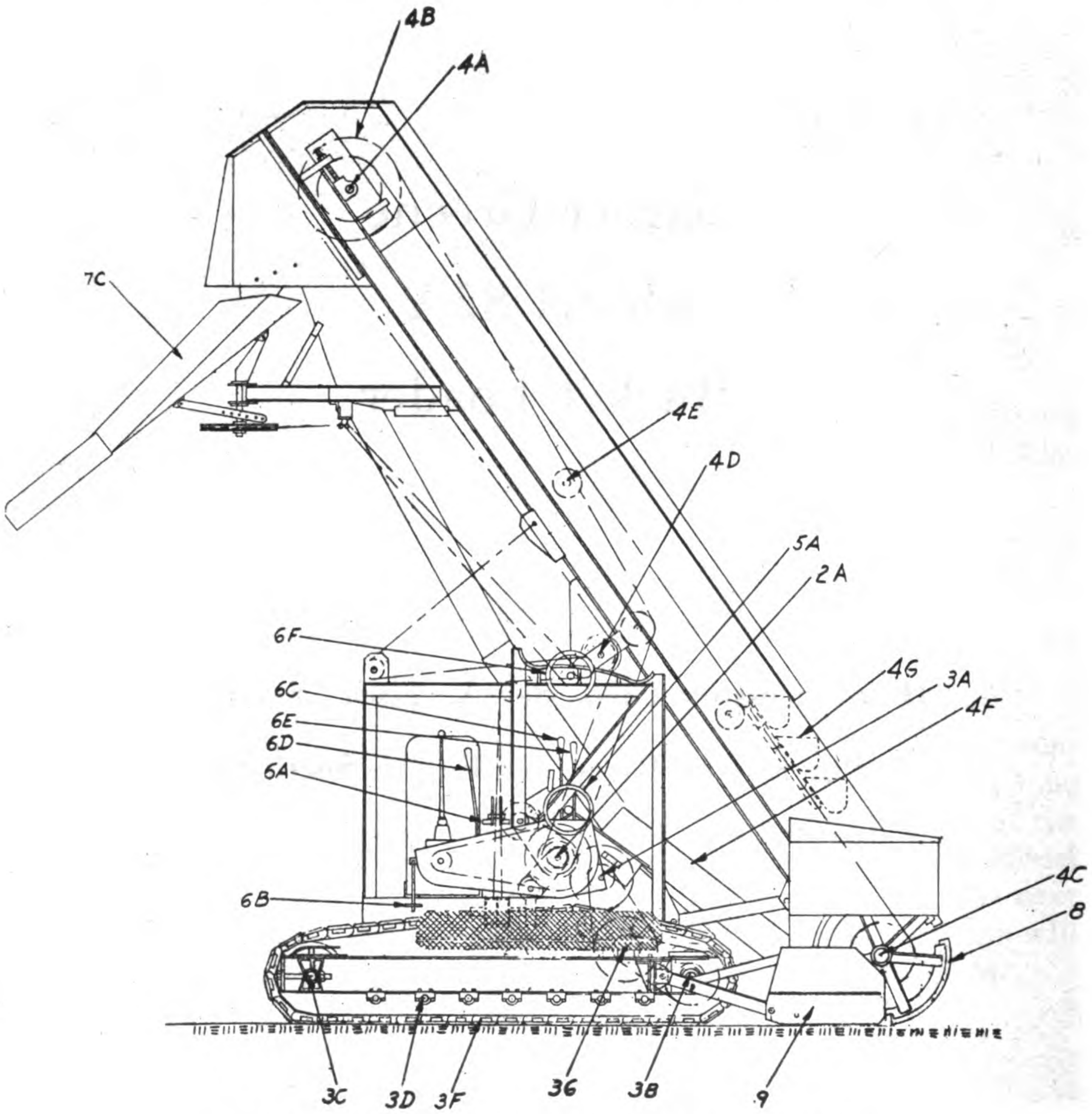
Numbers Refer to Contents Page for Identification.



Twin Discharge Spout For Travel Dryer Set-up.



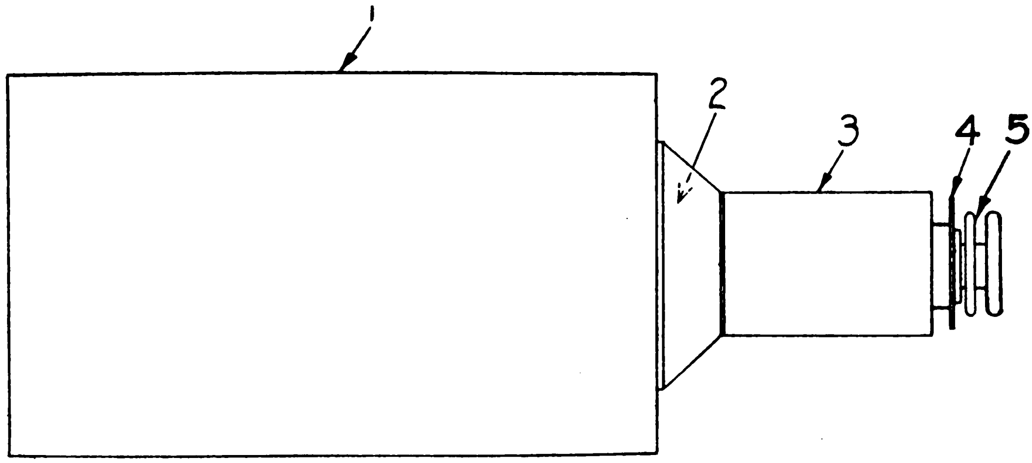
Discharge Spout For Travel Mixer Set-up.



Model 82-A Bucket Loader With Swivel Spout.

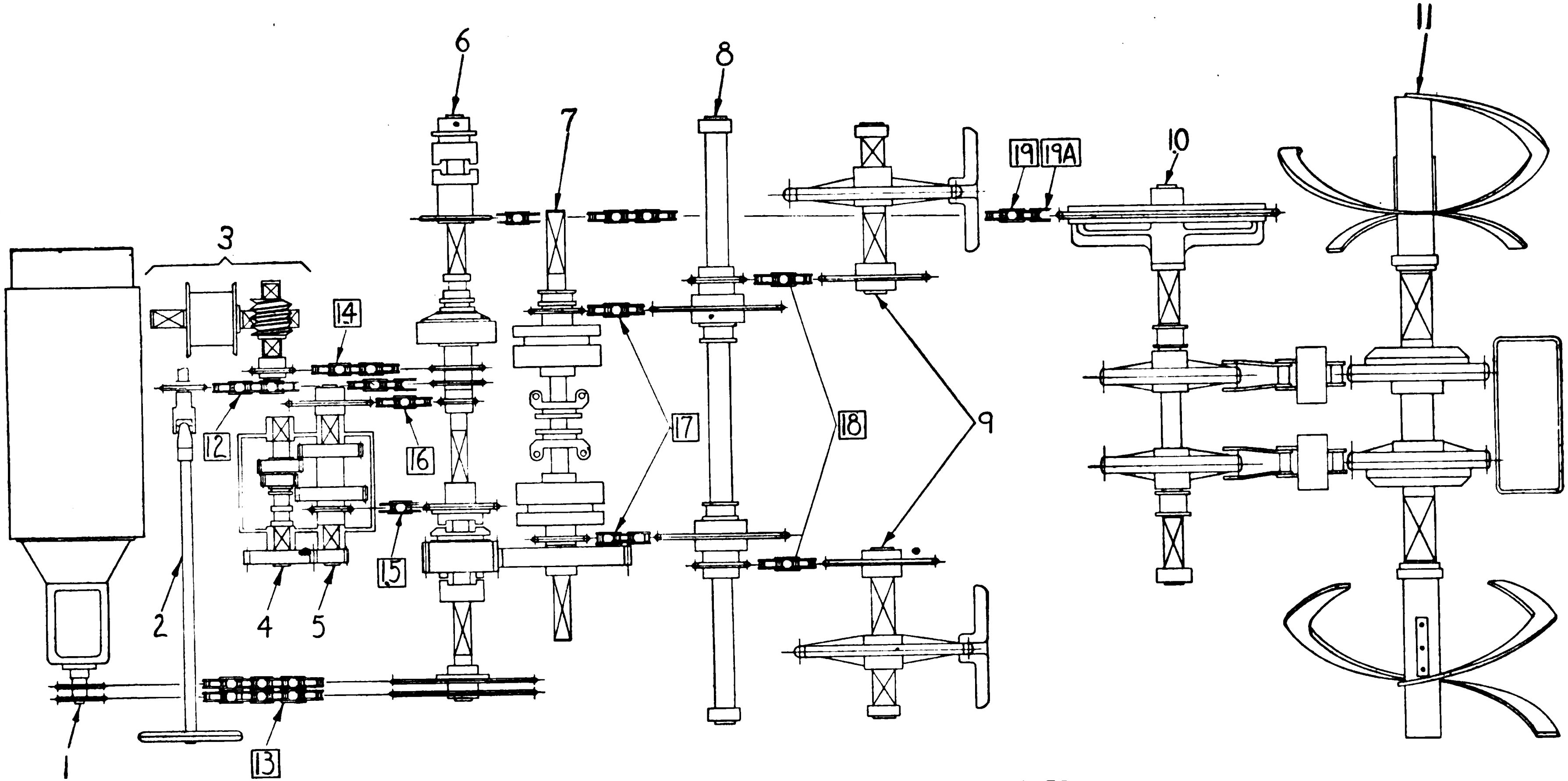
82-A BUCKET LOADER INDEX

POWER UNIT
(B/M 82-240-C & B)



Ref. No.	No. Req.	Part No.	Description
1.	1	EN-B-D8*	Buda Engine (For Lipe Clutch)
		EN-B-D4*	Buda Engine (For Fuller Clutch)
	2	R1-458	Flat Head Cap Screw, Nut and Lock Washer, ⅝" x 4"
	2	R1-156	Machine Bolt, Nut, and Lock Washer, ⅝" x 4"
	4	R1-290	Machine Bolt, Nut, Lockwasher, and 2 Cut Washers, ⅝" x 1¾"
2.	1	CL-WL-A1*	Master Lipe Clutch
		CL-FU-A2*	Master Fuller Clutch
2A.	1	BR-N-A1	Pilot Ball Bearing (New Departure #7505)
3.	1	TR-FU-C3*	Main Transmission (For Lipe Clutch)
		TR-FU-C4*	Main Transmission (For Fuller Clutch)
	1	OI-GT-B	Gitts Oiler, ⅛"
	1	R1-11	⅛" Button Head, Male Alemite
	1	F-82-241 W	Take Up Pad
	1	H-82-241 W	Take Up Screw
	1	R1-794	Hex Nut, 1"
	1	M-82-241	Belt Flashing
	2	R1-428	Flat Head Cap Screw, Nut, and Lock Washer, ¼" x 1"
4.	1	H-82-246 W	Guard Plate
	1	C-82-246	$\frac{1}{16}$" U Shaped Gasket
5.	1	B-19-743	Double Sprocket, 15-Tooth, 1¼" Pitch
	1	U-82-246	$\frac{1}{32}$" Gasket 6" x 6" Square
	1	EL-BA-C	6V-19 Plate Battery
	1	EL-CN-A1	Galvanized Flexible Conduit, ½" x 10'0"
	1	EL-CA-CO	Starting Cable #0 x 12'0"
	2	EL-WT-C6	Battery Cable Terminal, Closed Barrel
	2	EL-WT-BO	Copper Cable Lug #0
	1	E-46-277 W	Cover
	2	C-3-951	Collar
	4	R1-933	Set Screw, ⅜" x ¾"

*For Selection of Proper Units, See Key to Serial Number System, in Accessory Section.



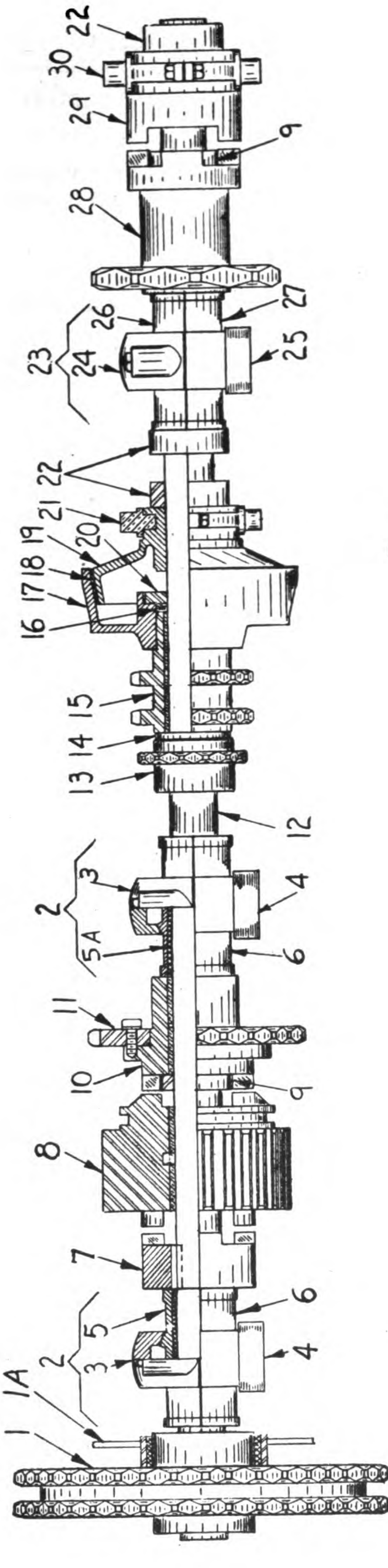
DRIVE SHAFTING AND CHAINS

(See parts list on following page)

DRIVE SHAFTING AND CHAINS

(See illustration on preceding page)

Ref. No.	No. Req.	Part No.	Description
			Shafts
1.			Engine Shaft
2.			Hoist Control Shaft
3.			Hoist Shaft
4.			Gear Box Idler Shaft
5.			Gear Box Drive Shaft
6.			Main Jack Shaft
7.			Crawler Clutch Shaft
8.			Oscillating Shaft
9.			Crawler Drive Shaft
10.			Head Shaft
11.			Foot Shaft
			Chains (B/M 82-105-D & G)
12.	1	AA-6-58R	Strand of Diamond #434 Chain, 1" Pitch, 26 Links & 1 Offset (From #6 to #2)
13.	1	AZ-6-65R	Strand of Diamond #D470 Chain, 1¼" Pitch, 74 Links & 1 Offset (From #1 to #6)
14.	1	KK-6-58R	Strand of Diamond #434 Chain, 1" Pitch, 36 Links & 1 Offset (From #6 to #3)
15.	1	KK-6-64R	Strand of Diamond #470 Chain, 1¼" Pitch, 36 Links & 1 Offset (From #6 to #5)
16.	1	XX-6-58R	Strand of Diamond #434 Chain, 1" Pitch, 48 Links (From #5 to #6)
17.	2	AH-6-64R	Strands of Diamond #470 Chain, 1¼" Pitch, 56 Links & 1 Offset (From #7 to #8)
18.	2	GG-6-91R	Strands of Diamond #478 Chain, 2" Pitch, 32 Links & 1 Offset (From #8 to #9)
19.	1	EC-6-110R	Strand of Baldwin #378-S Chain, 2.609" Pitch, 152 Links & 1 Offset (From #6 to #10)
19a.	1	W-6-110R	Strand of Baldwin #378-S Chain, 2.609" Pitch, 23 Links (To be added to 19 when 30" Boom Extension is used)
		A-6-58	Roller Link Diamond #434, 1" Pitch
		B-6-58	Connecting Link Diamond #434, 1" Pitch
		C-6-58	Offset Link Diamond #434, 1" Pitch
		A-6-65	Roller Link Diamond #D470, 1¼" Pitch
		B-6-65	Connecting Link Diamond #D470, 1¼" Pitch
		C-6-65	Offset Link Diamond #D470, 1¼" Pitch
		A-6-64	Roller Link Diamond #470, 1¼" Pitch
		B-6-64	Connecting Link Diamond #470, 1¼" Pitch
		C-6-64	Offset Link Diamond #470, 1¼" Pitch
		A-6-91	Roller Link Diamond #478, 2" Pitch
		B-6-91	Connecting Link Diamond #478, 2" Pitch
		C-6-91	Offset Link Diamond #478, 2" Pitch
		A-6-110	Roller Link Baldwin #378-S, 2.609" Pitch
		B-6-110	Connecting Link Baldwin #378-S, 2.609" Pitch
		C-6-110	Offset Link Baldwin #378-S, 2.609" Pitch



MAIN JACK SHAFT

(See parts list on following page)

MAIN JACK SHAFT

(B/M 82-235-A1)

(See illustration on preceding page)

Ref. No.	No. Req.	Part No.	Description
1.	1	3619 A	Sprocket, 40-Tooth
	1	R1-1032	Allen Cup Point Safety Set Screw, ⅝"x1¼"
	1	R1-1030	Allen Cup Point Safety Set Screw, ⅝"x¾"
	1	K-17-33	Key, ½" x ½" x 4½"
1a.	1	M-82-246 WB	Guard Plate
2.	2	13-216-K	2$\frac{7}{16}$" Ball & Socket Bearing, Complete
3.	2	961 A	Bearing Cap
	4	R1-82	Machine Bolt, Nut, & Jam Nut, ⅝" x 6¼"
4.	2	3708	Bearing Base
	4	R1-244	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅝" x 2¼"
	2	BT-17-109	Shim, 16 Ga.
	2	BW-17-109	Shim, 20 Ga.
	2	N-17-71	Bearing Stop, ¼"
	2	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"
5.	1	3369 D	Upper Half Bearing
	1	F-17-43	Pipe, ¼" x 2" (For #5)
	1	R1-649	Pipe Coupling, ¼" (For #5)
5a.	1	3369 D	Upper Bearing Half
	1	AF-17-43	Grease Pipe, (For #5a)
	1	D-17-43	Grease Pipe, (For #5a)
	1	N-17-43	Grease Pipe, (For #5a)
	2	R1-682	Ell, ¼" x 45° (For #5a)
	1	R1-649	Pipe Coupling, ¼" (For #5a)
	1	R1-12	¼" Button Head Alemite, Male (For #5a)
6.	2	3369 A	Lower Bearing Half
7.	1	E-3-1001	Jaw Clutch
	2	R1-1031	Allen Cup Point Safety Set Screw, ⅝" x 1"
	1	R1-1030	Allen Cup Point Safety Set Screw, ⅝"x¾"
	1	D-3-1205	Special Allen Cup Point Safety Set Screw, ⅝" x ¾"
	2	PP-17-33	Key, ½" x ½" x 1$\frac{13}{16}$"
8.	1	C-18-234	Gear, 31-Tooth
	2	F-8-95	Bronze Bushing
	1	R1-11	⅛" Button Head Alemite, Male
9.	2	O-3-944	Collar
	4	R1-1012	Allen Cup Point Safety Set Screw, ⅜"x½"
10.	1	F-3-1001	Jaw Clutch & Sprocket Hub
	2	F-8-95	Bushing
	2	R1-11	⅛" Button Head Alemite, Male
11.	1	T-19-543	Sprocket, 22-Tooth
	6	R1-503	Hex Head Cap Screw, & Lock Washer, ½" x 1½" (A.S.F. Thrd)
12.	1	A-82-236	Shaft, 2$\frac{7}{16}$" x 5' 7$\frac{1}{16}$", S.A.E. 4140
13.	1	C-19-689	Sprocket, 14-Tooth
	1	R1-1020	Allen Cup Point Safety Set Screw, ½"x⅜"

Main Jack Shaft (continued)

Ref. No.	No. Req.	Part No.	Description
	1	R1-1022	Allen Cup Point Safety Set Screw, ½"x½"
	1	AM-17-33	Key, ½" x ½" x 2⅛"
14.	1	H-17-164	Bronze Washer
15.	1	J-19-782	Double Sprocket, 15-Tooth
	2	P-8-95	Bronze Bushing
16.	1	T-17-105	Felt Washer
17.	1	3509 B	Cone Clutch (Female Half)
	1	R1-943	Set Screw, ½" x 1¼"
	1	R1-942	Set Screw, ½" x 1"
	1	AA-17-32	Key, ⅜" x ⅜" x 1⅝"
	1	R1-11	⅛" Button Head Alemite, Male
18.	1	A-3-1077	Clutch Lining, Gatke
	8	R1-33	Flat Head Stove Bolt, Hex Nut, & Lock Washer, $\frac{3}{16}$" x ¾"
19.	1	2680 E	Cone Clutch (Male Half)
	1	GG-17-106	Feather Key, ½" x ½" x 4¾"
20.	1	P-3-944	Collar
	2	R1-1016	Allen Cup Point Safety Set Screw, ⅜"x1⅛"
21.	1	3605 A	Shifter Ring
	2	R1-107	Machine Bolt, Nut, & Lock Washer, ⅜" x 2¼"
	2	BE-17-9	Washer
	1	R1-11	⅛" Button Head Alemite, Male
22.	3	M-3-944	Collar
	6	R1-949	Set Screw, ⅝" x ⅞"
23.	1	13-216-M	2$\frac{3}{16}$" Ball & Socket Bearing, Complete
24.	1	961	Bearing Cap
	2	R1-82	Machine Bolt, Nut, & Jam Nut, ⅝" x 6¼"
25.	1	3708	Bearing Base
	2	R1-244	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅝" x 2¼"
	1	H-17-165	Shim, 14 Ga.
	1	BT-17-109	Shim, 16 Ga.
	1	BW-17-109	Shim, 20 Ga.
	1	N-17-71	Bearing Stop, ¼"
	1	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"
26.	1	3369 A	Upper Bearing Half
27.	1	3369 D	Lower Bearing Half
	1	J-17-43	Pipe, ¼" x 4"
	1	R1-649	Pipe Coupling, ¼"
	1	R1-12	¼" Button Head Alemite, Male
28.	1	2982 A	Sprocket, 11-Tooth
	2	C-8-94	Bronze Bushing

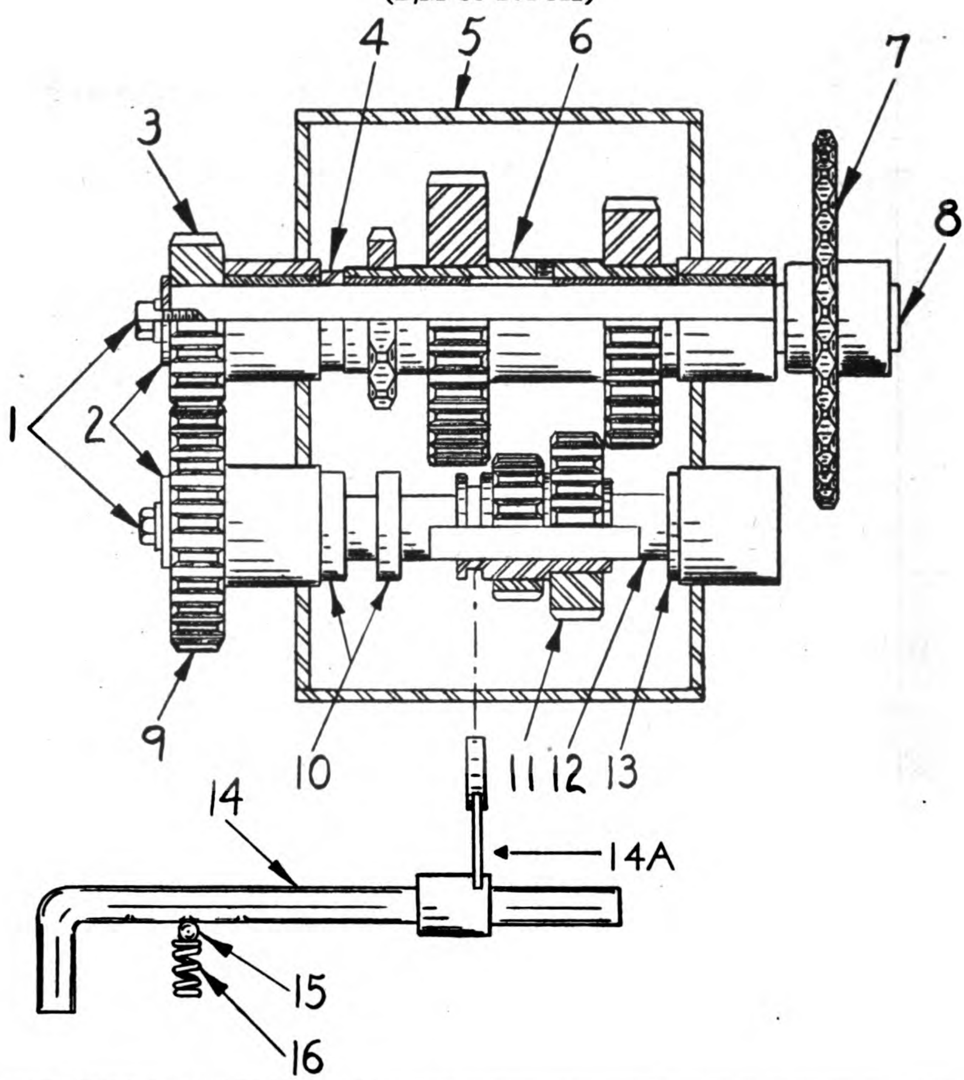
(continued on next page)

Main Jack Shaft (continued)

Ref. No.	No. Req.	Part No.	Description
	2	R1-12	¼" Button Head Alemite, Male
29.	1	3176	Jaw Clutch
	1	G-17-106	Feather Key, ½" x ½" x 3¾"
30.	1	2432	Shifter Ring
	1	R1-11	⅛" Button Head Alemite, Male
	2	R1-107	Machine Bolt, Nut, & Lock Washer, ⅜" x 2¼"

GEAR BOX

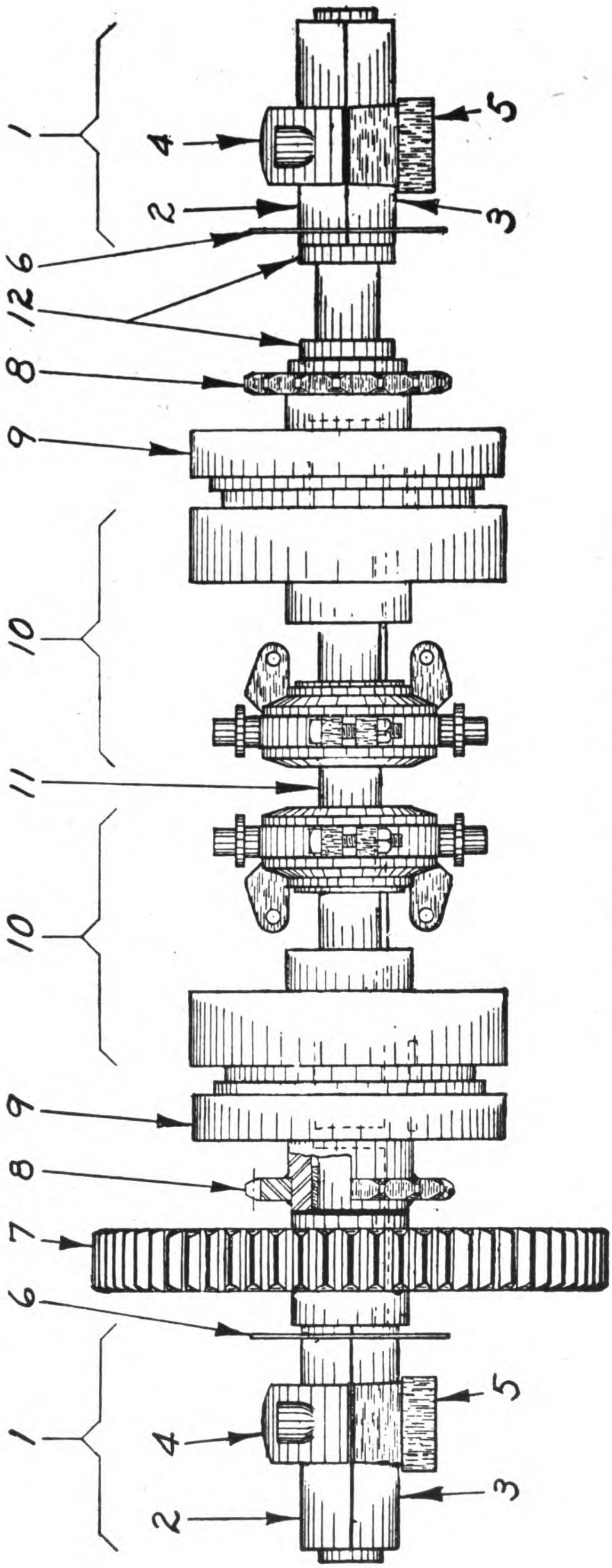
(B/M 53-101-A1)



Ref. No.	No. Req.	Part No.	Description
1.	2	R1-541	Hex Head Cap Screw, Nut, & Lock
	2		Washer, ½" x 1"
2.		OO-17-9	Washer
3.	1	A-18-232	Gear, 13-Tooth

Gear Box (continued)

Ref. No.	No. Req.	Part No.	Description	
	2	C-17-30	Key, ¼" x ¼" x 1½"	
4.	1	P-3-938	Collar	
	1	R1-1012	Allen Cup Point Safety Set Screw, ⅜"x½"	
5.	1	A-53-103 WM	Gear Box	
	1	N-53-103 RW	Gear Box Cover	
	1	EC-17-25	Rod, ½" x 10½", S.A.E. 1020	
	2	R1-606	Cotter, ⅛" x 1¼"	
	4	J-17-43	Pipe, ¼" x 4"	
	1	D-17-43	Pipe, ¼" x 1¼"	
	5	R1-649	Pipe Coupling, ¼"	
	5	R1-12	¼" Button Head Alemite, Male	
	1	C-3-23	Dog Point Set Screw, ⅜" x ⅝"	
6.	1	B-18-230 W	Gear Cluster, 29-Tooth, 31-Tooth, & 11-Tooth Sprocket	
	2	P-8-55	Bronze Bushing	
	2	R1-12	¼" Button Head Alemite, Male	
7.	1	19-474-0	Sprocket, 31-Tooth	
	1	R1-940	Set Screw, ½" x ¾"	
	1	R1-942	Set Screw, ½" x 1"	
	1	AF-17-32	Key, ⅜" x ⅜" x 2$\frac{11}{16}$"	
8.	1	A-53-104	Shaft, 1$\frac{11}{16}$" x 1' 8$\frac{5}{16}$", S.A.E. 4140	
	2	G-8-52	Bronze Bushing	
9.	1	C-18-233	Gear, 32-Tooth	
	2	C-17-30	Key, ¼" x ¼" x 1½"	
10.	2	A-3-1002	Collar	
	2	R1-935	Set Screw, ⅜" x 1"	
11.	1	A-18-228 W	Gear Cluster, 16-Tooth and 14-Tooth	
	2	P-17-108	Feather Key, ¼" x ¼" x 8¼"	
12.	1	B-53-104	Shaft, 1$\frac{11}{16}$" x 1' 4$\frac{15}{16}$", S.A.E. 4140	
13.	1	AA-17-9	Washer	
14.	1	C-53-105	Shifter Rod	
14.A	1	A-3-1003 W	Shifter Yoke	
15.	1	R1-19	Steel Ball, $\frac{7}{16}$" Dia.	
16.	1	C-46-55	Spring	
	1	B1-8-57	Bronze Bushing	
	1	G-8-52	Bronze Bushing, (For External Gear End)	
	1	C-18-232	Gear, 21-Tooth	Interchangeable with 3 and 9
	1	B-18-232	Gear, 17-Tooth	
	1	B-18-233	Gear, 28-Tooth	
	1	A-18-233	Gear, 24-Tooth	
	2	AA-53-103	Shim, 20 Ga.	
	2	BB-53-103	Shim, 20 Ga.	
	2	P-53-103	Shim, ¼"	
	2	Q-53-103	Shim, 10 Ga.	
	2	T-53-103	Shim, 16 Ga.	
	2	U-53-103	Shim, ¼"	
	2	V-53-103	Shim, 10 Ga.	
	2	W-53-103	Shim, 16 Ga.	



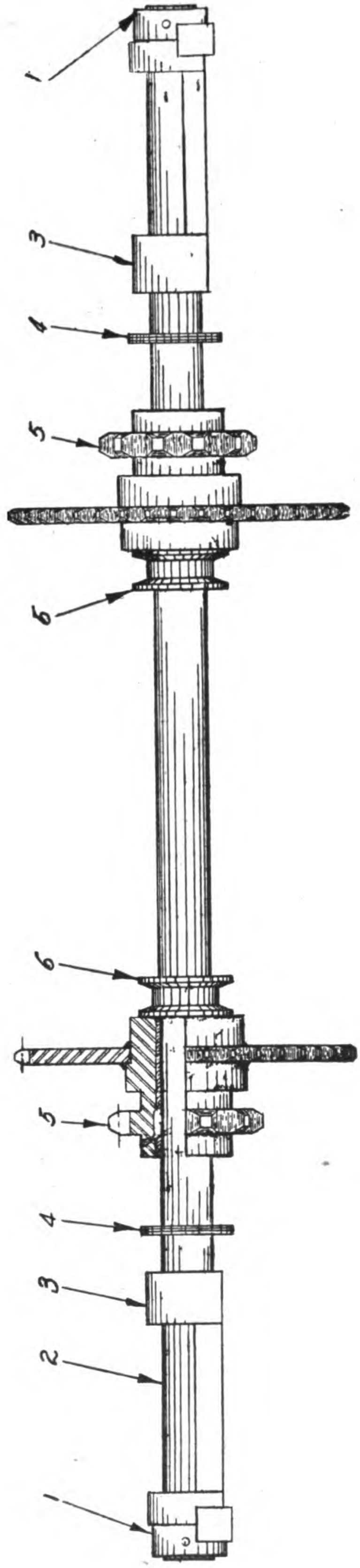
CRAWLER CLUTCH SHAFT

CRAWLER CLUTCH SHAFT

(B/M 82-200-A2)

(See illustration on preceding page)

Ref. No.	No. Req.	Part No.	Description
1.	2	13-214-G	Ball & Socket Bearing (Complete)
	4	R1-81	Machine Bolt, Nut & Jam Nut, ⅝" x 5¾"
2.	2	825 B	Bearing, Upper Half
	2	E-17-43	Pipe, ¼" x 1½"
	2	R1-649	Pipe Coupling, ¼"
	2	R1-12	¼" Button Head Alemite, Male
3.	2	825 A	Bearing, Lower Half
4.	2	822 B	Bearing Cap
5.	2	821	Bearing Base
	1	B-17-136	Shim, ⅜"
	1	A-17-136	Shim, ⅜"
	6	A-17-110	Shim, 14 Ga.
	2	N-17-71	Bearing Stop, ¼"
	2	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"
	4	R1-247	Machine Bolt, Nut, & Lock Washer, & Cut Washer, ⅝" x 3"
6.	2	N-82-173	Patch Plate
7.	1	3435	Spur Gear, 64-Tooth
	1	R1-949	Set Screw, ⅝" x ⅞"
	1	R1-950	Set Screw, ⅝" x 1¼"
	1	E-17-33	Key, ½" x ½" x 3½"
8.	2	C-19-680 WM	Sprocket, 15-Tooth
	2	H-8-75	Bronze Bushing
	2	O-8-75	Bronze Bushing
	4	R1-12	¼" Button Head Alemite, Male
9.	2	3511	Clutch Hub, 8"
	2	ZZ-17-33	Key, ½" x ½" x 2⅜"
10.	2	3-1007-A	Barber-Greene 8" Friction Clutch (For Details See Page 348)
	2	AT-17-33	Key, ½" x ½" x 6¾"
	2	R1-11	⅛" Button Head Alemite, Male
11.	1	A-82-200	Shaft, 1$\frac{15}{16}$" x 4' 1½", S.A.E. 4140
12.	2	M-3-941	Collar
	4	R1-933	Set Screw, ⅜" x ¾"



OSCILLATING SHAFT

OSCILLATING SHAFT

(B/M 82-66-C)

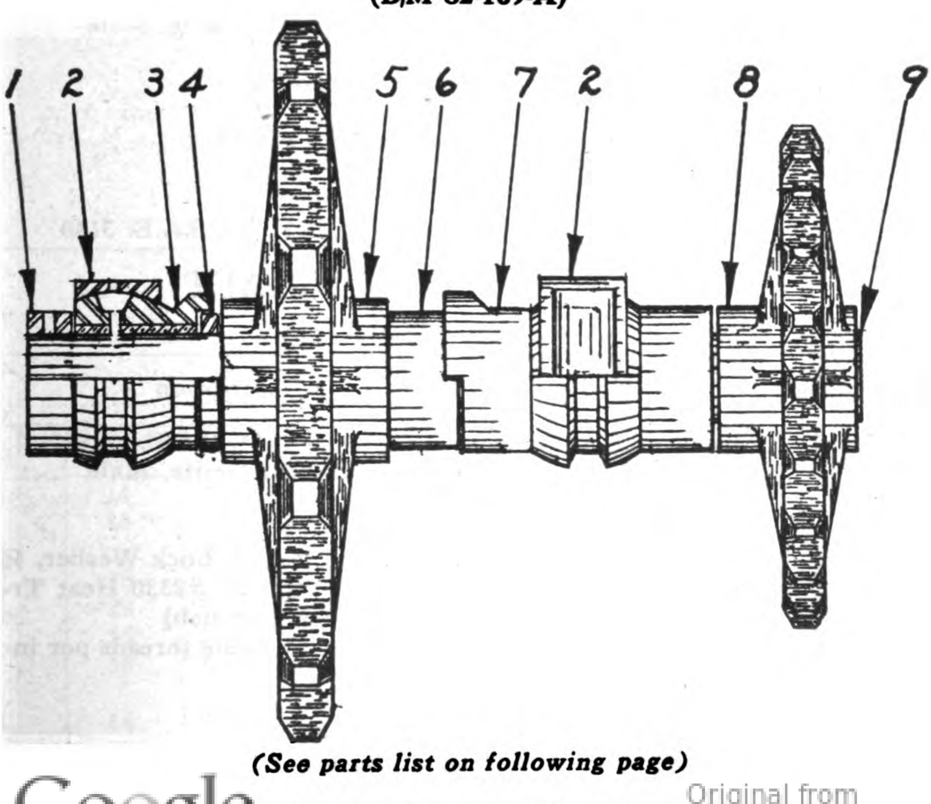
(B/M 82-169-A)

(See illustration on preceding page)

Ref. No.	No. Req.	Part No.	Description
1.	2	F-3-949	Collar
	2	R1-137	Machine Bolt, Nut, & Lock Washer, ½" x 4½"
	6	OC-17-9	Washers
2.	1	B-82-66	Shaft, 2$\frac{1}{16}$" x 6' 2", S.A.E. #3140
3.	2	2387	Bearing
	8	R1-295	Machine Bolt, Nut, & Lock Washer, & two Cut Washers, ⅝" x 3¾"
	8	R1-1162	Bevel Washer, ⅝"
	38	A-17-111	Shim, #10
	4	KK-17-111	Shim, #16
	4	G-24-85	Keeper
4.	6	JI-17-9	Washer
5.	2	19-656-A	Sprocket, 10-Tooth & 39-Tooth
	2	BB-8-95	Bronze Bushing
	2	CC-8-95	Bronze Bushing
	4	R1-682	Elbow, ¼" x 45°
	4	F-17-43	Pipe, ¼" x 2"
	4	R1-12	¼" Button Head Alemite, Male
6.	2	R1-591	Standard Collar, 2$\frac{1}{16}$"

CRAWLER DRIVE SHAFT

(B/M 82-169-A)



(See parts list on following page)

Crawler Drive Shaft (continued)

(See illustration on preceding page)

Ref. No.	No. Req.	Part No.	Description
1.	2	B-3-949	Collar
	2	R1-138	Machine Bolt, Nut, & Lock Washer, ½" x 4¾"
2.	4	2483	Bearing Cap
	6	R1-165	Machine Bolt, Nut, & Lock Washer, ⅝" x 7½"
	2	R1-164	Machine Bolt, Nut, & Lock Washer, ⅝" x 7"
3.	2	2485	Bearing
	2	AA-8-92	Bronze Bushing
	2	R1-866	Pipe Plug, ¼"
	2	C-17-43	Pipe, ¼" x ⅞"
	2	R1-649	Pipe Coupling, ¼"
	2	R1-12	¼" Button Head Alemite, Male
4.	2	F-3-948	Collar
5.	2	1506 C	Sprocket, 10-Tooth
	4	R1-950	Set Screw, ⅝" x 1¼"
	2	R1-951	Set Screw, ⅝" x 1½"
	4	W-17-34	Key, ⅝" x ⅝" x 4½"
6.	2	G-3-948	Collar
7.	2	2482 A	Bearing
	4	JJ-8-94	Bronze Bushing
	2	R1-866	Pipe Plug, ¼"
	2	C-17-43	Pipe, ¼" x ⅞"
	2	R1-649	Pipe Coupling, ¼"
	2	R1-12	¼" Button Head Alemite, Male
8.	2	2975	Sprocket, 21-Tooth
	4	R1-949	Set Screw, ⅝" x 1"
	2	R1-950	Set Screw, ⅝" x 1¼"
	4	Y-17-34	Key, ⅝" x ⅝" x 4"
9.	2	C-82-77	Shaft, 2$\frac{7}{16}$" x 1' 11$\frac{3}{16}$", S.A.E. 3140

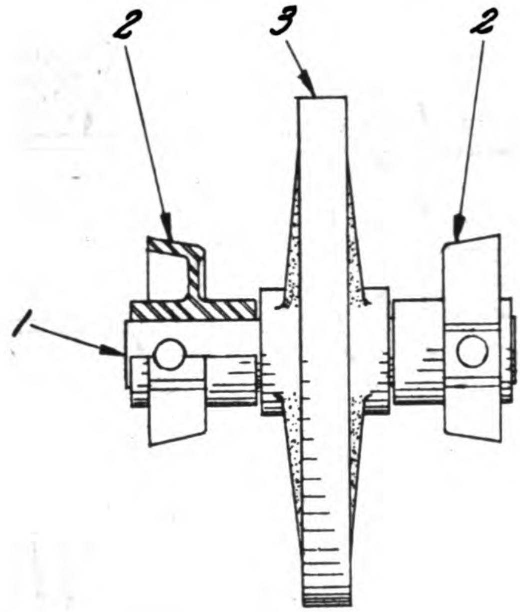
CRAWLER TAKE-UP SHAFT

(From B/M 82-169-A)

Ref. No.	No. Req.	Part No.	Description
1.	2	A-82-77	Shaft, 2$\frac{7}{16}$" x 1' 1¾", S.A.E. #1020
	2	R1-12	¼" Button Head Alemite, Male
2.	4	3372	Take-Up Bearing
	4	R1-160	Machine Bolt, Nut, & Lock Washer, ⅝"x5"
	4	C-17-102	Bolt, 1" x 12", S.A.E. #2330 Heat Treated (4 Acme threads per inch)
	4	M-17-24	1" Square Nut (4 Acme threads per inch)
	8	KI-17-9	Washer
3.	2	362 B	Traction Wheel
	4	FF-8-95	Bronze Bushing

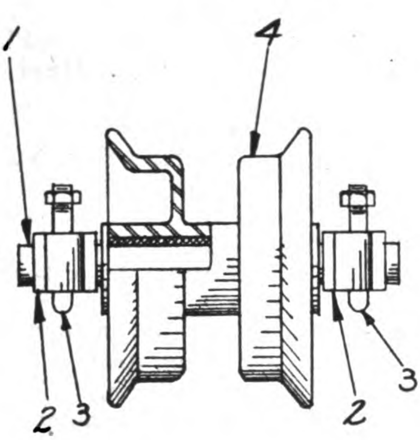
Crawler Take Up Shaft (continued)

(See parts list on following page)



CRAWLER ROLLER SHAFT

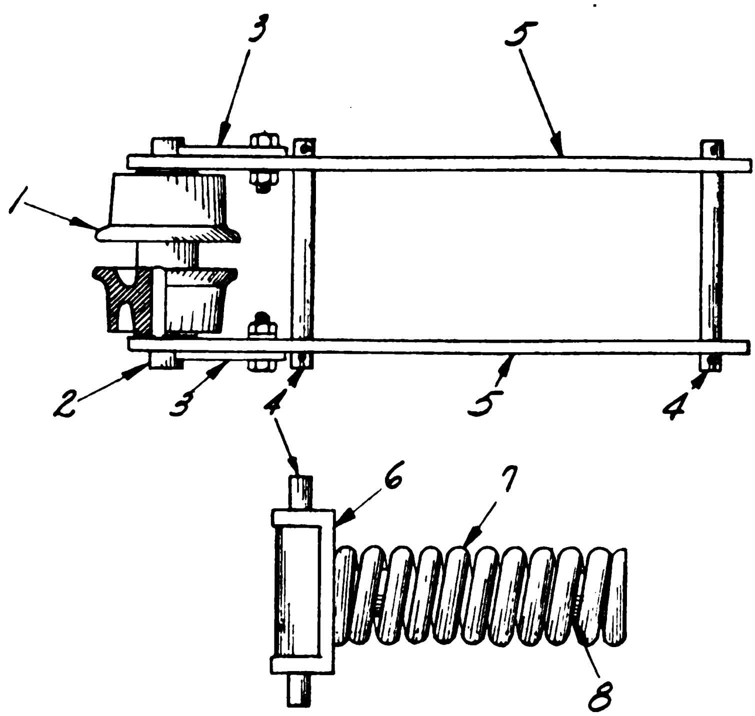
(From B/M 82-169-A)



Ref. No.	No. Req.	Part No.	Description
1.	14	A-62-21	Shaft, 1$\frac{11}{16}$" x 1' 0½", S.A.E. #1020
	14	R1-12	¼" Button Head Alemite, Male
2.	28	1300	Keeper
3.	28	A-3-172	U-Bolt, ⅝"
	56	R1-812	Hex Nut, & Lock Washer, ⅝"
	56	R1-1162	Bevel Washer, ⅝"
4.	14	3430	Flanged Roller
	28	AQ-17-9	Washer

CRAWLER SPRING TAKE-UP

(From B/M 82-169-A)



Ref. No.	No. Req.	Part No.	Description
1.	2	1070	Flanged Roller, 4"
2.	2	S-42-90	Shaft, 1 3/16" x 8¼", S.A.E. #1020
	2	R1-12	¼" Button Head Alemite, Male
3.	4	J-42-90	Keeper
	4	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
4.	4	E-42-90	Pin
	8	R1-614	Cotter, 3/16" x 1¼"
5.	4	H-42-90	Take-Up Arm
6.	2	667	Spring Seat
7.	2	B-46-45	Coil Spring
8.	2	668	Spring Retainer
	2	R1-133	½" x 3½" Machine Bolt, Nut, & Lock Washer

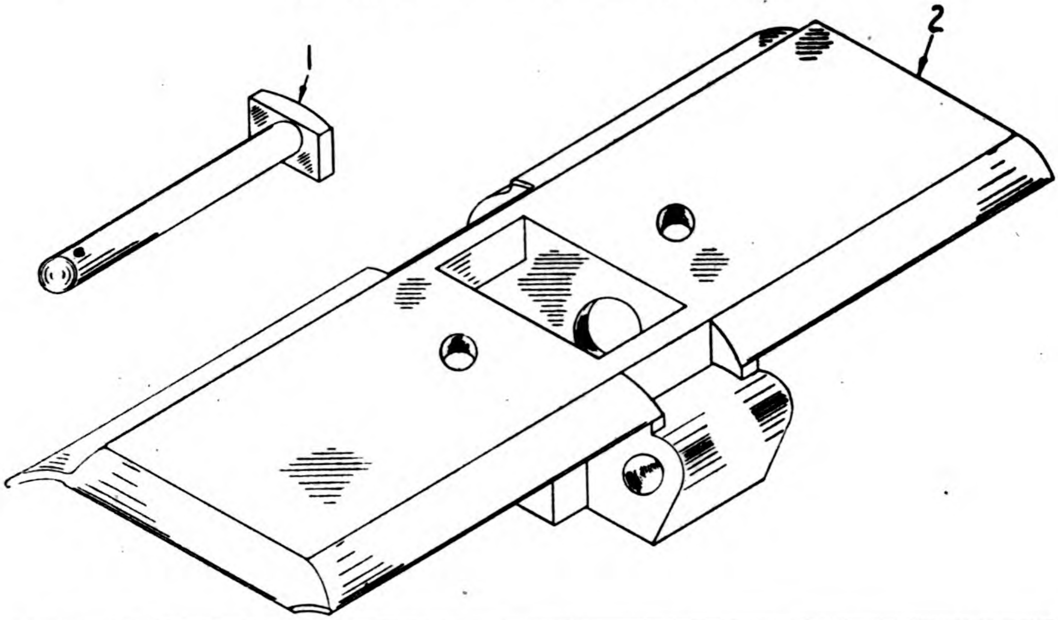
CRAWLER TREAD

(B/M 82-169-D)

Ref. No.	No. Req.	Part No.	Description
1.	82	A-38-17	T-Head Pin
	82	R1-630	Cotter, 3/16" x 1¼"
2.	82	1048	Crawler Link

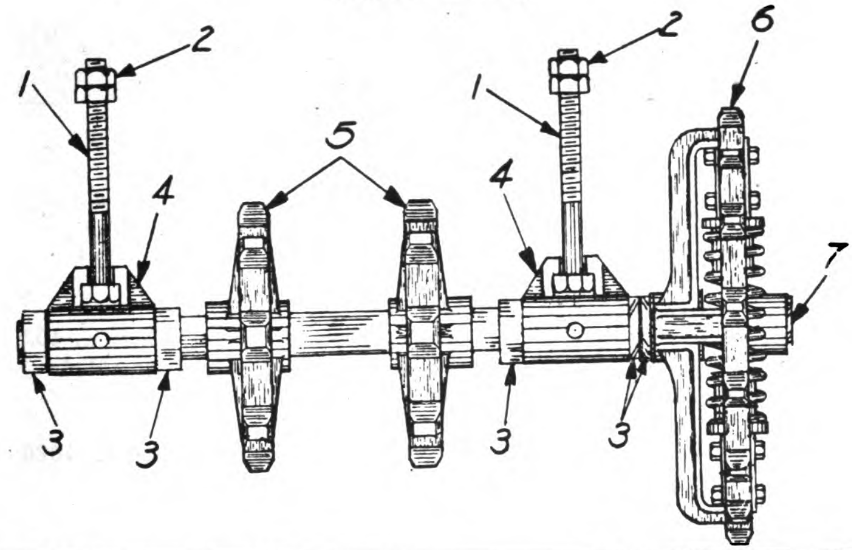
Crawler Tread (continued)

(See parts list on preceding page)



BOOM HEAD SHAFT

(B/M 82-237-A)



Ref. No.	No. Req.	Part No.	Description
1.	2	BN-17-24	Take-Up Bolt
2.	2	R1-796	1½" Hex Nut
	4	NG-17-9	Washer
3.	5	D-3-917	Collar
4.	2	3427	Take-Up Bearing
	2	R1-12	¼" Button Head Alemite, Male
	4	B-8-115	Bushing
5.	2	2994 C	Sprocket, 8-Tooth
	8	R1-548	Hex Head Cap Screw, Nut & Lock Washer, ⅞" x 3½"

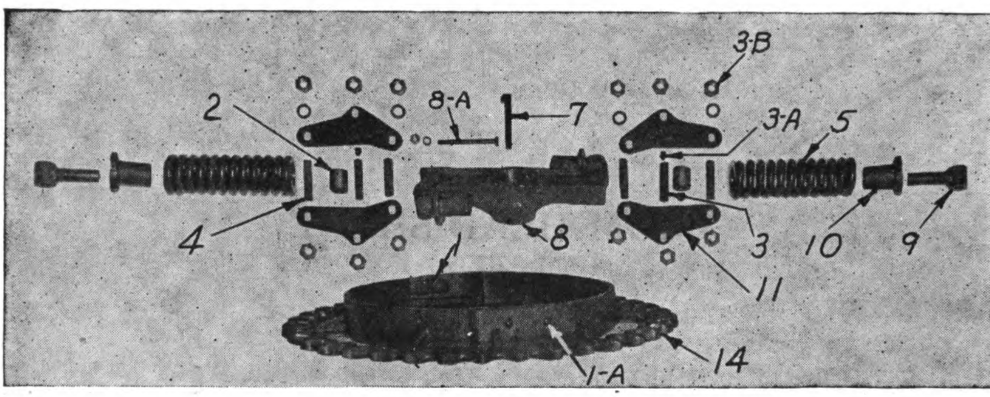
(continued on next page)

Boom Head Shaft (continued)

Ref. No.	No. Req.	Part No.	Description
	2	M-17-34	Key, ⅝" x ⅝" x 4⅞"
6.	1	19-103-C	Spring Release Sprocket, 37-Tooth (For Details See Below)
	1	A-17-88	Brass Washer
7.	1	A-82-237	Shaft, 2$\frac{11}{16}$" x 4' 0¾", S.A.E. #4140

SPRING RELEASE SPROCKET

(B/M 19-103-C)

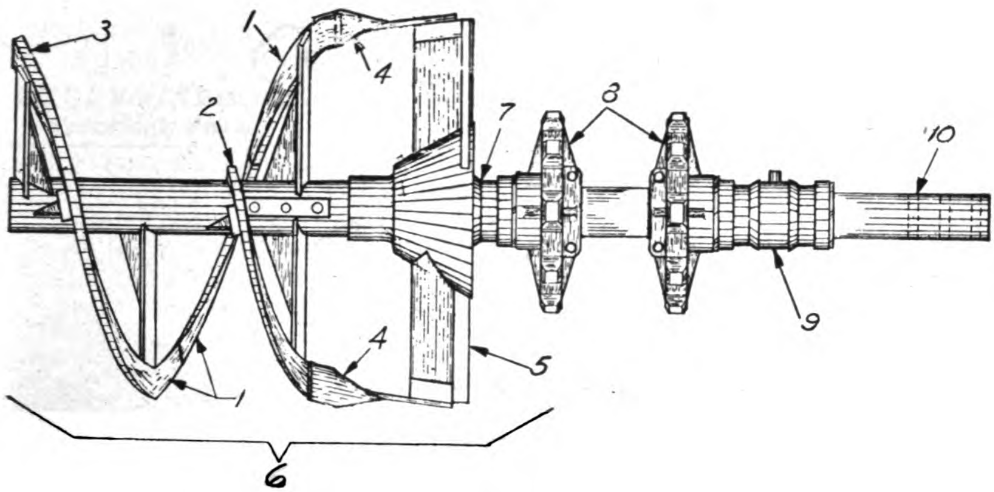


Ref. No.	No. Req.	Part No.	Description
1.	2	1157	Driving Cam
1a.	4	R1-890	Button Head Rivet, ⅜" x 2¾"
2.	2	B-19-51	Roller
3.	2	B-19-106	Roller Pin, ⅞" x 3¾", S.A.E. 1020
3a.	2	R1-11	⅛" Button Head Alemite, Male
3b.	12	R1-804	Half Nut, ⅞"
	6	R1-1183	Lockwasher, ⅞"
4.	4	A-19-106	Pivot Pin, ⅞" x 3¾", S.A.E. 1020
5.	2	C-19-106	Coil Spring
7.	1	A-17-38	Gib Key, ⅝" x 4½"
8.	1	472 C	Hub
	1	R1-951	Set Screw, ⅝" x 1½"
9.	2	C-3-656W	Adjustment Eye Bolt
10.	2	1158	Spring Retainer
	2	A-19-103	#14 Ga. Wire, 10"
11.	4	A-19-51	Roller Plate, High Carbon
14.	1	1156 A	Spring Release Sprocket, 37-Tooth
	1	R1-12	¼" Button Head Alemite, Male
	1	F-17-43	Pipe, ¼" x 2"
	1	R1-649	Pipe Coupling, ¼"

BOOM FOOT SHAFT

(B/M 82-11-A7)

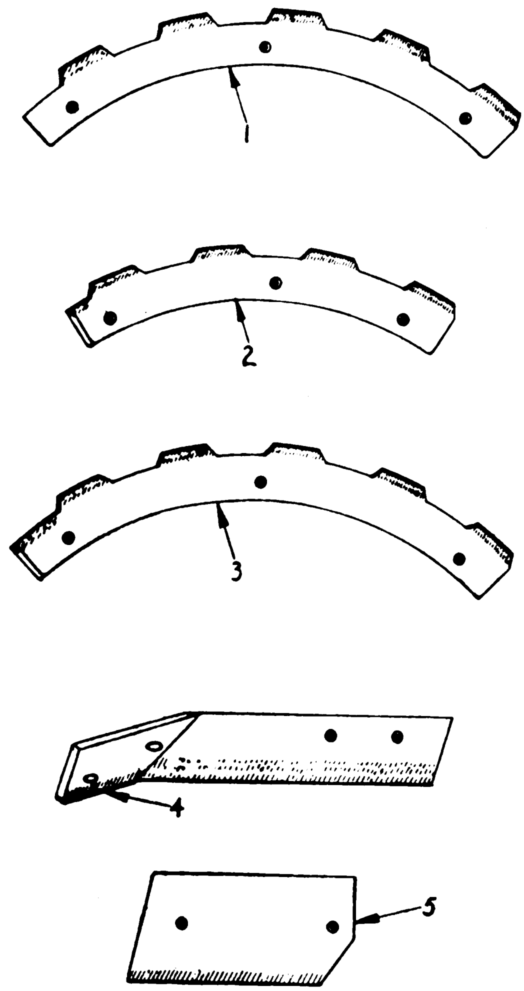
(Wearing Strips B/M 82-143-D)



Ref. No.	No. Req.	Part No.	Description
1.		A (R) 82-209	Wearing Strip } (For Details
		A (L) 82-209	Wearing Strip } See Following Page)
2.		C (R) 82-209	Wearing End Strip } (For Details
		C (L) 82-209	Wearing End Strip } See Following Page)
3.		B (R) 82-209	Wearing End Strip } (For Details
		B (L) 82-209	Wearing End Strip } See Following Page)
4.		N (R) 82-142	Scraper Bar } (For Details
		N (L) 82-142	Scraper Bar } See Following Page)
5.		O (R) 82-142	Scraper Bar } (For Details
		O (L) 82-142	Scraper Bar } See Following Page)
6.	1	F2 (R) 82-142 W	Spiral (As shown, Operator Side)
		F2 (L) 82-142 W	Spiral (Opposite Hand)
	6		Machine Bolt, Nut, & Lock Washer, ¾" x 5¾"
7.	1	3550	$3\frac{7}{16}$" Ball & Socket Bearing (Complete)
	2	MM-8-115	Bushing
8.	2	2915	Sprocket, 8-Tooth
	4	HH-17-34	Key, ⅝" x ⅝" x 5⅞"
	2	C-17-103	Bronze Washers
	2	D-17-164	Bronze Washers
9.	1	3550 A	$3\frac{7}{16}$" Ball & Socket Bearing (Complete)
	2	MM-8-115	Bushing
10.	1	A-82-11	Shaft, $3\frac{7}{16}$" x 4' 11¾", S.A.E. 1045
	2		¼" Button Head Alemite, Male

SPIRAL FEED WEARING STRIPS

(B/M 82-143-D)



Ref. No.	No. Req.	Part No.	Description
1.	3	A (R) 82-209	Wearing Strip (Operator Side)
	3	A (L) 82-209	Wearing Strip (Opposite Operator Side)
	18		Flat Head Cap Screw, Nut, & Lock Washer, ⅝" x 2"
2.	1	B (R) 82-209	Wearing Strip (Operator Side)
	1	B (L) 82-209	Wearing Strip (Opposite Operator Side)
	6		Flat Head Cap Screw, Nut, & Lock Washer, ⅝" x 2"
3.	1	C (R) 82-209	Wearing Strip (Operator Side)
	1	C (L) 82-209	Wearing Strip (Opposite Operator Side)
	6		Flat Head Cap Screw, Nut, & Lock Washer, ⅝" x 2"
4.	2	N (R) 82-142	Scraper Bar (Operator Side)
	2	N (L) 82-142	Scraper Bar (Opposite Operator Side)
	16		Flat Head Cap Screw, Nut, & Lock Washer, ⅝" x 2"

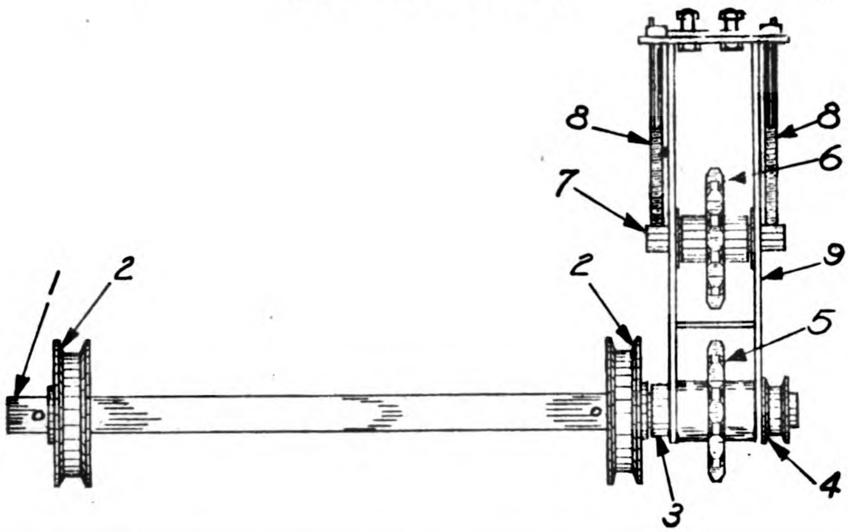
Spiral Feed Wearing Strips (continued)

Ref. No.	No. Req.	Part No.	Description
5.	2	O (R) 82-142	Scraper Bar, (Operator Side)
	2	O (L) 82-142	Scraper Bar, (Opposite Operator Side)
	8		Flat Head Cap Screw, Nut, & Lock Washer, ⅝" x 1¾"

NOTE: For Assembly of Wearing Strips See Boom Foot Shaft and Spiral on Preceding Pages.

BOOM PIVOT SHAFT

(From B/M 82-166-F1)



Ref. No.	No. Req.	Part No.	Description
1.	1	A1-82-166	Shaft, $2\frac{3}{16}$" x 4' $3\frac{1}{16}$", S.A.E. 1020
	2	R1-11	⅛" Button Head Alemite, Male
2.	2	694	Flanged Wheel
3.	1	G-3-945	Collar
4.	1	136 A	Collar
	1	R1-989	Low Head Set Screw, ⅝" x ¾"
5.	1	2983 B	Sprocket, 10-Tooth
	2	E-8-95	Bushing
6.	1	2983 C	Sprocket, 10-Tooth
	2	G-8-54	Bushing
7.	1	F-82-166	Shaft, $1\frac{11}{16}$" x 9" Cold Rolled Steel
	2	P-17-9	Washer
8.	2	A-17-24	Take-Up Bolt, ¾" x 14"
	1	T (R) 82-165	Take-Up Bolt Latch
	1	T (L) 82-165	Take-Up Bolt Latch
	2	R1-128	Machine Bolt, Nut, & Lock Washer, ½" x 2¼"
	2	AQ-17-10	Spacer

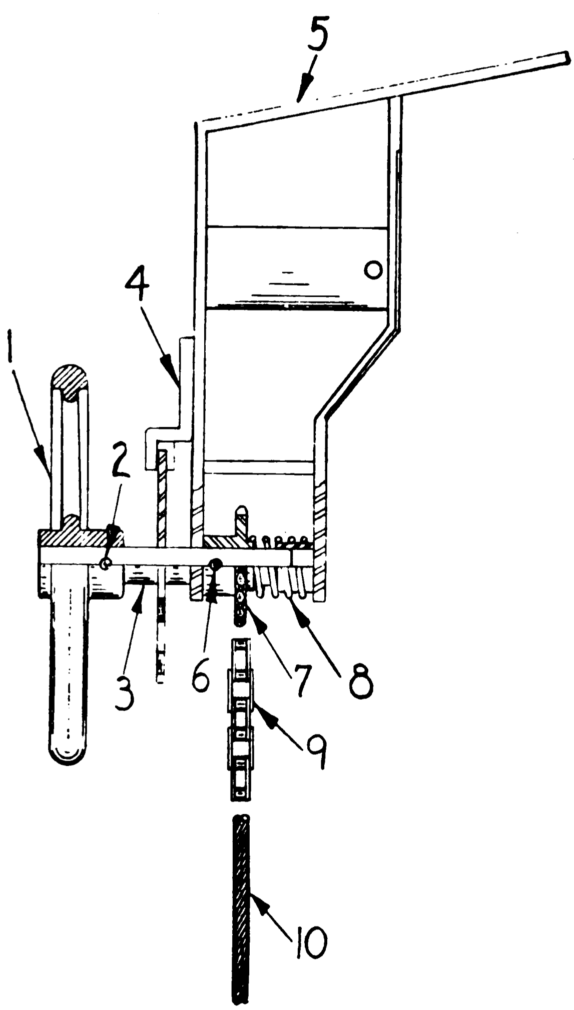
(continued on next page)

Boom Pivot Shaft (continued)

Ref. No.	No. Req.	Part No.	Description
	2	R1-127	Machine Bolt, Nut, & Lock Washer, ½"x2"
9.	1	M-82-165 W	Pivot Take-Up Support Frame
	1	N-82-165	Brace, ⅜" x 4" Bar
	2	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
	2	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"
	1	O-82-165	Brace, Upper ¼" Plate
	4	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
	2	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"

SWIVEL SPOUT CONTROL

(B/M 82-40-A2 & E)



(See parts list on following page)

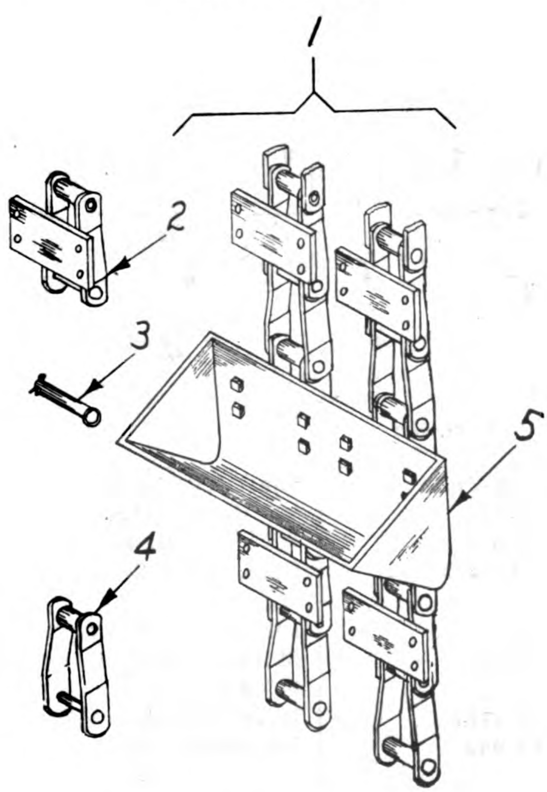
Swivel Spout Control (continued)

(See illustration on preceding page)

Ref. No.	No. Req.	Part No.	Description
1.	1	1392 D	Hand Wheel
2.	1	P-17-26	Pin
3.	1	DD1-82-39 W	Hand Wheel Shaft
4.	1	EE1-82-39 W	Hand Wheel Catch
	2	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"
5.	1	CC-82-39 W	Hand Wheel Bracket
	1	AY-17-25	Pin
	2	R1-612	Cotter, $\frac{3}{16}$" x 1"
6.	1	FH-17-26	Pin
7.	1	F-19-411	Sprocket, 13-Tooth
8.	1	C-46-173	Spring
9.	1	AO-6-51R	Strand Diamond Chain #433, 64-Links
10.	1	R1-898	Cable, ¼" x 20' 5" (8 x 19)
	1	R1-1087	Cable Thimble, ¼"
	4	R1-568	Cable Clamps, ¼"
	1	R1-1108	Turn Buckle, ⅜"
	2	R1-20	Fast Eye Blocks, #9
	2	R1-1114	Climax U-Bolt, & 4 Nuts, $\frac{5}{16}$"

BUCKET LINE WITH CHABELCO No. A-2842 CHAIN

(B/M 82-37-A1)



(See parts list on following page)

Bucket Line With Chabelco No. A-2842 Chain (continued)

(See illustration on preceding page)

Ref. No.	No. Req.	Part No.	Description
1.	2	BC-6-146R	Strands of Chabelco #A-2842 Chain 77 Links, with K22 Attachment B-6-25 W Every Second Link
2.	1	B-6-25 W	Attachment Link
3.	2	HH-26-F	Pin
	6	R1-621	Cotter, ¼" x 1⅛"
4.	1	A-6-146	Plain Link of Chabelco A-2842 Chain
5.	38	25-46-A	Bucket, 19" x 8" x 9¼"
	304	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"

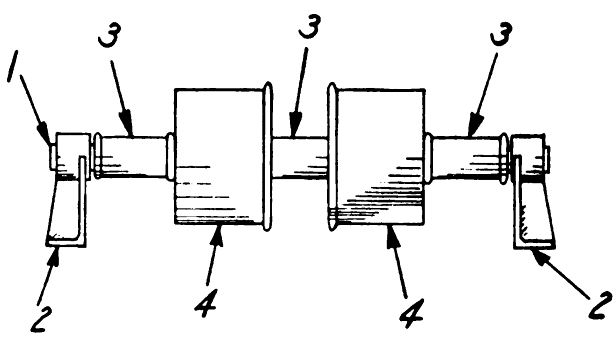
Additional Bucket Line—For 30" Extension

(B/M 82-37-F)

Ref. No.	No. Req.	Part No.	Description
1.	2	J-6-146R	Strands of Chabelco #A-2842 Chain 10 Links, with K22 Attachment B-6-25 W Every Second Link
5.	5	25-46-A	Bucket, 19" x 8" x 9¾"
	40	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"

BOOM IDLER SHAFT

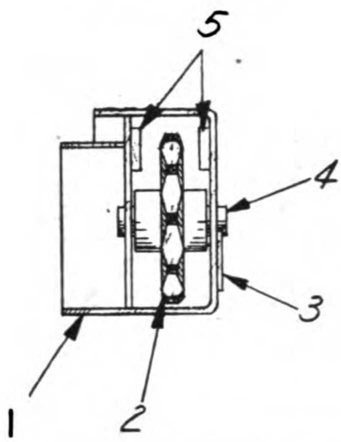
(B/M 82-211-A)



Ref. No.	No. Req.	Part No.	Description
1.	2	A-82-211	Shaft, $1\frac{7}{16}$" x 2' 5½", S.A.E. 1020
	4	R1-12	¼" Button Head Alemite, Male
	4	R1-339	⅜" x ¼" Reducing Bushing
	4	C-17-121	Pipe, ⅜" x 2"
2.	4	699	Idler Shaft Support
	8	R1-127	Machine Bolt, Nut, & Lock Washer, ½" x 2"
	8	R1-1161	Bevel Washer, ½"
	4	R1-942	Set Screw, ½" x 1"
3.	6	722	Spacer
4.	4	679-A	Roller

BUCKET LINE DRIVE CHAIN IDLER
For 30" Extended Boom Only

(B/M 38-245-B1)



Ref. No.	No. Req.	Part No.	Description
1.	1	H-38-245 W	Idler Support Bracket
	3	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"
2.	1	2983-C	Sprocket, 10-Tooth
	2	G-8-54	Bushing
3.	1	E-38-245	Keeper
	2	R1-103	Machine Bolt, Nut, & Lock Washer, ⅜" x 1¼"
4.	1	G1-38-245	Shaft, 1$\frac{11}{16}$" x 6¼", S.A.E. 1020
	1	R1-11	⅛" Button Head Alemite, Male
5.	2	C-38-245	Chain Guide Bar, 5"
	2	D-38-245	Chain Guide Bar, 3"
	2	R1-442	Flat Head Cap Screw, Nut, & Lock Washer, ½" x 1¾"

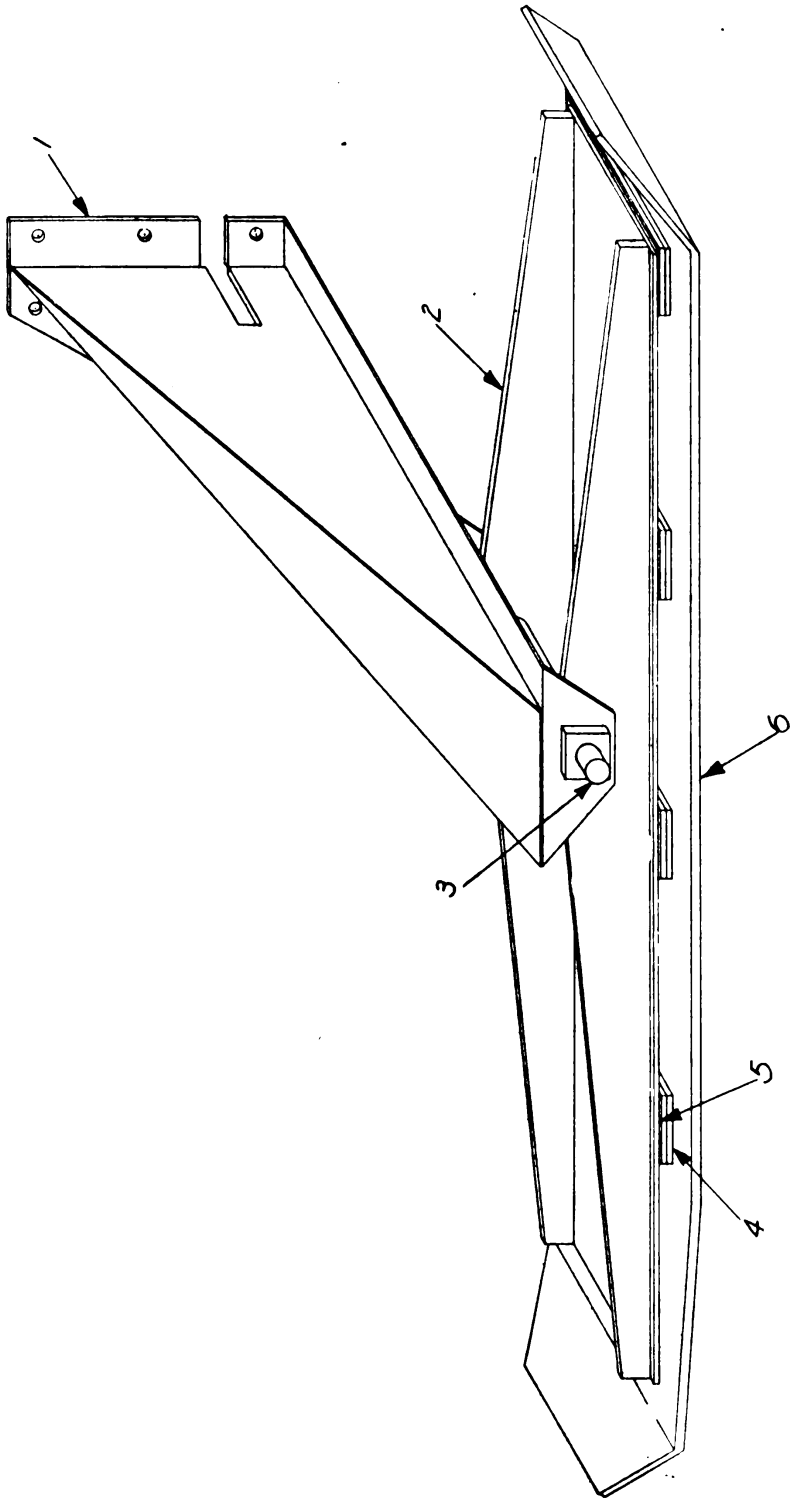
LONG SCRAPER SHOE

(B/M 82-215-A)

(See illustration on following page)

Ref. No.	No. Req.	Part No.	Description
1.	1	A (R) 82-216 W	Bracket (Opposite Operator Side Shown)
	1	A (L) 82-216 W	Bracket (Operator Side)
	12	R1-126	Machine Bolt, Nut, & Lock Washer, ½" x 1¾"
2.	2	B-82-216 W	Shoe Bracket
3.	2	GW-17-25	Shaft, 1" x 10⅛", S.A.E. 1020
	4	R1-625	Cotters, ¼" x 2"
4.	24	BF-17-110	Shim, ¼"
5.	8	BG-17-110	Shim, 12 Ga.
6.	2	H-82-217	Base Plate

Long Scraper Shoe (continued)

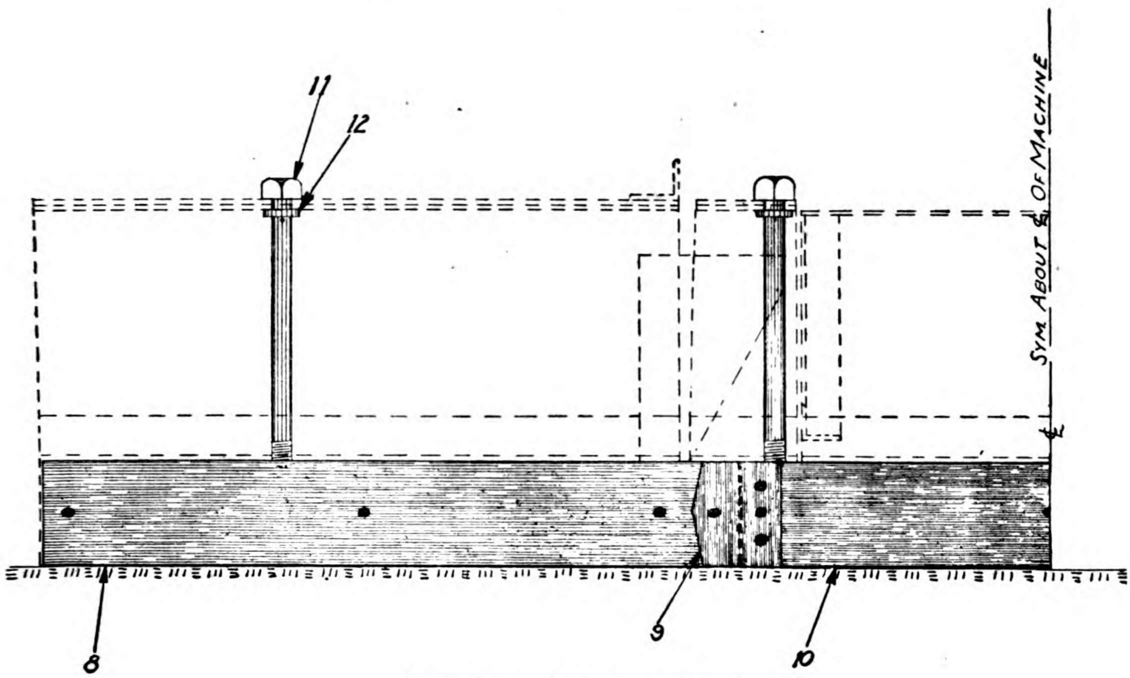


Ref. No.	No. Req.	Part No.	Description
	16	R1-307	Plow Bolt, Nut, & Lock Washer ½" x 2¼" (#3 Head)
	4	R1-306	Plow Bolt, Nut, & Lock Washer, ½" x 1½" (#3 Head)

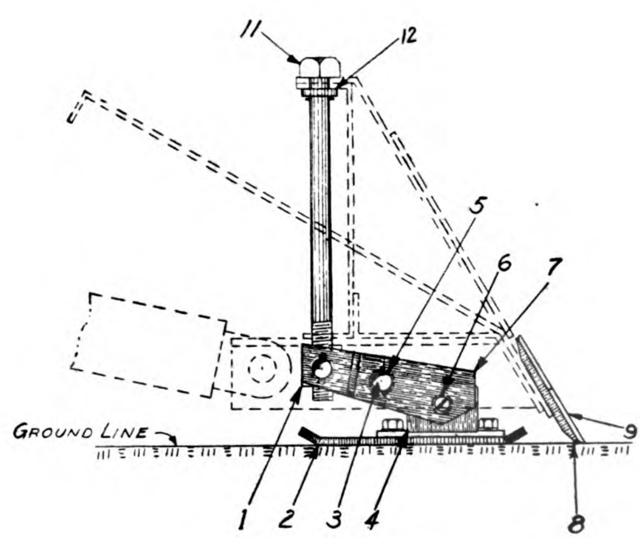
SCRAPER BLADE AND SHOES

From (B/M 62-239-A)
(B/M 62-239-B)
(B/M 82-85-A2)

(See parts list on following page)



Assembly of Scraper Blade



Side Elevation

Assembly of Scraper Shoes

Floating Scraper
Used with Paving Loaders

Scraper Blade and Shoes (continued)

Ref. No.	No. Req.	Part No.	Description
1.	4	E-62-239	Pivot Nut
2.	2	M-62-239	Outer Shoe, High Carbon Steel
	2	N-62-239	Center Shoe, High Carbon Steel
	8	R1-306	Plow Bolt, Nut, & Lock Washer, ½" x 1½", #3 Head
3.	4	AO-17-25	Pin
	8	R1-632	Cotter, ⅛" x 1¾"
4.	4	WU1 62-239-A	Bracket
5.	4	Z-17-13	Spacer
6.	8	AJ-17-11	Spacer
7.	4	A (R) 62-239	Side Plate (As Shown)
	4	A (L) 62-239	Side Plate (Opposite)
	8	R1-451	Flat Head Cap Screw, Nut, & Lock Washer, ⅝" x 1¼"
8.	2	D1-82-150	Scraper Side Blades
	6	R1-126	Machine Bolt, Nut, & Lock Washer, ½" x 1¾"
9.	2	J-62-243	Hinge Plate
	4	R1-441	Flat Head Cap Screw, Nut, & Lock Washer, ½" x 1½"
	2	R1-127	Machine Bolt, Nut, & Lock Washer, ½" x 2"
	2	Z-17-12	Spacer
	2	R1-174	Machine Bolt, Nut, & Lock Washer, ¾" x 2¼"
10.	1	AB-62-243	Scraper Center Blade
	1	R1-126	Machine Bolt, Nut, & Lock Washer, ½" x 1¾"
11.	4	F-62-239	Special Machine Bolt, 1" x 16"
	4	R1-623	Cotter, ¼" x 1½"
12.	4	E-3-952	Collar
	8	R1-623	Cotter, ¼" x 1½"

HOIST, SHEAVES & CABLE

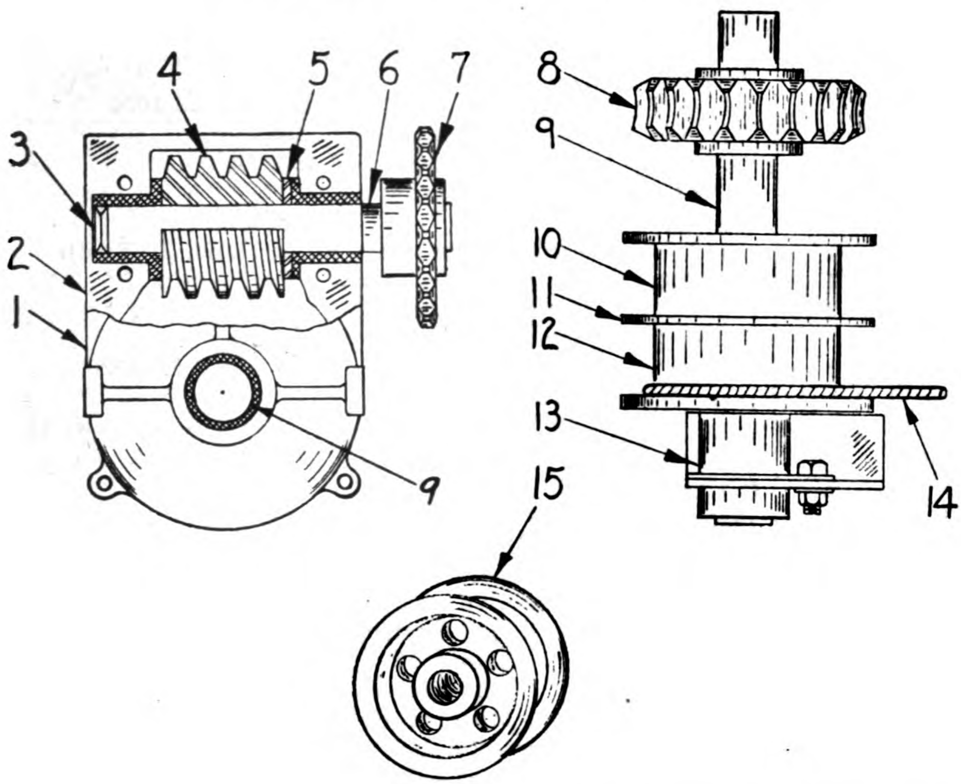
(B/M 82-118-A1)

(B/M 82-93-A3)

(See illustrations on next page)

Ref. No.	No. Req.	Part No.	Description
1.	1	N-82-61 WB	Worm Gear Housing
	4	BB-17-43	Pipe, ¼" x 4½"
	4	R1-683	Elbow, ¼" x 90°
	5	R1-649	Pipe Coupling, ¼"
	5	R1-12	¼" Button Head Alemite, Male
	1	CU-17-43	Pipe, ¾" x 7"
	2	B-17-123	Pipe, ¾" x 2"

Hoist, Sheaves & Cable (continued)



Ref. No.	No. Req.	Part No.	Description
	2	R1-408	Pipe Cap, ¾"
	2	R1-688	Elbow, ¾" x 90°
	2	R1-127	Machine Bolt, Nut, & Lock Washer, ½" x 2"
	1	R1-504	Cap Screw, & Lock Washer, ½" x 1¾"
	2	AF-17-43	Pipe, ¼" x 2½"
	2	C-17-43	Pipe, ¼" x ⅞"
	1	X-17-43	Pipe, ¼" x 7"
	1	R1-826	Pet Cock, ¼"
	1	CT-17-43	Pipe, ¾" x 5"
2.	1	A-3-224	Gasket
	2	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"
	4	R1-133	Machine Bolt, Nut, & Lock Washer, ½" x 3½"
	2	R1-126	Machine Bolt, Nut, & Lock Washer, ½" x 1¾"
	1	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
	4	R1-1168	Cut Washer, ½"
3.	2	C-18-49	Thrust Button
4.	1	E-18-68	Worm, Right Hand, Single Thread
	1	A-17-65	Taper Key, ⅜" x ⅜" x 3$\frac{15}{16}$"

(continued on next page)

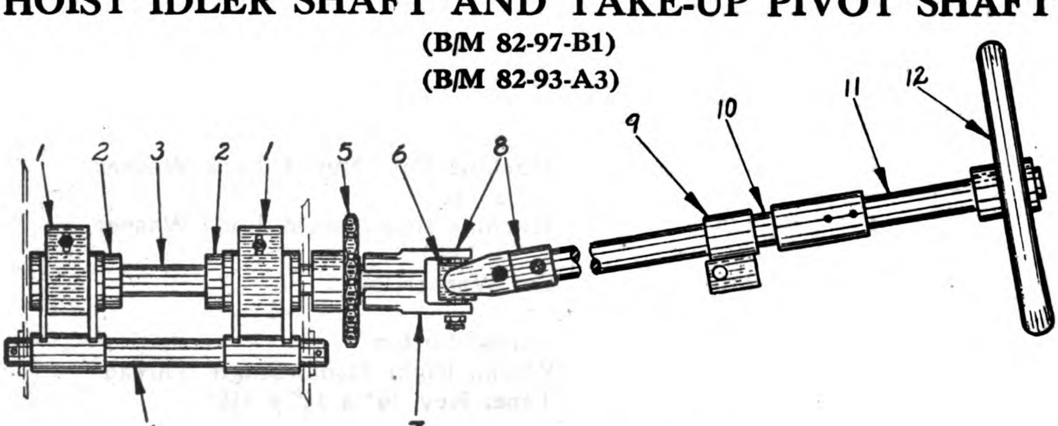
Hoist, Sheaves & Cable (continued)

Ref. No.	No. Req.	Part No.	Description
5.	1	D-17-63	Washer
6.	1	A-82-109	Shaft, 1$\frac{11}{16}$" x 11¼", S.A.E. 1020
7.	1	C-19-498	Sprocket, 19-Tooth
	1	R1-940	Set Screw, ½" x ¾"
	1	R1-942	Set Screw, ½" x 1"
	1	E-17-32	Key, ⅜" x ⅜" x 2¼"
8.	1	1639	Worm Gear, Right Hand, 21-Tooth
	1	Z-17-33	Key, ½" x ½" x 2⅝"
	2	R1-935	Set Screw, ⅜" x 1"
9.	1	C-82-61	Shaft, 1$\frac{15}{16}$" x 1' 4⅝", S.A.E. 1020
10.	1	1630	Drum
	2	R1-1029	Allen Cup Point Safety Set Screw, ⅝"x⅝"
11.	1	C-3-265	Drum Plate
12.	1	1630 A	Drum
	2	R1-1029	Allen Cup Point Safety Set Screw, ⅝"x⅝"
	1	AY-17-33	Key, ½" x ½" x 5¾"
13.	1	13-192-A	1$\frac{15}{16}$" Bearing
	2	E-13-192	Shim, ¼"
	5	F-13-192	Shim, 16 Ga.
	3	R1-128	Machine Bolt, Nut, & Lock Washer, ½" x 2¼"
	1	Y-17-43	Grease Pipe, ¼" x 3½"
	1	R1-649	Pipe Coupling, ¼"
	1	R1-12	¼" Button Head Alemite, Male
14.	1	R1-911	Cable, ⅜" x 56'-0", 6 x 19
	4	R1-570	Cable Clamp, ⅜"
	2	R1-1089	Cable Thimble, ⅜"
15.	9	868 A	Sheave
	9	K-17-14	Bushing
	3	R1-176	Machine Bolt, Nut, & Lock Washer, ¾" x 2¾"
	4	R1-177	Machine Bolt, Nut, & Lock Washer, ¾"x3"
	2	R1-459	Flat Head Cap Screw, Nut, & Lock Washer, ¾" x 3½"

HOIST IDLER SHAFT AND TAKE-UP PIVOT SHAFT

(B/M 82-97-B1)

(B/M 82-93-A3)



(See parts list on following page)

Hoist Idler Shaft and Take-up Pivot Shaft (continued)

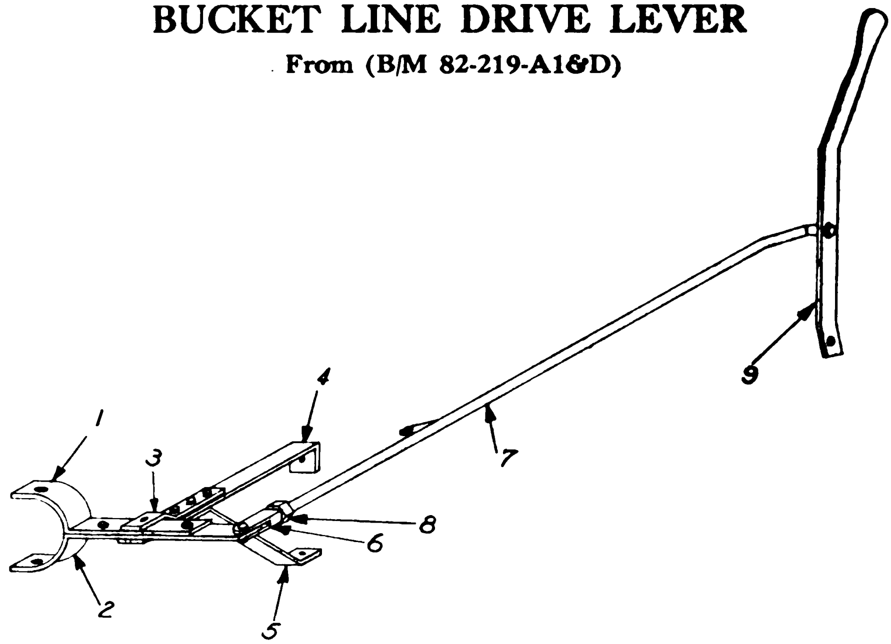
(See illustration on preceding page)

Ref. No.	No. Req.	Part No.	Description
1.	2	E-82-97 WB	Hoist Bracket
	2	BK-17-24	Take-Up Bolt, ½" x 3¼"
	5	R1-801	Half Nut, ½"
	3	R1-1168	Standard Cut Washer, ½"
	2	R1-11	⅛" Button Head Alemite, Male
2.	2	O-3-932	Collar
	2	R1-1009	Allen Cup Point Safety Set Screw, ⅜"x¼"
3.	1	C-82-96	Hoist Idler Shaft, 1$\frac{7}{16}$" x 1' 3$\frac{11}{16}$", S.A.E. #1020
4.	1	D-82-97	Take-Up Pivot Shaft, 1" x 1' 0-¾", S.A.E. #1020
	2	R1-623	Cotter, ¼" x 1½"
5.	1	19-475-A	Sprocket, 15-Tooth
	1	R1-932	Set Screw, ⅜" x ⅝"
	1	R1-934	Set Screw, ⅜" x ⅞"
	1	E-17-30	Key, ¼" x ¼" x 2"
6.	1	A-3-897	Universal Joint Connector
7.	1	3317-A	Universal Fork Half
	1	R1-11	⅛" Button Head Alemite, Male
	1	R1-131	Machine Bolt, Nut, & Lock Washer, ½"x3"
	1	R1-132	Machine Bolt, Nut, & Lock Washer, ½" x 3¼"
8.	3	3317	Universal Fork Half
	1	R1-131	Machine Bolt, Nut, & Lock Washer, ½"x3"
	1	R1-132	Machine Bolt, Nut, & Lock Washer, ½" x 3¼"
9.	1	J-82-96 W	Hand Wheel Shaft Bracket
10.	1	K-82-96 W	Hand Wheel Shaft, 1$\frac{7}{16}$" x 2'0⅝", S.A.E. #1020
	2	R1-107	Machine Bolt, Nut, & Lock Washer, ⅜" x 2¼"
11.	1	H1-82-96	Hand Wheel Shaft, 1$\frac{7}{16}$" x 1' 1¾", S.A.E. #1020
12.	1	1392-A	Hand Wheel
	1	H-17-30	Key, ¼" x ¼" x 2½"
	2	R1-1011	Allen Cup Point Safety Set Screw, ⅜"x⅜"

Always Give Serial Number of Machine, Parts Number and Description

BUCKET LINE DRIVE LEVER

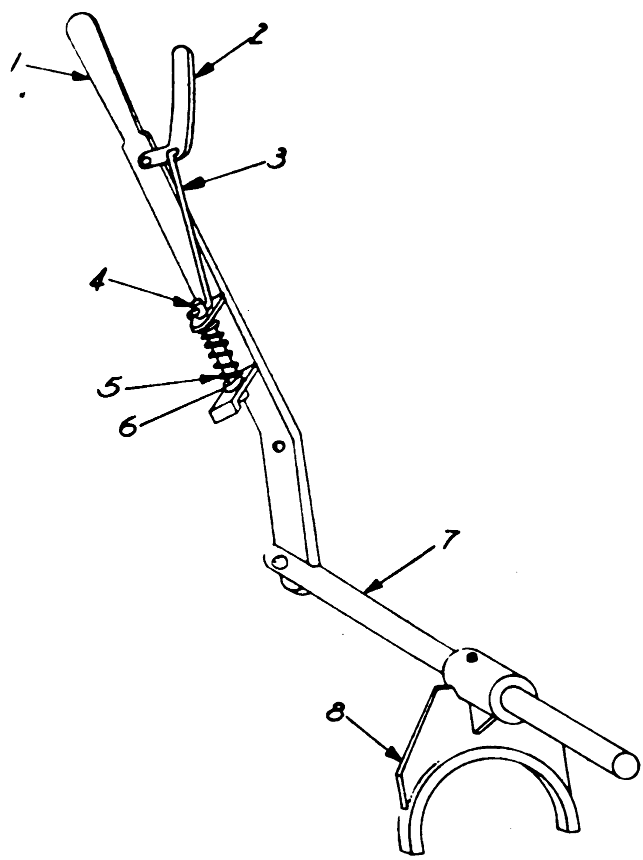
From (B/M 82-219-A1&D)



Ref. No.	No. Req.	Part No.	Description
1.	1	Z-82-219	Yoke Half (Upper)
2.	1	Y-82-219	Yoke Half (Lower)
	2	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
3.	1	F1-82-219	Pivot Bar
	1	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
	1	R1-127	Machine Bolt, Nut, & Lock Washer, ½" x 2"
	1	R1-441	Flat Head Cap Screw, Nut, & Lock Washer, ½" x 1½"
	1	P-17-23	Rivet, ½" x 2½"
	1	R1-605	Cotter, ⅛" x 1"
4.	1	N1-82-219	Pivot Support
	1	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
5.	1	G1-82-219	Brace
	1	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
6.	1	B-3-149	Yoke End
	1	C-17-23	Rivet, ½" x 1¾"
	1	R1-605	Cotter, ⅛" x 1"
7.	1	X-82-219-W	Rod
	1	G-42-47	Spring
	1	R1-605	Cotter, ⅛" x 1"
8.	1	R1-792	Hex Nut, ¾"
9.	1	S-82-41 W	Lever
	1	Z-17-23	Rivet, ½" x 1¼"
	1	R1-615	Cotter, ⅛" x 1½"

HIGH-LOW SPEED LEVER

From (B/M 82-179-A)

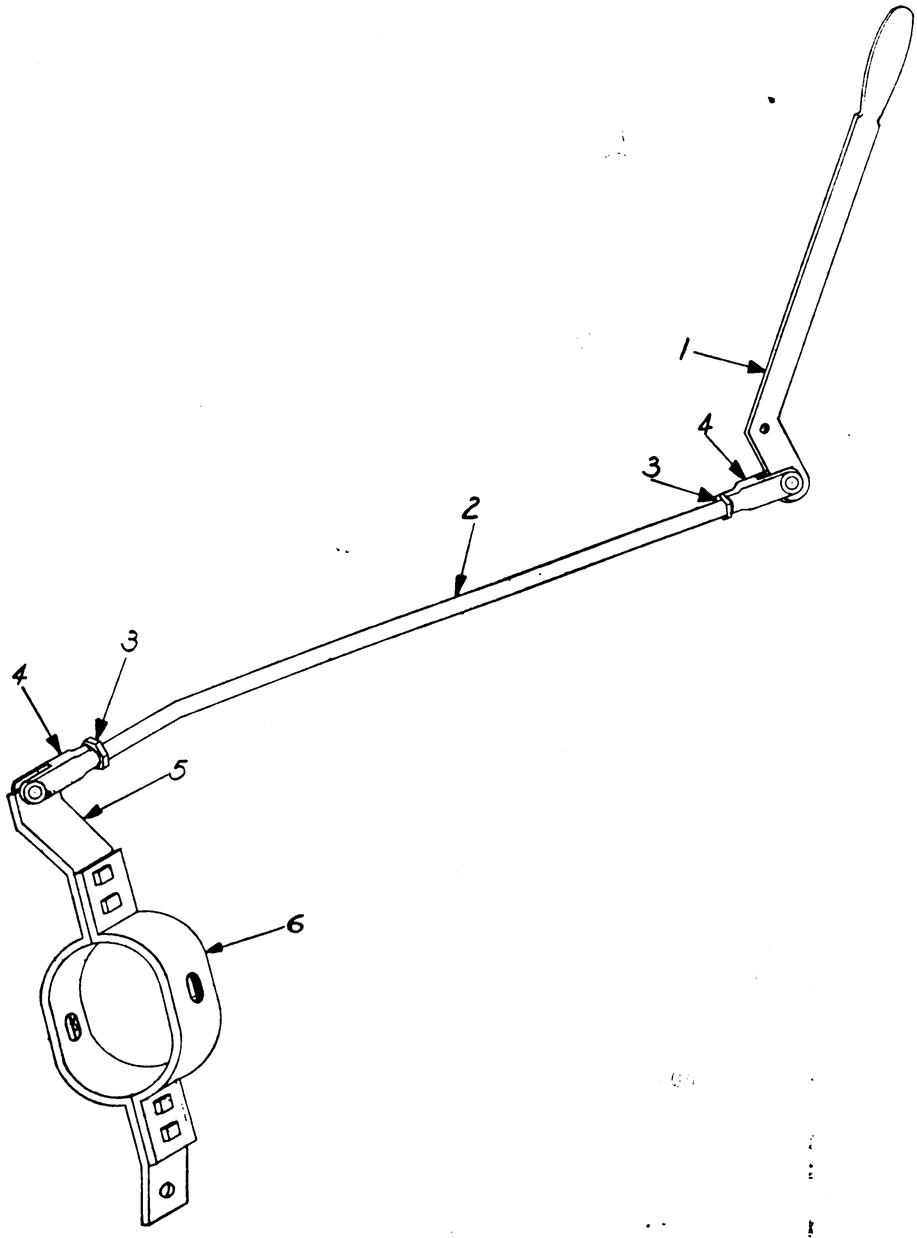


Ref. No.	No. Req.	Part No.	Description
1.	1	C-82-178 W	Lever
	1	O-17-23	Rivet, ½" x 1¼"
	1	KK-17-23	Rivet, ⅜" x 1¼"
	2	R1-604	Cotter, ⅛" x ¾"
2.	1	G-62-33	Grip Latch
	1	DC-17-23	Rivet, ¼" x 1⅛"
3.	1	N-82-45	Rod
	2	R1-601	Cotter, 3/32" x 1"
4.	1	N-62-33	Dog, ½" x 4⅝", S.A.E. 1020
5.	1	H-42-47	Spring
6.	1	J-62-33	Collar
	1	AA-17-26	Pin
7.	1	B-82-178	Shaft, 1" x 1' 5", S.A.E. 1020
8.	1	K-3-1003 W	Shifter Fork
	1	R1-933	Set Screw, ⅜" x ¾"

Always Give Serial Number of Machine, Parts Number and Description

HOIST LEVER

From (B/M 82-94-A1)



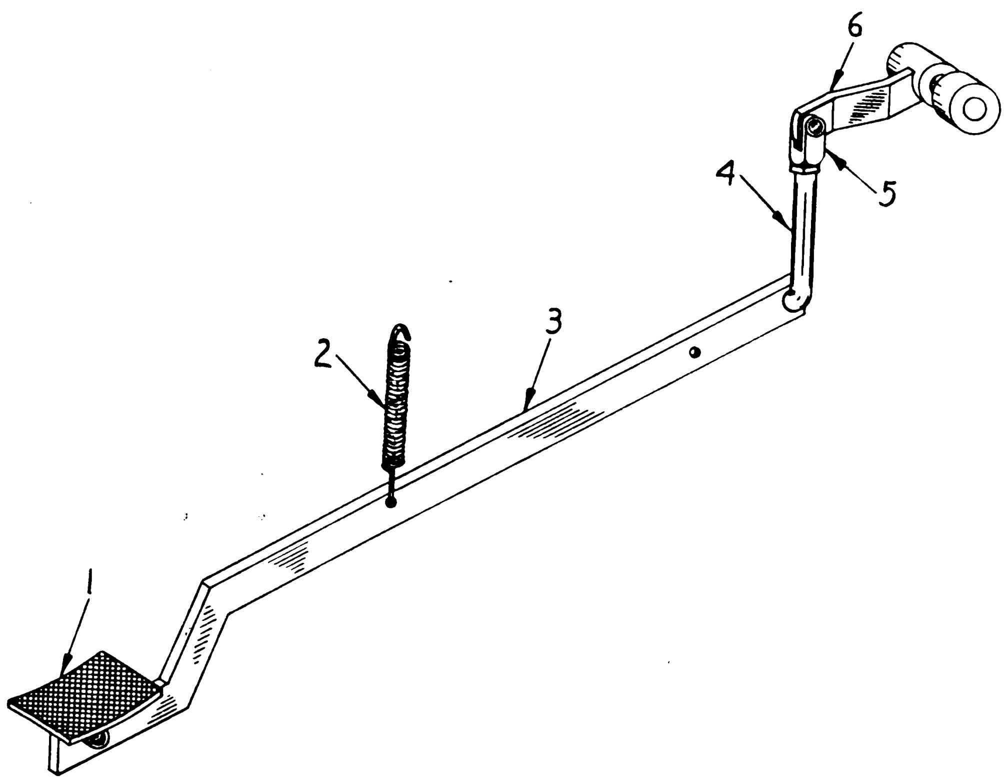
Ref. No.	No. Req.	Part No.	Description
1.	1	E-82-94 W	Lever
	1	V-17-27	Shaft, ⅝" x 3¼", S.A.E. 1020
	1	R1-615	Cotter, 5/32" x 1½"
	1	XX-17-11	Spacer
2.	1	B1-82-94	Rod, ¾" x 2' 8¼"
3.	2	R1-803	Half Nut, ¾"
4.	2	B-3-149	Yoke End
	2	R1-604	Cotter, ⅛" x ¾"
	2	UU-17-23	Rivet

Hoist Lever (continued)

Ref. No.	No. Req.	Part No.	Description
5.	1	D-82-94	Yoke Half (With Pivot)
6.	1	C-82-45	Yoke Half
	3	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
	1	R1-126	Machine Bolt, Nut, & Lock Washer, ½" x 1¾"
	1	R1-441	Flat Head Cap Screw, Nut, & Lock Washer, ½" x 1½"
	1	B-17-10	Spacer

MASTER CLUTCH LEVER

(B/M 82-243-A1)



Ref. No.	No. Req.	Part No.	Description
1.	1	C-3-149	Foot Lever Pad
	1	R1-215	Machine Bolt, Nut, & Lock Washer, & Cut Washer, ⅜" x 1½"
2.	1	C-46-154	Spring
3.	1	A1-82-243	Lever
	1	Z-17-23	Rivet
	1	R1-605	Cotter, ⅛" x 1"
4.	1	O-17-145	Rod, ¾" x 7"
	1	R1-803	Half Nut, ¾"
	1	R1-615	Cotter, ³⁄₁₆" x 1½"

(continued on next page)

Master Clutch Lever (continued)

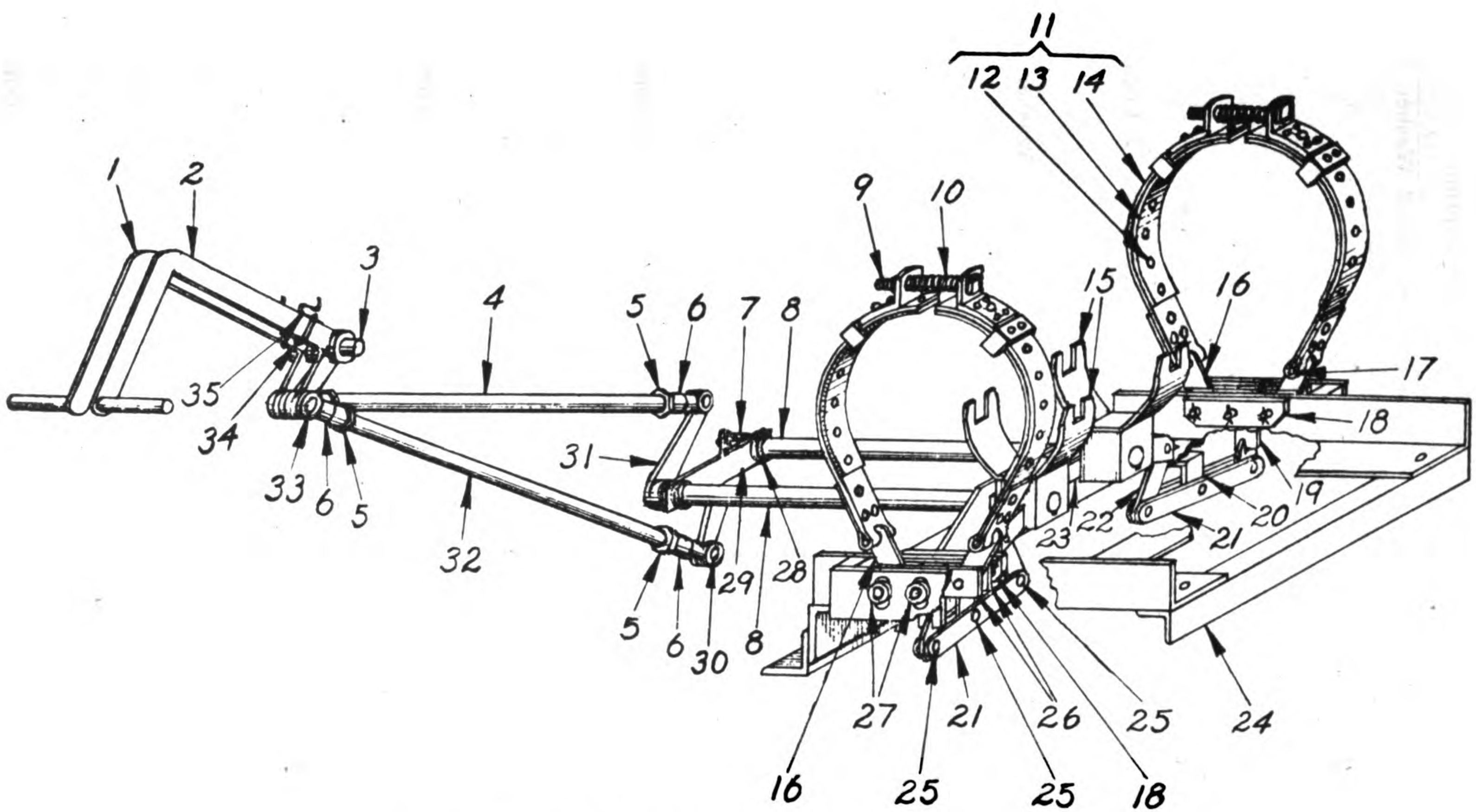
Ref. No.	No. Req.	Part No.	Description
5.	1	B-3-149	Yoke End
	1	C-17-23	Rivet
	1	R1-605	Cotter, ⅛" x 1"
6.	1	F-3-1209 W	Lever Arm
	1	R1-933	Set Screw, ⅜" x ¾"
	1	R1-935	Set Screw, ⅜" x 1"
6A.	1	C-17-30	Key, ¼" x ¼" x 1½"

STEERING LEVERS AND BRAKES

(B/M 82-106-A2)

(See illustrations on next page)

Ref. No.	No. Req.	Part No.	Description
1.	1	J (R) 82-43-W	Steering Lever
2.	1	J (L) 82-43-W	Steering Lever
3.	1	GG-17-25	Steering Lever Shaft
	2	R1-624	Cotter, ¼" x 1¾"
4.	1	C-82-43	Link Rod, ¾" x 2' 2 11/16"
5.	4	R1-792	Hex Nut, ¾"
6.	4	B-3-149	Yoke
7.	1	1715 A	Lever Arm
	1	C-17-30	Key, ¼" x ¼" x 1½"
	1	R1-129	Machine Bolt, Nut, & Lock Washer, ½" x 2½"
8.	2	A-82-43	Shifter Shaft, 1 5/16" x 2' 0 5/16"
9.	2	AZ-17-24	Machine Bolt, Nut, & Lock Washer, ½" x 6"
10.	2	H-42-47	Coil Spring
11.	4	C-82-206 R	Brake Band Half
12.	28	R1-892	Tubular Brass Rivets, #10 x 7/16"
13.	4	B-82-206	Brake Lining
14.	4	A-82-206	Brake Shoe
15.	2	G-3-395 W	Clutch Shifter Yoke
	4	R1-933	Set Screw, ⅜" x ¾"
	2	FZ-17-25	Yoke Pin, ½" x 2"
	4	R1-614	Cotter, 5/16" x 1¼"
	2	H-17-30	Key, ¼" x ¼" x 2½"
16.	4	K-82-202	Brake Link
17.	4	CZ-17-23	Button Head Rivet, ⅝" x 1¾"
	4	R1-605	Cotter, ⅛" x 1"
18.	2	Q-82-202	Retainer Bar
19.	2	C1-3-1057 W	Link
20.	2	M1-82-202	Lever Hanger
	2	R1-225	Machine Bolt, Nut, Lock Washer, & Cut Washer, ½" x 1¾"



STEERING LEVERS AND BRAKES

(continued on next page)

Steering Levers and Brakes (continued)

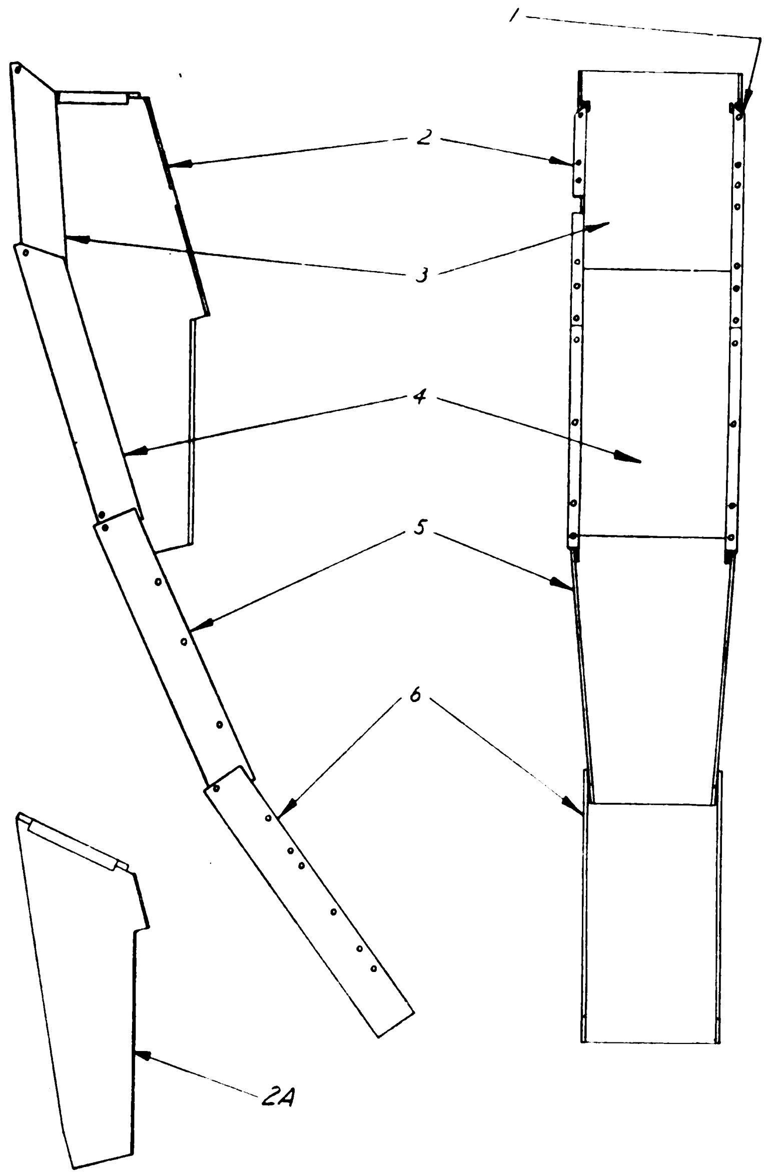
(See illustration on preceding page)

Ref. No.	No. Req.	Part No.	Description
	2	R1-226	Machine Bolt, Nut, Lock Washer, & Cut Washer, ½" x 2"
	2	Q-17-139	Shim, 16 Ga.
	2	S-17-139	Shim, 12 Ga.
	2	VV-17-139	Shim, 14 Ga.
	2	WW-17-139	Shim, 24 Ga.
21.	4	P-82-202	Lever Arm
22.	2	J1-82-202	Yoke to Lever Arm Link
23.	1	N-82-202	Spacer Bar
	2	R1-440	Flat Head Cap Screw, Nut, & Lock Washer, ½" x 1¼"
24.	1	H1-82-202 W	Lever Support
	6	R1-278	Machine Bolt, Nut, Lock Washer, & Two Cut Washers, ½" x 1½"
25.	6	FY-17-25	Lever Pin, ½" x 1⅝"
	12	R1-614	Cotter, $\frac{3}{16}$" x 1¼"
26.	4	O-82-202	Equalizer Lever Arm
27.	6	D-3-1057 W	Link Pin
	6	R1-614	Cotter, $\frac{3}{16}$" x 1¼"
28.	2	T-3-932	Collar
	2	R1-933	Set Screw, ⅜" x ¾"
29.	1	N-82-44	Bearing Bar
	2	R1-124	Machine Bolt, Nut, & Lock Washer, ½" x 1¼"
30.	2	C-17-23	Button Head Rivet, ½" x 1¾"
	2	R1-605	Cotter, ⅛" x 1"
31.	1	1715 C	Lever Arm
	1	C-17-30	Key, ¼" x ¼" x 1½"
	1	R1-129	Machine Bolt, Nut, & Lock Washer, ½" x 2½"
32.	1	D-82-43	Link Rod, ¾" x 2' 0"
33.	2	A-17-27	Lever Pin, ½" x 1½"
	2	R1-609	Cotter, ⅛" x 2"
34.	2	B-46-268	U-Bolt, ¼"
	4	R1-787	Hex Nut, ¼"
35.	2	A-46-268	Steering Lever Spring

Always Give Serial Number of Machine, Parts Number and Description

BOOM DUST CHUTE

(B/M 82-21-B2)
(B/M 82-185-C)



Ref. No.	No. Req.	Part No.	Description
1.	1	H (L) 82-257 W	Chute Side Plate (Opposite Operator Side) (For 30" Extended Boom Only)
2.	1	H (R) 82-257 W	Chute Side Plate (Operator Side) (For 30" Extended Boom Only)
	6	R1-223	Machine Bolt, Nut, & Lock Washer, & Cut Washer, ½" x 1¼"
	8	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
	8	R1-1161	Bevel Washer, ½"

(continued on next page)

Boom Dust Cover (continued)

Ref. No.	No. Req.	Part No.	Description
2a.	1	D (R) 82-257 W	Chute Side Plate (Operator Side) (For Standard Boom Only)
	1	D (L) 82-257 W	Chute Side Plate (Opposite Operator Side) (For Standard Boom Only)
	4	R1-224	Machine Bolt, Nut, & Lock Washer, & Cut Washer, ½" x 1½"
3.	1	C-82-185	Dust Chute Pan (30" Extension Only)
	2	R1-102	Machine Bolt, Nut, & Lock Washer, ⅜" x ⅞"
4.	1	A-82-21	Dust Chute Pan
	2	R1-563	Twisted Chain, 3/16" x 32"
	4	R1-102	Machine Bolt, Nut, & Lock Washer, ⅜"x1"
	2	R1-102	Machine Bolt, Nut, & Lock Washer, ⅜" x ⅞"
5.	1	B-82-21	Dust Chute Pan
	2	R1-562	Twisted Chain, 3/16" x 28"
	4	R1-102	Machine Bolt, Nut, & Lock Washer, ⅜"x1"
	8	R1-748	3/16" Tracer Repair Link
6.	1	D-82-21	Dust Chute Pan
	2	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
	2	R1-104	Machine Bolt, Nut, & Lock Washer, ⅜" x 1½"
	6	R1-223	Machine Bolt, Nut, Lock Washer & Cut Washer, ½" x 1¼"

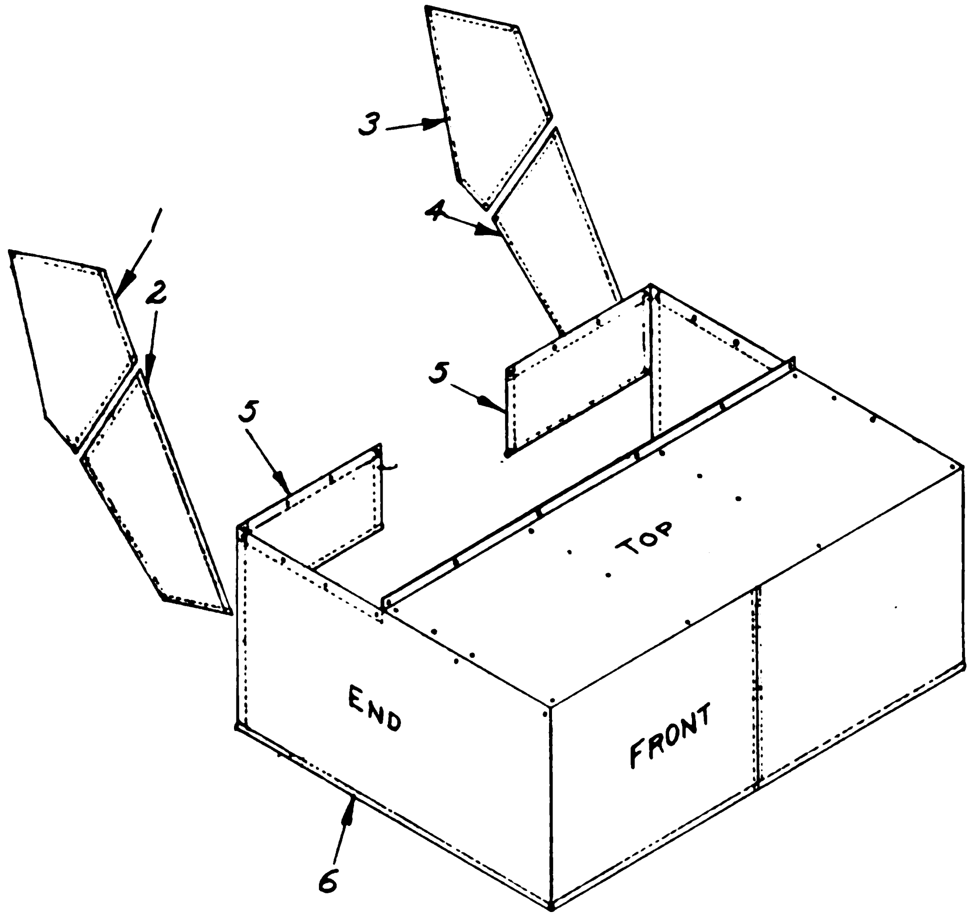
CANVAS COVERS for SPIRAL and RETURN CHUTE

(B/M 82-187-A1 & B1)

(See illustration on next page)

Ref. No.	No. Req.	Part No.	Description
1.	1	H1 (R) 82-187	Dust Chute Upper Side Cover (Operator's Side)
	2	R1-223	Machine Bolt, Nut, Lock Washer, & Cut Washer, ½" x 1¼"
	1	R1-213	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅜" x 1"
2.	1	K (R) 82-187	Dust Chute Lower Side Cover (Operator's Side)
	1	R1-223	Machine Bolt, Nut, Lock Washer, & Cut Washer, ½" x 1¼"
	3	R1-213	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅜" x 1"
3.	1	H1 (L) 82-187	Dust Chute Upper Side Cover (Opposite Operator's Side)
	2	R1-223	Machine Bolt, Nut, Lock Washer, & Cut Washer, ½" x 1¼"

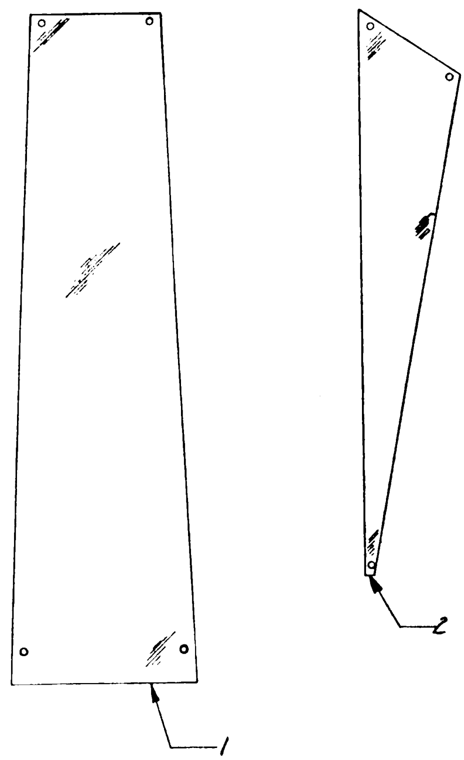
Canvas Covers for Spiral and Return Chute (continued)



Ref. No.	No. Req.	Part No.	Description
	1	R1-213	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅜" x 1"
4.	1	K (L) 82-187	Dust Chute Lower Side Cover (Opposite Operator's Side)
	1	R1-223	Machine Bolt, Nut, Lock Washer, & Cut Washer, ½" x 1¼"
	3	R1-213	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅜" x 1"
5.	2	A-82-187	Canvas Housing Rear Panels
	8	R1-214	Machine Bolt, Nut, & Lock Washer, ⅜" x 1¼"
6.	1	A-82-188	Canvas Housing For Spiral
	4	R1-102	Machine Bolt, Nut, & Lock Washer, ⅜" x 1"
	16	R1-213	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅜" x 1"
	14	R1-223	Machine Bolt, Nut, Lock Washer, & Cut Washer, ½" x 1¼"

SWIVEL SPOUT AND LINER PLATES

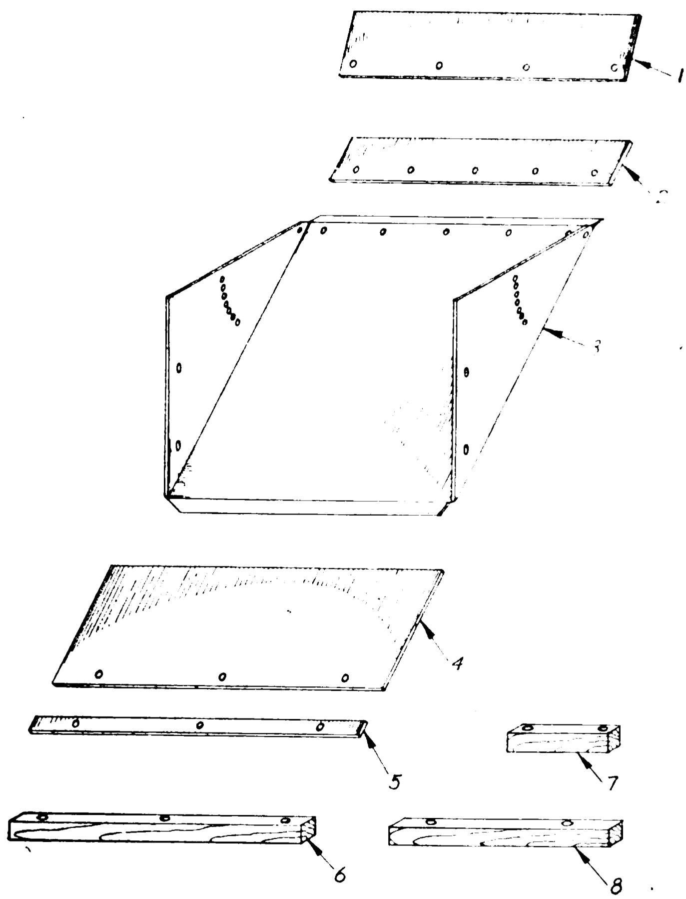
From (B/M 82-38-A1)



Ref. No.	No. Req.	Part No.	Description
	1	82-38-A1	Swivel Spout Complete with Support Frame, Control Sheave, Spout Yoke and Spout
1.	1	N-42-43	Bottom Liner Plate
	2	R1-101	Machine Bolt, Nut, & Lock Washer, 3/8" x 3/4"
	2	R1-434	Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 1"
2.	2	M-42-43	Side Liner Plate
	6	R1-101	Machine Bolt, Nut, & Lock Washer, 3/8" x 3/4"

Always Give Serial Number of Machine, Parts Number and Description

DISCHARGE SPOUT AND FLASHING
(Mixer Travel Plant)
(B/M 848-135-A&B)



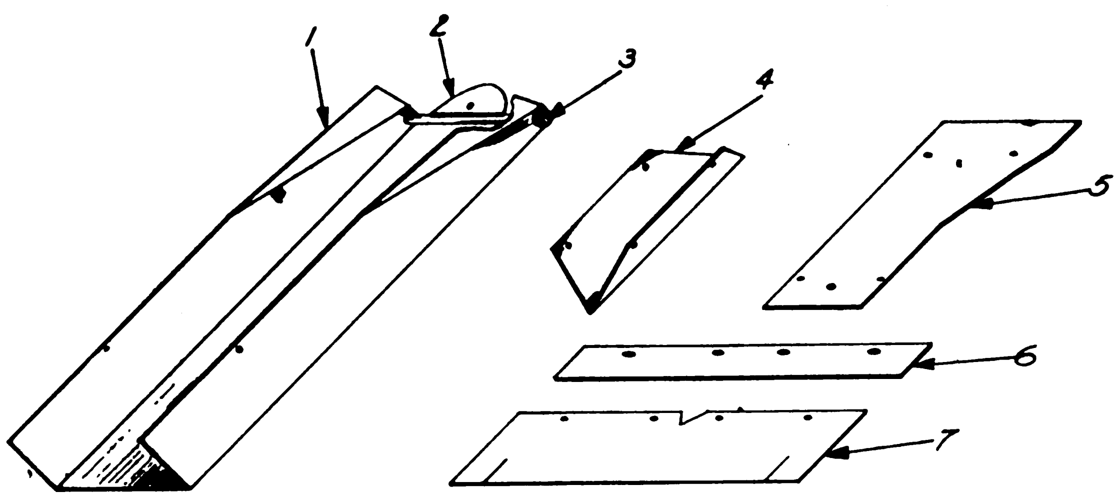
Ref. No.	No. Req.	Part No.	Description
1.	1	C-82-104	Patch Plate
	4	R1-213	Machine Bolt, Nut, Lock Washer, & Cut Washer, 3/8" x 1"
2.	1	B-82-104	Rubber Flashing
	5	R1-332	Stove Bolt, Nut, Lock Washer, & Cut Washer, 1/4" x 1"
3.	1	A-82-104	Spout
	4	R1-213	Machine Bolt, Nut, Lock Washer, & Cut Washer, 3/8" x 1"
4.	1	G-848-136	Rubber Flashing
5.	1	H-848-136	Hold Down Bar
	3	R1-435	Flat Head Cap Screw, Nut, & Lock Washer, 3/8" x 1 1/4"
6.	1	K-848-136	End Wood Block
	3	R1-217	Machine Bolt, Nut, Lock Washer, & Cut Washer, 3/8" x 2"

(continued on next page)

Discharge Spout and Flashing (continued)

Ref. No.	No. Req.	Part No.	Description
7.	2	M-848-136	Side, Vertical Wood Block
	4	R1-217	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅜" x 2"
8.	2	J-848-136	Side, Horizontal Wood Block
	4	R1-217	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅜" x 2"
	2	R1-565	Strand 31 Links Twisted Chain, $\frac{3}{16}$"
	2	R1-564	Strand 17 Links Twisted Chain, $\frac{3}{16}$"
	8	R1-748	Trace Repair Links
	4	R1-213	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅜" x 1"

TWIN DISCHARGE CHUTES
(Travel Dryer)
From (B/M 833-66-A)



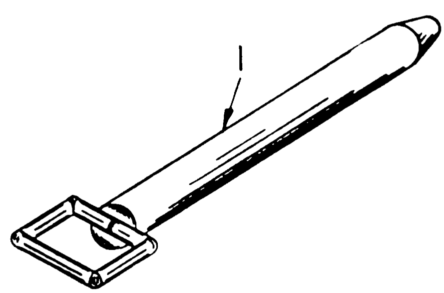
Ref. No.	No. Req.	Part No.	Description
1.	1	B (R) 833-66 W	Discharge Chute (Operator Side)
	1	B (L) 833-66 W	Discharge Chute (Opposite Operator Side)
	4	B-46-277	Spring
	4	K-833-66	Support Bar
	2	R1-101	Machine Bolt, Nut, & Lock Washer, ⅜" x ¾"
2.	2	E-833-66 W	Hinge
	2	A-17-10	Spacer
	2	R1-125	Machine Bolt, Nut, & Lock Washer, ½" x 1½"
3.	2	FW-17-25	Hinge Rod
	4	R1-607	Cotter, ⅛" x 1½"

Twin Discharge Chutes (continued)

Ref. No.	No. Req.	Part No.	Description
4.	1	C-833-67	Center Liner Plate
	4	R1-435	Flat Head Cap Screw, Nut, & Lock Washer, ⅜" x 1¼"
5.	1	F (R) 833-67	Hopper Liner (Operator Side)
	1	F (L) 833-67	Hopper Liner (Opposite Operator Side)
	4	R1-435	Flat Head Cap Screw, Nut, & Lock Washer, ⅜" x 1¼"
	4	R1-103	Machine Bolt, Nut, & Lock Washer, ⅜" x 1¼"
6.	1	C-833-66	Backing Bar
	4	R1-214	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅜" x 1¼"
7.	1	D-833-66	Flashing
	4	R1-214	Machine Bolt, Nut, Lock Washer, & Cut Washer, ⅜" x 1¼"

DRAW BAR PIN

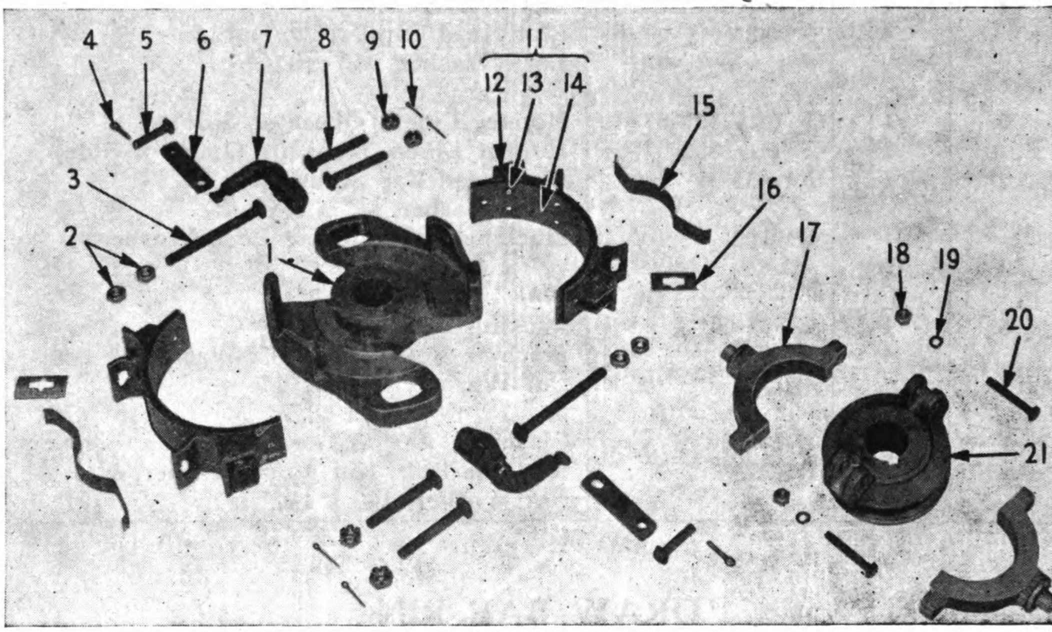
From (B/M 848-140-A)



Ref. No.	No. Req.	Part No.	Description
1.	1	A-3-1037 W	Draw Bar Pin

Always Give Serial Number of Machine, Parts Number and Description

B-G 8" FRICTION CLUTCH



Ref. No.	No. Req.	Part No.	Description
1.	1	3436	Clutch Carrier
2.	4	R1-801	Half Nut, ½"
3.	2	C-46-208	Machine Bolt, ½" x 5¾"
4.	2	R1-605	Cotter, ⅛" x 1"
5.	2	C-3-1011	Toggle Pin
6.	2	A-3-1011	Toggle Link
7.	2	A-3-1010	Clutch Lever
8.	4	B-46-208	Machine Bolt, ½" x 3½"
9.	4	D-46-208	Slotted Nut, ½"
10.	4	R1-606	Cotter, ⅛" x 1¼"
11.	2	A-3-1008 WR	Clutch Band Half (Complete)
13.	24	R1-892	Rivet, Tubular #10 x $\frac{7}{16}$"
14.	2	F-3-1008	Clutch Lining
15.	2	B-3-1011	Spring
16.	1	A-3-1007	Shim, 10 Ga.
16.	1	C-3-1007	Shim, 14 Ga.
17.	1	897	Shifter Yoke
18.	2	R1-789	Hex Nut, ⅜"
19.	2	R1-1179	Lock Washer, ⅜"
20.	2	R1-36	Machine Bolt, ⅜" x 2¼"
21.	1	3438	Shifter Collar

Always Give Serial Number of Machine, Parts Number and Description

GASOLINE TANK

B/M 82-218-C

Ref. No.	No. Req.	Part No.	Description
	1	F-82-218W	Gasoline Tank, 25 U. S. Gallons
	3	R1-223	Machine Bolt, Nut & Lock Washer, & Cut Washer, ½" x 1¼"
	1	C-46-100S	Utility Coupling
	1	R1-718	Street Elbow, ¼" x 90°
	1	R1-826	Pet Cock, ¼"
	1	R1-871	Pipe Plug, 1¼"
	1	F-17-202W	Elbow, 1¼" x 30°
	1	D-17-45	Pipe Cap, 1¼"
	1	GG-17-125	Pipe, 1¼" x 1'-3"
	1	R1-1093	Copper Tube, 5/16" x 6'-0"
	1	R1-710	Elbow, Imperial #69F, 5/16" OD, ⅛" I PT
	1	N-17-125	Pipe, 1¼" x 1'-0"

TOOLS—82-A

B/M 82-6-E

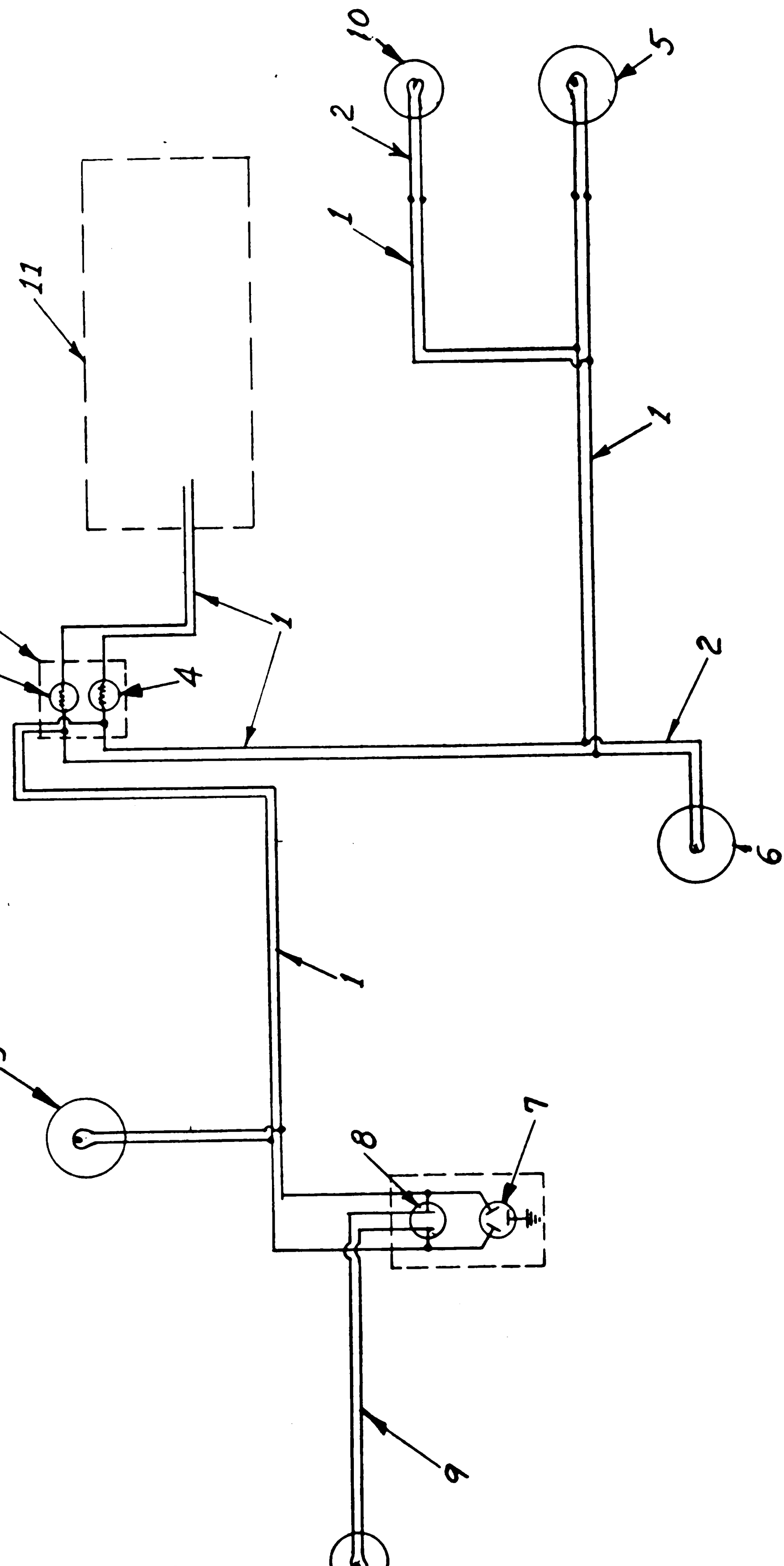
Ref. No.	No. Req.	Part No.	Description
	1	B-46-20	Engineer's Wrench, ⅜" x ½"
	1	WW-46-20	Engineer's Wrench, ⅝" x ¾"
	1	E-46-20	Construction Wrench, 1"
	1	MM-46-20	Adjustable Wrench, 12"
	1	M-46-20	Allen Set Screw Wrench, ⅜"
	1	BB-46-20	Oil Can
	1	AN-46-20	Alemite Gat Gun
	1	AH-46-20	Heavy Duty Ind. Hose (For Gat Gun)
	1	ZZ-46-20	Check Nut Wrench, ½" x ⅝"
	1	G-46-219	Crank Case Plug Wrench, ⅝" x ⅝" x 4"
	1	G-46-20	Construction Wrench, 1½"
	1	R1-1240	Buda Spanner Wrench
	1	R1-1241	Bendix Magneto Wrench
	2	B-62-241	Shim, ½"
	4	C-62-241	Shim, ¼"
	2	R1-154	Machine Bolt, Nut & Lock Washer, ⅝" x 3½"

LIGHTING SYSTEM

From B/M 82-282-A

Ref. No.	No. Req.	Part No.	Description
1	1	R1-397	#14-2 B. X. L. Cable x 32'-0"
2	1	R1-1192	#14 Solid Single Braid Rubber Covered Wire x 8'-0"
3	1	EL-FB-B	Fuse Plug, cut-out, double pole, mainline. 30 Amp.—125 V.

(continued on next page)


10
5
2
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11
3
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1
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7
9

Lighting System (continued)

Ref. No.	No. Req.	Part No.	Description
	2	R1-320	Round Head Stove Bolt Nut, and Lockwasher, 3/16" x 3/4"
4.	2	EL-FS-B6	6 Amp. 110 Volt Plug Fuse
5.	2	EL-LA-C	Flood Lamp, Steber No. 572, includes the following four items:
	2	EL-LA-C-1	Body with Reflector and Cord
	2	EL-LA-C-2	Bracket
	2	EL-LA-C-3	Ring with Clamp
	2	EL-LA-C-4	Lens with Gasket
	2	R1-754	1/4" I.D. Loom x 2'-0"
	2	EL-BU-H	100 W, 110 Volt Bulb
6.	1	EL-SO-A1	Weather-proof Socket, 1/2"—90° Angle Tap with 2 1/4" Shade Holder Bottom
	1	EL-RE-A1	Dome Reflector, 12" Diameter, 100 W. with 2 1/4" Fitter
	1	EL-BU-H	100 W., 110 Volt Bulb
7.	1	EL-RC-A1	3 Wire Polarized, Bakelite, Flush Receptacle, 15 Amp.—125 Volt
8.	1	EL-RC-C1	2 Wire Panel Surface Mounting Porcelain Receptacle, 15 Amp.—125 Volt
9.	1	EL-TL-A1	Trouble Lamp, Shockproof, Keyless Socket with Rubber Handle, Reflector Guard and Rubber Cord x 25'-0" Long
10.	1	EL-SO-A1	Weather-proof Socket, 1/2"—90° Angle Tap, with 2 1/4" Shade Holder Bottom
	2	EL-BU-F	50 W., 110 Volt Bulb
11.	1	PP-KA-A1	Kato Model 23A Gas Driven Power Plant (For Details See Accessory Section)
	1	R1-1197	4 Gauge Rubber Covered Stranded Wire x 5'-6"
	1	R1-763	7/16" I.D. Loom x 4'-6"
	4	EL-WT-D2	7/16"—90 Amp., Copper Soldering Lug

NUMERICAL INDEX OF B-G PARTS

(For Accessory Parts and Index See Accessory Section).

(For Engine Parts and Index, See Engine Section).

"No. Req." is total for the entire parts list.

*Indicates chain. Unit price shown is average price per link in strands.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

Part Number	Page	No. Req.	Lbs. Each	Unit Price
C-3-23	311	1	.01	.03
B-3-149	334			
	336			
	338	8	.5	.36
C-3-149	337	1	.7	.50
A-3-172	317	28	.8	.18
A-3-224	331	1	.1	.40
C-3-265	332	1	3.6	.45
G-3-395-W	338	2	9.2	6.45
C-3-656-W	320	2	2.3	2.34
A-3-897	333	1	.6	1.18
D-3-917	319	5	.4	1.63
O-3-932	333	2	.3	.73
T-3-932	340	2	.4	.65
P-3-938	311	1	.5	.70
M-3-941	313	2	.7	1.14
M-3-944	309	3	2.4	2.03
O-3-944	308	2	2.0	1.35
P-3-944	309	1	2.3	1.63
G-3-945	323	1	.8	1.04
F-3-948	316	2	1.2	1.53
G-3-948	316	2	3.5	1.98
B-3-949	316	2	2.8	1.62
F-3-949	315	2	2.0	1.56
C-3-951	304	2	.5	.66
E-3-952	330	4	.2	.30
E-3-1001	308	1	9.5	15.48
F-3-1001	308	1	14.8	35.70
A-3-1002	311	2	.9	1.13
A-3-1003-W	311	1	1.9	5.50
K-3-1003-W	335	1	3.2	5.67
3-1007-A	313	2	46.5	39.00
A-3-1007	348	2	.1	.06
C-3-1007	348	2	.1	.06
A-3-1008-WR	348	4	3.6	3.88
F-3-1008	348	4	.4	.89
A-3-1010	348	4	1.3	.97
A-3-1011	348	4	.2	.54
B-3-1011	348	4	.1	.18
C-3-1011	348	4	.1	.15
A-3-1037-W	347	1	10.0	3.66
C1-3-1057-W	338	2	.8	.60
D-3-1057-W	340	6	.3	.33
A-3-1077	309	1	.7	2.40
D-3-1205	308	1	.1	.15
F-3-1209-W	338	1	1.5	1.70
B-6-25-W	326	1	5.3	2.08
A-6-58	306		.2	.13
AA-6-58-R	306		3.9	3.85
B-6-58	306		.1	.14
C-6-58	306		.2	.47
KK-6-58-R	306		5.4	5.15
XX-6-58-R	306		7.1	6.24
A-6-64	306		.3	.27
B-6-64	306		.3	.19
C-6-64	306		.3	.61
AH-6-64-R	306		15.1	11.25
KK-6-64-R	306		9.8	7.45
A-6-65	306		.6	.54
AZ-6-65-R	306		36.2	31.69
B-6-65	306		.4	.43
C-6-65	306		.7	1.35
A-6-91	306		1.3	.81
B-6-91	306		.9	.54
C-6-91	306		1.1	.90
GG-6-91-R	306		36.0	18.18
A-6-110	306		1.1	.68
B-6-110	306		.8	.22

Part Number	Page	No. Req.	Lbs. Each	Unit Price
C-6-110	306		1.0	.49
EC-6-110-R	306		145.4	63.58
W-6-110-R	306		21.9	10.28
A-6-146	306		3.3	.23
BC-6-146-R	306		330.2	112.42
J-6-146-R	306		42.8	14.60
G-8-52	311	3	.8	1.99
G-8-54	323			
	327	4		1.69
P-8-55	311	2		1.44
B1-8-57	311	1	6	1.68
H-8-75	313	2	1.1	1.05
O-8-75	313	2		1.98
AA-8-92	316	2		2.70
C-8-94	309	2		1.22
JJ-8-94	316	4		2.70
BB-8-95	315	2		2.70
CC-8-95	315	2	1.1	1.69
E-8-95	323	2		1.53
F-8-95	308	4		1.40
P-8-95	309	2		2.10
B-8-115	319	4		3.10
MM-8-115	321	4		5.47
13-192-A	332	1	4.3	6.36
E-13-192	332	2	.9	.06
F-13-192	332	5	.2	.06
13-214-G	313	2	22.9	7.10
13-216-K	308	2	25.7	10.31
13-216-M	309	1	25.7	10.09
AA-17-9	311	1	.2	.08
BE-17-9	309	2	.3	.03
BX-17-9	317	28	.5	.06
JI-17-9	315	6	.8	.08
K1-17-9	316	8	.3	.06
NG-17-9	319	4	.3	.06
OC-17-9	315	6	.1	.06
OO-17-9	310	2	.2	.06
P-17-9	323	2	.3	.06
A-17-10	346	2	.1	.12
AQ-17-10	323	2	.1	.12
B-17-10	337	1	.1	.11
AJ-17-11	330	8	.1	.12
XX-17-11	336	1	.1	.12
Z-17-12	330	2	.4	.16
Z-17-13	330	4	.6	.18
K-17-14	332	9	.1	.18
C-17-23	334			
	338			
	340	4	.2	.06
CZ-17-23	338	4	.2	.08
DC-17-23	335	1	.1	.06
KK-17-23	335	1	.1	.08
O-17-23	335	1	.3	.06
P-17-23	334	1	.2	.08
UU-17-23	336	2	.1	.08
Z-17-23	334			
	337	2	.1	.06
A-17-24	323	2	1.6	.52
AZ-17-24	338	2	.3	.34
BK-17-24	333	2	.3	.16
BN-17-24	319	2	9.1	2.48
M-17-24	316	4	.5	.12
AO-17-25	330	4	.4	.60
AY-17-25	325	1	.2	.17
EC-17-25	311	1	.6	.25
FW-17-25	346	2	.6	.76
FY-17-25	340	6	.1	.20

NUMERICAL INDEX OF B-G PARTS (Continued)

Part Number	Page	No. Req.	Lbs. Each	Unit Price
FZ-17-25	338	2	.1	.20
GG-17-25	338	1	1.2	.53
GW-17-25	327	2	2.1	.78
AA-17-26	335	1	.1	.09
FH-17-26	325	1		.10
P-17-26	325	1	.1	.18
A-17-27	340	2	.2	.12
V-17-27	336	1	.3	.29
C-17-30	311			
	338			
	340	7	.1	.08
E-17-30	333	1	.2	.09
H-17-30	333			
	338	3	.1	.09
AA-17-32	309	1	.1	.15
AF-17-32	311	1	.1	.12
E-17-32	332	1	.1	.12
AM-17-33	309	1	.1	.15
AT-17-33	313	2	.1	.24
AY-17-33	332	1	.4	.22
E-17-33	313	1	.2	.18
K-17-33	308	1	.1	.19
PP-17-33	308	2	.1	.14
Z-17-33	332	1	.2	.16
ZZ-17-33	313	2	.1	.18
HH-17-34	321	4	.6	.32
M-17-34	320	2	.1	.29
W-17-34	316	4	.5	.15
Y-17-34	316	4	.1	.18
A-17-38	320	1	.4	.32
AF-17-43	308			.07
	331	3	.2	.09
BB-17-43	330	4	.2	.05
C-17-43	331	2	.1	.11
CT-17-43	331	1	.4	.14
CU-17-43	330	1	.6	.04
D-17-43	308			
	311	2	.2	
E-17-43	313	2	.1	.07
F-17-43	308			
	315			
	320	6	.1	.05
J-17-43	309			
	311	5	.1	.08
N-17-43	308	1	.5	.18
D-17-45	349	1	.3	.30
X-17-43	331	1	.2	.09
Y-17-43	332	1	.1	.07
D-17-63	332	1	.5	.81
A-17-65	331	1	.2	.10
N-17-71	308			
	309			
	313	5	.3	.06
A-17-88	320	1	1.6	1.74
C-17-102	316	4	2.6	1.50
C-17-103	321	2	.7	1.10
T-17-105	309	1	.1	.30
G-17-106	310	1	.2	.27
GG-17-106	309	1	.1	.36
P-17-108	311	2	.1	.34
BT-17-109	308			
	309	3	.3	.06
BW-17-109	308			
	309	3	.3	.06
A-17-110	313	6	.5	.06
BF-17-110	327	24	.3	.06
BG-17-110	327	8	.3	.06
A-17-111	315	38	.1	.06
KK-17-111	315	4	.1	.06
C-17-121	326	4	.1	.05
B-17-123	330	2	.1	.07
GG-17-125	349	1	2.8	.40
N-17-125	349	1	2.3	.30
A-17-136	313	1	4.1	.79
B-17-136	313	1	3.9	.70
Q-17-139	340	2	.3	.06
S-17-139	340	2	.3	.06
VV-17-139	340	2	.1	.06
WW-17-139	340	2	.1	.06
O-17-145	337	1	.8	.68
D-17-164	321	2	1.3	1.90
H-17-164	309	1	.5	.80
H-17-165	309	1		.06
F-17-202-W	349	1	1.1	1.43
C-18-49	331	2	.1	.84
E-18-68	331	1	11.8	10.05
A-18-228-W	311	1	8.1	20.85
B-18-230-W	311	1	46.0	51.12
A-18-232	310	1	2.3	6.75
B-18-232	311	1	4.8	8.28
C-18-232	311	1	7.8	8.25
A-18-233	311	1	10.8	10.98
B-18-233	311	1	14.8	12.24
C-18-233	311	1	19.9	14.85
C-18-234	308	1	57.5	58.80
A-19-51	320	4	1.5	.60
B-19-51	320	2	.8	1.50
19-103-C	320	1	207.5	121.48
A-19-103	320	2	.1	.06
A-19-106	320	4	.5	2.22
B-19-106	320	2	.5	2.22
C-19-106	320	2	.5	2.94
F-19-411	325	1	1.2	3.53
19-474-O	311	1	15.0	11.25
19-475-A	333	1	3.6	7.58
C-19-498	332	1	6.2	10.44
T-19-543	308	1	8.5	9.31
19-656-A	315	2	64.5	54.27
C-19-680-WM	313	2	17.1	17.88
C-19-689	308	1	4.3	9.48
B-19-743	304	1	10.8	22.35
J-19-782	309	1	12.0	25.88
G-24-85	315	4	.4	.29
25-46-A	326	43	28.5	6.00
HH-26-F	326	2	.5	.27
A-38-17	318	82	.8	.30
C-38-245	327	2	.9	.34
D-38-245	327	2	.5	.29
E-38-245	327	1	.5	.29
G1-38-245	327	1	3.8	1.38
H-38-245-W	327	1	14.5	2.99
M-42-43	344	2	9.9	1.55
N-42-43	344	1	36.4	4.02
G-42-47	334	1	.3	.20
H-42-47	335			
	338	3	.3	.06
E-42-90	318	4	1.0	.32
H-42-90	318	4	7.7	1.15
J-42-90	318	4	.3	.29
S-42-90	318	2	2.3	1.50
AH-46-20	349	1	2.0	7.25
AN-46-20	349	1	3.4	5.75
B-46-20	349	1	1.3	.53
BB-46-20	349	1	.3	.18
E-46-20	349	1	4.4	3.78
G-46-20	349	1	7.3	3.36
M-46-20	349	1	.1	.06
MM-46-20	349	1	2.0	1.68
WW-46-20	349	1	2.3	1.20
ZZ-46-20	349	1	.9	.78
B-46-45	318	2	10.5	2.30
C-46-55	311	1	.1	.12
C-46-154	337	1	.1	.24
C-46-173	325	1	.1	.15
B-46-208	348	8	.3	.18
C-46-208	348	4	.4	.12
D-46-208	348	8	.1	.08
G-46-219	349	1	.1	.28
A-46-268	340	2	.1	.36
B-46-268	340	2	.1	.41
B-46-277	346	4	.2	.39
E-46-277-W	304	1	1.3	1.07
C-46-100-S	349	1	.2	.65
A-53-103-WM	311	1	74.3	41.00
AA-53-103	311	2	.2	.06
BB-53-103	311	2	.2	.06
N-53-103-RW	311	1		3.38
P-53-103	311	2	1.5	.42
Q-53-103	311	2	.8	.33
T-53-103	311	2	.3	.29
U-53-103	311	2	1.5	.42
V-53-103	311	2	.8	.34
W-53-103	311	2	.4	.27
A-53-104	311	1	12.5	5.20
B-53-104	311	1	10.4	5.64
C-53-105	311	1	3.5	1.50
A-62-21	317	14	7.3	2.18
G-62-33	335	1	.2	.39
J-52-33	335	1	.1	.23
N-62-33	335	1	.3	.29

NUMERICAL INDEX OF B-G PARTS (Continued)

Part Number	Page	No. Req.	Lbs. Each	Unit Price
62-239-A WU #1	330	4	3.0	1.50
A (R) 62-239	330	4	1.5	.40
A (L) 62-239	330	4	1.5	.40
E-62-239	330	4		3.95
F-62-239	330	4	3.6	.54
M-62-239	330	2	3.1	.65
N-62-239	330	2	13.0	2.07
B-62-241	349	2	1.0	.10
C-62-241	349	4	.6	.05
AB-62-243	330	1	16.8	3.98
J-62-243	330	2	1.8	.43
A-82-11	321	1	150.9	26.70
A-82-21	342	1	66.3	8.88
B-82-21	342	1	63.0	8.88
D-82-21	342	1	58.5	6.51
82-38-A1	344	1	304.0	50.33
CC-82-39-W	325	1	25.8	6.32
DD1-82-39-W	325	1	3.2	.95
EE1-82-39-W	325	1	.6	.61
S-82-41-W	334	1	5.7	1.15
A-82-43	338	2	7.6	1.56
C-82-43	338	1	3.0	1.20
D-82-43	340	1	2.8	.92
J (R) 82-43-W	338	1	5.9	2.91
J (L) 82-43-W	338	1	5.9	2.91
N-82-44	340	1	1.8	.43
C-82-45	337	1	3.0	1.05
N-82-45	335	1	.1	.36
C-82-61	332	1	13.4	3.06
N-82-61-WB	330	1	48.2	39.54
B-82-66	315	1	97.0	18.99
A-82-77	316	2	15.9	4.26
C-82-77	316	2	29.2	11.16
B1-82-94	336	1	3.9	.98
D-82-94	337	1	5.0	.95
E-82-94-W	336	1	4.2	1.19
C-82-96	333	1	4.8	1.53
H1-82-96	333	1	4.1	1.50
J-82-96-W	333	1	.5	.69
K-82-96-W	333	1	8.3	3.65
D-82-97	333	1	2.7	.82
E-82-97-WB	333	2	4.5	4.70
A-82-104	345	1	49.8	6.18
B-82-104	345	1	1.2	1.55
C-82-104	345	1	4.8	.92
A-82-109	332	1	7.0	1.80
F 2 (R) 82-142-W	321	1	242.0	74.90
F 2 (L) 82-142-W	321	1	242.0	74.90
N (R) 82-142	322	2	8.0	5.31
N (L) 82-142	322	2	8.0	5.31
O (R) 82-142	323	2	3.0	.65
O (L) 82-142	323	2	3.0	.65
D1-82-150	330	2	18.1	2.95
M-82-165-W	324	1	23.4	3.90
N-82-165	324	1	4.6	.81
O-82-165	324	1	2.5	.54
T (R) 82-165	323	1	.2	.24
T (L) 82-165	323	1	.2	.24
A1-82-166	323	1	53.6	7.17
F-82-166	323	1	5.3	4.19
N-82-173	313	2	1.4	.38
B-82-178	335	1	3.5	2.08
C-82-178-W	335	1	4.4	1.73
C-82-185	342	1	45.0	5.13
A-82-187	343	2	1.0	2.58
H1 (R) 82-187	342	1	1.0	2.48
H1 (L) 82-187	342	1	1.0	2.48
K (R) 82-187	342	1	1.4	2.66
K (L) 82-187	343	1	1.4	2.66
A-82-188	343	1	26.0	28.40
A-82-200	313	1	40.3	11.85
J1-82-202	340	2	.1	.27
K-82-202	338	4	.4	.29
H1-82-202-W	340	1	54.6	10.84
M1-82-202	338	2	.2	.36
N-82-202	340	1	1.8	.43
O-82-202	340	4	.7	.30
P-82-202	340	4	.8	.33
Q-82-202	338	2	.4	.27
A-82-206	338	4		.34
B-82-206	338	4		.27
C-82-206-R	338	4	1.3	1.68
A (R) 82-209	322	3	6.9	6.36
82-209	322	3	6.9	6.36

Part Number	Page	No. Req.	Lbs. Each	Unit Price
B (R) 82-209	322	1	4.5	6.54
B (L) 82-209	322	1	4.5	6.54
C (R) 82-209	322	1	5.9	6.32
C (L) 82-209	322	1	5.9	6.32
A-82-211	326	2	12.5	3.30
A (R) 82-216-W	327	1	44.0	9.11
A (L) 82-216-W		1	44.0	9.11
B-82-216-W	327	2	57.0	9.74
H-82-217	327	2	69.5	8.84
F-82-218-W	349	1	85.0	24.25
F1-82-219	334	1	1.1	.35
G1-82-219	334	1	4.0	.72
N1-82-219	334	1	3.6	.68
X-82-219-W	334	1	6.5	1.63
Y-82-219	334	1	4.2	.79
Z-82-219	334	1	3.4	.68
A-82-236	308	1	71.9	18.57
A-82-237	320	1	77.0	19.35
F-82-241-W	304	1	2.8	.98
H-82-241-W	304	1	2.8	1.44
M-82-241	304	1	.3	.48
A1-82-243	337	1	5.5	.95
C-82-246	304	1		.22
H-82-246-W	304	1	7.0	2.90
M-82-246-WB	308	1	19.0	5.78
U-82-246	304	1	.1	.20
D (R) 82-257-W	342	1	37.8	4.91
D (L) 82-257-W	342	1	37.8	4.91
H (R) 82-257-W	341	1	56.8	7.09
H (L) 82-257-W	341	1	56.8	7.09
136-A	323	1	2.4	1.20
362-B	316	2	71.6	23.88
472-C	320	1	35.0	27.85
667	318	2	6.0	1.08
668	318	2	1.1	.45
679-A	326	4	33.0	8.28
694	323	2	20.0	9.68
699	326	4	6.6	2.16
722	326	6	2.3	.60
821	313	2	8.0	1.50
822-B	313	2	3.4	1.08
825-A	313	2	4.8	1.95
825-B	313	2	5.1	2.28
B (R) 833-66-W	346	1	33.0	4.63
B (L) 833-66-W	346	1	33.0	4.63
C-833-66	347	1	3.0	.65
D-833-66	347	1	3.3	4.21
E-833-66-W	346	2	2.8	.99
K-833-66	346	4	.3	.27
C-833-67	347	1	6.5	1.17
F (R) 833-67	347	1	7.0	1.24
F (L) 833-67	347	1	7.0	1.24
G-848-136	345	1	5.0	6.39
H-848-136	345	1	3.1	.65
J-848-136	346	2	.4	.42
K-848-136	345	1	1.3	.61
M-848-136	346	2	.5	.25
868-A	332	9	3.6	1.08
897	348	2	4.9	3.75
961	309	1	5.2	1.31
961-A	308	2	5.2	1.68
1048	318	82	19.6	5.65
1070	318	2	11.4	4.02
1156-A	320	1	128.5	76.68
1157	320	2	128.5	4.80
1158	320	2	3.0	3.48
1300	317	28	2.0	1.00
1392-A	333	1	13.2	3.99
1392-D	325	1	13.5	3.35
1506-C	316	2	65.3	35.98
1630	332	1	13.4	5.52
1630-A	332	1	13.4	5.52
1639	332	1	14.6	16.38
1715-A	338	1	2.0	2.45
1715-C	340	1	2.0	2.45
2387	315	2	17.0	5.58
2432	310	1	2.5	8.64
2482-A	316	2	20.1	15.70
2483	316	4	4.9	2.37
2485	316	2	11.0	10.34
2680-E	309	1	10.1	13.78
2915	321	2	58.8	41.71
2975	316	2	35.4	29.02
2982-A	309	1	29.3	24.67
2983-B	323	1	18.8	10.24

NUMERICAL INDEX OF B-G PARTS (Continued)

Part Number	Page	No. Req.	Lbs. Each	Unit Price
2983-C	323			
	327	2	19.5	10.24
2994-C	319	2	68.0	23.16
3176	310	1	6.4	18.49
3317	333	3	.9	.78
3317-A	333	1	.9	1.44
3369-A	308			
	309	3	6.3	2.37
3369-D	308			
	309	3	6.3	2.52
3372	316	4	13.9	5.82
3427	319	2	29.2	17.28
3430	317	14	61.4	18.36
3435	313	1	45.8	44.79
3509-B	309	1	16.3	11.40
3511	313	2	35.5	13.74
3550	321	1	26.0	31.56
3550-A	321	1	26.0	31.56
3605-A	309	1	2.8	7.08
3619-A	308	1	62.5	68.00
3708	308			
	309	3	6.9	3.18
BR-N-A1	304	1	.3	1.70
CL-WL-A1	304	1	57.0	41.00

Part Number	Page	No. Req.	Lbs. Each	Unit Price
CL-FU-A2	304	1		71.54
EL-BA-C	304	1	58.0	12.96
EL-CA-CO	304	1	5.2	4.20
EL-CN-A1	304	1		.82
EL-FB-B	349	1	.8	.35
EL-LA-C	351	2	3.0	5.28
EL-LA-C1	351	2		2.24
EL-LA-C2	351	2		1.00
EL-LA-C3	351	2		.90
EL-LA-C4	351	2		.21
EL-RC-A1	351	1	.4	1.15
EL-RC-C1	351	1	.3	.56
EL-RE-A1	351	1	1.3	2.17
EL-SO-A1	351	2	.5	.88
EL-TL-A1	351	1	1.8	2.75
EL-WT-BO	304	2	.1	.16
EL-WT-C6	304	2	.2	.25
EL-WT-D2	351	4	.1	.07
EN-B-D8	304	1	1300.0	768.95
EN-C-D4	304	1	1285.0	722.84
TR-FU-C3	304	1	300.0	211.00
TR-FU-C4	304	1	300.0	211.00
O1-GT-B	304	1	.1	.20
PP-KA-A1	351	1	131.0	149.00

FOR R-1 NUMERICAL INDEX

SEE ACCESSORY SECTION

NUMERICAL INDEX

82-A ACCESSORY SECTION

CONTENTS

Ordering Parts

The Serial Number, shown and described below, is the means by which Barber-Greene identifies the bills of materials used in manufacturing any particular machine and must be given when ordering parts. This Serial Number provides an accurate method of indicating in the sequence of serial numbers any design changes that have been made.

Serial Number Plate

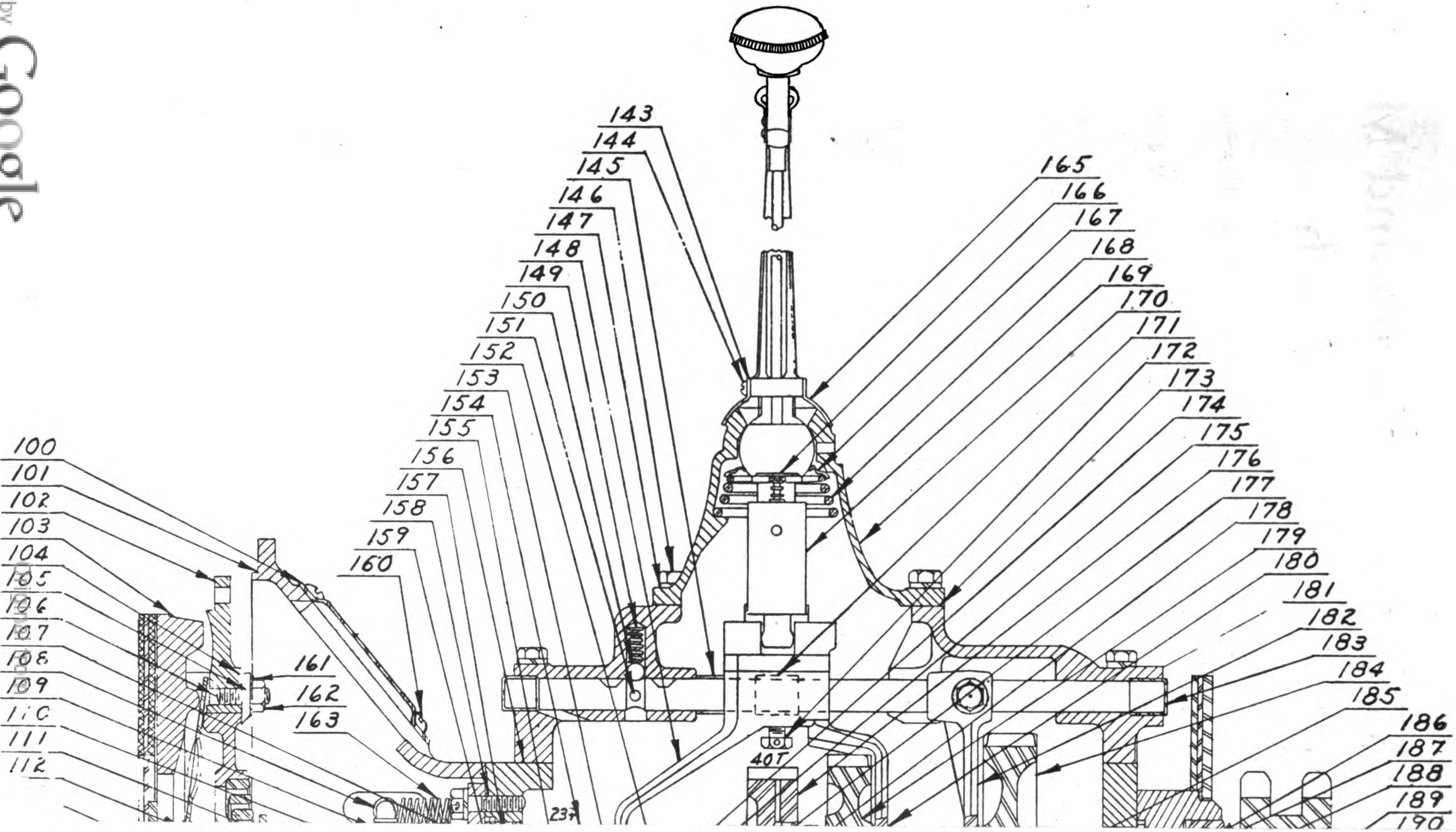
The Serial Number Plate appears on the frame above the operator's platform. Always give the serial number of your machine, part number, and description when ordering parts.

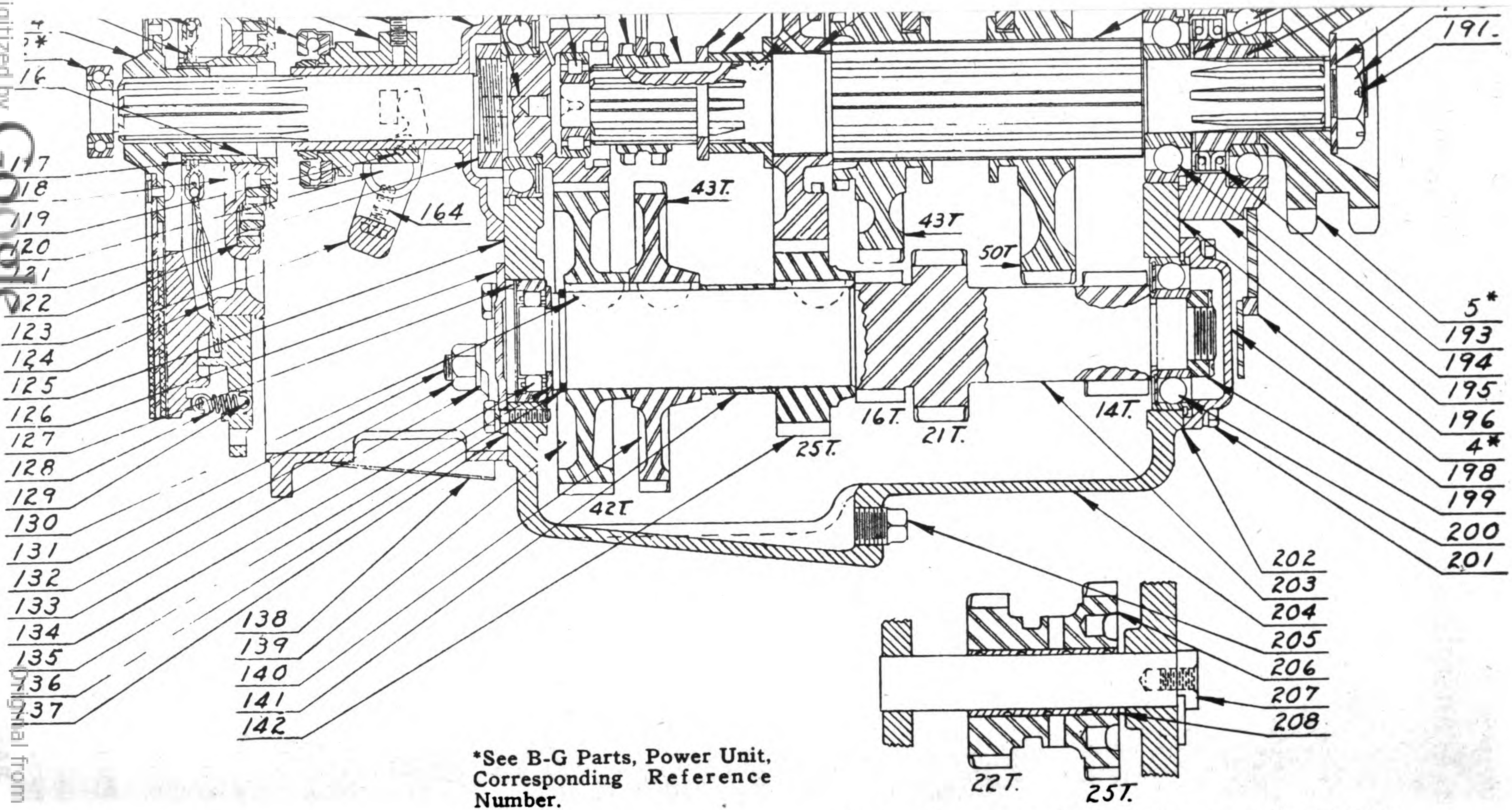
Key to Serial Number System

82A-8-37

The first number (82A) indicates the machine model. The last number (37) indicates the schedule of manufacture in which the machine was built. The middle number (8) indicates the number or place of the machine in that schedule of manufacture. The machine above is Model 82A and is the 8th machine manufactured in the 37th schedule. The next machine built will have serial number 82A-9-37. The next schedule will be 38 and the serial number of the first machine will be 82A-1-38.

Main Transmission and Master Clutch (Lipe)





HIGH REVERSE GEAR & BUSHING ASSEMBLY

*See B-G Parts, Power Unit, Corresponding Reference Number.

Figure 401

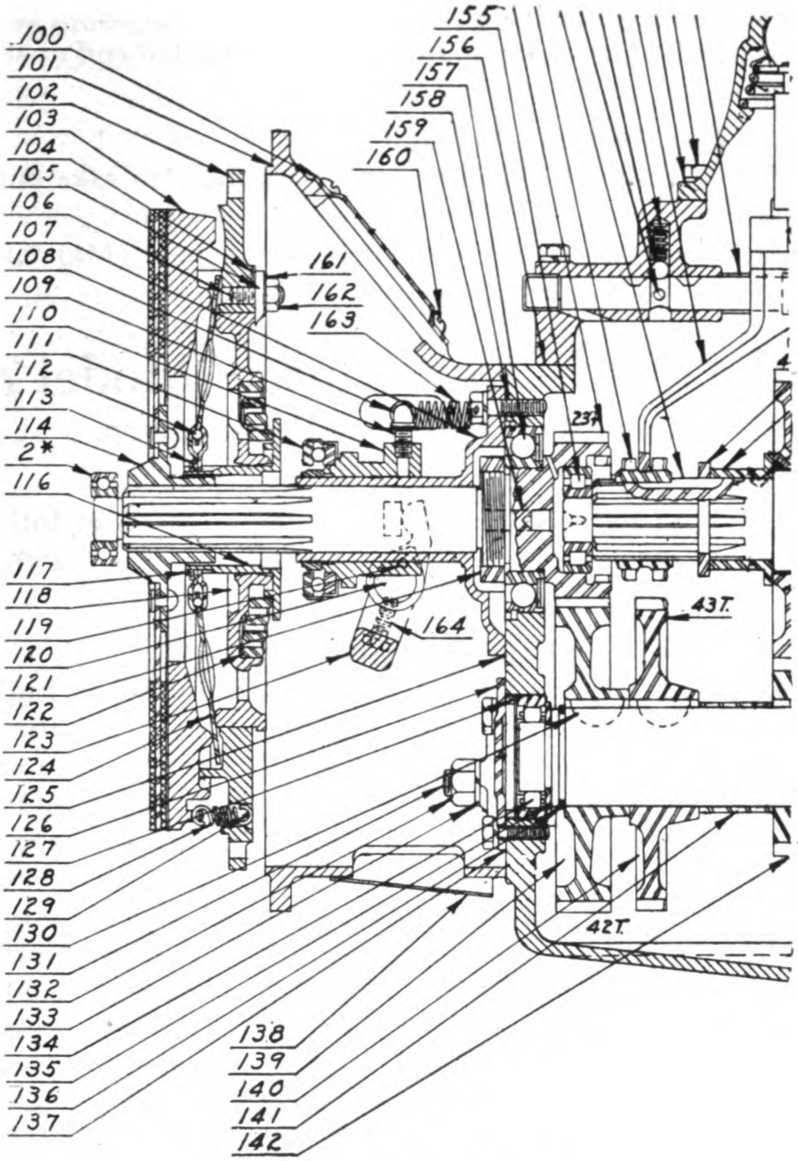


Figure 403. **Lipe Clutch.**

remove lock nut (199) from countershaft. Now pull mainshaft and countershaft assemblies out as far as possible, take off bearing (194). Tilt mainshaft (185) to take out through top of case, leaving sliding gears (179) and 184 in case, for removal loose. Now take off pilot bearing (155) and sliding clutch (153), using latter to free bearing. Take out key (152), and rotate washer (174) to line up with grooves in shaft, then remove. Take off sleeve (175) and gear (176).

Removal of Clutch Release Mechanism

Take off spring (163), grease piping, and pedal shaft 230 by removal of collars (249), lever arm (229), and screws (164), in yoke (123). Slide off carrier (110) with bearing (111).

Removal of Clutch Shaft and Drive Gear

Remove drive gear bearing cover (107) and withdraw shaft and gear (154), with bearing (157) which is held in place by nut (121).

Removal of Reverse Gearing

Remove lock plate (235) and use bolt in threaded end of shaft (207) for withdrawal of shaft, freeing gear (206).

Removal of Countershaft Assembly

Remove bearing (199) and tilt shaft assembly to take out through top of case.

To remove gears (139), (140), (142), and spacer (141) take off the snap ring (136).

Maintenance of Lipe Clutch (Model Z32-S)

Note: Numbers referred to below refer to cross section.

Disassembly

With transmission removed from engine, proceed as follows:

Remove cap screws in flywheel ring (102) and take clutch assembly from engine flywheel.

Pressure Plate Removal and Replacement:

Pressure plates (103) dished in excess of .015" or badly scored should be replaced with new plates. No special tools or fixtures are required for this purpose. First, place the clutch assembly on a convenient arbor press or drill press with the pressure plate down and compress the release sleeve (116) as far as it will go. Then remove the four pull back spring pins (129). Turn clutch over and place on the bench with the release sleeve (116) down. The pressure plate may then be removed. Driving lugs of pressure plate must be free in slots of flywheel ring (102), from .003" to .004" loose. Hook pull-back springs (128) in small holes provided for them in pressure plate, then put new pressure plate in place of one removed. Be careful not to cramp the pull-back springs or allow the release levers (124) to overlap. Replace clutch in arbor press with pressure plate down and draw down the release sleeve (116) before replacing the pull-back spring pins. Caution must be maintained not to overstretch the pull-back springs. This is the reason for compressing the clutch before replacing the pull-back spring pins.

Cover Plate Disassembly:

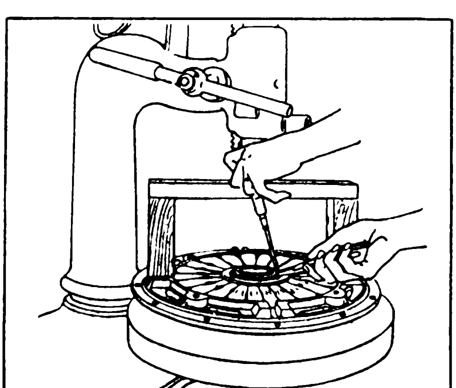


Figure 404

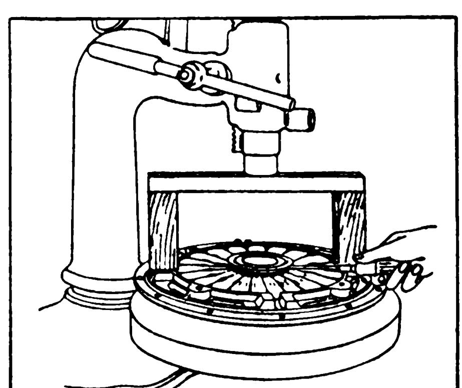


Figure 405

Remove pressure plate (103) as described under Pressure Plate Removal and Replacement. Place assembly on an arbor or drill press with the assembly resting on clutch sleeve (116). Place two substantial blocks, approximately 5" long, on the flywheel ring (102) so that they rest over the driving lug slots. Arrange a strong bar on top of these blocks. Compress the assembly and lock the press in position.

Remove the snap ring (117). We suggest the use of a special snap ring spreader for this purpose. See Figure 404.

Remove fulcrum rings, (113), levers (124), and balls (112). Fig. 405.

Slowly release the assembly which will make the spring (122), sleeve (116), and remaining parts removable.

To Assemble Cover Plate:

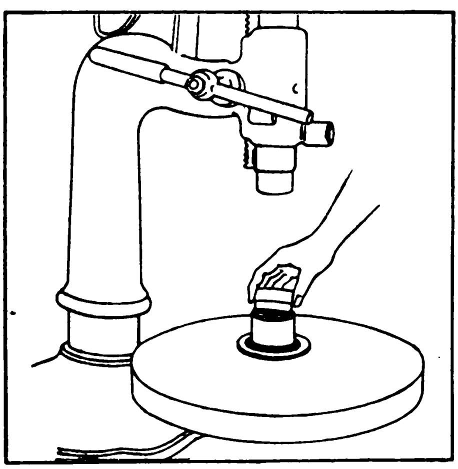


Figure 406

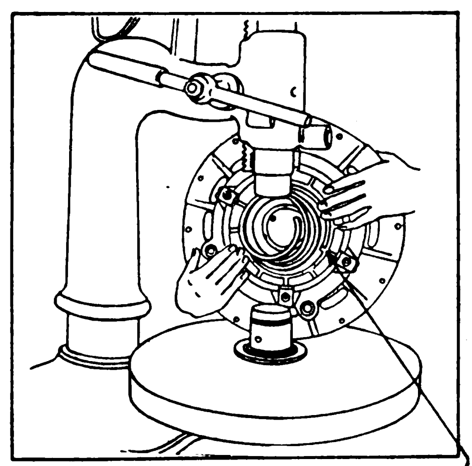


Figure 407

Place sleeve (116) on table of drill or arbor press. Insert the coned pilot tool shown above in sleeve, to act as a guide in assembling sleeve in the adjusting plate. Figure 406.

With large coil of the pressure spring (122) abutting the small boss in the adjusting plate, place the flywheel ring (102) adjusting plate (118) and spring above the sleeve. Figure 407.

Arrange two blocks and bar on the assembly, or use U-shaped tool as shown. Compress the assembly carefully, lock the press and remove the coned pilot tool. Figure 408.

Check the fulcrum rings (113) for flatness, or excessive wear. Select two good fulcrum rings and place one of them, cupped side up, over the sleeve (116). Figure 409.

Arrange the 20 levers (124), (If "used" levers, be sure they are straight and not excessively worn) on the fulcrum ring so that the end of the levers nest just inside the retaining rim of the flywheel ring. Figure 410.

Place one ball (112) in each of the holes in the small end of the levers. Figure 411.

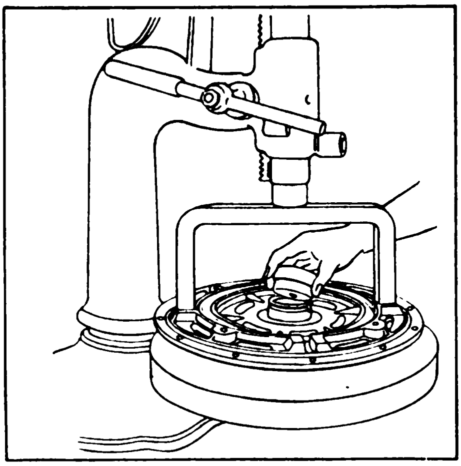


Figure 408

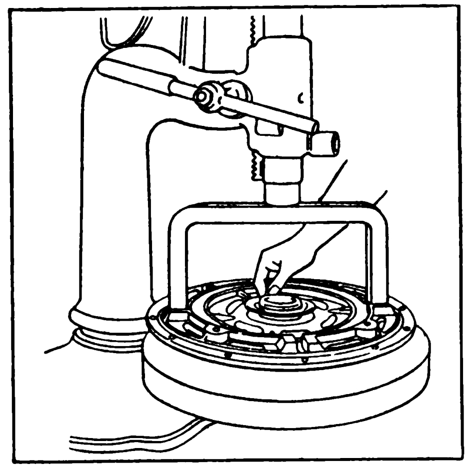


Figure 409

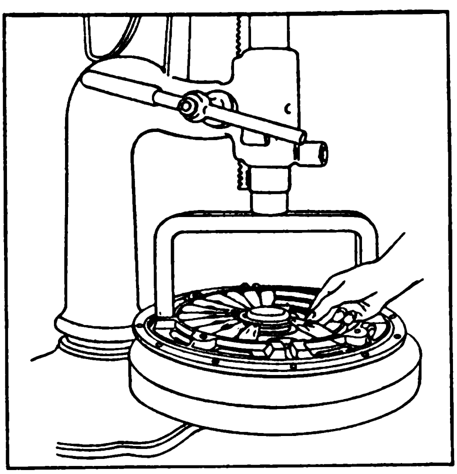


Figure 410

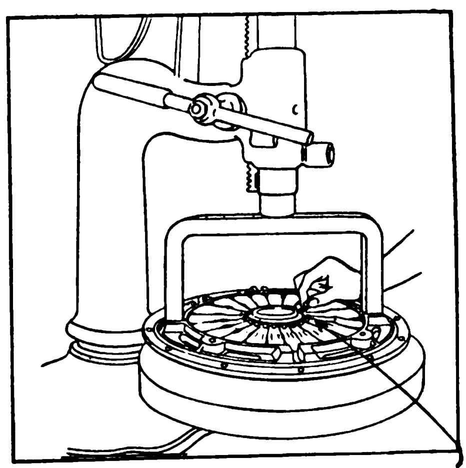


Figure 411

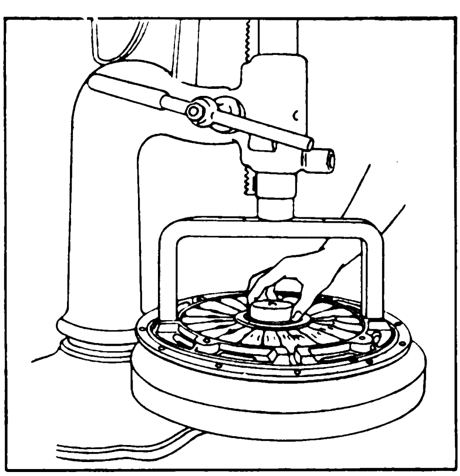


Figure 412

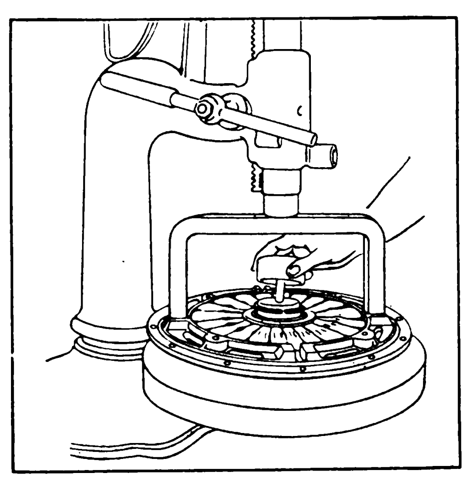


Figure 413

Assemble the remaining fulcrum ring (113) firmly and carefully over the sleeve (116). Be sure no ball bearings become displaced, or the levers overlap each other. Figure 412.

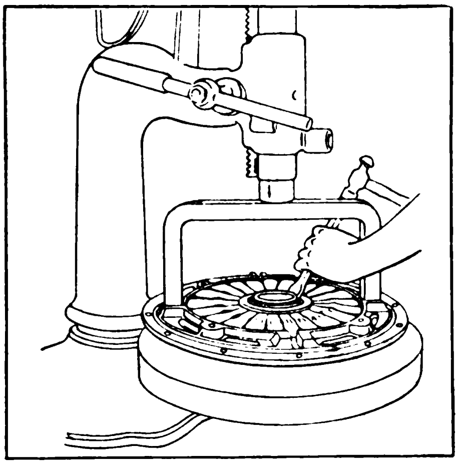


Figure 414

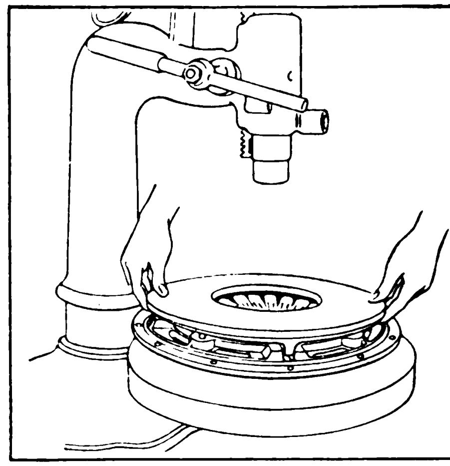


Figure 415

Place coned pilot tool on the sleeve and a NEW snap ring (117) on the cone. Then place the cupped tool on the snap ring and drive the ring home. Figure 413.

Remove cone and cup from the sleeve and by means of the staking tool tap the snap ring home. The ends of the snap ring should not be in line with the keyways in the sleeve. Best results are obtained if staking starts opposite the snap ring ends and from this point work toward the end. Figure 414.

Test each of the 20 levers to see that they are locked in place by a ball bearing. Then assemble pressure plate in the four driving slots of the flywheel ring (if old plate is used, assemble with "0" marked driving lug in the "0" marked driving slot). Figure 415.

Assemble retractor springs (128) and install pins (129). Refer to instructions under Pressure Plate Removal and Replacement. Figure 416.

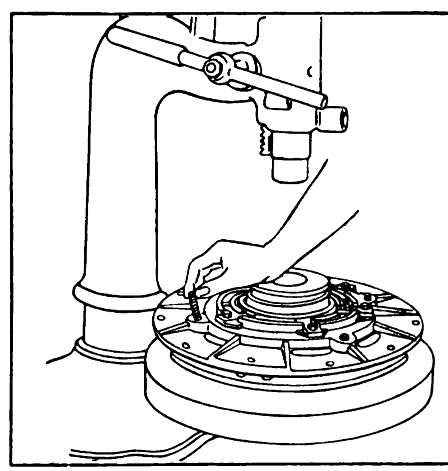


Figure 416

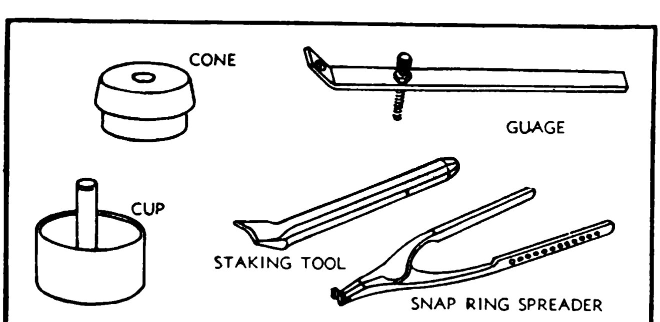


Figure 417

Here are shown special tools with which assembly, disassembly and adjustment are easily and accurately accomplished.

Precautions in Assembling Clutch:

1. Make sure large coil of spring has its end located at left of small boss (stop) on adjusting plate.
2. Remove any burrs in bore of adjusting plate or on release sleeve. Sleeve must be a "free fit" in adjusting plate.
3. Before using old fulcrum rings test them on a flat surface. If warped or badly worn, use new rings.
4. Always use new snap ring when rebuilding and be sure it is firmly seated in its slot by tapping the ring home.
5. Test each lever after assembly to make sure it has a ball bearing locking it in the fulcrum rings.
6. Use new pull back springs if old ones are stretched (coils closed —not open).
7. Pressure plate must be free in slots of flywheel ring. Approximately .004" - .006" looseness must be provided. If old plate is used assemble the "0" marked lug in the "0" marked slot of the flywheel ring.
8. If new facings have been assembled to the driven plate or a new plate is used, make sure that six shims are located under each adjusting strap.
9. If the face of the clutch sleeve is scored, use a new sleeve.

Assembling Clutch to Engine:

1. Make sure release bearing (111) and flywheel bearing (115) are in usable condition.
2. Try cover plate assembly (102) in flywheel before inserting driven plate (114) so as to make sure it is a free fit in the flywheel.
3. Use spare spline to align disc (114).
4. Friction face of flywheel should be smooth.
5. When bolting clutch assembly to flywheel, screw in each bolt until it contacts cover plate assembly. Then gradually tighten every other bolt until assembly is drawn tight to flywheel; tighten remaining bolts.

Installing New Clutch Driven Plate:

Before installing a new driven plate (114) assembly, the adjusting straps should be removed and six shims placed under each strap, otherwise the clutch will not release properly after the new plate is installed.

It is advisable to replace the entire plate assembly and not to reface, since refaced plates are often bent and otherwise impaired so that difficult clutch action results.

The clutch forms a complete self-contained unit and no driving pins or other separate parts require attention. A spare splined shaft for centering the driven plate while bolting the clutch in place is advised since this method facilitates assembling the transmission in place.

The driven plates are furnished with the spline ends pointed so as to make the job of piloting the transmission easy to perform. The pressure plate side of each driven plate has the spline ends pointed and the flywheel side is left plain.

After installing new driven plate, should the clutch not release properly, either the pedal adjustment is insufficient, resulting in excessive lash or there is need for additional shims. Bent driven plates and tight splines also cause a drag (clutch not releasing).

Adjustment of Lipe Clutch: See Operator's Manual.

Main Transmission and Master Clutch Parts

Transmission—B-G Specification TR-FU-C3
Lipe Clutch—B-G Specification CL-WL-A1

NOTE: Barber-Greene uses the original manufacturer's parts number. In the following parts list, unmarked numbers are Fuller Manufacturing Co.

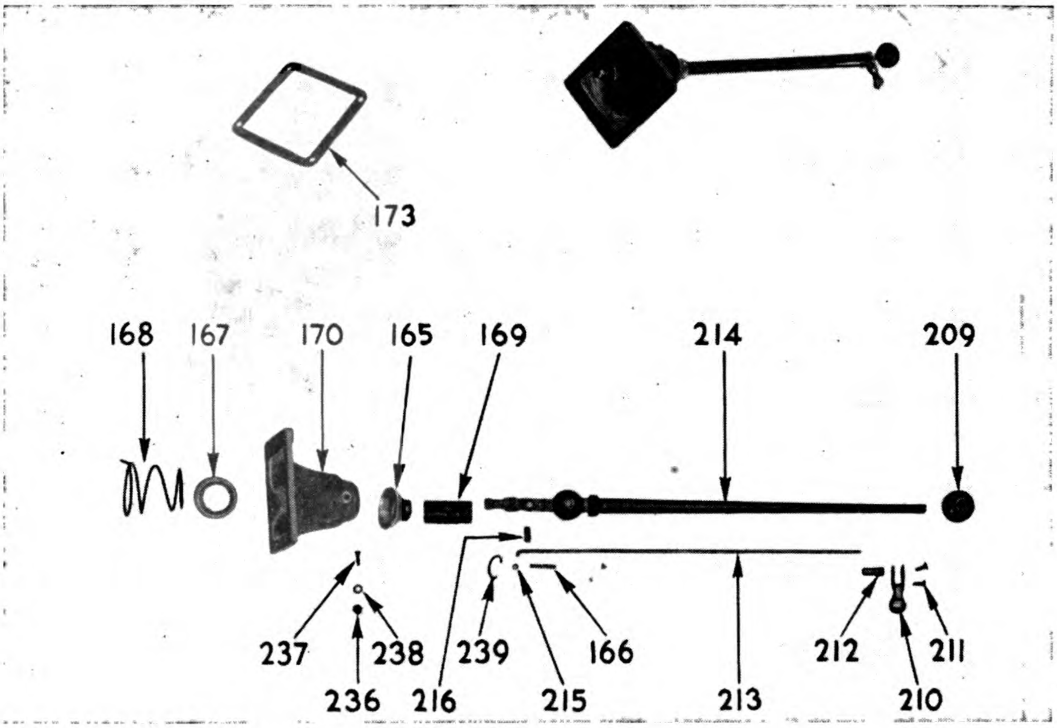
Abbreviations:
C.S.—Countershaft
Cl.—Clutch
M.S.—Mainshaft

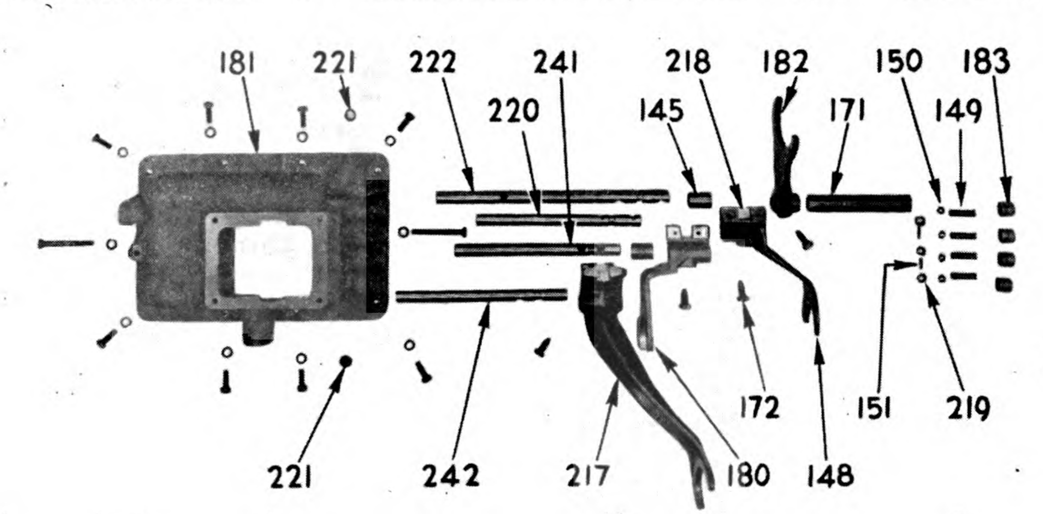
*Lipe
**B-G Parts Only

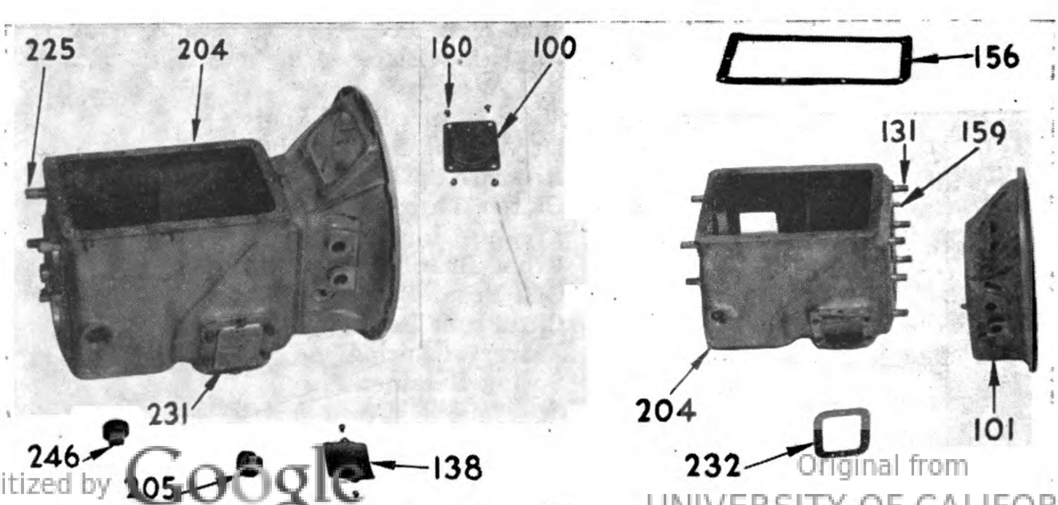
Ref. No.	No. Req.	Part No.	Description
100.	1	1565	Clutch Hand Hole Cover
101.	1	4361	Clutch Housing #3 Flange
102.	1	AC2-5*	Flywheel Ring and Stud Assembly
103.	1	C1-5*	Pressure Plate
104.	28	C20-1*	Adjusting Shim
105.	4	C10-2*	Adjusting Strap
106.	4	X21-12*	Flywheel Ring Stud
T107.	1	5320	Front Bearing Cover
108.	1	3231	Throwout Bearing Oil Pipe Elbow
109.	1	3230	Throwout Bearing Oil Pipe Nipple
T110.	1	4733	Cl. Release Bearing Carrier
111.	1	4694	Cl. Release Bearing
112.	20	X17-3*	Lever Locking Ball
113.	2	C13-12*	Fulcrum Ring
114.	1	Z14-1*	Driven Disc. Assembly (With Facings)
	2	C18-96*	Loose Facings
	18	X14-10*	Loose Facing Rivets
115.	1	BR-N-A1**	New Departure Bearing #7505 (Pilot Bearing)
116.	1	AC4-37*	Sleeve
117.	1	C11-3*	Snap Ring
118.	1	C3-28*	Adjusting Plate
T119.	1	X-6-11	#11 Woodruff Key
T120.	1	4416	Short Clutch Pedal Shaft
T121.	1	4647	Drive Gear Bearing Nut
122.	1	C5-2*	Pressure Spring
T123.	1	2772	Clutch Throwout Yoke
124.	20	C8-20*	Pressure Lever
125.	1	4461	Front Bearing Cover Gasket
126.	1	1149	C.S. Front Bearing Cover
127.	1	5349	C.S. Front Bearing Spacer
128.	4	C6-2*	Retractor Spring
129.	4	C7-2*	Spring Retainer Pin

(continued on next page)

Main Transmission (Continued)







Main Transmission (Continued)

Ref. No.	No. Req.	Part No.	Description
130.	3	X-6-E	#E Woodruff Key
131.	6	1632	Clutch Housing Stud
132.	6	X-1-1000	⅝"—18 S.A.E. Plain Nut
133.	6	X-3-1000	⅝" Plain Lockwasher
134.	1	5478	C.S. Front Roller Bearing
135.	1	5350	C.S. Front Bearing Washer
136.	1	4504	C.S. Snap Ring
137.	1	1051	C.S. Front Bearing Cover Gasket
138.	1	4398	Hand Hole Cover Plate
139.	1	5334	C.S. Drive Gear 42-Tooth 6—6.928" Pitch
140.	1	5345	C.S. P.T.O. 43-Tooth 6—7" P Gear
141.	1	6435	C.S. Gear Spacer
142.	1	5808	C.S. 3rd Speed Gear 25-Tooth 6—6.928" Pitch
143.	1	X-3-302	#12 Plain Lock Washer
144.	1	X-8-251	⅜"—24 Round Head Machine Screw
145.	2	5664	Yoke Bar Spacer, Rear (1st and Reverse and 4th and Dir. Yoke Bar)
146.	16	X-8-600	⅜"—16 x 1" Hex Head Cap Screw
147.	42	X-3-600	⅜" Plain Lockwasher
148.	1	5322	4th and Dir. Speed Shifting Yoke
149.	4	1064	Position Finder Spring
150.	4	X-14-800	½" Steel Ball
151.	2	1634	Interlock Cross Pin
152.	1	6332	M.S. Washer Key
153.	1	6074	M.S. Sliding Clutch
T154.	1	5333	Clutch Shaft & Drive Gear
155.	1	6364	M.S. Pilot Bearing
156.	1	5412	Shifting Bar Housing Gasket
T157.	1	212 MFG	Drive Gear Ball Bearing
158.	1	X-8-612	⅜"—16 Hex Head Special Cap Screw
	2	X-8-602	⅜"—16 x 1½" Screw
159.	2	1631	Transmission Case Dowel Pin
160.	6	X-8-509	5/16"—18 x 1½" USS Filister Head Cap Screw
161.	4	X-10-23*	Flywheel Ring Stud Nut Lockwasher
162.	4	X4-20*	Flywheel Ring Stud Nut
163.	1	4425	Tension Spring
T164.	2	X-7-603	⅜"—24 x 1" Hex Head Screw
165.	1	2962	Gear Shift Lever Bell
166.	1	1687	Latch Rod Spring
167.	1	2538	Gear Shift Lever Washer
168.	1	2536	Gear Shift Lever Spring
169.	1	3418	Reverse Stop Sleeve
170.	1	4530	Gear Shift Lever Housing
171.	1	5680	Yoke Bar Spacer (1st and Reverse Bar)
172.	5	3220	Shifting Yoke Locking Screw
173.	1	1642	Center Control Cover Gasket
174.	1	6333	M.S. 4th Speed Gear Washer
175.	1	4369	M.S. 4th Speed Gear Sleeve
176.	1	5807	M.S. 3rd Speed Gear 40-Tooth 6—6.928" Pitch

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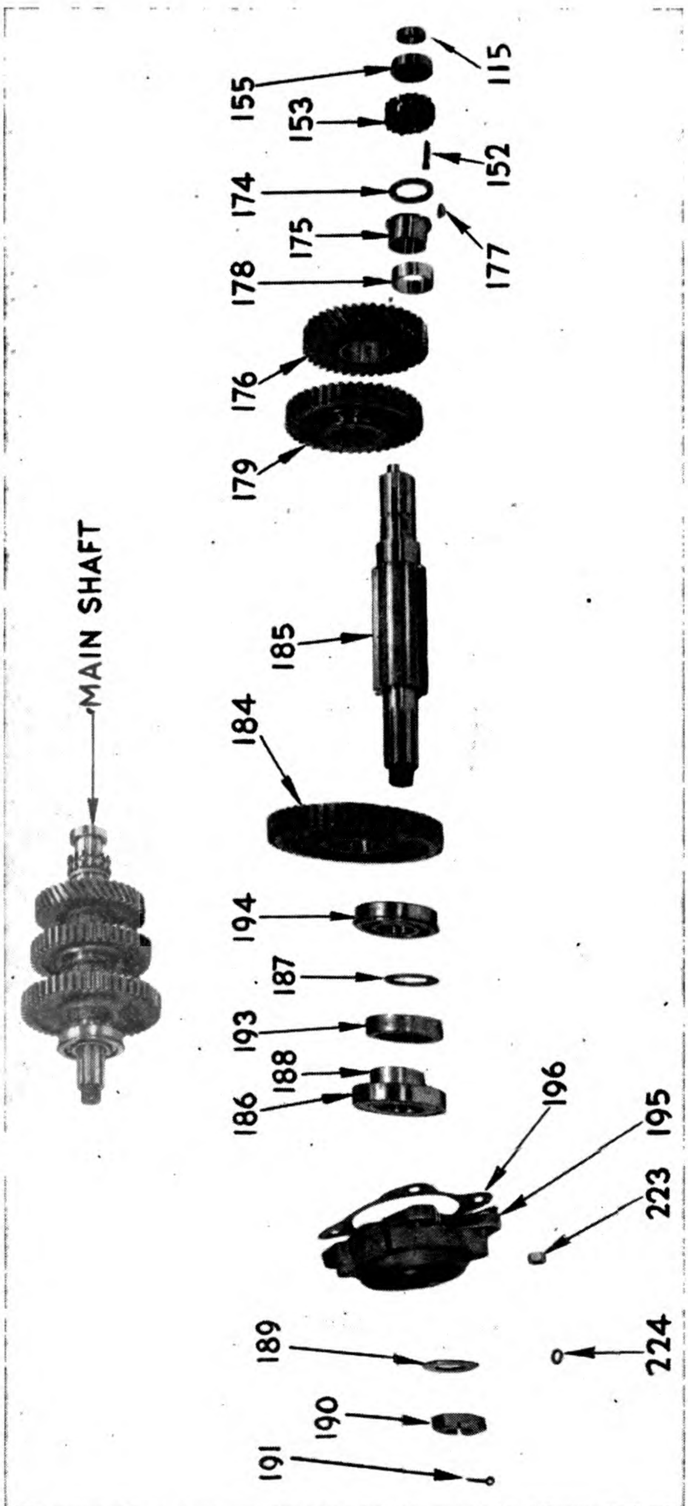
Main Transmission (Continued)



Main Transmission (Continued)

Ref. No.	No. Req.	Part No.	Description
177.	1	X-6-3	#3 Woodruff Key
178.	1	5332	M.S. Gear Bushing
179.	1	5497	2nd Speed Sliding Gear
180.	1	5323	2nd and 3rd Speed Shifting Yoke
181.	1	5573	Shifting Bar Housing
182.	1	5324	1st and Reverse Speed Shifting Yoke
183.	4	2939	Short Thimble For Yoke Bar Hole
184.	1	5341	1st Speed Sliding Gear 50-Tooth 6—7″ Pitch
185.	1	6400	Splined M.S.
186.	1	BR-F-P1**	Fafnir 212 W Ball Bearing
187.	1	4590	M.S. Rear Bearing Washer
188.	1	A-3-1106**	Spacer
189.	1	5423	M.S. Universal Joint Washer
190.	1	1792	M.S. Castle Nut
191.	1	X-4-415	⅛″ x 2½″ Cotter Pin
193.	1	OS-CR-A1**	Perfect Oil Seal #362220
194.	1	309 MG	M.S. Rear Ball Bearing
195.	1	3542**	Bearing Cap
196.	1	5358	Rear Bearing Cover Gasket
198.	1	5321	C.S. Bearing Cover
199.	1	4714	C.S. Rear Bearing Nut
200.	1	308 MFG	C.S. Rear Ball Bearing
201.	7	X-8-604	⅜″—16 x 1¼″ Hex Head Cap Screw
202.	1	5348	C.S. Rear Bearing Cover Gasket
203.	1	5496	C.S. With 1st, 2nd and Low Reverse Gear
204.	1	6025	Transmission Case (Studded in Rear)
205.	1	X-12-1201	¾″ Pipe Plug—Square
206.	1	5498	High Reverse 22-Tooth and 25-Tooth 6-7″ Pitch Speed Gear
207.	1	5331	High Reverse Idler Shaft
208.	1	5344	High Reverse Gear Bushing
209.	1	1075	Gear Shift Lever Ball
210.	1	1697	Spoon Latch For Reverse Stop
211.	2	1708	Spoon Latch Rivet
212.	1	2531	Reverse Latch Rod End
213.	1	3411	Gear Shift Lever Latch Rod
214.	1	3441	Gear Shift Lever
215.	1	3198	Latch Rod Washer
216.	1	3437	Reverse Stop Sleeve Pin
217.	1	5415	High Reverse Speed Shifting Yoke
218.	1	5147	1st and Reverse Speed Stop Plate
219.	3	X-14-1200	¾″ Steel Ball
220.	1	5326	4th and Direct Speed Yoke Bar
221.	2	1929	Oil Retaining Thimble
222.	1	5328	1st & Reverse Speed Yoke Bar
223.	4	X-1-1000	⅝″—18 S.A.E. Plain Nut
224.	4	X-3-1004	⅝″ Lockwasher (Shakeproof)
225.	4	1632	Bearing Support Stud
226.	2	X-13-206	#7 x $\frac{3}{16}$″ "Z" Type Self-Tapping Screw
227.	1	1956	Name and Number Plate
T228.	2	C-3-951**	Collar
T230.	1	6434	Cl. Pedal Shaft
231.	2	2840	Cover for P.T.O. Opening

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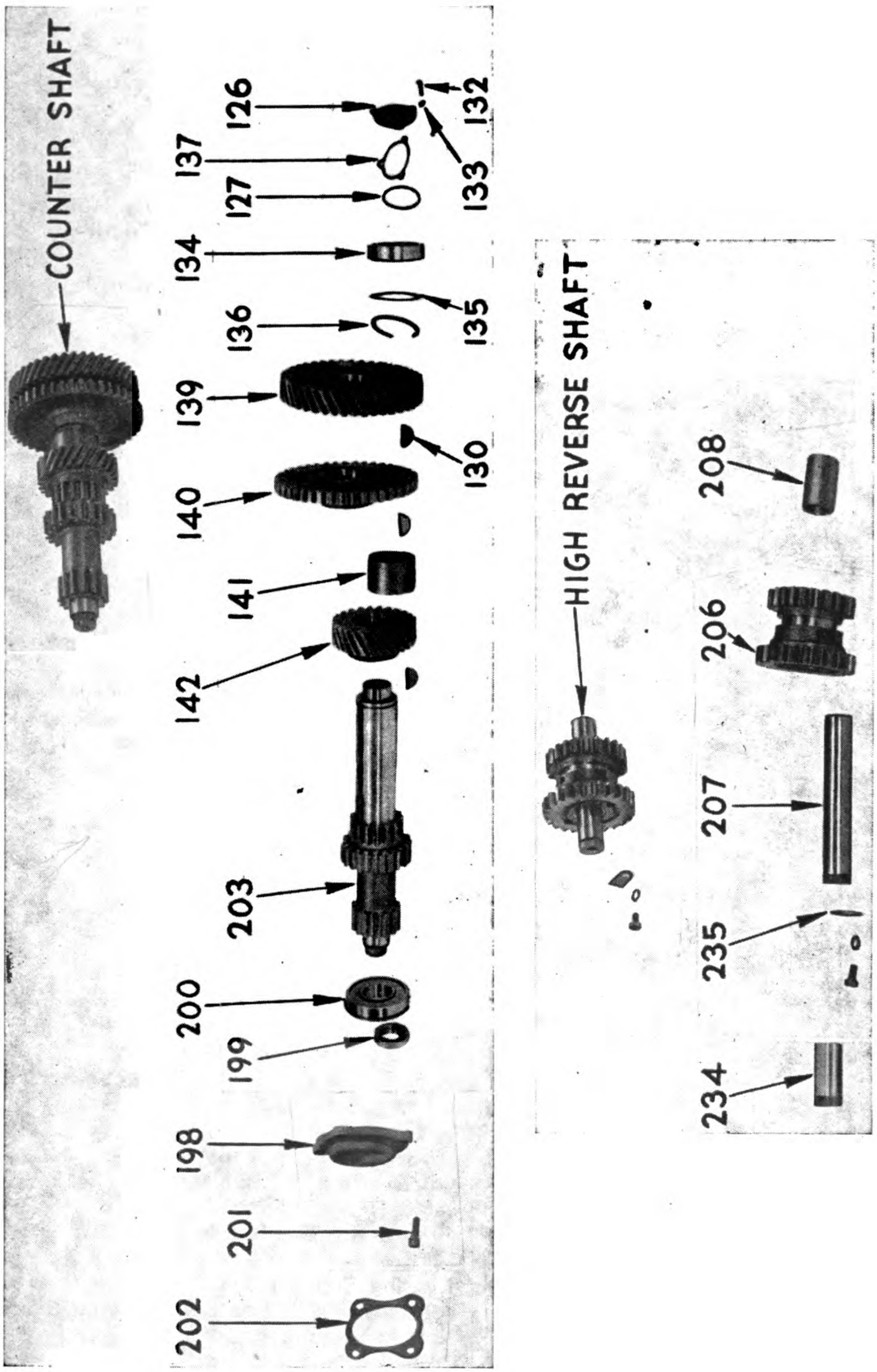
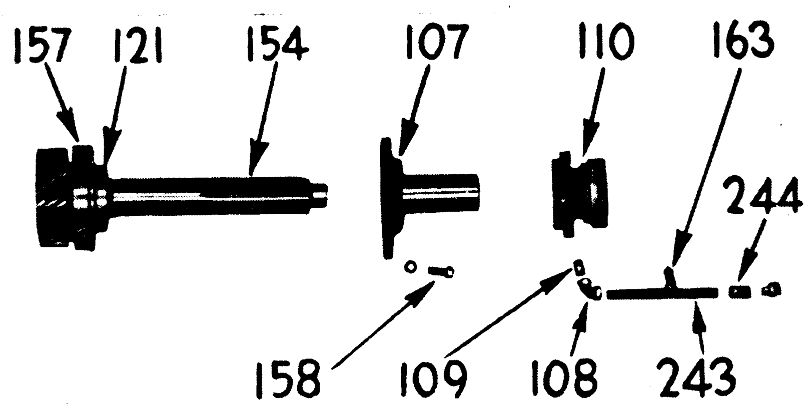
Main Transmission (Continued)

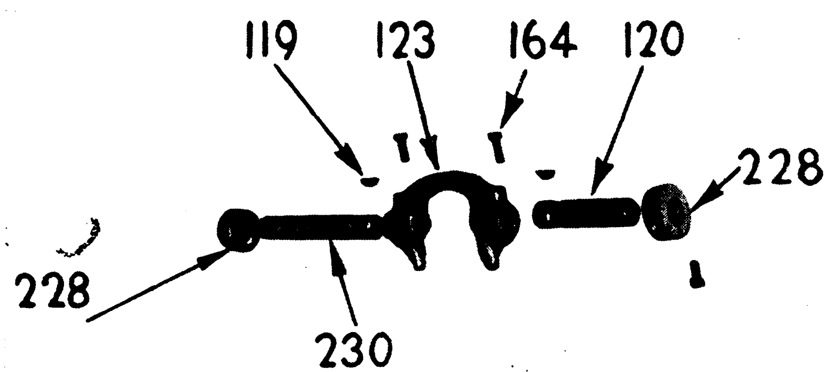


Main Transmission (Continued)

Ref. No.	No. Req.	Part No.	Description
232.	2	1684	P.T.O. Cover Gasket
233.	14	X-8-606	3/8"—16 x 7/8" Hex Head Cap Screw
234.	1	4480	Idler Shaft Hole Plug
235.	2	1638	Reverse Idler Shaft Lock
236.	1	X-1-500	5/16"—24 S.A.E. Plain Nut
237.	1	2271	Gear Shift Lever Pivot Pin
238.	1	X-3-500	5/16" Plain Lockwasher
239.	1	3875	Clip For Reverse Sleeve
240.	1	2401	Brake Shaft Hole Plug
241.	1	5327	2nd and 3rd Speed Yoke Bar
242.	1	5329	High Reverse Speed Yoke Bar
243.	1	3232	Oil Pipe
244.	1	3233	Oil Pipe Coupling
246.	1	X-12-2001	1¼" Pipe Plug (Square)

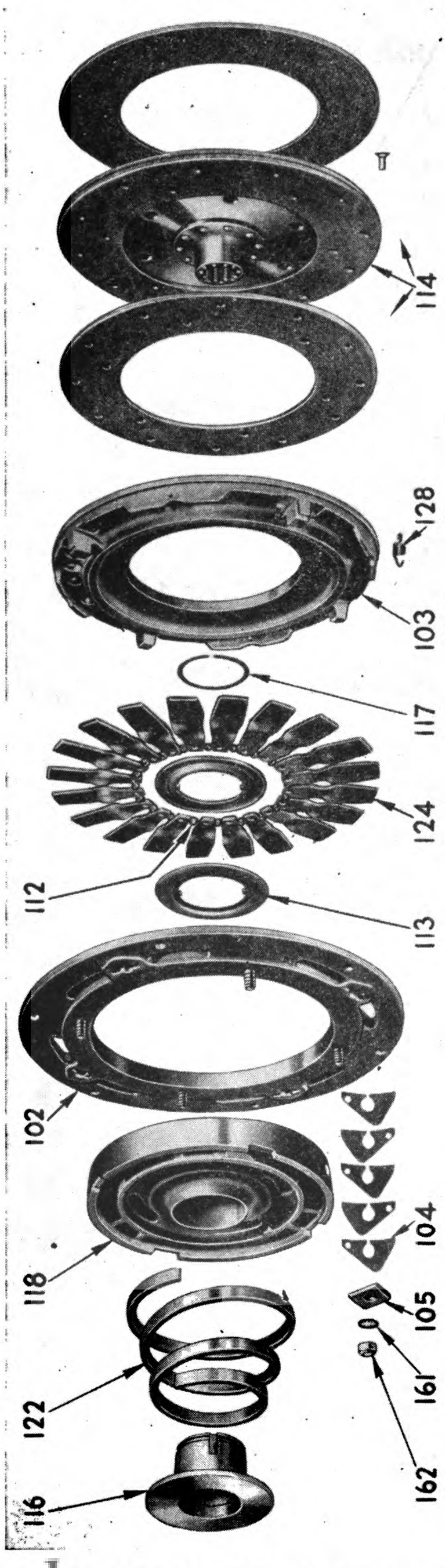
Master Lipe Clutch





Parts illustrated on this page and marked "T" in transmission parts list, are parts peculiar to Lipe Clutch.

Master Lipe Clutch (Continued)



Master Fuller Clutch

Specification:

Fuller Model 8"—14 multiple disc clutch.
(See Main Transmission)

Description:

The clutch driving drum is bolted to the engine flywheel which drives the multiple friction dry disc assembly mounted on the main transmission shaft. It is enclosed by a standard bell housing. Lever control is provided for engaging and disengaging transmission from engine.

Adjustment:

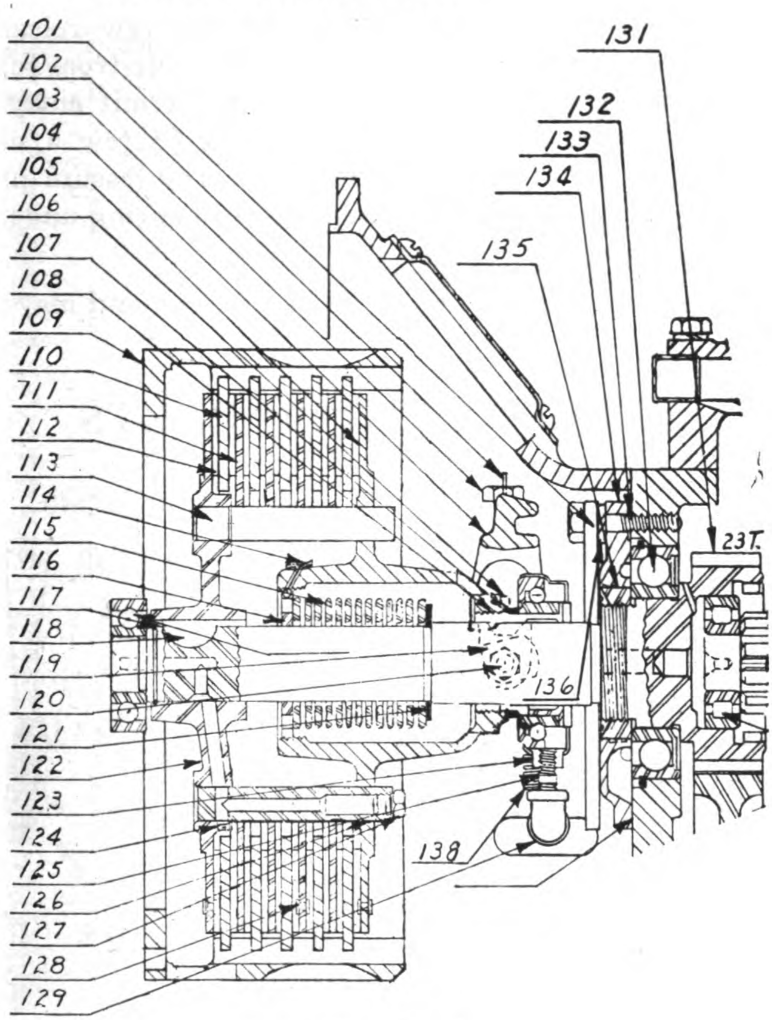
This is a spring loaded clutch and no adjustment is required.

Maintenance:

When the driven friction discs become worn replacement of clutch facing is necessary.

DISASSEMBLY OF FULLER CLUTCH

With the transmission removed from the engine, this clutch may be dismantled in the following manner:



Fuller Clutch.

Removal of Clutch Shaft and Clutch Assembly—

Take inspection cover from bell housing and remove lock wire (102) and loosen yoke screws (103), withdraw long clutch pedal shaft and drive the short clutch pedal shaft from yoke and housing.

Remove cap screws and take off bearing cover (134) so that clutch shaft with gear and clutch assembly may be taken from transmission.

Removal of Driving Flange Assembly—

Take pipe plug (127) out of driving flange pin (113), then place the assembly under an arbor press with gear end firmly supported. Press driving flange (122) assembly down on the shaft to expose lock ring (117) and remove lock ring. Apply pressure on driving flange as close as possible to its hub.

Now place clutch assembly under press so that gear end is below and free to permit pressing shaft through clutch assembly until woodruff key (118) touches plate (116). Driving flange assembly (122) and clutch plates are now free for removal.

Removal of Pressure Plate Assembly—

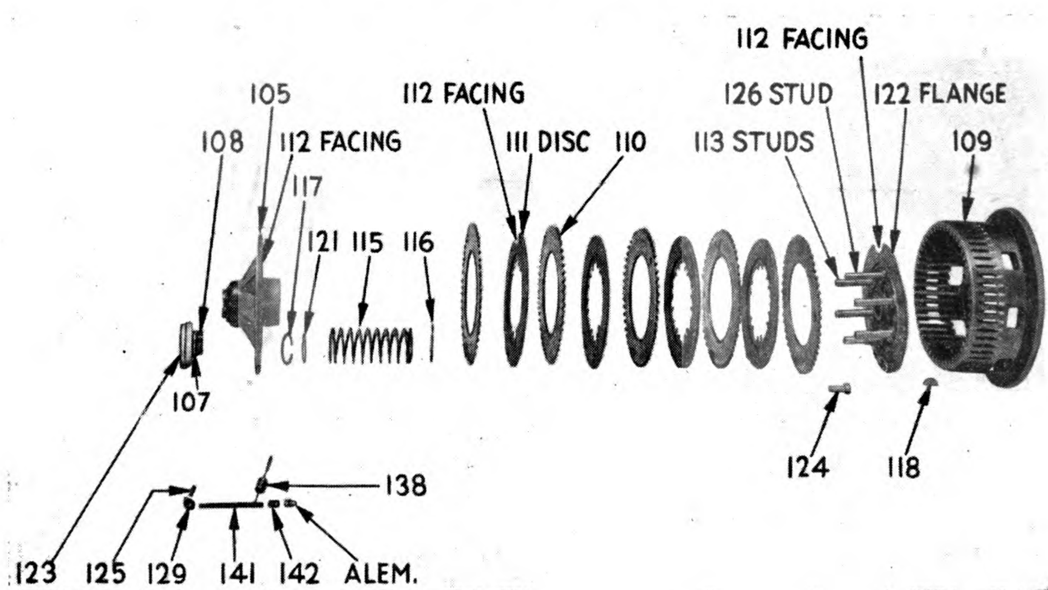
Take out woodruff key (118) and pressure plate (105) assembly is free.

Now force out locking ring (107) and unscrew release bearing sleeve (108). Remove cotter pin (114). Insert a bolt from release bearing end. Bolt head should be small enough to permit entry but large enough to prevent its passage through spring. Screw a nut against spring retaining plate (116) until tension is off pressure plate (105). Unscrew spring retaining plate, and remove with spring under pressure.

Removal of Clutch Driven Drum—

This is held to engine flywheel by cap screws and may be readily removed.

FULLER CLUTCH PARTS



Fuller Clutch (Continued)

Fuller Clutch Parts

8″—14 Facing (B-G Specification CL-FU-A2)

For Fuller Transmission Model #5-A-43 (B-G Specification TR-FU-C4).

Fuller Clutch used on Loaders with Serial #82-7-37 and below.

For Fuller Transmission with Lipe Clutch see Main Transmission and Master Clutch.

Note: B-G Parts only are marked **. Unmarked are Fuller.

Ref. No.	No. Req.	Part No.	Description
T101.	1	B-17-189**	¼″ Asbestos Brake Lining
T102.	1	1819	Locking Wire for Yoke Screw
T103.	2	X-7-603	⅜″—24 x 1 Hex. Hd. Bolt
T104.	1	3229	Clutch Release Yoke
105.	1	3584	Clutch Pressure Plate
106.	1	X-6-11	#11 Woodruff Key
107.	1	3578	Clutch Release Bearing Sleeve Lock
108.	1	3439	Clutch Release Bearing Sleeve
109.	1	2843	Clutch Driving Drum
*110.	5	2302	Clutch Outer Disc. (See Note)
111.	4	1141	Clutch Inner Disc
112.	10	1839	Clutch Facing
113.	5	4347	Clutch Driving Flange Stud
114.	1	X-4-306	3/32″ x ¾″ Cotter Pin
115.	1	2868	Clutch Spring—"A" Weight
116.	1	1175	Clutch Spring Adjusting Plate
117.	1	1248	Clutch Driving Flange Locking Ring
118.	1	X-6-18	#18 Woodruff Key
T119.	2	3995	Clutch Release Yoke Washer
T120.	2	1399	Clutch Release Yoke Stud
121.	1	1009	Clutch Spring Thrust Washer
122.	1	3300	Clutch Driving Flange
123.	1	3092	Clutch Release Bearing
124.	1	3226	Driving Stud Lock Screw
125.	1	3230	Oil Pipe Nipple
126.	1	4348	Clutch Driving Flange Stud
127.	1	R1-865**	⅛″ Standard Pipe Plug
128.	150	1292	Clutch Facing Rivet
129.	1	3231	Oil Pipe Elbow
T131.	1	5574	Clutch Shaft and Drive Gear 23T 6—6.928″ Pitch

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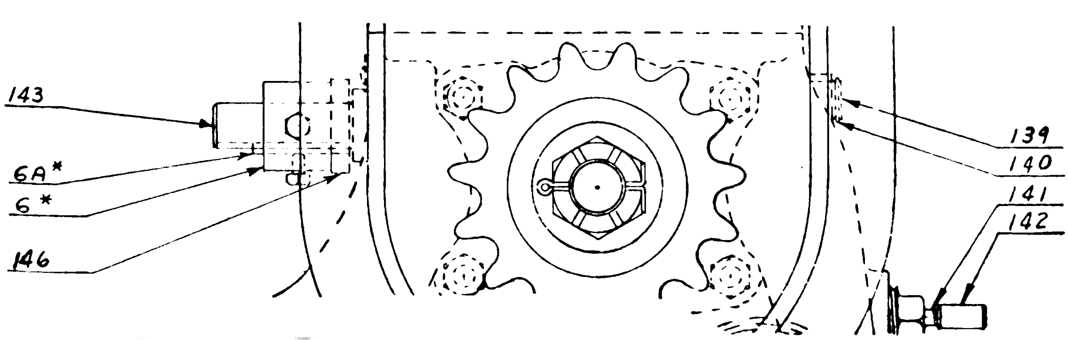
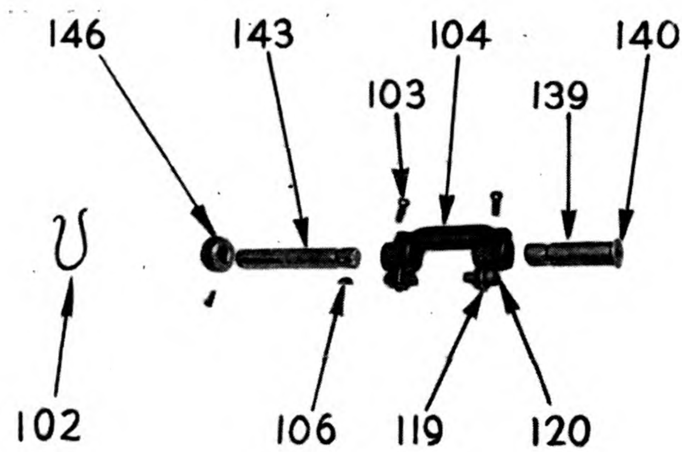
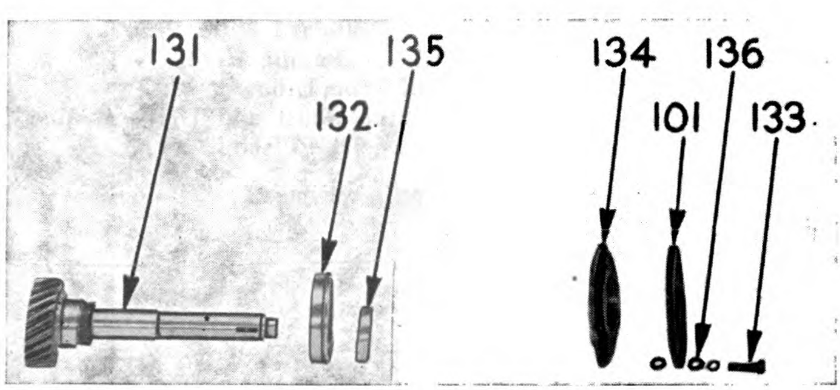


Fuller Clutch (Continued)

Ref. No.	No. Req.	Part No.	Description
T132.	1	212MFG	Drive Gear Ball Bearing
T133.	3	X-8-602	⅜″—16 x 1½″ Screw
T134.	1	5561	Front Bearing Cover
T135.	1	4658	Drive Gear Bearing Nut
T136.	3	BE-17-9**	#12 Ga. Washer
138.	1	3234	Oil Pipe Tension Spring
T139.	1	A-197	Short Clutch Pedal Shaft
T140.	1	3995	Short Pedal Shaft Washer
141.	1	3232	Oil Pipe
142.	1	3233	Oil Pipe Coupling
143.	1	6434	Clutch Pedal Shaft
T146.	1	C-3-951	Collar
	1	R1-935**	⅜″ x 1″ Set Screw for Lever Arm
	1	R1-933**	⅜″ x ¾″ Set Screw for Lever Arm

*Note: One Clutch Outer Disc to be an A2-302-H or Master Disc and to be assembled at front of clutch.





Parts illustrated on this page and marked "T" in *clutch* parts list are *transmission* parts, peculiar to Fuller Clutch. Parts without "T" are for clutch proper. For *transmission* parts common to either Fuller and Lipe Clutch, See Main Transmission.

Fuller Clutch (Continued)

Machines equipped with FULLER CLUTCH can be converted to use LIPE CLUTCH by utilizing the following parts:

Ref. No.	No. Req.	Part No.	Description
	1	CL-WL-A1	Model #Z-32-S W. C. Lipe Clutch
			Transmission Parts Peculiar to Lipe Clutch. (See Main Transmission Parts Marked "T")
T107	1	5320	Front Bearing Cover
T110	1	4733	Clutch Release Bearing Carrier
T119	1	X-6-11	#11 Woodruff Key
T120	1	4416	Short Clutch Pedal Shaft
T121	1	4647	Drive Gear Bearing Nut
T123	1	2772	Clutch Throwout Yoke
T154	1	5333	Clutch Shaft and Drive Gear
T157	1	212 MFG	Drive Gear Ball Bearing
T164	2	X-7-603	3/8"—24 x 1" Hex Head Screw
T228	1	FP-17-9	Washer
T230	1	6434	Clutch Pedal Shaft
			Engine Parts Peculiar to Lipe Clutch. (See Buda Engine Parts B-G Specification #EN-B-D8)
1600	1	K-40125	Flywheel for Lipe Clutch
1604	1	H-12599	Flywheel Housing for Lipe Clutch
2115	1	4740	Starter Adapter for Lipe Clutch
	3	R1-483**	Cap Screws 3/8"-16 x 2½"

Always Give Serial Number of Machine, Parts Number and Description

Lighting Plant

Kato Model 23-A Generator with Model X-511 Johnson gasoline engine Barber-Greene Specification PP-KA-A1.

SPECIFICATIONS OF GENERATOR

Current Characteristics— AC-110V—60 Cycle.

Capacity—500 Watts.

Speed—1800 R. P. M.

SPECIFICATIONS OF POWER UNIT

Type—Model #X-511 Single Cylinder—4 Cycle—air cooled.

Power—1 HP @ 1800 R.P.M.

Bore and Stroke—2¼" Bore x 1¾" Stroke.

Starting—By Starter.

Ignition—High Tension Magneto built in fly wheel by Johnson.

Spark Plug—Champion #J-8 (14 M.M.).

Carburetor—Adjustable speed down draft type built by Johnson.

Air Cleaner—United Air Cleaner Model #A-8285 Oil Bath Type.

Cooling—Air Cooled by fan on fly wheel.

Governor—Fly ball type mounted on crank shaft built by Johnson.

Lubrication—Metered splash system to all internal parts.

Gas Tank Capacity—⅞ Gallon.

Crank Case Oil Capacity—¾ Pint.

Maximum Fuel Consumption—1½ Pints per Hour.

Oil Change—¾ Pint every 40 working hours.

IMPORTANCE OF FOLLOWING INSTRUCTIONS

If the instructions which follow are carefully carried out, long and efficient service will be received from this unit.

INSPECTION OF UNIT

This unit has been carefully tested and packed before leaving the factory. Upon receipt, check thoroughly for any damage that may be due to shipping. Make sure that all nuts and bolts are tight and that the engine and generator armature turn over freely.

GENERAL INSTRUCTIONS AS TO OPERATION AND MAINTENANCE

Keep the Unit Clean (Figure Z):

Do not allow plant to become covered with grease and dirt. Wash occasionally with gasoline or carbon tetrachloride.

This unit must be operated at about 1800 to 1900 rpm in order to generate the proper voltage and cycle. Speed is adjusted at factory. Should further adjustment be necessary, see engine instructions.

Generator is furnished with double sealed ball bearings (15). They

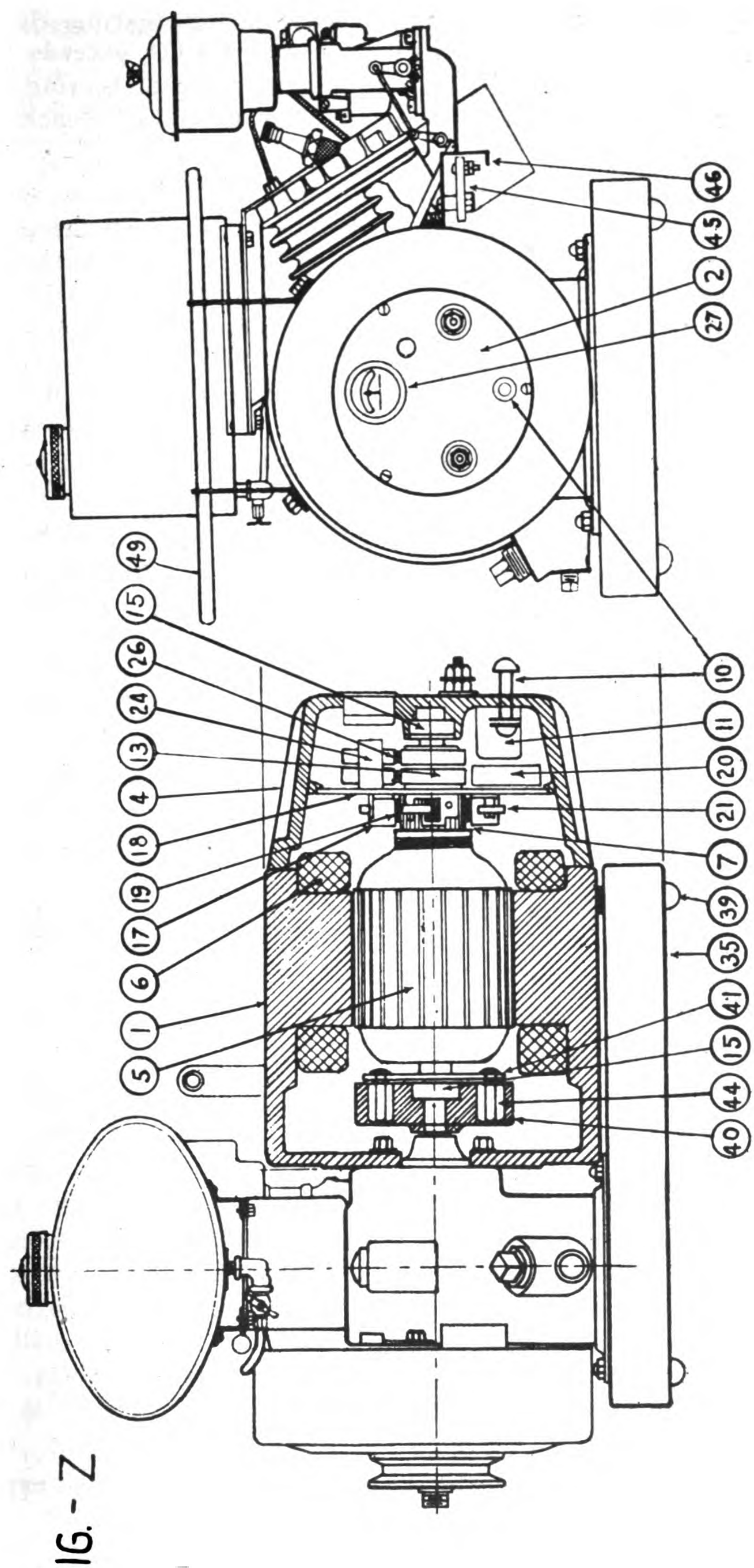


FIG. - Z

are packed with sufficient grease for the life of the bearing. However, if unit is operated in a place where the temperature exceeds 120°F, the bearings should be repacked with a high grade of bearing grease [Superla #2-X (Standard Oil) or equal]. For method of repacking see "Coupling Instructions."

The commutator (7) and collector rings (13) should be polished occasionally. To do this make a polisher by taking a pliable piece of wood about the same width as the commutator and fold several layers of duck over the end and tack in place. This canvas pad held on the commutator or slip ring when plant is running will clean them and give a high polish. If the commutator or slip ring becomes grooved, polish with a very fine grade of sand paper and then follow up with the pad. The commutator, collector rings, brushes (19 and 26), bearings (15) and coupling bushings (44) are the only parts of this generator subject to wear.

The brushes must fit into their holders (17 and 24) so that they are free and move up and down without sticking or binding. Spring tension on all brushes should be strong enough to prevent chattering. All brushes should bear upon the commutator or collector with equal pressure. Brushes must line up with slip rings. Provision is made for adjustment so that the AC brushes are centered on the rings by the use of fibre washer between brush holder block and mounting ring.

The bearings are subject to gradual wear. Check clearance between armature (5) and field pole (6) occasionally. Bearing must be replaced before it is worn to the extent that it will allow the armature to rub on the pole. If generator is run very long with armature rubbing pole, the armature winding will be burned out which necessitates expensive rewinding or replacement of the armature. It is important that the inner bearing race must not be loose on shaft and the outer race is snug in housing, however it is permissible for outer race to creep in the housing.

ARMATURE DRIVE

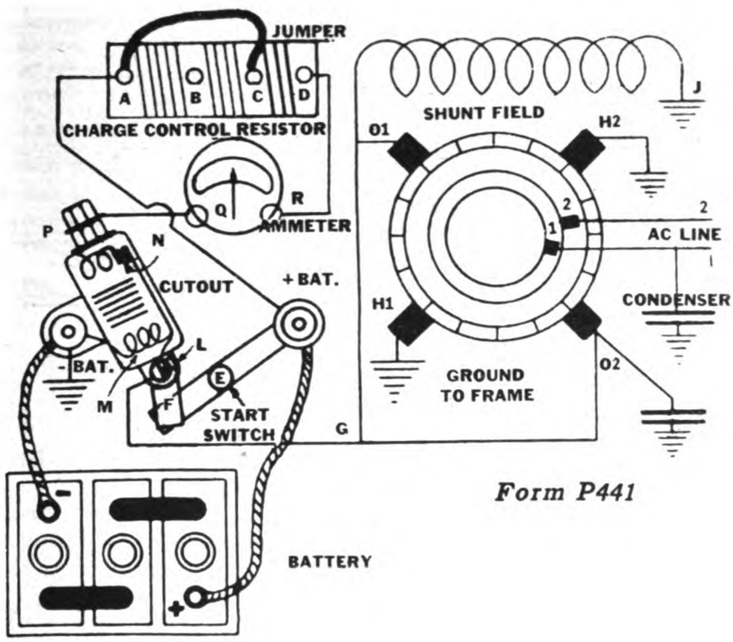
Driven end of armature (5) is carried on end of engine shaft. Armature is held concentric by pilot bearing carried on engine shaft.

Rotative power or torque is transferred from engine to armature through rubber bushings (44) carried on armature driving disc to driving pins mounted on armature driving disc (40). This arrangement permits angular misalignment between armature shaft and engine shaft. With this driving arrangement, the chance of stress on any bearing due to slight misalignment is eliminated. Pilot bearing (15) will allow several degrees of misalignment and still keep armature shaft concentric with engine shaft. The pilot bearing does not turn. It is grease sealed with sufficient lubrication for life of bearing.

Resilience of rubber bushings tends to cushion or iron out explosion impulses, and prevent them from being transmitted to armature. If rubber bushings become hard, they should be replaced.

CONNECTIONS TO GENERATOR

Connect AC load wires to wires (1) and (2), brought out end of generator. The load should be connected to the plant through a standard fuse block.



Form P441

TO TRACE CURRENT FLOW WHEN STARTER BUTTON IS PRESSED

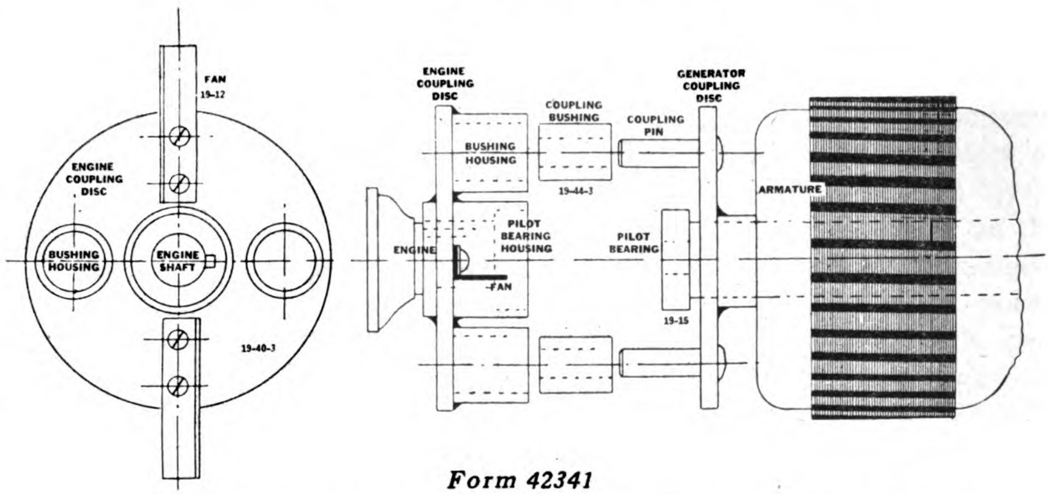
For self-cranking battery wires are connected to positive and negative post of generator as shown on diagram of sheet form P441.

When the starter button "E" is pressed, current flows from the positive or plus battery, through contact "F" of starter switch to terminal "L" thence to "G" where it branches, part flowing through shunt field of generator to ground "J" and through ground back to negative side of battery, (negative battery and negative side of plant are grounded). The current also flows from "G" to brushes "02" and "01", through armature and out at "H2" and "H1" to ground negative battery. This flow of current, through the shunt field, energizes the field and with the flow of current through the armature, causes the generator to act as a cranking motor and starts the engine.

Battery charging equipment, mounted on generator is not used, because the battery is charged by generator on main power plant. Therefore, cut-out "P", ammeter "Q" and charge control resistor "ABCD" are disconnected from battery circuit, as shown on form P441.

Changing speed of the engine will effect the AC voltage and frequency. To change speed, consult the engine manual. The voltage of the generator should be adjusted to approximately 135 volts with no load on the AC or DC.

Coupling Instructions



Form 42341

The above drawings show the coupling arrangement of these plants in detail. In time, the rubber bushings (44) of this coupling will wear and lose their resiliency and must be replaced.

To replace the bushings, it is simply necessary to remove the cover (4) over the outer end bell (2) of the generator, then remove the screws holding the end bell in place. Lift up or remove both the DC (19) and the AC brushes (26) in order that they will not be damaged. Now remove the end bell or pull away just far enough so that the coupling pin clears the coupling bushing housing. It is not necessary to disconnect any wires.

The worn bushings may now be removed from the housings. Insert new bushings and push armature back into place, making sure that the coupling pin slides into the bushing properly and that the pilot bearing lines up in the pilot bearing housing in the engine side of the coupling.

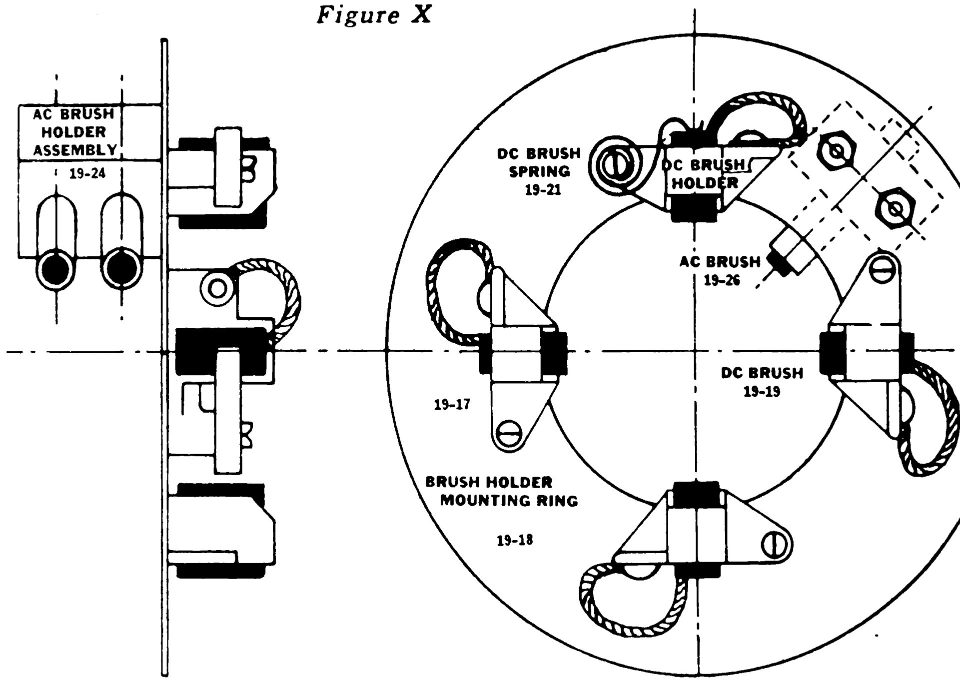
Carefully replace the generator end bell, making sure that all of the brushes are lifted or removed to prevent damage to them in replacing the end bell. After the screws are tightened make sure that the armature is free, then replace the brushes.

The bearings are grease sealed with sufficient lubrication for their life, consequently, it is not necessary to grease them. However, if this machine is operated in a place where the temperature exceeds 120°F., the bearing housing should be repacked with a high grade of bearing grease [Superla #2-X (Standard Oil) or equal].

When armature is replaced, check for end play very carefully, there should not be more than 1/32″ end play. Coupling bushing housing must have clearance from the generator coupling disc, they must not rub. Armature must turn freely with no binding.

Due to the fact that these bushings are of rubber, no oil or grease should be used on the coupling pins or bushing housing as it will deteriorate the rubber.

Figure X



SIDE VIEW OF AC AND DC
BRUSH HOLDER ASSEMBLY

DC SIDE OF BRUSH
HOLDER ASSEMBLY

Above is shown the brush holder arrangement in detail. Brushes must be replaced before they are worn to the extent that they will not make proper contact on the commutator or slip rings. Clean commutator and slip rings occasionally with #00 sand paper.

ENGINE OPERATION AND MAINTENANCE

HOW TO START

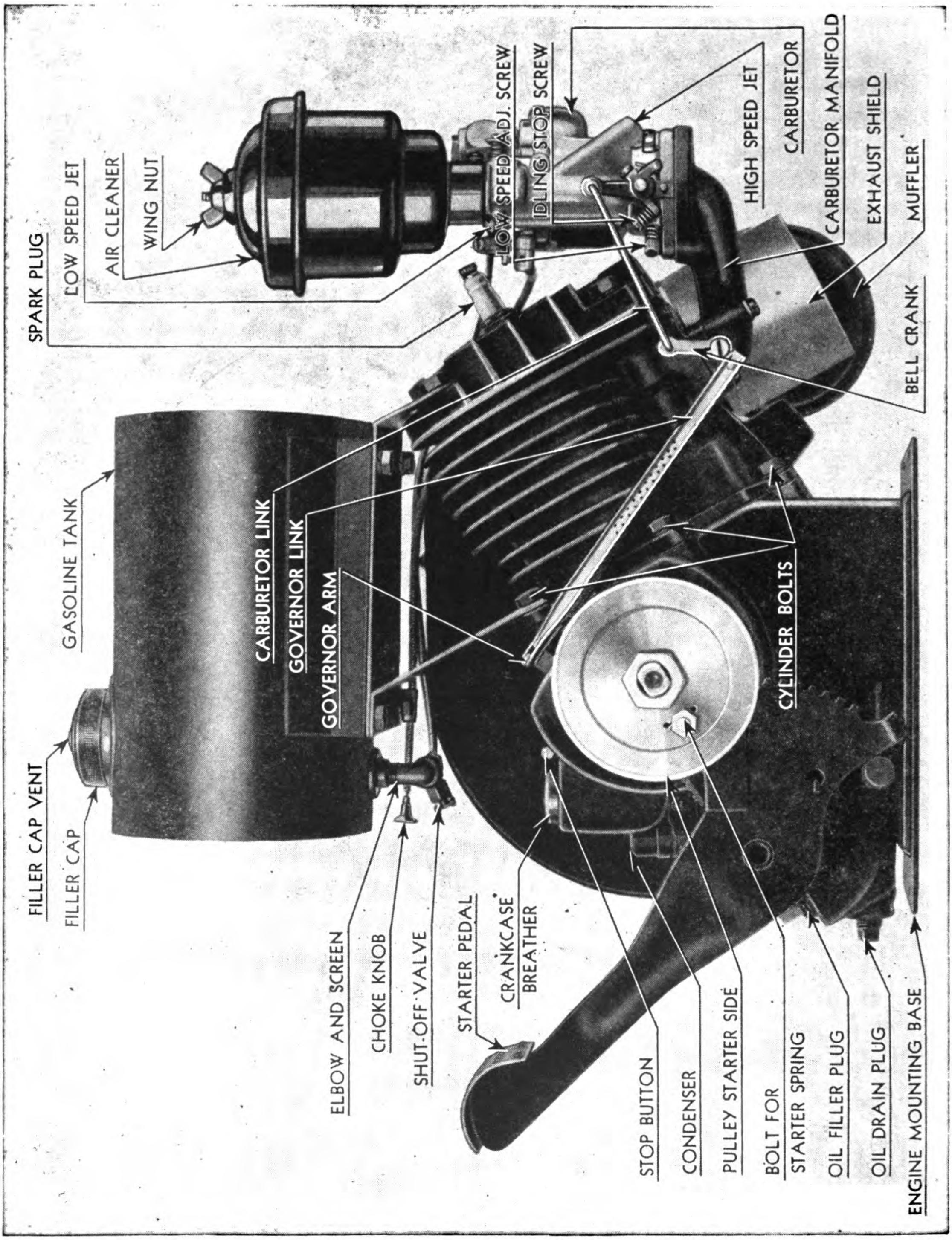
1. DO NOT ATTEMPT TO START UNTIL CRANKCASE HAS BEEN FILLED WITH OIL.
2. Fill gas tank with regular grade gasoline. (Do not use high test gasoline.)
3. Pull up on choke button. (Do not use choke to start when engine is warm unless necessary.
4. Press starter button on end of generator. If for any reason the starter does not function, engine can be started by wrapping starting rope around "V" Pulley on engine crank shaft and giving one quick pull.

IMPORTANT—During extreme cold weather, the oil in the crankcase congeals—becomes thick and "sticky". No effort should be made to start without first warming up as severe damage may result. Be sure engine can be turned over FREELY before attempting to start.

5. Push choke button in gradually upon having started engine.
6. To stop—Press Button on side of armature plate (See illustration on Page 5). Hold until engine stops turning.

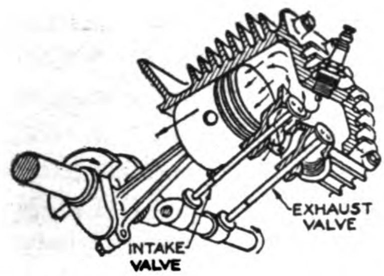
The Four (Stroke) Cycle

The IRON HORSE operates on the 4 (stroke) cycle principle—

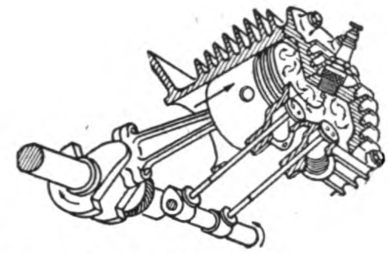


requiring four strokes of the piston to complete the events of the cycle —INTAKE, COMPRESSION, POWER and EXHAUST.

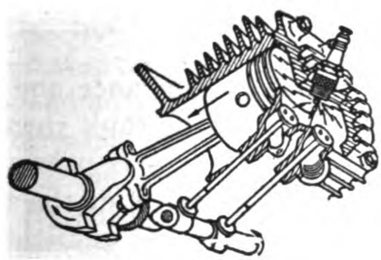
Admission of fresh fuel charges and discharges of the burned gases is by way of two poppet valves (intake and exhaust), operated by cams and timed to open and close at predetermined positions of the piston as follows:



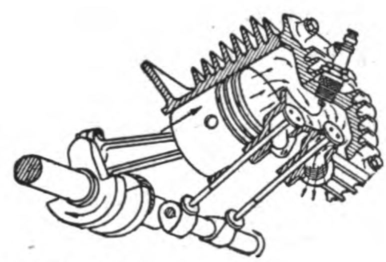
INTAKE:
1. Piston moving downward.
2. Intake valve opened by cam.
3. Suction created by downward movement of piston draws fuel vapor from carburetor into cylinder.



COMPRESSION:
1. Piston moving upward.
2. Valves closed.
3. Fuel charge compressed.



POWER:
1. Both valves closed.
2. Spark ignites compressed fuel charge.
3. Fuel charge burns and expands rapidly — forcing piston down to deliver power impulse. (Piston moving downward).



EXHAUST:
1. Piston moving upward.
2. Exhaust valve opened by cam.
3. Exhaust gases forced out of cylinder into atmosphere.

Carburetion

Carburetion on the IRON HORSE is provided by a conventional float feed, down draft carburetor. Correct fuel level at high and low speed jets in the mixing chamber is maintained at all times by a float valve in the float chamber—gasoline is gravity fed from the tank located immediately above the engine.

The float valve is operated, through a simple lever arrangement, by a small hollow metal float, consequently, when the float chamber is empty, the float is at rest near the bottom of the chamber. The float valve is then off its seat (open) and permits gasoline to flow into the float chamber. As this chamber begins to fill, the float rises and gradually closes the float valve—when the proper level is reached, the float valve closes completely.

On suction impulses of the engine, air is drawn through the mixing chamber of the carburetor, where air and gasoline are mixed to form a combustible vapor which is conducted into the cylinder by way of the manifold and intake valve.

The carburetor is provided with a high and low speed jet to insure correct fuel mixture throughout the entire speed range of the engine.

Care of Fuel System

No difficulty should be experienced with the fuel system if a good clean grade of gasoline is used and poured into the tank from a clean container and funnel. Be sure funnel is clean. Use fresh gasoline—gasoline left standing for any length of time will result in the formation of gum, which clings to the wall of the gas tank, clogs small carburetor passages and jets as well as to clog the screen installed at top of carburetor float chamber.

Gasoline gum, we are told, is present in all gasolines and so long as it remains in suspension, it causes no particular harm, but as the gasoline ages, gum commences to accumulate.

This gum has the appearance of a "varnish-like" substance and can be detected very easily by sticking screwdriver into the tank through the filler opening and scraping along the bottom. If gum is present, a sticky formation will be noted. It clings to the inner walls of the tank where it can have no actual effect on starting and running qualities of the engine; however, it does not confine itself to the walls of the tank only, but also collects on the small screen attached at top of carburetor float chamber to obstruct free passage of gasoline through the carburetor. In extreme cases, it clogs the small passages in the carburetor and the fuel line as well.

Excessive gum accumulation will naturally interfere with starting and running of the engine. If the fuel supply is shut off by this gummy formation, the engine simply cannot be started. IT MUST HAVE GASOLINE TO START AND RUN.

Gasoline gum is not readily soluble in gasoline, therefore, little good will come of attempting to remove it by washing the affected parts in gasoline. To remove—rinse inside of tank and the check valve assembly with ALCOHOL or LACQUER THINNER. (Lacquer thinner is highly INFLAMMABLE—use with caution).

Gum accumulation in the gas tank and other parts can be reduced to a minimum by always using comparatively fresh gasoline. Since the IRON HORSE uses but very little, gasoline should not be stored in large quantities—keep only a small supply on hand to insure freshness. BE SURE THERE IS NO WATER IN THE GASOLINE TANK AND THAT SCREEN IN THE TANK AND CARBURETOR (end of gas line above float chamber) ARE CLEAN.

CARBURETOR ADJUSTMENT

Since all IRON HORSE engines are thoroughly tested before leaving the factory, the carburetor is properly adjusted and should require no further adjustment; however, in event the original adjustment has been altered, proceed as follows:

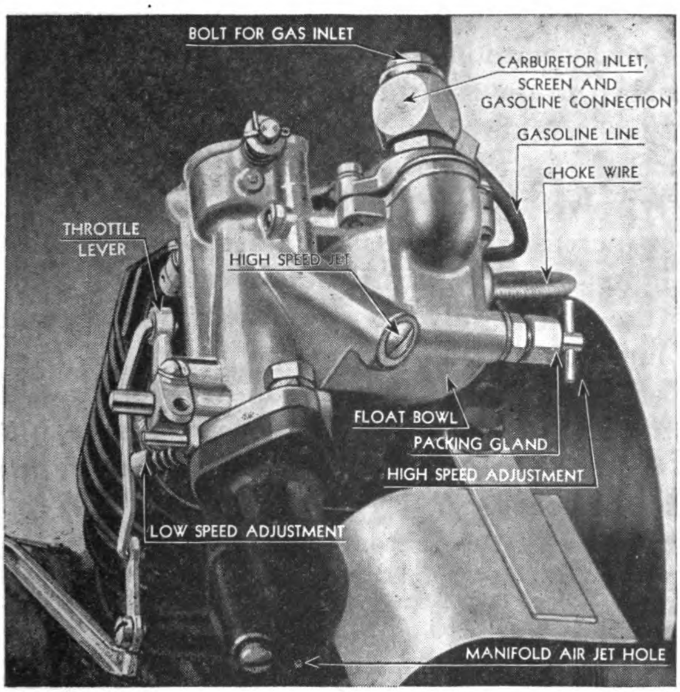
1. Close low speed adjusting needle until it rests gently on its seat.
2. Close high speed adjusting needle until it rests gently on its seat. (See illustration below).
   (NOTE—Under no circumstances screw adjusting needles down tightly on seats—to do so will injure both the seat and needle and result in failure thereafter to obtain satisfactory carburetor adjustment).
3. Open slow speed adjusting needle approximately ¾ turn (left).
4. Open high speed adjusting needle approximately ¾ turn (left).
5. Start engine as instructed and operate until thoroughly warmed up.
6. Apply full load.
7. Turn high speed adjusting needle to right or left as desired to obtain best performance.
8. To adjust low speed—remove load, hold throttle lever at closed position, move to left facing engine. See illustration at left. Adjust shutter stop screw to permit engine to run at 800 - 1000 R.P.M. Turn low speed adjusting needle to right or left as required to obtain best performance. After adjusting slow speed jet readjust high speed jet for final and recheck slow speed jet.

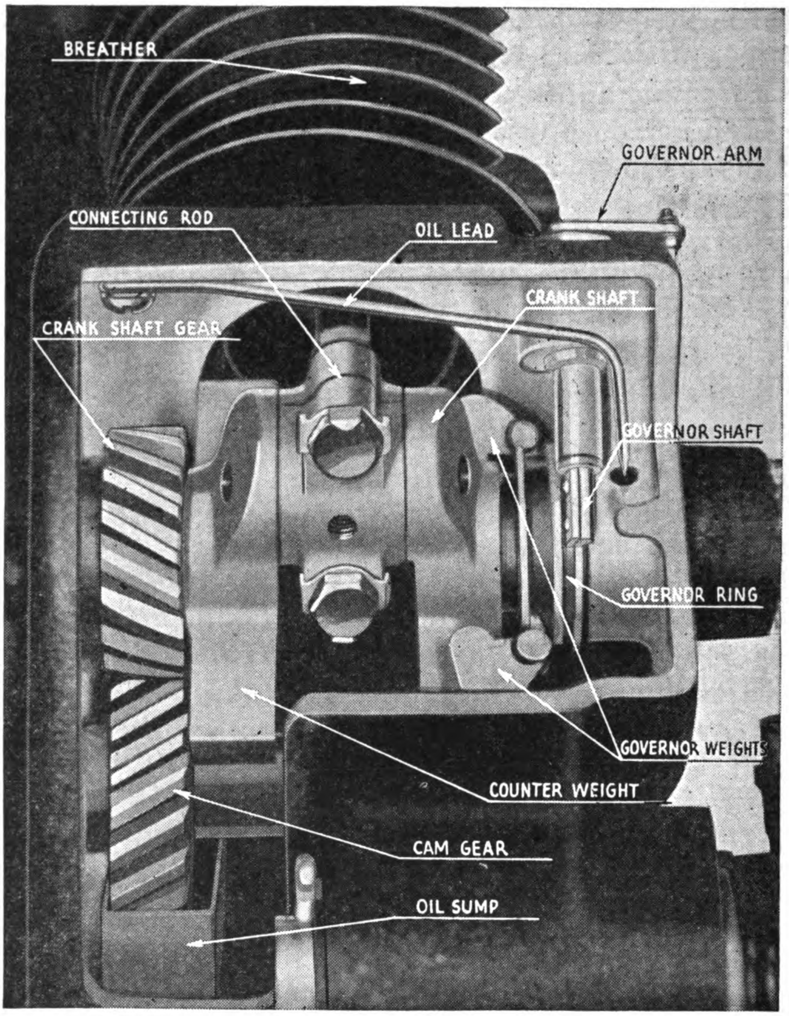
Be sure all governor link connections are free and that there are no indications of binding.

Governor Throttle Control

Since the IRON HORSE is designed to operate normally at 2250-2350 R.P.M. the carburetor is constructed with a shutter valve which is controlled by a mechanical governor as the engine load varies.

The governor is built on to the crankshaft and is of the fly-weight





centrifugal type—connected to the carburetor valve by means of a small crank arm and link.

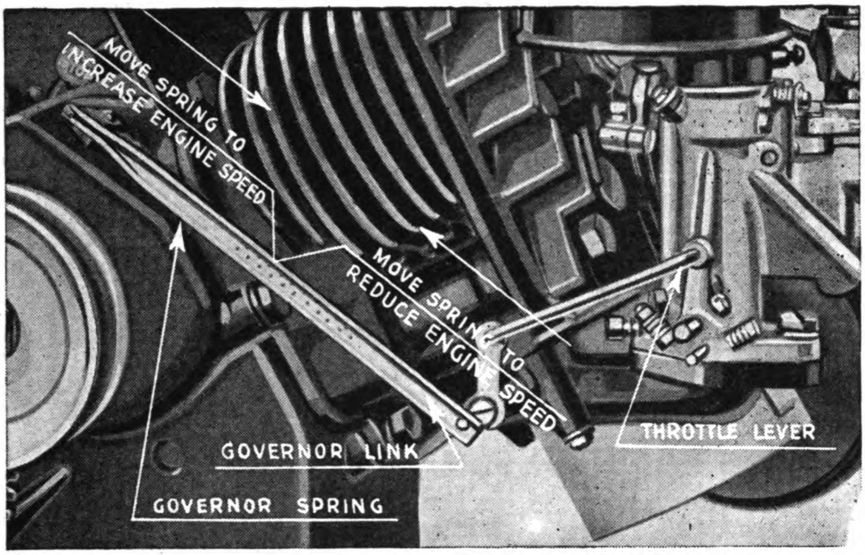
As long as the engine remains motionless, the butterfly valve is held open by a small spring attached to the control link; however, upon having been started, the governor weights are thrown outward, due to centrifugal force, causing movement of the governor arm resulting in partial closing of the butterfly valve, thereby reducing the charge admitted to the cylinder. Further increase in engine speed has a considerable effect on the governor weights—causing greater action of the governor arm, consequently, closing the shutter valve to a point where a constant speed of 2250 to 2350 revolutions per minute is maintained.

Any increase in the load applied will cause a drop in revolutions—reducing the effect of centrifugal force on the governor weights, resulting in the butterfly valve being opened to admit a larger charge until normal engine speed has been reached.

Governor control is adjusted at the factory and should not be altered.

To Adjust Engine Speed

Speed of the engine is controlled by action of the governor and ten-



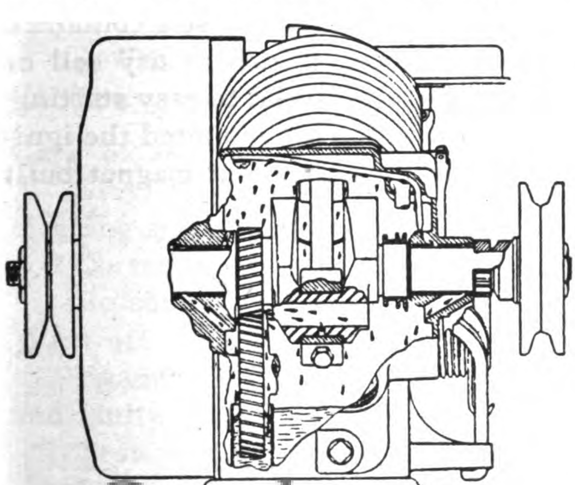
sion of the governor spring, therefore any change in the tension of this spring will effect the speed at which the engine is running. It will therefore be seen that normal engine speed may be adjusted to a lower or somewhat higher speed to conform to requirements.

Since the spring acts to hold the shutter valve open to admit a full charge to the cylinder, a decrease in tension will result in slower engine speed. An increase in engine speed is then obtained by increasing the tension on this spring.

Various spring tensions can be obtained by hooking the spring in one of the several holes in the control link for this purpose.

If you have reason to assume the engine is not turning at its recommended R.P.M. (2250 to 2350), apply a speed indicator to the end of the crankshaft to determine engine speed. To decrease engine speed, decrease tension of spring by hooking in one of small holes closer to the governor arm. To increase engine speed, simply increase tension of the spring by attaching it to one of the holes further distant from the governor arm, as indicated by arrows.

(CAUTION: Do not attempt to stretch the governor spring. Any change in length will render it useless so far as obtaining correct speed and speed variation is concerned).



Lubrication

Lubrication of moving parts is accomplished by the SPLASH System. The cam gear operates in a small oil sump, into which the proper amount of oil is metered at all times, in such a manner that oil is picked up between the teeth of the gear and forced out with considerable pressure as the teeth of this gear and the crankshaft gear mesh, as shown.

The spray of oil from the gears is then picked up by the revolving crankshaft and distributed thruout the crankcase and cylinder, thus an ample supply of oil reaches all bearings and bearing surfaces.

There are no additional moving parts required to circulate the oil—if the crankcase has been filled to the proper level, oil circulation commences the instant the engine is started.

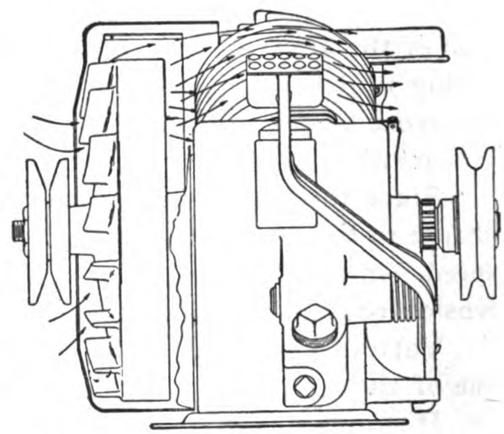
Crankcase—

Remove large oil filler plug and add motor oil to point of overflow. Follow recommendations under "Lubrication", page 33.

Air Cleaner

Drain, clean and add new motor oil daily. Follow recommendations under "Lubrication", page 33.

Cooling



The IRON HORSE is air cooled, being equipped with cooling fins on the cylinder and cylinder head to radiate excess heat generated within the cylinder.

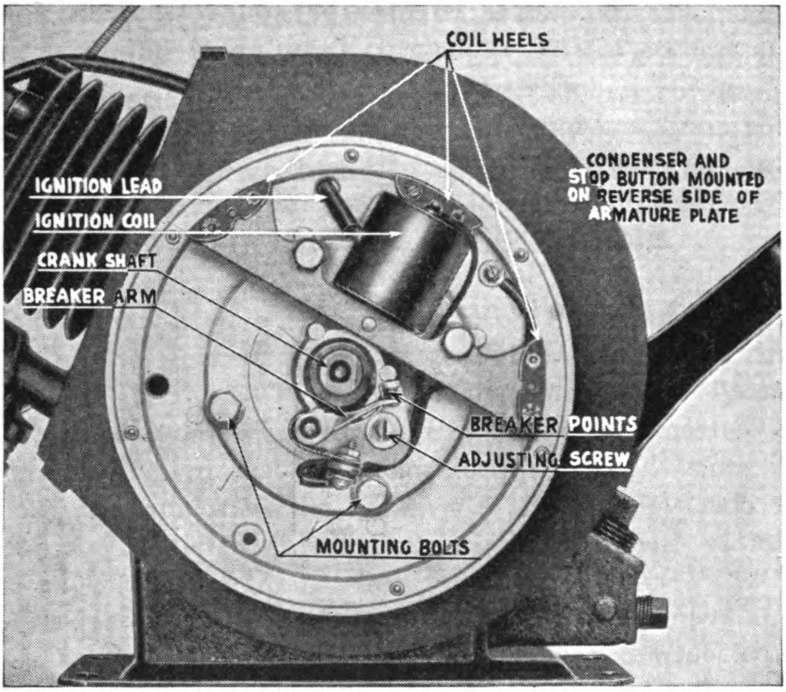
To insure an ample supply of air for cooling purposes under all conditions, a blower system is built into the engine. This blower consists of a series of air fins cast onto the face of the flywheel, which is covered by a shroud to continually direct a blast of air onto the cylinder and head, thus maintaining satisfactory operating temperature.

The cooling system requires no attention—in event of overheating see Trouble Chart.

When mounting in an enclosure, be sure ample room is allowed for air circulation,—provision must be made to permit fresh cool air to enter on flywheel side and sufficient opening to discharge heated air.

The Magneto

The magneto, as supplied on the IRON HORSE, is a self contained unit requiring no assistance from outside sources such as dry cell or storage battery to produce the strong spark so essential to easy starting. It consists chiefly of an armature plate, on which are mounted the ignition coil, condenser and breaker points and a permanent magnet built into the flywheel.



Its operation is extremely simple:—As the pole pieces of the magnet pass over the heels of the coil, a magnetic field is built up about the coil, causing a current to flow thru the primary winding.

At the proper time, the breaker points are opened by action of a cam machined on the crankshaft, thus breaking the primary circuit. This stops the flow of primary current, which causes the magnetic field about the coil to break down instantly—an electrical current of exceptionally high voltage is induced in the fine secondary winding of the coil, which is carried to the spark plug where it jumps the gap between the points to ignite the compressed charge in the cylinder.

Due to its rugged construction, the magneto will perform efficiently throughout the entire life of the engine. It requires no lubrication, therefore, no attention other than an occasional inspection of the breaker points and spark plug connections.

Spark Plug

A Champion No. J-8 (14MM), which can be purchased from any Champion dealer, is recommended to be used in the IRON HORSE.

Care of Ignition System

SPARK PLUG—Remove spark plug for occasional inspection, cleaning and adjustment of points.

Correct setting of gap .030″.

Be sure porcelain or insulator is dry and clean before replacing. Wipe off with dry cloth to remove traces of moisture or residue.

Examine for cracked or broken porcelain. (Hard starting, missing and faulty operation are often caused by a defective insulator).

Test plug by placing body of plug on cylinder head with ignition lead attached—crank engine to observe spark between points. (The spark may not be visible in bright light, nevertheless, a pronounced "snap" is audible if sparking takes place). CAUTION: Under no circumstances crank engine with spark wire detached—Doing so may injure coil or condenser.

IMPORTANT—In event of requiring the installation of a new spark plug — BE SURE TO INSTALL A CHAMPION No. J-8 (14MM).

MAGNETO—Under no circumstances should the magneto be tampered with unless it is evident that hard starting or faulty operation can be traced to some irregularity in it.

Before attempting to make adjustments, remove ignition lead from the spark plug—hold it approximately ⅛" from cylinder head; crank engine to observe spark. If a weak or no spark appears, the difficulty is most likely due to improperly adjusted, pitted or corroded breaker points.

In this event it is necessary to remove the flywheel as follows:

Remove shroud covering flywheel.

Remove flywheel nut and pulley.

Have someone grasp rim of flywheel to absorb shock.

Strike end of crankshaft a light blow with soft hammer or mallet. (Be careful not to injure end of crankshaft). One or two applications is all that is necessary. Puller may be obtained from Johnson Motors at nominal cost.

Upon removal of flywheel, notice the breaker points are operated by a flat surface machined on the crankshaft.

Examine condition of points by spreading with blunt instrument.

If pitted or corroded, turn crankshaft until points close. Insert small flat file between points—draw back and forth gently to dress down points. Insert new points if necessary.

To check breaker point gap—turn crankshaft slowly until points have opened and are wide apart.

Insert feeler gauge between points—Correct gap setting .018"—.020".

If necessary to make corrections, loosen breaker plate adjusting screw. Page 11.

Increase gap by moving breaker assembly towards crankshaft—reduce by moving opposite direction. (Note:—Breaker gap is governed by distance from follower to center of crankshaft when passing over flat section).

Tighten breaker plate adjusting screw.

Replace flywheel, pulley and nut. (Make certain flywheel key is properly placed in keyway—this is IMPORTANT).

Tighten nut with large wrench.

Replace shroud. Attach lead to plug—start engine as instructed. Operate ten to fifteen minutes—stop to retighten flywheel nut.

CAUTION: The flywheel is keyed to the tapered end of the crankshaft by a soft aluminum Woodruff key. If the flywheel nut is not properly tightened in assembly or should loosen, the power strokes of the engine will cause the key to shear off flush with the crankshaft, without injury to either the crankshaft or zinc flywheel. Ignition timing, however, will be affected and in this event the engine will commence to run irregularly and ultimately stop. BE SURE THE FLYWHEEL NUT IS TIGHT.

Removing Carbon and Care of Valves

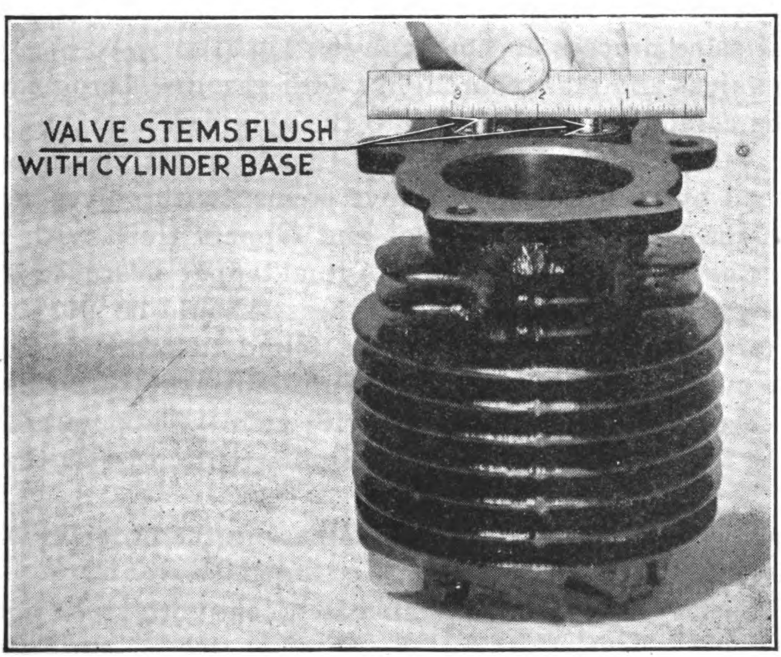
After a long period of operation, it may be necessary to detach the cylinder head to remove carbon from combustion chamber, head of piston and valves.

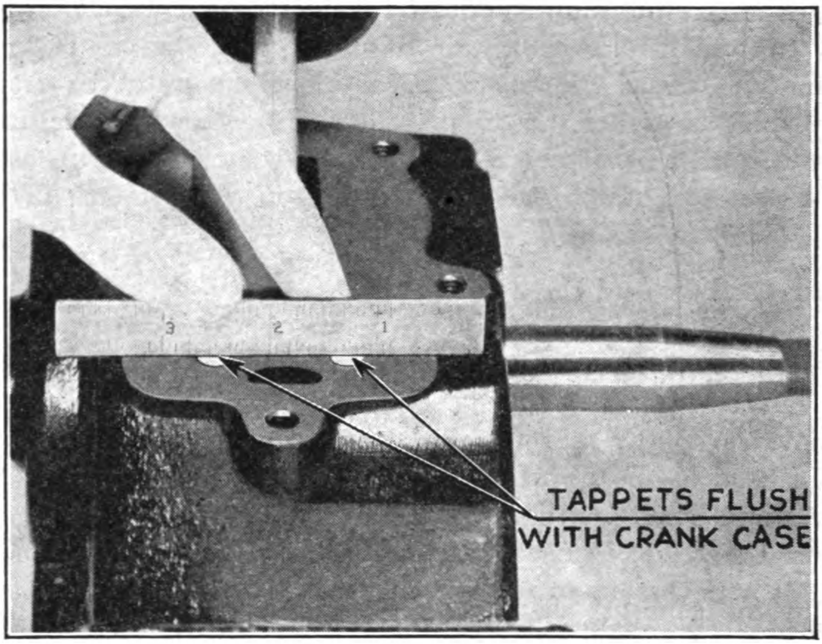
Remove carbon by scraping with blunt instrument being careful not to scratch head of the Lynite piston. Wash cylinder head, head of piston, valves and gasket with gasoline.

Unless the valves and seats are badly pitted they need not be ground in—since it is necessary to remove only the excess carbon accumulation. This can be accomplished by turning the flywheel slowly until one of the valves has opened—apply a small quantity of kerosene on the valve and valve seat. Turn flywheel until valve closes—make sure it has seated. Turn valve back and forth with valve grinding tool to work carbon off head and valve seat. Repeat same on both valves.

TO GRIND VALVES—If advisable to grind valves, due to blow-by and loss of compression: (Note—Cylinder is detachable from the crankcase and held in position by five tap bolts; also, that valve stems and springs are entirely inclosed and accessible only upon removal of the cylinder as shown in illustration.)

Remove shroud, flywheel and armature plate as previously instructed.





Remove five bolts holding cylinder in position.

Lift cylinder from crankcase.

Compress each valve spring to withdraw retainer pins.

Remove valves, retainers and springs. (Note—Exhaust valve head marked with prick punch).

Scrape excess carbon from valve head, stem, valve guide and seat in cylinder block. Wash with gasoline.

Coat face of valve with medium fine valve grinding compound.

Replace valve and grind by turning back and forth with valve grinding tool. Be sure valve is seated. One or two minutes of grinding should be sufficient. (A small spring placed under the valve head will simplify this operation).

Repeat same process on both valves.

Wash valves and seats thoroughly with gasoline, being careful that none of the compound is washed into the cylinder.

Insert valves in original position. Check tappet clearance—this is accomplished by seeing that the valve stems (with valves seated) are flush with the base of the cylinder and tappets flush with crankcase bolting face as shown in illustration. Actual tappet clearance is obtained by installing a gasket of suitable thickness—should be .012″.

If, after grinding, valve stems are found to protrude beyond the base of the cylinder, simply grind carefully until they are flush. (Make certain face of valve stem is square with stem). Tappets are adjusted flush at the factory and should require no attention other than inspection.

Reassemble valves, springs and retainers in the order in which they were disassembled.

Place gasket in position on crankcase (coat both sides lightly with grease.)

Install cylinder—compress piston rings slightly to permit piston entering cylinder. Be careful not to break or bend rings. A sprung ring will never seal properly.

Replace cylinder bolts—draw up evenly and tightly.

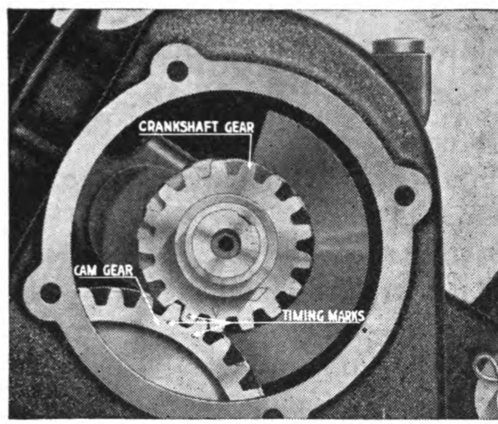
Install cylinder head.

Replace armature plate, flywheel and shroud, as instructed on Page 438.

IMPORTANT—Be sure flywheel nut is tight. Operate engine ten to fifteen minutes, then retighten nut.

(CAUTION—It is IMPORTANT that all traces of carbon have been removed from valve stem and guide—failure to do so will result in sluggish valve action, likewise interfere with efficient operation of the engine and starting qualities).

Timing



IGNITION — Since set ignition timing, with no advance or retard, is employed on the IRON HORSE, timing of the ignition is done at the factory and cannot be altered.

Width of the breaker point gap, of course, has some effect on timing; nevertheless, if the breaker points are adjusted as instructed on Page 438, timing is correct.

VALVES — The valves are properly timed on every IRON HORSE before it leaves the factory, therefore it should cause no concern. However, if the engine has been completely disassembled and the valves thrown out of time, proceed as follows: Note punch marks on cam and crankshaft gears.

Turn cam gear until the two punch marks are visible.

Insert crankshaft—meshing teeth in such a manner that the punch marked tooth on the crankshaft gear is meshed between the two punched teeth on the cam gear as shown. Complete reassembly of engine.

TROUBLE CHART

Fuel Supply

Tank empty.

Fuel line clogged.

Check valve not functioning.

Air leak in fuel line.

Water or foreign substance in gas tank.

Engine will not start if flooded. Allow to settle few moments before cranking again.

Gum in gasoline.

Knocking

Engine not properly mounted (loose).

Engine over-loaded.

Carburetor adjustment too rich.

Excessive accumulation of carbon.

Flywheel loose.

Connecting rod loose.

Wrist pin and piston loose.

Carburetor

Choke not functioning.
Cogged jet.
Needle valve worked loose.
Needle valve improperly adjusted.
Loosely mounted.

Magneto

Pitted or improperly adjusted breaker points.
Loose electrical connections.
Defective condenser.
Defective ignition coil.

Uneven Running (Surging) is Frequently Caused by

Defective spark plug.
Improperly adjusted carburetor.
Air leak in gas line.
Gasoline low in tank.
Water or foreign substance in gas tank.
Governor link injured — bent or twisted, causing excessive drag on governor arm and carburetor lever. Should be straight with no indication of binding.
Loose electrical connections.
Accumulation on magneto breaker points—pitted or corroded.
Weak condenser, or ignition coil.

Spark Plug

Ignition lead detached.
Fouled (carbon or oil).
Improperly adjusted points.
Porcelain cracked or broken.
Porcelain covered with moisture or residue.

Engine

Loss of compression—
Leaky valves.
Sticky valves.
(Valve stem and guide carboned).
Piston rings inactive.
(Ring grooves filled with carbon).
Governor spring broken or detached.

Overheating

Oil level in crankcase too low.
Carburetor adjusted too lean.
Restricted air flow around engine.
Engine over-loaded.
Leaky valves.
Piston rings seized in ring grooves.
Excessive carbon accumulation.

LIGHTING PLANT PARTS LIST

Refer to Figures at End of List

Figure	No. Req.	Part No.	Description
			ENGINE PARTS
C	2	7-46	Nut—Cylinder to Crankcase Stud
C	2	7-169	Rivet—Oil Sump to Crankcase Cover
C	5	7-226	Washer—Cylinder to Crankcase Screw
C	8	13-134	Washer—Crankcase Cover Screw
C	2	21-294	Lock Plates—Connecting Rod Screw
C	8	21-359	Screw—Crankcase Cover to Crankcase
C	2	21-501	Screw—Connecting Rod
C	2	25-24	Stud—Cylinder to Crankcase
C	3	37-86	Screw—Cylinder to Crankcase
	3	51-151	Lock Washer—Mounting Plate Screw
C	2	53-8	Lock Ring—Wrist Pin
C	1	53-14	Nut—Crankshaft—Flywheel Side
C	1	53-16	Shaft—Cam Gear
C	2	53-19	Valve Springs
C	2	53-23	Pin—Valve Spring Seats
C	2	53-31	Retainer—Cam Gear Shaft
C	1	53-40	Spring—Governor Control
C	1	53-42	Drain Plug—Crankcase
C	1	53-43	Filler Plug—Crankcase
C	1	53-44	Gasket—Crankcase Cover
B	1	53-51	Name and Instruction Plate
C	1	53-55	Lock Nut—Exhaust Elbow
C	1	53-65	Sleeve—Governor
C	1	53-80	Exhaust Elbow
C	7	53-81	Screw—Cylinder Head
C	2	53-86	Rivet—Governor Link
C	1	53-109	Lock Washer—Crankshaft Nut—Flywheel Side
C	2	53-120	Seat—Valve Spring
C	1	53-157	Thrust Washer—Crankshaft—Starter Side—.062″ Thick
C	1	53-159	Cam and Gear
C	1	53-161	Link—Governor Control
C	1	53-207	Key—Crankshaft
C	1	53-211	Thrust Washer—Crankshaft—Magneto Side—.032″
C	1	53-225	Crankcase Cover Only
C	1	53-256	Gasket—Cylinder to Crankcase
C	1	53-296	Cylinder Head
C	1	53-297	Oil Sump
C	1	53-299	Gasket—Cylinder Head
C	1	53-300	Valve—Intake
C	1	53-303	Disc—Breather

(continued on next page)

Lighting Plant Parts List (Continued)

Figure	No. Req.	Part No.	Description
C	1	53-304	Nozzle—Breather
C	1	53-305	Cap—Breather
C	2	53-308	Push Rods
	1	53-309	Shield—Spark Plug
	2	53-316	Screw—Spark Plug Shield
C	2	53-326	Retainer for Bearing Seal
C	2	53-328	Seal for Bearing
	1	53-329	Bearing—Magneto Plate Side
C	1	53-330	Bearing—Crankcase Side
C	1	53-335	Cover—Breather
C	1	53-338	Wrench
C	1	53-355	Oil Lead Wire
C	1	53-405	Wrist Pin
C	2	53-407	Piston Ring—Compression
C	1	53-408	Piston Ring—Oil Control
C	1	53-414	Valve—Exhaust
B	2	61-109	Screw—Name Plate
C	1	53-765	Screw—Oil Lead Wire
C	1	71-1102	Nut—Oil Lead Wire Screw
	3	71-1311	Screw—Generator Mounting Flange
C	2	71-1445	Rivet—Governor Bracket to Crankshaft
C	1	71-1531	Washer—Oil Lead Wire Screw
C	1	76-152	Spark Plug
C	1	54-162	Breather Baffle
C	1	54-203	Governor Plate
C	1	53-500	Piston
		GENERAL ENGINE ASSEMBLIES	
C	1	54-10	Governor Bushing Assembly
C	1	54-18	Muffler Assembly
B	1	54-117	Choke Wire and Cable Assembly, 14" Long
C	1	54-121	Shield for Exhaust Outlet
B	1	54-159	Flywheel Shroud
C	1	54-168	Connecting Rod Assembly (Includes #21-501 and #21-294)
C	1	54-169	Crankcase Cover and Oil Sump Assembly (Includes #7-169 and #53-297)
C	1	54-188	Cylinder and Valve Guide Assembly
C	1	375,105	Crankcase Assembly (Includes #53-304, #54-162, #71-1102, #71-1531, #53-765, #53-355, #53-330, #53-328, and #53-326)
C	1	54-195	Crankshaft with Governor Weights and Sleeve Assembled (Includes #71-1445, #53-65, and #54-303)
		MAGNETO PARTS—See Figure B	
B	1	3-28	Lock Washer—Breaker Base Screw
B	4	13-134	Washer—Magneto Plate Screw
B	1	15-249	Screw—Condenser
B	1	17-212	Lock Washer—Flywheel Shroud to Back Plate Screw
B	1	21-200	Washer—Breaker Base Screw
B	1	21-200	Washer—Choke Cable Clamp on Shroud
B	2	21-256	Washer—Breaker Arm Screw
B	1	25-74	Screw—Breaker Base
B	1	39-169	Screw—Flywheel Shroud to Back Plate
B	2	51-135	Screw—Magneto Plate—Short

Lighting Plant Parts List (Continued)

Figure	No. Req.	Part No.	Description
B	1	53-59	Back Plate—Flywheel Shroud
B	2	53-79	Clamp—Mounting Choke Cable
B	2	53-89	Screw—Magneto Plate—Long
B	1	71-36	Fiber Washer—Stop Switch
B	1	71-46	Lock Washer—Magneto Coil Mounting Screw
B	1	71-49	Washer—Stop Switch
B	2	71-66	Fiber Washer—Breaker Spring Screw
B	2	71-66	Fiber Washer—Stop Switch
B	2	71-471	Nut—Stop Switch Screw
B	1	71-471	Nut—Breaker Screw
B	1	71-828	Screw—Breaker Arm
B	1	71-828	Screw—Stop Switch
B	2	71-916	Lock Washer—Stop Switch
B	1	71-916	Lock Washer—Breaker Spring Screw
B	1	71-1148	Bushing—Breaker Plate
B	1	71-1449	Fiber Washer—Breaker Post
B	1	71-1473	Screw—Coil to Magneto Plate
B	6	71-1474	Rivet—Back Plate to Magneto Plate
B	1	71-1487	Lock Washer—Condenser Mounting Screw
		MAGNETO ASSEMBLIES	
B	1	54-131	Stop Button
B	1	72-1081	Flywheel
B	1	72-1031	Breaker Arm
B	1	72-1014	Condenser
B	1	72-1018	Coil with Heels and Spark Plug Lead
B	1	72-1023	Breaker Base and Point
B	1	72-1024	Lead—Breaker to Stop Switch
B	1	72-1026	Lead—Coil to Breaker
B	1	72-1097	Magneto Complete
B	1	72-1044	Magneto Plate With Bearing
B	1	72-1063	Magneto Plate Complete with Coil, Heels, Breaker, Spark Plug Lead and Stop Switch
B	1	72-1065	Spark Plug Lead
		CARBURETOR PARTS—Float Feed Type	
A	2	5-136	Lock Washer—Manifold to Cylinder Screw
A	2	13-52	Lock Washer—Carburetor to Manifold Screw
A	2	13-306	Gland—Gasoline Line
A	2	13-307	Nut—Gasoline Line
A	4	19-124	Lock Washer—Gasoline Tank Mounting Screw
A	3	21-359	Screw—Gasoline Tank to Bracket
A	1	43-110	Screw—Air Cleaner
A	2	51-47	Screw—Carburetor to Manifold
A	1	51-135	Screw—Gasoline Tank to Bracket—Long
A	1	53-54	Gasket—Manifold to Cylinder
A	1	53-88	Screw—Manifold to Cylinder—Long
A	1	53-394	Manifold
A	1	53-399	Bell Crank
A	1	53-401	Link Wire—Carburetor Control
A	1	53-402	Shoulder Screw—Bell Crank Mounting
A	1	53-403	Gasket—Carburetor to Manifold
A	2	53-409	Cotter Pin

(continued on next page)

Lighting Plant Parts List (Continued)

Figure	No. Req.	Part No.	Description
A	1	53-435	Disc—Throttle Valve
A	2	53-456	Bar Nuts—Gas Tank Mounting
A	1	53-458	Bracket—Gasoline Tank—Short
A	1	53-459	Bracket—Gasoline Tank—Long
A	1	53-460	Gasoline Tank with Cap
A	1	53-484	Screw—Manifold to Cylinder—Short
A	1	53-508	Carburetor Body
A	1	53-510	Choke Lever and Swivel
A	1	53-511	Screw—Choke Lever Clamp
A	1	53-512	Screw—Choke Lever Swivel
A	1	53-515	Disc—Choke Shutter
A	1	53-517	Screw—Throttle Shutter
A	1	53-517	Screw—Choke Shutter
A	1	53-518	Chokeshaft
A	1	53-519	Choke Friction Spring
A	1	53-520	Washer—Choke Friction Spring
A	1	53-521	Cotter Pin for Choke Shaft
A	1	53-522	Float
A	1	53-523	Float Pinion Pin
A	1	53-524	Cover—Float Bowl
A	1	53-525	Vent Screw—Float Bowl Cover
A	1	53-526	Lock Washer—Float Bowl Cover Vent Screw
A	3	53-527	Screw—Float Bowl Cover
A	1	53-528	Screw—Float Bowl Cover—Long
A	4	53-529	Lock Washer—Float Bowl Cover Screw
A	1	53-530	Gasket—Float Cover
A	1	53-531	Idling Tube
A	1	53-532	Idle Adjusting Screw
A	2	53-533	Spring—Idle Adjusting Screw Spring
A	1	53-535	Inlet Connection
A	1	53-536	Screw—Inlet Connection
A	1	53-537	Gasket—Inlet Connection Screw
A	1	53-538	Screen—Inlet
A	1	53-539	Inlet Needle and Seat
A	2	53-540	Gasket—Inlet Seat
A	1	53-541	Main Nozzle
A	1	53-542	Gasket—Main Nozzle
A	1	53-543	Screw—Main Nozzle Plug
A	1	53-544	Needle Valve
A	1	53-545	Main Fuel Orifice
A	1	53-546	Needle Valve Mounting Insert
A	1	53-547	Gasket—Stuffing Box Gland
A	1	53-548	Nut—Needle Valve
A	1	53-549	Packing—Needle Valve
A	1	53-550	Throttle Shaft
A	1	53-552	Throttle Stop Lever
A	1	53-553	Screw—Throttle Lever Clamp
A	1	53-569	Gasket—Air Cleaner Body
A	1	53-572	Stud—Air Cleaner
A	1	53-574	Wing Nut—Air Cleaner
A	1	53-575	Air Cleaner Adapter
A	1	53-610	Screw—Idle Adjustment
A	1	71-1487	Lock Washer—Air Cleaner Adapter
A	1	300,386	Gasket—Air Cleaner Adapter

Lighting Plant Parts List (Continued)

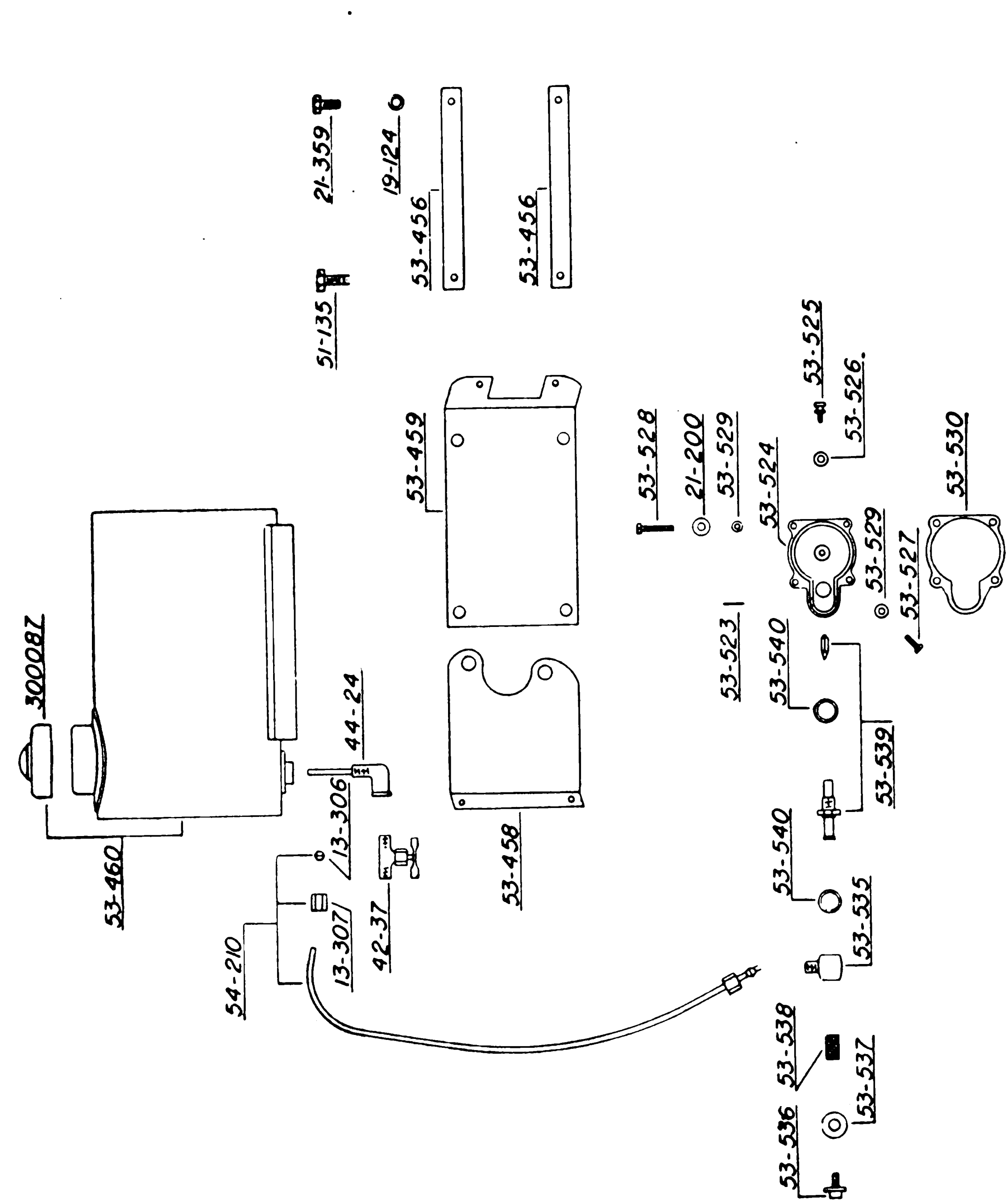
Figure	No. Req.	Part No.	Description
			FLOAT FEED CARBURETOR ASSEMBLIES
A	1	42-37	Shut-off Valve Assembly
A	1	44-24	Elbow and Screen Assembly
A	1	54-210	Gasoline Line with Nuts and Glands (Includes #13-307, and #13-306)
A	1	54-211	Carburetor Complete
A	1	54-254	Air Cleaner Complete—Oil Bath (Includes #43-110, #53-574, #53-572, #53-569, #53-575, #300,386, and #71-1487)
A	1	99910	Briggs and Stratton Sediment Bulb
			MODEL 23-A GENERATOR (See Figure X and Z and Form 42341)
1.	1	23-1A	Generator Frame
2.	1	19-2A	Generator End Bell
4.	1	19-4	Generator End Bell Shield
5.	1	23-5A	Armature, Complete
6.	1	23-6	Field Coil, Set of 4
7.	1	19-7	Commutator
10.	1	19-10	Push Button Starter
11.	1	19-11	Cutout
	2	19-12	Fan Angles
13.	1	19-13A	Collector Ring Assembly
15.	2	19-15	Bearing
17.	4	19-17	DC Brush Holder
18.	1	19-18	Brush Holder Mounting Ring
19.	4	19-19	DC Brush
20.	3	19-20	Condenser
21.	4	19-21	DC Brush Spring
24.	1	19-24	AC Brush Holder Assembly
26.	2	19-26	AC Brush and Spring
29.	3	19-29	Generator Frame Mounting Bolt
27.	1	19-27	Ammeter (20-0-20)
35.	1	19-35	Base
39.	3	19-39	Rubber Mounting Feet
40.	1	19-40-3	Coupling—Engine Side
41.	1	19-41-3	Coupling—Generator Side
42.	1	19-42-3	Coupling Spacer Washer
44.	2	19-44-3	Coupling Rubber Bushing
45.	1	19-45	Charge Control Resistor
46.	1	19-46	Charge Control Resistor Cover
48.	2	19-48	Carrying Handle Bracket
49.	1	19-49	Carrying Handle Bar
	2	19-64	¼"—20 threads, x ¾" long Hexhead Capscrews for Handles
	2	19-65	¼"—20 threads, x ½" Long Screws for Resistor Mounting Bracket
	2	19-66	¼"—20 threads, x 1/3" Long Machine Screws, Resistor to Bracket
	2	19-67	¼"—20 Threads Nuts
	2	19-68	¼" Inside Diameter x ⅝" Outside Diameter x ⅜" Fibre Washer
	3	19-69	¼"—20 Threads, x 1¼" Machine Screws

(continued on next page)

Lighting Plant Parts List (Continued)

Ref. No.	No. Req.	Part No.	Description
		19-70	Endbell to Frame
	3		#10—24 Threads, x ¾" Long Machine Screws with Washers and Nuts, for Brush Ring to Endbell
	4	19-71	#10—32 Threads, x ⅜" Long Machine Screws, Brush to Brush Holder
	4	19-72	#6—32 Threads, x 1¾" Long Machine Screws, Brush Holder to Ring with Nuts and Lockwashers
	4	19-73	5/16"—24 Threads, x 5/16" Long Brush Holder Plugs
	2	19-74	A. C. Leads
	4	19-75	A. C. Leads to A. C. Brush Holder Machine Screws #8-32 Threads, x ¼" Long
	1	19-76	DC Brush to Cutout Lead
	3	19-77	Potter Z640 Condenser
	2	19-78	#10—32 Threads, x ⅜" Long Machine Screw, Ammeter to Endball
	2	19-79	5/16"—18 Threads, x 1¼" Long Machine Bolt, Terminal Bolts
	3	19-80	#10-32 Threads, x ⅜" Long Machine Screw with Washer, Endbell Shield to Endbell
	4	19-81	¼"—20 Threads, x 1¾" Long Gas Tank to Engine Hexcap Screw
	4	19-82	¼" Inside Diameter x ½" Outside Diameter x 1¼" Long, Metal Gas Tank Spacer Sediment Bowl

See Parts Drawings
on pages 450-451
452-453
454-455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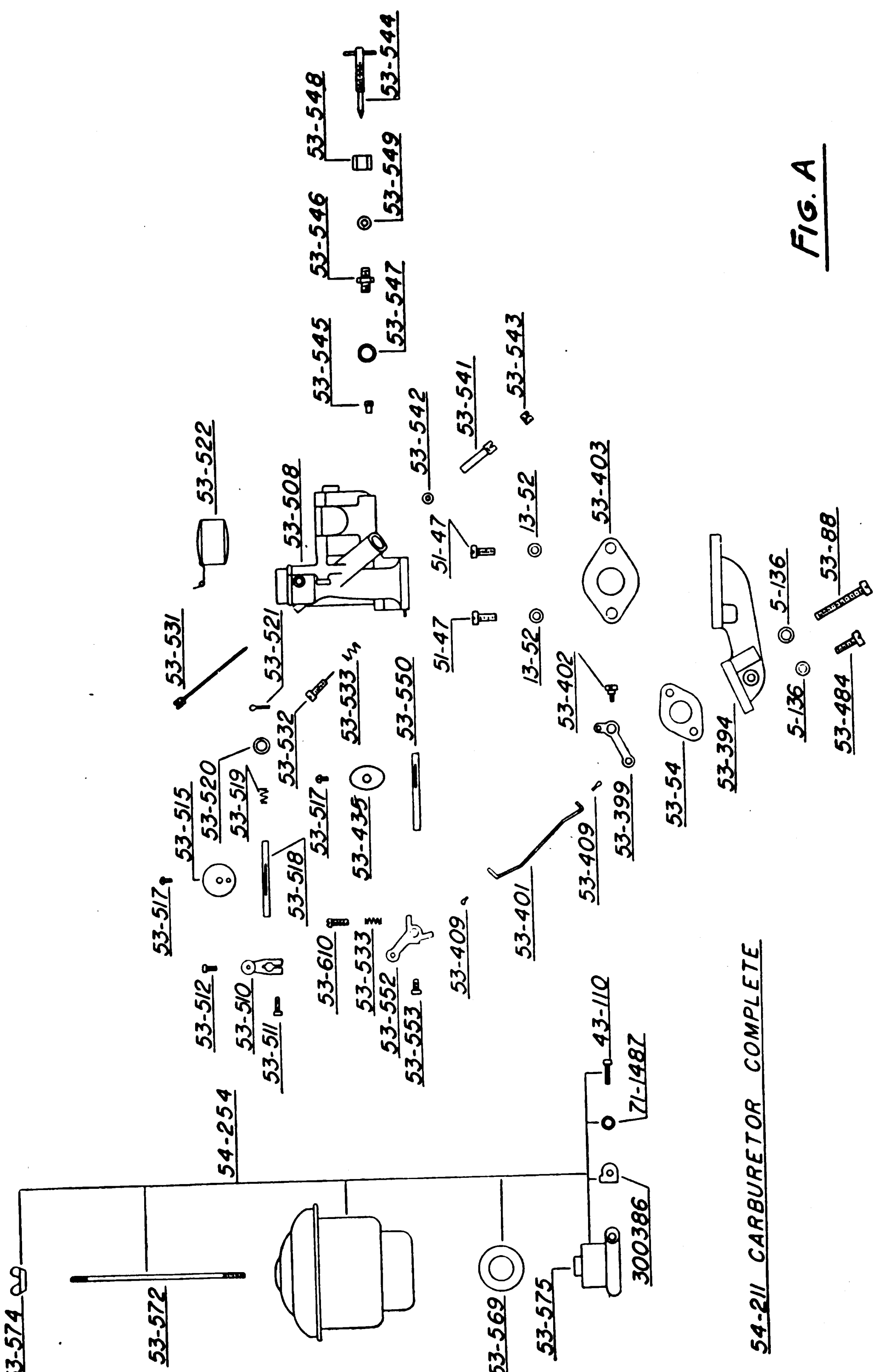
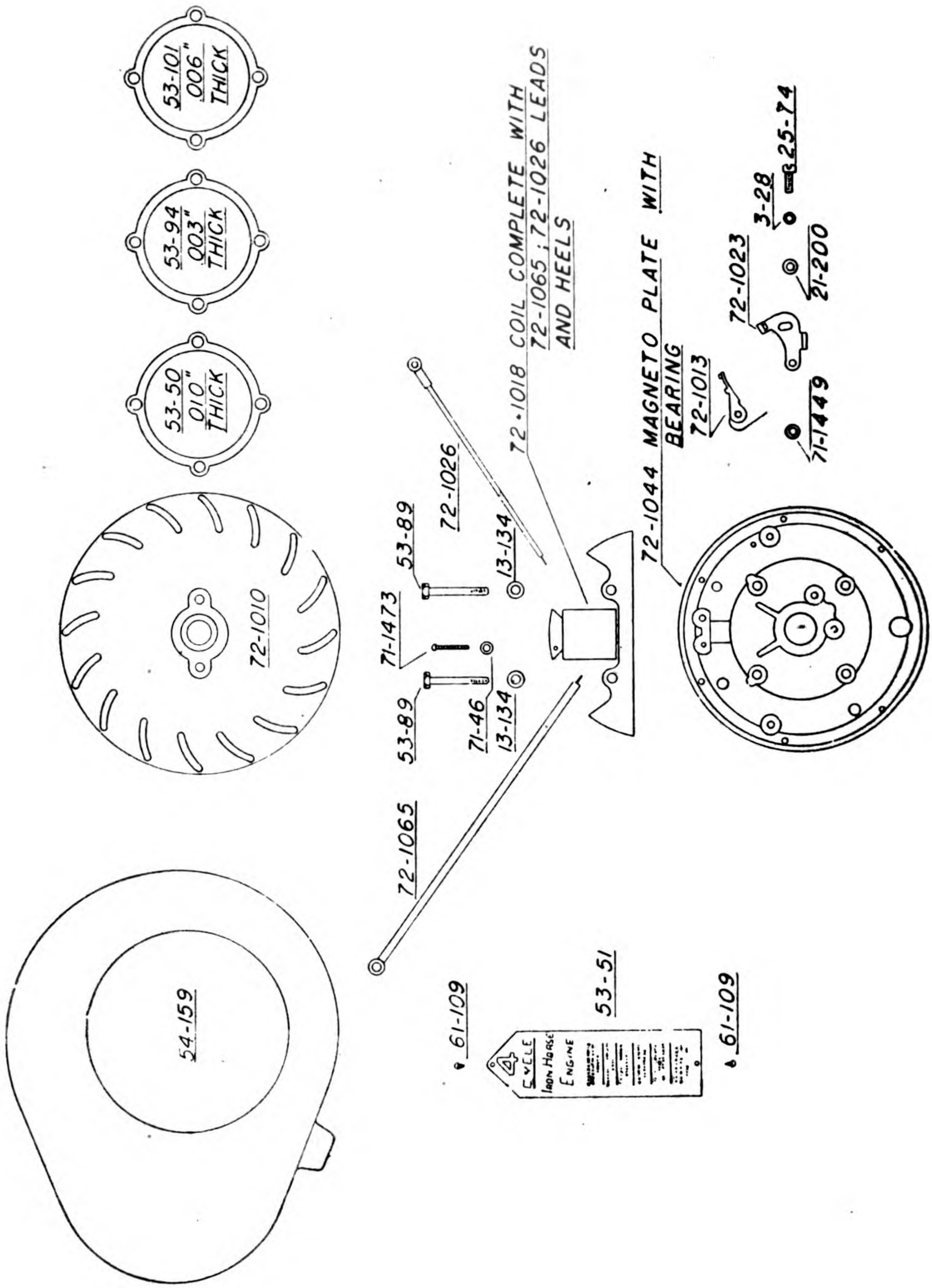


54-211 CARBURETOR COMPLETE

FIG. A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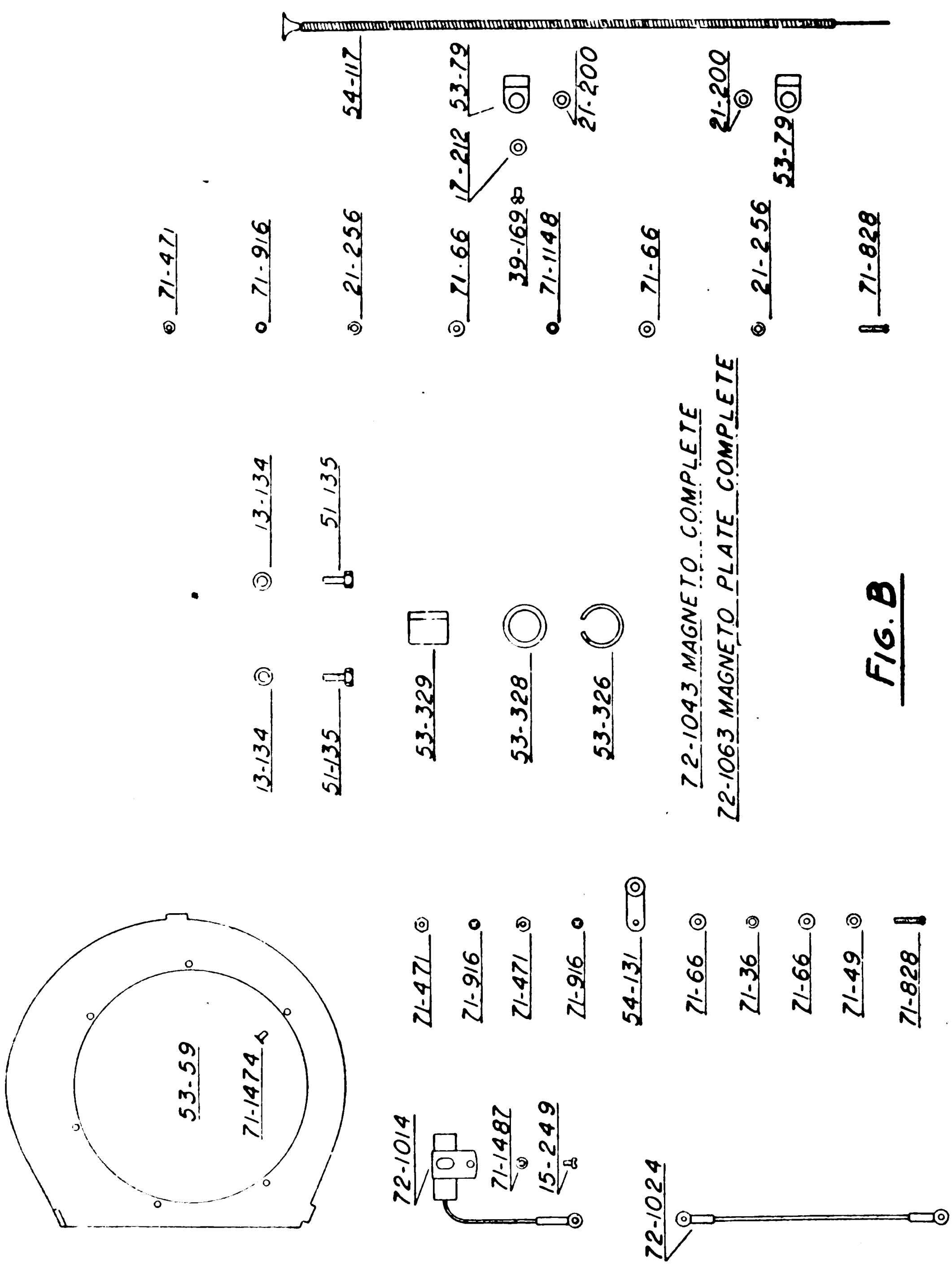
72-1065
61-109
53-51
61-109
IRON HORSE
ENGINE
72-1010
53-89
71-1473
71-46
13-134
53-89
13-134
72-1026
53-50
.010"
THICK
53-94
.003"
THICK
53-101
.006"
THICK
72-1018 COIL COMPLETE WITH
72-1065 ; 72-1026 LEADS
AND HEELS
72-1044 MAGNETO PLATE WITH
BEARING
72-1013
72-1023
71-1449
21-200
3-28
25-74



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71-36
71-66
71-49
71-828
13-134
51-135
53-329
53-328
53-326
13-134
51 135
72-1043 MAGNETO COMPLETE
72-1063 MAGNETO PLATE COMPLETE
71-471
71-916
21-256
71-66
39-169
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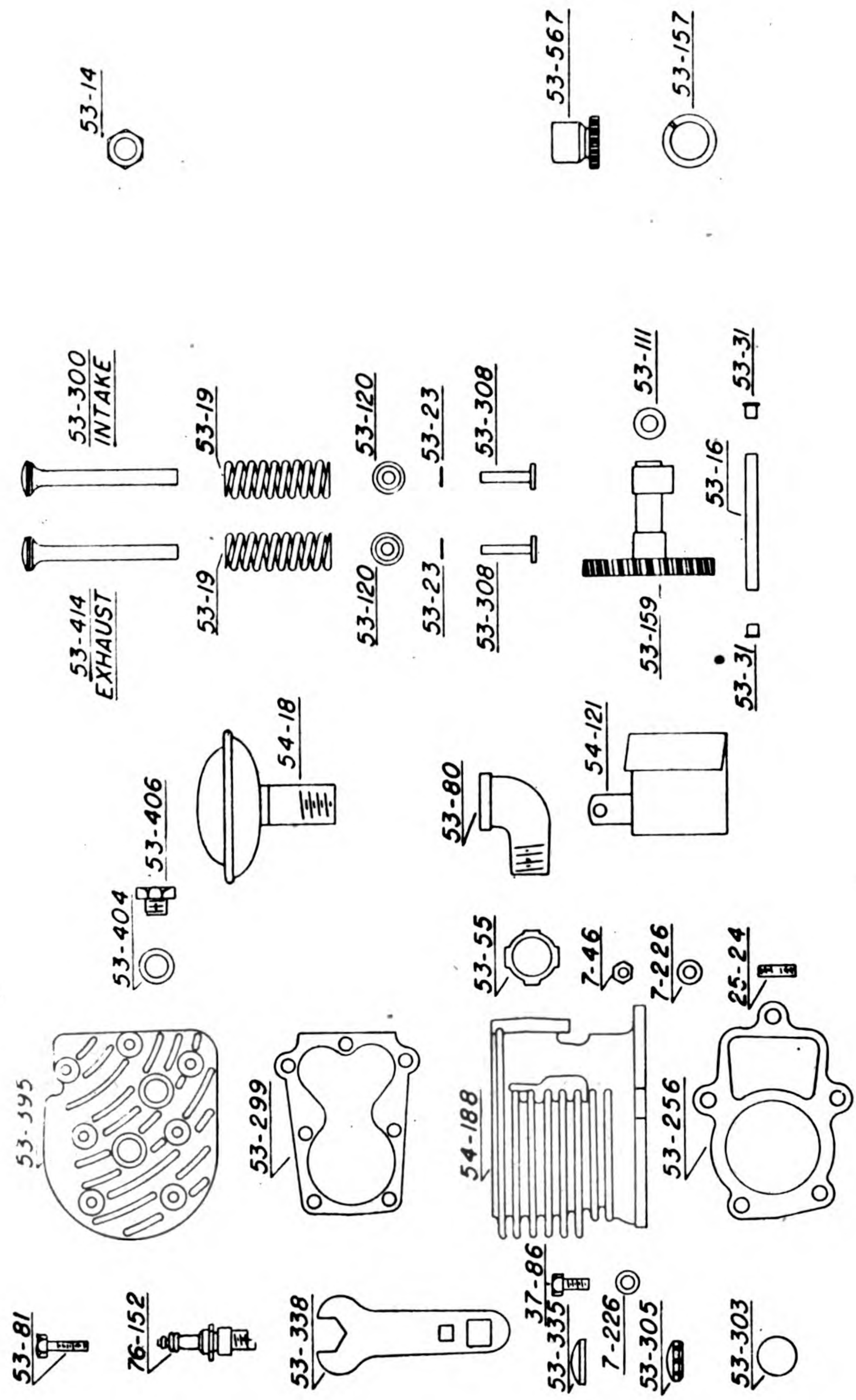
54-117
53-79
17-212
21-200
21-200
53-79

FIG. B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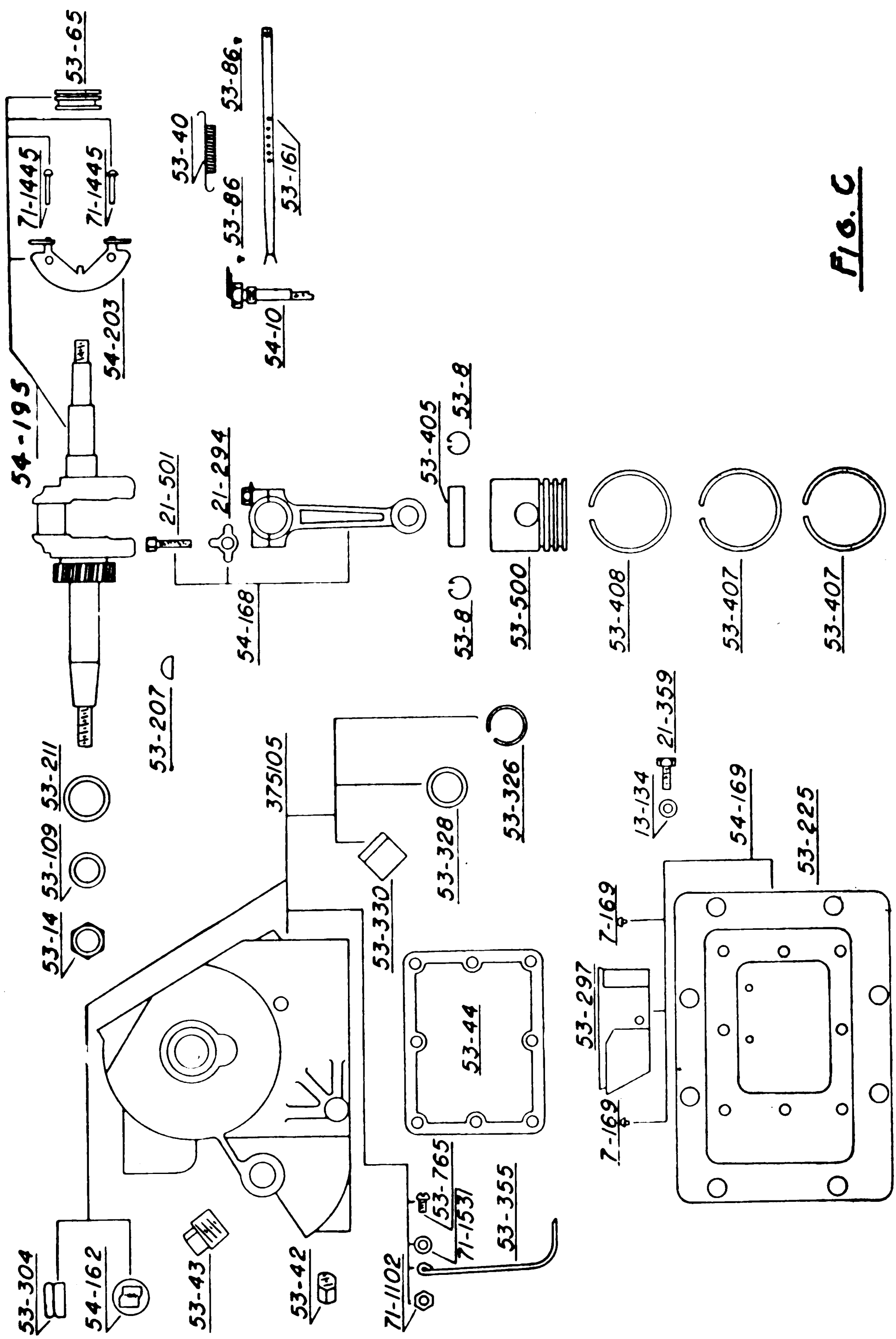
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7-169
7-169
53-297
53-44
53-765
71-1531
53-355
71-1102
53-42
53-43
54-162
53-304

FIG. C

NUMERICAL INDEX
ACCESSORY SECTION

"No. Req." is total for entire parts list.

Prices subject to change without notice.

Part Number	Page	No. Req.	Unit Price	Part Number	Page	No. Req.	Unit Price
C1-5	411	1	12.20	19-15	447	2	2.67
X-1-500	417	1	.04	19-17	447	4	.27
X-1-1000	413			19-18	447	1	1.78
	415	10	.06	19-19	447	4	.40
AC2-5	411	1	10.01	19-20	447	3	.45
3-28	444	1	.02	19-21	447	4	.23
C3-28	411	1	4.13	19-24	447	1	1.78
X-3-302	413	1	.02	19-26	447	2	.45
X-3-500	417	1	.02	19-27	447	1	.89
X-3-600	413	42	.02	19-29	447	3	.05
C-3-951	415			19-35	447	1	10.68
	422	3	.66	19-39	447	3	.18
X-3-1000	413	6	.04	19-40-3	447	1	2.67
X-3-1004	415	4	.01	19-41-3	447	1	1.78
A-3-1106	415	1	2.98	19-42-3	447	1	.18
X4-20	413	4	.02	19-44-3	447	2	.36
AC4-37	411	1	5.25	19-45	447	1	1.34
X4-306	421	1	.02	19-46	447	1	.53
X-4-415	415	1	.02	19-48	447	2	.45
C5-2	411	1	2.48	19-49	447	1	.45
5-136	445	2	.02	19-64	447	2	.04
C6-2	411	4	.06	19-65	447	2	.04
X-6-3	415	1	.02	19-66	447	2	.04
X-6-11	411			19-67	447	2	.04
	421			19-68	447	2	.02
	423	3	.08	19-69	447	3	.04
X6-18	421	1	.08	19-70	448	3	.04
X-6-E	413	3	.08	19-71	448	4	.03
C7-2	411	4	.01	19-72	448	4	.03
7-146	443	2	.02	19-73	448	4	.04
7-169	443	2	.02	19-74	448	2	.04
7-226	443	5	.02	19-75	448	4	.04
X-7-603	413			19-76	448	1	.04
	421			19-77	448	3	.45
	423	6	.08	19-78	448	2	.03
C8-20	411	20	.15	19-79	448	2	.04
X-8-251	413	1	.03	19-80	448	3	.03
X-8-509	413	6	.05	19-81	448	4	.03
X-8-600	413	16	.08	19-82	448	4	.13
X-8-602	413			19-124	445	4	.02
	422	5	.08	C20-1	411	28	.02
X-8-604	415	7	.08	X21-12	411	4	.12
X-8-606	417	14	.06	21-200	444	2	.02
X-8-612	413	1	.11	21-294	443	2	.02
C10-2	411	4	.06	21-359	443		
X-10-23	413	4	.01		445	11	.02
C11-3	411	1	.08	21-501	443	2	.04
X-12-1201	415	1	.06	21-256	444	2	.02
X-12-2001	417	1	.08	23-1A	447	1	16.02
C13-12	411	2	.36	23-5A	447	1	21.36
13-52	445	2	.02	23-6	447	1	10.68
13-134	443			25-24	443	2	.04
	444	12	.02	25-74	444	1	.02
X-13-206	415	2	.02	37-86	443	3	.02
13-306	445	2	.02	39-169	444	1	.02
13-307	445	2	.02	42-37	447	1	.33
Z14-1	411	1	14.55	43-110	445	1	.02
X14-10	411	18	.01	44-24	447	1	.29
X-14-800	413	4	.06	51-47	445	2	.04
X-14-1200	415	3	.08	51-135	444		
15-249	444	1	.02		445	3	.02
X17-3	411	20	.01	51-151	443	3	.02
BE-17-9	422	3	.03	53-8	443	2	.04
FP-17-9	423	1	.06	53-14	443	1	.08
B-17-189	421	1	1.76	53-16	443	1	.29
17-212	444	1	.02	53-19	443	2	.12
C18-96	411	2	2.63	53-23	443	2	.02
19-2A	447	1	5.34	53-31	443	2	.02
19-4	447	1	2.23	53-40	443	1	.12
19-7	447	1	5.34	53-42	443	1	.04
19-10	447	1	.89	53-43	443	1	.12
19-11	447	1	1.78	53-44	443	1	.04
19-12	447	2	.09	53-51	443	1	.08
19-13A	447	1	3.56	53-54	445	1	.04

NUMERICAL INDEX OF ACCESSORY SECTION (Continued)

Part Number	Page	No. Req.	Unit Price	Part Number	Page	No. Req.	Unit Price
53-55	443	1	.04	53-543	446	1	.08
53-59	445	1	.42	53-544	446	1	.33
53-65	443	1	.42	53-545	446	1	.21
53-79	445	2	.08	53-546	446	1	.21
53-80	443	1	.37	53-547	446	1	.02
53-81	443	7	.04	53-548	446	1	.12
53-86	443	2	.02	53-549	446	1	.04
53-88	445	1	.02	53-550	446	1	.17
53-89	445	2	.04	53-552	446	1	.25
53-109	443	1	.02	53-553	446	1	.04
53-120	443	2	.02	53-569	446	1	.04
53-157	443	1	.04	53-572	446	1	.08
53-159	443	1	2.28	53-574	446	1	.08
53-161	443	1	.04	53-575	446	1	.75
53-207	443	1	.08	53-610	446	1	.04
53-211	443	1	.02	53-765	444	1	.02
53-225	443	1	.29	54-10	444	1	.71
53-256	443	1	.04	54-11	444	1	.25
53-296	443	1	.83	54-18	444	1	.83
53-297	443	1	.12	54-117	444	1	.21
53-299	443	1	.08	54-121	444	1	.12
53-300	443	1	.58	54-131	445	1	.12
53-303	443	1	.02	54-137	444	1	6.97
53-304	444	1	.04	54-159	444	1	1.45
53-305	444	1	.04	54-162	444	1	.04
53-308	444	2	.17	54-168	444	1	1.25
53-309	444	1	.54	54-169	444	1	.50
53-316	444	2	.08	54-188	444	1	5.40
53-326	444	2	.04	54-195	444	1	7.47
53-328	444	2	.12	54-210	447	1	.42
53-329	444	1	.58	54-211	447	1	6.64
53-330	444	1	.58	54-254	447	1	3.32
53-335	444	1	.04	61-109	444	2	.08
53-338	444	1	.12	71-36	445	1	.02
53-355	444	1	.04	71-46	445	1	.02
53-394	445	1	.83	71-49	445	1	.02
53-399	445	1	.04	71-66	445	4	.02
53-401	445	1	.08	71-471	445	3	.02
53-402	445	1	.04	71-828	445	2	.02
53-403	445	1	.04	71-916	445	3	.02
53-405	444	1	.25	71-1102	444	1	.02
53-407	444	2	.21	71-1148	445	1	.02
53-408	444	1	.21	71-1311	444	3	.04
53-409	445	2	.02	71-1445	444	2	.02
53-414	444	1	.58	71-1449	445	1	.02
53-435	446	1	.04	71-1473	445	1	.02
53-456	446	2	.08	71-1474	445	6	.02
53-458	446	1	.08	71-1487	445		
53-459	446	1	.08		446	2	.02
53-460	446	1	3.32	71-1531	444	1	02
53-484	446	1	.02	72-1014	445	1	.50
53-500	444	1	2.08	72-1018	445	1	4.98
53-508	446	1	2.49	72-1023	445	1	.25
53-510	446	1	.25	72-1024	445	1	.12
53-511	446	1	.04	72-1026	445	1	.12
53-512	446	1	.04	72-1031	445	1	.25
53-515	446	1	.12	72-1044	445	1	2.08
53-517	446	2	.04	72-1063	445	1	9.96
53-518	446	1	.17	72-1065	445	1	.42
53-519	446	1	.04	72-1081	445	1	5.81
53-520	446	1	.04	72-1097	445	1	15.77
53-521	446	1	.02	76-152	444	1	.58
53-522	446	1	.62	A-197	422	1	.68
53-523	446	1	.04	212 MFG	413		
53-524	446	1	.21		422		
53-525	446	1	.17		423	3	5.63
53-526	446	1	.02	308 MFG	415	1	4.80
53-527	446	3	.04	309 MG	415	1	5.78
53-528	446	1	.04	1009	421	1	.11
53-529	446	4	.02	1051	413	1	.02
53-530	446	1	.08	1064	413	4	.05
53-531	446	1	.42	1075	415	1	.26
53-532	446	1	.17	1141	421	4	.85
53-533	446	2	.04	1149	411	1	.39
53-535	446	1	.21	1175	421	1	.34
53-536	446	1	.08	1248	421	1	.04
53-537	446	1	.02	1292	421	150	8.94
53-538	446	1	.08	1399	421	2	.11
53-539	446	1	.83	1565	411	1	.30
53-540	446	2	.02	1631	413	2	.08
53-541	446	1	.25	1632	413		
53-542	446	1	.02		415	10	.08

NUMERICAL INDEX OF ACCESSORY SECTION (Continued)

Part Number	Page	No. Req.	Unit Price
1634	413	2	.08
1638	417	2	.08
1642	413	1	.08
1684	417	2	.04
1687	413	1	.04
1697	415	1	.11
1708	415	2	.04
1792	415	1	.38
1819	421	1	04
1929	415	2	04
1956	415	1	N/C
2271	417	1	.08
2302	421	5	.60
2401	417	1	.15
2531	415	1	.15
2536	413	1	.11
2538	413	1	.08
2772	411		
	423	2	3.00
2840	415	2	.26
2843	421	1	12.75
2868	421	1	2.51
2939	415	4	.11
2962	413	1	.23
3092	421	1	3.26
3198	415	1	.04
3220	413	5	.11
3226	421	1	.04
3229	421	1	1.88
3230	411		
	421	2	.11
3231	411		
	421	2	.11
3232	417		
	422	2	.26
3233	417		
	422	2	.11
3234	422	1	.23
3300	421	1	5.25
3411	415	1	.38
3418	413	1	.75
3437	415	1	.11
3439	421	1	1.76
3441	415	1	7.50
3542	415	1	8.80
3578	421	1	.19
3584	421	1	3.52
3875	417	1	.08
3995	421		
	422	3	.04
4347	421	5	.37
4348	421	1	.75
4361	411	1	22.50
4369	413	1	4.13
4398	413	1	.38
4416	411		
	423	2	.53
4425	413	1	.19
4461	411	1	.08
4480	417	1	.71
4504	413	1	.15
4530	413	1	3.00
4590	415	1	.15

Part Number	Page	No. Req.	Price Unit
4647	411		
	423	2	.53
4658	422	1	.75
4694	411	1	2.25
4714	415	1	.26
4733	411		
	423	2	3.45
4740	423	1	4.01
5147	415	1	3.19
5320	411		
	423	2	3.38
5321	415	1	1.24
5322	413	1	2.81
5323	415	1	3.00
5324	415	1	2.40
5326	415	1	1.88
5327	417	1	1.88
5328	415	1	1.88
5329	417	1	1.88
5331	415	1	2.93
5332	415	1	1.50
5333	413		
	423	2	17.06
5334	413	1	8.44
5341	415	1	12.00
5344	415	1	2.06
5345	413	1	6.75
5348	415	1	.04
5349	411	1	.27
5350	413	1	.11
5358	415	1	.08
5412	413	1	.08
5415	415	1	5.18
5423	415	1	.15
5478	413	1	2.06
5496	415	1	19.88
5497	415	1	14.25
5498	415	1	7.50
5561	422	1	1.69
5573	415	1	15.00
5574	421	1	17.06
5664	413	2	.34
5680	413	1	.30
5807	413	1	16.87
5808	413	1	6.75
6025	415	1	40.88
6074	413	1	4.39
6332	413	1	.75
6333	413	1	1.13
6364	413	1	6.45
6400	415	1	24.15
6434	415		
	422		
	423	3	.86
6435	413	1	.37
H-12599	423	1	42.00
K-40125	423	1	48.00
99910	447	1	.30
300,386	446	1	.04
BR-F-P1	415	1	4.62
BR-N-A1	411	1	1.70
CL-WL-A1	423	1	41.00
OS-CR-A1	415	1	1.95

R1 PART NUMBER NUMERICAL LISTING OF COMMON HARDWARE ITEMS

Part Number	Page	Quan.	Wt.	Unit Price
R1- 11	304			
	308			
	309			
	310			
	313			
	320			
	323			
	327			
	333	17		.12
R1- 12	308			
	309			
	310			
	311			
	313			
	315			
	316			
	317			
	318			
	319			
	320			
	321			
	326			
	330			
	332	58	.1	.14
R1- 19	311	1		.04
R1- 20	325	2	.4	.25
R1- 33	309	8		.01
R1- 36	348	2	.1	.03
R1- 81	313	4	.8	.09
R1- 82	308			
	309	6	.8	.12
R1- 101	344			
	346	10	.2	.02
R1- 102	342			
	343	16	.2	.02
R1- 103	327			
	347	6	.2	.02
R1- 104	342	2	.2	.02
R1- 107	309			
	310			
	333	6	.2	.03
R1- 124	308			
	309			
	313			
	324			
	325			
	326			
	327			
	331			
	340	362	.4	.04
R1- 125	318			
	324			
	331			
	334			
	337			
	341			
	342			
	346	31	.4	.04
R1- 126	327			
	330			
	331			
	337	22	.4	.04
R1- 127	324			
	326			
	330			
	331			
	334	15	.4	.04
R1- 128	323			
	332	5	.4	.04
R1- 129	340			
	338	2	.4	.04
R1- 131	333	2	.4	.05
R1- 132	333	2	.4	.05

Part Number	Page	Quan.	Wt.	Unit Price
R1- 133	318			
	331	6	.4	.05
R1- 137	315	2	.4	.05
R1- 138	316	2	.4	.05
R1- 154	349	2	.8	.08
R1- 156	304	2	.8	.08
R1- 160	316	4	.8	.09
R1- 164	316	2	.8	.10
R1- 165	316	6	.8	.10
R1- 174	330	2	.8	.10
R1- 176	332	3	.8	.10
R1- 177	332	4	.8	.10
R1- 185	321	8	1.0	.12
R1- 187	321	6	1.4	.13
R1- 213	342			
	343			
	345			
	346	36	.2	.02
R1- 214	343			
	347	16	.2	.02
R1- 215	337	1	.2	.02
R1- 217	345			
	346	11	.2	.02
R1- 223	342			
	343			
	349	29	.4	.04
R1- 224	342	4	.4	.04
R1- 225	338	2	.4	.04
R1- 226	340	2	.4	.05
R1- 233	341	6	.4	.05
R1- 244	308			
	309	6	.5	.07
R1- 247	313	4	.8	.08
R1- 278	340	6	.4	.08
R1- 290	304	4	.5	.08
R1- 295	315	8	.8	.08
R1- 306	328			
	330	12	.3	.05
R1- 307	328	16	.3	.05
R1- 320	351	2		.01
R1- 332	345	5	.1	.01
R1- 339	326	4	.1	.04
R1- 397	349	1	12.8	4.16
R1- 408	331	2	.3	.10
R1- 428	304	2	.1	.04
R1- 434	344	2	.1	.06
R1- 435	345			
	347	11	.1	.06
R1- 440	340	2	.2	.10
R1- 441	330			
	334			
	337	6	.2	.10
R1- 442	327	2	.2	.11
R1- 451	330	8	.4	.15
R1- 453	322	8	.4	.16
R1- 454	322	46	.4	.16
R1- 458	304	2	.6	.38
R1- 459	332	2	.8	.39
R1- 503	308	6	.2	.06
R1- 504	331	1	.2	.06
R1- 541	310	2	.2	.05
R1- 548	319	8	.7	.26
R1- 562	342	2	1.0	.25
R1- 563	342	2	1.2	.29
R1- 564	346	2	.6	.13
R1- 565	346	2	1.2	.25
R1- 568	325	4	.1	.04
R1- 570	332	4	.2	.05
R1- 591	315	2	2.6	.96
R1- 601	335	2		.00
R1- 604	335			
	336	4		.00
R1- 605	334			

Part Number	Page	Quan.	Wt.	Unit Price
	337			
	338			
	340			
	348	13		.00
R1- 606	311			
	348	6		.00
R1- 607	346	4		.00
R1- 609	340	2		.00
R1- 612	325	2		.00
R1- 614	318			
	338			
	340	30		.00
R1- 615	334			.00
	336			
	337	3		.00
R1- 621	326	6		.00
R1- 623	330			
	333	14		.00
R1- 624	338	2		.00
R1- 625	327	4		.00
R1- 630	318	82		.00
R1- 632	330	8		.01
R1- 649	308			
	309			
	311			
	313			
	316			
	320			
	330			
	332	21	.1	.06
R1- 682	308			
	315	6	.1	.09
R1- 683	330	4	.1	.08
R1- 688	331	2	.4	.09
R1- 710	349	1	.1	.14
R1- 718	349	1	.2	.09
R1- 748	342			
	346	16	.1	.02
R1- 754	351	2		.10
R1- 763	351	1	.1	.18
R1- 787	340	4		.01
R1- 789	348	2		.01
R1- 792	334			
	338	5	.2	.03
R1- 794	304	1	.4	.05
R1- 796	319	2	1.4	.04
R1- 801	333			
	348	9	.1	.01
R1- 803	336			
	337	3	.2	.03
R1- 804	320	12	.2	.05
R1- 812	317	56	.2	.02
R1- 826	331			
	349	2	.2	.32
R1- 866	316	4	.1	.02
R1- 871	349	1	.4	.05
R1- 890	320	4	.1	.01

Part Number	Page	Quan.	Wt.	Unit Price
R1- 892	348			
	338	52		.01
R1- 898	325	1	1.9	2.01
R1- 911	332	1	12.9	5.21
R1- 932	333	1		.03
R1- 933	304			
	313			
	335			
	338			
	340	16		.03
R1- 934	333	1		.03
R1- 935	311			
	332			
	338	5		.03
R1- 940	311			
	332	2	.1	.04
R1- 942	309			
	311			
	326			
	332	7	.1	.04
R1- 943	309	1	.1	.05
R1- 949	309			
	313			
	316	11	.1	.06
R1- 950	313			
	316			
	321	11	.1	.07
R1- 951	316			
	320	3	.2	.09
R1- 989	323	1	.1	.09
R1-1009	333	2		.05
R1-1011	333	2		.05
R1-1012	308			
	311	5		.05
R1-1016	309	2		.09
R1-1020	308	1		.07
R1-1022	309	1		.08
R1-1029	332	4		.10
R1-1030	308	2		.11
R1-1031	308	2	.1	.12
R1-1032	308	1	.1	.16
R1-1087	325	1	.1	.05
R1-1089	332	2	.2	.06
R1-1093	349	1	.7	.58
R1-1108	325	1	.8	.48
R1-1114	325	2	.1	.07
R1-1161	326			
	341	16	.1	.03
R1-1162	315			
	317	64	.2	.04
R1-1168	331			
	333	7	.1	.01
R1-1179	348	2		.00
R1-1183	320	6	.1	.02
R1-1192	349	1		.09
R1-1197	351	1	1.1	.41

ENGINE SECTION

Buda Engine Model HP - 298

B-G Specification: EN-B-D8 with Lipe Clutch
EN-D-D4 with Fuller Clutch

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(Continued on next page)

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I. GENERAL INFORMATION

A. SPECIFICATIONS

MODEL - Buda HP-298

TYPE - 6 Cylinder, Gasoline, Water cooled

POWER - 50 HP @ 1400 RPM (normal operating speed)

BORE AND STROKE - 3-3/4" and 4-1/2"

DISPLACEMENT - 298 Cubic Inches

ROTATION - Clockwise, viewing front or fan end of engine

WEIGHT - Net - 1140 Pounds

Shipping - 1290 Pounds

Export - 1580 Pounds

CUBAGE - 51 Cubic Feet

CAPACITIES - Gas Tank - 25 U. S. Gallons

Crankcase Oil Capacity - 6 Quarts

Air Cleaner Oil Capacity - 1 Quart

Cooling System - 5-1/3 Gallons

CONSUMPTION - Gasoline - 5 Gallons per Hour (Maximum)

Oil - 35 Quarts per 100 hours
(Air cleaner and crankcase)

B. ACCESSORIES

DESCRIPTION	BUDA CO. NUMBER	MANUFACTURER'S NUMBER	MANUFACTURER'S NAME
1 - Air Cleaner	A-6557	A-6605	Donaldson Company, Inc. St. Paul, Minnesota
2 - Pre-Cleaner	A-6565	X-1537-A	Donaldson Company, Inc. St. Paul, Minnesota
3 - Starter	1733	718-R	Delco-Remy Corporation Anderson, Indiana
4 - Generator	H-12175	1101671	Delco-Remy Corporation Anderson, Indiana
5 - Voltage Control Unit	5864	5864	Delco-Remy Corporation Anderson, Indiana
6 - Push Button Switch	DE-44122	1385	Delco-Remy Corporation Anderson, Indiana
7 - Magnetic Switch	AP-6297	1549	Delco-Remy Corporation Anderson, Indiana
8 - Lubricating Oil Filter	H-11677	CSB-41-302M	DeLuxe Products, Corp. LaPorte, Indiana
9 - Governor	K-40166	A-1729	Pierce Governor Company Anderson, Indiana

DESCRIPTION	BUDA CO. NUMBER	MANUFACTURER'S NUMBER	MANUFACTURER'S NAME
10 - Carburetor	A-11307	Model #456-2 Outline #0-8015 Fuel Valve Assem. #54	Zenith Carburetor Div. Bendix Aviation Corp. Detroit, Michigan
11 - Distributor	4757	643-X	Delco-Remy Corp. Anderson, Indiana
12 - AC Spark Plugs	H-11629	#87-S 18 mm	A. C. Spark Plug Company Flint, Michigan
13 - Fuel Pump	2903	855758	A. C. Spark Plug Company Flint, Michigan
14 - Ignition Switch	3998	50704	Briggs & Stratton
15 - Ignition Coil	1755	528-C	Delco Remy Corp. Anderson, Indiana

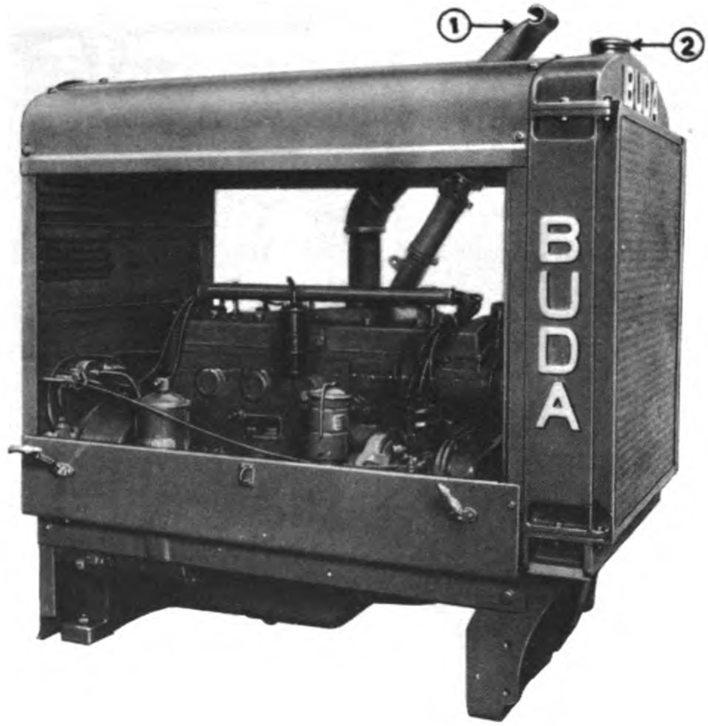


FIGURE A
Right Side of Power Unit

1. *Exhaust Outlet*
2. *Radiator Cap*

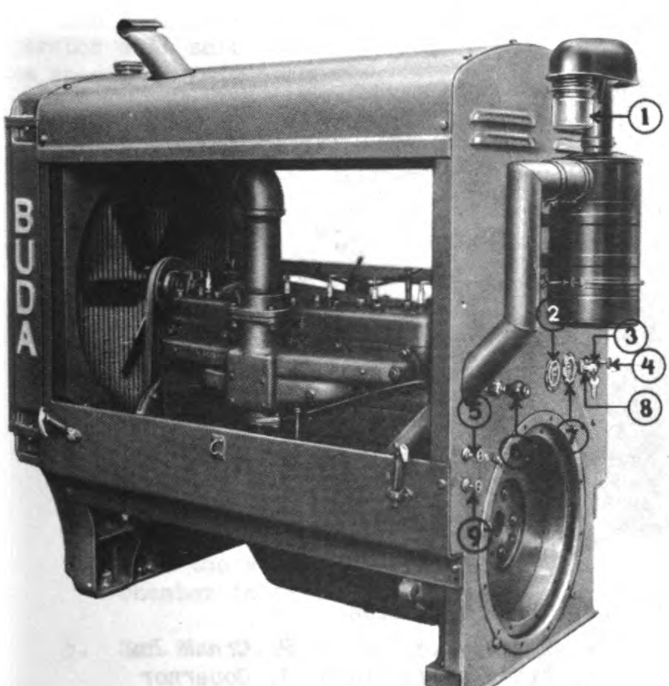


FIGURE B
Left Side of Power Unit

1. *Collector Pre Cleaner*
2. *Ammeter*
3. *Starter Button*
4. *Spark Control*
5. *Hand Throttle*
6. *Governor Throttle*
7. *Oil Pressure Gauge*
8. *Ignition Key*
9. *Choke Control*

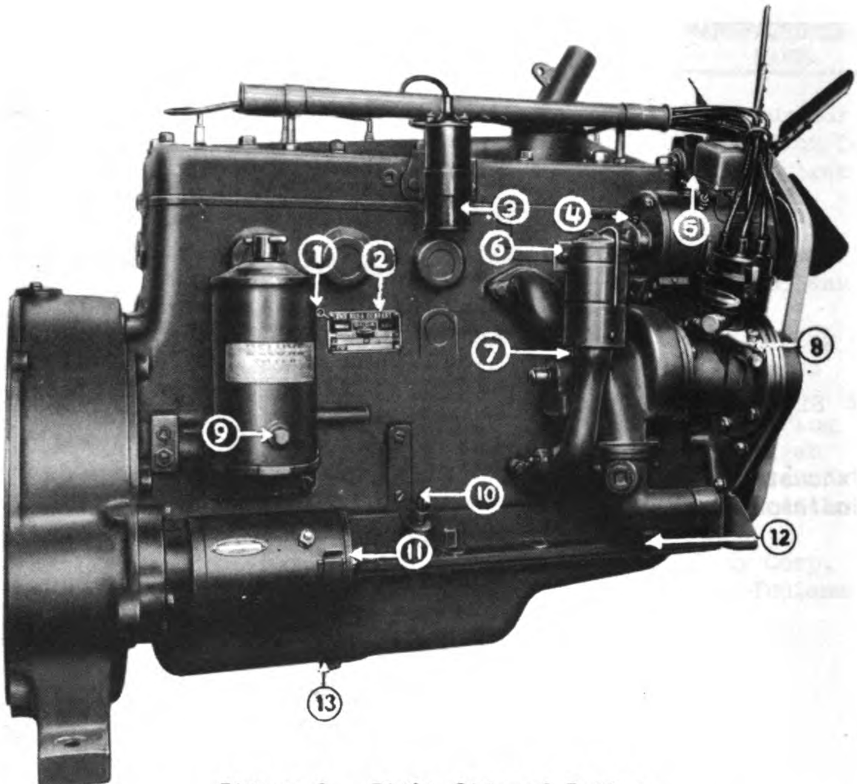


Figure C - Right Side of Engine

1. *Block Drain*
2. *Identification Plate*
3. *Ignition Coil*
4. *Generator Oil Cup*
5. *Generator Control*
6. *Oil Filter and Breather*
7. *Water Pump Oil Cup*
8. *Distributor Spark Advance*
9. *Oil Filter Drain Plug*
10. *Oil Level Gauge*
11. *Starter Oil Cup*
12. *Water Pump Drain*
13. *Oil Pan Drain*

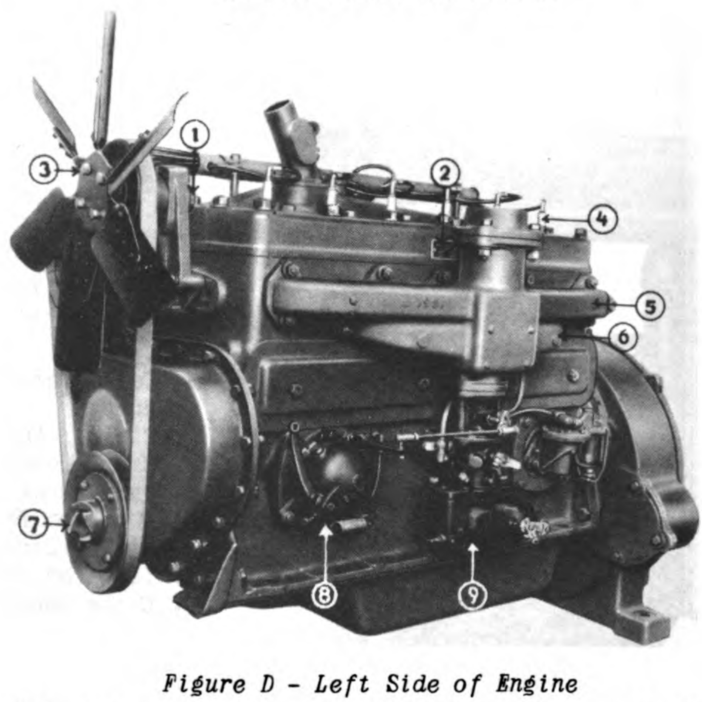


Figure D - Left Side of Engine

1. *Fan Adjustment*
2. *Tappet Clearance Plate*
3. *Fan Blade Assembly Screws*
4. *Spark Plug*
5. *Exhaust Manifold*
6. *Intake Manifold*
7. *Crank Jaw*
8. *Governor*
9. *Carburetor*

II. OPERATION

A. OPERATING SUGGESTIONS

Time spent on the inspection and care of the engine will be many times repaid in long life and trouble free operation.

Do not operate engine for any length of time with one or more cylinders weak or missing. Keep the engine in good operating condition. If trouble develops, stop and correct it before it becomes serious.

Keep the engine clean. An operator while cleaning the engine discovers trouble in the making, caused by loose fastenings, leaky connections, etc. Oil should never be allowed to collect on wires or electrical equipment.

Keep the radiator filled with clean lime free water and do not run the engine without water in the cooling system, or add cold water to an overheated engine. If the radiator leaks, have it repaired. Do not use radiator cements that are applied internally, as they hinder the cooling action of the radiator.

Check oil level with bayonet gauge. Use the carburetor choke no more than necessary, as this allows raw gasoline to enter the cylinders, pass the pistons and dilute the oil.

In starting a cold engine allow time for the engine to warm up slowly. Never race a cold engine.

The service life of an engine can be greatly prolonged by a careful breaking-in period.

Don't stop the engine immediately after it has been working hard. Allow it to idle a few minutes to allow the water to circulate and carry away the intense heat. Slower and more even temperature changes aid greatly in preventing warping of valves and distortion of cylinder heads and manifold assemblies.

Don't allow the engine to labor unnecessarily at low speed. A good operator will shift to a lower gear just before an engine starts to lug at low speed.

Use a good grade of lubricating oil manufactured by a reliable refinery. See "Lubricating Instructions" for oil recommendations.

B. STARTING THE ENGINE

When starting any new engine, or an engine that has been standing idle for some time, make the following check-up:

1. See that there is fuel in the fuel tank.
2. See that the cooling system is full of clean water.
3. See that oil is up to the proper level in crankcase.
4. Open the valve in the gasoline line and allow the carburetor float chamber to fill.
5. Set the throttle lever about one-quarter open
6. The engine should now be ready to start. With the ignition switch in the OFF position, the throttle closed, pull the choke control

out as far as possible and crank the engine over two or three half turns. Push the choke control about three-quarters of the way in and pull throttle one-quarter of the way out. Turn the ignition switch to the ON position and press starter button. As soon as engine fires release starter button. Use choke only as necessary to keep engine running until it warms up.

7. CAUTION -- Never operate the engine after it is warm with the choke control pulled out, as this will cause an excess of raw fuel to be drawn into the cylinders, resulting in dilution of the crankcase oil or possibly stopping the engine due to an over-rich mixture.

   If the engine does not start immediately, push in the choke and continue cranking until the engine fires.

   In extremely cold weather, when starting is sometimes difficult, crank the engine with the choke control pulled out for a few revolutions, or it may be necessary to pour a small quantity of gasoline into each cylinder through the spark plug holes. Wait a few moments for the gasoline to evaporate, turn on the switch and proceed as before.

C. COLD WEATHER HINTS

A good hot spark from clean correctly adjusted spark plugs is essential in cold weather. The ignition system should be checked at the start of the season.

Be sure the lubricating oil is correct for the prevailing temperatures.

DRAIN COOLING SYSTEM. Unless antifreeze solution is used, always drain the Cooling System at freezing temperatures. Open radiator water pump and water jacket drain cocks.

To start an engine in cold weather, crank one or two revolutions with the choke closed before turning on the ignition switch. Push in the choke half way and open throttle about one-quarter and turn on the ignition switch to start. This prevents extreme flooding. As soon as possible push the choke in to running position. Do not apply load with the choke closed --- wait until the engine warms up.

In extremely cold weather, after stopping the engine at the end of the day, it is advisable to drain the oil into a clean container, this oil to be kept in a warm place or heated before being poured into the engine. This will insure easy starting and proper lubrication at once.

This method will also permit the use of summer oil recommendations in winter when load conditions are severe.

DO NOT RACE A COLD ENGINE.

It is especially important in cold weather to test the specific gravity of the battery. A battery freezes between the temperatures 20 degrees above zero and 50 degrees below zero depending on the state of its charge. Do not add water after shutting down for the night. It will freeze quickly. See that it gets a charge after adding water.

D. FREEZING MIXTURES

Denatured Alcohol and Water

Freezing temperature degrees fahrenheit	Amount of alcohol to add to each gallon of water
20	2 Pts.
0	4 Pts.
-20	6 Pts.
-40	10 Pts.
-60	19 Pts.

For example, for each gallon of water placed in the radiator when the temperature draws near 20° below zero, add six pints of denatured alcohol.

Ethyl Glycol (Prestone) and Water

Freezing temperature degrees fahrenheit	Amount of ethyl glycol to add to each gallon of water
16	2 Pts.
0	4 Pts.
-19	6 Pts.
-34	8 Pts.
-49	10 Pts.
-62	12 Pts.

E. CARE OF THE ENGINE

A GENERAL inspection of the engine should be made at regular intervals, to insure long life and to prevent breakdowns while on the road. One hour a week spent on this inspection will save time and money in the end.

Keep your engine clean. There is nothing that will better promote freedom from engine trouble than cultivating the habit of keeping the engine clean. A dirty engine often covers minor defects or maladjustments that would not become serious if given immediate attention.

1. New Engine after 8 Hours Operation and First 100 Hours.

(a) Tighten cylinder head studs and check all other studs, clamps and connections for loose fittings and leaks.

(b) Clean carburetor gasoline fuel screen and gasoline tanks strainer and sediment bulb.

2. Every 8 to 10 Hours Operation (Daily)

(a) Visual Inspection -
- a. See that ignition and other electrical connections are tight.
- b. See that water, gasoline and oil lines are tight.
- c. Check fan belt (tighten if necessary).
- d. Check oil pressure gauge. The indicator should return to zero if not sprung.

(b) Check oil level in crankcase. If necessary to add oil see recommendations under "Lubricating Instructions".

(c) Check water in radiator.

(d) Clean air filter and refill with fresh oil. Use same grade oil as in crankcase.

(e) Remove air pre-cleaner, inspect center tube and clean, if necessary, with cloth on stick. Clean and empty jar on pre-cleaner.

3. Every 50 Hours Operation.

(a) Repeat instructions on 8 to 10 hour operation.

(b) Check Lubrication. See recommendations under "Lubricating Instructions".

(c) Clean carburetor gasoline fuel screen, and gasoline tank, strainer and sediment bulb.

(d) Check battery water level.

4. Every 100 Hours Operation .

(a) Repeat 50 hours operation instructions.

(b) Check Lubrication. See recommendations under "Lubricating Instructions".

(c) Check valve tappet adjustment using a feeler gauge and two wrenches as shown in Figure H. The valve tappet clearances are given on the plate attached to the engine, intake .006 , exhaust .009.

(d) Inspect and remove the carbon deposits from the spark plugs, Examine the porcelain. If it is cracked or chipped either inside or outside, replace the plug. The gap between the electrodes should be .025 of an inch. Adjust the side electrode - never the center one.

(e) Inspect the commutator and the brushes on starter and generator: If the commutator is dirty, clean with No. 00 sandpaper. Check brush spring tension. Blow or brush dust and dirt out of starter and generator at the commutator end, with dry compressed air or hand bellows to prevent short circuits, grounding and sticking brushes. See Electrical System, "starter," and "generator."

(f) Check specific gravity of each battery cell with a hydrometer. A reading of 1.250 to 1.285 indicates fully charged, 1.230 half charged, and 1.150 dead. Never take a reading shortly after adding water. See Electricl System, "Battery".

(g) Remove cover and check distributor interrupter points. See page 545.

(h) Remove crankcase breather and wash with gasoline.

5. Every 1000 Hours

(a) Repeat 100 hour operation instructions.

(b) Clean the outside of engine by washing with kerosene, distillate or grease solvent (if the dirt is thick allow it to soak for ten minutes), then wash off dirt with water.

(c) Remove cylinder head, clean carbon, and grind and adjust valves. Always replace cylinder head gasket with a new one. See maintenance section, page 517.

(d) Remove oil pan, wash out sludge, if any, and clean oil pump screen. While pan is off, inspect inside of engine to see if oil suction screen bracket is tight, cotter pins and locks in connecting rods and main bearing in place, and make sure all connecting rod bolt nuts and main bearing capscrews are tight. Replace oil pan gasket.

(e) Remove air cleaner and dissassemble unit for a thorough cleaning. Wash unit inner screen with gasoline. See page 535.

(f) Install new spark plugs. Check points to .025 inch clearance.

(g) Flush radiator with flushing solution as per recommendation page 531.

(h) Inspect spark plug cables, battery cables and all electric wiring.

(i) Inspect cut-out relay on control unit as per instructions page 550. Adjust as needed.

(j) Check for air leaks in oil circulating system (see instructions paragraph #3, page 526.)

(k) Test the compression by cranking the engine over slowly at each compression stroke. If one or two cylinders only lack compression, inspect the valve and tappet clearances on these cylinders before removing the head. Insufficient valve clearance will cause burned valves and lack of compression. Should the engine show poor compression on all cylinders the valves should be re-ground.

6. Every 2000 Hours, Major Overhaul

(a) Repeat 1000 hour operation instruction.

(b) Completely disassemble engine and inspect all parts for wear, replace parts where necessary.

(c) Clean carbon out of ring grooves of pistons and install new rings.

(d) See maintenance section page 517.

F. LUBRICATING INSTRUCTIONS

1. LUBRICATING RECOMMENDATIONS

The most essential requirement for any successful engine operation is oil. Lack of oil or the use of poor oil is responsible for most engine failures. Use a good quality of oil manufactured by a reliable refinery. The best oil will be found to be the cheapest over a long period of engine operation. We recommend S.A.E. 40 for operating temperatures over 90 degrees Fah., S.A.E. 30 for temperatures from 32 to 90 degrees Fah., and S.A.E. 20 for temperatures from 0 degrees to 32 degrees Fah., and S.A.E. 10 for temperatures below 0 degrees. For special high temperatures use S.A.E. grade #50. These numbers correspond to the grades of oil sold by first class service stations.

The use of SAE #50 is not recommended with the exception that it may be indicated for hot climatic and heavy load conditions. Care must be exercised in using this heavy body oil, as the power loss due to using an oil of this weight will result in an increase in oil pan temperature more than offsetting any possible gain in lubricating value.

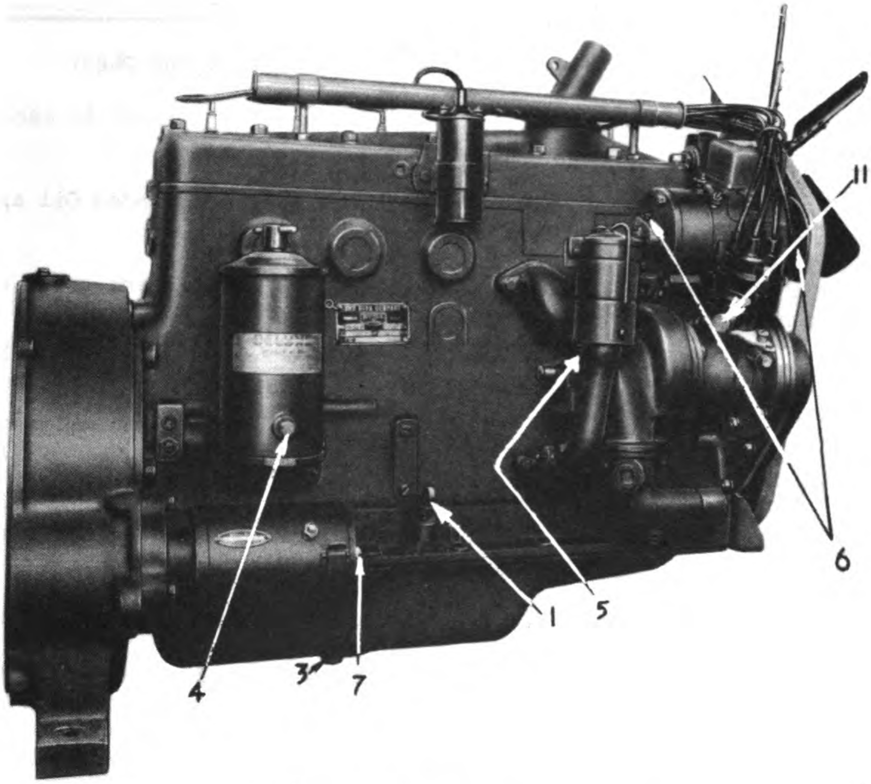


Figure Ca - Right Side of Engine

1. Crankcase Oil Level Gauge
3. Crankcase drain
4. Oil Filter Drain
5. Water Pump Oil Cup
6. Generator Oil Cups
7. Starter Oil Cup
11. Distributor Grease Cup

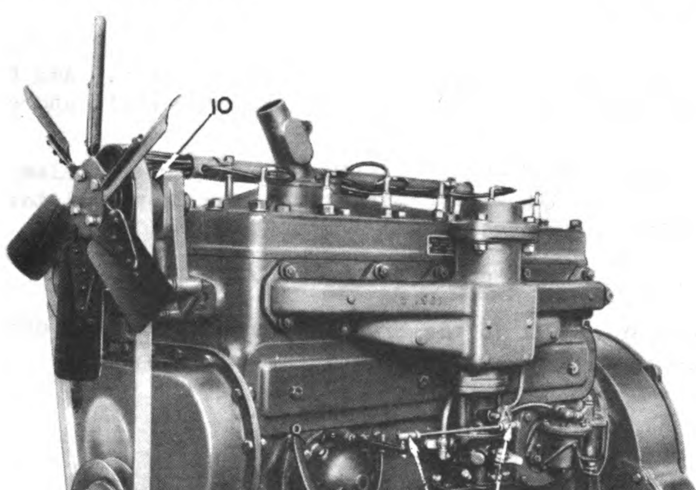


Figure Da - Left Side of Engine

8. Crankcase Pan
9. Governor, Throttle Shaft, and Carburetor Shaft Links
10. Fan Grease Plug

2. ENGINE LUBRICATION AT 10, 50 AND 100 HOURS OPERATION

See Illustrations Ca and Da on preceeding page.

Daily - 8 to 10 Hours of Operation

1. Crankcase Oil Level Gauge. Check and add recommended Oil as needed if below "Full" mark.

2. Air Filter. Clean and refill with fresh oil of same grade used in crankcase.

Every 50 Hours of Operation

3. Crankcase. Drain while engine is hot and refill with 6 quarts of recommended oil.

4. Oil Filter. Drain, remove element, clean filter housing, and install new filter element.

5. Water pump. Fill oil cup with same grade oil as used in crankcase.

6. Generator. Add 6 to 8 drops of oil of same grade as used in crankcase.

7. Starter. Add 6 to 8 drops of oil of same grade as used in crankcase.

Every 100 Hours of Operation

8. Crankcase. Drain while engine is hot. Add one gallon of cheap light oil (SAE #10) to flush crankcase. Do Not Use Kerosene. With flushing oil in crankcase, run engine at idling speed for two minutes. Drain the flushing oil and add 6 quarts of oil of recommended grade.

9. Governor, Throttle Shaft, and Carburetor Shaft. Add few drops of oil on governor link joints, governor throttle shaft and carburetor shaft.

10. Fan. Remove plug and fill with grease by use of Alemite fitting. Use little grease as too much grease may distort fan hub seals.

11. Distributor - Turn grease cup down 1/2 turn.

    Add a drop of oil to the breaker cam and put a few drops of oil on the wick on the camshaft under the rotor.

G. TROUBLE CHART

Troubles	Possible Causes
Loss of Power	Valves need grinding or adjusting. Rings worn. Cylinders worn. Rings stick in grooves. Thin or rich mixture. Poor plugs; points; or adjustment needed. Distributor points need filing and adjustment Gas line or pump over-heated.
Engine Knocks	Low water. Distributor advanced. Thin mixture. Hot fuel pump or lines. Carbon. Poor gasoline. Rod or main bearings worn. Loose flywheel. Lack of oil.
Faulty Carburetion	Flooding or starving. Water in fuel. Dirty strainer. Lack of gasoline. Faulty fuel pump.
Excessive Smoke	Carbon trouble. Dilution. Worn cylinders and rings. Improper oil.
Back-Fire in Muffler	Cam gears out of time. Ignition setting. Sticky valve stems. Broken valve springs.
Back-Fire at Carburetor	Thin mixture. Out of gasoline. Sticky inlet valves. Broken valve spring. Cam gear out of time. Ignition setting. Air leak in manifold.
Hard to Start	Weak battery, Defective points. Defective coil. Poor gas. Fouled plugs. Too much choke. Out of time. Water in gas. Oil too heavy.
Engine Misses	Faulty ignition. Plugs and points. Loose wires. Dirt in jets. Leaky gaskets. Too close valve adjustment. Sticky valves. Broken valve springs.

Troubles	Possible Causes
Engine over-heats	Lack of water. Lack of oil. Late ignition. Radiator clogged. Poor hose fittings. Water pump trouble. Lime in cylinders. Carburetor choke partly closed. Loose fan belt. Thin mixture due to over-heated fuel lines and fuel pump. Water pump suction partially closed by obstruction or collapsed hose. Water pump impeller loose on shaft. Thermostat faulty.

H. IMPORTANT PRECAUTIONS

1. Do not tamper with the engine governor if you are not thoroughly familiar with it. The governor is correctly set when it leaves the factory. Do not adjust the rod leading from the governor lever to the carburetor lever.

2. Absolute CLEANLINESS should be the rule at all times, and especially when engine parts are exposed.

3. Do not fail to investigate the cause of backfiring and misfiring.

4. Do not leave the engine out in the weather if it can possibly be avoided Always protect the end of the exhaust pipe from rain, if the engine is standing idle.

HIGH ALTITUDE OPERATION

Gasoline engine power is reduced when operating at high altitudes. The reduced density of the air causes a loss of compression, and the lowered oxygen content reduces combustion efficiency. The power loss is approximately 3 to 3-1/2 percent for each 1000 foot increase in elevation.

Up to an elevation of about 3000 feet, the power loss is due primarily to the decrease in cylinder compression and may be regained by increasing the compression. Up to this altitude the oxygen content of the air is probably sufficient for efficient combustion.

For instance, an engine may be equipped with a high compression head for delivery of normal power output at an elevation of 3000 feet. However, if the engine so equipped is used at higher elevations, the power loss will again be 3 to 3-1/2 percent for each 1000 foot increase in elevation.

If the carburetor is set for operation at normal levels, the fuel mixture will become increasingly rich as the altitude of operation is increased, due to the reduced air density and consequent loss of oxygen. This causes inefficient combustion and carbon deposits. In general, a carburetor set for operation at normal levels will perform satisfactorily up to an elevation of 3000 feet. Above this, the fuel jet should be adjusted or changed to provide the proper ratio of fuel to air for efficient combustion.

III. MAINTENANCE

A. ENGINE PROPER

1. THE CYLINDER AND CRANKCASE ASSEMBLY

The cylinder and crankcase housings are cast integral. All oil leads are drilled passages in the crankcase. Pistons and connecting rods are removable from the top of the engine. One piece removable push rod covers are of ample size to permit ready inspection or replacement of the valve push rod mechanism.

2. MAIN BEARINGS

The main bearings (#12 in illustration E below) are of precision type and can be replaced individually. No scraping or fitting is required. Replacement can be easily made by simply pushing the old shell around and installing the new without disturbing the crankshaft. The upper shells are not dowelled, the lower shells (#12) are dowelled in the caps to hold them in place. No shims are required. There are seven main bearings. Crankshaft thrust is carried by the rear main lug.

After extended service should the crankshaft be found to become worn out of round .003" or more, it should be removed and reground to a standard undersize. Replacement bearings can be furnished .010", .020", .030", and .040" diameter undersize.

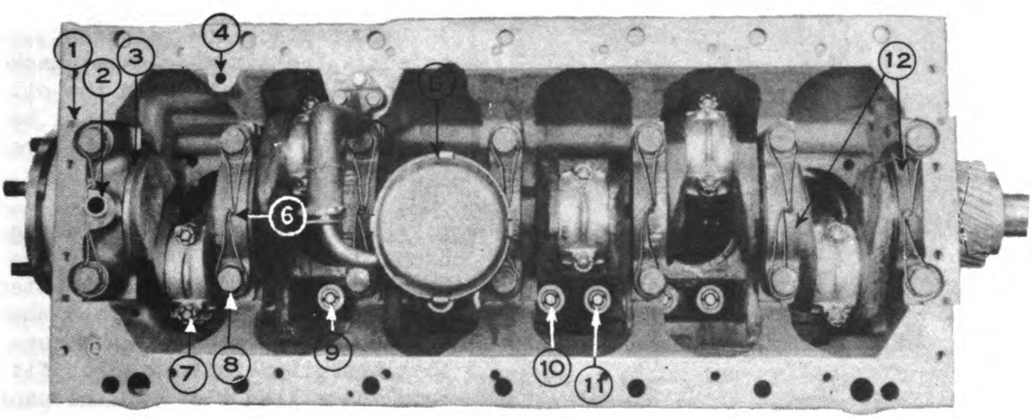


Figure E - Lower Crankcase View

1. *Side Cap Seals*
2. *Rear Brg. Drain Tube*
3. *Thrust Main*
4. *Excess Oil Return Hole*
5. *Floto Screen*
6. *Main Bearing Bolt Safety Wire*
7. *Cyl. Number 6 Rod*
8. *Cyl. Number 6 Main Bearing Caps*
9. *Valve Stem (With Cam Removed)*
10. *Retainer Lock.*
11. *Retainer Cup*
12. *Main Bearings*

3. REAR BEARING CAP

The rear bearing cap has an oil return tube (2) in it which drains below the oil level in order to assist in preventing oil leak through the rear main bearings. Illustration E shows the cap with the tube in place.

4. REAR BEARING OIL SEAL

The rear bearing oil seal (Figure F) is a combination oil slinger (6) and felt oil seal (4). The slinger is machined integral with the crankshaft. The oil thrown off the slinger drains down into a reservoir (7) cast integral in the rear bearing cap. The oil then passes through the drain tube and into the oil pan.

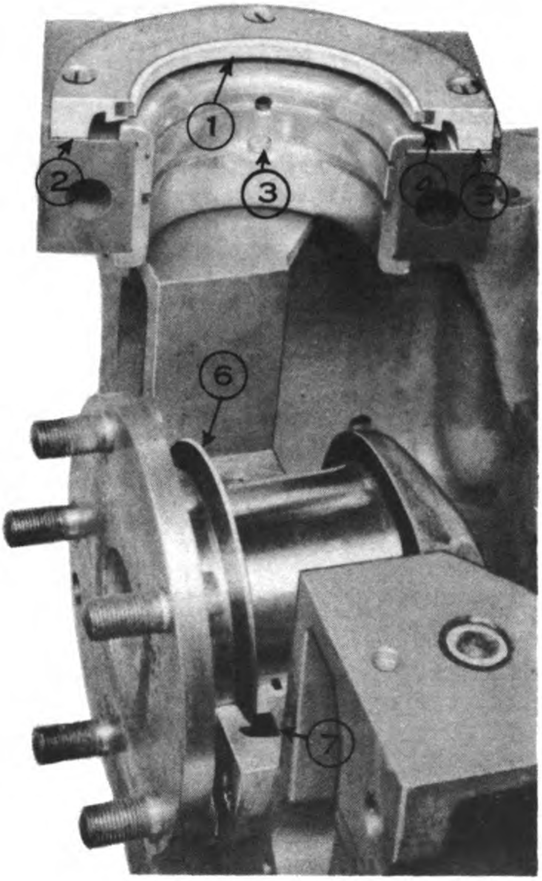


Figure F
Rear Bearing Cap and Seal

1. *Graphite & Oil Coated Surface*
2. *Upper Retainer in Place*
3. *Lower Bearing Dowel*
4. *Shellac Stiffened Felt Seal*
5. *Selected Gasket Thickness*
6. *Oil Slinger*
7. *Oil Slinger Cavity*

The rear bearing felt oil seal retainer (2) is a split disc type with a groove on the inside diameter to hold the felt (1). The retainer is mounted back of the oil slinger with the felt contacting the crankshaft diameter which is a little larger than the main bearing diameter.

To replace the felt seal, put enough shellac in the groove so the felt will soak up the shellac as the seal is worked into the groove. Allow the shellac to dry with the felt in place before trimming flush with the end of the retainer. The shellac is to prevent the felt from turning with the shaft.

To replace the retainer, select a (retainer to case) gasket so the clearance between the oil slinger and the retainer will be .015 - .020 inches, when the crank is forward.

Use care whenever replacing front or rear cap. Whenever the front or rear bearing needs attention, care must be exercised when the cap is replaced to make sure that the oil retainers which fit into the milled slots in the caps have the proper seal installed to prevent an oil leak through these slots or between the cap and the case proper.

If the standard fillers are not available these grooves can be sealed with woolen yarn, which should be firmly calked into place by means of a small drift and hammer, pounding the yarn gradually up into the grooves until they are packed full.

5. PISTON AND CONNECTING RODS

The cast iron piston has three compression rings and slotted type oil control ring. See Fig. G.

The piston pins (3) are the full-floating type and are made to rotate in either the piston or the connecting rod bushing. The pins are held in place by means of snap rings (4) which lock in a groove in the outer end of the piston boss which prevents the piston pin (3) from coming in contact with the cylinder walls. The piston pins have the ends ground flat and polished to prevent their cutting through the lock rings. Replacement pins can be furnished in standard .005", .010", .015" and .020" oversize.

With cast iron pistons the pin should be fitted tighter in the pistons than in the upper end of the rod. It should be possible to push the pin through the rod bushing without exerting any considerable force, but the pins should be tight enough in the pistons to enable the mechanic to drive the pin in with the palm of his hand.

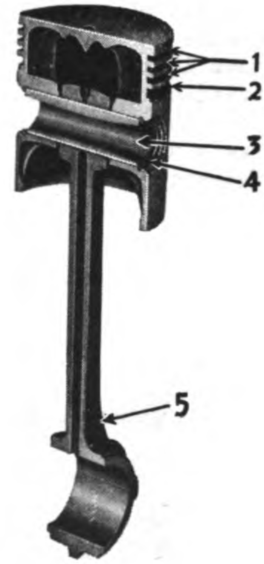


FIGURE G
Cutaway Section of Piston and Rod

1. *Compression Ring Grooves*
2. *Oil Ring Groove*
3. *Piston Pin*
4. *Piston Pin Snap Ring*
5. *Connecting Rod Arm*

The connecting rod (5) is fitted with bronze piston pin bushings and the babbitt type crank pin bearing which is spun in the connecting rod. The connecting rods are rifle drilled for pressure lubrication to the piston pins. Figure G shows the sectional view through the connecting rod and piston assembly. The side clearance between the connecting rod and the crankshaft cheeks should be maintained at .004" - .006".

The babbitted type connecting rod can be furnished in standard undersizes the same as the main bearings. If the crankshaft is out of round it should be removed and reground to a standard stock size as outlined under main bearings. After the cylinder head is removed the connecting rod and piston assembly can be removed from the top. In reassembling the cap to the rod, be sure that the numbers on the cap and the rod are on the same side. This should be done to be sure that the cap is installed on the rod in the same position as originally assembled.

Cylinders may be checked for wear with an inside micrometer, taking cross measurements the whole length of each cylinder. Most of the cylinder wear comes near the top of the cylinder in the ring travel. If the cylinders are found to taper more than .005", or if the cylinder is found to be out of round, it should be reground. All cylinders should be reground the same size, following S.A.E. practice, grinding them either to .010", .020", .030", .040" oversize. Pistons are carried in stock in these sizes. Semi-finished pistons are also available. If cylinders are not reground it is recommended that they be smoothed up with fine emery cloth or fine cylinder hone.

6. VALVES AND TAPPETS

Before taking the valves to the valve grinding bench, be sure that all the carbon has been removed from the cylinder block, and from the valves as carbon deposits frequently cause difficulty in the valve grinding operation.

All of the valve adjustments are to be made while the engine is hot. To make the valve tappet adjustment use a feeler gauge and two wrenches as shown in the picture. The valve tappet clearances are given on the plate attached to the engine, intake .006, exhaust .009. See valve diagram. After the tappet clearance has been adjusted hold the adjusting screw securely and lock in place with the check nut. Check again and see that the clearance did not change when the lock nut was tightened.

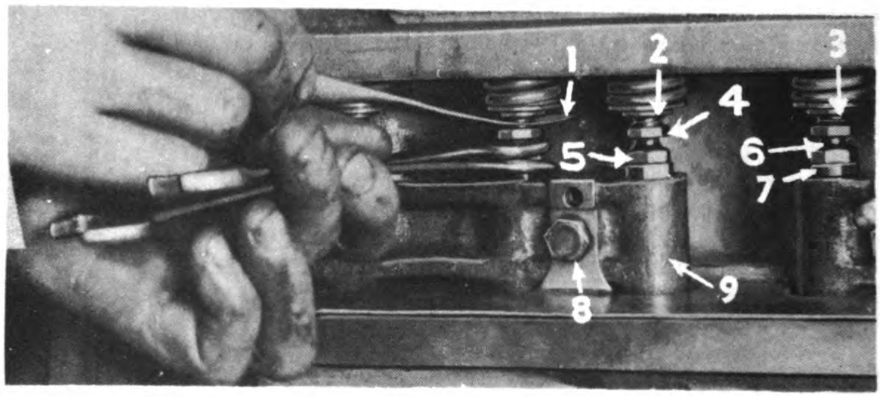


Figure H - Tappet Adjustment

1. *Feeler Gauge*
2. *Retainer Cups*
3. *Retainer Lock*
4. *Adjusting Nut*
5. *Lock Nut*
6. *Adj. Screw*
7. *Tappet Body*
8. *Tappet Cluster Mounting Bolt*
9. *Valve Tappet Cluster*

The valve tappet clusters (9) are bolted to the cylinder block. By removing the capscrews (8) the entire structure can be removed from the engine. The tappet adjusting screw lock nut (5) will prevent the tappet from dropping out of the bracket. If any difficulty is experienced in removing the bracket after the capscrews have been removed, turn the engine over part way which will rotate the camshaft and relieve the tappet from the strain put upon it, due to a valve being held partially open by the cam.

NOTE: Dowels are used to properly align the valve tappet bracket assembly in the block, and these MUST be in place when reassembling.

CAUTION: The opening for the screws holding this assembly in place opens into the cylinder bores, so if for any reason any of these capscrews are replaced, ones of IDENTICAL LENGTH MUST BE USED.

7. REMOVING VALVE AND SPRING

Cylinder head must be removed before springs can be taken out. Compress the spring with a "c" or plier type compressor. Then remove split locks from valve stem. Release spring, remove lifter, and pull valve out through the top of the block. The spring can then be pried out with screw driver.

Reinstallation

Put spacer, spring and retainer in their proper positions and slip them together in valve chamber. Drop valve through from the top of the block. Compress spring and put the retainer locks in their groove on the valve stem. Grease applied to the inside of the lock will hold them in position while spring is being released.

8. REMOVING AND REPLACING OF CYLINDER HEAD

To properly tighten the cylinder head, the center row of nuts should be drawn down very tightly, starting from the center and working to the front and back, alternately. The outside rows should then be drawn down firmly by alternating from one side to the other and working alternately from the center to both ends. In this way the gasket is worked out towards the sides, as it is compressed and will then draw down evenly. When all of the nuts have been drawn down for the first time, they should be gone over again following the same rotation. A little judgment will have to be used to know when the cylinder head is tight. A little cup grease may be used on both sides of the gasket before the cylinder head is put down on the studs, but do not use snellac or any other similar gasket cement.

When the engine is warmed up after fitting the cylinder head, all the cylinder head stud nuts should be drawn down once more as described before.

9. TIMING GEARS

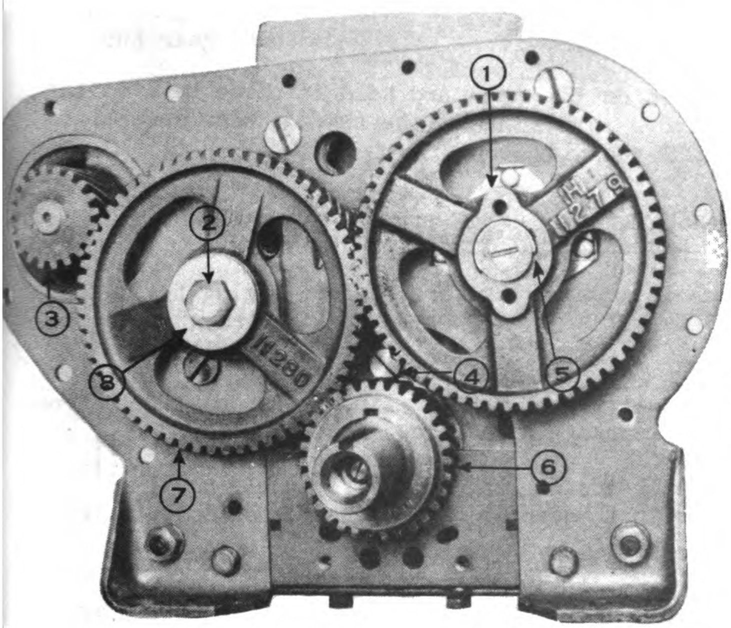


Figure I - Timing Gear

1. *Cam Retainer Lock*
2. *Left Hand Threaded Bolt*
3. *Accessory Gear*
4. *Front Main Bearing Locating Screw*
5. *Cam Gear Retainer Clip*
6. *Crank Gear*
7. *Idler Gear*
8. *Idler Gear Thrust Washer*

The crankshaft gear drives the camshaft and accessory drive gear through an idler gear. The camshaft and accessory drive shaft turn in the same direction as the crankshaft. The gears are on fixed centers and adjustment is made by selecting oversize or undersize gears.

Each gear is marked with a number within either a circle (indicating oversize) or a letter U (indicating undersize). The surrounding symbol denotes oversize or undersize respectively and the number within gives the deviation from the standard in thousandths of an inch. Thus: 2, gear is .002 oversized; or 3, gear is .003 undersized. When a letter S is used it denotes an even dimension gear. The figures given represent radial and not diametrical variation.

Crankshaft, idler and camshaft gears should be fitted with .002 backlash, while the accessory drive gear can have appreciably more backlash. When ordering one gear for replacement use the size marking of the old gear with allowance for wear on the others.

The idler gear (7) rotates on a stub shaft which is pressed into the crankcase. The shaft is secured in position by means of a lockscrew which screws into the right hand side of the crankcase. In assembling this shaft the screw hole in the shaft must line up with the corresponding hole in the crankcase. Oil is fed to the base of the hollow shaft which supplies a stream of oil to the gear housing. Because oil is fed to the base of the stub shaft an acorn lock nut is screwed over the protruding end of the lockscrew and sealed against the crankcase with a copper asbestos gasket.

The idler gear bushing is the thin wall type which is pressed in place and broached after assembly and prior to the cutting of the gear teeth, therefore, the idler gear and bushing must be replaced as one part. (See Figure I on page 521.) The end play is limited by the thrust washer (8) on the end of the shaft and should be .006" clearance. The thrust washer (8) is pinned to the shaft to prevent turning. The thrust washer is held in place by a capscrew (2). To prevent working loose the capscrew (2) has a left hand thread which will be kept tight by the engine rotation.

The camshaft runs in four precision type bearings. At the flywheel end it drives the oil pump through a pin and fork coupling. The thrust is taken at the timing gear end by a thrust plate attached to the front end of the crankcase. This thrust collar fits in a groove formed at the junction of the front camshaft bearing load and the rear of the camshaft gear hub.

The camshaft gear is pressed on the shaft and held in place by a spring wire lock, which snaps in a groove in the end of the shaft. When assembling a new gear, allow .004" to .008" end play.

10. TIMING THE CAMSHAFT

The base circle clearance is .006", therefore, before timing the engine, tappet adjustment between the tappet adjusting screw and the valve should be set to .006" clearance.

A. Adjust the intake valve lifter of No. 1 cylinder (second lifter from timing gear end) to the proper clearance as outlined above.

B. Turn the crankshaft until the marking on the flywheel, No. 1 cylinder I.O. (intake open), is in the center of the inspection hole in the flywheel housing.

C. Turn the camshaft in the direction of rotation (same direction as crankshaft) until No. 1 cylinder intake valve lifter takes up the slack between the lifter and the valve stem. This point can be determined by rotating the lifter with your fingers. A slight drag indicates the proper point. Slip idler gear into mesh with cam and crankshaft gears. It is not necessary to time water pump gear. See instruction for ignition timing, page 445.

D. To check valve timing, turn engine in direction of its rotation slowly. At the same time, feel No. 1 cylinder intake tappet. When a slight drag is felt, the timing mark I.O. (Intake Open) on flywheel should be in center of inspection hole in flywheel housing.

E. Unless the gears have been replaced after the engine leaves the factory it will not be necessary to resort to the above as the teeth are marked on the crank, cam and idler gears.

11. FLYWHEEL AND HOUSING

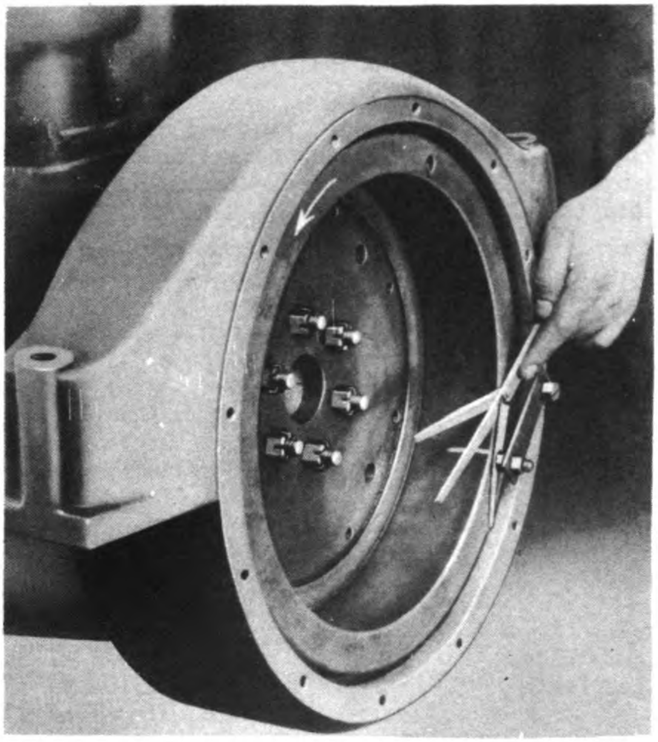


Figure J
Method for checking Trueness of Flywheel.

Whenever replacing the flywheel, care must be taken to insure its running true without excessive wabble. An easy method of checking the trueness of the flywheel is shown in the illustration below. Feelers are used in order to determine the maximum runout, and this should not exceed ten-thousandths of an inch. If a toolmaker's indicator is available, this can be used by bolting into the flywheel housing and permitting the stem to rub against the flywheel. The engine should be turned slowly and the high and low sides of the flywheel noted. If the flywheel runs out of true more than ten-thousandths it should be removed and the crankshaft flange recess inspected for dirt or other foreign matter.

12. NOMINAL CLEARANCES

The clearances given in the following table are for the desired fits. Fits should never be made tighter than the low limit values given in the table. Where engines are being reassembled with old gears the high limits specified for the gear fits may be larger than the values given in the table.

Piston to Cylinder Clearance:
    Fit snug on a .003 x $\frac{1}{2}$ feeler ribbon.
Compression ring gap:
    .015 gap.
Oil ring gap:
    .008 gap.
All ring to groove clearances:
    .0005 to .0015.
Piston pin in piston:
    Size to size or light tap fit with wood or leather mallet.
Piston pin to rod bushing:
    .00075 to .001.
    Care should be exercised in making these fits.
Crankshaft end play:
    .004 to .008.
Main bearing clearances:
    .002 to .004.

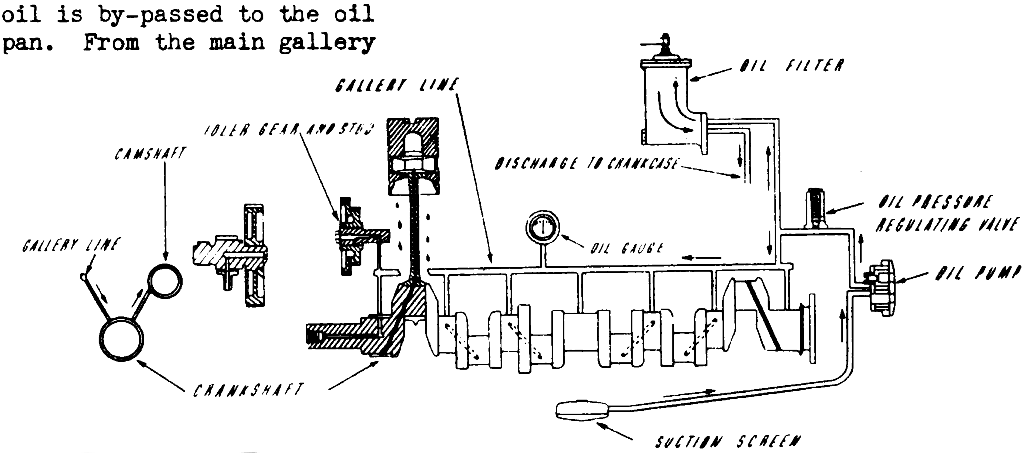
Connecting rod side clearance:
.004 to .006.
Connecting rod bearing clearance:
.002 to .004.
Camshaft bearing clearances:
.002 to .0035.
Camshaft end play:
.005 to .008.
Idler gear end play:
.005 to .008.
Accessory gear end play:
.005 to .008.
All gear back lash:
Idler gear .002
Accessory gear .005.
Valve stem to guide, intake and exhaust:
.002 to .004.
Tappet adjustment (set hot):
Intake .006", Exhaust .009".
Valve lifter or tappet fit to guide:
.0005 to .001.
Water pump shaft to bushing:
.002 to .003.
Oil pump gears back lash:
Not over .002.
Oil pump gears to case:
Not over .002 on a side.
Oil pump gears to case flange:
To be flush.
Spark plug gap:
Approximately .025.
Distributor points:
.018 to .024.
Side clearance between connecting rod and crankshaft cheeks:
.004 to .006.

B. LUBRICATING SYSTEM

1. OIL CIRCULATION

The engine is lubricated by means of the conventional pressure feed system. See Figure K. The oil is drawn from the pan through a suction screen to the oil pump. From the pressure side of the pump, it enters a drilled passage in the crankcase casting to the oil pressure relief valve. Here excess oil is by-passed to the oil pan. From the main gallery

Figure K
Lubricating Oil Diagram



line, side passages are drilled to the main bearings and idler gear stud. From the main bearing the oil is delivered to the crank bearings by means of the drilled crankshaft. The piston pin receives its oil from the crank pin bearings through the rifle drilled connecting rods. The cylinders are lubricated by oil thrown from the crank pin bearings.

From the main bearings, side passages lead to the camshaft bearings. A supply of oil is delivered to the idler gear hub through the drilled idler gear shaft. Oil from the hubs of this gear is thrown out spraying the entire gear train. A portion of the oil is forced thru the oil filter to remove impurities.

2. OIL PUMP

The oil pump assembly fits in a recess in the flywheel end of the crankcase and is held in place by four cap screws. See Fig. L. Connections to the pressure and suction passages in the crankcase are made by hollow dowels sealed against oil leaks by copper asbestos gaskets. The oil pump itself is bolted to the rear of the crankcase as pictured in the illustration. The four screws (3) which mount the oil pump to the crankcase are clearly shown in the picture. To remove the oil pump assembly it is necessary to remove only the four cap screws which fasten the oil pump to the crankcase.

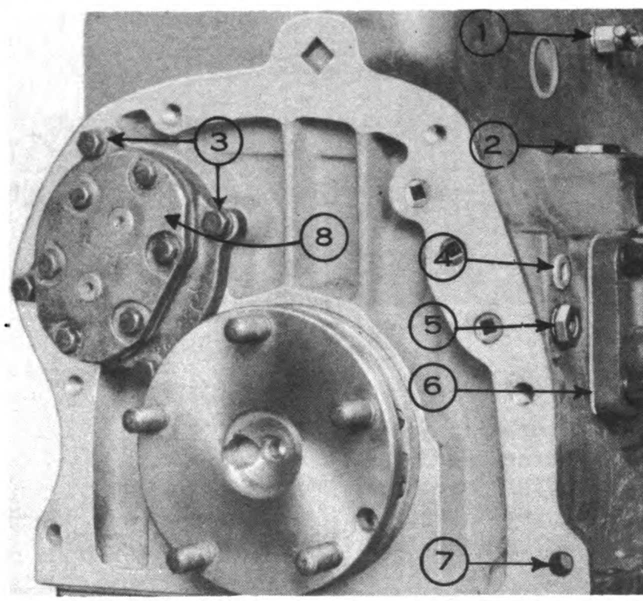


Figure L - Rear Crankcase View

1. *Block Drain*
2. *Oil Pressure Relief Cover*
3. *Oil Pump Mounting Bolt*
4. *Priming Hole*
5. *Pressure Connection*
6. *Filter Pad*
7. *Dowel Bolt Hole*
8. *Oil Pump*

Illustration Number M shows the front and rear view of the oil pump along with the view of the component parts. The oil pump body has a hydraulic relief (1) machined in the casting. The oil which would otherwise be trapped between the teeth is allowed to return through the hydraulic relief to the pressure side of the pump. There are no removable parts in this type of relief. The idler gear (2) and the drive gear (6) have bushings which were machined in the gear blanks before the teeth were cut. The gears and bushings should be replaced as units. The plug (13) is used as oil seal at the end of the idler shaft. This plug should not be removed from the oil pump body. The oil inlet (12) and the oil outlet (11) passages are through the two locating sleeve dowels.

To assemble the oil pump, put the drive gear (6) and the idler gear (2) in the housing. Place the gasket (4) in place in the housing. Set the cover in place starting the idler shaft (3) in the idler gear (2) and then

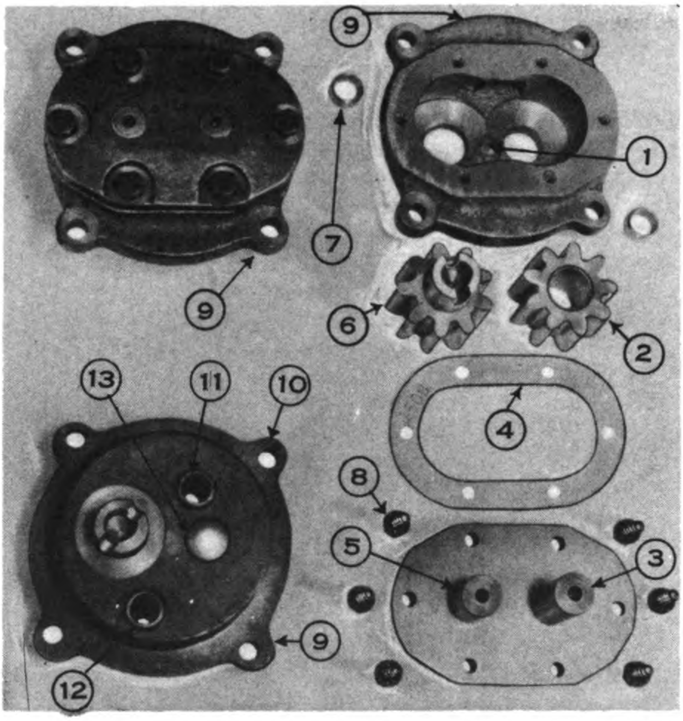


Figure M - Exploded View of Oil Pump

1. *Hydraulic Relief*
2. *Idler Gear with Bushing*
3. *Idler Gear Shaft Pressed into Cover*
4. *Cover Gasket*
5. *Drive Gear Shaft Pressed into Cover*
6. *Gear with Integral Slotted Drive*
7. *Pump Mounting Dowels*
8. *Cover screw and shakeproof washer*
9. *Front View of Assembly*
10. *Rear View of Assembly*
11. *Oil Outlet Hole*
12. *Oil Inlet Hole*
13. *Idler Shaft Oil Seal Plug*

the drive gear shaft (5) in the drive gear (6). Make sure the holes of the gasket (4) are in alignment with the cover and body capscrew holes before installing and tightening the six capscrews (8). Make sure the two sleeve dowels (3) are in place.

To prime the pump, see Figure L, remove the plug (4) marked "prime." This plug is located near the oil pressure relief valve on the side of the crankcase. This priming hole opens into the suction passage leading to the oil pump. Priming must be done while the engine is running and can be most easily done by means of a hand oil pump or gun. However, the same results can be obtained by connecting a piece of tubing to the oil priming connection and raising the oil level above the level of the pump, forcing a quantity of oil into the suction passage while the engine is running.

Do not run the engine more than a few seconds without oil pressure. The priming hole should be covered as quickly as possible, using your thumb until the oil circulates. Afterwards the engine can be shut down and the plug replaced. If this does not correct the trouble, check the oil pressure relief valve for a weak spring, broken spring, defective seat, or a check ball held open by foreign matter. Check or replace the oil pressure gauge.

3. LOCATING AIR LEAKS

Air pressure applied to the suction side, or the upper plug on the right-hand side of the engine, should indicate the location of an air leak, and while air pressure applied to the discharge or lower plug on the right-hand side of the engine will sometimes disclose the location of pressure leak, this condition is more readily discovered by fastening to this opening a copper tube which is attached to an oil reservoir which is strong enough to permit air pressure being applied to it. This air pressure will force the oil through the bearings and any loose bearings can be easily discovered by means of the excess oil flowing through the bearings.

4. OIL PRESSURE RELIEF VALVE

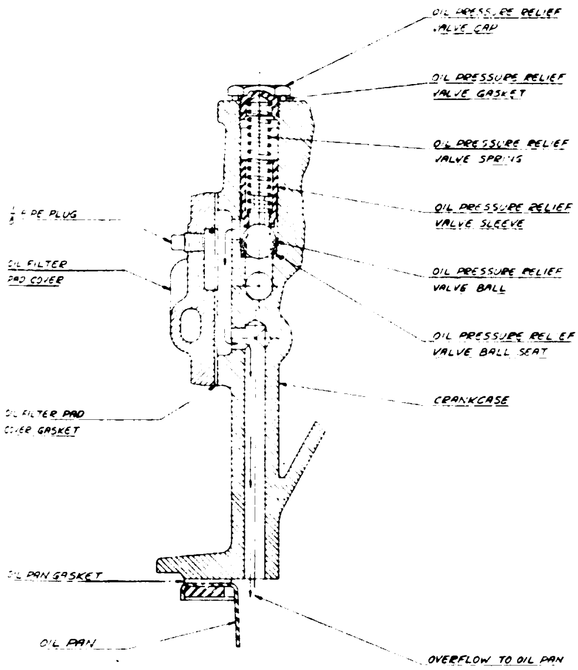


Figure N
Oil Pressure Release Valve

The oil pressure relief valve, (see Figure N), is designed to maintain an operating pressure of approximately 30 lbs. at normal speed and temperatures. No adjustment is provided. The spring furnished is of the proper weight and length. A temporary adjustment can be made by stretching or compressing the spring, however a new spring should be obtained as . stretched spring soon loses its tension.

The oil pressure relief valve spring and ball are accessible by removing the large hexagon nut located just back of the filter.

5. OIL FILTER

This oil filter is located on the right side of the engine near the flywheel housing. See Figure A. The DeLuxe lubricating oil filter has a removable cartridge. Figure NN shows a sectional view through the filter. The unfiltered oil enters the inlet passage from the pressure side of the engine lubricating system and flows upward through the center tube until about half way up where it is released through two holes to spray against the side of the cone. The oil washes down, keeping the surface of the cone clean and allowing any heavier than oil particles to fall into the sump from where they can be drained off as the sump in the filter is never agitated. The pressure within the filter then forces the oil upward through the cartridge.

The pressure within the filter is controlled by a valve built into the base of the cover handle. The cover is also fitted with a perforated cap which holds the cartridge in a rigid position.

The cartridge which actually does the cleaning is constructed of specially prepared, long thread cotton, so supported that it cannot compress under pressure. This construction permits the oil to reach all parts of the filter medium for efficient cleaning. The clean oil flows back to the engine crankcase from the outlet on the top.

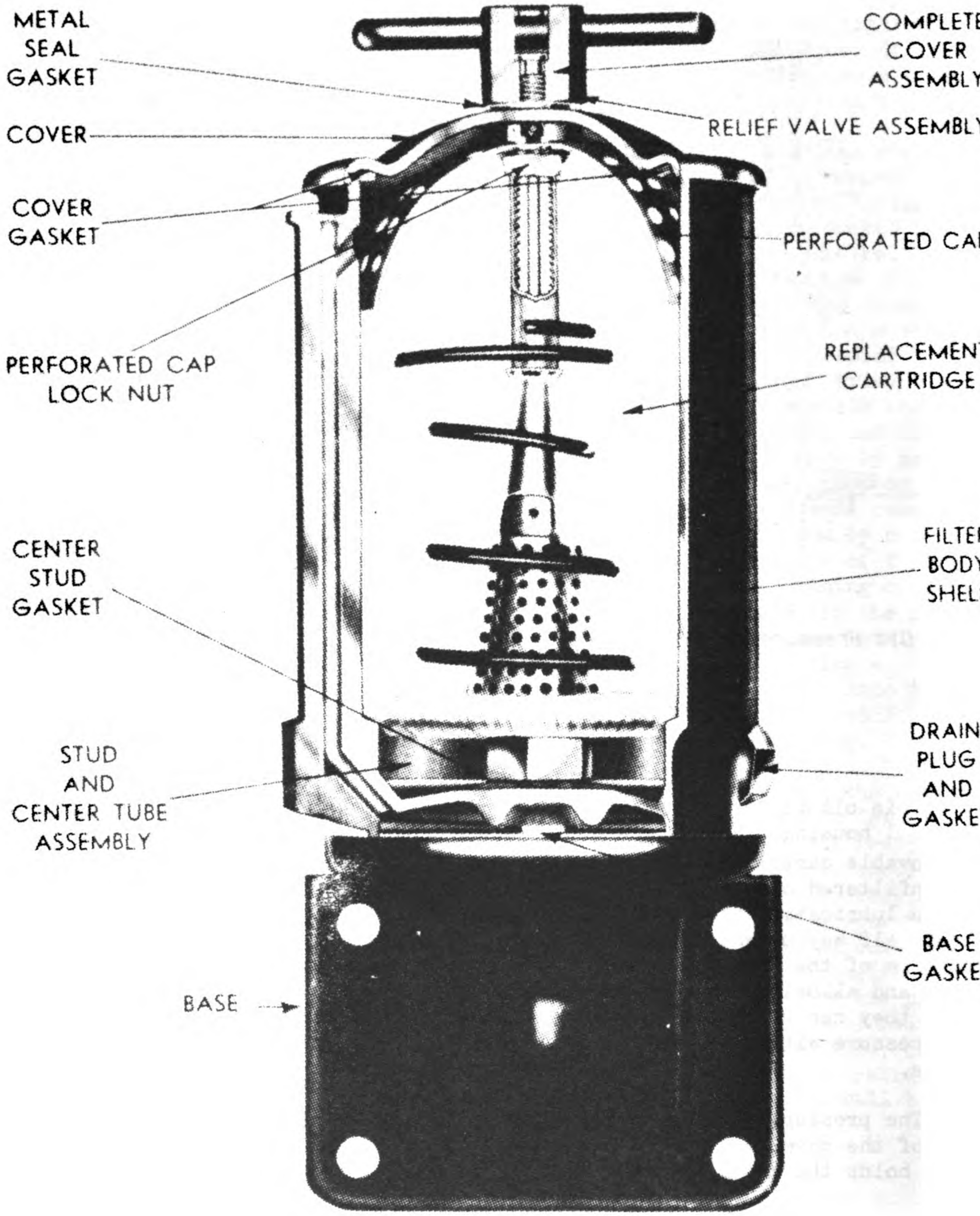


Figure NN
Oil Filter.

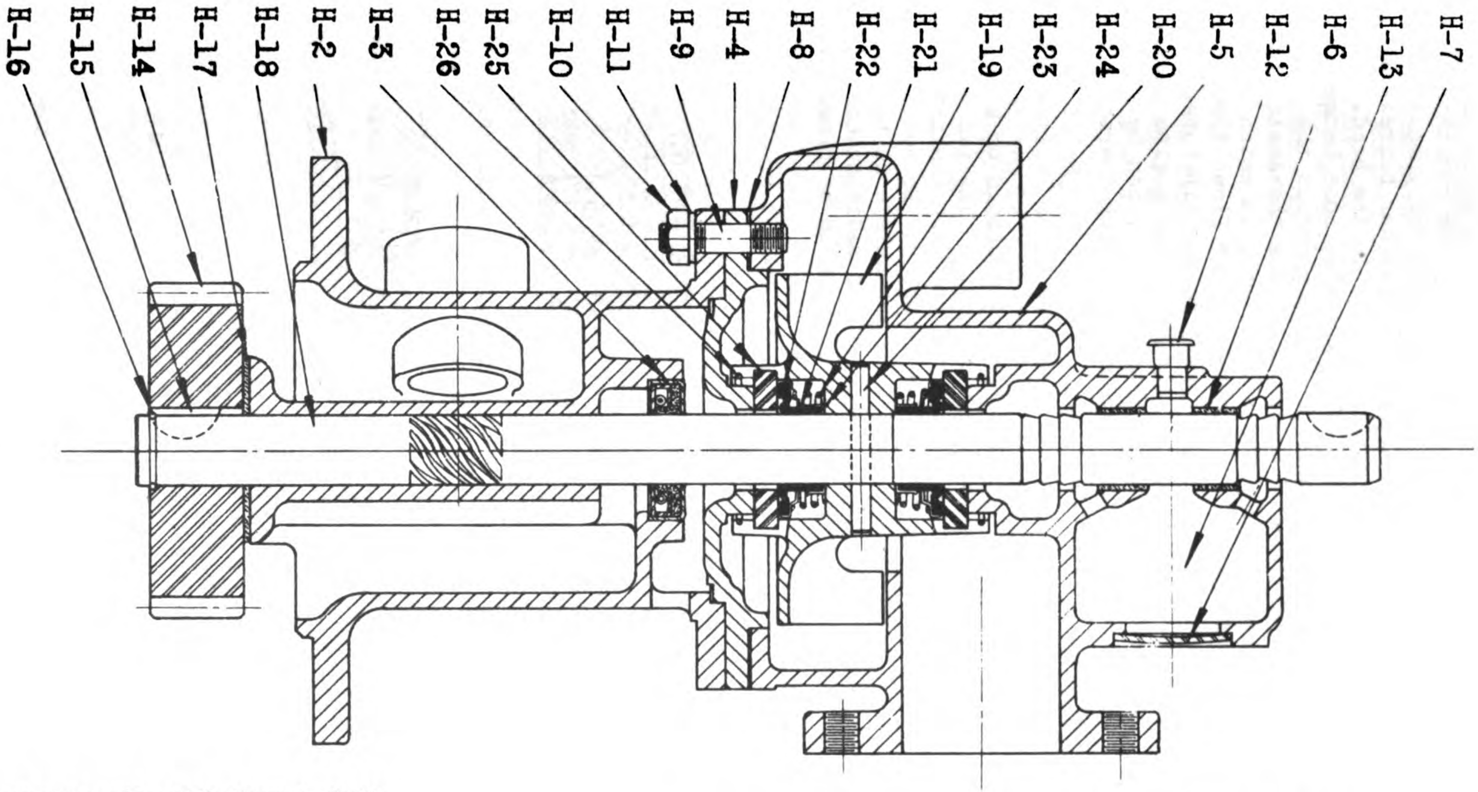


Figure O

WATER PUMP

Water pump assembly with through shaft
(Includes indented items)
H-2 Water pump drive bearing sleeve
H-3 Water pump drive oil seal
H-4 Water pump seal plate
H-5 Water pump body
H-6 Water pump body bushing
H-7 Water pump body expansion plug 1-1/4"
H-8 Water pump body to drive gasket
H-9 Water pump body to drive stud
H-10 Water pump body to drive stud nut 5/16"-24"
H-11 Water pump body to drive stud copper washer

H-12 Water pump body oil pump cup
H-13 Water pump body wool packing
H-14 Water pump drive gear
H-15 Water pump drive gear woodruff key
H-16 Water pump drive gear snap wire
H-17 Water pump drive gear thrust washer
H-18 Water pump drive shaft

H-19 Water pump impeller
H-20 Water pump impeller pin

Water pump seal assembly
(Includes the following 6 items)
H-21 Water pump flexible seal
H-22 Water pump seal clamp ring
H-23 Water pump seal spring
H-24 Water pump seal spring guide
H-25 Water pump seal carbon washer
H-26 Water pump seal retainer snap wire

C. COOLING SYSTEM

The engine is water cooled with a belt-driven fan blowing air through a radiator. The cooling system is similar to that used in any automobile. Water from the radiator is forced through a water pump by the rotation of the impeller. After leaving the water pump the water passes around and between all cylinder barrels and valves and to the outlet passage in the head. A thermostat is located in the outlet hose between radiator and cylinder head. It controls the operating temperature of the engine. The thermostat is adjustable by means of a handwheel, on which instructions are given. As the warm water flows through the radiator, the water is cooled by the air forced through the radiator by the fan. The engine should be operated at a temperature of 180°, can be checked by removing radiator cap and inserting thermometer in water.

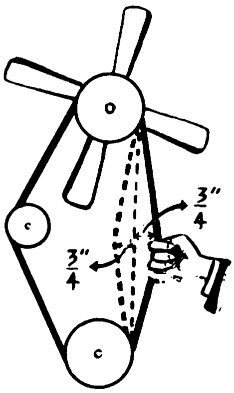


Figure P

Showing Fan Belt Adjustment

The water circulating system should be kept clean and free from scale deposits. The fan belt should be tight, but with not too much tension as to cause excessive wear. See Figure P. Do not allow dust, bugs, leaves, etc., to accumulate in the air passages between the tubes of the radiator coil. At frequent intervals, all debris should be blown out.

1. WATER PUMP

The water pump, see Figure Q, is the impeller type pump with the spring gland packless seal. The driven end of the pump shaft is lubricated by crankcase oil. The other end of the shaft is lubricated by an oil soaked packing (H13). The packing should be kept filled with a light weight engine oil which is to be added through the oil cup (H12). With the carbon washer seals (H25) no adjustment is necessary or possible. The construction of the pump is shown in the drawing. The enlarged section (Figure Q) shows the seal construction of water pump.

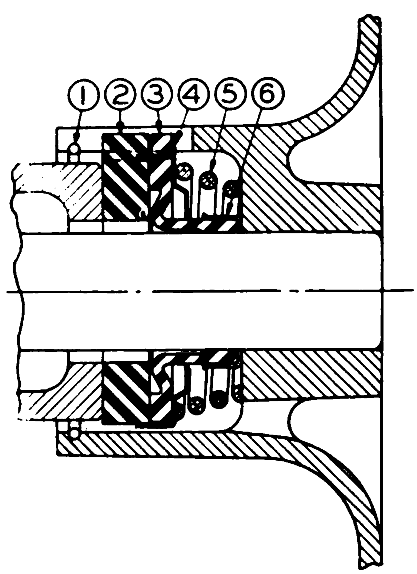


Figure Q - Enlarged Section shows Seal Construction

A. Carbon washer (2) is located between the flexible seal (3) and the pump body. Lugs on the washer fit into milled slots in the impeller and the entire assembly revolves with the shaft.

A spring (5) loaded flexible seal (3) holds the carbon washer against the face of the pump body preventing leaks. Brass shields (4) and (6) protect the seal and washer. The retainer wire (1) holds the seal in place during assembly. The water pump drive gear is keyed and secured on the shaft by a spring wire retainer in a groove in the end of the shaft. If necessary to dismantle the water pump be sure to remove the burrs on the ends of the shaft to prevent damage to the bushings. The body is secured to the drive housing by four nuts. Removing the body will expose one seal and removing the drive gear, and then the shaft, will permit complete disassembly.

When reassembling be sure the oil retainer is in proper position in the drive housing, using care in pushing the shaft in position to avoid breaking the carbon disc. Do not push in farther than necessary to assemble the gear to avoid damage to the seal.

The water pumps have provision for driving a magneto or generator, or other accessories from the rear end of the water pump shaft by means of a flexible coupling. It is extremely important that the alignment of the accessory be carefully made, since mis-aligment gives rise to excessive wear on water pump bushings.

RADIATOR FAN

The fan runs on anti-friction bearings and needs no attention except for greasing and to keep belt tight. Do not tighten excessively. Vee type belts must run with some slack.

To adjust fan belt, see Figure P, loosen clamp nut on fan spindle at the back of the bracket. Loosen lock nut on adjusting screw. Tighten or loosen the belt by turning the handwheel of the adjusting screw. Check fan belt tension by pulling the longest straight side for a slack of 3/4 of an inch in either direction, or a total of 1-1/2 inches.

RADIATOR

Clean, lime free water should always be used in the radiator system if it is at all possible to procure it. The use of hard water will cause scale to form in the engine jackets and in the radiator and tend to clog up the circulation system. Dirt, of course, performs the same damage.

The radiator and engine system should be drained and thoroughly flushed out every three months and refilled with clean water as deposits of dirt and foreign matter will accumulate and obstruct the circulation and also the heat transfer values of the radiator and cooling system. If anti-freeze solutions have been in use, it is well to put on new hose connections upper and lower, each year. Anti-freeze solutions have a tendency to cause disintegration of rubber hoses and if this progresses to an acute stage the rubber which crumbles away will pass into the system and fill up water passages, etc., and will also tend to swell up and stop circulation through the water system. Examine hoses carefully at least twice a year and replace when necessary.

Should the water system become clogged, particularly the radiator, one of the first things to do is to remove the connections upper and lower and plug the upper connection, then put a hose on the bottom of the radiator and put on 20 or 30 pounds of water pressure. This reverses the flow and will tend to carry any dirt which has been lodged down in the tubes back upward and out through the top of the radiator. While doing this, allow the radiator to overflow through the top. If the radiator is so badly clogged that this does not serve to free the circulation then the following solutions are to be recommended for cleaning:

1. A solution of one part of muriatic acid to three parts of water in sufficient quantity to fill up the radiator.

2. A solution made up with three or four cans of commercial lye added to a sufficient quantity of water to fill up the cooling system will work very well.

In either case the solution should be heated to luke warm before pouring into the system and should be allowed to stand in the system for three or four hours. After the removal the radiator and engine should be flushed thoroughly with clean water and the system again filled up with clean water.

Cold Weather Hints for freezing mixture. See Operation, Section C.

D. THE FUEL SYSTEM

1. PRINCIPLE OF OPERATION

The fuel system prepares and serves the "food" to the engine. The necessary units to perform this task are a carburetor, gasoline strainer, an air-cleaner, and a governor.

The fuel is gravity fed from the fuel tank thru the gasoline strainer, to the carburetor. There the raw gasoline is vaporized by the action of the air drawn into the carburetor by the vacuum-suction of the piston action. The air passed into the carburetor is thoroughly cleaned by an oil bath air cleaner and a collector type pre-cleaning unit, the latter unit prevents large particles of matter from entering the air cleaner, and the oil bath cleaner stops the finer dust and dirt from entering the carburetor. In the carburetor, the proper amount of air is mixed with the fuel to provide the right amount of gas and air mixture for efficient combustion.

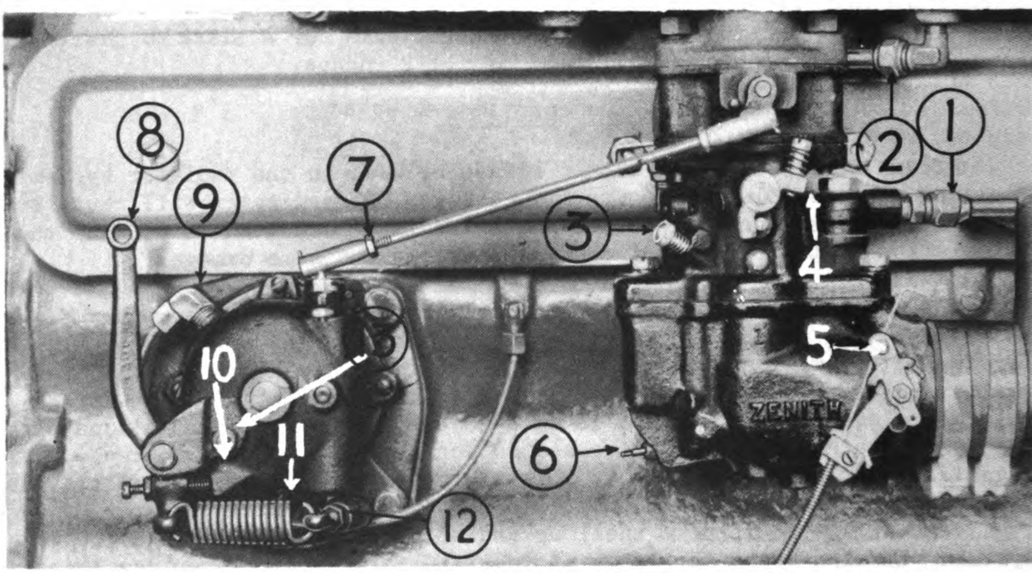


Figure R -- Close-up of Governor and Carburetor.

1. *Fuel Supply Line*
2. *Equalizer Air Line*
3. *Idle Jet Adjustment*
4. *Idling Adjusting Screw*
5. *Choke Control*
6. *Power Jet Adjustment*
7. *Adjustable Control Rod*
8. *Governor Lever*
9. *Governor Oil Line*
10. *First Speed Stop*
11. *Governor Spring*
12. *Regulation Adjustment*
13. *Surge Spring Adjusting Screw*

The speed of the engine is controlled by the rate of flow of the fuel into the engine. A lever for increasing or decreasing engine speed is connected to a carburetor throttle valve.

The adjustable speed governor automatically regulates the speed of the engine. When the load on the engine increases, the governor opens the throttle, but will not allow the engine to operate beyond its maximum safe speed. This adjustable speed governor maintains the rate of operation at a constant level, increasing engine power when necessary or decreasing it to the minimum requirements. A 20% variation in speed is possible without changing weights or springs.

The fuel system should be kept clean and free from both air and gasoline leaks. Detailed instructions for servicing and repairing the fuel system is given under each unit heading.

2. CARBURETOR

The Zenith carburetor is of the plain tube type with an adjustable main jet, an accelerating pump and an economizing device.

The main jet determines the maximum amount of fuel which may be obtained for high speed operations. The main jet adjustment reduces this amount if it is turned toward its seat. Ordinarily the main jet adjustment has no effect after it is two turns open.

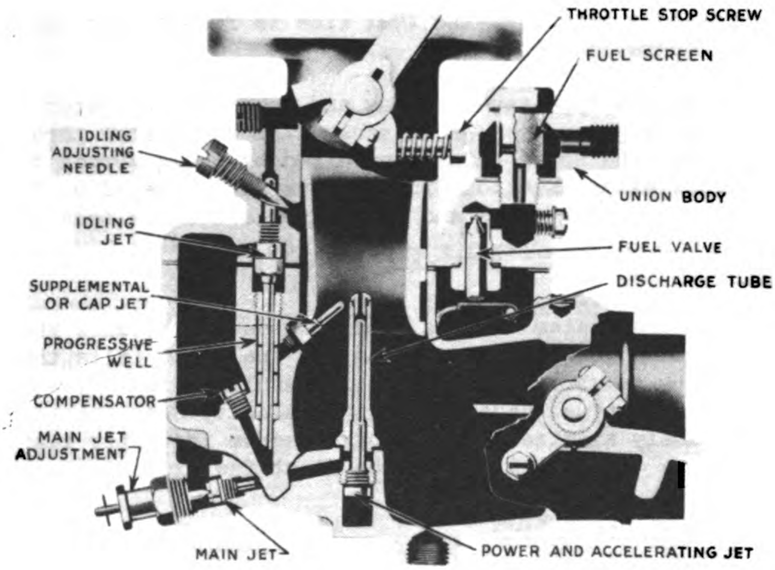
To set this adjustment, open the throttle to approximately 1/4 open. Turn the adjustment clockwise, shutting off the fuel until the engine speed decreases due to too lean mixture. Now open the adjustment until the engine speed decreases due to too much fuel. The adjustment should be set at a position half way between these two extremes.

OPERATION

The Zenith Compound Nozzle System of carburetion consists of two jets--the Main Jet, directly connecting fuel in the bowl with the air stream in the carburetor barrel through the Main Jet Discharge Tube; and the Compensating Jet flowing into an open well and connected with the air stream through the Supplemental Jet. See Figure S.

Figure S

Zenith Carburetor



The Main Jet flow varies with suction, delivering more fuel as the engine speed increases, thus its tendency is to richness at top engine speed. The Compensating Jet is not affected by suction, thus flows the same at all speeds and has a tendency to leanness at top engine speed. In combination, the rich and lean jets give an average mixture of correct proportions.

IDLING

The idling system functions only on starting and idling. When the throttle is opened past the idling position, the fuel goes the other way through the discharge tubes and the idling system is automatically out of operation.

It consists of an Idling Jet and tube to supply the fuel, and the Idling Needle Valve to correct the idling mixture, and a channel to carry the mixture into the carburetor barrel at the edge of the throttle.

The desired idling speed is set by the stop screw on the throttle lever.

FULL POWER AND ACCELERATION: Full power, either for top speed or hard pulling, requires a richer mixture than part throttle operation. So does acceleration.

This additional richness of mixture is provided by combined accelerating and economizing systems operated by the vacuum above the throttle valve.

There is a plunger pump to force fuel into the air stream; a check-valve to prevent fuel from being forced back into the fuel bowl; and an economizer valve to control the additional fuel flow. The suction above the throttle holds the pump at the top of the pump well when the throttle is partially closed. As the throttle is opened the suction decreases, releasing the pump which drops to the bottom of the well, forcing fuel ahead of it.

The economizer valve is opened as the pump nears the bottom of the well. This opens a passage for the accelerating charge and, if the throttle is held open, for the additional ration of fuel necessary for full speed or power.

ECONOMY:

As the throttle is closed or the load lightens, the pump is lifted by the increased suction, so the fuel flow is reduced for anything less than full-load operation.

This vacuum type accelerating and economizing system may be used to advantage with a governor. In this case the carburetor throttle valve is usually wide open, the speed being controlled by the governor valve. By "bridging" the governor with a suction line the pump is actuated by the suction above the controlling governor valve and economizer action is thus retained.

STARTING:

The Idling System acts as a priming device because when the engine is at rest the idling jet is submerged in the fuel that fills the well. The throttle should be slightly opened as this results in a very strong suction on the idling jet. The fuel passing at high velocity over the edge of the throttle plate is finely atomized and the high vacuum instantly vaporizes and mixes it with the air. This will assure the first few explosions.

MAINTENANCE OF CARBURETOR

Clean gasoline strainer in carburetor, every 50 hours.

Trouble Shooting

The most common troubles are worn fuel valves, dirty screen, and a "sticky" float. The worn fuel valve and sticky float allow gasoline to continue flowing into carburetor after the carburetor is full causing the gasoline to flood. Replace worn parts. In the case of the sticky float which is usually caused by a bent bracket, bend bracket into its correct position--if this does not correct the trouble, replace with new bracket.

The dirty screen causes misfiring. Remove the dirt from the screen.

3. AIR CLEANER

Abrasive dust is the chief cause of engine wear. The function of an air cleaner is to prevent the entrance of dirt laden air into the engine cylinders. In order to remove the dirt efficiently, the air cleaner must be properly serviced. Service air cleaner daily or more often under severe dust conditions. (See Maintenance Suggestions.)

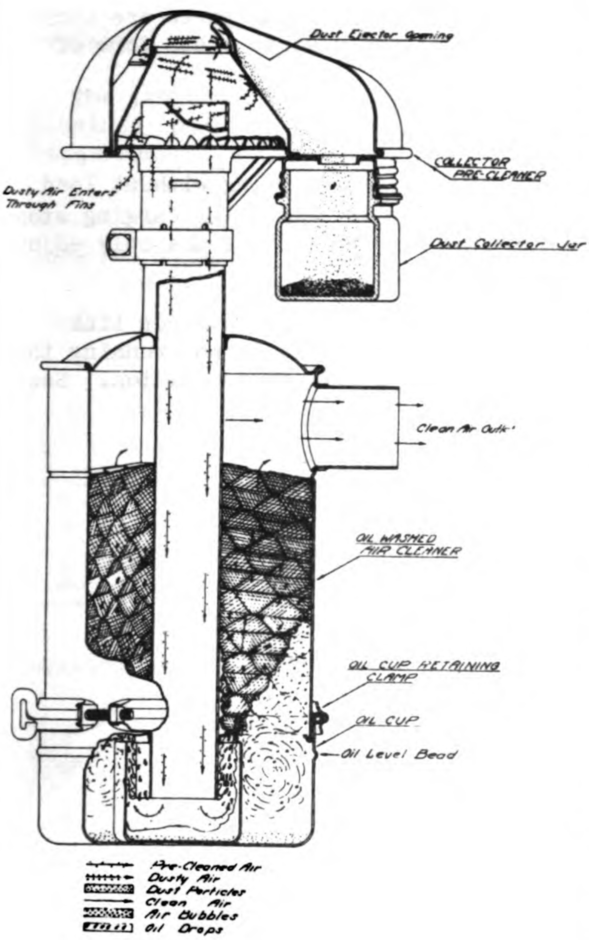


Figure T
Donaldson Air Cleaner

To obtain maximum efficiency from an oil washed air cleaner, the cup should be filled to the indicator level with a good grade oil. (See Figure T.) Raising the oil level <u>does not</u> increase efficiency.

As a rule, it is quite satisfactory to use the same oil as that used in the engine crankcase. Except in extreme heat or cold--below 10° dilute OE S.A.E. 10 with 1/3 kerosene, above 90° use OE S.A.E. 50.

MAINTENANCE OF AIR CLEANER

Every 8 to 10 hours (Daily)

1. Clean air filter cup and refill with fresh oil to proper level. Empty dust collection jar. CAUTION: Inspect all joints between the air cleaner and the carburetor. Make sure these joints are air tight. Ram a cloth through center inlet tube to remove any dust.

Every 1,000 Hours

1. Remove air cleaner for a thorough cleaning. Repeat steps in Every 8 Hours Maintenance and also do the following: Wash inner screen in gasoline

4. GOVERNOR

The automatic control of engine speed is regulated by a Pierce Centrifugal Governor--horizontal type, see Figure R.

The governor is enclosed in the housing. The shaft is driven by a gear off the camshaft. On the shaft is a weight holder or spider which supports two governor weights.

As the governor shaft rotates, the centrifugal energy developed in the two weights causes these two weights to swing outward on their pivots. The centrifugal energy of the weights is counterbalanced by a spring, the tension of which can be regulated.

When the centrifugal energy of the weights overcomes the spring tension, a thrust bearing is forced against the rocker yoke to which the governor control lever is attached.

The movement of the rocker yoke lever causes the control lever to move which in turn opens and closes the throttle valve.

MAINTENANCE

The only lubrication necessary is to put a few drops of oil every 100 hours on the governor link ball joints. The inside working parts are lubricated by pressure from the engine oiling system and need no other form of lubrication.

ADJUSTMENTS

If engine speed is unstable at top engine speed, running without load, loosen lock nut (13 in Figure R) and screw in very slowly until surging stops, do not screw in far enough to increase engine speed. This is the only adjustment operator will ever have to make.

If it is ever necessary to replace ball joints of the governor link rod, make certain the rod is adjusted so that when engine is not running the governor link rod holds the governor throttle in a wide open position. See Figure R.

E. ELECTRICAL SYSTEM

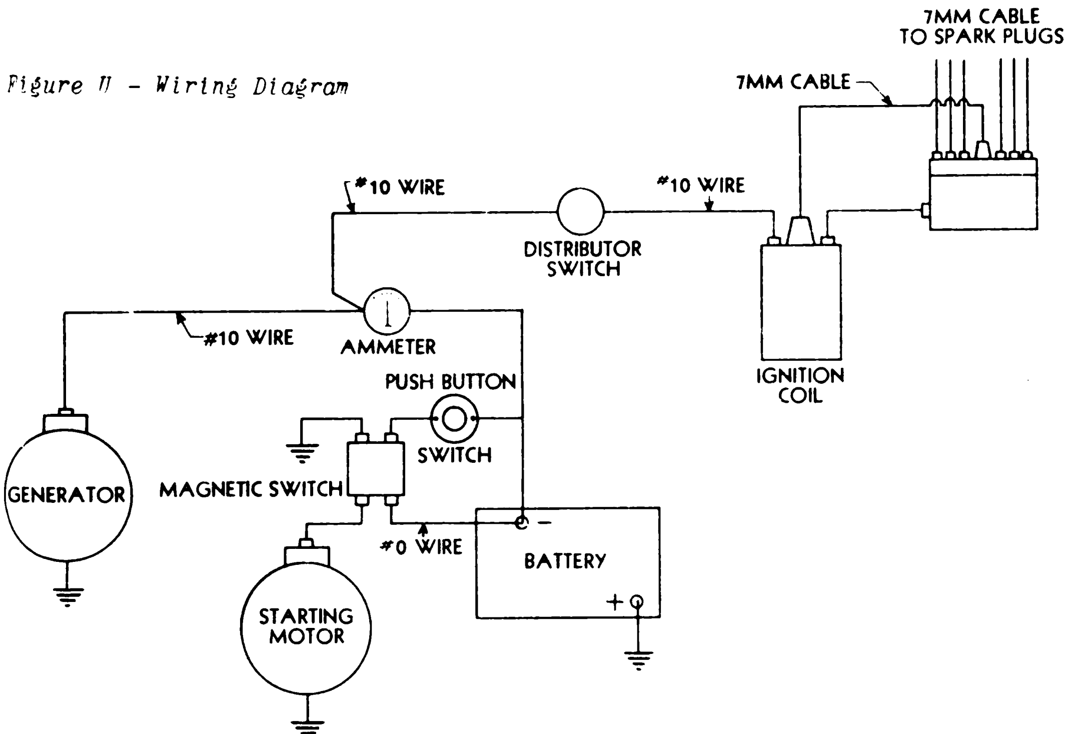
1. GENERAL DESCRIPTION AND SPECIFICATIONS

DESCRIPTION

Electrical equipment is costly. To prolong its life reduce replacement expense and lost time, reasonable care and periodic inspection is required. The following instructions are the result of actual field operations. If these instructions are followed, economical and trouble-free performance will be obtained.

The ignition, or electrical, system of this engine is made up of the following: starter, distributor, ignition coil, spark plugs, generator, voltage control unit, switches, battery, and ammeter.

Figure V - Wiring Diagram



DISTRIBUTOR IGNITION

The battery ignition system employs a distributor and coil. The distributor is so timed to the engine that the spark for the respective cylinders is delivered at the instant it is required. The condenser and coil together produce a high tension spark.

In the distributor housing is a pair of interrupter points operated by a six-lobe cam, a condenser and an automatic spark advance device. See Figure W. The interrupter points charge the coil by completing the circuit with the battery. (See the Wiring Diagram.) The condenser assists the coil in producing the high tension spark. The automatic spark advance works on the fly-ball principle; as the speed of the engine increases, the weights fly outward and advance the spark.

The starter is controlled by a magnetic switch which is operated by a remote control push button switch. The distributor has a key locked ignition switch; and the generator's charging of the battery is automatically regulated to increase or decrease, and stop by a voltage control unit. Under each unit of the electrical system will be found a detailed description and instructions for maintenance and repair.

The following specifications for each unit are here given for quick reference. See the descriptive matter for interpretation of specifications and instructions for maintenance and adjustments.

SPECIFICATIONS

STARTER

The starter is a Delco-Remy Model 718-R, Cranking Motor, 4 pole, 4 field, 6 volt unit, Bendix drive. The armature rotates in a grey iron bearing at commutator end and an oilless bushing in pinion housing.

Rotation: clockwise viewing drive end.

Brush Spring Tension: 24 to 28 ounces.

No Load: 6000 r.p.m. - 65 amperes - 5.0 volts.

Lock Torque: 15 lbs. - 570 amperes - 3.5 volts.

IGNITION COIL

The coil is a 6 volt Delco-Remy #528-C induction type.

SPARK PLUGS

AC #87. Gap setting approximate .025 inch.

GENERATOR

The generator is a Delco-Remy Model 1101671, 6 volt, 4-7/16 inch frame diameter, third brush unit, ball bearing in drive end, bronze bushing in the commutator end.

Rotation: clockwise viewing driving end.

Brush Spring Tension: 14-18 ounces.

Cold Output: 19 to 21 amperes at 8.35 to 8.50 volts at 1800 r.p.m.

Hot Output: 9 to 12 amperes at 7.35 to 7.65 volts at 2000 r.p.m.

Field Current (third brush lifted): 4.0 to 6.1 amperes at 6 volts.

VOLTAGE CONTROL UNIT

This control unit is a Delco-Remy Model 5864. It has two elements: the cut-out relay and the step voltage control.

CUT-OUT RELAY ELEMENT

Air Gap: .015 inch (points closed).

Point Opening: .020 inch.

Closing voltage: 6.3 to 6.0 volts.

STEP-VOLTAGE CONTROL ELEMENT

Air Gap: .035 inch.

Point Opening: .010 inch.

Contact Spring Tension: .5 to 1.1 ounce.

Armature Travel: .035 inch.

Points Open: 6.95 to 7.35 volts at 150° F.

Points Closed: 6.0 volts maximum at 150° F.

SWITCHES

For the cranking motor system:

One Delco-Remy 1549 Magnetic Switch

Maximum voltage to close switch: 4.7 volts

Current draw: 3.1 to 3.7 at 4.0 volts.

One Delco-Remy Model 1385 Push-button Switch.

Ignition Switch for Distributor:

One Briggs & Stratton Universal 2 post lock switch, key removable in off position only, Model 40437.

BATTERY

This is a 17 plate, 6.3 volt battery.

DISTRIBUTOR

The Delco-Remy Model 643-X ignition distributor has the following specifications:

Counter-clockwise rotation, viewing driving end.

Cam angle - 35°.

Contact point pressure - 17 to 21 ounces.

Contact point opening - .018 to .024 inches.

Manual adjustment - 15°.

Centrifugal advance starts - 2° Engine at 600 r.p.m.

Intermediate advance - 15° Engine at 1600 r.p.m.

Maximum advance - 24.0° Engine at 2550 r.p.m.

2. STARTER

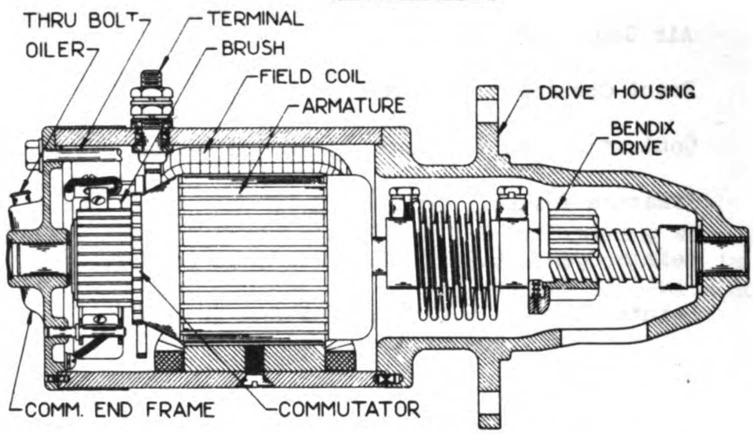


Figure V - Delco-Remy Starting Motor

The starter motor is mounted on the flywheel housing by a #1 S.A.E. flange. The Bendix drive, keyed to the armature shaft, automatically engages the cranking pinion with the flywheel gear when the armature begins to revolve as the magnetic switch is closed, thereby completing the circuit to the battery. When the engine fires, the overrunning effect of the flywheel on the pinion disengages it from the flywheel. See Figure V above.

STARTER MOTOR MAINTENANCE

With reasonable care at given intervals, the life of the starter motor can be prolonged indefinitely with trouble-free performance. Because operating conditions vary, the operator must use his good judgment as to the periods of normal maintenance when operating conditions are dusty or dirty, extremely hot, continuous, etc. The following, however, for most operating conditions, can be safely adhered to:

Every 50 Hours of Operation

Lubricate the bearings at the commutator end with 6 to 8 drops of light engine oil through the hinge cap oilers.

Inspect the brushes and commutator. Cover band must be removed for the inspection. If commutator is dirty, clean it with No. 00 sandpaper. Never use emery cloth. If commutator is rough, out of round, or has high mica, it should be turned down in a lathe and the mica undercut 1/32 inch. Worn brushes should be replaced. (See Generator Brushes, as same instruction for Generator brushes applies to starter motor brushes.) If brushes wear rapidly, check for excessive brush spring tension, roughness or high mica on the commutator. See spring tension specifications for starter motor on Page 438.

Every 2000 Hours of Operation

The starter motor should be disassembled for a thorough cleaning and inspection of all parts. The Bendix drive should be cleaned and oiled with a penetrating oil, as any accumulation of dirt on the drive restricts the free movement of the pinion. Never clean the armature or fields in any degreasing tank, or with grease dissolving material, since these may damage the insulation. The commutator should be trued in a lathe and mica undercut if necessary. Replace all worn parts. Check wiring and connections. Do not use acid flux in soldering electrical connections--only rosin flux must be used. Submit reassembled unit to No-Load and Torque Tests. See specifications of starter motor on Page 338. See instructions for No-Load and Torque Test included under Checking Starter Failure.

CHECKING STARTER FAILURE

If the cranking motor does not develop rated torque and cranks the engine slowly or not at all, check the battery, battery terminals and connections, and battery cables. Corroded, frayed, or broken cables should be replaced and loose or dirty connections corrected. Do not replace cables with new ones of smaller diameter as this cuts down the amount of energy to the starting motor thus reducing cranking power. The cranking motor switch should be checked for burned contacts and the switch contacts cleaned or replaced if necessary.

If all these are in order, remove the cover band of the cranking motor and inspect the brushes and commutator. The brushes should form good contact with the correct brush spring tension. A dirty commutator can be cleaned with a strip of No. 00 sandpaper held against the commutator with a stick while the cranking motor operates. NEVER USE EMERY CLOTH TO CLEAN COMMUTATOR. If the commutator is very dirty, or burned, or has high mica, remove the armature from the cranking motor and take a cut off the commutator in a lathe. The mica should be undercut to a depth of 1/32".

If there are burned bars on the commutator, it may indicate open circuited armature coils which will prevent proper cranking. Inspect the soldered connections at the commutator riser bars. An open armature will show excessive arcing at the commutator bar which is open, on the no-load test.

Tight or dirty bearings will reduce armature speed or prevent the armature from turning. A worn bearing, bent shaft, or loose field pole screws will allow the armature to drag on the pole shoes, causing slow speed or failure of the armature to revolve. Check for these conditions.

If the brushes, brush spring tension and commutator appear in good condition, the battery and external circuit found satisfactory, and the cranking motor still does not operate correctly, it will be necessary to remove the cranking motor for no-load and torque checks.

NO-LOAD TEST

Connect the cranking motor in series with a battery of the specified voltage and an ammeter capable of reading several hundred amperes. If an r.p.m. indicator is available, read the armature r.p.m. in addition to the current draw.

TORQUE TEST

For a torque test, a high capacity, direct current ammeter, volt meter, storage battery, cable, torque arm, and a spring balance are needed.

Fasten torque arm securely to starter motor shaft. Motor should be clamped rigid to a work bench. Hook spring balance scale to torque arm exactly twelve inches from the center of the motor shaft. Connect the high capacity ammeter in series with the motor, battery, and the volt meter, from the starter terminal to the ground. A single pole knife switch for the convenience of closing the circuit may be used. With circuit closed (current flows through starter motor) a reading can be obtained from the spring balance in pounds, and the current draw from the ammeter, and the voltage from the volt meter. Compare these readings of the test with the specifications.

Caution: Do not continue test longer than necessary, as the motor heats up rapidly on this test.

INTERPRETING RESULTS OF NO-LOAD AND TORQUE TESTS

1. Rated torque, current draw and no-load speed indicates normal condition of cranking motor.

2. Low free speed and high current draw with low developed torque may result from:

   a. Tight, dirty, or worn bearings, bent armature shaft or loose field pole screws which would allow the armature to drag.

   b. Shorted armature. Check armature further on growler.

   c. A grounded armature or field. Check by raising the grounded brushes and insulating them from the commutator with cardboard and then checking with a test lamp between the insulated terminal and the frame. If test lamp lights, raise other brushes from commutator and check fields and commutator separately to determine whether it is the fields or armature that is grounded.

3. Failure to operate with high current draw:

   a. A direct ground in the switch, terminal or fields.

   b. Frozen shaft bearings which prevent the armature from turning.

4. Failure to operate with no current draw:

   a. Open field circuit. Inspect internal connections and trace circuit with a test lamp.

   b. Open armature coils. Inspect the commutator for badly burned bars. Running free speed, an open armature will show excessive arcing at the commutator bar which is open.

   c. Broken or weakened brush springs, worn brushes, high mica on the commutator, or other causes which would prevent good contact between the brushes and commutator. Any of these conditions will cause burned commutator bars.

5. Low no-load speed, with low torque and low current draw indicates:

   a. An open field winding. Raise and insulate ungrounded brushes from commutator and check fields with test lamp.

   b. High internal resistance due to poor connections, defective leads, dirty commutator and causes listed under 4.c. above.

6. High free speed with low developed torque and high current draw indicates shorted fields. There is no easy way to detect shorted fields, since the field resistance is already low. If shorted fields are suspected, replace the fields and check for improvement in performance.

3. DISTRIBUTOR

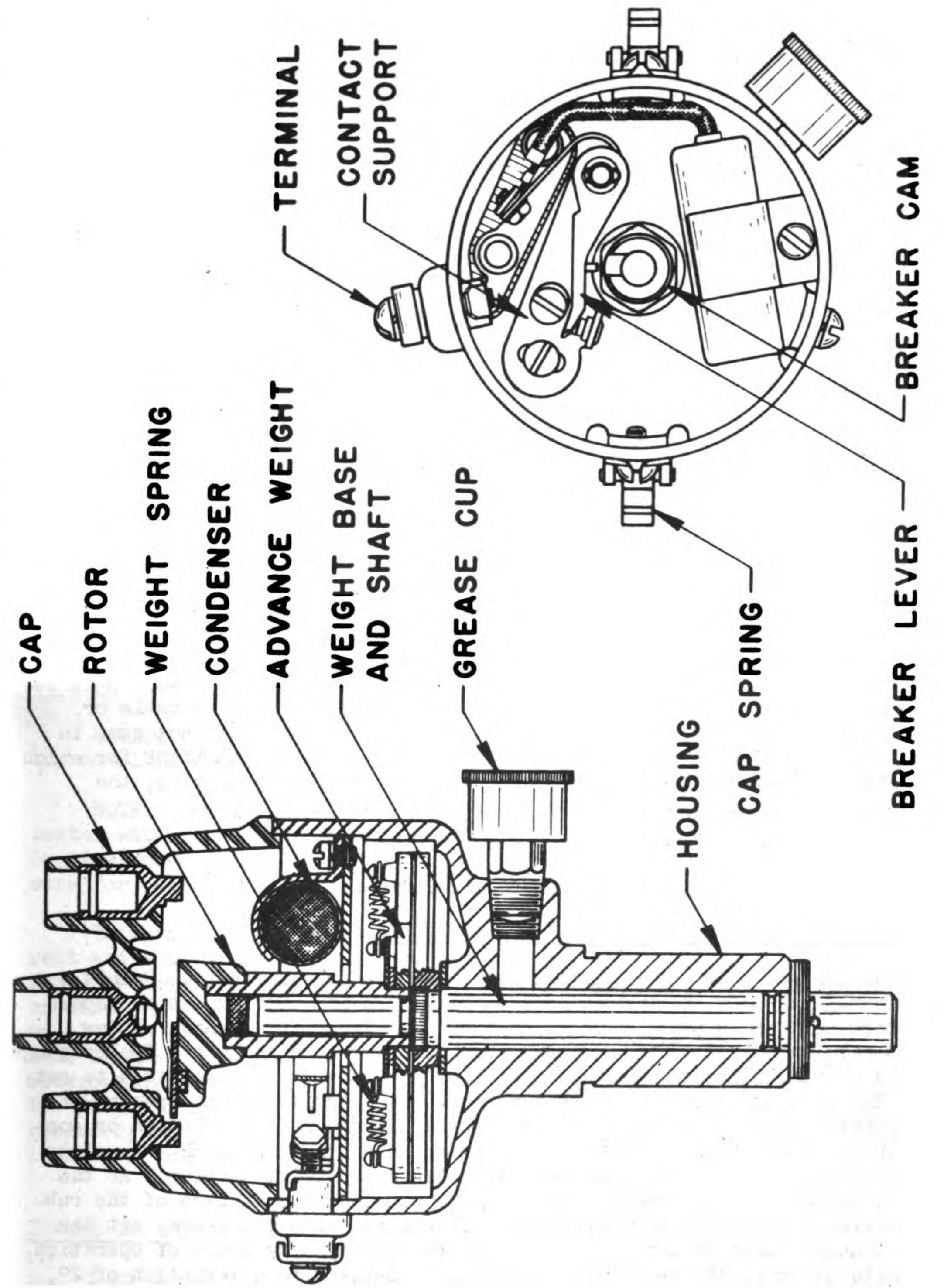


Figure W

With periodic inspection and reasonable care, the life of this distributor will be long and trouble-free. As has been indicated, operating conditions vary, therefore periods of inspection and maintenance must be left to the operator's judgment. However the following intervals are suggested:

Every 100 Hours

Keep the grease cup filled with high temperature grease. Turn cup down one-half turn.

Add a drop of oil to the breaker cam and put a few drops of oil on the wick in the camshaft under the rotor. Also inspect the contact points, rotor, and cap. See Figures W. Replace the cap or rotor if they are cracked or show carbonized paths indicating the secondary current is leaking to a ground over the surface of the Bakelite. If the contact points are burned or pitted, they should be replaced or dressed with a clean, fine cut contact file. The file should not be used on other metals and should not be allowed to become greasy or dirty. NEVER USE EMERY CLOTH TO CLEAN CONTACT POINTS. Contact surfaces, after considerable use, may not appear bright and smooth but this is not necessarily an indication that they are not functioning satisfactorily.

Oxidized contact points may be caused by high resistance, or loose connections in the condenser circuit, oil or foreign materials on the contact surfaces - most commonly, high voltage in the primary circuit is the cause. Check for these conditions where burned contacts are experienced.

CHECKING IGNITION FAILURE

In the case of defective ignition, it must be first determined whether the fault is in the distributor or elsewhere. In general, when only one cylinder misfires, the fault is in the spark plug. See information under Spark Plugs.

Misfiring of one cylinder may be due to a chafed or broken cable or loose cable connection. The metal terminals of the cable must not come in contact with any metal parts of the engine except those connections for which they are designated. If the cable and plugs are in good condition, the trouble is probably with the distributor, coil, or condenser.

3 SERVICE ADJUSTMENTS

Checking and Adjusting the Contact Point Opening

The contact point opening must be set to the proper limits. Points set too closely may tend to burn and pit rapidly. Points with excessive separation tend to cause a weak spark at high speed. The point opening of new points may be checked with a feeler gauge. However, do not use a feeler gauge on used points, since the roughness of used points make it impossible to set the point opening correctly by this method. To check the point opening of used points, use a dial indicator or a contact angle meter. The cam or contact angle is the angle in degrees of cam rotation through which the points remain closed. This angle increases with decreased point opening. As the rubbing block of a new breaker arm wears in rounding the corners of the rubbing surface, contact angle increases. Therefore, with a new arm, set the contact angle about 3° less than with an arm worn by many hours of operation. The angle given in the test specifications is subject to a variation of 2°, plus or minus, depending upon these conditions.

The contact point pressure must fall within the limits given. Weak tension will cause point chatter and ignition miss at high speed, while excessive tension will cause undue wear of the contact points, cam, and rubbing block.

NOTE: The use of the synchroscope is recommended for with it you can accurately check cam angle, spark advance, and synchronization on distributors removed from the engine. The synchroscope will also show excessive distributor shaft eccentricity as indicated by variation in synchronization.

After a distributor has been repaired, the calibration of the centrifugal automatic mechanism should be checked. Proper engine performance cannot be obtained unless the centrifugal curve is within the limits specified for the engine.

Checking the Condenser

Four factors affect condenser performance and each factor must be considered in making any condenser test.

BREAKDOWN results in the failure of the insulating material, a direct short between metallic elements of the condenser. This prevents any condenser action.

LOW INSULATION RESISTANCE or leakage prevents the condenser from holding a charge. A condenser with low insulation resistance is said to be weak. All condensers are subject to leakage which up to a certain limit is not objectionable. When it is considered that the ignition condenser performs its function in approximately 1/12,000 of a second, it can be said that leakage can be large without detrimental effects. Nevertheless, leakage must be considered in any condenser test.

HIGH SERIES RESISTANCE is excessive resistance in the condenser circuit due to broken strands in the condenser lead or to defective connections. This will cause burned contact points and ignition failure upon initial start and at high speeds.

CAPACITY is built into the condenser and is determined by the area of the metallic elements and the insulating and impregnating materials.

NOTE: For a complete check of the condenser, it is desirable to use a tester which will check for the above four conditions. The United Motors Service Four-Way Condenser Tester is one instrument which will check condensers for each of these four factors.

To test the condenser without an instrument, 110 volt alternating current and a test light is required. To charge the condenser, place one test prong on the condenser lead, and the other on the case. Then short circuit or discharge the condenser by touching the condenser lead to the case A small blue spark will occur between the condenser case and the condenser lead if the condenser is in good condition. Due to the characteristics of alternating current, it may be necessary to repeat the procedure several times before the spark occurs. If no spark occurs, the condenser should be replaced, or if the light glows when charging the condenser, the condenser is shorted and must be replaced.

TIming the Distributor

Turn the engine with hand crank until the piston in cylinder No. 1 moves upward on the compression stroke so that the top dead center line on the flywheel is centered in the timing hole of the flywheel housing.

Set the distributor so that the points just start to open. Tighten the distributor bracket so the distributor cannot turn in the bracket.

4. Coil

The best way to check the coil without instruments is to remove one spark plug wire from the plug while the engine is running, and hold the terminal close to the cylinder head. A coil in good condition will produce a spark that will jump a gap 3/8 of an inch. The spark should be "fat" and blue - not "stringy" and yellow.

5. SPARK PLUGS

The most common spark plug difficulties are: gap too wide and plug short circuited.

The proper distance between the electrodes is .025 inch. Too wide a gap increases its resistance and interferes with the operation of the engine at low speeds causing engine to miss and difficult to start. Always adjust the outside electrode, never the center one.

The spark has a tendency to burn the electrode, thereby gradually increasing the gap. Therefore it is important to check the spark plug gaps every 60 hours of operation.

A short circuit in the plug is usually caused by a cracked or porous insulator, or by fouling of the electrode or insulator. Any of these conditions will cause misfiring by permitting the current to stray from its intended path.

6. GENERATOR

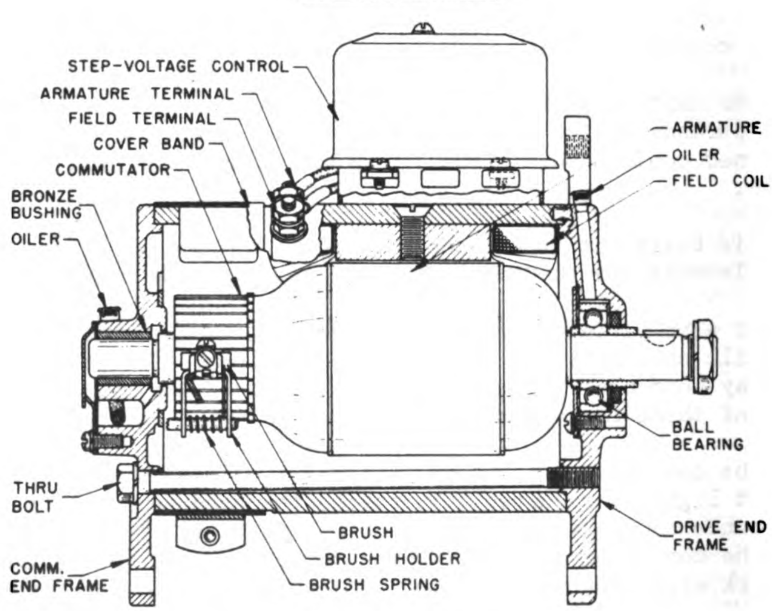


Figure Y - Delco-Remy Generator

GENERATOR MAINTENANCE AND INSPECTION

In order that normal service may be obtained from the generator with a minimum of trouble, a regular inspection and maintenance procedure should be followed.

Because operating conditions vary, the operator must use his good judgment when these periods of inspection and maintenance should occur. The following periods are suggested. (See Figure Y.)

Every 50 Hours of Operation

The two hinge cap oilers should be supplied with 6 to 8 drops of light engine oil. Do not oil excessively.

Remove cover band and inspect commutator and brushes. If commutator is dirty, clean with No. 00 sandpaper. NEVER USE EMERY CLOTH. All dust must be blown from generator. If commutator is rough or out of round or has high mica (the insulation material between the copper bars), remove the generator from engine and disassemble the armature from the generator. Turn commutator down in a lathe, removing only sufficient material to true up commutator and remove roughness and high mica. Undercut the mica 1/32 inch. (See reinstallation caution.)

Check the brush spring tension. Excessive spring tension causes commutator and brushes to wear rapidly. Low spring tension will cause reduced generator output, and arcing and burning of commutator and brushes. Check pigtail lead connections at the brushes to see that they are tight. A poor connection in the charging circuit will cause generator to build up excessive voltage which may result in burned field or armature windings. To replace worn brushes, see information under Generator Brushes.

Every 2,000 Hours of Operation

The generator should be removed from engine and disassembled for a thorough cleaning and inspection of all parts. Never clean the armature or fields in any degreasing tank. The ball bearings should be cleaned and repacked with a good grade of ball bearing grease. All worn parts replaced. If necessary, the commutator should be trued in a lathe and the mica undercut. Check all wiring and connections. Use only rosin flux in making all soldered connections. Acid flux must never be used on electrical connections.

REINSTALLATION CAUTION

After the generator is reinstalled on the engine, or at any time after leads have been disconnected and then reconnected to the generator, a jumper lead should be connected momentarily between the BATTERY and ARMATURE terminals of the regulator before starting the engine. This allows a momentary surge of current from the battery to the generator which correctly polarizes the generator with respect to the battery it is to charge.

CHECKING GENERATOR FAILURE

1. No Output. Remove cover bands and check for sticking or worn brushes and burned commutator bars. Burned bars, with other bars fairly clean, indicate open circuited coils. If brushes are making good contact with commutator, and commutator looks okay, use test leads and light, and check as follows:

a. Raise grounded brush (brush with wire connected to generator case). Check with test points from armature terminal ("A") to frame. Testing light should not glow. If it does, the generator is grounded; to locate ground, raise other brush or brushes from commutator and with one test lead on frame, check with the other test lead, first, the field terminal ("F"); second, the commutator; third, the brush holder. Testing light should not glow. NOTE: During the foregoing procedure, make certain the voltage control points in control unit are closed, so circuit is not open. Do not run or test generator on open circuit. To do so may destroy regulator or generator.

b. If generator is not grounded, check field for open circuit. Ground field terminal. Place one test lead on the brush not grounded (one without the wire to generator case), the other test lead on the negative (-) pole of battery. Testing lamp should glow.

c. If the field is not open, check for shorted field. Repeat same hook-up as in Paragraph b, but instead of testing lamp, use an accurate ammeter. Field draw at 12 volts should be 1.25 to 1.45 amperes. Excessive current draw indicates shorted field. If an ammeter is not available, during step (b) the short will be indicated by testing light glowing very brightly.

d. If trouble has not been located, remove generator from engine and take out armature and check with growler for short circuit.

2. Unsteady or Low Output:

a. Check drive belt tension.

b. Check brush spring tension and brushes for sticking.

c. Inspect commutator for roughness, grease and dirt, dirt in slots, high mica, out of round, burned bars. With any of these conditions, the commutator must be turned down in a lathe and the mica undercut. In addition, with burned bars which indicate open circuit, the open circuit condition must be eliminated or the armature replaced.

3. Excessive Output. Excessive output usually results from a grounded generator field--grounded either internally or in the regulator (control unit). Opening the field circuit (disconnecting lead from field terminal of regulator or generator) with generator operating at a medium speed will determine which unit is at fault. If the output drops off, the voltage control unit is causing the condition. If output remains high, the field is grounded in the generator, either at the pole shoes, leads, or at the field terminal.

4. Noisy Generator. Noisy generator may be caused by loose mounting or drive pulley, or worn, dry or dirty bearings, or improperly seated brushes. (See Brush Replacement.)

GENERATOR BRUSHES

The positions of the brushes should remain as originally set at the factory where careful test runs are made and brush positions are correctly determined. These positions should not be disturbed because the current and voltage regulator automatically adjusts increase or decrease flow of the current, except where there is a third brush. If it is necessary to remove brush rigging for replacement, mark its position before removing.

Good brush contact is necessary for efficient generator performance. Keep commutator clean with No. 00 sandpaper--never use emery cloth. Brushes must move freely in their holders with proper spring pressure. When brushes are new and full length, they are usually under enough spring pressure if the spring is in the first notch of brush lever. As brushes wear shorter, it may be necessary to move the spring one or two notches. Excessive arcing at the brushes can be due to improper spring pressure, brushes sticking in holder, extremely short brushes, rough or eccentric commutator, overloaded generator and an overloaded high speed condition. Any or all such causes should be corrected, to avoid the melting of solder from the commutator which may cause an open circuit in the armature winding or damage brush holder and bracket.

BRUSH REPLACEMENT PROCEDURE

After cover band has been removed, remove screws to which brush pigtails are attached. Remove the worn brushes and clean commutator with No. 00 sandpaper--do not use emery cloth. Place the new brushes in their holders and connect brush pigtails. To seat brushes properly, cut a strip of No. 00 sandpaper slightly wider than the brush. Slip under one brush at a time. (Where there is a third brush, this and the adjacent main brush can be seated at the same time.) With the abrasive side against the brush and the brush at its proper spring tension, draw the paper back and forth in downward motions about twelve times, making certain that the entire face of brush is being ground. Do not grind excessively! Blow out the dust and examine both edges of the brush to see that they are touching the commutator properly.

Before replacing cover band, fold brush "pigtail" wires down so that they will not touch the band. They must not touch any metal except that of the brush holder to which they are attached. This precaution prevents a short or ground at the generator. The connection screws attaching the brush pigtails to the holders must be tight.

GENERATOR THIRD BRUSH ADJUSTMENT

The output of this generator may be increased or decreased by adjusting the third brush. The generator should be hot when adjustment is made. The hot output setting should not exceed 12 amperes at 2000 r.p.m.--the normal operating r.p.m. is 1400 to 1500 r.p.m., so at these speeds the ammeter readings will be slightly lower.

To increase output, move the third brush in direction of the armature rotation; to lower output, move brush in opposite direction. The generator output should be checked and adjusted to the specified setting with an accurate ammeter. Battery should be fully charged (Hydrometer reading 1.250 or over) for checking. If not fully charged, a 1/4 ohm variable resistance should be inserted into circuit. If battery is fully charged ammeter should be inserted between armature terminal and battery lead. If battery is low (1.250 to 1.230), the 1/4 ohm variable resistance should be inserted between the ammeter and battery lead with the ammeter hooked in at the armature terminal. NOTE: Make certain that the contact points in the Step-Voltage control are closed so circuit is grounded; else circuit is open and no adjustment can be made. See heading "Step-Voltage Control".

7. VOLTAGE CONTROL UNIT

Mounted on the generator enclosed in the same case cover are two elements of the control unit performing different functions. See Figure Z below.

The cut-out relay prevents the battery from discharging back through the generator whenever engine is stopped or is not running fast enough for the generator to charge. It is entirely automatic in action.

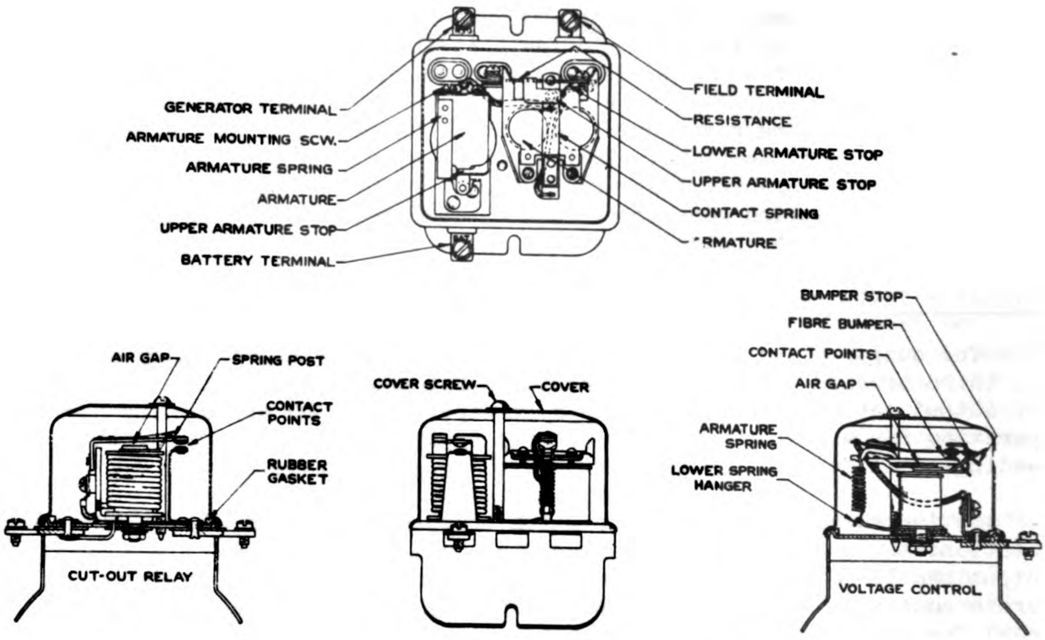


Figure Z - Step-Voltage Control Unit

Likewise is the step-voltage control automatic in permitting full generator output (as set by adjusting the third brush), when the battery is low and cutting down the output to a low value so battery overcharge can be avoided.

MAINTENANCE

The cut-out relay should have an inspection every 1,000 hours to see that contact points are clean and properly adjusted. (See Specifications and Figure Z.) If adjustment is necessary:

(1) Set air gap between armature and core to .015". Then set the contact point opening to .020" by bending the armature stop.

(2) Connect a voltmeter between the generator terminal of the control unit and ground.

(3) Adjust the relay so the points will close when the generator voltage reaches 6.3 to 6.9 volts by raising or lowering the spring post. Raising the spring post increases the closing voltage.

(4) With an accurate ammeter in the charging circuit, the relay points should open when the ammeter reads between 0-3.0.

The step-voltage control should also be inspected every 1,000 hours of operation for clean points and proper adjustment.

Check the opening and closing of the contacts. With the voltage control at operating temperature (150°F.), connect a test voltmeter between the "BAT" terminal and the voltage control base. Connect a 1/4 ohm variable resistance into the charging circuit at the same terminal. Slowly increase generator speed. If step-voltage control points do not open, cut in resistance. Voltage at which points open should be 6.95 to 7.35 volts at 150°F. Cut-out resistance or reduce generator speed. Voltage at which points close should be 6.0 volts at 150°F.

Closing voltage adjustment. Adjust closing voltage by adjusting air gap. Bend the lower armature stop down to decrease the air gap and lower the closing voltage. Bend up to raise the closing voltage. The foregoing can be called electrical checks and adjustments because the necessary test equipment measures the electrical energy.

CHECKS AND ADJUSTMENTS (Mechanical):

The contact point pressure should be .5 to 1.1 ounces and is measured with a spring gauge hooked to the flat spring which carries the upper contact, at the contact point. Check pull required to separate points. Adjust by bending flat spring.

The air gap is checked by pushing the armature down against the lower armature stop and measuring between the armature and core. Adjust by bending the lower armature stop.

The armature travel is checked between the armature and the lower armature stop and is adjusted by bending the upper armature stop.

The point opening check is made with the armature held down against the lower armature stop and is adjusted by bending the contact spring post.

No maintenance other than inspecting and cleaning of contacts is necessary.

8. MAGNETIC SWITCH

The Magnetic Switch is a 6-volt unit used in the cranking motor to battery circuit. It is operated by a remote control push button which, when the contacts are closed, energizes the magnetic switch and closes the switch contacts. See Figure AA below, and Specifications, page 539.

The switch mounting should be well grounded. If mounting is made on an insulated surface, a ground lead should be connected from one of the mounting screws to a convenient ground.

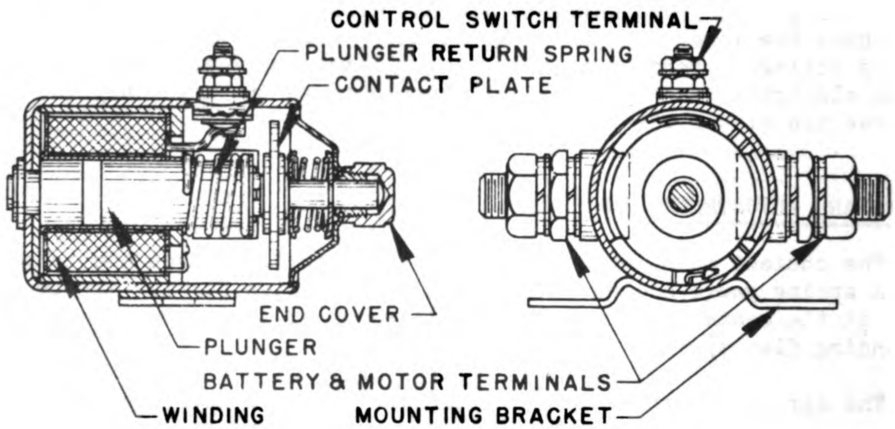


Figure AA - Magnetic Switch

9. REMOTE CONTROL PUSH BUTTON

The Model 1385 Delco-Remy Remote Control Push Button requires no attention other than checking the terminal connections occasionally to make sure they are tight and clean. See Figure BB below.

Figure BB
Push Button

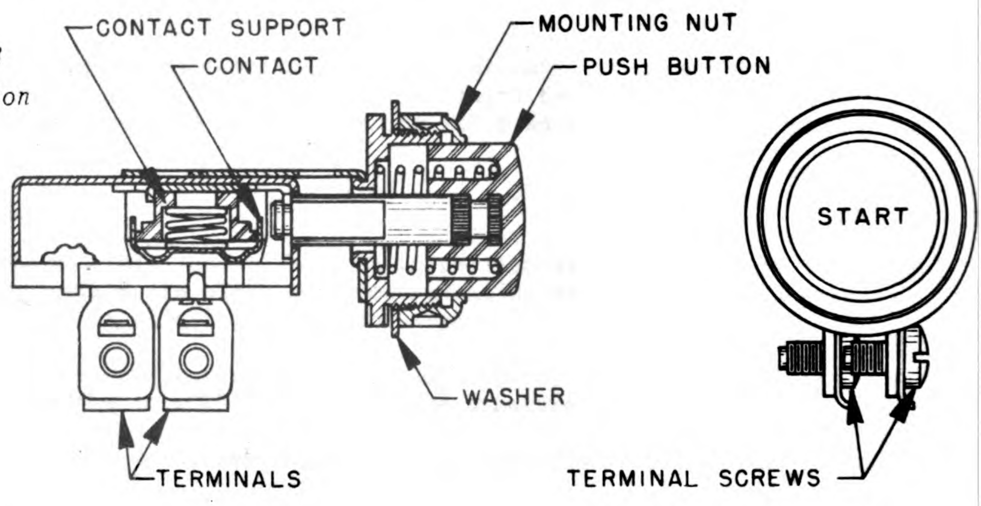
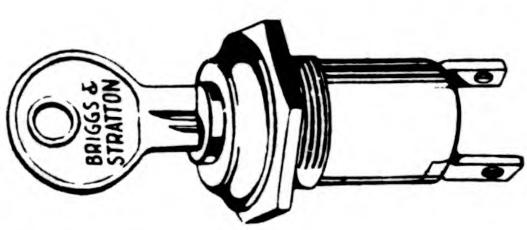


Figure CC
Ignition Switch



10. STORAGE BATTERY

The storage battery requires frequent and systematic attention. Its neglect is costly. In general, follow the instructions from the battery manufacturer for best results.

INSPECTION AND CARE OF STORAGE BATTERY

Inspect the battery every 100 operating hours. Do not allow the surface of the electrolyte to get below the top of the separators. Keep it above by regularly adding sufficient clean distilled water as often as is necessary. Do not fill higher than just below the bottom of the filling tube. Never add acid to the battery.

Keep terminals tight and clean. If they show tendency to corrode, clean and apply a thin coat of vaseline to protect them from the acid. Keep the outside of the batteries clean. Neutralize any electrolyte that may be on the metal surfaces with a cloth saturated with ammonia or bicarbonate of soda solution (one pound of soda to one gallon of water), then wash off with water and dry.

At least once a month test the specific gravity of each cell with a hydrometer. A reading of 1.250 to 1.285 indicates fully charged, 1.230 half charged, and 1.150 dead. Never take a reading shortly after adding water. CAUTION: Do not allow battery to stand in the discharged state. It may become ruined by sulphation.

If the battery requires frequent addition of water and is gassing excessively have it tested. If in good condition, it is undoubtedly due to overcharging. Decrease the charging rate to avoid damage to the battery. If one or more cells continually require more water than others, it is an indication of a damaged cell which should be checked by the local battery service station.

COLD WEATHER CARE

It is especially important in cold weather to test the specific gravity. A battery freezes between the temperatures 20 degrees above zero and 50 degrees below zero depending on the state of its charge. Do not add water after shutting down for the night. It will freeze quickly. See that it gets a charge after adding water.

WARNING

SPARE PARTS can be supplied promptly and accurately only if positively identified by correct part number and correct part name.

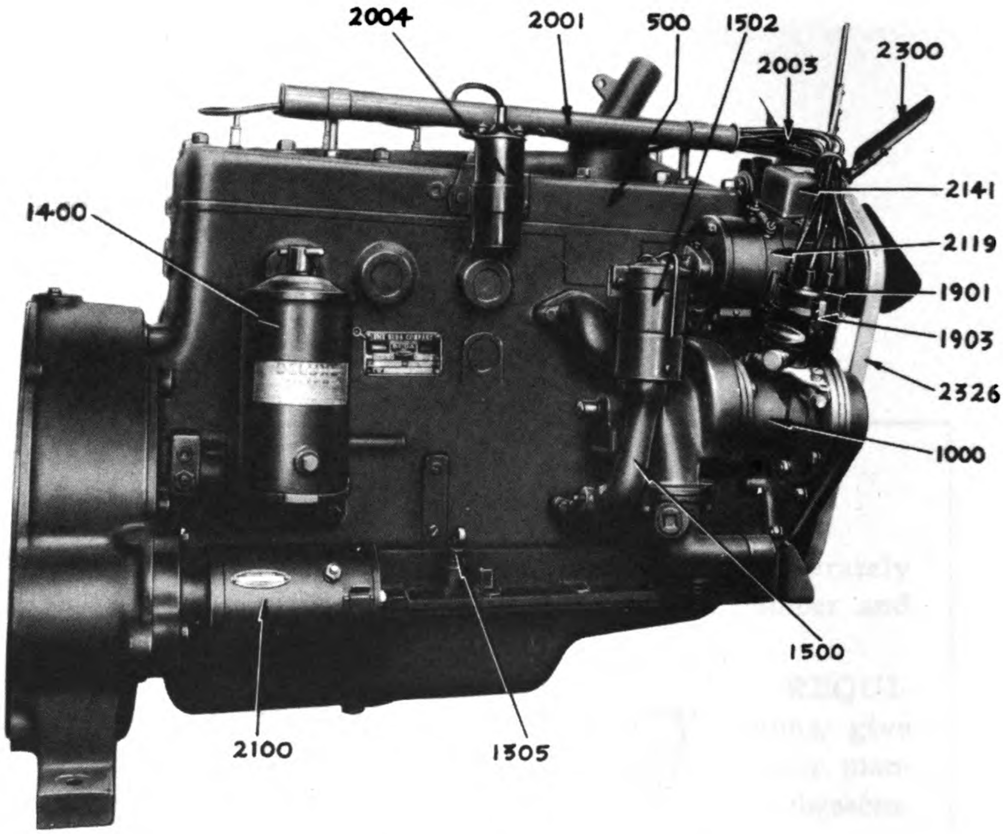
FURNISH THIS INFORMATION ON ALL REQUISITIONS. WITHOUT FAIL, on all requisitions, give name of machine, name of manufacturer, model or size, manufacturer's serial number of each machine and subassemblies attached to machine, and components and accessories for which spare parts are required.

List spare parts for only one make or kind of machine on each requisition.

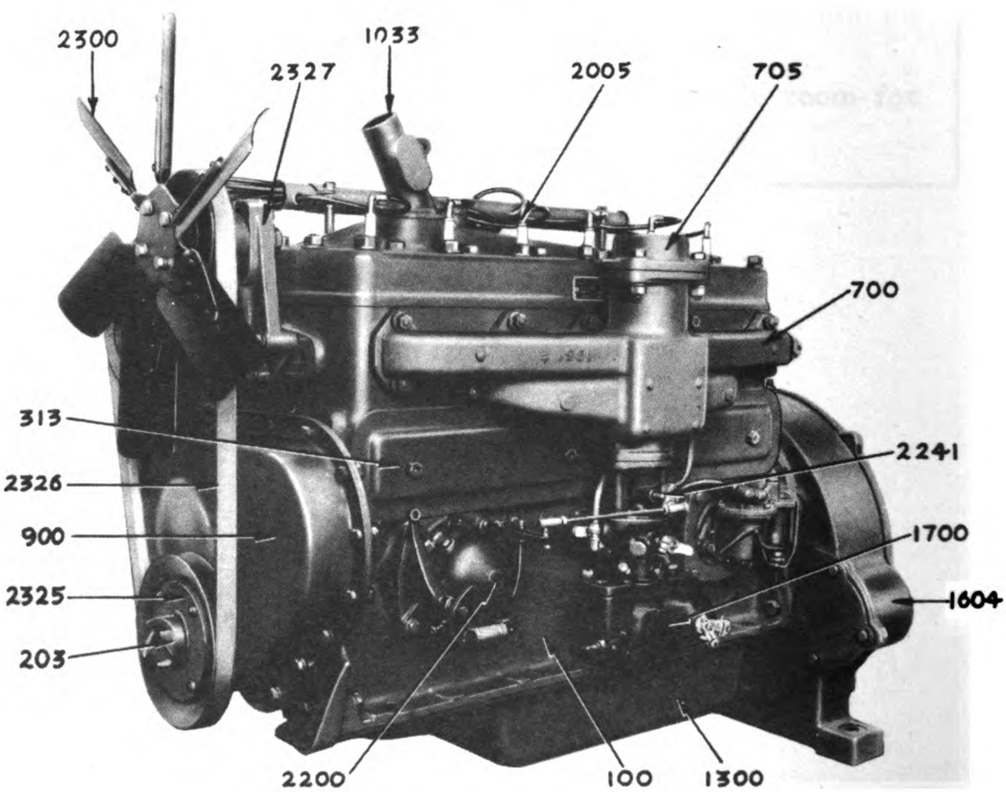
Requisitions must be double spaced to provide room for office notations when necessary.

ENGINE PARTS LIST

BARBER-GREENE COMPANY, Aurora, Illinois



Right Side



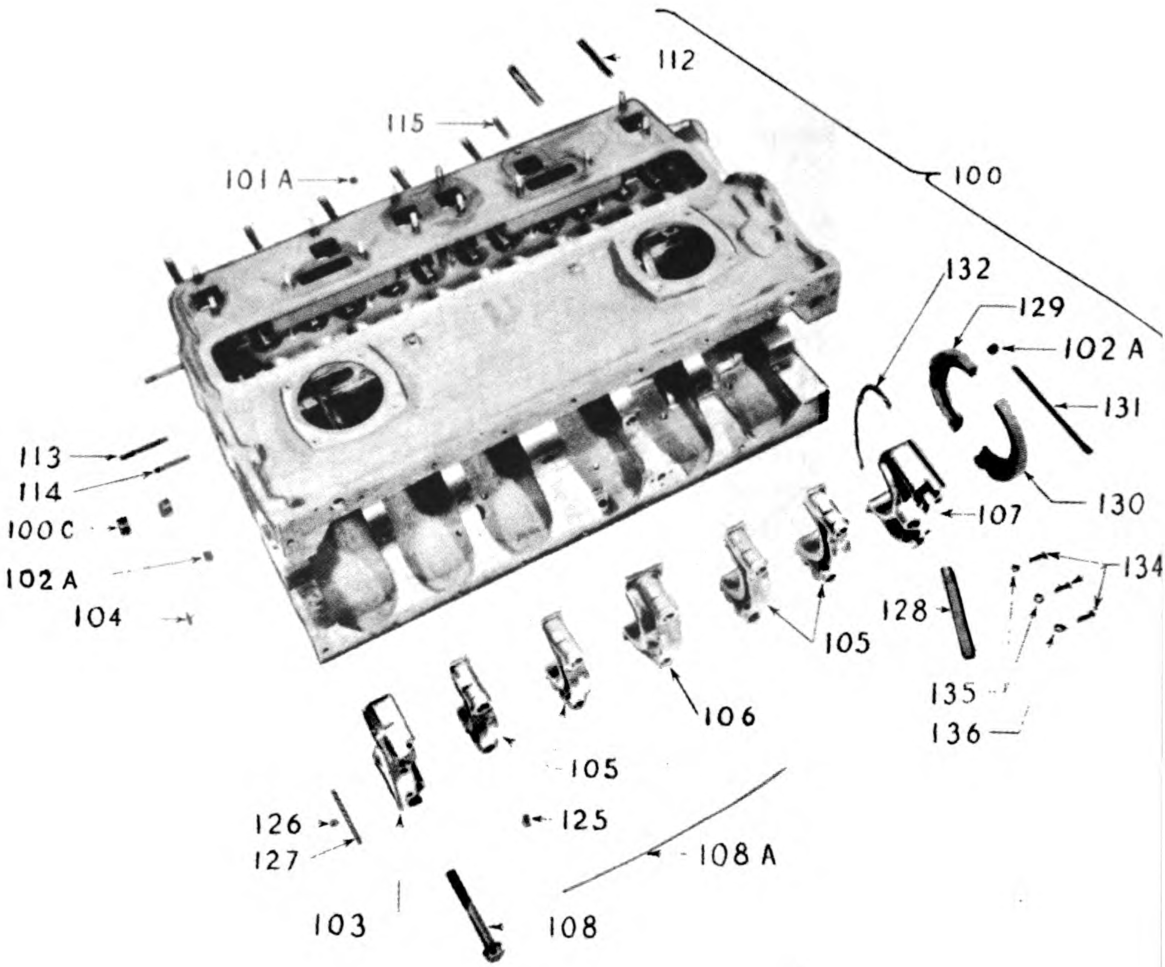
Left Side

I N D E X

Buda Engine HP-298

B-G Specification: EN-B-D4 with Fuller Clutch
EN-B-D8 with Lipe Clutch

CYLINDER AND CRANKCASE



NOTE: **Main bearings can be furnished in standard or the undersize listed below. Be sure to specify the size required. Unless otherwise stated standard main bearings will be furnished.**

When cylinder and crankcase assemblies are sent in for reboring BE SURE TO REMOVE ALL MAIN BEARINGS, VALVES, etc. before shipping. We will not be responsible for their loss or damage. All rebored cylinders will be returned without main bearings or valve and lifter assemblies, but will be fitted with new pistons, rings and piston pins, and camshaft bearings.


101


102

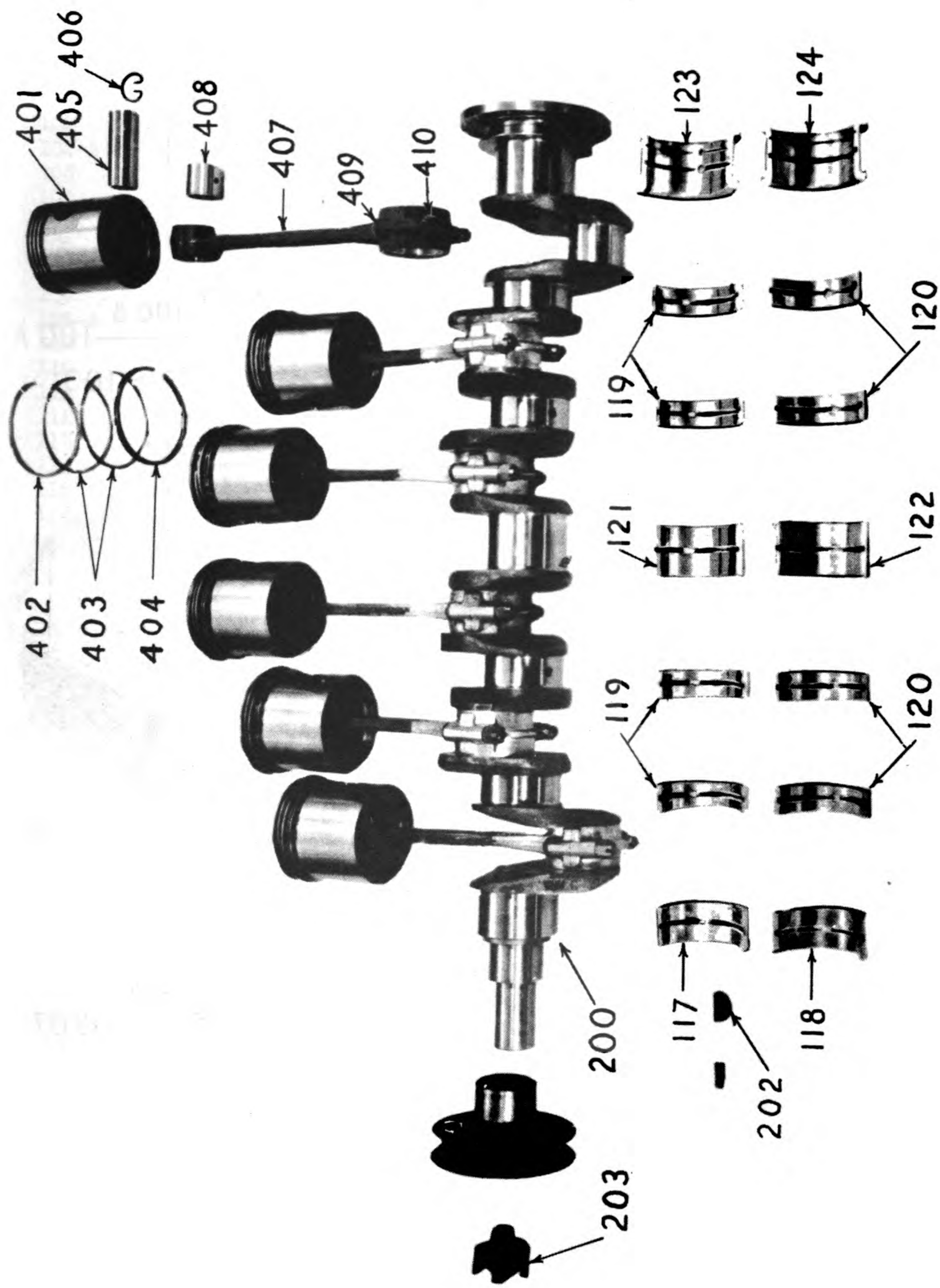

109


110


111

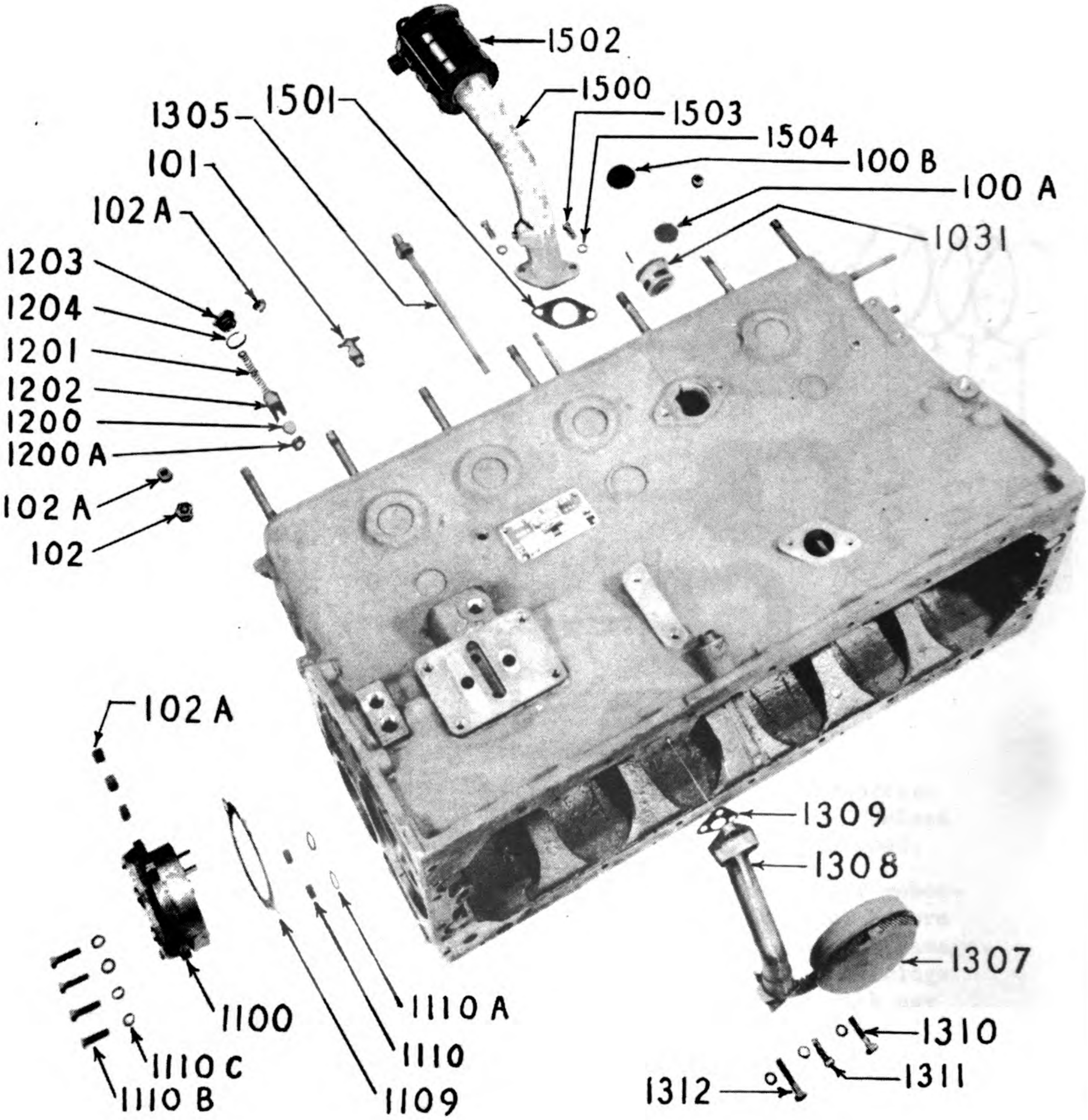
(See Reference Numbers on next page)

CRANKSHAFT, BEARINGS, PISTONS AND CONNECTING RODS



CRANKCASE OIL

CIRCULATING PARTS



CYLINDER AND CRANKCASE (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
100	1	H-12396	Cylinder and crankcase assembly (Includes all items thru Ref. No. 116)
100-A	5	103895	Cylinder expansion plug 1-1/4"
100-B	1	103896	Cylinder expansion plug 1-1/2"
100-C	2	103875	Water jacket pipe plug 3/4"
101	1	H-11175	Water jacket drain cock
	1	103877	Oil pressure gauge pipe plug 1/8"
102	1	1034	Oil pressure gauge connection
102-A	8	DE-4870	Cylinder pipe plug 3/8"
103	1	H-12288	Front bearing cap
104	1	2034	Front bearing retainer screw
105	4	1005	Intermediate bearing cap
106	1	1004	Center bearing cap
107	1	H-11951	Rear bearing cap
108	14	1018	Main bearing cap capscrew
108-A	7	DE-5476	Main bearing cap capscrew lockwire
109	1	DE-51302	Camshaft front bearing
110	2	DE-56103	Camshaft intermediate bearing
111	1	H-12295	Camshaft rear bearing
112	22	1083	Cylinder head stud
113	2	1655	Fan bracket stud - long
114	1	1656	Fan bracket stud - short
115	14	3943	Intake and exhaust manifold stud
116	4	1357	Valve cover stud
	1	5654	Fan bracket stud
	1	H-11704	Complete set of engine gaskets


117


119


121


123


118


120


122

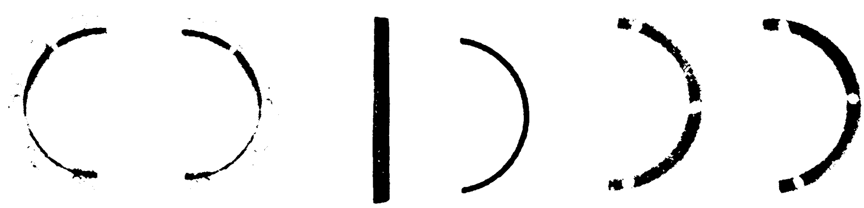

124

NOTE: All main bearings as listed below are sold in pairs only consisting of upper and lower halves.

117&118	1	1022-23	Front bearing-upper and lower -Standard
117&118	1	1022-23A	Front bearing-upper and lower-.010" Undersize
117&118	1	1022-23B	Front bearing-upper and lower-.020" Undersize
117&118	1	1022-23C	Front bearing-upper and lower-.030" Undersize
117&118	1	1022-23D	Front bearing-upper and lower-.040" Undersize
119&120	4	1024-25	Intermediate bearing upper and lower Standard
119&120	4	1024-25A	Intermediate bearing upper and lower .010" Undersize
119&120	4	1024-25B	Intermediate bearing upper and lower .020" Undersize
119&120	4	1024-25C	Intermediate bearing upper and lower .030" Undersize
119&120	4	1024-25D	Intermediate bearing upper and lower .040" Undersize

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
121&22	1	1026-27	Center bearing -upper and lower - Standard
121&22	1	1026-27A	Center bearing -upper and lower - .010" Undersize
121&22	1	1026-27B	Center bearing -upper and lower -.020" Undersize
121&22	1	1026-27C	Center bearing- upper and lower -.030" Undersize
121&22	1	1026-27D	Center bearing -upper and lower -.040" Undersize
123&24	1	1028-29	Rear bearing -upper and lower-Standard
123&24	1	1028-29A	Rear bearing -upper and lower-.010" Undersize
123&24	1	1028-29B	Rear bearing -upper and lower-.020" Undersize
123&24	1	1028-29C	Rear bearing -upper and lower-.030" Undersize
123&24	1	1028-29D	Rear bearing -upper and lower-.040" Undersize

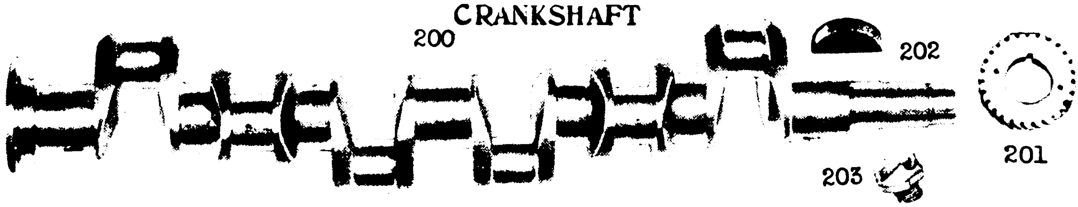
125 126 127 128 135



129 130 131 132 133 134

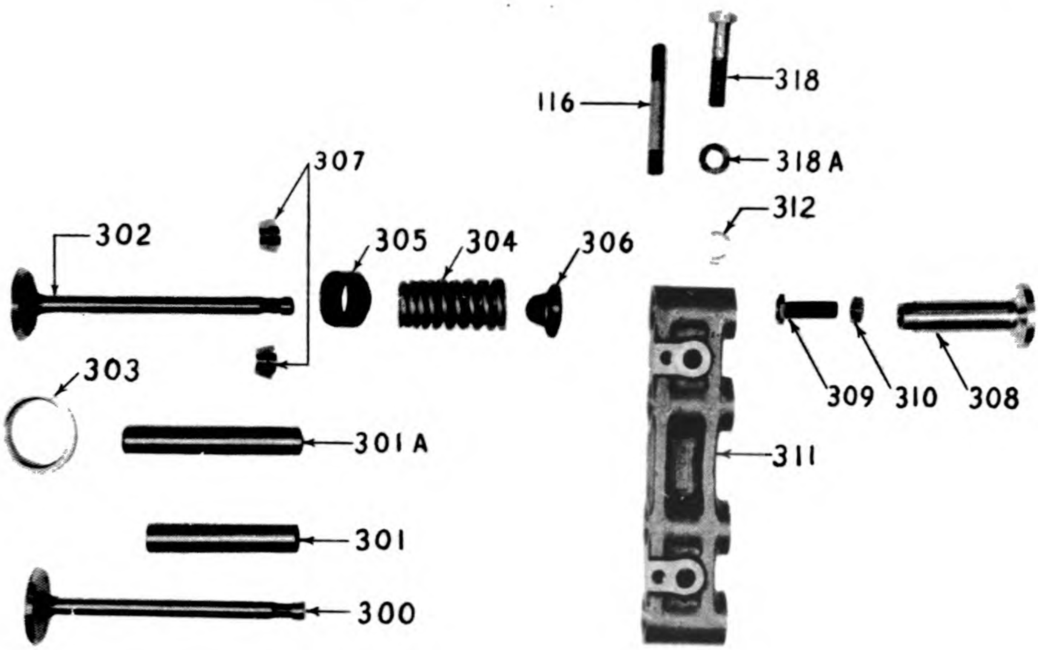
125	7	1030	Main bearing dowel
126	2	H-12289	Front bearing oil stop - short
127	4	H-11950	Main bearing oil stop - long
128	1	DE-55139	Rear bearing cap tube
129	1	DE-56131	Rear bearing oil seal - upper
130	1	DE-56131	Rear bearing oil seal - lower
131	2	DE-56165	Rear bearing oil seal felt
132	2	1561	Rear bearing oil seal gasket - light
133	2	1438	Rear bearing oil seal gasket - heavy
134	6	1560	Rear bearing oil seal capscrew

CRANKSHAFT

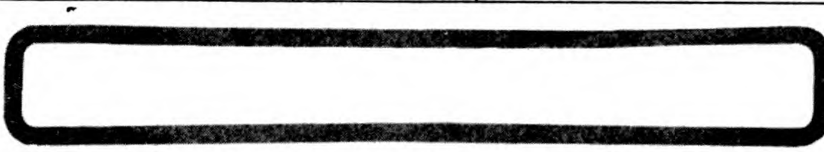


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
200	1	DE-51184	Crankshaft
201	1	H-12092	Crankshaft gear See Note below
202	1	113879	Crankshaft gear key #D
203	1	H-12245	Crankshaft jaw

NOTE: Timing gears are matched sets of camshaft, crankshaft, and idler gears. The end of face is marked to indicate standard (S), oversize (⊕), or undersize (U). The figure in circle or "U" indicates change from standard pitch diameter in thousandths of an inch. In ordering replacement, specify symbol and figure on old gear.



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
300	6	1310	Intake valve
301	6	1345	Intake valve guide
302	6	3312	Exhaust valve
303	6	3230	Exhaust valve seat
301A	6	1315	Exhaust valve guide
304	12	H-12329	Valve spring
305	12	H-11807	Valve spring seat - upper
306	12	H-11805	Valve spring seat - lower
307	24	H-12280	Valve spring retainer - halves
308	12	H-11731	Valve lifter
309	12	2313	Valve lifter adjusting screw
310	12	1304	Valve lifter adjusting screw nut
311	3	H-11730	Valve lifter bracket



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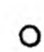


316

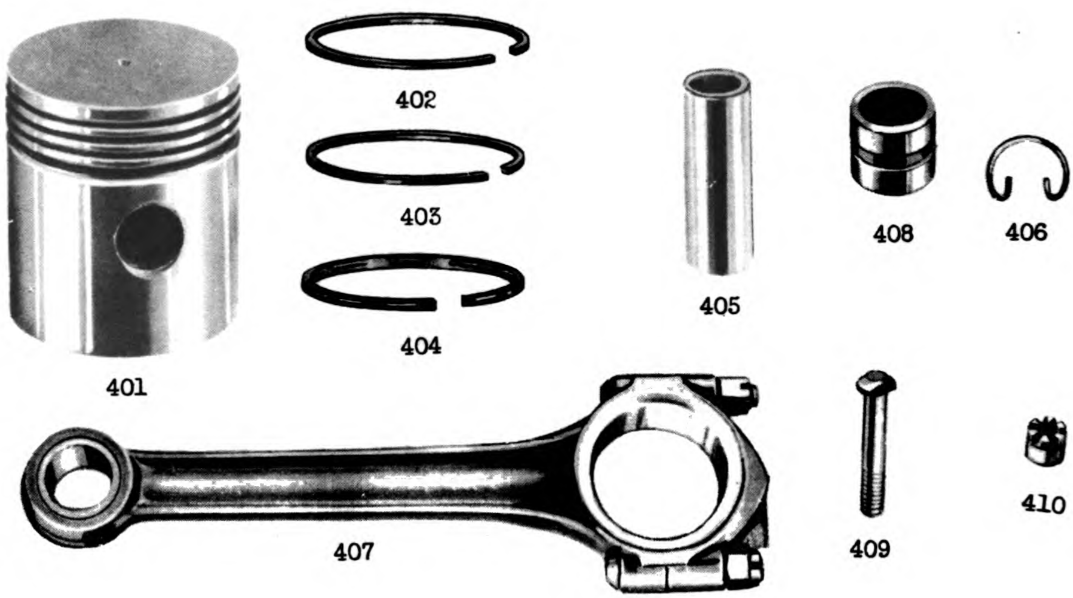
(See Reference Numbers on next page)

VALVE LIFTER AND COVER (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
318	6	100137	Valve lifter bracket capscrew 3/8"-16 x 1-3/4"
312	6	1305	Valve lifter bracket capscrew dowel
318-A	6	103321	Valve lifter bracket capscrew lock-washer 3/8"
313	1	1070	Valve cover plate
314	1	1033	Valve cover plate gasket
315	4	2065	Valve cover plate stud nut
316	4	1359	Valve cover plate stud nut gasket
317	1	1346	Valve chamber baffle plate.

PISTON AND CONNECTING ROD

NOTE: Pistons are only supplied fitted with piston pins and rings and can be furnished in the following stock sizes: Standard .020" and .040" oversize.



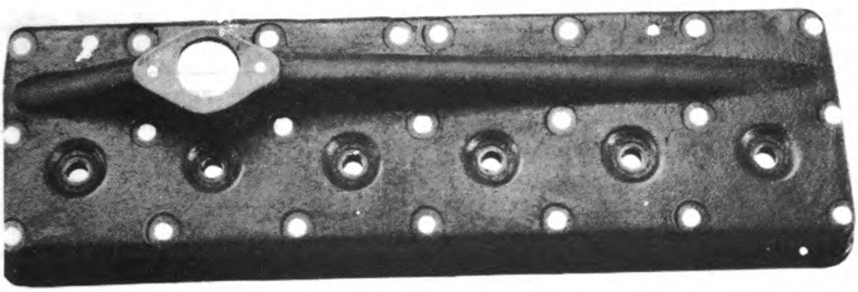
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	6	H-12404	Piston assembly (Includes all items through Ref.No. 406)
401	6	H-11960-P	Piston fitted with pin
403	18	1223	Piston ring - 1st, 2nd, 3rd.
404	6	3227	Piston ring - lower (Piston ring stock sizes, standard, .010", .020", .030" and .040" oversize)
405	6	1225	Piston pin (Piston pin stock sizes, standard .005", .010", .015", and .020" oversize)
406	12	RSE-155	Piston pin retaining spring

PISTON AND CONNECTING ROD (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
407	6	1266	Connecting rod assembly (Includes bushings, bearings, bolts and nuts)
408	6	1253	Connecting rod bushing
409	12	1261	Connecting rod bolt
410	12	1255	Connecting rod nut

NOTE: Connecting rods are fitted with bearings spun directly in the rod and cannot be replaced separately.

CYLINDER HEAD



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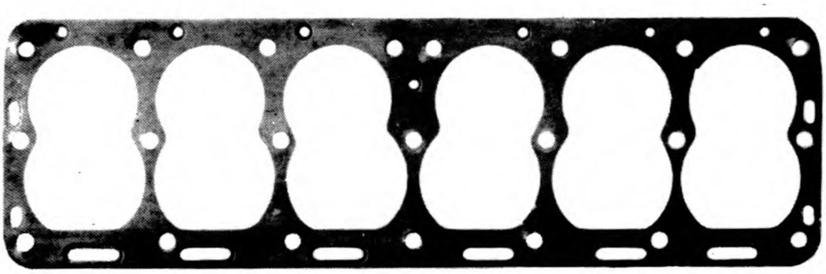

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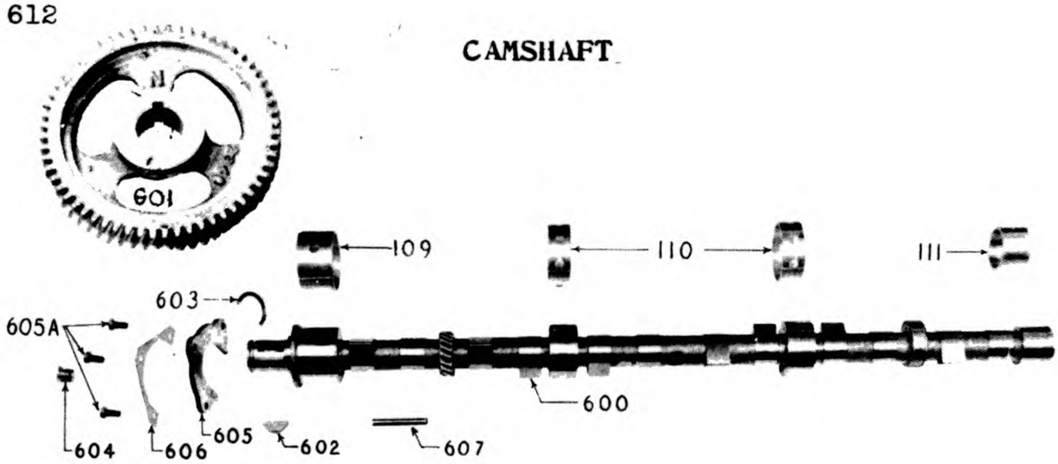
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
500	1	H-11078	Cylinder head
	1	112715	Cylinder head pipe plug 1/2"
501	1	1061	Cylinder head gasket
502	22	103028	Cylinder head stud nut -1/2" - 20
503	22	CUE-705	Cylinder head stud washer
504	1	4030E	Cylinder head tappet clearance plate

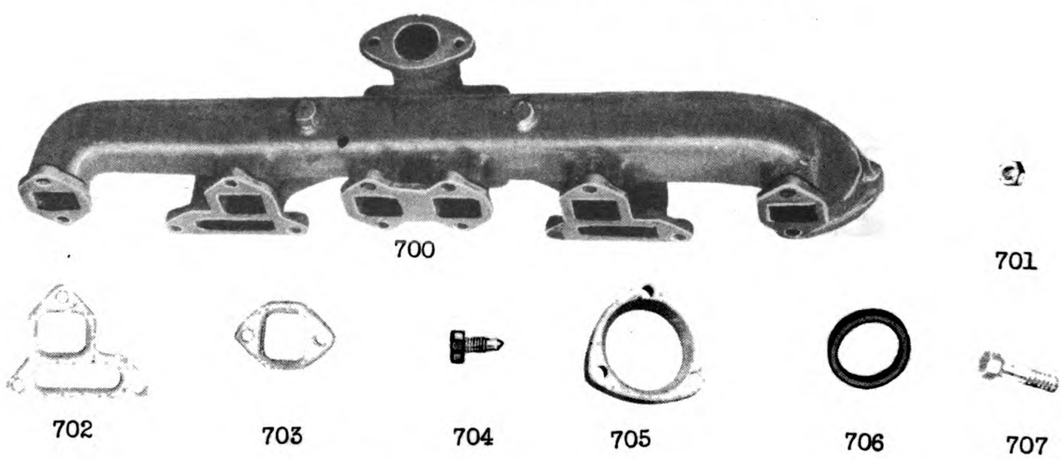
Always give Serial Number of Machine, Parts Number and Description.

CAMSHAFT



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
600	1	1392	Camshaft - front gear - rear eccentric
601	1	H-11279	Camshaft gear (See Note bottom of P. 508)
602	1	113782	Camshaft gear key No. 15
603	1	1307	Camshaft gear retainer
604	1	1318	Camshaft plug
605	1	1309	Camshaft thrust collar
605-A	3	113698	Camshaft thrust collar capscrews - 1/4-28 x 1/2" SAE
606	1	1341	Camshaft thrust collar lockwire
607	1	1308	Camshaft oil pump drive pin

INTAKE AND EXHAUST MANIFOLD



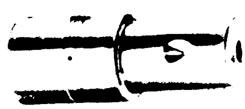
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
700	1	1351	Intake and exhaust manifold
701	14	114547	Intake and exhaust manifold stud nut 3/8"-24 SAE
	14	DE-40036	Intake and exhaust manifold stud washers
	2	103865	Intake and exhaust pipe plug 1/8" sq.hd.
702	2	1316	Intake and exhaust port gasket
703	4	1317	Exhaust port gasket
704	1	3360	Exhaust manifold set screw

INTAKE AND EXHAUST MANIFOLD (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
705	1	1352	Exhaust manifold flange
706	1	1353	Exhaust manifold flange gasket
707	3	100149	Exhaust manifold flange bolt 7/16" -13 x 1-3/4" USS
701	3	115773	Exhaust manifold flange bolt nut 7/16" - 13 USS

IDLER GEAR

800



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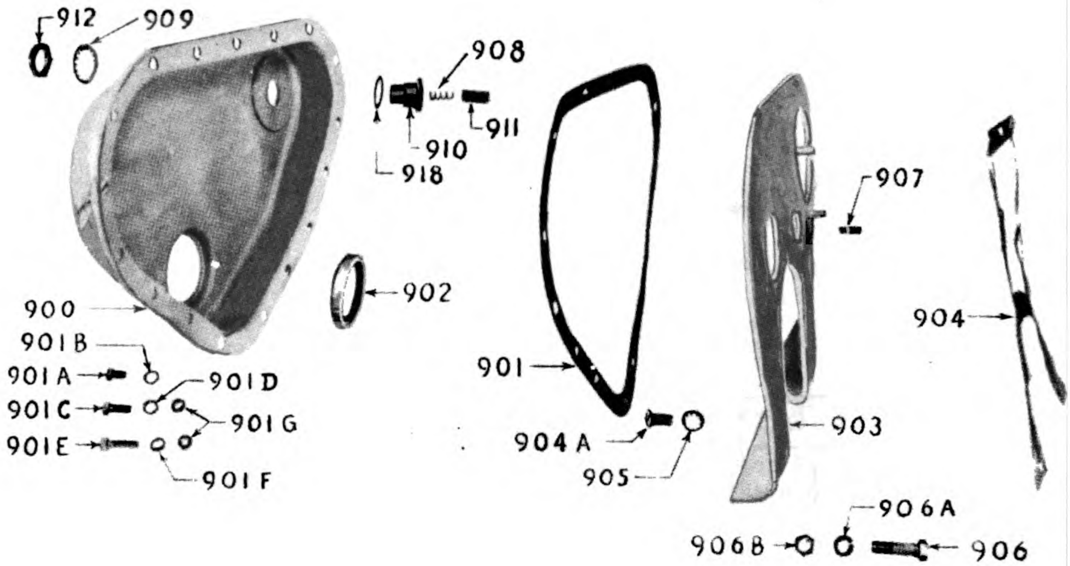
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
800	1	H-11280	Idler gear (See Note bottom of P. 608)
801	1	1452	Idler gear shaft
	1	103720	Idler gear shaft pin 3/16 x 1/2"
802	1	3432	Idler gear thrust washer
803	1	1458	Idler gear thrust screw
804	1	DE-4134	Idler gear shaft lockscrew
805	1	131410	Idler gear shaft lockscrew blind nut 5/8" - 11 USS
806	1	105453	Idler gear shaft lockscrew gasket 5/8"

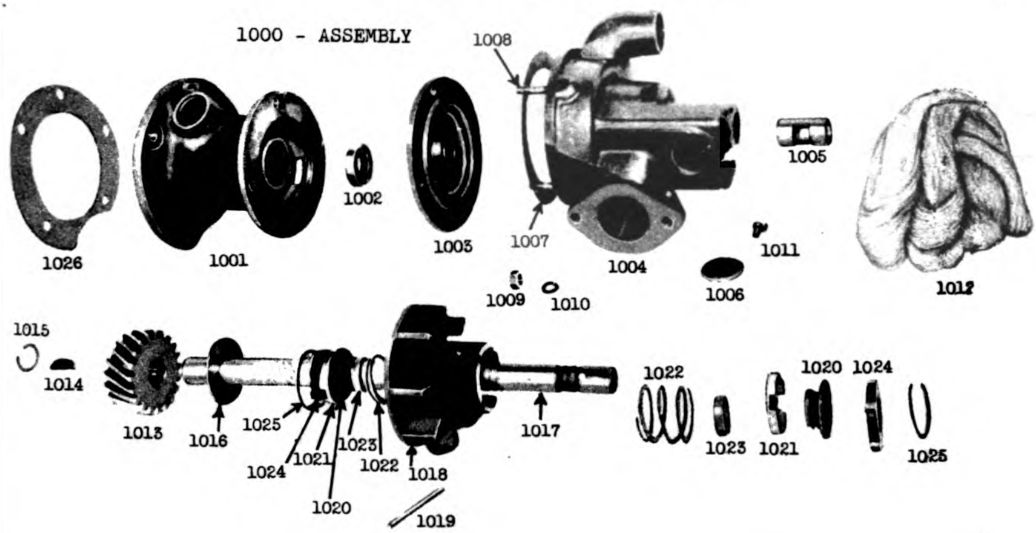
FRONT END COVER AND SUPPORT



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
900	1	H-11275	Front end cover
901	1	H-11276	Front end cover gasket
901-A	5	106974	Front end cover capscrews 3/8"-16 x 1/2" USS
901-C	9	106330	Front end cover capscrews 3/8"-16 x 7/8" USS
901-E	3	100135	Front end cover capscrews 3/8"-16 x 1-1/4" USS
901-G	12	102635	Front end cover capscrews nut 3/8" -16 USS
902	1	PA-117	Front end cover oil seal
901-B,D,F	17	103321	Lockwasher U.S.S. 3/8"
903	1	H-11274	Front support plate
904	1	H-11277	Front support plate gasket
904-A	4	137332	Front support plate screw 1/2"-13 x 1" USS
905	4	1050	Front support plate lockwasher -special
906	2	1054	Front support plate dowel bolt

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
906-B	2	103028	Front support plate dowel bolt nut 1/2" - 20 SAE
907	2	3040	Front support plate stud - for water pump
	1	H-11718	Water pump shaft thrust bearing assembly (Includes all items thru Ref. No. 913)
908	1	H-11363	Water pump shaft thrust spring
909	1	138577	Water pump shaft thrust washer
910	1	H-11719	Water pump shaft thrust housing
911	1	H-11720	Water pump shaft thrust button
912	1	H-11721	Water pump shaft thrust nut
913	1	H-11722	Water pump shaft thrust gasket

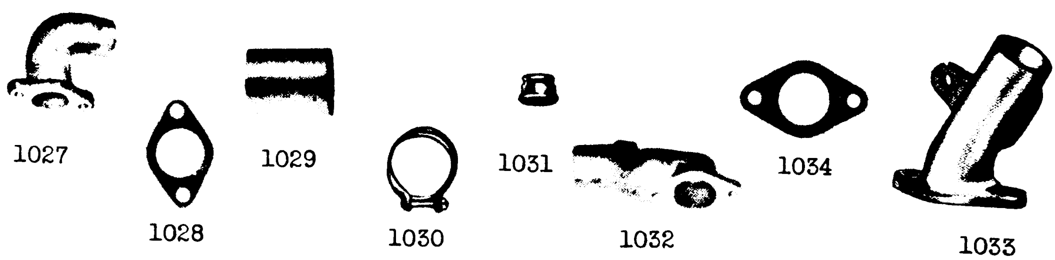
WATER CIRCULATING PARTS



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1000	1	H-11816	Water pump assembly with through shaft (Includes all items thru Ref. No. 1025)
1001	1	H-11750	Water pump drive bearing sleeve
1002	1	H-11773	Water pump drive oil seal
1003	1	H-11751	Water pump seal plate
1004	1	H-11589	Water pump body
1005	1	H-11595	Water pump body bushing
1006	1	103895	Water pump body expansion plug 1-1/4"
1007	1	H-11597	Water pump body to drive gasket
1008	4	ASE-126	Water pump body to drive stud
1009	4	103025	Water pump body to drive stud nut 5/16" - 24" SAE
1010	4	115308	Water pump body to drive stud copper washer 5/16"
1011	1	114998	Water pump body oil cup 5/16"
1012	1	H-11605	Water pump body wool packing
1013	1	H-11593	Water pump drive gear
1014	1	103906	Water pump drive gear woodruff key #8
1015	1	H-11604	Water pump drive gear snap wire
1016	1	H-11596	Water pump drive gear thrust washer
1017	1	H-11935	Water pump drive shaft

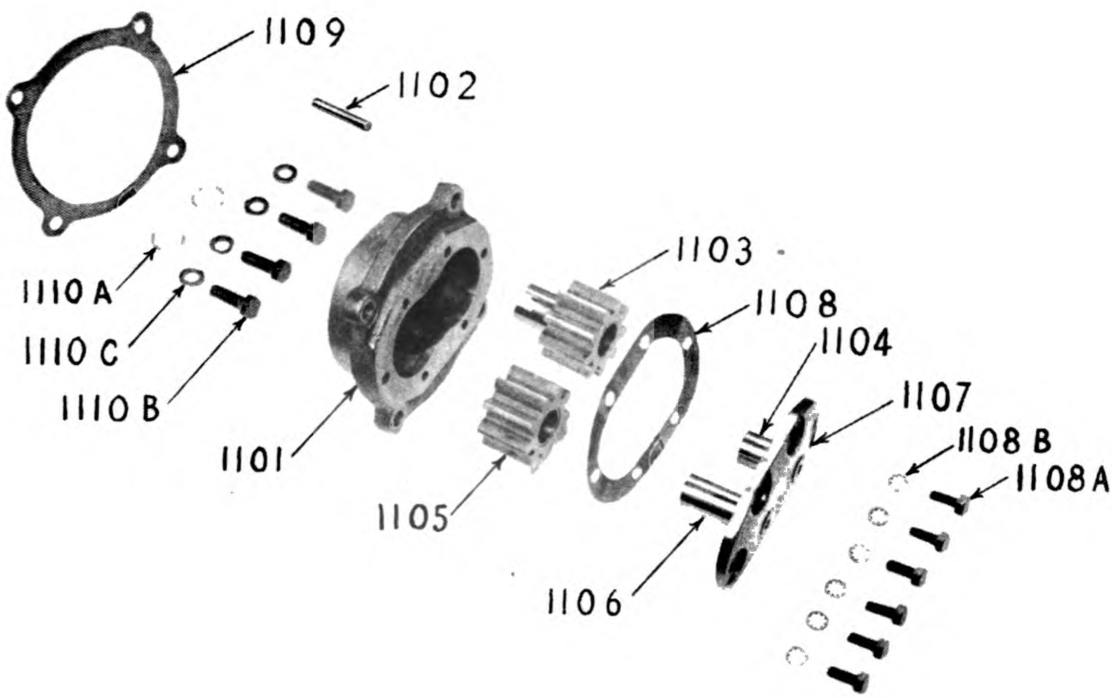
WATER CIRCULATING PARTS (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1018	1	H-11591	Water pump impeller
1019	1	103730	Water pump impeller pin 3/16 x 1-3/4"
	1	H-12560	Water Pump seal assembly (Includes the following 6 items)
1020	2	H-11600	Water pump flexible seal
1021	2	H-11601	Water pump seal clamp ring
1022	2	H-11599	Water pump seal spring
1023	2	H-11598	Water pump seal spring guide
1024	2	H-11603	Water pump seal carbon washer
1025	2	H-11602	Water pump seal retainer snap wire
1026	1	H-11288	Water pump flange gasket



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1027	1	H-11366	Water pump to cylinder connection
1028	1	1645	Water pump connection gasket
	2	106331	Water pump connection capscrews 3/8"16 x 1-1/8" USS
1029	1	CUE-824	Water pump connection hose
1030	2	AP-6081	Water pump connection hose clamp
1031	1	H-11281	Cylinder water distributor
	1	103583	Cylinder water distributor dowel #2 x 3/4"
1032	1	H-11566	Water inlet pipe
	1	106330	Water inlet pipe capscrew 3/8"-16 x 7/8" USS
	1	100139	Water inlet pipe capscrew 3/8"-16 x 2-1/2" USS
	1	GE-144	Water inlet pipe gasket
1033	1	4645	Cylinder head water outlet pipe
	2	100134	Cylinder head water outlet pipe capscrew 3/8"-16 x 1" USS
1034	1	1639	Cylinder head water outlet pipe gasket

OIL PUMP

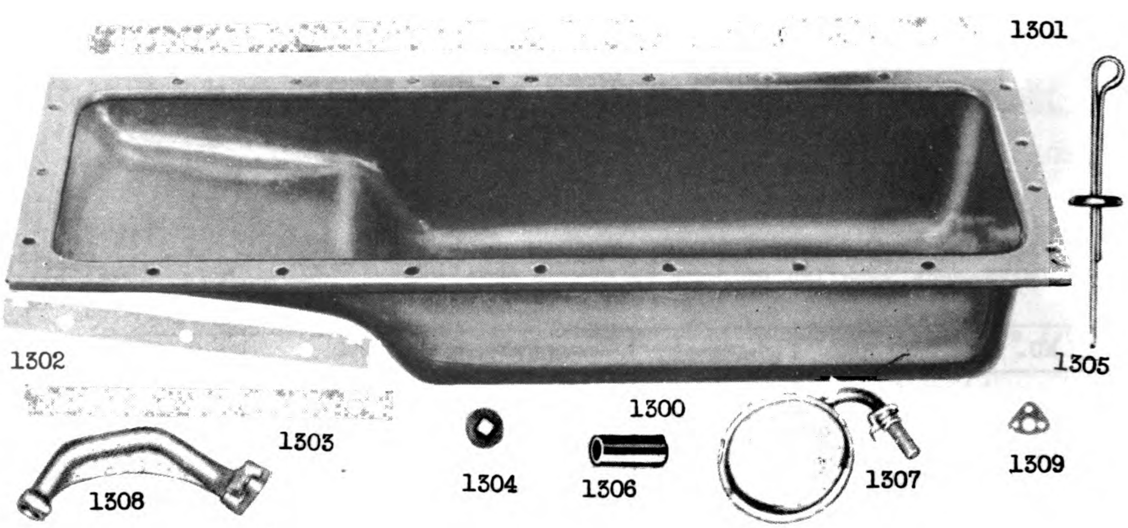


REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1100	1	5875	Oil pump assembly (Includes all items to Ref. No. 1109)
1101	1	5876	Oil pump body
1102	1	1535	Oil pump body pin
	1	103892	Oil pump body expansion plug 3/4"
1103	1	5879	Oil pump gear - driver
	1	1563	Oil pump drive gear bushing
1104	1	1510	Oil pump drive shaft
	1	H-11141	Oil pump gear plug
1105	1	5880	Oil pump idler gear
	1	1562	Oil pump idler gear bushing
1106	1	1509	Oil pump idler shaft
1107	1	5899	Oil pump cover (Includes shafts)
1108	1	1508	Oil pump cover gasket
1108-A	6	106319	Oil pump cover capscrew -1/4"-20 x 5/8" USS
1108-B	6	114604	Oil pump cover star washer #14
	2	V-2084	Oil pump cover screw gasket
1109	1	1546	Oil pump to case gasket
1110	2	1547	Oil pump to case dowel
1110-A	2	105453	Oil pump to case dowel gasket 5/8"
1110-B	4	100122	Oil pump to case capscrew 5/16"-18 x 1" USS
1110-C	4	103320	Oil pump to case lockwasher 5/16"

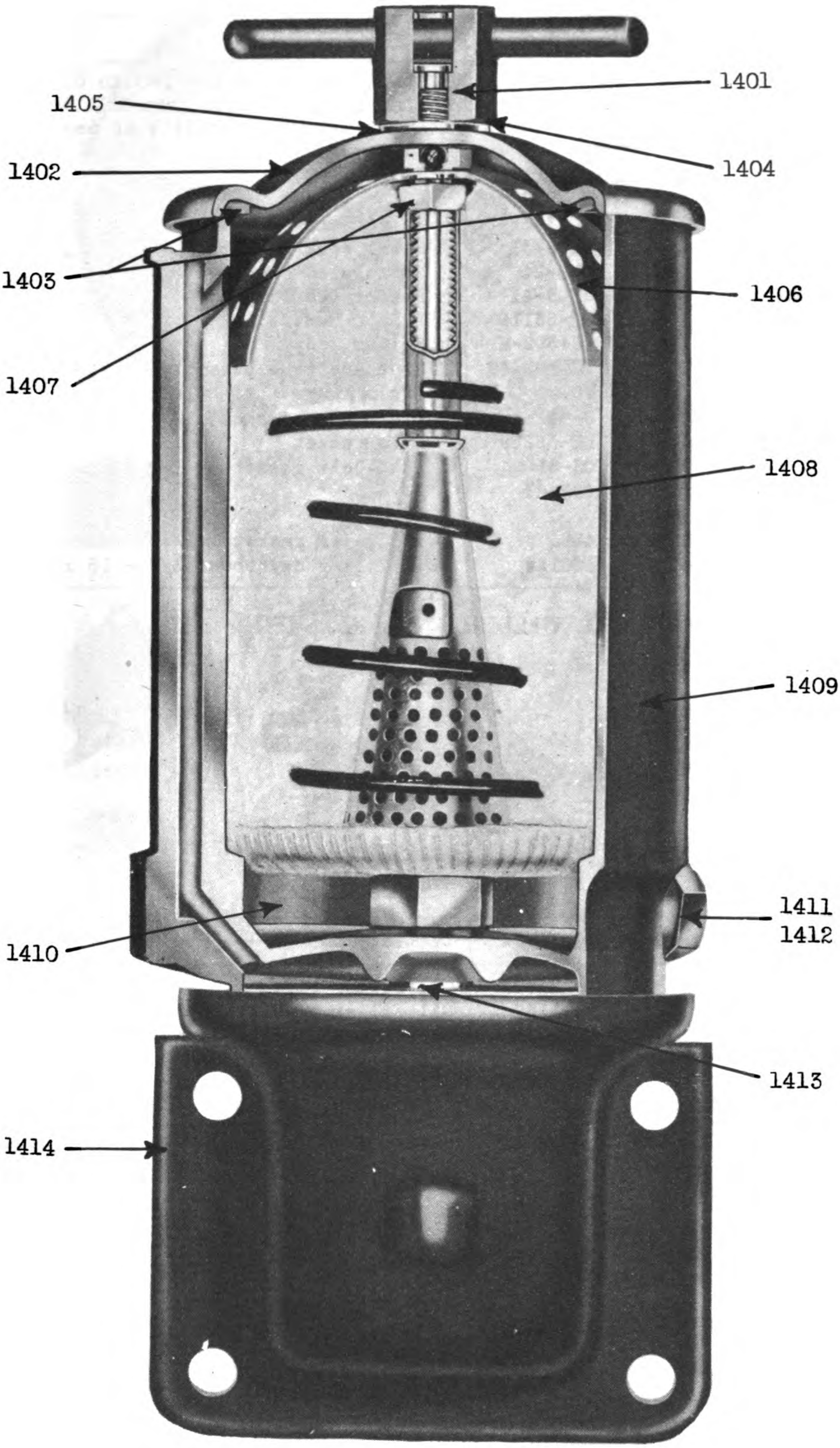
OIL PRESSURE RELIEF VALVE

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1200	1	104924	Oil pressure relief valve ball 5/8"
	1	DE-40318	Oil pressure relief valve seat
1201	1	3545	Oil pressure relief valve spring
1202	1	DE-40317	Oil pressure relief valve sleeve
1203	1	5529	Oil pressure relief valve cap
1204	1	1530	Oil pressure relief valve cap gasket

OIL PAN AND SCREEN



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1300	1	1531	Oil pan
1301	2	1539	Oil pan gasket - Side
1302	1	1540	Oil pan gasket - Front
1303	1	1541	Oil pan gasket - Rear
	22	106330	Oil pan capscrew 3/8"-16 x 7/8" USS
1304	1	H-12178	Oil pan drain plug (Magnetized) 1"
1305	1	H-12030	Oil level gauge
1306	1	H-12035	Oil level gauge adapter
1307	1	DE-3284	Oil pan screen - floating type
1308	1	H-12000	Oil pan screen bracket
1309	1	1526	Oil pan screen bracket gasket
	2	100111	Oil pan screen bracket capscrew
	1	100109	Oil pan screen bracket capscrew



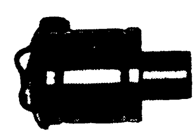
(See References on next page)

OIL FILTER (Continued)

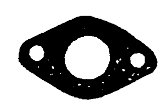
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1400	1	H-11677	Oil filter assembly - Deluxe CSB-41-302M (Includes all items thru Ref. No. 1414)
1401	1	CUS-100	Cover assembly consists of next six items:
1402	1	CUS-21	Cover
1403	1	DE-56270	Cover gasket
1404	1	JCUS-32-34	Releif valve assembly
1405	1	JCUS-31	Metal seal gasket
1406	1	CUS-24	Perforated cap
1407	1	JCUS-41	Perforated locknut
1408	1	DE-56119	Filter Cartridge
1409	1	CS-302-M	Filter body
1410	1	CS-121-49	Stud and tube assembly
1411	1	CS-50	Drain plug
1412	1	CS-52	Drain plug gasket
1413	1	DE-56269	Base gasket
	1	CS-51	Stud bolt gasket
1414	1	CSB-41	Base
1415	1	4595	Oil filter gasket
	4	100134	Oil filter capscrews 3/8 - 16 x 1" USS

OIL FILLER AND BREATHER

1500



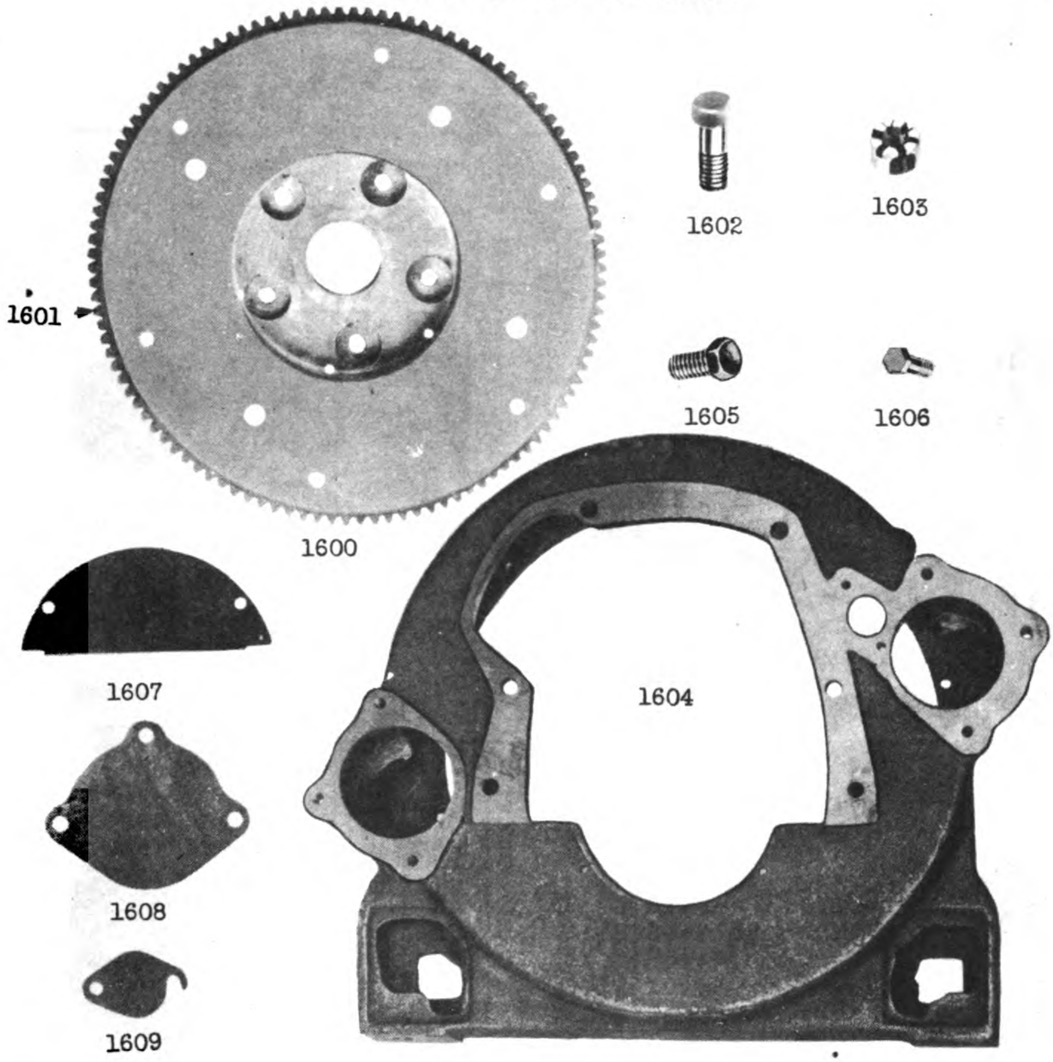
1502



1501

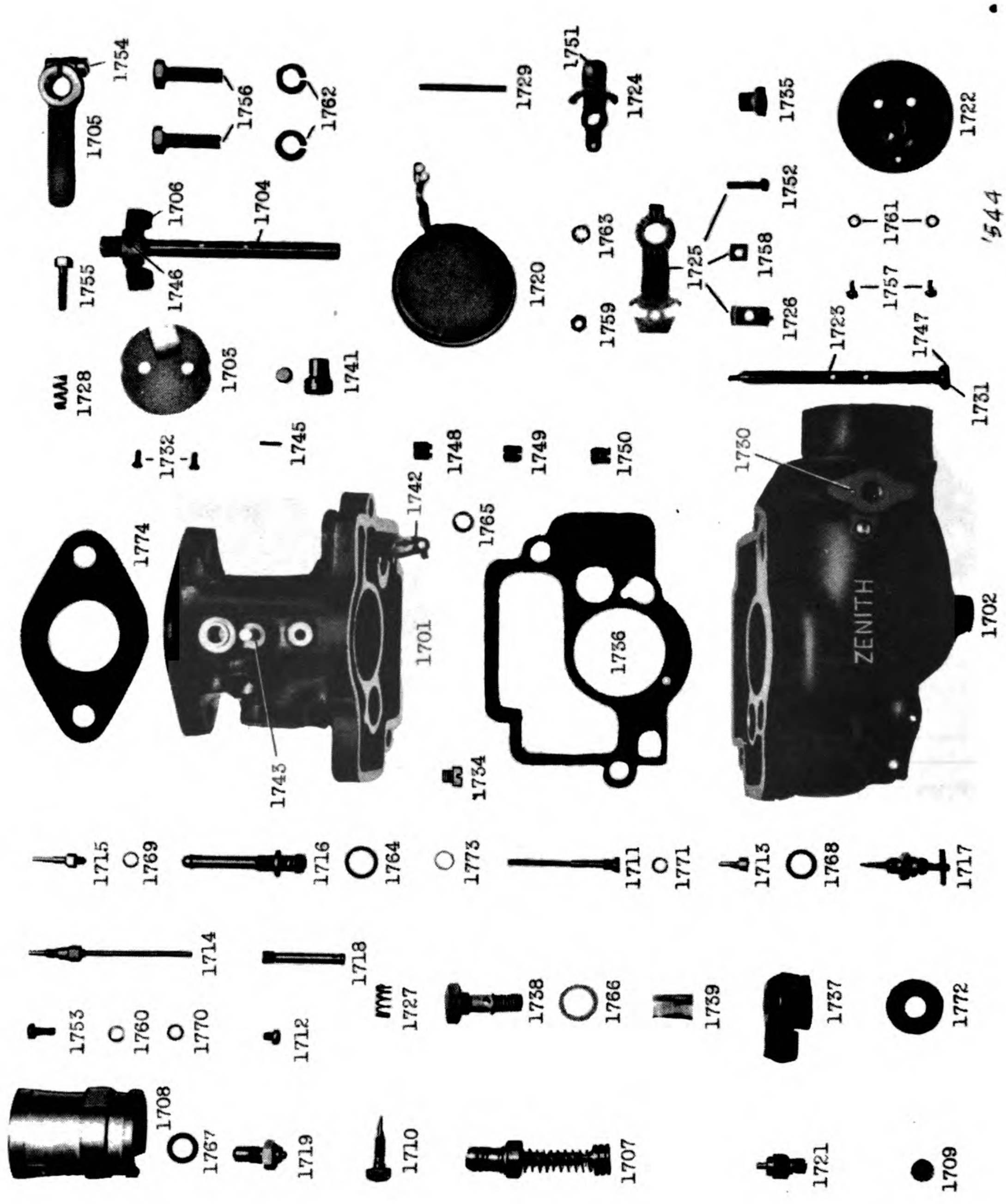
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1500	1	H-12050	Oil filler pipe
1501	1	DE-1169	Oil filler pipe gasket
	2	100121	Oil filler pipe capscrew 5/16-18 x 3/4" USS
1502	1	DE-51170	Oil filler pipe breather cap assembly

Always Give Serial Number of Machine, Parts Number and Description.



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1600	1	K-40125	Flywheel for Lipe Clutch
	1	H-12109	Flywheel for Fuller Clutch
1601	1	1152	Flywheel ring gear SAE #3
1602	5	H-12111	Flywheel bolt
1603	5	CUE-763	Flywheel bolt nut - 1/2" - 20 SAE
	5	106500	1/2" Standard Lock Washer
1604	1	H-12599	Flywheel housing for Lipe
		DE-56043	Flywheel housing for Fuller
1605	4	2074	Flywheel housing capscrew
1606	2	1054	Flywheel housing dowel bolt
	2	103028	Flywheel housing dowel bolt nut - 1/2" - 20" SAE
1607	1	1078	Flywheel housing dust plate
	2	106973	Flywheel housing dust plate capscrew 5/16" 18 x 1/2" USS
1608	1	1705	Starter opening cover
	3	106630	Starter opening cover capscrew - 3/8" - 16 X 7/8" USS
1609	1	1079	Timing indicator cover
	2	100121	Timing indicator cover capscrew 5/16" - 18 x 3/4" USS

CARBURETOR



(See Reference numbers on next page)

CARBURETOR

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1700	1	H-11307	Carburetor Assembly - Zenith 456-2 (Includes all items to ref. #1774)
1701	1	B1584x1	Throttle Body
1702	1	B3-22E	Fuel Bowl Assembly
1703	1	C21-106	Throttle Plate
1704	1	C23-243	Throttle Shaft
1705	1	C24-10	Throttle Clamp Lever (Right Side)
1705	1	D-5707	Throttle Clamp Lever (Left Side)
1706	1	C28-67	Throttle Stop Lever
1707	1	C36-18	Vacuum Pump Assembly
1708	1	C38-14A	Venturi #28
1709	1	C41-9	Check Valve Assembly
1710	1	C46-6	Idle Adjusting Screw
1711	1	C51-3	Power and Accelerating Jet #14
1712	1	C52-3	Compensating Jet #25
1713	1	C52-6	Main Jet #29
1714	1	C54-1	Idling Jet #14
1715	1	C57-1	Cap Jet #27
1716	1	C66-5	Discharge Tube Assembly
1717	1	C71-6	Main Jet Adjustment
1718	1	C76-21	Progressive Well
1719	1	C81-3	Fuel Valve and Seat Assembly #54
1720	1	C85-6	Float
1721	1	C97-10	Power Jet Valve (Blank)
1722	1	C101-21	Air Shutter Plate Assembly
1723	1	C105-86	Air Shutter Shaft
1724	1	C106-2	Air Shutter Lever Assembly
1725	1	C109-2	Air Shutter Bracket Assembly
1726	1	C110-1	Bracket Wire Clamp
1727	1	C111-17	Idle Adjusting Screw Spring
1728	1	C111-62	Throttle Stop Screw Spring
1729	1	C120-6	Float Axle
1730	2	T73-15	Bracket Drive Screw
1731	1	C130-4	Thrust Washer (Left Hand)
1732	2	C136-3	Throttle Plate Screw
1734	1	C138-61	Channel Screw
1735	1	C140-2	Bracket Assembly Screw
1736	1	C142-38	Bowl to Body Gasket
1737	1	G148-9A	Union Body
1738	1	C149-17	Filter Plug
1739	1	C150-1	Filter Screen
1741	1	CR-9-43	Throttle Lever Bushing
1742	1	CR88-2	Float Hinge Bracket
1743	1	CR121-10	Throttle Stop Pin
1744	1	CR-134-1	Swivel (Part of Item 1724)
1745	1	CT-63-2	Lever Bushing Taper Pin
1746	1	CT63-4	Stop Lever Taper Pin
1747	1	CT63-2	Thrust Washer Taper Pin
1748	1	CT-91-1	Bowl Drain Plug
1749	1	CT91-1	Governor Bypass Plug
1750	1	CT91-1	Bowl Drain Plug
1751	1	T8S8-7	Air Shutter Lever Swivel Screw
1752	1	T8S8-10	Clamp Screw, Air Shutter
1753	1	T1S10-6	Venturi Screw

CARBURETOR - Continued

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
1754	2	T8S10-9	Clamp Lever Clamp Screw
1755	1	T8S10-13	Throttle Stop Screw
1756	2	T8S31-16	Bowl to Body Screw
1757	2	T15B6-4	Air Shutter Retaining Screw
1758	1	T21S8	Clamp Screw Nut
1759	1	T22S8	Air Shutter Shaft Nut
1760	1	T41-10	Venturi Screw Lockwasher
1761	2	T43-6	Retaining Screw Lockwasher
1762	2	T43-103	Bowl to Body Screw Lockwasher
1763	1	T45-8	Shaft Nut Lockwasher
1764	1	T56-2	Discharge Tube Washer
1765	1	T56-5	Channel Screw Washer
1766	1	T56-10	Filter Plug Washer
1767	1	T56-23	Fuel Valve Seat Washer
1768	1	T56-23	Adjustment Washer
1769	1	T56-24	Cap Jet Washer
1770	1	T56-24	Compensating Jet Washer
1771	1	T56-24	Main Jet Washer
1772	1	T56-36	Union Body Washer
1773	1	T56-48	Power & Accelerating Jet Washer
1774	1	1645	Carburetor flange gasket
	2	DE-4999	Carburetor flange stud
	2	121932	Carburetor flange stud nut - 3/8" - 24 SAE
	1	K-40234	Carburetor bypass line assembly

FUEL PUMP MOUNTING PARTS

1801

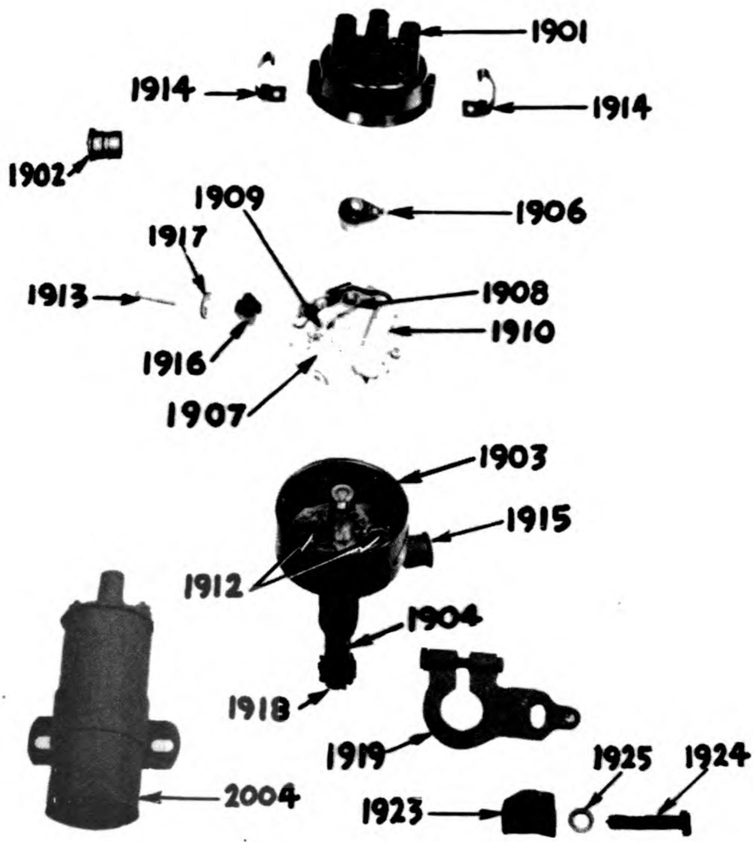
1802

1803

1804

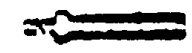
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	2903	Fuel pump assembly AC#855758
1801	1	1812	Fuel pump adaptor
1802	1	1811	Fuel pump adaptor gasket
	4	106325	Fuel pump adaptor capscrews 5/16 - 18 x 7/8" USS
	6	103320	Fuel pump to adaptor lockwasher 5/16"
1803	1	ISE-149	Fuel pump to adaptor gasket
	2	100122	Fuel pump to adaptor capscrew 5/16-18 x 1" USS
1803	1	ISE-149	Fuel pump hole cover gasket
	2	100121	Fuel pump hole cover capscrew 5/16-18 x 3/4" USS
1804	1	ISE-148	Fuel pump hole cover (used when fuel pump not used)
	1	H-12410	Fuel Pump to carburetor line

IGNITION ACCESSORIES



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	4757	Distributor Assembly Delco-Remy #643-X (Includes all items through Part No. 26513.)
1901	1	824735	Distributor Cap
1902	1	821604	Distributor Cap Carbon Button
1903	1	822622	Distributor Housing
1904	1	824738	Distributor Main Shaft
1905	1	822627	Distributor Cam
1906	1	820445	Distributor Rotor
1907	1	821150	Breaker Plate
1908	1	813238	Breaker Lever
1909	1	1848038	Contact Point and Support
1910	1	1869704	Condenser
1911	2	818222	Distributor Weight
1912	2	1835699	Distributor Weight Spring
	1	106496	Breaker Plate Support Lockwasher
	1	33436	Breaker Lever Stud Insulating Washer 5/16"
	1	1837832	Breaker Lever Stud Insulating Washer 9/32"
	1	810794	Breaker Lever Spring Attaching Screw Washer
	1	106496	Condenser Attaching Screw Lockwasher
	2	106496	Cap Spring Screw Lockwasher
	1	810074	Shim Washer (.005 thick)

2001

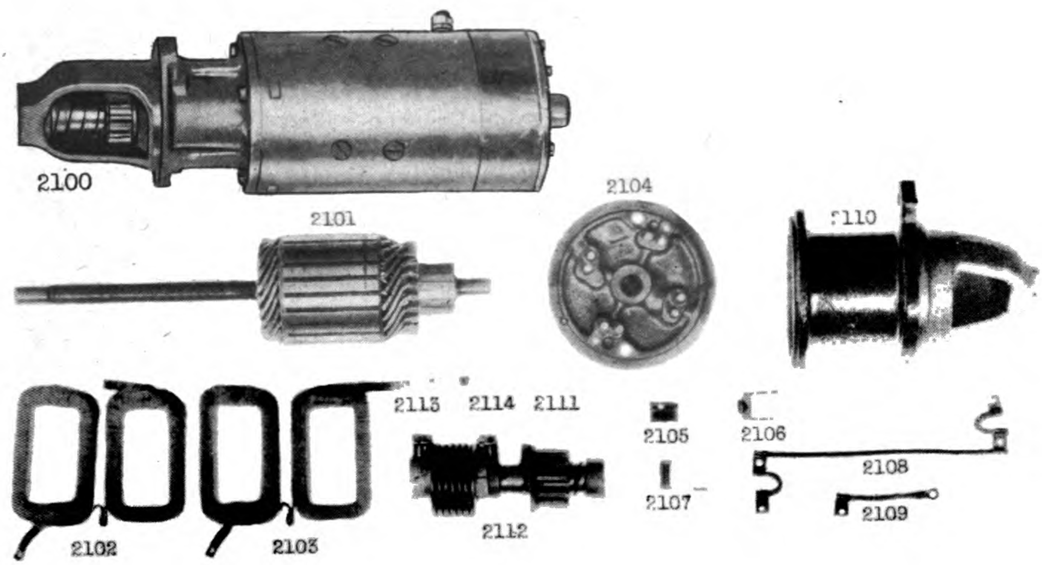


2002

2003

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	810078	Shim Washer (.010 thick)
	3	811912	Space Washer (under gear)
	1	811912	Space Washer (under weight plate)
	1	121841	Terminal Screw Lockwasher
	2	811124	Weight Washer
	1	115607	Breaker Plate Support Screw
	1	813511	Breaker Lever Spring Screw
	1	816784	Contact Adjusting Screw
	1	131951	Condenser Attaching Screw
	2	115607	Cap Spring Screw
1913	1	107715	Terminal Screw
	1	813245	Breaker Lever Retainer Spring
1914	2	1871838	Cap Spring
	2	1847289	Cap Spring Support
	1	816803	Felt Wick
1915	1	805579	Grease Cup
1916	1	821160	Terminal Screw Bushing
1917	1	26153	Terminal Screw Clamp
1918	1	H-11872	Distributor Gear
	1	2725	Distributor Gear Pin
1919	1	3731	Distributor Arm (Includes items thru 81304
		813044	Hold Down Screw
		813045	Hold Down Spring
		813046	Hold Down Washer
1923	1	H-11340	Distributor Arm Support
1924	1	100137	Distributor Arm Support Capscrew 3/8-16 x 1-3/4"
1925	1	103321	Distributor Arm Support Capscrew Lockwasher 3/8"
	1	AP-5816	Distributor Boot
1984	1	3998	Ignition Switch, Briggs & Stratton #50704
			Cable Tube
2001	1	1716	Cable Tube Assembly (Includes all items through #100121.)
2002	1	1708	Cable Tube Only
	2	1709	Cable Tube Stud
	2	1710	Cable Tube Clip
	2	100121	Cable Tube Clip Screw
2003	1	1735	Distributor Cable Set
	1	3729	Distributor Cable Rubber Tie Ring
2004	1	1755	Ignition Coil - 6 Volt Delco-Remy #528-C
	1	H-11419	Ignition Coil Bracket
	2	106324	Ignition Coil Bracket Capscrew 5/16-18 x 5/8"
	2	103320	Ignition Coil Bracket Capscrew Lockwasher 5/16"
	2	117061	Ignition Coil Bracket Capscrew Nut 5/16" - 18
2005	6	H-11629	Spark Plug, AC-87

STARTER AND GENERATOR



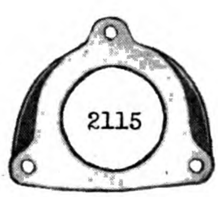
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2100	1	1733	Starting Motor Assembly - Delco-Remy-718-R (Includes all items to Ref. No. 2115)
2101	1	818002	Armature
	4	810601	Pole shoe
	4	828675	Pole shoe screw
	1	826938	Field Terminal stud
	2	1861076	Field Terminal stud Insulation washer
	1	809051	Field Terminal stud Insulation bushing
	2	805790	Field Terminal stud plain washer
	2	110730	Field Terminal stud lockwasher
	1	134569	Field Terminal stud nut (1/4 thk)
	1	805258	Field Terminal stud nut (5/32 thk)
2102	1	810627	Field Coil Assembly (Upper)
2103	1	810626	Field Coil Assembly (Lower)
2104	1	815839	Commutator end Frame & Pin Sub Assembly (Includes following 8 items only)
	2	817314	Brush holder stop pin
	2	817313	Brush holder hinge pin
	2	812015	Brush holder stop pin & Insulation
	2	812016	Brush holder hinge pin & Insulation
	1	809062	Dowel pin - Commutator end
	1	1865182	End plug - Commutator end
	1	1880642	Oiler - Commutator end
	1	802691	Oil wick - Commutator end
2105	4	811553	Brush
2106	4	810226	Brush holder
2107	4	1855685	Brush spring
	4	115903	Brush attaching screw
	4	106495	Brush attaching screw lockwasher

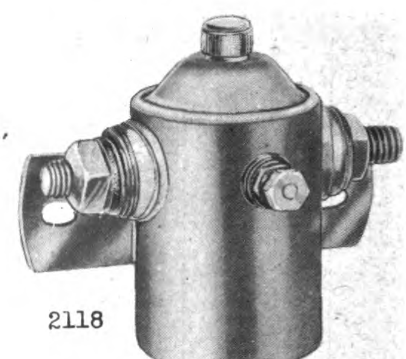
STARTER AND GENERATOR (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2108	2	813554	Brush ground lead
	2	122159	Brush ground lead screw
	2	106496	Brush ground lead screw lockwasher
2109	1	819362	Brush connector lead
	1	135616	Brush lead screw
	1	106497	Brush lead screw lockwasher
	1	833602	Space washer - Commutator End
	1	817114	Cover band
2110	1	1839100	Motor Drive Housing
	1	810620	Motor drive housing bushing
	1	809593	Dowel pin - Drive end
	1	124546	Woodruff key
	1	833602	Space washer - Commutator End .563 x 63/ 64.1/16)
	1	809815	Space washer - Commutator End .626 x 1.062 x 1/16)
	1	1849774	Space washer - Commutator End .626 x 1.062 x 3/32)
	2	809053	Thru bolt
	2	103319	Thru bolt lockwasher
2110	1	811194	Motor Drive (Includes following 7 items)
2111	1	811080	Gear and shaft assembly
	1	808949	Drive head
2112	1	809518	Drive spring
2113	1	810287	Head spring screw
2114	1	810288	Shaft spring screw
	2	806427	Lockwasher
	2	811559	Support
2115	1	4740	Starter adaptor (for Lipe Clutch)
2116	3	100137	Starter capscrews 3/8-16 x 1-3/4"

2116

2117



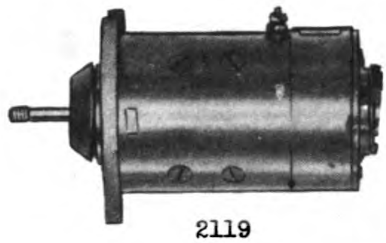


2118

2117	1	DE-44122	Push button switch - Delco-Remy #1385
2118	1	AP-6297	Magnetic switch - Delco-Remy 1549

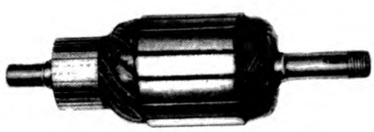
Always give Serial Number of Machine, Parts Number and Description.

STARTER AND GENERATOR (Continued)



2119

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2119	1	H-12175	Generator assembly - Delco-Remy #1101671-6 volt (Includes all items to Ref. No. 2142)



2120

2121

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2128

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2120	1	817807	Armature
2121	2	813496	Pole shoe
	2	828675	Pole shoe screw
2122	1	1858754	Terminal stud and lead assembly
2123	1	1858749	Terminal stud only
	2	1858753	Terminal stud insulation washer
	2	1858752	Terminal stud plain washer
	4	802757	Terminal stud lockwasher
	4	121743	Terminal stud nut
2124	1	814978	Field Coil (R.H.)
2125	1	1863510	Field Coil (L.H.)
	1	1857107	Terminal clip (To Brush)
2126	1	817216	Commutator end frame & pin sub assembly (Includes following 5 items only)
	1	817313	Brush holder hinge pin
	1	817314	Brush holder stop pin
	1	812016	Brush holder hinge pin and insulation
2127	1	812823	Bushing - Commutator end
	1	812015	Brush holder stop pin and insulation
	1	809062	Dowel pin - Commutator end
	1	1880635	Oiler - Commutator end
	1	804076	Oil wick - Commutator end
	1	816315	Oil hole plug - Commutator end
2128	1	809698	Third brush plate

STARTER AND GENERATOR (Continued)


2129


2130


2131

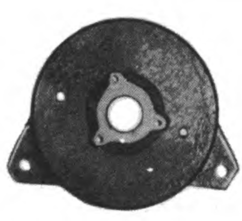

2132


2133


2134

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2129	1	817532	Third brush plate clamp
	1	141543	Third brush plate clamp screw
	1	106497	Third brush plate clamp screw lockwasher
	1	809824	Third brush plate spring washer
	1	809614	Third brush plate spring washer pin
2130	3	820517	Brush
2131	3	809642	Brush holder
2132	2	809644	Brush spring (3rd and ground)
2133	1	809658	Brush spring (Insulated Main)
	3	1862803	Brush attaching screw
	3	106495	Brush attaching screw lockwasher
	3	809551	Brush attaching s crew plain washer
	1	809688	Brush ground lead
	2	141540	Brush lead screw
	2	802730	Brush lead screw lockwasher
2134	1	820524	End Cover plate - Commutator end
	1	817220	End Cover plate gasket - Commutator end
	3	1868330	End Cover plate screw - Commutator end
	3	106496	End Cover plate screw L.W. Commutator end


2135


2136


2137

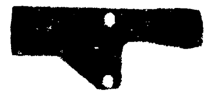

2138


2139

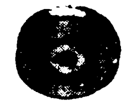
2135	1	1872638	Cover band
	1	107728	Cover band screw
	1	103088	Cover band screw nut
2136	1	1838678	Drive End Frame
	1	1880635	Oiler (Drive End)
	1	817224	Space collar (Outside - Drive End)
	1	809945	Space washer (Inside - Drive End)
2137	1	903203	Ball bearing (Drive end)
2138	1	1855702	Ball bearing retainer plate (Drive end)
	1	1855701	Ball bearing retainer plate gasket (Drive End)
	3	1866970	Ball bearing retainer plate screw (Drive End)
	3	802731	Ball bearing retainer plate screw Lock washer
	1	809961	Felt washer (Drive End)
[illegible]9	1	819104	Felt washer retainer plate (Drive End)

STARTER AND GENERATOR (Continued)

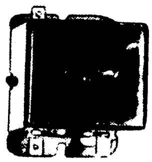
2140



2142



2144



2141

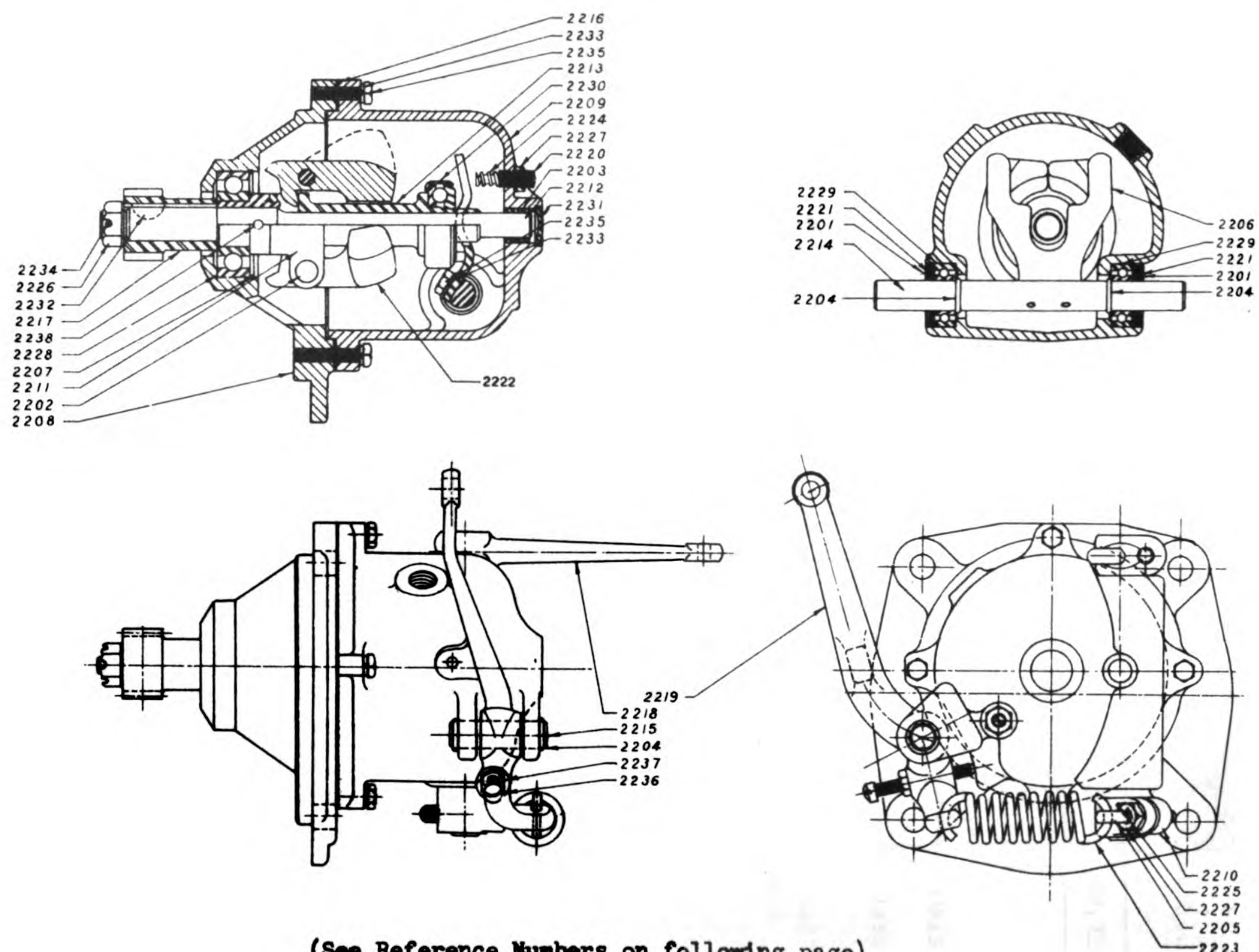
2143

2145

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	1	809593	Dowel pin (Drive End)
	1	124545	Woodruff key (Drive End)
	1	806915	Shaft nut (Drive End)
	1	804000	Shaft nut lockwasher (Drive End)
2140	2	815018	Thru bolt
	2	108579	Thru bolt lockwasher
2141	1	5864	Control Unit
	2	132900	Control Unit mounting screw
	2	138479	Control Unit mounting screw Lock washer
	2	1856056	Control Unit mounting screw plain washer
	1	1850025	Lead Assembly (A"terminal to control Unit)
	1	1873937	Lead Assembly (F"terminal to control Unit)
2142	1	H-12148	Generator bracket
	2	106330	Generator bracket capscrews 3/8"-16 x 7/8" U.
	2	100122	Generator bracket capscrews 5/16"-18 x 1" US
2143	1	H-11345	Generator adjusting brace
	1	106324	Generator adjusting brace capscrew 5/16"-18 x 5/8" USS
2144	1	H-12117	Generator pulley
2145	1	1743	Ammeter

Always give Serial Number of Machine, Parts Number and Description.

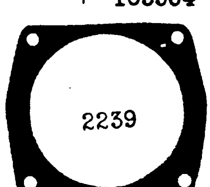
PIERCE GOVERNOR ASSEMBLY NO. A-1729 — B



(See Reference Numbers on following page)

GOVERNOR (Continued)

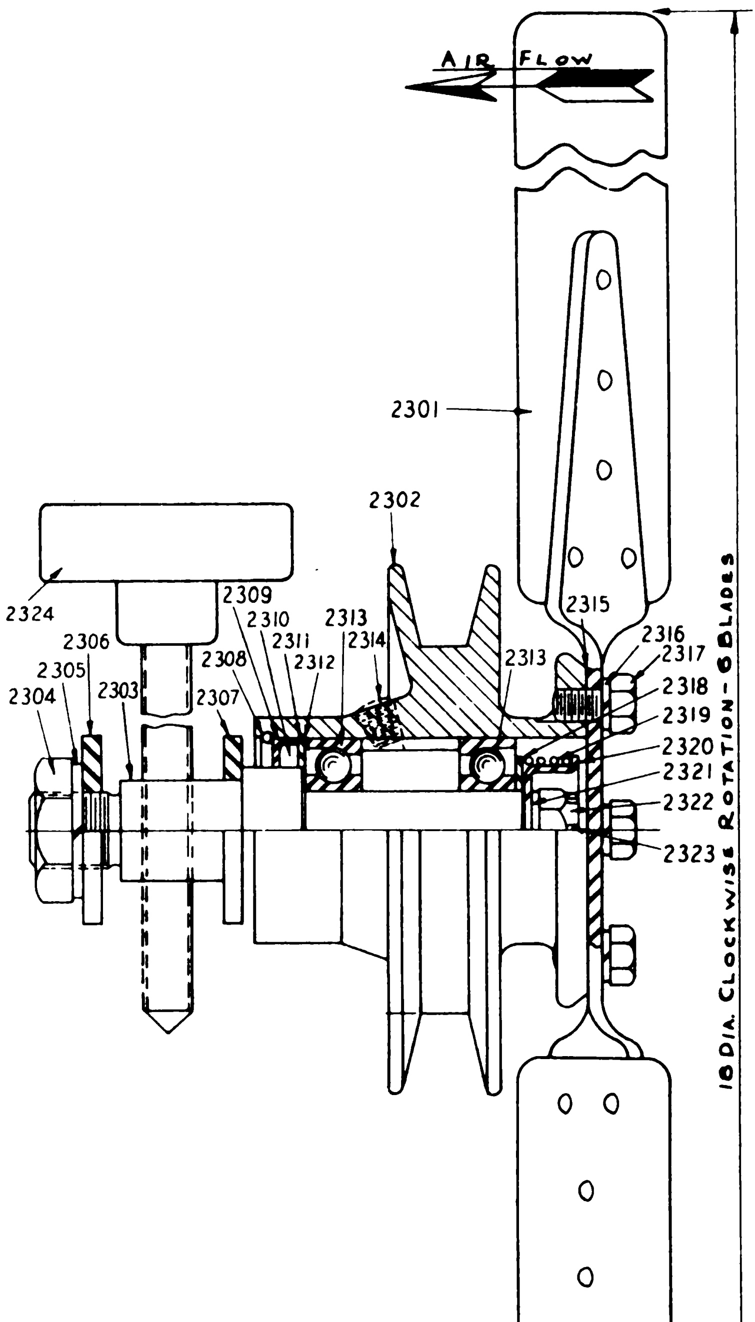
REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2200	1	K-40166	Governor Assembly Pierce A-1729-B (Includes all items to Ref. No. 2239)
2201	2	G-3040	Bearing retainer
2202	2	G-5950	Weight pins
2203	1	G-3168	Drive shaft bushing
2204	4	G-3494	Snap ring
2205	1	G-3947	Spring eye link
2206	1	G-6026	Yoke
2207	1	G-4159	Bearing retainer spring
2208	1	G-4200	Governor body cap
2209	1	G-4201	Governor body
2210	1	G-4203	Adjusting screw bracket
2211	1	A-1938	Weight spider Assembly
2212	1	G-4205	Spider shaft
2213	1	G-4206	Thrust sleeve
2214	1	G-6905	Rocker shaft
2215	1	G-4208	Lever shaft
2216	1	G-4209	Gasket
2217	1	G-4211	Gear, Buda #2810
2218	1	G-4305	Throttle Lever
2219	1	G-4306	Governor adjusting lever
2220	1	G-5113	Bumper screw
2221	2	G-5210	Oil retaining washer
2222	2	G-4449	Weights
2223	1	SN-278	Spring
2224	1	SN-266	Bumper spring
	1	X-28	1/8 x 7/8 pin
2225	2	X-82	Tapper pin #1 x 7/8
2226	1	X-763	Castle nut 3/8 - 24 SAE
2227	3	X-217	Check nut 1/4 - 28 SAE
2228	1	X-310	Bearing
2229	2	X-328	Bearing
2230	1	X-330	Thrust bearing
2231	1	X-454	Welch plug
2232	1	X-461	Woodruff key #2
	1	X-463	Lock Washer 1/4"
	1	X-532	Welch plug 5/16
2233	4	X-540	Lock Washer #10
	1	X-557	Hex. cap screw 1/4-28 x7/8-SAE
2234	1	X-425	Cotter pin 3/32 x 3/4
2235	4	X-824	Hexagon capscrew 10-24 x 3/4 USS
2236	1	X-846	Fillister head capscrew 12-24 x 1-1/2
2237	1	X888	Hexagon nut 12-24
2238	1	X-935	Spider to shaft groove pin
	1	103564	Governor drive gear taper pin #0 x 1"



2240

	1	H-11902	Governor link assembly
2239	1	1811	Governor gasket
	4	100121	Governor capscrews - 5/16"-18 x 3/4" USS
	1	1863	Governor oil line
	2	120704	Governor oil line nut 41-F-3/16
	1	120703	Governor oil line union 48-F-3/16
2240	1	4776	Governor oil line restrictor elbow
2241	1	H-11928	Governor valve box

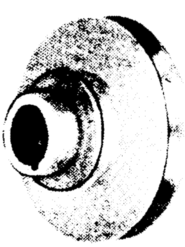
FAN, BELT AND PULLEY



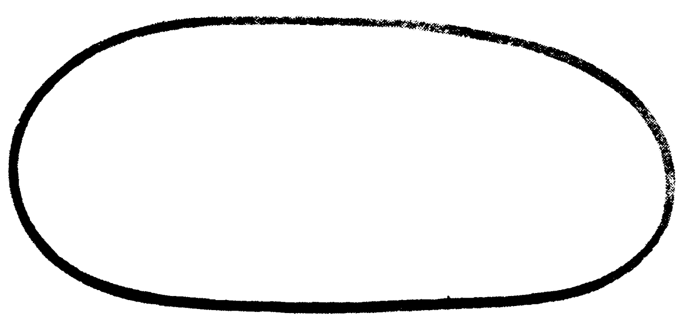
(See Reference Numbers on following page)

FAN BELT AND PULLEY (Continued)

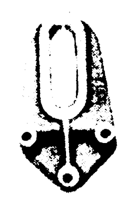
REF.NO.	NO.REQ.	P. PART NO.	DESCRIPTION
2300	1	H-12101	Fan Assembly 18" -6 Blade (Includes all items thru Ref. No. 2323)
2301	1	2605	Fan blade assembly 18" 6 blade
2302	1	B-108157	Fan hub
2303	1	1622	Fan spindle
2304	1	122403	Fan spindle clamp nut 3/4 - 16 SAE
2305	1	103326	Fan spindle clamp nut lockwasher 3/4"
2306	1	1620	Fan spindle clamp washer - rear
2307	1	1628	Fan spindle clamp washer - front
2308	1	C-4832	Fan spindle oil retainer cork lockwire
2309	1	C-3159	Fan spindle oil retainer cork retainer
2310	1	C-3158	Fan spindle oil retainer cork
2311	1	C-3157	Fan spindle cork retaining washer
2312	1	C-3837	Fan spindle bearing gasket - rear
2313	2	C-2815	Fan spindle bearing
2314	1	103883	Fan hub oil plug 1/8" slotted
2315	1	4614	Fan blade gasket
2316	4	103320	Fan blade capscrew lockwasher 5/16"
2317	4	106973	Fan blade capscrew 5/16-18 x 1/2" USS
2318	1	C-2963	Fan spindle cone clamp wahher
2319	1	C-2962	Fan spindle cone spring
2320	1	C-2961	Fan spindle cone spring retainer
2321	1	103323	Fan spindle cone clamp nut lockwasher 1/2"
2322	1	C-2674	Fan spindle cone clamp nut
2323	1	C-2283	Fan spindle clamp nut cotter
2324	1	1618	Fan spindle adjusting screw



2325



2326



2327

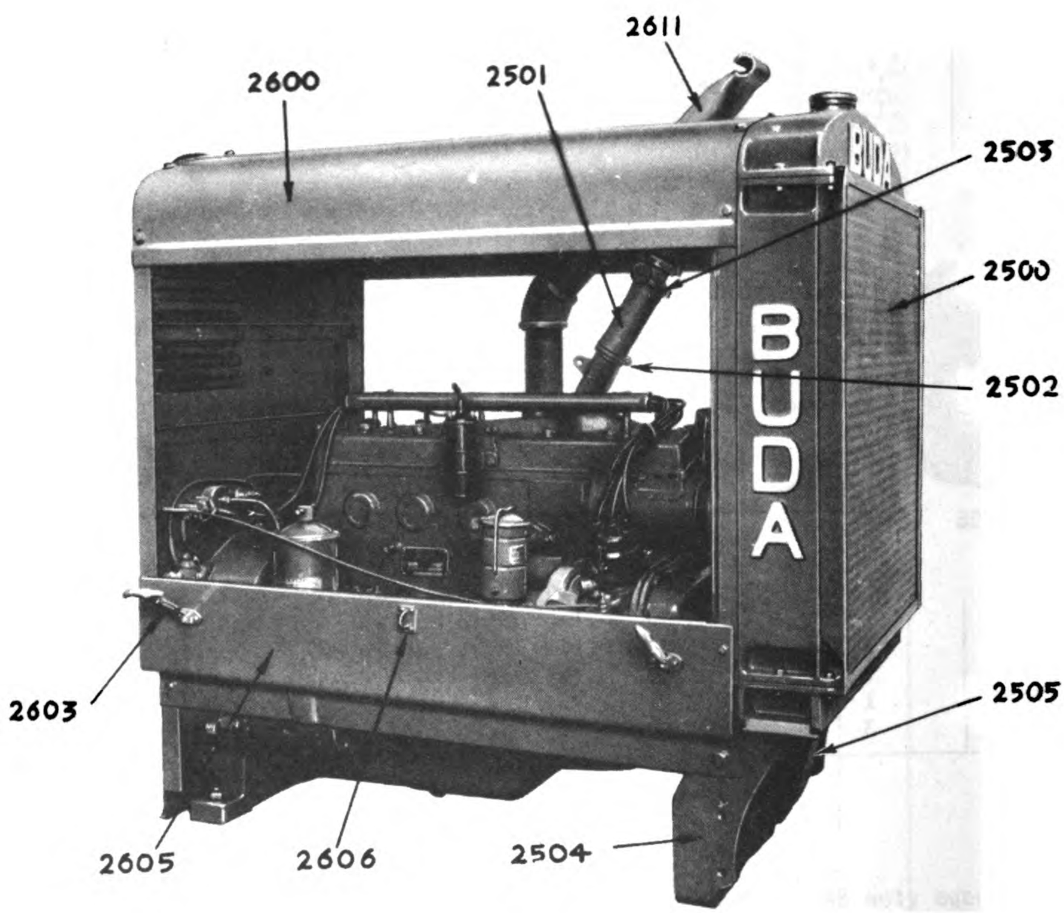
2325	1	H-12086	Fan drive pulley
	1	DE-51708	Fan drive pulley key
2326	1	H-12096	Fan belt
2327	1	1651	Fan bracket
	3	103026	Fan bracket stud nut 3/8-24 SAE

Always give Serial Number of Machine, Parts Number and Description.

STARTING CRANK

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2400	1	H-12237	**Starting crank 6-1/2" shank**

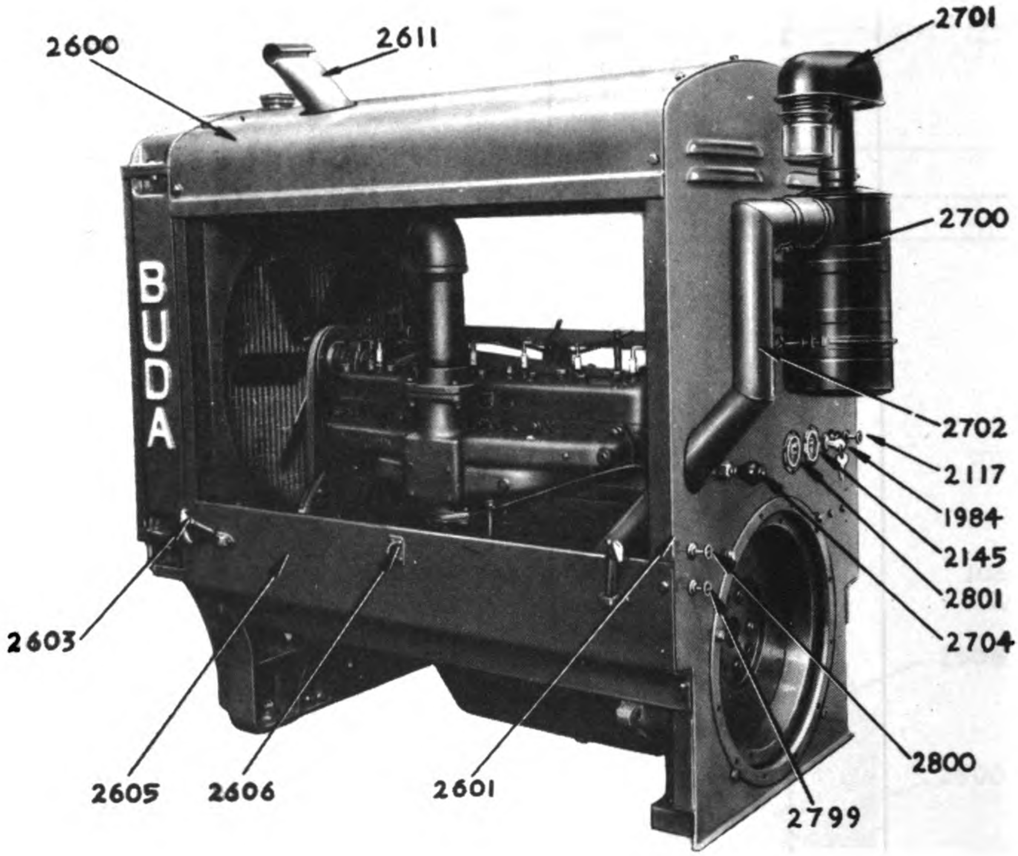
RADIATOR AND FRONT SUPPORT GROUP



RADIATOR AND FRONT SUPPORT - Continued

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2500	1	AP-6152	Radiator Assembly
	1	AP-4900	Radiator Shroud
	1	AP-5550	Radiator outlet connection
	1	AP-5057	Radiator outlet connection gasket
	2	100134	Radiator outlet connection capscrew 3/8"-16 x 1" USS
	2	103321	Radiator outlet connection lockwasher 3/8"
	1	AP-3067	Radiator outlet connection hose
	2	AP-6081	Radiator outlet connection hose clamp
	1	AP-5077	Radiator inlet adaptor
	1	AP-5056	Radiator inlet adaptor gasket
	4	100133	Radiator inlet adaptor capscrew 3/8"-16 x 3/4" USS
	4	103321	Radiator inlet adaptor lockwasher 3/8"
	1	AP-5151	Radiator inlet connection
	1	GE-144	Radiator inlet connection gasket
	2	100133	Radiator inlet connection capscrew 3/8"-16 x 3/4" USS
	2	103321	Radiator inlet connection lockwasher 3/8"
2501	1	AP-657	Radiator inlet connection hose
2502	2	AP-6081	Radiator inlet connection hose clamps
	1	AP-5065	Radiator pad cover
	1	AP-5057	Radiator pad cover gasket
	2	100134	Radiator pad cover capscrew 3/8"-16 x 1" USS
	2	103321	Radiator pad cover lockwasher 3/8"
	2	AP-5246	Radiator shim pad
	1	106645	Radiator pipe plug, 1-1/4" countersunk
	1	42E-1/4"	Radiator Drain cock
2503	1	AP-4755	Thermostat (hose type)
2504	1	AP-5140	Power Plant Front Support
	2	AP-3068	Power Plant Front support shim
	2	108600	Power Plant Front support capscrew to engine 1/2" - 13 x 1-7/8" USS
	2	103323	Power Plant Front support lockwasher 1/2"
	2	102637	Power Plant Front support nuts 1/2"-13
2505	1	AP-3187	Starting crank support bracket
	4	100134	Starting crank support bracket capscrew 3/8"-16 x 1" USS
	4	103321	Starting crank support bracket lock-washer 3/8"
	4	117062	Starting crank support bracket nuts 3/8"-16 USS

SHEET METAL AND MUFFLER



REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2600	1	AP 5226	Hood top
	16	100121	Hood top capscrew 5/16-18 x 3/4" USS
	16	102634	Hood top capscrew nuts 5/16-18 USS
2601	1	AP-6037	Rear panel
	2	100121	Rear panel capscrew 5/16-18 x 3/4" USS
	2	102634	Rear panel capscrew nuts 5/16-18 USS
2602	2	AP-6065	Side doors
2603	4	AP-5136	Side door latch handle
2604	4	AP-5137	Side door latch handle catch
	16	110499	Side door latch handle bolts #10-24 x 3/8" USS
2605	1	AP-6062	Side door sills R.H.
2605	1	AP-6063	Side door sills L.H.
	8	100121	Side door sill capscrew 5/16-18 x 3/4" USS

SHEET METAL AND MUFFLER (Continued)

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
	8	102634	Side door sills capscrew nuts 5/16-18 USS
2606	2	AP-6064	Hasps and Staples (For padlock)
2611	1	AP-3162	Muffler (crimped typed)
	1	AP-6355	Muffler pipe nipple
	1	R1-707	2-1/2" I.P.S. 45° muffler pipe elbow

Air Cleaner

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2700	1	AP-6557	Air Cleaner Donaldson A-6605
2701	1	AP-6565	Air cleaner precleaner Donaldson X-1357-A
	2	AP-6000	Air cleaner bracket
	2	AP-6014	Air cleaner bracket spacer
	4	100134	Air cleaner bracket capscrew 3/8-16 x 1" USS
	4	117062	Air cleaner bracket capscrew nuts 3/8-16 USS
2702	1	AP-6128	Air cleaner tube
	2	AP-5235	Air cleaner tube hose
	4	AP-6081	Air cleaner tube hose clamps

Miscellaneous

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2799	1	AP-4712	Spark control
2800	1	AP-6157	Throttle Assembly
	1	AP-4713	Choke control
	1	AP-4792	Choke control clip
	1	100764	Choke control clip screw #10-32x1/2"SAE
	1	103101	Choke control clip screw #10-32 SAE
2801	1	AP-3883	Oil pressure gauge
	1	AP-4781	Throttle control rod swivel
	1	AP-4782	Throttle control rod swivel collar
	1	112865	Throttle control rod swivel screw #8-32 x 3/16" USS

Governor Control

REF.NO.	NO.REQ.	PART NO.	DESCRIPTION
2704	1	DE-51682	Governor Control Assembly
	2	DE-51678	Governor control clamp
	1	DE-51679	Governor control swivel
	1	107761	Governor control swivel cotter 1/16" x 5/8"
	1	106263	Governor control swivel washer 3/8"
	1	110498	Governor control swivel setscrew #10-24 x 1/4" USS

NUMERICAL INDEX

BUDA MODEL HP 298 ENGINE

"No. Req." is total for entire parts list.
Prices subject to change without notice.

Part Number	Page No.	No. Req.	Unit Price
R-1-707	639	1	.00
T1S10-6	623	1	.05
B3-22E	623	1	9.00
T8S8-7	623	1	.05
T8S8-10	623	1	
T8S10-9	624	2	.05
T8S10-13	624	1	.05
T8S31-16	624	2	.10
CR-9-43	623	1	.15
T15B6-4	624	2	.05
CUS-21	620	1	1.00
T21S8	624	1	.05
C21-106	623	1	1.10
T22S8	624	1	.05
C23-243	623	1	.75
CUS-24	620	1	1.00
C24-10	623	1	1.20
X-28	633	1	.05
C28-67	623	1	.75
JCUS-31	620	1	.10
JCUS-32-34	620	1	1.50
C36-18	623	1	.85
C38-14A	623	1	2.40
CSB-41	620	1	5.00
JCUS-41	620	1	.10
C41-9	623	1	.25
T41-10	624	1	.05
42E-$\frac{1}{4}$"	637	1	.50
T43-6	624	2	.05
T43-103	624	2	.05
T45-8	624	1	.05
C46-6	623	1	.35
CS-50	620	1	.20
CS-51	620	1	.05
C51-3	623	1	.75
CS-52	620	1	.05
C52-3	623	1	.45
C52-6	623	1	.75
C54-1	623	1	.60
T56-2	624	1	.05
T56-5	624	1	.05
T56-10	624	1	.05
T56-23	624	2	.05
T56-24	624	3	.05
T56-36	624	1	.05
T56-48	624	1	.05
C57-1	623	1	.40
CT63-2	623	1	.05
CT-63-2	623	1	.05
CT63-4	623	1	.05
C66-5	623	1	.75
C71-6	623	1	.90
T73-15	623	2	.05
C76-21	623	1	.85
C81-3	623	1	.75
X-82	633	2	.05
C85-6	623	1	.90
CR88-2	623	1	.10
CT91-1	623	2	.10
CT-91-1	623	1	.10
C97-10	623	1	.80
CUS-100	620	1	3.75
C101-21	623	1	1.75
C105-86	623	1	.60
C106-2	623	1	.35
C109-2	623	1	.35
C110-1	623	1	.05
C111-17	623	1	.10
C111-62	623	1	.10
PA-117	614	1	.85
C120-6	623	1	.10
CR121-10	623	1	.05
CS-121-49	620	1	1.50
ASE-126	615	4	.12
C130-4	623	1	.05
CR-134-1	623	1	.20
C136-3	623	2	.05
C138-61	623	1	.05
C140-2	623	1	.05
C142-38	623	1	.25
GE-144	616	2	.08
	637		
ISE-148	624	1	.12
C148-9A	623	1	1.10
ISE-149	624	2	.05
C149-17	623	1	.40
C150-1	623	1	.20
RSE-155	610	12	.08
X-217	633	3	.06
SN-266	633	1	.15
CS-302-M	620	1	4.75
X-310	633	1	1.80
X-328	633	2	.50
X-330	633	1	2.70
X-425	633	1	.03
X-454	633	1	.06
X-461	633	1	.12
X-463	633	1	.06
X-532	633	1	.06
X-540	633	4	.04
X-557	633	1	.20
AP-657	637	1	.45
CUE-705	611	22	.04
CUE-763	621	5	.05
X-763	633	1	.10
CUE-824	616	1	.18

Part Number	Page No.	No. Req.	Unit Price
X-824	633	4	.06
X-846	633	1	.08
X888	633	1	.03
X-935	633	1	.10
1004	607	1	2.00
1005	607	4	1.75
1018	607	14	.34
1022-23	607	1	3.75
1022-23A	607	1	4.20
1022-23B	607	1	4.60
1022-23C	607	1	5.00
1022-23D	607	1	5.20
1024-25	607	4	3.30
1024-25A	607	4	3.75
1024-25B	607	4	4.00
1024-25C	607	4	4.20
1024-25D	607	4	4.40
1026-27	608	1	4.60
1026-27A	608	1	5.00
1026-27B	608	1	5.50
1026-27C	608	1	5.80
1026-27D	608	1	6.00
1028-29	608	1	6.60
1028-29A	608	1	7.15
1028-29B	608	1	7.50
1028-29C	608	1	7.70
1028-29D	608	1	7.90
1030	608	7	.04
1033	610	2	.22
1034	607	1	.30
1050	614	4	.04
1054	614	4	.15
	621		
1061	611	1	2.20
1070	610	1	1.60
1078	621	1	.20
1079	621	1	.10
1083	607	22	.15
1152	621	1	3.50
DE-1169	620	1	.10
1223	610	18	.20
1225	610	6	.95
1253	611	6	.38
1255	611	12	.08
1261	611	12	.20
1266	611	6	7.75
SN-1270	633	1	.20
1284	611	1	35.00
1304	609	12	.04
1305	610	6	.08
1307	612	1	.04
1308	612	1	.25
1309	612	1	.55
1310	609	6	.90
1315	609	6	.40
1316	612	2	.25
1317	612	4	.10
1318	612	1	.14
1341	612	1	.03
1345	609	6	.40

Part Number	Page No.	No. Req.	Unit Price
1346	610	1	.34
1351	612	1	28.50
1352	613	1	2.25
1353	613	1	.15
1357	607	4	.06
1359	610	4	.02
1392	612	1	33.00
1438	608	2	.04
1452	613	1	2.50
1458	613	1	.10
1508	617	1	.05
1509	617	1	.65
1510	617	1	.65
1526	618	1	.04
1530	618	1	.06
1531	618	1	11.00
1535	617	1	.04
1539	618	2	.10
1540	618	1	.06
1541	618	1	.06
1546	617	1	.04
1547	617	2	.06
1560	608	6	.04
1561	608	2	.04
1562	617	1	.20
1563	617	1	.20
B1584x1	623	1	7.00
1618	635	1	1.60
1620	635	1	.16
1622	635	1	4.30
1628	635	1	.16
1639	616	1	.04
1645	616	2	.04
	624		
1651	635	1	2.75
1655	607	2	.06
1656	607	1	.06
1705	621	1	.16
1708	626	1	1.50
1709	626	2	.16
1710	626	2	.15
1716	626	1	3.00
1733	627	1	24.00
1735	626	1	3.50
1743	631	1	1.60
1755	626	1	3.50
1811	624	2	.10
	633		
1812	624	1	1.60
1863	633	1	1.25
A-1938	633	1	1.80
2034	607	1	.10
2065	610	4	.08
2074	621	4	.08
V-2084	617	2	.04
C-2283	635	1	.02
2313	609	12	.28
2605	635	1	6.25
C-2674	635	1	.16

Part Number	Page No.	No. Req.	Unit Price	Part Number	Page No.	No. Req.	Unit Price
2725	626	1	.05	C-4832	635	1	.08
C-2815	635	2	3.30	DE-4870	607	8	.06
				AP-4900	637	1	
2903	624	1	5.00	DE-4999	624	2	.20
C-2961	635	1	.40	AP-5056	637	1	.10
C-2962	635	1	.40	AP-5057	637	2	.06
C-2963	635	1	.20	AP-5065	637	1	.20
3040	615	2	.06	AP-5077	637	1	1.75
G-3040	633	2	.30	G-5113	633	1	.10
AP-3067	637	1	1.00	AP-5136	638	4	.35
AP-3068	637	2	.30	AP-5137	638	4	.35
C-3157	635	1	.24	AP-5140	637	1	15.00
C-3158	635	1	.16	AP-5151	637	1	2.00
C-3159	635	1	.40	G-5210	633	2	.10
AP-3162	639	1	5.80	AP-5226	638	1	8.50
G-3168	633	1	.26	AP-5235	639	2	.15
AP-3187	637	1	2.00	AP-5246	637	2	.20
3227	610	6	.50	DE-5476	607	7	.02
3230	609	6	1.00	5529	618	1	.20
DE-3284	618	1	1.30	AP-5550	637	1	1.50
3312	609	6	1.40	5654	607	1	.16
3360	612	1	.50	D-5707	623	1	1.10
3432	613	1	.30	AP-5816	626	1	.60
G-3494	633	4	.06	5864	631	1	3.50
3545	618	1	.05	5875	617	1	14.50
3729	626	1	.05	5876	617	1	4.75
3731	626	1	.50	5879	617	1	2.50
C-3837	635	1	.15	5880	617	1	2.50
AP-3883	639	1	2.25	5899	617	1	2.75
3943	607	14	.10	G-5950	633	2	.16
G-3947	633	1	.50	AP-6000	639	2	.70
3998	626	1	3.20	AP-6014	639	2	.20
4030E	611	1	.20	G-6026	633	1	1.80
DE-4134	613	1	.20	AP-6037	638	1	9.25
G-4159	633	1	.25	AP-6062	638	1	4.20
G-4200	633	1	4.50	AP-6063	638	1	2.10
G-4201	633	1	6.90	AP-6064	639	2	.20
G-4203	633	1	2.40	AP-6065	638	2	6.50
G-4205	633	1	1.80	AP-6081	616	10	.05
G-4206	633	1	1.80		637		
G-4208	633	1	1.20	AP-6128	639	1	9.25
G-4209	633	1	.05	AP-6152	637	1	86.00
G-4211	633	1	1.80	AP-6157	639	1	.75
G-4305	633	1	.90	AP-6297	628	1	3.25
G-4306	633	1	1.10	AP-6355	639	1	.95
G-4449	633	2	.60	AP-6557	639	1	11.00
				AP-6565	639	1	2.40
4595	620	1	.06	G-6905	633	1	.60
4614	635	1	.15	10013A	639	4	
4645	616	1	1.75	H-11141	617	1	.10
AP-4712	639	1	.75	H-11175	607	1	.40
AP-4713	639	1	.60	H-11274	614	1	7.00
4740	628	1	3.00	H-11275	612	1	6.50
AP-4755	637	1	11.00	H-11276	614	1	.35
4757	625	1	8.50	H-11277	614	1	.15
4776	633	1	.35	H-11279	612	1	5.75
AP-4781	639	1	.20	H-11280	613	1	5.25
AP-4782	639	1	.20	H-11281	616	1	1.20
AP-4792	639	1	.20	H-11288	616	1	.08

Part Number	Page No.	No. Req.	Unit Price
H-11307	623	1	22.50
H-11340	626	1	.65
H-11345	631	1	.40
H-11363	615	1	.04
H-11366	616	1	.90
H-11419	626	1	1.20
H-11566	616	1	1.65
H-11589	615	1	6.60
H-11591	616	1	2.25
H-11593	615	1	5.75
H-11595	615	1	.60
H-11596	615	1	.25
H-11597	615	1	.12
H-11598	616	2	.08
H-11599	616	2	.20
H-11600	616	2	.35
H-11601	616	2	.08
H-11602	616	2	.05
H-11603	616	2	.35
H-11604	615	1	.05
H-11605	615	1	.12
H-11629	626	6	.65
H-11677	620	1	16.00
H-11704	607	1	7.00
H-11718	615	1	1.40
H-11719	615	1	.65
H-11720	615	1	.50
H-11721	615	1	.15
H-11722	615	1	.04
H-11730	609	3	3.40
H-11731	609	12	1.00
H-11750	615	1	9.50
H-11751	615	1	3.85
H-11773	615	1	1.50
H-11805	609	12	.10
H-11807	609	12	.06
H-11816	615	1	29.00
H-11872	626	1	1.65
H-11902	633	1	1.35
H-11928	633	1	6.50
H-11935	615	1	6.50
H-11950	608	4	.15
H-11951	607	1	3.85
H-11960P	610	6	5.35
H-12000	618	1	2.85
H-12030	618	1	.50
H-12035	618	1	.30
H-12050	620	1	1.75
H-12086	635	1	6.00
H-12092	608	1	4.40
H-12096	635	1	2.25
H-12101	635	1	15.00
H-12109	621	1	16.00
H-12111	621	5	.16
H-12117	631	1	2.50
H-12148	631	1	2.50
H-12175	629	1	25.00
H-12178	618	1	.16
H-12237	636	1	3.50

Part Number	Page No.	No. Req.	Unit Price
H-12245	608	1	2.50
H-12280	609	24	.08
H-12288	607	1	3.85
H-12289	608	2	.05
H-12295	607	1	.70
H-12329	609	12	.40
H-12396	607	1	240.00
H-12404	610	6	5.10
H-12410	624	1	2.20
H-12560	616	1	1.35
H-12599	621	1	42.00
26153	626	1	.05
33436	625	1	.01
DE-40036	612	14	.15
K-40125	621	1	48.00
K-40166	633	1	25.40
K-40234	624	1	1.00
DE-40317	618	1	.28
DE-40318	618	1	.35
DE-44122	628	1	.90
DE-51170	620	1	4.00
DE-51186	608	1	90.00
DE-51302	607	1	.60
DE-51678	639	2	.30
DE-51679	639	1	.55
DE-51682	639	1	9.75
DE-51708	635	1	.06
DE-55139	608	1	.12
DE-56043	621	1	24.00
DE-56103	607	2	.55
DE-56119	620	1	1.05
DE-56131	608	2	1.25
DE-56165	608	2	.08
DE-56269	620	1	.20
DE-56270	620	1	.15
100109	618	1	.04
100111	618	2	.04
100121	620	38	.04
	621		
	624		
	626		
	633		
	638		
100122	617	8	.04
	624		
	631		
100133	637	6	.04
100134	616	14	.04
	620		
	637		
100135	614	3	.04
100137	610	10	.06
	626		
	628		
100139	616	1	.06
100149	613	3	.06
100764	639	1	.04
102634	638	26	.02
	639		
102635	614	12	.02

Part Number	Page No.	No. Req.	Unit Price
102637	637	2	.04
103025	615	4	.02
103026	635	3	.02
103028	611	26	.04
	615		
	621		
103088	630	1	.02
103101	639	1	.02
103319	628	2	.01
103320	617	16	.01
	624		
	626		
	635		
103321	610	38	.01
	614		
	626		
	637		
103323	635	3	.01
	637		
103326	635	1	.02
103564	633	1	.04
103583	616	1	.02
103720	613	1	.04
103730	616	1	.10
103865	612	2	.04
103875	607	2	.10
103877	607	1	.04
103883	635	1	.02
103892	617	1	.04
103895	607	6	.04
	615		
103896	607	1	.06
103906	615	1	.04
104924	618	1	.06
105453	613	3	.04
	617		
106263	639	1	.04
106319	617	6	.04
106324	626	3	.04
106325	624	4	.04
106330	614	34	.04
	616		
	618		
	631		
106331	616	2	.04
106495	627	7	.01
106496	625	9	.01
	628		
	630		
106497	628	2	.01
	630		
106500	621	5	.02
106630	621	3	.08
106645	637	1	.15
106973	621	6	.04
	635		
106974	614	5	.04
107715	626	1	.01
107728	630	1	.05

Part Number	Page No.	No. Req.	Unit Price
107761	639	1	.01
B-108157	635	1	4.50
108579	631	2	.02
108600	637	2	.08
110498	639	1	.02
110499	638	16	.04
110730	627	2	.01
112715	611	1	.06
112865	639	1	.01
113698	612	3	.04
113782	612	1	.04
113879	608	1	.04
114547	612	14	.08
114604	617	6	.01
114998	615	1	.30
115308	615	4	.04
115607	626	3	.01
115773	613	3	.20
115903	627	4	.01
117061	626	2	.02
117062	637	8	.02
120703	633	1	.08
120704	633	2	.08
121743	629	4	.02
121841	626	1	.01
121932	624	2	.04
122159	628	2	.01
122403	635	1	.06
124545	631	1	.04
124546	628	1	.02
131410	613	1	.04
131951	626	1	.01
132900	631	2	.01
134569	627	1	.05
135616	628	1	.01
137332	614	4	.20
138479	631	2	.10
138577	615	1	.05
141540	630	2	.01
141543	630	1	.01
802691	627	1	.05
802730	630	2	.01
802731	630	3	.01
802757	629	4	.01
804000	631	1	.05
804076	629	1	.05
805258	627	1	.05
805579	626	1	.20
805790	627	2	.01
806427	628	2	.01
806915	631	1	.10
808949	628	1	.40
809051	627	1	.05
809053	628	2	.10
809062	627	2	.05
	629		
809518	628	1	.55
809551	630	3	.05

Part Number	Page No.	No. Req.	Unit Price
809593	628	2	.05
	631		
809614	630	1	.05
809642	630	3	.10
809644	630	2	.05
809658	630	1	.05
809688	630	1	.10
809698	629	1	.30
809815	628	1	.05
809824	630	1	.02
809945	630	1	.05
809961	630	1	.05
810074	625	1	.02
810078	626	1	.02
810226	627	4	.10
810287	628	1	.07
810288	628	1	.06
810601	627	4	.50
810620	628	1	.10
810626	627	1	1.80
810627	627	1	1.80
810794	625	1	.01
811080	628	1	3.90
811124	626	2	.01
811194	628	1	5.50
811553	627	4	.05
811559	628	2	.07
811912	626	4	.05
812015	627	3	.10
	629		
812016	627	3	.10
	629		
812823	629	1	.20
813238	625	1	.50
813245	626	1	.01
813496	629	2	.50
813511	626	1	.02
813554	628	2	.10
814978	629	1	1.00
815018	631	2	.10
815839	627	1	1.50
816315	629	1	.05
816784	626	1	.05
816803	626	1	.05
817114	628	1	.10
817216	629	1	1.25
817220	630	1	.05
817224	630	1	.10
817313	627	3	.05
	629		

Part Number	Page No.	No. Req.	Unit Price
817314	627	3	.05
	629		
817532	630	1	.05
817807	629	1	7.50
818002	627	1	5.00
818222	625	2	.20
819104	630	1	.05
819362	628	1	.15
820517	630	3	.10
820445	625	1	.25
820524	630	1	.05
821150	625	1	.75
821160	626	1	.15
821604	625	1	.05
822622	625	1	1.50
822627	625	1	1.00
824735	625	1	.85
824738	625	1	1.50
826938	627	1	.10
828675	627	6	.05
	629		
833602	628	2	.05
903203	630	1	1.15
1835699	625	2	.10
1837832	625	1	.05
1838678	630	1	2.00
1839100	628	1	3.25
1847289	626	2	
1848038	625	1	.30
1849774	628	1	.05
1850025	631	1	.10
1855685	627	4	.05
1855701	630	1	.05
1855702	630	1	.10
1856056	631	2	.01
1857107	629	1	.01
1858749	629	1	.01
1858752	629	2	.01
1858753	629	2	.02
1858754	629	1	.10
1861076	627	2	.01
1862803	630	3	.01
1863510	629	1	1.00
1865182	627	1	.05
1866970	630	3	.01
1868330	630	3	.01
1869704	625	1	.45
1871838	626	2	
1872638	630	1	.50
1873937	631	1	.15
1880635	629	2	.05
	630		
1880642	627	1	.05

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