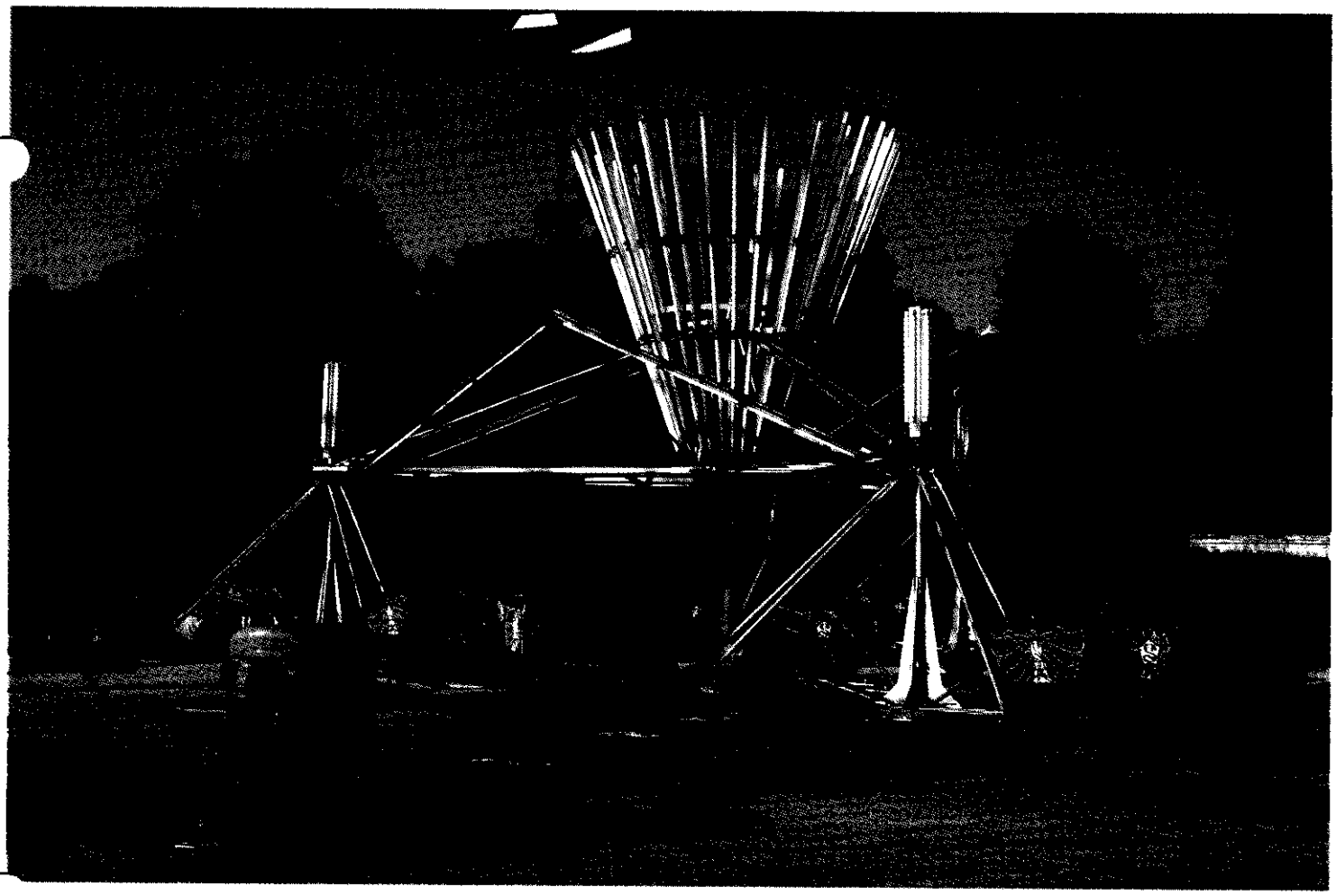


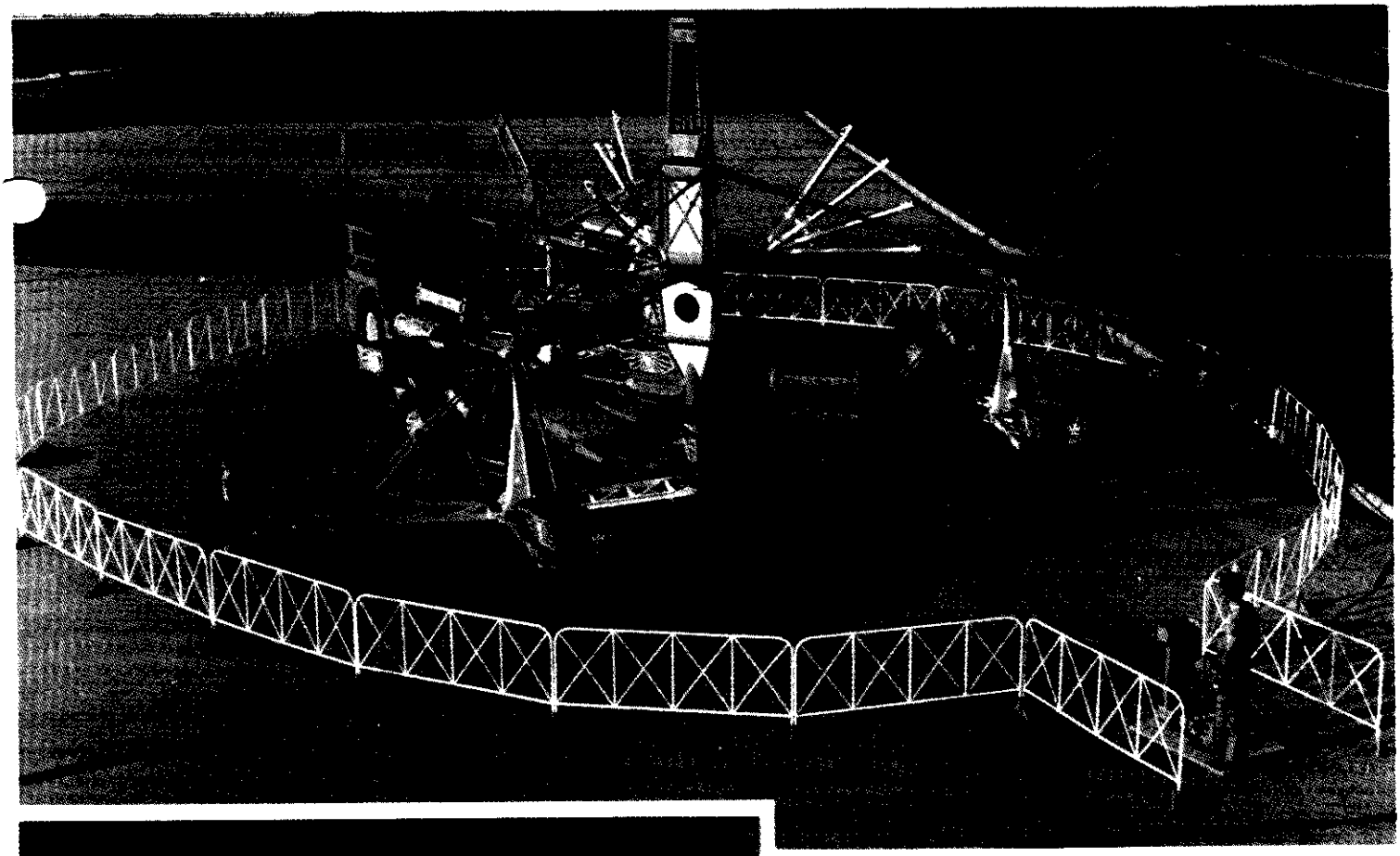
STANDARD & DELUXE SCRAMBLER®

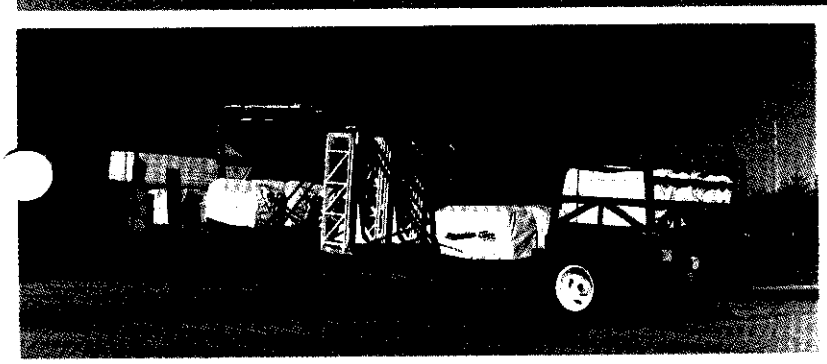
- Simultaneous Loading
- 12 Seat, 36 Passenger Capacity
- Electric Motor; Hydraulic Option Available
- Flourescent Lighting Standard; 30 Panel Funnel on Deluxe
- Proven Profit Potential

ELI BRIDGE COMPANY

800 CASE AVENUE JACKSONVILLE, ILLINOIS 62650 USA

800-274-0211 (217-245-7145) FAX 217-479-0103





"T.M.S." SCRAMBLER®

- 12 Seats, 36 Passengers, Simultaneous Loading
- Trailer Mounted; Easy Assembly and Disassembly
- Single Lever Speed Control/Hydrostatic Transmission
- Hydraulic Disc Brakes
- Fluorescent Lighting Standard;
- Programmed Incandescent TURBOLITES™ Optional
- Proven Profitable Midway Success

ELI BRIDGE COMPANY

800 CASE AVENUE JACKSONVILLE, ILLINOIS 62650 USA

800-274-0211 (217-245-7145) FAX 217-479-0103

INSTRUCTIONS

FOR

ERECTING

OPERATING

SERVICING

THE

Scrambler®

BIG ELI

MANUFACTURED BY THE

ELI BRIDGE COMPANY

INCORPORATED

800-820 CASE AVENUE

JACKSONVILLE, ILLINOIS 62650

AREA CODE 217 PHONE 245-7145

****

This set of instructions has been compiled for Big Eli SCRAMBLER

MODEL _____ SERIAL NUMBER _____

NAME _____

ADDRESS _____

CITY _____ STATE _____

NOTICE

SOME WORDS ABOUT SAFETY

THE BIG ELI SCRAMBLER RIDE HAS BEEN CAREFULLY DESIGNED AND BUILT WITH THE SAFETY OF YOUR PASSENGERS IN MIND. IT WILL PROVIDE THRILLING ENTERTAINMENT FOR YOUR PATRONS IF PROPERLY OPERATED AND MAINTAINED. AS WITH ANY AMUSEMENT RIDE, CARELESS OPERATION OF THE SCRAMBLER CAN CAUSE UNNECESSARY RISK TO PEOPLE. PROPER MAINTENANCE OF THE SCRAMBLER IS ESSENTIAL. PASSENGERS MUST NOT BE ALLOWED TO MISBEHAVE. FOLLOWING THESE BASIC RULES WILL HELP YOU PROTECT YOUR PATRONS FROM INJURY AND YOURSELF FROM LAWSUITS:

1. READ THIS ENTIRE INSTRUCTION MANUAL THOROUGHLY BEFORE OPERATING THE SCRAMBLER. REQUIRE ANY OTHER PERSON OPERATING THE SCRAMBLER TO READ THIS INSTRUCTION MANUAL THOROUGHLY AND COMPLETELY.

2. OPERATE THE SCRAMBLER ONLY AT OR BELOW THE MAXIMUM SPEED FOR WHICH IT HAS BEEN ADJUSTED BY ELI BRIDGE COMPANY (11 REVOLUTIONS PER MINUTE OF THE CENTER POLE WHEN POWERED BY GASOLINE ENGINE, AND 11.4 REVOLUTIONS PER MINUTE OF THE CENTER POLE WHEN POWERED BY ELECTRIC MOTOR.) THE FORCES ACTING ON THE SCRAMBLER AND ITS PASSENGERS RISE SHARPLY AS THE OPERATING SPEED IS INCREASED. THESE FORCES CAN REACH DANGEROUS LEVELS IF THE SCRAMBLER IS OVERSPEEDED.

3. DO NOT ALLOW ANYONE UNDER THE INFLUENCE OF DRUGS OR ALCOHOL TO GET ON THE RIDE. DO NOT ALLOW PRE-SCHOOL CHILDREN TO RIDE UNLESS ACCOMPANIED BY A RESPONSIBLE ADULT.

4. DO NOT PERMIT ANYONE UNDER THE INFLUENCE OF DRUGS OR ALCOHOL TO OPERATE THE SCRAMBLER.

5. DO NOT PUT THE RIDE INTO MOTION UNTIL THE HANDLEBAR ON EACH SEAT IS LOCKED.

6. OBSERVE YOUR PASSENGERS CAREFULLY AND CONTINUOUSLY. ANY PASSENGER WHO MIGHT STAND WHILE THE SCRAMBLER IS IN MOTION IS LIKELY TO BE INJURED. PERSONS EXTENDING THEIR ARMS FROM THE SEATS MAY THEREBY BE INJURED. IF ANY PASSENGER MISBEHAVES IN ANY WAY STOP THE RIDE IMMEDIATELY. REFUSE RIDES TO ANY PERSON WHO MIGHT ENDANGER HIMSELF OR OTHERS.

7. THE HANDLEBAR LATCHES ON THE SEATS HAVE BEEN PROPERLY ADJUSTED AT THE FACTORY BUT MAY, AFTER EXTENDED USE AND WEAR, REQUIRE READJUSTMENT. A HANDLEBAR THAT DOES NOT LATCH IS UNSAFE. WITHOUT THE SECURITY OF THE HANDLEBAR, THE PASSENGER MAY, WITHOUT REALIZING THE CONSEQUENCE, MOVE FORWARD OR STAND UP, EXPOSING HIMSELF TO EXTREME DANGER OF BEING THROWN FROM THE RIDE. INSPECTION OF THE LATCHES IS QUICK AND EASY. SECTION "J" IN THE MANUAL EXPLAINS IN DETAIL HOW TO PERFORM THIS MAINTENANCE.

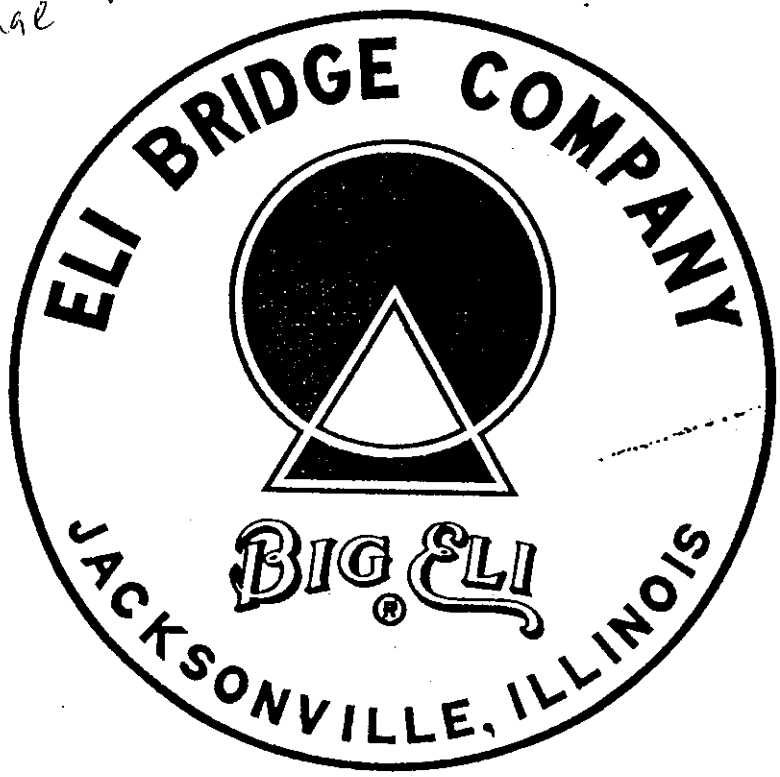
Operation and Maintenance

of

Big Eli Scrambler

Change in bearing change on THIS

Change in



ELI BRIDGE COMPANY

800 CASE AVENUE
JACKSONVILLE, ILLINOIS 62650
PHONE 217/245-7145

800-637-7444

"C"

Big Eli Scramblers first went into service in 1954. Nearly every Scrambler delivered since that time is still in service. From the beginning the Big Eli Scrambler was designed and built for easy operation, maintenance, and replacement of parts as needed. Eli Bridge Company has always been ready to help with any problems that occur. Owners and operators have called or written the factory about their problems of operation and maintenance, and through the years these problems have tended to be much the same. These suggestions cover those questions most frequently asked. This manual is divided into four parts: 1) Operation; 2) General Maintenance; 3) Seats; and 4) Lubrication.

Recently, owners of a TMS, in replacing these bearings, discovered the spherical outer races of two bearings to be badly cracked, yet still together. They sent them to us. It was the first time we were able to see bearings in this condition, and we felt sure that they would give us valuable information about what was happening. We sent the bearings on to the Sealmaster Bearing Company for their analysis.

We want to emphasize that each of the four failed or about to fail bearings on the TMS Scramblers were not replaced according to our original recommendations of 3,000 hours or four years, whichever came first. These four bearings had been used five and six seasons. Had they been replaced when they were supposed to have been, then failure might never have occurred.

We have been working closely with the Sealmaster people, and we expect to have a modification available in the near future, at which time you will be informed. For the present we feel that it is imperative that these bearings be replaced regularly. On ground-model Scramblers replacement after 3,000 hours or four years, whichever comes first, still seems to be a proper replacement schedule. However, indications are that this is not conservative enough for the TMS Scrambler, and so at this time we are establishing a new replacement schedule:

The TMS Scrambler top sweep Sealmaster SF-47 ball bearing flange units must be replaced every [redacted] years, whichever comes first.

We suggest that you tag or mark the installation date on each new bearing, so that you can be sure when each should be replaced.

We know that our recommendations for replacing these bearings have often been ignored in the past. From what we have seen in 1984, however, this bulletin must be taken as a warning of the most serious nature. Failure of one of these bearings during operation can create a disaster.

The safety of your passengers and equipment demands that the [redacted] season replacement schedule be followed faithfully. We consider this replacement schedule to be mandatory.

William C. Deem

William C. Deem
Chief Engineer
ELI BRIDGE COMPANY

LOSS CONTROL

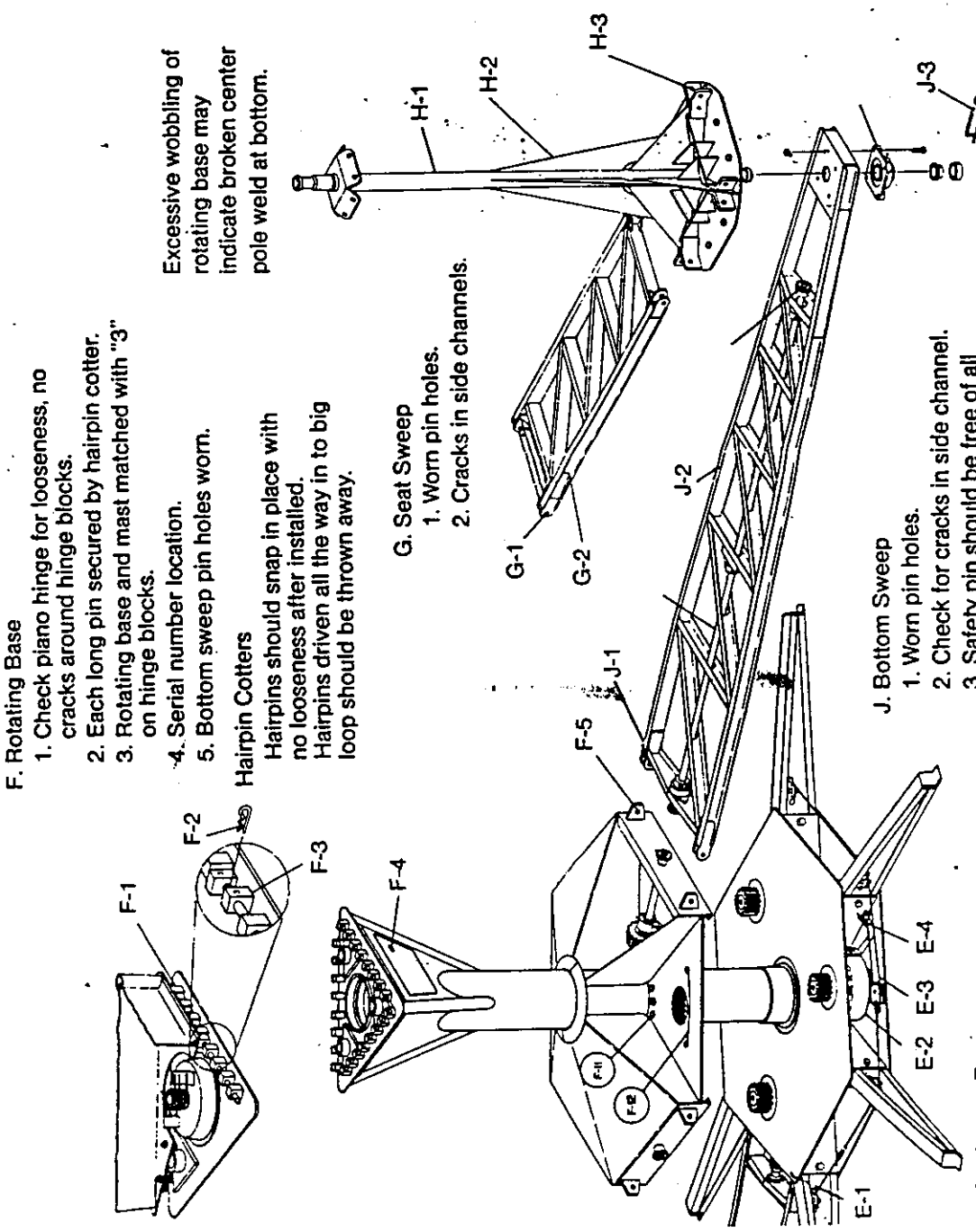
Amusement Ride Inspection Guide

Scrambler

Manufacturer: Eli Bridge Company

Speed: 11.0 RPM gas; 11.4 RPM electric

Capacity: 12 seats



F. Rotating Base
1. Check piano hinge for looseness, no cracks around hinge blocks.
2. Each long pin secured by hairpin cotter.
3. Rotating base and mast matched with "3" on hinge blocks.
4. Serial number location.
5. Bottom sweep pin holes worn.

Hairpin Cotters
Hairpins should snap in place with no looseness after installed. Hairpins driven all the way in to big loop should be thrown away.

Excessive wobbling of rotating base may indicate broken center pole weld at bottom.

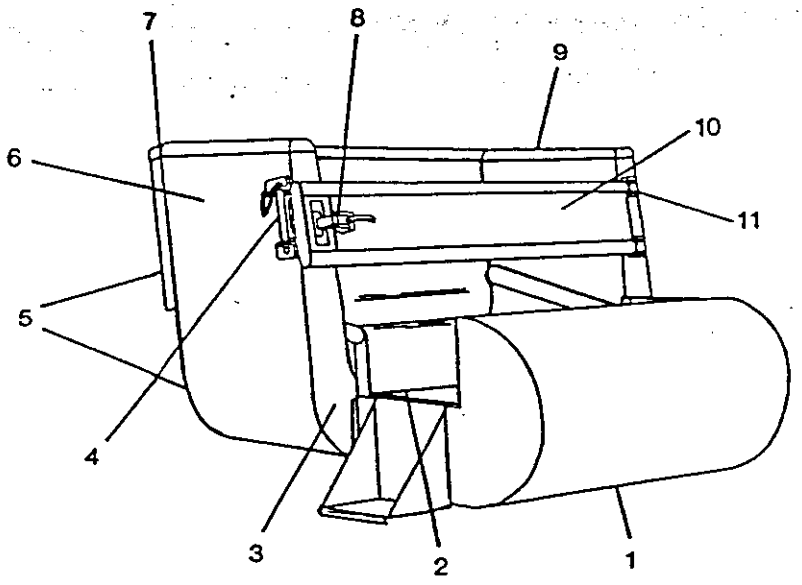
G. Seat Sweep
1. Worm pin holes.
2. Cracks in side channels.

J. Bottom Sweep
1. Worm pin holes.
2. Check for cracks in side channel.
3. Safety pin should be free of all obvious defects.

H. Unit Pole
1. Check for cracks anywhere along length of main tube.
2. Gussets must be in place.
3. Worm pin holes for seat sweep.

E. Stationary Base
1. Serial number location.
2. Both brakes functioning and at least 1/8" of lining on each brake shoe.
3. Equalizer used.
4. Spring on each brake arm.

Note: Sweeps travel in a 5 point star pattern.



Seat

1. Cracks or rivets missing in footbottom, wood board in bottom of footbottom.
2. Lip on bottom of seat cushion extends under lip of footbottom.
3. Cracks in front rib: Where handlebar strikes front of seat. Where hinge blocks are bolted on. Where handlebar hinge rubber bumpers are attached.
4. California latch.
5. Back sheet rivets missing.
6. Cracks or rivets missing in seat body, crushed ribs.
7. No cracks where back top tray connects to end top tray, both sides.
8. Latch and striker engagement, roller in striker functioning. Bent or cut striker. At least 1/4" engagement, where seat structure is sound. Check for latch body and sliding bolt wear.
9. No dry rot in wood boards, remove boards to check for cracks in structure underneath. Boards should be free of splinters.
10. On back of handlebar, rubber bumpers in place. Warning decal fully readable. Lap bar bolts tight and bar swings freely. Handlebar web not worn through where lap bar bumps.
11. Nyliners and hinge pins snug. If worn, excess play is evident at door handle and door may ride on striker plate.

No holes worn through inside skin under seat cushion. Repair patches to be made of structural aluminum, not steel or soft aluminum. Seat equipped with end cushion at right end. No broken air-locks, in seat, footbottom, or step.

SCRAMBLER MOTION.

The main center pole turns in a clockwise direction, while the unit poles turn counterclockwise. This causes each seat to trace a "star" pattern back and forth across the operating circle. As each seat reaches the outside of the circle it comes to a dead stop. From a dead stop, it picks up speed so that by the time it is passing the center of the circle it is going about 25 miles per hour. This requires about 1.2 seconds, and by the time another 1.2 seconds have elapsed the seat has again come to a dead stop.

For normal operation the seat must move in its proper path. Watch the way one seat moves. If you were to look down from above, suppose that when the seat reaches the outside of the operating circle you call that the 12:00 o'clock position. The next time that that seat reaches the outside of the operating circle on that side it should be about in the 11:30 position. In other words, the place where one particular seat reaches the outside of the operating circle moves in a counterclockwise direction. If it does not, if you see that the seat is going directly back and forth to exactly opposite positions, or is in fact advancing in a clockwise direction, DO NOT OPERATE THE RIDE. YOU HAVE A CONDITION THAT MUST BE CORRECTED.

" Also, if you see the passengers sliding from one side of the seat to the other, " AND THEY ARE NOT TRYING TO DO SO, then this is another sign that something is wrong.

One or more of the following things may exist:

1. The Scrambler is being operated faster than 11 rpm with gasoline engine, or 11.4 rpm with electric motor.
2. The slip clutches are too loose, so that they cannot turn the unit poles properly.
3. The slip clutch disks have gotten grease on them from over-lubrication. This causes the slip clutches to function improperly.

Grease on the clutch disks can be very tricky. The clutch may appear to work normally for a long time, and then suddenly, right in the middle of a ride, start slipping excessively. There is no reason for grease to be on the clutch disks, but a careless operator with a little grease can ruin perfectly good clutch disks. If grease gets on your clutch disks do not try to clean them; replace them.

To repeat, whenever you see a seat advancing around the circle in a clockwise direction, stop the ride and do not carry any more passengers until after you have corrected the problem. (See maintenance information on the slip clutches.)

A Scrambler operating incorrectly in this way changes the whole "feel" of the ride. Instead of being directed just to the right end of the seat, the passengers may move to the left and forward as well. This will make the passengers feel insecure, and in fact it may put them in actual danger because this is not the normal way in which a Scrambler should operate. They learn to brace themselves to resist the normal forces, but sometimes do not know how to handle these strange forces.

Since the side pressures are directed to the right, as a general rule the heaviest person should be seated next to the outside, nearest the door opening, with lighter persons to his left.

1. A man should normally be seated to the outside with his lady seated to his left.
2. Children riding with parents should be seated to the far left and not between them.

Do not allow pre-school children to ride without a dependable adult. The child should be seated either on the lap of the adult or to the left of the adult, so that the child will not be squeezed. Children from 6 to 12 years can usually take care of themselves, but they should be watched very carefully by the operator. If the operator sees any tendency for a child to move about in the seat or to show that he is not holding on as well as he should, the operator should stop immediately and not continue the ride until he is certain that the child is secure. Children who do not follow the operator's instructions should be removed from the ride.

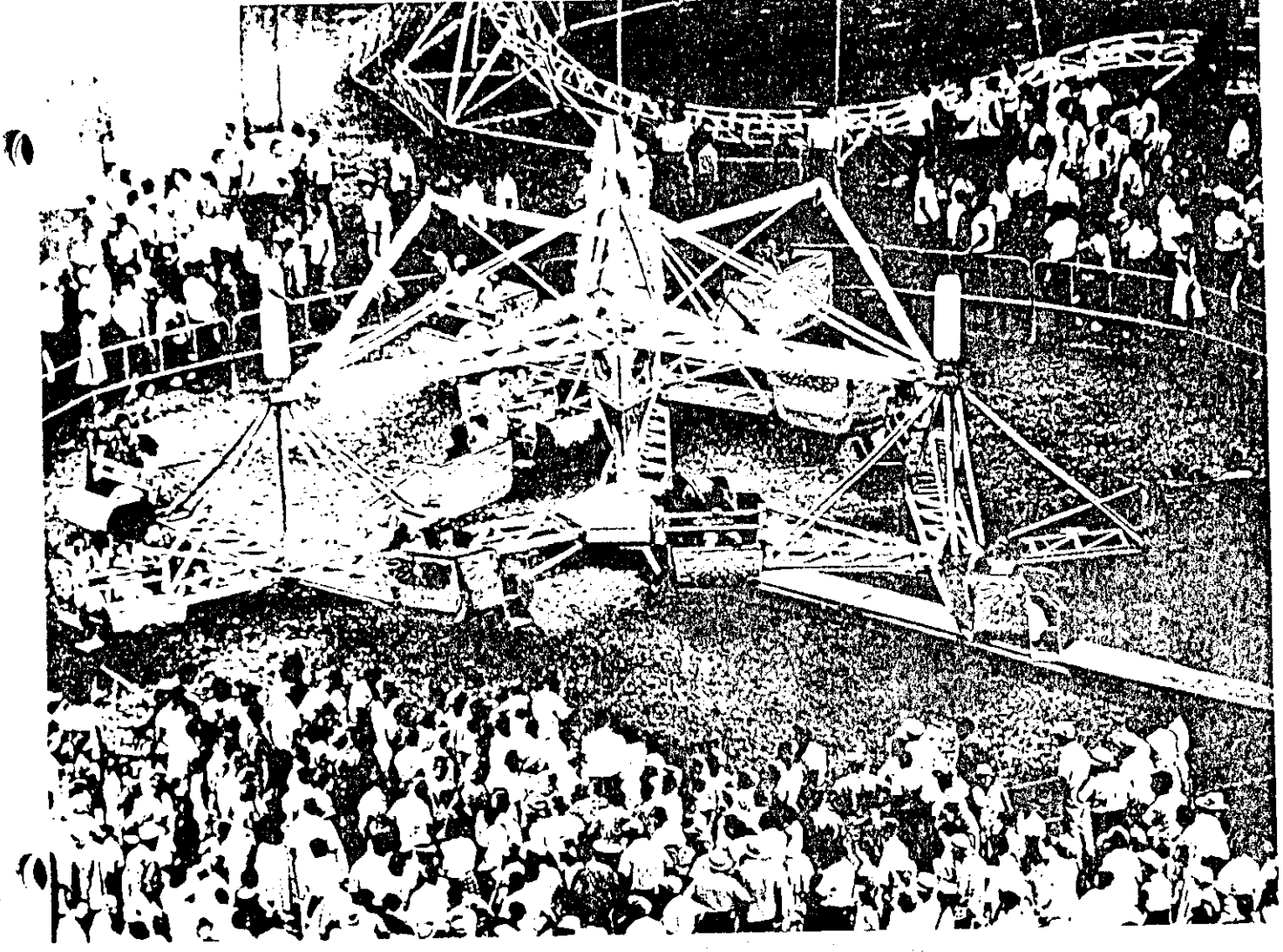
PASSENGER SAFETY.

The passengers can climb into the seats by themselves. With a large crowd, an extra man or two can help to keep the people moving. The handlebar on the seat will usually lock itself if the passengers do not do it. It does not need the attention of the operator in most cases, but the operator must not fail to observe whether all handlebars are locked, and lock any that are not already locked. But be sure that the lap bar in each seat swings freely, with no binding in the hinges.

The handlebar latches on the seats have been properly adjusted at the factory but may, after extended use and wear, require readjustment. A handlebar that does not latch is unsafe. Without the security of the handlebar, the passenger may, without realizing the consequence, lean forward or stand up, exposing himself to extreme danger of being thrown from the ride. Inspection of the latches is quick and easy. This is covered in the "seat" section.

The passengers must remain seated at all times while the Scrambler is in operation. Occasionally someone gets the idea to change positions in a seat with another person. It is almost impossible to change without opening the handlebar and at least one of the passengers standing. This is extremely dangerous and should never be tolerated. That is why the decal is placed on the back of each handlebar, which says, "CAUTION: While Scrambler is in Motion:

- Keep Handlebar Closed
- Do Not Stand Up"



No. A-1

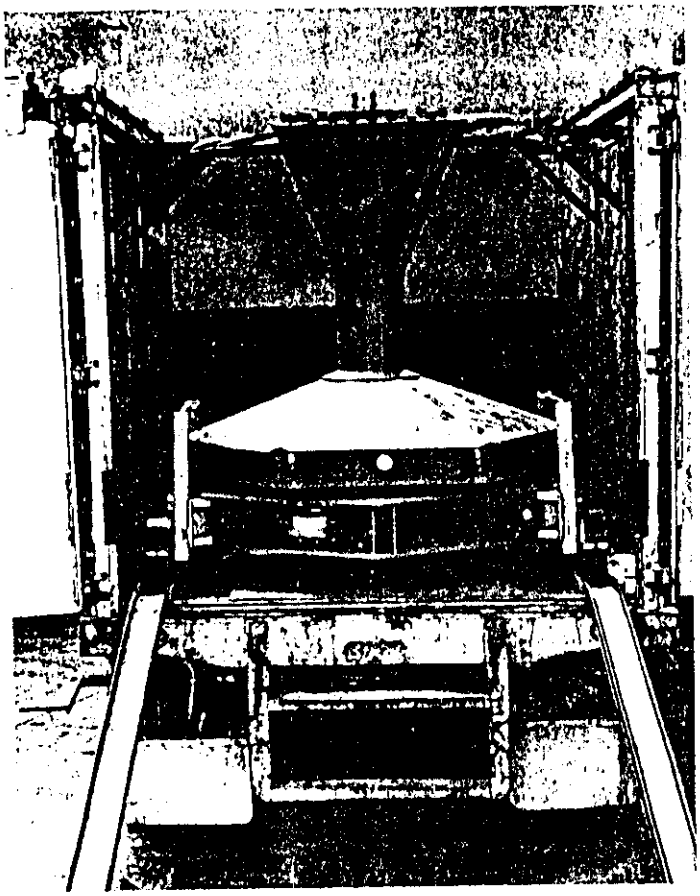
GENERAL DESCRIPTION

The SCRAMBLER, which is shown in Picture No. A-1 is a flat ride which rotates about a large center pole. This center pole is made of three parts: the mast, which is the removable top section; the rotating base; and the stationary base. The rotating base remains on the stationary base when the SCRAMBLER is disassembled. Extending from the center pole are three top and three bottom sweeps. The top sweeps are supported by the top sweep tie rods. The unit poles on the ends of the sweeps hang from the top sweeps, and the bottom sweeps are locked to the bottoms of the unit poles. There are four seat sweeps pinned to the bottom of each unit pole, and the outer ends of the seat sweeps are supported by the seat sweep tie rods, which pin to the top of the unit pole. Seat brace tie rods fasten to the lower part of each unit pole. Each seat is attached to the SCRAMBLER by three pins: two of them connect the bottom of the seat to the seat sweep, and the third pin fastens the seat brace tie rod to the top of the seat. Three drive unit sections connect the stationary base to the power unit truck which is located outside the operating circle.

The main center pole turns in a clockwise direction, while the unit poles turn counterclockwise. This causes each seat to trace a "star" pattern back and forth across the operating circle. As each seat reaches the outside of the circle it comes to a dead stop. From a dead stop, it picks up speed so that by the time it is passing the center of the circle it is going about 25 miles per hour. This requires about 1.2 seconds. See picture Nos. A-2 and A-3. By the time another 1.2 seconds have elapsed the seat has again come to a dead stop.

The seats are self-loading and all 12 can be loaded simultaneously. A maximum of 36 passengers can be handled per ride. The standard model SCRAMBLER has a gross weight of 18,087 lbs., and it is recommended that it be carried on a van at least 35 ft. in length. See Picture No. A-4.

CONTENTS



No. A-5

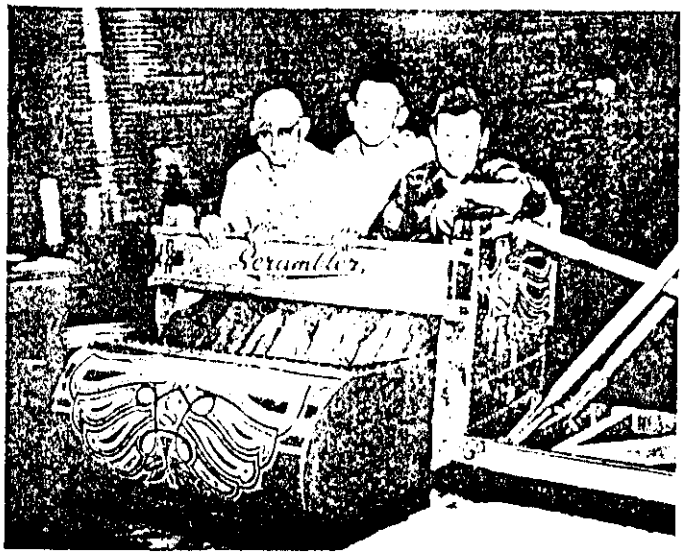
LOCATION

After you have decided where you want the SCRAMBLER to stand you must select the spot for the power unit truck. Most operators will probably want the power unit truck close to the ticket office, so that the operator can also take tickets. You should decide this before you take the center pole off the van so that the van can be spotted properly.

The base section of the center pole rides on dollies in the van (see Picture No. A-5), and the pin locations for the drive unit section going back to the power unit truck are located off to one side, so that the unloading ramps for the center pole base section do not line up with the drive shaft going to the power unit. Look at the way the base section is sitting in the van and you will then be able to tell where to position the van for unloading.

The SCRAMBLER itself requires a circle 52 ft. in diameter, and between the ride and the fence should be a space at least three feet wide. A square lot 60 feet on each side should be adequate if the power unit truck and ticket office are in the corner of the square. The 52 ft. diameter circle should be as flat and level as possible, so that the passengers can step directly from the ground into a seat anywhere around the circle. If you set up the SCRAMBLER on a slight grade, it is better to let it follow the slope than to level it, because in leveling some seats will be close to the ground, while others may be so high off the ground that the passengers will not be able to climb into the seats.

No. A-2



No. A-3

No. A-4

ERECTING DIRECTIONS FOR BIG ELI SCRAMBLERS

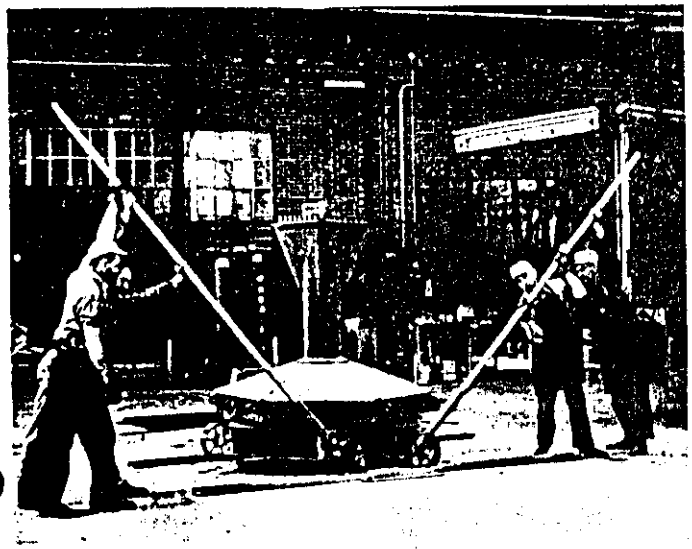
Erecting a BIG ELI SCRAMBLER is a simple operation and briefly consists of the following steps:

1. Erection of the center pole
2. Hanging the top sweeps to the center pole
3. Suspending the unit poles from the top sweeps
4. Hanging the bottom sweeps on the unit poles and pinning them to the center pole
5. Installing the light panels
6. Hanging the seat sweeps on the unit poles
7. Attaching the seats to the seat sweeps
8. Pinning the three drive unit sections together and to the center pole
9. Pinning the power unit truck to the outer end of the drive unit
10. Assembling the seven chain couplings
11. Connecting the [illegible] cables
12. Connecting the light wires
13. Assembling the ticket office
14. Locating the fence

An experienced ride man should be able to assemble the SCRAMBLER from the above instructions, because it is practically impossible to put it together incorrectly. All similar parts are interchangeable and 95% of all the assembly pins are alike. Although the erection of the BIG ELI SCRAMBLER is not difficult, the following directions are explained very carefully so that the SCRAMBLER operator will know exactly what he must do to assemble the SCRAMBLER. Fast and safe erection is of more concern to the portable ride operator than it is to the operator who is able to leave his ride in one location, and so these instructions for assembly are prepared to cover especially the erection of the SCRAMBLER from the bed of an open top van equipped with a hand winch.

No. B-3

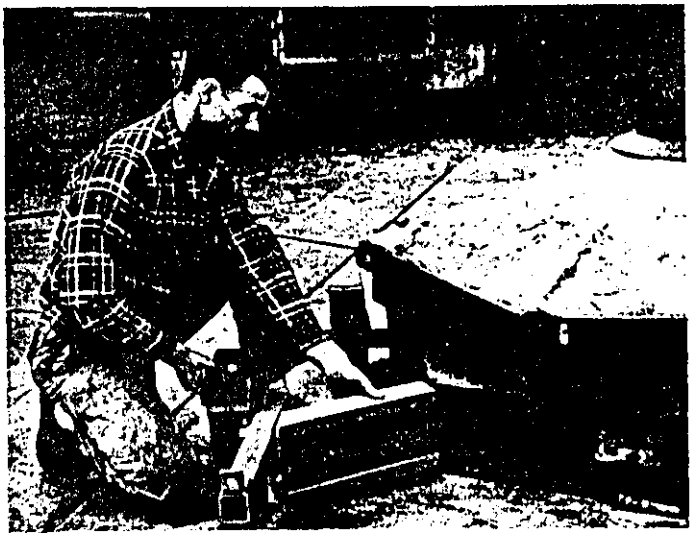
When the base section reaches the bottom of the ramps, all four wheels stand on the runway channels. See Picture No. B-3. Next, drop the wheels so that the base will lower to the ground. To do this remove the bars which connect the tops of the dollies. Next, insert the two 10 ft. long sections of pipe in the dolly sockets on one side of the base. Two men on each pipe pull the upper ends outward and downward. See Picture No. B-4.



No. B-4

Lower both dollies together or the two men on the high side will have to support more than their share of the weight. If both teams work together neither team will have a very heavy load. The dollies are pivoted so that they ride in an over-center position. In lowering, they swing back over center, and the closer you get to the ground the heavier the load is. When the pipes nearly touch the ground the base section hits bottom and the load is taken off the pipes so they can be removed from the dollies. Then lower the other side of the base section.

With the base section on the ground, take out the dollies and put in the legs. Remove the pin which holds the dolly in the socket, and then take out the dolly, as shown in Picture No. B-5. Take care that you do not

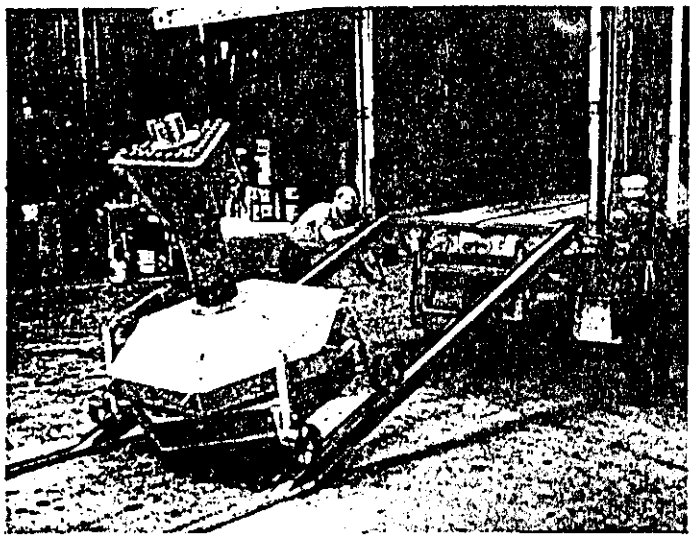


No. B-5

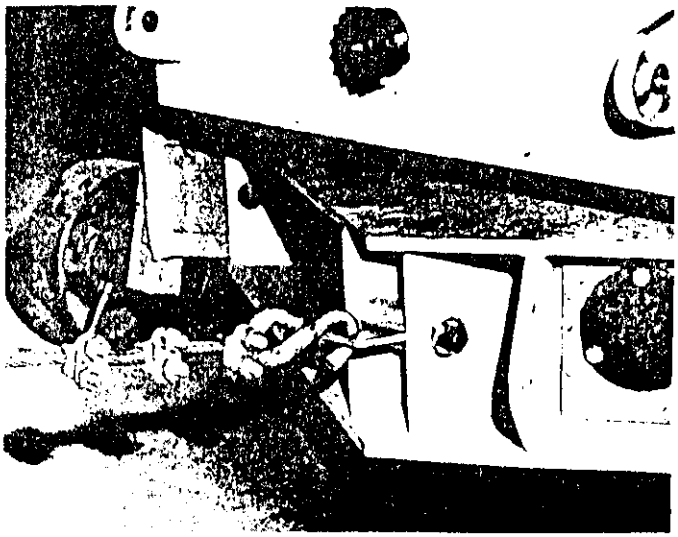
No. B-6

pinch your fingers with the dollies. After the dollies are out, put the legs in and pin them in place. See Picture No. B-6. The six pins that hold the legs in the base are longer than the rest of the assembly pins. This size of pin is used in no other place in the SCRAMBLER.

DIRECTIONS FOR ERECTING THE MAIN STRUCTURE OF THE SCRAMBLER



No. B-1



No. B-2

ERECTION OF THE CENTER POLE

FOUNDATION

The SCRAMBLER rests its entire weight on its center section. No special foundation is required. You will not need to lay planks under the base section, because the weight is distributed much better when the whole base section sits directly on the ground. Also, everything you put under the center pole raises the seats higher, and climbing into the seats becomes more difficult. Occasionally you will have to set up the SCRAMBLER on very uneven ground. Some blocking may be necessary to get the dollies and legs in and out of the base, but use only what is absolutely necessary and distribute it uniformly under the base.

CENTER POLE BASE SECTION

The center pole base section is the first major part of the SCRAMBLER to leave the van. Lay the two sections of channel runway on each side of the spot you have picked out for the center pole. If you erect the SCRAMBLER on concrete these channels will not be necessary, but on soft ground the channels will prevent the dolly wheels from burying themselves. Next, position the ramps as shown in Picture No. B-1. Locate these ramps securely so that they will not slip from the van while the base section is being lowered. This base section weights approximately 5000 lbs. but it is one of the easiest parts of the SCRAMBLER to handle. The winch cable is hooked to a special plate pinned in the base section. See Picture No. B-2.

Start the base down the ramps with a crowbar, from inside the van, and two men on the winch ease it down the ramp by gradually slackening the cable. If the cable is firmly anchored to the hook and the ramps are anchored to the van bed, the base can be rolled down safely without knees or other supports under the ramps. Even so, for safety, stand clear when loading or unloading the base.

With the mast resting on the base section lift the top of the mast to a vertical position, as in Picture No. B-10. It must drop straight down on three large shear pins on the top of the rotating base. If the mast binds on these pins raise the low side of the mast with a crowbar to drop it down over the shear pins.

To take off the mast lift it straight up until it clears the large shear pins. To do this, pry up on the near side with two crowbars under the hinge blocks and at the same time pull the top of the mast toward you. This will lift the mast high enough to clear the shear pins. Then lay it over on its side and lift it off onto the van.

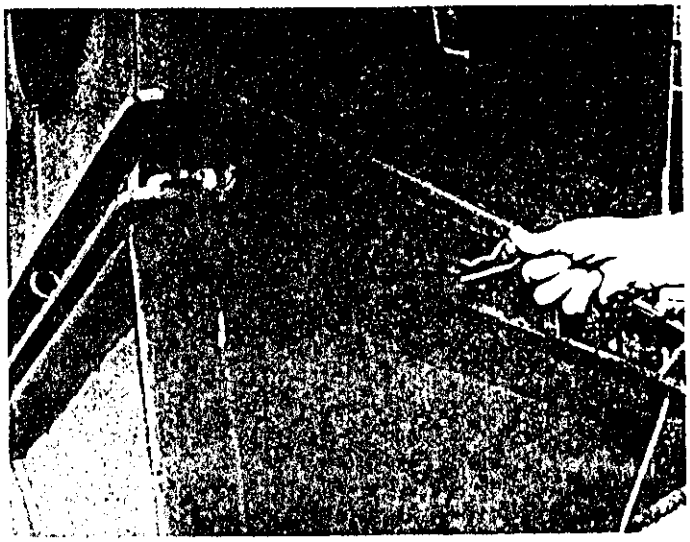
When you raise the mast do not mash any of the wires on top of the rotating base.

No. B-11

Drive in the long hinge pins after starting all three of them. See Picture No. B-11. Be sure that the hairpin holes in the hinge pins are horizontal when you start. If the hinge pin turns as you drive it you can straighten it with a punch inserted in the hairpin hole. See Picture No. B-8. These pins cannot be turned after the whole SCRAMBLER is set up. The three hinge pins are pointed on each end and may be driven from either end. Use the driving rod supplied. This rod has a recess in the end which fits the pointed ends of the hinge pins. It is smaller in diameter than the hinge pins, and will center itself on the point of the hinge pin. Do not use a drift pin because it may slip to one side and cut into the side of the pin holes. This will not happen if you use the special driving rod.

Before you drive in the hinge pins, coat them lightly with grease. These pins drive in and out easily if kept well greased. When the SCRAMBLER is not balanced these pins sometimes turn or shift slightly. A dry pin may squeak but a little grease will stop the noise.

THESE HINGE PINS MUST BE LOCKED WITH HAIR-PINS OR THEY WILL WORK OUT. See Picture No. B-12.

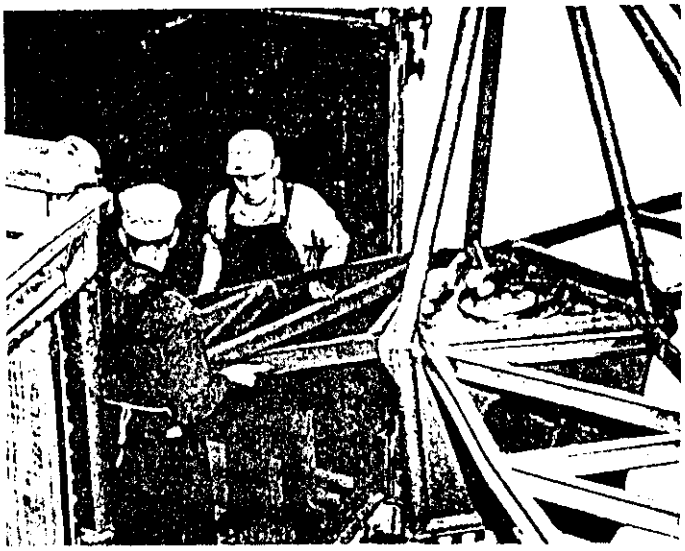


No. B-12

If these three hinge pins are not through all 48 hinge blocks, do not operate the SCRAMBLER because the center pole would then be structurally unsound.

HANGING THE TOP SWEEPS TO THE CENTER POLE

Attach the top sweeps after the center pole is completed. Slide the top sweep back to the center pole and lay it flat on the van floor. Lift the end next to the center pole and pin it in place. See Picture No. B-13.



No. B-13

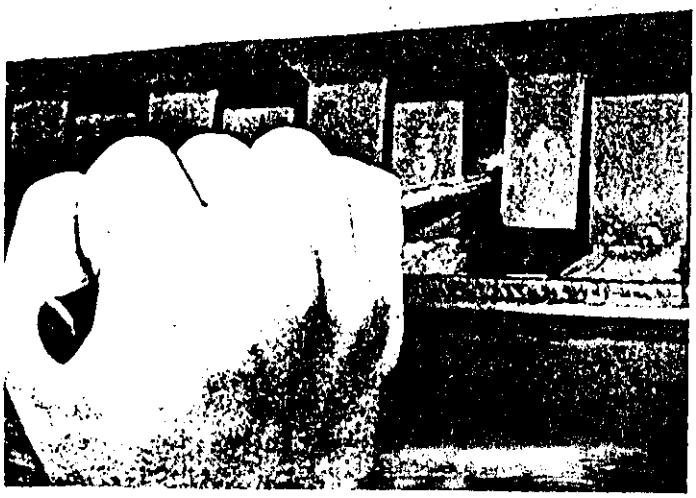
ALL PINS MUST BE LOCKED
WITH HAIRPIN COTTERS.

After the legs are pinned in place block up the outer ends until all are tight, but don't block them so that the center is raised off the ground. If they are not blocked tightly the center pole may weave a little when the SCRAMBLER is operated with an unbalanced load. With tight blocking, the center pole will not sway with any passenger load. See Picture No. B-7.

No. B-7

CENTER POLE MAST

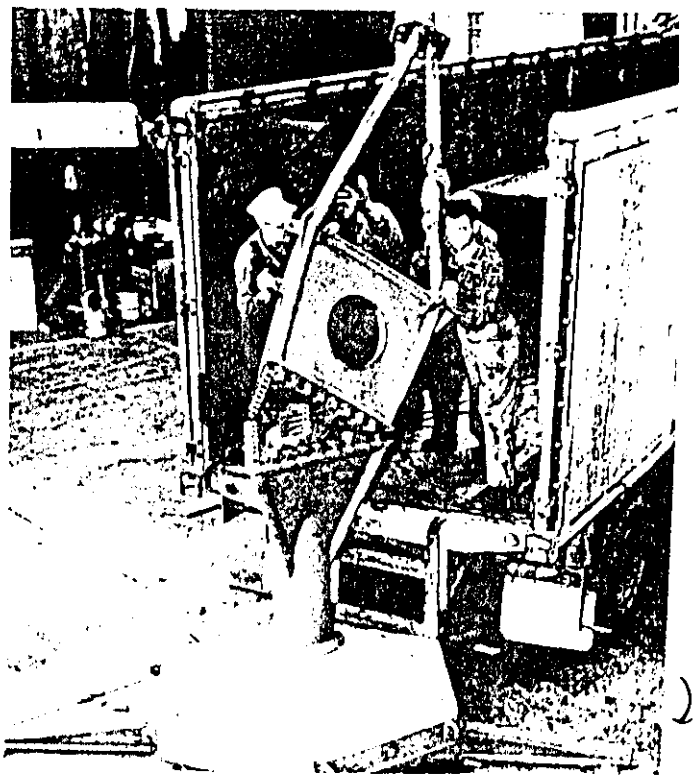
Next, attach the mast, which is the top part of the center pole. Set the ramps to one side and then back the van against the base section. The mast is on its side in the van. Scoot it to the rear of the van with the bottom of the mast next to the base section. Always locate the mast in the same position on the rotating base. Match up the "3" stamped on one hinge block on the mast with the "3" stamped on a similar hinge block on the rotating base. See Picture No. B-8.



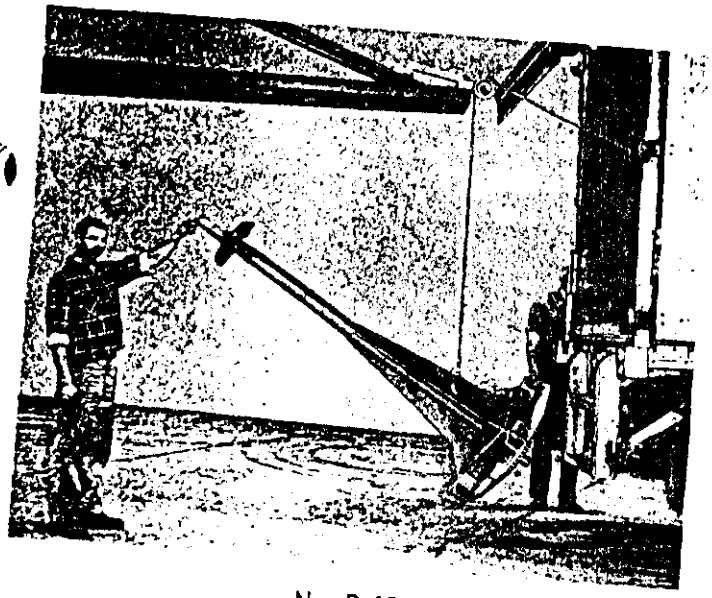
No. B-8

Four men then lift the mast into place. Raise it horizontally and set the bottom of the mast on top of the center pole base section. See Picture No. B-9.

No. B-9

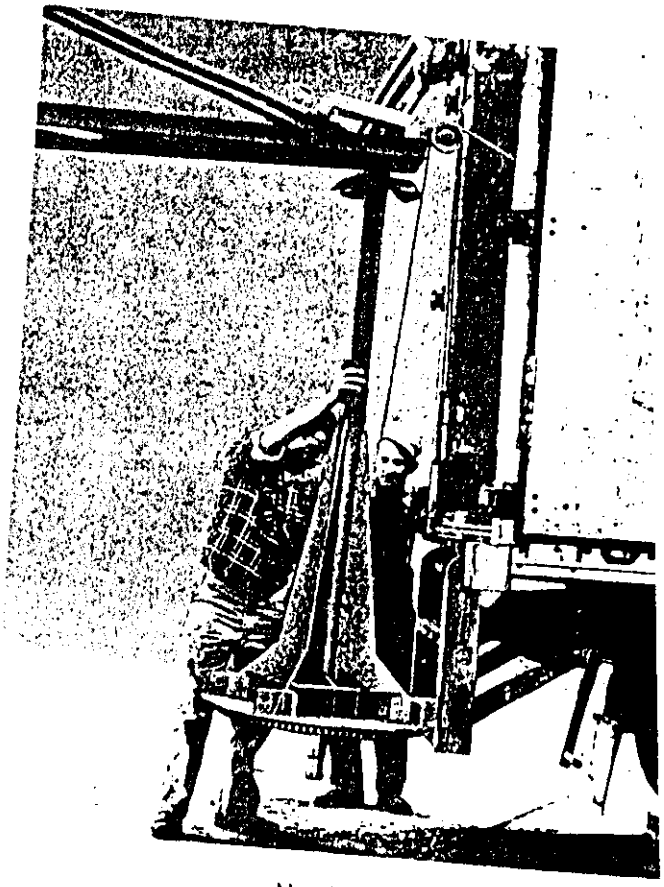


No. B-10

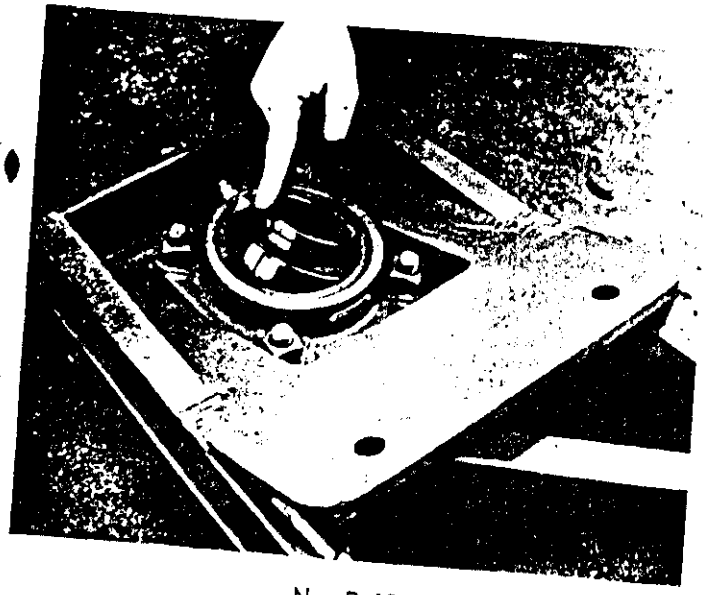


No. B-18

man can guide the top of the pole up through the top sweep bearing, when the winch lifts the pole off the van floor.



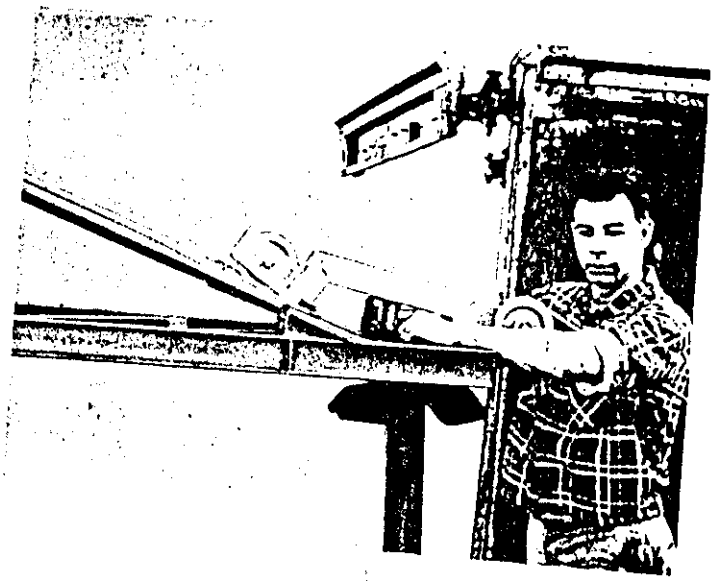
No. B-20



No. B-19

Grease the bearing bore and the top of the pole so that the pole will not rust in place. The set collar on the bearing must be on the top side of the sweep. See Picture No. B-19. Sometimes in traveling this self-aligning bearing will turn upside down. If this happens the gears will not mesh properly.

Raise the unit pole through the bearing as far as it will go, as shown in Picture No. B-20. Insert the split collar so that the small end will drop down inside the bearing when the cable is slackened. See Picture No. B-21. Slacken the cable and the unit pole drops to its operating position hanging from the top sweep as shown in Picture No. B-22.



No. B-21

When the SCRAMBLER is used portably the set screws which lock the bearing inner race to the unit pole need not be used, but in a permanent installation it is good practice to tighten these set screws.

HANGING THE BOTTOM SWEEPS ON THE UNIT POLES AND PINNING THEM TO THE CENTER POLE

Slide the bottom sweep on edge to the rear of the van with the pin connections toward the center pole. Reposition the winch cable so that it hangs down about

LOCK ALL PINS WITH HAIRPIN COTTERS AS SOON AS THEY ARE INSTALLED.

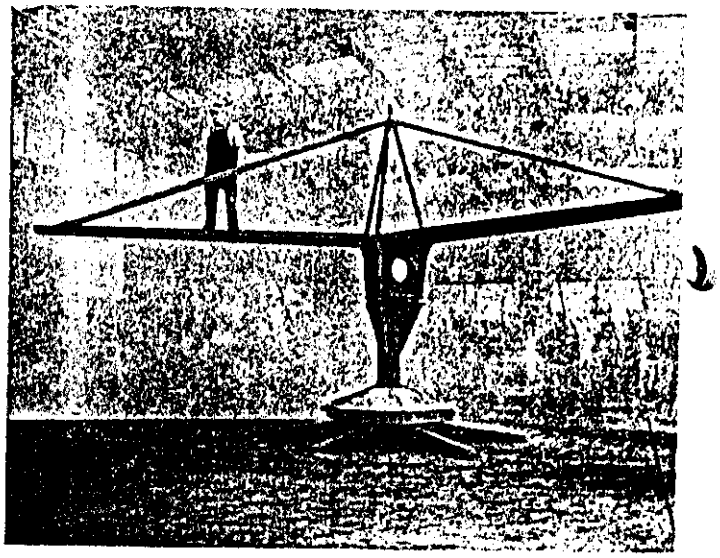
With the outer end of the sweep resting on the van floor, pin the top sweep tie rods, as shown in Picture No. B-14. Raise the outer end of the tie rod so that the pin will drive in the top of the mast without binding. Pin both tie rods to the top of the mast first. The outer ends of the tie rods can hang free but put no weight on them or the rods will bend easily.

Next, lift up the outer end of the top sweep. As it rises, both tie rods must be guided onto the top sweep clevis plate at the same time. As soon as the holes are aligned drive in the pins. Do this quickly because this is one of the heaviest pieces you will have to lift. See Picture No. B-15. Many operators hang all three top sweeps before hanging unit poles or bottom sweeps. See Picture No. B-16.

No. B-14

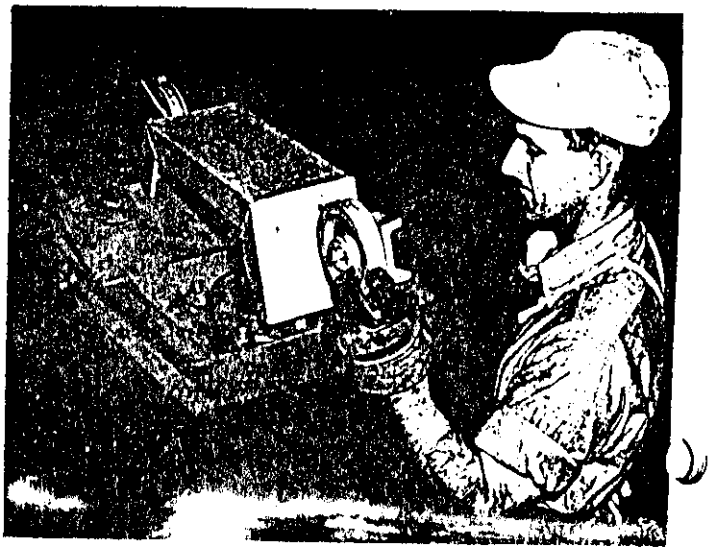
SUSPENDING THE UNIT POLES FROM THE TOP SWEEPS

You are furnished a small dolly to assist in getting the unit poles and bottom sweeps off the van and onto the SCRAMBLER. This dolly hooks over the edge of the top sweep clevis plate and drops down inside the outer end of the top sweep. See Picture No. B-17. The small sheave in front handles the unit pole. Draw the winch cable over the sheave and down between the sheave and the top sweep. Roll the unit pole to the rear of the van, and hook the cable into the unit pole as shown in Picture No. B-18. Here the pole balances on the cable. One



No. B-16

No. B-15

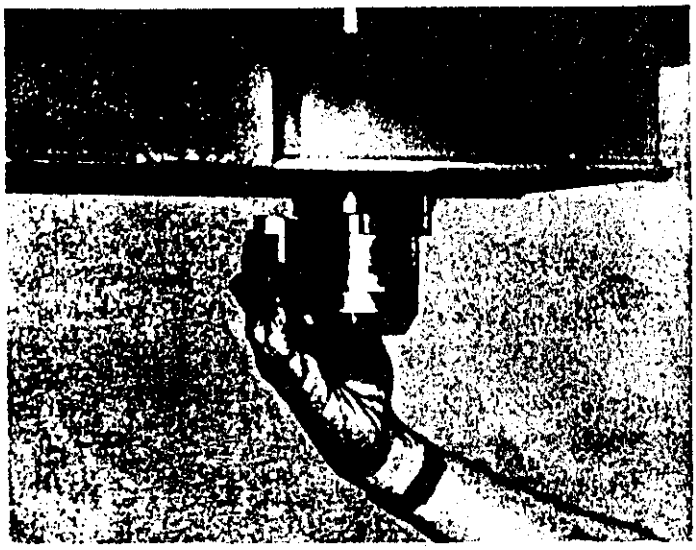


No. B-17

BE SURE TO LOCK THESE PINS WITH HAIRPIN COTTERS.

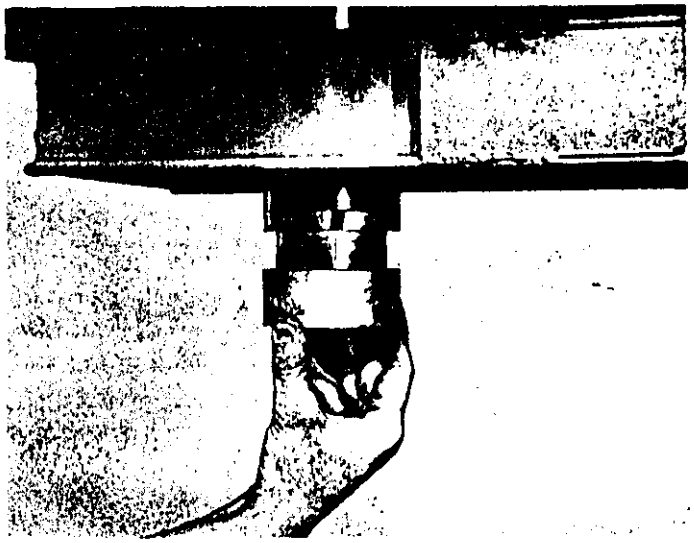
With the sweep centered on the unit pole, raise the bottom sweep with the winch so that the stub shaft goes through the bearing. The shaft may bind in the bearing. The bearing is self-aligning and is perhaps cocked to one side. The set collar on this bearing must be next to the ground. Sometimes this bearing also turns upside down when it is riding on the truck. Tap the inner race slightly if it needs to be straightened. Stand on the sweep and shift your weight from side to side; this slight twisting of the sweep frequently starts the bearing on the unit pole. Raise the sweep as high as it will go freely, to provide plenty of clearance for the bottom split rings. However, if the cable is too tight the teeth of the bevel gears bottom on each other, and the sweep bends slightly, causing the bearing to pull down and away from the unit pole. Then the split rings will not go in until you have slackened the cable. It should not be necessary to use a pry bar to raise the outer end. Be sure that your cable is neither too loose nor too tight before you use a pry bar.

The stub shaft on the bottom of the unit pole is similar to the one at the top, but the split rings are positioned differently. At the top the split rings drop down inside the top sweep bearing, but at the bottom the entire split ring is below the bearing. The shoulder goes next to the bearing as shown in Picture No. B-27. Align the holes in the split rings with the hole in the stub shaft, and then slip the locking ring over the outside of the split ring as in Picture No. B-28. Turn it until the holes in it are in line with the others. Then install the large safety pin through the locking ring, split ring, and stub shaft as shown in Picture No. B-29.

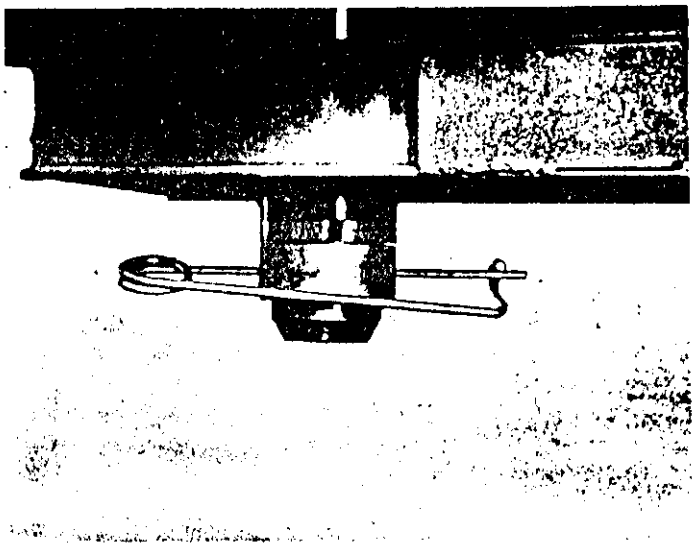


No. B-27

Inspect this safety pin carefully each time it is used to be sure that it is not damaged. If this safety pin comes out of its hole for any reason while the SCRAMBLER is operating there will be nothing to hold the locking ring in place. The locking ring could then fall off, followed by the split rings shortly thereafter. Nothing would then hold up the bottom sweep, and if it dropped to the ground while the SCRAMBLER was turning your SCRAMBLER would be damaged very severely. This is a very good way of locking the bottom sweep on the unit pole, and you should not be afraid of it, but at the same time you should know what might happen if you don't do what you are supposed to do. Any time the safety pin shows any sign of breaking you should replace it immediately.



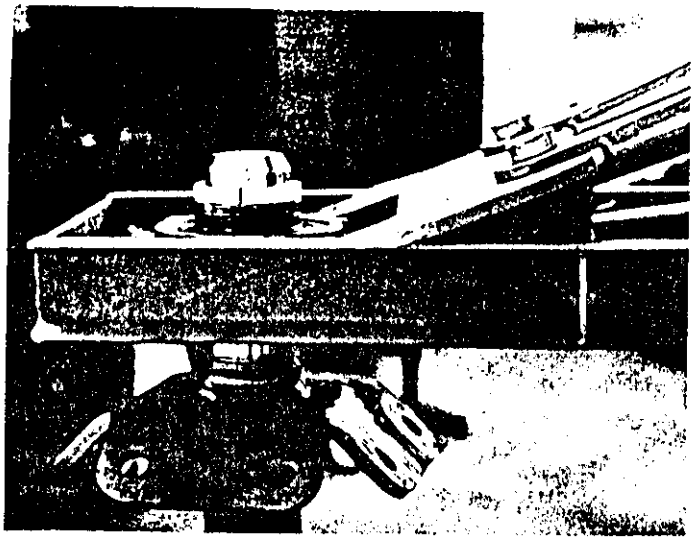
No. B-28



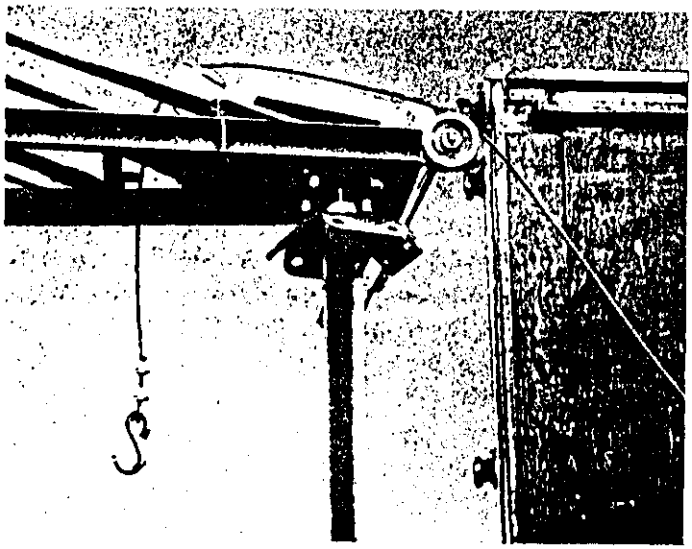
No. B-29

DISMANTLING THE SCRAMBLER

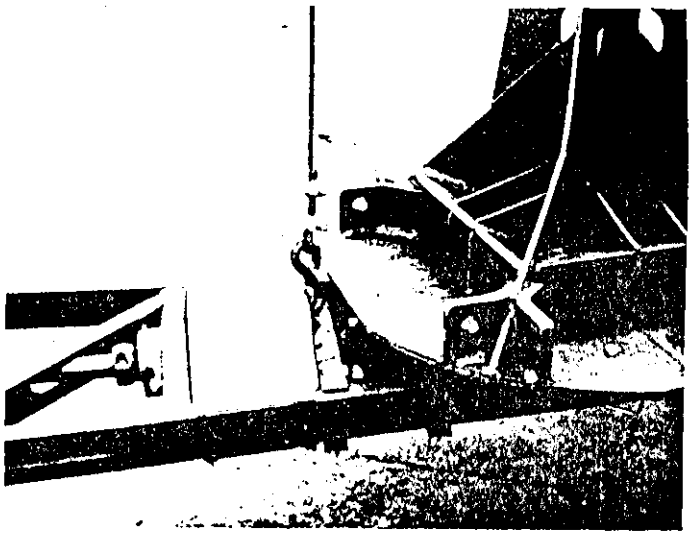
To take down the SCRAMBLER, simply reverse the operation of erecting it. Until you are thoroughly familiar with all phases of putting the SCRAMBLER together or tearing it down, do not try to make speed. First learn how to do everything right, and after that the speed will come naturally.



No. B-22

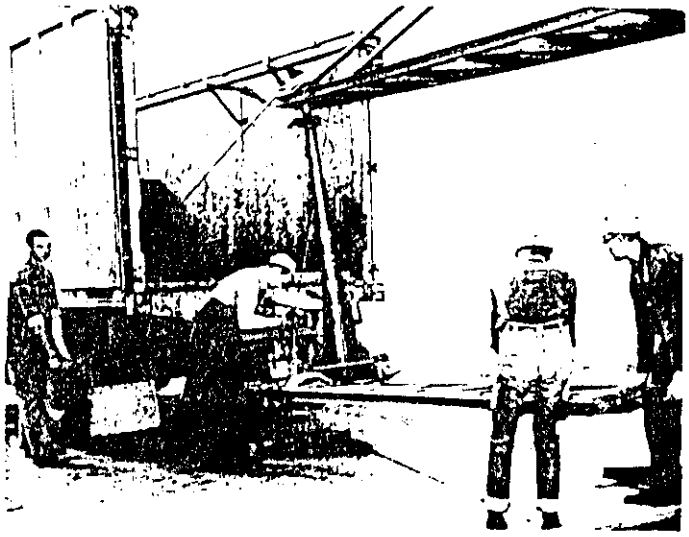


No. B-23



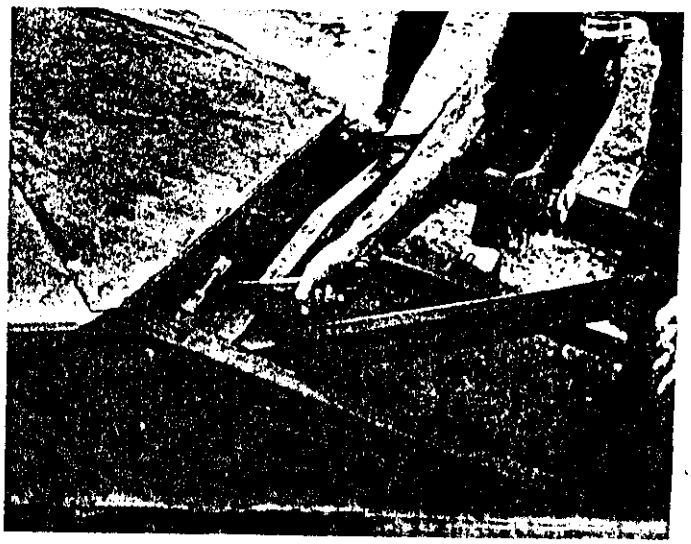
No. B-24

the top sweep as shown in Picture No. B-23. With the bottom sweep still on edge, two men grab the large end



No. B-25

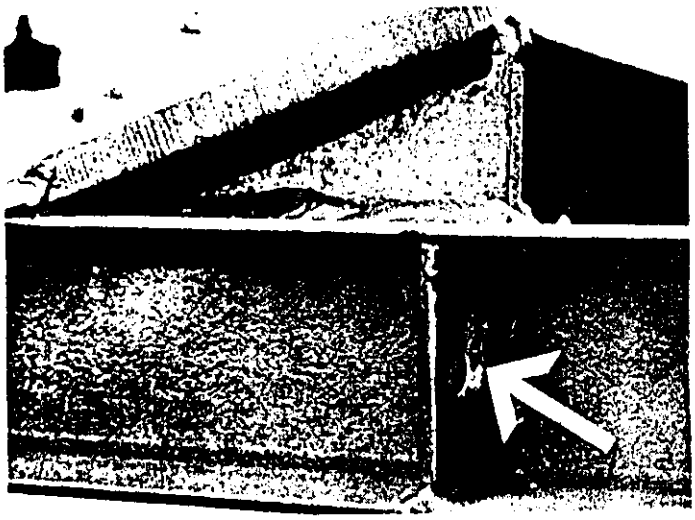
of the sweep and pull it almost off the van. The small end of the sweep is heavy. Use the hoist to handle that end. The two men hold the big end of the sweep, while the cable hook is hooked under the edge of the slip clutch guard as shown in Picture No. B-24. Connect to the top side of the sweep (the bottom slip clutch guard has a drain hole in the center). With the winch cable hooked to the guard the sweep will right itself. As the winch lifts the end of the sweep the two men on the other end control it, while a third man grasps the sweep near the point at which the cable is attached. As the cable tightens, the sweep swings out toward the center pole and also swings in toward the unit pole. The third man pushes on the unit pole and pulls on the cable to hold the sweep away from the unit pole. See Picture No. B-25. As soon as he has it to one side then the man on the winch lowers the cable immediately so that the bottom sweep drops down around the side of the unit pole. As soon as the sweep clears the side of the unit pole and swings down underneath, the two men on the other end of the sweep swing it into position and drive in the pins. See Picture No. B-26.



No. B-26

SCRAMBLER GABLE LIGHTS

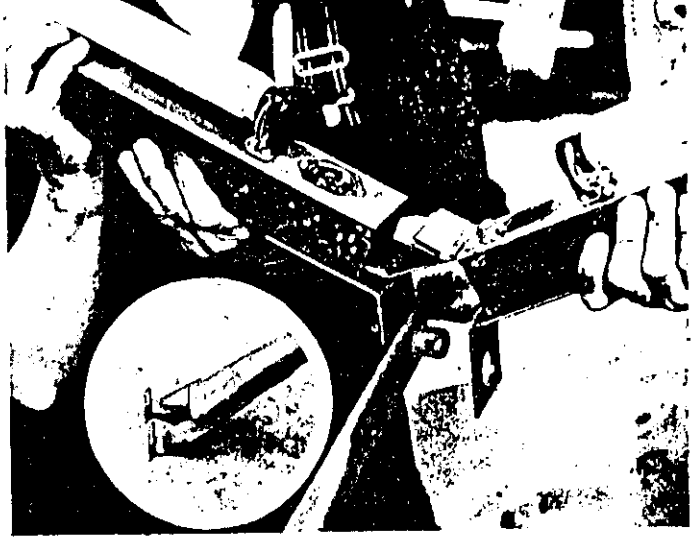
On one end of each gable light panel is a short piece of pipe, and in this pipe a small cross pin sticks out of one side near the end. If at any time this crosspin gets broken off order a new assembly for the end of the light panel, and do not try to repair it yourself. It is very important that this crosspin be there, and installed properly. Some SCRAMBLERS have come back to the factory with this part improperly repaired, or home-made and in at least one case this was responsible for the light panel coming loose and dropping down while the ride was in operation. Always use genuine Big Eli parts, in good condition.



No. C-4

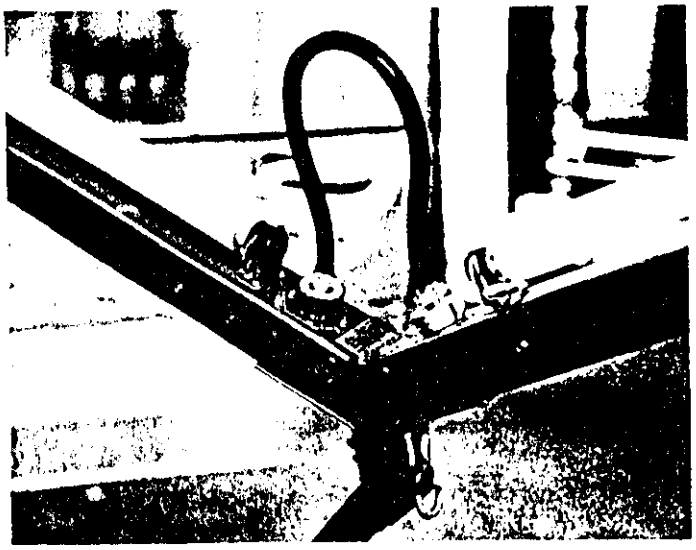
This end of the light panel fits into a small plate welded in the side of the top sweep. This plate shows in Picture No. C-4. The pin must go through the slot so that it is free to turn behind the plate. Until you are thoroughly familiar with how to hold the panels so the cross pin will pass through the slot, have someone help to guide the pin through the slot. One man must handle each panel to prevent bending or twisting of the light panels. One right hand and one left hand panel must be raised together. These panels differ only where they come together at the point. The bent plates extending beyond the end of one panel must fit inside the other. It is possible to put together two which have no plates but you will later find yourself trying to put together two which have plates, and they won't assemble. Therefore, be sure you have a right and a left.

Bring the two ends of the panels together, with the gable light tie rod between them as shown in Picture No. C-5. This tie rod should lie with the hook end away from



No. C-5

the center pole, and the bend of the hook must be against the ground. See the detail in the circle on Picture No. C-5. Slip the two gable light panels on the 1" crosspin of the gable light tie rod and lock them in place with hairpin cotters. Attach the short jumper which connects the two light panels at the point of the gable. See Picture C-6.



No. C-6

SCRAMBLER LIGHTING

The SCRAMBLER can be equipped with five different standard lighting systems:

A) The sweep lights, which lie directly beneath the top sweeps (standard and deluxe model SCRAMBLERS)

B) The gable lights, which begin near the outer ends of the top sweeps and rise to a point between the sweeps (standard and deluxe model SCRAMBLERS)

C) The mast lights, which rise to a point directly above the center pole (standard model SCRAMBLERS only)

D) The cluster lights, which are vertical lights positioned directly above each unit pole (standard and deluxe model SCRAMBLERS)

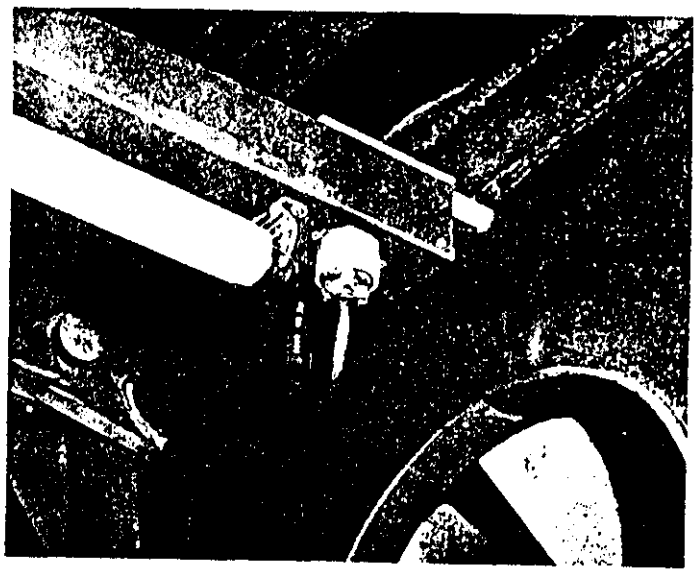
E) The funnel lights, which are thirty light panels surrounding the top of the center pole and forming an open-topped funnel (deluxe model SCRAMBLERS only)

While it is entirely possible to install the lights after the SCRAMBLER is completely assembled, you will find it is easier to do right after the top sweeps, unit poles, and bottom sweeps are pinned in place, and before the seat sweeps and seats are added.

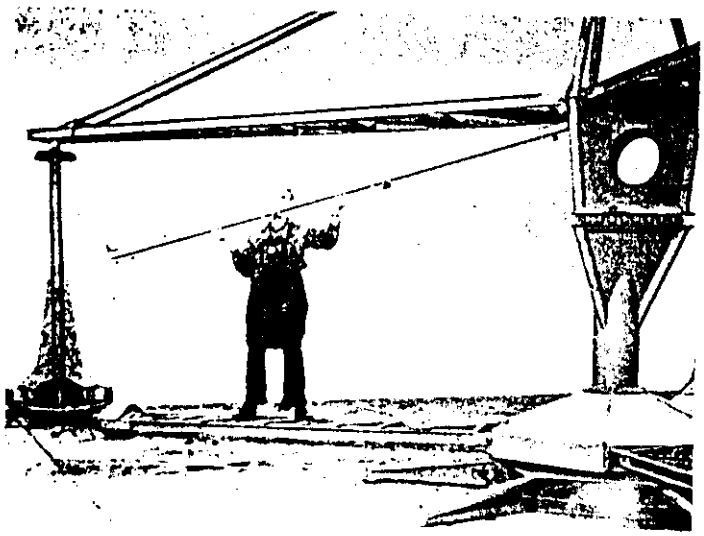
SCRAMBLER SWEEP LIGHTS

The sweep lights are the first to be installed. Hold the panel as shown in Picture No. C-1, so that the short section of pipe that extends beyond one end points toward the center pole.

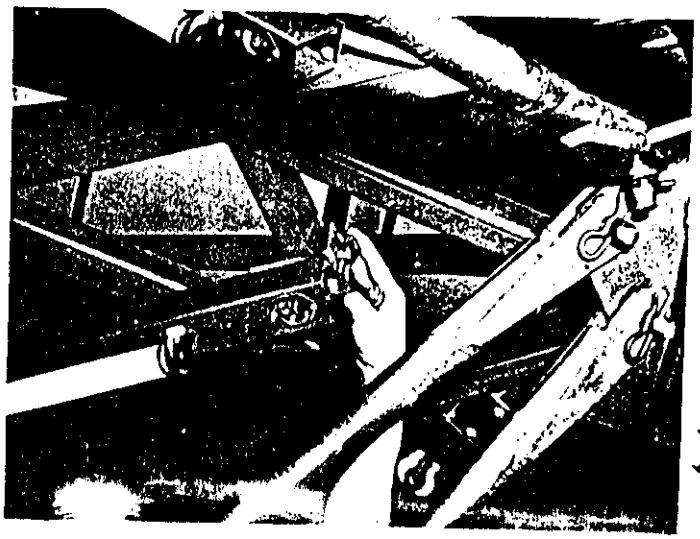
Insert this pipe in the hole that is above the mast porthole as shown in Picture No. C-2. Hold the strip up to keep from bending the pipe and then walk along the bottom sweep to the other end of the light strip. Watch your step as you walk along the sweep. There is an angle plate with a 1" hole in it on the outer end of the light strip. A short 1" diameter shaft is inside the top sweep near the outer end. Slip the angle plate over the end of this shaft and lock it in position with a hairpin cotter as shown, or a klik-pin. See Picture C-3. A hairpin cotter should be installed with the open end down, and a klik-pin with the head of the pin on top. Always use Big Eli hairpin cotters or klik-pins, and be sure that each one is in good condition. In this location, a broken or missing hairpin cotter or klik-pin could allow the sweep light to move outward and drop off the 1" pin. The sweep light could then fall, with the great possibility of striking and injuring one of your passengers, and so it is very important that you use the right kind of hairpin cotter of klik-pin, in good condition, so that this cannot happen. A sweep light that is not locked in place *will* walk off the pin in a very short time. This completes the installation of the top sweep light panel except for connecting the electrical jumpers from the breaker box inside the mast to the sweep light twist lock sockets.



No. C-2



No. C-1

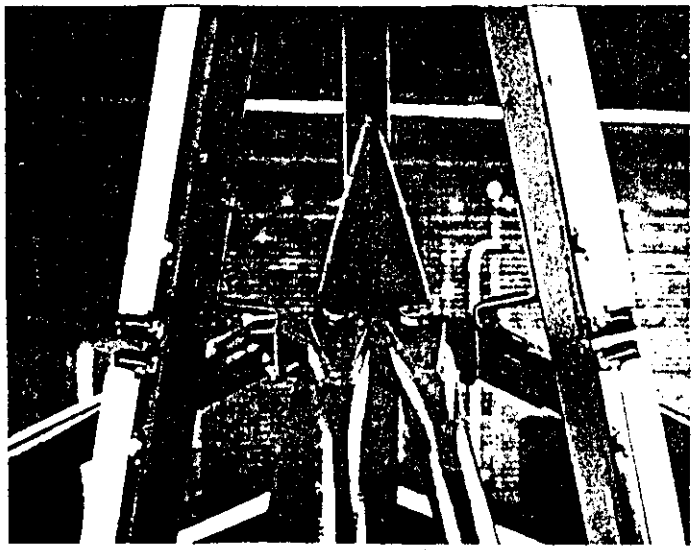


No. C-3

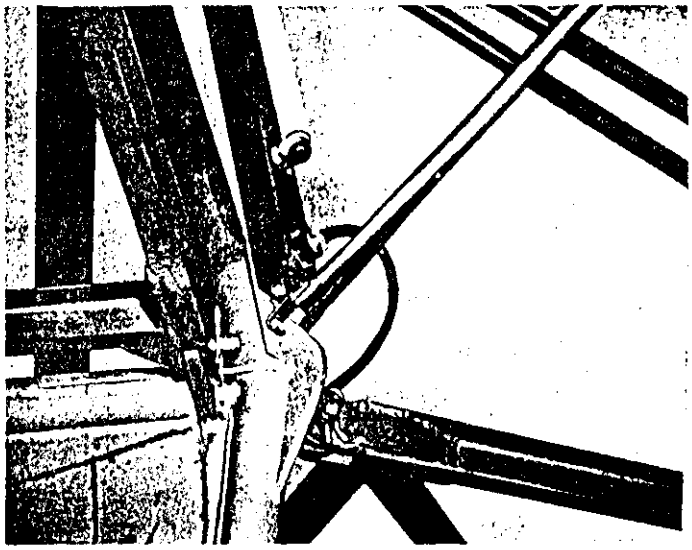
No. C-9

The mast light panels are the three short ones which are fastened to the mast. See Picture No. C-9. Down from the top of the mast panel is a bent plate and rod on the back of the strip. Insert this rod in a hole in the ½" thick plate at the top of the mast. See Picture No. C-10. After it is started in the hole, guide the slotted plate on the other end of the panel in behind the hook and crosspin, as shown in Picture No. C-11. This will lock the hook so that it cannot jump off the crosspin. The weight of the mast light panel will hold the panel in place.

Power goes from the slip rings to the breaker box inside the mast, and jumpers from the breaker box connect to the twist lock sockets in the mast light panels.



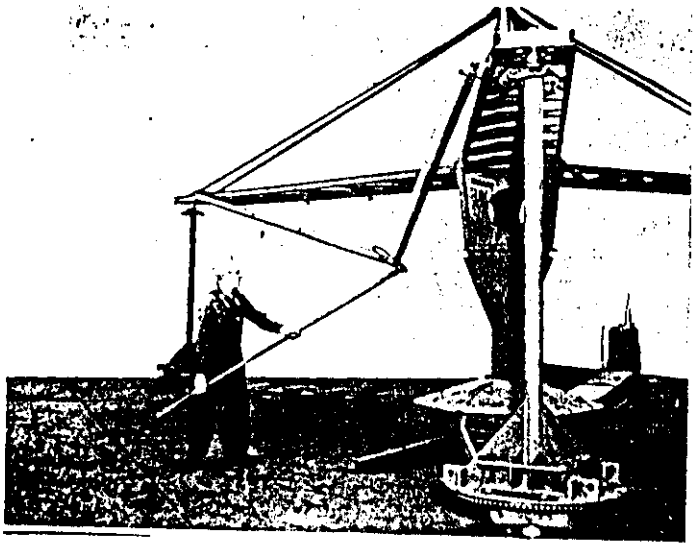
No. C-10



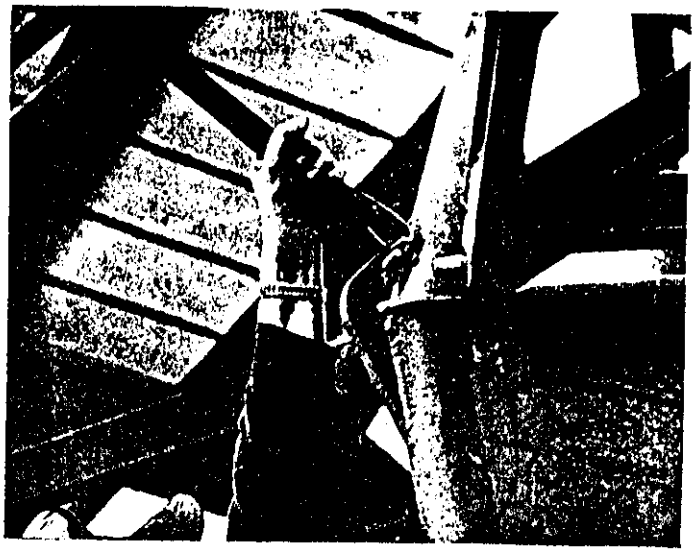
No. C-11

Push the hook end of the tie rod toward the center pole, as shown in Picture No. C-7. The point of the gable rises next to the center pole, travels to a vertical position, and begins to descend over center away from the center pole. At all times while raising or lowering the gable lights be careful that the strips do not bind on each other or in the slotted plates on the ends, or you may damage them severely.

When the gable has reached this position, the hook is in line with a short crosspin in the corner of the mast. See Picture No. C-8. Drop this hook over the crosspin and the gable lights will hold their position by their own weight. This completes the installation of the gable lights.

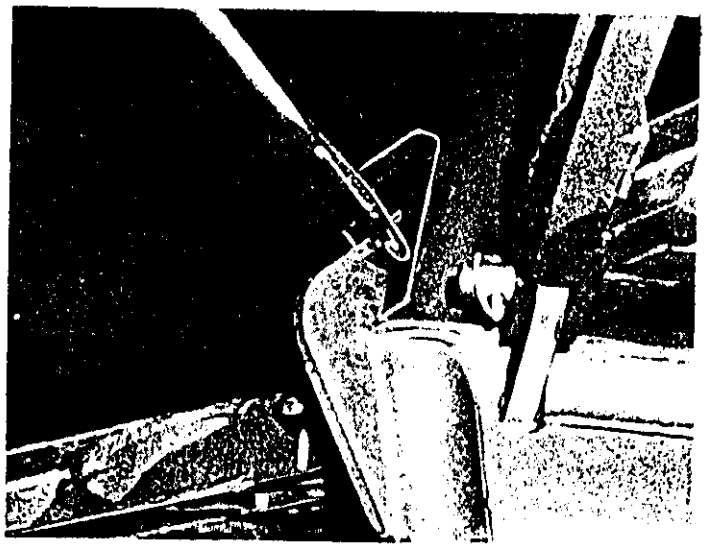


No. C-7

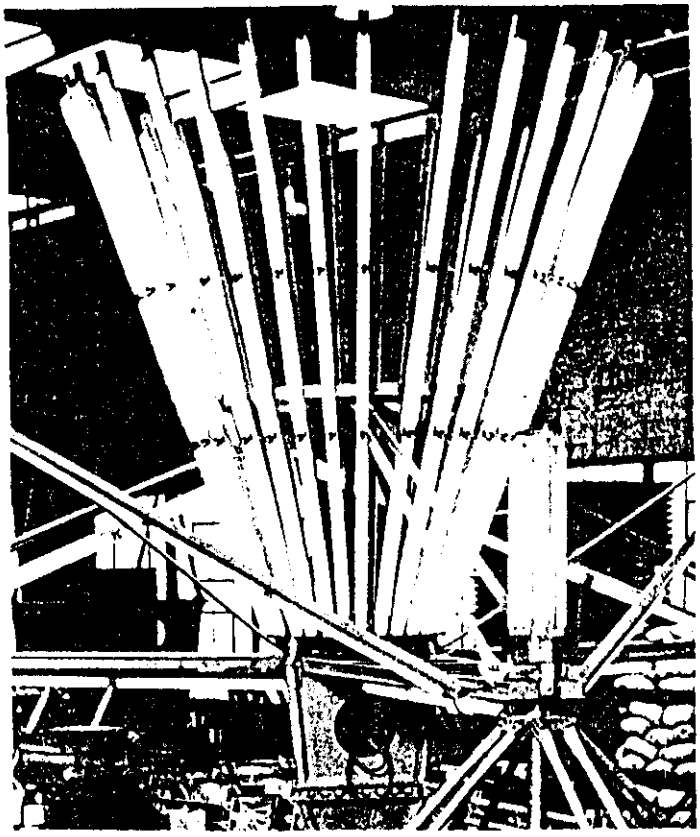


No. C-8

If you have the Deluxe Model SCRAMBLER, you are provided with a locking plate which is to be inserted behind the hook of the gable light tie rod, as shown in Picture No. C-8.5. On a Standard Model SCRAMBLER the mast light panel serves to lock the hook of the gable light tie rod.



C-8.5



No. C-16

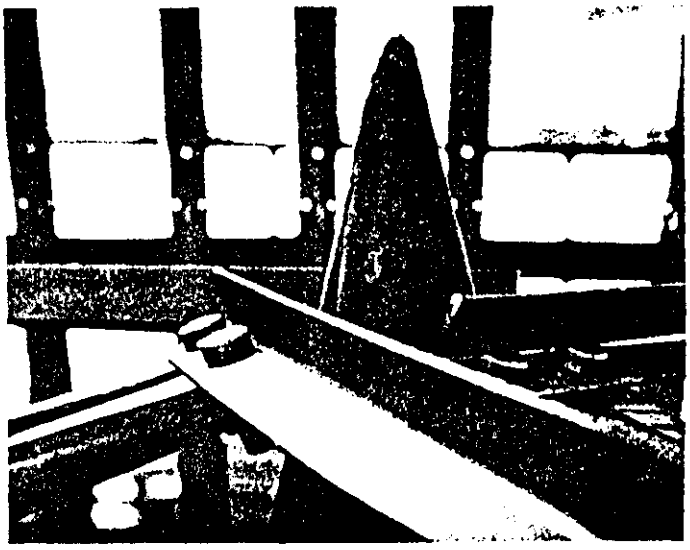
Funnel lights are furnished as standard equipment only on deluxe model SCRAMBLERS. The assembly consists of thirty light panels, each of which has three fluorescent lamps; a top and bottom mounting ring; mounting angles; and electrical jumpers.

To install the funnel lights five steps are necessary:

1) Pin in place the mounting angles.
2) Bolt the large top ring to the mounting angles.
3) Set in place the bottom ring.
4) Position the thirty light panels.
5) Complete the electrical connections.

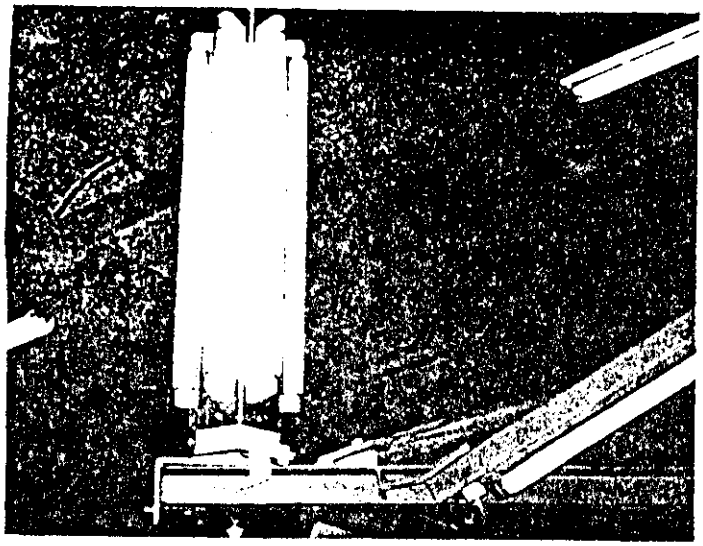
The following description will show in detail how to carry out each step.

There are three mounting angles. Each angle has two 1" holes on one end and a single bolt hole on the other. These angles show clearly in Picture No. C-17. Note that the angle has a slight twist to it. Because of this twist the angle can be used in only one way. The angle must be pinned into the top of the mast so that the other end is upright and not standing at an angle. It is easy to install these angles when you are setting up the SCRAMBLER; then you just stand on the top sweep and hold the angle in place when you pin the top sweep tie rods to the mast. If the SCRAMBLER is already set up, the job will be a little tougher. You must take out only one pin at a time or the sweep will fall, but before you take out any pins place a jack under the bottom end of the unit pole on that side and raise the unit pole until the load has been taken off the top sweep and the unit pole



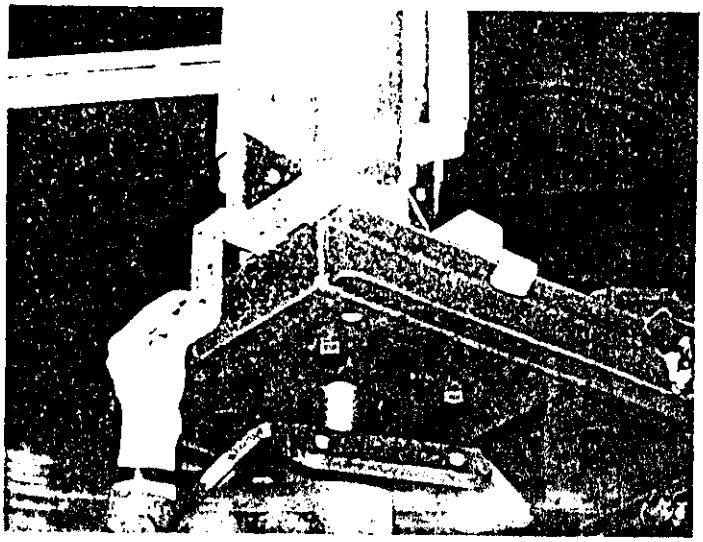
No. C-17

SCRAMBLER CLUSTER LIGHTS

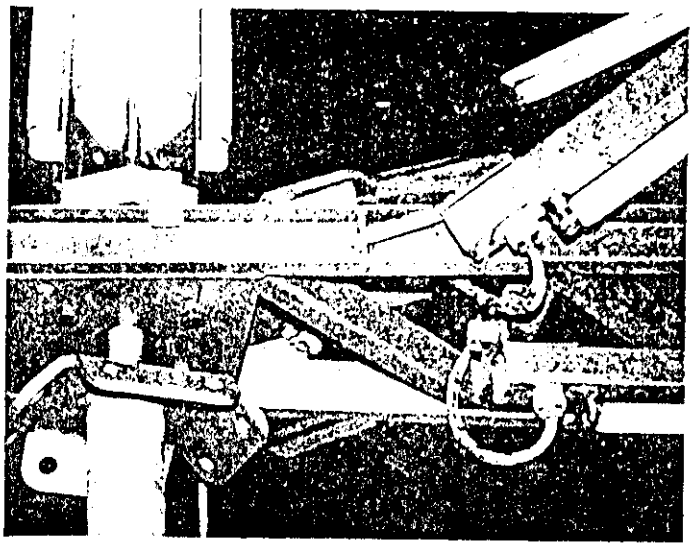


No. C-12

The cluster light assemblies are easily installed. There are three of these assemblies, and one is located on the outer end of each top sweep directly above each unit pole. Attaching the cluster light to the top sweep consists simply of sliding it on and attaching one thumb screw. On the bottom of the assembly there are flat bars extending out to the side, with a sharp bend on the end of each bar. These are made so that they slide over the top flange of the channel that makes up each side of the top sweep. Slide the cluster light assembly on the sweep as far as it will go, until the vertical bar on the bottom of the assembly butts against the outer end of the top sweep. Shift it around until the hole in the bar is lined up with the threaded hole in the end of the sweep, then screw in the 3 8" thumb screw supplied, as shown in Picture No. C-13. Be sure that this thumb screw is pulled up tight. If the bolt is allowed to work loose and fall off, the rotation of the SCRAMBLER will throw the cluster light off the top sweep into the paths of your



No. C-13

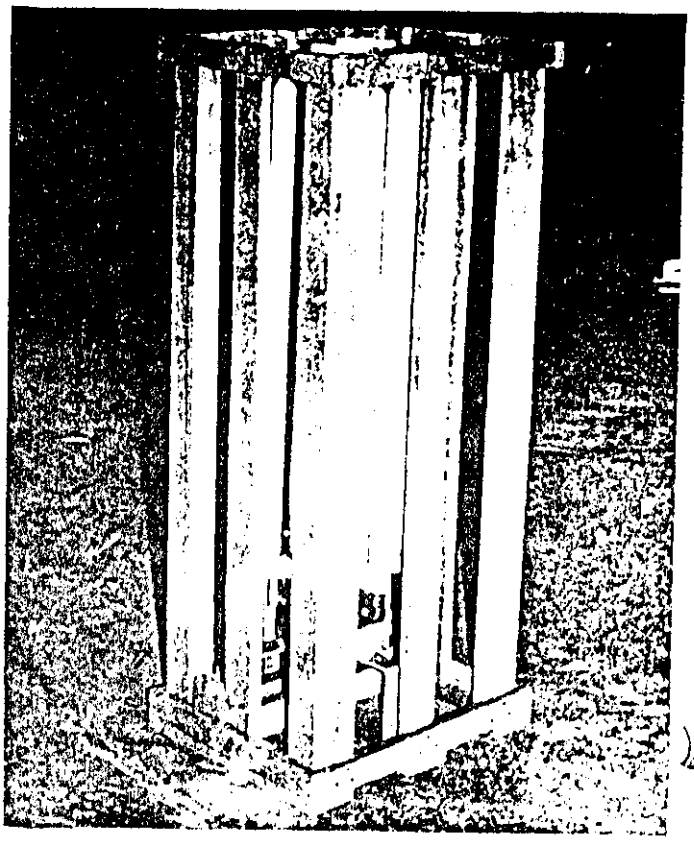


No. C-14

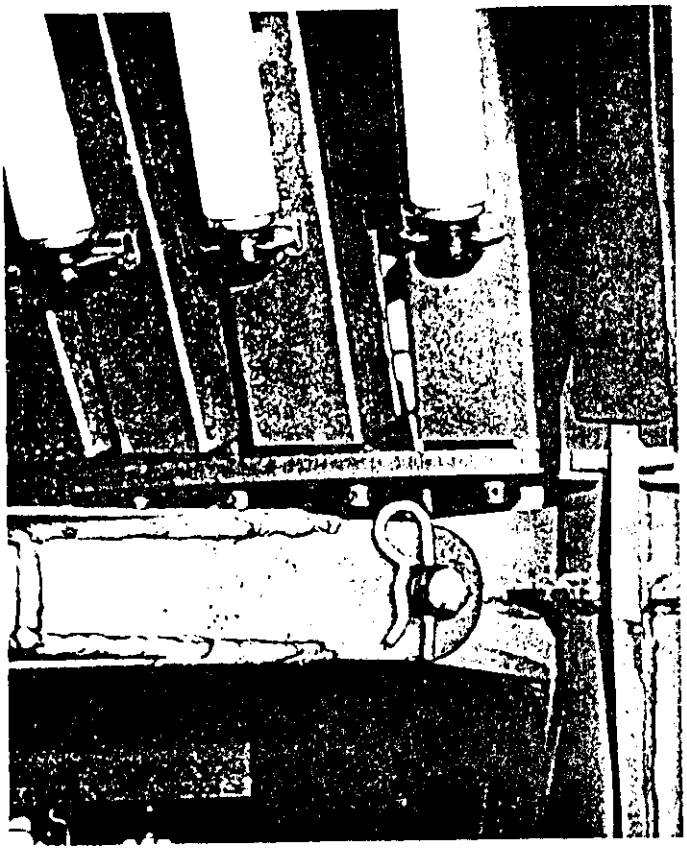
passengers, so BE ABSOLUTELY CERTAIN THAT THIS THUMB SCREW IS TIGHT. CHECK IT FREQUENTLY TO MAKE SURE IT STAYS TIGHT.

Complete the electrical connection by connecting the cluster light assembly to the twist lock socket on the outer end of the gable light panel, as shown in Picture No. C-14.

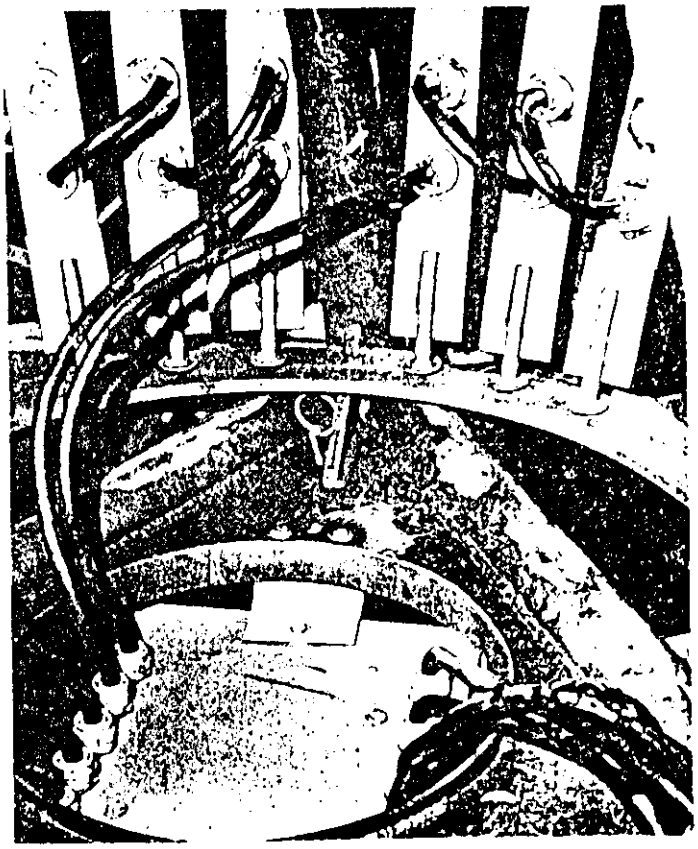
The cluster light is provided with a wooden crate, as shown in Picture No. C-15. Always carry it in the crate to protect it in shipment.



No. C-15



No. C-21



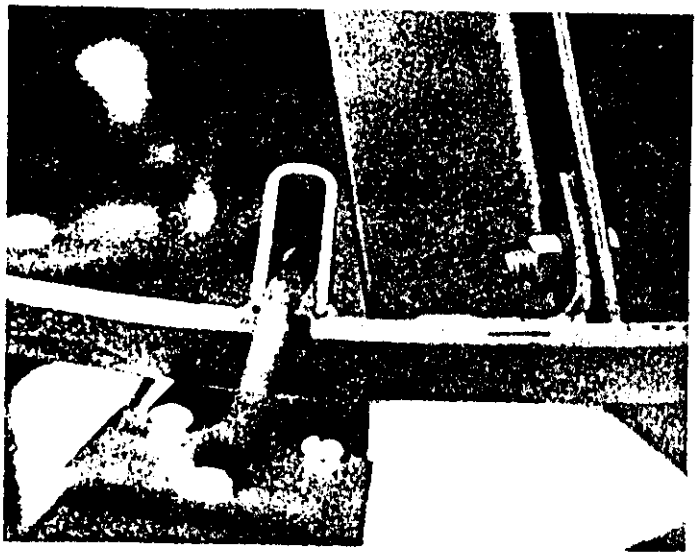
No. C-22

Electrical Cole. With the panels all in place, they can be secured to the bottom ring by inserting a cotter key through the hole in the rod on the bottom end of each light panel, and then spreading the cotter key to lock it in place. However, experience shows no tendency for these panels to rise up out of the sockets.

All SCRAMBLER lighting is three-conductor, grounded. This is all connected when your SCRAMBLER is delivered, but in the event you should have to re-connect the wires to the brushes or to the rings be sure that the green (ground) wire in the light panels makes contact with the white wire which has been painted green on the ends and which comes up out of the center pole. Contact white to white, and black on the lights to either black or red wires coming out of the center pole. Two sets of electric brushes are used to minimize the load carried by each, and so you should try to divide the lighting load between these two sets of brushes, by always being careful to connect no more than five funnel light panels together and into one jumper.

This completes the installation of the SCRAMBLER funnel lights.

begins to rise up out of the bearing on the top sweep. Then drive out the pin that will go through the end of the angle. Swing the outer end of the angle around so that it is parallel with the two top sweep tie rods. Drive in that pin and lock it in place with a hairpin cotter. Then drive out the second pin, swing the angle around until the holes are lined up, drive in the second pin, and lock it with a hairpin cotter. You may find that the sweep will sag when you remove a pin, and you may not be able to get the pin holes to line up again unless someone pushes up on the end of the sweep with a pole. When you have finished, the three angles will be sticking out in three directions at the top of the mast. The three angles must be on top of the tie rods, as shown in Picture No. C-17, or the light panels will not fit.

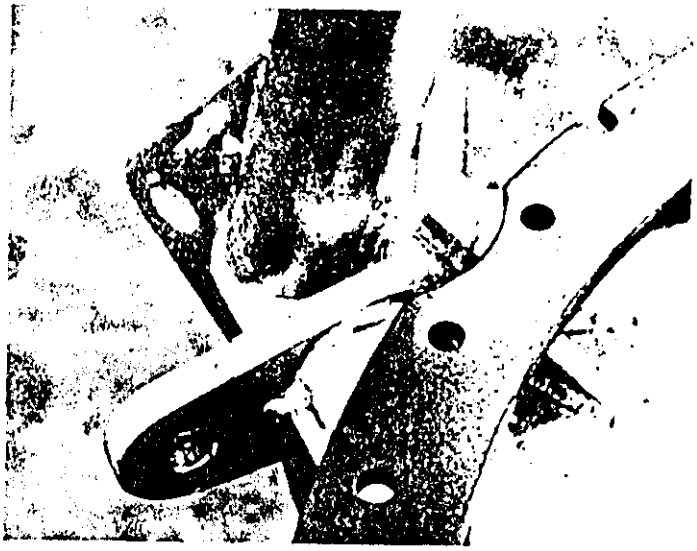


No. C-18

The large ring rests on, and bolts to, the outer end of each angle, as shown in Picture No. C-18, which shows this connection when viewed from above. It will go on in only one way. The small angles on the ring must lie against the vertical legs of the mounting angles. If the ring is upside down the mounting angles and the short angles will not lie against each other and you will not be able to bolt them together. Install the bolts to connect the ring to the mounting angles as shown.

Set in place the bottom ring as shown in Picture No. C-19. Notice the circular cutout on the outer edge. This cutout is necessary when you drop the ring down in place between the three legs of the mast. Line up the cutout as shown and it will clear the mast leg as you lower it. With the ring horizontal, slide it around until the three notches on the outer edge fit down over the triangular bracing plates directly underneath. Unless this is done the holes in the bottom ring will not be properly positioned for the light panels. This completes the installation of the bottom ring.

Position the thirty light panels. Handle them carefully to avoid breaking the lamps or bending the panels. In the middle of the back side of each light panel there is a plate with a bent rod welded to it. Slide the rod down through the rectangular eye on the inner side of the large top ring, as shown in Picture Nos. C-18 and C-20.



No. C-19

No. C-20

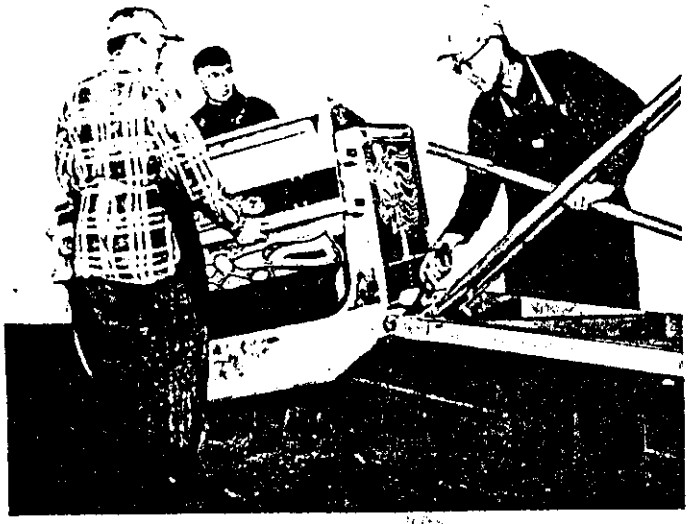
Then guide the rod on the lower end of the light panel through the hole in the bottom ring as shown in Picture No. C-21. The bottom ring is held in place by its own weight, so as you add the light panels do not put them all on one side or the bottom ring may tip. Twenty-four of the panels are alike, with a male and a female twist lock socket on the lower back side of each one. Six panels have only a female socket on each. There are nine jumpers coming out of the top of the breaker box inside the mast as shown in Picture No. C-22. With three of them connecting to the top sweep light panels, the other six connect to the funnel lights. Therefore, with 30 funnel light panels, five of them must be interconnected into each jumper coming from the breaker box. Interconnect them with the short jumpers as shown in Picture No. C-22. The fifth panel in each grouping must be the one which has only a single female twist lock socket on it. Connect no more than five panels into each jumper in order to stay within the requirements of the National

ATTACHING THE SEATS TO THE SEAT SWEEPS

One man can handle a seat if necessary, but it is much easier to guide it into its pin connections if two men hold it. See Picture No. D-5. You cannot install the

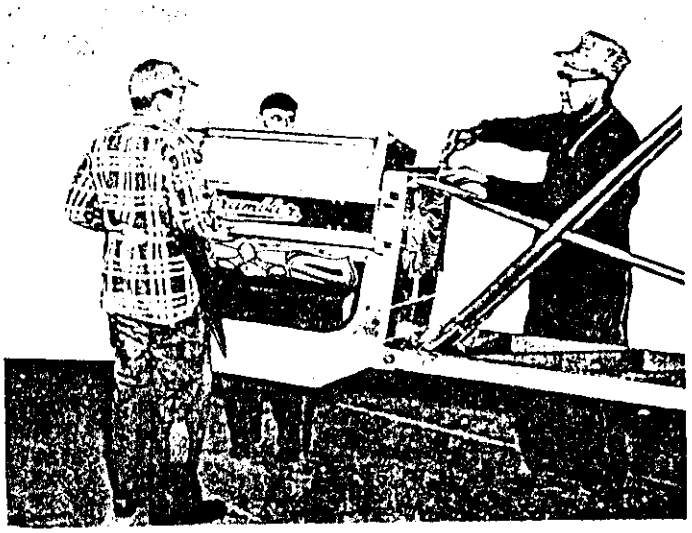
No. D-5

seat incorrectly. Drive in the two bottom pins first with the outer end of the seat lowered. See Picture No. D-6. Then raise the seat until the third pin connection lines



No. D-6

up, and drive that pin in. See Picture No. D-7. All three of these pins should go in quite easily. Be very careful when you install them that you do not damage the aluminum seat.



No. D-7

The entire seat weighs about 114 lbs. and is easy to handle. However, to keep the seat in good condition take care to keep from nicking or scratching it. The strength of the aluminum seat is in its alloy sheet covering on the outside and the inside. Every nick and gouge will reduce strength of these covering sheets. There are "sled runners" to protect the bottom of the seat when it is scooted. Do not pound on the assembly pins more than is absolutely necessary, because misalignment that requires excessive hammering may cause permanent damage to the structure which supports the pin connections.

The bottom pin connections are bolted in place with six ¼" cap screws. They are screwed into self-locking nuts which are riveted inside the seat. If any of these cap screws are backed out of the holes, tighten them to a torque load of 5 ft.-lbs. Similar bolts hold the top pin connection to the seat. They are under the block in the top of the seat.

AFTER YOU HAVE THE SEAT PINNED IN PLACE WITH ALL THREE PINS, LOCK THE PINS WITH HAIR-PIN COTTERS.

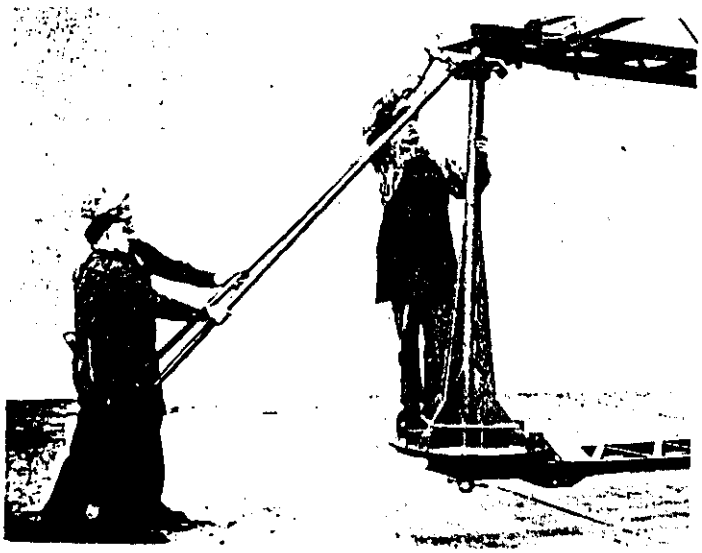
This concludes the hanging of the seat to the seat sweep.

DIRECTIONS FOR INSTALLING SEAT SWEEPS, SEATS, DRIVE UNITS, AND POWER UNIT TRUCK

HANGING THE SEAT SWEEPS ON THE UNIT POLES

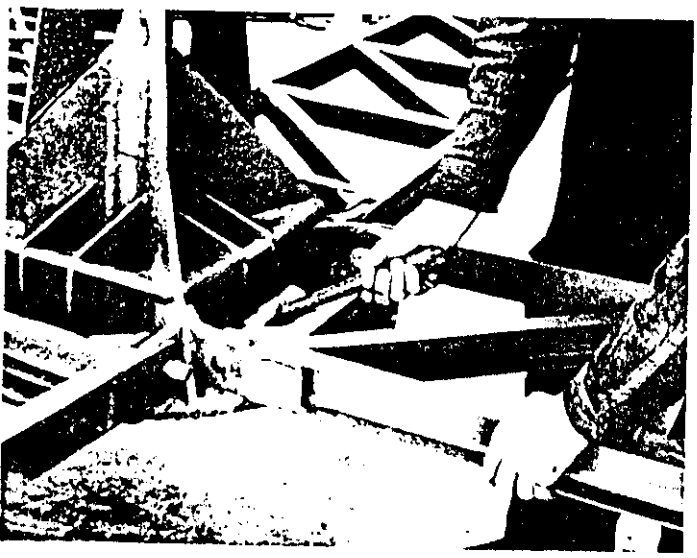
There are two lengths of tie rods remaining to be installed. The longer ones support the seat sweeps, and should be pinned in place all around the SCRAMBLER before any seat sweeps are positioned. All the tie rods are identical on each end and they are all interchangeable. Pin them to the tops of the unit poles.

LOCK THE PINS WITH HAIRPIN COTTERS. See Picture No. D-1.



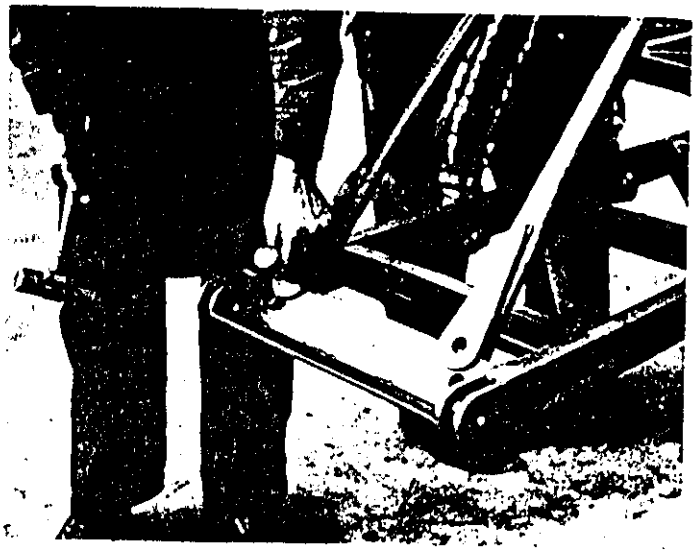
No. D-1

Let the tie rods hang by the top pin connections while you position the seat sweeps. Do not bear any weight on the tie rods or you might bend them.



No. D-2

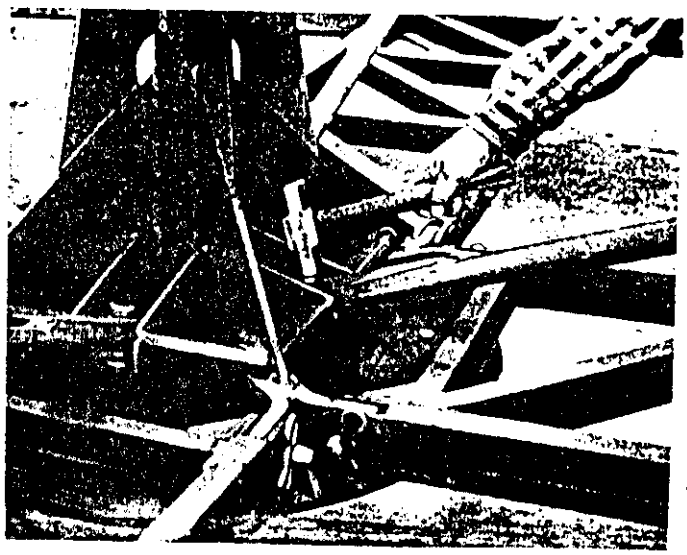
After all the tie rods are pinned, attach the seat sweeps. Pin the sweep to the unit pole as shown in Picture No. D-2. Move to the other end of the sweep and guide both tie rods onto the clevis plate as the sweep is raised into position. See Picture No. D-3. Drive in these two pins. This completes the hanging of the seat sweep on the unit pole.



No. D-3

Pin the short tie rods into the bottoms of the unit poles next. See Picture No. D-4. These tie rods are also interchangeable and identical on both ends. Slip them over the ½" plate set on an angle near the bottom of the unit pole, and let the tie rods hang until you have the seats in place. When you must drive out these pins, you may find the holes below to be of some help.

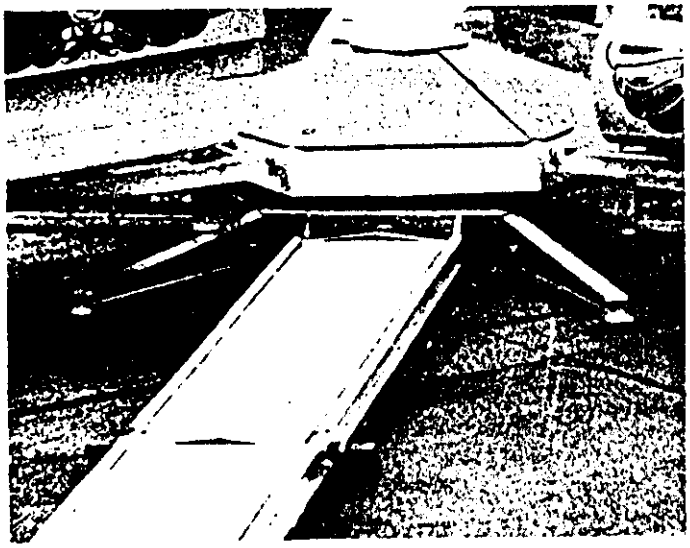
LOCK ALL PINS WITH HAIRPIN COTTERS.



No. D-4

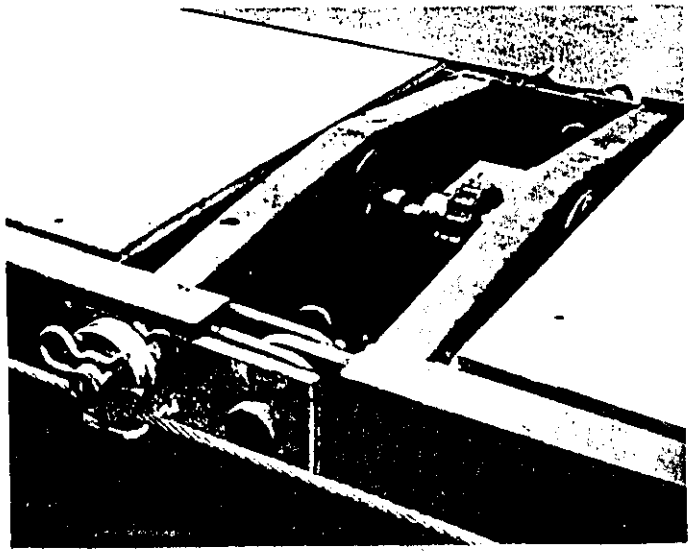
PINNING THE THREE DRIVE UNIT SECTIONS TOGETHER AND TO THE CENTER POLE.

A plywood floor is fastened to the top side of each drive unit section. Only one end of the section will fit on the pin connections at the center pole. See Picture No. D-13.



No. D-13

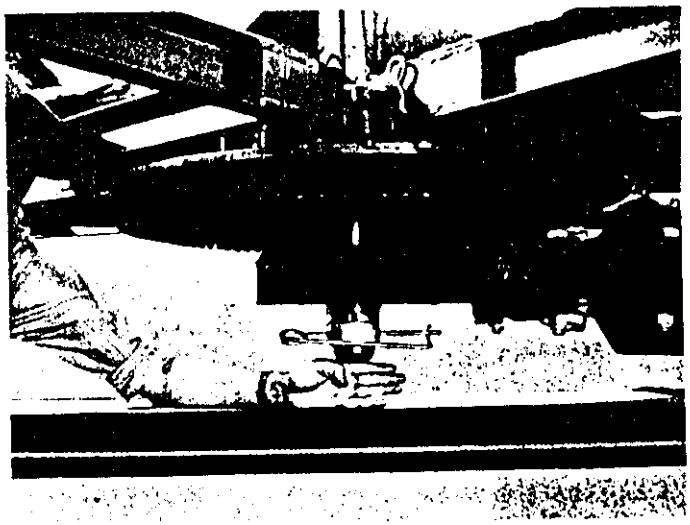
The remaining two sections can be added on in only one way. The three sections are interchangeable, but you will probable find installation easier if you will always install them in the same order.



No. D-14

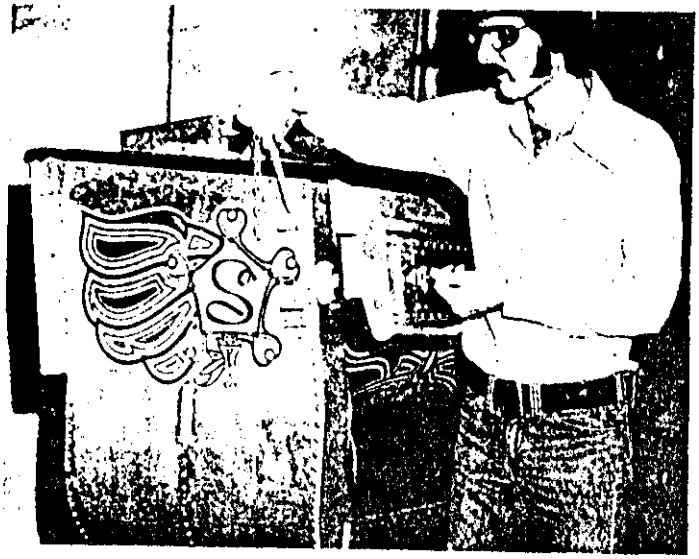
AFTER ALL OF THE PINS ARE DRIVEN, DO NOT FORGET TO LOCK THEM WITH HAIRPIN COTTERS.

Since the outer drive unit section must be raised, the brake cable must be held down so that passengers will not trip on it as they walk over the drive unit. The brake cable guides will help to do this. Before two drive unit sections are pinned together, hook in the brake cable guide and then drive in the pins. As you face the center pole the brake cable guide hooks into the right hand side of the drive unit connections as shown in Picture No. D-14.



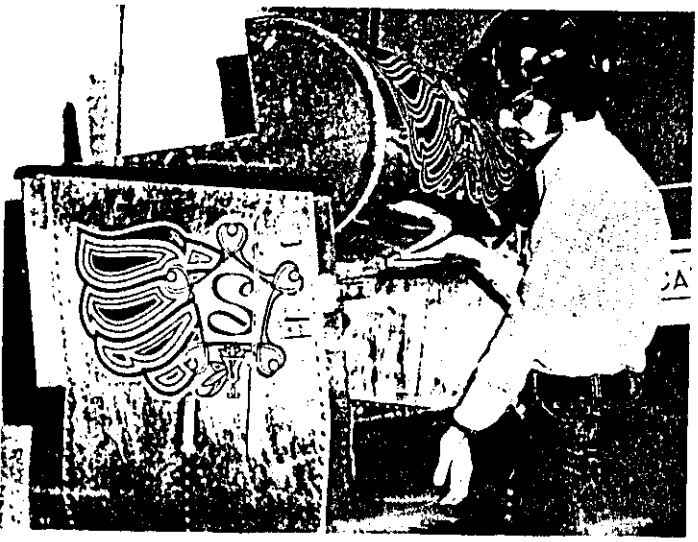
No. D-15

Be sure that the unit poles pass at least 3½" above the drive unit as shown in Picture No. D-15. The center pole will bend very slightly when the SCRAMBLER isn't loaded evenly on all sides, and you must have clearance between the unit pole and drive unit to allow for this bending. The three sections of drive unit do not need to lie perfectly flat. The outer section must be raised to connect it to the power unit truck. The shaft couplings will allow some misalignment, but the sections should be as straight and flat with each other as possible, because this will make the couplings last longer.



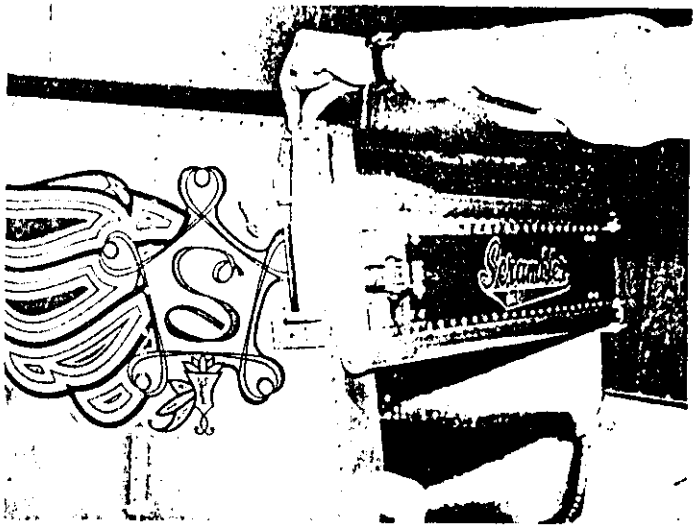
No. D-8

No. D-9

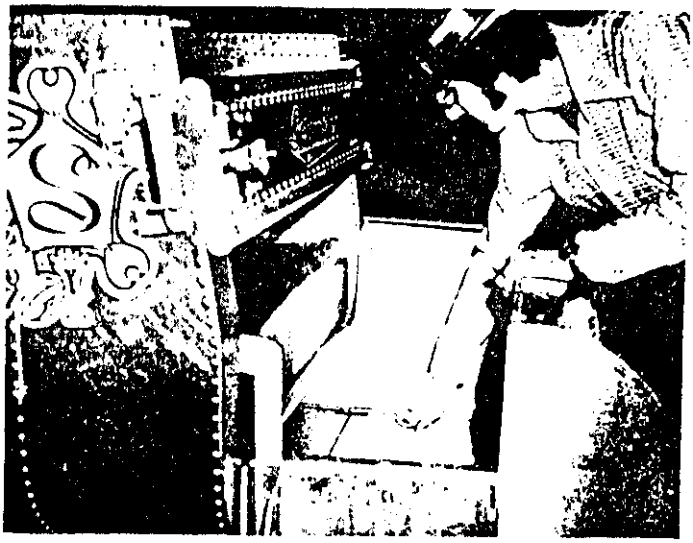


No. D-10

Open the seat handlebar as shown in Picture No. D-8. Pull the seat cushion forward to remove the pressure on the footbottom, as shown in Picture No. D-9. Fold up the lap bar and then swing the footbottom forward and up out of the way so that the seat cushion can be returned to its original position. See Picture No. D-10. Lower the footbottom to operating position, with the rear

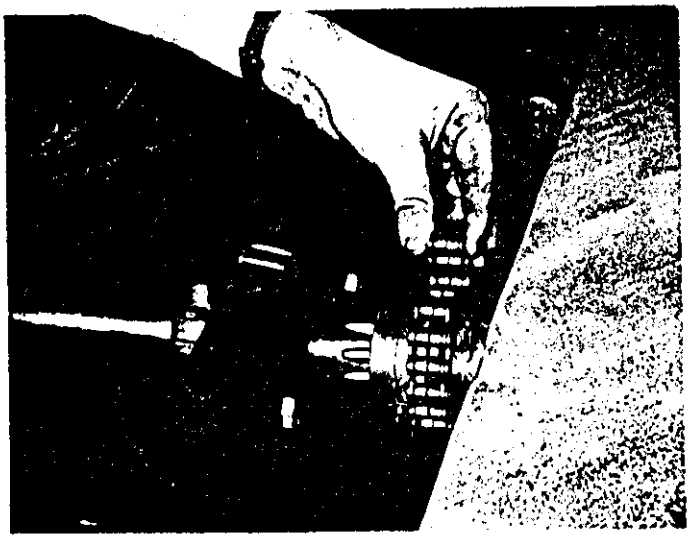


No. D-11

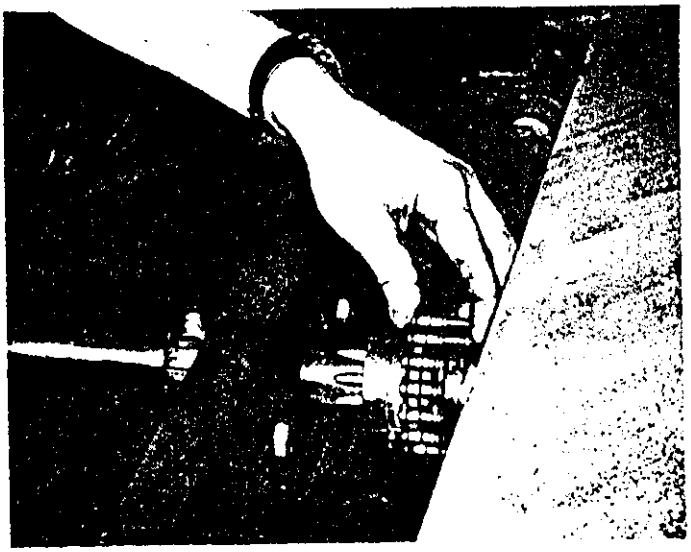


No. D-12

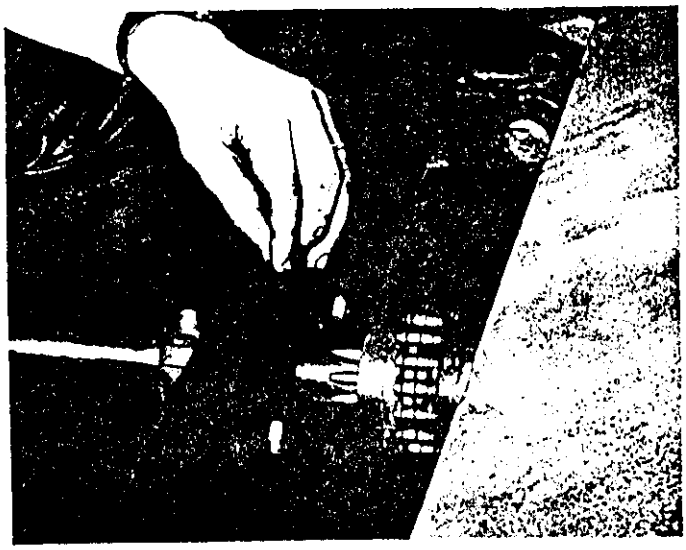
lip on the footbottom over the lip of the seat cushion. Lower the lap bar, close the handlebar, insert the locking pin, and hang the step over the end of the footbottom. See Picture No. D-11. Finally, lock the step to the footbottom and the footbottom to the seat with the three Airloc fasteners, as shown in Picture No. D-12. These quarter-turn fasteners can be locked with the special tool provided, a large screw driver, or a coin. All three of these Airlocs must be fastened. If all three are not locked, expensive damage to the seat can occur. Finally re-check to be sure that the footbottom is holding down the cushion. This completes the assembly of the seat to the SCRAMBLER.



No. E-1



No. E-2



No. E-3

CHAIN COUPLINGS

All the drive shafts in the SCRAMBLER are connected with flexible chain couplings. The seven roller chains installed each time the SCRAMBLER is set up are all the same, even though the chain sprockets do not all have the same inside dimensions.

There is a chain coupling on each end of each drive unit section and on the end of each bottom sweep next to the center pole. The following procedure should be used:

A) Align both chain sprockets so that the teeth are opposite each other. Before attaching any chains each shaft should turn freely without any other shaft turning. If another shaft is turning then the sprockets are binding against each other and the drive units must be blocked to relieve this binding. This should not happen on the bottom sweeps, because they remain flat all the time. Be sure that all shafts will turn freely before attaching any chains.

B) Feed the chain over the sprocket teeth so that the two ends come together at the top. See Picture No. E-1.

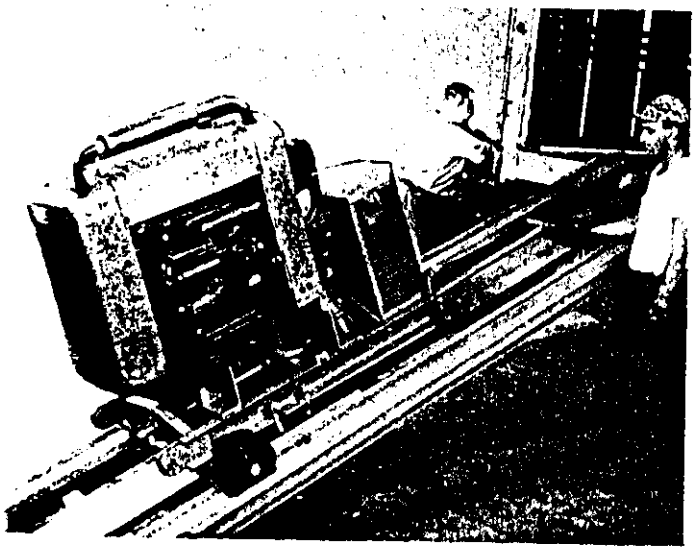
C) The removable connecting link consists of three parts: removable pin link, removable flat link, and locking spring. With the chain wrapped around the sprockets, insert the removable pin link into the two ends of the chain. See Picture No. E-2. This will hold the chain while you are locking it.

D) Slip the removable flat link over the protruding pins of the removable pin link, and squeeze the two parts of the connecting link together to expose the grooves in the crosspins. This is not easy if any of the parts are dirty, so clean them before you start.

E) A pocketknife is very useful in springing the locking spring on the pins. See Picture No. E-3. One end of the spring is slit while the other end is closed. Snap the slit end over one of the pins. When you have it seated in the pin groove, slide the spring along the groove until the solid end of the spring is seated around the pin. The slit end should then be directly over the remaining pin. Snap one side down into the groove, and spring the other side into place with a pocketknife. If the spring does not snap all the way into the groove replace it with another spring. This is very important on the bottom sweeps, because the brakes that stop the unit poles and seats from turning act through the bevel gears and drive shafts; if the chain coupling comes apart because a bad locking spring is used, there will be no brakes on the unit pole and the four seats fastened to it. Therefore, use your best coupling chains and springs on the bottom sweeps. The locking springs are inexpensive, so keep extra ones on hand at all times.

PINNING THE POWER UNIT TRUCK TO THE OUTER END OF THE DRIVE UNIT.

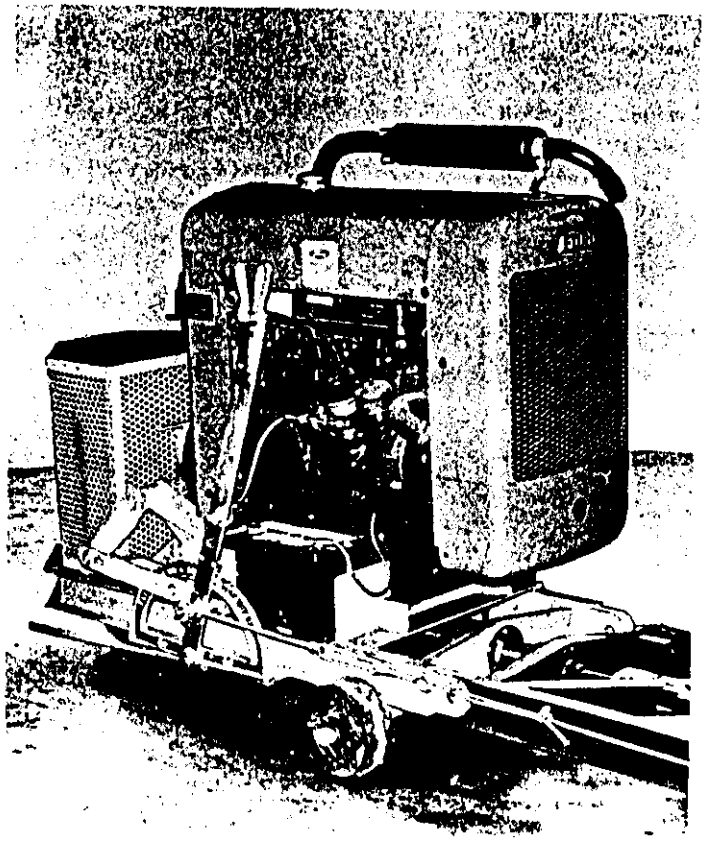
To move the power unit truck from the van, move the two runways closer together so that they are spaced the same as the two wheels on the engine truck. Set the runboard for the third wheel between the two runways, and support this board with short 2" by 2" boards that will reach from one ramp to the other. Angle stops for three of these boards have been welded to one side of each ramp. See Picture No. D-16. If you do not support the center runboard it will sag and the engine truck frame will drag.



No. D-16

Head the power unit truck down the ramp with the two wheels in front. You will find an eye on the other end of the truck for connecting to the winch cable. The wheels of the power unit truck are small, and will sink in soft ground, so keep them rolling if possible until the power unit is in position to pin to the drive unit. If the ground is too soft to do this, you may save time by re-spotting the van so that the power unit truck will be in its operating position when it reaches the bottom of the ramps. When the ground is extra soft some operators use the runway channels as a platform for the power unit truck. Usually this will not be necessary. Driving the two pins locates the engine truck properly. See Picture No. D-17.

LOCK BOTH PINS WITH HAIRPIN COTTERS.



No. D-17

ELECTRICAL WIRING FOR SCRAMBLER LIGHTING

Drawings and wiring diagrams for all lighting on your Big Eli Scrambler are included in this Section.

All light fixtures furnished are designed to use about 120 volt, 60 cycle power. A "three-wire" system is used inside the light panels, which provides a "hot" line and a neutral for carrying current, plus a third conductor for grounding the ride structure. The sockets in the light panels are individually grounded to the frame, and the electrical jumpers carry the ground connection through the collector rings to the base terminal block.

The internal wiring of the SCRAMBLER base assembly has been designed to accommodate either "split-220 volt" power or 120 volt power. DO NOT CHANGE THE INTERNAL WIRING. IT HAS BEEN CONNECTED PROPERLY FOR "SPLIT 220" VOLTS UNLESS ORDERED FOR 120 VOLTS.

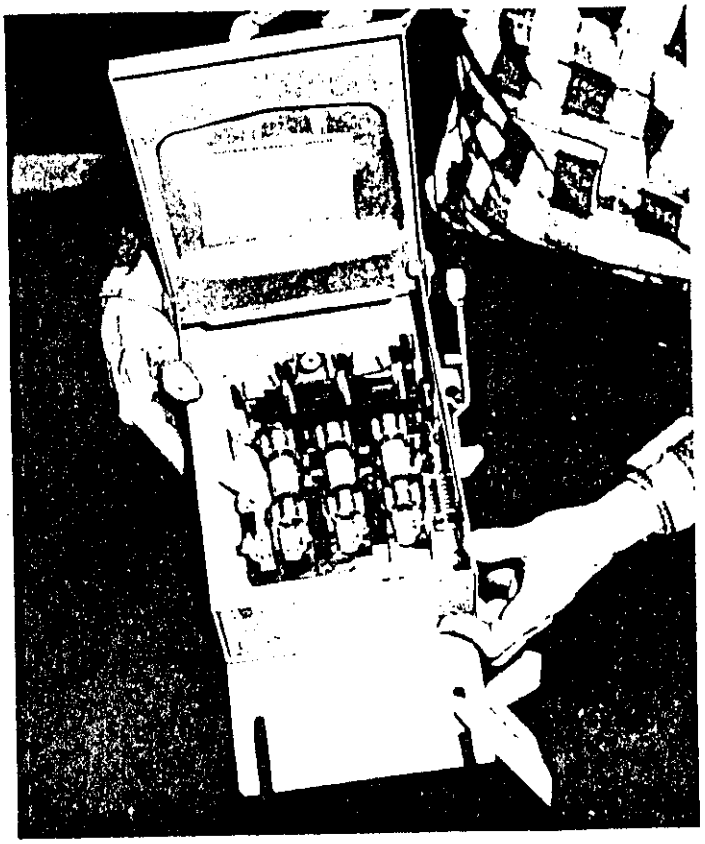
Many parks and portable operators have available 3-phase, 220 volt power. It is customary in this type of power to have also a "neutral". In the "split-220" type of service, the neutral with one hot wire will provide a 120 volt lighting circuit. Two of the three "hot" wires in the 3-phase system can be used in this way, and they must be identified by measuring the voltage (120 volts) to the neutral, because the third "hot" wire will deliver approximately 200 volts between it and the neutral, and, if used for lighting circuits, would burn out lamps and ballasts.

DO NOT CONNECT 220 VOLT POWER TO THE SCRAMBLER LIGHTING CIRCUIT UNLESS THE NEUTRAL AND THE TWO 120 VOLT LEGS HAVE BEEN CORRECTLY IDENTIFIED AND PROPERLY CONNECTED. DO NOT GUESS. GET A QUALIFIED ELECTRICIAN IF YOU ARE IN DOUBT.

A 33-foot four-conductor rubber-covered cable, wire size No. 6, is furnished for carrying power and ground from the switch box to the base terminal block. A sixty (60) ampere fuse capacity switch box for all lights is furnished with a metal bracket for mounting to the power unit truck. The box is of rain-tight style with three fused, switched terminals and a non-fused, non-switched terminal for the grounding connector. See Picture No. F-1. Both the four-conductor cable and the switch box have adequate capacity for both Standard and Deluxe Model SCRAMBLER lighting when "split 220" volt power is used.

CONNECTING INCOMING "SPLIT 220" VOLT POWER TO THE SWITCH BOX, AND FROM THE SWITCH BOX TO THE BASE TERMINAL BLOCK

If your incoming "split 220" volt power cable has four conductors, they should be color coded as follows: "hot" (red and black), neutral (white), and ground (green). Connect each of the two "hot" conductors (red and black), and the neutral conductor (white), to the appropriate line terminals at the top of the switch box. Connect the ground (green) conductor to the non-fused, non-switched terminal in the top of the switch box.



No. F-1

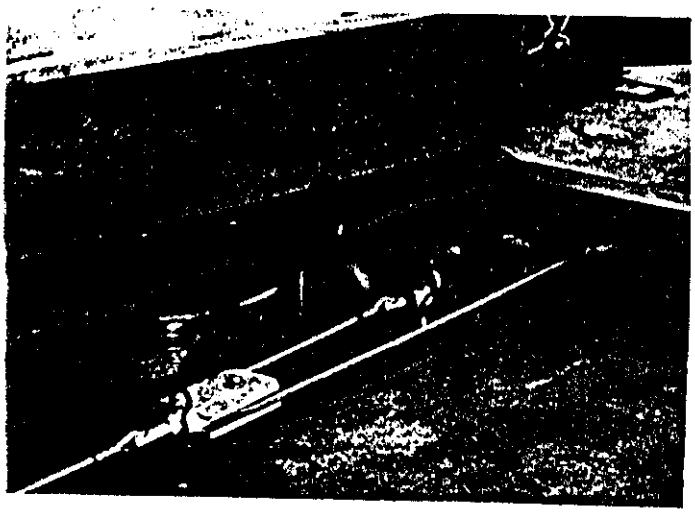
With four-conductor power coming into the switch box, the four conductors of the 33-foot drop which goes between the switch box and the base terminal block should be color coded the same, so that black is connected to black, red to red, white to white, and green to green.

Often portable operators get their "split 220 volt" power from their own portable generators. Usually there is no "system ground", or in other words each ride is grounded individually, and there is no ground wire going back to the generator. A three-conductor cable is then used. In this case the black and green wires are "hot", and the white is neutral. THIS IS A VERY IMPORTANT POINT THAT SHOULD NOT BE OVERLOOKED. WITH A THREE-CONDUCTOR CABLE and "SPLIT 220 VOLT" POWER THE GREEN CONDUCTOR IS "HOT" AND MUST BE CONNECTED TO A FUSED, SWITCHED TERMINAL IN THE SWITCH BOX. IF YOU CONNECT THE GREEN CONDUCTOR OF YOUR INCOMING "SPLIT 220 VOLT" POWER TO THE UN-FUSED, UN-SWITCHED TERMINAL IN THE SWITCH BOX, YOU WILL BE CONNECTING POWER DIRECTLY TO THE STRUCTURE. THIS IS HIGHLY DANGEROUS AND MUST NOT BE DONE.

Putting together these chain couplings is tedious, but with a little practice you should have no trouble putting one together in a minute. When disconnecting the coupling, remember that the locking spring may spring off into the grass or mud when you release it.

BRAKE CABLES

There are three brake cables: one cable passes through the equalizer and connects to each brake, the second cable connects to the brake cable equalizer and to the end of a long cable which extends back to the power unit. Connect the first cable first. Insert one end of the cable through the eye of the lever of the brake on your right as you stand on the drive unit and face the center pole. Slip on the short sleeve and insert the hairpin cotter to hold it. The cable is around the sheave in the brake cable equalizer. Run the other end of the cable around the back side of the center pole to the other brake, by feeding it through the cutouts and around the sheaves in the legs. Connect it to the second brake in the same way that you did the first. See Picture No. E-4.

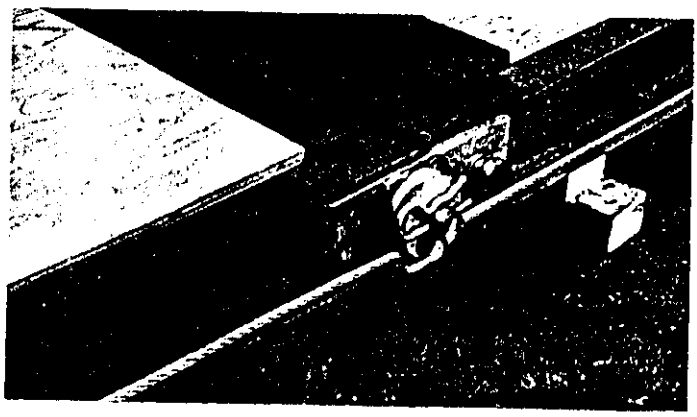


No. E-4

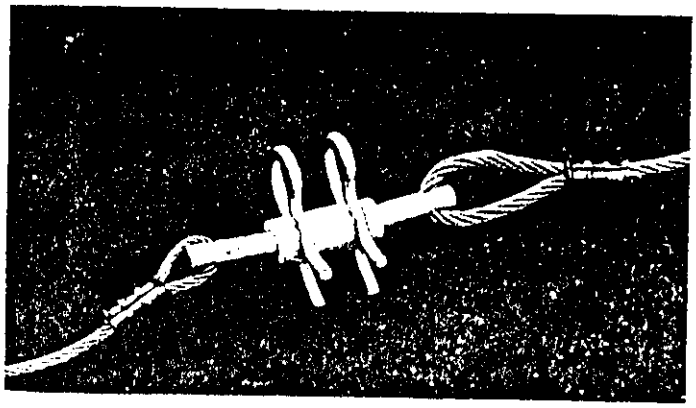
Next, connect one end of the remaining short cable to the socket of the brake cable equalizer, pass the cable around the sheave in the leg next to the drive unit, and fasten the other end of the cable to the connecting sleeve. There is a turnbuckle and an eye on one end of the long cable. Move the brake ratchet handle on the power unit truck as far as possible toward the center pole. Slip the eye of the turnbuckle over the pin near the bottom of the brake ratchet handle after removing the wing nut and washer, and then replace the wing nut and washer.

Next, run the cable through the brake cable guides on the side of the drive unit, by removing the outer hairpin, sliding the sheave out until the cable will slip on, sliding the sheave back, and replacing the hairpin.

After the drive unit chain couplings are connected, set in place the sheet metal covers as shown in Picture No. E-5. Fasten the other end of the long cable in the connecting sleeve. See Picture No. E-6.

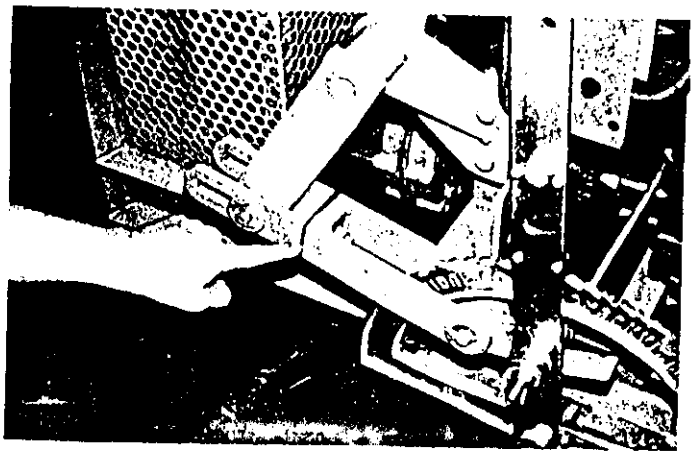


No. E-5

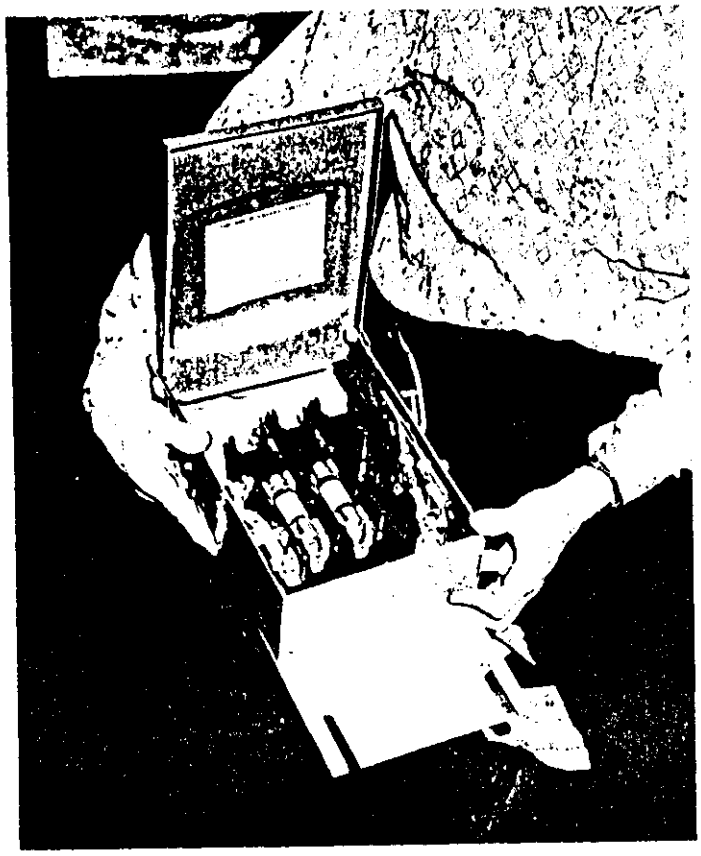


No. E-6

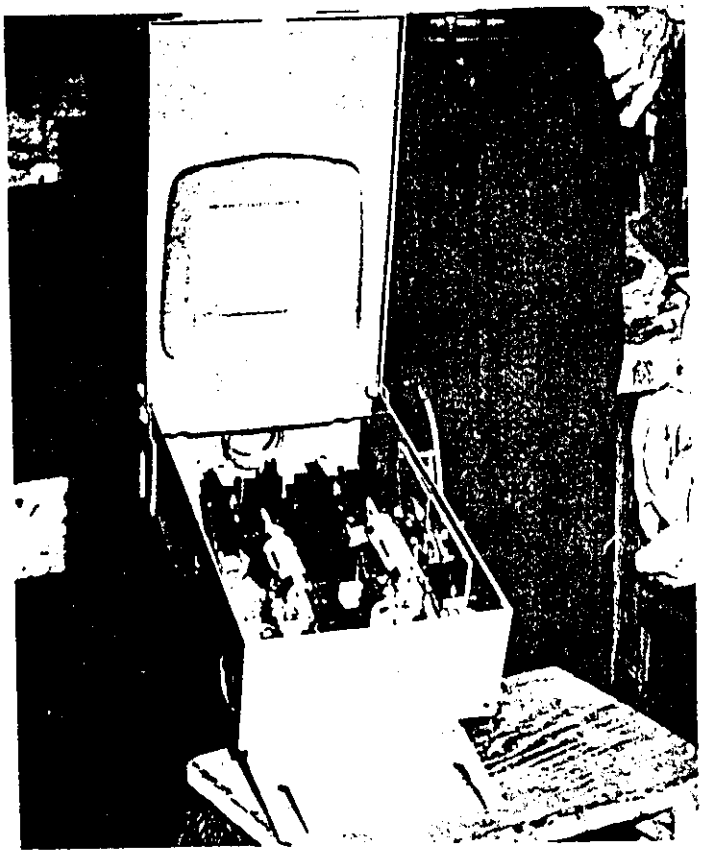
This completes the assembly of the brake cables, but some adjusting of the turnbuckles may be necessary. As you pull the brake ratchet handle away from the center pole, you will tighten the cable. This turnbuckle was adjusted when your SCRAMBLER was set up and operated in the factory, but you may need to change the adjustment as the brake shoes wear or the cable stretches. If you do make any changes be sure to adjust also the link connecting the brake ratchet handle to the clutch lever, by adding or removing washers, as shown in Picture No. E-7. When the brakes are set, the clutch lever should have moved far enough forward so that the clutch is completely disengaged.



No. E-7



No. F-3



No. F-4

GROUNDING

If your incoming power does not include a ground, then the following information which has been taken directly from the National Electrical Code will indicate how you should provide a proper electrical ground, or a "made" ground as the Code describes it.

250-81. Water Pipe. A metallic underground water piping system, either local or supplying a community, shall always be used as the grounding electrode where such a piping system is available. Where the buried portion of the metallic piping system is less than ten feet (including well casings bonded to the piping system) or there is some likelihood of the piping system being disconnected, it shall be supplemented by one or more of the grounding electrodes recognized in Sections 250-82 and 250-83.

250-82. Other Available Electrodes. Where a water system as described in Section 250-81 is not available, the grounding connection may be made to any of the following:

(a) The metal frame of the building, where effectively grounded.

(b) A continuous metallic underground gas piping system.

(c) Other local metallic underground systems, such as piping, tanks, and the like.

250-83. Made Electrodes. Where electrodes described in Sections 250-81 and 250-82 are not available, the grounding electrode shall consist of a driven pipe, driven rod, buried plate or other device approved for the purpose and conforming to the following requirements:

(a) Plate Electrodes. Each plate electrode shall present not less than 2 sq. feet of surface to exterior soil. Electrodes of iron, or steel plates shall be at least 1/4 inch in thickness. Electrodes of non-ferrous metal shall be at least 0.06 inch in thickness.

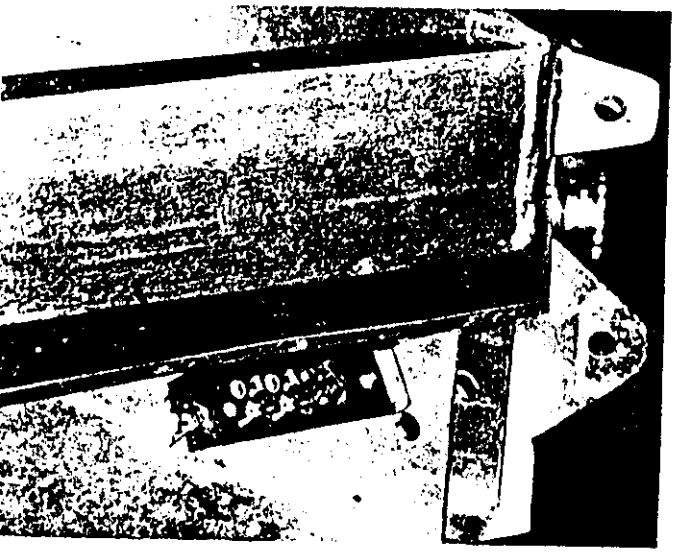
(b) Pipe Electrodes. Electrodes of pipe or conduit shall be not smaller than of the 3/4 inch trade size and, where of iron or steel, shall have the outer surface galvanized or otherwise metal-coated for corrosion protection.

(c) Rod Electrodes. Electrodes of rods or steel or iron shall be at least 5/8 inch in diameter. Approved rods of non-ferrous materials or their approved equivalent used for electrodes shall be not less than 1/2 in in diameter.

(d) Installation. Electrodes should, as far as practicable, be imbedded below permanent moisture level. Except where rock bottom is encountered,

With the incoming "split 220 volt" power carried in three-conductor cable into the switch box, the 33-foot rop should be connected at the switch box, black to lack, white to white, green (incoming) to red (33-foot rop), and the green conductor in the 33-foot drop should e connected to a "made" ground as described in the ational Electrical Code. (See the special section on Grounding".) WITH INCOMING "SPLIT 220 VOLT" OWER IN A THREE-CONDUCTOR CABLE DO NOT ONNECT THE GREEN CONDUCTOR OF THE INCOM-NG CABLE TO THE GREEN CONDUCTOR OF THE 3-FOOT DROP.

Connect the other end of the 33-foot drop to the base rminal block on your SCRAMBLER, which has four rminals on it. See Picture No. F-2. The internal wiring



No. F-2

the SCRAMBLER is color coded, red, black, white, d bare wire (ground). On the terminal block the red and ack conductors are not jumpered together. THESE TWO RMINALS MUST NOT BE JUMPERED TOGETHER LESS YOUR INCOMING POWER IS 120 VOLT. SEE E SECTION ON 120 VOLT POWER. When connecting 33 foot drop to the base terminal block, connect ck to black, red to red, white to white, and green to und (bare wire). This conforms to standard code prac-e of using green or bare wires for grounding wires, te for neutral, and black, red or other colors for "hot" es.

After the incoming power is turned on, but BEFORE u throw the switch, be sure to measure 120 volts from ch of the two hot wires to the neutral where they are nnected at the line terminals in the switch box.

FAILURE TO CHECK THE VOLTAGE MAY RESULT EXCESSIVE VOLTAGE GOING TO THE LAMP LLASTS, AND IF THIS HAPPENS THE BALLASTS ROUGHOUT THE SCRAMBLER WILL BURN OUT MOST IMMEDIATELY. REPLACING BALLASTS CAN VERY TIME CONSUMING AS WELL AS EXPENSIVE.

BE SURE THAT ONLY 120 VOLT POWER IS BEING LIVERED TO YOUR LIGHTS.

INSTRUCTIONS WHEN USING SINGLE-PHASE 120 VOLT POWER, FOR WHICH THE SCRAMBLER IS WIRED ONLY ON SPECIAL ORDER

If your incoming 120 volt line has only two conductors, one is "hot" (color coded black) and the other is neutral (color coded white). Connect each of these two conductors to the appropriate fused, switched terminals in the top of the switch box. Provide a proper equipment ground as described in the National Electrical Code. (see the special section on "Grounding".) Connect the ground to the non-fused, non-switched terminal in the top of the switch box.

If your incoming 120 volt line has three conductors, one is "hot" (color coded black), one is neutral (color coded white), and the third is ground (color coded green). Connect the "hot" (black) and neutral (white) conductors to the fused, switched terminals in the top of the switch box. Connect the ground (green) conductor to the non-fused, non-switched terminal in the top of the switch box. THIS APPLIES ONLY TO SINGLE-PHASE 120 VOLT POWER IN A THREE-CONDUCTOR CABLE. SEE THE SECTION ON "SPLIT 220 VOLT" POWER IF YOUR INCOMING POWER IS NOT 120 VOLT.

A 33 foot three-conductor drop is furnished for carrying power and ground from the switch box to the base terminal block. Lighting equipment for Standard Model SCRAMBLERS requires a No. 8 wire size, and for the Deluxe Model SCRAMBLER the lighting requires No. 2 wire size.

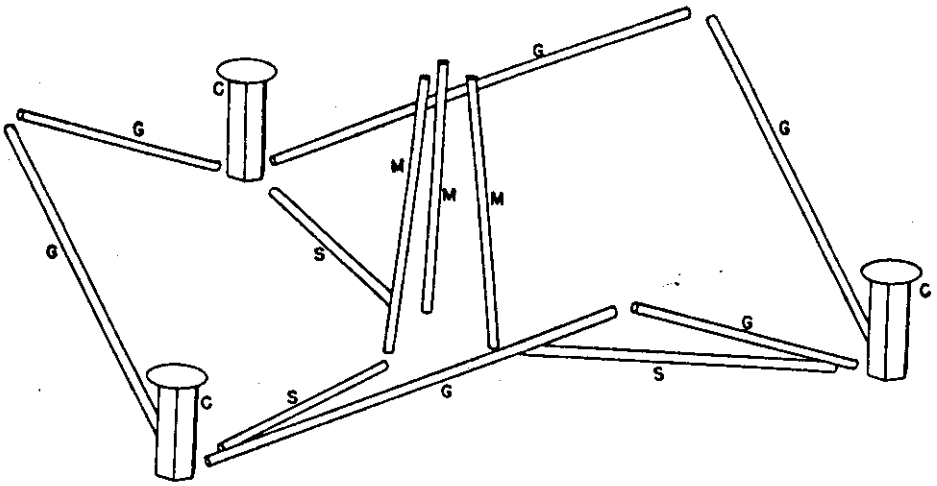
The switch box for all lights is furnished with a metal bracket for mounting the box to the power unit truck. The box is of rain-tight construction with two fuses and a non-fused, non-switched, terminal for the grounding conductor. A switch box with sixty (60) ampere fuse capacity is included for standard lighting. (See Picture No. F-3) A one-hundred (100) ampere fuse capacity switch is provided for deluxe lighting. (See Picture No. F-4).

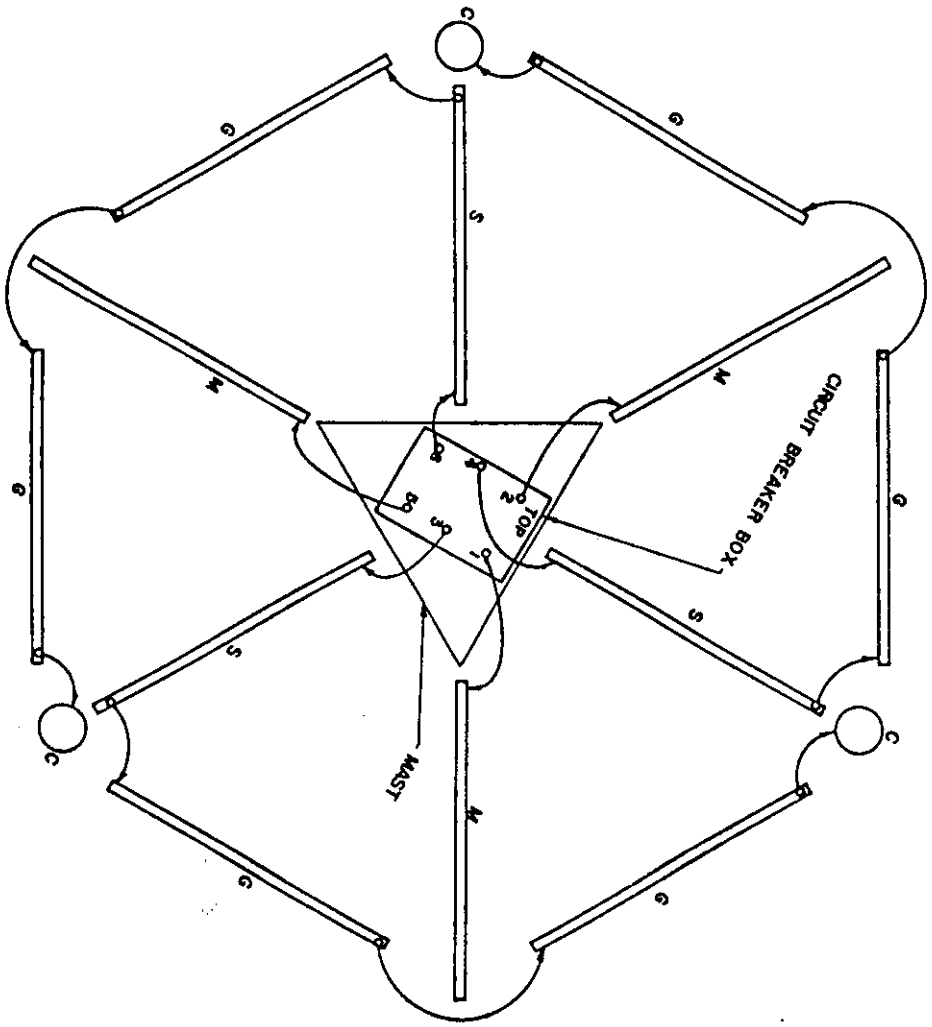
Connect the 33 foot drop to the switch box, following the color coding with each conductor. Connect the "hot" (black) conductor to the fused load terminal, the other end of which is connected to the incoming 120 volt "hot" (black) conductor. Connect the neutral (white) conductor to the other fused load terminal, on the other end of which is connected the incoming 120 volt neutral (white) conductor. Connect the ground (green) conductor to the non-fused, non-switched terminal.

Connect the other end of the 33 foot drop to the base terminal block on your SCRAMBLER, which has four terminals on it. See Picture No. F-2. The internal wiring of the SCRAMBLER is color coded red, black, white, and bare wire (ground). On the terminal block the black and red conductors are jumpered together. DO NOT REMOVE THIS JUMPER UNLESS YOU ARE CONNECTING TO "SPLIT 220 VOLT" INCOMING POWER. SEE THE SECTION ON "SPLIT 220 VOLT" POWER. When connecting the 33 foot drop to the terminal block, connect black to black, white to white, and green to ground. This conforms to standard code practice of using green or bare wire for grounding wires, white for neutral, and black, red, or other colors for "hot" wires.

The above instructions apply only when the incoming power is single phase, 120 volt.

STANDARD SCRAMBLER LIGHTING LAYOUT





CODE

G - GABLE LIGHTS
S - SWEEP LIGHTS
M - MAST LIGHTS
F - FUNNEL LIGHTS
C - CLUSTER LIGHTS

pipes or rods shall be driven to a depth of at least 8 feet regardless of size or number of electrodes used. Pipes or rods when less than standard commercial length shall preferably be of one piece. Such pipes or rods shall have clean metal surfaces and shall not be covered with paint, enamel or other poorly conducting materials. Where rock bottom is encountered at a depth of less than 4 feet, electrodes shall be buried in a horizontal trench, and where pipes or rods are used as the electrode they shall comply with Paragraphs 250-83 (b and c) and shall not be less than 8 feet in length. Each electrode shall be separated at least 6 feet from any other electrode, including those used for signal circuits, radio, lightning rods, or any other purpose.

250-84. Resistance. Made electrodes shall, where practicable, have a resistance to ground not to exceed 25 ohms. Where the resistance is not as low as 25 ohms, two or more electrodes connected in parallel shall be used.

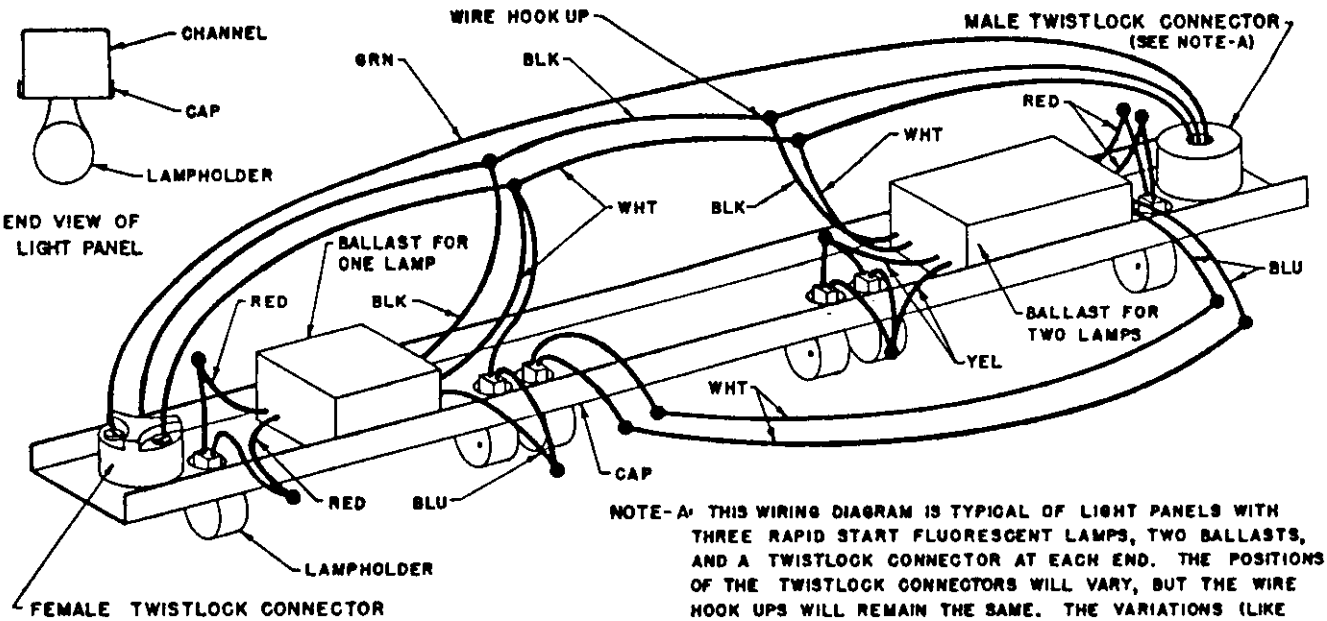
Continuous metallic underground water or gas piping systems in general have a resistance to ground of less than 3 ohms. Metal frames of buildings and local metallic underground piping systems, metal well casings, and the like, have, in general, a resistance substantially below 25 ohms. It is recommended that in locations where it is necessary to use made electrodes for grounding interior wiring systems, additional grounds, such as connections to a system ground conductor, be placed on the distribution circuit. It is also recommended that single electrode grounds when installed, and periodically afterwards, be tested for resistance.

INCANDESCENT LIGHTING

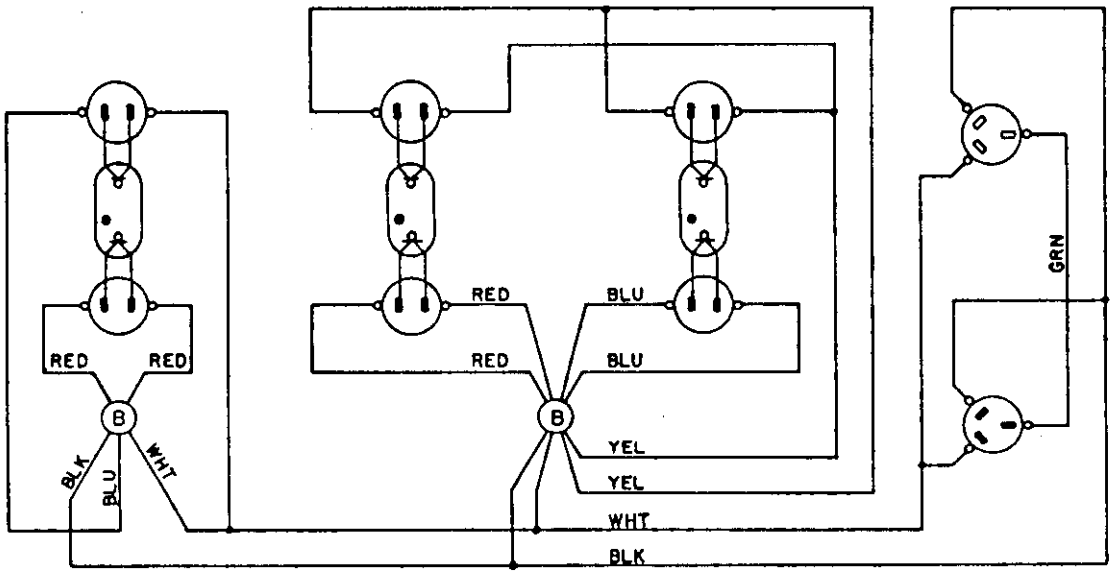
Incandescent light panels, available as optional lighting equipment beginning with SCRAMBLER Serial No. 415, can be used with bulbs no larger than 25 watts in order to comply with the National Electrical Code. This applies to both Standard and Deluxe lighting. Mast lights, only, on a Standard SCRAMBLER may be used with bulbs of 100 watts or less. It is necessary to use a Deluxe lighting switch box (100 ampere fuse capacity) with Deluxe incandescent lighting. The following table shows the rated currents drawn by fluorescent and incandescent lighting.

	AMPERES IN BREAKER BOX FEEDER CIRCUITS	
	FEEDER CIRCUIT C	FEEDER CIRCUIT B
STANDARD FLUORESCENT	4.9	7.4
STANDARD 25W INCANDESCENT	30.9	43.0
SAME, WITH 100W MAST LIGHTS	59.0	43.0
DELUXE FLUORESCENT	19.4	15.7
DELUXE INCANDESCENT 25W	108.1	86.9

WIRING DIAGRAM FOR: GABLE AND SWEEP



NOTE-A: THIS WIRING DIAGRAM IS TYPICAL OF LIGHT PANELS WITH THREE RAPID START FLUORESCENT LAMPS, TWO BALLASTS, AND A TWISTLOCK CONNECTOR AT EACH END. THE POSITIONS OF THE TWISTLOCK CONNECTORS WILL VARY, BUT THE WIRE HOOK UPS WILL REMAIN THE SAME. THE VARIATIONS (LIKE FINDING ONE OR BOTH OF THE TWISTLOCK CONNECTORS ATTACHED TO THE CHANNEL) ARE NECESSARY TO EASILY CONNECT THE JUMPERS.

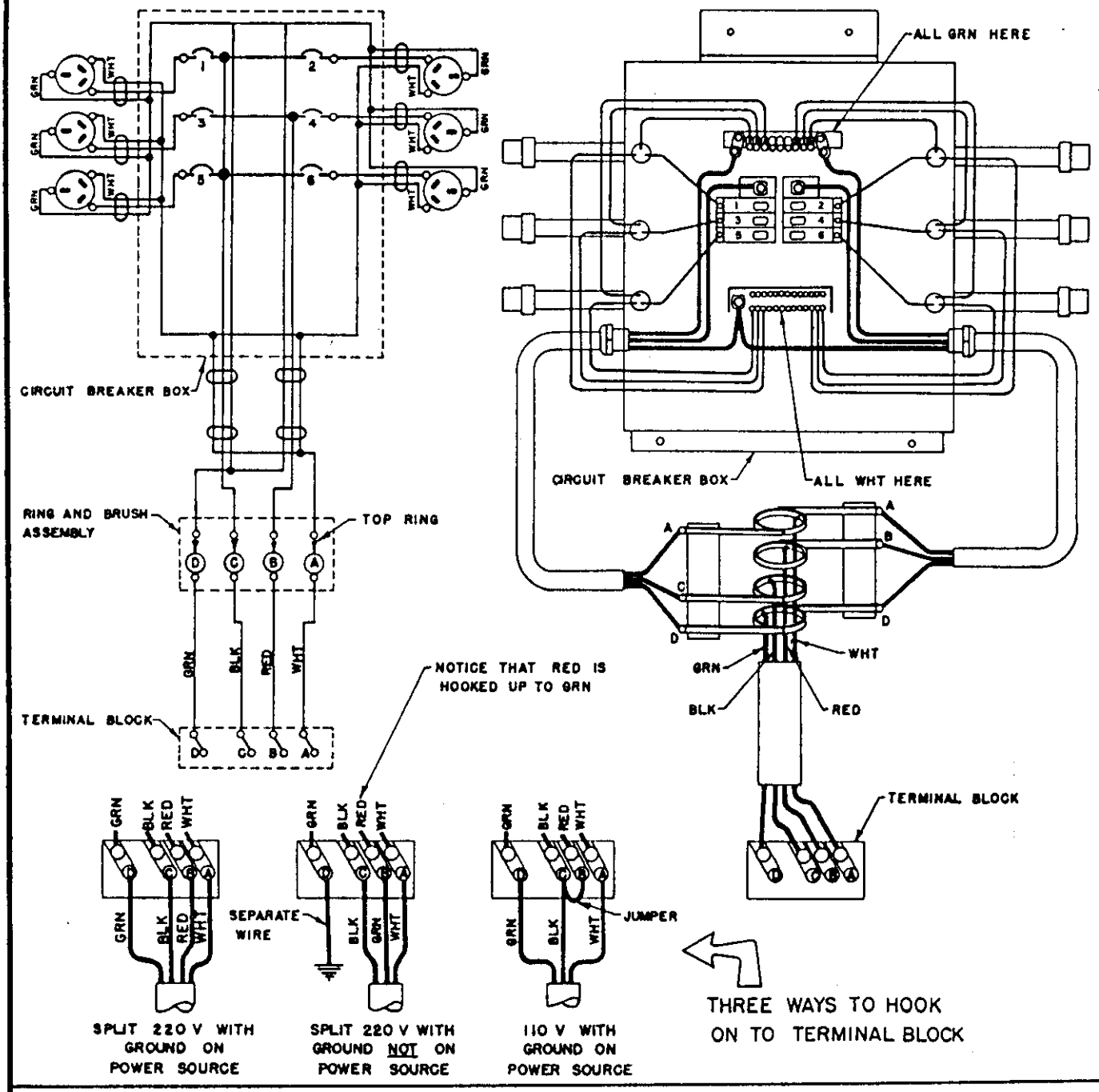


LEGEND

BLK- BLACK WIRE
WHT- WHITE WIRE
RED- RED WIRE
GRN- GREEN WIRE
BLU- BLUE WIRE
YEL- YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

STANDARD SCRAMBLER FEEDER CIRCUIT



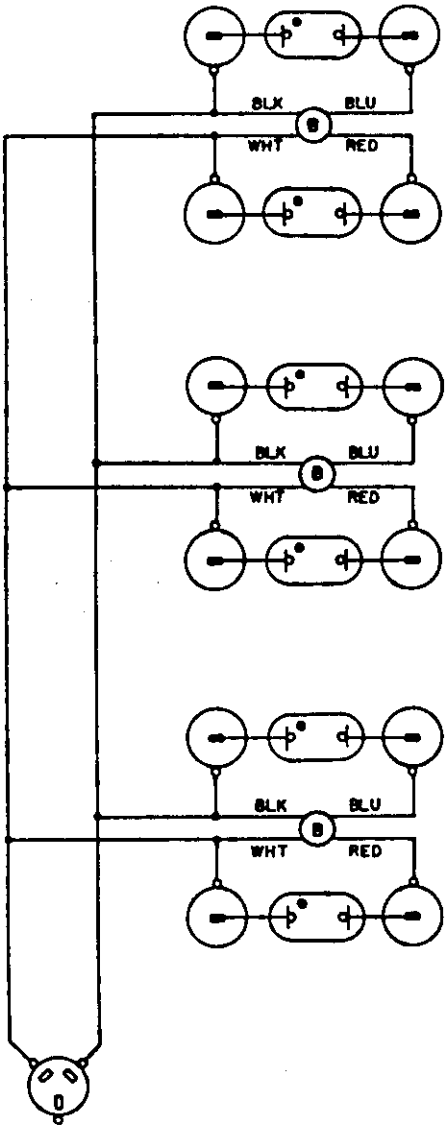
LEGEND

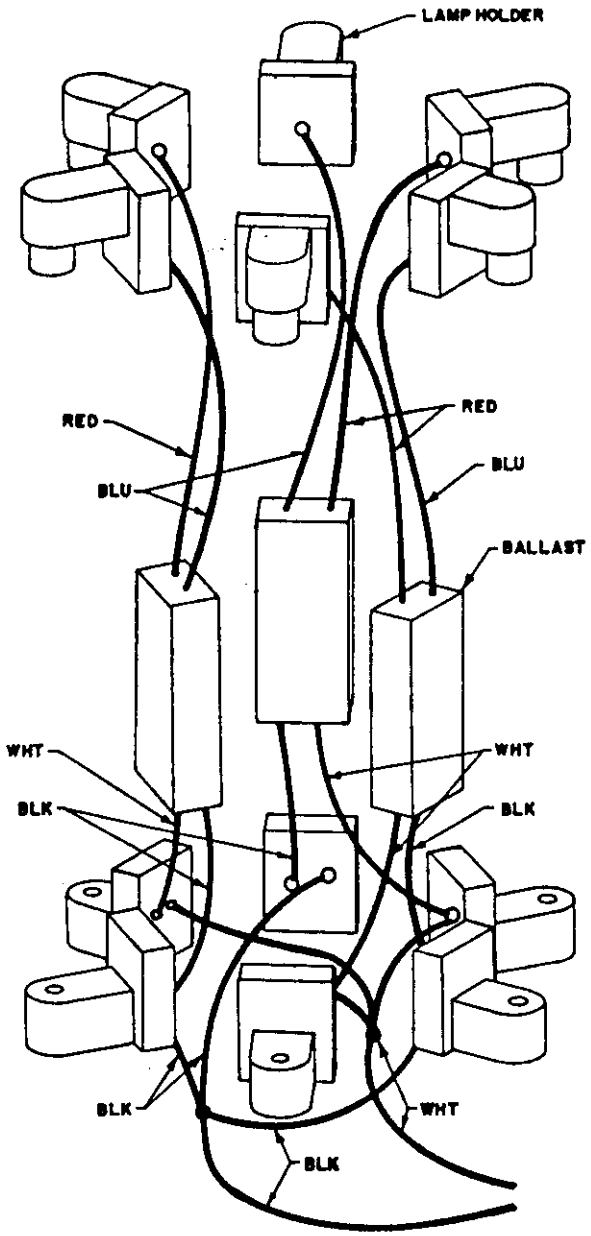
BLK- BLACK WIRE
WHT- WHITE WIRE
RED - RED WIRE
GRN - GREEN WIRE
BLU - BLUE WIRE
YEL - YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

WIRING DIAGRAM FOR: CLUSTER

THIS WIRING DIAGRAM TYPICAL OF CLUSTER LIGHTS HAVING SLIMLINE FLUORESCENT LAMPS



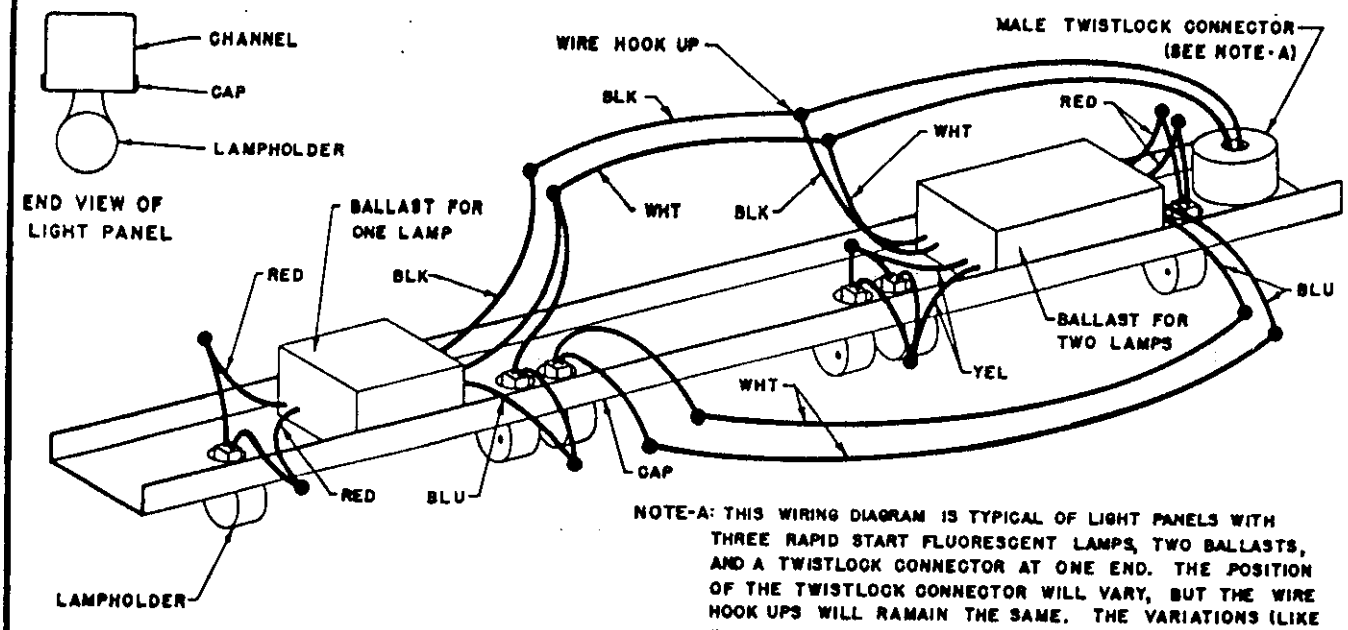


LEGEND

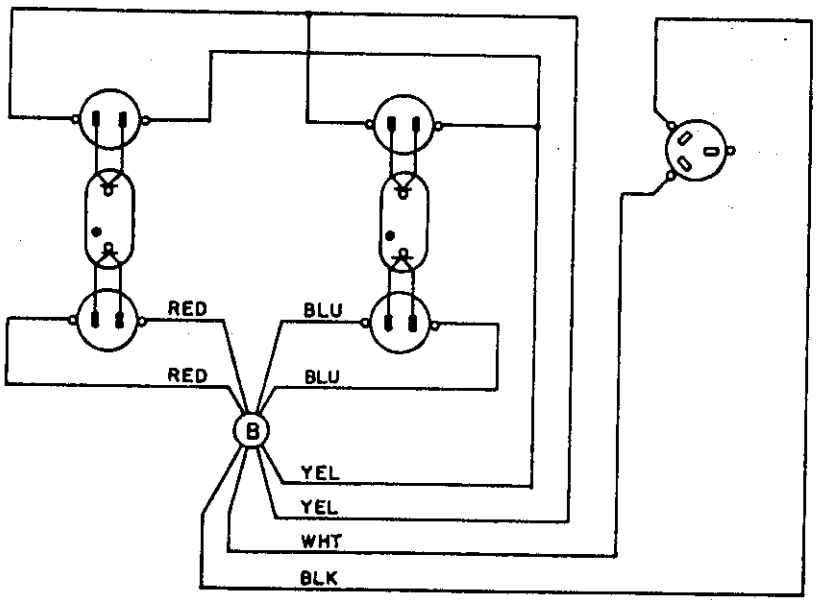
BLK- BLACK WIRE
WHT- WHITE WIRE
RED- RED WIRE
GRN- GREEN WIRE
BLU- BLUE WIRE
YEL- YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

WIRING DIAGRAM FOR: MAST



NOTE-A: THIS WIRING DIAGRAM IS TYPICAL OF LIGHT PANELS WITH THREE RAPID START FLUORESCENT LAMPS, TWO BALLASTS, AND A TWISTLOCK CONNECTOR AT ONE END. THE POSITION OF THE TWISTLOCK CONNECTOR WILL VARY, BUT THE WIRE HOOK UPS WILL REMAIN THE SAME. THE VARIATIONS (LIKE FINDING THE TWISTLOCK CONNECTOR ATTACHED TO THE CHANNEL) ARE NECESSARY TO EASILY CONNECT THE JUMPERS.

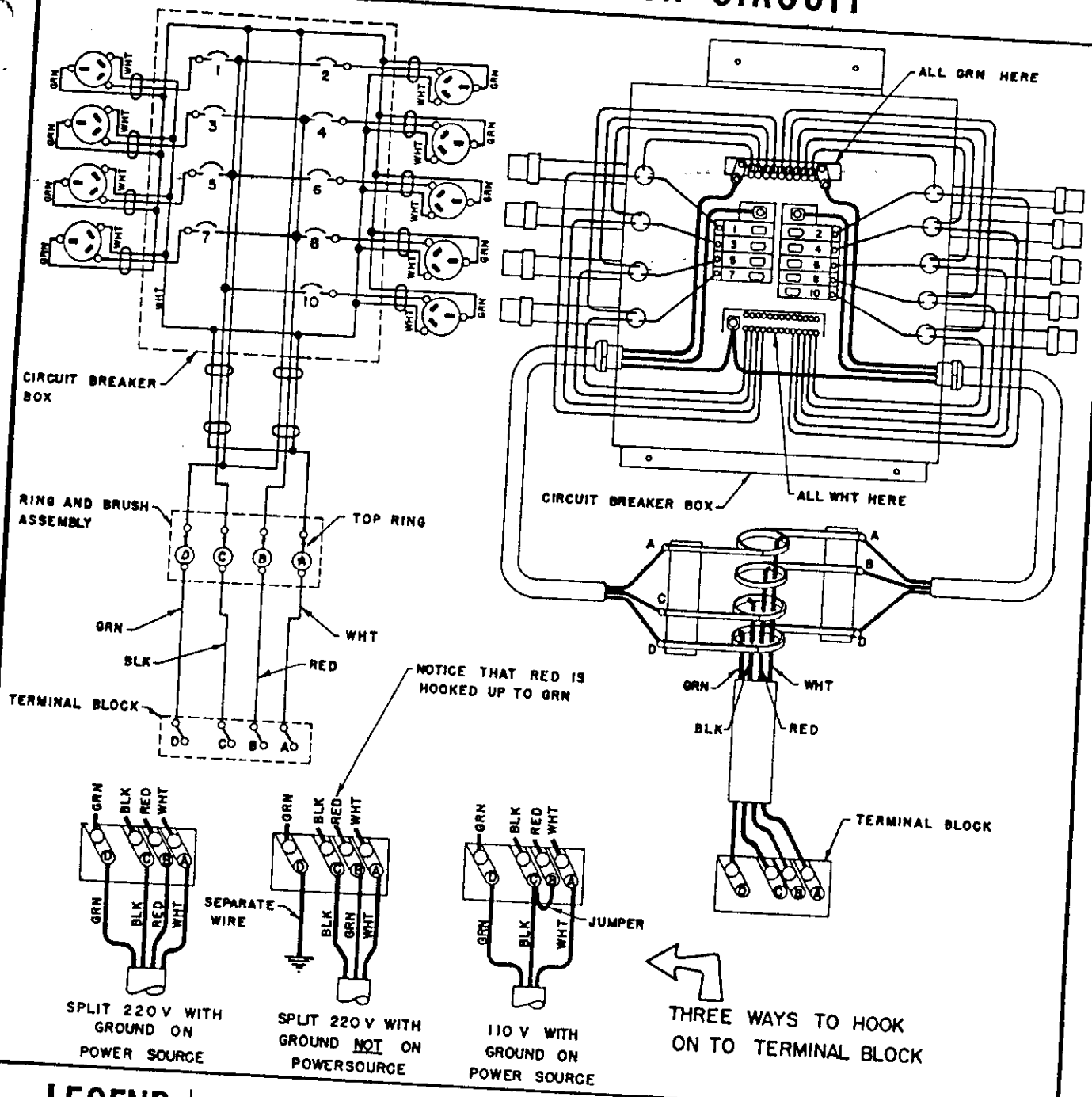


LEGEND

BLK- BLACK WIRE
WHT- WHITE WIRE
RED - RED WIRE
GRN - GREEN WIRE
BLU - BLUE WIRE
YEL - YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

DELUXE SCRAMBLER FEEDER CIRCUIT

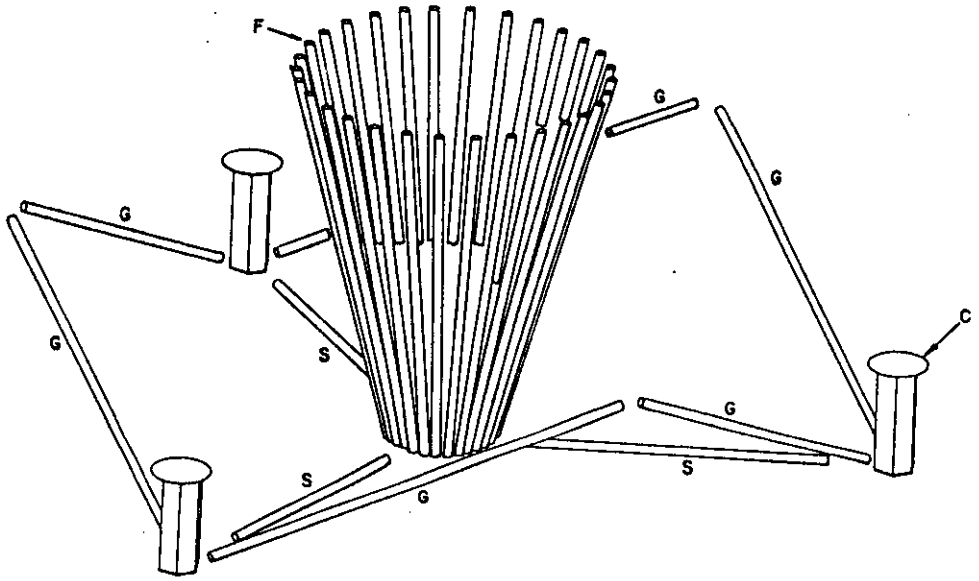


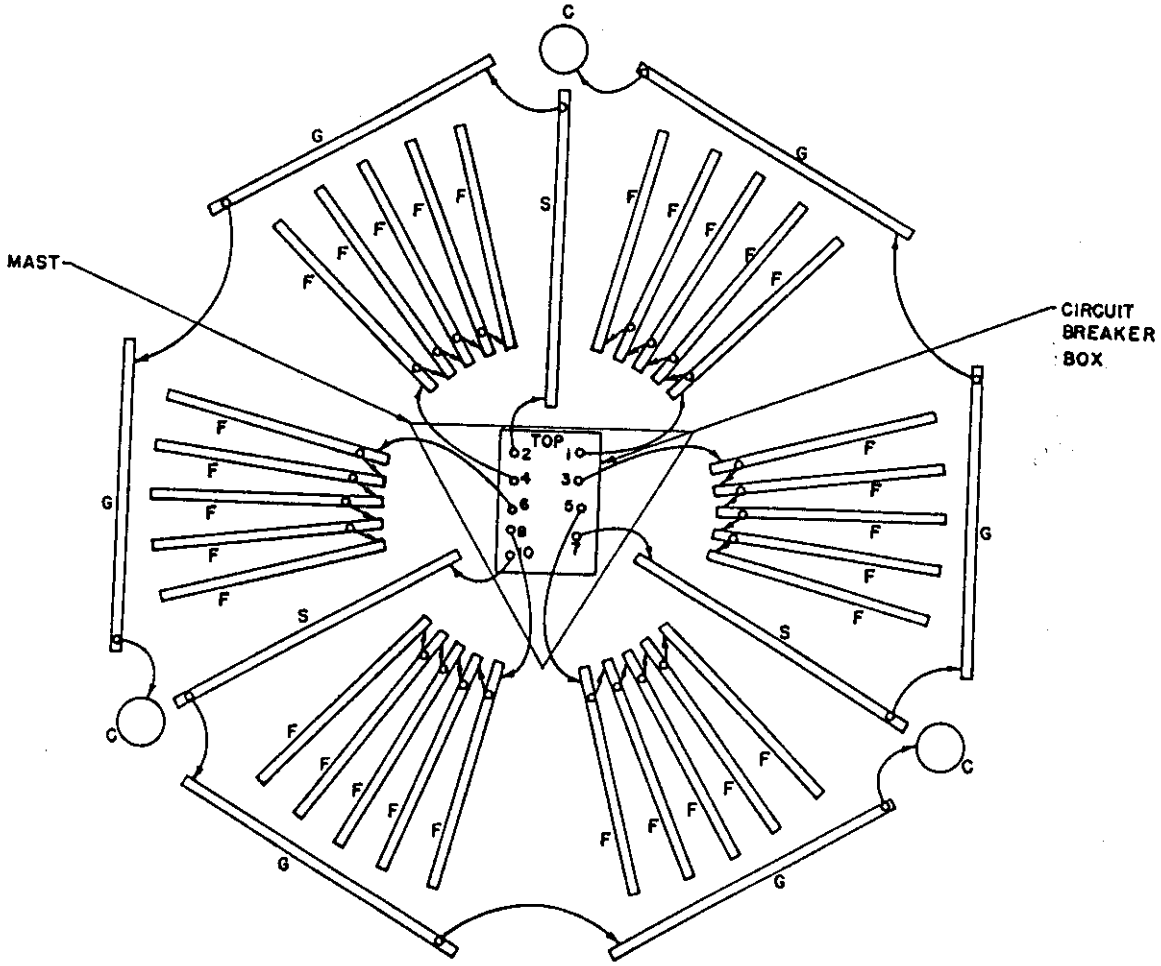
LEGEND

BLK- BLACK WIRE
WHT- WHITE WIRE
RED- RED WIRE
GRN- GREEN WIRE
BLU- BLUE WIRE
YEL- YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

DELUXE SCRAMBLER LIGHTING LAYOUT

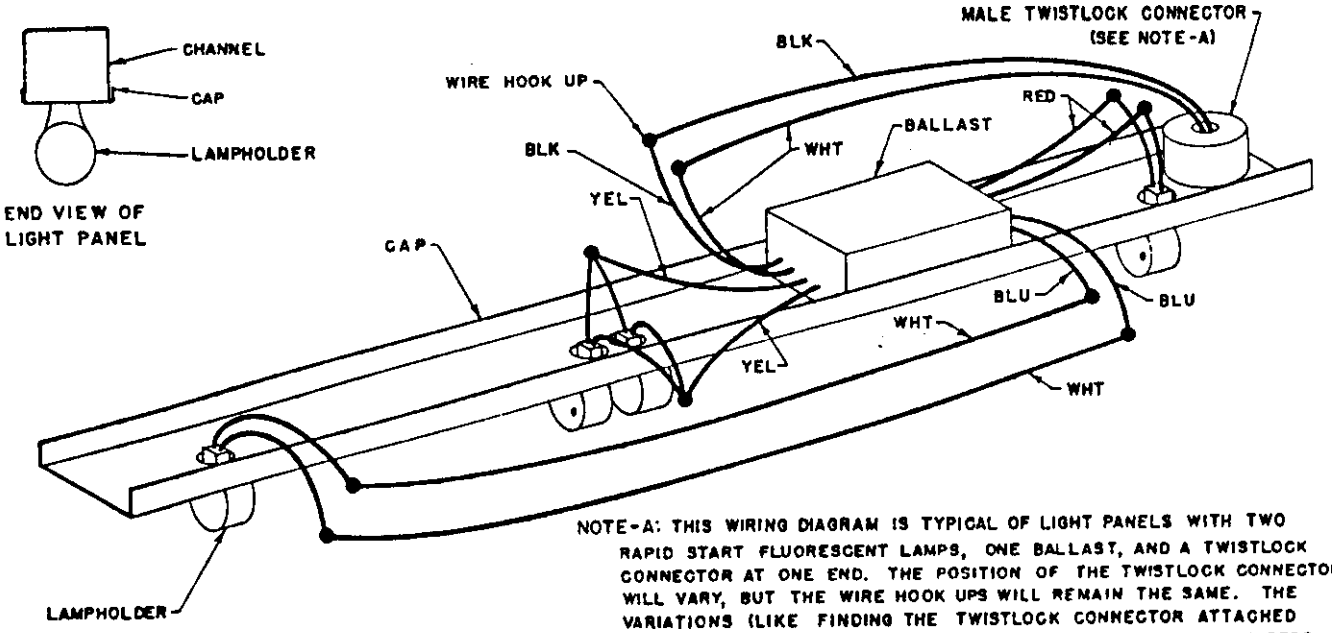




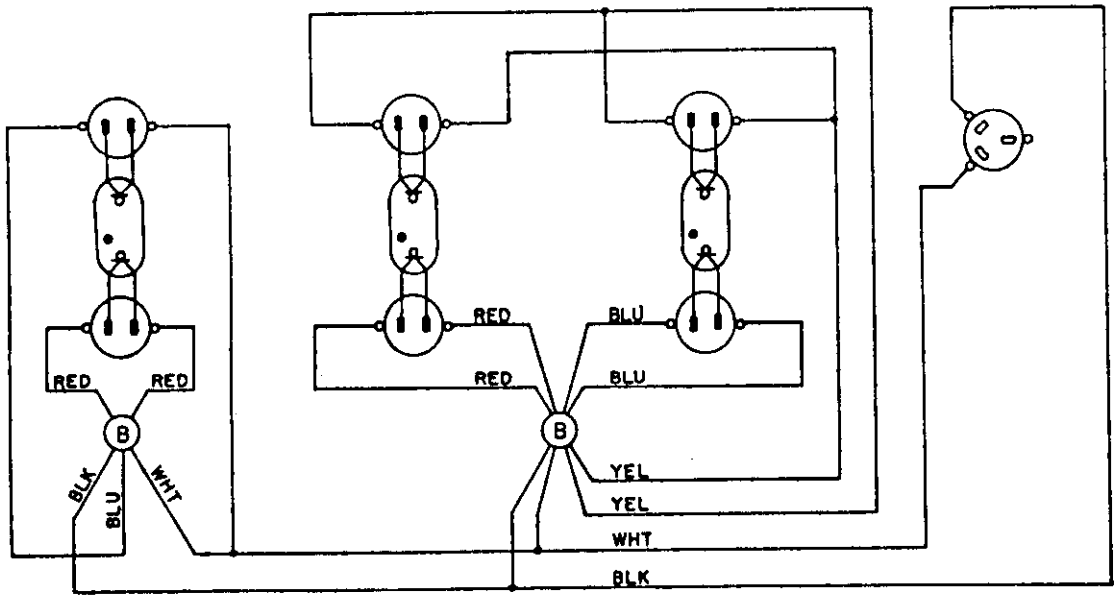
CODE

G - GABLE LIGHTS
S - SWEEP LIGHTS
M - MAST LIGHTS
F - FUNNEL LIGHTS
C - CLUSTER LIGHTS

WIRING DIAGRAM FOR: FUNNEL WITH ONE TWISTLOCK



NOTE-A: THIS WIRING DIAGRAM IS TYPICAL OF LIGHT PANELS WITH TWO RAPID START FLUORESCENT LAMPS, ONE BALLAST, AND A TWISTLOCK CONNECTOR AT ONE END. THE POSITION OF THE TWISTLOCK CONNECTOR WILL VARY, BUT THE WIRE HOOK UPS WILL REMAIN THE SAME. THE VARIATIONS (LIKE FINDING THE TWISTLOCK CONNECTOR ATTACHED TO THE CHANNEL) ARE NECESSARY TO EASILY CONNECT THE JUMPERS.

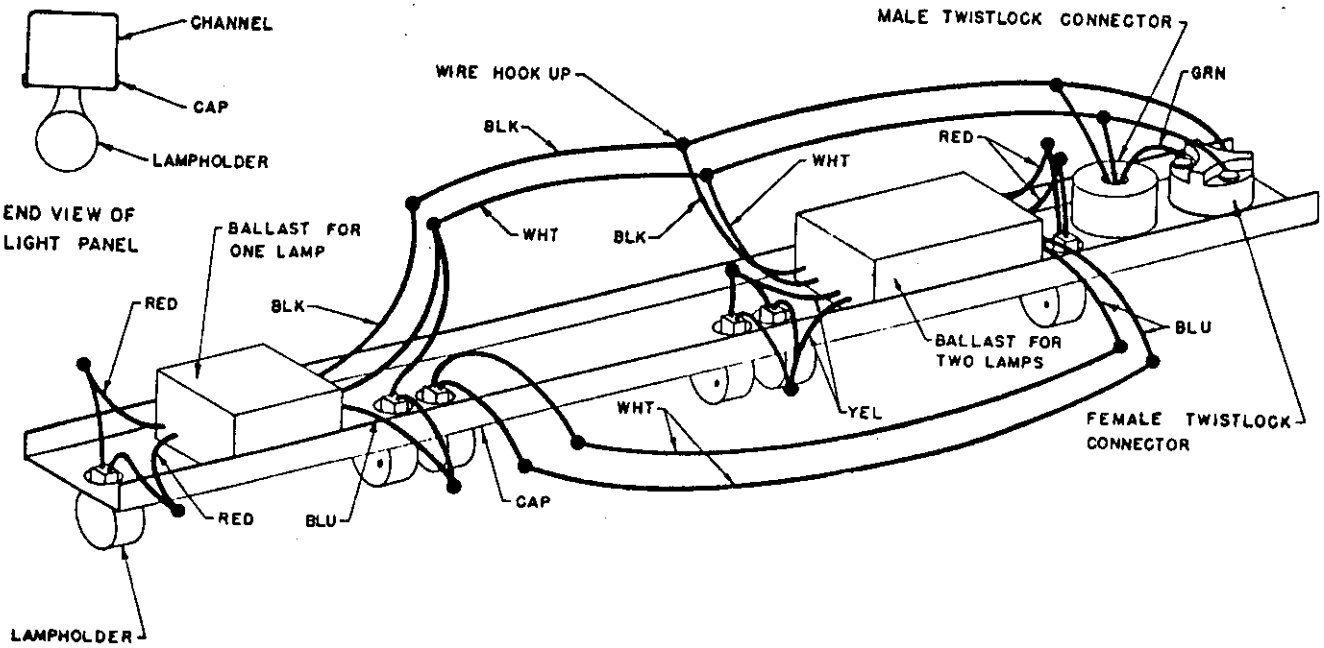


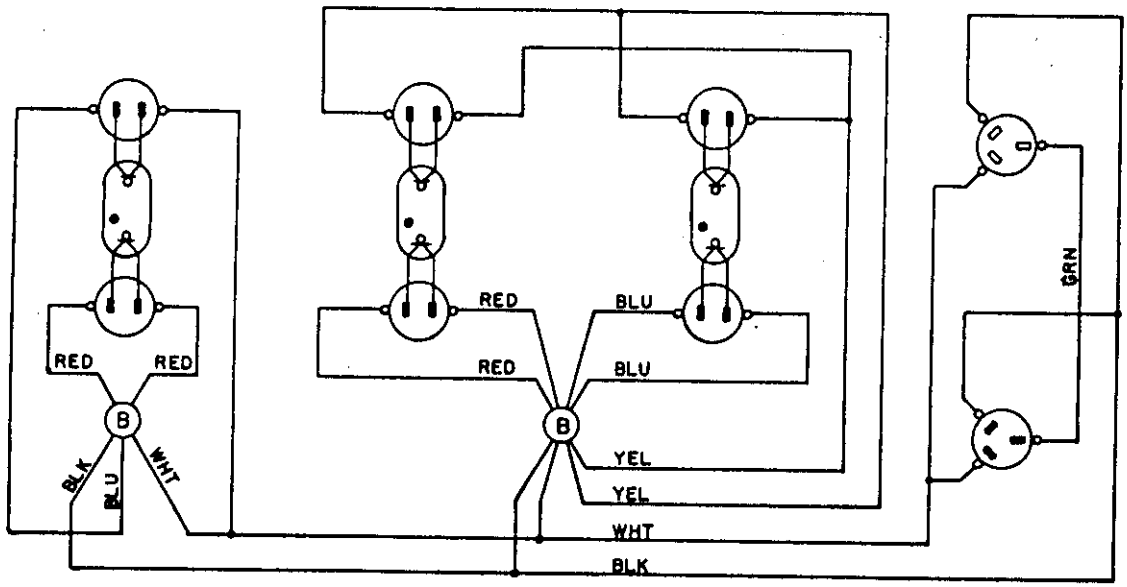
LEGEND

BLK- BLACK WIRE
WHT- WHITE WIRE
RED- RED WIRE
GRN- GREEN WIRE
BLU- BLUE WIRE
YEL- YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

WIRING DIAGRAM FOR: FUNNEL WITH TWO TWISTLOCKS





LEGEND

BLK- BLACK WIRE
WHT- WHITE WIRE
RED - RED WIRE
GRN - GREEN WIRE
BLU - BLUE WIRE
YEL - YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) [illegible]ITER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

OPERATING INSTRUCTIONS FOR THE SCRAMBLER

MAKE CERTAIN THAT EVERY PERSON WHO OPERATES THE SCRAMBLER READS THESE INSTRUCTIONS CAREFULLY. CARELESS OPERATION CAN CAUSE ACCIDENTS, OR PERMIT ACCIDENTS TO HAPPEN THAT COULD HAVE BEEN PREVENTED.

IT IS ESSENTIAL THAT EACH AND EVERY PERSON WHO MAY OPERATE THE SCRAMBLER FOR ANY PERIOD OF TIME, NO MATTER HOW SHORT THAT PERIOD OF TIME MIGHT BE, BE THOROUGHLY FAMILIAR WITH THE DANGERS ASSOCIATED WITH THE FOLLOWING:

1. FAULTY HANDLEBAR LATCHING
2. OVER-SPEEDING
3. INCORRECT PASSENGER PLACEMENT
4. USE OF DRUGS OR ALCOHOL
5. MISSING HAIRPIN COTTERS OR KLIK-PINS

OPERATOR INSTRUCTIONS

Every operator should read and understand this entire Instruction Manual thoroughly before operating the SCRAMBLER.

The Big Eli SCRAMBLER Ride has been carefully designed and built with the safety of your passengers in mind. It will provide thrilling entertainment for your patrons if properly operated and maintained. As with any amusement ride, careless operation of the SCRAMBLER can cause unnecessary risk to people. Proper maintenance of the SCRAMBLER is essential. Passengers must not be allowed to misbehave.

Vigilance on the part of the operator can prevent accidents. The operator must watch the ride at all times, and refuse rides to any person that, in his opinion, might be in danger.

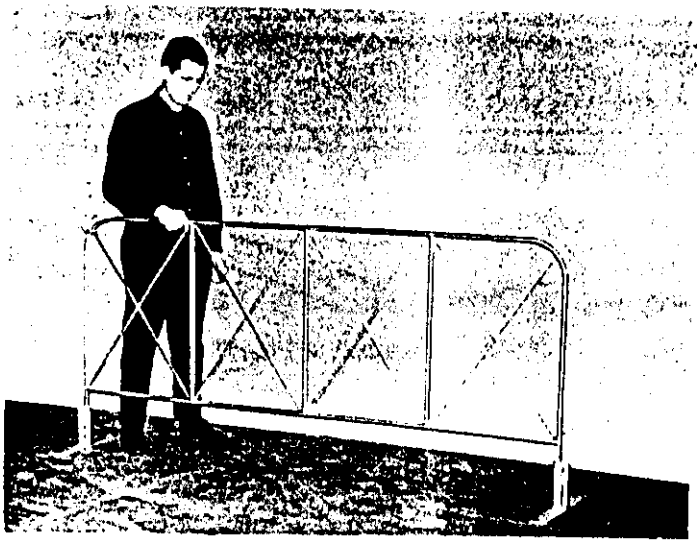
The operator must not become careless, because the SCRAMBLER is a fast ride which involves high accelerations and decelerations, and any person leaving his seat when the ride is in motion is almost certain to be severely injured.

USE OF DRUGS OR ALCOHOL

It is obvious that an operator who is under the influence of drugs or alcohol is a serious hazard to his passengers and under no circumstances should be permitted to operate the SCRAMBLER.

It is extremely dangerous to allow anyone under the influence of drugs or alcohol to get on the ride, for they often attempt to stand up or to extend their arms from the seat. The seats pass each other at 50 MPH, and a hand outstretched from one seat cannot touch another seat, but can touch another outstretched hand from another seat. Such practices are likely to result in injuries to the passengers.

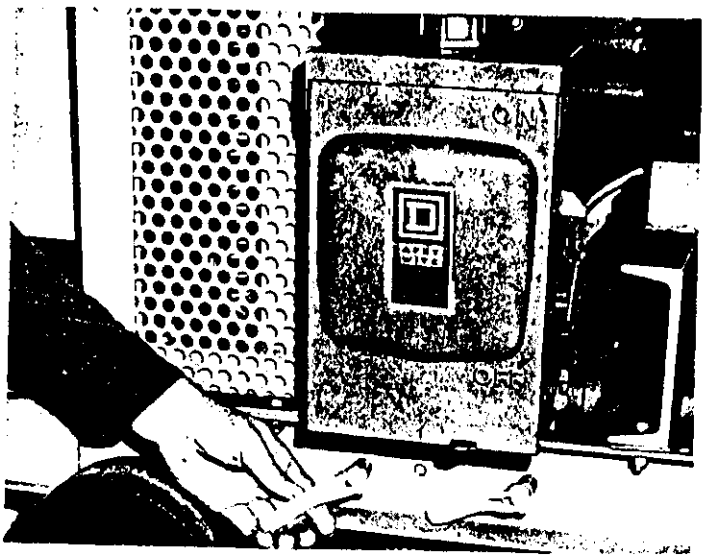
If any passenger misbehaves in any way, STOP THE RIDE IMMEDIATELY. Refuse rides to any person who might endanger himself or others.



No. G-1

LOCATING THE FENCE

Set the fence at least 3 ft. away from the SCRAMBLER all the way around. On the side next to the power unit you will be able to move the passengers faster if you allow yourself additional room. Setting two pieces of fence parallel to each other just to the right of the operator will form a "runway" which will channel the customers right by the operator so that he can take their tickets, and will also help to keep them from moving out into the path of the SCRAMBLER when it is operating.



No. G-2

ASSEMBLING THE TICKET OFFICE

The ticket office is not furnished as standard equipment, but is available from Eli Bridge Company. It is contained in two crates and one box, and is loose-pinhinged for easy assembly. Pin the four sides together and to the floor. Pin the decorating fins and flashing light to the top, and then set the whole assembly on top of the ticket office. Run electrical jumpers from the ticket office to the switch box on the power unit truck.

Two toggle handles under the switch box attach it to the power unit truck. See Picture No. G-2. Release the handles to lift the switch box from the power unit truck. When disassembling the SCRAMBLER, you may find it convenient to remove the switch box so that you can continue to have light even though the power unit has already been loaded in the van.

cold it sometimes throws off a small amount of oil, but this should stop after it has been operating for a while.

SPEED OF OPERATION

Maximum speed in revolutions per minute of the centerpole:

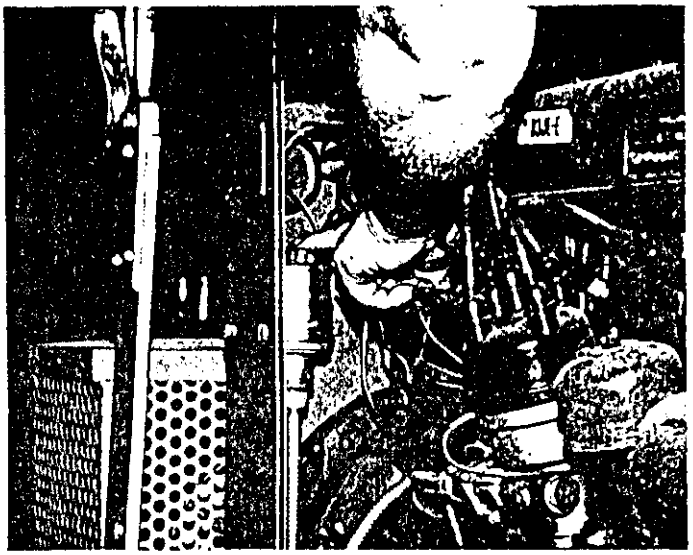
11.0 with gasoline engine
11.4 with electric motor

The SCRAMBLER should NOT be operated at speeds in excess of those stated above. The forces acting on the SCRAMBLER and its passengers rise sharply as the operating speed is increased. At speeds above the maximum rated speed these forces become DANGEROUS.

Operators are sometimes tempted to tamper with the throttle adjustment to increase the speed.

DON'T DO IT.

The speed of the Ford engine is regulated by a built-in governor, so that if the engine is operated beyond its governed speed the engine will shut itself off and it must be brought to a complete stop for re-setting the governor, as shown in Picture No. H-1, before it can be re-started.



No. H-1

WARNING: No governor-speed control system is foolproof, including this one. Any governor can be overridden at the carburetor. Be on your guard against operators who try this.

Electric motor power units as furnished by Eli Bridge Company cannot be made to overspeed except by changing V-belt sheaves. Such tampering is difficult to conceal. If you anticipate using a different power unit at any time, do not fail to consult Eli Bridge Company regarding the horsepower capacity and the speed at which the power unit is expected to turn the SCRAMBLER. In case of accidents involving injury of a passenger, speeds in excess of 11 RPM of the center pole when using a gasoline engine (11.4 RPM when powered with an electric motor) will be considered negligence on the part of the operator.

LENGTH OF RIDE

The main purpose of any amusement riding device is to please the passengers so that they will come back and bring their friends with them. Most operators find that the SCRAMBLER should not be operated for more than 1½ minutes, with each passenger load. Give your riders a chance to get used to the ride. Bring it almost to top speed and hold it there for most of the ride, then finish with a couple of revolutions at top speed. Changing the speed is the only way to give variety to the ride. However, the SCRAMBLER does not change speed rapidly, but requires 15 to 20 seconds to reach top speed, so gunning the engine will have almost no effect on the motion. What does happen is that after the ride has been slowed, preparatory to gunning, the acceleration back to full speed will add nothing to the thrill of the ride. If you think you have a better system, we suggest that you take a ride on it yourself before using it on your customers.

BRAKE OPERATION

The brakes are adjusted at the factory so that the SCRAMBLER can be stopped from top speed in 2/3 of a revolution of the center pole.

When the SCRAMBLER, with a full load of passengers is stopped quickly, the unit poles will continue to turn for a short time after the center pole has stopped. The brakes should be adjusted for a complete stop with a full load in at least 10 seconds. Do not make a practice of stopping rapidly, because a smoother stop will be easier on the SCRAMBLER. However, you should know that your brakes are good, and you should check them each time you erect the SCRAMBLER. A good way to stop the SCRAMBLER is to pull back on the brake ratchet handle until the engine idles, but don't move it back so far that it begins to tighten the brake cable. Let the SCRAMBLER slow down by itself for one revolution of the center pole, and then gradually tighten the brakes so that it comes to a complete stop in one more revolution of the center pole.

PASSENGER PLACEMENT

As the SCRAMBLER picks up speed, the passengers ill slide to their right against the end of the seat. This s caused by "centrifugal force" and is part of the ppeal of the ride; however, a heavy person can exert considerable amount of side pressure as a result. he actual side pressure each person feels, is in proortion to his own weight. In addition to the side pressure his own weight causes, each passenger will expeence the total of the side pressures of every passenger his left.

Since the side pressures are directed to the right, s a general rule the heaviest person should be seated ext to the outside, nearest the door opening, with ghter persons to his left.

1. A man should normally be seated to the outside with his lady seated to his left.
2. Children riding with parents should be seated to the far left and not between them.

Do not allow pre-school children to ride without a ependable adult. The child should be seated either n the lap of the adult or to the left of the adult, so that ne child will not be squeezed. Children from 6 to 12 ears can usually take care of themselves, but they hould be watched very carefully by the operator. If the perator sees any tendency for a child to move about in ne seat or to show that he is not holding on as well s he should, the operator should stop immediately and ot continue the ride until he is certain that the child is ecure. Children who do not follow the operator's instrucons should be removed from the ride.

BALANCING THE PASSENGER LOAD

Balancing the SCRAMBLER is not important. Your ssengers will get a greater thrill if other passengers in seats on other unit poles, but the SCRAMBLER elf will operate very well even though it is not baled. With one seat fully loaded you will have just ut the maximum out-of-balance condition possible. slip clutch built into each bottom sweep compenes for this out-of-balance by slipping when the load the gear teeth is the highest. Occasionally, the slip tch squeaks as it slips, but if this happens it is ely the friction surfaces rubbing against each other, is no cause for concern. Check the slip clutches n the SCRAMBLER is stopped and the brakes are Push on the back or front of any seat. It should take ood, hard push to slip the slip clutch, but you should uble to slip it. This is an excellent way to compare three bottom sweep slip clutches. If the three tches are not adjusted to operate in the same way the erences will be quite obvious when a seat on each pole is pushed in this way. Humid weather may cause the slip clutches to tighten up a little, and normal wear may cause them to loosen a little, but frequent adjustment is not necessary.

HANDLEBAR LATCHES

The passengers can climb into the seats by themselves. With a large crowd, an extra man or two can help to keep the people moving. The handlebar on the seat will usually lock itself if the passengers do not do it. However, the secondary latch will not lock itself; the long locking pin on a chain must be inserted after the handlebar is closed. The secondary latch has been designed so that the locking pin will be retained only if the handlebar is closed. If the locking pin is not inserted to lock the handlebar it will swing out at the end of the chain when the seat comes to the outside of the SCRAMBLER operating circle and it can be seen readily by the operator. If any of the locking pins are swinging loose, the operator should immediately stop the ride and insert the loose locking pins. The lap bar in each seat should swing freely, with no binding in the hinges.

The handlebar latches on the seats have been properly adjusted at the factory but may, after extended use and wear, require readjustment. A handlebar that does not latch, or a secondary latch without the locking pin properly inserted, is unsafe. Without the security of the handlebar, the passenger may, without realizing the consequence, move forward or stand up, exposing himself to extreme danger of being thrown from the ride. Inspection of the latches is quick and easy. Section "J" in the manual explains in detail how to perform this maintenance.

STARTING THE SCRAMBLER

Do not put the ride into motion until the handlebar on each seat is locked.

Before starting the engine, be sure that the brake ratchet handle is moved all the way to the rear, disengaging the engine clutch and setting the SCRAMBLER brakes. This puts the engine throttle in the idle position. If you find that the engine must have a little more gas when starting, press down on the throttle lever which is directly above the pivot for the brake ratchet handle. After the engine has started, release the throttle lever and the engine will idle.

When the brake ratchet handle is moved forward the SCRAMBLER brakes are released, the engine clutch is engaged, the throttle is opened, and the SCRAMBLER begins to turn. As it turns slowly, check for clearance between the SCRAMBLER and the fence, and between the bottoms of the unit poles and the drive units.

Advance the speed smoothly. Do not jerk the brake lever back and forth. Jerking causes unnecessary wear on the working parts. The fluid coupling will absorb a great deal of shock, but it should not be abused. As the fluid coupling is operated the oil inside may get very hot, so take care not to get burned on it. The guard all around the fluid coupling should always be in place whenever the power unit is operating. When the fluid coupling is

SERVICING INSTRUCTIONS FOR THE SCRAMBLER

YOUR SCRAMBLER HAS BEEN SERVICED WITH THE FOLLOWING LUBRICANTS:

A. Bearings: Texaco Marfak Multipurpose No. 2 Grease.

B. Open Gearing: Texaco Crater 5X Fluid Grease.

C. Gear Pot and Engine Transmission: Texaco Multigear EP-90 Grease.

D. Twin Disc 9.4 HSD fluid coupling: Filled at the Eli Bridge Company Factory with Fyrquel 150, made by the Stauffer Chemical Co., Westport, Connecticut.

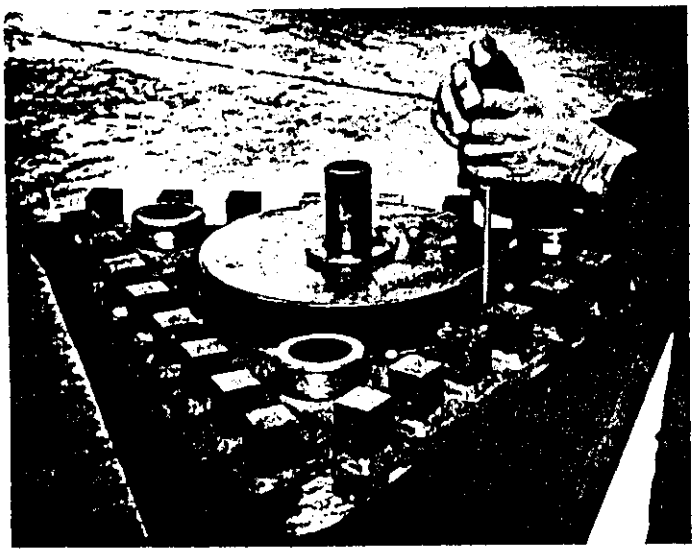
A lithium soap base grease is recommended. This type of grease will serve you the year round, and it will resist washing out of exposed bearings and gears longer than many types of grease. Any lithium soap grease can be used, but you should be sure that only lithium soap grease is used in the bearings, because some of the more common greases will not mix with this type of grease. The mixture may turn into a "soup" which will run out of the bearing housing rapidly. This will lead to bearing failure due to inadequate lubrication. Since you can observe the gears more closely than you can the bearings, and if you do not care to continue the use of a solvent-based grease after the breaking-in period, you can use any stiff grease that will hold to the gear teeth.

Lithium soap grease is recommended for bearings, but you will not damage them as long as you keep them well lubricated. Be sure to use a non-tacky, free-flowing grease. The Timken Company warns that greases containing zinc oxide should not be used in Timken bearings.

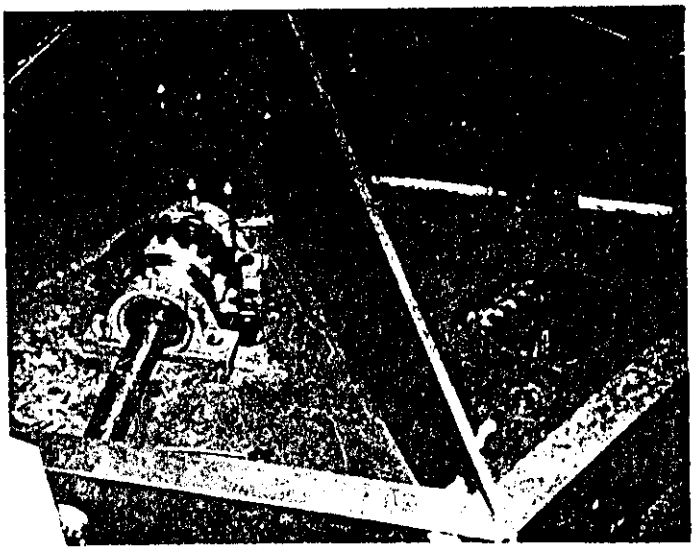
MAIN CENTER POLE BEARINGS

The center pole rides on Timken tapered roller bearings at the top and bottom of the rotating base. Also, another large Timken bearing carries a heavy gear inside the base. These three bearings are hand-packed with grease at the BIG ELI factory, but it is important that grit be kept out of the bearings, and so you should add clean grease once a week. As you pump new grease into the bearing the old grease will be forced out, taking with it much of the grit which may have seeped into the bearing enclosure.

The entire SCRAMBLER turns on ball or roller bearings. Some of these bearings are pre-lubricated by the bearing manufacturers, but have provision for adding grease. Other bearings fitted with Alemite grease fittings are to be greased in the following way:



No. I-1



No. I-2

The grease fitting for the top center pole bearing is in the side of the "hat" casting, and you can see it by looking through one of the portholes in the mast. See Picture No. I-1.

Remove the cover at the bottom of the rotating base to find the grease fittings for the two bottom main bearings. These two fittings are screwed into pipe extensions and can be seen in Picture No. I-2, next to the pole. One of these fittings supplies grease to the center pole bearing and the other one greases the floating gear bearing.

SCRAMBLER MOTION

The main center pole turns in a clockwise direction, while the unit poles turn counterclockwise. This causes each seat to trace a "star" pattern back and forth across the operating circle. As each seat reaches the outside of the circle it comes to a dead stop. From a dead stop, it picks up speed so that by the time it is passing the center of the circle it is going about 25 miles per hour. This requires about 1.2 seconds, and by the time another 1.2 seconds have elapsed the seat has again come to a dead stop.

For normal operation the seat must move in its proper path. Watch the way one seat moves. If you were to look down from above, suppose that when the seat reaches the outside of the operating circle you call that the 12:00 o'clock position. The next time that that seat reaches the outside of the operating circle on that side it should be about in the 11:30 positon. In other words, the place where one particular seat reaches the outside of the operating circle moves in a counterclockwise direction. If it does not, if you see that the seat is going directly back and forth to exactly opposite positions, or is in fact advancing in a clockwise direction, DO NOT OPERATE THE RIDE. YOU HAVE A CONDITION THAT MUST BE CORRECTED.

Also, if you see the passengers sliding from one side of the seat to the other, AND THEY ARE NOT TRYING TO DO SO, then this is another sign that something is wrong.

One or more of the following things may exist:

1. The SCRAMBLER is being operated faster than 11 rpm with gasoline engine, or 11.4 rpm with electric motor.
2. The slip clutches are too loose, so that they cannot turn the unit poles properly.
3. The slip clutch disks have gotten grease on them from over-lubrication. This causes the slip clutches to function improperly.

Grease on the clutch disks can be very tricky. The clutch may appear to work normally for a long time, and then suddenly, right in the middle of a ride, start slipping excessively. There is no reason for grease to be on the clutch disks, but a careless operator with a little grease can ruin perfectly good clutch disks. If grease gets on your clutch disks do not try to clean them; replace them.

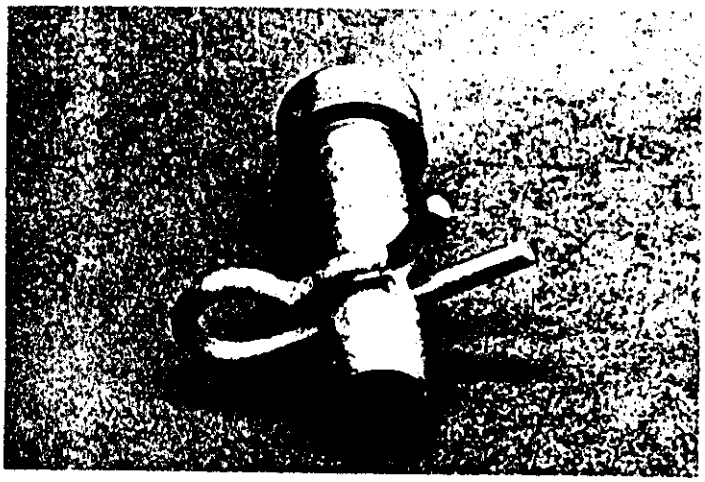
To repeat, whenever you see a seat advancing around the circle in a clockwise direction, stop the ride and do not carry any more passengers until after you have corrected the problem.

A SCRAMBLER operating incorrectly in this way changes the whole "feel" of the ride. Instead of being directed just to the right end of the seat, the passengers may move to the left and forward as well. This will make the passengers feel insecure, and in fact it may put them in actual danger because this is not the normal way in which a SCRAMBLER should operate. They learn to brace themselves to resist the normal forces, but sometimes do not know how to handle these strange forces.

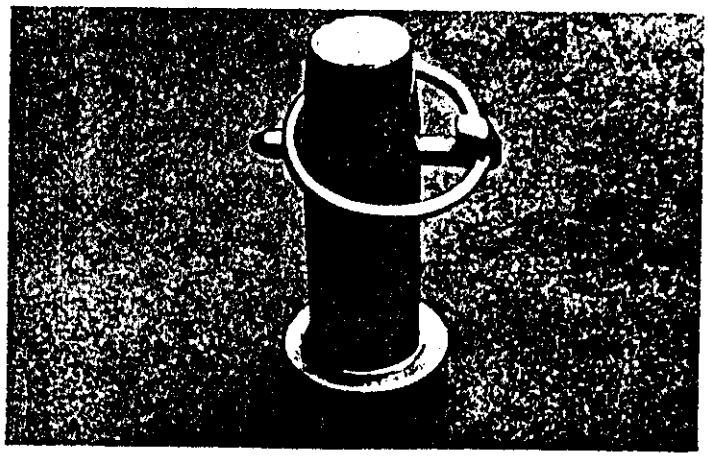
HAIRPIN COTTERS AND KLIK-PINS

Use a hairpin cotter or klik-pin on every pin. Either one should snap in place on the pin when installed, but should be discarded and replaced if it is loose on the pin. As the ride operates, the pins often rotate in their sockets, and defective hairpin cotters or klik-pins could fall out. Nothing would then prevent a pin from working out and falling off. This could cause major structural damage, and, most importantly, injuries to your passengers.

Keep a good supply of hairpin cotters or klik-pins on hand at all times, and replace defective ones immediately. Never use any but genuine Big Eli hairpin cotters or klik-pins. These have been carefully selected for this application on the SCRAMBLER. Any other kind may not fit properly, or may not have sufficient strength, and can actually be dangerous to use.



No. H-2

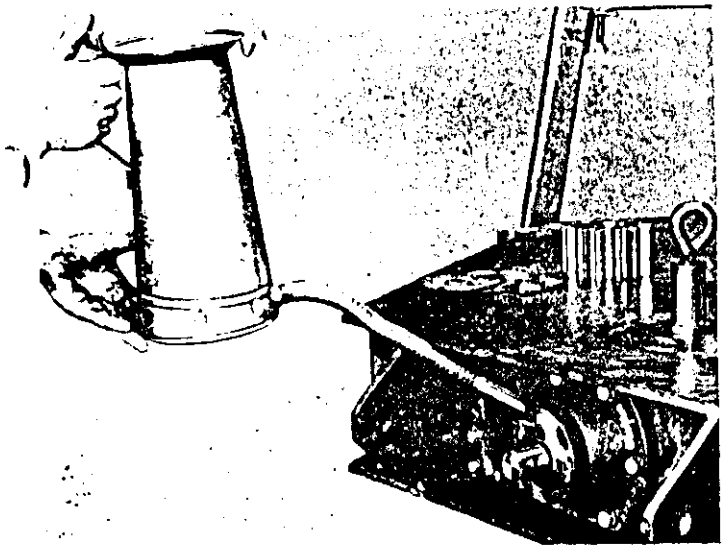


No. H-3

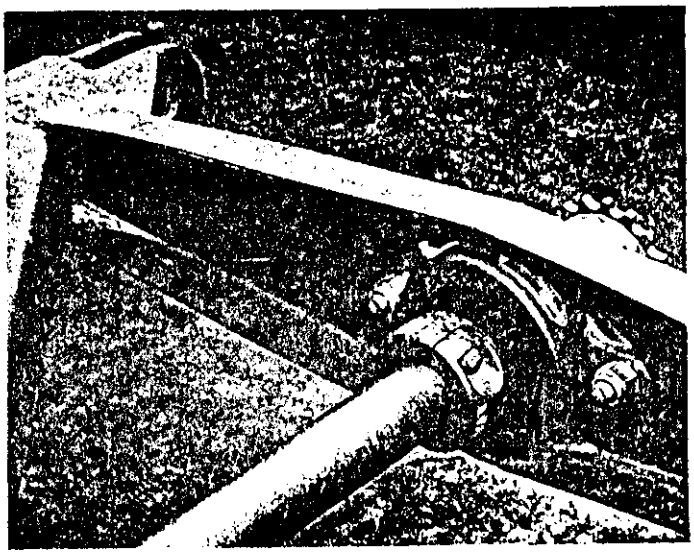
PLEASE BE CAREFUL

Do your part well and the BIG ELI SCRAMBLER will reward you liberally in pleasure to own and operate, and in good net returns on the money you have invested in it.

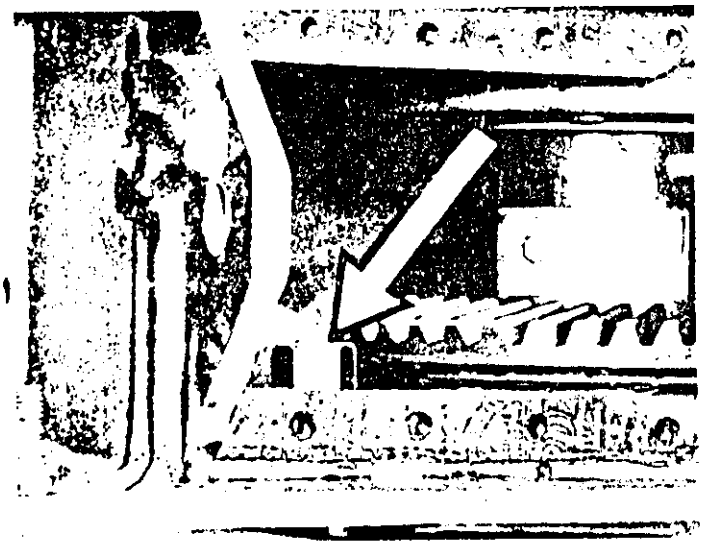
These basic rules will help you protect your patrons from injury, and protect yourself from lawsuits.



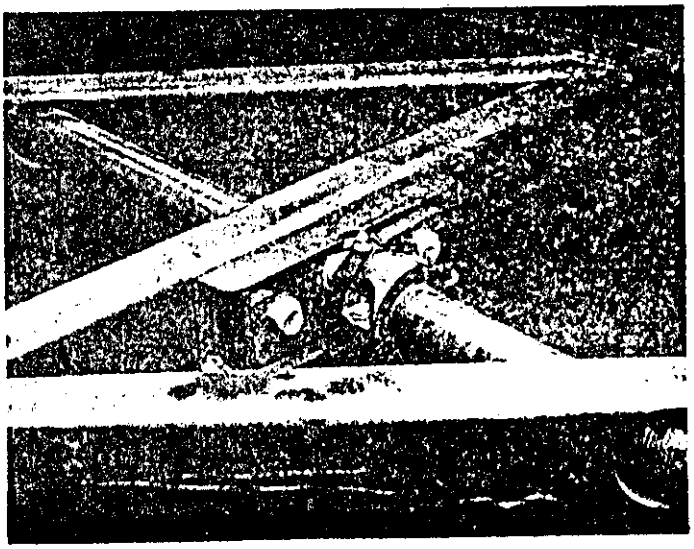
No. I-6



No. I-8



No. I-7

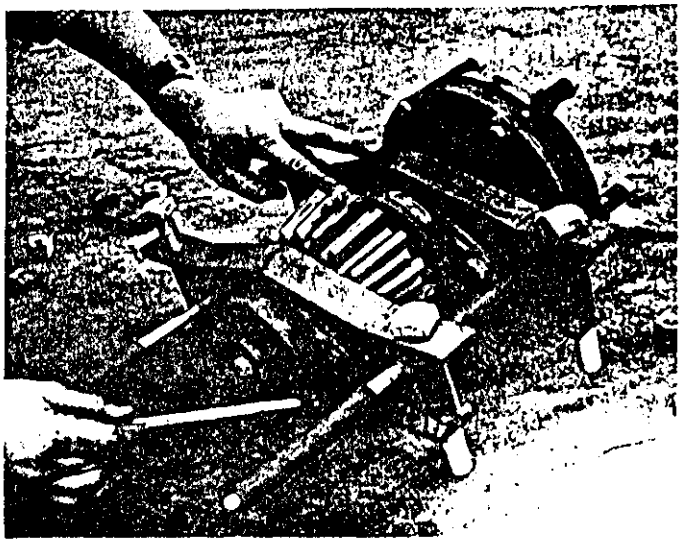


No. I-9

BOTTOM SWEEP DRIVE SHAFT BEARINGS

The long drive shaft in each bottom sweep runs in three bearings. A self-aligning ball bearing flanged pillow block is at each end of the shaft and a nylon bearing is in the middle. See Picture Nos. I-8 and I-9. All three of these bearings have grease fittings and they should be greased several times during the season.

The short shaft in the end of each bottom sweep turns in two more flanged pillow blocks, and there are grease fittings on each of these bearings. Do not grease these bearings oftener than once a season, and after greasing wipe off all surplus grease around the grease fittings and shaft seals. Do not permit grease to get on the slip clutch at any time. See Picture I-10. The clutch disk in the slip clutch turns on a nylon sleeve bearing, shown in Picture No. I-11, and it does not require lubrication.



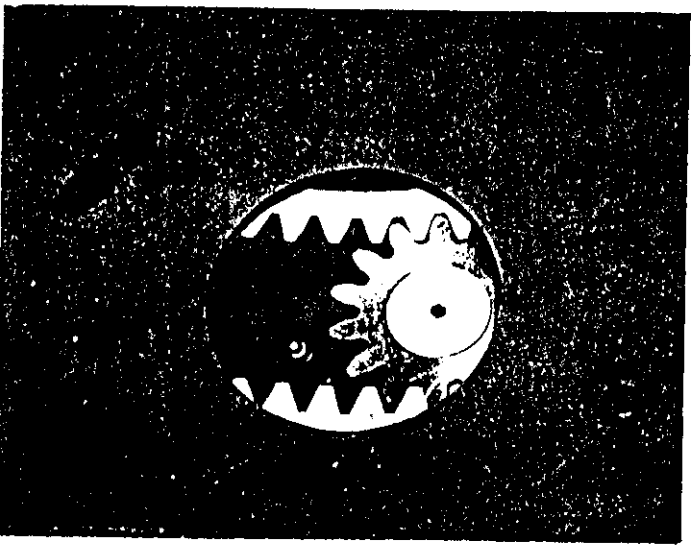
No. I-10

ROTATING BASE DRIVE SHAFT PILLOW BLOCKS

There are six ball bearing pillow blocks under the rotating base cover. See Picture No. I-2. Add grease to these bearings once a season unless you are operating under very dirty conditions. Then, it may be wise to add grease as often as once a week. The manufacturer says to add grease slowly with the shaft revolving wherever possible until grease begins to come out around the seals. If you are using a high pressure gun take care not to blow out the seals.

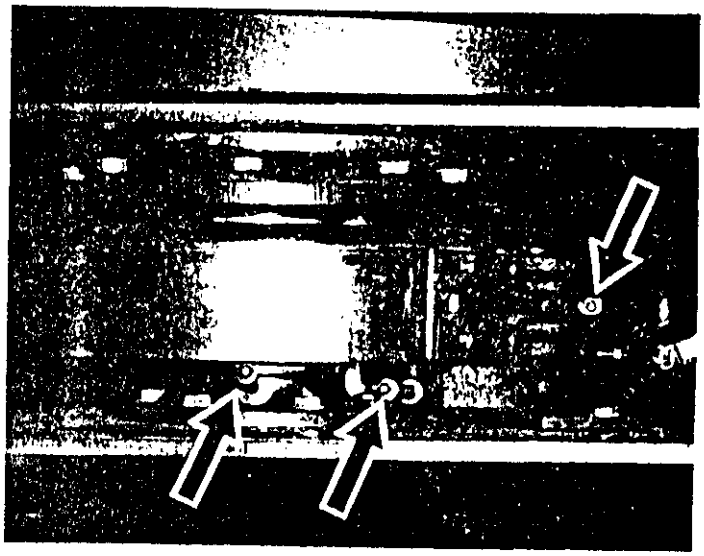
SPUR PINION SHAFT BEARINGS

While the cover is off, you can also grease the three self-aligning spherical roller bearings near the tops of the pinion shafts. Turn the rotating base until you can see the three pinions through the access holes. Beside each pinion you will find a grease fitting screwed into the top of an extension pipe mounted in the top bearing carrier. See Picture No. I-3. Pump grease into these bearings until grease comes out of the side of the fitting. These bearings are hand-packed with grease at the BIG ELI factory and all the grease needed will be that which works out of the seals. Usually these top bearings will not need to be greased more than once or twice a season. Over-greasing can be as bad on bearings as too little grease.



No. I-3

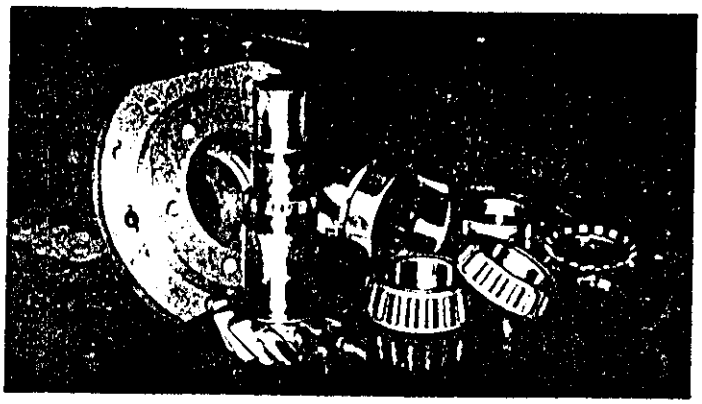
The bearing at the bottom of the gear shaft, which rives the SCRAMBLER runs in oil and needs no other ubrication. The bearing under each brake must be reased regularly. Operators often overlook this bearing, ecause it is so close to the ground. See Picture No. I-4. t probably needs grease more often than any other bear- ng on the SCRAMBLER. This grease fitting is screwed nto an extension pipe so that it is easy to reach from the utside. It would be wise to grease both bearings once week. The pressure-retaining grease fittings will help



No. I-4

GEAR POT BEVEL PINION BEARINGS

The bevel pinion in the gear pot turns on a double roll Timken tapered roller bearing. See Picture No. I-5. This bearing is lubricated by the oil in the gear pot and no further lubrication is needed.



No. I-5

To check the oil level in the gear pot, level the center pole base section, and then remove the access hole cover plate which is held by three bolts. The oil should reach just to the bottom of the access hole, so that any oil added will run out. Check the level after the gears have been idle for an hour or so, because the churning and heating caused by the gears in motion will make the oil expand to a greater volume than when it is cool.

Drain the oil and replace it once a year. See Picture No. I-6. During the breaking-in period it may need replacing sooner. The drain plug is just inside the access hole. It can be seen in Picture No. I-7. Drain the gear pot when the base section is up on wheels, so that a pan can be

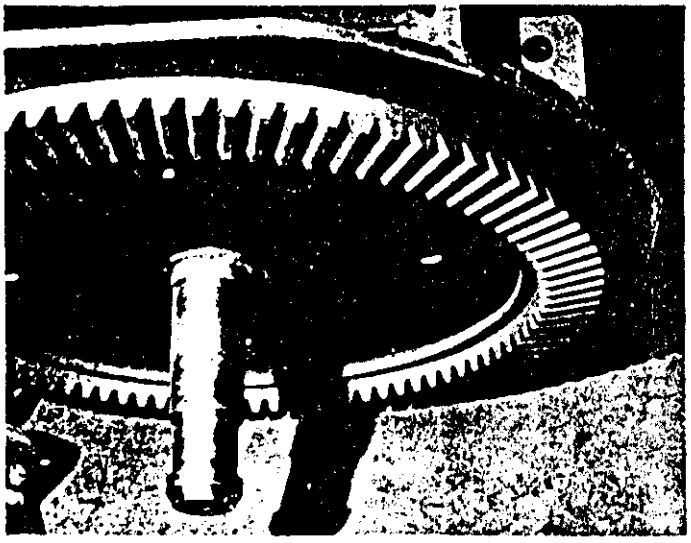
The straight power takeoff on the Ford engine turns in two bearings that are lubricated by the single grease fitting shown in Picture No. I-14.

Consult the Ford engine manual for instructions on greasing the clutch throw-out bearing.

GEARS

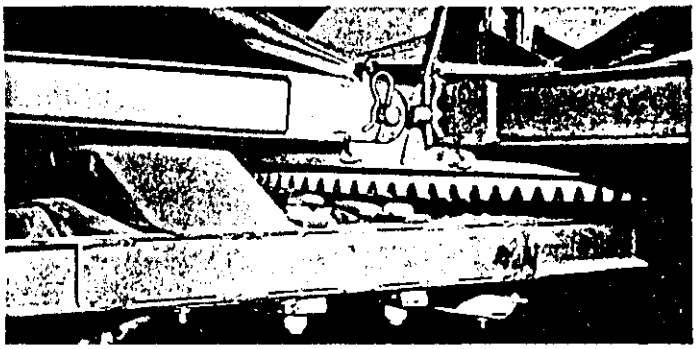
Your SCRAMBLER was set up, operated, and checked at the factory before it was delivered to you. However, the gears have not had much running time. It is important that the gears be greased properly at all times. At the factory the gears were coated with Texaco Crater 5X Fluid Grease, which is a grease containing a solvent that evaporates, leaving a very tacky coating of grease that will not throw off or drop off as many greases do. Use plenty of this grease, and re-apply it whenever the gears become dry. See Picture No. I-15. Regular grease can be used, but be sure that the gears do not become dry and start to wear. If there is any flaking of the cast iron gears in the base section then they are not being greased properly. Your gears should last many years if properly greased.

If your SCRAMBLER is in heavy service, the gears will probably need re-greasing once a week. DO NOT USE A SOLVENT-BASED GREASE IN ANY OF THE BEARINGS OR IN THE GEAR POT.



No. I-15

The bevel gear at the bottom of each unit pole is entirely in the open and grease can be applied easily. See Picture No. I-16.



No. I-16

To grease the large gears in the base section, remove the cover from the rotating base. The bevel ring gear down below is not exposed anywhere, but you can grease it by coating the bevel pinions and turning the center pole. The bevel pinions will in turn distribute the grease around the circle. See Picture No. I-2. You can grease the large spur gears through the access holes. See Picture Nos. I-2 and I-3. Only a few teeth of the large internal gear show in these holes, and the only way to grease them is to grease the spur pinions and the floating gear, and then turn the center pole. All of the teeth in the floating gear will pass by the access holes when you turn the rotating base.

Watch the oil level in the transmission on the power unit truck. Remove the square headed overflow plug, and add gear oil until it runs out of the overflow. This transmission should be drained and refilled with new oil once a year.

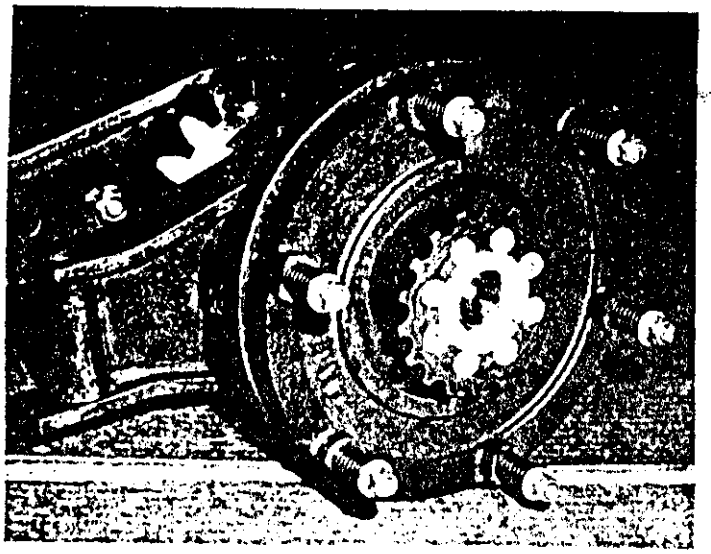
TWIN DISC 9.4 HSD FLUID COUPLING

The fluid in the coupling gets heavy usage, and the high temperature developed in the fluid is entirely normal. Until the coupling warms up and its enternal parts expand with heat, a little fluid may be thrown off the end next to the power unit. This should decrease as the heat increases.

If any trouble develops with the fluid coupling do not try to take it apart yourself. This should be done by the Twin Disc factory, authorized Twin Disc dealers, or Eli Bridge Company. Protect it from hard knocks because it is a precision-built device and can be damaged easily. If you give it reasonable care the Twin Disc fluid coupling will give you long, satisfactory service.

The fluid in the coupling should be drained and replaced once a year. If you remove the drain plug while the fluid coupling is still hot, unscrew the plug slowly to allow any internal pressure to escape. Otherwise, you may be burned by some very hot fluid as it spews out.

If you are familiar with the older model Twin Disc 10.6 Hydrosheave used through SCRAMBLER Serial No. 414 you may recall that SAE-10W oil was specified for it. The fluid coupling supplied, beginning with Serial No. 415, is not filled with oil, but with a special fire-resistant fluid called Fyrquel 150, made by the Stauffer Chem-

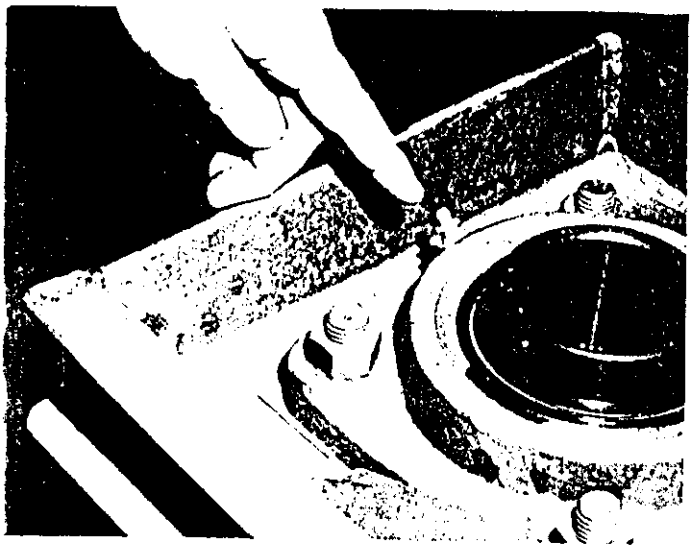


No. I-11

TOP AND BOTTOM SWEEP MAIN BEARINGS

A self-aligning ball bearing flanged pillow block is mounted on the outer end of each main sweep. See Picture No. I-12. The grease fittings on these bearings have a pressure relieving characteristic, so you cannot over-grease them. Greasing should be done at least once a year.

Beneath the grease fitting a small, loosely fitting pin extends through the hole in the casting into a hole in the spherical outer race of the bearing. This pin keeps both holes in alignment so grease can be pumped into the inner race of the bearing where it is needed. Occasionally this pin is sheared off when the unit pole is swung too far away from, or toward, the center pole

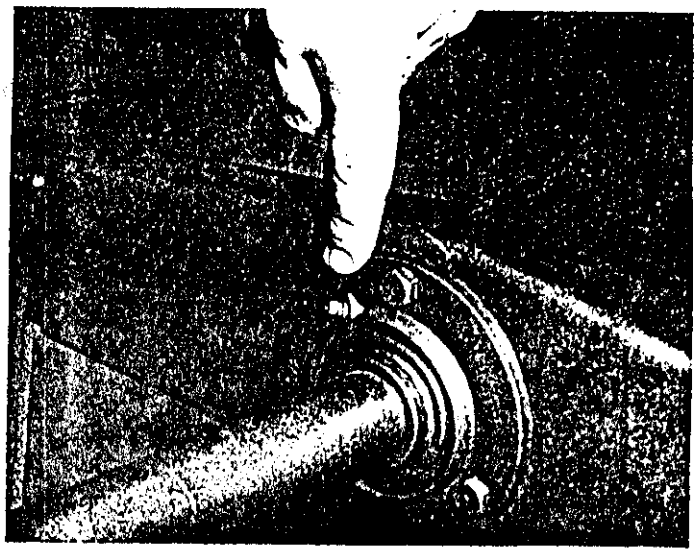


No. I-12

there is no limit in side-to-side swing). With the pin sheared the outer race can then rotate in the casting and grease will not reach the bearing. Replace the pin if it becomes broken.

DRIVE UNIT DRIVE SHAFT BEARINGS

Each drive shaft turns in three bearings. The Flangette bearing on each end is pre-lubricated at the factory. See Picture No. I-13. However, grease should be added



No. I-13

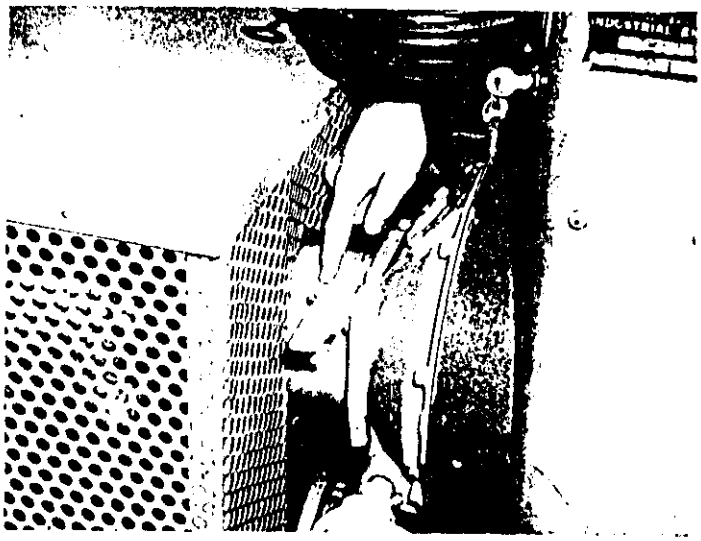
once or twice during the season. There is a grease fitting in the stamping which holds the bearing.

The bearing in the middle of each shaft is similar to the one in the middle of the long drive shaft in each bottom sweep. (Picture No. I-9). Each of these bearings should be greased regularly. Grease these bearings through the holes bored in the drive unit cover board.

POWER UNIT TRUCK BEARINGS

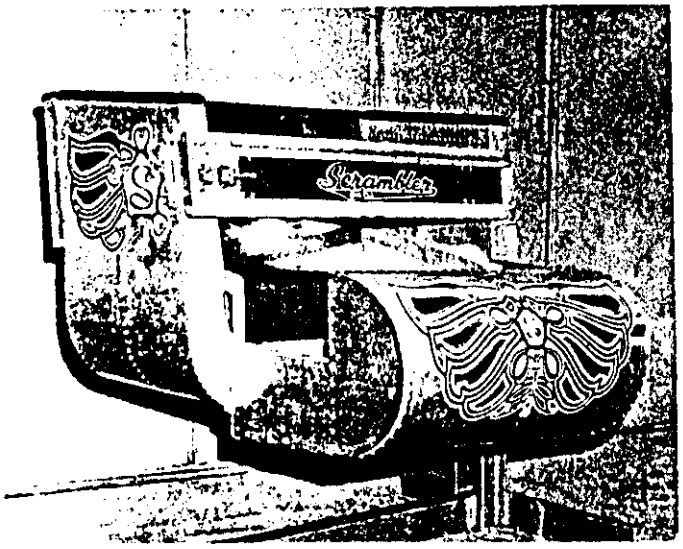
The drive shaft under the power unit runs on two Flangette bearings, which should be lubricated once or twice during the season.

A small pillow block is under the Twin Disc 9.4 HSD fluid coupling. In extremely dirty conditions, add grease as often as once a week, but usually once a month is plenty. Add grease slowly until it comes out of the pressure relief hole in the grease fitting rapidly. With a high pressure gun, take care not to blow out the seals.



No. I-14

MAINTENANCE OF SCRAMBLER SEATS



No. J-1

Your SCRAMBLER seats have been designed and built using advanced techniques developed by the aircraft industry as well as other industries to produce a high strength, low weight structure. They are precision built devices and need reasonable care to keep them in safe and attractive condition. Of all the parts of a ride, the seats are observed most closely by the public, and you should pay particular attention to the condition of the seats. Handle the seats carefully because the aluminum has a very fine finish which is easily damaged. Scratches cannot be removed, so it is best to keep the scratches from getting on the seats in the first place.

The major strength of the SCRAMBLER seat is in its aluminum sheet "skin" covering the outside and the inside. This is referred to as a "stressed skin" type of construction, and it produces a structure of maximum strength and maximum stiffness, for a minimum of weight. This kind of construction is widely used in many industries, such as aircraft, boats and certain kinds of house trailers. It is well recognized for its efficient use of materials to produce high quality structures. It does require, however, reasonable maintenance to preserve these favorable characteristics, and the stressed skin construction of the SCRAMBLER seat is no exception. Badly worn or missing rivets, or holes punched or worn in either outside or inside "skins" reduce the strength of the seat. A properly maintained SCRAMBLER seat must have all holes repaired with proper stressed skin type of patches that will replace the strength lost in the holes and that will prevent the growth of cracks that may be associated with the holes. Furthermore, all worn or missing rivets must be replaced. The strength of the seat depends on this being done.

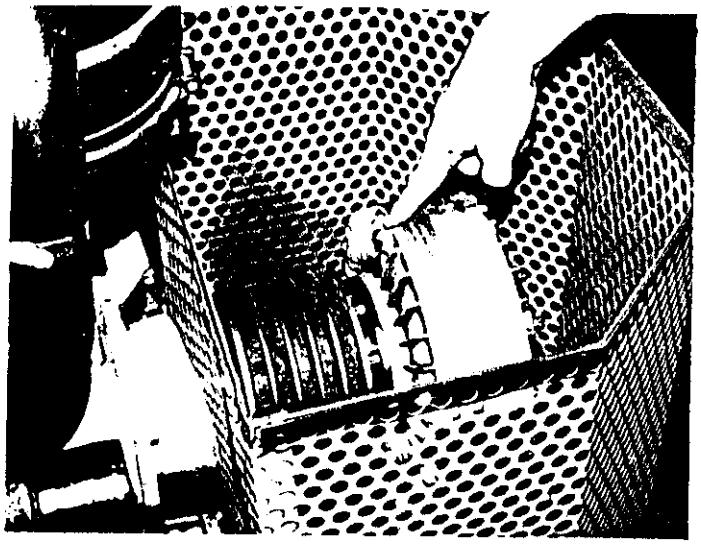
The SCRAMBLER seat, if given reasonable maintenance, can give year after year of excellent service, if the SCRAMBLER is not operated beyond the maximum factory-recommended speeds of 11.0 revolutions per minute of the center pole when powered by a gasoline engine, and 11.4 RPM with electric motor. How does speed affect the seat? Assume, for example, that there are three 200 pound people in the seat. As the ride turns, the forces act to push the passengers to their right against the side of the seat. The seat is designed to withstand these forces safely within the maximum speeds set by the factory. The following table will show how the load against the side of the seat, because of these three people, increases as the speed of the center pole is increased:

Center Pole RPM	Total Load Against the Side of the Seat
11.0	695 pounds
11.4	746
12.0	826
12.5	897
13.0	970
14.0	1,126
15.0	1,292
16.0	1,469

If the seat structure is designed to withstand safely a load of 746 pounds and the ride is overspeeded so that the load is actually 1,469 pounds, this is not wise or safe use of the equipment. It can also be very hazardous to the passengers. For example, at 16 RPM each 200 pound person pushes to his right with a force of 490 pounds. Many people cannot withstand forces of this kind. The seat structure will be subjected to forces and deflections that may render some of the built-in safety features ineffective. Overspeeding is doubly dangerous when the seat structure is not safely maintained. Never operate the SCRAMBLER faster than 11.0 RPM with gasoline engine, or 11.4 with electric motor.

CLEANING THE SEATS

In portable service it is quite difficult to keep oil, grease, and dirt off your equipment. However, after the ride is set up there is no reason why it cannot be cleaned. Dirt and grease can be removed with a mild soap and water followed by a clear water rinse. Only a soft polishing cloth should be used because a coarse cloth will scratch the aluminum. Do not polish with a circular motion, but move back and forth in straight lines. If any scratches do develop they will be less noticeable when the polishing is done in this way rather than when a circular motion is used. The upholstery, also, can be cleaned with mild soap and water. The plywood board in the footbottom can be removed for brushing out dirt.



No. I-17

ical Company, of Westport, Connecticut. Do not use anything but Fyrquel 150 in this Twin Disc 9.4 HSD fluid coupling. If you fill it with SAE-10W oil it will never come up to top speed.

There is no filling arrow on this fluid coupling as there was on the older Hydrosheave. To be sure that you have the right amount, drain it all out and refill it with 65 fluid ounces (two quarts plus one ounce) of Fyrquel 150. There are two drain plugs. Remove them both, and add fluid in the one closest to the V-belt drive.

FLEXIBLE CHAIN COUPLINGS

The rolls in the roller chains must be free to turn if the coupling is to work properly. Keep the chain clean and well greased. It is suggested that every time a chain is removed it be cleaned in gasoline and then re-greased with clean grease. Use very little grease. Excess grease will be thrown off as the shafts rotate. If the rolls are properly cleaned and greased, they will be bright, but if they are dark and rusted then they are not free to rotate because of inadequate lubrication or because of such severe misalignment that there is binding of the chain by the two sprockets. Try to correct either situation when it develops so that the chains will last as long as possible. Do not try to lubricate these chains with oil because it will be thrown off quickly.

The larger chains used on the slip clutches must be lubricated very sparingly. After greasing them wipe away all the grease you can. Grease must not be allowed to get on the slip clutches or accumulate inside the slip clutch covers. If grease gets on a slip clutch, clean the castings completely and replace the clutch disks. Grease on a clutch disk can change the entire motion of the ride, and this change can develop into a dangerous situation for your passengers.

BRAKES

Each brake shoe, both inner and outer, pivots on a pin which must be greased regularly. These two grease fittings can be seen in Picture No. I-4.

MISCELLANEOUS LUBRICATION

The brake cables pass around several small sheaves which should be greased to keep them from squeaking as they turn.

The brake ratchet handle pivot on the power unit truck should be greased to reduce wear at this point.

As mentioned in the erecting directions, the shaft sticking out of each end of the unit pole should be greased to prevent rusting and freezing in the bearing. This is important to park men, who will be leaving the SCRAMBLER erected in one spot for a long time.

Greasing the long hinge pins on the center pole was recommended in the erecting instructions.

See the power unit handbook for additional lubrication instructions for the Ford engine.

CARE OF V-BELTS

If the V-belts become covered with any kind of oil, wipe both the sheaves and the belts clean with a cloth soaked in low-flammability solvent. Water and steam can also be used to clean the belts without harming them. Do not use belt dressing on V-belts to stop slippage. When they are loose, clean them with a cloth dampened in the same solvent and tighten the drive slightly. The power unit is bolted to the power unit truck by four bolts. Add shims equally to all of these bolts to tighten the drive.

WEAR IN THE HANDLEBAR LOCK

THE HANDLEBAR LOCK AND STRIKER TAKE A GREAT DEAL OF PUNISHMENT, AND AS A RESULT, SOME WEAR WILL SHOW UP IN THE MATING PARTS.

UNRELIABLE LATCHING IS DANGEROUS. IF A HANDLEBAR FAILS TO LATCH OR BECOMES UNLATCHED, AND THE LOCKING PIN IS NOT PROPERLY INSERTED IN THE SECONDARY LATCH, THE PASSENGER WILL FEEL INSECURE. HE MAY MOVE FORWARD OR STAND UP, EXPOSING HIMSELF TO THE DANGER OF BEING THROWN FROM THE SEAT. INSPECT YOUR HANDLEBAR LOCKS AND SECONDARY LATCHES CAREFULLY. REPLACE THEM WHEN THEY CAN NO LONGER BE ADJUSTED TO FUNCTION PERFECTLY.

The SCRAMBLER seat is secured to the rest of the ride by the three pins on one side of the seat. As the ride turns, the forces which act in the seat cause it to flex slightly.

The sliding bolt must engage the striker a minimum of ¼" (one-quarter of an inch) for the latching of the handlebar to be safe. This assumes also that the entire SCRAMBLER seat is properly maintained, that no rivets are missing, that all holes are properly reinforced with aircraft-type patches, and that the SCRAMBLER is not operated beyond the maximum speed for which it was designed (11.0 rpm of the center pole when powered by a gasoline engine, and 11.4 rpm with an electric motor).

It is very easy to check the amount of engagement. In Picture No. J-4, with the handlebar closed and latched, a pencil line has been drawn on the front surface of the sliding bolt right next to the striker. In Picture No. J-5, the handlebar has been opened, and a scale is being used to measure the distance between the pencil line and the end of the sliding bolt. In this case the measurement is 3/8" (three-eighths of an inch), and this is adequate.

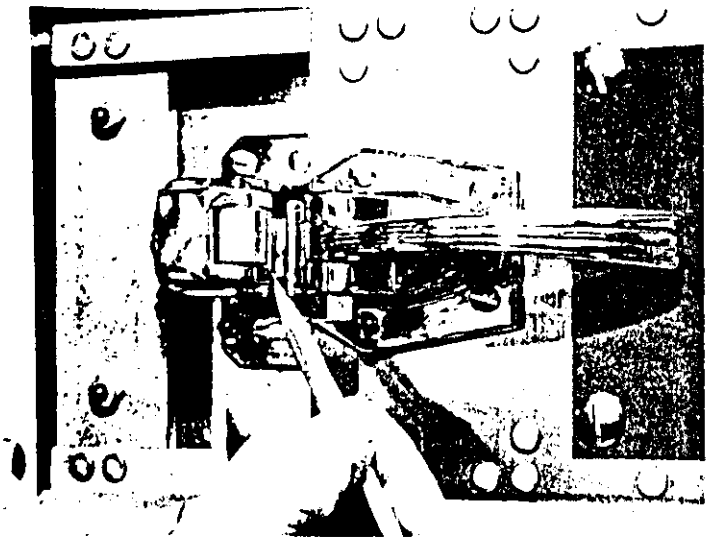
Any time the length of engagement measures less than ¼" (one-quarter of an inch) then you should replace the handlebar lock. In the event that the seats are structurally sound and new, but the locks do not provide or exceed the minimum engagement, notify the factory immediately.

Under no circumstances should you carry passengers in seats having less than minimum engagement.

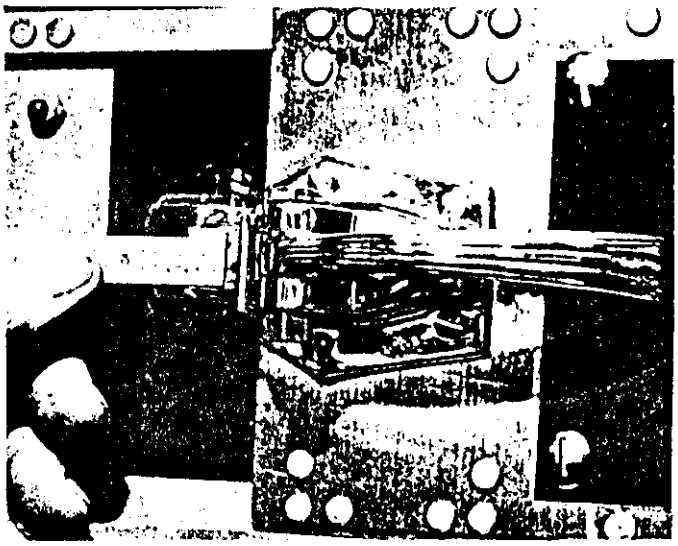
Sometimes the bolt assembly wears in such a way that the sliding bolt extends out too far. If this happens to such an extent that the beveled face goes past the roller permitting the flat surface of the bolt to strike the roller, both the lock and the striker will be damaged. Replace any lock in this condition.

The roller in the striker assembly should turn freely on its shaft. Sometimes a drop of oil will help to free a tight roller. If a tight roller cannot be loosened up, it will cause rapid wear and should be replaced before it ruins the lock as well.

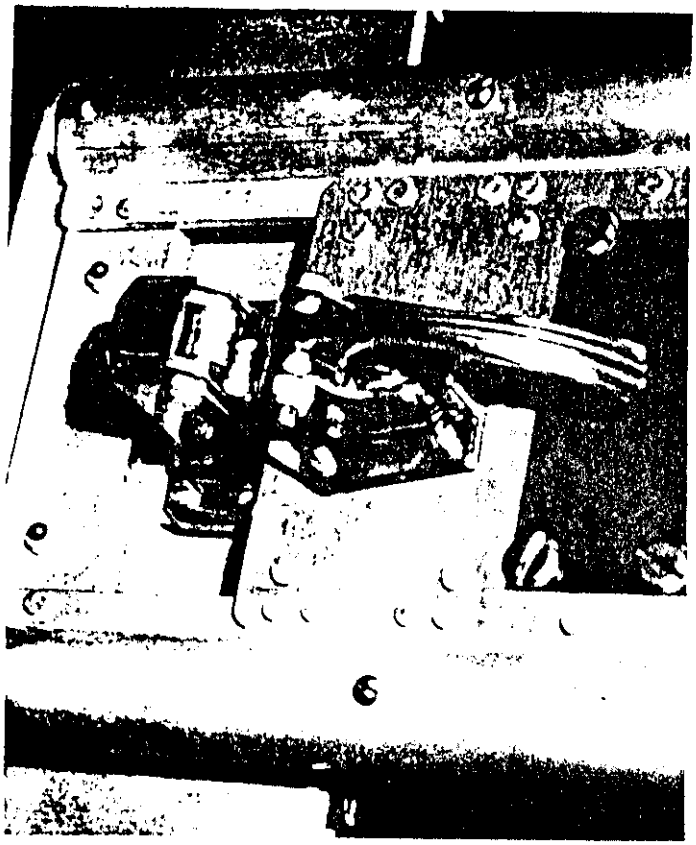
REMINDER: Proper latching is essential for safe operation. If you are unsure about any problem, consult the factory.



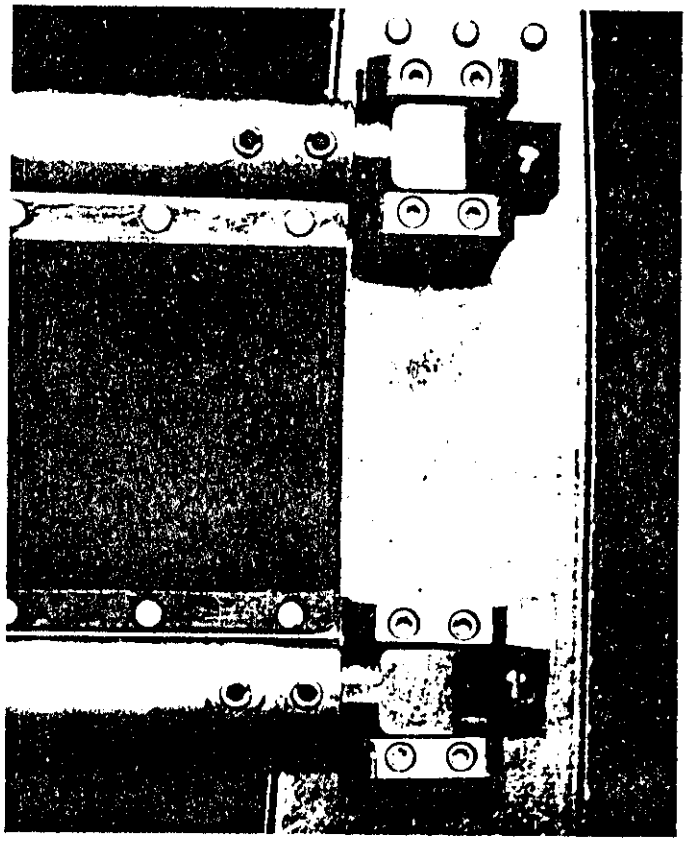
No. J-4



No. J-5



No. J-2



No. J-3

HANDLEBAR ADJUSTMENT

VERTICAL ADJUSTMENT OF SLIDING BOLT

The handlebars are all adjusted to latch properly at the factory. However, after a great deal of use some adjustments may be necessary. With the seat empty, the sliding bolt of the latch should be slightly below the center of the striker as shown in Picture No. J-2. If it is not, then loosen, but do not remove, the eight socket head cap screws on the hinge end of the handlebar, as shown in Picture No. J-3.

Position the latch in the striker and hold it there while you tighten the capscrews. The handlebar hinge pins turn in nylon bushings and should not show wear for many years.

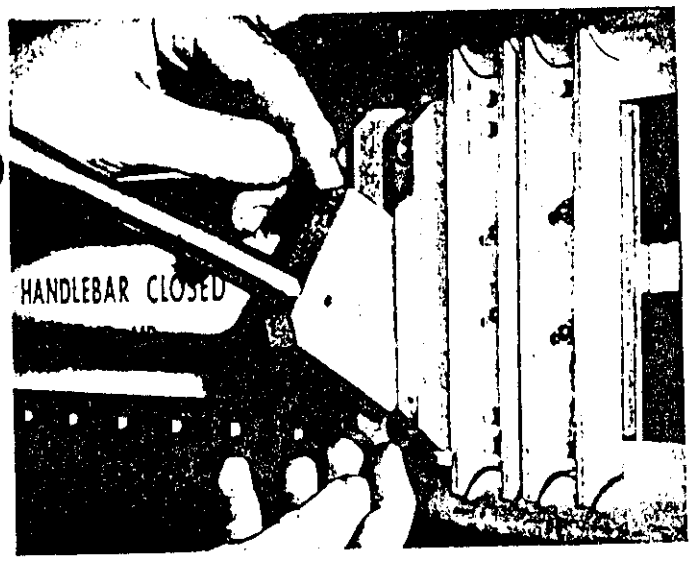
Warning: If the handlebar is permitted to droop too far because of misalignment or worn nylon bushings, the sliding bolt will not be able to enter the striker cavity, and then will not latch, creating the hazard of an unlocked handlebar. Do not operate the SCRAMBLER in this condition.

HANDLEBAR STRIKER ADJUSTMENT

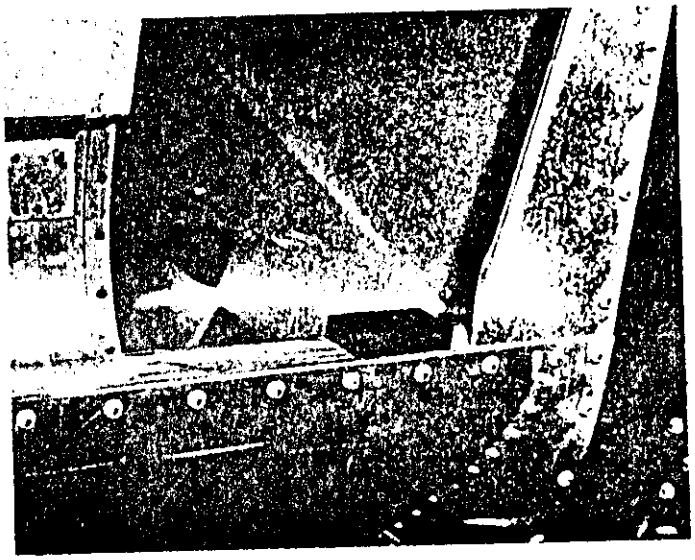
The striker (Picture No. J-2) is adjustable in and out. It should be set so that when the handlebar is closed gently without slamming it will still latch completely. The striker is held by a screw on the outside and another on the inside. If you do any adjusting of the striker be sure that the screws are thoroughly tightened when you are through, because loose screws could work out, the striker could fall off, and there would then be nothing to hold the handlebar shut. This could be extremely hazardous for your passengers, so be sure that these screws are always tight. A properly adjusted striker should be such that when the handlebar is closed there is still a very small amount of play between the rubber bumper on the back of the handlebar and the front of the seat.

SECONDARY LATCH

No adjustments are necessary on the secondary latch. However, if any of the parts become bent, broken, or badly worn, so that the locking pin cannot be inserted properly, they should be repaired or replaced.



No. J-9



No. J-10

CLEARANCE BETWEEN SEAT STEPS AND BOTTOM SWEEPS

The SCRAMBLER has been designed so that the seats are as close to the ground as possible, so that all passengers can step directly from the ground onto the seat steps. The clearance between the steps and the bottom sweeps where they pass over each other has been kept to a minimum intentionally. However, as the years pass, your assembly pins and pin holes will wear slightly, allowing the entire structure to settle. In a few instances it has settled to the extent that the steps have rubbed on the bottom sweeps as they passed over. This must not be allowed to continue, or it will cause expensive damage to the seats.

You can check this clearance easily by placing a seat directly above each bottom sweep, and then loading the seat with three adults. Check only one bottom sweep at a time (only one seat at a time is to be loaded). If you have interference it should show in this kind of test.

The clearance between the steps and the bottom sweeps on a new SCRAMBLER is about two and one-quarter inches. If you have lost this clearance it is easily corrected.

Place 5 16" thick shims under the top sweep bearing on each top sweep. The shims are to go between the bearing and the top sweep. This will raise the unit poles and the seats, and give you the clearance you need.

After the unit pole has been raised, the bevel pinion gear on the bottom sweep will not mesh properly with the gear on the bottom of the unit pole. Use shims to make these gears mesh properly. A complete assortment of shims for this purpose can be obtained from Eli Bridge Company. These shims are placed between the bottom sweep main bearing and the bottom sweep. Be sure that the same thicknesses of shims are used on opposite sides of the bearing. Enough shimming should be done to allow only a very small amount of backlash in these gears. Your own judgment will have to prevail here. However, remember that these gears should NOT fit together tightly, but should have a very small amount of play.

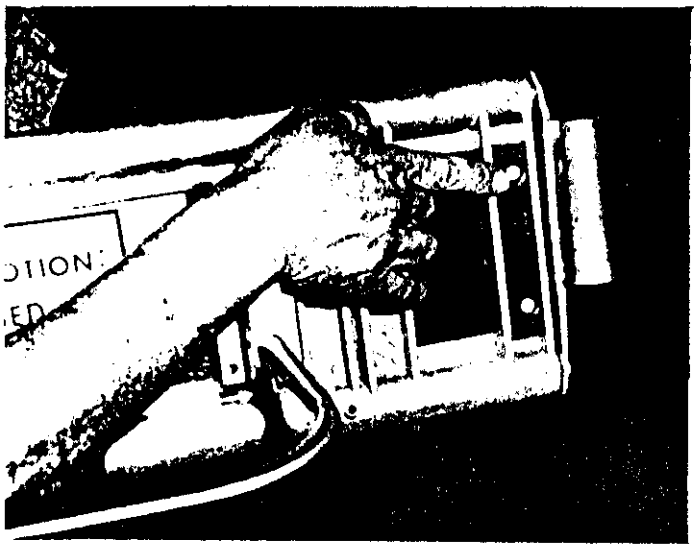
You will have to use some judgment in aligning the mounting holes in the bottom bearing with the holes in the bottom sweep before you tighten the bolts. The side-to-side play in these holes also affects the mesh of the gears. When you have the right amount of shim between bearing and sweep, notice how the pinion teeth mark the grease on the gear. The mark should be continuous along the flank of the tooth. If the gear teeth are marked at the ends only, then the bearing should be shifted to one side or the other until the correct marking appears on the gear teeth.

This procedure should be followed on each bottom sweep, so that all of the sweeps will be completely interchangeable. This is actually a very simple operation, but if you should encounter any difficulty, please feel free to contact Eli Bridge Company for advice.

The care you use with your SCRAMBLER will determine whether or not you have to use this procedure. Many SCRAMBLERS that have been in service for as long as ten years have never had clearance problems.

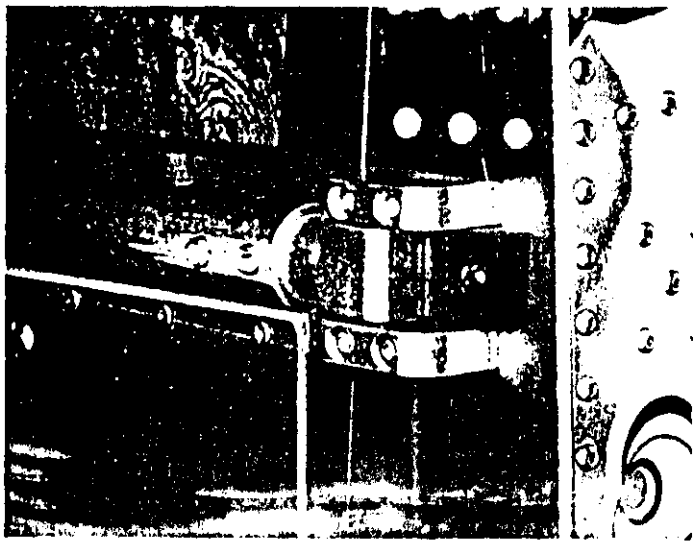
RUBBER BUMPERS

The rubber bumper on the back of the handlebar, is shown in Picture No. J-6. No handlebar should be without such a bumper in good condition. If there is no bumper here, the handlebar will strike the front of the seat and cut through it in a very short time, so be sure that all of these bumpers are in good condition.



No. J-6

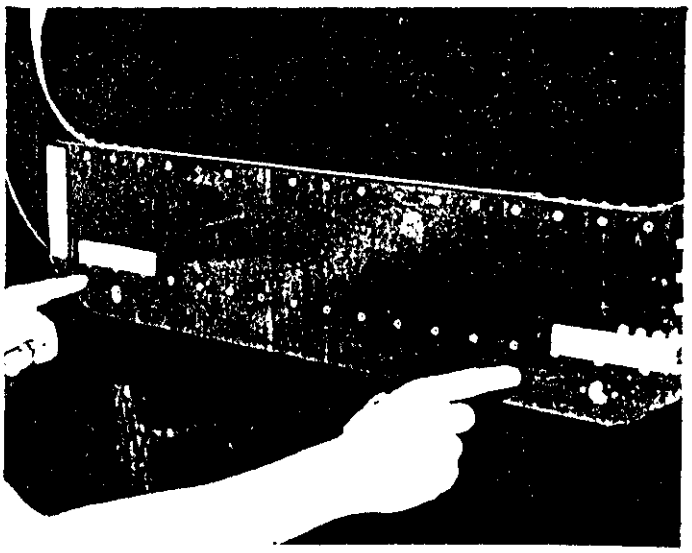
There are two rubber bumpers on the hinge end of the handlebar, and one of these can be seen in Picture No. J-7.



No. J-7

These bumpers keep the handlebar from swinging back over center, and also insure that the handlebar will close automatically when the SCRAMBLER starts turning, if the passengers have failed to latch it. There is considerable wear on these bumpers, and you will probably find that they will cut through and need replacing in a fairly short time. However, they are inexpensive, and you should keep some on hand. Failure to keep these bumpers in good condition can cause expensive damage to the seats.

There are three more sponge rubber pads on the front of the seat as shown in Picture No. J-8. There is a similar pad on the back of the step. These pads prevent the parts from scrubbing against each other, but their most important function is to keep the parts from rattling against each other. Your SCRAMBLER will be much quieter if you keep these rubber pads on the seats and steps than if you permit them to become lost.



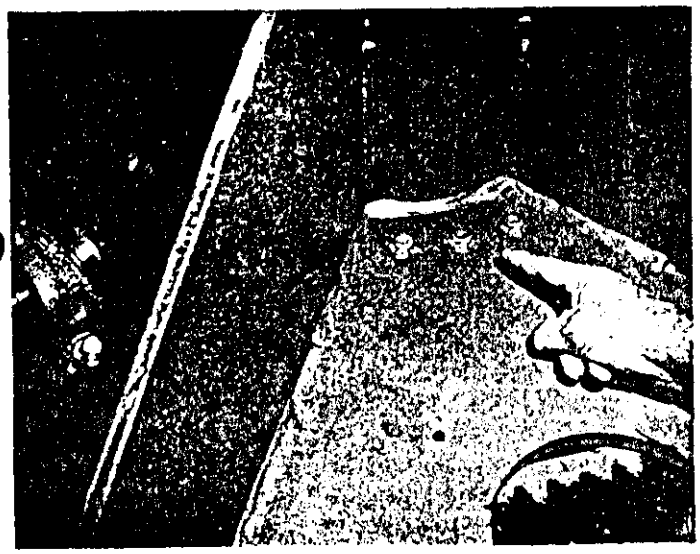
No. J-8

Each hinge block on the lap bar has two round rubber bumpers on it, so that the handlebar is protected from the the lap bar in both the up and down positions. Failure to keep all four rubber bumpers on each lap bar could cause the lap bar to cut into the handlebar in a very short time. See Picture No. J-9. Also, all the screws holding the lap bar hinge blocks must be kept tight.

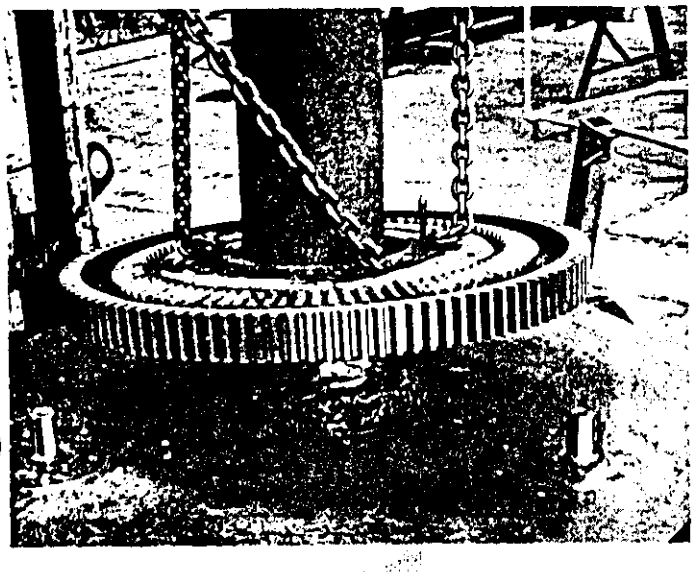
When a SCRAMBLER is used portably, it is important that the rubber bumper shown in Picture No. J-10 be in place. This bumper, which is attached to the footbottom, cushions the lap bar when the seat is folded and prevents it from wearing into the footbottom. Each seat is delivered [illegible] one of these bumpers attached to the footbotto[illegible] should get many years of service be[illegible], bumper [illegible] replacing.

entire base section weighs approximately 5,000 pounds, so the hoist should be able to raise that much. At first the rotating base may stick to the stationary base, because of the tight fit of the bearings. If it does stick, pry the two pieces apart with 2 x 4's on opposite sides. As soon as they are free, the rotating base can be removed. When the stationary pole is out of the top bearing, lift out the bearing cone and wrap it immediately to keep dirt and grit out of it. Never replace any bearings until they are cleaned thoroughly in clean, approved solvent and repacked with clean grease.

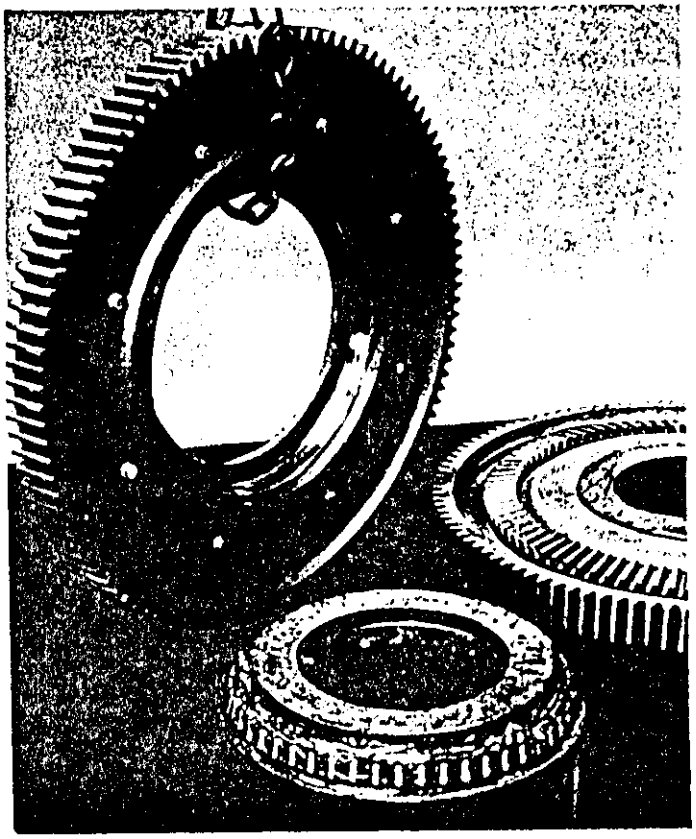
F. To remove any of the large gears, bearings, or castings attached to the rotating base, remove the cap screws holding them before removing the rotating base from the stationary base. The large internal gear is held to the rotating base with 12 socket head shoulder screws, one of which is indicated in Picture No. K-4. Every pair of shoulder screws is safetied with bailing wire to keep them from loosening. You may prefer to wait until the rotating base has been lifted off before unbolting the internal gear. The rest of the gears, bearings, and castings under the rotating base are held by 18 cap screws that are close to the 12 inch diameter center pole tube. Three of these are indicated in Picture No. K-5. After removing any necessary cap screws, raise the rotating base as described in Paragraph "E". The loosened gearing will remain on the stationary base, where it can be handled quite easily. Picture No. K-6 shows the center gears, bearings, and castings being raised. Attach a chain to the hub casting with ½"-13 cap screws as shown in picture. The floating gear rides on the large Timken bearing underneath it, as shown in Picture No. K-7, and



No. K-5



No. K-6



No. K-7

nothing holds it in place but its own weight. After removing the assembly from the stationary base, lift off the floating gear. Be sure that you raise it straight up so that you will not damage the bearing on which it rides.

To remove the bevel ring gear from the floating gear, remove the eight cap screws from the underneath side of the floating gear as shown in Picture No. K-7.

The bearing retaining ring is held on the bottom of the hub casting by 18 cap screws, as shown in Picture No. K-8. Removing them might make removal of the bearing cone easier, if you should need to do this.

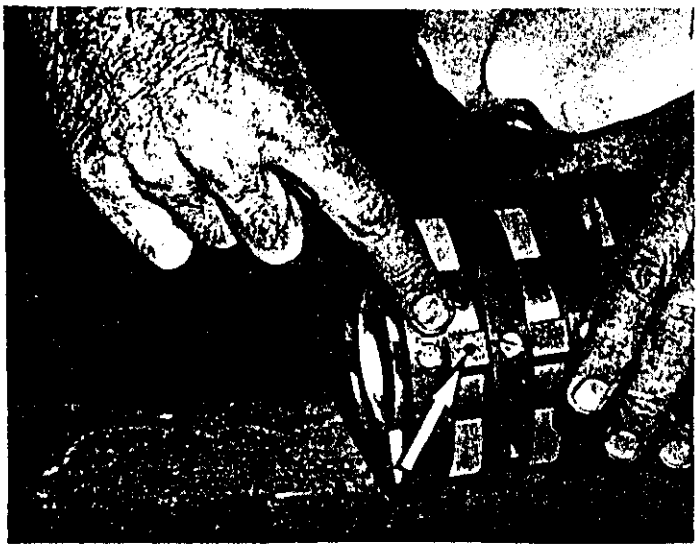
The bearing at the bottom of the stationary pole is exposed when the rotating base is raised. To remove the bearing cone, pry on both sides under the hardened ring beneath the bearing, as shown in Picture No. K-9. This bearing also should not be replaced without thoroughly cleaning and re-greasing it.

MAJOR DISASSEMBLY INSTRUCTIONS
FOR THE
SCRAMBLER CENTER POLE BASE SECTION

The rotating base remains on the stationary base at all times unless it becomes necessary to replace large gears, bearings, or castings. You may not need to remove the rotating base if you wish to service the brake and gear pot assemblies. However, if some of the large bearings, castings, or gears under the rotating base require attention, then use the following procedure:

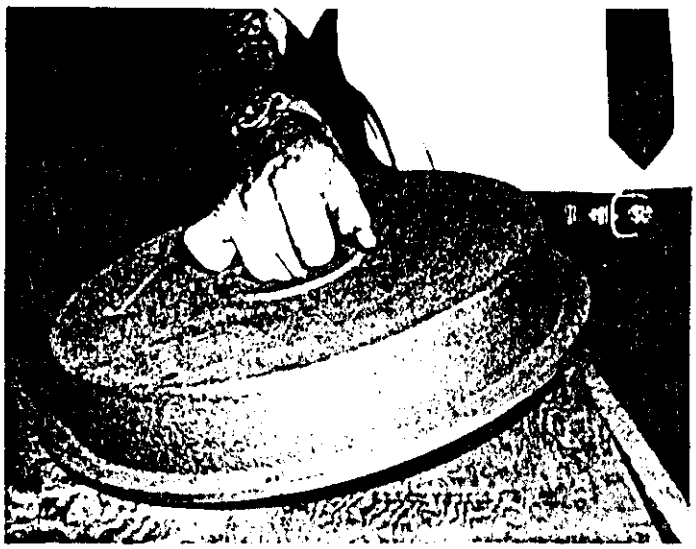
A. Remove the mast from the top of the base section.

B. Remove the slip ring assembly by taking out the screw and nut which hold it to the small tube sticking up through the hat casting at the top of the rotating base. The screw location is shown in Picture No. K-1.



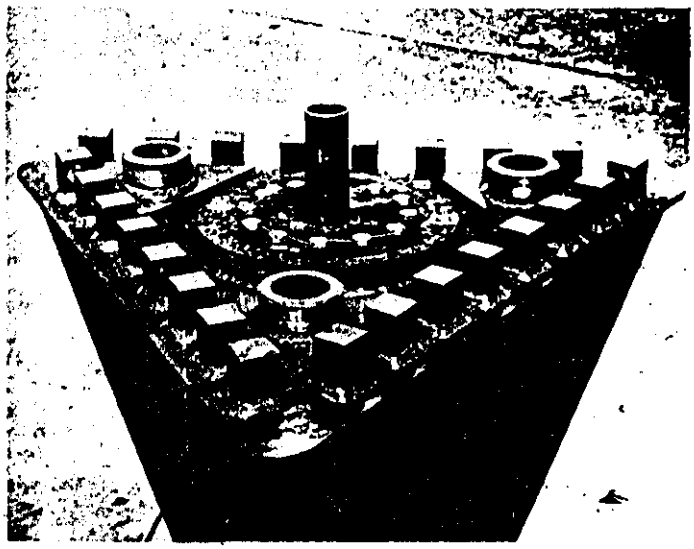
No. K-1

C. Remove the nine screws which hold down the hat casting (shown in Picture No. K-2), and lift off the hat.



No. K-2

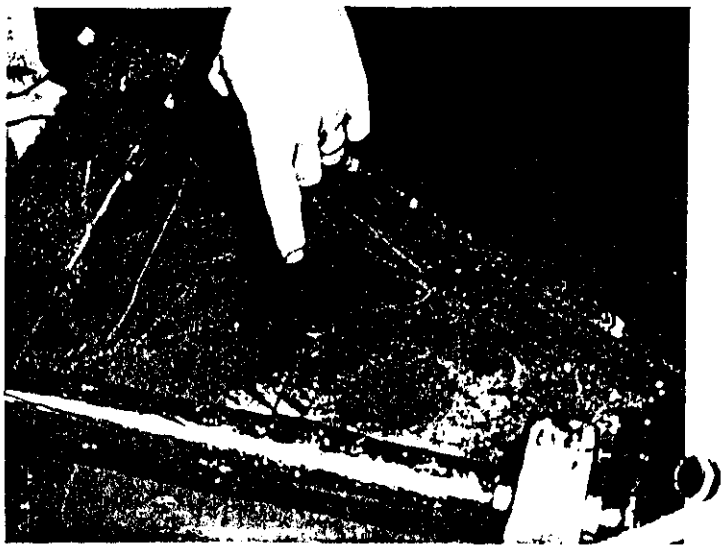
D. The twelve ½" high-strength bolts which hold down the cap on top of the pole can be seen in Picture No. K-3. Take out the locking wire and throw it away.



No. K-3

Do not use it again; replace it with new stove pipe wire when you re-assemble the center pole. Remove the twelve bolts and lift off the cap. There may be some thin shim under the cap, which must be replaced when you put the base section back together, so take care of them.

E. You are now ready to remove the rotating base. Insert a ¾" diameter rod through the hinge blocks on each side of the top of the rotating base. In the middle of each side wrap a chain around the rod and adjust the three chains so that you can pull vertically, with an equal pull on each chain, as you lift the rotating base. The

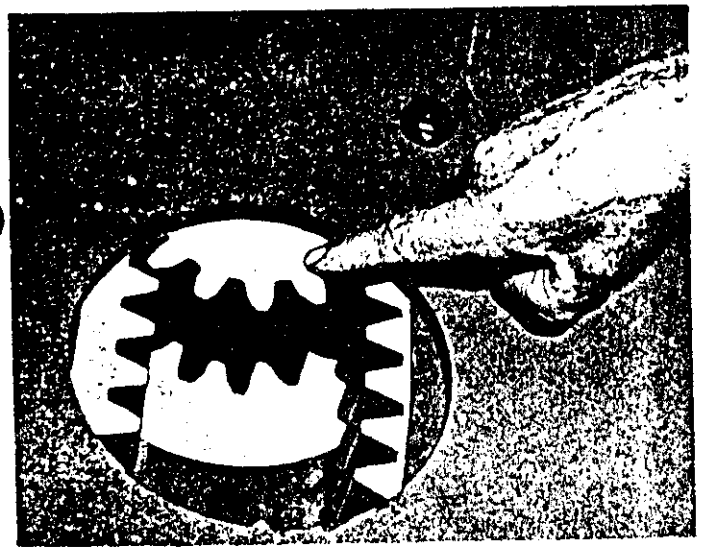


No. K-4

MAJOR DISASSEMBLY INSTRUCTIONS FOR THE SCRAMBLER GEAR POT AND BRAKE ASSEMBLIES

The brake and gear pot assemblies have been designed so that you can remove and replace any of the parts without dismantling the SCRAMBLER. The parts in all three assemblies are similar; and in some cases are alike, so the same procedure will apply to all three.

Remove the cover from the rotating base, and turn the base until the three spur pinions are completely visible in the access holes shown in Picture No. L-1. Remove the hold-down screw in the top of the pinion shaft, and lift out the pinion if it has not frozen to the shaft. It is not absolutely essential that the spur pinion come out at this time. Do not remove all three pinions unless you want to remove the gear pot assembly and both brakes; just remove the one where you are working.

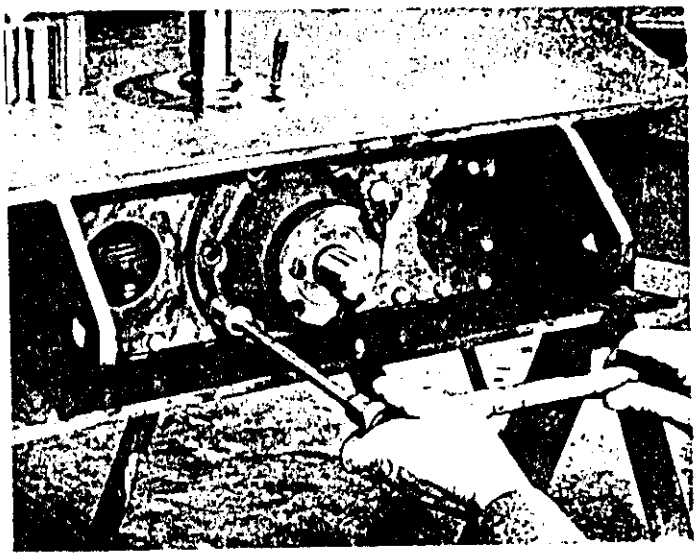


No. L-1

On the gear pot the following must be done before further steps can be taken:

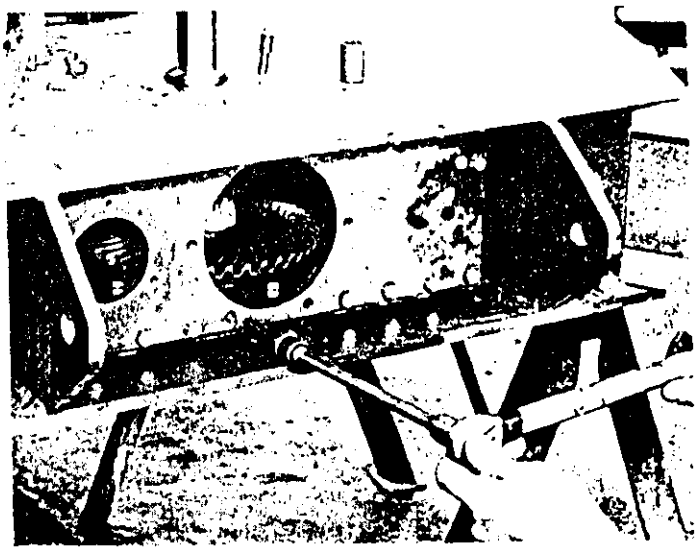
1. Drain the oil from the gear pot by removing the drain plug just inside the hand hole.

2. Remove the pinion casting from the cover plate by taking out the six cap screws which hold it. There are tapped holes in the flange of the pinion casting. Insert two of the six cap screws in these holes. Turn these screws in together and they will push against the cover plate to free the casting. See Picture No. L-2.



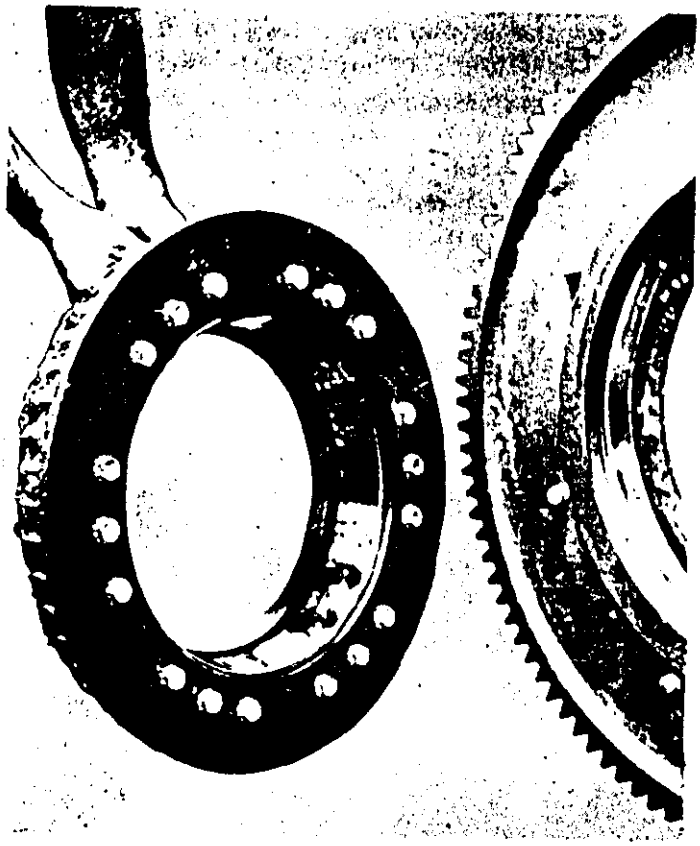
No. L-2

3. Before you can remove the cover plate you must remove the pinion casting, because there are four socket head cap screws under the flange of the casting and they must be removed. See Picture No. L-3. The remaining cap screws are exposed and can be removed. Pull away the cover plate from the dowel pins which locate it. Tap lightly from the inside to free it from the dowel pins.



No. L-3

The key in the hub of the bevel ring gear is held in place with a ⅛" cap screw which has a drilled head. A safety wire surrounds the hub and passes through the head of the cap screw as shown in Picture No. L-4. This safety wire should always be in place when the SCRAMBLER is in operation, because vibration could possibly cause the capscrew to back out, and if it should lodge in the gear teeth extensive damage could result.



No. K-8

No. K-9

When replacing these parts, the following procedure is recommended:

1. Reassemble the gears, bearings [illegible] ub casting, as in Picture No. K-8, and replace the [illegible] stationary base in the same manner as they were [illegible]

2. Lay the internal gear on a flat surface and lower the rotating base over it. Cap screw the rotating base to the internal gear with the 12 shoulder cap screws. Start all 12 screws at the same time, and then tighten gradually to 55 ft.-lbs. of torque. Safety each pair of shoulder cap screws with baling wire.

3. Lower the rotating base onto the stationary base. Set in place the top main bearing. Replace any shims that were under the cap when it was removed and reposition the cap. Start the 12 bolts in the bearing cap.

4. Replace all three spur pinions and insert the keys. Caution: Do not turn the pinions on their shafts, or the shafts may gall and freeze in the pinions. Be sure to use keys.

5. Start the 18 cap screws that hold the hub casting to the rotating base, but do not tighten them even finger tight.

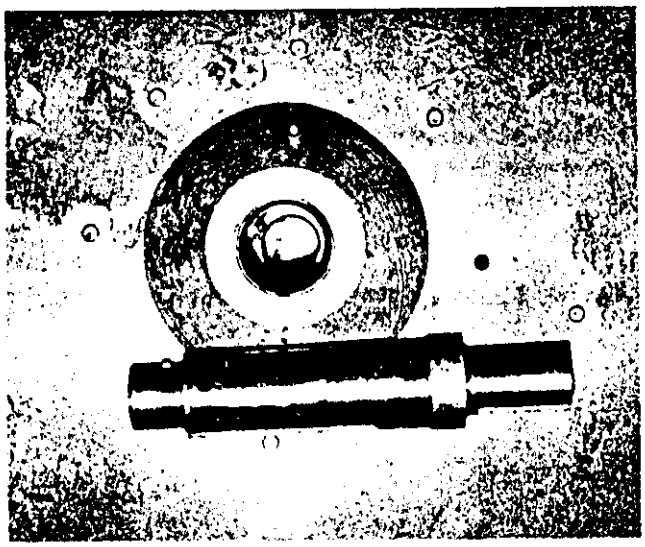
6. Connect the power unit truck and one drive unit to the base, and start the rotating base turning under power, while you gradually tighten the twelve cap screws at the top of the stationary pole. You can stand on a plank laid across trestles while you work. Tighten the cap screws gradually to 55 ft.-lbs. of torque. Go back and forth across the circle as you tighten, first drawing down all of the bolts to 35 ft.-lbs., then to 45 ft.-lbs., and finishing with 55 ft.-lbs. of torque. All the time these cap screws are being tightened the rotating base should be turning. The purpose of turning the base under power is to center the floating gear and hub casting for the best possible fit of the gears and pinions.

7. After the center pole cap is bolted in place, stop the rotating base and tighten gradually the 18 cap screws connecting the rotating base and the hub casting. Tighten them to 55 ft.-lbs. of torque.

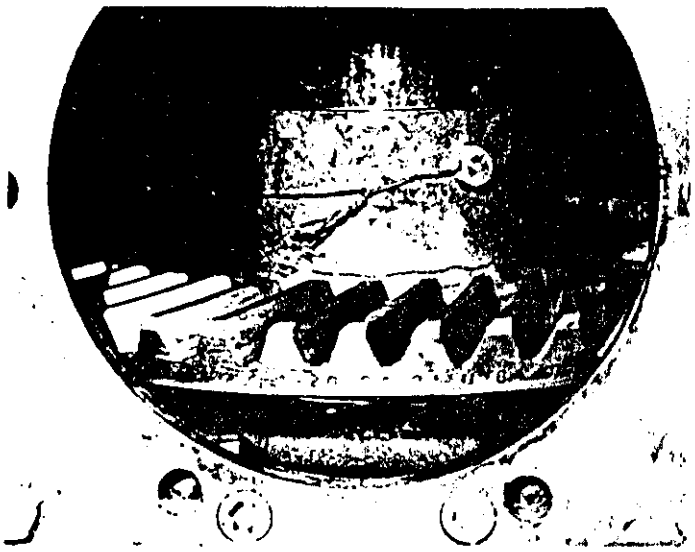
8. Make no more final adjustments until after the entire SCRAMBLER is set up. Then re-check the 12 cap screws at the top to be sure that they are pulled down to 55 ft.-lbs. of torque. Re-tighten as needed.

9. After the SCRAMBLER has been dismantled, thread the [illegible]ing wire through the cap screws at the top [illegible] pole as shown in Picture No. K-3, and [illegible] replace [illegible]t casting.

There is one spacing sleeve in the gear pot and two sleeves in each brake assembly. These sleeves have shoulders on one end only. In each case the shoulder goes next to the bearing which it touches. The gear pot sleeve can be aligned after the shaft is through it, but you must align the brake shaft sleeves before you insert the shaft. On the bottom end of the brake shaft there is a smaller diameter, and a small round pin sticks out of the side of this smaller diameter. This pin engages the keyway in the bottom sleeve. When you look down the hole before inserting the shaft, be sure the keyway in the bottom sleeve is on the opposite side of the hole from the key in the brake hub. The pin in the side of the top sleeve must be aligned with the key in the brake hub. See Picture No. L-8. It is very easy to forget about the small pin on the bottom, so take care to remember it.

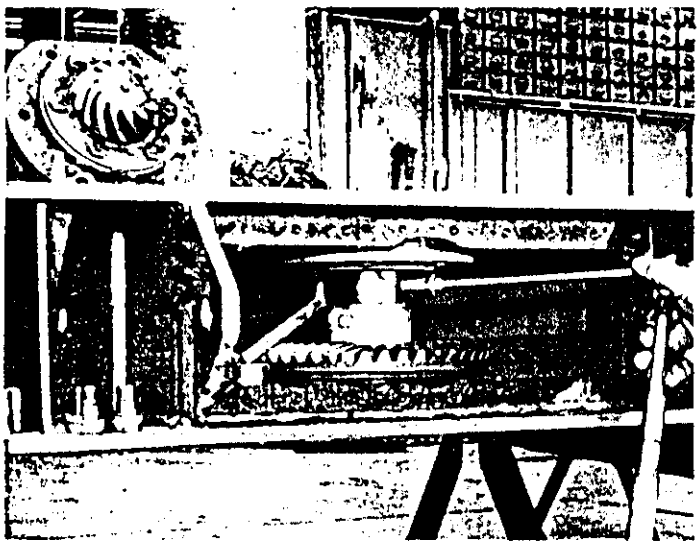


No. L-8



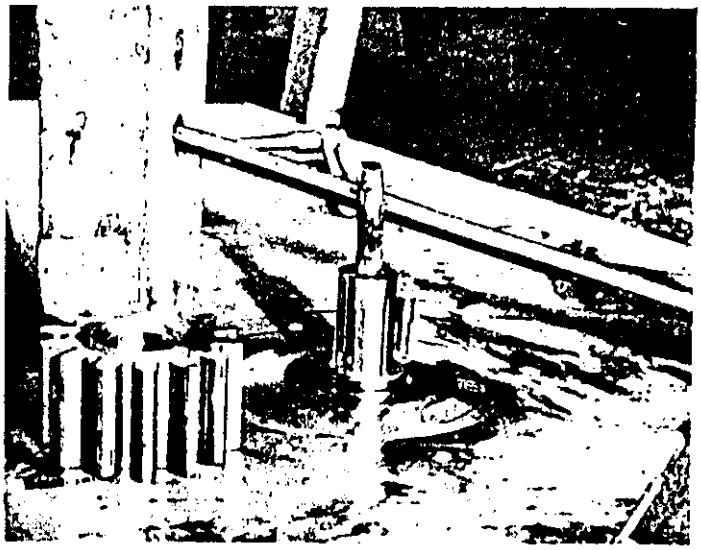
No. L-4

4. A long bolt runs through each spur pinion shaft, and it must be removed. See Picture No. L-5. Be sure to replace the self-locking nut, and not an ordinary nut, because you could get some very expensive damage in the gear pot if a nut were to work loose. The nut on each brake drum hub is riveted to the hub, so you will not need to worry about losing it. The purpose of this bolt is to hold down the shaft so that it will not rub on the rotating base. Nothing else holds down the shaft.



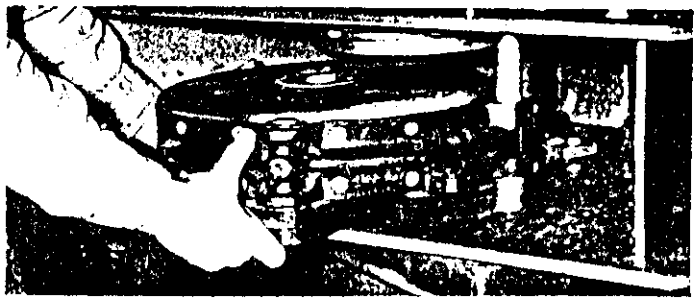
No. L-5

After the bolt is removed, then withdraw the spur pinion shaft. A ⅜" ey[illegible]lt is furnished, wi[illegible] screws down into the top o[illegible]haft. Use it to [illegible] shaft straight from the hole. In Picture No. L-6 notice how a block and bar are used to lift the shaft. In this picture the shaft is being pulled with the rotating base removed, but the shaft can be removed also with the base section assembled.



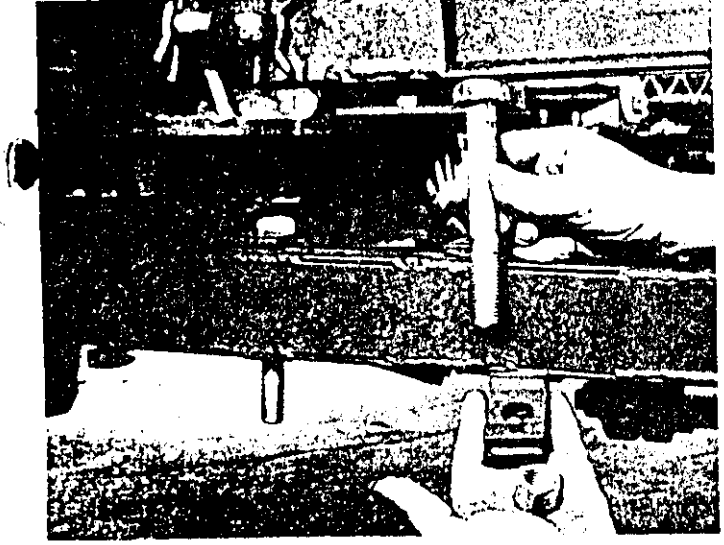
No. L-6

With the shafts removed, the brake drums and the bevel ring gear will slide out because there is nothing further holding them in place. See Picture No. L-7. It will be necessary to remove a rectangular plate under each brake lever arm, but this will be obvious when you

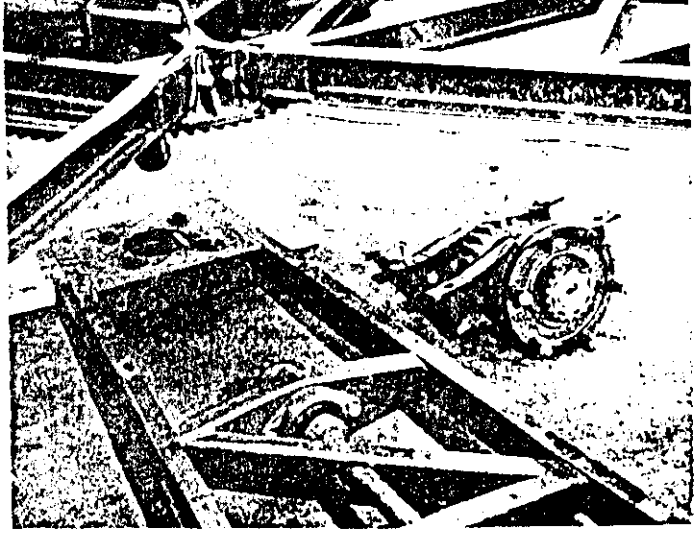


No. L-7

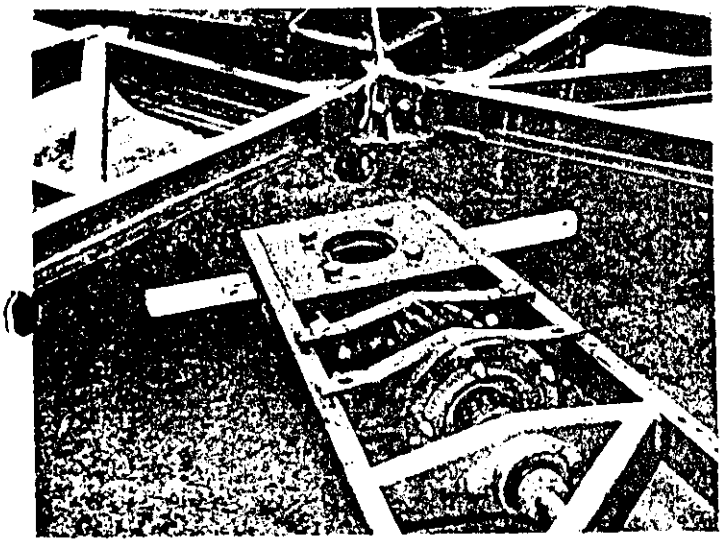
start to remove the brake drum. The castings bolted to the top and bottom base plates will then be out in the open and can be removed as needed. Take care when removing the top bearing carriers that they do not fall on your fingers. They are not particularly heavy, but they may drop out suddenly and catch your fingers. You can avoid this by blocking up under them before you remove the bolts.



No. M-4

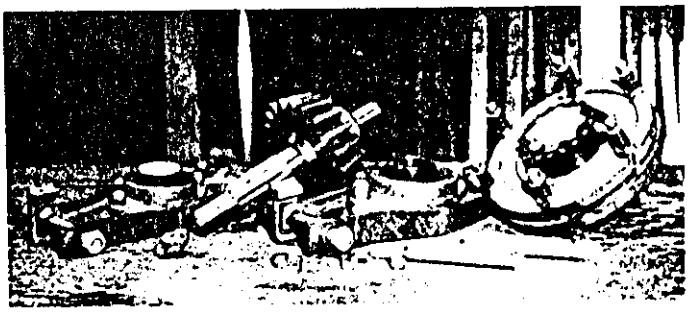


No. M-6



No. M-5

No. M-7



No. M-8

7. Next, lift out the removable slip clutch and pinion assembly, as shown in Picture No. M-6. All the parts of this assembly are shown in Picture No. M-7, as they are used on the sweep.

8. With the removal of a single cap screw from the outer end of the short shaft all of the parts of this assembly should come apart easily as shown in Picture No. M-8.

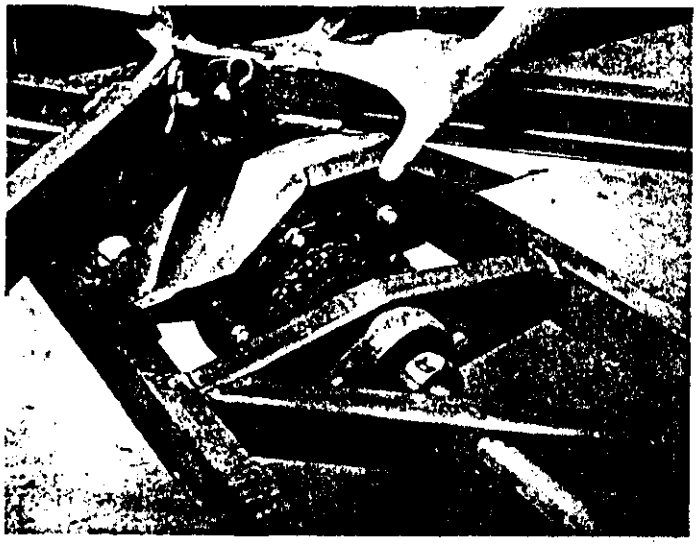
9. Unscrew the nuts that hold the springs on the slip clutch, and the slip clutch will then come apart as shown in Picture No. M-9. At this point, the facing can be replaced on the clutch disk, the clutch disk itself can be replaced by removing the eight socket head cap screws in the sprocket, or the entire clutch disk and hub assembly can be replaced.

MAJOR DISASSEMBLY INSTRUCTIONS
FOR THE SCRAMBLER BOTTOM SWEEP

From time to time you may need to replace a clutch disk in the slip clutch, but except for that it is unlikely that you will need to take apart the bottom sweep. The bottom sweep was designed so that a clutch disk can be replaced easily and quickly. The pictures show how this can be done without removing the pins from the bottom sweep. However, you may prefer removing the sweep and setting it on trestles or other supports while you work on it. To replace a clutch disk proceed in the following way:

1. Disconnect the chain coupling next to the center pole so that the unit pole will be free to turn.

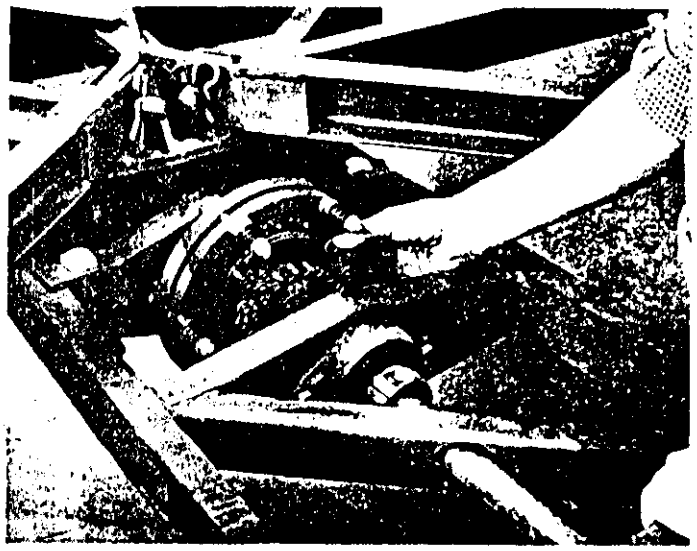
2. Remove the slip clutch cover as shown in Picture No. M-1.



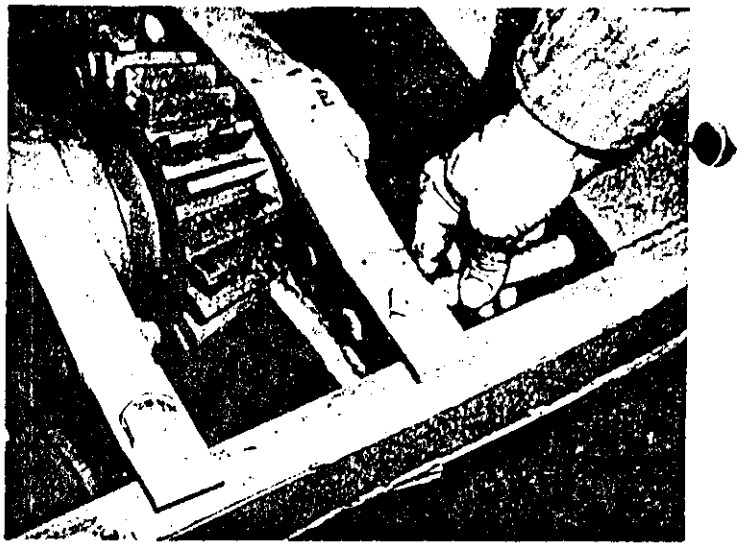
No. M-1

3. Remove the chain from the coupling next to the slip clutch as shown in Picture No. M-2. This is perhaps the most difficult job in replacing a clutch disk. This coupling is the same type as the others on the SCRAMBLER, except that it is larger and has a larger chain on it. The chain goes together in the same way as all the other chains.

4. There are two long bolts that run parallel to the sweep drive shaft. A self-locking nut and a tapered washer are on the end of each bolt. Remove these bolts as shown in Picture No. M-3.



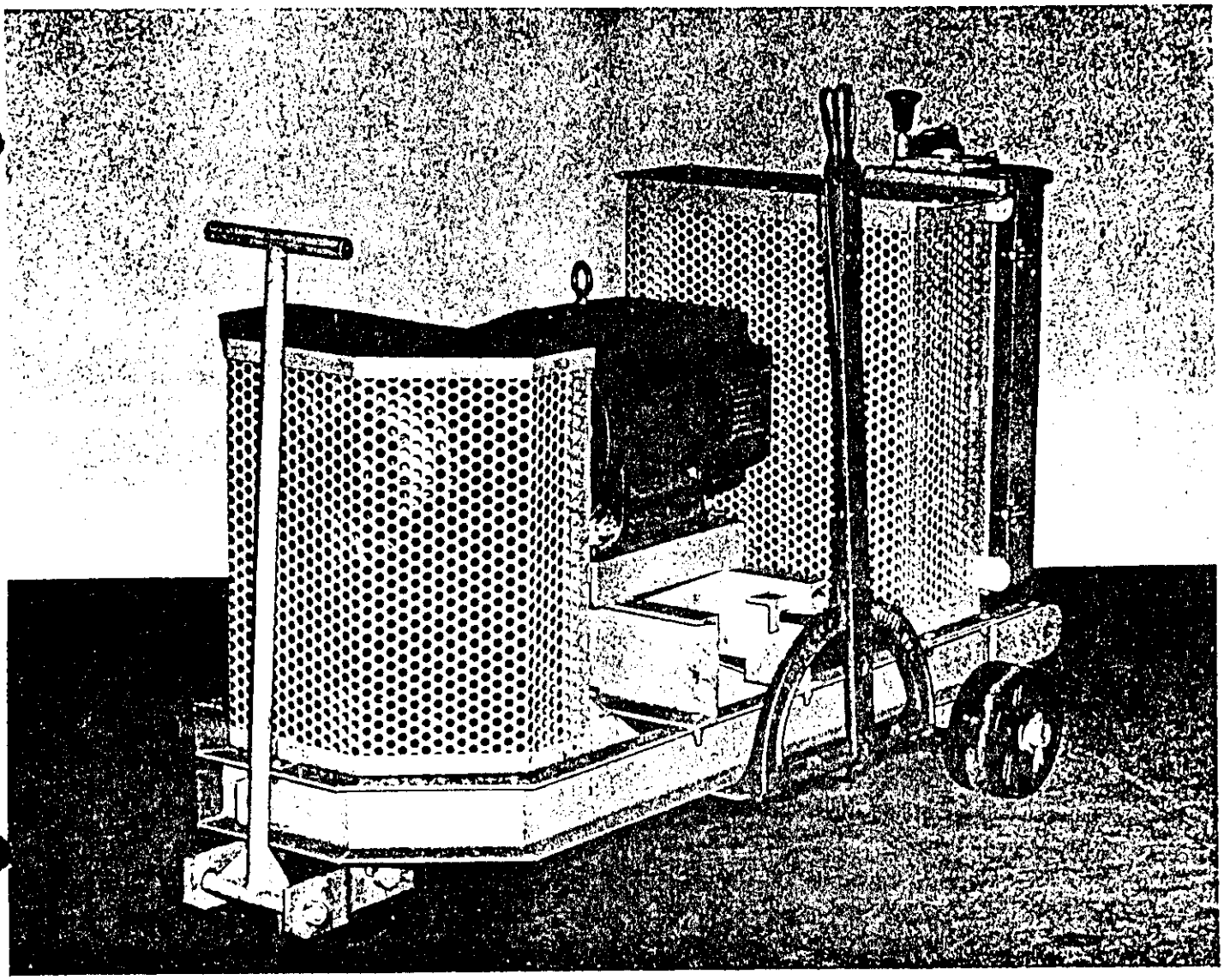
No. M-2



No. M-3

5. Remove the nuts and clamp blocks from the four vertical bolts, and remove the two bolts on the side next to the center pole. You will not be able to remove the other two bolts because the unit pole is in the way. See Picture No. M-4.

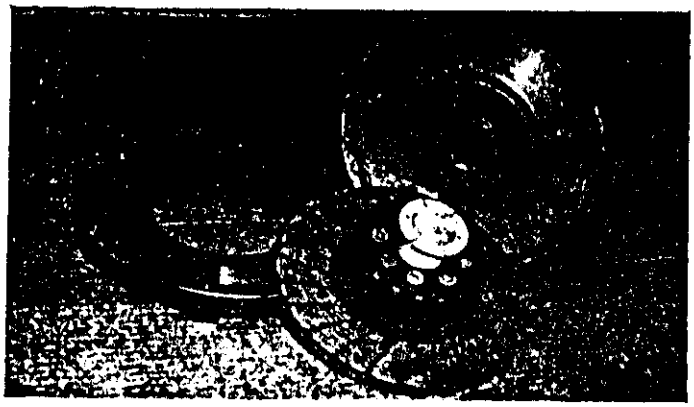
6. Next, unlock the sweep from the bottom of the unit pole and drop it down as shown in Picture No. M-5. Use a block under the outer end to hold the slip clutch off the ground.



SCRAMBLER EQUIPPED WITH ELECTRIC MOTOR DRIVE

The SCRAMBLER can be equipped with a 10 horsepower, 1710 RPM, 3 phase, wound rotor induction motor, 230/460 volts, 60 cycle alternating current. With this motor are a drum controller, a resistor bank, and a magnetic starter. All four of these units are wired together completely. Connect the three lead-in wires to terminals L1, L2, and L3 in the top of the magnetic starter, and the SCRAMBLER is ready to operate.

Red arrows have been painted on both the Twin Disc 9.4 HSD fluid coupling and the motor to show the direction they should turn. If the motor turns in the opposite direction, interchange two of the lead-in wires to reverse direction. As you face the grill which surrounds the fluid coupling, the coupling should be turning counterclockwise.



No. M-9

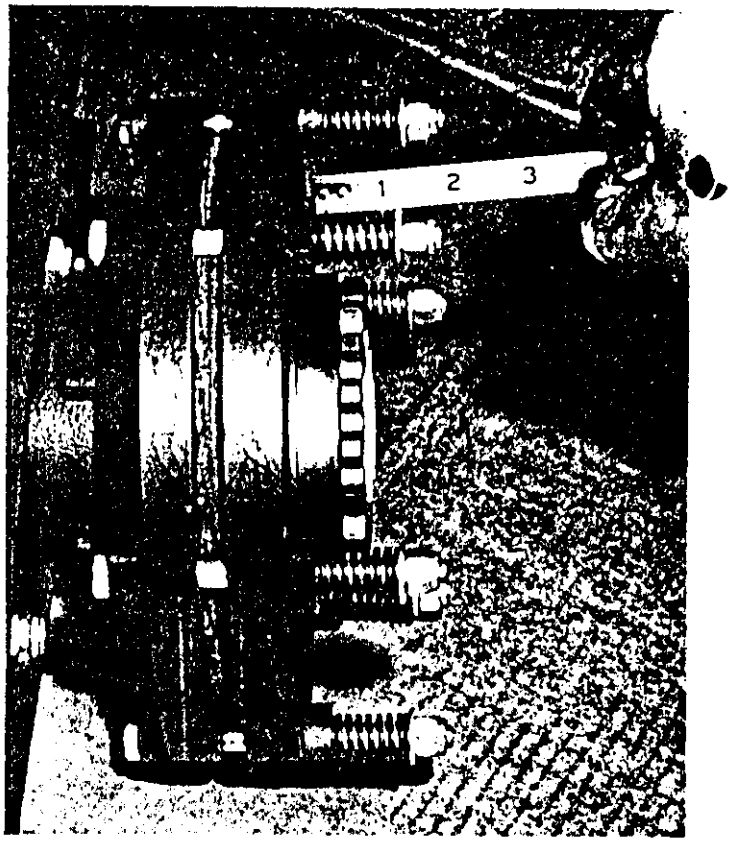
10. When reassembling the entire unit do not tighten the springs until the shaft has been run through the splined hub of the slip clutch and through the nylon bushing of the clutch disk hub. This is very important, if you are to avoid tightening the springs with the clutch disk off center. The shaft will align the two parts while the springs are being tightened. Compress the springs until they are each 1-3/32" high as shown in Picture No. M-10. This is how your slip clutches were all adjusted at the factory.

11. When you re-install this assembly in the bottom sweep, tighten first the long parallel bolts, replace the chain on the slip clutch coupling, and then tighten the four vertical bolts. Turn the shaft from time to time as you are tightening these bolts to be sure there is no bind in the entire drive. Also, when you have connected the bottom sweep to the unit pole again, you may wish to shift the assembly slightly for better mesh of the bevel pinion with the unit pole bevel ring gear.

There are many pieces in the bottom sweep drive, and they must be assembled in the proper order. To be sure, compare what you are doing with another bottom sweep.

Eventually, some wear will develop in the bevel ring gears and pinions, and there will be more back lash between the gear teeth than there should be. To reduce the back lash in these gears, add additional shims under the large flanged pillow block bolted to the outer end of the bottom sweep.

With good clutch springs all adjusted to the proper height of 1-3/32", there can still be a variation in the performance of a slip clutch. As the friction surfaces of the clutch disk wear in, the characteristics of the slip clutch can change, and so you must observe how the SCRAMBLER behaves when it is carrying a passenger load. The factory load test consists of putting 600 pounds in each of the 12 seats, bringing the ride up to full speed, and then braking it to a stop. Under this kind of loading condition, when the center pole is stopped as quickly as possible, the unit poles will continue to turn and come to a stop about 10 seconds after the brake is applied. If the clutches are adjusted properly all three unit [illegible]



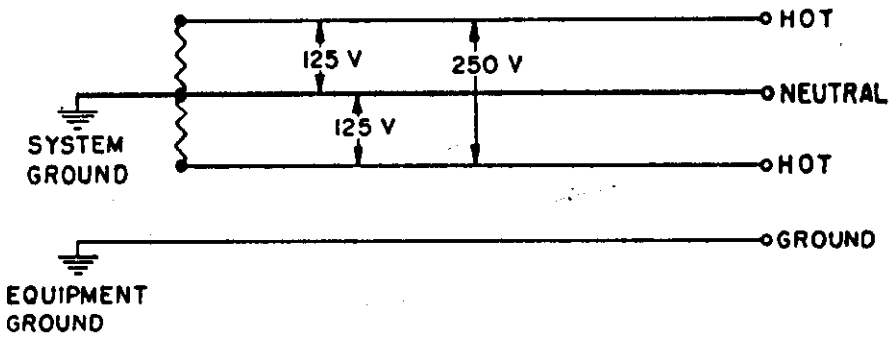
No. M-10

will stop turning at almost exactly the same time.

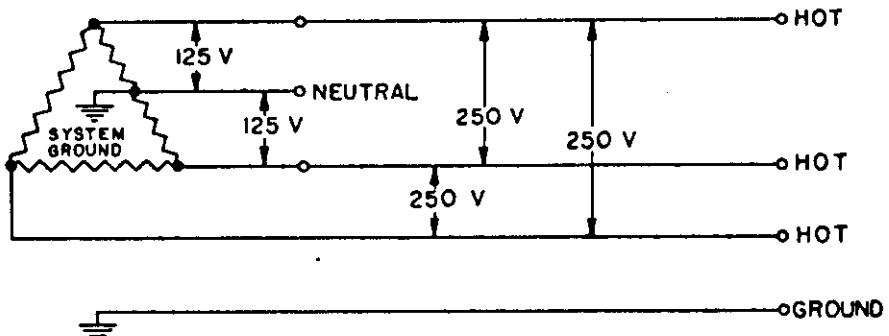
A second way to check the slip clutches is to bring the SCRAMBLER up to top speed with no passengers in any of the seats, then set the brakes quickly and firmly. With no passengers, the unit poles should stop at the same time as the center pole. If you find that one or more of the unit poles continues to turn after the center pole is stopped, then the slip clutches are not adjusted tight enough. Check to be sure that all the springs on each slip clutch are tightened to an overall height of 1-3/32". If the unit poles still continue to turn after the center pole has stopped, it will be necessary to tighten the clutch springs even more. Be sure to tighten all six springs on each clutch to the same height. This does not necessarily mean that all three slip clutches will be adjusted exactly the same. All three may be different from each other; the important thing is that they function in the same way. This method of testing the slip clutches with no passengers is by far the easiest way to check them.

The third method is also very easy, but may not tell you quite as much. With the SCRAMBLER stopped and the brakes set, push on the back or front of any seat. It should take a good, hard push to slip the slip clutch, but you should be able to slip it. This is an excellent way of comparing the three bottom sweep slip clutches. If the three clutches are not adjusted to operate in the same way the differences will be quite obvious when a seat on each unit pole is pu[illegible] in this way.

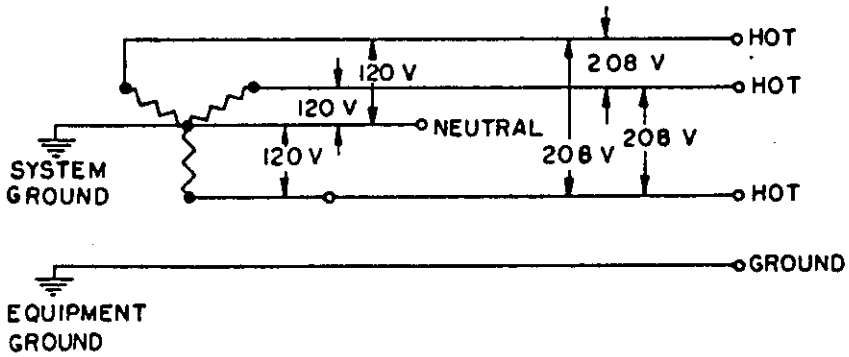
WIRING DIAGRAM FOR: FORMS OF POWER AVAILABLE



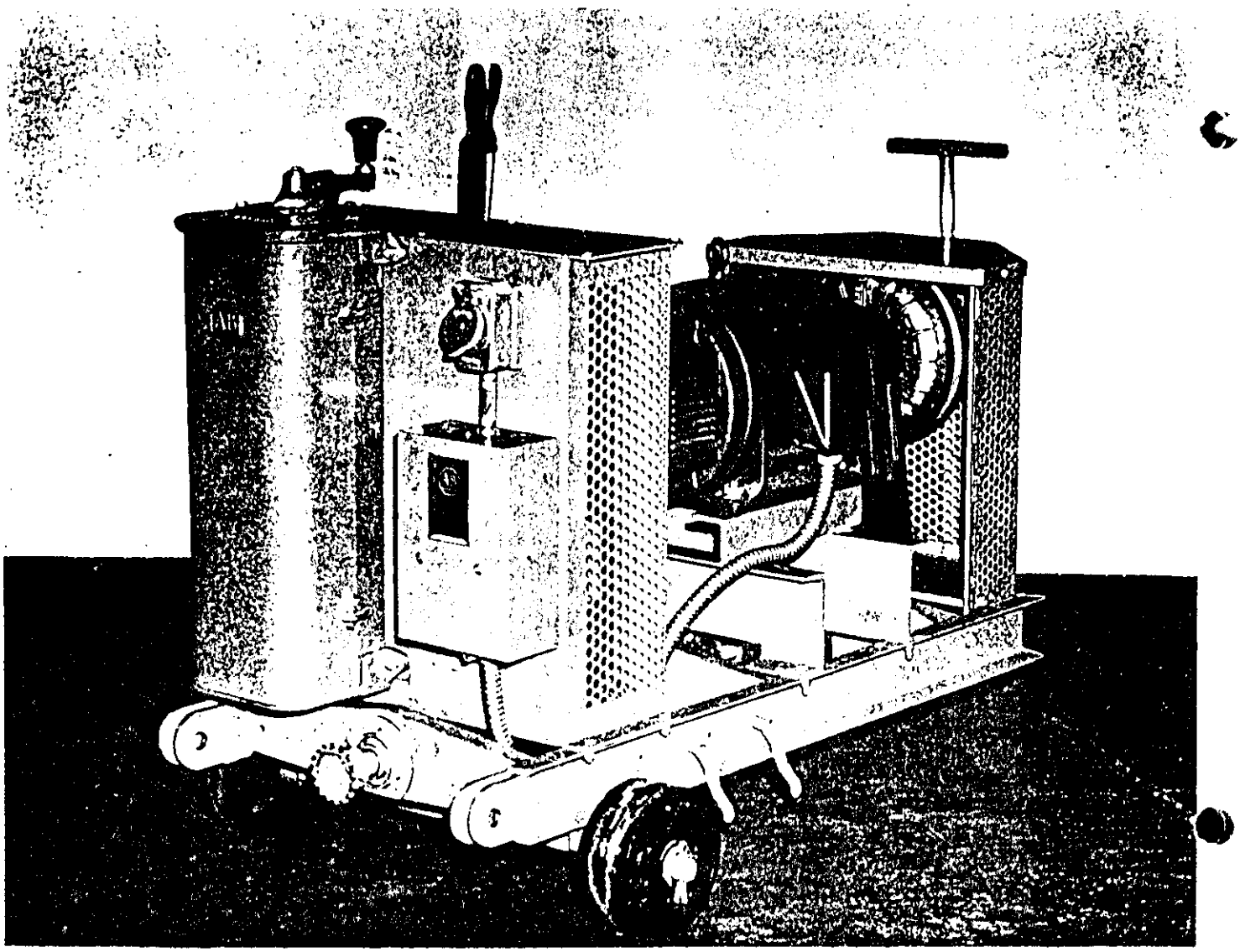
"SPLIT 220"



DELTA WINDING



"Y" WINDING



To start the motor, insert the key in the switch that is mounted directly above the magnetic starter. Flip the key and the drum controller can then be operated to start the motor. Release the brake ratchet handle, and then move the drum controller to the first position. Hold it there until the motor picks up the load, then advance the controller to the next notch. There are 11 steps on the controller. Always move the drum controller in easy stages that will not be hard on the motor. If you advance the control to the wide open position rapidly, there will be a great strain on the motor and large amounts of current will be used. The drum controller will provide a smooth start, together with a great range of operating speeds to give variety to the ride. The control handle can be padlocked if desired, when the ride is not in use.

The wiring diagram for the drum controller and the resistor bank is located inside the cover of the drum controller.

If the V-belts should slip, the drive can be tightened by shimming equally under the channels which support the motor.

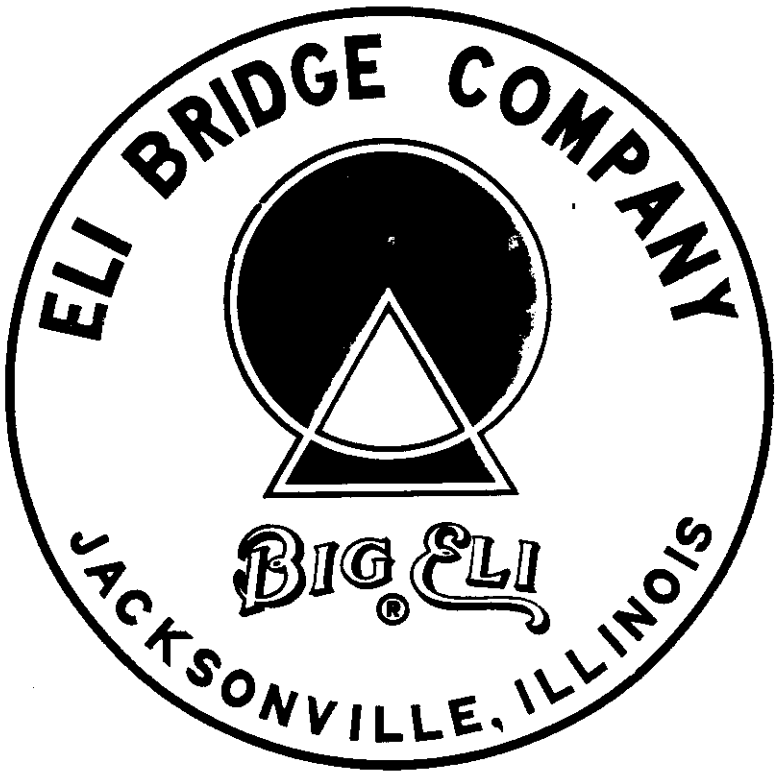
This electric motor drive will give long and reliable service if it is given reasonable care.

Scrambler

Operation and Maintenance

of

Big Eli Scrambler



ELI BRIDGE COMPANY
800 CASE AVENUE
JACKSONVILLE, ILLINOIS 62650
PHONE 217/245-7145

OPERATION AND MAINTENANCE OF BIG ELI SCRAMBLERS

Big Eli Scramblers first went into service in 1954. Nearly every Scrambler delivered since that time is still in service. From the beginning the Big Eli Scrambler was designed and built for easy operation, maintenance, and replacement of parts as needed. Eli Bridge Company has always been ready to help with any problems that occur. Owners and operators have called or written the factory about their problems of operation and maintenance, and through the years these problems have tended to be much the same. These suggestions cover those questions most frequently asked. This manual is divided into four parts: 1) Operation; 2) General Maintenance; 3) Seats; and 4) Lubrication. Each part is in alphabetical order, with cross-referencing to help you to find the information you need. Keep this manual handy, and it should help you to solve many of the problems that arise. If you have a problem that is not covered, do not hesitate to contact the factory.

OPERATION

Every operator should read and understand these instructions thoroughly before operating the Scrambler.

The Big Eli Scrambler Ride has been carefully designed and built with the safety of your passengers in mind. It will provide thrilling entertainment for your patrons if properly operated and maintained. As with any amusement ride, careless operation of the Scrambler can cause unnecessary risk to people. Proper maintenance of the Scrambler is essential. Passengers must not be allowed to misbehave.

Vigilance on the part of the operator can prevent accidents. The operator must watch the ride at all times, and refuse rides to any person that, in his opinion, might be in danger.

The operator must not become careless, because the Scrambler is a fast ride which involves high accelerations and decelerations, and any person leaving his seat when the ride is in motion is almost certain to be severely injured. Overspeeding can cause accidents. Do not exceed 11.0 rpm with a gasoline engine, nor 11.4 rpm with an electric motor drive.

ALCOHOL AND DRUGS. See "Drugs and Alcohol".

BALANCING THE PASSENGER LOAD.

Balancing the Scrambler is not important. Your passengers will get a greater thrill if other passengers are in seats on other unit poles, but the Scrambler itself will operate very well even though it is not balanced. With one seat fully loaded you will have just about the maximum out-of-balance condition possible. The slip clutch built into each bottom sweep compensates for this out-of-balance by slipping when the load on the gear teeth is the highest. Occasionally, the slip clutch squeaks as it slips, but if this happens it is merely the friction surfaces rubbing against each other, and is no cause for concern.

OPERATION

Check the slip clutches when the Scrambler is stopped and the brakes are set. Push on any seat, and it should require a good, hard push to slip the slip clutch, but you should be able to slip it.

There is a second way to observe the action of the slip clutches. The factory load test consists of putting 600 pounds in each of the 12 seats, bringing the ride up to full speed, and then braking it to a stop. Under this kind of loading condition, when the center pole is stopped as quickly as possible, the unit poles will continue to turn and come to a stop about 10 seconds after the brake has been applied. If the clutches are adjusted properly all three unit poles will stop turning at almost exactly the same time. If all 12 seats are empty, then the three unit poles should stop turning at the same time as the center pole.

A third way, and perhaps the easiest way, to observe the action of the slip clutches is to operate the Scrambler with no one in any of the seats. Bring it up to full speed, and then set the brakes quickly and firmly. All three unit poles should stop turning at the same time as the center pole stops. If any one of them keeps on turning, then the slip clutch is not adjusted tight enough. Tighten the clutch springs to a uniform height of 1-3/32", or tighter if necessary to get the unit poles to stop turning when the center pole does. Be sure to adjust <u>all</u> the springs on one slip clutch to the same height.

Humid weather may cause the slip clutches to tighten up a little, and normal wear may cause them to loosen a little, but frequent adjustment is not necessary.

Inspect them frequently to be sure that the clutch disks are dry and have no grease on them. Replace any greasy clutch disks you find; do not try to clean them.

<u>BRAKE OPERATION</u>.

The brakes are adjusted at the factory so that the Scrambler can be stopped from top speed in 2/3 of a revolution of the center pole.

When the Scrambler, with a full load of passengers is stopped quickly, the unit poles will continue to turn for a short time after the center pole has stopped. The brakes should be adjusted for a complete stop with a full load in at least 10 seconds. Do not make a practice of stopping rapidly, because a smoother stop will be easier on the Scrambler. However, you should know that your brakes are good, and you should check them each time you erect the Scrambler. A good way to stop the Scrambler is to pull back on the brake ratchet handle until the engine idles, but don't move it back so far that it begins to tighten the brake cable. Let the Scrambler slow down by itself for one revolution of the center pole, and then gradually tighten the brakes so that it comes to a complete stop in one more revolution of the center pole.

<u>DRUGS OR ALCOHOL</u>.

It is obvious that an operator who is under the influence of drugs or alcohol is a serious hazard to his passengers and under no circumstances should be permitted to operate the Scrambler.

It is extremely dangerous to allow anyone under the influence of drugs or alcohol to get on the ride, for they often attempt to stand up or to extend their arms from the seat. The seats pass each other at 50 MPH, and a hand outstretched from one seat cannot touch another seat, but can touch another outstretched hand from another seat. Such practices are likely to result in injuries to the passengers.

If any passenger misbehaves in any way, STOP THE RIDE IMMEDIATELY. Refuse rides to any person who might endanger himself or others.

ELECTRIC MOTOR SPEED. See "Speed of Operation".

GASOLINE ENGINE SPEED. See "Speed of Operation".

HANDLEBAR, LOCKED. See "Passenger Safety".

LATCHED HANDLEBAR. See "Passenger Safety".

LENGTH OF RIDE.

The main purpose of any amusement riding device is to please the passengers so that they will come back and bring their friends with them. Most operators find that the Scrambler should not be operated for more than 1-1/2 minutes, with each passenger load. Give your riders a chance to get used to the ride. Bring it almost to top speed and hold it there for most of the ride, then finish with a couple of revolutions at top speed. Changing the speed is the only way to give variety to the ride. However, the Scrambler does not change speed rapidly, but requires 15 to 20 seconds to reach top speed, so gunning the engine will have almost no effect on the motion. What does happen is that after the ride has been slowed, preparatory to gunning, the acceleration back to full speed will add nothing to the thrill of the ride. If you think you have a better system, we suggest that you take a ride on it yourself before using it on your customers.

LOCATION OF PASSENGERS. See "Passenger Placement".

LOCKED HANDLEBAR. See "Passenger Safety".

MOTION OF THE SEAT. See "Scrambler Motion".

OUT-OF-BALANCE LOADING. See "Balancing the Passenger Load".

PASSENGER PLACEMENT.

As the Scrambler picks up speed, the passengers will slide to their right against the end of the seat. This is caused by "centrifugal force" and is part of the appeal of the ride; however, a heavy person can exert a considerable amount of side pressure as a result. The actual side pressure each person feels is in proportion to his own weight. In addition to the side pressure his own weight causes, each passenger will experience the total of the side pressures of every passenger to his left.

Since the side pressures are directed to the right, as a general rule the heaviest person should be seated next to the outside, nearest the door opening, with lighter persons to his left.

1. A man should normally be seated to the outside with his lady seated to his left.
2. Children riding with parents should be seated to the far left and not between them.

Do not allow pre-school children to ride without a dependable adult. The child should be seated either on the lap of the adult or to the left of the adult, so that the child will not be squeezed. Children from 6 to 12 years can usually take care of themselves, but they should be watched very carefully by the operator. If the operator sees any tendency for a child to move about in the seat or to show that he is not holding on as well as he should, the operator should stop immediately and not continue the ride until he is certain that the child is secure. Children who do not follow the operator's instructions should be removed from the ride.

PASSENGER SAFETY.

The passengers can climb into the seats by themselves. With a large crowd, an extra man or two can help to keep the people moving. The handlebar on the seat will usually lock itself if the passengers do not do it. It does not need the attention of the operator in most cases, but the operator must not fail to observe whether all handlebars are locked, and lock any that are not already locked. But be sure that the lap bar in each seat swings freely, with no binding in the hinges.

The handlebar latches on the seats have been properly adjusted at the factory but may, after extended use and wear, require readjustment. A handlebar that does not latch is unsafe. Without the security of the handlebar, the passenger may, without realizing the consequence, lean forward or stand up, exposing himself to extreme danger of being thrown from the ride. Inspection of the latches is quick and easy. This is covered in the "seat" section.

The passengers must remain seated at all times while the Scrambler is in operation. Occasionally someone gets the idea to change positions in a seat with another person. It is almost impossible to change without opening the handlebar and at least one of the passengers standing. This is extremely dangerous and should never be tolerated. That is why the decal is placed on the back of each handlebar, which says, "CAUTION: While Scrambler is in Motion:

- Keep Handlebar Closed
- Do Not Stand Up"

PATH OF THE SEAT. See "Scrambler Motion".

PLACEMENT OF PASSENGERS. See "Passenger Placement".

PROCEDURE IN STOPPING THE RIDE. See "Brake Operation".

RIDE LENGTH. See "Length of Ride".

SCRAMBLER MOTION.

The main center pole turns in a clockwise direction, while the unit poles turn counterclockwise. This causes each seat to trace a "star" pattern back and forth across the operating circle. As each seat reaches the outside of the circle it comes to a dead stop. From a dead stop, it picks up speed so that by the time it is passing the center of the circle it is going about 25 miles per hour. This requires about 1.2 seconds, and by the time another 1.2 seconds have elapsed the seat has again come to a dead stop.

For normal operation the seat must move in its proper path. Watch the way one seat moves. If you were to look down from above, suppose that when the seat reaches the outside of the operating circle you call that the 12:00 o'clock position. The next time that that seat reaches the outside of the operating circle on that side it should be about in the 11:30 position. In other words, the place where one particular seat reaches the outside of the operating circle moves in a counterclockwise direction. If it does not, if you see that the seat is going directly back and forth to exactly opposite positions, or is in fact advancing in a clockwise direction, DO NOT OPERATE THE RIDE. YOU HAVE A CONDITION THAT MUST BE CORRECTED.

Also, if you see the passengers sliding from one side of the seat to the other, AND THEY ARE NOT TRYING TO DO SO, then this is another sign that something is wrong.

One or more of the following things may exist:

1. The Scrambler is being operated faster than 11 rpm with gasoline engine, or 11.4 rpm with electric motor.
2. The slip clutches are too loose, so that they cannot turn the unit poles properly.
3. The slip clutch disks have gotten grease on them from over-lubrication. This causes the slip clutches to function improperly.

Grease on the clutch disks can be very tricky. The clutch may appear to work normally for a long time, and then suddenly, right in the middle of a ride, start slipping excessively. There is no reason for grease to be on the clutch disks, but a careless operator with a little grease can ruin perfectly good clutch disks. If grease gets on your clutch disks do not try to clean them; replace them.

To repeat, whenever you see a seat advancing around the circle in a clockwise direction, stop the ride and do not carry any more passengers until after you have corrected the problem. (See maintenance information on the slip clutches.)

A Scrambler operating incorrectly in this way changes the whole "feel" of the ride. Instead of being directed just to the right end of the seat, the passengers may move to the left and forward as well. This will make the passengers feel insecure, and in fact it may put them in actual danger because this is not the normal way in which a Scrambler should operate. They learn to brace themselves to resist the normal forces, but sometimes do not know how to handle these strange forces.

SLIP CLUTCH ADJUSTMENT. See "Balancing the Passenger Load".

SPEED OF OPERATION.

Maximum speed in revolutions per minute of the center pole:

11.0 with gasoline engine
11.4 with electric motor

The Scrambler should NOT be operated at speeds in excess of those stated above. The forces acting on the Scrambler and its passengers rise sharply as the operating speed is increased. At speeds above the maximum rated speed these forces become DANGEROUS.

Operators are sometimes tempted to tamper with the throttle adjustment to increase the speed.

DON'T DO IT.

The speed of the Allis-Chalmers G-138 engine, used on Scramblers through Serial No. 414, is regulated by a governor. The maximum speed has been limited by installing a throttle stop and by cutting off the excess throttle rod after adjusting the maximum center pole speed to 11.0 RPM. If the throttle stop is in place and the throttle rod has not been extended and readjusted, the ride should not exceed rated speed using the combination brake-throttle control provided.

The Ford engine, used on Scramblers beginning with Serial No. 415, has a built-in governor that shuts the engine off when it has been over speeded. When this happens, the engine must be brought to a complete stop and the governor re-set.

WARNING: No governor-speed control system is foolproof. Any governor can be tampered with. Be on your guard against operators who try this.

Electric motor power units as furnished by Eli Bridge Company cannot be made to overspeed except by changing V-belt sheaves. Such tampering is difficult to conceal. If you anticipate using a different power unit at any time, do not fail to consult Eli Bridge Company regarding the horsepower capacity and the speed at which the power unit is expected to turn the Scrambler. In case of accidents involving injury of a passenger, speeds in excess of 11 RPM of the center pole when using a gasoline engine (11.4 RPM when powered with an electric motor) will be considered negligence on the part of the operator.

STANDING UP. See "Passenger Safety".

STARTING THE SCRAMBLER.

Do not put the ride into motion until the handlebar on each seat is locked, and the locking pin is inserted in the secondary latch.

When using the Allis-Chalmers G-138 gasoline engine power unit:

Before starting the engine, be sure that the engine clutch is disengaged and that the hinged dog has been dropped down to keep the clutch disengaged. Then advance the brake ratchet handle until the throttle is half open. After the engine is started and running, set the brakes with the brake ratchet handle. This tightens the cable on the clutch lever so that the hinged dog can be flipped over. When you have done this, then each time the brakes are set the engine clutch will disengage automatically.

When using the Ford gasoline engine power unit:

Before starting the Ford engine, move the brake ratchet handle all the way to the rear, setting the Scrambler brakes. This disengages the engine clutch and puts the engine throttle in the idle position. If you find that the engine must have more gasoline when starting, press down on the throttle lever which is directly above the pivot for the brake ratchet handle. After the engine has started, release the throttle lever and the engine will idle.

As the brake ratchet handle moves forward, the Scrambler brakes are released, the engine clutch is engaged, and then the throttle is opened. As the Scrambler begins to turn slowly, check for clearance between the Scrambler and the fence, and between the bottoms of the unit poles and the drive units.

The Ford engine has a built-in governor so that if the engine is operated beyond its governed speed the engine will shut itself off, and it must be brought to a complete stop for re-setting the governor before it can be re-started.

Advance the speed smoothly. Do not jerk the brake lever back and forth. Jerking causes unnecessary wear on the working parts. The fluid coupling will absorb a great deal of shock, but it should not be abused. As it is operated, the fluid inside will get hot, so take care not to get burned on it. The guard and cover should be over the fluid coupling, sheaves, and belts at all times when the power unit is running.

STOPPING PROCEDURE. See "Brake Operation".

STOPPING TIME. See "Brake Operation".

TIME TO REACH TOP SPEED. See "Length of Ride".

PLEASE BE CAREFUL

Do your part well and the Big Eli Scrambler will reward you liberally in pleasure to own and operate, and in good net returns on the money you have invested in it.

These basic rules will help you protect your patrons from injury, and protect yourself from lawsuits.

GENERAL MAINTENANCE

ADJUSTING BRAKES. See "Brakes".

ADJUSTING SLIP CLUTCHES. See "Bottom Sweeps".

ADJUSTMENT OF BRAKE RATCHET. See "Power Unit".

ADJUSTMENT OF GEAR MESH. See "Bottom Sweep".

ADJUSTMENT OF SPROCKETS. See "Bottom Sweeps", "Chain Couplings", "Drive Units", and "Stationary Base".

AMPERE REQUIREMENT FOR LIGHTING. See "Lighting".

AXLE, DOLLY, BENT. See "Dollies for Center Pole".

BACKLASH IN GEARS. See "Bottom Sweeps".

BALLAST SHORTING OUT. See "Lighting".

BASE LEGS.

Base legs are often referred to as mud sills by operators.

Frequently Scramblers are observed in which the operator has blocked under the ends of the base legs so much that the center is clear off the ground. This is not only unnecessary; it is bad practice. The center pole stationary base is a large hexagon plate 60" wide. Because of its large area it is able to spread out the weight very well. The base legs are for the purpose of resisting tipping of the center pole and that is all. When excessive blocking is put under the ends of the base legs this raises the entire Scrambler that much higher off the ground, and every bit that is put under the base legs just makes it that much harder for your passengers to climb in the seats.

About the only maintenance problem with base legs that has ever been reported to the factory is that occasionally the small sheave for the brake cable gets broken. You are supplied with a sheave in each base leg, but actually only four are used at one time, so it is possible to have two broken sheaves and still have a fully functioning brake cable. However, you should not trv to run your brake cables over broken sheaves. If you do you will run the risk of wedging and locking the brake cable between the broken sheave and the opening in the base leg. These sheaves are not difficult to replace. Just chisel out the small sheave axle and weld in a new one with a new sheave on it.

Sometimes Scramblers brought into the factory have the cutouts in the base legs enlarged. Instead of using factory-built replacements for worn or broken brake cables, the operators have made up their own, using cable clamps. These cable clamps will not pass through the original cutouts in the base legs, and so the operators enlarge the holes. In addition to weakening the base legs, an improper cutout in the base leg can cause a brake cable to snag or jam in the cutout, making it impossible to operate the brakes properly. If factory-built brake cables are used, then no enlarging of the cutouts in the base legs will be necessary and the base legs will not be weakened. Therefore, only factory-built brake cables should be used.

BASE LEG BLOCKING. See "Base Legs".

BASE LEG SHEAVES BROKEN. See "Base Legs".

BEARING BOLTS LOOSE, DRIVE UNITS. See "Drive Units".

BEARING CUP DAMAGE. See "Bearings".

BEARING FAILURE. See "Bearings".

BEARING LIFE. See "Bearings".

BEARING PIN SHEARED. See "Top Sweeps".

BEARING REPLACEMENT SCHEDULE. See "Bearings".

BEARING REPLACEMENT, TOP AND BOTTOM SWEEPS. See "Bearings".

BEARINGS.

All structural members turn on and are supported by ball or tapered roller bearings. The entire drive line which operates the Scrambler turns on ball, tapered roller, and spherical roller bearings, as well as supplementary nylon sleeve bearings in the middle of long shafting. The selection of bearings throughout has been done to provide the longest life and the most trouble-free service possible.

The greatest enemy of precision bearings is dirt and grit. When grit gets in a bearing along with the grease it acts like a grinding compound to grind away the parts. Therefore, keep the bearings clean by always using clean grease. The large center pole bearings are not sealed but are in housings with close clearances, and it is particularly important that these bearings be given regular and ample shots with a grease gun using clean grease. In this way any grit that has worked its way into the bearing will tend to be forced out by the new, clean grease being pumped in.

In using precision ball and roller bearings, the one fact that must always be taken into consideration is that there is no way to predict accurately just how long a bearing will last. Bearings are selected on the basis of what is known as a B-10 life. What that means is that the load rating of a bearing as supplied by the bearing

manufacturer tells how much load the bearing can support for a certain number of hours of service. However, it also means that 90% of the bearings will last longer than the manufacturer claims they will, but 10% will not last that long.

Only one bearing application on the Scrambler has been a problem in this respect, and this is the Sealmaster SF-47 flanged pillow block on the outer end of each top and bottom sweep. Failure of a few of these occurred before 1967. When the bearing failed, the inner race split apart, and this allowed the unit pole to drop through while the ride was turning, causing injuries to the passengers and damage to the equipment. At no charge, top sweep bearing retaining rings were sent to every Scrambler owner from Serial No. 1 through 290, with instructions not to operate the Scrambler unless the rings were in place. The purpose of the retaining ring was to retain the inner race of the bearing so that it could not drop through in the event the bearing failed. After Serial No. 290, the hole in the top sweep structure was made smaller for the same purpose.

Even though these retaining rings were furnished at no charge, some owners still did not install them, and on at least one occasion a bearing failed and allowed the unit pole to drop.

WARNING: FAILURE OF THE SF-47BEARING ON THE TOP SWEEP WHILE THE RIDE IS OPERATING COULD CAUSE SERIOUS INJURY TO PASSENGERS AND SEVERE DAMAGE TO YOUR EQUIPMENT. Therefore, regardless of the appearance of the bearings, replace them after 3,000 hours of service, or four years, whichever comes first. Failure to lubricate properly and keep clean will further reduce bearing life.

While the same bearing is used on the bottom sweep, if it should fail it would not be as much of a hazard to the passengers as the one on the top sweep. It would still be advisable to change the bearing according to the same replacement schedule.

FURTHER WARNING: DO NOT operate Scrambler Serial No. 1 through 290 without the special retaining ring installed in the space between the SF-47 bearing and the top sweep.

Another thing that sometimes happens with this bearing is that, in portable operation and while being transported down the highway, the entire bearing turns over upside down in the cast iron housing. This can happen on both the top and bottom sweeps, and if it does it can drastically change the mesh of the gears on the unit poles and bottom sweeps. In fact, the gears will not mesh at all if the bottom sweep bearing turns over. All you have to remember is that the set collar of the bearing should be on the top side of the top sweep bearing and on the bottom side of the bottom sweep bearing. If you find that the bearing is turned over, lever it back with a stick, but be sure to pivot about the grease fitting because it will not turn over otherwise; the pin in the outer race will prevent the rotation.

The only way that grease which is pumped into the bearing through the grease fitting can get into the bearing is through a hole in the spherical outer race. This hole is kept in line with the grease fitting by a small loose pin. Occasionally the operators swing the unit pole in the bearing and shear off this pin. When this happens there is nothing to keep the hole in the spherical outer race in line with the grease fitting, and the grease you pump in will not reach the bearing. To check on this pin, remove the grease fitting and you will find the pin down in the hole. Clean out the grease and you can tell if the pin is keeping the spherical outer race in its proper location.

Replacement pins are available from the factory. If you choose to tilt the unit pole against the pin, unbolt the bearing, turn it 90 degrees, and bolt it back in position. However, the position of the bearing as set by the factory has proved to be most satisfactory to most operators.

The most expensive bearings on the Scrambler are the large Timken tapered roller bearings on the center pole. There are three of these bearings, and the service life of all three has been excellent. There has never been a case reported to the factory where one of these bearings has come apart or seized on the shaft. Even where it has been necessary to replace the bearings, they would still turn quite freely. Sometimes the bearing cone shows discoloration, but hardly ever is there a damaged roller. The most common damage that shows up is pitting or spalling of the rolling surface of the bearing cup. What this looks like is a small piece of the surface has popped or flaked out leaving a small rough depression. Many bearings examined at the factory have had these pitted marks on them, and the bearings were still continuing to turn quite well, with no indication of a real problem developing. However, if you disassemble the center pole and discover this pitting on the bearing surfaces it would be wise to replace the bearing cup at least, and the bearing cone if any of the rollers show defects.

In replacing the bearing cup, you will find that it is fairly difficult to remove the old bearing cup because it was "shrunk" in place, and this is how you should install the new one: pack the bearing cup in dry ice and leave it until it has thoroughly chilled down. It will then drop in place in the bearing seat, and you will not have to tap it at all. Then when it warms up to room temperature it expands to a tight fit within the housing. Be sure that it is seated all the way before it starts to warm up.

Two bearings operate usually under very dirty conditions. These are the bearings underneath the two brake drums. This bearing is not readily seen because the brake drum hangs out over it, and operators sometimes fail to take proper care of it. In spite of this, there have been almost no reports of problems with these bearings. Where it is located makes it easy for mud, grease, and particles wearing off the brake shoes to accumulate. Clean out around this bearing housing regularly, and add shots of clean grease regularly to pump grit out of the bearing housing. These bearings are self-aligning spherical roller bearings of high quality, and they deserve proper care.

Any bearing is going to be able to perform well only if it is securely anchored in place. Gears and couplings require firmly anchored bearings in order to work properly and give long life. Loose bearings on shafting will cause a lot of noise and

and vibration. This is particularly true on the long drive shafts in the drive units and bottom sweeps. The bearings on the rotating base drive shafts seem to want to get loose more than any others, and this is probably because the bolts for the bearings are threaded into tapped holes rather than into self-locking nuts which are used in other bearing applications on the Scrambler..

Nylon sleeve bearings are used in two ways on the Scrambler: as a sleeve bearing, and as a liner in a ball bearing pillow block to prevent seizure of the ball bearing on the steel shaft because of rusting. These nylon bearings take a great deal of abuse, and will get by with very little lubrication. However, the load carrying ability of the nylon bearing is greatly increased if a little grease is used. Be sure not to use special greases such as Never-Seez around the nylon, because some of the ingredients in these greases may cause the nylon to swell up, and may actually cause the bearing to tighten up and prevent the shaft from turning in the bearing. Common greases have never seemed to cause any problems of this kind, but it has definitely been a problem where Never-Seez has been used.

BEARINGS FOR ROTATING BASE DRIVE SHAFTS. See "Rotating Base", "Bearings".

BEARINGS IN CENTER OF DRIVE UNITS. See "Drive Units".

BEARINGS RIGIDLY MOUNTED. See "Bearings".

BEARING TILT ON FLOATING GEAR. See "Gears".

BEARING TURNOVER. See "Bottom Sweeps", "Unit Poles".

BEARING UNDER THE BRAKE. See "Bearings".

BELL CLAPPER. Referred to as "Unit Pole".

BENT CHANNEL RUNWAYS. See "Channel Runways".

BENT CLUTCH COVER. See "Bottom Sweep".

BENT DOLLY AXLES. See "Dollies for Center Pole".

BENT SAFETY PIN. See "Safety Pins".

BENT TIE RODS. See "Tie Rods".

BENT UNIT POLE. See "Unit Poles"

BEVEL PINION KEYS. See "Rotating Base".

BEVEL PINIONS, LOOSE. See "Gears".

BEVEL RING GEAR RUBBING. See "Rotating Base".

BEVEL RING GEAR TEETH WEAR. See "Gears".

BLACKTOP FOUNDATION. See "Stationary Base".

BLOCKING UNDER BASE LEGS. See "Base Legs".

BLOCKING UNDER CENTER POLE. See "Stationary Base".

BOLTS FOR INTERNAL GEAR. See "Rotating Base".

BOLTS, HIGH TENSILE. See "Mast".

BOLTS LOOSE IN DRIVE UNIT BEARINGS. See "Drive Units".

BOTTOM BEARING RING PINS. See "Stationary Base".

BOTTOM SWEEPS.

Of all the pin connections on the Scrambler those connecting the bottom sweeps to the rotating base have the highest loads and are subjected to the greatest pounding as the ride operates Consequently, as the years of service build up, these pin holes are almost always the first ones to show wear. Eventually, you will want to tighten up these connections to eliminate the sloppy fit that develops from wearing the holes oversize. Eli Bridge Company stocks two sizes of oversize pins for use after the holes have been reamed out to a larger size. The original hole size is 1". The first oversize pin is 1-1/16" in diameter and is identified by a single groove cut in the side of the pin head. The largest oversize pin stocked is 1-1/8" in diameter and has two grooves cut in the side of the head. Do not attempt to use oversize pins unless the pin holes have been properly prepared by line-reaming using special equipment available from Eli Bridge Company.

Beginning with Serial No. 92, all new bottom sweeps were equipped with a removable slip clutch and pinion assembly, which was designed for long life and easy maintenance. This assembly can be fitted to all older Scramblers, with the slight modifications that are necessary, and many owners of earlier Scramblers have made this conversion. There is one problem that has shown up since this design was put in service, but it is due to improper maintenance. The clutch disk hub turns on a nylon sleeve bearing as the clutch slips. The Scrambler manual suggested limited lubrication of this bearing, but it appears that some operators have overdone it and have put in too much grease. Also, instead of using very sparing amounts of grease on the chain coupling attached to the clutch disk hub some operators apparently just stick a handfull of grease on the chain coupling without regard to what happens to it. The result of this over-greasing is that the grease sometimes gets on the clutch face. When this happens the operation of the slip clutch becomes very unpredictable. The slip characteristics can change while the Scrambler is operating, and this can be very dangerous to the passengers. (For a fuller explanation of this see "Scrambler Motion" in the OPERATION section of this manual.)

WARNING: DO NOT ALLOW GREASE TO GET ON THE CLUTCH DISKS. KEEP THEM CLEAN, DRY, AND FREE OF GREASE AT ALL TIMES. IF GREASE GETS ON THE CLUTCH FACES DO NOT TRY TO CLEAN THEM BUT REPLACE THE CLUTCH FACINGS. DISCONTINUE GREASING THE NYLON SLEEVE BEARING IN THE CLUTCH DISK HUB; LET IT RUN DRY. WIPE OFF ALL SURPLUS GREASE ON THE CHAIN COUPLING THAT CONNECTS THE CLUTCH DISK HUB TO THE BOTTOM SWEEP DRIVE SHAFT.

The design of the installation of the slip clutch and pinion on Scramblers up through Serial No. 91 gave reasonably satisfactory service, but reports from owners and operators indicated that replacement of parts was often quite difficult because of their location and because of rust "freezing" the parts together. There were numerous reports of bearing damage, wear of keys and keyways, clutch disk breakage, and failure of spline shafts. The new design attempted to eliminate most of these problems and at the same time make all parts more accessible and more easily replaceable. It has been used without change since 1960, and the reports from owners and operators indicate practically no trouble of any kind with this design.

The covers on the slip clutches sometimes get bent out of shape. This happens most frequently on the bottom cover, but also sometimes happens on the top, and is caused by mishandling the sweep. When the sweep is dropped so that the weight falls on the cover it sometimes is forced up against the slip clutch. In some cases where this has been observed there has been so much interference that the clutch has actually worn all the way through the cover. The clutch springs rub against the bent-up cover, and wear away the sides of the springs. When this happens the adjustment of the spring to a height of 1-3/32" has no real significance because the strength of the spring has been partially ground away. In order for the slip clutch to work properly the clutch springs must be adjusted to produce the proper squeeze on the clutch disk. Therefore, if you find the sides of any of the clutch springs worn away, replace them with new ones adjusted to a height of 1-3/32". It should be quite obvious when the clutch is dragging against a bent-up clutch cover; just turn the shaft and listen before you install the bottom sweep. If it is dragging you can hear it. If you do, then correct the situation. Do not allow it to drag.

With good springs all adjusted to the proper height of 1-3/32", there can still be a variation in the performance of a slip clutch. As the friction surfaces of the clutch disk wear in, the characteristics of the slip clutch can change, and so you must observe how the Scrambler behaves when it is carrying a passenger load. The factory load test consists of putting 600 pounds in each of the 12 seats, bringing the ride up to full speed, and then braking it to a stop. Under this kind of loading condition , when the center pole is stopped as quickly as possible, the unit poles will continue to turn and come to a stop about 10 seconds after the brake is applied. If the clutches are adjusted properly all three unit poles will stop turning at almost exactly the same time.

A second way to check the slip clutches is to bring the Scrambler up to top speed with no passengers in any of the seats, then set the brakes quickly and firmly. With no passengers, the unit poles should stop at the same time as the center pole. If you find that one or more of the unit poles continue to turn after the center pole is stopped, then the slip clutches are not adjusted tight enough. Check to be sure that

all the springs on each slip clutch are tightened to an overall height of 1-3/32". If the unit poles still continue to turn after the center pole has stopped, it will be necessary to tighten the clutch springs even more. Be sure to tighten all six springs on each clutch to the same height. This does not necessarily mean that all three slip clutches will be adjusted exactly the same. All three may be different from each other; the important thing is that they function in the same way. This method of testing the slip clutches with no passengers is by far the easiest way to check them.

The third method is also very easy, but may not tell you quite as much. With the Scrambler stopped and the brakes set, push on the back or front of any seat. It should take a good, hard push to slip the slip clutch, but you should be able to slip it. This is an excellent way of comparing the three bottom sweep slip clutches. If the three clutches are not adjusted to operate in the same way the differences will be quite obvious when a seat on each unit pole is pushed in this way.

Squeaking slip clutches are sometimes asked about. This is nothing more than the clutch disk slipping inside the clutch, and it is entirely normal. There has never been any indication that a squeaking clutch is a sign of trouble. However, clutches are sometimes reported to be jumping or "stuttering". This may be a sign of grease; replace the clutch facings; do not try to clean them. Also, be sure to clean away any grease on the cast iron pieces of the clutch, as well as the clutch hub.

The chain couplings on the bottom sweeps will give excellent service, but they must be in good alignment. Usually there is no difficulty with the coupling connecting the slip clutch to the long drive shaft, because it stays connected all the time. The coupling connecting the bottom sweep to the rotating base can sometimes give difficulty. When you wrap the chain around the two coupling halves it should fall in place easily without any forcing. There is a little clearance in the pin connection, and you can sometimes align the two coupling halves just by bumping the sweep to one side or the other. If still more adjustment is needed (and it rarely is), loosen the bolts holding the long drive shaft bearing right next to the coupling. There is a little adjustment available in the oversize bearing bolt holes, and this should be enough to bring the two coupling halves into alignment. Do not forget to tighten the bearing bolts when you are finished. A properly aligned chain coupling will have a coupling chain that can still be wiggled with the fingers after it has been connected. A bound-up chain is an indication of an improperly aligned coupling.

In the beginning it was anticipated that the coupling chain would wear out and have to be replaced much more frequently than the chain sprockets. Experience has shown that the reverse is true. If the chain is kept well lubricated so that it remains loose and limber it will outlast the sprockets. The sprocket teeth wear down where the rollers rub against them. As wear develops, the coupling becomes looser, so that there can be quite a bit of backlash, and this can cause pounding in the coupling which accelerates the wear. With an unbalanced load on a unit pole, as the loaded seat moves toward the outside of the operating circle it leads the drive, but after it reaches the outside it wants to stay there, and therefore lags the drive. This causes a reversal of the loading of the drive in the bottom sweep and this is the principal cause of wear of couplings, splines, clutches, gear teeth, and pin holes in the bottom sweeps. Backlash in the chain coupling puts additional burdens on

the drive members, and so it is important to replace the chain sprockets when the teeth get worn down. This reversal of loading occurs only on the bottom sweeps and on the rotating base drive shafts that couple to the long drive shafts in the bottom sweeps.

Sometimes operators call the factory to inquire about the pinion on a bottom sweep completely missing the gear on the bottom of the unit pole. What happens is that in traveling down the road the Sealmaster SF-47 bearing on the outer end of the bottom sweep turns over upside down. All that is necessary is to lever the entire bearing halfway around with a stick. Just be sure that the spherical outer race pivots about the grease fitting, or you may shear off the pin that positions the hole in the spherical outer race that is in line with the grease fitting.

As the Scrambler service life builds up, all of the pin holes in the entire structure will tend to loosen slightly. This will then allow the entire structure to settle down slightly to a lower level. Sometimes this goes so far that the steps on the seats hit the bottom sweeps as they pass over the top of them. To correct this, just add shims under the Sealmaster SF-47 bearing on the outer end of the top sweep. It will then be necessary to adjust the mesh of the pinion on the bottom sweep with the gear on the bottom of the unit pole. To bring these two gears closer to each other, add shims between the Sealmaster SF-47 bearing and the 12" channel on the outer end of the bottom sweep. If you do not make the same adjustment on all three top and all three bottom sweeps, then it would be wise to number the sweeps so that they are always used in proper pairs. If the same adjustment is made on all three top and all three bottom sweeps, then interchangability is not affected.

If it is necessary to adjust the mesh of the bottom sweep pinions and unit pole gears because of wear, add shims to the bottom sweep bearing as described above. If the mesh is too tight, then remove some of the shims.

BRAKE ADJUSTMENT. See "Brakes".

BRAKE BOTTOM BEARING. See "Bearings".

BRAKE CABLES. See "Brakes."

BRAKE DRUM GREASING. See "Spring Start Up", "Winter Storage".

BRAKE DRUM GROOVED. See "Brakes".

BRAKE RATCHET ADJUSTMENT. See "Power Unit".

BRAKE REMOVAL. See "Brakes".

BRAKE DRUM REVOLUTIONS PER MINUTE. See "Speeds".

BRAKES.

Tests have shown that the Scrambler can be stopped just about as quickly with one brake as with two. However, having both brakes connected provides an extra measure of safety in the event that either brake should fail for any reason. For safety, do not try to operate the Scrambler with only one brake.

The only adjustment on the braking system is the single turnbuckle in the long brake cable. How this is adjusted depends upon the individual preference of the operator, but it should be adjusted so that the Scrambler can be brought quickly and smoothly to a complete stop with the least amount of effort by the operator. The recommended adjustment is that the turnbuckle be tightened so that the brake ratchet handle in the fully braked position is toward the rear end of the ratchet teeth, so that the operator can lean on the handle and let his weight against the handle do most of the braking effort.

The brake cables do eventually wear out and have to be replaced. Sometimes brake cables are brought into the factory with cable clamps on them instead of the swaged fittings furnished on new cables. The cable clamps will not pass through the holes in the base legs, and so the operators then cut the holes out bigger, which weakens the base legs. Also, in cutting out the base legs, sometimes it is not done properly and it becomes possible for the brake cable to get snagged and locked up in the opening. When this happens the brakes will not work properly, and you may not be able to stop the Scrambler when it is necessary. Therefore, for safety, always use factory-built brake cables.

The brake shoes are self-adjusting and will continue to grip the brake drum as long as there is lining in the brake shoes. However, these brakes get a lot of use, and eventually the linings will have to be replaced. If they are not, the brake shoes will drag on the brake drum and wear grooves in it. If the grooves are not too deep, the outer and inner surfaces of the brake drum can be turned down on a lathe to recondition the surfaces. However, this is a precision machining operation, and not every machine shop could be expected to do it.

There is a bent spring that connects both the inside and the outside brake shoes together underneath the brake drum. If this spring is not there, the two brake shoes will not work together properly. You can feel it by reaching down underneath the brake shoes.

A short extension spring connects the brake lever to one of the vertical plates in the stationary base. This spring is extremely important; it must be there. If it is not there, two things will happen:

1. The brake shoes will drag all the time, and this means that the power unit will have to overcome this braking action to turn the ride. It usually is not a heavy braking effort, but it is enough so that extra loading is on the driving gears. Normally the large driving gears in the center pole last for many years, but this extra effort caused by a missing spring can completely wear out a set of gears in a very few months.

2. With no spring, you will find that the center pole cannot be turned counterclockwise. It may turn for just a few feet, and then lock up tight. It will still turn in the regular clockwise direction. Any time you observe this kind of lockup of the center pole, look at both brakes. You may find that one or both of the springs is missing. Do not operate the ride unless this #77 brake spring is on each brake.

Frequently, owners or operators call the factory inquiring about how to remove a brake drum or brake shoe. The entire procedure was fully described with photographs in the Scrambler Manual furnished with each ride, but it is apparent that many operators are never given the Manual to read. Therefore, to repeat the procedure, it is really quite simple. Just do the following steps:

1. Reach up under the brake drum to find the long 1/2" bolt that goes through the brake drum hub and the vertical shaft. The bolt is screwed into a self-locking nut that is fastened to the side of the hub. Using a socket wrench and an extension, back out the bolt and remove it from the hub.

2. Remove the small plate that is underneath the brake lever. It is fastened to the bottom plate of the stationary base with a single bolt, and its purpose is just to hold up the brake lever so that the brake shoes will not sag and wear crooked.

3. Next, remove the special screw in the very top of the vertical shaft. To get to it, remove the cover of the rotating base, and turn the rotating base so that one of the round holes is directly above the brake shaft. Sometimes the hexagon socket in the special screw gets filled with hard grease, and the socket cannot be seen. Clean it out, and remove the special screw with an Allen hexagon wrench.

4. With the screw out, the pinion can be lifted up off the shaft. However, it may be tight on the shaft and not come off easily. This does not matter; you do not need to take it off.

5. Screw a coarse thread 3/4" bolt into the top of the shaft, and use the bolt to lift the shaft out. THERE IS NOTHING ELSE HOLDING THE SHAFT IN PLACE.

6. With the shaft out, slide the brake drum, brake shoes, brake lever, and pivot pin for the brake lever all out to the side and all at one time.

With all of this out, you will have complete access to the top and bottom bearing housings if you should wish to remove them. Be careful when you remove the top one because it is heavy and can pinch fingers rather easily if it drops down after the last bolt has been removed.

All of this can be done while the Scrambler is erected, but of course it will be easier if it is dismantled.

Replacement of all of these parts is actually more difficult than removing them. The bearings at the top and bottom are self-aligning, and getting the shaft to go down through the top bearing, through the keyed hub of the brake drum, through the keyed sleeve above the bottom bearing, and through the bottom self-aligning bearing requires a good deal of patience. Just be sure that all parts are rust-free and all burrs or ridges have been smoothed. Also, apply grease liberally to the shaft and the interior of each part the shaft must pass through. You may think that the shaft just will not go all the way through, but remember that this is done all the time at the factory, and the man who does it uses no special tools or equipment.

BRAKE, SPRING MISSING. See "Brakes".

BREAKER BOXES. See "Lighting", "Mast".

BROKEN DOLLY LEVER STOP. See "Dollies for Center Pole".

BROKEN DOLLY WHEELS. See "Dollies for Center Pole".

BROKEN FLUORESCENT LAMPS. See "Lighting".

BROKEN HAIRPIN COTTERS. See "Hairpin Cotters and Klik-pins".

BROKEN PIN IN SEALMASTER SF-47 BEARING. See "Top Sweeps".

BROKEN PIN IN STATIONARY BASE. See "Stationary Base".

BROKEN PIN ON GABLE LIGHT. See "Lighting".

BROKEN SAFETY PIN. See "Safety Pins".

BROKEN SHEAVES IN BASE LEGS. See "Base Legs".

BROKEN TIE RODS. See "Tie Rods".

BROKEN UNIT POLE. See "Unit Pole".

BROKEN WINCH CABLE. See "Winch".

BROKEN WINCH GEAR. See "Winch".

BRUSHES, ELECTRIC. See "Mast", "Rotating Base".

BUCKETS. Referred to as "Seats".

BURNOUT OF TERMINAL BLOCK. See "Lighting".

BYPASSING THE GOVERNOR. See "Power Unit".

CABLE BREAKAGE. See "Winch".

CABLES FOR BRAKES. See "Brakes".

CAPACITY OF SWITCH BOXES. See "Lighting".

CARS. Referred to as "Seats".

CAST IRON DUST AROUND SPUR PINIONS. See "Gears".

CENTER FLOAT. See "Stationary Base".

CENTER POLE BEARING. See "Bearings".

CENTER POLE BLOCKING. See "Stationary Base".

CENTER POLE COVER VIBRATION. See "Rotating Base".

CENTER POLE HINGE PIN DRIVING ROD. See "Driving Rod for Hinge Pins".

CENTER POLE LOADING. See "Stationary Base".

CENTER POLE LOCKUP; DOES NOT TURN COUNTERCLOCKWISE. See "Brakes".

CENTER POLE TOP BEARING COVER, REFERRED TO AS "HAT CASTING". See "Rotating Base".

CENTER POLE WOBBLE. See "Stationary Base".

CHAIN COUPLINGS.

All shafting on the Scrambler is connected with Link-Belt flexible chain couplings. All but three are the RC-5016 size; those three are RC-6018 and they are used to connect the slip clutch hub to the bottom sweep long drive shaft. The couplings used on the higher speed shafting in the engine truck and drive units are fitted with double keys, while those lower speed shafts of the bottom sweeps and rotating base are equipped with spline bores. The keyed shafting seems to show very little wear, but the very heavy, reversed loading of the bottom sweep drive causes even the splined connections to show wear after a few years use, and so you should expect to have to replace some of the splined shafting and splined couplings after several years of use.

In assembling the chain to the two coupling halves it is very important that the two sprockets be in alignment. Often all that is necessary is to bump one of the structural members and it will shift enough for the chain to go on easily. If that is not enough, then loosening the bearing bolts next to one of the sprockets will usually permit a little shifting because of the slightly oversize bolt holes. Do not forget to re-tighten the bearing bolts. A properly assembled chain will still be easily movable back and forth on the sprocket teeth. If it is bound up so that it cannot be wiggled, then the two coupling halves are not close enough in alignment.

Owners and operators often ask about whether or not the drive units should be leveled from the center pole back to the engine. Certainly it is true that the straighter a drive line is the easier it will be on all working parts. However, these

flexible chain couplings are designed to be operated as much as three degrees out of line. It has always been recommended by Eli Bridge Company that the drive units follow the contour of the ground within this three degree limitation. How do you know if you are within that limit? By the way the couplings go together. After the drive units are pinned together and before you connect any chains to the couplings, turn the shaft in each drive unit by hand. If it turns freely so that the sprockets of the drive units on either side do not touch those on the shaft you are turning, then you are within the limit. However, if another shaft turns with the one you are turning, block up under the place where the two drive units come together until only the one shaft is turning. Just be sure that you do not block the drive units up so high that they are less than 3-1/2" from the bottoms of the unit poles.

A good coupling chain will be limber and flexible, with bright rollers. If a chain gets stiff so that it will not conform easily to the chain sprockets, and cleaning and lubricating it does not loosen it, then it should be replaced. Always keep extra connecting links on hand, because the coupling will be only as good as the connector for the chain.

CHANNEL RUNWAYS.

The five-inch channels that are supplied for use as runways for the center pole when it is ramped out of the trailer often get bowed. This is because the soil underneath was too soft to give proper support to the channels and they bowed down under the load. Actually a little bowing in these channels is not bad at all, because it enables you to slip them under the dolly wheels perhaps a little easier than if they were absolutely straight. However, with too much bow it will be difficult to slide the channel under both dolly wheels, and the center pole will tend to bury the channels, which will make rolling the center pole along the channels very difficult, if not impossible. Therefore, if you find that the bowing of the channels has reached the point where it is interfering with getting the center pole in or out of the trailer, then it is time to straighten them. This can be done quite easily under an arbor press, which you will find in almost any machine shop.

CHANNEL RUNWAYS BENT. See "Channel Runways".

CLEANING THE SEATS. See "Spring Start Up", "Winter Storage".

CLEARANCE AROUND THE RIDE. See "Clearances Required".

CLEARANCE FOR POWER UNIT. See "Clearances Required".

CLEARANCE OVER DRIVE UNIT. See "Clearances Required".

CLEARANCE OVERHEAD. See "Clearances Required".

CLEARANCES REQUIRED.

The Scrambler operates within a 52 foot diameter circle. However, the fence should never be closer than three feet from the ride, and preferably four feet, so that

no one outside the fence can reach in and touch one of the seats or passengers while the ride is operating. In the same way, it must be so that the passengers cannot reach out and touch anyone outside the fence, or the fence itself. Therefore, a space 60 feet by 60 feet is recommended for locating the Scrambler, if the power unit is placed in the corner of the square. On the other hand, if the power unit is to be located directly in front of the ride, then the depth of the lot must be increased to 69 feet to provide clearance for the power unit truck.

The Scrambler is not a high ride, but it is important that overhead clearance be maintained so that the lighting equipment will not strike any overhead obstructions. Standard mast lights have an overall height of 17 feet - 1/4 inch. Funnel lights have an overall height of 20 feet - 4 inches. Overall height of the gable lights is 13 feet - 7-1/2 inches.

Where the unit poles pass over the top of the drive units they must clear by at least 3-1/2 inches. The reason for this is that there is a little flexing of the center pole under an out-of-balance load. This is entirely normal and to be expected. However, space must be left so that the bottoms of the unit poles will not strike the drive units even when the center pole flexes.

The clearance between the seat steps and the bottom sweeps where they pass over each other has been kept to a minimum intentionally so that the seats are as close to the ground as possible and all passengers can step directly from the ground onto the seat steps. However, as the years pass, your assembly pins and pin holes will wear slightly, allowing the entire structure to settle. In a few instances it has settled to the extent that the steps have rubbed on the bottom sweeps as they passed over. This must not be allowed to continue, or it will cause expensive damage to the seats.

You can check this clearance easily by placing a seat directly above each bottom sweep, and then loading the seat with three adults. Check only one bottom sweep at a time (only one seat at a time is to be loaded). If you have interference it should show in this kind of test.

The clearance between the steps and the bottom sweeps on a new Scrambler is about two and one-quarter inches. If you have lost this clearance it is easily corrected.

Place 5/16" thick shims under the top sweep bearing on each top sweep. The shims are to go between the bearing and the top sweep. This will raise the unit poles and the seats, and give you the clearance you need.

After the unit pole has been raised, the bevel pinion gear on the bottom sweep will not mesh properly with the gear on the bottom of the unit pole. Use shims to make these gears mesh properly. A complete assortment of shims for this purpose can be obtained from Eli Bridge Company. These shims are placed between the bottom sweep main bearing and the bottom sweep. Be sure that the same thicknesses of shims are used on opposite sides of the bearing. Enough shimming should be done to allow only a very small amount of backlash in these gears. Your own judgment will have to prevail here. However, remember that these gears should NOT fit together tightly, but should have a very small amount of play.

You will have to use some judgment in aligning the mounting holes in the bottom bearing with the holes in the bottom sweep before you tighten the bolts. The side-to-side play in these holes also affects the mesh of the gears. When you have the right amount of shim between bearing and sweep, notice how the pinion teeth mark the grease on the gear. The mark should be continuous along the flank of the tooth. If the gear teeth are marked at the ends only, then the bearing should be shifted to one side or the other until the correct marking appears on the gear teeth.

This procedure should be followed on each bottom sweep, so that all of the sweeps will be completely interchangeable. This is actually a very simple operation, but if you should encounter any difficulty, please feel free to contact Eli Bridge Company for advice.

CLUTCH ADJUSTMENT. See "Bottom Sweeps".

CLUTCH CONTROL. See "Power Unit".

CLUTCH COVER BENT. See "Bottom Sweeps".

CLUTCH, GREASY. See "Bottom Sweeps".

CLUTCH LEVER. See "Power Unit".

CLUTCH SPRINGS WORN OFF. See "Bottom Sweeps".

CLUTCH SQUEAK. See "Bottom Sweeps".

CLUTCH THROWOUT BEARING. See "Power Unit".

CONCRETE FOUNDATION. See "Stationary Base".

CONNECTING NEUTRAL TO GROUND. See "Lighting".

CONTACTS FOR DRUM CONTROLLER. See "Electric Motor".

COTTER PINS IN FUNNEL LIGHT PANELS. See "Lighting".

COTTERS, HAIRPIN, BROKEN. See "Hairpin Cotters and Klik-pins".

COUPLING CHAINS. See "Chain Couplings".

COUPLINGS. See "Rotating Base".

COVER FOR CENTER POLE TOP BEARING, REFERRED TO AS "HAT CASTING". See "Rotating Base".

COVER FOR CLUTCH, BENT. See "Bottom Sweeps".

COVERS FOR ROTATING BASE, PAINTED. See "Rotating Base".

COVER VIBRATION, ROTATING BASE. See "Rotating Base".

CRACKS IN SEAT SWEEPS. See "Seat Sweeps".

CROOKED UNIT POLE. See "Unit Pole".

CURRENT REQUIRED FOR LIGHTING. See "Lighting".

DAMAGED BEARINGS. See "Bearings".

DIRECTION OF SCRAMBLER ROTATION. See "Electric Motor".

DIRTY BEARINGS. See "Bearings".

DOLLIES, FINGER PINCHING. See "Dollies for Center Pole".

DOLLIES FOR CENTER POLE.

The dollies for ramping the center pole base section up and down the ramp and for supporting the base section in the trailer while on the highway must take a great deal of punishment. It is fairly common for these dollies to get bent or broken because of the rough handling they receive.

When Scramblers come back to the factory for servicing or repair, it is not unusual to find broken dolly wheels. For many years these were purchased wheels, but recently Eli Bridge Company has been making them to a different and stronger design.

Occasionally the axles for the wheels are bent so that the wheels do not stand straight. Usually they can be straightened, but sometimes they must be replaced. The axle on which the dolly lever pivots also is bent sometimes, and this too can usually be straightened.

The square tube lever sometimes is broken or bent at the pivot. Recently this design has been modified to reinforce the square tube at the pivot. What this consists of is a round tube going through the square tube where formerly there was just a hole on each side of the square tube. The new round tube provides better support on the pivot axle and does not wear nearly as rapidly as the former design.

When the square tube lever goes over center it bumps against an angle welded to the part which slips in the stationary base. This keeps it from going farther over center. There has been some difficulty with this angle bending or breaking off. Recently it has been replaced with a heavy block welded where the angle was located formerly.

When handling the dollies in and out of the stationary base the various pieces pivot on each other and it is very easy to get fingers pinched.

DOLLY AXLES BENT. See "Dollies for Center Pole".

DOLLY LEVER STOP BROKEN. See "Dollies for Center Pole".

DOLLY WHEELS. See "Dollies for Center Pole".

DRIVE SHAFT BEARINGS. See "Rotating Base".

DRIVE UNIT BEARINGS, BOLTS LOOSE. See "Drive Units".

DRIVE UNIT CENTER BEARINGS, GREASING. See "Drive Units".

DRIVE UNIT CLEARANCE. See "Clearances Required".

DRIVE UNIT FLOOR VIBRATION. See "Drive Units".

DRIVE UNIT PIN HOLES WORN. See "Drive Units".

DRIVE UNITS.

A common problem with drive units is that after they have been used for several years noisy vibrations show up. This is usually caused by one or two things: a) the boards covering the drive units get loose on the bolts holding them down and they vibrate against the steel structure; or b) the pin holes get worn so that the drive units vibrate in the pin connections. If the boards are loose, tighten the bolts. If necessary add more bolts. Some operators put rubber strips between the boards and the steel, and this seems to help the vibration problem very much. It is easy to check the tightness of the pin connections; just stand on one side of the joint. With the engine running but the Scrambler not turning, you may be able to observe an immediate change in the noise level when you stand on the drive unit. Of course, you should stand where there is no blocking underneath, so that your weight will take out any slack in the joint. If you find that the pin holes are worn and are producing the noise, they can be line reamed for oversize pins, by using special equipment available from Eli Bridge Company.

The factory is often asked if the drive units should all three be leveled. This is not really necessary, because the flexible chain couplings are designed to accomodate up to three degrees of angular misalignment. To check this out, after the drive units are pinned together and before the coupling chains are installed, turn the shafts by hand. If they are too far out of line, when you turn one shaft the chain sprockets on the ends of the shafts will rub against each other and will turn the next shaft. If this happens, block up under the drive units until all three shafts are free to turn. There is nothing wrong with leveling the drive units, but you will get quite satisfactory service if there is a little misalignment. Some operators dig out under the engine truck wheels or remove them, to lower the drive. This is a lot of work, and you certainly can not dig a hole in a concrete street. The Scrambler was designed so that it could be operated on concrete, and this means that the drive units will not be level in that situation.

Wear of the sprockets in the drive units is not much of a problem because the shafts turn at a higher speed, and the loading is always in one direction. It is important that sparing amounts of lubrication be used regularly on the chains to keep them functioning. However, because of the higher speeds of the shafts any excess

grease will be thrown off quickly.

The nylon bearing in the middle of each drive shaft is there to minimize vibration of the shaft. Without this center bearing, the shaft is long and slim enough so that it will flop around and strike against the structural members it passes through. It is important that this bearing be kept bolted tightly in place and that it be lubricated regularly. Holes are bored in the wood covers so that you can get a grease gun on the grease fittings.

DRIVE UNIT SHAFT SPEED. See "Speeds".

DRIVE UNITS STRAIGHT. See "Drive Units".

DRIVING ROD FOR HINGE PINS.

The hinge pin driving rod assembly consists of a steel rod with an alloy steel end which has been machined so that there is a recess in the end which fits the pointed ends of the hinge pins that connect the center pole mast to the rotating base. It is important that this rod be used so that the hinge blocks will not get hammered and dented, which can happen easily if a flat-ended rod is used. The recessed end keeps the rod well away from the hinge blocks.

This driving rod is a very difficult piece to make, because as it is used the forces acting want to split out the end of the rod, and this is what happens rather frequently. The only answer is to replace the rod when it gets broken. It is not practical to try to repair it because of the special heat treatment that is used in making it.

The other end of the driving rod will get mushroomed because of the heavy pounding. Always grind off the mushroomed part to prevent chips from breaking off and flying through the air, where they could hit someone in the eye.

DROPPING FLUORESCENT LAMPS. See "Lighting".

DROPPING SWEEP LIGHT PANELS. See "Lighting".

DRUM CONTROLLER. See "Electric Motor".

DRUM SHAFT GEAR BREAKAGE. See "Winch".

DUMBELL. Referred to as "Unit Pole".

ELECTRICAL BREAKER BOX. See "Mast".

ELECTRICAL CODE. See "Three-wire Grounded Electrical Wiring".

ELECTRICAL JUMPERS FOR MAST LIGHTS. See "Lighting".

ELECTRICAL POWER REQUIREMENTS. See "Three-wire Grounded Electrical Wiring".

ELECTRICAL SHORTS. See "Lighting".

ELECTRIC BRUSHES. See "Mast", "Rotating Base".

ELECTRIC MOTOR. (See also "Winter Storage".)

There has never been a report to the factory of troubles with the electric motor used to drive some Scramblers. They seem to be almost maintenance-free.

One owner called the factory to find out how to make the motor run in the opposite direction. It seems that he had been operating his Scrambler backwards for two years. This is a very bad practice because the passengers ride backwards and all of the seat structure has been designed for forward motion. All that is necessary to change the direction of the motor is to interchange any two of the three wires which power it. There is an arrow on the top of the motor showing which direction it should go, but it may have worn off or been painted over. The main thing to remember is that the center pole should always turn clockwise, and the three unit poles should always turn counterclockwise.

The drum controller for the electric motor has contacts which will wear out in time, and will have to be replaced. These are bolt-on pieces, and they are available as a set from Eli Bridge Company.

The sheave size on the fluid coupling is the same whether the power source is an electric motor or a gasoline engine. It is a five-groove "B" section with a 6.0" pitch diameter, and it has a quick-detachable bore. On Scramblers through Serial No. 414, the driven sheave down below is a five-groove "B" section 9.4" pitch diameter with a 1-1/16" bushing, when used with an electric motor. With an Allis-Chalmers G-138 gasoline engine this sheave is the same except it has a 7.4" pitch diameter. On Scramblers beginning with Serial No. 415 the driven sheave down below is a five-groove "B" section 9.4" pitch diameter with a 1-1/16" bushing, when used with either an electric motor or with a Ford gasoline engine.

The electric motor is a 10 horsepower, 1710 RPM, 3 phase, wound rotor induction motor, 208-220/440 volts, 60 cycle alternating current. The voltage range means that this motor can be used with 208, 220 or 440 volts, and the motor is built to handle all three voltages.

ELECTRIC MOTOR SPEEDS. See "Speeds".

ENGINE TRUCK WHEEL REMOVAL. See "Power Unit".

EXTENSION FOR GREASE FITTINGS. See "Rotating Base", "Stationary Base".

FAILURE OF GEARING IN GEAR POT. See "Gears".

FAILURE OF TOP SWEEP BEARING. See "Bearings".

FALLING GLASS. See "Lighting".

FATIGUE CRACKS. See "Seat Sweeps".

FENCE CLEARANCE. See "Clearances Required".

FINGER PINCHING IN DOLLIES. See "Dollies for Center Pole".

FLAKING OF GEARS. See "Gears".

FLOATING GEARS. See "Rotating Base".

FLOATING GEAR BEARING. See "Bearings".

FLOATING GEAR RUBBING. See "Rotating Base".

FLOATING GEAR TILT. See "Gears".

FLOATING THE CENTER. See "Stationary Base".

FLOOR VIBRATION IN DRIVE UNITS. See "Drive Units".

FLUID COUPLING. See "Power Unit".

FLUID DRIVE TEMPERATURE. See "Power Unit".

FLUORESCENT TUBES, DROPPED. See "Lighting".

FRACTURE OF WELD CONNECTING POLE TO STATIONARY BASE. See "Stationary Base".

FUEL SAFETY. See "Power Unit".

FUNNEL LIGHTS, LOCKED WITH COTTER PINS. See "Lighting".

GABLE LIGHT BROKEN PIN. See "Lighting".

GABLE LIGHT PANEL, TWISTED. See "Lighting".

GASOLINE ENGINE. See "Winter Storage".

GASOLINE ENGINE SPEED. See "Speeds".

GASOLINE SAFETY. See "Power Unit".

GEAR LUBRICATION. See "Gears".

GEAR MESH ADJUSTMENT. See "Bottom Sweeps".

GEAR POT GEARING FAILURES. See "Gears".

GEARS. This term is sometimes used to describe what in this manual is called "Sprockets".

GEARS.

There have been practically no reports of gear breakage on the Scrambler. The most common problem is excessive wear of the gear teeth on the big gears in the center

pole. This has occurred simply because the gears were not lubricated enough. A sure sign of insufficient lubrication is if you find cast iron particles around the driving pinion or the two braking pinions. Also, when a gear begins to wear, there will be a depression worn on the side of the tooth that you can feel easily with your finger. Factory records show that many gears are still giving excellent service after more than fifteen years use, but this has been possible only through regular and adequate lubrication.

It is hard to coat grease on all of the gear teeth inside the center pole base section, because some of them cannot be seen unless the center pole is taken apart. However, by greasing the gears which do show, while you turn the rotating base by hand, enough grease will be transferred to the hidden gear teeth to give them satisfactory lubrication.

Sometimes the factory gets calls about the bevel ring gear underneath the rotating base rubbing on the underneath side of the rotating base. There has never been any trouble connected with these gear teeth rubbing; operators have just wondered why it was happening, and if they should do anything about it. The floating gear which has a bevel ring gear attached to the top of it rides on a single tapered roller bearing, and the seating of the gear on the bearing depends upon the weight of the gear, plus the gear tooth pressure of the three bevel pinions up on top of the rotating base. If one or more of the bevel pinions gets loose because of pillow block bearing bolts getting loose, the bevel pinion or pinions will not press equally down on the bevel ring gear. Then when the Scrambler is operating under an un-balanced load, the load carried by each of the bevel pinions is not equal. The unequal gear tooth pressure then tends to tip the entire floating gear a little and this tipping then allows the tips of the bevel ring gear teeth to touch the underneath side of the rotating base. This causes the teeth to be worn off on the high end next to the center pole, and width of this wear is sometimes nearly 1/2". This rubbing also cuts a groove on the underneath side of the rotating base. The evidence indicates that this rubbing will not occur if the bevel pinions on top of the rotating base are adjusted to a tight mesh with the bevel ring gear down below, and held that way with securely bolted ball bearing pillow blocks that are on each side of the bevel pinions. To repeat, even where the wear occurs, there has been no indication that this leads to other problems.

The large internal gear bolted to the underneath side of the rotating base is very heavily loaded. The entire starting and stopping of the center pole is powered through this gear. Occasionally, some of the 12 shoulder bolts get loose. Check these bolts frequently to be certain that they are securely tightened, because you will not have good control of the ride if this gear is not properly tightened. Occasionally center poles brought into the factory for servicing have some of these bolts broken off. Do not operate the ride unless all 12 bolts are in place and pulled tight. Missing bolts will allow the gear to warp out of shape, which can even break the gear, so do not try to get by without all of the bolts in place. If you find that these bolts loosen after you have once tightened them, it is recommended that you drill a 1/8" hole through the head of each bolt, and then, with 19 gage stove pipe wire, safety wire each pair of bolt heads together to prevent their loosening.

If you are convinced that you are greasing the gears enough but you are still finding a lot of cast iron particles around the pinions and worn away places on the gear teeth it may be that one of the brakes is dragging. The lever on each brake must

have a spring attached to it and to one of the vertical plates in the stationary base, for the purpose of pulling the brake shoes back away from the brake drum when the brakes are released. If a spring is missing from either brake the extra drag of the brake can cause rapid wear of the gear teeth. Another way in which these missing springs affect the ride is if you try to turn the center pole by hand in a counter-clockwise direction. You will find that it turns just a very short distance and then locks up tight. Be certain that there is a spring on each of the brake levers whenever you operate the Scrambler if you want to get maximum life out of your gears.

The bevel ring gear and pinion set in the gear pot has given excellent service, and the only real problems that have occurred have been caused by other things. A few years after Scramblers first went into service, a ring gear and pinion set was returned to the factory with the teeth very badly chewed up. It appeared that some foreign object had gotten in between the teeth. On this same gear set, a capscrew which held a key in place was missing, and it was felt that this capscrew had worked out and then fallen in the gear teeth. In 1962 a notice was sent out to all Scrambler owners advising them to replace this capscrew with one having a drilled head with a safety wire through it to prevent its falling out. The capscrew and safety wire were furnished to each Scrambler. However, this did not seem to solve the problem, because damaged gear sets continued to be reported to the factory from time to time. Finally it was discovered that the problem was in the mounting of the bevel pinion. This pinion turns on two tapered roller bearings, and it is a characteristic of such bearings that the inner race, or bearing cone, will rotate slightly under load. The bearing cone of one of the bearings rubbed against a toothed washer that controlled the adjustment of the bearing. As the rubbing continued, eventually a tooth on the washer wore off, and when this happened the adjusting nut controlling the bearing position was allowed to loosen, and this in turn loosened the bearing and allowed the bevel pinion to move into tighter mesh with the bevel ring gear and finally climb up over it. What this all means is that the solution to the problem was to put a hardened steel washer between the bearing cone and the toothed washer, and this eliminated the problem. Since Scrambler Serial No. 158, all pinion casting assemblies have been equipped with these hardened steel washers, and all of these assemblies which have been returned to the factory for servicing have had the hardened washer added. If you have one of these earlier model Scramblers you might want to consider modifying yours before you have trouble. The factory has an exchange program so that you can order a re-conditioned pinion casting assembly, and then send yours in after you have made the replacement. You will be credited for all of the parts which are reusable.

The gears in the transmission on the engine truck are often noisy, but very seldom is there a need to replace gears. So long as adequate lubrication is maintained in the transmission case, these gears give excellent service.

GEARS NOT MESHING. See "Bottom Sweeps", "Top Sweeps", "Unit Poles".

GEAR TEETH RUBBING AGAINST ROTATING BASE. See "Rotating Base".

GEAR TOOTH FLAKING. See "Gears".

GEAR TOOTH WEAR. See "Gears".

GETTING FLUORESCENT TUBES TO LIGHT. See "Lighting".

GOVERNOR BY-PASS. See "Power Unit".

GREASE FITTING EXTENSIONS. See "Rotating Base", "Stationary Base".

GREASE LEVEL IN TRANSMISSION. See "Power Unit".

GREASING BRAKE DRUMS. See "Spring Start Up", "Winter Storage".

GREASING DRIVE UNIT CENTER BEARINGS. See "Drive Units".

GREASY CLUTCH. See "Bottom Sweeps".

GRIT IN BEARINGS. See "Bearings".

GROOVED BRAKE DRUM. See "Brakes".

GROOVES WORN IN GEAR TEETH. See "Gears".

GROOVE WORN ON UNDER SIDE OF ROTATING BASE. See "Gears", "Rotating Base".

GROUND CONDITIONS. See "Stationary Base".

GROUNDED WIRING. See "Three-wire Grounded Electrical Wiring".

GROUNDING. See "Lighting".

GROUND-NEUTRAL IMPROPER CONNECTION. See "Lighting".

GROUND PRESSURE. See "Stationary Base".

GUARD AROUND HYDROSHEAVE AND V-BELTS. See "Power Unit".

GUSSET PLATES FOR UNIT POLES. See "Unit Poles".

HAIRPIN COTTER LOCK ON HINGE PIN. See "Rotating Base".

HAIRPIN COTTERS AND KLIK-PINS.

It has been well established that Scrambler pins "work" and rotate in the joints. It is also certain that if these pins are not secured many of them will "walk" right out of the joint. It is extremely important that every pin be locked with a hair-pin cotter or a Klik-pin. Hairpin cotters can be used on every pin connection, and Klik-pins can be used on most of them. Which kind you use is up to you. Some operators prefer one kind and some prefer another. Either will be effective only if maintained in good condition. A defective safety device is worse than none at all.

The most common problem with hairpin cotters is that operators hammer them in place instead of pushing them on by hand. They go too far, and bend the hairpin open so far that it will not lock. Then when they try to re-bend it, it sometimes breaks. A good hairpin cotter is one that snaps on the pin, and fits snugly without rattling when it is installed.

Klik-pins do not seem to get out of shape or break as readily as hairpin cotters, but some operators complain that they turn with the pins so that it is difficult to remove the Klik-pins. Also, some refer to Klik-pins as "mouse traps" because of the way they spring over center and pinch fingers that are in the way. Do not use a Klik-pin if it has been bent out of shape or if the spring has lost its tension. When flipped over, the spring ring should strike the pin with a firm "snap". Damaged or weak Klik-pins should be discarded, and new ones installed.

The important thing to remember is have a complete supply of the devices you prefer, to keep them in good condition, and to use one on every assembly pin you install.

HAIRPIN COTTERS BROKEN. See "Hairpin Cotters and Klik-pins".

HARD WASHER ON PINION SHAFT. See "Gears".

HAT CASTING. See "Rotating Base".

HIGH TENSILE BOLTS. See "Mast".

HINGE PIN. See "Rotating Base".

HINGE PIN DRIVING ROD. See "Driving Rod for Hinge Pins".

HOME-MADE TIE RODS. See "Tie Rods".

"HOT" RIDES. See "Lighting".

HYDROSHEAVE GUARD. See "Power Unit".

HYDROSHEAVE HEAT. See "Power Unit".

HYDROSHEAVE OIL LEAKAGE. See "Power Unit".

HYDROSHEAVE REPAIR. See "Power Unit".

HYDROSHEAVE RPM. See "Speeds".

HYDROSHEAVE SEAL REPLACEMENT. See "Power Unit".

INCANDESCENT LIGHTING. See "Lighting".

INTERNAL GEAR BOLTS. See "Rotating Base".

INTERIOR PAINTING OF TIE RODS. See "Tie Rods".

JUMPERS FOR MAST LIGHTS. See "Lighting".

JUMPING SLIP CLUTCHES. See "Bottom Sweeps".

KEYS FOR BEVEL PINIONS. See "Rotating Base".

KLIK-PINS AND HAIRPIN COTTERS. See "Hairpin Cotters and Klik-pins".

LEAKING OIL IN HYDROSHEAVE. See "Power Unit".

LEVEL DRIVE UNITS. See "Drive Units".

LEVELING THE RIDE. See "Stationary Base".

LEVEL OF OIL IN TRANSMISSION. See "Power Unit".

LEVER STOP BROKEN. See "Dollies for Center Pole".

LIFE OF BEARINGS. See "Bearings".

LIGHTING. (See Lighting Diagrams at the back of this manual.)

Earlier Scramblers were equipped with incandescent lighting, but because of owner interest fluorescent lighting equipment was developed and it has been furnished as standard equipment for many years. More recently, some owners have expressed interest in returning to incandescent lighting.

Incandescent lighting requires more power and puts out less light than fluorescent, and there is quite a bit of maintenance necessary to keep the bulbs lit and the sockets in good working condition. However, the wiring is very simple in comparison with that used on fluorescent lighting, and the wiring problems are much less. Many operators are unfamiliar with electrical circuits used in fluorescent lighting, and do not know how to go about correcting any problems that arise.

The transformers, or ballasts, sometimes get moisture in them and short out. When they short out, the fluorescent tubes usually will not light, and sometimes the structure gets "hot". If you cannot get a tube to light, even when you replace it with a new one, it is better to disconnect the panel to avoid the possibility of having a "hot" ride, and then look into the problem when you are not trying to carry passengers.

When you first turn on your lighting some of the tubes may not light. Rubbing briskly on the outside of the tube is sometimes all that is necessary to get the tube to come on. Sometimes they won't light because of low voltage. The ballasts are rated at 118 volts. A good ground is important for consistent starting.

There is a lot of glass in a fluorescent tube, and a tube that is improperly installed can fall out while the Scrambler is turning. This can be very hazardous to the passengers, not only from the shattered glass but also from the phosphor coating inside the tubes. This coating can be toxic, and you should avoid breathing the vapors from a broken tube. Try to keep from getting the coating on your hands. If you do handle broken tubes, try to wash off thoroughly as soon as possible.

Not only the fluorescent tubes, but the entire light panel must be securely fastened in place. There have been a few occasions where an operator has failed to install a hairpin cotter to lock in place the outer end of a sweep light. Without this hairpin cotter in place, the centrifugal force of the ride as it turns will move the light panel outward, and when this happens it can slide right off the pin and fall down on the passengers. Do not let this happen; make doubly sure that each top sweep light panel is secured in place with a hairpin cotter or a Klik-pin. Whichever you use, be sure that it is in good condition.

The gable lights rising to a point on each side of the Scrambler have on their lower ends pins which go through small plates on the sides of the top sweeps. There is a little locking pin on the side of each one of these pins, and the purpose of this locking pin is to keep the gable light panel from coming out of the hole in the plate after the gable lights are raised to their operating position. Some gable lights brought in to the factory have these little locking pins broken off, and some have the whole end snapped off. It is very dangerous to operate the Scrambler with these locking pins missing. Ordinarily there would be no problem, but a fast start or a fast stop might cause the gable light to pull right out, and then it would drop down into the path of the passengers.

These locking pins do not break out easily, and there has never been a satisfactory explanation of how it happens. Sometimes when the gable lights are installed the operator fails to get the locking pin all the way through the small plate on the top sweep. Then when he pushes up the point of the gable lights to operating position the end is rigid because of the locking pin being in the plate, and as the gable light is raised the light panel gets badly twisted. A twisted gable light panel is a sure sign that the operator did not have the locking pin all the way through the small plate. Twisting the panel does put a load on the locking pin, and this may be the only thing that is done to break it off. If the pin is broken off, do not attempt to repair it yourself, but obtain from Eli Bridge Company a new pin plate assembly which can be bolted on the end of the light panel.

Deluxe Scramblers are equipped with funnel lights, and at the bottom of each panel there is a pin with a cotter key hole in it. The only reason that this hole is put there is for the convenience of the operator if an inspector insists on the panel being locked in place; the hole is already there and all that is necessary is installing the cotter key. As it turns out, this has worked in reverse; some inspectors when they see these holes without cotter keys in them are convinced that the factory intended cotter keys to be there. Until someone can come up with an explanation of how these panels could lift themselves out of their sockets, the factory position will continue to be that the cotter keys in these holes are absolutely unnecessary.

Occasionally operators report that the terminal block in the stationary base gets burned out. This was investigated at the factory and it was found that excessive heating was occurring because of wrought washers and nuts on the bolts to which the wires were connected. These washers and nuts were there to raise the connection high enough so that the wing nuts would not hit the other end of the terminal lug. Power coming through the wires would pass down through the bolts to the lugs, but part of the current passed down through the wrought washers and nuts. These pieces

were not absolutely flat against each other, and this caused electrical resistance to occur through these washers and nuts. The resistance produced heating, which burned out the phenolic block to which the terminals were fastened. The solution to the problem was to replace the wrought washers and nuts with a solid brass piece brazed to the terminal lug, so that a low-resistance electrical path was created. Tests showed that the heating was substantially reduced, and this design was then introduced in production, beginning with Scrambler Serial No. 268. This improved design of terminal block can be adapted to any Scrambler, so if you have "burnout" problems it is suggested that you try one of these improved blocks.

A very serious problem can exist when a ride is "hot". If electrical power is accidentally connected into the frame of the ride a person stepping on or off the ride can be shocked severely and even fatally. If the ground and the ride are wet from rain the problem can be much worse than when they are dry. A shorted ballast, a bare wire touching the structure, or incorrect wiring can each cause a "hot" ride. Check closely the wiring and lighting diagrams at the back of this manual. If you see any sign that the ride is "hot", do not attempt to carry passengers until you have eliminated the problem.

Across the nation there has been a trend toward the use of three-wire grounded electrical circuits. For quite some time all Big Eli rides have been equipped with this kind of lighting. For more detailed information see the special section of Three-wire Grounded Electrical Wiring. The most common problem as far as lighting goes is that in servicing a light panel, such as replacing a ballast, the operator hooks up the ground wire to the neutral or the "hot" wire. When this happens the entire ride is charged with about 120 volts. The green ground wire must be connected only to green. The whole idea of the three-wire grounded system was to provide extra protection from getting a "hot" ride, but if it is improperly connected the hazard is actually greater than on the old two-wire ungrounded system.

On earlier lighting equipment the power coming from the electric rings was connected directly to the light panels, and the jumper going to the mast lights was spliced so that one jumper connected power to all three mast panels. To bring the equipment into conformance with current electrical codes, Eli Bridge Company is now furnishing breaker boxes with individual jumpers going to each light panel. Older Scramblers can be equipped with this modification.

The switch box on a Standard Scrambler has a fuse capacity of 60 amperes, while a Deluxe Model has 100 amperes fuse capacity. These boxes are substantially oversize for the current load of a Scrambler equipped with fluorescent lighting, but many owners like to modify their lighting in some way, and the oversize switch box will permit substantial modification before the capacity of the box is exceeded.

The current requirements for lighting panels equipped with fluorescent lamps were determined by measuring the actual current required by each kind of panel, and those values were as follows:

STANDARD SCRAMBLER:	Amperes per Panel	Panels per Scrambler	Total Amperes per Scrambler
Cluster Light	1.3	3	3.9
Gable Light	.8	6	4.8
Sweep Light	.8	3	2.4
Mast Light	.4	3	1.2
Total Amperes per Standard Scrambler			12.3
DELUXE SCRAMBLER:			
Cluster Light	1.3	3	3.9
Funnel Light	.8	30	24.0
Gable Light	.8	6	4.8
Sweep Light	.8	3	2.4
Total Amperes per Deluxe Scrambler			35.1

LIGHTS, FLUORESCENT, BROKEN. See "Lighting".

LIMITING SPEEDS. See "Rotating Base".

LINE REAMING FOR OVERSIZE PINS. See "Rotating Base", "Seat Sweeps".

LOADS ON PIN CONNECTIONS. See "Pins and Pin Holes".

LOCKING PINS WITH HAIRPIN COTTERS OR KLIK-PINS. See "Pins and Pin Holes".

LOCKUP OF CENTER POLE (WILL NOT TURN COUNTERCLOCKWISE). See "Brakes".

LOOSE BEARINGS ON BEVEL PINIONS. See "Gears".

LOOSE BOLTS IN DRIVE UNIT BEARINGS. See "Drive Units".

LOOSE PIN HOLES IN DRIVE UNITS. See "Drive Units".

LUBRICATION REQUIREMENT OF GEARS. See "Gears".

MAGNAFLUX TESTING. See "Seat Sweeps".

MAST.

The mast on the center pole has not given any problems. At any rate, none have ever been reported to the factory.

The first 26 Scrambler center poles were recalled to the factory for modifications, but since that time there has been no structural change of any kind on the mast. Part of this modification involved installing shear pins on the rotating base and shear pin sockets on the bottom of the mast. These sockets are bolted in place, and the 3/4" high tensile bolts are tightened to a torque of 350 foot-pounds. It is very important that these not be disturbed, so do not try to remove them. There has never been a report of any problems with these shear pin sockets and the bolts which hold them.

Recent models of the Scrambler have had an electrical breaker box mounted up inside the mast. This is for convenience only. It can be added to any Scrambler and will not affect the erection or the operation. However, the breaker box is necessary to bring the Scrambler into closer conformance with current electrical codes.

Sometimes in swinging up or swinging down the mast the electric brushes and brush holders are bent where they are struck by the mast. A little care in handling the mast will prevent this from happening.

The pin connections for the top sweeps do not have to take nearly as much load as do those for the bottom sweeps, and so it is very rare to find the top sweep pin joints worn enough oversize to require line reaming for oversize pins. However, the equipment for doing this is available if you feel that it is necessary to go to oversize pins in that location.

MAST HINGE PIN DRIVING ROD. See "Driving Rod for Hinge Pins".

MAST LIGHT JUMPERS. See "Lighting".

MAXIMUM SPEED. See "Speeds".

MISSING BRAKE SPRING. See "Brakes", "Gears".

MOISTURE IN BALLASTS. See "Lighting".

MOTOR, ELECTRIC. See "Electric Motor".

MOUSE TRAP. See "Hairpin Cotters and Klik-pins".

MUD SILLS. Referred to as "Base Legs".

MUSHROOMED PINS. See "Pins and Pin Holes".

NAMEPLATE. See "Rotating Base", "Serial Number".

NATIONAL ELECTRICAL CODE. See "Three-wire Grounded Electrical Wiring".

NEUTRAL-GROUND IMPROPER CONNECTION. See "Lighting".

NOISY TRANSMISSION. See "Gears", "Power Unit".

NUMBER OF PARTS REQUIRED.

In portable operation of Big Eli Scramblers, operators sometimes fail to keep on hand enough of the various pins and other equipment needed for proper erection and operation of the Scrambler. Every part of the Scrambler is there for a reason, and for maximum safety every part supplied with the Scrambler should be used. The list below shows all of those parts, not including all of the basic structural parts and basic hand tools:

Number Required	Description
12	Seat Covers
12	Shock cords
1	Base pull plate assembly
1	Winch Cable hook
6	Tie rods, top sweep
24	Tie rods, seat sweep
12	Tie rods, seat brace
3	Tie rods, gable panel
2	Loading runway ramps
2	Runway extension channels
1	Wood runboard
3	Wood cross-members
1	Unit Pole hoist dolly
4	Base dolly assemblies
1	Long tie bar with cotter keys
1	Short tie bar with cotter keys
2	Base dolly lever poles
2	Crowbars, 4 ft.
28	Fence sections
29	Fence post sockets
1	Main brake cable with turnbuckle
1	Brake cable equalizer
1	Equalizer brake cable
1	Intermediate brake cable
1	Brake cable connection
2	Brake cable end connections
2	Brake cable guide assemblies
7	Base pins (1 extra)
160	Assembly pins (7 extra)
185	Hairpin cotters (6 extra)
or 182	Klik-pins (7 extra)
and 3	Hairpin cotters
3	Unit pole top split rings
3	Unit pole bottom split rings

Number Required		Description
3	- -	Unit pole retaining rings
3	- -	Unit pole safety pins
7	- -	Chains for couplings
3	- -	Mast assembly pins
1	- -	Mast hinge pin drive rod
2	- -	Joint Splices, drive unit

On a Standard Model Scrambler the lighting equipment includes:

Number Required		Description
3	- -	Mast panels
3	- -	Sweep panels
6	- -	Gable panels
3	- -	Crates, each containing a cluster light assembly
3	- -	Twist lock jumpers, 30", for cluster lights
6	- -	Twist lock jumpers, 20", for sweep and gable lights
3	- -	Thumb screws, 3/8" x 3/4"

On a Deluxe Model Scrambler the lighting equipment includes:

Number Required		Description
3	- -	Sweep panels
6	- -	Gable panels
3	- -	Crates, each containing a cluster light assembly
2	- -	Crates, containing 30 funnel light panels, one funnel light top ring, one funnel light bottom ring, three funnel light top ring mounting angles
30	- -	Cotter keys, 3/16" x 1"
3	- -	Thumb screws, 3/8" x 3/4"
3	- -	Twist lock jumpers, 30", for cluster lights
6	- -	Twist lock jumpers, 20" for sweep and gable panels
24	- -	Twist lock jumpers, 14", for funnel light panels

NYLON BEARINGS. See "Bearings".

OIL LEAKAGE, HYDROSHEAVE. See "Power Unit".

OVERHEAD CLEARANCE. See "Clearances Required".

OVERSIZE PINS. See "Pins and Pin Holes", "Rotating Base", "Seat Sweeps".

OVERSPEEDING. See "Speeds".

OWNERSHIP RECORDS. See "Serial Number".

PAINTING INSIDE OF TIE RODS. See "Tie Rods".

PAINTING ROTATING BASE COVERS. See "Rotating Base".

PAINT REQUIREMENTS. See "Spring Start Up".

PARTS REQUIRED. See "Number of Parts Required".

PASSENGER CAPACITY. See "Rotating Base".

PHOSPHOR COATING. See "Lighting".

PIN BROKEN ON GABLE LIGHT. See "Lighting".

PINCHING FINGERS IN DOLLIES. See "Dollies for Center Pole".

PIN HOLES IN MAST. See "Mast".

PIN HOLES IN TIE RODS REAMED. See "Tie Rods".

PIN HOLES, OVERSIZE. See "Pins and Pin Holes".

PIN HOLES WORN. See "Rotating Base", "Unit Poles".

PIN IN SEALMASTER SF-47 BEARING OUTER RACE. See "Bearings".

PINION CASTING ASSEMBLY. See "Gears".

PINION KEYS. See "Rotating Base".

PINION SHAFT HARD WASHER. See "Gears".

PIN LOADS. See "Pins and Pin Holes".

PINS AND PIN HOLES.

Every assembly pin throughout the Scrambler has a diameter of 1". Almost all of them are the same length; there are six longer ones which connect the base legs to the stationary base, and three long pins which connect the mast to the rotating base. Because of the almost universal interchangeability of the assembly pins, in a portable operation each pin will eventually be used in every pin hole, so that it is subjected to high loads and low loads, depending upon the location. Consequently, in portable use there is very little wear on the 1" diameter of the pin, although both ends of the pin get spread and flattened from pounding it in and out of the joint. In a park location, there will be very little damage done to either end of the pin, but the pins used in the heavily loaded joints will show wear on the 1" diameter.

The mushroomed ends of every pin should be kept ground off, because of the danger of flying metal particles or chips when the pin is struck with a hammer. To check the wear on the diameter of the pin, a new pin can be as much as .003" less than 1", or .997", so you can establish how much wear there is on your pins by measuring them and comparing your measurements with those of a new pin. If you have no way of measuring, remove a pin from a tight joint and insert it in a joint that appears to be too loose. If you can observe that the joint is not obviously tighter, then this is a good indication that the pin diameter is worn down and should be replaced.

The pin holes are where the wear usually shows up. Eventually some of the pin holes may get so enlarged from wear and pounding of the pins in the holes that you will want to do something about it. Eli Bridge Company has equipment available for loan which will enable you to line ream the pin holes for oversized pins. The oversize pins come in two different sizes: 1-1/16" and 1-1/8". The 1-1/16" pins can be identified by the single ring cut in the side of the pin head, while the 1-1/8" pins have two rings cut in the head. Both sizes of oversize pins are stocked by the factory so that they are readily available, but you must specify what you want, because standard 1" pins will be sent unless otherwise requested.

It is necessary that the pin holes be line reamed or the interchangeability of the structural members will be affected. Therefore, if you decide to go to oversize pins contact the factory and use the proper equipment to do the job right. Do not ream to 1-1/8" if a 1-1/16" pin will tighten the pin connection.

The use of a single diameter assembly pin throughout the Scrambler was decided upon to keep to a minimum the number of extra pins an operator should have on hand and also to make it easier for him to assemble the ride. Any standard assembly pin can be used in 152 different places. However, because the structural loads in each one of these joints is not the same, some pin holes will obviously wear more than others. Experience has shown that wear develops in approximately the following order:

1. Bottom sweep connections to the rotating base show wear the quickest.

2. Seat sweep connections to the unit pole come next.

3. Next, seat sweep tie rods extending from the top of the unit pole to the outer end of each seat sweep.

4. Then, top sweep connections to the center pole mast.

5. Then, the connections of the drive units to each other, to the stationary base, and to the engine truck.

6. Seat brace tie rods, which extend from the top of the seat to the bottom of the unit pole, are next.

7. Seat connections to the ends of the seat sweeps very rarely have to be enlarged.

8. The factory records show very few top sweep tie rods or base legs having to have oversize pins installed.

Every pin "works" in its pin connection, some more than others. Unless every pin is safetied with a hairpin cotter or a Klik-pin it can "walk" right out of a joint. When this happens, structural members can get loose and this can cause severe injuries to passengers or even by-standers. Therefore, never operate the Scrambler unless each and every pin is secured in place with a hairpin cotter or Klik-pin that is in good condition and is properly installed on the pin. It does not make any difference which kind of safety device you use; both are stocked by Eli Bridge Company, and it is up to your own preference which kind you use. Either kind can be used in every location but one, and that is on the long pins which connect the mast to the rotating base. In this location only a hairpin cotter can be used.

To repeat, NEVER OPERATE THE SCRAMBLER UNLESS EVERY PIN IS LOCKED IN PLACE WITH A HAIRPIN COTTER OR A KLIK-PIN.

PINS KEYING BOTTOM BEARING RING. See "Stationary Base".

PINS, LOCKING WITH HAIRPIN COTTERS. See "Pins and Pin Holes".

PIN SHEARED IN SEALMASTER SF-47 BEARING. See "Top Sweeps".

PIN TO CONNECT ROTATING BASE TO MAST. See "Rotating Base".

POWER REQUIREMENTS. See "Lighting", "Three-wire Grounded Electrical Wiring".

POWER TAKE-OFF SHAFT. See"Power Unit".

POWER UNIT.

Check the power unit manufacturer's instruction manual for the proper servicing and maintenance of your power unit.

The following general rules can apply to many kinds of power units:

1. Every 8 hours of operation:

   A. Fill the fuel tank.

   B. Check the oil level.

   C. Check the radiator.

D. Check the air cleaner.

E. Check the fuel strainer bowl.

F. Inspect all connections.

2. Every 60 hours of operation:

A. Change crank case oil.

B. Inspect the water pump.

3. Every 250 hours of operation:

A. Remove spark plugs, clean, and check spark gaps.

4. Every 1000 hours of operation:

A. Drain and flush cooling system. Refill with clean soft water.

B. Remove oil pan and wash out sludge.

Essential to the maximum efficiency of any engine is keeping it clean. Never remove inspection covers, plugs, or breathers without first removing all dirt from around them to prevent its entrance into the engine. Go over the entire engine frequently and clean it. In addition to cleaning off dirt and grease, many troubles caused by loose connections, nuts, or cap screws will be discovered before they develop.

Handle fuel carefully to prevent entrance of dirt and water which can cause damage and operational failure of the engine. Fuel should always be kept in a red, tightly closed, approved container, clearly labeled on the outside what kind of fuel is within. NEVER ATTEMPT TO REFUEL A HOT ENGINE.

The Twin Disc Hydrosheave was used on every Scrambler through Serial No. 414, whether powered by a gasoline engine or an electric motor. It has given excellent service, has smoothed the application of power to the Scrambler, and has reduced the shock loads to the entire drive, with only a few minor problems showing up. The Twin Disc company discontinued the 10.6 Hydrosheave and replaced it with the 9.4 fluid coupling, which is installed on all Scramblers beginning with Serial No. 415.

The fluid inside the fluid coupling can get very hot as it is used. Occasionally, the seal inside the fluid coupling leaks a small amount of fluid. When this happens, the fluid flows back toward the engine or electric motor, and is thrown off, sometimes on the operator's clothes. If the seal is defective it can be replaced. Eli Bridge Company can furnish a new seal, along with instructions on how to install it, or you can take it to a Twin Disc dealer who can do this for you. Do not attempt to take apart the fluid coupling without the proper instructions, because you may lose small parts down inside that will be almost impossible to get out. Notice that the case of the fluid coupling is welded after the rotating parts are inside, so it is not possible to disassemble the case in order to retrieve any parts lost inside.

Leaking fluid may not be due to a bad seal. This can also happen when you first start up and until the entire fluid coupling has warmed and expanded to operating temperature. If there is leakage of this kind it will almost always stop within a very few minutes.

Scrambler power units from Serial No. 1 through 43 had the Hydrosheave mounted on the standard Allis-Chalmers straight power takeoff shaft, which has a diameter of 1-5/32". This proved to be too light and so a new, heavy-duty straight power take-off was designed to replace the Allis-Chalmers unit and it has been used since that time with highly satisfactory results.

The five-groove sheave on the fluid coupling has a 6" pitch diameter, and is identified as a QD-5B-6.0, which means it is a quick-detachable design with a tapered bore, and is for use with "B" section V-belts. On Scramblers through Serial No. 414, the sheave down underneath the Hydrosheave has a pitch diameter of 7.4" when powered by an Allis-Chalmers gasoline engine, and 9.4" when with an electric motor. On Scramblers beginning with Serial No. 415 the sheave down underneath the fluid coupling has a pitch diameter of 9.4" when powered by either a Ford gasoline engine or an electric motor.

The V-belts operating in the sheaves should always be used in matched sets of five belts. There are very slight differences in length of V-belts, and unless they are matched in length the load will not be carried equally by each of the belts. Up through Scrambler Serial No. 414 the belt length is 38" when used with an Allis-Chalmers gasoline engine, a 10.6 Hydrosheave, and a 7.4" pitch diameter sheave; or when used with an electric motor, a 10.6 Hydrosheave, and a 9.4" pitch diameter sheave, the belt length is 48". With the Twin Disc 9.4 HSD fluid coupling (beginning with Scrambler Serial No. 415) the same 48" belt lengths and the same 9.4" pitch diameter sheave are used on the electric motor drive, but 46" belts are used with the Ford gasoline engine along with the 9.4" sheave.

Oil or grease should not be left standing on the V-belts, because this will cause them to deteriorate. Wipe off the belts and sheaves regularly with a cloth soaked in low-flammability solvent. Water and steam can also be used to clean the belts, and this will not harm them. If the belts slip do not use any kind of belt dressing on them, but tighten the belts. Properly tightened belts will not slip. The way to tighten is to loosen the bolts which hold the power unit mounting angles to the frame of the power unit truck, raise up the power unit angles, slip shims equally under all four bolting locations, and then re-tighten the bolts. Be sure to use the same amount of shims in each of the four locations, or the V-belt sheaves will not be in line with each other and this will cause unnecessary wear on the V-belts.

The guard for the fluid coupling and the V-belts was originally just a "fence" around three sides, but there were some reports of people reaching over the fence and touching the hot fluid coupling, and so the guard was extended by covering over the top. Beginning with Scrambler Serial No. 415 it has been extended to provide more complete guarding of the belts and sheaves.

The transmission used on all Scramblers for many years was an Allis-Chalmers unit modified by Eli Bridge Company. This unit has been discontinued by Allis-Chalmers, and a replacement unit requiring only the addition of new mounting holes on the engine truck will be available from Eli Bridge Company after the existing supply of Allis-Chalmers transmissions has been exhausted.

The Allis-Chalmers transmission has given excellent service, but often operators have asked about the high noise level of the gears inside. It is true that this unit has been noisy, but still it has always done a very good job, provided it has been properly lubricated. The pipe plug on the sides of both old and new units should be removed to check the level of the transmission grease. The lubricant should come up to the bottom of the hole.

In order for the Scrambler to turn 11.0 revolutions of the center pole when powered with a gasoline engine, the output shaft connected to the transmission on one end and to the drive unit drive shaft on the other should be turning 357 RPM. With an electric motor, this shaft should turn 372 RPM in order to turn the Scrambler center pole 11.4 revolutions per minute.

The most serious problem with the Scrambler is convincing operators not to run it beyond the factory-recommended top speed. The factory position is stated quite clearly in the manual, and the top speeds are posted on a cast aluminum name plate mounted in clear view on the center pole. With the electric motor drive this is no problem because the top speed cannot be changed easily; it is just on the Allis-Chalmers gasoline engine that the problem has existed. Just before a new Scrambler was delivered, a throttle stop was installed on the Allis-Chalmers engine, the throttle lever was pushed against the throttle stop, the top speed was checked and adjusted as required, and then the excess throttle rod was sawed off. If you do not have a throttle stop on your Allis-Chalmers throttle quadrant, get one. They are stocked by Eli Bridge Company, and take just a few minutes to install. Above all, never by-pass the governor. Excessive speeds can and do damage the equipment and can injure the passengers. The Ford engine has a built-in governor which shuts off the engine when it is overspeeded. The engine must be brought to a complete stop, and the governor re-set, before it can be operated again.

Some owners and operators claim that they cannot get the business unless the ride is overspeeded. This is simply not true. Recently ONE SCRAMBLER in ONE YEAR carried over ONE MILLION PASSENGERS, and the top speed was less than the factory-recommended top speed.

There is one adjustment that you should watch rather carefully, and this is the inter-connection between the engine clutch and the brake cable. The brake ratchet handle should be positioned so that the last notch of the ratchet is engaged when the Scrambler brakes are fully set. This adjustment is made by tightening or loosening the large turnbuckle on the brake cable. Having made this adjustment, the cable that connects to the clutch lever of the Allis-Chalmers engine must be adjusted accordingly. When the brake lever is all the way back so that the brakes are firmly set, the clutch lever should be such that the clutch is fully disengaged, and not too far either way. In one direction the clutch will drag, which will wear it out in a hurry, and in the other direction it will put an excessive load on the throwout bearing. The way to tell when it is right is to flip over the dog that holds the clutch out of engagement. If the clutch lever is in the right position this dog will just slip down behind the cast stop on the bell housing, when the brake ratchet handle is pulled back to the fully-braked position. On the Ford engine the only adjustment that can be made to the linkage is by adding or removing washers in the link connecting the brake ratchet handle to the clutch lever.

A frequent question concerns whether or not the drive shaft should be leveled from the power unit in to the center pole. Certainly there is nothing wrong with having the shaft level, but the Scrambler has been designed with the idea that the shaft will not always be absolutely level, and in fact on a concrete street it cannot be. The flexible chain couplings connecting each of the drive shafts have the capability

of operating with up to three degrees of angular misalignment. This is not a large angle, but it is enough to provide quite a bit of flexibility in the location of the drive units and power unit truck. Some operators feel that they have to remove the wheels from the engine truck in order to get the drive shaft down lower. This is a lot of work and experience indicates that it is not worth the effort. The couplings will work quite satisfactorily with the wheels remaining on the engine truck.

POWER UNIT CLEARANCE. See "Clearances Required".

POWER UNIT RULES. See "Power Unit".

POWER UNIT SERVICING. See "Power Unit".

PROCEDURE FOR REMOVING BRAKES. See "Brakes".

REAMING TIE ROD PIN HOLES. See "Tie Rods".

RECORDS OF OWNERSHIP. See "Serial Number".

REMOVABLE SLIP CLUTCH AND PINION ASSEMBLY. See "Bottom Sweeps".

REMOVING BRAKES. See "Brakes".

REMOVING WHEELS OF ENGINE TRUCK. See "Power Unit".

REPLACING SWEEP BEARINGS. See "Bearings".

REPAIRS OF FLUID COUPLING. See "Power Unit".

REQUIRED PARTS. See "Number of Parts Required".

REQUIREMENTS FOR ELECTRICAL POWER. See "Three-wire Grounded Electrical Wiring".

RIGID BEARING MOUNTING. See "Bearings".

ROD FOR DRIVING HINGE PINS. See "Driving Rod for Hinge Pins".

ROTATING BASE. (See also "Bearings", "Gears".)

The only structural modification of any consequence made on the rotating base was the addition of shear pins on the top side to "key" the mast to the rotating base. During the first year of service of the Scrambler it became apparent that there were loads showing up on the long hinge pin connections between the mast and the rotating base that had never shown up during factory testing. What was happening was that some hinge blocks on the corners were cracking out the welds holding them. This was found in the field inspection of one Scrambler and in the course of modifications being performed on the original Scrambler. This was a potentially dangerous situation, and immediately a modification was developed to eliminate the problem, namely the addition of shear pins on the top of the rotating base and shear pin

sockets on the bottom of the mast. The modified Scrambler was handed over to an outside consulting engineer who subjected it to proof tests in the materials testing laboratory of the University of Illinois. As a result of these successful tests he approved of the modification, and the first 26 Scramblers were then recalled for this modification. Since that time there have been no problems associated with the hinge blocks and shear pins connecting the two structural members.

The long hinge pins are effective only if they are through all of the hinge blocks, so that the full strength of the center pole structure can be developed. There is some tendency for these pins to "walk" out of the joints, and so it is very important that a hairpin cotter be used to keep each pin locked in place. A Klik-pin cannot be used for this because there is no place for the snap ring to slip over. Never operate the Scrambler unless these three long hinge pins are locked in place with a hairpin cotter.

The Scrambler serial number is stamped in an aluminum plate fastened to the side of the rotating base approximately at eye level. The serial number reads, for example, 397-73, and this means that it is the 397th Scrambler and was delivered in 1973. This name plate also states the maximum passenger capacity of 36, a maximum speed of 11.0 RPM of the center pole with gasoline engine power, and 11.4 RPM of the center pole with electric motor power. This plate was made of cast aluminum with raised letters so that it would not rust away and would take a great many coats of paint before being covered up so much that it could not be read. Some of the earliest Scramblers did not have this aluminum nameplate on the center pole. If you have one of these early Scramblers, a new nameplate stamped with the proper serial number can be obtained from Eli Bridge Company. It is recommended that you install one if there is none on your center pole now. Some states are now requiring such a nameplate, or its equivalent, before a ride can be given a permit to operate.

The top center pole bearing is protected by a cover in the shape of an old-time straw hat, and is generally referred to as the "hat casting". There is a gasket to seal it off from the top of the rotating base, and nine screws to fasten it down. These screws need to be kept tight to keep out dirt and grit that might seep into the bearing. Also clean grease needs to be pumped into the grease fitting on the side of the hat casting to supply proper lubrication to the top bearing. Some Scramblers brought into the factory for servicing show that no grease has ever been added to this top bearing from the time it left the factory new. Fortunately, these top bearings are always well packed with grease when they are first installed, and the low speed at which they operate makes it easy for grease to be retained in the bearing over a long period of time. Very seldom has there been a problem with this top bearing because of too little lubrication.

The welded triangular structure at the upper end of the rotating base is completely sealed except for the screw holes holding the hat casting and those holding the name plate in place. As tight as these are, it appears that hot, moisture-laden air seeps through these holes into the interior, and then when night comes and the air cools off the moisture condenses out on the inside of the structure. Whether or not this is really what happens, the fact is that an accumulation of water has been found in many of these structures. Preferably there should be no water inside and the cavities should be sealed and dry. Since water has been found there, the

factory now drills a small 1/4" weep hole in the lowest points of each of these cavities, so that any water which condenses on the inside can drain out. If your center pole does not have these holes, put them in. All holes should be kept open so that the cavities can drain at all times.

The electric brushes fastened to the top of the hat casting will last longer if a little vaseline is rubbed on the electric rings from time to time. In the beginning only two brushes and rings were used. When the change was made to a three-wire grounded system an additional ring had to be added. Then later when the funnel lights were developed the current load was so high that a fourth brush and ring had to be added. As each ring and brush was added the height increased, so that it became increasingly more difficult to swing over the mast when setting up or dismantling the center pole. If your Scrambler has three or four rings and brushes you must use extra care to avoid damaging the brushes.

The lower part of the rotating base is covered with a three-piece sheet metal cover that is coated with R-Mir-Dek slip-resistant plastic material. This coating is applied to prevent the operator or the passengers from slipping on this sloping surface in case there is water or grease on it. Because it is a rough surface it collects dirt rather easily, and instead of cleaning it many operators paint a slick enamel over it. This of course eliminates the slip-resistant surface, and it can become very hazardous for anyone to step on it.

These covers sometimes rattle and vibrate as the Scrambler turns. This can be corrected quite easily. Remove the cover, turn it over upside down on the ground with one of the flat sides against the ground, stand with your feet next to the bend in the cover, and pull up on the raised edge to give the cover a slight additional bend. When you re-install it, it should be over-bent just enough so that you have to push down a little at the bend in order to start the wing nut. You will find that this will stop the noise and vibration of the covers.

Under the covers are the three rotating base drive shafts. These shafts have gone through three major modifications. The first ones had three ball bearing pillow blocks on each shaft, and the bevel pinion was keyed to the shaft with a 2" long key. The bevel pinion was increased in size so that a key 4-5/16" long was used. This was because the keyways were wearing rather rapidly in the small size. The bearing next to the chain coupling was removed, because it was found that very slight differences in the size of shims under the three bearings would stress the shaft so much that it was subject to failure within a year's time. By eliminating the outer bearing, and keeping only those on each side of the bevel pinion, this problem was eliminated. If your rotating base drive shafts have three bearings on them, remove the outer ones and save them for spares. It has been established that the shafts will last longer with two bearings than with three. The final modification was to go to splined shafts, with a splined bore in the bevel pinion and a splined bore in the chain sprocket. This has greatly extended the life of the drive, but even so the splines in the chain sprocket wear loose in time because of the heavy loading they receive.

These chain sprockets, even with a spline bore, get worn badly. When that time comes the best thing to do is replace the shaft and the chain sprocket. Do not try to replace just one part because this will take care of just half of the problem. By the time the splines are worn loose it is likely that the teeth of the chain sprocket will also be badly worn so that there is a lot of looseness in the coupling. Whenever the sprockets get loose in the chain in this connection of the bottom sweeps to the rotating base the pounding of the coupling as the load reverses through the shafting will cause the wear to increase at a great rate. It is typical of sprockets that the more they wear, the faster they wear. Worn couplings permit the unit poles to rotate a small amount and the seats to move also, even with the brakes set, and this can cause a passenger to fall. It is much wiser to replace couplings than to risk an injury. A light coat of grease on the chains will prolong the life of the couplings.

The 12 socket-head shoulder screws holding the large internal gear to the underneath side of the rotating base should always be kept tight, because a loose gear is not a properly supported gear, and excessive looseness can possibly cause the gear to break. If you have a continuing problem with the bolts getting loose, drill a 1/8" hole through the side of each bolt head and safety wire each pair of bolts to each other using 19 gage stove pipe wire.

The large gear that turns freely underneath the rotating base is referred to as the floating gear. It has mounted on top of it a 90 tooth bevel ring gear which meshes with the three bevel pinions on top of the rotating base. Frequently, operators inquire about the high points of the teeth on the bevel ring rubbing against the underneath side of the rotating base plate and wearing a groove in it. This also wears away the tops of the bevel gear teeth until there is a flat surface about 1/2" wide. It appears that the only way that this can happen is if the bearings on the bevel pinion shafts get loosened so that the pinions do not mesh as firmly into the bevel ring gear as they should. Then, under an unbalanced load where the gear tooth load is not the same on all three pinions, the one-sided load can tip down the floating gear on one side and tip it up on the other. This then causes the rubbing to take place. It is possible because the floating gear is supported on a single tapered roller bearing that depends on the weight of the floating gear to keep it seated. This wearing of the teeth and the cutting of the groove has never seemed to develop beyond a certain point, and has never seemed to be the cause of other problems.

Proper operation of the two large bearings at the bottom of the rotating base does require proper lubrication. The two grease fittings which feed these two bearings were raised on pipe extensions after it became apparent that on many Scramblers the accumulation of grease and dirt under the covers of the rotating base was so great that many operators were not aware of the grease fittings being where they were. If these two grease fittings on your Scrambler do not have the pipe nipple extensions on them it is suggested that you add them. In addition to getting them up where they can be seen they do help to keep the fittings clean, and therefore are better able to keep dirt and grit out of the bearings.

The pins which connect the rotating base to the bottom sweeps carry the heaviest loads, and when wear develops in any pin holes it is almost certain to show up here first. If these holes get loose, under an unbalanced passenger load the bottom sweep will swing first one way and then the other. When this happens the

pins pound in the joints and cause the holes to wear even faster. Line reaming of these pin holes for oversize pins is a good answer, and the special equipment for doing this is available from Eli Bridge Company. Do not try to ream the holes one at a time; always line ream clear through both sides of the sweep and through both pin connections of the rotating base. If you do not line ream, you may lose the interchangeability of the sweeps, but with line reaming they will still be interchangeable. Oversize pins are stocked by Eli Bridge Company. The 1-1/16" diameter oversize pin is identified by a single groove cut in the side of the pin head, and the 1-1/8" pin has two grooves in it.

ROTATING BASE COVERS, PAINTED. See "Rotating Base".

ROTATING BASE COVER VIBRATION. See "Rotating Base".

ROTATING BASE DRIVE SHAFT BEARINGS. See "Bearings", "Rotating Base".

ROTATING BASE HINGE PIN. See "Rotating Base".

ROTATING BASE WATER CONDENSATION. See "Rotating Base".

RUBBING OF FLOATING GEAR. See "Rotating Base", "Gears".

RUNWAYS BENT. See "Channel Runways".

SAFETY PINS.

The safety pin which secures the locking collar to the bottom end of the unit pole, and holds the bottom sweep in place, is an extremely important piece. Without it, the locking collars can fall off and then the bottom sweep. With the Scrambler turning, a dropping bottom sweep is almost certain to cause structural damage and there is a great risk of injury to passengers. There has been excellent service with these large safety pins, and the only ones which have been replaced, as far as the factory records show, have been those which were damaged in some way other than while the ride was in operation. Do not take chances; if you see any sign that any one of your three safety pins is defective replace it immediately. If it has been bent out of shape, it is questionable whether it should be straightened, because it may have been overstressed when it was first bent, or the straightening process itself might overstress the metal to the point that it could fail when you least expect it. Replacement is the best procedure to follow if the safety pin is damaged.

SAFETY WITH GASOLINE. See "Power Unit".

SEALMASTER SF-47 BEARING. See "Bearings".

SEAL REPLACEMENT IN FLUID COUPLING. See "Power Unit".

SEAT CLEANING. See "Spring Start Up", "Winter Storage".

SEATS. See special section on "SEATS".

SEAT SWEEP CRACKS. See "Seat Sweeps".

SEAT SWEEPS.

Except for worn pin holes, there has been just one other problem with seat sweeps reported to the factory, and this was reported just once. A Scrambler which had had many years of service was checked all over thoroughly. Some of the seat sweeps were reported to have small fatigue cracks in the side channels where the tapered piece is welded to the outer pin connection with the narrow end welded to the vertical web of the side channel. The cracks were said to be along the vertical weld connecting the tapered piece to the channel. Such cracks have never been found in a factory inspection, and apparently these did not show up except under magnaflux testing. The seat sweep is an extremely important structural member, and so it is essential that you inspect every seat sweep regularly to be certain that cracks are not developing as described. To repeat, factory records show this occurring on only one Scrambler; it may have happened to others, but has never been reported.

After years of use, the pin holes do wear, and as the passengers ride in the seats they will be aware of the sweep bumping back and forth as the loads reverse in the sweep. Line reaming the holes for oversize pins will put them back in like-new condition, and the interchangeability of all of the seat sweeps will not be affected if you use the special equipment available from Eli Bridge Company to do the job. Oversize pins are stocked by the factory. Standard pin diameter is 1", and you should not go to 1-1/8" pins until you have first tried line reaming to 1-1/16". Unless the wear in the pin holes is excessively great, the holes should clean up with the 1-1/16" line reamer. The 1-1/16" pins are identified by a single ring machined into the side of the pin head, and a double ring is cut in the head of the 1-1/8" pin.

SERIAL NUMBER. (See also "Rotating Base", "Stationary Base".)

The serial number of the Scrambler can be found in two locations. One is the large cast aluminum nameplate mounted at eye level on the outside of the rotating base. The other location is on the top plate of the stationary base, above and to the right of where the drive unit pins to the base. As you stand on the drive unit and face toward the center pole, there are two pin connections attaching the drive unit to the stationary base. The one to your right is close to the corner of the large six-sided plate that makes up the top of the stationary base. Between the right pin connection and the corner of the plate, and on top of the plate close to the edge, you will find the serial number stamped there. It may be necessary to scrape off paint, dirt, and hardened grease to get to it, but you should find it there.

The serial number, for example 397-73, means that it is the 397th Scrambler to be delivered, and it was delivered in 1973.

Records of ownership are maintained at the factory, and so in order to insure that you get the proper parts when you order be sure that you include the serial number of your ride. There are slight differences between models, and for some parts it will be impossible for the Parts Department to be able to send you the proper parts if the serial number is not known.

SPEEDS.

The Scrambler should never be operated beyond the maximum recommended top speeds: 11.0 revolutions per minute of the center pole when powered by a gasoline engine, and 11.4 RPM of the center pole when powered by an electric motor.

The following table will show what happens to the loads on the structural members when the speed is increased beyond the recommended maximums:

Center Pole RPM	Per Cent Overload
11.0	0%
11.4	7.4%
12	19.0%
12.5	29.1%
13	39.6%
14	61.9%
15	85.9%
16	115.0%

It is obvious from these figures that going above the recommended maximum speeds can very quickly put excessive structural loads on the Scrambler load carrying members, for which they were not designed. Not only is this dangerous to the structure, but of even greater importance it is very hazardous to the passengers. Many persons cannot take the excessive speeds without getting bruises or even broken bones. It has been well demonstrated that excessive speeds are not necessary to get good business with the Scrambler. One Scrambler reportedly carried over one million passengers in a single year, and it was operating at less than the maximum recommended speed.

Owners and operators sometimes inquire about the speeds of various parts of the Scrambler when powered by gasoline engine and by electric motor. The following table lists these speeds.

Location	Allis-Chalmers Gasoline Engine	Ford Gasoline Engine	Electric Motor
Center pole RPM	11.0	11.0	11.4
Unit pole RPM	13.8	13.8	14.3
Spur pinion turning center pole	108	108	112
Brake RPM	108	108	112
Bottom sweep drive shaft RPM	111.6	111.6	115.6
Drive unit drive shaft RPM	357	357	372
Engine truck drive shaft RPM	357	357	372
Engine truck bottom sheave RPM	1071	1071	1115
Fluid coupling no-slip RPM	1320.9	1678	1747

With an electric motor, the sheave size on the fluid coupling is a 6.0" pitch diameter, five-groove, quick-detachable unit for "B" section V-belts. The driven sheave down below is a five-groove, "B" section 9.4" pitch diameter sheave with a 1-1/16" bushing in it. The matched set of belts are 48" long.

With an Allis-Chalmers gasoline engine and the 10.6 Hydrosheave, the same sheave is used on the Hydrosheave as with an electric motor, and the sheave down below is a 7.4" pitch diameter, "B" section, five-groove sheave with the same 1-1/16" bushing. Use 38" V-belts, "B" section, in matched sets of five belts only. With the Ford gasoline engine and the Twin Disc 9.4 HSD fluid coupling, the same 6" pitch diameter sheave is used on the fluid coupling as on the Hydrosheave, and the sheave down below is a 9.4" pitch diameter. With the Ford engine use 46" belts in matched sets. Never use unmatched belts, because there are slight differences in length of belts, and unless they are matched in length each belt will not be carrying its full load, and this will cause some belts to wear out more quickly than others.

Proper output speed from either gasoline engine or electric motor depends on the V-belts properly tensioned so that they do not slip. If your belts are slipping, tighten them by raising the gasoline engine or the electric motor and shimming under the mounts: Never try to stop belt slippage by applying belt dressing.

SPLICED JUMPERS FOR MAST LIGHTS. See "Lighting".

SPLINE SHAFTS. See "Bottom Sweeps", "Rotating Base".

SPLIT-220 VOLT POWER. See "Three-wire Grounded Electrical Wiring".

SPRING MISSING FROM BRAKE LEVER. See "Brakes".

SPRINGS FOR CLUTCH, WORN. See "Bottom Sweeps".

SPRING START UP.

Before you start using your Scrambler in the spring, check it all over thoroughly to make certain that every part is in good condition and is ready for a full season's use.

Check over all of the structural members to see if there are any dents or bends that should be removed, any defective welds that should be repaired, or any places that are hammered and should be smoothed.

Go over all of the pins and grind off any mushroomed ends. Inspect every hairpin cotter or Klik-pin, and replace any that are defective.

Clean off all surplus grease, and be very careful to remove any grease on the brake drums BEFORE THE CENTER POLE IS TURNED, to keep the grease from getting on the brake shoes.

Be sure that all of the big gears are given a good coating of heavy grease that will not throw off. Drain and replace the oil in the engine truck transmission and the gear pot in the stationary base.

Check the V-belts on the engine truck to see that they are in good condition and are tight enough to pull the load. Tighten them by shimming if necessary.

On Scramblers through Serial No. 414, check the oil level in the Hydrosheave by turning it so the arrow is pointing up, and the oil is just ready to run out of the filling hole. Beginning with Serial No. 415, to be sure that the Twin Disc 9.4 HSD fluid coupling has enough fluid in it, it is wise to drain it all out and replace the fluid with 65 fluid ounces (two quarts, plus one fluid ounce) of Fyrquel 150 fire-resistant fluid made by the Stauffer Chemical Company of Westport, Connecticut.

Check the electric rings and brushes, and replace them if they are getting badly worn. Put a little vaseline on the rings to cut down on the wear.

The appearance of the Scrambler structure is very important. Your customers will judge your equipment by its appearance. An attractive, well-painted riding device is bound to attract attention and get the business. Before starting out, give the structure a good coat of aluminum paint. Only six gallons of paint are required to paint the entire structure. Spray painting is recommended, but a very satisfactory job can be done with a brush. There is much more to painting, however, than merely applying the paint. The beauty and durability of a paint job depends primarily on the condition of the surface to which the paint is applied. No paint will give good service if applied to a greasy, dirty surface. Clean all of the steel with low-flammability solvent before applying the aluminum paint. If the old paint is flaking or is blistered any place, scrape these spots down, sand them, and then apply steel primer before putting on the finish coat of aluminum paint.

See the special section on "SEATS", immediately following this section on "GENERAL MAINTENANCE", for suggestions about what to do with your Scrambler seats to prepare them for a full season of use.

Begin the season with your Big Eli Scrambler in top mechanical condition and with an appearance that will make it an outstanding point of interest on the midway.

SPROCKET ALIGNMENT. See "Bottom Sweeps", "Chain Couplings", "Drive Units", "Stationary Base".

SPLINE SHAFTS. See "Bottom Sweeps", "Rotating Base".

SPROCKET TEETH WEAR. See "Chain Couplings".

SPROCKET WEAR. See "Bottom Sweeps", "Chain Couplings", "Drive Units", "Rotating Base", "Stationary Base".

SPUR PINION RPM. See "Speeds".

SQUEAKING SLIP CLUTCH. See "Bottom Sweeps".

STATIONARY BASE.

Quite a few questions are asked about locating the center pole. Should it be set directly on the ground, or should it be raised up by blocking up under the ends of the base legs? Eli Bridge Company recommends only that it be placed directly on the ground, for two reasons: first of all, in order to handle your passengers as quickly as possible the steps on the seats need to be as close to the ground as possible so that the passengers can step directly into them without assistance. Every piece of blocking which goes under the center pole raises the seats the same amount, and increases the difficulty of entering the seats.

Secondly, the total weight on the ground under the center pole is approximately 13,500 pounds. The area of the bottom of the stationary base is 3,118 square inches, and this means that the loading on the ground under the base is 4.33 pounds per square inch. To get the same kind of support by blocking under the ends of the base legs you would have to have pads 23" x 23" under each one. Where operators have "floated" the center in this way they have never been observed to place this large a pad under each base leg. To compare in another way, an average man weighing 175 pounds has shoes, each of which have an area of about 36.8 square inches. When he stands on the ground he exerts a pressure of about 2.38 pounds per square inch. The Scrambler center pole base section exerts a pressure less than twice that of a man. Therefore, it is not worth the effort to "float" the center, because it will not be supported as well as if the stationary base rests directly on the ground.

The ground conditions underneath the center pole will, of course, have some effect on the blocking you might have to use. Concrete or blacktop provide an excellent base. Firm soil or gravel also serve very well. A muddy location might require some kind of foundation under the center pole. Perhaps an easy way to judge this is how your feet sink in as you walk. If they sink in easily, then you might expect the center pole to do the same, although in one case known to the factory, a railroad carnival moved onto a lot so muddy that the wagons, when rolled off the railroad cars, sank not to the axles but to the wagon beds. In order to use the lot, approximately a one foot thickness of sawdust was spread over the entire lot, and the Scrambler was set up on the sawdust. No additional foundation was used under the center pole. The Scrambler operated at that location for a week, with no shifting and no tilting. It was as firm at the end of the week as it was in the beginning. If a Scrambler can be operated with that kind of soil condition underneath, there seems little reason for going to a lot of work to spread out the load any more, or "float" the center.

Another question that arises frequently is whether or not the ride should be leveled. The factory recommendation is that the Scrambler should always follow the slope, so that the seats are all about the same distance from the ground. If you are on sloping ground and you level the ride, some of the seats may nearly touch while others will be so high that no one can climb in them. Going with the slope will enable you to handle your passengers much easier than if the ride is leveled. The bearings in the center pole are substantially oversize, and they can handle the side loads of a non-leveled ride without difficulty. One precaution you must keep in mind is that there must always be clearance between the bottom ends of the unit poles and the tops of the drive units, so when you pick the location for the Scrambler the power unit must be approximately on the same level as the center pole.

In addition to the nameplate on the rotating base, the Scrambler serial number is stamped on the top of the stationary base just to the right of where the drive units connect to it.

The flexible chain coupling that connects the drive unit drive shaft to the pinion casting assembly of the stationary base has given good service. It is a higher speed drive than some others on the Scrambler, and the loading on the coupling is less because of this. As long as the chain is kept lubricated, sparingly but

regularly, and as long as the set screws are kept tight, the coupling will last a long time.

Connecting the coupling chain around the two chain sprockets requires that both of the sprockets be in close alignment. There is a little clearance built into the pin connections where the drive unit attaches to the stationary base, and often the sprockets can be brought into good alignment just by bumping the drive unit to one side or the other. If this still does not get them enough in line, loosen the bolts holding the flangette bearing on the end of the drive unit. There is a little looseness in the bolt holes that will permit a little shifting of the chain sprocket on the drive unit drive shaft. When the two sprockets are in proper alignment, the coupling chain should fold around them easily without any forcing necessary. When connected, the chain should still be free enough so that it can be wiggled from side to side with just the fingers.

Some problems developed with the pinion casting assembly, and they are discussed, along with the way the problems were solved, in the section on "Gears".

The top bearing carriers and the brake bottom bearing carriers all had extensions added to the grease fittings so that they could be seen more readily, and also to help to keep the grease fitting clean.

The problems associated with the brakes are covered in the section on "Brakes".

The 10" diameter pole is "shrunk fit" into the stationary base by cooling it and shrinking it with dry ice. Then when it warms up to room temperature it is a very tight fit in the base. After that the entire assembly is turned upside down and the bottom end of the pole is welded to the bottom plate on the base. There have been a very few cases where this weld has broken through, and this has allowed the center to work itself loose. In a few cases it has turned slightly in the base. The most pronounced thing that is noticed is that the center pole begins to weave back and forth. As the pole works loose it tends to rise up out of the stationary base. When this happens the end loading for the tapered roller bearings disappears, and the pole is no longer tightly restrained. If you see any sign of center pole wobble while the Scrambler is operating, or you observe looseness of the center when you push up and down on a seat that is toward the outside of the operating circle, do not operate the ride and above all do not carry any more passengers until the problem is corrected. The entire rotating base and stationary base should be brought back to the factory for repair. Do not try to do this yourself. This weld breakage has occurred only a very few times in the entire history of Scrambler service, so it really should not be a great concern for you, but you should be aware that on a very few occasions this weld has broken. There has never been a report of injuries or other damage when this has happened.

There is a hardened steel ring underneath the bottom center pole main bearing. It is characteristic of tapered roller bearings that the bearing cone turns slightly on the shaft, and the hardened ring is put there as a wear-resistant surface, so that the tightness of the main bearings will not change because of wear. This ring is keyed to the stationary base with two small vertical pins that are anchored in the top of the

stationary base. Occasionally these pins get broken off. This is no big problem, but if you ever take apart the base section and find these two pins broken off, replace them. Without the pins, the hardened ring can turn on the stationary base, and this then can cause the top of the stationary base to wear away a little since it is not a hardened surface.

The terminal block fastened inside the stationary base has given some problems of burning out, and this is covered in the section on "Lighting".

STATIONARY POLE WELD FRACTURE. See "Stationary Base".

STEPS HITTING BOTTOM SWEEP. See "Bottom Sweeps", "Top Sweeps".

STOP, THROTTLE. See "Power Unit".

STORAGE. See "Winter Storage".

STRAIGHT DRIVE UNITS. See "Drive Units".

STRAIGHT POWER TAKE-OFF SHAFT. See "Power Unit".

STRUCTURAL PAINTING. See "Spring Start Up".

"STUTTERING" SLIP CLUTCHES. See "Bottom Sweeps".

SWEEP BEARING REPLACEMENT. See "Bearings".

SWEEP LIGHT DROPPED. See "Lighting".

SWEEP PIN HOLES WORN. See "Bottom Sweeps", "Seat Sweeps", "Top Sweeps".

SWITCH BOX CAPACITY. See "Lighting".

TEETH WORN OFF ON BEVEL RING GEAR. See "Gears".

TEMPERATURE OF HYDROSHEAVE. See "Power Unit".

TENSION OF V-BELTS. See "Power Unit".

TERMINAL BLOCK BURNOUT. See "Lighting".

THREE-WIRE GROUNDED ELECTRICAL WIRING. (See also "Lighting".)

Definitions:

Conductor: Copper wire, rubber or plastic coated, used to conduct electricity. Bare copper wire is often used for ground connections. Copper tubing or solid bars are used as conductors in high current applications.

Color Code: The rubber or plastic coating on copper wire is often produced in colors for purposes of identification. This permits you to immediately identify a specific conductor even though you cannot see the other end.

Four-wire system: This may apply to a three phase application and include three hot wires and a neutral. It may apply to the three phase application and include three hot wires and a ground. It may apply to a lighting circuit as used on Big Eli products that includes two hot wires, a neutral, and a ground.

Ground: Ground is the electric voltage of the earth. Although a small handfull of "dirt" is not a good conductor, the earth itself will conduct an almost unlimited amount of electricity. People walking about are also at ground voltage. If you touch a conductor that has a voltage different from ground voltage, a current will pass through you to ground. If the current is large enough you will feel a "shock" which can be a light "tingle", or a fatal jolt. Conductors connecting to ground are bare or green.

Hot Wire: A hot wire is one that is connected to a source of voltage different from ground voltage and will provide a flow of electric current to ground or to another conductor at a different voltage. Hot wires may be color coded any color except green or white.

Neutral: A "neutral" is a conductor used to complete the path for current flow from a load (lamp, motor, etc.) back to a power source. It is often at ground voltage, but not necessarily so. It returns to the generator the electric current delivered to the load by the hot wire. It is color coded white.

Single Phase: A source of electric power using two conductors (one hot wire and one neutral). It is most often provided at about 120 volts and is used for all lighting except for special systems.

Split 220: This consists of two hot wires and a neutral. The neutral serves as a return conductor for both hot wires. The voltage between the two hot wires may be 220 volts or 208 volts, depending on the connections at the generator. When using split 220, it is essential that the conductors are color coded, so that you do not connect lighting circuits across the two hot wires. This will apply 220 volts and burn out the transformers, tubes, lamps, etc. The use of split 220 permits you to have two separate lighting circuits with three wires instead of four. It is used because it will handle a given load with fewer pounds of copper wire than an equivalent two-wire cable at 110 volts.

Three Phase: Three separate sources of electric power produced by one generator that may be used together to drive electric motors, or separately for lighting circuits.

Three-wire system: As used in this material, a three-wire system means one hot wire, one neutral, and one ground conductor. The ground conductor is expected to carry current only when there is leakage current to ground from a fluorescent transformer or fixture, or faulty insulation. Its only purpose is to provide a path for current from the equipment to ground, preventing the equipment from becoming "hot".

All of the wiring on recent Big Eli Scramblers is a three-wire system including one hot wire, one neutral, and one ground conductor. The terminal block in the base of newer Scramblers will accommodate either a three-wire system at about 120 volts, or a split 220 volt connection. If the terminal block has only three lugs, do not under any circumstances connect 220 volts to it. The three-lug terminal block is for one hot wire, one neutral, and one ground conductor. It is for about 120 volts only. If the terminal block has four lugs, you can connect two hot wires, one neutral, and one ground conductor (split 220). Be sure you connect to the right terminals.

CAUTION: When using split 220 volts, the incoming power cable may have only three conductors. If so, they will probably be color coded black, white, and green. In this case the green wire will be a hot wire, and must not be connected to the ground terminal on the terminal block, but to the red (rear) terminal. With a split 220 and only three conductors, you will have to provide a "made" ground to connect to the ground lug on the terminal block.

With the three-wire system used within the Scrambler the ground conductor is connected to each light panel, not in the electric circuit but to the panel structure itself. When the incoming connections including an electrical ground are properly made to the terminal block, then the entire structure of the ride will be properly grounded.

If the system does not include an electrical ground, the grounding terminal on the terminal block should be connected to a made ground as described in the National Electrical Code as follows;

250-81 water pipe. A metallic underground water piping system, either local or supplying a community, shall always be used as the grounding electrode where such a piping system is available. Where the buried portion of the metallic system is less than 10 ft. (including well casings bonded to the piping system) or there is some likelihood of the piping system being disconnected, it shall be supplemented by one or more of the grounding electrodes recognized in sections 250-82 and 250-83.

250-82. Other available electrodes. Where a water system as described in section 250-81 is not available, the grounding connection can be made to any of the following:

(a) The metal frame of the building, where effectively grounded.

(b) A continuous metallic underground gas piping system.

(c) Other local metallic underground systems such as piping, tanks, and the like.

250-83 Made electrodes. Where electrodes described in sections 250-81 and 250-82 are not available, the grounding electrodes can consist of a driven pipe, driven rod, buried plate, or other device provided for the purpose of conforming to the following requirements:

(a) Plate Electrodes. Each plate electrode shall present not less than 2 square feet of surface to exterior soil. Electrodes of iron or steel plates shall be at least 1/4". Electrodes of non-ferrous metal shall be at least 0.06" in thickness.

(b) Pipe Electrodes. Electrodes of pipe or conduit shall be not smaller than 3/4" in size and where of iron or steel shall have the outer surface galvanized or otherwise metal coated for corrosion protection.

(c) Rod Electrodes. Electrodes of rods of steel or iron must be at least 5/8" in diameter. Approved rods of non-ferrous materials or their approved equivalent used for electrodes shall be not less than 1/2" in diameter.

(d) Installation. Electrodes should, as far as practicable, be embedded below permanent moisture level. Except where rock bottom is encountered, pipes or rods shall be driven to a depth of at least 8 feet regardless of size or number of electrodes used. Pipes or rods when less than standard commercial length shall preferably be of one piece. Such rods or pipes shall have clean metal surfaces and shall not be covered with paint, enamel, or other poorly conducting materials. Where rock bottom is encountered at a depth of less than four feet, electrodes shall be buried in a horizontal trench, and where pipes or rods are used as the electrode they shall comply with paragraphs 250-83 (b and c) and shall not be less than eight feet in length. Each electrode shall be separated at least six feet from any other electrode including those used for signal circuits, radio, lightning rods, or any other purpose.

250-84. Resistance. Made electrodes shall, where practicable, have a resistance to ground not to exceed 25 ohms. Where the resistance is not as low as 25 ohms, two or more electrodes connected in parallel shall be used. Continuous metallic underground water or gas piping systems in general have

a resistance to ground of less than 3 ohms. Metal frames of buildings and local metallic underground piping systems, metal wall casings, and the like, have in general, a resistance substantially below 25 ohms. It is recommended in locations where it is necessary to use made electrodes for grounding interior wiring systems, additional grounds, such as connections to a system ground conductor, be placed on the distribution circuit. It is also recommended that single electrode grounds when installed, and periodically afterwards, be tested for resistance.

THROTTLE CONTROL. See "Power Unit".

THROTTLE ROD. See "Power Unit".

THROTTLE STOP. See "Power Unit".

THROWOUT BEARING FOR CLUTCH. See "Power Unit".

TIE RODS.

If a tie rod is given reasonable care it will last for a great many years. In time, some of the tie rods will develop substantial wear in the pin holes, but reaming them out for oversize pins, as well as the pin holes to which they attach, will put them back in like-new condition provided the tie rods have been kept well painted and are not deteriorating from rust. The equipment for reaming is available from Eli Bridge Company.

Frequently, Scramblers brought into the factory have tie rods which are bent and never straightened, some broken and re-welded, and occasionally there is a tie rod completely home-made. These tie rods are extremely important structural members. Without every one of them the structure would not hold together properly. A bent tie rod will not fit properly, and will throw the structures out of line. A broken and re-welded tie rod is a very questionable thing, and it is the factory recommendation that a broken tie rod be discarded and replaced with a new one. A home-made tie rod may not be constructed of the same high quality materials used by Eli Bridge Company, and the strength originally designed into the Big Eli product may be missing in the substitute tie rod. Therefore, you are discouraged from trying to make your own tie rods.

All of the tie rods are hollow, and it is easy to paint the outsides, but the insides must be protected also to prevent rusting out from the inside. The best way to paint them is to pour a good grade of liquid primer in one end and let it run out the other. Keep doing this, rotating the tie rod to a new position each time, until you are sure that the entire inside surface of the tie rod has been prime painted.

TIGHT BLOCKING THE BASE LEGS. See "Base Legs".

TIGHT PILLOW BLOCKS. See "Bearings".

TIMKEN BEARINGS. See "Bearings".

TIPPING OF FLOATING GEAR BEARING. See "Gears".

TOOTHED WASHER WEAR. See "Gears".

TOOTH WEAR ON GEARS. See "Gears".

TOP BEARING COVER. See "Rotating Base".

TOP SPEEDS. See "Rotating Base", "Speeds".

TOP SWEEP BEARING FAILURE. See "Bearings".

TOP SWEEP BEARING RETAINER RING. See "Bearings".

TOP SWEEP PIN HOLES. See "Mast".

TOP SWEEPS. (See also "Bearings".)

The most critical problem that has ever shown up on the top sweeps has been the failure of a few Sealmaster SF-47 bearings, which are the large bearings that support each unit pole. This is thoroughly reviewed in the section on "Bearings".

A second problem concerns the change of mesh of the gears at the bottom of the unit pole when this same SF-47 bearing has its spherical outer race turn over upside down while the ride is being transported down the highway. This problem is also covered in the "Bearings" section.

A third problem concerns the shearing off of a pin below the grease fitting of this bearing. See the "Bearing" section.

The pin connections which attach the top sweep to the mast, and the top sweep to the top sweep tie rods, become worn in time, and may require line reaming for over size pins. The equipment for doing this properly is available from Eli Bridge Company.

As wear does develop in all of the pin connections, the whole Scrambler will tend to "droop" lower. Eventually, it may get low enough so that the steps on the seats rub against the tops of the bottom sweeps as they pass over each other. This can be easily corrected by raising up the Sealmaster SF-47 bearing on the outer end of the top sweep. Place shims under the bearing to hold it in its higher position, and re-tighten the bolts holding the bearing. This shimming may then require a change of shims on the bottom sweep SF-47 bearing in order for the proper gear mesh to be maintained. This is thoroughly covered in the section on "Bottom Sweeps".

TRANSFORMERS SHORTING OUT. See "Lighting".

TRANSMISSION GEARS. See "Gears".

TRANSMISSION GREASE LEVEL. See "Power Unit".

TRANSMISSION NOISE. See "Power Unit".

TUBS. Referred to as "Seats".

TURNBUCKLE FOR BRAKE CABLE. See "Power Unit".

TURNED DOWN UNIT POLE SHAFT. See "Unit Poles".

TURNOVER OF BEARING. See "Bottom Sweeps", "Top Sweeps".

TWISTING THE GABLE LIGHT PANELS. See "Lighting".

UNIT POLE BREAKAGE. See "Unit Poles".

UNIT POLE, CROOKED. See "Unit Poles".

UNIT POLE GUSSET PLATES. See "Unit Poles".

UNIT POLES.

Several years after the Scrambler went into service, an owner contacted the factory about a crooked unit pole on which the 90 tooth bevel ring gear fastened to it went in and out of mesh with the bevel pinion on the bottom sweep as the ride turned. This was the first such report and a factory representative went there to inspect the Scrambler. What had happened was that the unit pole had broken in two right above the four triangular plates at the lower end of the unit pole. The owner had had it re-welded, but the person who did the work did not get the two parts straight, and the pole ended up crooked.

The owner was advised to replace the pole, since straightening it did not seem to be a practical thing to do. However, Eli Bridge Company's principal concern was the breakage of the unit pole in the first place. In the design work on the Scrambler this location where the pole broke was one that received a great deal of attention and analysis, because it was determined to be one of the more highly stressed areas on the Scrambler. In addition to Eli Bridge Company analysis, the structure was proof tested by an outside consulting engineer, and his conclusion was that IF THE SCRAMBLER WAS OPERATED AT OR BELOW THE MAXIMUM SPEEDS RECOMMENDED BY THE MANUFACTURER THE STRESS LEVEL AT THIS LOCATION ON THE UNIT POLE WAS LOW ENOUGH TO BE NO PROBLEM. Therefore, on the basis of this proof test, it could be concluded that where a unit pole broke at this location it could be caused only by overspeeding.

The factory received reports of this kind of breakage on four unit poles over a period of a couple of years. At the time there were about 300 Scramblers in service, and so this meant that about four out of 900 unit poles were reported to have broken. It was felt that, because of the potential danger to the passengers, a design change was necessary to eliminate the problem. Gusset plates were developed to bridge over this higher stressed area, and the design was reviewed by the same firm of outside consulting engineers. With their approval of the design change, these

gusset plates, along with instructions for installing them, were sent at no charge to every Scrambler owner. Since the addition of the gusset plates, there have been no reports of unit pole breakage. Some owners were very slow about installing the gusset plates, and perhaps there are some Scramblers which still do not have them on the unit poles. If your Scrambler is not equipped with the gusset plates, get them on. If, for any reason, you do not have them to put on, contact the factory and they will be furnished to you at no charge if you have never previously received a set of the gusset plates. Otherwise, if you lost them you will be charged for the direct cost of making them, but it is very important that there be four of these gusset plates on every unit pole.

The mesh of the gear teeth on the 90 tooth bevel ring gear with the bevel pinion teeth requires that the unit pole be located in its proper position in relation to both the top sweep and the bottom sweep. Occasionally operators call the factory to find out why the two gears do not mesh at all, but are separated from each other so far that the ring gear passes completely above the bevel pinion. This is a very simple problem to correct. What has happened is that the spherical outer race of the Sealmaster SF-47 ball bearing pillow block on the outer end of the bottom sweep has turned over upside down. When this happens the sweep drops down farther on the unit pole and this causes the two gears to move away from each other. Turn the bearing over by levering it with a board, but be sure that the spherical outer race of the bearing is pivoted about the grease fitting, because there is a small pin under the grease fitting that keeps a hole in the race lined up with the grease fitting.

The mesh of the gears can also be affected when the Sealmaster SF-47 on the outer end of the top sweep is shimmed to a higher level to eliminate the seat steps dragging on the bottom sweep. The section on "Bottom Sweeps" covers the adjustments necessary when this occurs.

One Scrambler returned to the factory for service had had the ends of the unit poles machined down to a smaller diameter so that they could be used in smaller bearings in the top and bottom sweeps. This is a very dangerous practice. The sizes of all structural members and bearings on the Scrambler have been determined by structural analysis, and for an owner or an operator to reduce the size of a critical structural member or use a smaller bearing without even consulting the factory is a very foolhardy procedure. Do not do it.

It is inevitable that in time the pin holes on the unit poles will become worn and enlarged. There are 20 pin holes on each unit pole, and experience indicates that all of them may, in time, have to be enlarged for oversize pins. Do not try to do this without first obtaining the proper equipment from the factory so that all holes can be line reamed. You can go to either 1-1/16" or 1-1/8" diameter pins, but it is advisable to try to get by with 1-1/16" diameter first, and usually this will be quite enough to put the holes back in first class condition. Naturally, the holes reamed out on the unit poles must be matched by similarly reamed holes on the structural members which attach to them. The 1-1/16" pins are identified by a single ring cut in the side of the pin head, and the 1-1/8" diameter pins have two rings in the head.

UNIT POLE SHAFT, REDUCED IN SIZE. See "Unit Poles".

V-BELT GUARD. See "Power Unit".

V-BELTS REQUIRED. See "Speeds".

V-BELT TENSION. See "Power Unit".

VIBRATION OF DRIVE UNIT FLOOR. See "Drive Units".

VIBRATION OF ROTATING BASE COVER. See "Rotating Base".

WASHER WEAR IN PINION CASTING ASSEMBLY. See "Gears".

WATER IN ROTATING BASE. See "Rotating Base".

WEAR OF GEAR TEETH. See "Gears".

WEAR OF SPROCKET TEETH. See "Chain Couplings".

WEAR RATE IN PIN CONNECTIONS. See "Pins and Pin Holes".

WEAVING OF CENTER POLE. See "Stationary Base".

WEIGHT CARRIED BY CENTER POLE. See "Stationary Base".

WELD FRACTURE OF STATIONARY POLE. See "Stationary Base".

WET BALLASTS. See "Lighting".

WHEELS FOR DOLLIES. See "Dollies for Center Pole".

WINCH.

The winch gives generally good service if it is not mis-used. A few owners have ordered replacement drum shaft gears. This is the large gear that is attached to the winch drum itself. It gets broken or has teeth knocked out when extra heavy loads are put on it. One of the ways the winch can be overloaded is by not keeping the slack out of the cable when the center pole base section is headed down the ramp. When the base section rolls over the top and starts down the ramp it will hit the winch cable with a terrific jolt if there is slack in the cable. This can cause the cable to break, to pull out the end connection on the cable or break teeth out of the gear if the pawl is engaging gear teeth at the time.

Very likely some of the overloading that occurs on the winch is caused by its being used for jobs other than handling the Scrambler parts. It is to be expected that a winch would be needed from time to time around a carnival lot, but from the factory position there is no way to anticipate the kind of loads that might be put on a winch in this way.

In a few cases owners have purchased winchs and mounted them on the trailers themselves. This has not always been done correctly, and the mounting has not always been able to withstand the loads put on it. Any time you wish to mount a winch yourself, consult the factory for information about the porper way it should be done.

WINCH CABLE BREAKAGE. See "Winch".

WINTER STORAGE.

Many Big Eli Scrambler rides are located in amusement parks, and they are left up throughout the year. It is advisable to remove the seats and light panels, and place them in storage, because these parts will be most affected by winter weather.

Electric motors power most Scramblers in parks, and it would be a good idea to move the motor into storage also. However, if it is left out, it should be well protected from the weather. Where paint has been chipped off, the rust should be sanded off and the bare metal given a coat of engine enamel to protect it. All steel that is not to be painted should be given a good coat of grease to help prevent it from rusting.

Sand off any rust throughout the structure of the ride, and touch up the spots with primer to minimize rusting.

Put a heavy coating of grease on the pins and pin connections to keep out water, to keep rusting to a minimum, and to make the pins easy to remove in the spring.

Be sure that all bearings have been given a good lubrication.

The tops of the unit poles and their bearings should be covered.

Remove all coupling chains and store them in a closed can of light oil or kerosene. This will keep the chains lubricated and flexible. Coat plenty of grease on the chain sprockets to hold down rusting. With the chains removed, the unit poles will have to be tied down to keep them from "windmilling".

It is important that the brake drums be protected from rusting, and while greasing the brake drum surfaces will give good protection from rusting, it is very important that the grease not get on the brake shoes. A better procedure would be to cover them thoroughly with a waterproof cover.

The seats should be thoroughly cleaned whether they are left on the ride or placed in storage. It will be much easier to remove any dirt that is on them if it is done while the dirt is fresh. Also, the aluminum finish will be preserved much longer if dirt and grease are cleaned off the seats regularly.

If the Scrambler is a portable one, it will very likely be stored in a trailer, and so in general it will be better protected than one in a park. The same kind of attention should be given to all parts of the ride as outlined above.

If a gasoline engine power unit is used with the ride, the radiator and engine block should be drained to prevent freezing. It is also a good idea to drain the gasoline from the tank and carburetor. Gasoline will gum up if allowed to stand for a long period of time.

WIRING, THREE-WIRE GROUNDED. See "Three-wire Grounded Electrical Wiring".

WOBBLE OF CENTER POLE. See "Stationary Base".

WORN BRAKE DRUM. See "Brakes".

WORN CLUTCH SPRINGS. See "Bottom Sweeps".

WORN PIN HOLES. See "Bottom Sweeps", "Drive Units", "Mast", "Rotating Base", "Seat Sweeps", "Top Sweeps", "Unit Poles".

WORN OFF BEVEL RING GEAR TEETH. See "Gears".

SEATS

INTRODUCTION

Your Scrambler seats have been designed and built using advanced techniques developed by the aircraft industry as well as other industries to produce a high strength, low weight structure. They are precision built devices and need reasonable care to keep them in safe and attractive condition. Of all the parts of a ride, the seats are observed most closely by the public, and you should pay particular attention to the condition of the seats.

Handle the seats carefully because the aluminum has a very fine finish which is easily damaged. Scratches cannot be removed, so it is best to keep the scratches from getting on the seats in the first place.

The major strength of the Scrambler seat is in its aluminum sheet "skin" covering the outside and the inside. This is referred to as a "stressed skin" type of construction, and it produces a structure of maximum strength and maximum stiffness, for a minimum of weight. This kind of construction is widely used in many industries, such as aircraft, boats, and certain kinds of house trailers. It is well recognized for its efficient use of materials to produce high quality structures. It does require, however, reasonable maintenance to preserve these favorable characteristics, and the stressed skin construction of the Scrambler seat is no exception. Badly worn or missing rivets, or holes punched or worn in either the outside or inside "skins" reduce the strength of the seat. A properly maintained Scrambler seat must have all holes repaired with proper stressed skin type of patches that will replace the strength lost in the holes and that will prevent the growth of cracks that may be associated with the holes. Furthermore, all worn or missing rivets must be replaced. The strength of the seat depends on this being done.

The Scrambler seat, if given reasonable maintenance, can give year after year of excellent service, if the Scrambler is not operated beyond the maximum factory-recommended speeds of 11.0 revolutions per minute of the center pole when powered by a gasoline engine, and 11.4 RPM with electric motor. How does speed affect the seat? Assume, for example, that there are three 200 pound people in the seat. As the ride turns, the forces act to push the passengers to their right against the side of the seat. The seat is designed to withstand these forces safely within the maximum speeds set by the factory. The following table will show how the load against the side of the seat, because of these three people, increases as the speed of the center pole is increased:

Center Pole RPM	Total Load Against the Side of the Seat
11.0	695 pounds
11.4	746
12.0	826
12.5	897
13.0	970
14.0	1,126
15.0	1,292
16.0	1,469

If the seat structure is designed to withstand safely a load of 746 pounds and the ride is overspeeded so that the load is actually 1,469 pounds, this is not wise or safe use of the equipment. It can also be vary hazardous to the passengers. For example, at 16 RPM each 200 pound person pushes to his right with a force of 490 pounds. Many people cannot withstand forces of this kind. The seat structure will be subjected to forces and deflections that may render some of the built-in safety features ineffective. Overspeeding is doubly dangerous when the seat structure is not safely maintained. Never operate the Scrambler faster than 11.0 RPM with gasoline engine, or 11.4 with electric motor.

These suggestions for the care of your Scrambler seats are based on observations made by factory personnel, and calls and letters from owners and operators.

ADJUSTING HANDLEBAR. See "Spring Start Up".

ADJUSTMENT OF STRIKER. See "Handlebar".

AIR-LOC BREAKAGE. See "Footbottom".

AIR-LOC LOADS. See "Footbottom Straps".

AIR-LOC RECEPTACLE REPLACEMENT. See "Seat Body Structure".

AIR-LOC RECEPTACLES. See "Footbottom", "Step".

AIR-LOCS. See "Spring Start Up".

AIR-LOC STUD. See "Step".

ALUMINUM HANDLEBAR. See "Rubber Bumpers and Pads", "Handlebar".

ALUMINUM PIN CONNECTIONS, CORRODED. See "Seat Body Structure".

APPLICATION OF DECALS. See "Decals".

AUTOMATIC CLOSING OF HANDLEBAR. See "Rubber Bumpers and Pads".

BACK BLOCK. See "Wood Blocks".

BACK SHEET. See "Seat Body Structure".

BANGING SEAT. See "Seat Body Structure".

BENT LAP BAR. See "Lap Bar".

BOTTOM SWEEPS HIT BY STEPS. See "Step".

BOWED LAP BAR. See "Lap Bar".

BRASS SLIDING BOLT. See "Handlebar".

BUMPER FOR HANDLEBAR. See "Handlebar", "Rubber Bumpers and Pads".

BUMPER ON FOOTBOTTOM. See "Rubber Bumpers and Pads".

BUSHINGS, NYLON. See "Handlebar".

CAUTION DECAL. See "Decals", "Handlebar", "Spring Start Up".

CEMENTED UPHOLSTERING. See "Cushions".

CLEANING THE SEATS. (See also "Spring Start Up".)

In portable service it is quite difficult to keep oil, grease, and dirt off your equipment. However, after the ride is set up there is no reason why it cannot be cleaned.

Dirt and grease can be removed with a mild soap and water followed by a clear water rinse. Only a soft polishing cloth should be used because a coarse cloth will scratch the aluminum. Do not polish with a circular motion, but move back and forth in straight lines. If any scratches do develop they will be less noticeable when the polishing is done in this way rather than when a circular motion is used. If the aluminum surface becomes dull and oxidized it can be brightened by polishing with Never Dull Aluminum Polish, which is available from Eli Bridge Company.

Clean the upholstery with mild soap and water. Always keep dirt and trash out from under the seat cushion, because it causes rapid wear of the aluminum "skin" beneath the cushion board.

The plywood board in the footbottom can be removed for cleaning. There are two holes in the footbottom that are covered by the board, and they are there to make it easier for you to brush out any dirt or trash that accumulates in the footbottom.

CLEARANCE IN PIN CONNECTIONS. See "Seat Body Structure".

CORRODED PIN CONNECTIONS. See "Seat Body Structure".

CRACKED SEAT RIBS. See "Seat Body Structure".

CRACKS AROUND STRIKER. See "Seat Body Structure".

CRACKS IN FRONT RIB. See "Seat Body Structure", "Spring Start Up".

CRACKS IN TOP BACK TRAY. See "Seat Body Structure".

CUSHIONS. (See also "Spring Start Up".)

The earliest Scrambler seats had no pad on the right side, no upholstered sheet across the back, and the seat cushion was of flat construction so that the front edge of the cushion was no higher than the back. The first change was to raise the front edge of the seat cushion. This was suggested and tried out by the first Scrambler owner, and it was found to be a very worthwhile change. It greatly improved the ride characteristics, and gave a much greater feeling of security to the passengers. The second change was the introduction of the upholstered cushion on the right end. The motion of the Scrambler slides the passengers to their right, and there were some reports coming back to the factory of passengers who were not able to withstand these forces very well. The pad was made so that it could be added to earlier models which did not have it, and since its introduction there have been practically no reports of passengers having any more difficulties of this kind. The upholstered back sheet was developed because the bare aluminum sheet made black marks on people's clothing as they slid along the seat, and the upholstery material stopped that. Also, the bare aluminum could get very hot in the summer sun, and this upholstery material helped to hold down the temperature.

The seat cushion itself has gone through several modifications, but any of the designs will fit any Scrambler seat. The original padding was quite soft, compared to the present construction. The softer construction allowed the covering material to fold over in wrinkles, and then eventually the wrinkles would cut through. The firmer construction used at present has the padding material cemented to the wooden frame underneath, and then the upholstery material is cemented on top of that. In this way, the entire pad acts together, with no parts sliding over each other.

This cushion design has been subjected to a great deal of testing, and it is made the way it is so that it will be able to withstand the punishment it must take as the Scrambler operates. Frequently, cushions are brought into the factory, or are examined by factory representatives on the spot, and they are found to be of entirely different construction than that used by Eli Bridge Company. Do not change the design. Do not use a different kind of padding or cushioning unless you first consult with the factory. Do not fasten new material over the old without completely cementing the new to the old. A substantial part of the security of the passenger is due to the firmness of this seat cushion. A loose, soft cushion can be hazardous to the passengers.

Sometimes operators make their own wooden frame for the seat cushion. If this is not made correctly it may wear holes in the inside skin quickly, because it does not fit the interior of the seat properly.

Where the upholstery material is folded around the wooden frame, it is sometimes stapled so that the heads of the staples stick out against the inside skin. These staple heads can wear into the inside skin also.

The seat cushion needs the small aluminum lip which sticks out of the bottom edge of the front side. Cushions are often found where this lip is completely worn away. Without this lip to fit under the edge of the footbottom, the seat cushion is not properly held in position. In most circumstances the cushion will remain where it is supposed to be, even if the retaining lip is not there, but there are conditions that can develop where the

cushion can move forward toward the footbottom, and this can be very frightening to passengers who may be riding at the time. Therefore, do not operate the ride unless every seat cushion has the lip on the front edge, and every one is under the lip of the footbottom.

For safety, every Scrambler seat should have a seat cushion in good condition and properly restrained by the footbottom, an upholstered end pad, and an upholstered back sheet.

DAMAGE TO OUTSIDE SKIN. See "Seat Body Structure".

DECAL, "CAUTION". See "Handlebar", "Spring Start Up".

DECALS. (See also "Spring Start Up".)

The decals prepared for use on Scrambler seats add a great deal to the attractiveness of the ride, if they are properly applied and maintained. Complete directions for applying these decals, along with a squeegee, are supplied when decals are ordered. Formerly Eli Bridge Company supplied varnish-applied decals, but in response to numerous requests from customers all orders are filled with pressure-sensitive, die-cut vinyl decals, requiring no varnish. The directions are as follows:

DIRECTIONS FOR APPLYING BIG ELI PRESSURE-SENSITIVE DECALS

1. Clean off the surface where the decal is to be applied, using Tide detergent and water. Rinse with clear water.
2. Add a handfull of Tide detergent to a five-gallon bucket of water. This will be used for conditioning the decal so it can be properly positioned.
3. Carefully strip off the backing from the decal. Take care that you do not stretch or tear the decal. After the backing has been removed, do not let the sticky surface fold over on itself or it will stick so tightly that the decal will be destroyed in trying to separate it.
4. Place the decal, sticky-side up, on a flat surface and sponge the sticky surface thoroughly with the Tide detergent and water solution prepared in step 2. The Tide solution provides lubrication so that you can shift the decal a little on the seat as you position it in place. Without the Tide solution, the decal will stick to whatever it touches and it cannot be moved.
5. Carefully place the thoroughly wetted decal on the seat. When it is properly positioned, squeegee the decal, beginning at the center and working all air bubbles and water out toward the edges.
6. The decals that go on the ends of the seats are die cut to fit over the rivet heads, and so they must be very carefully located.
7. This completes the installation of the pressure-sensitive decals.

Old decals can be removed with paint remover.

Some operators have reported that the decal on the footbottom wears off where it touches the seat cushion after the footbottom is folded. Others have reported that this will not happen if the decal and the seat cushion are dry when the footbottom is folded up.

The most important decal is the one on the back of the handlebar, which says,

"CAUTION: While Scrambler is in motion:
-Keep handlebar closed
-Do not stand up"

Every seat must have this information in full view of the passengers. Unless this information is where they can read it, you are not giving the passengers proper warning. If the decal is missing or un-readable, and the passengers open the handlebar and stand up, then you have not given them proper warning. Never carry passengers on the Scrambler unless every handlebar has this decal on it.

DECAL VARNISH. See 'Decals".

DECAL WEARING OFF OF FOOTBOTTOM. See 'Decals", "Footbottom".

DROPPING FOOTBOTTOM. See "Footbottom".

DRY STORAGE OF SEATS. See "Winter Storage".

END PAD. See "Cushions".

END PLUG FOR HANDLEBAR. See "Handlebar".

FLAT CUSHION. See "Cushions".

FLOORBOARD. See "Cleaning the seats", "Footbottom", "Spring Start Up".

FOOTBOTTOM.

The main structure of the footbottom has given good service through the years, but there have been some problems with some of the details of construction.

The end where the step is located has held up well, except for occasional problems with the Air-Loc quarter-turn fastener which connects the step to the footbottom. In some cases the Air-Loc stud wears an oversize hole in the step, and then it falls out and is lost. In others the Air-Loc receptacle on the footbottom gets broken. The receptacle is easy to replace, because it just involves installing two rivets. If the Air-Loc stud is lost from the step because the hole is too big, a patch with a smaller hole must be riveted to the step, and then a new Air-Loc stud with crosspin is installed.

The other end of the footbottom has had more problems. The earliest one was cracking of the flange of the end piece right where it joined the long angle across the top of the footbottom. A tapered piece was developed to spread the load more at that joint,

and this has generally been successful, but occasionally there are footbottoms which have cracks somewhere in this corner in spite of the corner reinforcement. If this tapered reinforcement, or parts to which it is attached, show any cracks or any rivets missing, repair or replace the cracked piece, or if only rivets are missing replace the rivets. It is important that this corner be structurally sound, because as the passengers enter and leave the seat they tend to twist the footbottom as they put their weight on the step, and if the corner is cracked in any way the twisting will tend to make the cracks grow larger and longer. The time to correct the situation is before a real structural problem has developed.

A second problem on that end of the footbottom concerns where the long strap is attached. The hole tends to get larger, and sometimes cracks develop around that corner. If you find any cracks, contact the factory for recommendations as to what should be done. It will help the factory to make proper recommendations if you could send along a picture to show what you have found, or if you cannot get a picture make a small sketch. The more you can describe what your problem is, the easier it will be for the factory to help you.

Frequently footbottoms are found where the lip which hangs up over the edge of the seat is almost completely worn away. Without this lip, there is nothing to hold up the footbottom except for the two Air-Loc quarter-turn fasteners which lock the footbottom to the front of the seat. If these fasteners are also missing, then there is great risk of the footbottom dropping down where it can strike the bottom sweep. This can be very hazardous to anyone riding in the seat. For safety, you need the retaining lip in good condition and hanging over the edge of the seat, and also you need both Air-Locs in good condition and fastened to the front of the seat. Here again it is recommended that you contact the factory for advice on how to solve the problem. Factory records show that on at least one occasion a Scrambler seat did not have the lip on the footbottom, did not have either Air-Loc holding the footbottom to the seat, and the footbottom did drop down to where it was hit by the bottom sweep. And there were people riding in the seat. Do not take chances; the footbottom must be firmly anchored in position.

The wooden board in the footbottom takes a lot of the punishment that would otherwise be inflicted on the aluminum skin underneath. It is a simple board, and as it wears out or rots out it can be lifted out and replaced easily. Without the board in place, it is common to find footbottoms badly buckled downward where the passengers have stood or braced their feet. This is particularly true where women have small heels on their shoes; such shoes exert great pressure and the wooden board needs to be there to distribute the load. Lifting up the board discloses two holes in the aluminum skin, which were put there to make brushing out the interior easier.

The decal on the front of the footbottom is reported to wear off rather rapidly where it touches the seat cushion after the footbottom is folded up into the seat. However, other operators say that this will not happen if the decal and cushion are both thoroughly dry before the seat is folded.

FOOTBOTTOM DROPPING. See "Footbottom".

FOOTBOTTOM FLOOR. See "Cleaning the Seats", "Footbottom", "Spring Start Up".

FOOTBOTTOM LIP. See "Footbottom".

FOOTBOTTOM REINFORCEMENT. See "Footbottom".

FOOTBOTTOM RUBBER BUMPER. See "Rubber Bumpers and Pads".

FOOTBOTTOM STRAPS. (See also "Footbottom".)

Each seat assembly has two footbottom straps which permanently connect the footbottom to the seat shell, and also act to locate and position the footbottom in the operating position and in the storage position. It is necessary for the holes at the ends of the straps to be exactly the right distance apart for the footbottom to position properly for operating. If the holes become worn and elongated, too much load is placed on the Air-Loc fasteners which anchor the footbottom to the front rib. Then with the weight of passengers getting in and out, the Air-Locs will be damaged, or the front rib of the seat may be damaged, or both. If this should happen, the fastening of the footbottom to the seat becomes uncertain and dangerous.

The straps are connected to the seat shell by 3/8-24 cap screws threaded into anchor nuts. The anchor nuts are attached to reinforced areas of the inside skins. In removing and replacing the cap screws from these anchor nuts, be careful not to cross thread or otherwise damage the nuts. Replacement of these anchor nuts requires opening up the outside skin, which is a difficult job.

The straps are attached to the footbottom with 3/8-24 cap screws and self-locking nuts.

It takes only a few moments to determine whether the holes are worn. If they are, and the footbottom does not fit up snugly against the front rib, then replace the footbottom straps.

FOOTBOTTOM TWISTING. See "Footbottom".

FRAME FOR SEAT CUSHION. See "Cushions".

FRONT RIB CRACKS. See "Seat Body Structure". "Spring Start Up".

FUNCTION OF WOOD BLOCKS. See "Wood Blocks".

GREASING GEARS TO REDUCE SEAT RUMBLE. See "Seat Body Structure".

HANDLEBAR.

Early Scramblers were fitted with welded steel handlebars, and some of them are still in service. There were two significant problems with the steel construction. One was the difficulty of maintaining a painted surface where the passengers rubbed their hands as they held on, and the second was the accumulation of moisture inside the hollow part of the handlebar. The moisture caused rusting of the interior, and as the ride operated the rusty water would sometimes come out on the passengers.

The aluminum handlebar construction eliminated both problems. It was ruggedly designed and has given excellent service since it was first introduced. In a very few cases the roll pins which connect the handlebar hinge blocks to the handlebar itself have become a little loose. Whenever looseness develops in this connection of the handlebar hinge plug to the handlebar it is the factory recommendation that the handlebar be replaced, or at least be sent back to the factory to see whether or not it can be salvaged. This is an extremely important connection, so do not take chances with it.

Basically the same handlebar latch (or lock) and striker set has been used since the Scrambler was first introduced, although there has been considerable modification. After the first year, the striker was changed to the next larger size in order to make adjustment easier. The pin for the latch handle was replaced with a bolt and self-locking nut. The sliding bolt in the latch was changed from a rounded end to a 45 degree beveled end, and the material was changed from brass to malleable iron for better wear. There had been a hole through the latch body for installing a padlock to prevent opening of the latch, but it was found that this hole could actually prevent the latch from closing, particularly after some wear had developed in the sliding bolt and where it slid in the latch body, and so the hole in the latch body was discontinued.

The handlebar striker is adjustable in and out. It should be set so that when the handlebar is closed gently without slamming it will still latch completely. The striker is held by a screw on the outside and another on the inside. If you do any adjusting of the striker be sure that the screws are thoroughly tightened when you are through, because loose screws could work out, the striker could fall off, and there would then be nothing to hold the handlebar shut. This could be extremely hazardous for your passengers, so be sure that these screws are always tight. A properly adjusted striker should be such that when the handlebar is closed there is still a very small amount of play between the rubber bumper on the back of the handlebar and the front of the seat.

The handlebars are all adjusted to latch properly at the factory. However, after a great deal of use some adjustments may be necessary. The latch should be slightly below center on the striker. If it is not, then loosen, but do not remove, the eight socket head cap screws on the hinge end of the handlebar. Position the latch in the striker and hold it there while you tighten the cap screws. The handlebar hinge pins turn in nylon bushings and should always be kept in good working condition or replaced.

Warning: If the handlebar is permitted to droop because of misalignment or worn nylon bushings, the sliding bolt will not be able to enter the striker cavity, and then will not latch, creating the hazard of an unlocked handlebar. Do not operate the Scrambler in this condition.

THE HANDLEBAR LOCK AND STRIKER TAKE A GREAT DEAL OF PUNISHMENT, AND AS A RESULT, SOME WEAR WILL SHOW UP IN THE MATING PARTS. UNRELIABLE LATCHING IS DANGEROUS. IF THE HANDLEBAR FAILS TO LATCH OR BECOMES UNLATCHED, THE PASSENGER WILL FEEL INSECURE. HE MAY LEAN FORWARD OR STAND UP, EXPOSING HIMSELF TO THE DANGER OF BEING THROWN FROM THE SEAT. INSPECT YOUR HANDLEBAR LOCKS CAREFULLY. REPLACE THEM WHEN THEY CAN NO LONGER BE ADJUSTED TO FUNCTION SAFELY.

The Scrambler seat is secured to the rest of the ride by the three pins on one side of the seat. As the ride turns, the forces which act on the seat cause it to flex slightly. The sliding bolt must engage the striker a minimum of 1/4" (one-quarter of an inch) for the latching of the handlebar to be safe, and this assumes also that the entire Scrambler seat is properly maintained, that no rivets are missing, that all holes are properly reinforced with stressed skin type patches, and that the Scrambler is not operated beyond the maximum speed for which it was designed (11.0 RPM of the center pole when powered by a gasoline engine, and 11.4 RPM with an electric motor).

It is very easy to check the amount of engagement. With the handlebar closed and latched, draw a pencil line on the front surface of the sliding bolt right next to the striker. Open the handlebar and measure the distance between the pencil line and the end of the sliding bolt.

Any time the length of engagement measures less than 1/4" then you should replace the handlebar lock. In the event that the seats are structurally sound and new, but the locks do not provide or exceed the minimum engagement, notify the factory immediately. Under no circumstances should you carry passengers in seats having less than minimum engagement.

Sometimes the bolt assembly wears in such a way that the sliding bolt extends out too far. If this happens to such an extent that the beveled face goes past the roller, permitting the flat surface of the bolt to strike the roller, both the lock and the striker can be damaged. Replace any lock in this condition.

The roller in the striker assembly should turn freely on its shaft. Sometimes a drop of oil will help to free a tight roller. If a tight roller can not be loosened up, it will cause rapid wear and should be replaced before it ruins the lock as well. Never carry passengers in a seat where the striker has no roller. Replace the striker first. Replace it also if the sides of the striker are badly bent out of shape, or worn and cut by the sliding bolt hitting because it was mis-aligned. Beginning with Serial No. 415, a 5/16" thick spacer has been added under the striker so that the roller pin lies within the sides of the striker, to prevent the pin from working out of the roller. These spacers can be added to any Scrambler seat beginning with Serial No. 17.

REMINDER: Proper latching is essential for safe operation. If you are unsure about any problem, consult the factory.

The handlebar must be prevented from swinging up and over center, so that it swings back and hits the seat sweep tie rod. The rubber handlebar stops do this if they are in good condition, but if they get cut or worn they will not be able to resist the handlebar swing, and as it swings back toward the tie rod it will bear against the heads of the screws which hold in place the two rubber handlebar stops. Without the rubber to act as a cushion and spring, the handlebar will strike the screws and drive them into the seat, tearing out the threaded fasteners inside the seat. Once they are torn out there is no way to repair them without completely taking apart the seat structure. Therefore, it is very important to keep the rubber handlebar stops in place and in good functioning condition

The rubber bumper in the other end of the handlebar should be examined for damage, but since it first began to be used there has never been a report of trouble with it.

The hollow aluminum extrusion that makes up the top and bottom members of the handlebar has a round aluminum plug fastened in the end next to the latch on Scramblers through Serial No. 414. Occasionally, handlebars are seen with one or both of these round plugs missing. They should be replaced, because of the greater risk of someone getting hooked or snagged in the open tube, as compared with the closed, rounded end when a plug is there.

The lap bar assembly must be firmly attached to the back of the handlebar. Some of the screws occasionally work loose and fall out. In order for the lap bar to function properly, all screws must be in place and firmly tightened. There should be two small round rubber bumpers on each lap bar hinge block.

BE SURE A COMPLETELY READABLE "CAUTION" DECAL IS ON THE BACK OF EACH HANDLEBAR.

In 1973 the State of California required that there be a secondary latch on all Scrambler handlebars. This was developed and made available as a modification kit. After these secondary latches had been in service for nearly two seasons the Scrambler owners were asked for comments. The response was quite favorable, and because of that and because the secondary latch offers an additional measure of safety, the secondary latch was installed as standard equipment on all Scramblers beginning with Serial No. 415, and can be adapted to any earlier Scrambler equipped with aluminum handlebars.

HOLES FOR DIRT REMOVAL IN FOOTBOTTOM. See "Footbottom".

HOLES IN INSIDE SKIN. See "Seat Body Structure".

HOLES WORN IN STRAP. See "Footbottom Straps".

INCLINED CUSHION. See "Cushions".

INSIDE SKIN. See "Seat Body Structure".

INSTRUCTION FOR APPLYING DECALS. See "Decals".

KIT FOR TOP BACK TRAY MODIFICATION. See "Seat Body Structure".

LAP BAR. (See also "Spring Start Up".)

The most common thing that shows up on the stainless steel lap bar is that it gets bent out of shape. This is surprising in view of how difficult it is to bend the ends of the lap bar when it is being manufactured. This bowing of the long straight section does not seem to affect the function of the lap bar, but it does cause some interference in the hinged ends. The aluminum parts rub on each other when this happens, and sometimes the wear is substantial.

The small rubber mushroom bumpers, for cushioning the lap bar to keep it from striking the handlebar in both the up and down positions, do not seem to stay in place very well. It is not known whether these bumpers just do not stay where they are supposed to or whether the passengers pick them off. There is not a great problem if these bumpers are missing, although eventually the lap bar may wear a hole through the handlebar where it is hit, and so it is advisable to keep these rubber bumpers on the lap bar. There are two of them on each end of the lap bar.

On the first lap bars that were delivered the pieces that were bolted to the handlebars had through-bolts with self-locking nuts on them. It was found that occasionally passengers would pinch their fingers because of the nuts being where they were, and so the design was changed so that the screws are threaded into drilled and tapped holes in the blocks. This is not as positive as the self-locking nuts were, and it is necessary to check these screws frequently to be certain that they are pulled tight. If part of these screws get lost, the lap bar could fall off. Therefore, since the lap bar is an essential piece of safety equipment, it is important that you check each one regularly to be certain that all screws are tight and the lap bar is functioning properly. In the factory final inspection of a new Scrambler, the lap bar must be loose enough to fall down of its own accord when the handlebar is closed; if it does not, then it is worked over until it does.

The lap bar has been an important addition to the Scrambler seat, and it has given an added measure of safety to the passengers, particularly to the small children. To do a proper job, it must be maintained well.

LAP BAR HINGE BLOCK. See "Rubber Bumpers and Pads".

LATCH. See "Handlebar".

LATCH BODY HOLE. See "Handlebar".

LATCH HANDLE. See "Handlebar".

LIP FOR FOOTBOTTOM. See "Footbottom".

LIP FOR RETAINING CUSHION. See "Cushions".

LOADS IN SEATS. See "Introduction".

LOADS ON AIR-LOCS. See "Footbottom Straps".

LOOSE UPHOLSTERING. See "Cushions".

MALLEABLE IRON SLIDING BOLT. See "Handlebar".

MILDEW. See "Winter Storage".

MINIMUM ENGAGEMENT OF SLIDING BOLT. See "Handlebar".

MUSHROOM BUMPERS FOR LAP BAR. See "Lap Bar".

NEVER DULL ALUMINUM POLISH. See "Cleaning the Seats", "Spring Start Up".

NYLON BUSHINGS. See "Handlebar".

OLD DECAL REMOVAL. See "Decals".

OUTSIDE BLOCK. See "Wood Blocks".

OUTSIDE SKIN DAMAGE. See "Seat Body Structure".

OVERSPEEDING. See "Introduction".

PADDING FOR CUSHION. See "Cushions".

PAD ON END OF SEAT. See "Cushions".

PAINTED HANDLEBAR. See "Handlebar".

PAINTING OVER R-MIR-DEK. See "Step".

PAINTING SEATS. See "Spring Start Up".

RUBBER BUMPER FOR HANDLEBAR. See "Handlebar".

RUBBER BUMPER FOR LAP BAR HINGE. See "Lap Bar", "Rubber Bumpers and Pads".

RUBBER BUMPER ON FOOTBOTTOM. See "Rubber Bumpers and Pads".

RUBBER BUMPERS AND PADS. (See also "Spring Start Up".)

There is a rubber bumper built into a recess on the locking end of the handlebar, so that as the handlebar closes this rubber bumper is what strikes the front of the seat instead of the handlebar itself. This rubber bumper has been used since the aluminum handlerbar was introduced. Early Scramblers were equipped with steel handlerbars and there was no provision on that handlebar for a good bumper. In that case, a strip of adhesive-backed sponge rubber was stuck to the front of the seat where the handlebar hit, but in a short time the rubber strip would peel off and then the handlebar would strike the seat directly. Since the rubber bumper was built into the back of the aluminum handlebar there have been no problems reported with it.

On the other end of the handlebar there are two rubber blocks that are there to prevent the handlebar from swinging back over center and hitting the seat sweep tie rods. These rubber hinge blocks are easily replaced, but operators often neglect them until the rubber is completely worn away. Then the handlebar starts striking the screws which are there to hold the rubber hinge blocks. In a short time the handlebar drives these screws back inside the seat, tearing out the threaded fastener inside the seat, so that it becomes impossible to re-install the rubber hinge blocks. These blocks have to be considered as protective devices, that in protecting will be worn or cut away so that they must be replaced. It is much better to install the inexpensive rubber hinge blocks than try to repair the damage caused by the screws being drivin back inside the seat.

These rubber hinge blocks also serve to help the handlebar close automatically when the Scrambler starts turning, if the passengers have failed to latch it. There is a lot of wear on these bumpers, and you will probably find that they will cut through and need replacing in a fairly short time.

Sponge rubber pads are used on the front of the seat to cushion where the footbottom touches, and another pad is used on the back of the step to separate it from the footbottom. These pads help to prevent the parts from scrubbing against each other, but their most important function is to keep the parts from rattling against each other. Your Scrambler will be much quieter if you keep these rubber pads on the seats and steps than if you permit them to become lost.

Each hinge block on the lap bar has two round rubber bumpers on it, so that the handlebar is protected from the lap bar in both the up and down positions. Failure to keep all four rubber bumpers on each lap bar will cause the lap bar to wear into the handlebar.

There is a rubber bumper attached to the angle across the top of the footbottom, and it is on the end away from the step. This bumper is necessary only if the Scrambler is used portable. It cushions the lap bar when the seat is folded and prevents it from wearing into the footbottom.

RUBBER HANDLEBAR STOP. See "Rubber Bumpers and Pads", "Seat Body Structure".

RUBBING OF FOOTBOTTOM DECAL. See "Decals".

RUMBLING OF SEATS. See "Seat Body Structure".

SCREWS DRIVEN INTO SEAT. See "Rubber Bumpers and Pads".

SCREWS IN LAP BAR. See "Lap Bar".

SEAT BANG. See "Seat Body Structure".

SEAT BLOCKS. See "Spring Start Up", "Wood Blocks".

SEAT BODY STRUCTURE

The seat body structure is the main load carrying member of the seat, and the safety of the passengers requires that it be maintained in serviceable and safe condition. This requires that the inside and the outside skins be free from holes or cracks, that the three ribs which position the two skins be structurally sound, that the structure across the back of the seat be intact, and that the pin connections which support the seat be sufficiently strong.

One of the more critical areas is the inside skin. Factory inspections have disclosed numerous examples of the inside skins being deliberately cut open with a chisel in order to get at money which had dropped through a small hole worn in the skin. Operators who have done this have literally "cut the heart out" of the strength of the inside skin, with no thought for how they were weakening the seat. In other cases, operators have allowed trash to collect inside the seat and under the seat cushion. As the ride operates the wooden frame of the seat cushion, scrubbing against the trash, has worn holes through the inside skin. From the small holes worn through, cracks have developed that have enlarged the holes to very serious proportions.

In handling the seat in and out of a trailer, operators sometimes drop it and it usually falls on the rounded bottom corners at one end or the other. At the very least this wears off or breaks off rivets, and at the worst it buckles in the corners and cracks the ribs. Damage sustained by the outside skin in this kind of handling reduces the load carrying capability of the outside skin. Another kind of damage that occurs to the outside skin is due to failure to anchor the seats in the trailer. In traveling down the road, the seats bounce against each other, and the pin connection at the top of one seat bashes in the top of the other end of the seat next to it. This is not a heavily loaded part of the seat, but the damage could spread to a more critical area, and it certainly disfigures the seat. If the seats are adequately restrained in the trailer this will not happen.

On some earlier Scrambler seats the aluminum sheet riveted across the back below the back box lost rivets and became loose one at a time. This appears to be associate with passengers bracing their feet against the footbottom and pushing very hard against the back. Later Scramblers have more extensive fasteners connecting this sheet to the back rib. Rivets which are missing should be replaced without delay.

The top back tray connects to each end of the back rib. Frequently, the flange of this back tray is cracked out next to the rib. In order to check this it is necessary to remove the back wooden block. If you find any cracks there, you are strongly urged to obtain a modification kit from Eli Bridge Company. This kit includes a heavier back tray and all the necessary fasteners. Some states will not permit a Scrambler to operate if there are cracks present there, and Eli Bridge Company would share the view that any cracks should be removed, either by repair or by replacement.

There have been a few instances where the front rib has cracked next to the striker. This has occurred mostly in the earlier Scramblers that did not have an inside reinforcement behind the striker. Since the reinforcement has been added there have been no reports of cracks developing in that area. If you find any cracks around any of your strikers, see about having repairs made. A crack growing in the vicinity of the striker could cause the loss of a striker, with the great possibility of hazard to passengers because of a handlebar with nothing to latch it to.

If the rubber handlebar stops are not kept in good working condition, the handlebar swinging back over center can drive the screws, which hold the rubber stops, back inside the seat, breaking off the threaded plate nuts riveted inside the seat and starting cracks that may be very difficult to stop and reinforce.

The early Scrambler seats had Air-Loc receptacles attached to the front rib on the inside. From time to time these receptacles would break, and replacement was practically impossible. A few cut round holes on the bottom in the outside skin, made the replacement, and then covered the holes with circular patches riveted in place. Besides cutting into a primary structural member, this was not a practical procedure because later replacement would require the same procedure again. A modified front was developed for the seat, so that the Air-Loc receptacles were mounted outside of the seat shell, fully accessible for replacement if necessary. Factory records indicate that there are about as many broken and unrepaired Air-Locs in this new, accessible location as there were in the old location. This modification is available to all older Scramblers having the Air-Locs inside the seat.

Besides wearing holes in the inside skin, the seat cushion wears off rivet heads. Badly worn rivets should be replaced. The lip on the footbottom lies on top of the row of rivets along the front edge of the seat, and these rivets are often badly worn.

Occasionally reports reach the factory of the aluminum seat tabs becoming badly corroded. The surface of the tab appears to be made of many layers of paper, and the layers peel off quite easily. The reason for this kind of corrosion has not been established, but where it occurs, the pin connections should be replaced. In recent years the top pin connection on the seat has been made of plated steel, rather than aluminum.

The seats need to be as free of defects as you can make them. As with any other kind of mechanical device, when they are used a lot they will wear out, and if they are mishandled they will get damaged. The kind of wear and damage that can occur to a seat is so varied that it would be impossible to prepare instructions for the way all repairs should be made. The only thing that can be done in a manual of this kind is call your attention to some of the kinds of damage that can occur, and then encourage you to contact the factory for assistance in bringing the seats back to a safe and serviceable condition. Describe your problem fully and, if possible, send a photograph of what the problem is.

Operators occasionally have asked about rumbling of the seats. This is not always the fault of the seats; on some occasions this has been due to insufficient lubrication of the large gears driving the Scrambler in the center pole. If you observe rumbling and vibration of the seats, check the lubrication on these gears before you try to do anything else.

The pin connections of the seat to the seat sweep have a little built-in clearance so that the parts can be assembled easily. As the Scrambler turns, and as the direction of load changes, the seats shift from side to side within the pin connections, and the banging as the seat hits each end is quite audible outside the ride.

SEAT CUSHION RETENTION. See "Spring Start Up".

SEAT CUSHIONS. See "Cushions", "Spring Start Up".

SEAT LOADS. See "Introduction".

SEAT PADS. See "Rubber Bumpers and Pads".

SEAT STRENGTH. See "Introduction".

SECONDARY LATCHING. See "Handlebar".

SIDE LOADS IN SEAT. See "Introduction".

SKIN, INSIDE. See "Seat Body Structure".

SLIDING BOLT. See "Handlebar".

SLIDING BOLT MINIMUM ENGAGEMENT. See "Handlebar".

SOFT PADDING. See "Cushions".

SPONGE RUBBER STRIP. See "Footbottom", "Rubber Bumpers and Pads", "Step".

SPRING START UP.

Inspect every seat thoroughly to be sure that there are no holes worn or punched in either the inside or the outside skins, or for that matter in any part of the seat. Contact the factory if you have any question about what to do if you find any holes, but do not fail to make necessary and proper repairs of all holes.

Check to see if there are any cracks in the skins or ribs. Cracks must be prevented from growing and spreading. Look particularly around the striker and the handlebar hinge blocks, all of which are fastened to the front rib.

Any rivets that are missing should be replaced. If any rivet heads are badly worn, they should be replaced.

The two Air-Loc receptacles fastened to the front of the seat and the two Air-Loc studs in the footbottom should all be properly functioning, as well as the Air-Loc which connects the step to the footbottom. Replace any parts which are not in good condition. It is essential that all three of these Air-Locs be working on every seat. This is a matter of safety that cannot be ignored. If you do not know how to take care of this, contact the factory for advice.

Check to be certain that all bolts and all screws are tight throughout the seat. If you find that any of the threaded fasteners inside the seat are missing or are stripped out so that the bolt or screw does not tighten properly, do not ignore it; you may have a serious problem that should be checked. If you are in doubt, contact the factory.

The handlebar should be fully functioning, and should be adjusted so that the sliding bolt of the latch engages the striker slightly below center, so that as the passenger weight is added to the seat and it springs downward slightly, the latch will move toward the center of the striker. Every sliding bolt should be free to move in and out, with good spring pressure behind it, and the bolt itself should not be worn away so that it will not latch properly in the striker. Each striker should have a good roller, and the two sides of the striker body should not be worn away or bent out of shape. The hinge pins and nylon bushings on the other end of the handlebar should be tight so that there is no looseness in the joints.

Check the lap bars to be sure that all swing freely, that the hinge pins and nylon bushings are all in good working order, and that the entire assembly is securely fastened to the handlebar.

Every rubber bumper should be in place and in good working condition. This includes two handlebar hinge bumpers, a long bumper on the other end of the handlebar, four round bumpers on the lap bar hinge blocks, two rubber strips on the front of the seat, one on the back of the step, and a bumper fastened to the footbottom for the lap bar to hit on a portable Scrambler when the seats are folded.

The seat cushions should be free from rips and tears, and the wood frame should be soundly connected and free of rot. If the upholstering is torn, cement more material over the top; do not staple another piece over it and do not add any kind of padding. Every cushion must have a retaining lip sticking out from under the front for the footbottom lip to hook over for retention of the cushion.

Wash down the seats thoroughly. Polish the bare aluminum with Never-Dull aluminum polish to remove the dulling caused by oxidation. If the surface becomes too dulled, roughened, and beat up to take a good polish, you might want to consider painting the seats. If you should decide to do this, contact the factory for some suggestions as to the best way to get a good paint job on the seats. You might want to consider bringing the seats in to the factory for re-conditioning before having them painted, which can also be done at the factory.

The wood blocks on the top of the seat must be kept well painted to keep them from deteriorating. Also, they are a very visible part of the seat and should be kept well painted for appearance's sake.

The wooden floorboard in the footbottom should be painted to help preserve it.

Check over the decals, and replace any that are in bad condition. Of greatest importance, do not carry passengers on your Scrambler unless every handlebar has a CAUTION decal on the back of it.

STAINLESS STEEL LAP BAR. See "Lap Bar".

STAPLES IN CUSHION FRAME. See "Cushions".

STEEL HANDLEBAR. See "Handlebar", "Rubber Bumpers and Pads".

STEPS. (See also "Footbottom".)

The steps attached to the Scrambler seat footbottoms deserve careful attention because unsure footing will cause accidents. Remember that the passenger is usually in a hurry to get in or out, and is off balance with his weight on one foot.

The steps are carefully shaped at the factory to fit. The tread surface is coated with R-Mir-Dek, a plastic non-skid material. In time it will wear off. R-Mir-Dek is available from Eli Bridge Company, and should be re-applied in order to maintain a non-skid surface. Painting enamel over R-Mir-Dek destroys the non-skid property, and is bad practice.

If the Air-Lok stud in the step, or the receptacle in the footbottom becomes damaged so that the step will not lock properly, replace the damaged part promptly. Loose steps cause accidents.

Steps that become bent should also be replaced to avoid accidents. Occasionally, wear in tie rod pin holes will accumulate to the extent that steps will drag over the bottom sweeps. By the time this occurs, the pin connections in the sweeps are loose, too, and an overhaul is probably needed. At the time the steps begin to drag on the bottom sweeps, however, it may not be practical to bring the ride to the factory for overhaul. At the same time, it is dangerous to permit the steps to drag. For this reason, beginning with Serial No. 393, the steps are one inch higher than the previous steps, but otherwise identical, so that they are completely interchangeable with all Big Eli Scrambler seats.

A sponge rubber strip is attached to the back of each step, and its purpose is to separate the step from the footbottom so that the two parts will not scrub against each other, and also so that the two parts will not rattle while the ride is operating.

STEPS HITTING BOTTOM SWEEPS. See "Steps".

STOPS FOR HANDLEBAR. See "Rubber Bumpers and Pads", "Seat Body Structure".

STORAGE OF SEATS. See "Winter Storage".

STRAP FOR FOOTBOTTOM. See "Footbottom", "Footbottom Straps".

STRENGTH OF SEAT. See "Introduction".

STRESSED SKIN CONSTRUCTION. See "Introduction".

STRIKER. See "Handlebar", "Spring Start Up".

STRIKER ADJUSTMENT. See "Handlebar".

STRIKER-CAUSED CRACKS. See "Seat Body Structure".

STRIKER ROLLER. See "Handlebar".

STRIKER, WORN. See "Handlebar".

STUD FOR AIR-LOC. See "Footbottom", "Step".

TAB SIDE BLOCK. See "Wood Blocks".

TOP BACK TRAY. See "Seat Body Structure".

TWISTING FOOTBOTTOM. See "Footbottom".

UPHOLSTERED BACK ASSEMBLY. See "Cushions".

UPHOLSTERED BACK SHEET. See "Cushions".

UPHOLSTERED BLOCKS. See "Wood Blocks".

UPHOLSTERED END PAD. See "Cushions".

UPHOLSTERING CEMENTED. See "Cushions".

UPHOLSTERY. See "Cleaning the Seats", "Spring Start Up".

WEARING AWAY OF FOOTBOTTOM DECAL. See "Decals".

WEAR OF SLIDING BOLT. See "Handlebar".

WELDED STEEL HANDLEBAR. See "Handlebar".

WINTER STORAGE.

Because the seats are seen at closer range than most other parts of the ride, and because your patrons come in physical contact with them, it is important to keep them clean and in good repair. During winter storage, they should be kept clean and dry. Storage inside a building is best, but not often available to many operators. The most important thing is to keep them dry. If the seats are stored wet or damp in a trailer, there is a strong chance that the upholstering will mildew, and retain a strong unpleasant odor.

It is well to wash off dirt and sticky films before storage. The longer dirt and finger prints remain on the seats, the harder they are to get off. Just be sure the seats are completely dry before putting them away.

While cleaning them up is a good time to look for missing rivets, cracks, holes in the skins, and any other damage that should be repaired before placing the ride in service again. Make a list, order any materials needed, and have all the materials at hand when you begin repair work. If there are any holes in the skins, dented ribs, or suspicious looking areas, consult the factory about repairs.

WOOD BLOCKS. (See also "Spring Start Up".)

Around the top of the seat are three wood blocks, referred to as the tab side block, the back block, and the outside block. On early model seats, these blocks were covered with upholstery material, and secured to the seats with wood screws. The screws worked loose and came out, so they were replaced by through bolts. The blocks seemed to rot in a short time, so the upholstery material was eliminated, and the blocks were painted instead. Then the side-to-side through bolts were changed to flat head screws going vertically through the blocks into anchor nuts attached to the aluminum trays below. This arrangement is in current use, and can be adapted to any of the earlier Scramblers.

The only purpose the seat blocks serve is to cover sharp edges of aluminum for protection, and to present a more attractive appearance. If the blocks become splintery, or cracked, or partly broken away, they will no longer protect the passengers from sharp edges. They may be a hazard themselves. And in such condition they certainly do not contribute to the appearance of the ride.

If the blocks are worn out, replace them. If they can be repaired, use plastic wood or a similiar material to fill cracks and repair them. When you paint them, remember: peoples' clothing will come in contact with each block. Make sure the paint will not rub off. Make sure you leave no "tears" to release wet paint on someone's clothing.

If the wood has rotted, replace the blocks. Rotted wood is no protection, and its continued use will only invite injury.

WOOD FRAME FOR SEAT CUSHION. See "Cushions".

WOOD FLOORBOARD. See "Footbottom", "Spring Start Up".

WOOD FRAME, WEARING IN SEAT. See "Seat Body Structure".

WOOD ROT. See "Footbottom", "Wood Blocks".

WORN HOLES IN STRAPS. See "Footbottom Straps".

WORN RIVET HEADS. See "Seat Body Structure".

WORN STRIKER. See "Handlebar".

LUBRICATION

BEARING SEALS BLOWN. See "Power Unit Truck Bearings", "Rotating Base Drive Shaft Pillow Blocks", and "Twin Disc Hydrosheave".

BOTTOM SWEEP DRIVE SHAFT BEARINGS.

The long drive shaft in each bottom sweep runs in three bearings. A self-aligning ball bearing flanged pillow block is at each end of the shaft and a nylon bearing is in the middle. All three of these bearings have grease fittings and they should be greased several times during the season.

The short shaft in the end of each bottom sweep turns in two more flanged pillow blocks, and there are grease fittings on each of these bearings. It should not be necessary to lubricate these two bearings oftener than once a season.

The clutch disc in the slip clutch turns on a nylon sleeve bearing. Older Scramblers are provided with a grease fitting to lubricate this bearing. There has been some indication that operators occasionally over-grease this bearing and the excess grease gets out on the clutch faces, ruining them. Therefore, on all new Scramblers this grease fitting will be discontinued and the nylon bearing will operate without lubrication. DO NOT LUBRICATE THIS NYLON BEARING. THIS APPLIES TO ALL SCRAMBLERS BEGINNING WITH SERIAL NO. 92, AND ALL OLDER ONES WHICH HAVE BEEN MODIFIED AND ARE NOW EQUIPPED WITH THE REMOVABLE SLIP CLUTCH AND PINION ASSEMBLY. The shaft just oscillates back and forth in the nylon bearing, and under these conditions it will operate quite well without lubrication.

BRAKE BEARINGS. See "Spur Pinion Shaft Bearings".

BRAKE SHOE PIVOTS.

Do not forget to grease the pivot pins for the brake shoes. The grease fittings are on pipe extensions that can be seen under the brake drum.

CLUTCH THROW-OUT LINKAGE.

The Ford gasoline engine became the standard power unit beginning with Serial No. 415. The throttle and clutch linkage with the brake ratchet handle requires occasional lubrication of its pivot points to maintain easy operation and minimize wear.

DRAIN PLUG. See "Gear Pot Bevel Pinion Bearings".

DRIVE UNIT DRIVE SHAFT BEARINGS.

Each drive shaft turns in three bearings. The Flangette bearing on each end is pre-lubricated at the factory. However, grease should be added once or twice during the season. There is a grease fitting in the stamping which holds the bearing.

The bearing in the middle of each shaft is similar to the one in the middle of the long drive shaft in each bottom sweep. Each of these bearings should be greased regularly. Grease these bearings through the holes bored in the drive unit cover board.

EXTENSION TO GREASE FITTINGS. See "Main Center Pole Bearings" and "Spur Pinion Shaft Bearings".

FLEXIBLE CHAIN COUPLINGS.

The rolls in the roller chains must be free to turn if the coupling is to work properly. Keep the chain clean and well greased. It is suggested that every time

a chain is removed it be cleaned in low-flammability solvent and then re-greased with clean grease. Use very little grease. Excess grease will be thrown off as the shafts rotate. If the rolls are properly cleaned and greased, they will be bright, but if they are dark and rusted then they are not free to rotate because of inadequate lubrication or because of such severe misalignment that there is binding of the chain by the two sprockets. Try to correct either situation when it develops so that the chains will last as long as possible. Do not try to lubricate these chains with oil because it will be thrown off quickly.

There is a larger chain coupling which connects the slip clutch to the bottom sweep drive shaft. While it is necessary to provide a little lubrication for this coupling, IT IS EXTREMELY IMPORTANT THAT IT NOT BE OVER-GREASED. Some operators, instead of removing the covers so they can get to the coupling properly, apparently just stick a handful of grease on the coupling by reaching up under the cover and expect the grease to distribute itself. What happens is that the grease gets thrown off where it can get on the clutch faces. When this happens it can quickly ruin the facings, causing erratic operation of the clutch. This can be dangerous, because it can change the whole character of the Scrambler ride and possibly make your passengers insecure. To grease this coupling, remove the clutch cover, work grease into the coupling chain all the way around, and then WIPE OFF ALL SURPLUS GREASE. NEVER USE OIL OR LIGHT GREASE WHICH CAN RUN OFF THE COUPLING.

GEAR POT BEVEL PINION BEARINGS.

The bevel pinion in the gear pot turns on a double roll tapered roller bearing. This bearing is lubricated by the oil in the gear pot and no further lubrication is needed.

To check the oil level in the gear pot, level the center pole base section, and then remove the access hole cover plate which is held by three bolts. The oil should reach just to the bottom of the access hole, so that any oil added will run out. Check the level after the gears have been idle for an hour or so, because the churning and heating caused by the gears in motion will make the oil expand to a greater volume than when it is cool.

Drain the oil and replace it once a year. During the breaking-in period it may need replacing sooner. The drain plug is just inside the access hole. Drain the gear pot when the base section is up on wheels, so that a pan can be slid underneath to catch the oil. Approximately 11 quarts of Texaco Multigear EP-90 is required, when replacing the oil.

GEAR POT OIL LEVEL. See "Gear Pot Bevel Pinion Bearings".

GEARS.

Your Scrambler was set up, operated, and checked at the factory before it was delivered to you. However, the gears did not have much running time. It is important that the gears be greased properly at all times. At the factory the gears were coated with Texaco Crater 5X Fluid Grease, which is a grease containing a solvent that evaporates, leaving a very tacky coating of grease that will not throw off or drop off as many greases do. Use plenty of this grease, and re-apply it

whenever the gears become dry. Regular grease can be used, but be sure that the gears do not become dry and start to wear. If there is any flaking of the cast iron gears in the base section then they are not being greased properly. Your gears should last many years if properly greased.

If your Scrambler is in heavy service, the gears will probably need re-greasing once a week. DO NOT USE A SOLVENT-BASED GREASE IN ANY OF THE BEARINGS OR IN THE GEAR POT.

The bevel gear at the bottom of each unit pole is entirely in the open and grease can be applied easily.

To grease the large gears in the base section, remove the cover from the rotating base. The bevel ring gear down below is not exposed anywhere, but you can grease it by coating the bevel pinions and turning the center pole. The bevel pinions will in turn distribute the grease around the circle. You can grease the large spur gears through the access holes. Only a few teeth of the large internal gear show in these holes, and the only way to grease them is to grease the spur pinions and the floating gear, and then turn the center pole. All of the teeth in the floating gear will pass by the access holes when you turn the rotating base.

Watch the oil level in the transmission of the power unit truck. Remove the overflow plug, and add gear oil until it runs out of the overflow. This transmission should be drained and refilled with new oil once a year. Use Texaco Multigear EP-90 grease, or equivalent.

GREASE FITTING EXTENSION. See "Main Center Pole Bearings" and "Spur Pinion Shaft Bearings".

HYDROSHEAVE. See "Twin Disc 9.4 HSD Fluid Coupling".

LEVEL OF OIL IN GEAR POT. See "Gear Pot Bevel Pinion Bearings".

LUBRICANTS.

THE SCRAMBLER IS TO BE SERVICED WITH THE FOLLOWING LUBRICANTS:

A. Bearings: Texaco Marfak Multipurpose No. 2 Grease.
B. Open Gearing: Texaco Crater 5X Fluid Grease.
C. Gear Pot and Engine Transmission: Texaco Multigear EP-90 Grease.
D. Hydrosheave (used through Scrambler Serial No. 414): Filled by the Twin Disc factory with SAE-10W oil.
Twin Disc 9.4 HSD Fluid Coupling (used beginning with Scrambler Serial No. 415): Filled by Eli Bridge Company with 65 fluid ounces (two quarts plus one fluid ounce) of Fyrquel 150, made by the Stauffer Chemical Co., of Westport, Connecticut. DO NOT USE OIL IN THIS FLUID COUPLING. IT REQUIRES FYRQUEL 150.

A lithium soap base grease is recommended. This type of grease will serve you the year round, and it will resist washing out of exposed bearings and gears longer than many types of grease. Any lithium soap grease can be used, but you should be sure that only lithium soap grease is used in the bearings, because some of the more common greases will not mix with this type of grease. The mixture may

turn into a "soup" which will run out of the bearing housing rapidly. This will lead to bearing failure due to inadequate lubrication.

Lithium soap grease is recommended for bearings, but you will not damage them as long as you keep them well lubricated. Be sure to use a non-tacky, free-flowing grease. The Timken Company warns that greases containing zinc oxide should not be used in Timken bearings.

MAIN CENTER POLE BEARINGS.

The center pole rides on Timken tapered roller bearings at the top and bottom of the rotating base. Also, another large Timken bearing carries a heavy gear inside the base. These three bearings are hand-packed with grease at the Big Eli factory, but it is important that grit be kept out of the bearings, and so you should add clean grease once a week. As you pump new grease into the bearing the old grease will be forced out, taking with it much of the grit which may have seeped into the bearing enclosure.

The entire Scrambler turns on ball or roller bearings. Some of these bearings in the past have been pre-lubricated by the bearing manufacturers, with no provision for adding grease. More recently, all are fitted with grease fittings and are to be greased in the following way:

The grease fitting for the top center pole bearing is in the side of the "hat" casting, and you can see it by looking through one of the portholes in the mast.

Remove the cover at the bottom of the rotating base to find the grease fittings for the two bottom main bearings. These two fittings are screwed into pipe extensions next to the pole. One of these fittings supplies grease to the center pole bearing and the other one greases the floating gear bearing.

MISCELLANEOUS LUBRICATION.

The brake cables pass around several small sheaves which should be greased to keep them from squeaking and wearing as they turn.

The brake ratchet handle pivot on the power unit truck should be greased to reduce wear at this point.

As mentioned in the erecting directions, the shaft sticking out of each end of the unit pole should be greased to prevent rusting and freezing in the bearing. This is important to park men, who will be leaving the Scrambler erected in one spot for a long time.

Greasing the long hinge pins on the center pole was recommended in the erecting instructions.

See the power unit handbook for additional lubrication instructions for the gasoline engine.

OIL DRAIN PLUG. See "Gear Pot Bevel Pinion Bearings".

OIL LEVEL IN GEAR POT. See "Gear Pot Bevel Pinion Bearings".

OIL QUANTITY REQUIRED. See "Gears" and "Gear Pot Bevel Pinion Bearings".

OIL REPLACEMENT. See "Gear Pot Bevel Pinion Bearings" and "Gears".

POWER UNIT TRUCK BEARINGS.

The drive shaft under the power unit runs on two Flangette bearings, which should be lubricated once or twice during the season.

A small pillow block is under the fluid coupling. In extremely dirty conditions, add grease as often as once a week, but usually once a month is plenty. Add grease slowly until it comes out of the pressure relief hole in the grease fitting rapidly. With a high pressure gun, take care not to blow out the seals.

The straight power take-off shaft on the gasoline engine turns in two bearings that are lubricated by a single grease fitting.

QUANTITY OF OIL REQUIRED. See "Gears" and "Gear Pot Bevel Pinion Bearings".

REPLACING OIL. See "Gear Pot Bevel Pinion Bearings" and "Gears".

ROTATING BASE DRIVE SHAFT PILLOW BLOCKS.

There are six ball bearing pillow blocks under the rotating base cover. Add grease to these bearings once a season unless you are operating under very dirty conditions. Then, it may be wise to add grease as often as once a week. The manufacturer says to add grease slowly with the shaft revolving wherever possible until grease begins to come out around the seals. If you are using a high pressure gun take care not to blow out the seals.

SEALS BLOWN IN BEARINGS. See "Power Unit Truck Bearings", "Rotating Base Drive Shaft Pillow Blocks", and "Twin Disc 9.4 HSD Fluid Coupling".

SPUR PINION SHAFT BEARINGS.

While the cover is off, you can also grease the three self-aligning spherical roller bearings near the tops of the pinion shafts. Turn the rotating base until you can see the three pinions through the access holes. Beside each pinion you will find a grease fitting screwed into the top of an extension pipe mounted in the top bearing carrier. Pump grease into these bearings until grease comes out of the side of the fitting. These bearings are hand-packed with grease at the Big Eli factory and all the grease needed will be that which works out of the seals. Usually these

top bearings will not need to be greased more than once or twice a season. Over-greasing can be as bad on bearings as too little grease.

The bearing at the bottom of the gear shaft, which drive the Scrambler runs in oil and needs no other lubrication. The bearing under each brake must be greased regularly. Operators often overlook this bearing, because it is so close to the ground. It probably needs grease more often than any other bearing on the Scrambler. This grease fitting is screwed into an extension pipe so that it is easy to reach from the outside. It would be wise to grease both bearings once a week. While you are there, do not forget to grease the pivots for the brake shoes through the grease fittings which are on pipe extensions.

TOP AND BOTTOM SWEEP MAIN BEARINGS.

A self-aligning ball bearing flanged pillow block is mounted on the outer end of each main sweep. Greasing should be done at least once a year. Add grease until it comes out around the seals slightly.

TWIN DISC 9.4 HSD FLUID COUPLING.

This fluid coupling was used, starting with Scrambler Serial No. 415. Before that the 10.6 Hydrosheave was used, and this unit has been discontinued in favor of the 9.4 unit. However, they are not directly interchangeable, because the newer unit is slightly smaller, it must be turned faster for the same power output, and is not filled with oil but with a special fire-resistant fluid, Fyrquel 150, made by the Stauffer Chemical Company, of Westport, Connecticut.

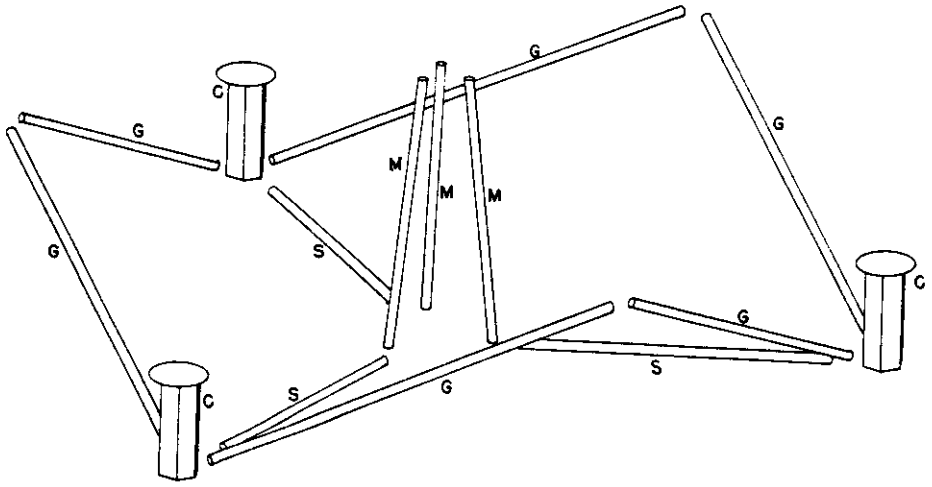
The fluid in the fluid coupling gets heavy usage and the high temperature developed by the fluid is entirely normal. Until the fluid coupling warms up and its internal parts expand with heat, a little fluid may be thrown off the end next to the power unit. This should decrease as the temperature rises.

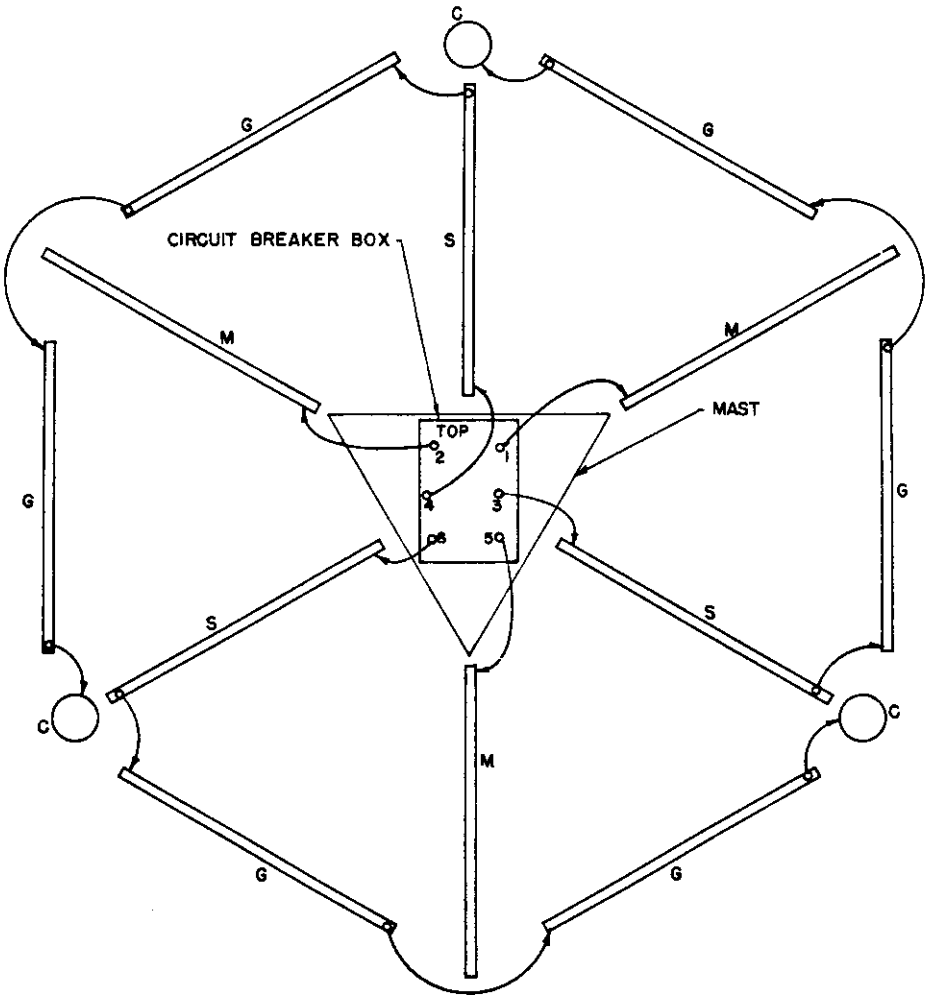
If any trouble develops with the fluid coupling, do not try to take it apart without full instructions. Preferably this should be done by the Twin Disc factory, authorized Twin Disc dealers, or Eli Bridge Company. If you try to take it apart, and you don't have the proper instructions, you can lose small parts down inside which can add great expense to your repair bill. Protect it from hard knocks, because it is a precision-built device and can be damaged easily. If you give it reasonable care, the fluid coupling will give you long, satisfactory service.

You should drain and replace the fluid once a year. If you remove the drain plug while the fluid coupling is still hot, unscrew the plug slowly to allow any internal pressure to escape. Otherwise, you may be burned by some very hot fluid as it spews out. If your Scrambler is fitted with the older model 10.6 Hydrosheave (furnished with Scramblers through Serial No. 414) wait until the Hydrosheave is cool, and then check the oil level by removing the drain plug and rotating the Hydrosheave until one of the arrows on the outside case is pointing vertically. The oil should be just ready to overflow through the drain plug hole when the Hydrosheave is in this position. Do not fill the entire volume of the Hydrosheave, because the oil must have room to expand. Filling it completely with oil will cause the seals to blow out, and may do damage to other parts of the Hydrosheave.

For Scramblers beginning with Serial No. 415, the newer model Twin Disc 9.4 HSD fluid coupling is used. There is no filling arrow on this coupling. To be sure you have the right amount of fluid, drain it out and re-fill it with 65 ounces (two quarts plus one fluid ounce) of Fyrquel 150. There are two drain plugs, and the one on the side closest to the V-belt sheave allows the fluid to enter more easily and quickly.

STANDARD SCRAMBLER LIGHTING LAYOUT

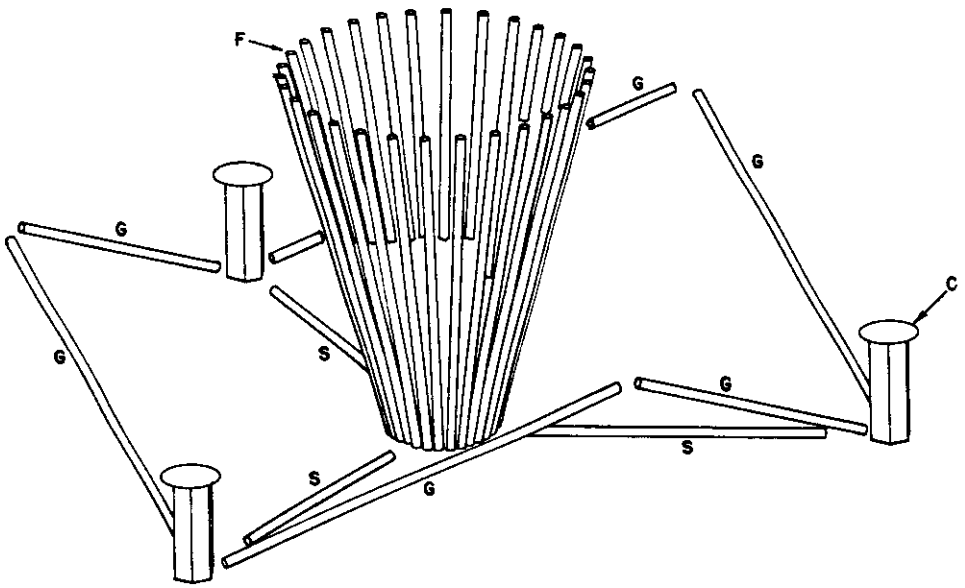


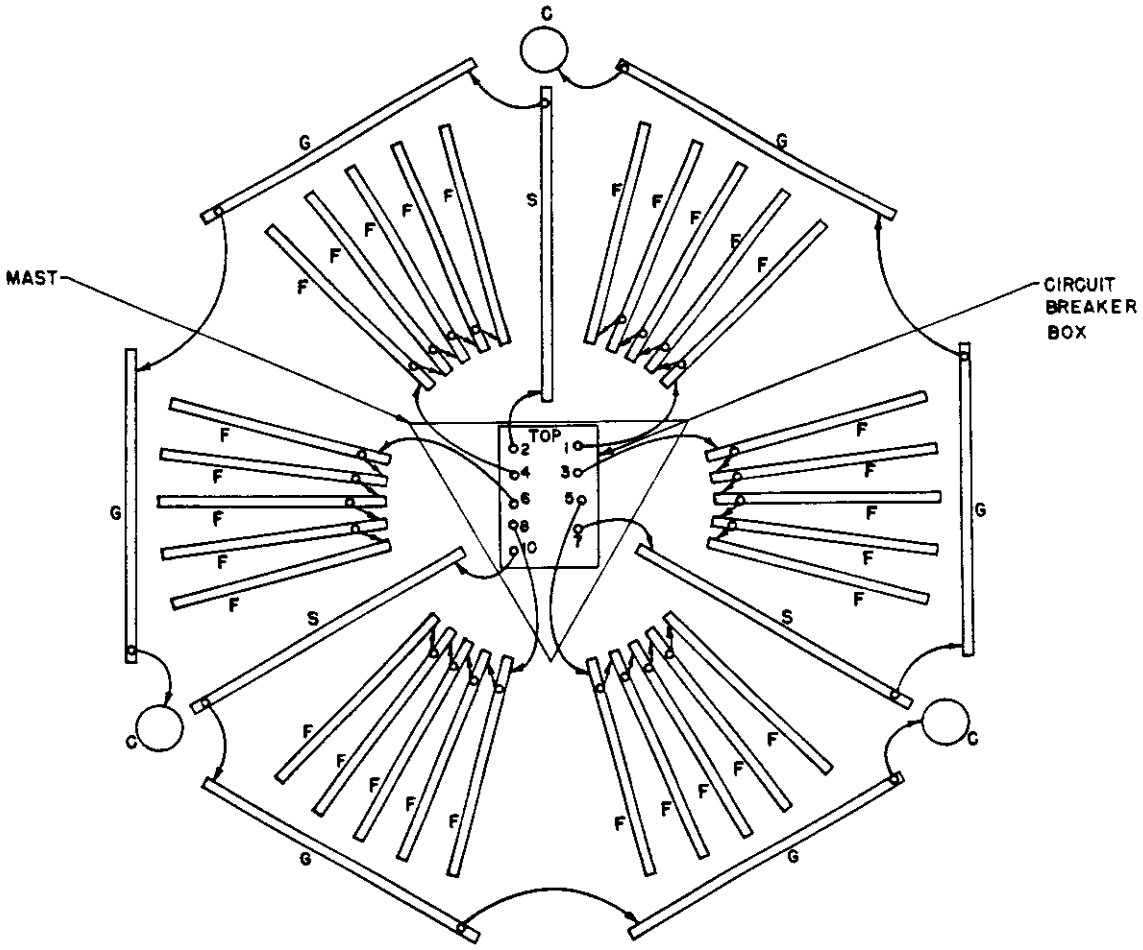


CODE

G - GABLE LIGHTS
S - SWEEP LIGHTS
M - MAST LIGHTS
F - FUNNEL LIGHTS
C - CLUSTER LIGHTS

DELUXE SCRAMBLER LIGHTING LAYOUT

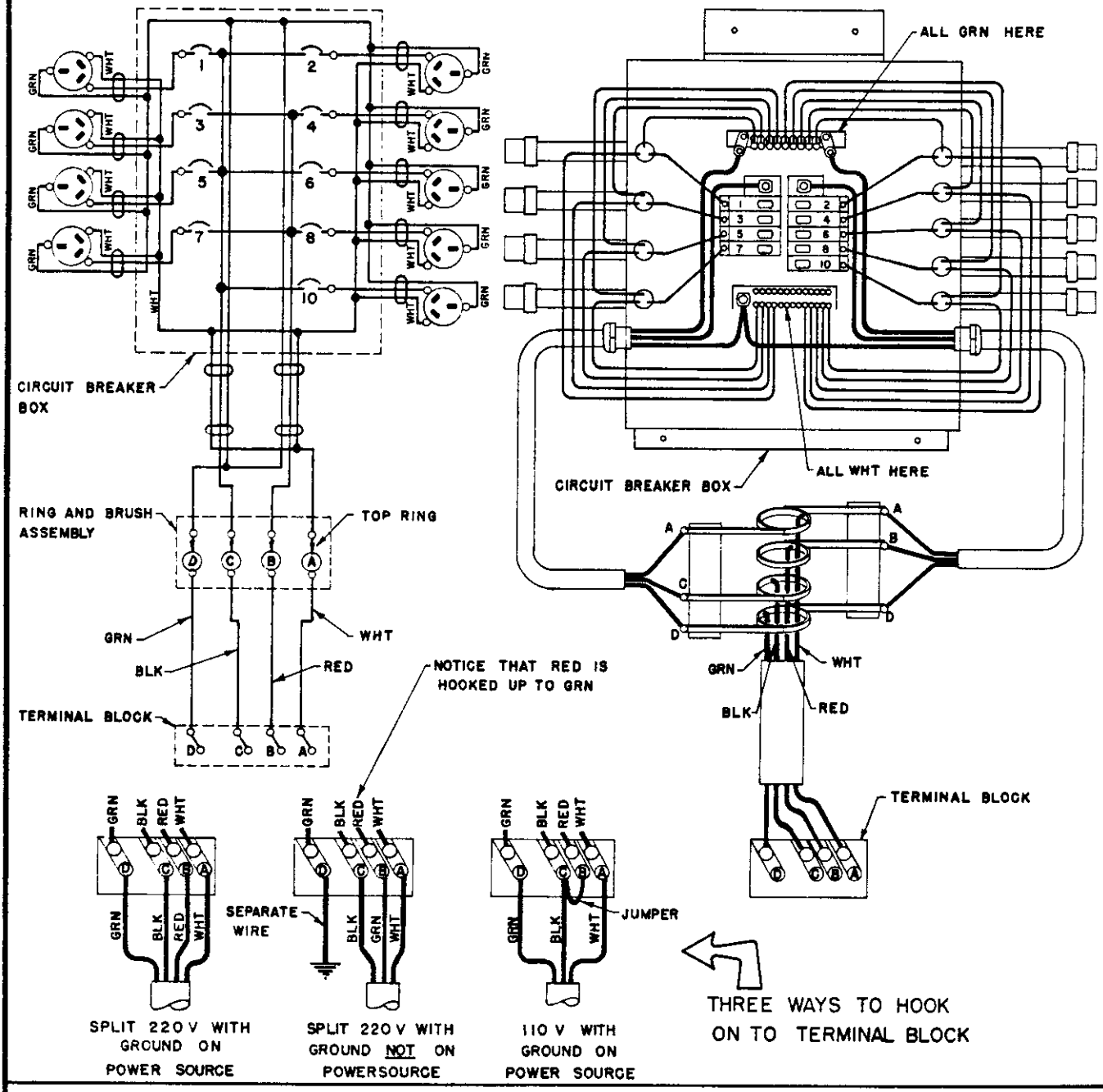




CODE

G - GABLE LIGHTS
S - SWEEP LIGHTS
M - MAST LIGHTS
F - FUNNEL LIGHTS
C - CLUSTER LIGHTS

DELUXE SCRAMBLER FEEDER CIRCUIT

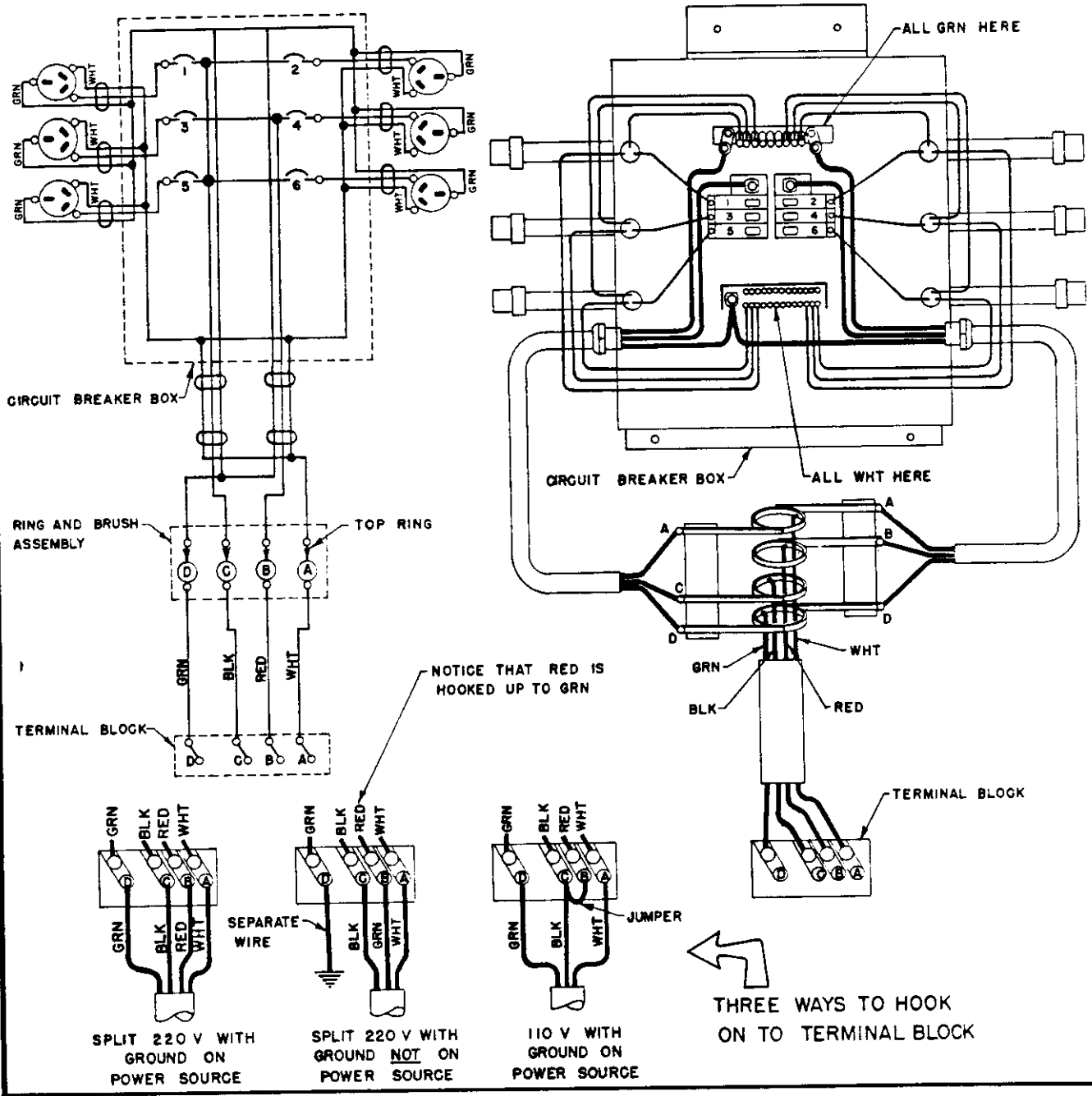


LEGEND

BLK- BLACK WIRE
WHT- WHITE WIRE
RED - RED WIRE
GRN - GREEN WIRE
BLU - BLUE WIRE
YEL - YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

STANDARD SCRAMBLER FEEDER CIRCUIT

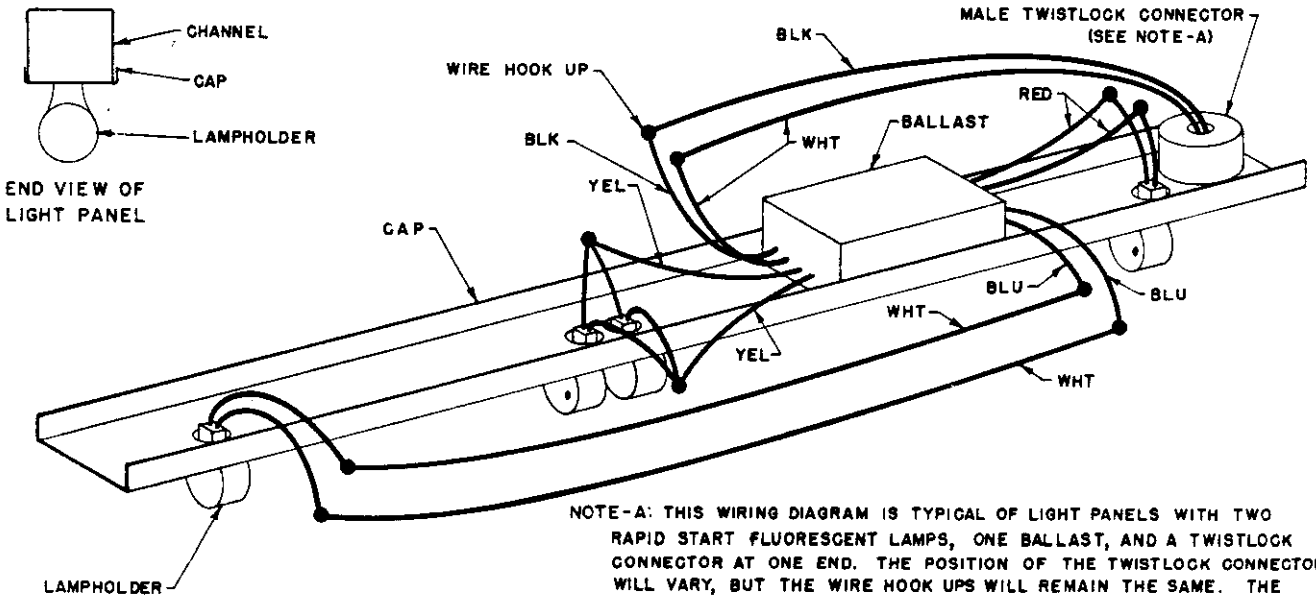


LEGEND

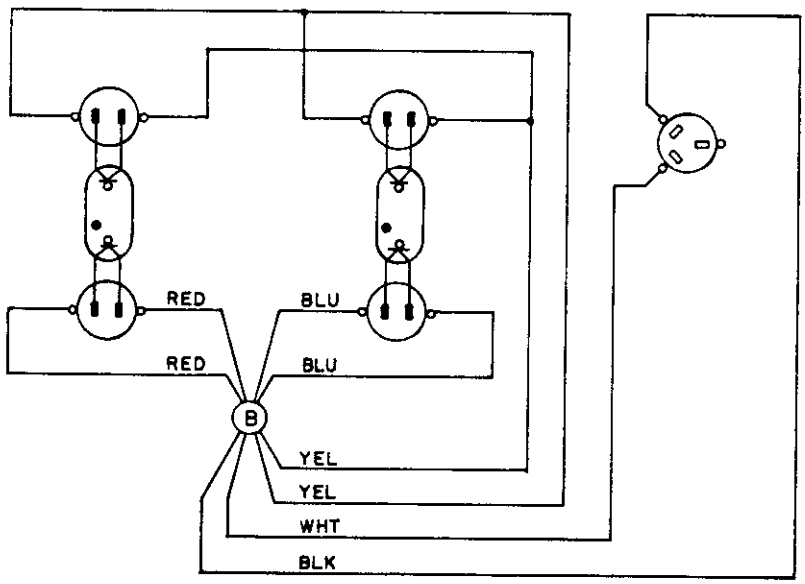
BLK- BLACK WIRE
WHT- WHITE WIRE
RED- RED WIRE
GRN- GREEN WIRE
BLU- BLUE WIRE
YEL- YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

WIRING DIAGRAM FOR: MAST



NOTE-A: THIS WIRING DIAGRAM IS TYPICAL OF LIGHT PANELS WITH TWO RAPID START FLUORESCENT LAMPS, ONE BALLAST, AND A TWISTLOCK CONNECTOR AT ONE END. THE POSITION OF THE TWISTLOCK CONNECTOR WILL VARY, BUT THE WIRE HOOK UPS WILL REMAIN THE SAME. THE VARIATIONS (LIKE FINDING THE TWISTLOCK CONNECTOR ATTACHED TO THE CHANNEL) ARE NECESSARY TO EASILY CONNECT THE JUMPERS.

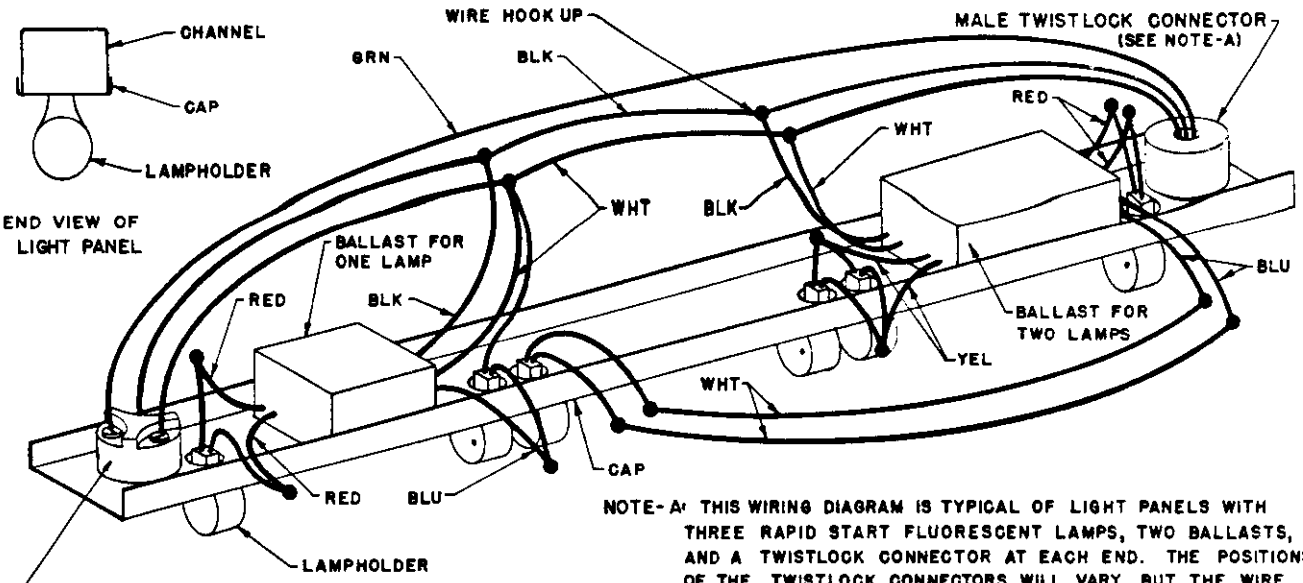


LEGEND

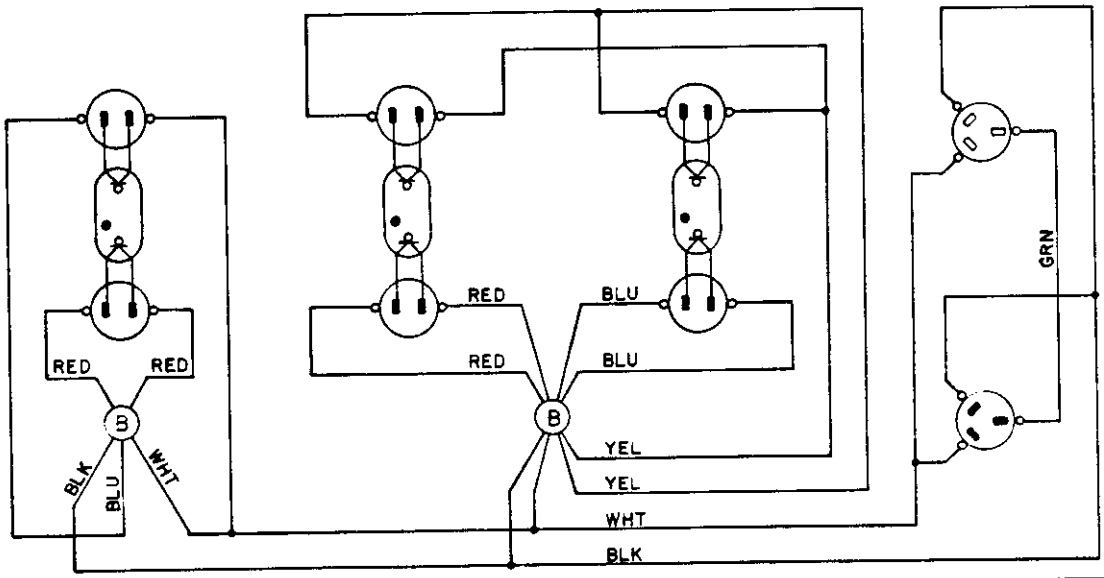
BLK- BLACK WIRE
WHT- WHITE WIRE
RED- RED WIRE
GRN- GREEN WIRE
BLU- BLUE WIRE
YEL- YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

WIRING DIAGRAM FOR: SWEEP GABLE



NOTE-A: THIS WIRING DIAGRAM IS TYPICAL OF LIGHT PANELS WITH THREE RAPID START FLUORESCENT LAMPS, TWO BALLASTS, AND A TWISTLOCK CONNECTOR AT EACH END. THE POSITIONS OF THE TWISTLOCK CONNECTORS WILL VARY, BUT THE WIRE HOOK UPS WILL REMAIN THE SAME. THE VARIATIONS (LIKE FINDING ONE OR BOTH OF THE TWISTLOCK CONNECTORS ATTACHED TO THE CHANNEL) ARE NECESSARY TO EASILY CONNECT THE JUMPERS.



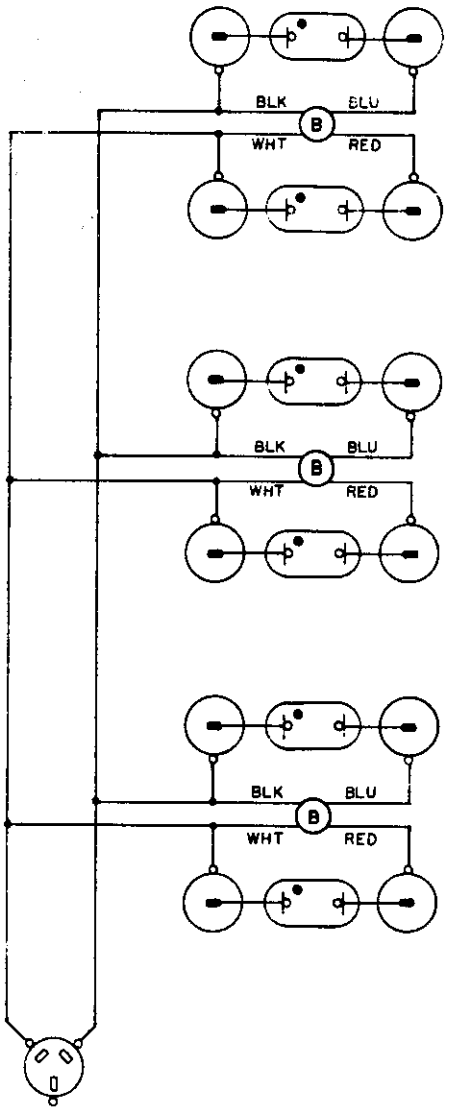
LEGEND

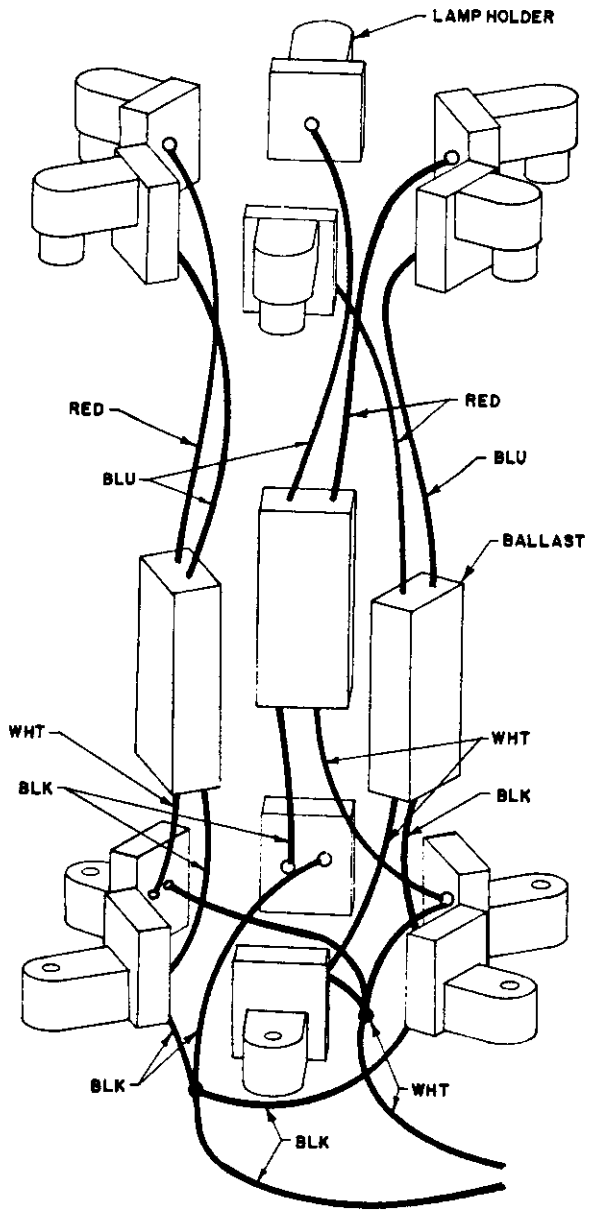
BLK- BLACK WIRE
WHT- WHITE WIRE
RED- RED WIRE
GRN- GREEN WIRE
BLU- BLUE WIRE
YEL- YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

WIRING DIAGRAM FOR: CLUSTER

THIS WIRING DIAGRAM TYPICAL OF CLUSTER LIGHTS HAVING SLIMLINE FLUORESCENT LAMPS



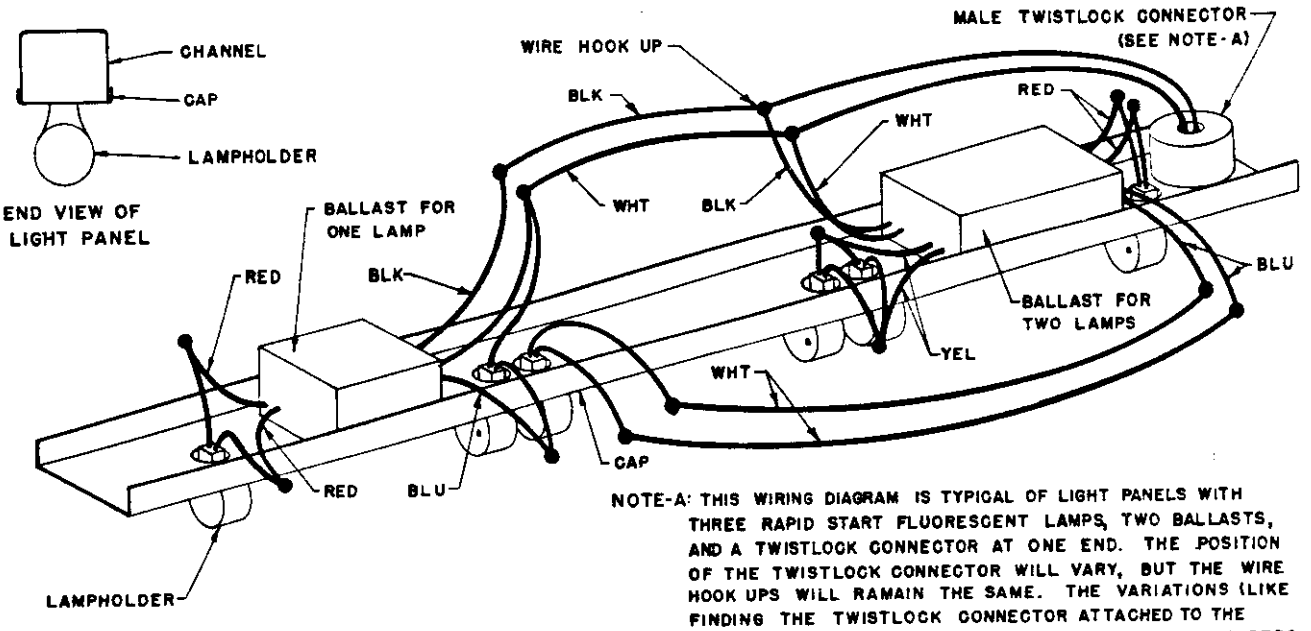


LEGEND

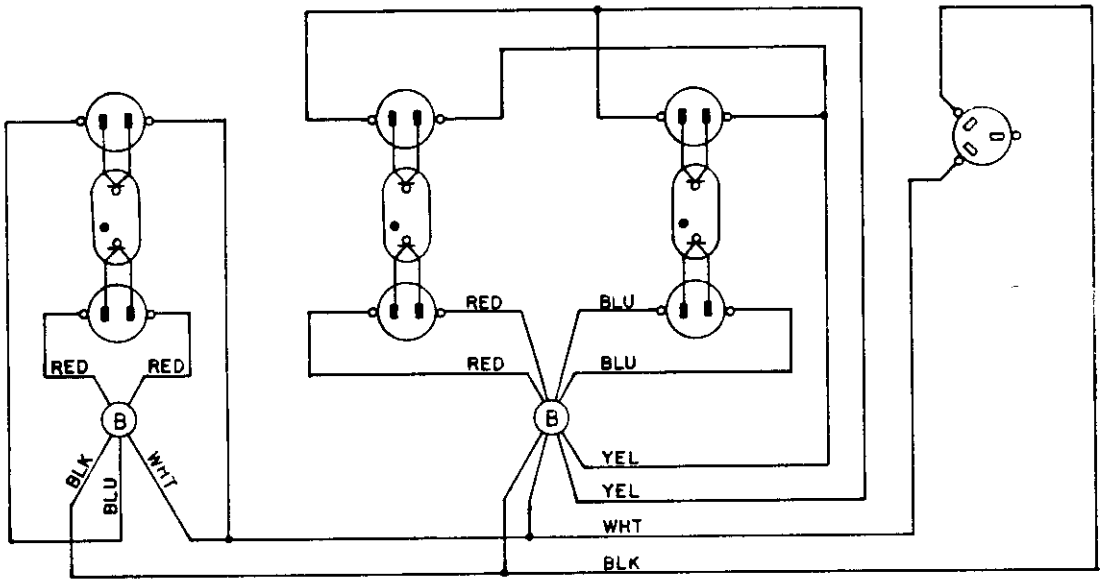
BLK- BLACK WIRE
WHT- WHITE WIRE
RED- RED WIRE
GRN- GREEN WIRE
BLU- BLUE WIRE
YEL- YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

WIRING DIAGRAM FOR: FUNNEL WITH ONE TWISTLOCK



NOTE-A: THIS WIRING DIAGRAM IS TYPICAL OF LIGHT PANELS WITH THREE RAPID START FLUORESCENT LAMPS, TWO BALLASTS, AND A TWISTLOCK CONNECTOR AT ONE END. THE POSITION OF THE TWISTLOCK CONNECTOR WILL VARY, BUT THE WIRE HOOK UPS WILL RAMAIN THE SAME. THE VARIATIONS (LIKE FINDING THE TWISTLOCK CONNECTOR ATTACHED TO THE CHANNEL) ARE NECESSARY TO EASILY CONNECT THE JUMPERS.

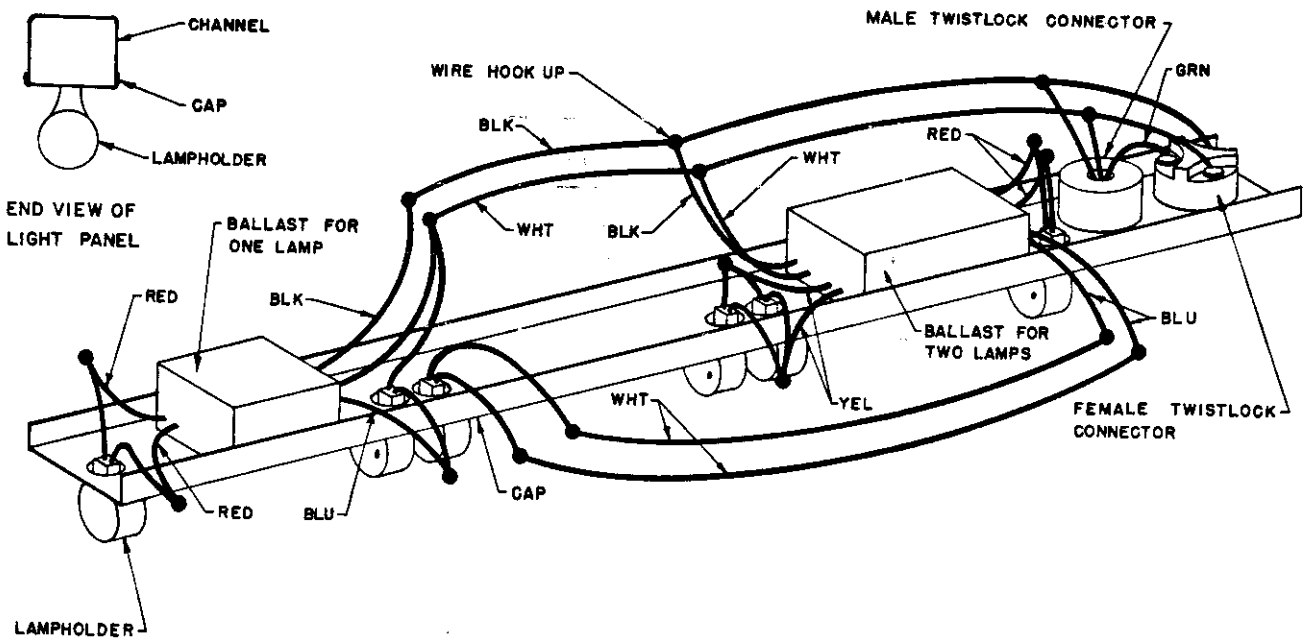


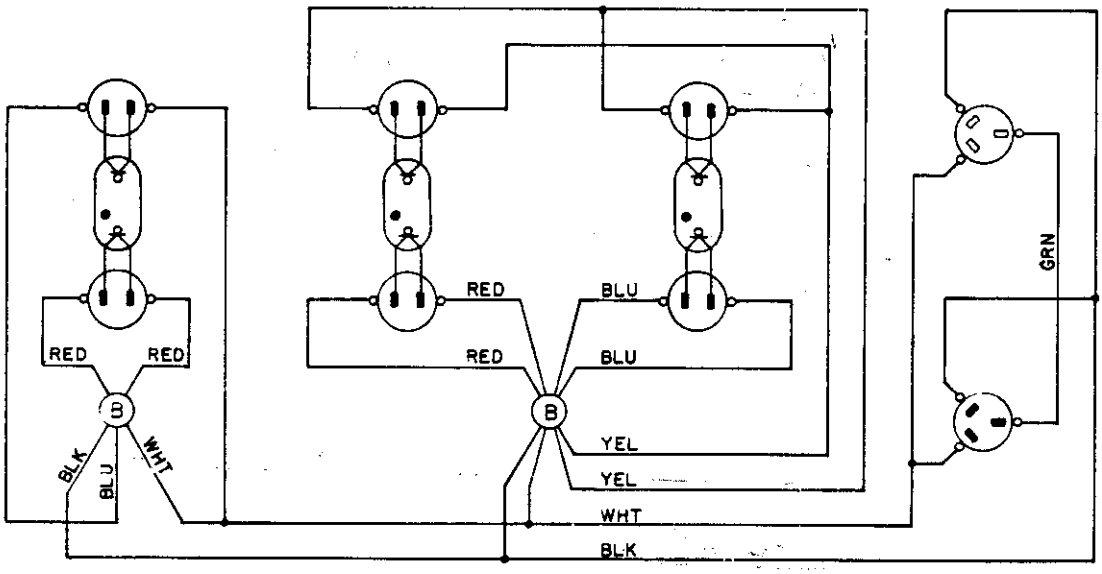
LEGEND

BLK- BLACK WIRE
WHT- WHITE WIRE
RED- RED WIRE
GRN- GREEN WIRE
BLU- BLUE WIRE
YEL- YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

WIRING DIAGRAM FOR: FUNNEL WITH TWO TWISTLOCKS



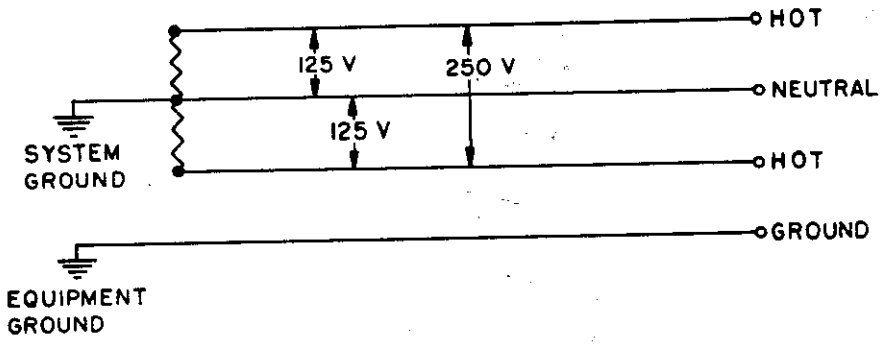


LEGEND

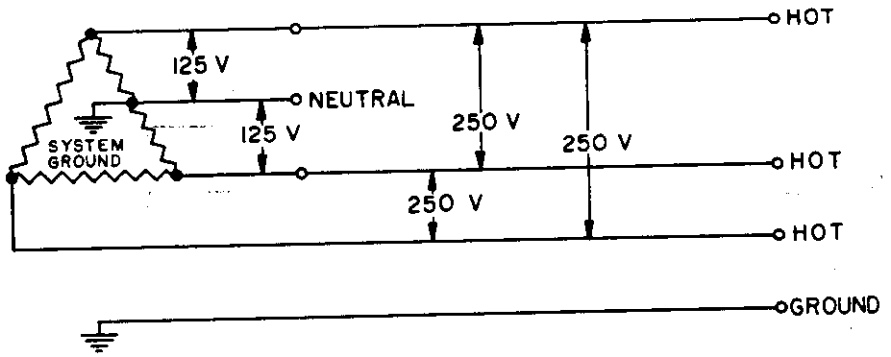
BLK- BLACK WIRE
WHT- WHITE WIRE
RED- RED WIRE
GRN- GREEN WIRE
BLU- BLUE WIRE
YEL- YELLOW WIRE

- ONE CONDUCTOR WIRE
- TWO WIRES CROSSING, NO CONNECTION
- PERMANENT CONNECTION
- WIRES CONNECTING
- GROUND
- SCREW CONNECTION
- THREE CONDUCTOR CABLE
- FOUR CONDUCTOR CABLE
- MALE TWISTLOCK CONNECTOR
- FEMALE TWISTLOCK CONNECTOR
- LAMPHOLDER, ONE PIN
- LAMPHOLDER, TWO PIN
- (B) BALLAST
- (S) STARTER
- FLUORESCENT LAMP, TWO PIN
- FLUORESCENT LAMP, FOUR PIN
- ELECTRIC RING AND BRUSH
- CIRCUIT BREAKER
- FUSE
- SWITCH
- ENCLOSURE

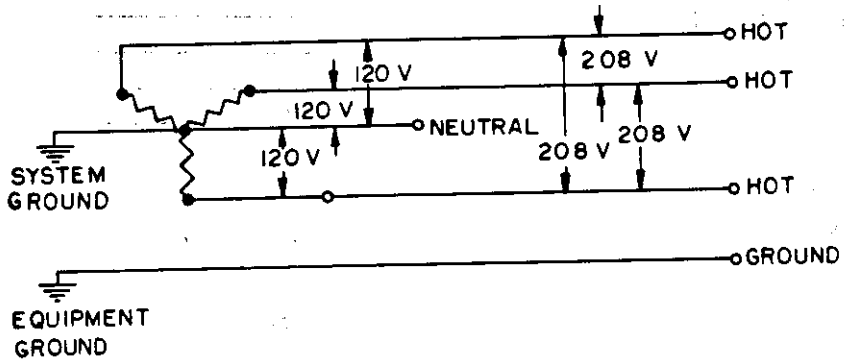
WIRING DIAGRAM FOR: FORMS OF POWER AVAILABLE



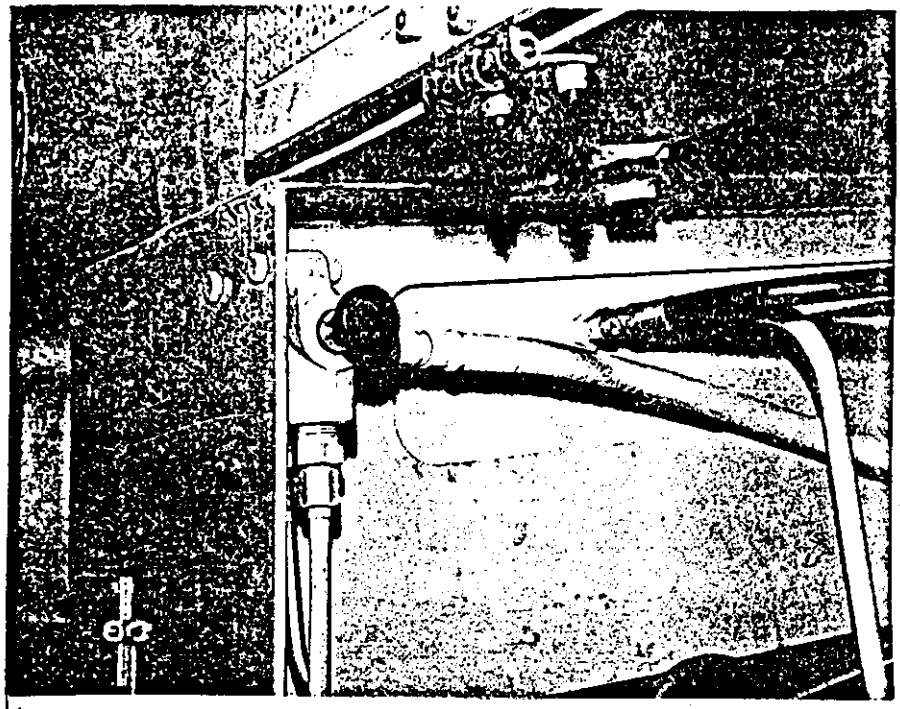
"SPLIT 220"



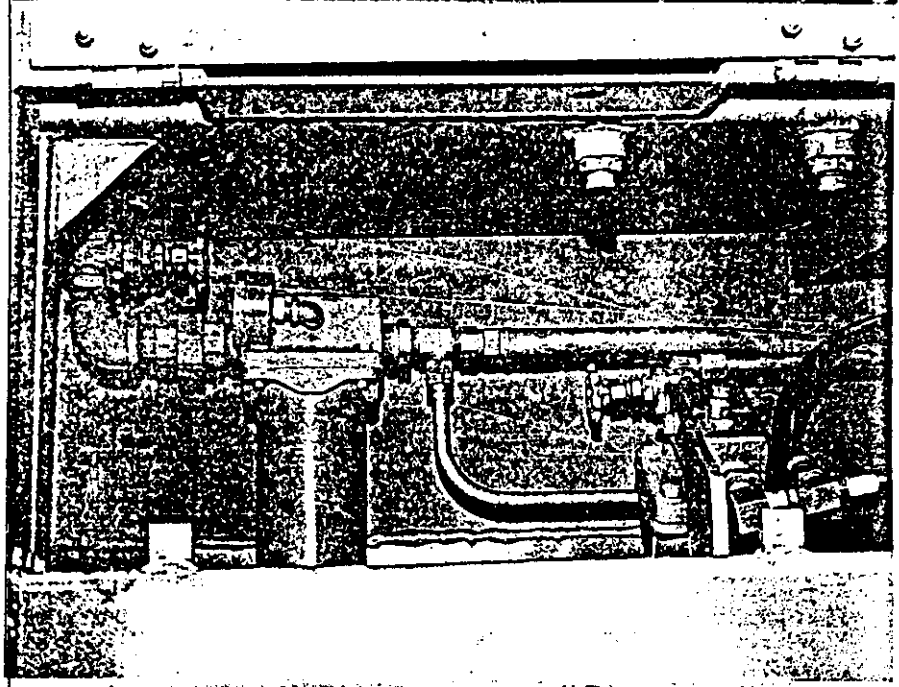
DELTA WINDING



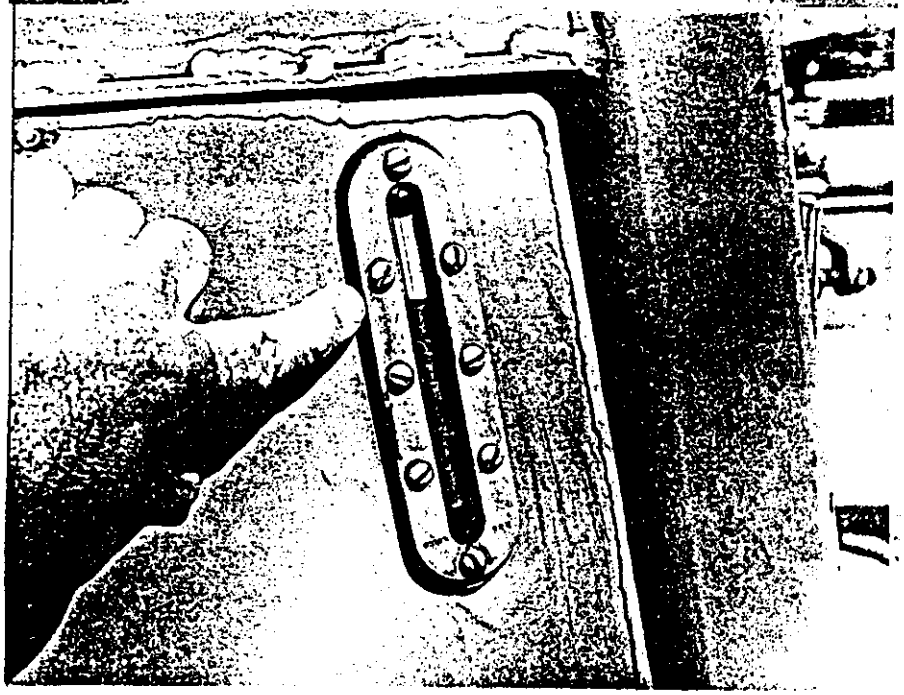
"Y" WINDING



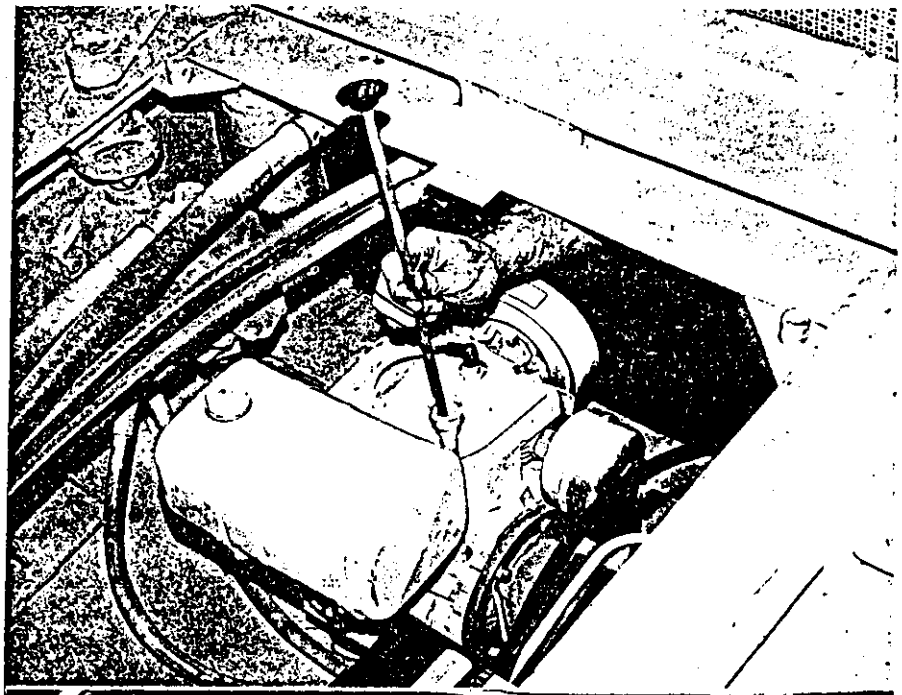
9



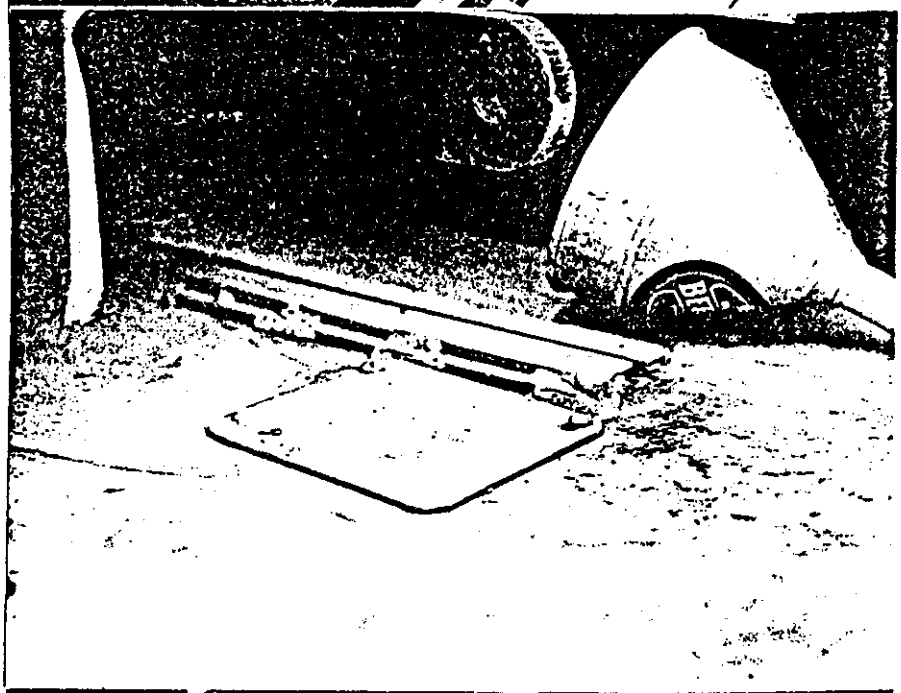
10



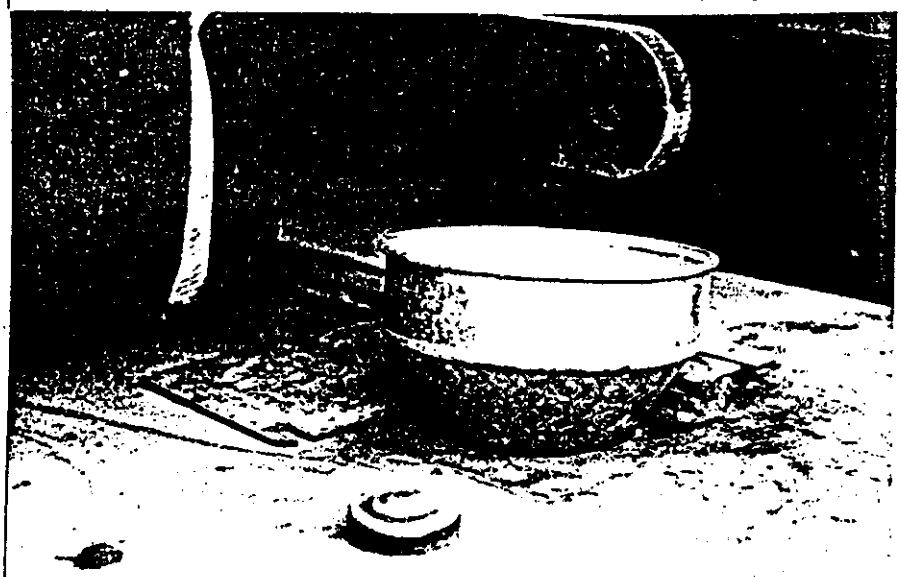
11



12



13



14

When you start the engine, check the gages on the two filters under the hydraulic reservoir to be sure that the pump is pulling freely and not developing excessive suction in the intake filter nor excessive backpressure in the return line filter. The vacuum gage on the suction filter is shown in Picture No. 15. The gage shows vacuum in inches of mercury. This is a very important gage that should be watched not only during the setup operation but from time to time during the operation of the ride. If this filter should get clogged, with the gage showing a high reading, the oil going to the hydrostatic transmission which drives the ride would be cut off. In a very short time this could ruin the hydrostatic transmission. Some filters have a by-pass circuit in them so that when they become clogged the oil just flows around the filter until such time as the filter is changed. This suction filter has no by-pass, and is used because it is the specific recommendation of the hydrostatic transmission manufacturer. For the safety and continued operation of the hydrostatic transmission, this does require that you check this filter regularly and frequently.

The return line filter shown in Picture No. 16 has a pointer on the top which shows the condition of the filter. When the pointer moves from the green "O.K." portion to the red "Change" portion, the filter should be changed. This filter does have a by-pass, so that if the filter is not changed when it should be, the oil goes around it. Of course, there is no cleaning of the oil when this occurs and the protection to the whole hydraulic system will be lost.

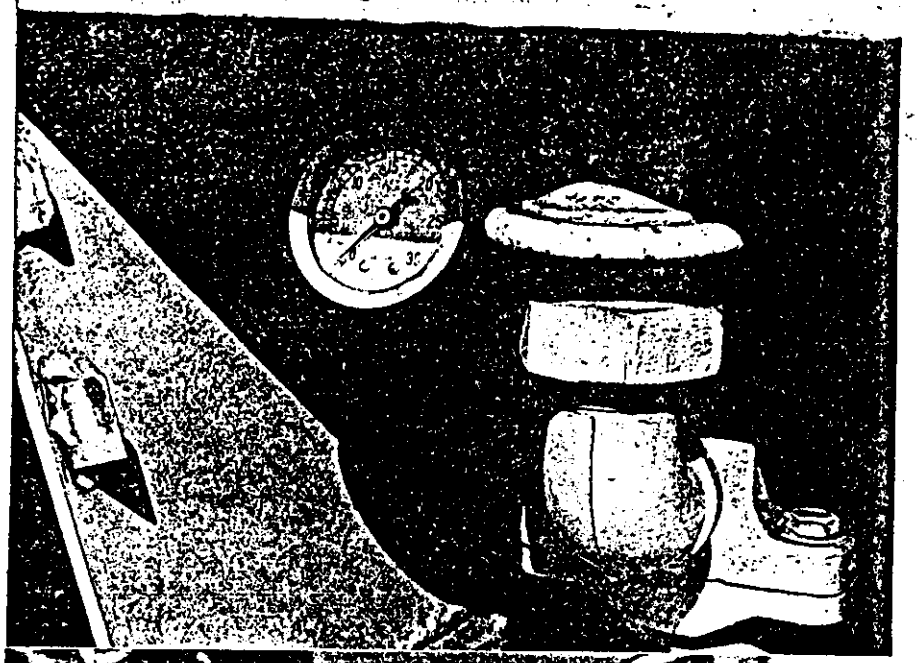
The engine is set at the factory to operate at 2,000 RPM, and it should always be adjusted to that speed.

Next, go forward on the left hand side of the trailer to the opening in the side beam where three valve handles can be seen. See Picture No. 17. The first thing to do is push down the two outside handles all the way, and then hold each one down until you can hear the engine load up, just to be sure that the main cylinders are fully retracted. Sometimes they tend to drift down slightly. If these cylinders get extended they will interfere with the proper operation of the small cylinders which raise the large cylinders up to operating position. The small cylinders are both controlled by the single valve lever in the center.

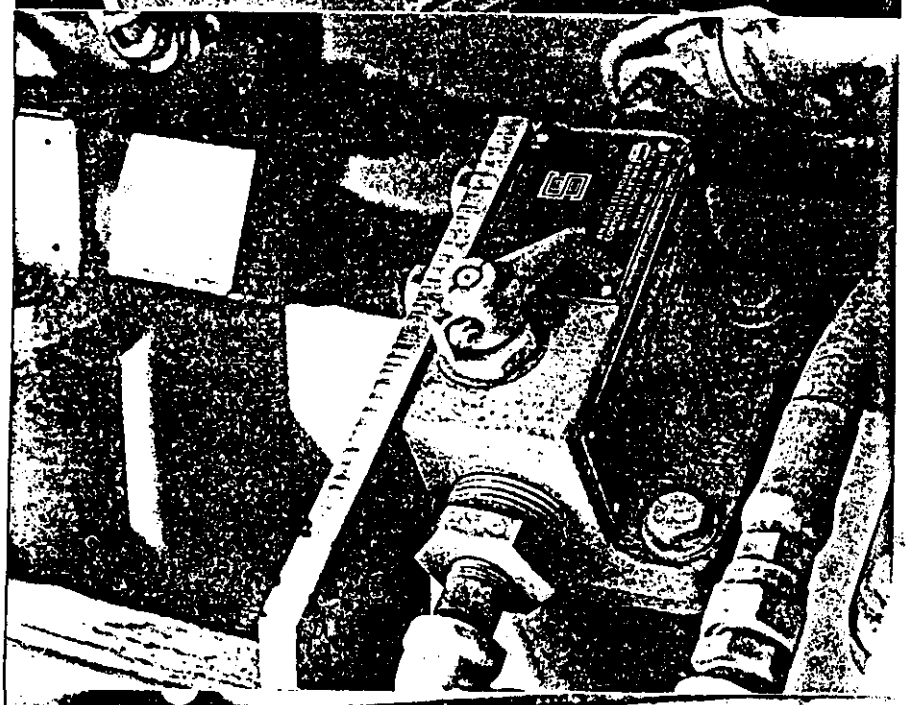
Push the outer handles in the direction you want the trailer to move. In this case it will not actually move, since it is supported by the tractor, but you move the outside handles down as though you were lowering the trailer and retracting the landing gear. Note: you do <u>not</u> move the handle in the direction the cylinder rod goes; just the opposite is true.

Next, raise the middle handle all the way. This will cause the large landing gear cylinder trunnions to rise into operating position as shown in Picture No. 18. The two trunnions hardly ever come up together. This is normal, because of the difference in line pressure losses going to each cylinder. When the two trunnions have been fully raised, and you can hear the engine load up, insert a trunnion pin into each trunnion linkage to lock it in place. In Picture No. 18, the man on the far end is preparing to insert this trunnion pin, and the installed pin can be seen in Picture No. 19. This trunnion pin has a built-in sliding "hammer" for driving the pin in and out. There are two different sizes of pins of this design, and the ones used here are the longer of the two. The sliding hammer will do a very satisfactory job, but as you use it or handle it be sure that you do not get pinched. In installing the trunnion pins you may find it necessary to hold up on the center valve handle while the pin is being driven in.

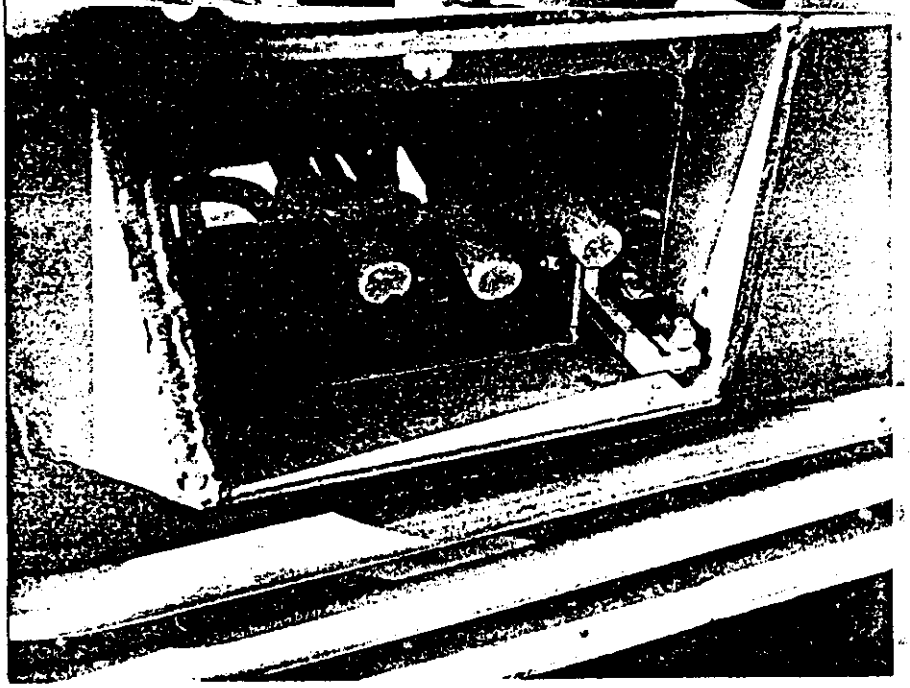
After the two trunnion pins are in place, raise the two outside handles as shown in Picture No. 20. This will extend the cylinders and lower the landing gear, until



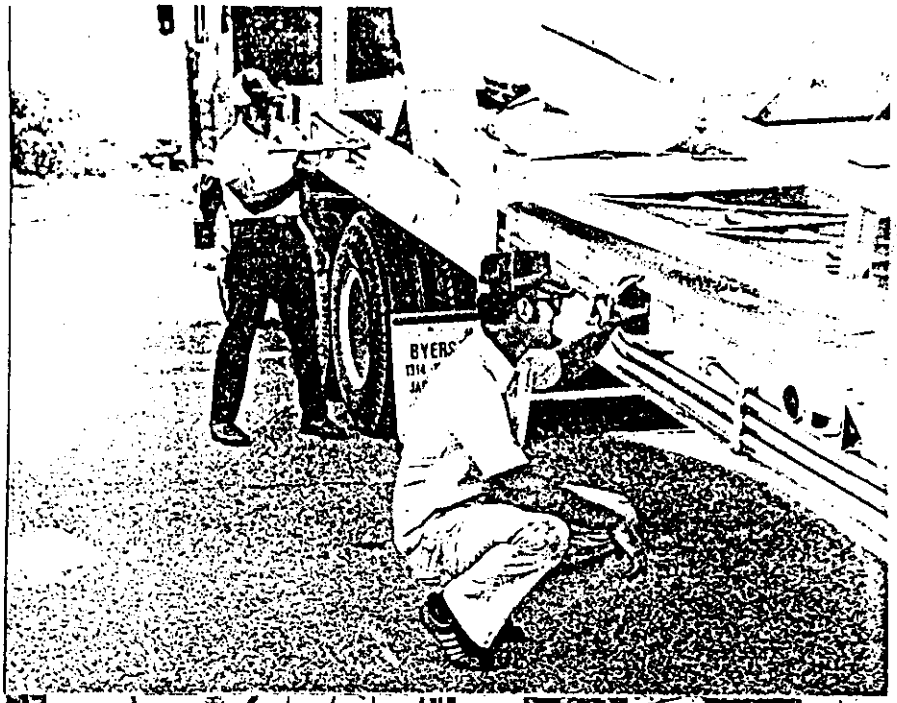
15



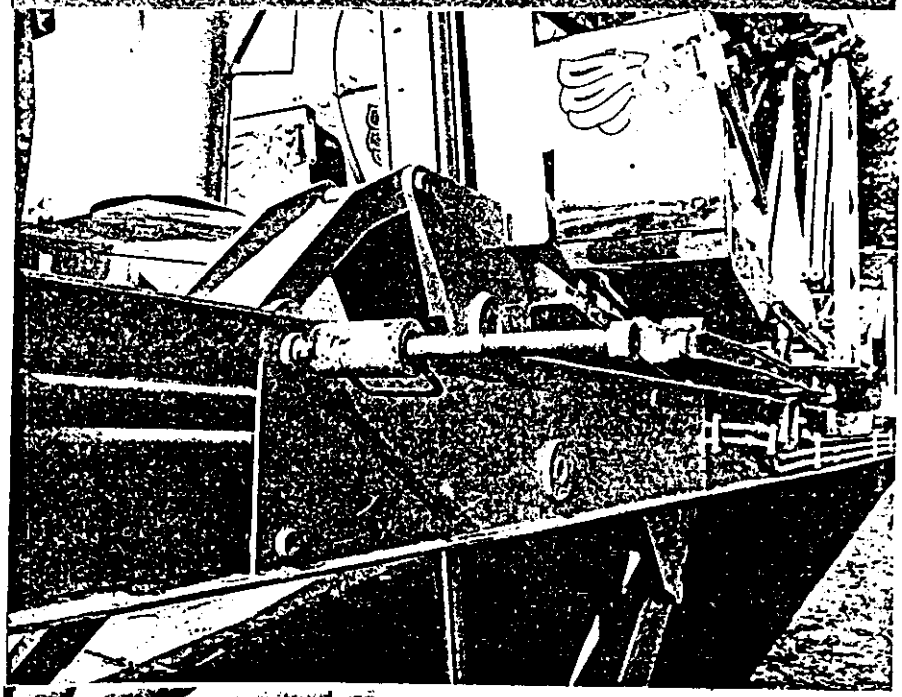
16



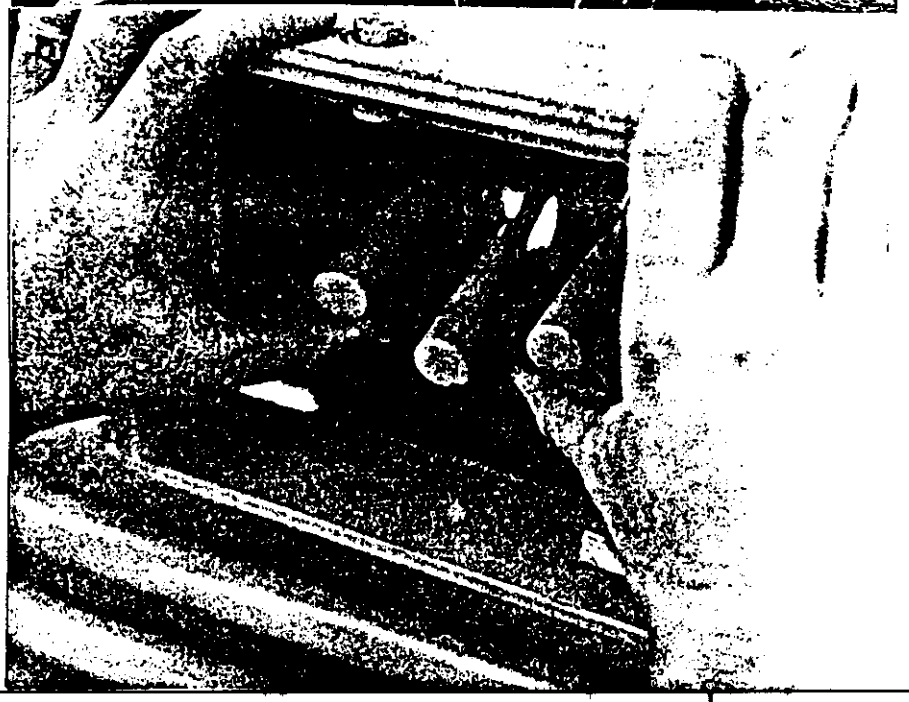
17



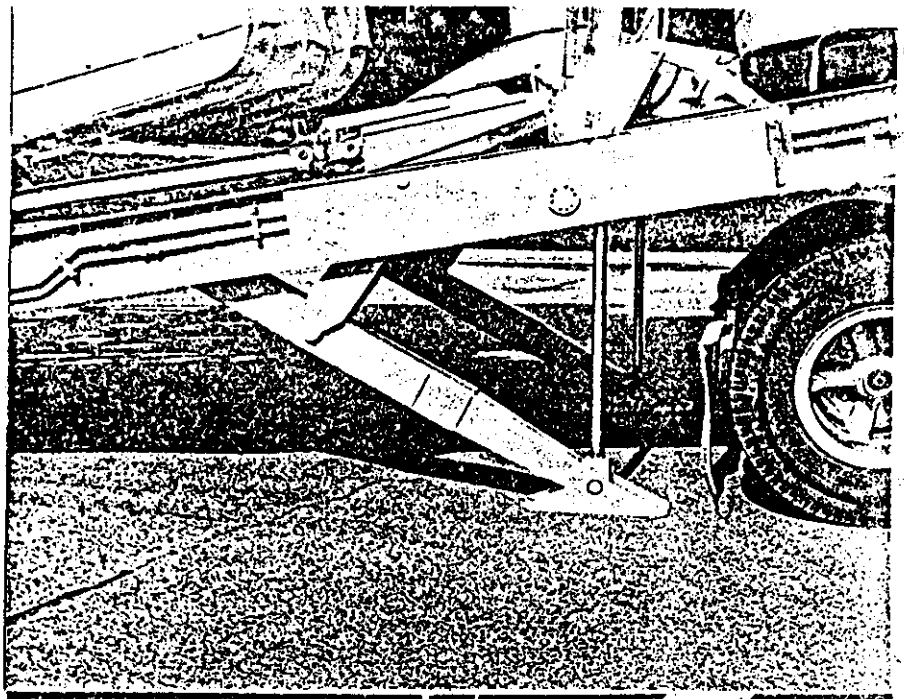
18



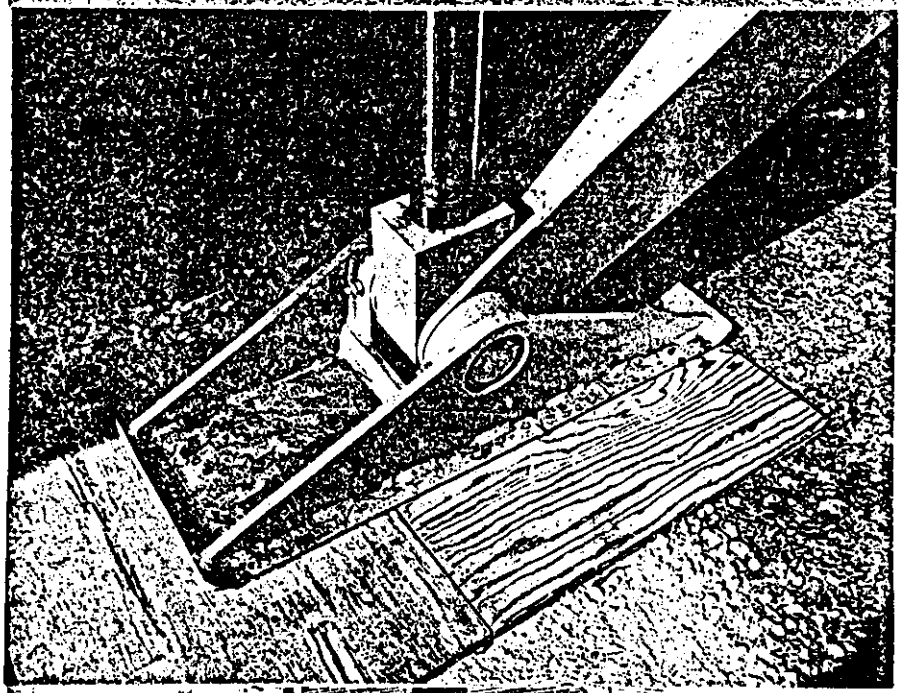
19



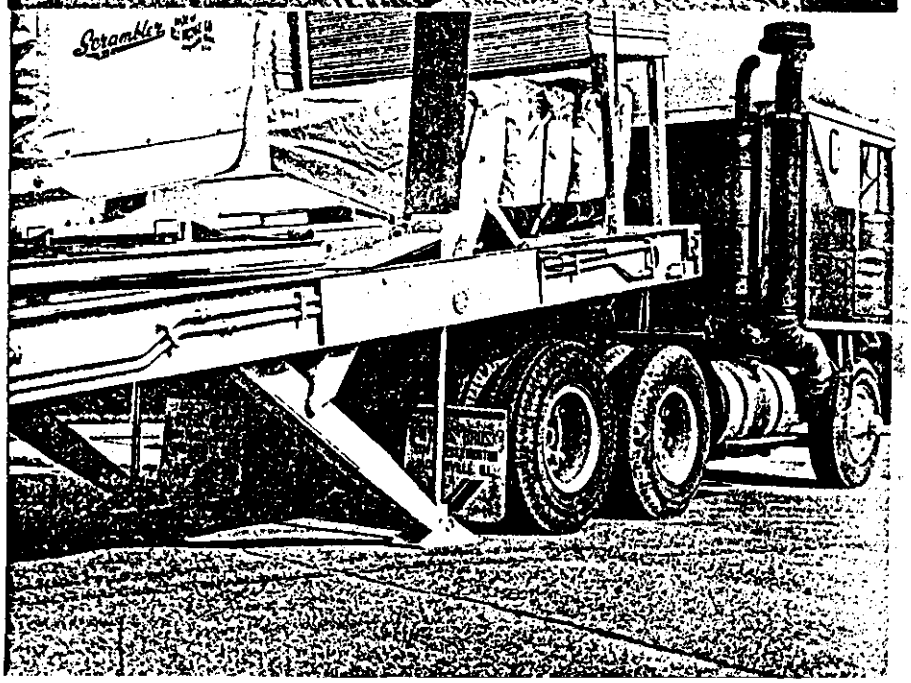
20



21



22



23

the weight of the trailer can be picked up with the landing gear feet, as shown in Picture No. 21. It would be advisable to put a steel plate or a piece of half-inch plywood under the landing gear feet, as shown in Picture No. 22, to spread the load; otherwise, in soft ground or blacktop the feet may sink in. Do not use thicker material or the trailer will not go all the way to the ground.

As nearly as possible, always keep the load straight down on the landing gear. Trying to operate on a steep side-to-side slope can put excessive side loads on the landing gear and even damage them, so you should try to pick a spot that is as flat from side-to-side on the trailer as you can.

The trailer should be raised until it is almost ready to lift off the fifth wheel. See Picture No. 23. There should still be a little pressure on the fifth wheel. Release the kingpin and drive out the tractor, leaving the trailer supported by the landing gear, as shown in Picture No. 24.

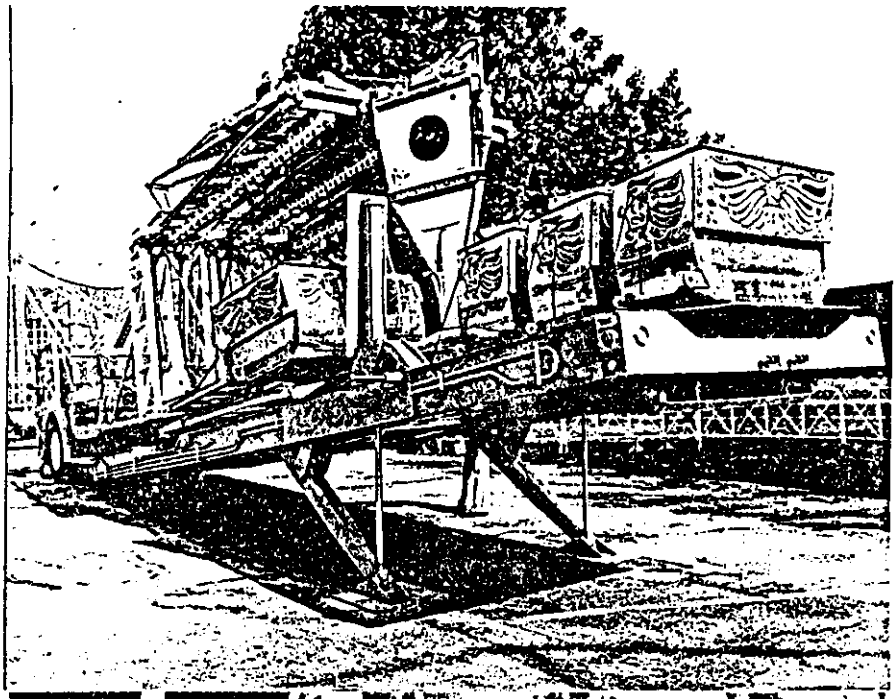
DANGER: NEVER UNDER ANY CIRCUMSTANCES GET UNDER THE TRAILER UNLESS THE TRACTOR IS HOOKED UP TO THE KINGPIN OF THE TRAILER SO THE TRACTOR CAN SUPPORT THE LOAD. WITHOUT THE TRACTOR IN POSITION TO CARRY THE LOAD, THE ELEVATED POSITION DEPENDS ON HYDRAULIC CYLINDERS, HOSES, TUBES, AND VALVES. THESE ARE HIGH QUALITY PIECES OF EQUIPMENT, BUT YOU SHOULD NEVER RELY ON THEM TO PROTECT YOU IF YOU SHOULD NEED TO GET UNDER THE TRAILER.

With the trailer up on its landing gear, be sure to remove the long pins that lock the kingpin plate in position. They are to be found all the way to the front on each side of the trailer, as shown in Picture No. 25. To get to this pin, remove the quick-release pin as is being done in Picture No. 26, lift up the pin guard, and replace the thumb pin in the guard.

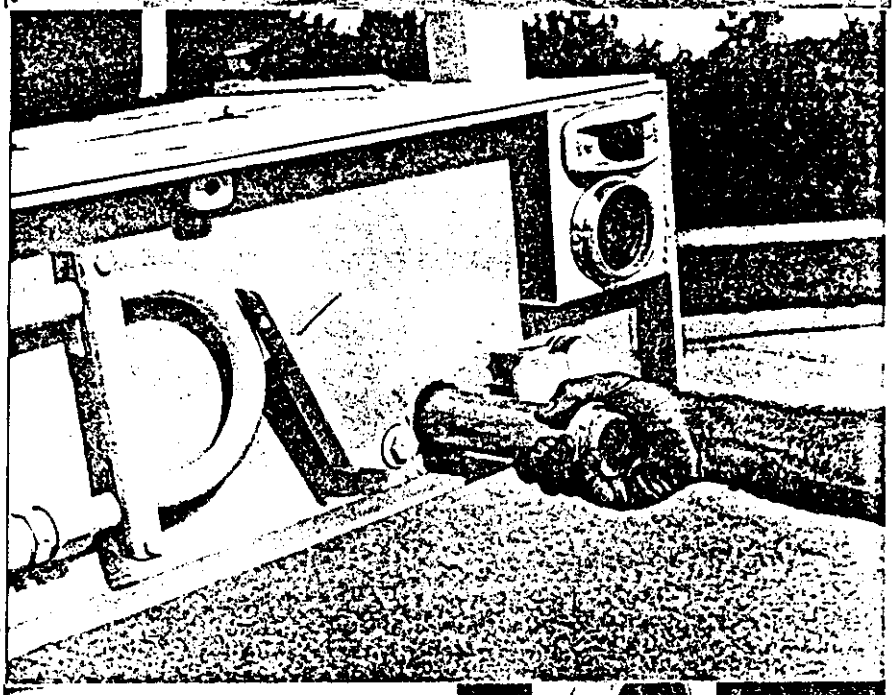
When going down the highway with the trailer, the main deck of the trailer is slanted upward at the front, but the kingpin plate must be horizontal for the fifth wheel to operate properly, and so the entire kingpin plate pivots on heavy linkages, as shown in Picture No. 27. The long pins lock the linkage so it can carry the kingpin load, and they must be removed when the trailer is to be lowered to the ground so that the kingpin plate can fold up inside the trailer. If these long pins are not removed, all the weight of the front end of the trailer will rest on the kingpin when the trailer is lowered to the ground. In fact, you will not be able to take the trailer all the way to the ground. The load may damage the kingpin if the whole weight is allowed to rest on it. Therefore, do not forget to remove the long pins as soon as you drive out the tractor.

It is recommended that you put a piece of plywood on the ground where the kingpin will touch, to keep the kingpin clean and undamaged.

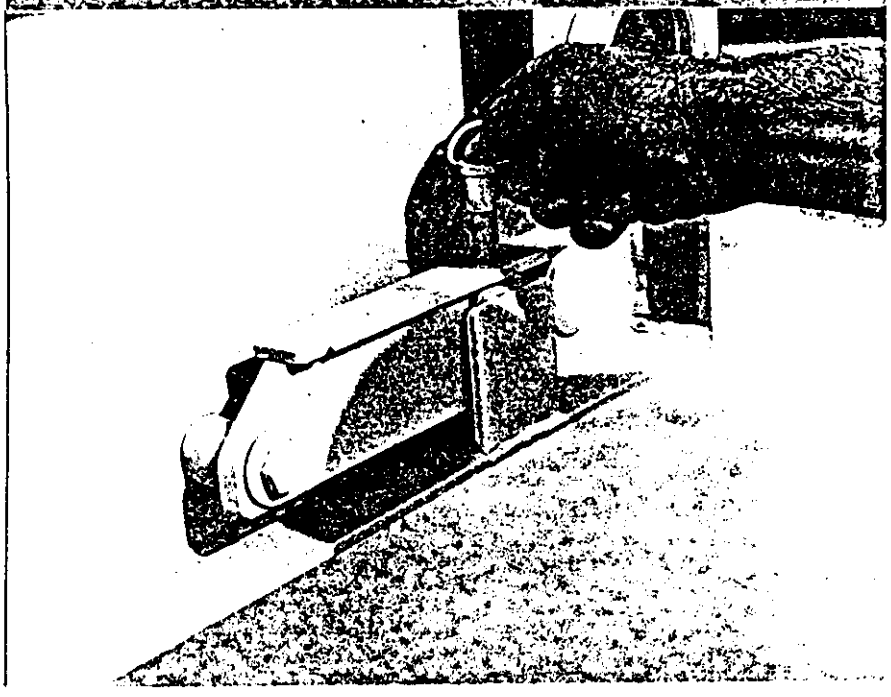
The long pin is made to fit loosely, and ordinarily you can pull it out from the outer end. If it has sat for a long time, and some rust has formed in the holes, it may be necessary to bump the inner end of the pin with a heavy hammer, through the open front end of the kingpin plate in Picture No. 27. A light hammer will not work because the pin is so big and heavy that it cannot be moved with a lightweight tap. Removal of these pins will be easier if the pins are always greased before they are inserted. Do not use a hammer any more than necessary to avoid damaging the end of the pin. Often twisting the pin will free it so it can be removed. The twisting can be done on either end of the pin.



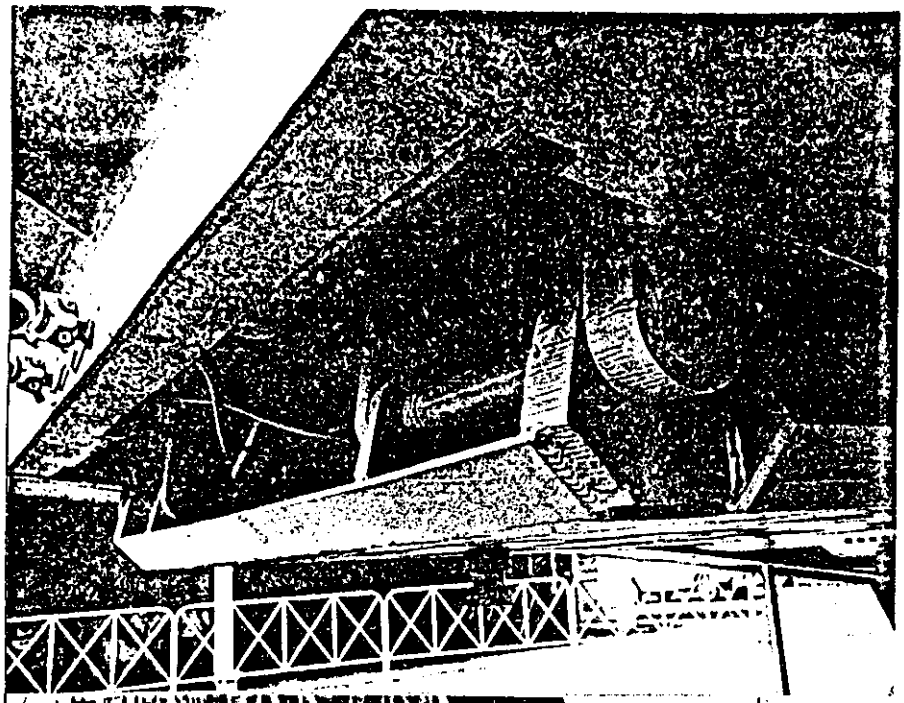
24



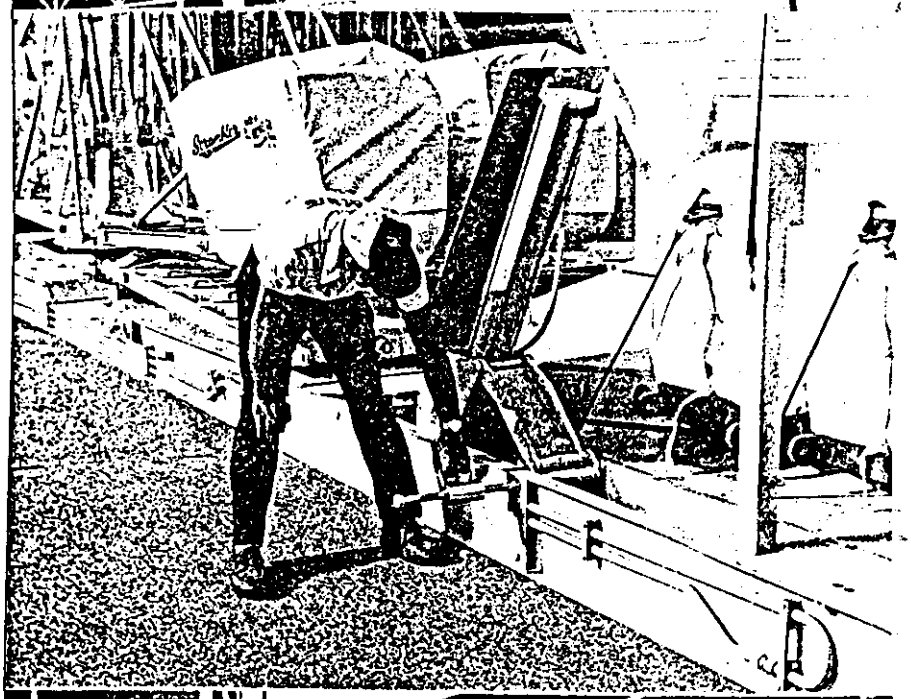
25



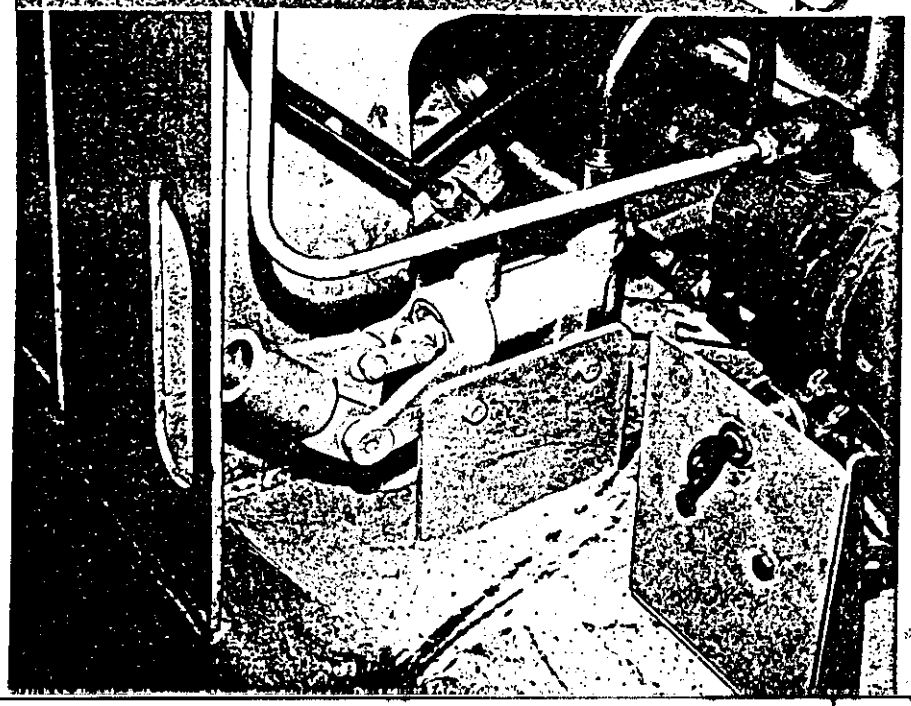
26



27



28



29

WARNING: NEVER MOVE THE TRAILER WITH A TRACTOR UNLESS THE LONG PINS ARE INSTALLED AND BOTH PINS LOCKED TO KEEP THE LONG PINS FROM WORKING OUT. WITHOUT LOCKS, THE PINS COULD WORK OUT BEYOND THE TRAILER, EXTENDING INTO TRAFFIC ON EITHER SIDE AT GREAT HAZARD TO PASSING VEHICLES OR PEOPLE. IF THE PINS WERE TO COME ALL THE WAY OUT, THE KINGPIN PLATE OF THE TRAILER WOULD TRY TO FOLD INSIDE, PINCHING AND POSSIBLY BREAKING THE KINGPIN OR THE FIFTH WHEEL, AND MAKING IT DIFFICULT, IF NOT IMPOSSIBLE, TO STEER THE TRACTOR AND TRAILER. THEREFORE, NEVER MOVE THE TRAILER WITH A TRACTOR UNLESS THE LONG PINS ARE IN PLACE TO LOCK DOWN THE KINGPIN PLATE, A LATCH IS ACROSS THE OUTER END OF EACH LONG PIN, AND THE LATCH IS SECURED WITH A THUMBPIN.

Next, push the two outside valve handles down and lower the trailer all the way to the ground. After the trailer is on the ground, hold down both valve handles until you hear the load increase on the engine. This will indicate that the main landing gear cylinders are fully retracted.

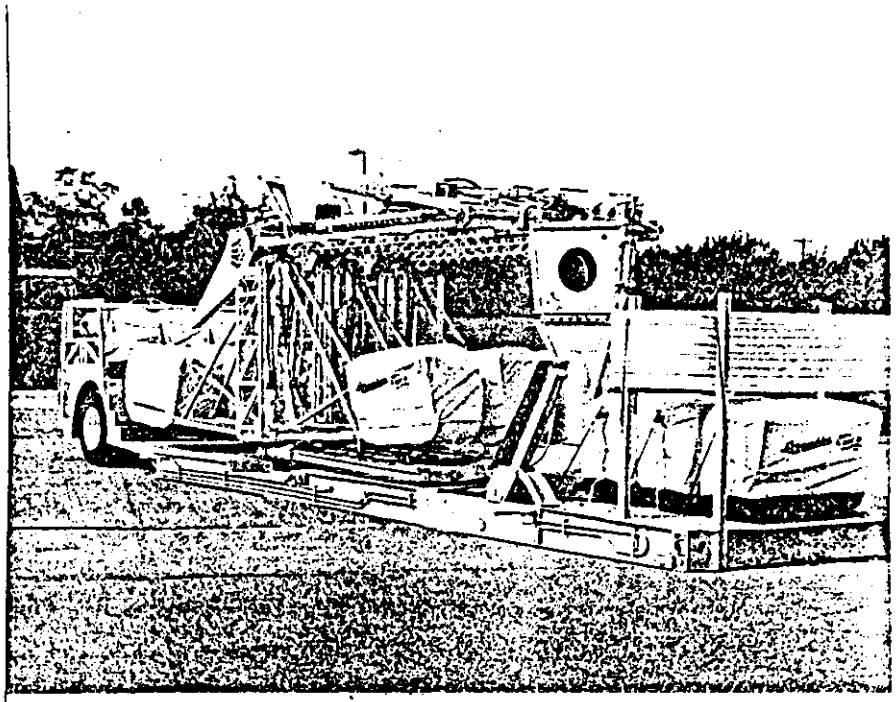
Next, remove the trunnion pins from the landing gear trunnion linkage, as shown in Picture No. 28. Push down on the center valve handle, and this will lower the cylinders down inside the trailer until the doors are flush. The two cylinders will not be likely to come down together, and this is normal procedure to be expected.

Alternative procedure: If for some reason the engine-driven pump cannot be used, a hand pump is provided at the extreme rear of the trailer, as shown in Picture No. 29. Push the selector switch (Picture No. 9) all the way in, and this will direct hydraulic oil to the hand pump and to the setup hydraulic circuit. The valve handles operate in the same way, but another person will have to be at the rear of the trailer to operate the hand pump. This hand pump is not hard to use, but of course it will take more time for the cylinders to extend or retract than if the engine-driven pump were used. The handle for the hand pump is stored in one of the tool boxes at the front of the trailer. If you should lose this handle, be sure that the replacement is one inch in diameter so that it will closely fit the socket casting of the hand pump, or you may break the casting when the load on the handle is the heaviest.

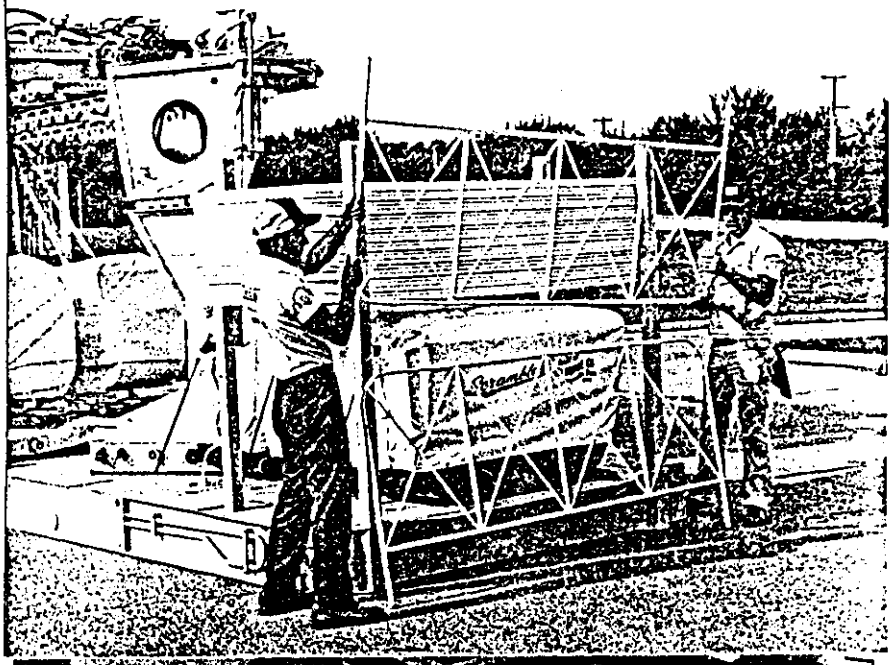
This completes the placement of the trailer on the ground where you want the TMS Scrambler to operate. See Picture No. 30.

C. FENCE LOCATION

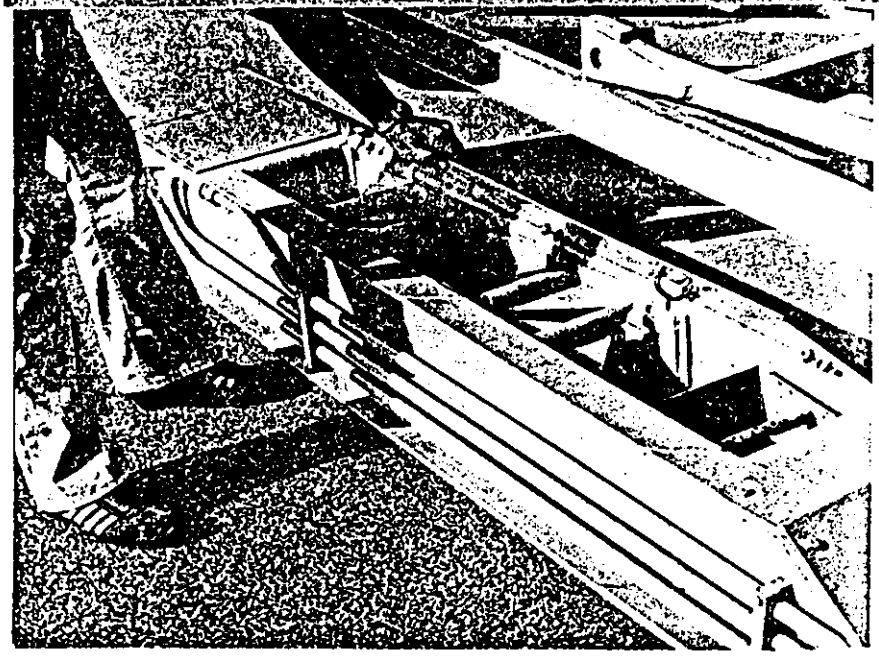
The next thing to do is to remove the fence from the front end of the trailer, as shown in Picture No. 31, and the fence feet from the compartment on each side of the trailer to the rear of the unit poles, as shown in Picture No. 32. Set up the fence so that it is 30 feet from the center pole all the way around. Since this operation will take a substantial amount of time, the engine should be shut off until you are ready to use hydraulic power again. With the fence all removed from the front end, pull out the four posts which carry the fence and slide them under the raised part of the rear end of the trailer. See Picture No. 33. After the ride is all set up, there should be a minimum of three feet between the Scrambler seats and the fence all the way around.



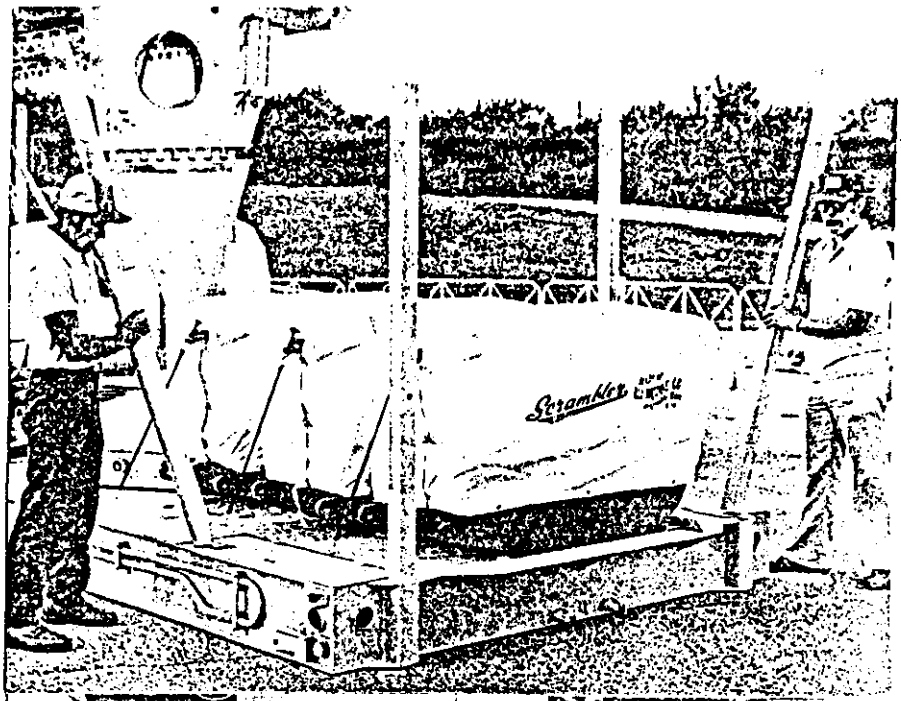
30



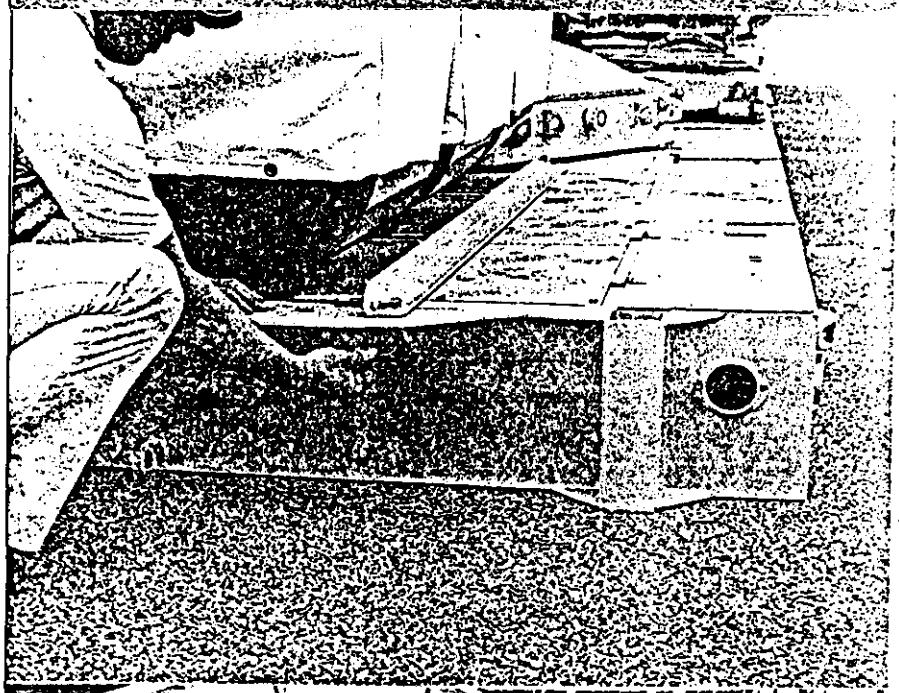
31



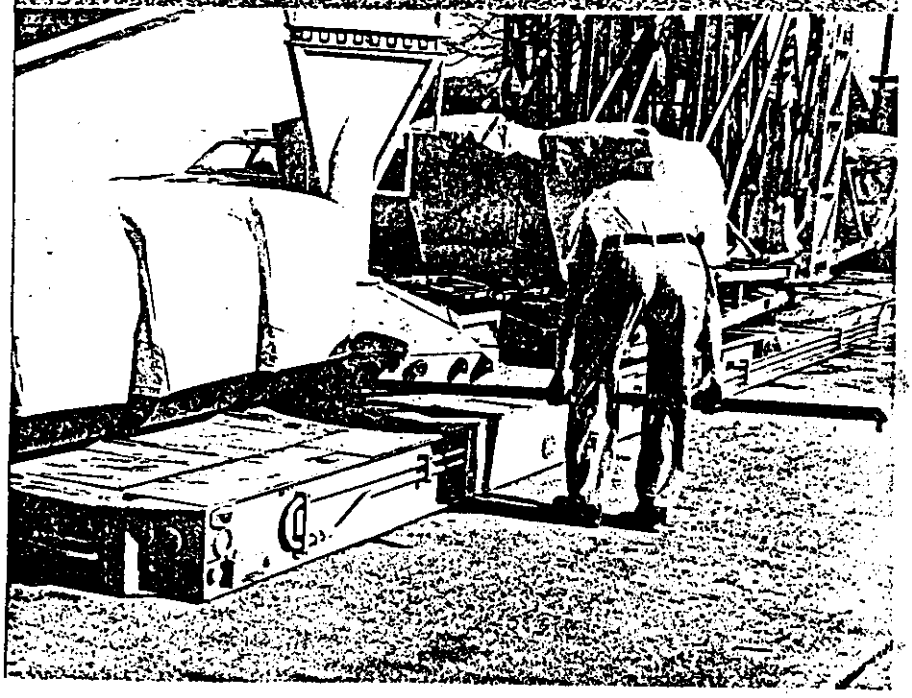
32



33



34



35

D. REMOVE SAFETY LOCKS USED IN HIGHWAY OPERATION

Next, there are three things that should be done: 1) Remove the seat lock angle from the front end of the trailer; 2)Remove the sweep lock angle just to the rear of the center pole; and 3) Remove the load binder and chain which tie together the outer ends of all three top sweeps. All three of these should be done at this time before you forget it. If you do forget one of the latter two, and go ahead trying to open up the Scrambler, you will very likely bend or break something, so do not forget to remove all three.

The seat lock angle is held in place by one Klik-pin at the front end of the trailer, as shown in Picture No. 34. Remove the Klik-pin and swing the angle around to the left side of the trailer, as shown in Picture No. 35. This makes it easier for you to see how to get the rear end of the seat lock angle out of the keyhole in the deck. See Picture No. 36. Slide the seat lock angle, also, under the rear end of the trailer. The seat lock angle must always be used when traveling on the highway to keep the seats from walking out of their tracks. Do not forget to install it before you move the trailer.

The sweep lock angle lies across the tops of all three bottom sweeps on the ends next to the center pole. A pin on each end extends down through the outer sweeps, where it is secured by a Klik-pin. See Picture No. 37. Reach under the sweep, remove each Klik-pin, lift out the sweep lock angle, replace the Klik-pins, and store the sweep lock angle under the rear end of the trailer. This sweep lock angle is essential to keep the three sweeps locked together and prevent their spreading apart when traveling on the highway. Never move the trailer without the sweep lock angle pinned and locked in place.

To get to the load binder and chain, climb up one of the vertically-folded seat sweeps on either side of the trailer, and you will see the chain and load binder which tie all three top sweeps together on the outer ends (Picture No. 38). Loosen the load binder, disconnect the chain, and store both in a fence foot compartment. Do not leave the load binder and chain on top of one of the top sweeps, because if it should fall off while the Scrambler is turning someone could get injured.

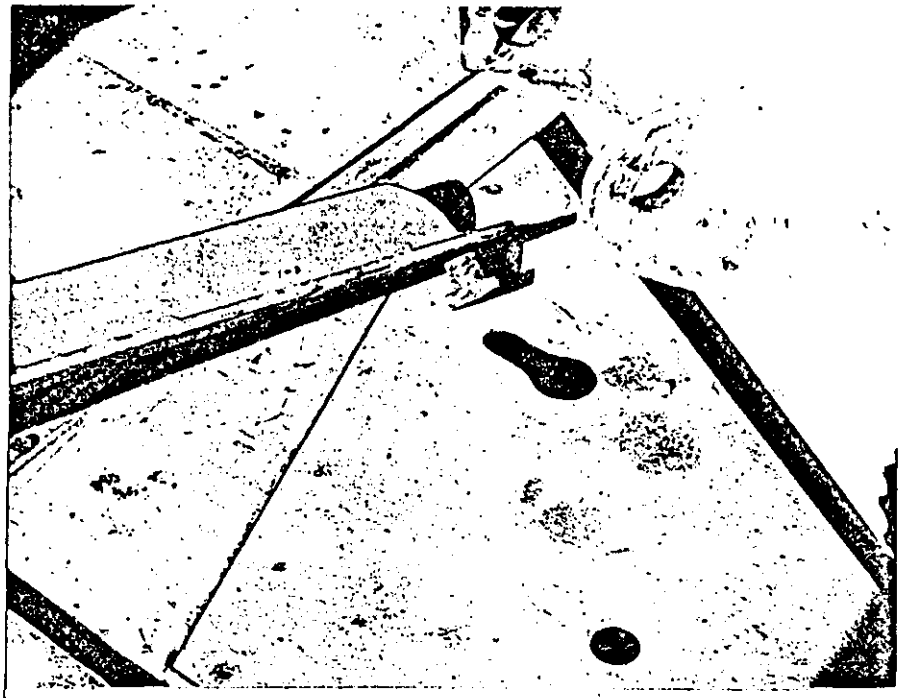
Do not forget to remove all three restraining devices: the seat lock angle, the sweep lock angle, and the load binder and chain.

E. REMOVE THE THREE SEATS FROM THE FRONT END OF THE TRAILER

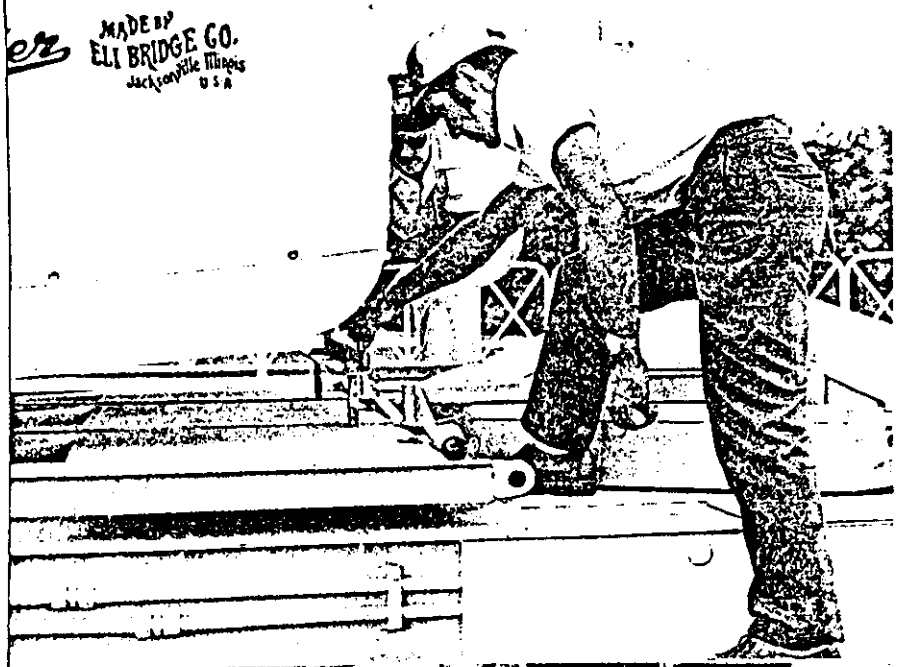
Take off the seat covers from the three seats on the front end of the trailer, as shown in Picture No. 39, and then slide the seats out of the tracks, as shown in Picture No. 40. Set each seat down parallel to the fence and directly in front of the trailer (see Picture No. 41). Position them so that as you open up the sweeps and turn the center pole there will be no possibility of a seat being hit.

F. CONNECT HYDRAULIC LINES TO THE MAST CYLINDER

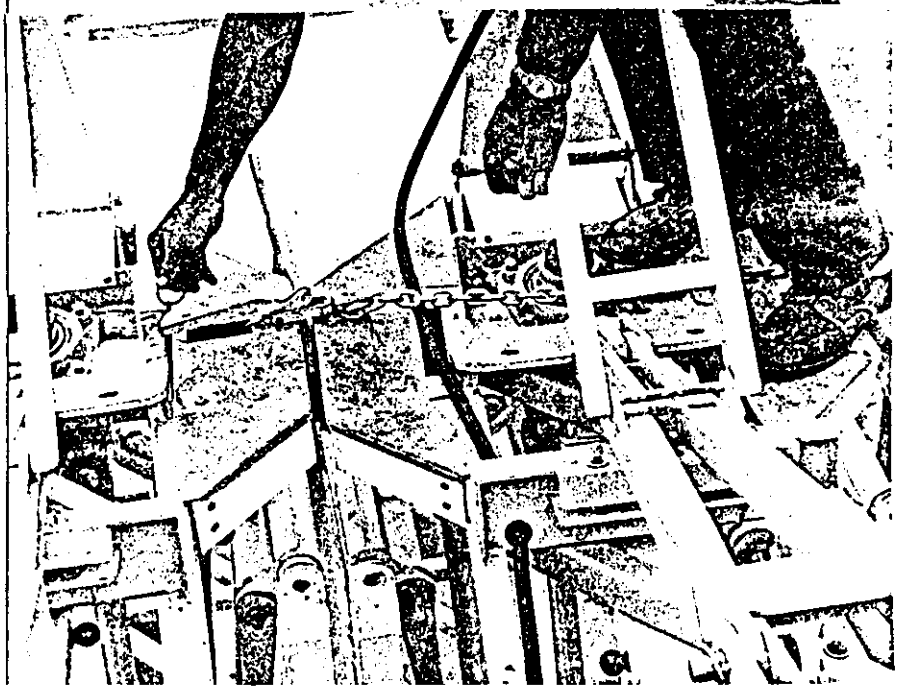
Open up and lay down flat the hose door which is in the floor of the trailer just forward of the center pole, and uncoil the two hoses you will find there. See Picture No. 42. The valve which controls the flow through these two hoses is located on the left hand side at the extreme front end of the trailer, as shown in Picture



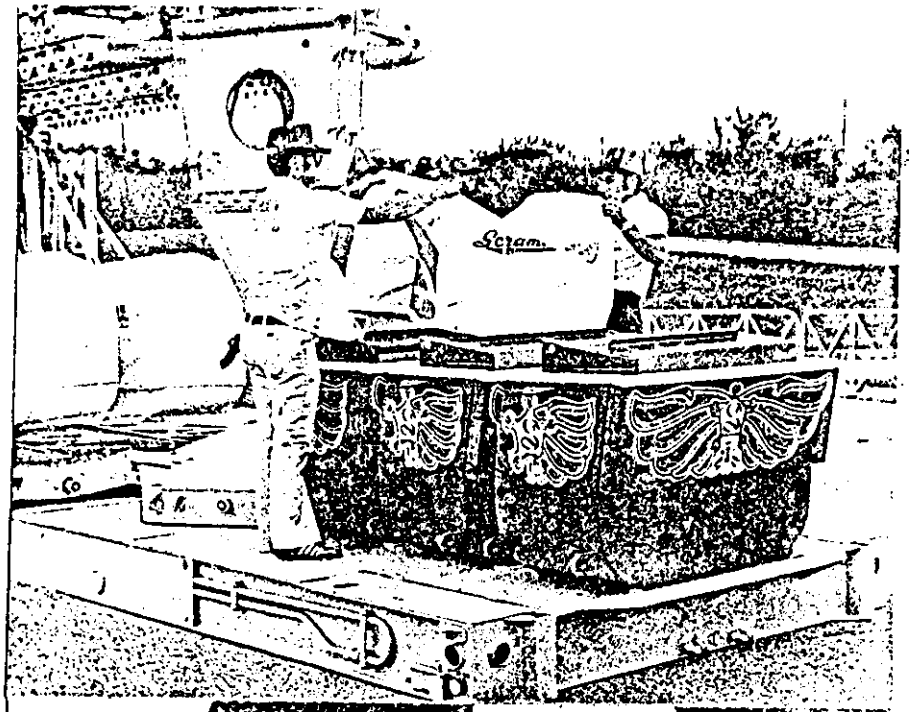
36



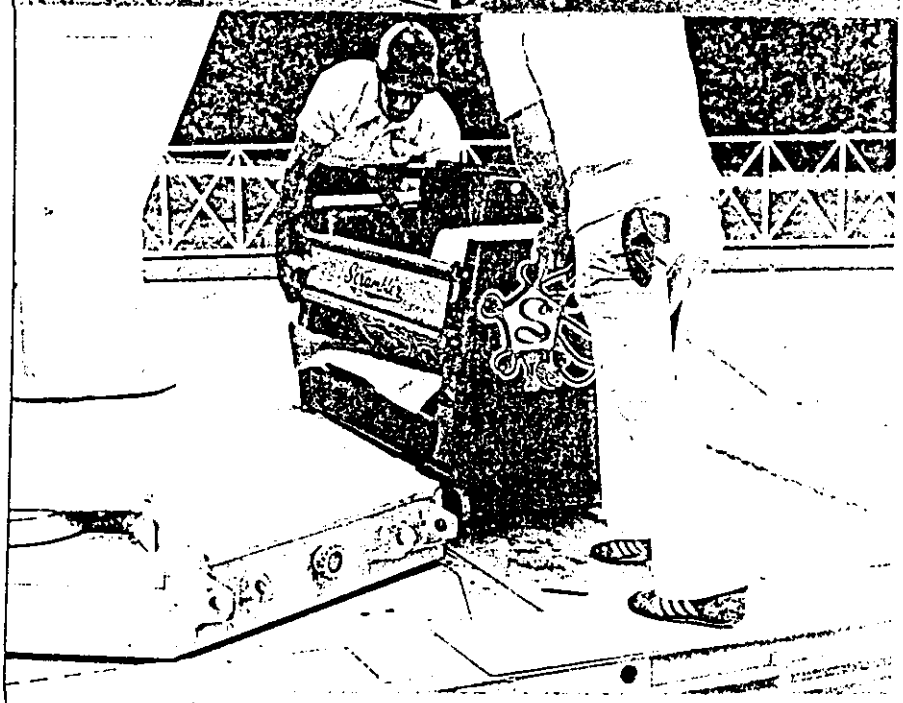
37



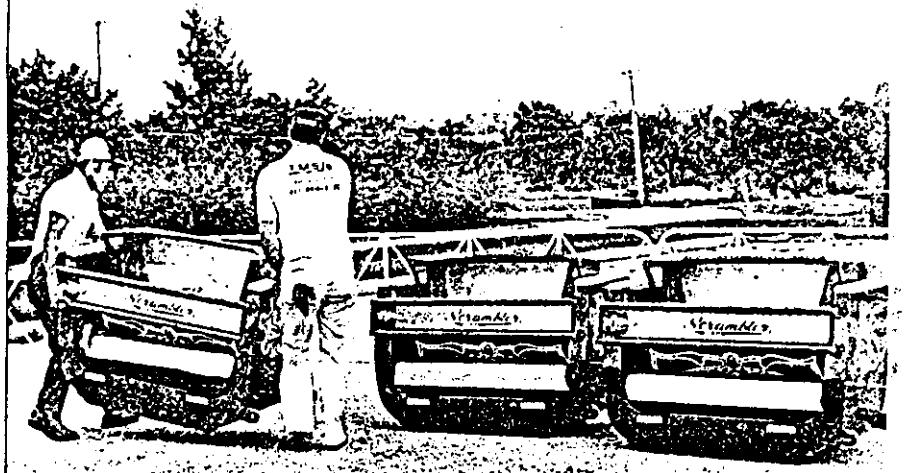
38



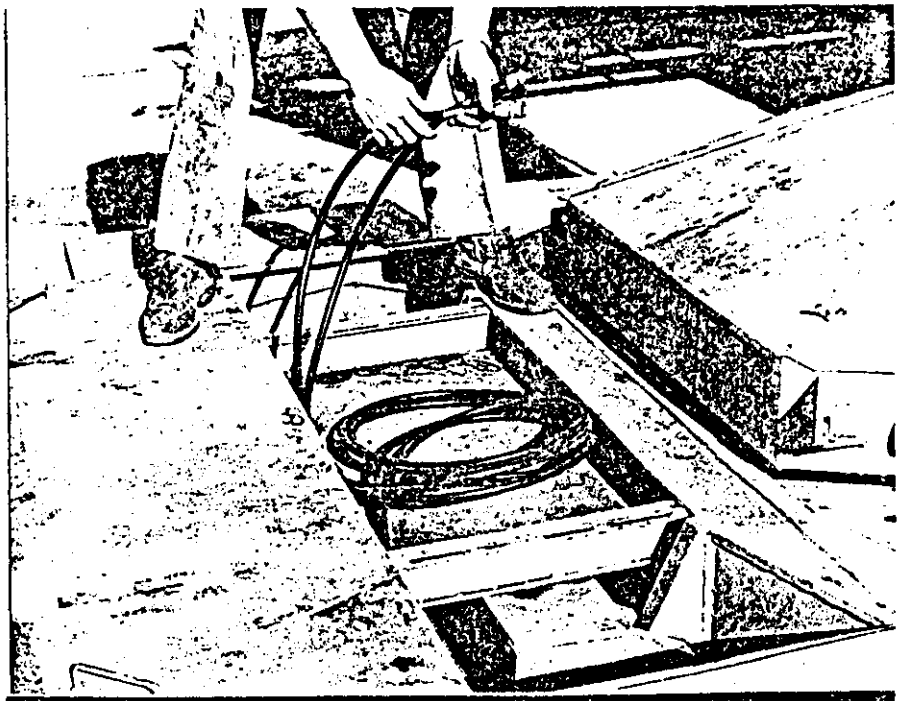
39



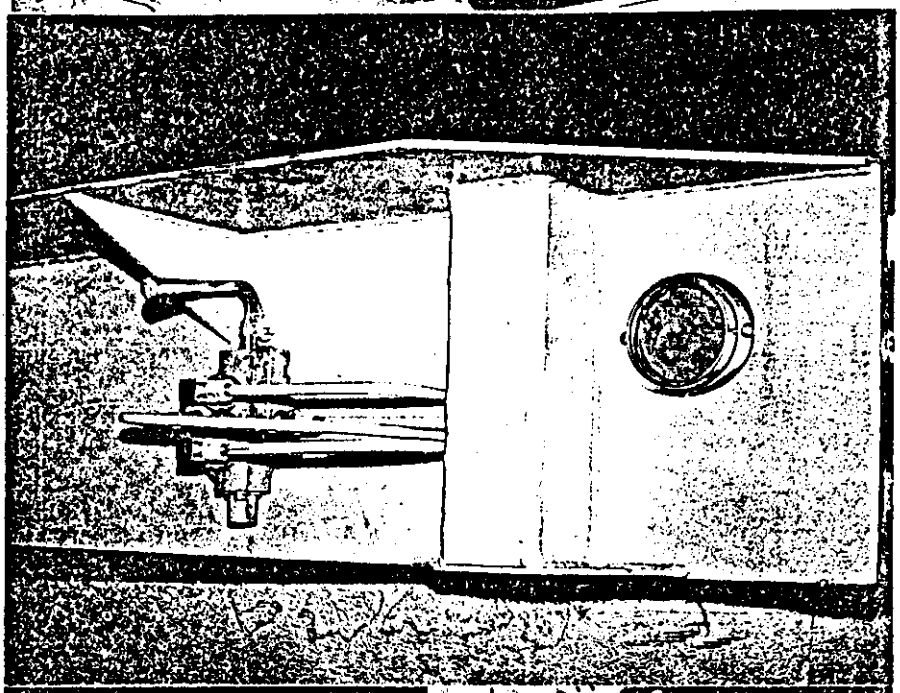
40



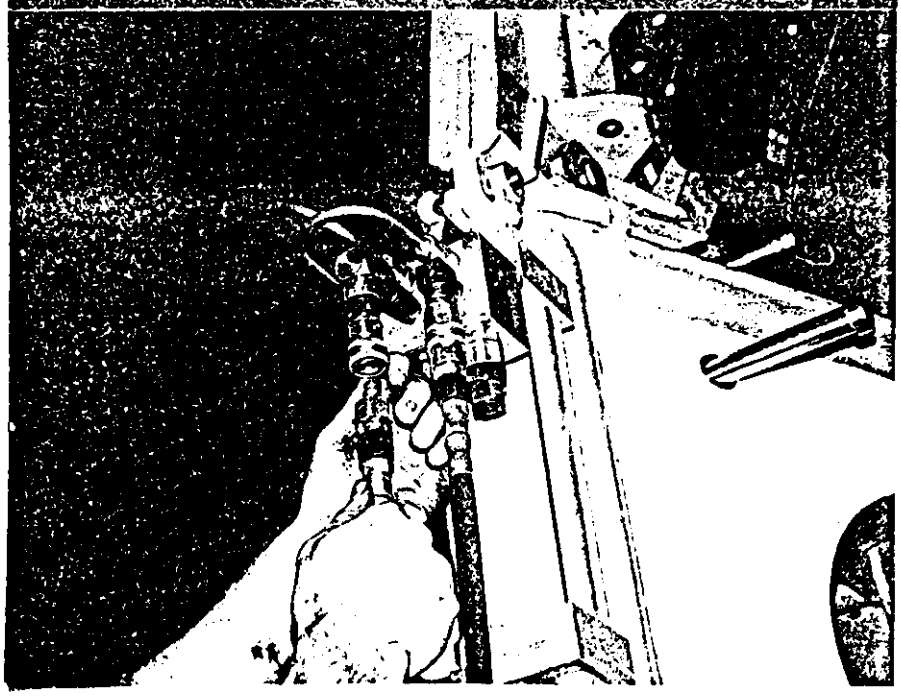
41



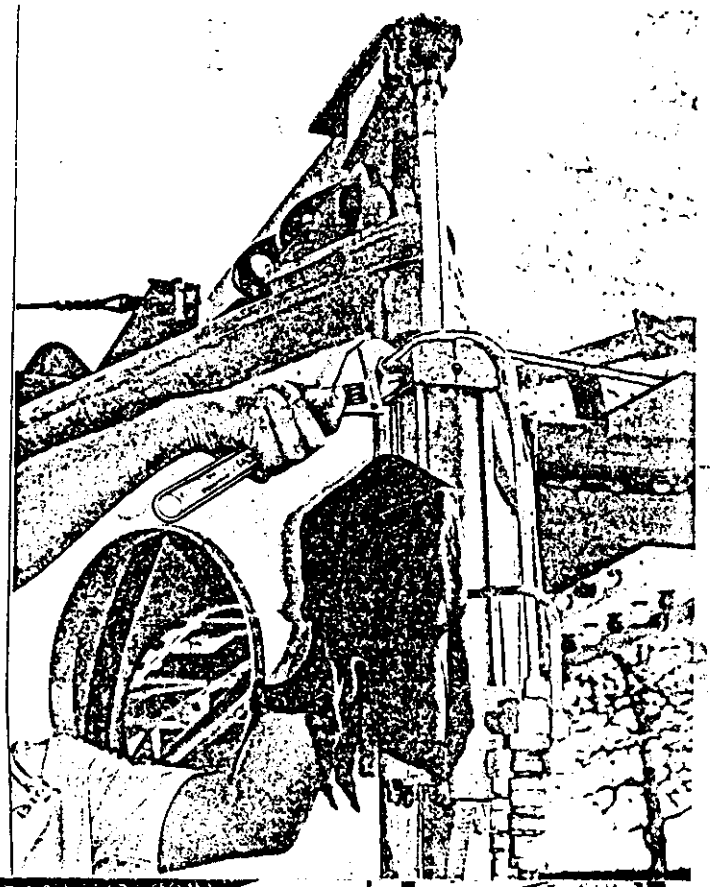
42



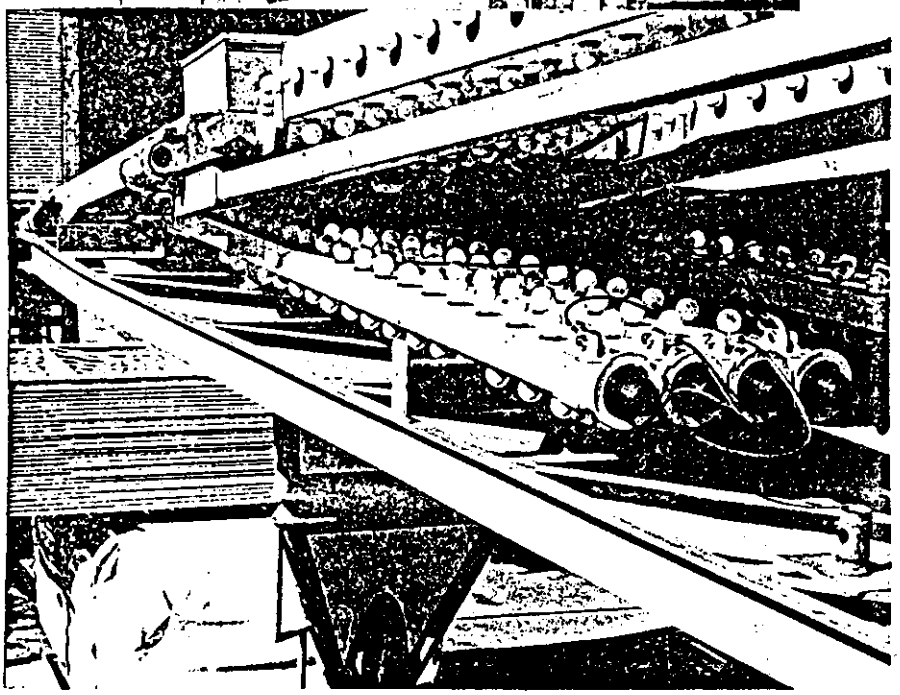
43



44



45



46

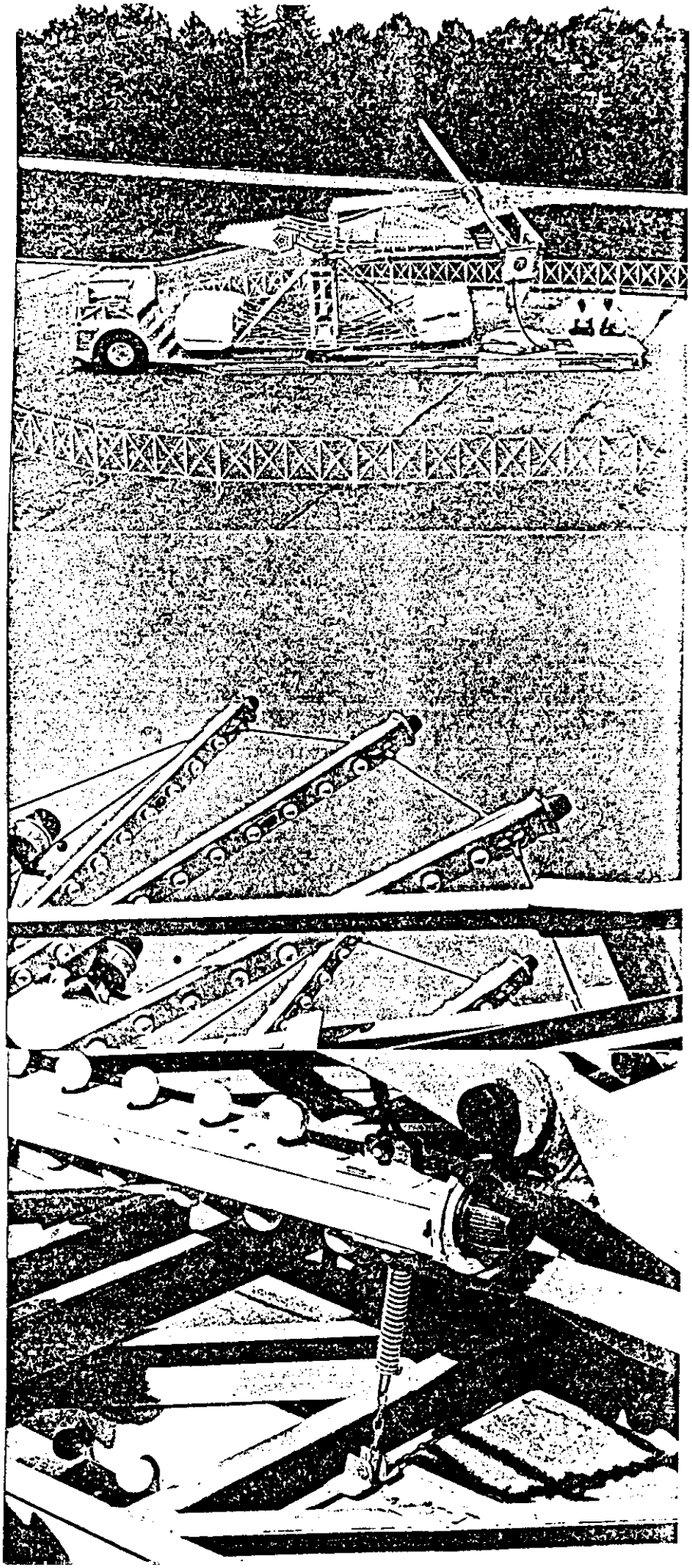
No. 43. With the engine shut off, move the valve handle up and down all the way to bleed off any pressure that may be in either hose. They should have been de-pressurized when disconnected, but someone may have accidentally levered the valve handle and directed hydraulic pressure into one or both of the hoses.

Next, connect the two hoses to the counterbalance valve that is attached to the top of the cylinder, high on the front side of the center pole. See Picture No. 44. The quick-disconnect fittings will go on in only one way, so you cannot connect them incorrectly. If you find you cannot connect either one of them, this is because the proper procedure was not used when they were disconnected. That proper procedure is: before disconnecting the hoses, shut off the engine, and then lever the valve handle both up and down to bleed off any hydraulic pressure that may be in either end of the cylinder. If you do not do this, you can disconnect, but you cannot re-connect the hose couplings until you bleed off the pressure in both ends of the cylinder. To do this, unscrew slightly the fittings at each end of the cylinder as shown in Picture No. 45, until enough oil has seeped out around the threads to get rid of the built-up pressure. It is advisable to have a rag handy to pick up any oil drops that form to keep the oil from dripping on the cover over the lower end of the center pole. After relieving the oil pressure, re-tighten the fittings and you should then be able to connect the hoses. Connecting and disconnecting the couplings should always be done with no pressure on either end of the cylinder, and this can only be checked by shutting off the engine and levering the valve handle both ways to bleed off any oil pressure back to the reservoir. The counterbalance valve is high and difficult to reach, but it was located there so that a passenger walking by should not strike his head against the sharp edges or corners of the valve body.

Do not attempt to release the pressure in either the hoses or the cylinder by shoving some object into any of the hose coupling orifices. This will not relieve the pressure, and it may damage the coupling so that it cannot be used. Relieve the pressure in the hoses only by shutting off the engine and levering the valve handle both ways, or as a last resort by unscrewing the fittings on the cylinder.

G. RAISE THE MAST AND LIGHTING EQUIPMENT

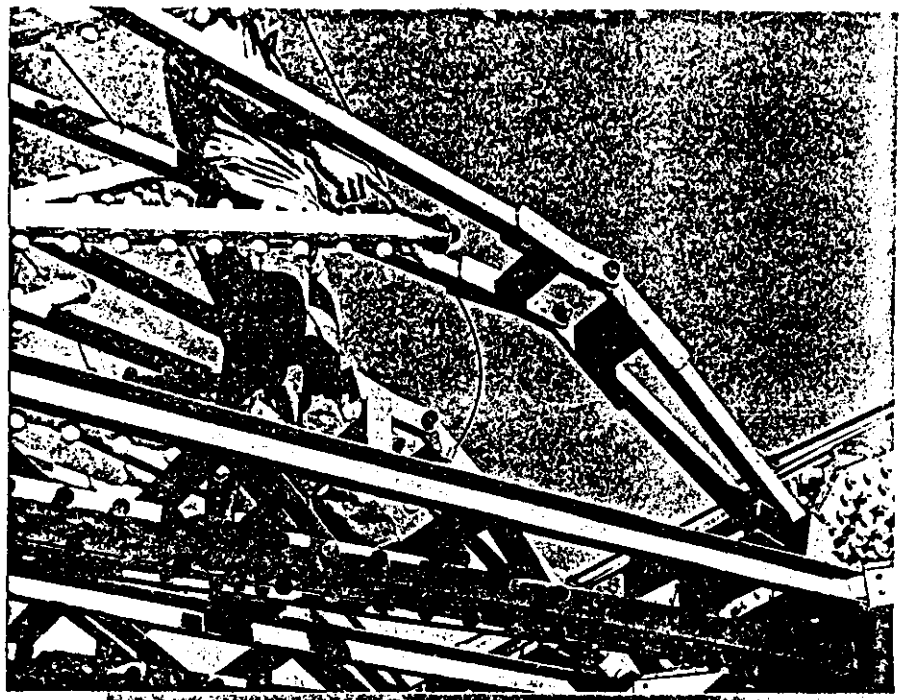
Start the engine again, and raise the mast by raising the handle of the valve shown in Picture No. 43. This operation requires the highest hydraulic pressure in the entire setup of the Scrambler. Move the handle to the full upward position. As the mast rises it brings up with it the top sweep tie rods, the paddle lights at the ends of the top sweeps and at the top of the center pole, and the fan lights, which are stored side-by-side on the top sweeps. See Picture No. 46. The speed with which they come up into position will vary according to the oil temperature: the hotter the oil, the faster they will rise. On occasion, when the air temperature is quite cold, you may find it necessary to climb up on the top sweeps and assist by lifting on the tie rods on the ends closest to the center pole. This may also be true if you are using the hand pump in any kind of temperature. Be sure to stand clear of all moving parts as they rise into position as shown in Picture No. 47. As the mast rises, and the fan lights lift above the top sweeps, they sometimes whip back and forth. Be ready to stop immediately in case one of the panels swings to one side so that it cannot pass through the space between each pair of tie rods. Always watch closely to be sure that they are not being snagged on anything. The fan lights rise from their side-by-side stored position to their operating positions with the outer ends one above the other and connected to each other by cables as shown in Picture No. 48. As the fan lights are raised, the first one to come up is on one side, the next one on the far side, the next on the near side, etc. The cable attached to the first light panel pulls up the second panel, etc. When all have been raised, the final connection is spring-tensioned



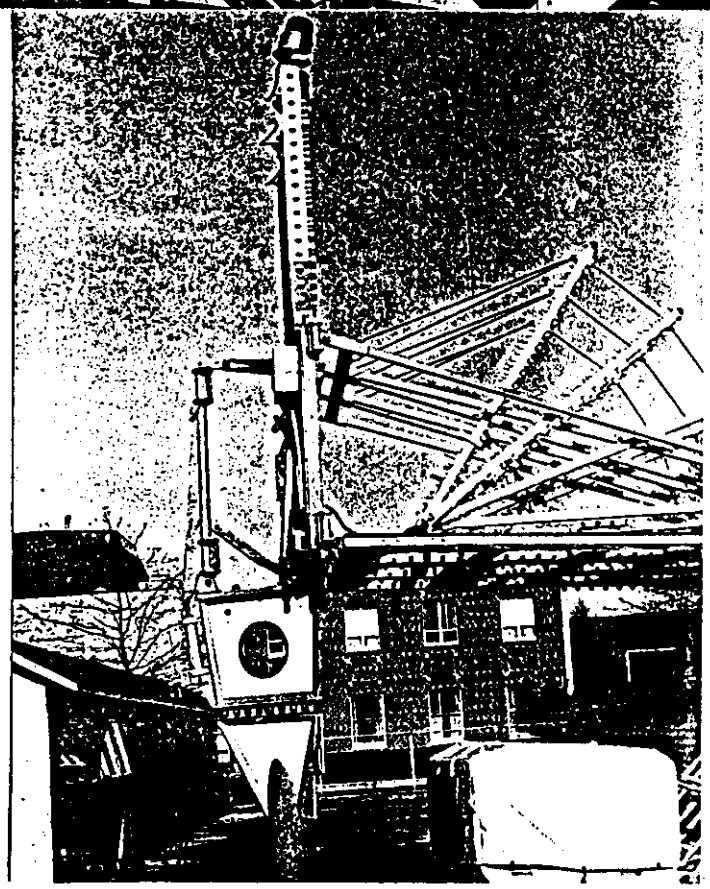
47

48

49



50



51

to the top sweep to take out any slack that may be in the cables, and hold the fan lights reasonably firm in position. See Picture No. 49. The light panel third from the top is the one that must be watched most carefully to see that it does not hang up on the top sweep tie rods, because it is the one with the closest clearance. See Picture No. 50. The cables themselves should be watched to be sure that they are hanging freely from one light panel to another. Occasionally, the cable will get looped around the bracket on the light panel and not pull out to its full length when the fan lights are raised. It would be advisable to have someone standing so he can check them as they rise into operating position; the man operating the valve cannot see everything from his position at the front.

When the mast cylinder has been fully retracted the mast will have been raised to its operating position, as shown in Picture No. 51. Picture No. 52 shows how the paddle lights which extend beyond the top sweeps act to counterbalance the hinged top sweep tie rods. You should never try to fold down the mast lights without a paddle light counterbalancing each pair of top sweep tie rods, because the paddle lights raise the hinge point of the tie rods above dead center as the mast folds over. If the hinge point does not rise on each pair of tie rods you cannot fold over the mast, and to try to do so may damage the structure, so always leave the paddle lights attached. There are springs on each tie rod down stop as shown in Picture No. 53. They will assist in moving the tie rods up as the mast folds over, but the springs work for just a short distance (See Picture No. 54) and then the paddle light counterbalances must take over.

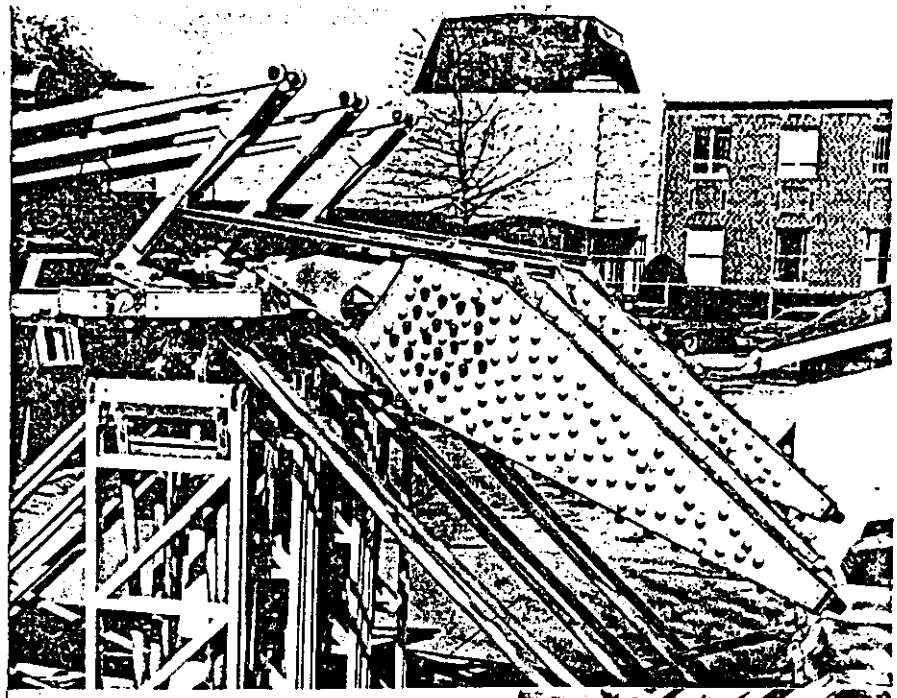
All the lighting panels are permanently connected, both electrically and mechanically, so all can be turned on in the open or folded position, or anywhere in between. See Picture No. 55.

H. PIN IN PLACE THE STIFF LEGS

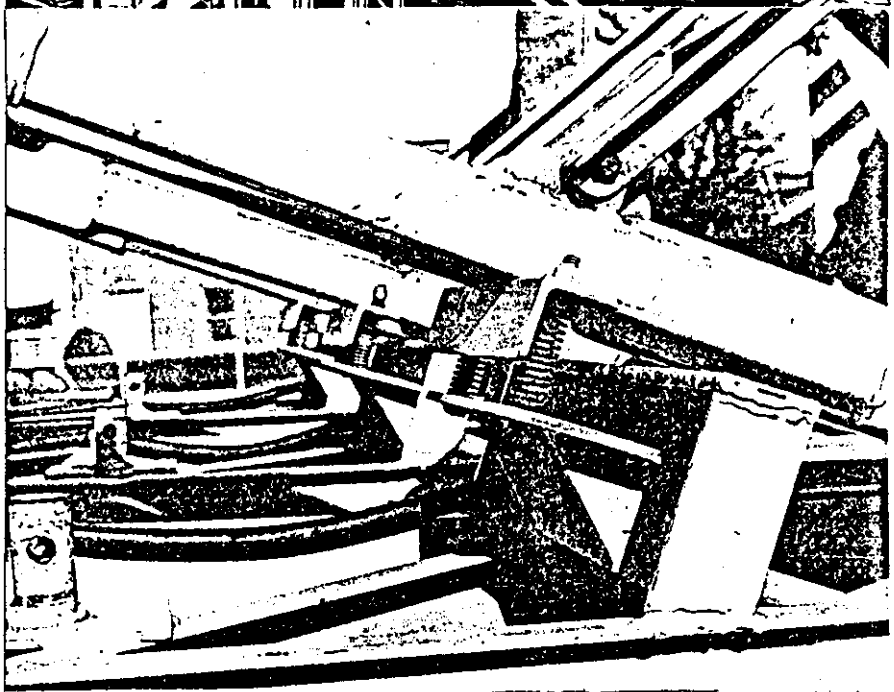
The next thing to do is connect the stiff legs in the mast to the top of the mast box. The purpose of these stiff legs is to provide a rigid brace for the mast as the sweeps are swung into position. With the mast raised, swing the two stiff legs forward until they are up against the pin connections at the bottom. Reach through the hole in the side of the mast box and pull the spring-loaded, pivoting stiff leg anchor bar down inside the mast box far enough so that the stiff legs can be swung over in line with the pin connections as shown in Picture No. 56. WARNING: IF THE LIGHTS ARE TURNED ON, THEN POWER IS GOING TO THE ELECTRIC RINGS AND BRUSHES, AND THEY ARE ELECTRICALLY "HOT", SO BE CAREFUL THAT YOU DO NOT GET AGAINST ANY OF THEM WHEN PULLING DOWN THE STIFF LEG ANCHOR BAR. Next, release the stiff leg anchor bar, and the springs will push up on each side of the pin connections on the lower ends of the stiff legs. See Picture No. 57. Be sure you do not get your fingers between the anchor bar and the circular ring welded in the top of the mast box. The spring-loading of the anchor bar can cause you to get your fingers pinched rather easily if you are not careful.

Next, insert the long pin which goes all the way through the mast box, as shown in Picture No. 58. Secure the end with both a hairpin and a Klik-pin (see Picture No. 59). This long pin locks in place the stiff leg anchor bar. The hairpin cotter goes right next to the mast box panel and holds the pin in correct operating position. There is a remote possibility that, because of its location, the pin could work and turn in the hole in such a way as to force out the hairpin cotter. If this should happen, the long pin might conveivably work all the way out as the ride turns and drop into the paths of the passengers unless the long pin is stopped by the Klik-pin, so be sure to use both the hairpin cotter and the Klik-pin. The long pin has two diameters on it so that it can be inserted all the way through the mast before the full size part of the pin must be driven in the holes. WARNING: NEVER TRY TO SWING THE SWEEPS AROUND TO OPERATING POSITION WITHOUT THE STIFF LEGS BOTH COMPLETELY PINNED IN PLACE, OR YOU WILL DAMAGE THE RIDE.

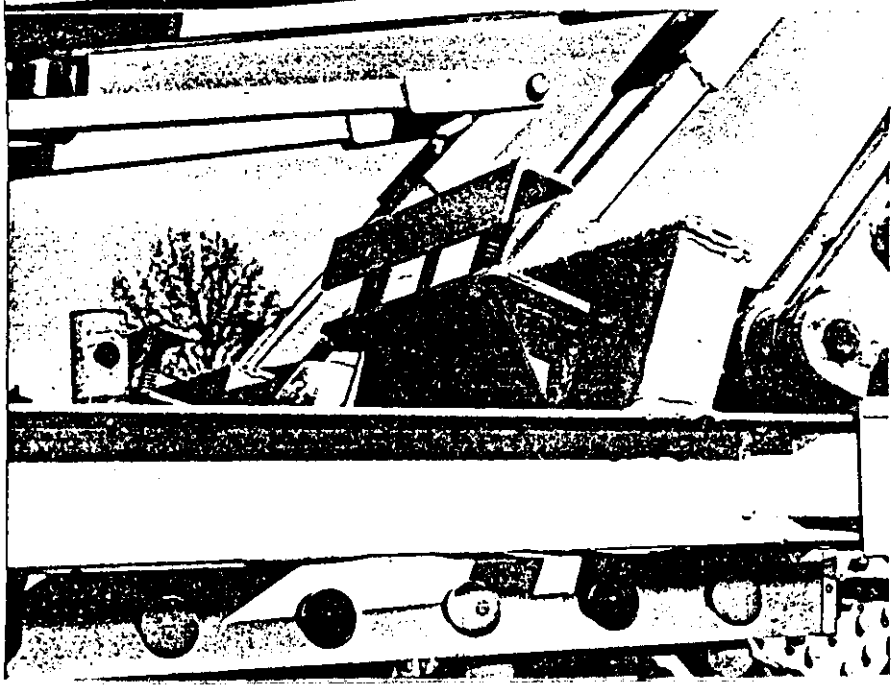
As shown in Picture No. 60, the pin to lock down the stiff legs to the anchor



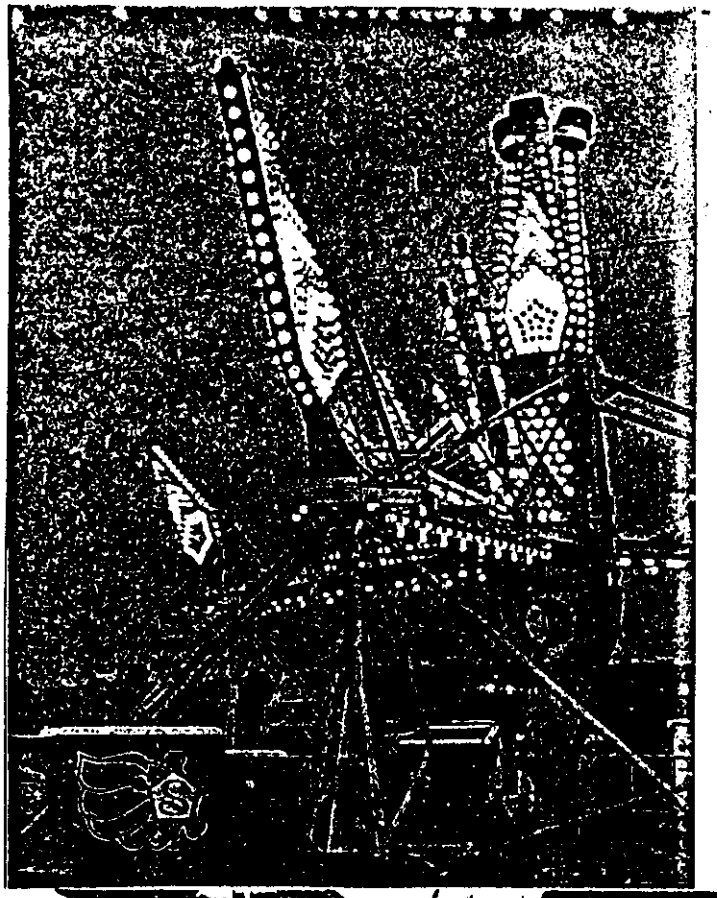
52



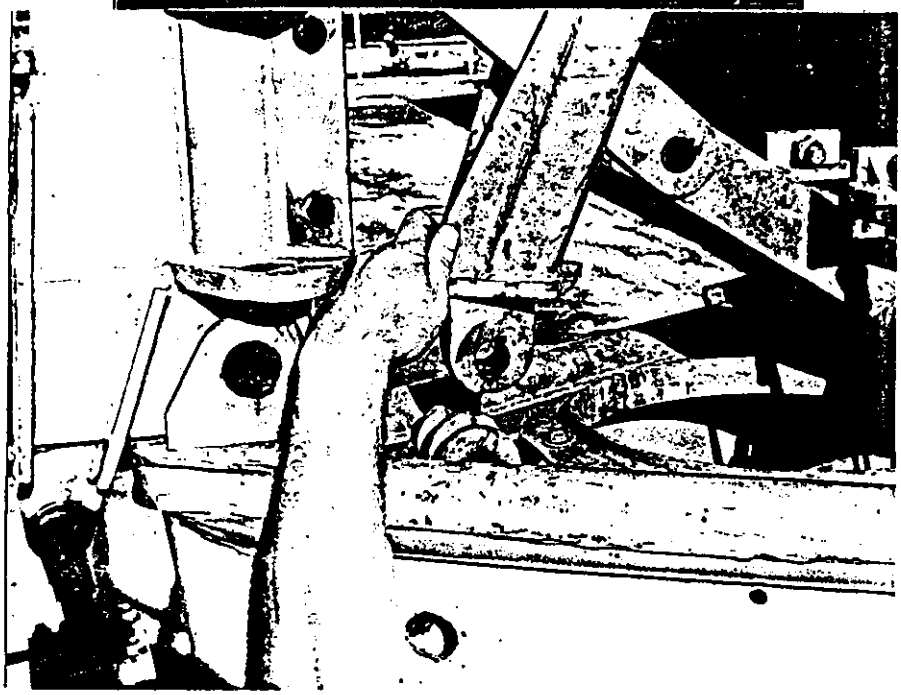
53



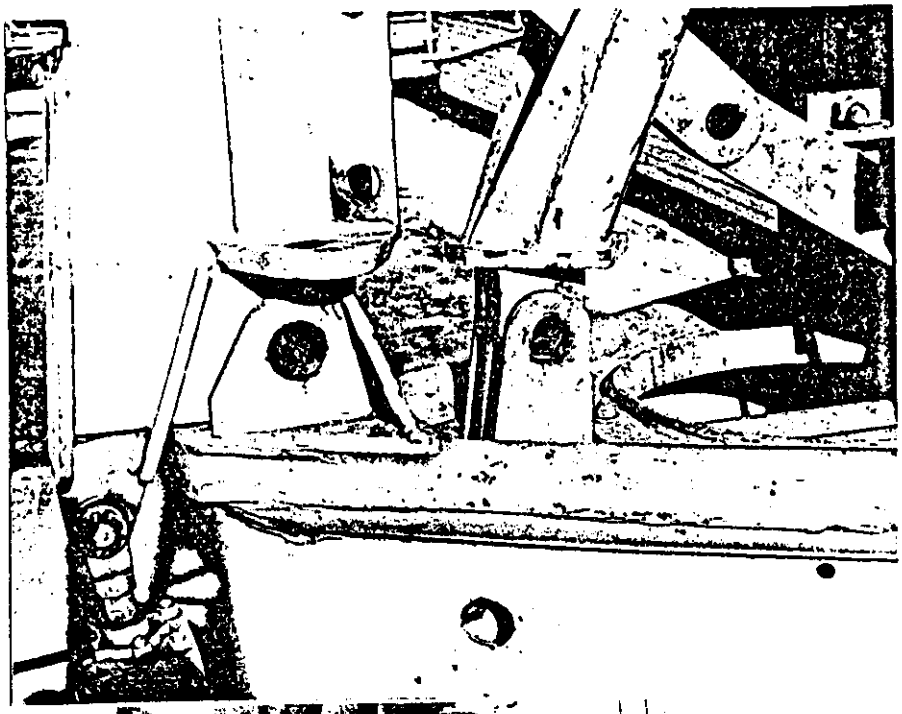
54



55

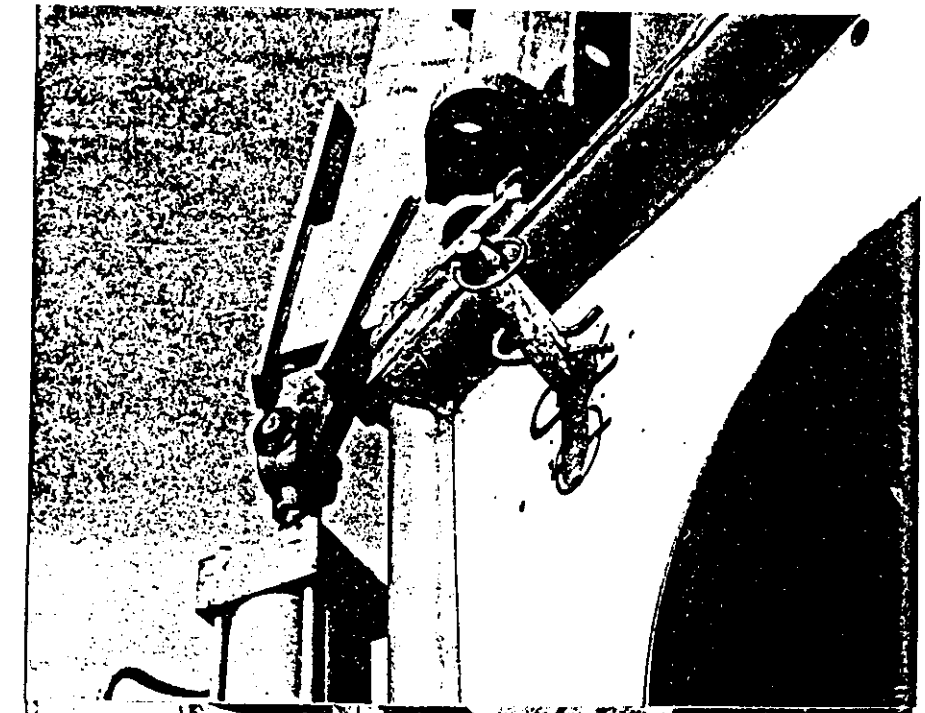


56

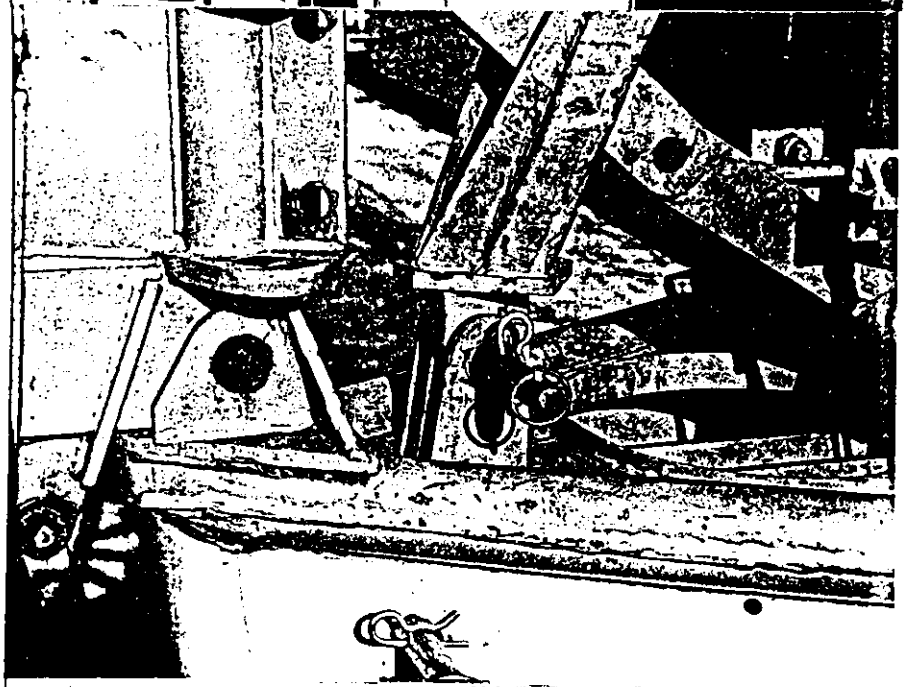


57

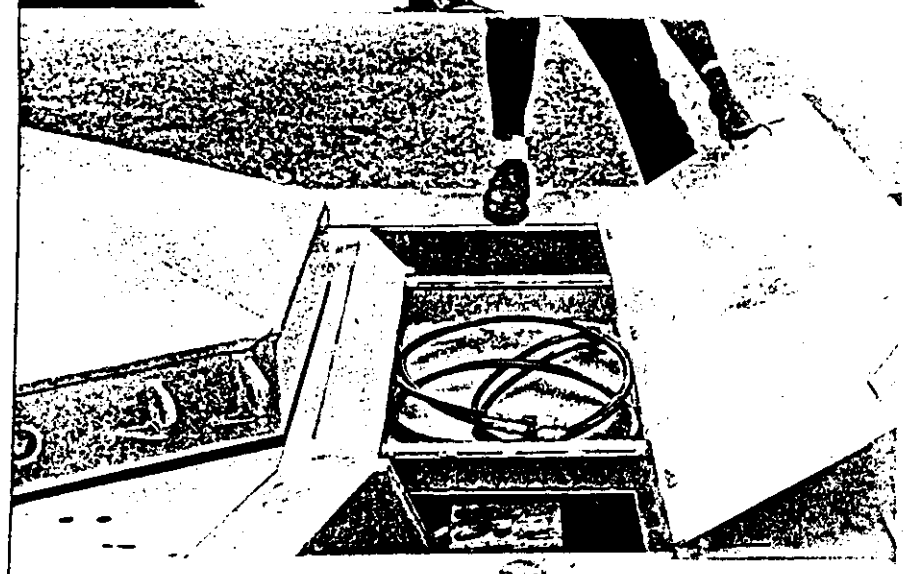
58



59



60



61

bar is then driven in, and locked in place with both a hairpin cotter and a Klik-pin. Here again the reason for the double lock is because of the double diameters on the pin for easy insertion, and for security of the pin.

I. DISCONNECT HYDRAULIC LINES TO MAST CYLINDER

With the stiff legs locked in position, the next thing to do is shut off the engine, and then de-pressurize the hoses and cylinder by moving the valve lever up and down all the way. Then disconnect the hose couplings, coil up the hoses, and store them away in the hose box. Have a rag handy when you snap apart the hose couplings to catch the few drops of oil that are lost each time you disconnect. This will keep the oil from dripping down on the center pole cover where it could become slippery under foot. If you have not de-pressurized the hoses as you should, you will get a fairly substantial squirt of oil when you disconnect. Then close the hose door (Picture No. 61).

J. INSTALL CENTER POLE BRACING CABLES

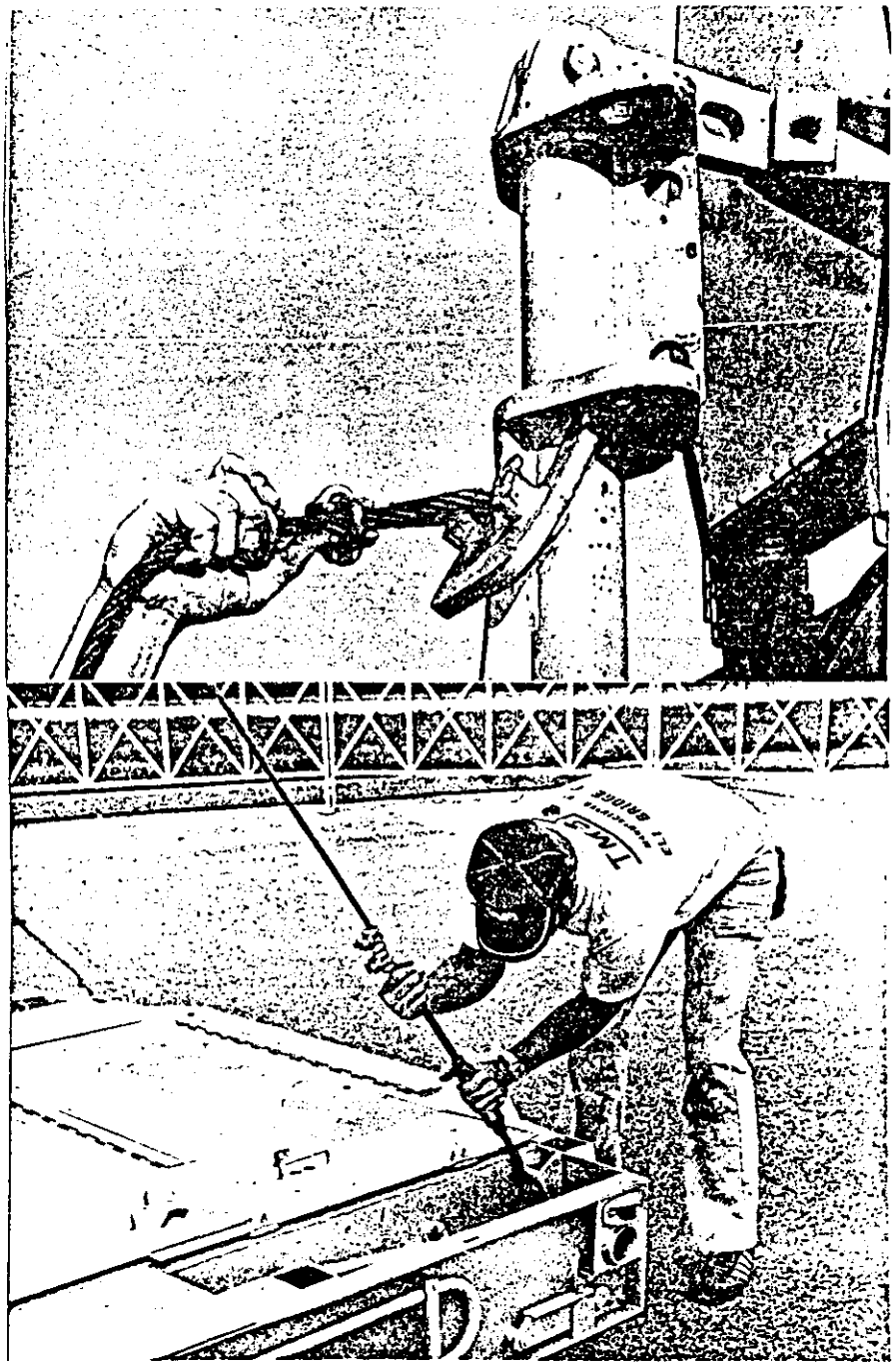
Next, open the tool box doors on each side of the trailer at the front end, remove the two long half-inch cables, and hook them to the two round knobs near the top of the front mast post and to the eye in each corner of the trailer. You must loop the thimble on the end of the cable over the top knob first, as shown in Picture No. 62, and then hook the turnbuckle on the other end of the cable in the corner eye as shown in Picture No. 63. If you try to connect the bottom end first you will not be able to make the top connection. Tighten both cables equally, and as tight as you can get them without using a bar in the turnbuckle (see Picture No. 64).

K. SWING SWEEPS AND UNIT POLES INTO OPERATING POSITION

Next, you start up the engine again. You will find a hydraulic valve in the left fence foot storage box, as shown in Picture No. 65. Lift up on the valve handle, and three cylinders will raise up the three unit poles, as shown in Picture No. 66. This will unload the transport blocks that support and lock in position the unit poles when traveling on the highway. Remove the left block only, as is being done in the picture, after taking out the two Klik-pins holding it in place. With the transport block out, the exposed cylinder rod can be seen in Picture No. 67. Replace the Klik-pins in the transport block (Picture No. 68).

DANGER: DO NOT REMOVE MORE THAN ONE TRANSPORT BLOCK AT A TIME. ALL THE SUSPENDED WEIGHT OF THE SCRAMBLER IS TO THE REAR OF THE CENTER POLE, AND TO HAVE MORE THAN ONE UNIT POLE HANGING FROM THE CENTER POLE IN THIS POSITION WOULD PUT AN EXCESSIVE BENDING LOAD ON THE CENTER POLE AND COULD CAUSE IT TO FAIL. REMEMBER: DISCONNECT ONLY ONE TRANSPORT BLOCK AT A TIME. THE SECOND TRANSPORT BLOCK MUST NOT BE REMOVED UNTIL THE FIRST UNIT POLE AND SWEEPS HAVE BEEN SWUNG AROUND TO OPERATING POSITION, TO HELP BALANCE OUT THE BENDING LOAD ON THE CENTER POLE.

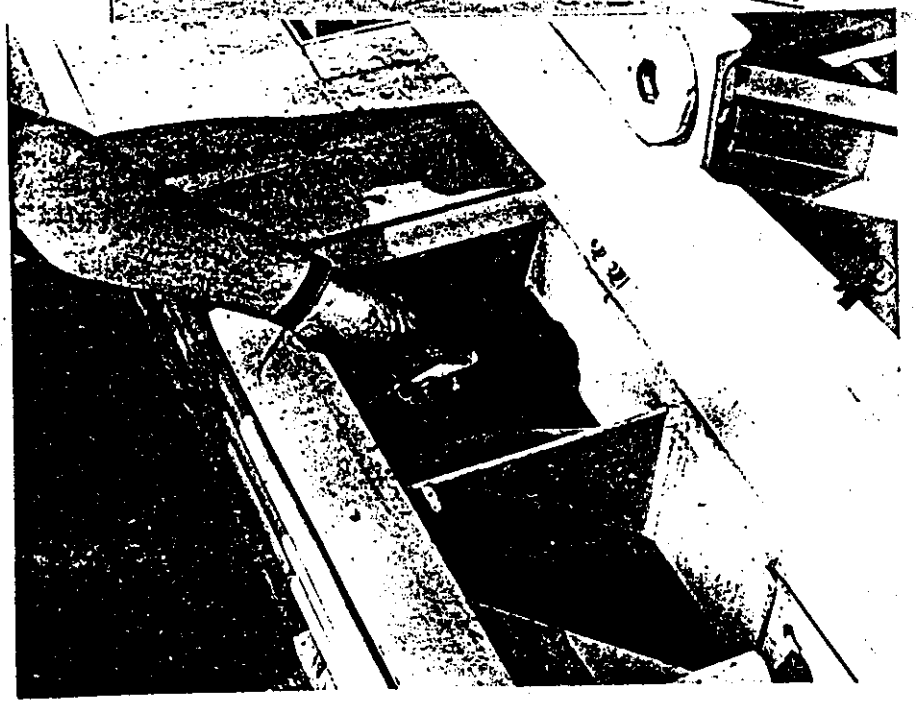
DANGER: WHEN YOU ARE OPERATING THE VALVE TO LOWER THE THREE UNIT POLE LIFT CYLINDERS, DO NOT HAVE THE DOOR IN A VERTICAL POSITION WITH YOUR HAND OVER THE TOP AS SHOWN IN PICTURE NO. 68.5. AS YOU CAN SEE IN THE PICTURE, THERE IS JUST ENOUGH ROOM FOR YOUR HAND, AND IF YOU LOWER THE CYLINDERS YOUR HAND WILL GET CRUSHED BETWEEN THE TOP OF THE DOOR AND THE SEAT SWEEP. THEREFORE, ALWAYS LAY THE DOOR DOWN FLAT WHEN OPERATING THE VALVE CONTROLLING THE UNIT POLE LIFT CYLINDERS.



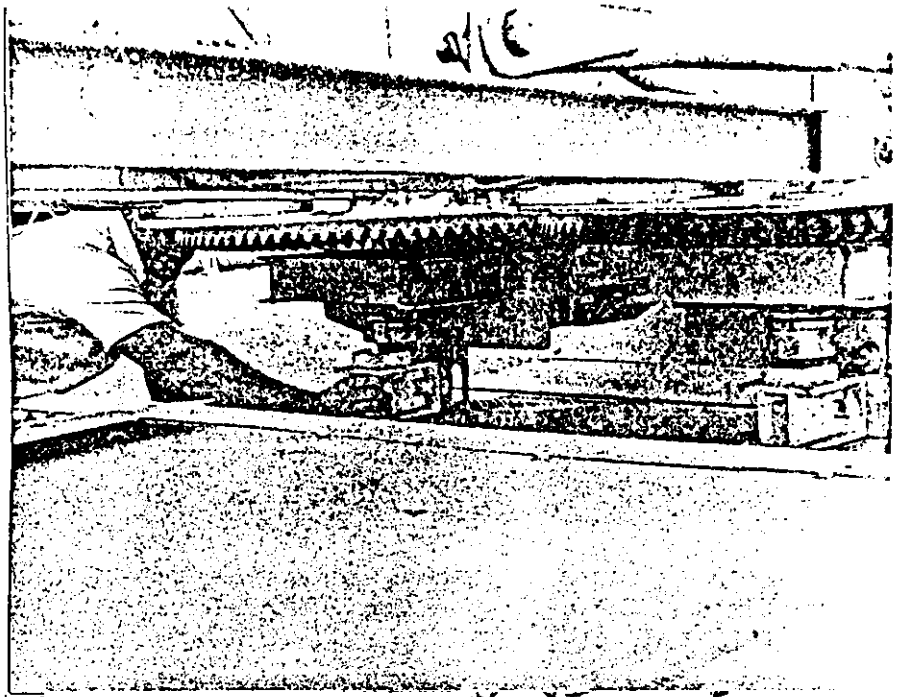
62

63

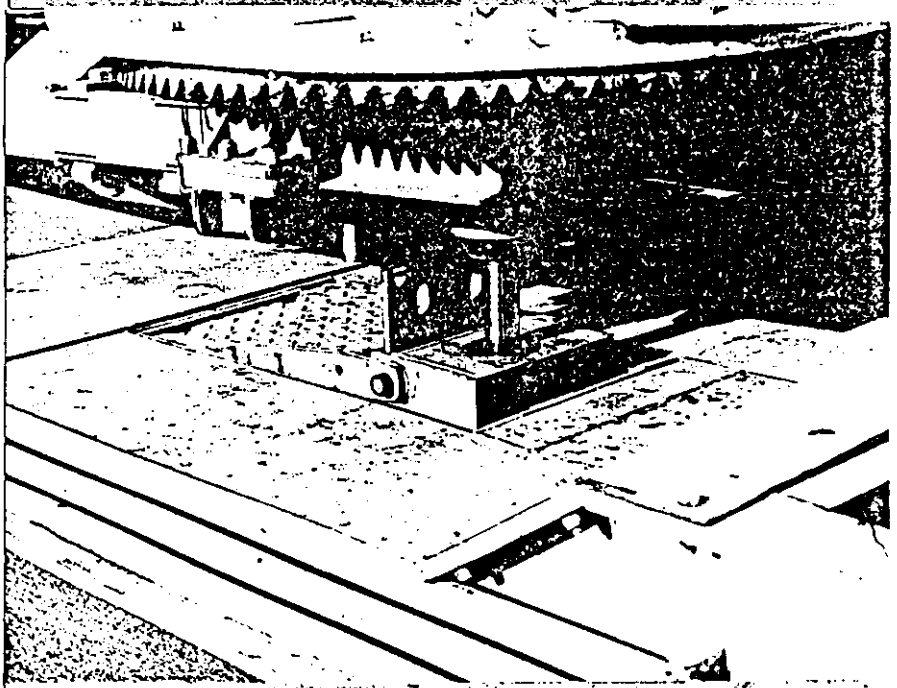
64



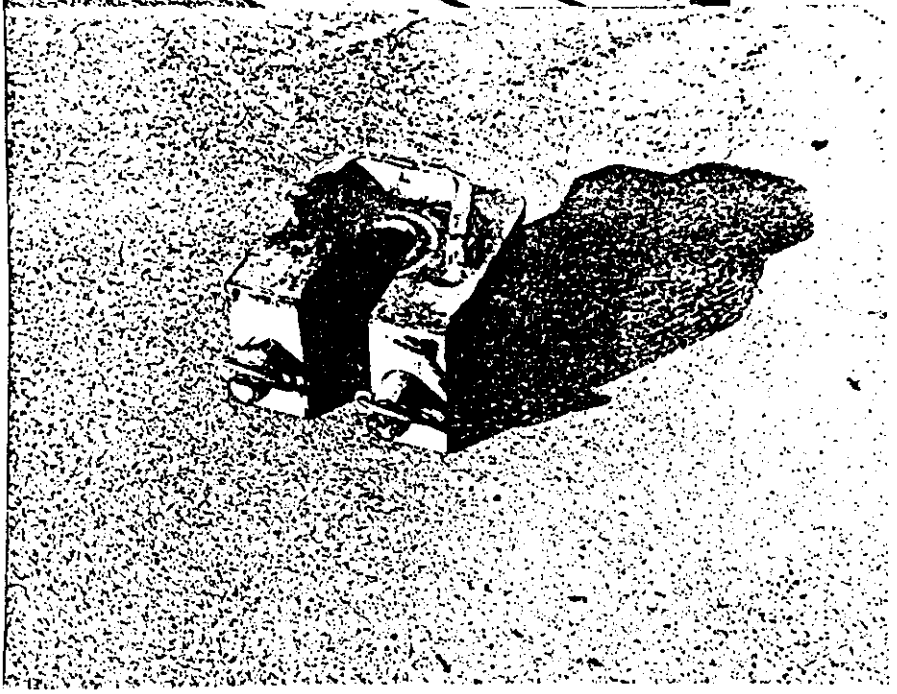
65



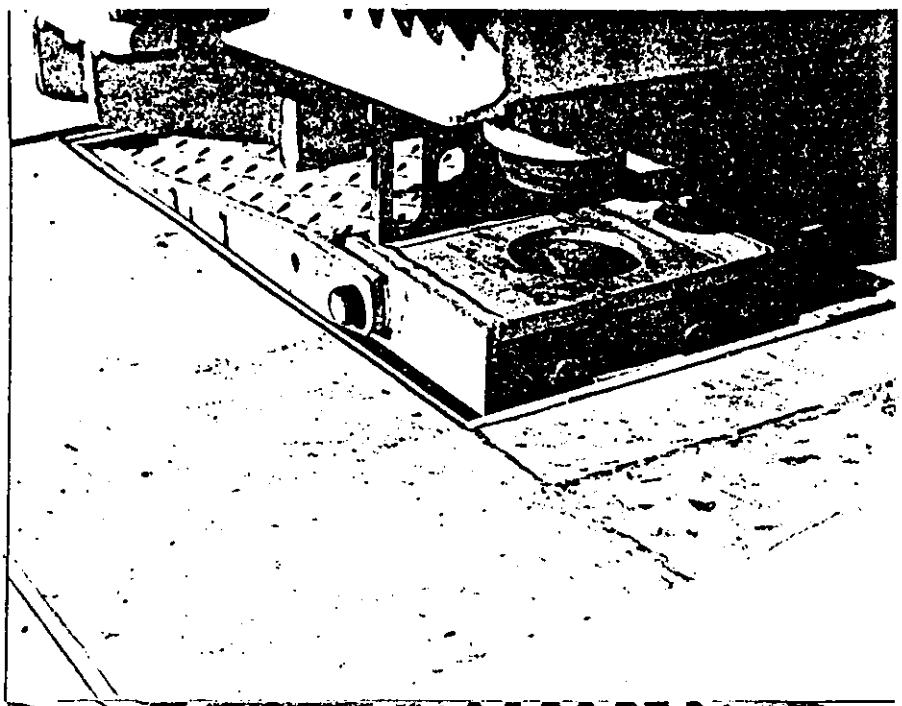
66



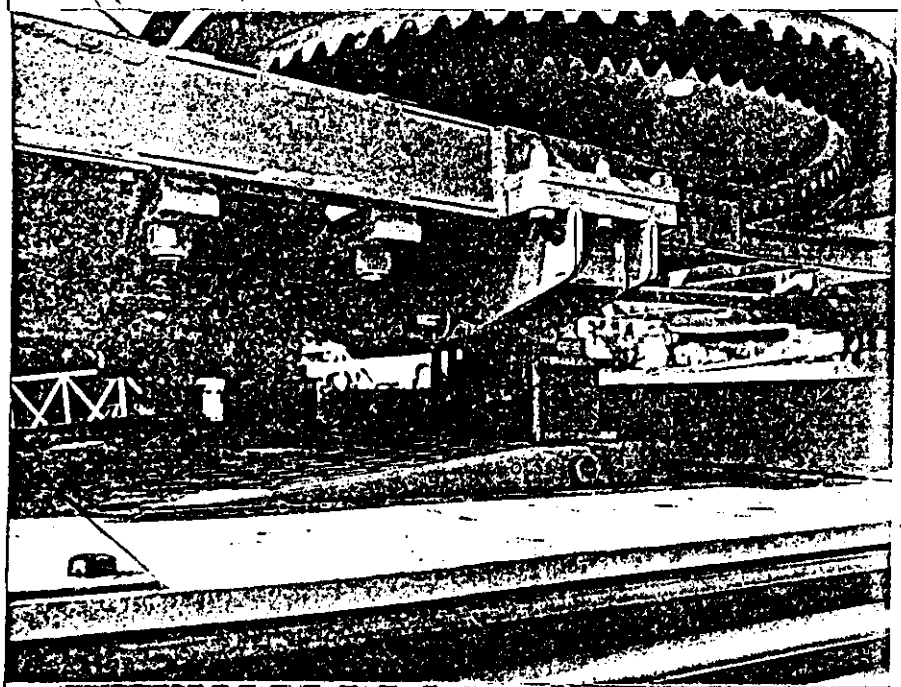
67



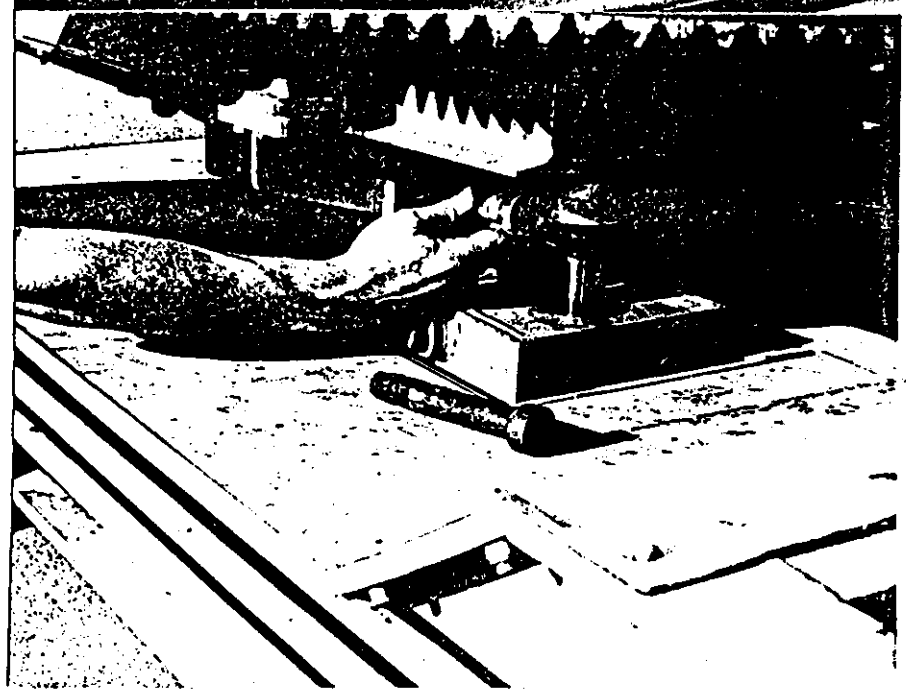
68



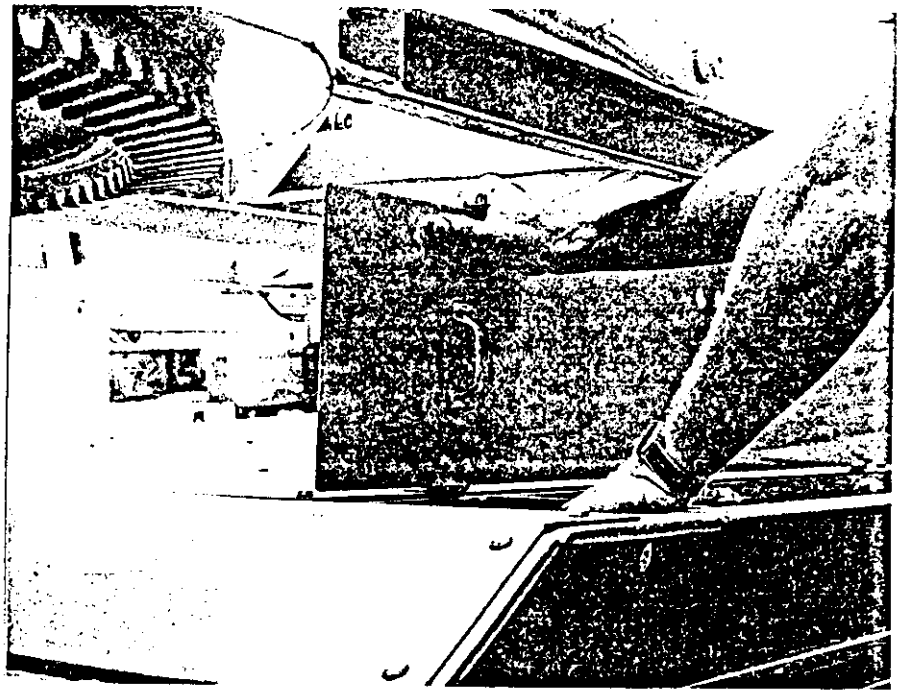
69



70



71



68.5

Push the valve lever down and the three cylinders will all retract. When fully retracted, the sound coming from the engine will increase, indicating that it is picking up a load. See Picture No. 69.

A vertical plate extends from the unit pole lift box in the floor of the trailer up to the underside of the bottom sweep, where it is pinned to transverse plates on the bottom sweep with two long pins that are secured with a Klik-pin on each. Remove these two pins and put the Klik-pins back on them. See Picture Nos. 70 and 71. This releases any connection between the left unit pole and sweep structure, and the trailer frame, so that the left sweeps and unit pole can be swung out to the left.

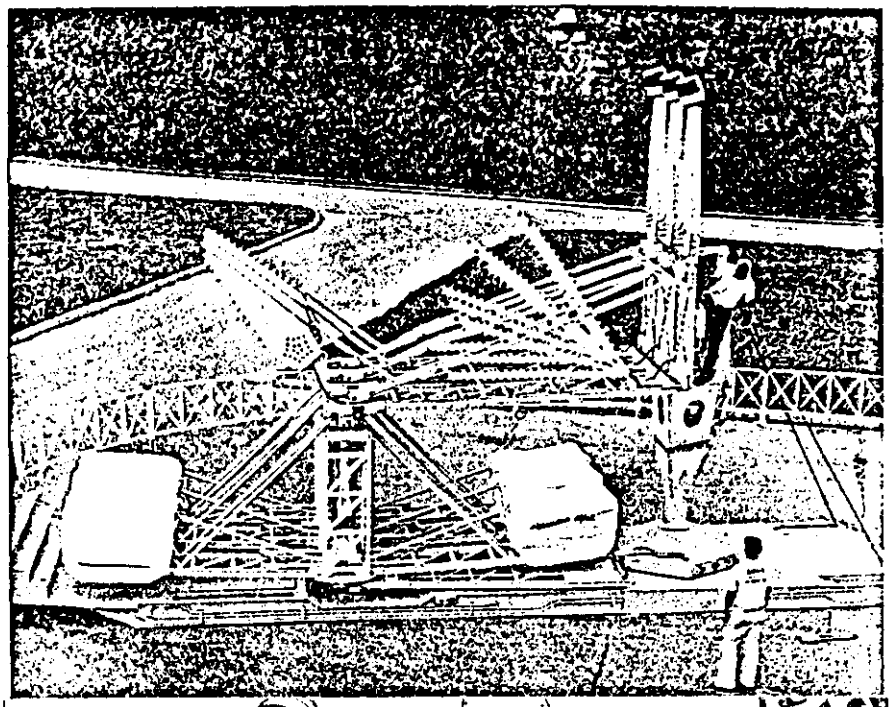
As an alternative procedure, these long pins can be removed from the left sweep while the cylinders are holding up the unit poles. If the trailer is on a slope, the sweep may put a side pressure on the pins, making them difficult to remove. If this occurs, you may find them easiest to remove when the unit poles are jacked up.

At this point, when you are getting ready to swing out the sweeps, one man should be standing on the top of the mast box, ready to pin in place the top of the mast, or "barn door" as it is referred to, when it is swung around. See Picture No. 72. There are electrical wires and wire rope cables that must be kept from being pinched and squeezed as the "barn door" shuts. Picture Nos. 73 and 74 show where this pinching can take place. The man on top must watch for this pinching, but he must never get between the barn door and the center pole structure as it is being closed. If he sees that pinching is about to take place, he must tell the man on the ground to stop pushing around the sweeps and back up until the cables and wires have been cleared before swinging all the way in. The leverage is so great, the man on top would have no chance of slowing down or stopping the swinging structures in time to prevent his being pinched himself. Therefore, he must at all times be sure that he is not in a position to get pinched.

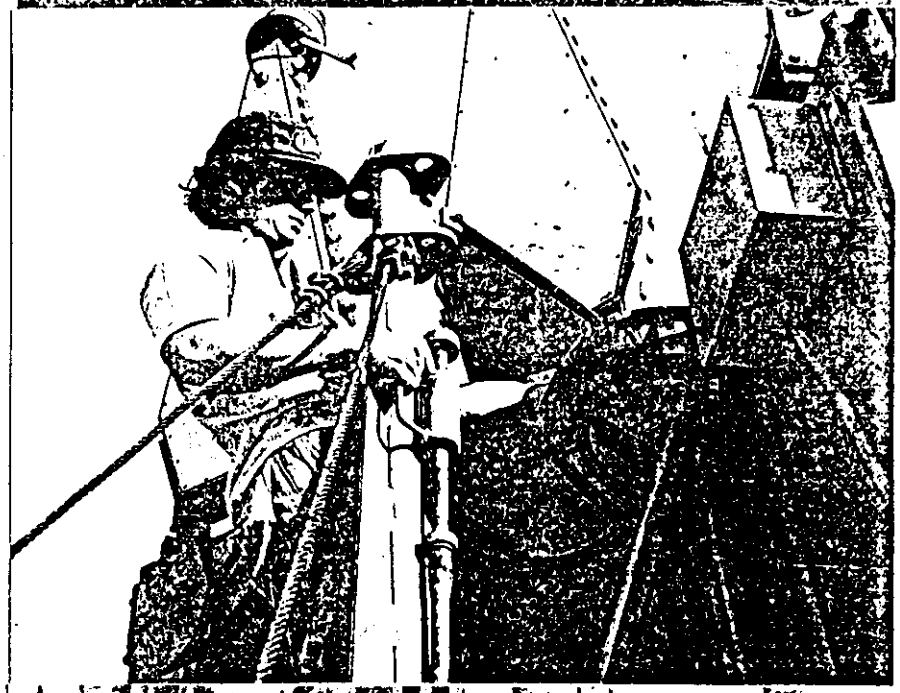
On the forward end of the left and right bottom sweeps (next to the center pole), a spacer tube is attached to each sweep by two short chains. Be sure that this spacer tube has been lifted up and laid on top of the bottom sweep before swinging the sweep into operating position. See Picture No. 75. Otherwise, the tube spacer will get in the way and prevent the sweep from swinging all the way into position.

The wide ends of the left and right bottom sweeps are supported by torsion bars that are designed to support the bottom sweeps only, and not a man jumping on the sweep. See Picture No. 76. Therefore, avoid putting heavy loads on the sweep which could twist the torsion bar so that the sweep might not line up for pinning. The torsion bar is the sole support for the wide end of the bottom sweep when you are traveling on the highway and when you are swinging the sweeps from the stored to the operating positions. Endangering this support could be very hazardous, so don't jump on the sweep.

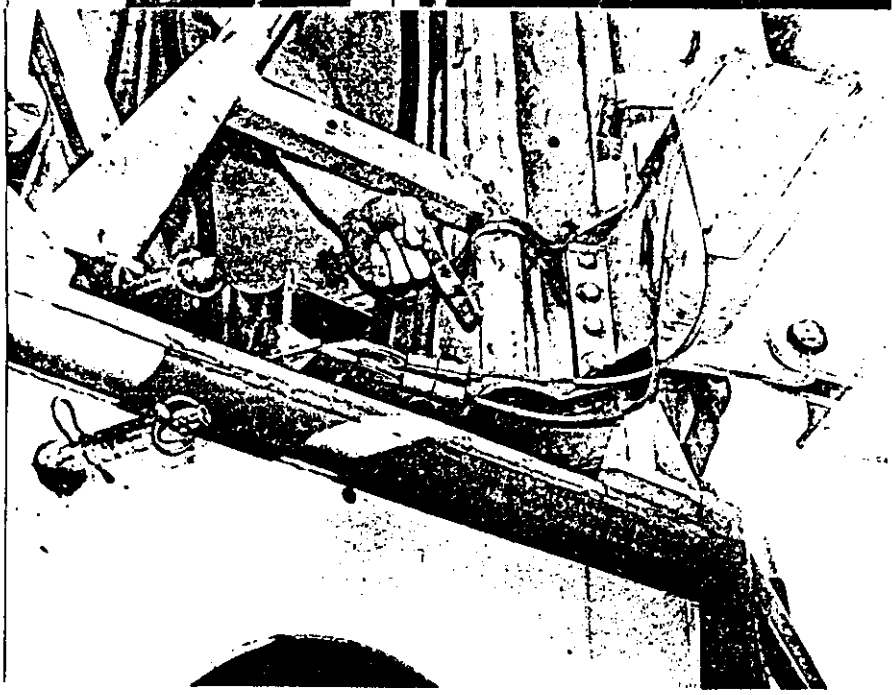
The man on the ground pushes on the seat furthest from the center pole, as shown in Picture No. 77, and swings the left sweeps and unit pole around into operating position. The left barn door will not go all the way into its pinning position, but when it is as far around as you can push it, use the short tie cable, as shown in Picture No. 77.5, to connect the bottom sweep to the front end of the trailer to keep it from swinging back. Then unlock the right sweeps and unit pole, and swing them around into operating position. The right barn door should move fairly easily into the fully seated, pinning position. Position the "elephant" pin, as shown in Picture No. [illegible] so that it is ready to drive in when the holes are lined up. The elephant pins are the shorter ones with the built-in sliding hammer and with the Klik-pin holes in the small end, and they are to be used in the lower sets of holes on the barn doors. Drop the



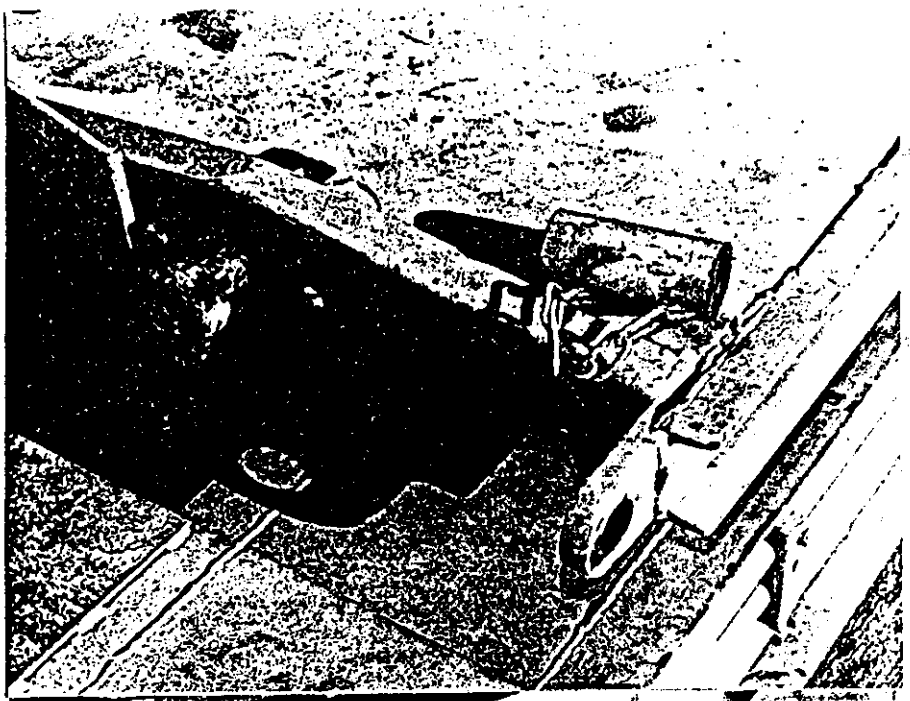
72



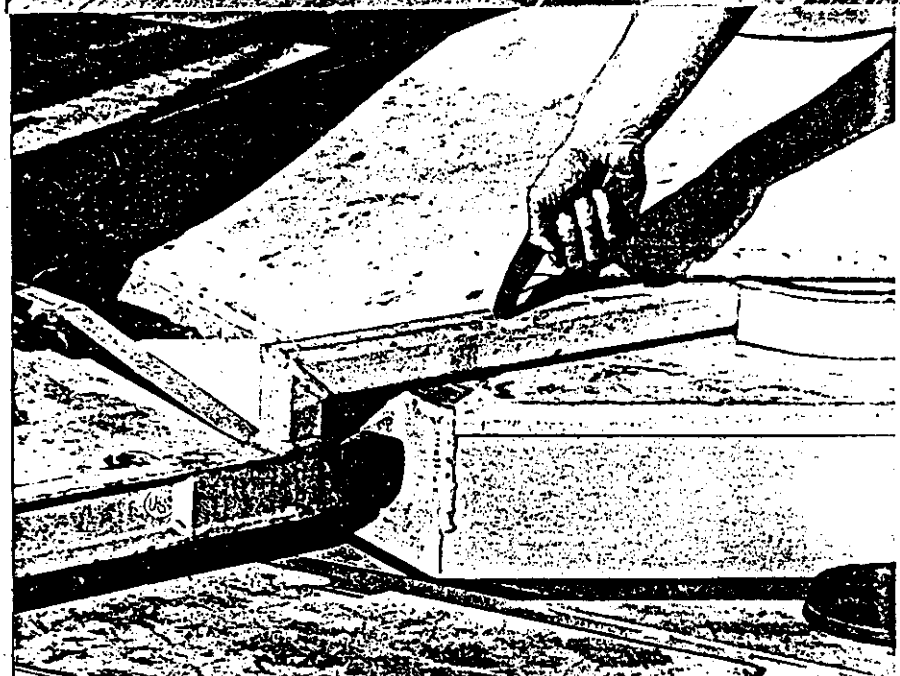
73



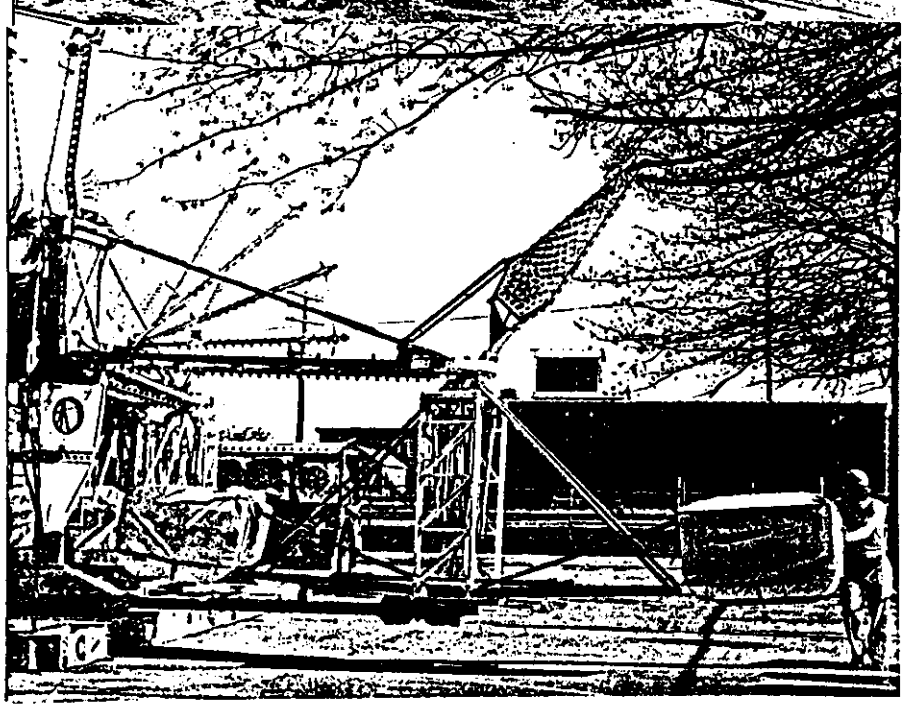
74



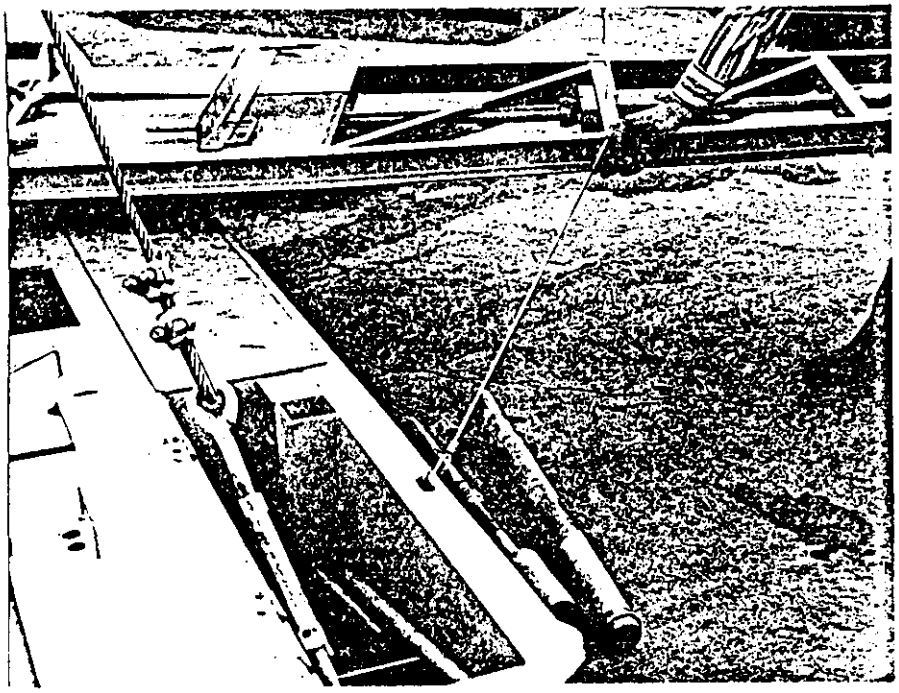
75



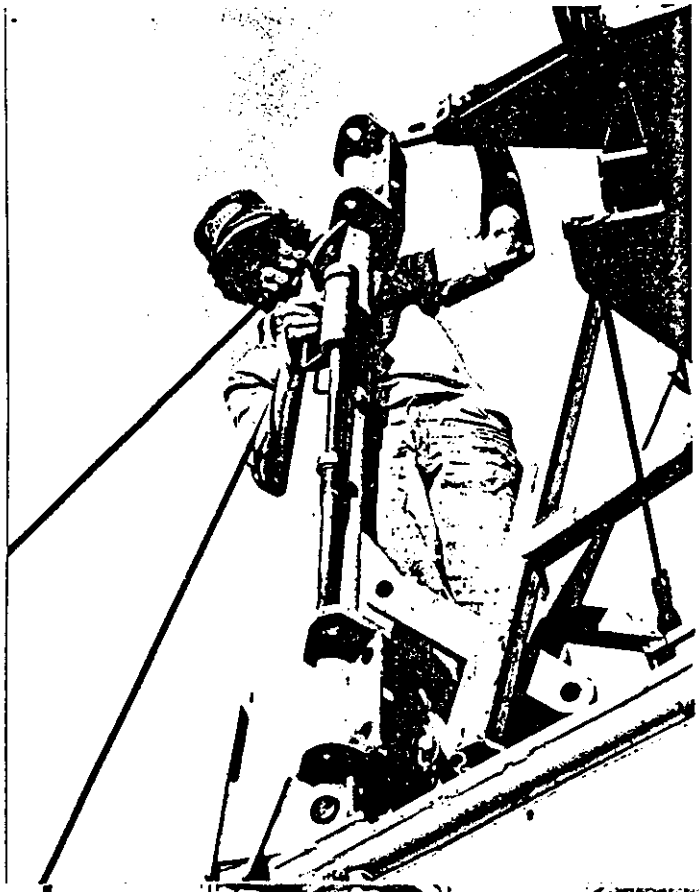
76



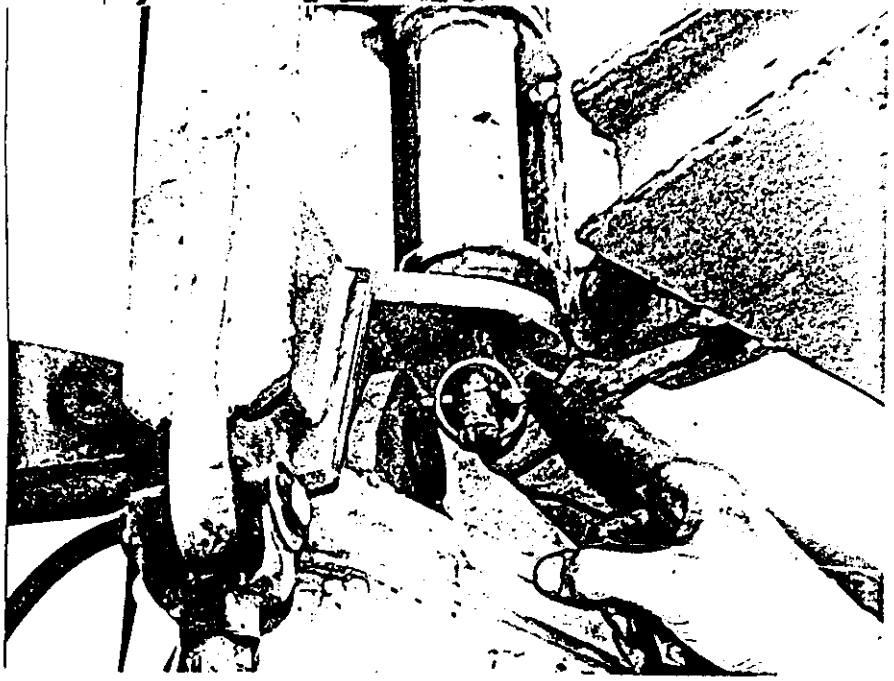
77



77.5

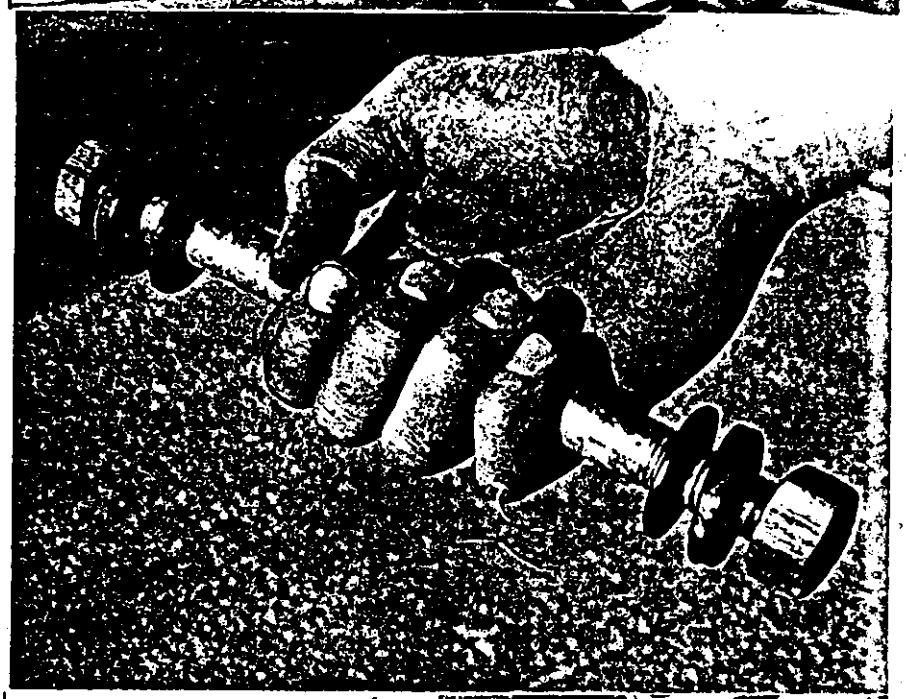


78

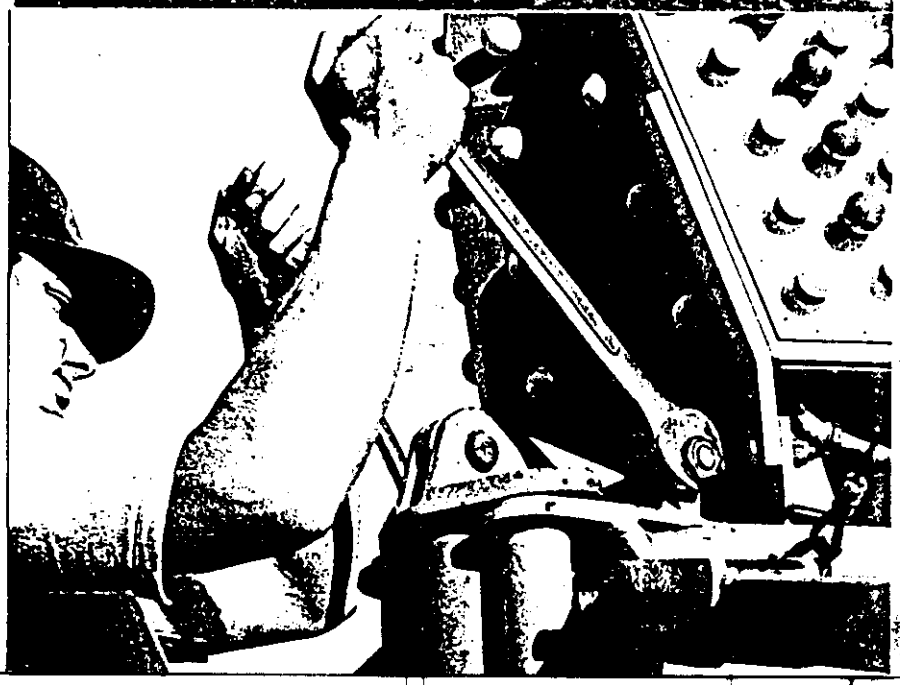


79

80



81



82

"elephant" pin in the bottom set of holes when they are lined up. Then bring in the left barn door, and pin it with the second elephant pin. The elephant pins should be positioned so that when they are driven in place it will be easy to lock them with Klik-pins. At this point the top pin holes in the barn doors should not quite line up with the holes in the front post. Also, at this point the third unit pole should still be supported on its transport block.

It is important that the swinging structure be secured in place with the elephant pin, in case the ride is on a slope and the sweeps want to swing away from the front post position. Be sure to lock each elephant pin with a Klik-pin, as shown in Picture No. 79.

WARNING: TO REPEAT, DO NOT GET YOUR HANDS BACK IN THE CORNER WHERE THE HINGED PARTS COME TOGETHER. IF SOMETHING IS IN THE WAY, THE MAN ON TOP SHOULD SIGNAL THE MAN ON THE GROUND TO STOP AND BACK AWAY THE SWEEPS UNTIL THE WIRES OR CABLES HAVE BEEN CLEARED OUT OF THE WAY. THEN THE SWEEPS CAN BE SWUNG BACK AGAIN.

Install the elephant pin, as shown in Picture No. 80. Warning: Do not have more than one side swinging back and forth at one time. They could get out of control and both swing back toward the rear of the trailer, causing the excessive bending load on the center pole you have been previously warned about.

The top holes of neither barn door should be lined up at this time, but to get them in line, a bolt taken from the pin box is passed through the top triangle and both barn doors. There must be a two-piece spherical washer under the bolt head, and another two-piece spherical washer should be slipped on the bolt before the nut is threaded on. The bolt, nut, and spherical washers are shown in Picture No. 81.

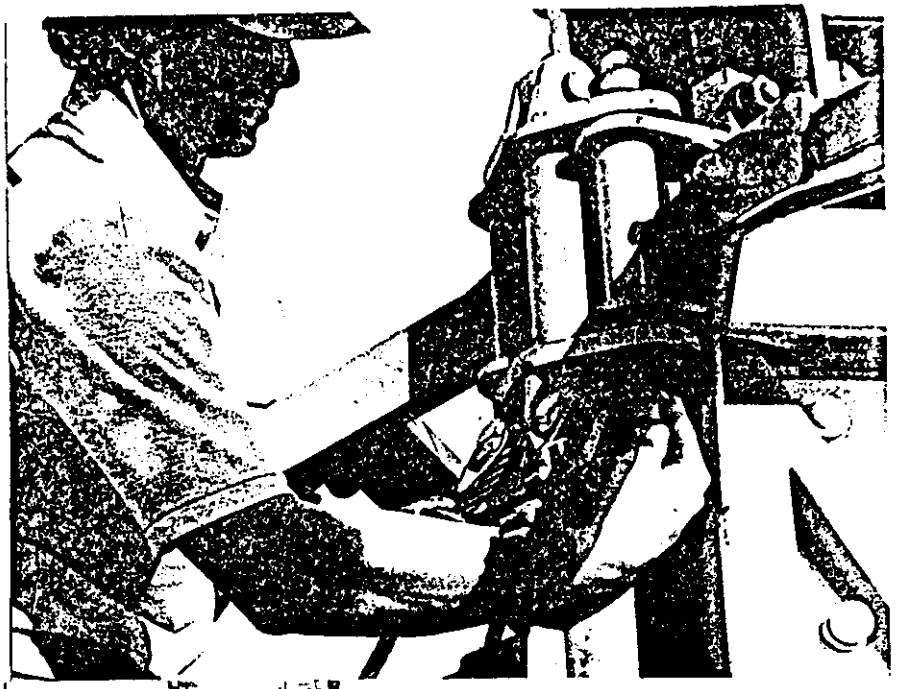
With the bolt in place, tighten the bolt and nut, using the box end wrenches in the tool box, as shown in Picture No. 82. The man who is doing the tightening must be sure he has good footing, because if one of the wrenches slips off it would be easy for him to fall if he has not braced himself well with his feet. You may find that you would prefer using a ratchet wrench for tightening this bolt, as it will save time. When the bolt has been fully tightened, the vertical pin holes will be in line, and the top two pins can then be driven in. Do not try to drive in these pins if the holes are not in line; to do so will only enlarge and elongate the pin holes. When you drive in these two pins, be sure that the hole in the end is out in the open so you can install a Klik-pin as soon as each pin is driven in place. See Picture No. 83.

All four of these pins which connect the barn doors to the front post are stored in the tool boxes at the front of the trailer.

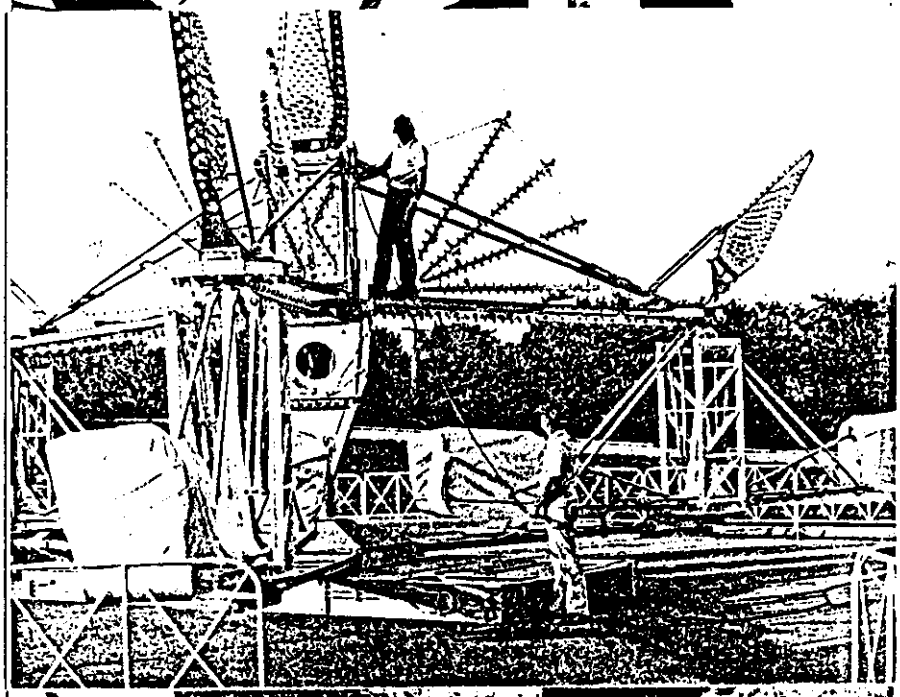
L. REMOVE CENTER POLE BRACING CABLES

Disconnect the two cables going from the front of the trailer to the top of the mast, and store each one away in a tool box. Do not forget to do it at this time, because, if you do not, you may later turn the center pole and accidentally hit some of the seats against the cables, and this can damage the seats. See Picture No. 84.

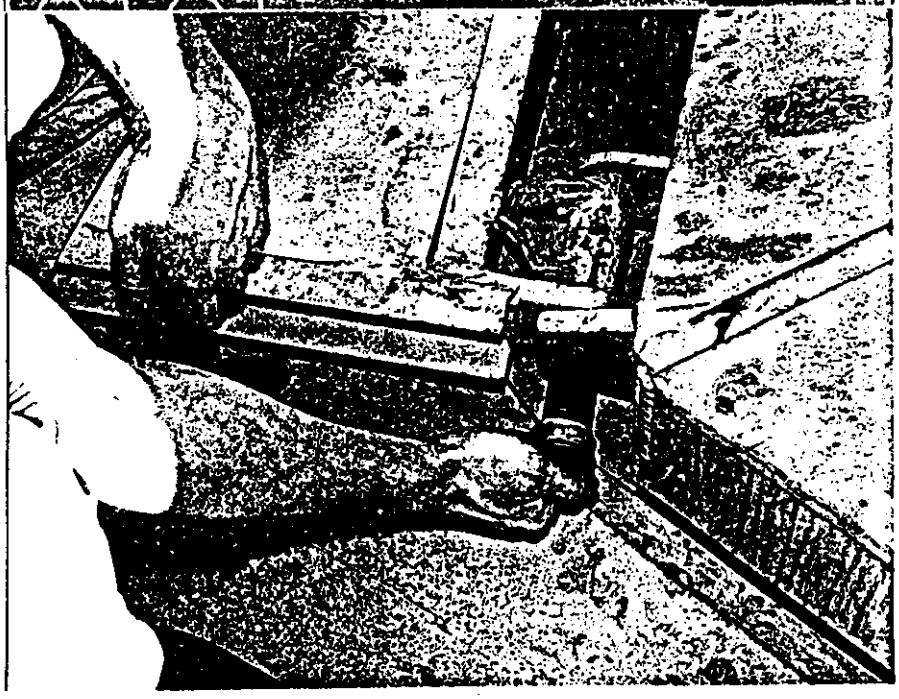
(As the bottom sweeps are swung around into operating position, a small block, shown in Picture No. 84.5, acts as a bumper to keep the sweep from swinging in too far, because if it does, it will push back the long drive shaft in the bottom sweep when the two drive shafts butt against each other, and then the chain coupling cannot be installed. The small bumper block prevents this from happening.)



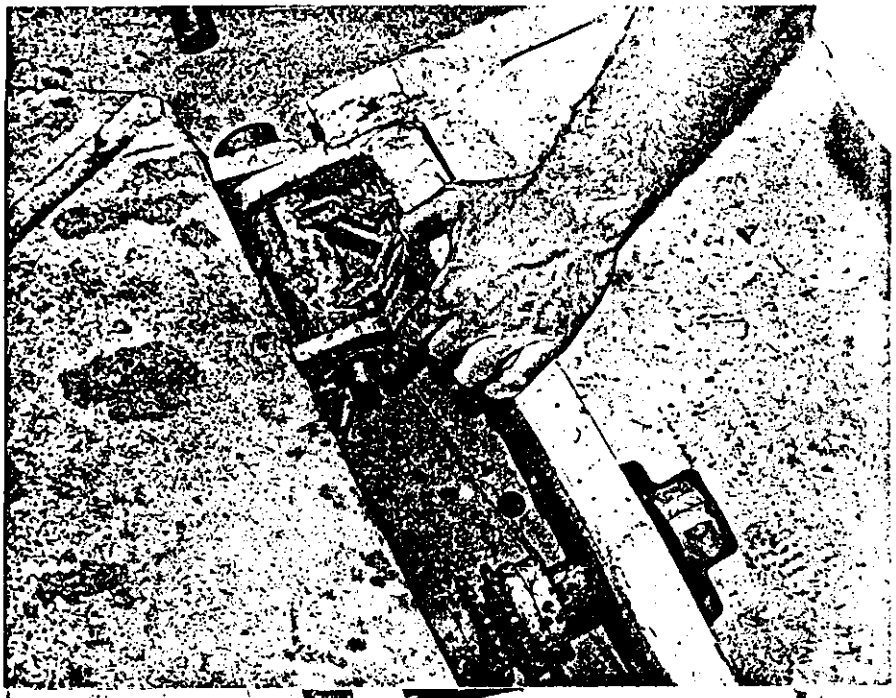
83



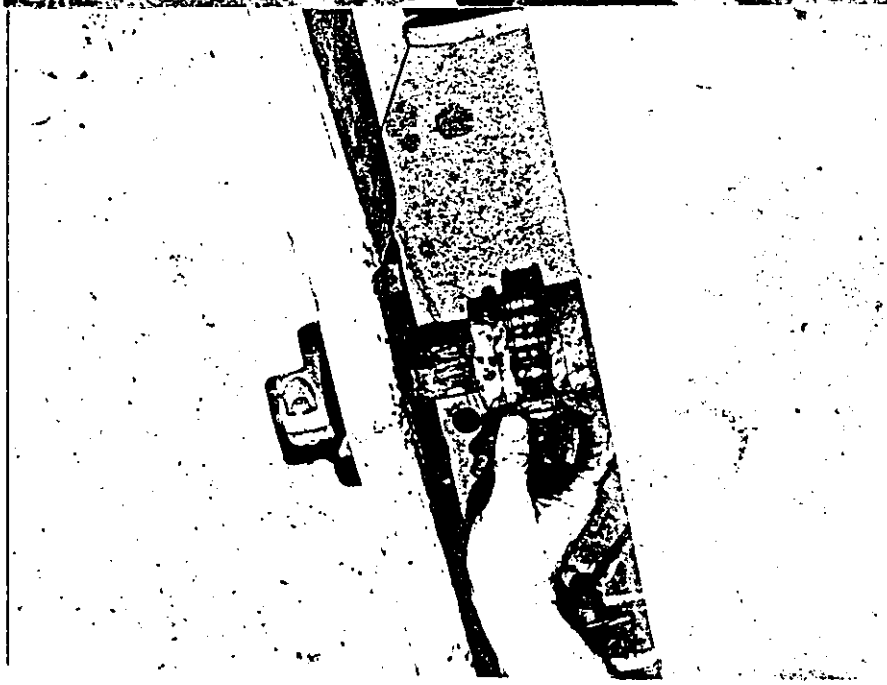
84



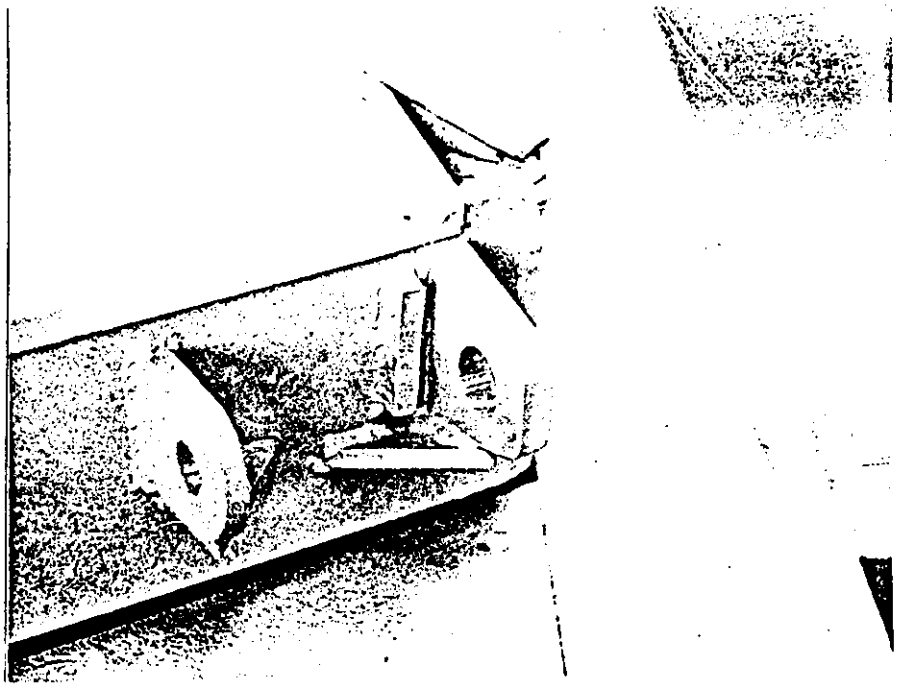
85



86



87



84.5

M. PIN THE BOTTOM SWEEPS

The next thing to do is pin in place the bottom sweeps. Drop the spacer tube down between the tabs before you insert the pin, as shown in Picture No. 85. Be sure the chains hang straight and are not crossed, or you will not be able to get the pin through the spacer. The hole in the spacer is larger on one end than the other, so that the pin can be slipped most of the way through before it must finally be hammered in place. The large inside diameter of the spacer goes to the outside of the sweep. The heads of the pins are to go on the outsides of the sweeps rather than on the insides as has been the practice with standard Scramblers. With the pins in place, lock each one with a Klik-pin, as shown in Picture No. 86. If the first pin driven in goes through the spacer, then the second one will go in much easier than if the reverse procedure is used. To help in aligning the holes, a man on the end of the outer seat can move the sweep back and forth much easier than if you try to do this next to the center pole.

The tube spacer is used to prevent the sweep from shifting sideways. A side shift will put a side load on the chain coupling, and the coupling must be protected from this. All the driving and braking of the unit pole and seat rotation acts through this coupling, and so it is very important to keep the coupling in good condition and fully functioning.

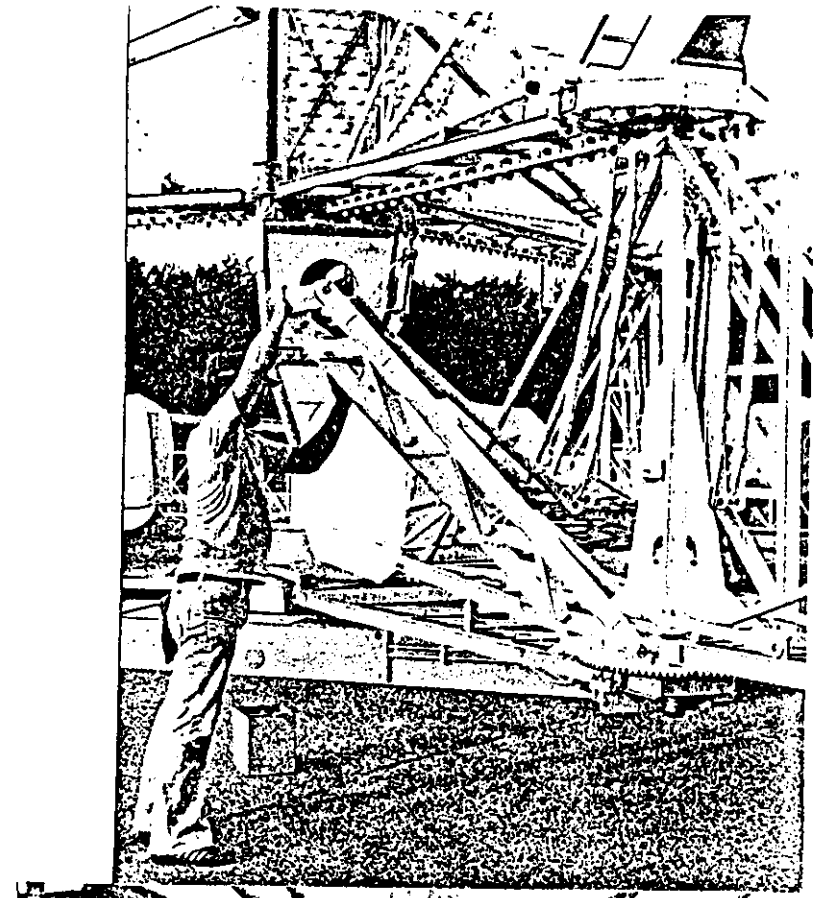
Next, install the chains on the chain couplings of the left and right bottom sweeps to connect the drive shafts. See Picture No. 87.

N. FOLD DOWN SEAT SWEEPS AND TIE RODS

The six seat sweeps that are stored vertically are to be un-pinned where they are attached to the unit poles, and swung down in position, as shown in Picture No. 88. The seat sweep tie rod joints are pinned with the heads of the pins on the inside and the pins are locked with Klik-pins on the outside, as shown in Picture No. 89. Note that the pins have indentations in the tops of the pin heads; this indentation identifies the pins that go in these tie rod joints. In driving in these large pins, be careful not to hit the small pins that are permanent hinge pins in the tie rods or you may shear off the snap rings that hold the small pins in place, and the pins could then drop out. See Picture No. 90.

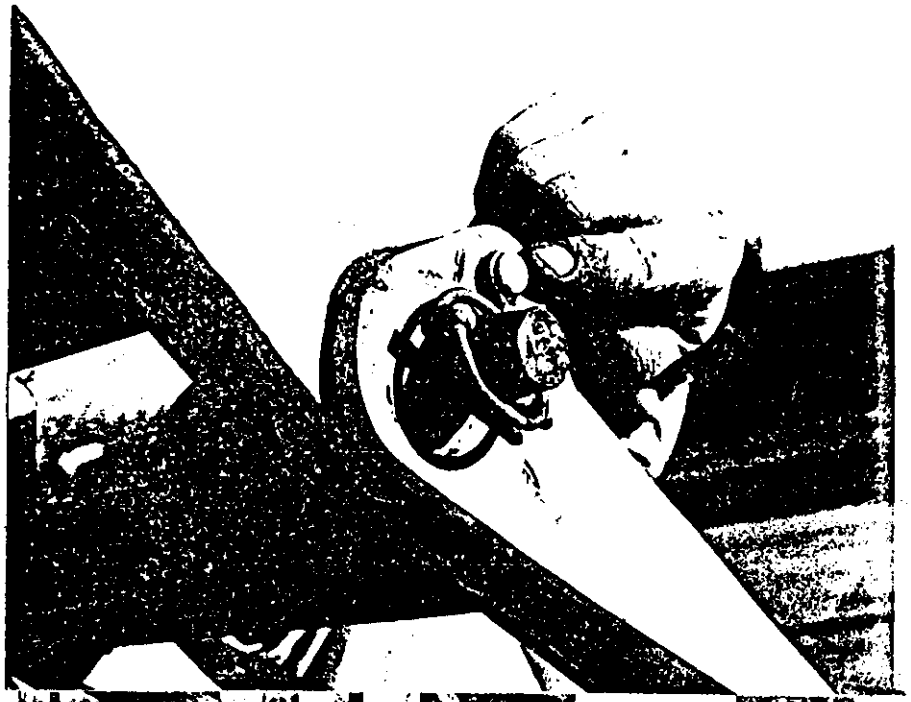
The seat brace tie rods are then unpinned from their storage locations on top of the seat sweeps that are never folded up (see Picture Nos. 91 and 92). Position the tie rod on the unit pole, and pin in that end with a standard assembly pin, the head of which should be on the top side. Be sure to lock each pin with a Klik-pin.

At this point the center sweeps and unit pole are still locked to the trailer frame by the vertical plate sticking up out of the trailer and pinned to the bottom side of the bottom sweep. With the other sweeps pinned in place, the bending load on the center pole has been minimized, and probably there will be little, if any, weight on the remaining transport block, so that it can be removed at this time. With this sweep still locked to the trailer by the vertical plate, all the seat sweeps and unit poles can be pushed around by hand, by slipping the bottom sweep slip clutches. Before you can do this, however, you must first lift out the square tube that locks the seat sweeps to the bottom sweeps, as shown in Picture No. 93. Store the tubes in

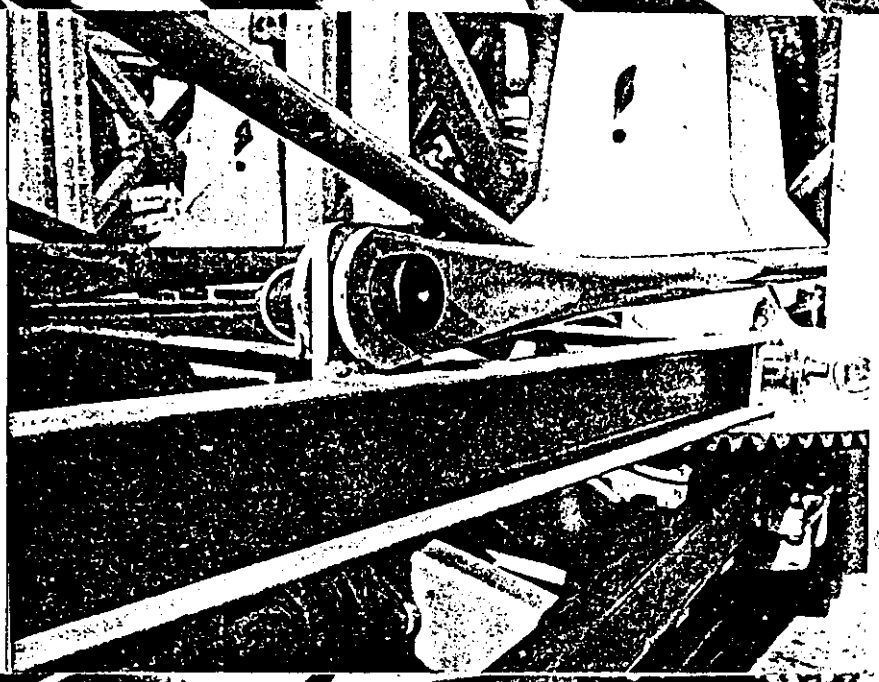


88

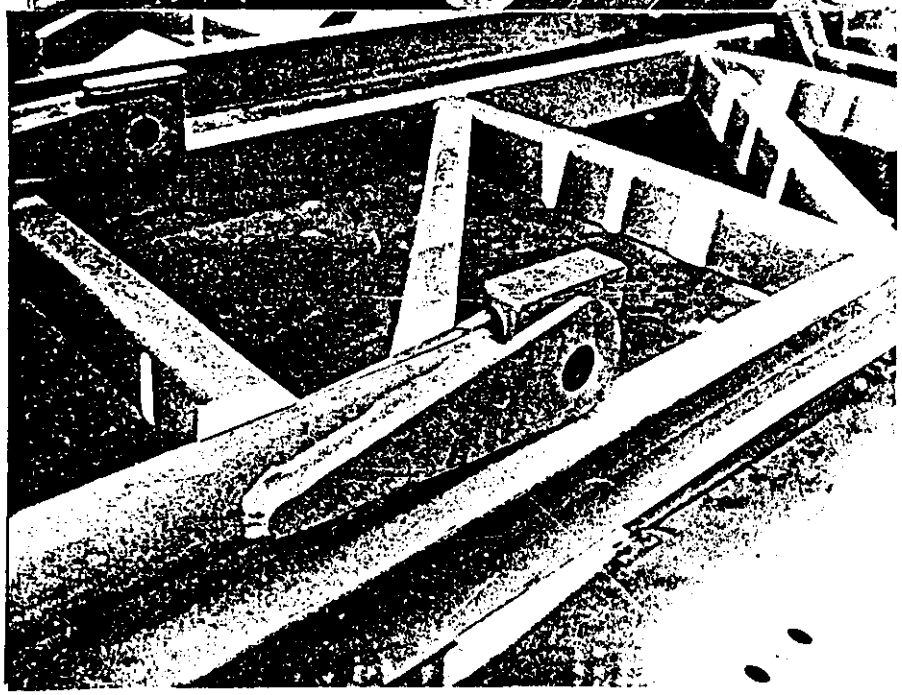
89



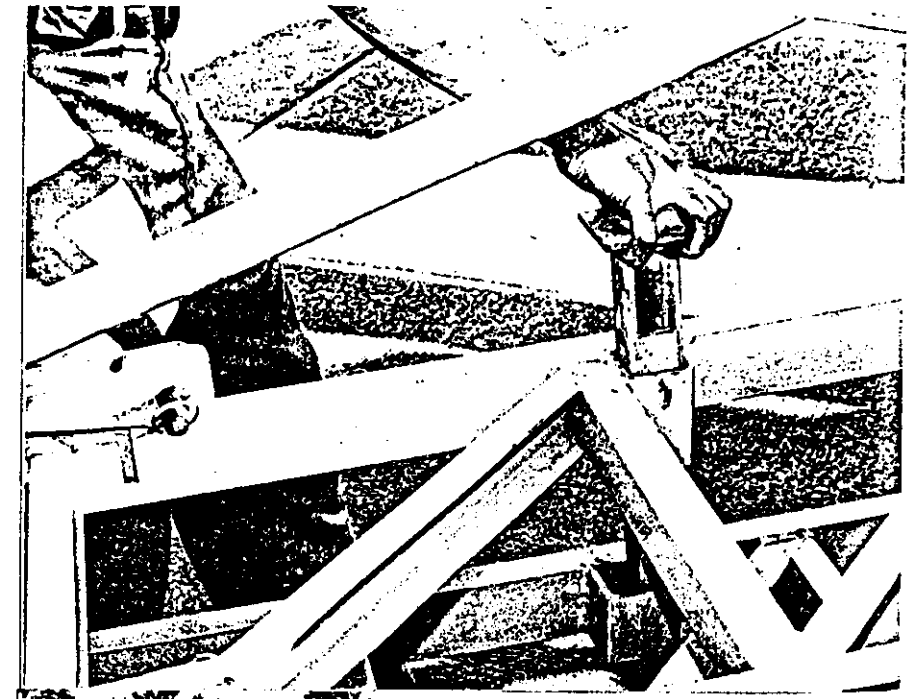
90



91

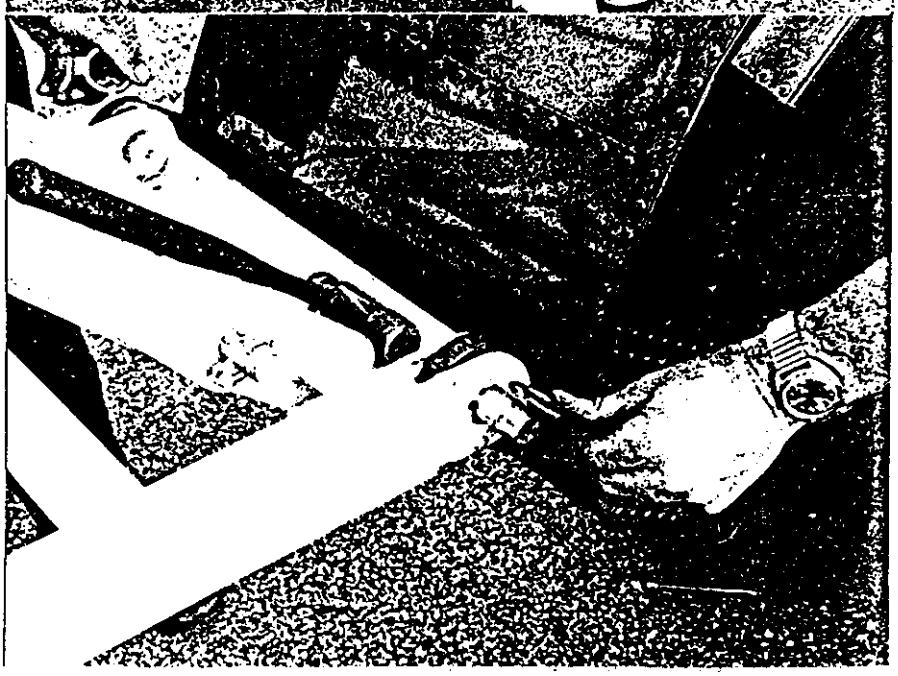


92

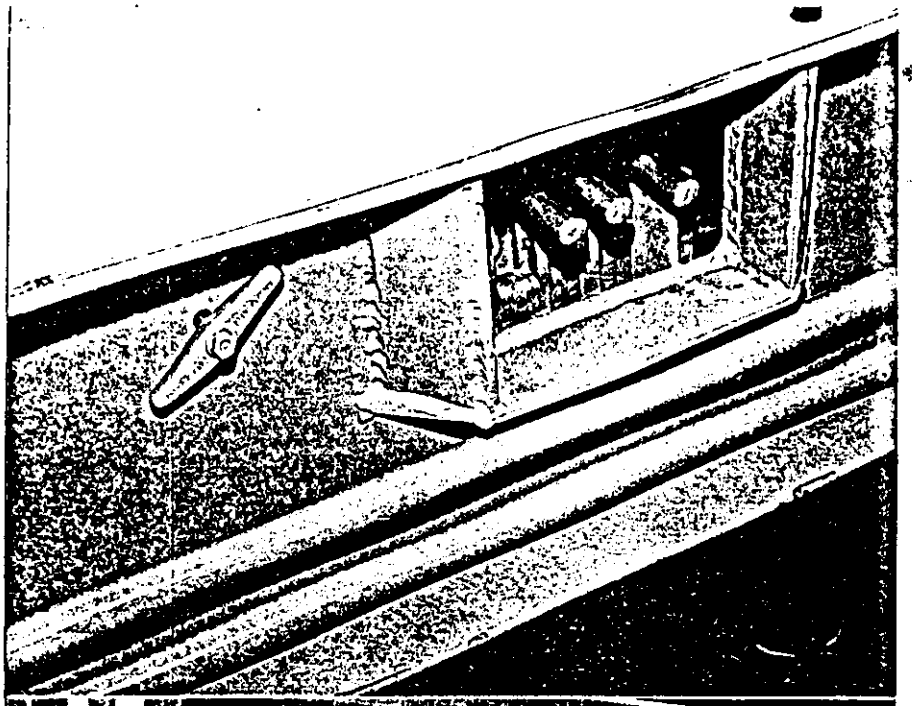


93

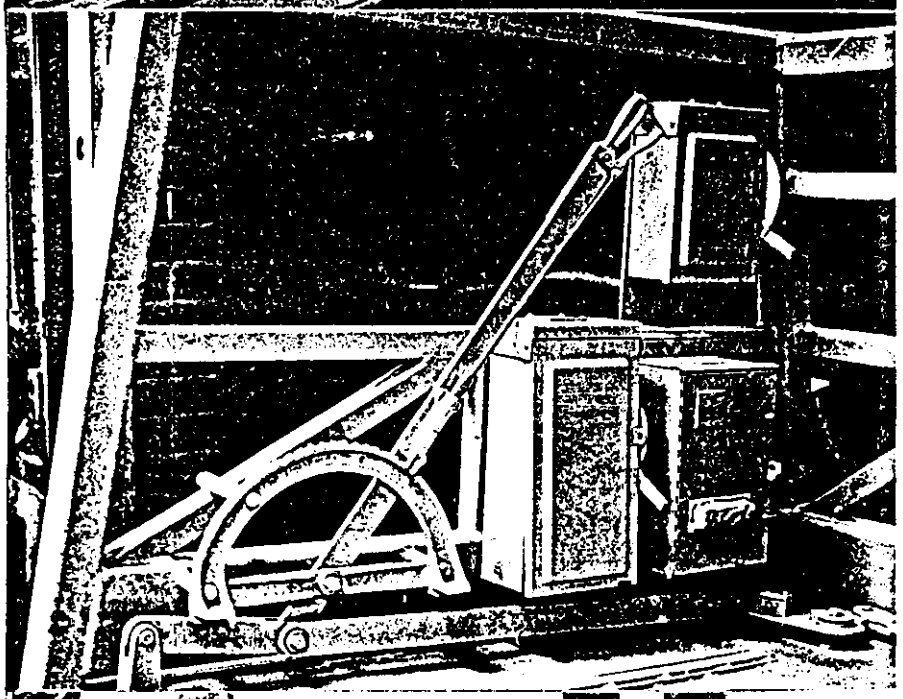
94



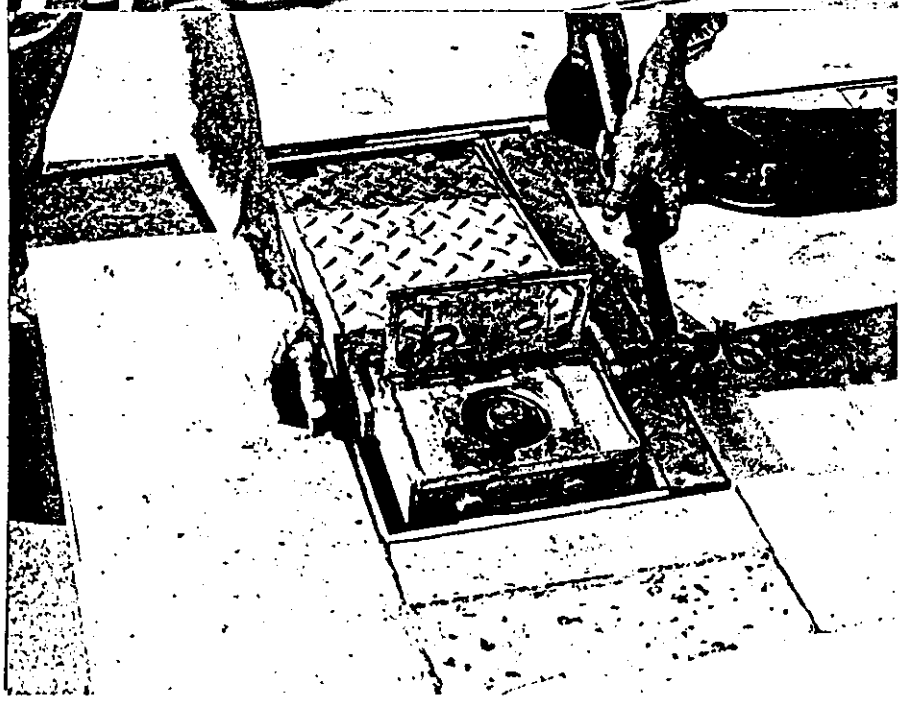
95



96



97



98

the fence foot boxes. Position the seat sweeps for the greatest ease in installing the seats.

O. INSTALLING THE THREE SEATS THAT ARE ON THE GROUND

The three seats which were earlier removed from the front end of the trailer should be installed next. Raise up the end of the seat as shown in Picture No. 94, and drive in the two bottom pins first, with the heads of the pins on the inside as shown in Picture No. 95. Lock each pin with a Klik-pin on the outside as shown. Then lift up the outer end of the seat, guide the seat brace tie rod onto the top pin connection of the seat and drive in the pin. The head of the pin should be on top, and the bottom end of the pin should be locked with a Klik-pin.

Fold out the footbottom of the seat and lock it in place with quarter-turn fasteners on the front face of the seat.

Hang the step on the right end of the footbottom, and lock it in place with the single quarter-turn fastener.

Never operate the ride unless all footbottoms and steps are securely locked in position with the quarter-turn fasteners.

Before turning the center pole, be sure to open the by-pass needle valve which you will find on the left side of the trailer just forward of the landing gear valve opening, as shown in Picture No. 96. Turn this valve handle as far as it will go counterclockwise. This will allow the hydraulic driving motor connected to the center pole to free-wheel, without building up excess hydraulic pressure elsewhere in the hydraulic circuit.

After that, disconnect the center sweeps and unit pole, and turn the center pole by hand until the sweeps and seat sweeps are just past the edge of the trailer. Then set the brake on the ride by moving the brake ratchet handle firmly to the rear, to keep the ride from turning further. See Picture No. 97.

P. FOLD DOWN UNIT POLE LIFT BOXES

The three unit pole lift boxes can then be folded down so that the floor is flush. To do this, remove the hairpin cotter which locks in place the long pin, and then drive out the long pin, as shown in Picture No. 98. Note that the hairpin cotter used in this location is of smaller size than those used elsewhere on the ride. This small hairpin cotter is used only in this location. The long pin has two different diameters on it, so you will not have to drive it out very far before it will be loose and can be pulled out easily. (Note: the long pins will only go through in one direction, and when you install them be sure that the hairpin hole is horizontal so that you can insert the hairpin cotter to lock it in place.)

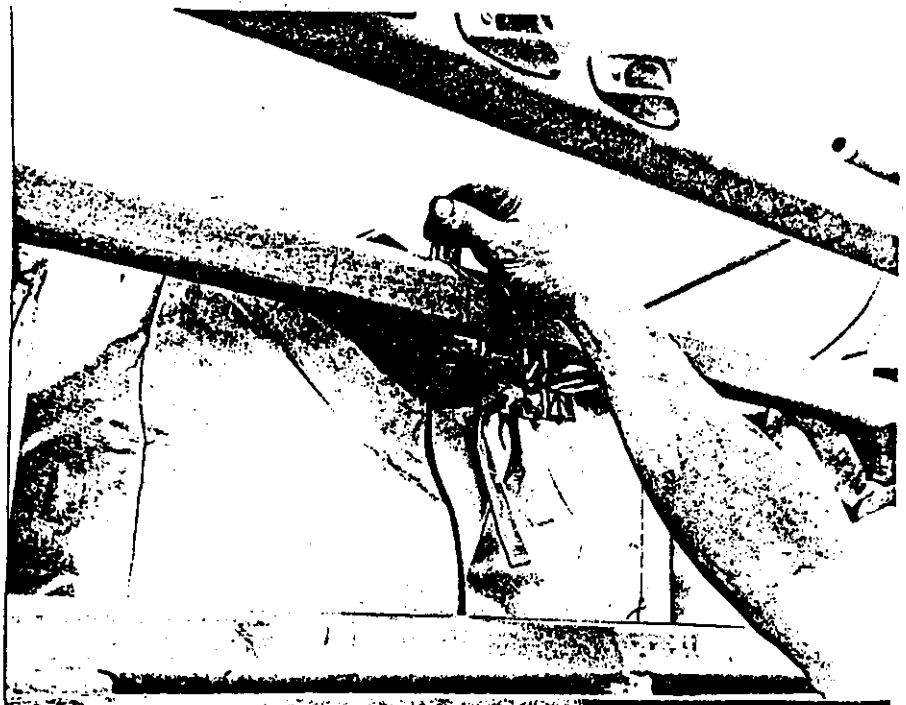
Lift up the slanted top door, as shown in Picture No. 99. Straighten out the smaller door which was hanging vertically, and fold over the cylinder box, as shown in Picture No. 100. Let both doors come to rest on the top as shown in Picture No. 101. This will provide a continuous walking surface on the trailer floor.

The transport blocks can be stored either with the cylinder boxes down inside the trailer or they can be stored in the fence foot storage boxes.

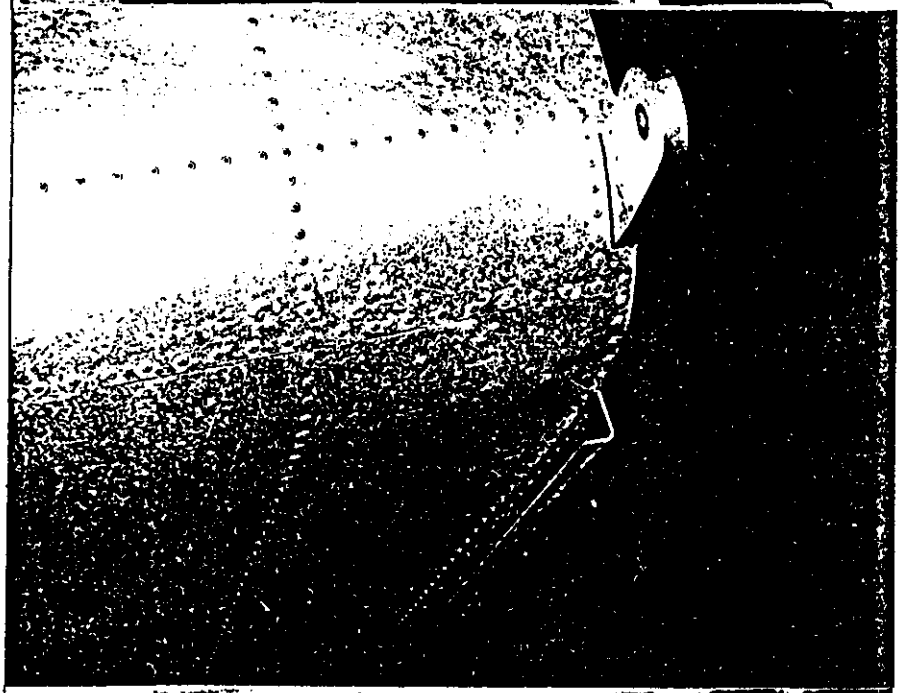
99

100

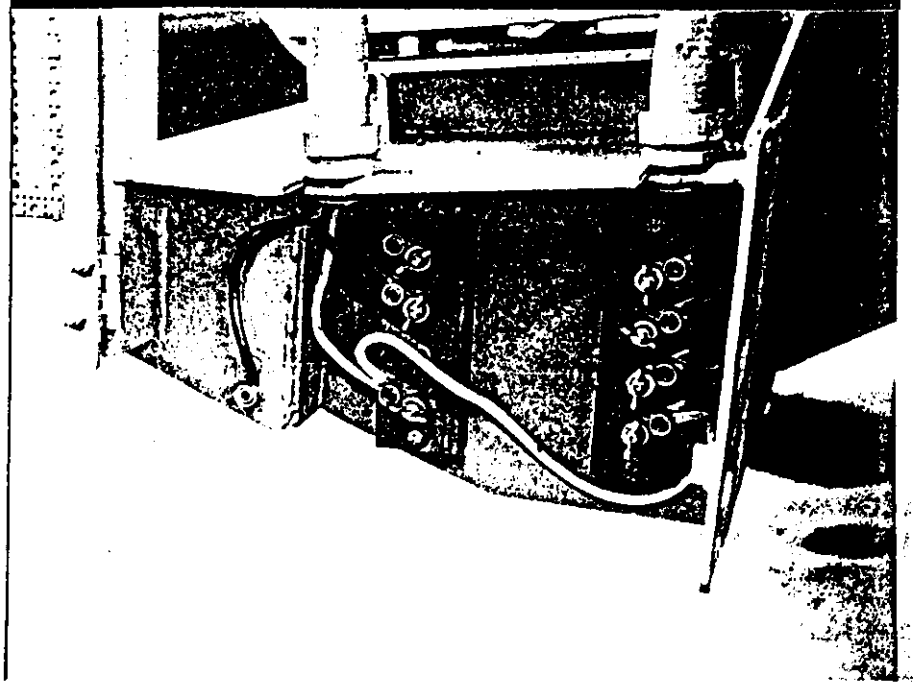
101



102



103



104

Q. INSTALL THE THREE SEATS STORED ON THE REAR END

Unpin the seats where they are attached to the midrail across the back of the trailer, as shown in Picture No. 102. Slide them out, one by one, and attach them to the remaining three seat sweeps. By having the seat sweeps right next to the trailer floor, the seats can be set on the floor and will not have to be lifted very far when installing them. Be sure to lock all pins with Klik-pins.

Notice that only the six seats that are removed have an extended rail underneath on the back side (see Picture No. 103). The horizontal flange of this rail engages the slot on the trailer floor to hold the seat securely when traveling on the highway. The rail is made of aluminum for light weight, and in time it may wear to the point where it will need replacement. Never store a seat on the trailer if this flange is badly worn or you may lose the entire seat out into traffic. You will avoid this if you replace the part when it is worn.

The step for each seat is carried in the folded-up footbottom. If left free to rattle around, it will dent the front skin of the footbottom from the inside. You are provided with two kinds of seat covers: rip-stop vinyl covers for traveling on the highway, and canvas covers for the seats when fully opened on the ride. If you will wrap the step in the canvas cover before placing it in the footbottom you will avoid the dents in the footbottom.

With all seats pinned in place, this completes the assembly of the ride. Before going any further, go around and check every pin to be sure it is locked in place with a Klik-pin or hairpin. Also, be sure to check that there is at least three feet of clearance between the seats and the fence all the way around the ride, and that there is at least $3\frac{1}{2}$ inches of clearance between each unit pole and the top deck of the trailer.

R. CONNECTING ELECTRICAL POWER

Open the door on the right side at the rear of the trailer to get to the terminal blocks for connecting electric power to the ride. What you will see is shown in Picture No. 104.

On the left side is the block that connects to the light circuits. From the top down, lugs one and two are for 120 volt hot wires. Lug position number three is empty. Lug number four is the neutral. There is no equipment ground on this terminal block; the equipment ground is brazed to the trailer frame below and to the left.

On the right side is the block that connects to the 15 horsepower drive motor. From the top down, lugs one, two, and three are for phase legs, and lug number four is a neutral. The motor itself does not use a neutral, but the incoming wiring will be simplified by having the three hot wires and the neutral all connected to the one terminal block.

If you carry your own generators, they will probably be wye connected. That means that voltage will measure 208 volts from line to line, and 120 volts from each line to neutral. With the incoming four-wire leads connected to the motor block on the right, the top two hot lines and the neutral are jumpered straight across to the lighting terminal block. These jumpers are already attached to the two terminal blocks.

If you are using purchased power, it will probably be delta connected, which means that voltage will measure 240 volts from line to line, 120 volts from each of two lines to neutral, and 208 volts from the "wild phase" to neutral.

> WARNING: WHEN CONNECTING POWER TO THE RIDE THAT HAS THE "WILD PHASE", BE SURE TO IDENTIFY THAT LINE WITH A METER, AND CONNECT IT TO THE THIRD LUG ON THE RIGHT HAND BLOCK, SO THAT YOU DO NOT CONNECT IT TO A LIGHT CIRCUIT. IF YOU ACCIDENTALLY CONNECT THIS LINE INTO THE LIGHT CIRCUIT, YOU WILL PROBABLY BURN OUT ALL OF THE BALLASTS BEFORE YOU REALIZE WHAT IS HAPPENING.

When it is necessary to correct rotation on the motor, trade lines on lugs one and two only. Do not trade the "wild phase" line to correct motor rotation, or you will burn out your ballasts or lamps. When viewed through the open door, the motor should turn counterclockwise. An arrow is painted on the motor, as shown in Picture No. 105, to show the proper direction of rotation.

Connect the equipment ground line to the lug attached to the trailer frame below and to the left of the terminal block.

The main disconnects for the electric motor and the 110 volt lights, plus the pushbutton switch for the motor controller, are all on the right side of the elevated rear platform of the trailer within easy reach of an operator standing there by the brake ratchet handle. In case there is any kind of an electrical problem, throw the main disconnects immediately.

In addition, you should provide an electrical ground as described in the National Electrical Code and connect that to the ground terminal near the terminal blocks in the right rear corner of the trailer. This terminal is silver soldered to the trailer frame for good grounding.

The following information has been taken directly from the National Electrical Code.

250-81. WATER PIPE. A metallic underground water piping system, either local or supplying a community, shall always be used as the ground electrode where such a piping system is available. Where the buried portion of the metallic piping system is less than ten feet (including well casings bonded to the piping system) or there is some likelihood of the piping system being disconnected, it shall be supplemented by one or more of the grounding electrodes recognized in Sections 250-82 and 250-83.

250-82. OTHER AVAILABLE ELECTRODES. Where a water system as described in Section 250-81 is not available, the grounding connection may be made to any of the following:

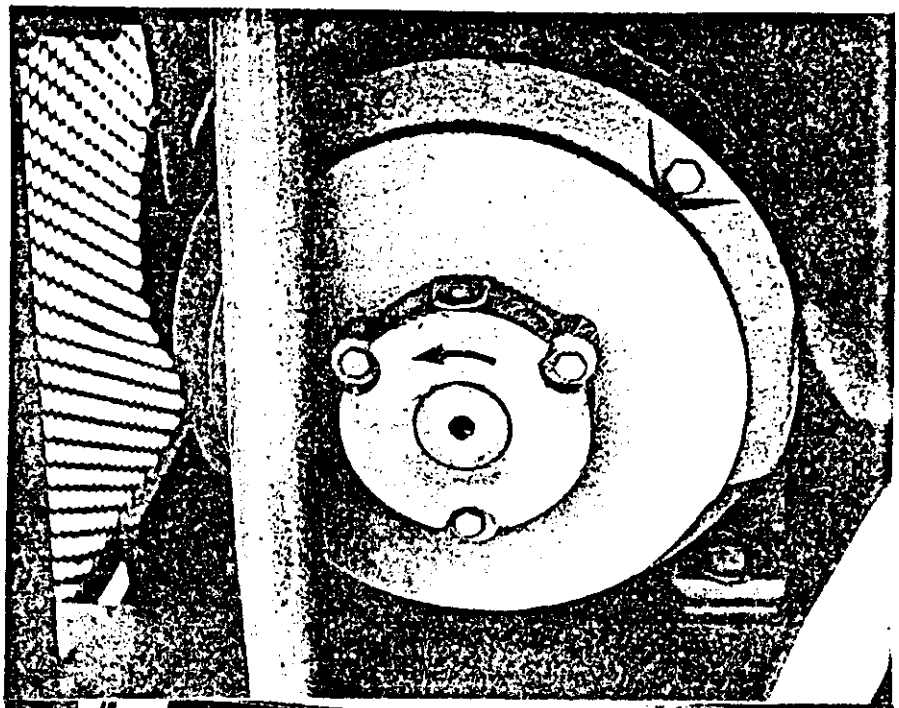
(a) The metal frame of the building, where effectively grounded.

(b) A continuous metallic underground gas piping system.

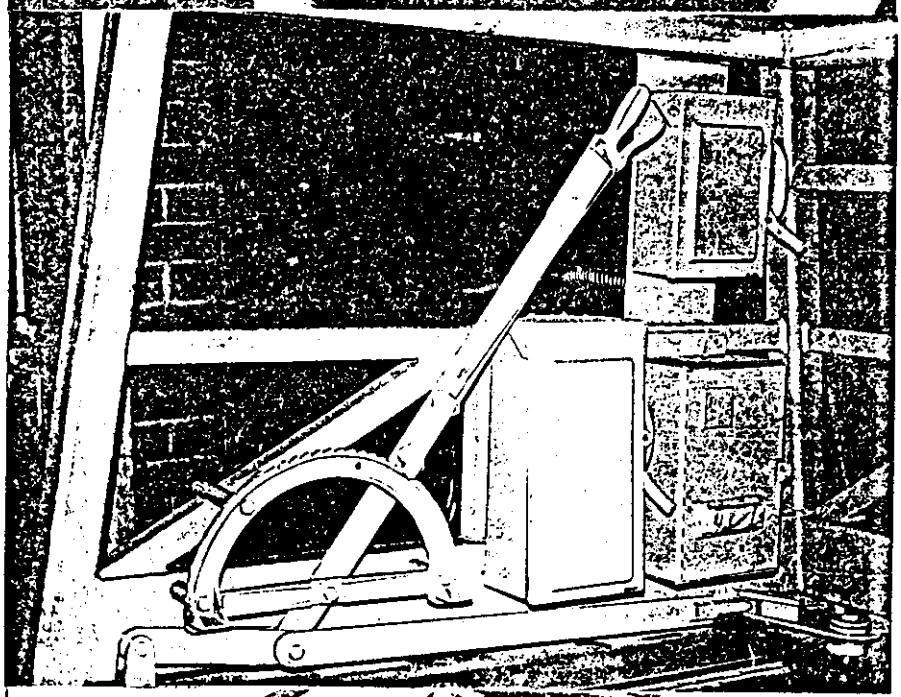
(c) Other local metallic underground systems, such as piping, tanks, and the like.

250-83. MADE ELECTRODES. Where electrodes described in Sections 250-81 and 250-82 are not available, the grounding electrode shall consist of a driven pipe, driven rod, buried plate, or other device approved for the purpose and conforming to the following requirements:

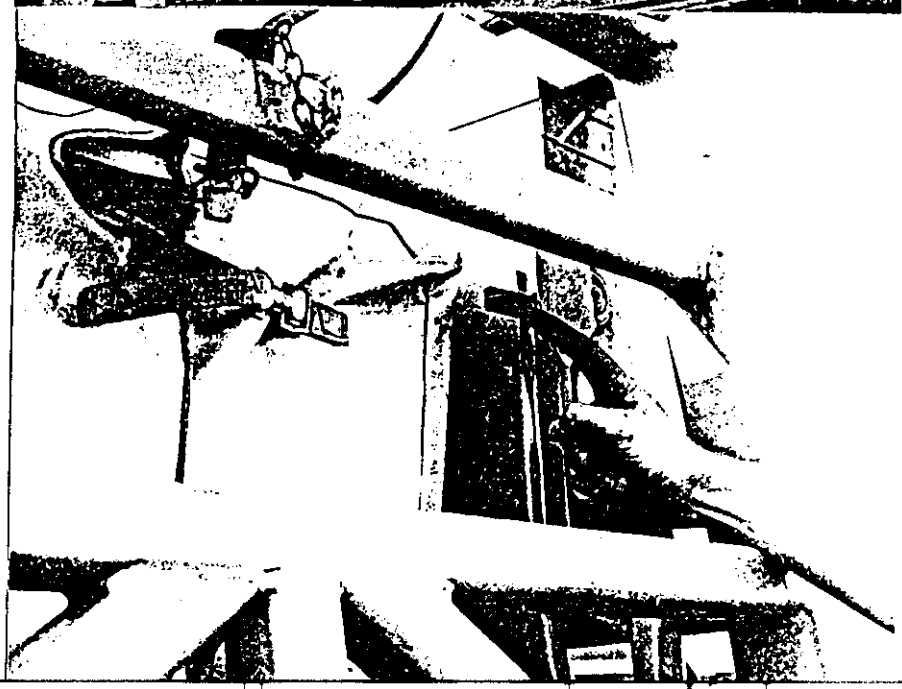
(a) PLATE ELECTRODES. Each plate electrode shall present not less than two square feet of surface to the exterior soil. Electrodes of iron or steel plates



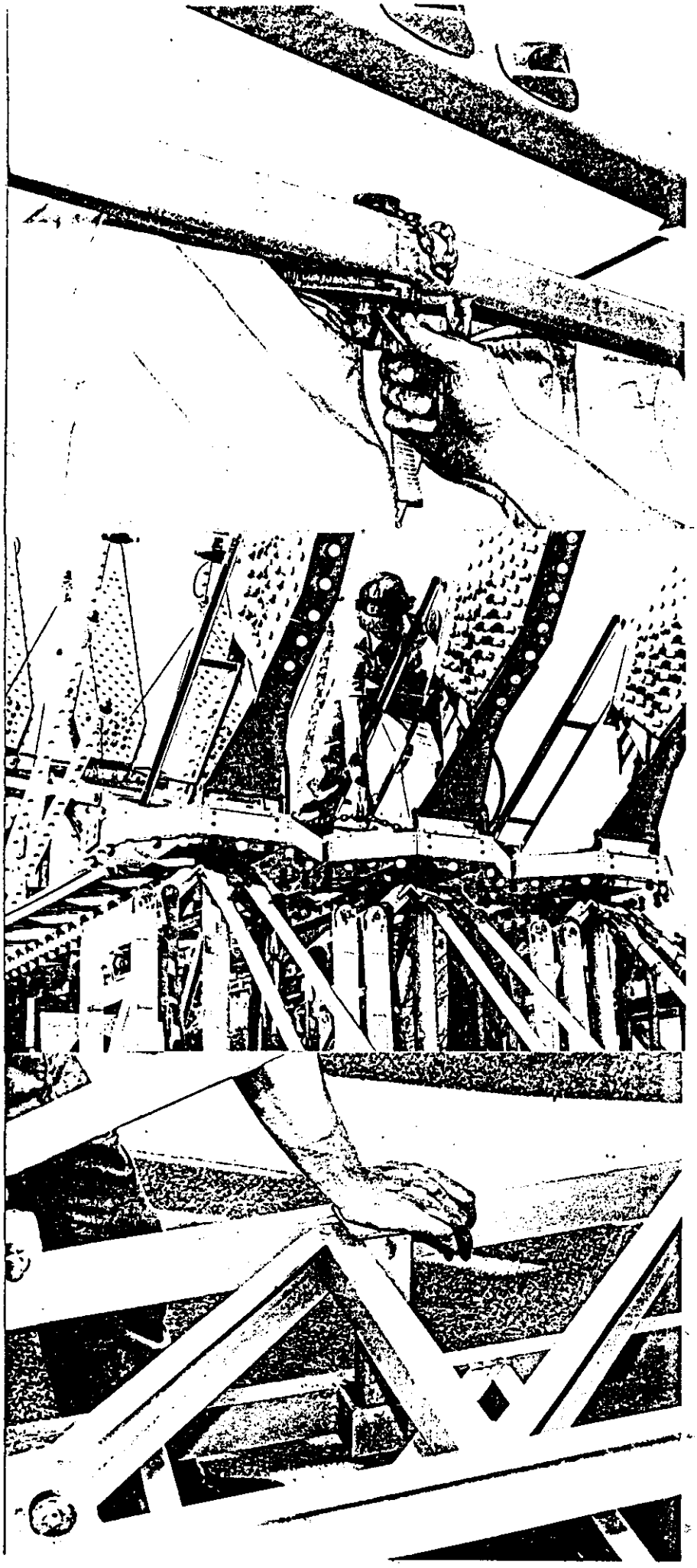
105



106



107



108

109

110

shall be at least $\frac{1}{4}$ inch in thickness. Electrodes of non-ferrous metal shall be at least 0.06 inch in thickness.

(b) PIPE ELECTRODES. Electrodes of pipe or conduit shall be not smaller than of the 3/4 inch trade size, and where of iron or steel, shall have the outer surface galvanized or otherwise metal-coated for corrosion protection.

(c) ROD ELECTRODES. Electrodes of rods of steel or iron shall be at least 5/8 inch in diameter. Approved rods of non-ferrous materials or their approved equivalent used for electrodes shall be not less than $\frac{1}{2}$ inch in diameter.

(d) INSTALLATION. Electrodes should, as far as practicable, be embedded below permanent moisture level. Except where rock bottom is encountered, pipes or rods shall be driven to a depth of at least 8 feet regardless of size or number of electrodes used. Pipes or rods when less than commercial length shall preferably be of one piece. Such pipes or rods shall have clean metal surfaces and shall not be covered with paint, enamel, or other poorly conducting materials. Where rock bottom is encountered at a depth of less than 4 feet, electrodes shall be buried in a horizontal trench, and where pipes or rods are used as electrodes they shall comply with Paragraph 250-83 (b and c) and shall be not less than 8 feet in length. Each electrode shall be separated at least 6 feet from any other electrode, including those used for signal circuits, radio, lightning rods, or any other purpose.

250-84. RESISTANCE. Made electrodes shall, where practicable, have a resistance to ground not to exceed 26 ohms. Where the resistance is not as low as 25 ohms, two or more electrodes connected in parallel shall be used.

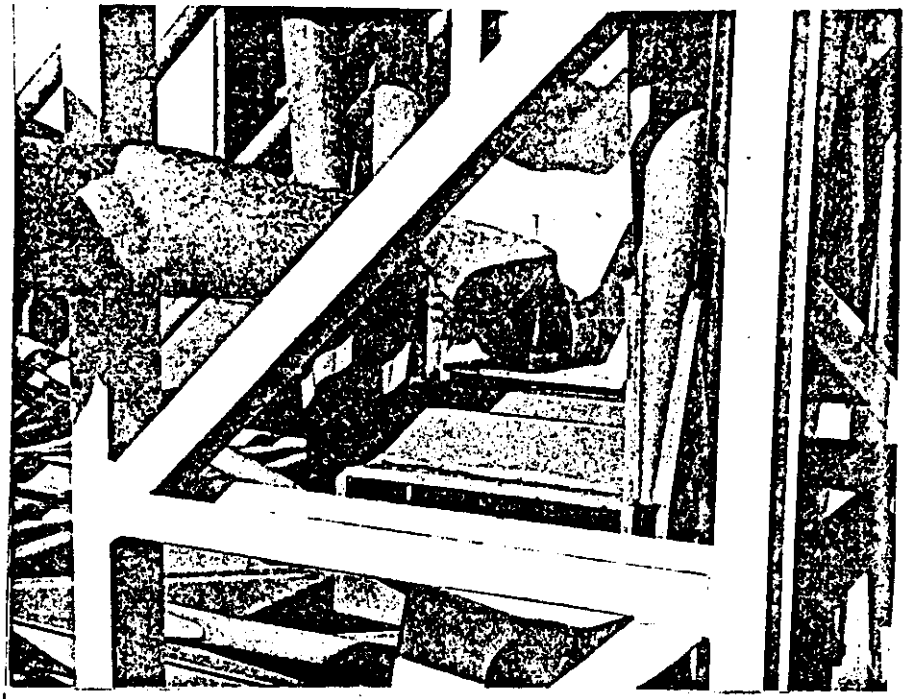
Continuous metallic underground water or gas piping systems in general have a resistance to ground of less than 3 ohms. Metal frames of buildings and local metallic underground piping systems, metal well casings, and the like, have, in general, a resistance substantially below 25 ohms. It is recommended that in locations where it is necessary to use made electrodes for grounding interior wiring systems, additional grounds, such as connections to a system ground conductor, be placed on the distributic circuit. It is also recommended that single electrode grounds when installed, and periodically afterwards, be tested for resistance.

S. DISMANTLING THE RIDE

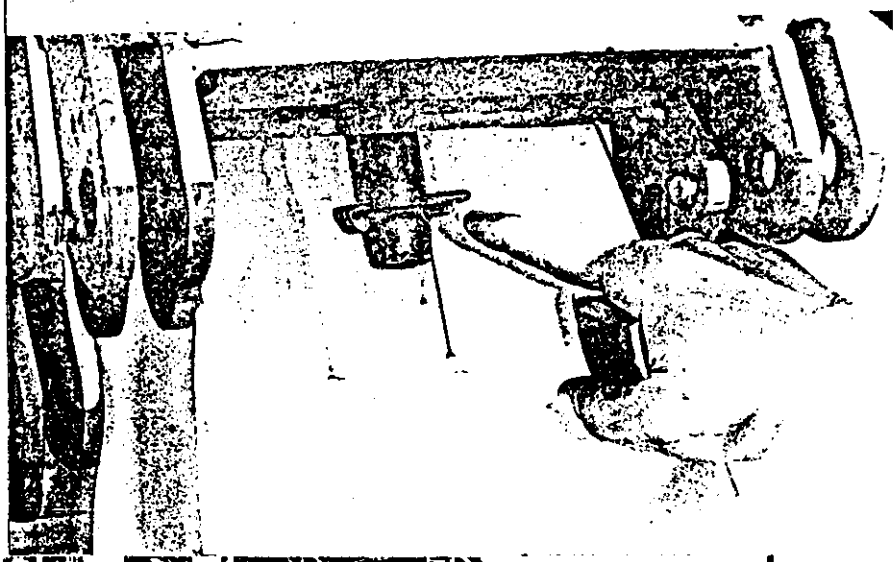
Essentially, dismantling the ride is the reverse of the setup, except for a few minor changes or precautions.

When tearing down at night it is advisable to leave all the lights on for maximum visibility. If you do, when you store the three seats up on the rear end, leave the right seat, next to the brake ratchet handle, slid forward. Otherwise, you will not be able to shut off the lights when you are through, because the light switch handle will not clear that seat. See Picture No. 107. After the switch is thrown, the seat can be slid back and pinned to the back midrail. Be sure all three seats are pinned in place, and all three pins are each locked with a Klik-pin, as shown in Picture No. 108.

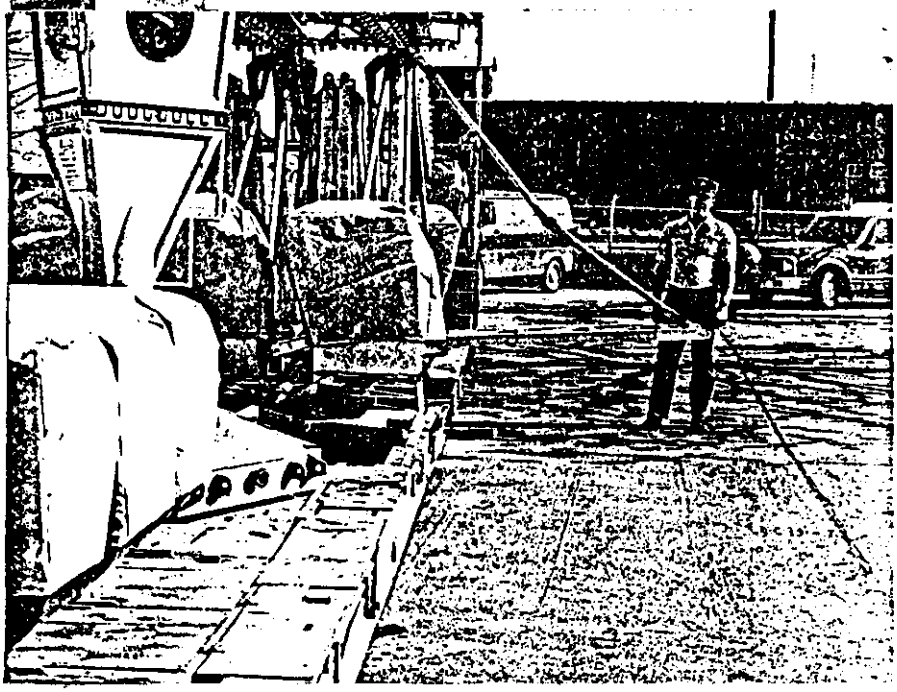
Before removing the bolt and nut which hold the tops of the barn doors together, take out the two top vertical pins, and loosen partway the two bottom elephant pins.



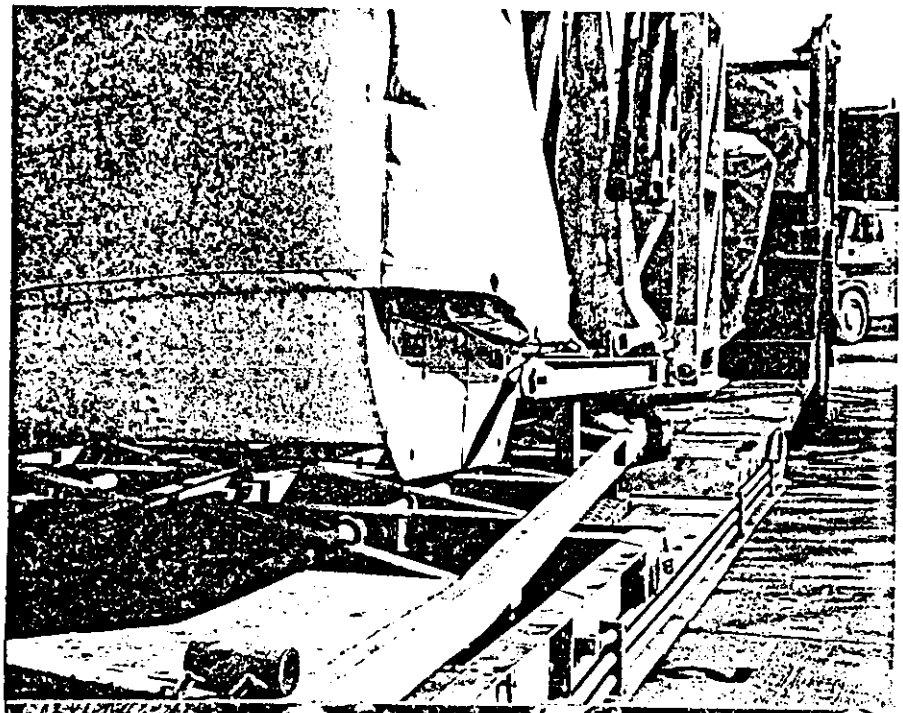
111



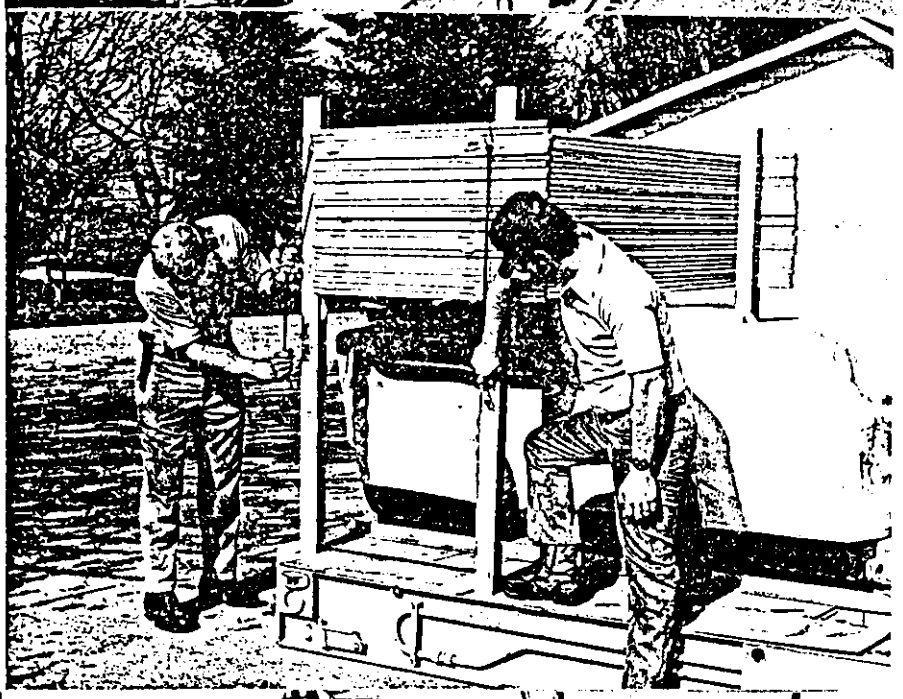
112



113



114



115

116

Before lowering the barn doors and fan lights, pull together the outer ends of all three top sweeps with the chain and load binder, so that as the barn doors fold over they will not have to force together the sweep ends. When climbing up the folded seat sweep to get on top, the top sweep and unit pole may lean outward so that you may not be able to pull the sweeps together with the load binder on the first try. DO NOT TRY TO FOLD OVER THE BARN DOORS UNLESS THE SWEEPS ARE LOCKED TOGETHER HERE. Hook the ends of the chain on the two outer sweeps and then lift on the chain in the middle, as shown in Picture No. 109. Usually this will pull the sweeps together. You can also take several "bites" with the load binder to get them together.

Be sure that the seat sweeps have been locked in position by dropping in place the square tubes that go between the seat sweeps and the bottom sweeps, as shown in Picture No. 110.

When the seat sweeps are folded up, be sure that a pin is driven in to lock it in place, as shown in Picture No. 111. The head of the pin must be on the top as shown. Be sure to lock each pin with a Klik-pin as shown in Picture No. 112. If this pin were ever to come out, the seat sweep could drop down right in the path of oncoming traffic as can be seen in Picture No. 113, so avoid this hazard by locking each pin with a good Klik-pin.

The rip-stop vinyl seat covers must be used when traveling on the highway in order to keep the seat cushions from vibrating out. With the cover in place, the cushion can stick out somewhat, as shown in Picture No. 114, but without the seat cover the cushion can fall out into traffic and this can be very hazardous. Therefore, never travel on the highway unless the rip-stop vinyl seat covers, in good condition, are all in place and pulled up tight.

When the fence sections have been racked, do not forget to tie them down with the rubber tarp straps, as shown in Picture No. 115.

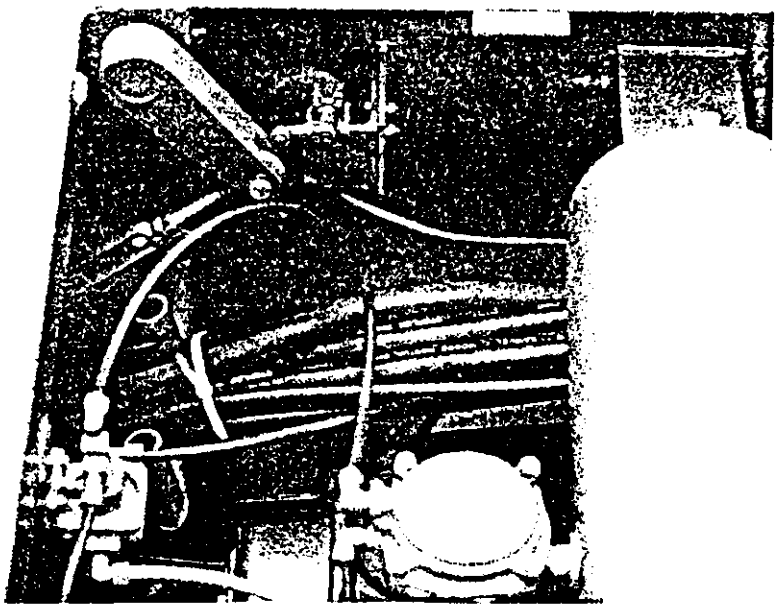
When the front of the trailer has been raised, DO NOT FORGET TO INSTALL THE LONG PINS WHICH LOCK IN PLACE THE KINGPIN PLATE LINKAGE. And do not forget to lock in place the long pins so that they cannot come out.

T. OPERATING THE BIG ELI TMS SCRAMBLER

Before turning on the electric motor, be sure that the brake ratchet handle is in the rear, braked position, as shown in Picture No. 106. This will then put the hydrostatic transmission in neutral, as it should always be when the motor is started or stopped. Unless the brake ratchet handle is in this rear position you will not be able to start the electric motor, because a micro-switch, shown in Picture No. 115.5, must be engaged by the brake bell crank as shown before the pushbutton starter on the magnetic controller is energized. Let the motor run for at least 20 seconds before moving the brake ratchet handle forward to engage the hydrostatic transmission and start the ride turning. A charge pump keeps all the internal parts of the transmission lubricated, and you should allow enough time for the pressure to build up, to insure adequate lubrication, before engaging the transmission. The transmission goes smoothly from a neutral position to full speed, so the brake ratchet handle can be held at any position and the transmission will respond accordingly. The electric motor runs continuously, and it should never be shut off, except under emergency conditions, unless the hydrostatic transmission is in neutral.

The by-pass needle valve on the left side of the trailer, next to the landing gear valve, must be closed completely by turning the knob clockwise all the way, so full hydraulic power will get to the hydraulic motor driving the ride. See Picture No. 96.

Ease the brake ratchet handle forward slightly so that the center pole turns



115.5

slowly to check for fence clearance all the way around. Also, when viewed from the top, the center pole should be turning in a clockwise direction, and the unit poles counterclockwise.

The procedure for handling passengers on the TMS Scrambler is virtually identical to what is used on a standard Scrambler, and you are referred to the standard Scrambler manual for complete operating procedure. However, there are a few special procedures that should be used with the TMS Scrambler.

When the Scrambler is turning, never enter or leave the steps on the rear platform of the trailer. The clearance between the Scrambler and the trailer structure on the rear end is too close to do this safely, so always wait until the ride is stopped before using the steps on the rear of the trailer. Picture No. 116 shows how close this clearance is. Note that the step is not assembled to the seat (which would reduce clearance even more), nor is the man standing all the way down on the deck of the trailer.

If you will always stop the Scrambler so that one bottom sweep is directly over the rear end of the trailer, you will minimize the traffic over the trailer, and reduce the opportunity for people to fall down when climbing over the trailer. The sweep acts to block off the trailer from cross traffic.

At all times when the ride is open to the public, every door on the trailer must be closed. On the rear end, particularly, the doors act as guards for moving machinery, and they must be kept closed.

> DANGER: NO ONE WITH BARE FEET SHOULD BE ALLOWED ON THE RIDE. THERE ARE SEVERAL DOORS IN THE FLOOR OF THE TRAILER, AND DOOR CLEARANCES MAY BE LARGE ENOUGH FOR TOES TO GET IN, SO KEEP BARE FEET OFF THE RIDE TO AVOID INJURIES.

After a ride has been completed, move the brake ratchet handle back to a neutral position so that the hydrostatic transmission is no longer powering the ride. Let it coast down for one revolution, and then gradually apply the brakes until the ride comes to a complete stop. This should be done fairly swiftly and smoothly, so that the braking time is not extended. Firm braking is a clear indication to the passengers that the ride is still in motion, and they should remain seated until the ride has stopped. Remember that the electric motor is to run continuously, and should never be shut off except in emergency conditions, unless the hydrostatic transmission is in neutral.

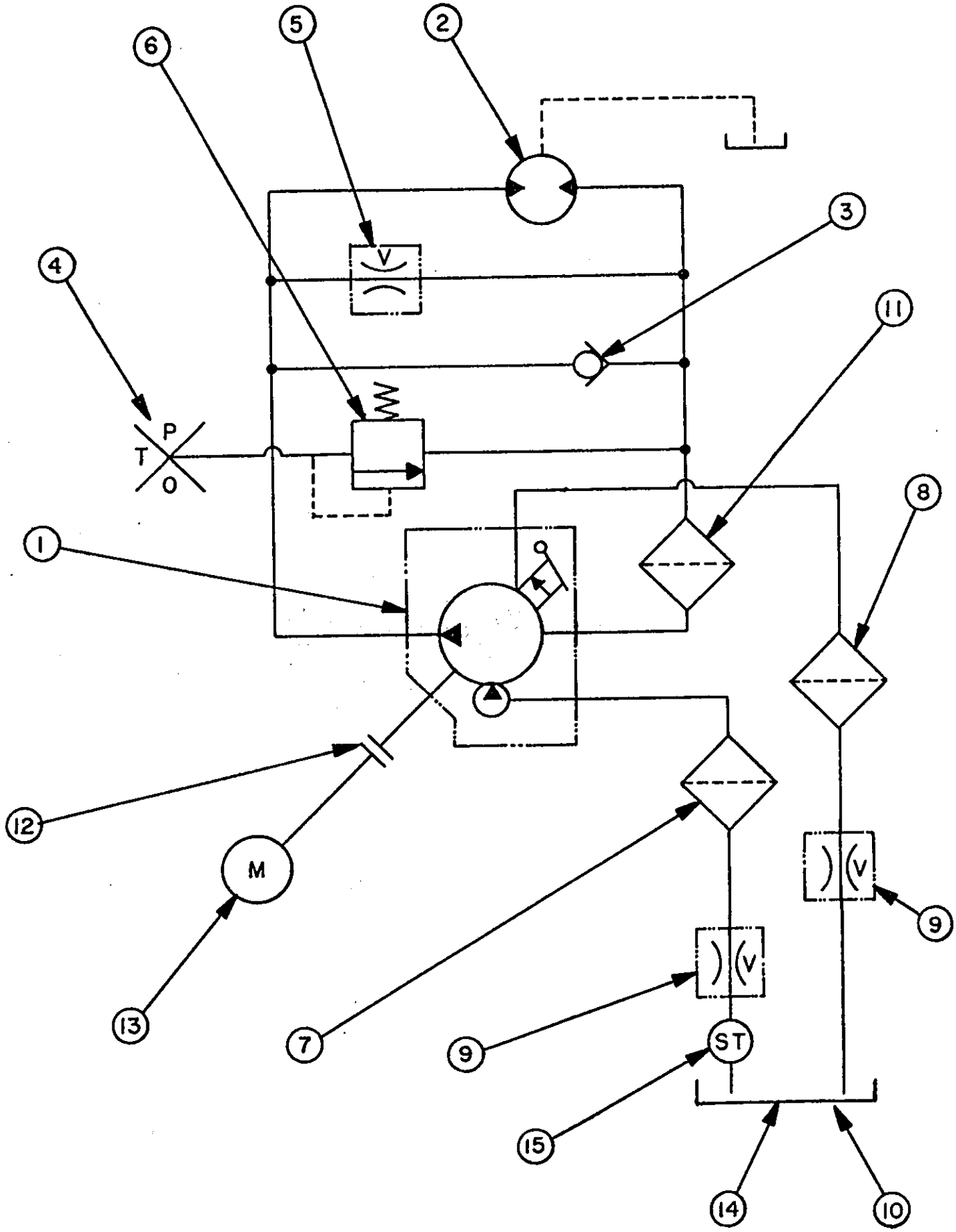
> THE TMS SCRAMBLER HAS BEEN BASED ON THE STANDARD SCRAMBLER, AND PARTS FOR IT HAVE BEEN CHANGED ONLY WHERE NECESSARY TO ACCOMODATE TO THE ERECTION AND OPERATION FROM ITS OWN TRAILER. THEREFORE, THE ERECTION MANUAL AND MAINTENANCE MANUAL FOR THE STANDARD SCRAMBLER APPLY EQUALLY TO THE TMS SCRAMBLER, EXCEPT WHERE THESE NECESSARY CHANGES HAVE BEEN MADE.

U. RECOMMENDATIONS FOR OPERATING AND SERVICING THE BIG ELI TMS HYDRAULIC SYSTEM

Figure 1 shows the complete Big Eli TMS hydraulic operating circuit, and Figure 2 shows the set-up circuit. Each portion of the circuit is identified by a code number. Table 1 lists code numbers, quantities, names and part numbers, and manufacturers. Following that is a functional description and sequence of operations for the entire hydraulic circuit. Throughout all the description of the hydraulic circuitry all of the hydraulic components are identified by their code numbers.

TABLE 1

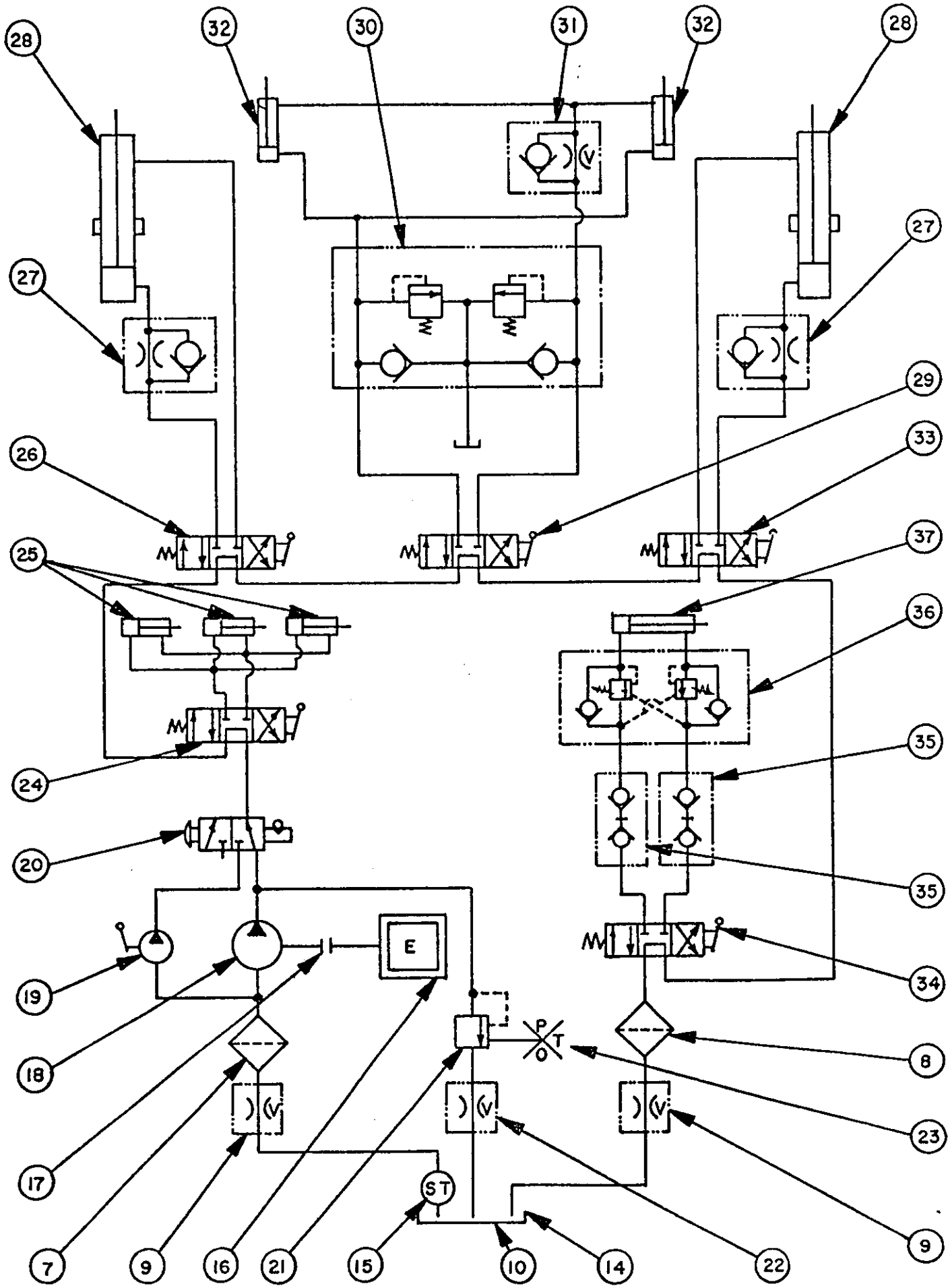
Code Number	Quantity	Name and Part Number	Manufacturer
1	1	Hydrostatic transmission #18-2010	(Sundstrand)
2	1	Hydraulic motor, Series 2000, #104-1025 9.9 cu. in. per rev., 1.25 dia. shaft	(Char-Lynn)
3	1	Check valve, #483-1D1-2	(Republic)
4		Gage port on relief valve	(Republic)
5	1	Needle valve, #P10M017	(Dragon)
6	1	Relief valve, #R6701-2-½S2-¼P	(Republic)
7	1	Suction filter, #TF-1-2A10-P-X-Y	(Schroeder)
8	1	Return line filter, #TF-1-1A10-P-D	(Schroeder)
9	2	Brass gate valves, one 1.000; one .500	
10	1	Breather cap on reservoir, #HC-120	(Hydro-Craft)
11	1	Filter, high pressure, 900 Series, Length 1, #972A-2R-S-110, with 970-P-110A 10 micron filter	(PMH-Fairey)
12	1	Coupling, #L150	(Lovejoy)
13	1	Electric motor, 15 HP, 3 phase, 1750 RPM, 254T Frame	(Century)
14	1	Reservoir	(Eli Bridge Co.)
15	1	Sump strainer, #10-1-100-RV-3	(Flo-Ezy)
16	1	Engine, 12 HP, #HH-120-120204F, Ser. 7153E	(Tecumseh)
17	1	Coupling, #L150	(Lovejoy)
18	1	Hydraulic pump, .258 cu. in./rev., #GC-6076-CA-2D-1	(Barnes)



BIG ELI TMS SCRAMBLER

HYDRAULIC OPERATING CIRCUIT

FIGURE 1



BIG ELI TMS SCRAMBLER

HYDRAULIC SET-UP CIRCUIT

FIGURE 2

19	1	Hand pump, #914-8D27	(Republic)
20	1	Selector valve, #SV22	(Dukes)
21	2	Relief valve, #R6701-2-½S2-¼P	(Republic)
22	1	Needle valve, #S-143-¼B	(Republic)
23		Gage port (part of "21")	(Republic)
24	1	Control valve, #DV-10-T-S-3-H-A	(Dukes)
25	1	Cylinder, #R-1361, 1.500 dia x 4.000 stroke	(Prince Mfg. Co.)
26	1	Stack valve, #DVS 30-22-TS-TS-TS-2H	(Dukes)
27	2	Check valve, with .040 orifice, #LT-75-00N	(Gresen)
28	2	Cylinder, 4.000 dia x 49.000 stroke, Series 3 TH Style E, Block Vee piston	(Ortman-Miller)
29		Stack valve (part of "26")	(Dukes)
30	1	Dual relief valve, with make-up checks, #MCD-22-T2P-25A	(Snap-Tite)
31	1	Needle valve, #JF2N	(Waterman)
32	2	Cylinder, 1.500 bore x 9.000 stroke Series 2 TH, Style G	(Ortman-Miller)
33		Stack valve (part of "26")	(Dukes)
34	1	Control valve, DV-10-T-S-3-H-A	(Dukes)
35	2	Quick-disconnect coupler, VHC6-6M and VHN6-6M	(Snap-Tite)
36	1	Overcenter valve, #MHH10-74P-40A-6	(Snap-Tite)
37	1	Cylinder, Model J-86B, 3.250 bore x 11,000 stroke	(Miller)

FUNCTIONAL DESCRIPTION

Operating Circuit

The hydrostatic transmission (1) contains a variable volume pump which supplies hydraulic pressure and flow to the hydraulic motor (2) in a closed loop. The transmission has a charge pump in it that draws hydraulic oil from the reservoir (14) through the sump strainer (15) through gate valve (9) and through suction filter (7).

A one-way check valve (3) allows the hydraulic motor (2) to free-wheel so that the inertia of the Scrambler wanting to continue to turn allows the fluid to short-circuit through check valve (3) instead of returning to the hydrostatic transmission (1) and driving it. A needle valve (5) when opened allows free flow in both directions, so that the Scrambler center pole can be turned in either direction by hand. Relief valve (6) limits the rate of acceleration of the Scrambler by limiting the driving pressure coming from the hydrostatic transmission (1) to the hydraulic motor (2). Excess pressure is bled off into the return line of the closed loop. A gage port (4) on relief valve (6) allows the installation of a gage for checking line pressure in the driving circuit. A high pressure filter (11) filters the hydraulic fluid returning from the hydraulic motor (2) to the hydrostatic transmission (1). The case drain from the hydrostatic transmission (1) flows through return line filter (8) through gate valve (9) back to the reservoir (14). The electric motor (13) drives the hydrostatic transmission (1) through the coupling (12).

In Picture No. 117, the hydrostatic transmission (1) is in the background. On the left is the relief valve (6), and on the right is the high pressure filter (11).

In Picture No. 118, taken from the opposite side, the hydrostatic transmission is seen to the left, with its output shaft on the top side connected to a rubber disk coupling that connects to the control linkage on top of the deck. The high pressure filter (11) is in the middle, and on the extreme right is the relief valve(6).

The electric motor (13) and the coupling (12) which drive the hydrostatic transmission (1) can be seen in Picture No. 119. Note that the motor mount is supported on rubber vibration isolators to minimize the transfer of hydraulic noise from the hydrostatic transmission into the trailer frame. The large hose in the left foreground is the return line in the closed loop, and the upper end is attached to the high pressure filter (11).

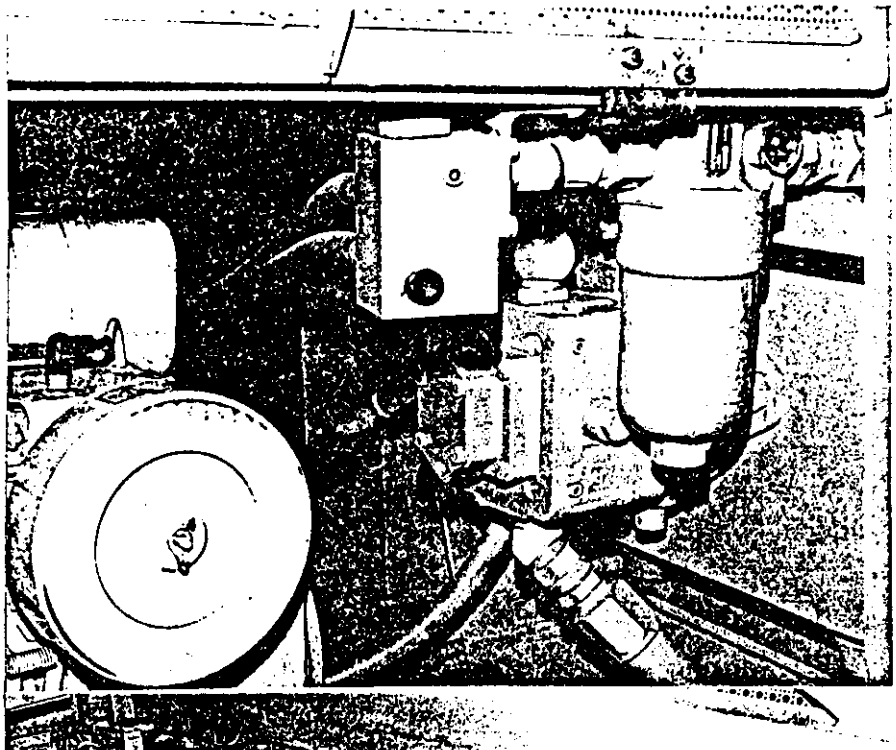
Picture No. 120 shows the mounting arrangement for the hydraulic motor (2) that turns the Scrambler. In the picture it has been pulled away from the torque arm to which it is normally attached.

In Picture No. 121 the manifold that is part of the driving circuit is shown. The two straight tubes extending up from the bottom of the picture are the pressure and return lines of the closed loop that extends between the hydrostatic transmission (1) and the hydraulic motor (2). The U-shaped tube connects the one-way check valve(3) between the two lines. The two black hoses go to the needle vavle (5) that is fastened to the left side of the trailer just forward of the stack valve that operates the landing gear. The needle valve (5) mount can be seen at the top left corner of Picture No. 122. The manifold in Picture No. 121 has two internal cavities; the lines on the left half are ported into one cavity, and those on the right half are in the other.

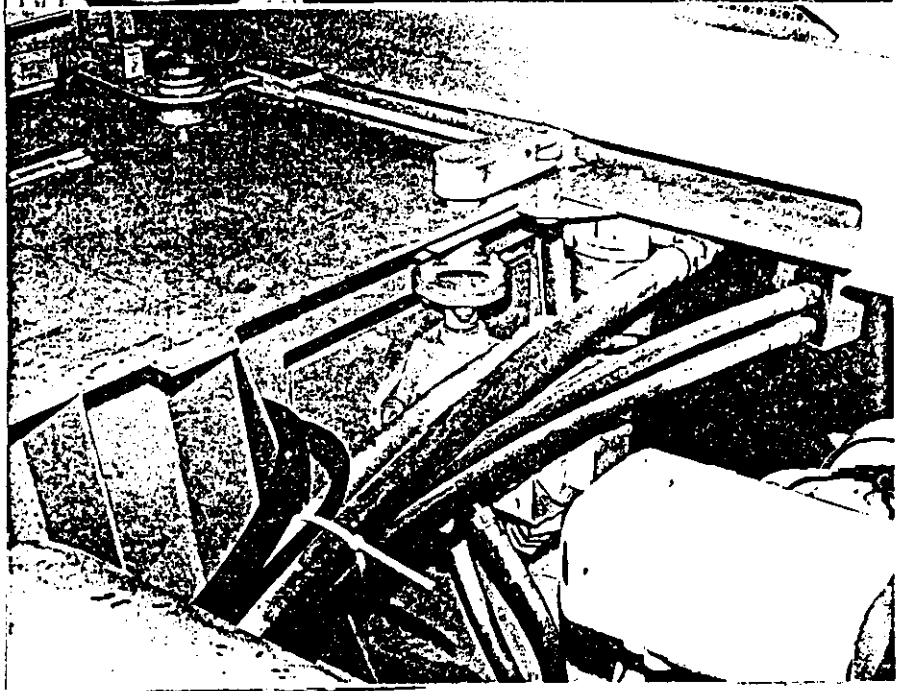
Picture No. 123 shows the breather-filler cap (10) on the top of the reservoir(14).

Set-up Circuit

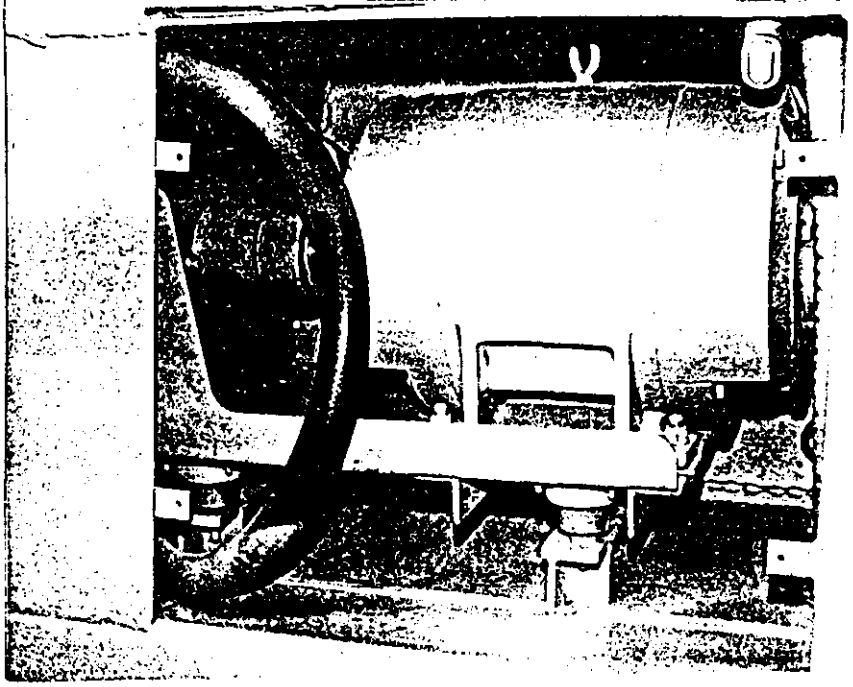
The engine (16), shown in Picture No. 3, powers the set-up circuit. It turns the hydraulic gear pump (18) through coupling (17) to provide hydraulic pressure and volume. The relief valve (21) bleeds off excess pressure back to the reservoir (14) through needle valve (22). The needle valve (22) is a backup in case the relief



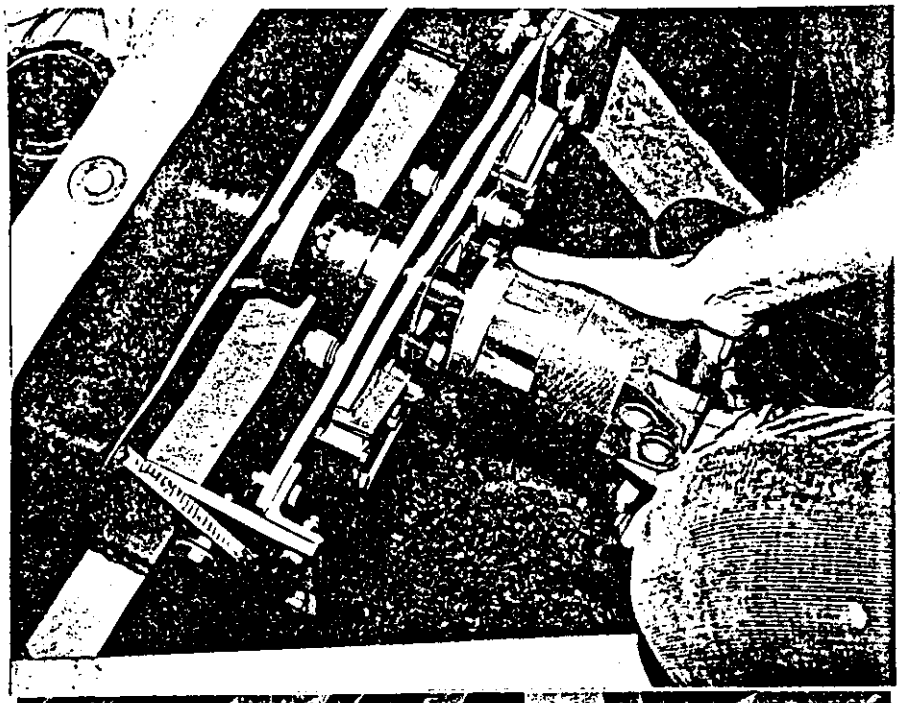
117



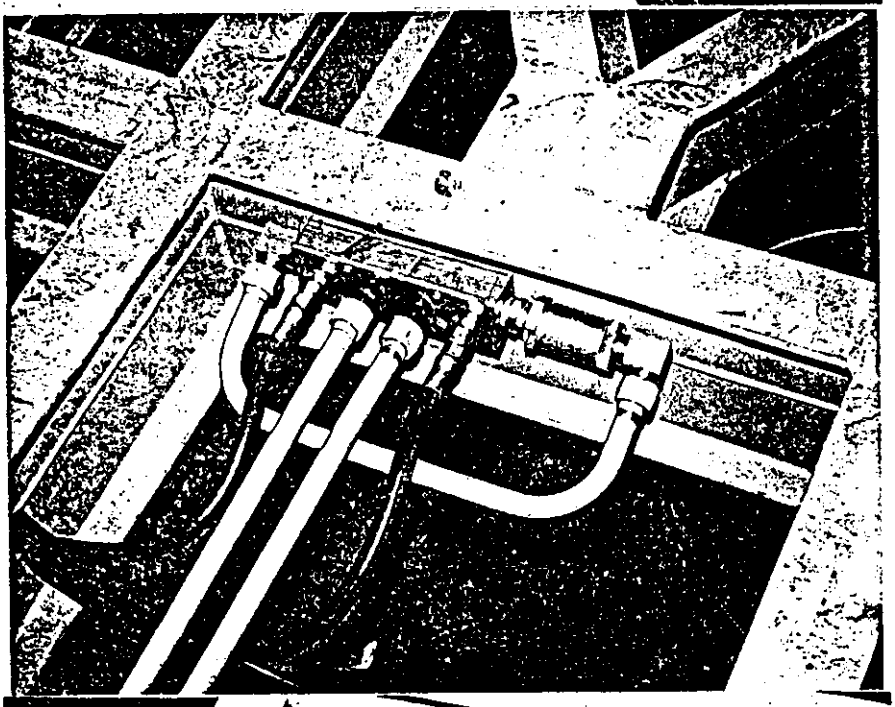
118



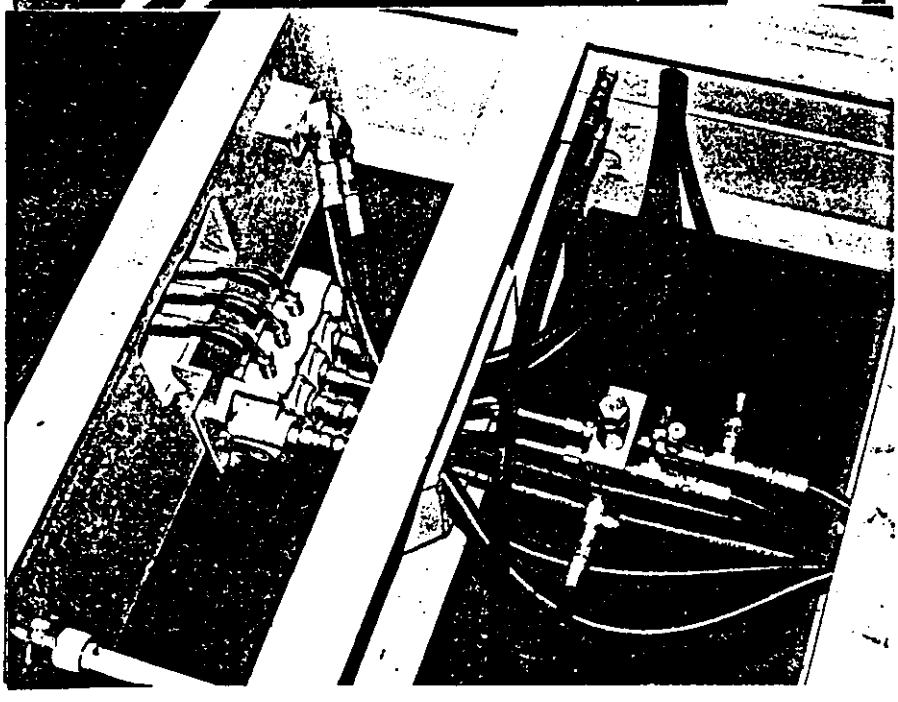
119



120



121



122

valve (21) should become blocked open by a particle of dirt. If this should happen, full line pressure could not be developed unless the needle valve (22) is closed. There is a gage port (23) on the side of the relief valve (21).

The gear pump (18) shares with the charge pump of the hydrostatic transmission (1) the use of the suction filter (7), gate valve (9) and strainer (15) in the reservoir (14).

A hand pump (19) can also be used to provide pressure and volume to the set-up circuit.

The position of the control knob on the selector valve (20) determines whether the engine-driven pump (18) or the hand pump (19) will be ported to the rest of the hydraulic circuit. When the selector knob is pulled out, the engine-driven pump is connected to the rest of the set-up circuit. When it is pushed in, the hand pump is in the set-up circuit.

From the selector valve (20) the hydraulic fluid goes to the control valve (24) which controls the three cylinders (25) which lift the three unit poles on the Scrambler. The three cylinders are on a common circuit and all three raise together but not necessarily at the same time.

The hydraulic fluid then flows from control valve (24) to stack valve (26) (29) (33) which controls the four cylinders that are involved in landing gear operation. The center handle of the stack valve (29) is raised, and this retracts the two cylinders (32). Each one of these cylinders (32) raises the trunnion which supports a main landing gear cylinder (28). On the cap end of each main landing gear cylinder (28) a check valve (27) has been installed. The check valve (27) has a .040 diameter orifice in it, so that there is free flow into the cap end of the cylinder, but oil can come out only at the rate that is allowed by the orifice. This limits the rate at which the trailer can be lowered. Without this check valve (27) the weight of the trailer forces the oil out of the cylinder faster than the small engine-driven pump (18) can supply the oil. With the speed of descent controlled, the gear pump (18) can keep up.

If the two outside handles of the stack valve (26) (29) (33) are raised before the trunnion has been raised up and locked in place, this can put a very high compression load on the trunnion lift cylinders (32) which can bend or break the cylinder rods of the trunnion cylinders (32). To minimize the possibility of this happening, the dual relief valve, with make-up checks (30), has been added. This valve (30) allows the cylinders (32) to be stroked either way by permitting the oil to flow from one end of the cylinder (32) to the other when the pressure exceeds the amount for which the dual relief valve has been set. This valve (30) can be set to operate at a different pressure in each direction. When oil flows from one end of the cylinder to the other the two volumes are not the same, because the cylinder rod occupies part of the volume on the rod end. This dual relief valve with make-up checks (30) is able to accommodate to this situation by bleeding excess oil back to the reservoir rather than to the other end of the cylinder.

The one-way check with adjustable orifice (31) controls the rate at which oil flows from the rod end of each cylinder (32), and it free-flows into the rod ends when the oil is flowing in that direction. This controls the rate at which the trunnion

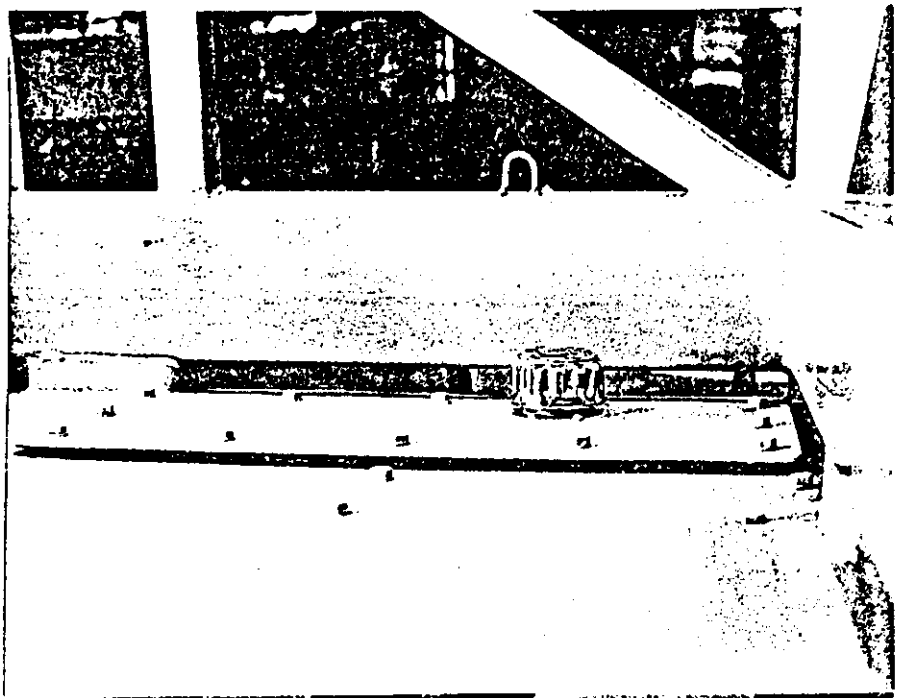
is lowered. The pressure adjustment on the dual relief valve (30) determines the rate at which the trunnion is raised.

From the stack valve (26) (29) (33) the oil flows to control valve (34) to the two quick-disconnects (35) to the overcenter valve (36) and to the cylinder (37) which raises the mast up into vertical position. The valve (34) is located on the extreme front end of the trailer. The quick-disconnects (35) are necessary in order to break the hose lines from the bed of the trailer up to the top of the center pole; otherwise, the Scrambler could not be turned because of the connected hoses. The overcenter valve (36) controls the rate at which the mast is raised and lowered, by pressure adjustments in each direction of flow.

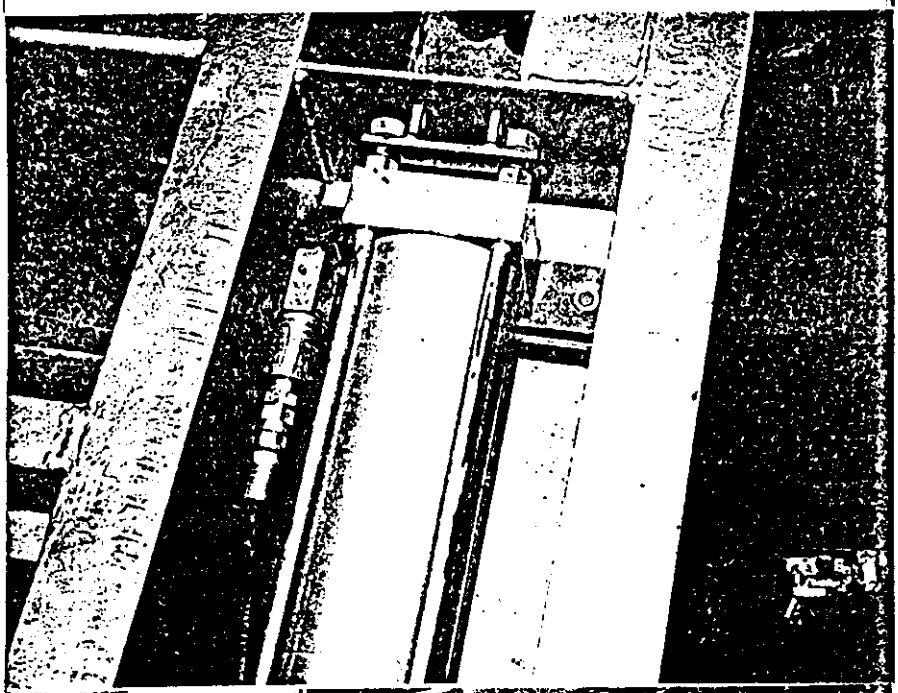
The oil leaving the control valve (34) goes back to the reservoir (14) through return line filter (8) and gate valve (9), all three of which are shared with the operating circuit. The gate valves (9) are located so that when it is necessary to change a filter element, the gate valve (9) is closed, shutting off the oil that would otherwise run out of the reservoir when the filter (8) or (7) housing was removed.

The coupling (17) is enclosed in a housing that can be seen on the left end of the engine (16) in Picture No. 6. The selector valve (20) is shown in Picture No. 9. In Picture No. 10, the suction filter (7) is shown to the left, with a gate valve (9) above and to the left of it. The return line filter (8) is partially shown on the right, with another gate valve (9) behind it. The two knobs sticking down from the bottom of the reservoir (14) and seen at the top right in Picture No. 10, are magnetic drain plugs. Push up on the plug, give it a counterclockwise quarter-turn and it can be withdrawn to check and clean off metal particles adhering to the magnet. When it is withdrawn, a conical, spring-loaded plug comes down from above to seal off the oil, so only a few drops are lost when the magnetic plugs are checked. The left rear corner of the reservoir (14) has a square tube sump that extends well below the bottom of the reservoir. There is a magnetic drain plug on the bottom of it, as well as a sight glass on the side. If any water condenses in the reservoir (14) it will go to the lowest point, and can be drawn off through this lowest magnetic drain plug. There are two sight glasses on the reservoir, and the upper one is shown in Picture No. 11.

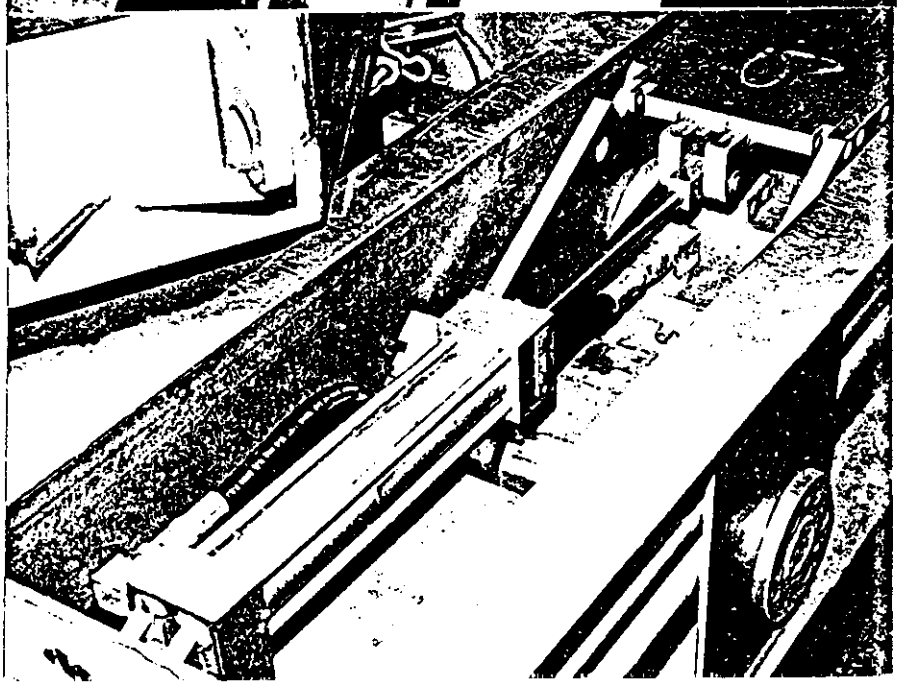
The vacuum gage on the suction filter (7) is shown in Picture No. 15, and the dirt indicator on the top of the return line filter (8) is shown in Picture No. 16. The handles for stack valve (26) (29) (33) are shown in Picture No. 20, as well as in Picture No. 122. Main landing gear cylinders (28) are shown extended in Picture Nos. 21, 22, and 23. Picture No. 124 shows the cylinder (28) lowered to its stored position in the floor of the trailer. The bracket with the two holes in it at the top of the cylinder provide a hinge point for the door that normally covers the cylinder when it is laid down, but which has been removed for the picture. The check valve with .040 diameter orifice (27) can be seen attached to the port on the cap end of the cylinder (28). Picture No. 125 shows a trunnion cylinder (32) fully extended; when fully extended, the main landing gear cylinder (28) is stored away as shown in the previous picture. Retracting the trunnion cylinder (32) raises the large cylinder (28) up into a near vertical position, so that it can be used most effectively in raising the front end of the trailer.



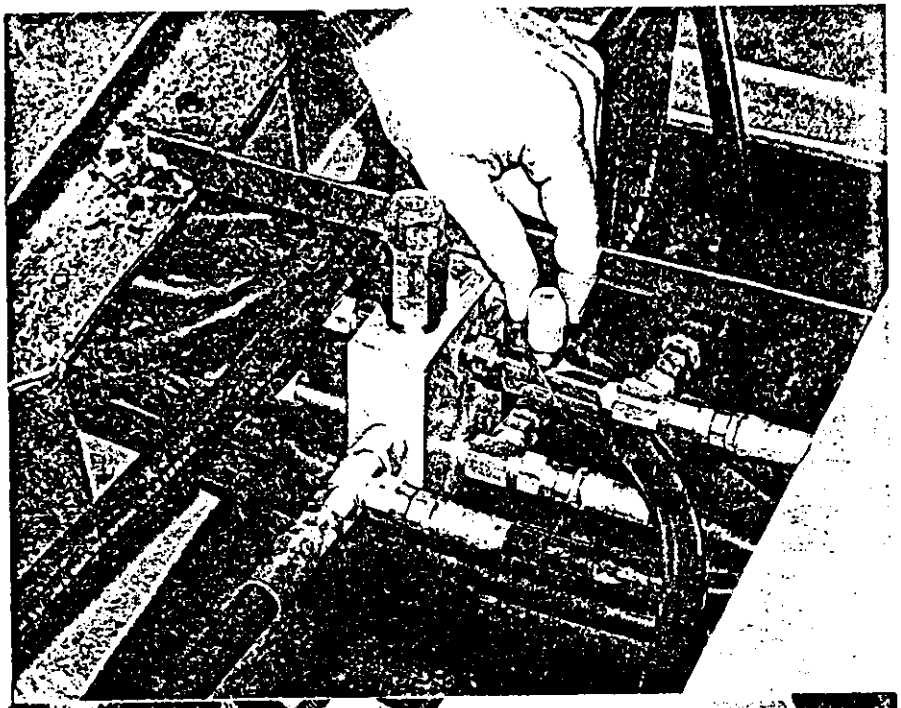
123



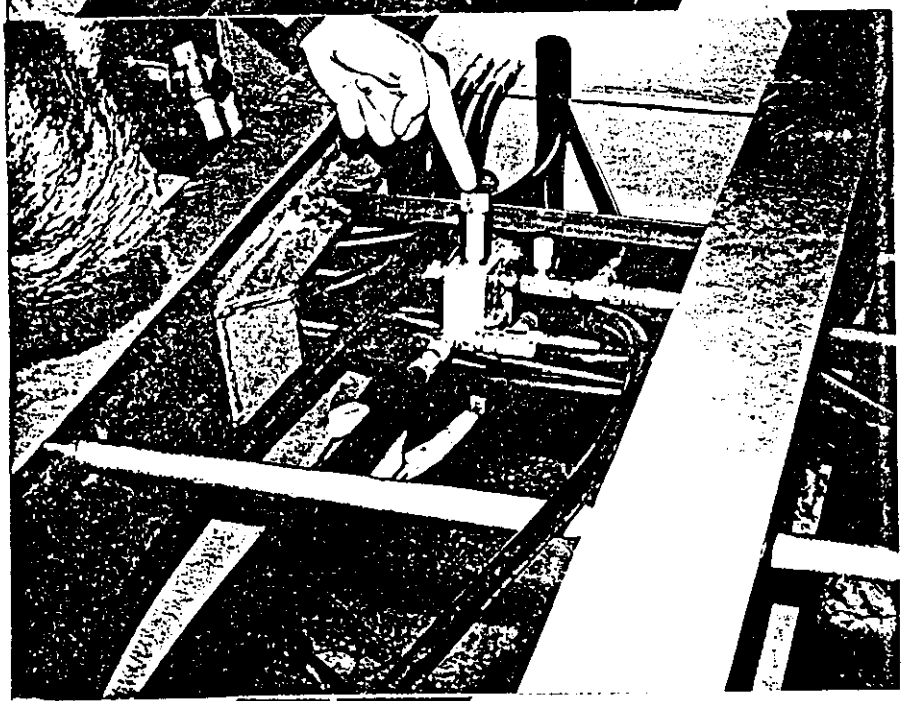
124



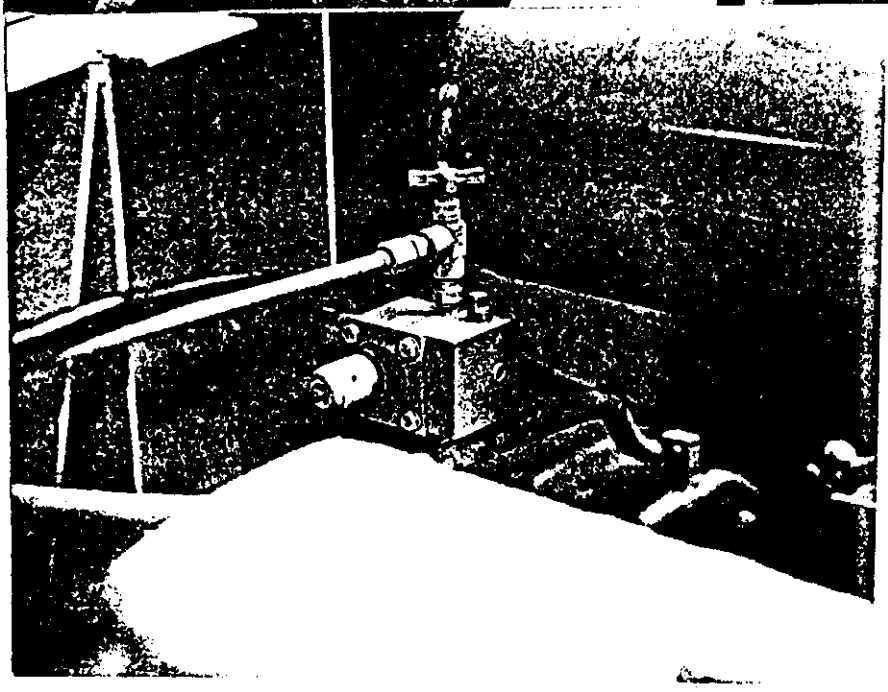
125



126



127



128

The hand pump (19) is shown in Picture No. 29. The quick-disconnects (35) are shown being attached in Picture No. 44, and the rectangular block to which they are attached is the overcenter valve (36), which is itself attached to the rod end of the mast cylinder (37). The clevis on the cylinder rod can be seen above the cylinder. In Picture No. 45 the cylinder rod is shown fully extended.

The control valve (24) which operates the unit pole lift cylinders (25) can be seen in Picture No. 65, and one of the cylinder rods can be seen in Picture No. 67.

Picture No. 126 shows the one-way check with adjustable orifice (31) being adjusted. Picture No. 127 shows the two pressure adjustments on the dual relief valve (30).

Picture No. 128 shows the pressure relief valve (21) and the needle valve (22).

Hydraulic Adjustments

Both the set-up and operating hydraulic circuits have relief valves that have been set at the factory. Normally they should not need to be re-adjusted. Each relief valve has a gage port for installing a pressure gage, but gages are not supplied because Eli Bridge Company's experience has been that gages installed in this way will not hold up in service (and several different kinds have been tried). Therefore, if at any time you feel you must check the pressure, install a gage but remove it when you are through. The set-up circuit relief valve is adjusted to provide a maximum pressure of 2,500 pounds per square inch, and the operating circuit is set at 2,100 pounds per square inch.

The overcenter valve (36) for the mast lift cylinder (37) is very sensitive to adjustment, and it has been carefully set at the factory, so no adjustment should be necessary. This valve controls the rate at which the mast rises and lowers, and if the overcenter valve adjustment is changed you could damage the structure or lighting equipment. If you feel that you have a problem with this valve adjustment, it is recommended that you contact the factory about it. Our experience has been that, once adjusted, it does not need re-adjustment.

The dual relief valve (30) is a very similar type of valve, which has been factory-adjusted and should not require re-adjustment.

Filtration

To have a smooth running hydraulic system and to get long life out of it requires clean oil. There is no substitute for clean oil. Only clean oil should be put in the reservoir (14) and it should be kept clean by continuous filtration. When the oil level becomes low or when it is changed, replace it with Mobil #423 only.

The sump strainer (15) is made of 100 mesh wire cloth, in which the openings are .005" in size. In case the screen gets clogged, there is a built-in by-pass on the end of the strainer so oil will not be blocked from the rest of the system. The strainer can be removed for cleaning by taking off the top tank cover (after carefully cleaning all around to prevent dirt from falling in the tank) and reaching down in the oil where the sump strainer (15) is located horizontally. It can be un-screwed by hand. This is a re-usable strainer that can be cleaned best by reverse flushing from the inside of the strainer.

The suction filter uses two disposable filter elements. When the filter elements become clogged the vacuum gage will show increasing suction. When the gage shows a vacuum of 5 inches of mercury, the filter elements should be changed. Between the tank and the filter there is a gate valve (9). Shut off this valve and it will prevent oil from escaping from the tank when you remove the filter housing. Remove the four bolts, slip down the housing, and this will expose the filter elements for replacement. The gate valve (9) will seal off the reservoir (14), but the oil in the filter and between the filter and the gate valve will spill, so have a container underneath to catch the spilled oil. Replace the filter elements and bolt the housing back in place. DO NOT FORGET TO RE-OPEN THE GATE VALVE ALL THE WAY. Failure to do so will result in damage to the filter and possibly the hydrostatic transmission or other hydraulic components. Do not let this filter get dirty or it will starve the transmission and very possibly ruin it. There is no by-pass in this filter, as specifically recommended by the manufacturer of the hydrostatic transmission, and it is essential that the filter be un-clogged at all times.

The return line filter (8) also can be isolated by a gate valve (9). A pointer on top of the filter housing is color coded to show you when the filter element should be changed. Replace the filter element in the same way as with the suction filter. Again, DO NOT FORGET TO RE-OPEN THE GATE VALVE, OR YOU WILL CAUSE EXPENSIVE DAMAGE.

The high pressure line filter has a color-coded indicator on the side to show when the filter element should be changed. The indicator, shown in Picture No. 129, is normally green, but when it is time to replace the filter element red will show in the openings. To replace the filter element, use a wrench on the square piece at the bottom to un-screw the housing. There is no gate valve on this filter, but it is located at the highest point in the hydraulic system and so a minimum of oil should be lost when you unscrew the housing.

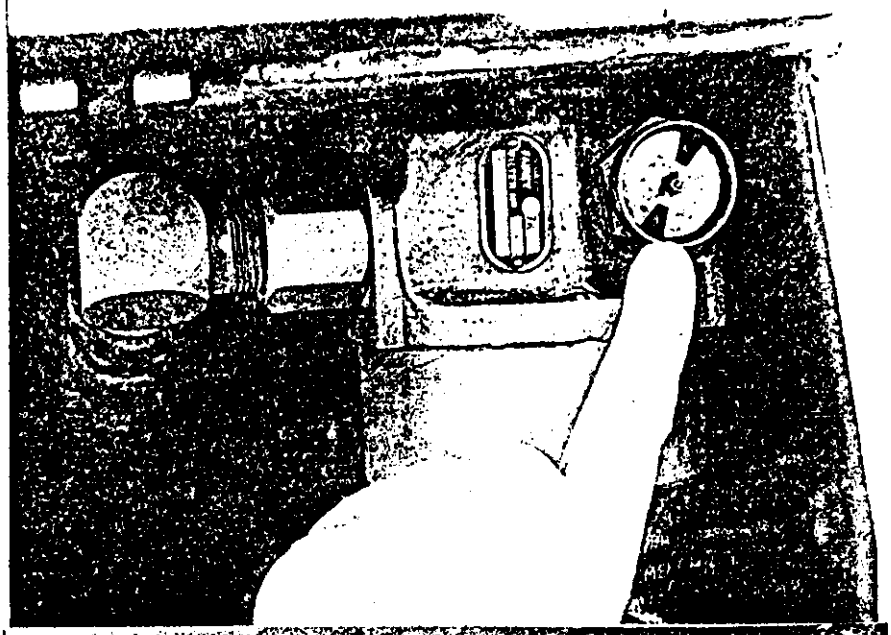
Care has been taken to provide you with good filtration to maintain a clean hydraulic system, but the system will be only as good as you allow it to be with the maintenance you give it.

V. MECHANICAL ADJUSTMENTS

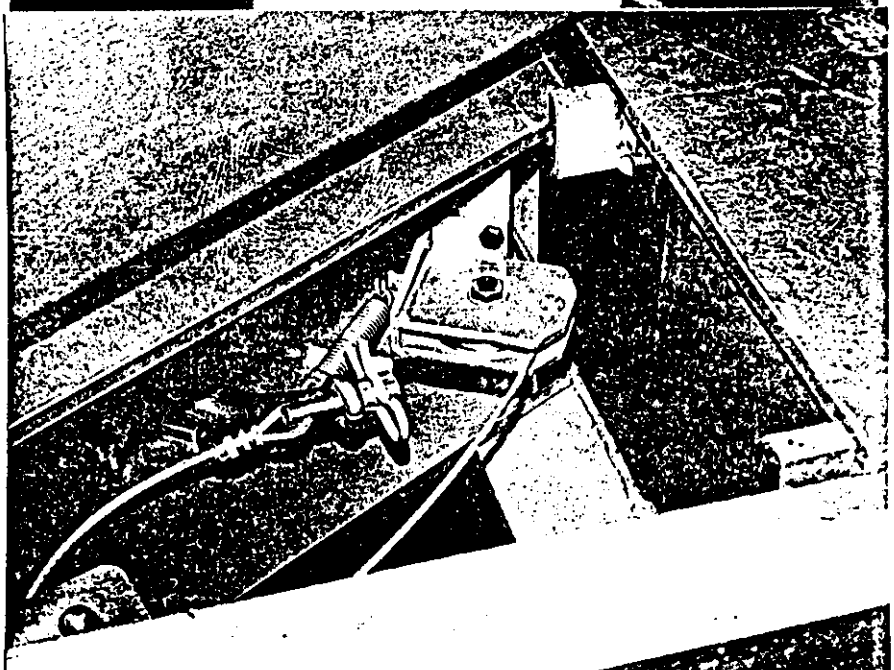
Brake Cable

Pulley brakets such as shown in Picture No. 130 are used in every location where the brake cable must change direction. Notice the bolt extending through the two side plates outside of where the cable passes through. This bolt keeps the cable between the plates and on the sheave. If you should ever have need to replace the brake cable, be sure that every pulley bracket has the retaining bolt installed with a self-locking nut on the other end, to be sure that it does not vibrate loose and fall out. Cotter pins may also be used. NEVER GET UNDER THE TRAILER TO REPLACE A BRAKE CABLE UNLESS THE KINGPIN IS SUPPORTED AND LOCKED ON A TRACTOR.

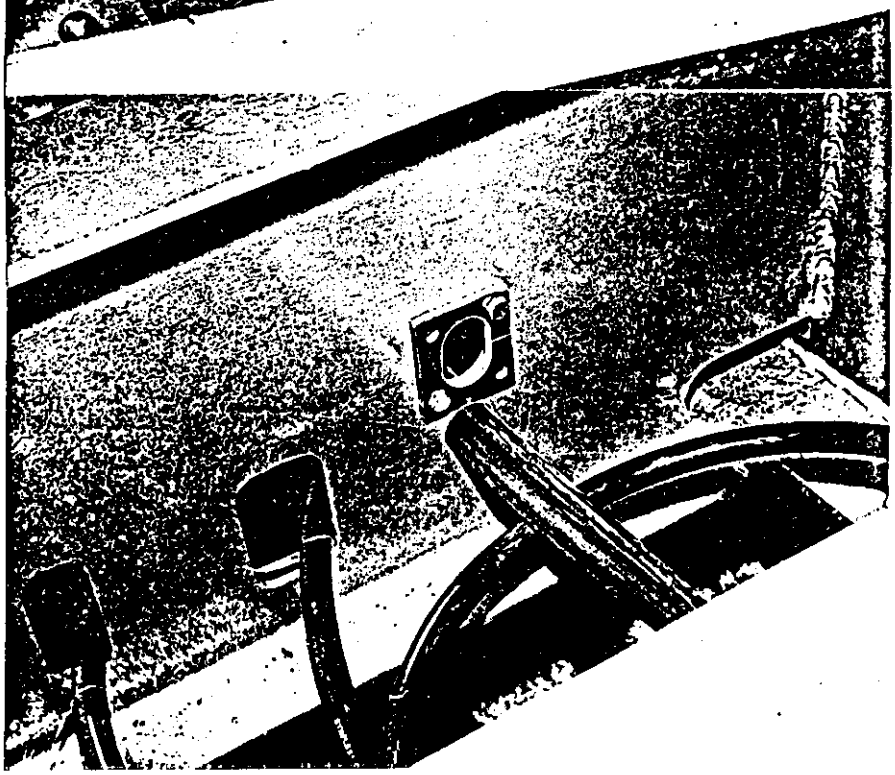
Where the brake cable is straight, but must pass through steel beams, a piece of phenolic is cut slightly smaller than the hole in the steel so that if there is any rubbing of the brake cable the rubbing will be against the phenolic rather than against the steel hole edges. See Picture No. 131. If the phenolic wears so that it should be replaced, notice that it is bolted in place, and one side is cut through. Un-bolt the piece and spring it over the brake cable to get it off.



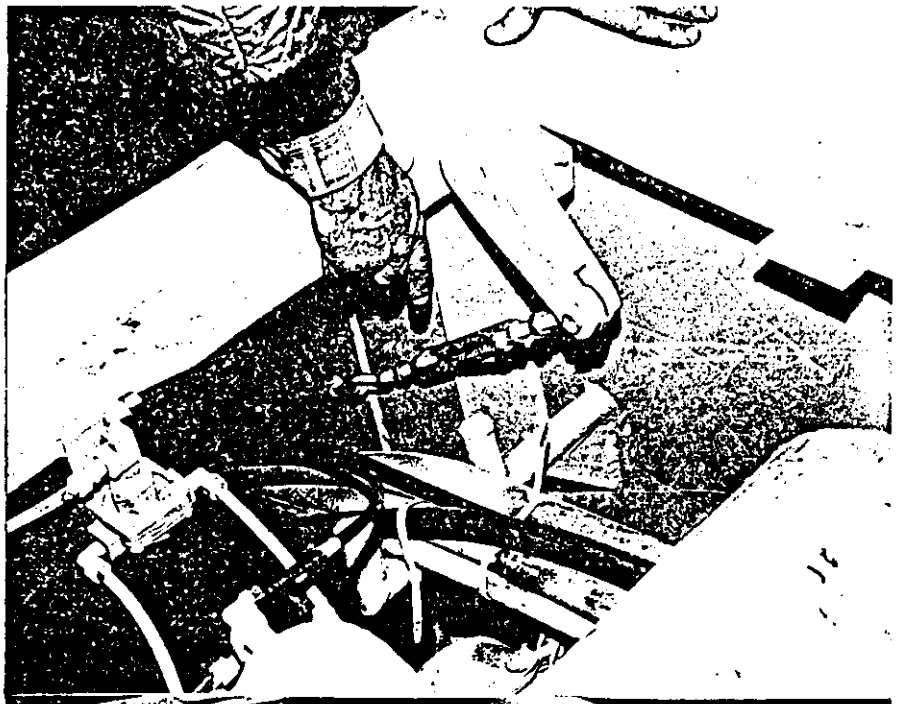
129



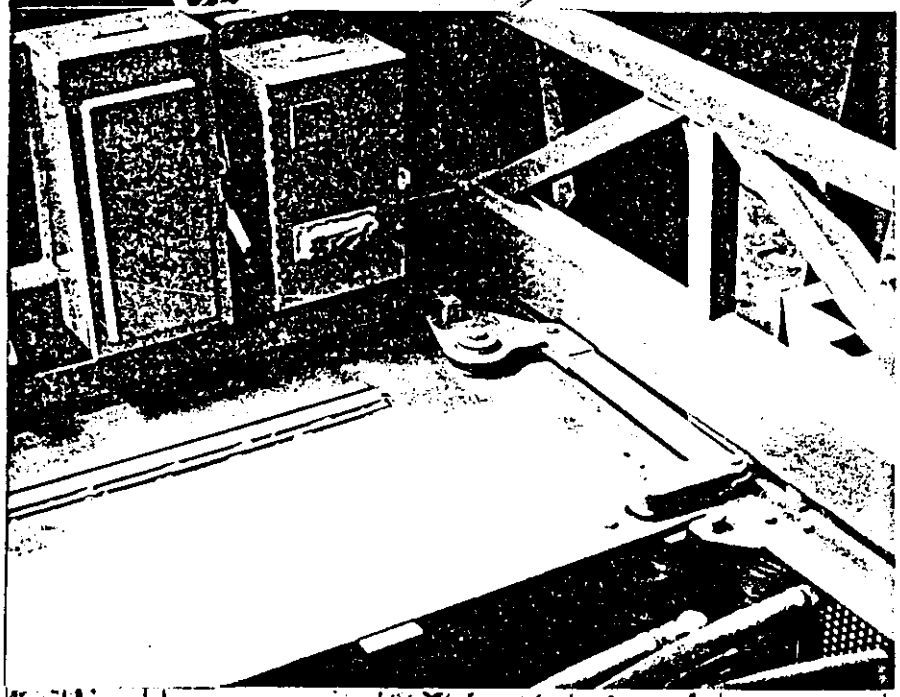
130



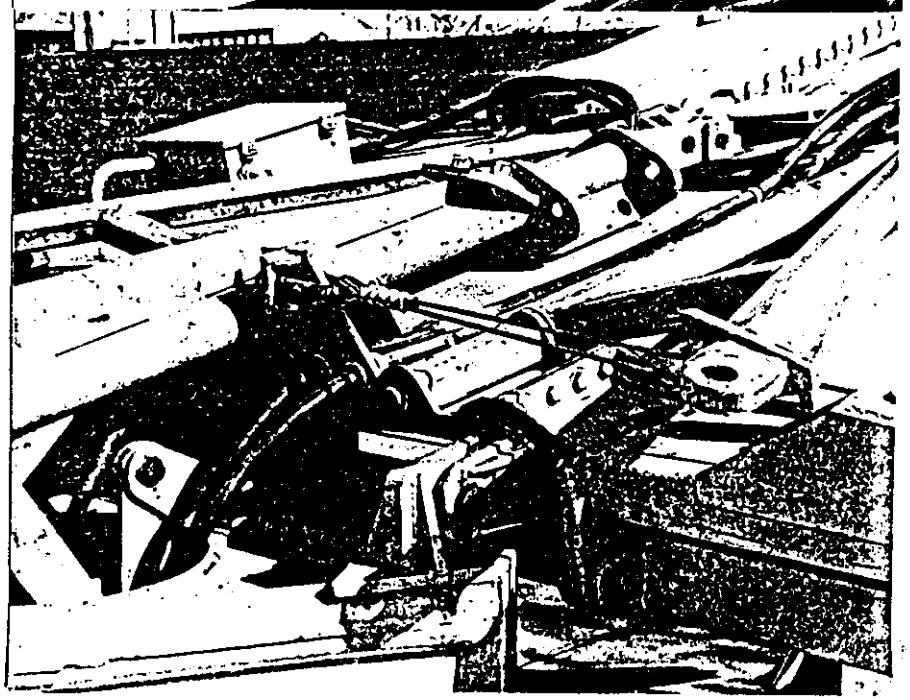
131



132



133



134

Picture No. 132 shows the turnbuckle that adjust the tension of the brake cable. It is located on the right side under the rear steps. To get to it, take off the removable deck on the rear end. Notice that there is a jam nut on each end of the turnbuckle. After you have made the proper adjustment, be sure to tighten each jam nut to keep both ends from unwinding.

Transmission Linkage

The linkages connecting the brake ratchet handle to the hydrostatic transmission control shaft are shown in Picture No. 133. To adjust the linkage, in the far corner of the picture, springs are on either side of the swivel which is bolted to the bell crank pivoting on the floor. Washers added or subtracted from each side of the swivel will provide some adjustment, but any adjustment here must be coordinated with the brake adjustment. Both should be set so that when the brake is fully set, the hydrostatic transmission is in neutral. The way to tell this is: when it is in neutral it makes the least amount of noise.

Anti-Sag Cables

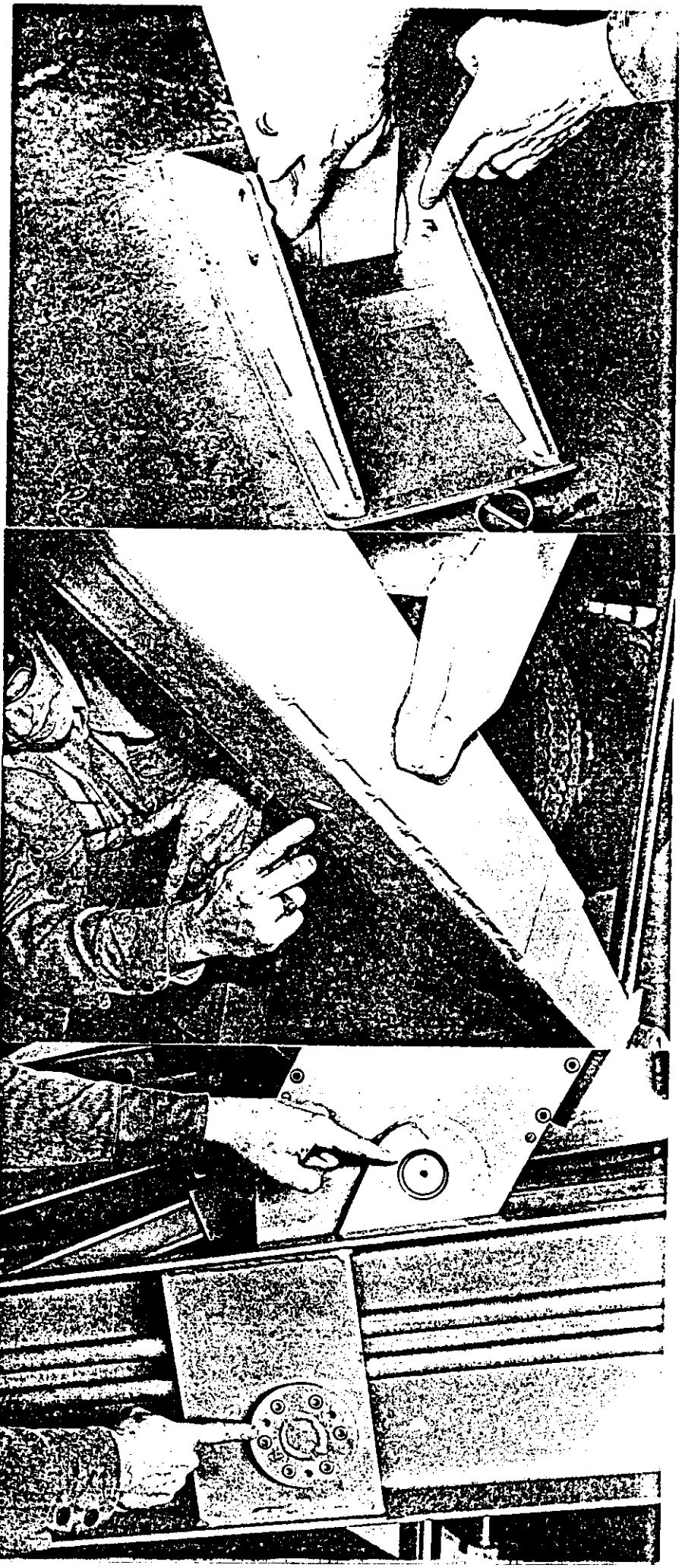
When the top of the center pole is laid over, ready to go down the highway, the two outer "barn doors" tend to sag. To counteract this, bracing cables have been fitted to the top sides of the barn doors, as shown in Picture No. 134. These cables can be loosened or tightened by the two self-locking nuts that are on the U-bolt at the left end of the cable in the picture. Caution: overtightening these cables should be avoided. If they are too tight, you will have difficulty swinging the sweeps together on the rear end of the trailer. The cables should be adjusted so that while the mast is still raised vertically, the sweeps can be pushed easily into storing position without having to really stretch these cables. As the ride is used, these cables are likely to get somewhat looser, so you will probably have to tighten them up a little from time to time.

V. LUBRICATION

The standard Scrambler manual covers the greasing points on the ride itself. In addition, there are some spots on the trailer that should be regularly lubricated.

In Picture No. 135, there are two grease zerks on each landing gear foot.

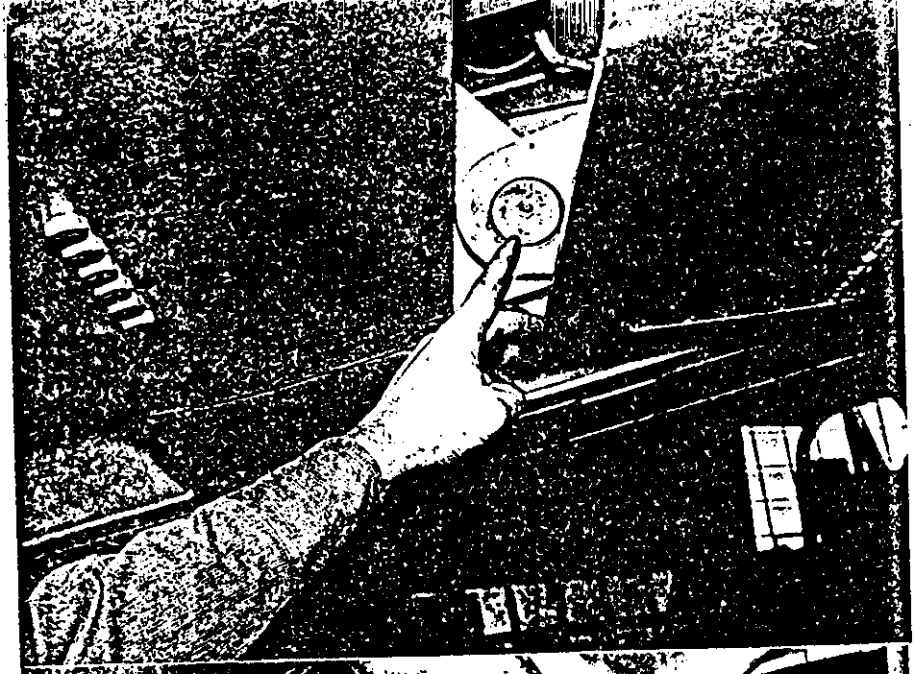
Half-way up the landing gear strut there is an access hole, being pointed to in Picture No. 136, for getting to the grease zerk that lubricates the pivot pin for the secondary link which extends up and to the right in the picture. The upper pivot of that secondary link is lubricated from a hole in the top deck of the trailer, but the landing gear must be fully retracted in order to reach that grease zerk. On the upper end of the landing gear strut, extending out of the upper left hand corner of the picture, there are two rollers running in tracks. Grease fittings can be found by looking up inside the trailer, either when the landing gear is extended or when it is retracted. DO NOT GET UNDER THE TRAILER UNLESS THE FRONT OF THE TRAILER IS SUPPORTED AND LOCKED TO THE FIFTH WHEEL OF THE TRACTOR.



135

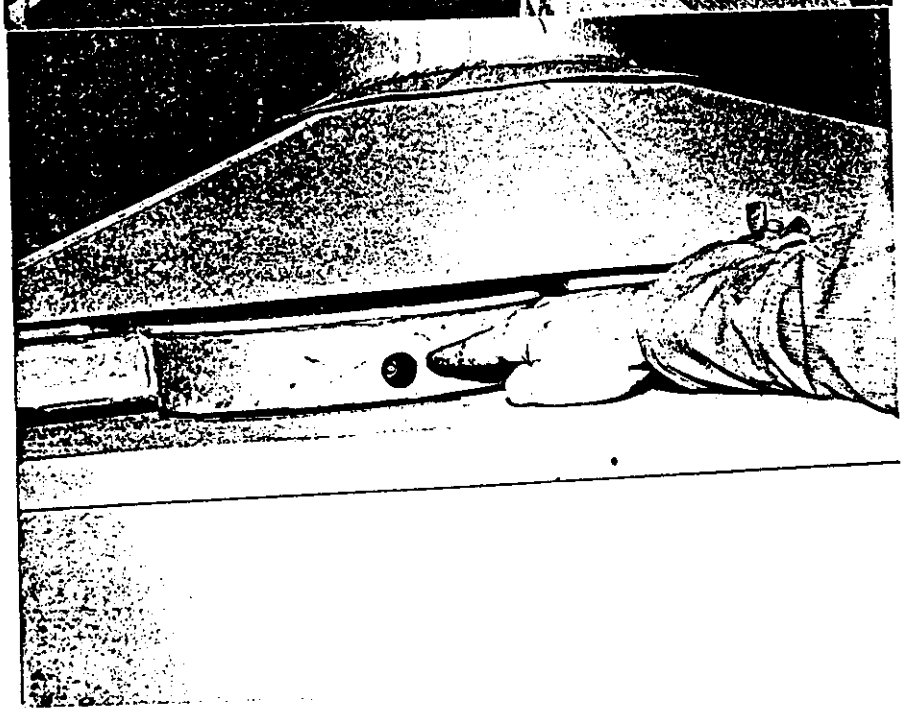
136

137

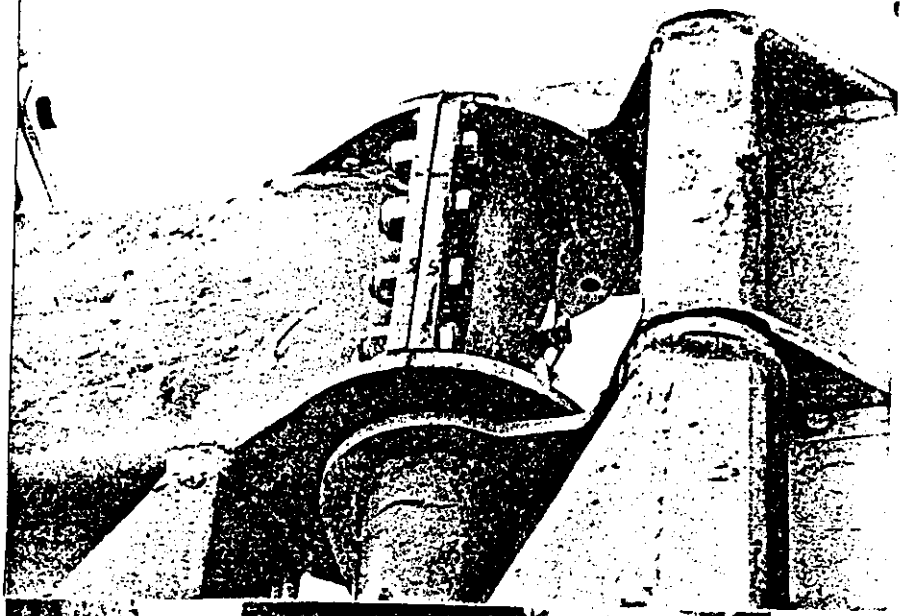


138

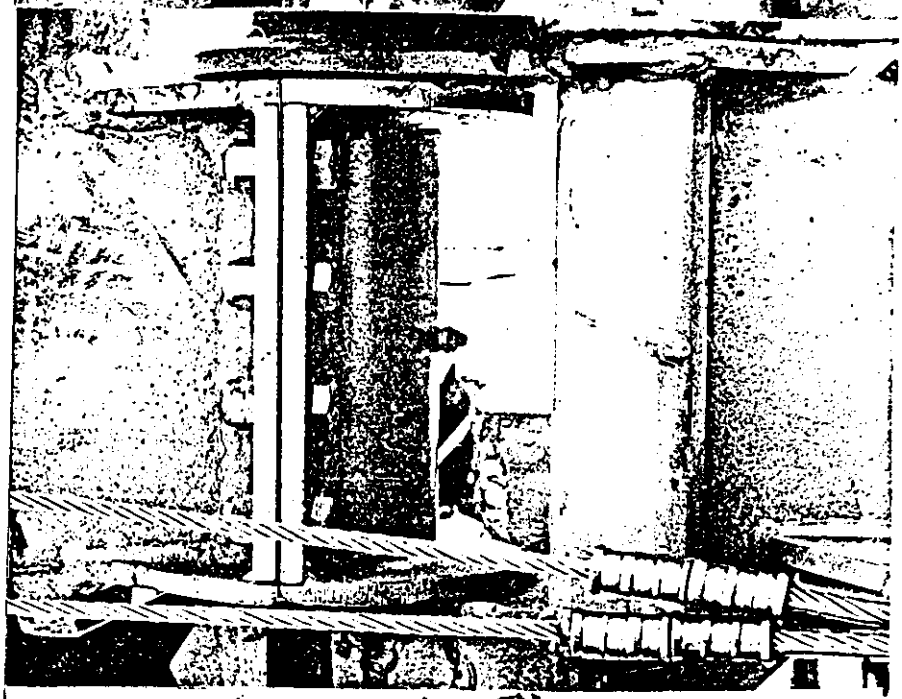
139



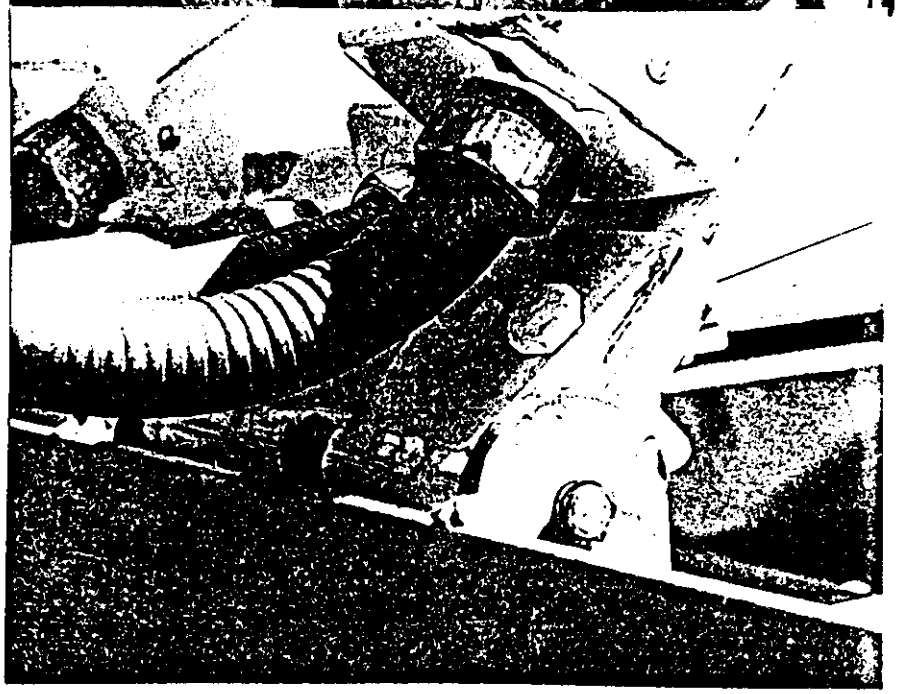
140



141



142



143

Picture No. 137 shows two pivot bearings: the lower one is the pivot on which the trunnion frame rotates, and the upper one is the pivot for the large landing gear cylinder. Both of these bearings are Teflon-lined and do not require lubrication. In fact, they should not be greased. Certain kinds of grease will cause the Teflon liner to come loose from the sleeve to which it is fastened, so be sure not to lubricate these two locations on each side of each landing gear. Leave them dry; this is the way they were meant to be used.

The kingpin plate on the front of the trailer pivots on the rear end, as shown in Picture No. 138. There is a grease fitting on the inner end of each pivot pin, and each one can be reached from underneath the trailer when it is on the fifth wheel of the tractor. DO NOT GET UNDER THE TRAILER UNLESS THE TRAILER IS SUPPORTED AND LOCKED TO THE FIFTH WHEEL OF THE TRACTOR.

The front end of the kingpin plate pivots on a double linkage system, as shown in Picture No. 139. All four of these grease fittings can be reached from the front of the trailer when it is raised in the air so that the kingpin plate is in its lowered position as shown.

Picture No. 140 shows the access hole and grease zerk which lubricates the vertical pivoting shaft on which the torsion bar rotates. This must be regularly lubricated in order for it to continue to rotate smoothly.

Picture Nos. 141 and 142 show the grease fittings which lubricate the barn door pivots and the stiff leg pivots. Loads are heavy in all eight of the pivots, so they should be regularly lubricated. Without regular lubrication, the interior surfaces will gall and not turn properly.

Picture No. 143 shows the grease zerk that is on the end of each fan light where it pivots next to the center pole. To keep these pivots working smoothly, grease all 12 regularly.

Many of the pin connections on the Scrambler remain connected at all times. They should be oiled regularly to prevent rusting in the joints. When storing the ride over the winter it would be advisable to apply grease to each joint to protect it from weather.

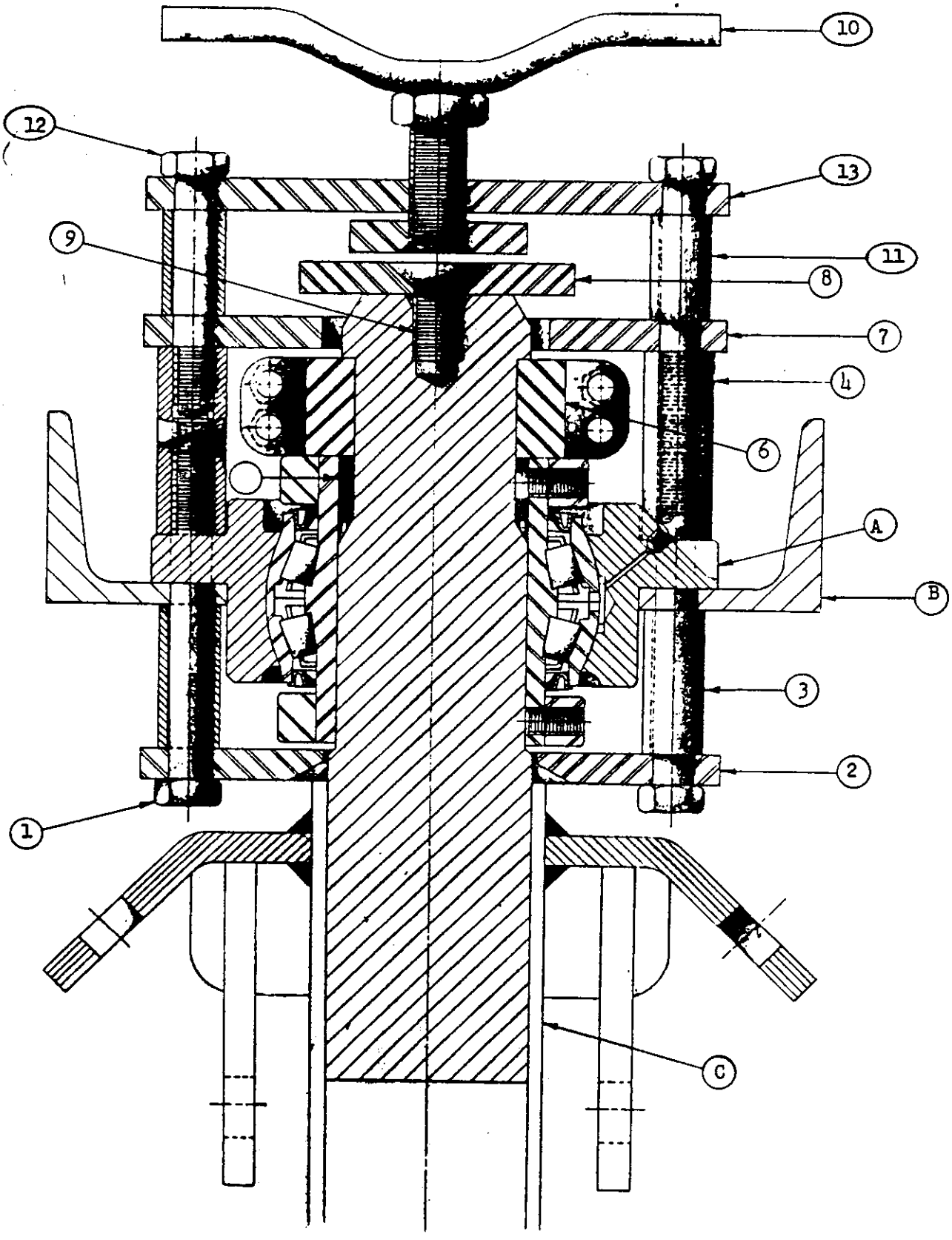
If you find that any of the joints are stiff, chances are that there has not been enough lubrication.

TRAILER MOUNTED SCRAMBLER

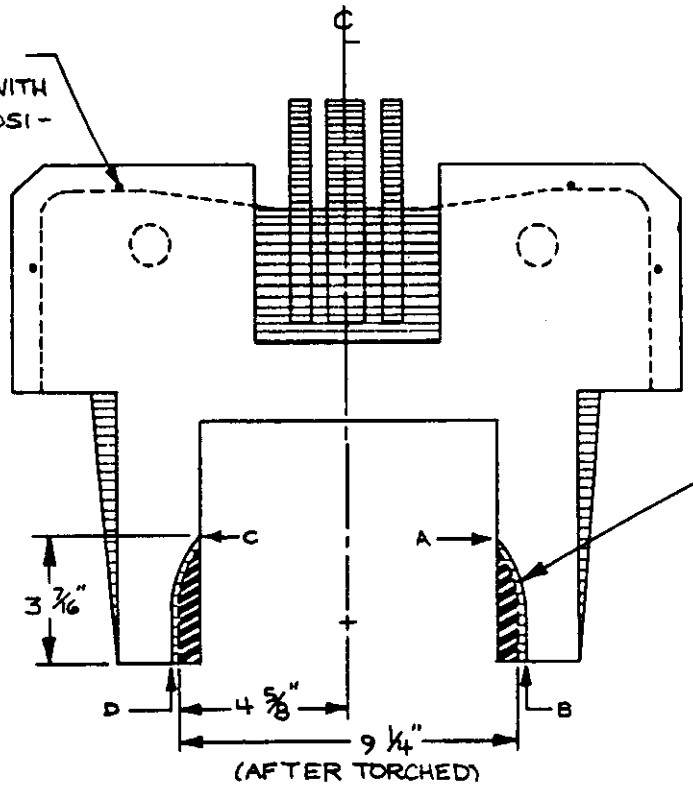
TOP SWEEP BEARING CHANGE . . .

ENCLOSED - SWEEP MODIFICATION INSTRUCTIONS

- RFP 215-C BEARING MOUNTING INSTRUCTIONS


10
12
13
9
11
8
7
4
6
A
B
3
2
1
C

(1) LAY TORCH TEMPLATE OVER CLEVIS PLATE WITH FOUR DOWEL PINS POSITIONED AS SHOWN.



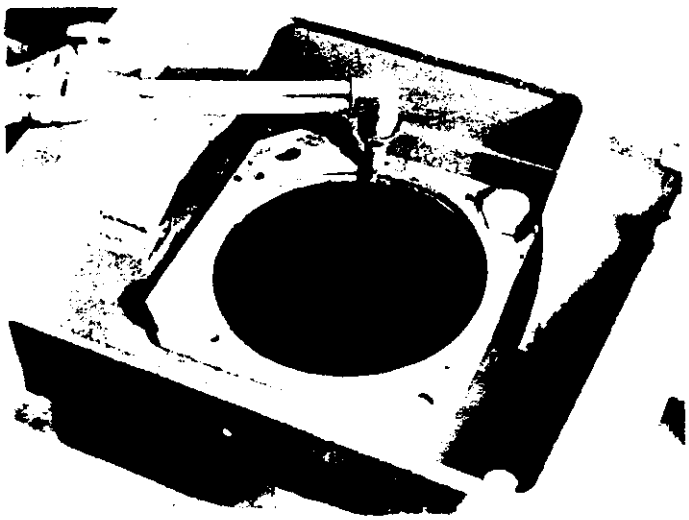
(2) REMOVE OLD BEARING!
* IF BEARING IS IN GOOD CONDITION AND WITHIN THE 3,000 HR./4 YEAR MAXIMUM USAGE RECOMMENDATIONS - IT CAN BE USED FOR A REPLACEMENT ON THE BOTTOM SWEEPS.

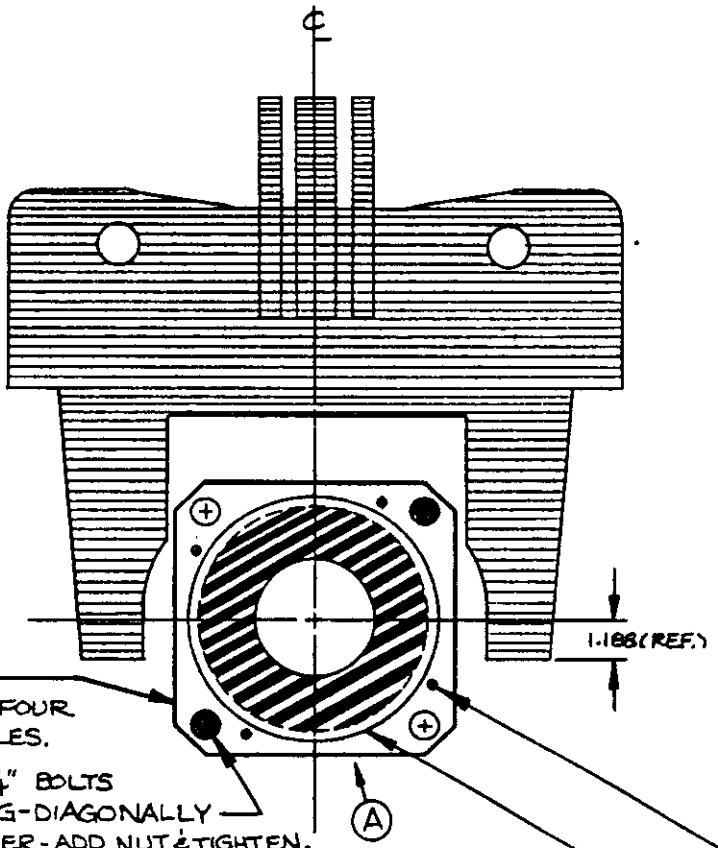
(3) TORCH CUT USING A 3/8" TIP
- GUIDE TIP ALONG THIS EDGE FROM POINT A TO B.
- BE CAREFUL NOT TO CUT THROUGH THE BEARING MOUNT CHANNEL BENEATH THE CLEVIS PLATE WHEN YOU GET CLOSE TO THE WELD AT POINT B
- ANY WELD LEFT IN THE CUT AWAY SECTION SHOULD BE GROUND FLAT TO ACCOMODATE THE NEW BEARING.
- FOLLOW THE ABOVE PROCEDURE BETWEEN POINTS C AND D.

LEGEND-
- CLEVIS PLATE
- CLEVIS - TORCH TEMPLATE
- CUT - AWAY SECTION

NOTE:
IF INSTRUCTIONS (ABOVE RIGHT) ARE FOLLOWED YOU SHOULD END UP WITH THE MINIMUM REQUIRED DIMENSIONS LISTED ON ABOVE DRAWING!

MODIFICATION OF T.M.S. TOP SWEEP CLEVIS PLATES ~
FOR BEARING CHANGE OVER - FROM SF-47 TO THE NEW RFP-215-C





① — PLACE TEMPLATE IN POSITION OVER THE FOUR BEARING MOUNTING HOLES.

— INSERT TWO OF THE 3/4" BOLTS FROM THE OLD BEARING - DIAGONALLY ACROSS FROM EACH OTHER - ADD NUT & TIGHTEN.

LEGEND -

- CLEVIS PLATE (MODIFIED)
- 12-INCH CHANNEL - TORCH TEMPLATE
- CUT - AWAY SECTION

② — DRILL (4) 1/4" PILOT HOLES.

— TORCH CUT USING A 3/8" TIP!

— GUIDE TIP CAREFULLY ABOU THIS EDGE COMPLETELY CIRCLING THE CIRCUMFRENC (SEE NOTE BELOW LEFT)

③

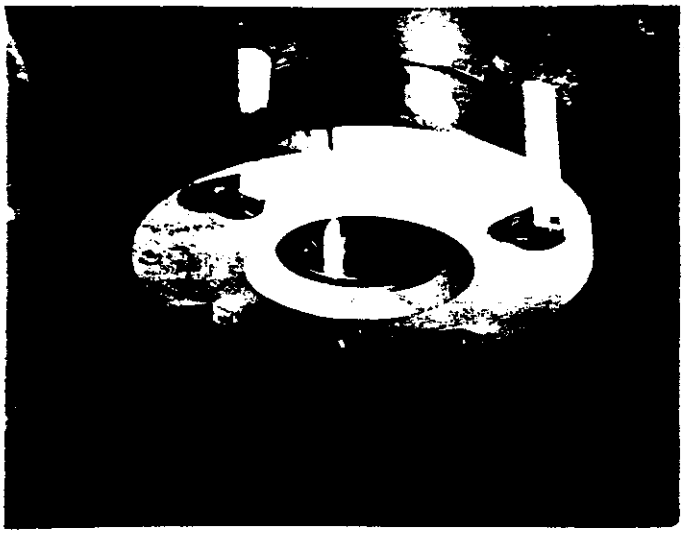
— REMOVE TEMPLATE

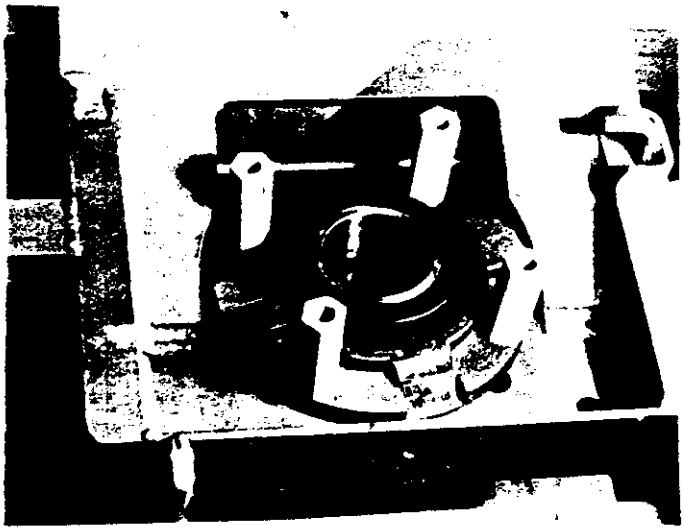
— DRILL THE (4) 1/4" PILOT HOLES OUT TO 21/32" DIA.

— PLACE RPF-215-C BEARING OVER THESE FOUR HOLES - LOCATING THE BEARING GREASE ZERK TOWARD POINT (A) ON ABOVE DRAWING.

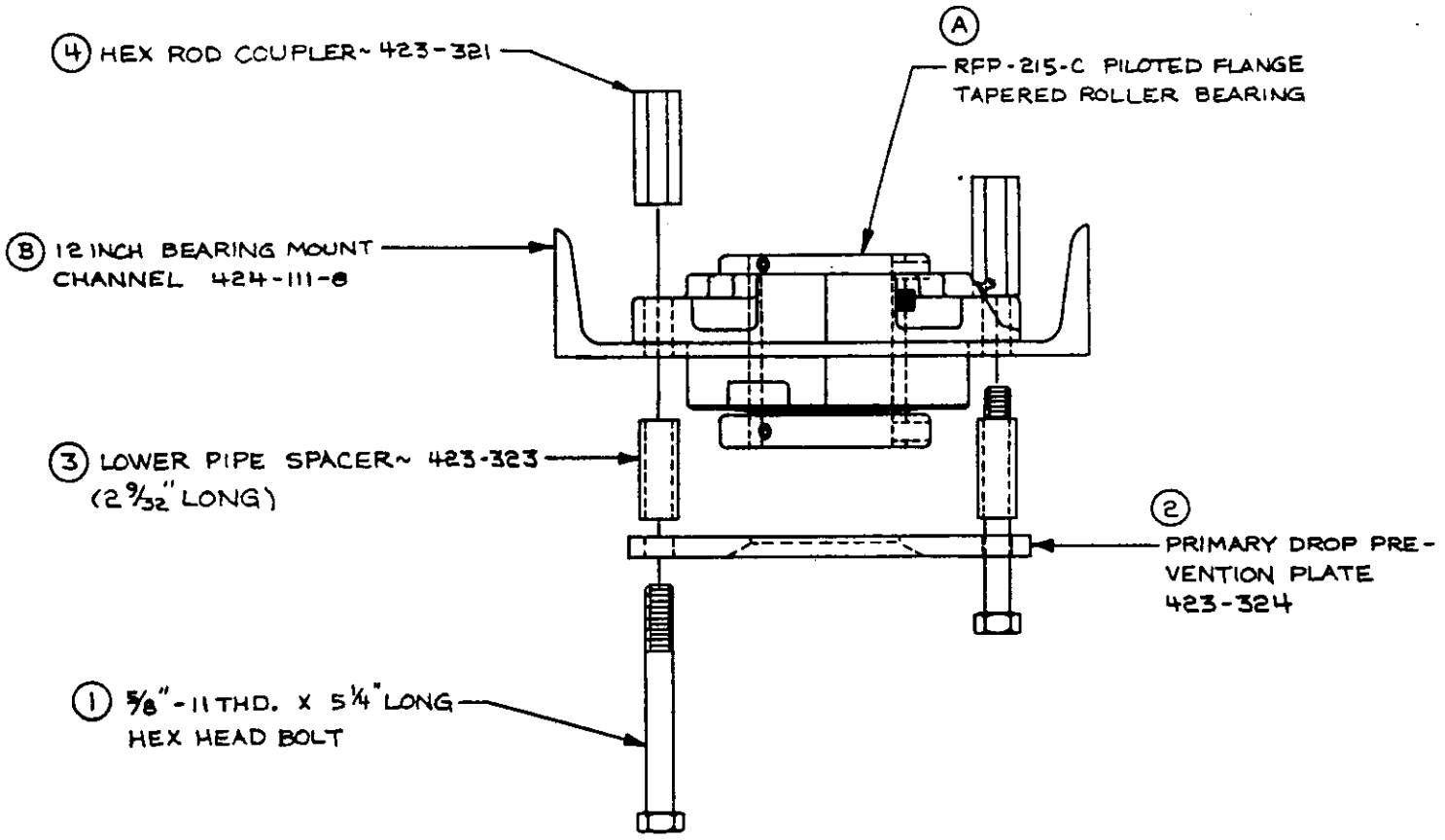
— NOTE: YOU SHOULD END UP WITH 6 3/8" DIA. ON THE CENTER HOLE AFTER TORCHING.

T.M.S TOP SWEEP - 12 IN. BEARING MOUNT CHANNEL MODIFICATION ~
FOR BEARING CHANGE OVER - FROM SF-47 TO THE NEW RFP-215-C





TOP



— PLACE (4) NO. (1) BOLTS UP THROUGH BOLT HOLES IN PLATE NO. (2) MAKING SURE THE BEVELED EDGE ON THE LARGE CENTER HOLE OF PLATE IS FACING DOWN.

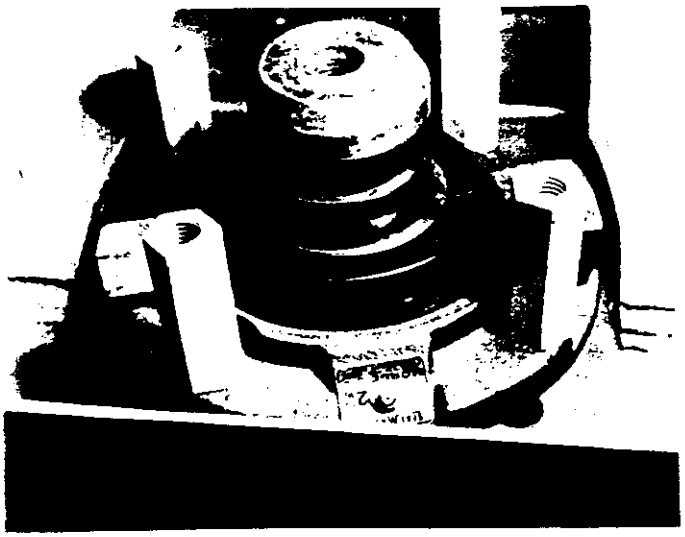
— PLACE (4) NO. (3) PIPE SPACERS OVER NO. (1) BOLTS ON TOP OF PLATE NO. (2).

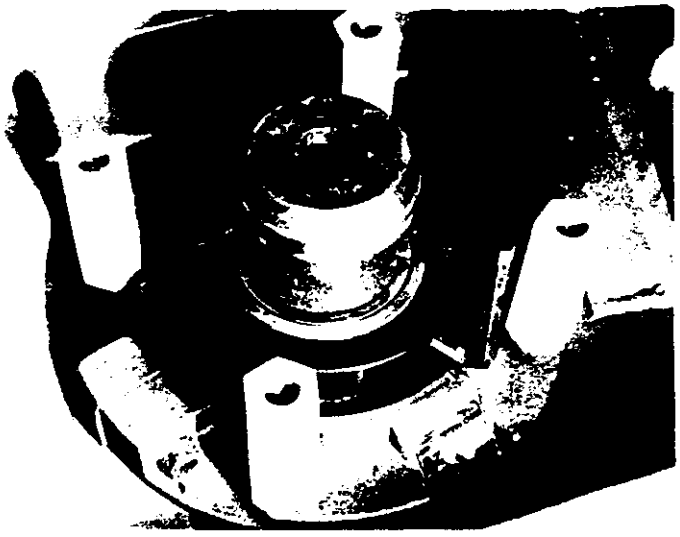
— RAISE ABOVE UNIT UP ON BOTTOM SIDE OF CHANNEL NO. (B), PUSHING BOLTS NO. (1) UP THROUGH BOTH CHANNEL NO. (B) (2 1/32" HOLES) AND BEARING NO. (A) MOUNTING HOLES.

— THREAD (4) NO. (4) HEX COUPLERS ONTO THE (4) NO. (1) BOLTS ON TOP SIDE OF BEARING NO. (A) AND HAND TIGHTEN.

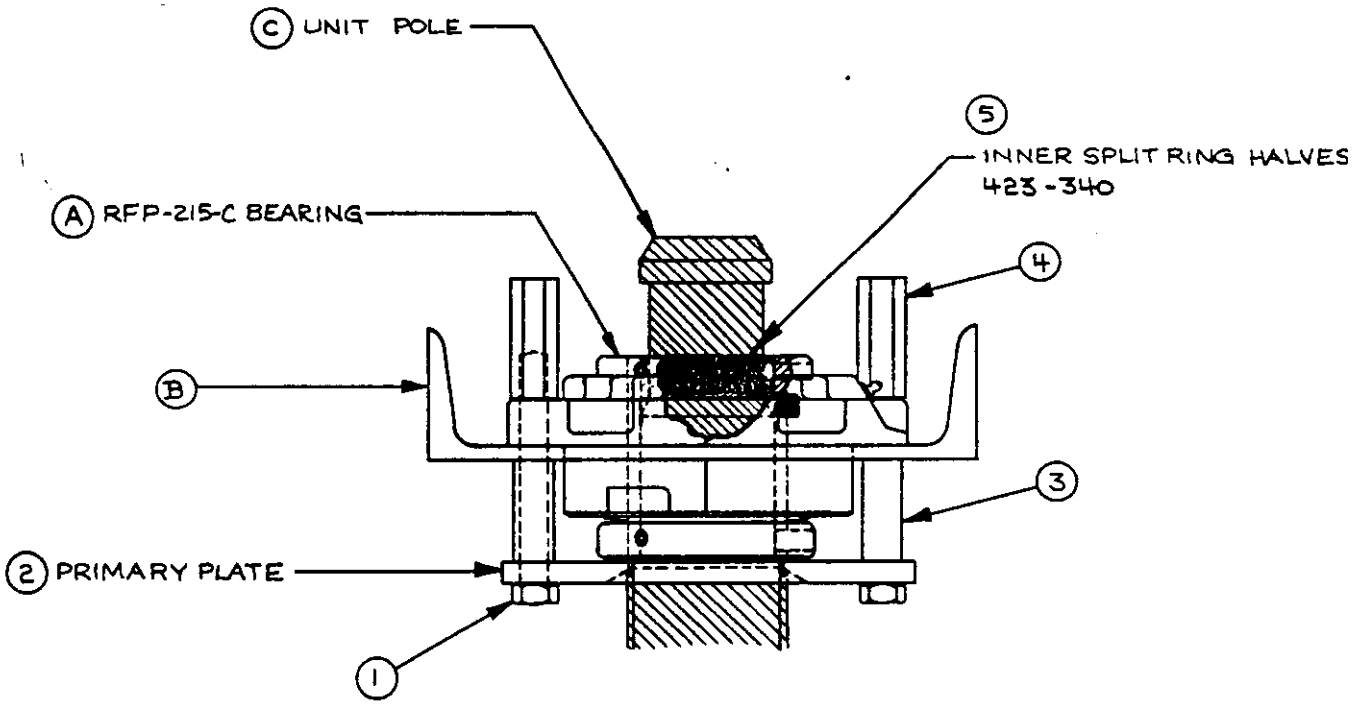
TMS - TOP SWEEP-BEARING / MOUNTING MODIFICATION ~
INSTRUCTIONS FOR ASSEMBLY

NOTE: TORCHING OF CHANNEL NO. (B) AND CLEVIS PLATE AS DESCRIBED ON PAGES 1 AND 2 MUST BE COMPLETED PRIOR TO ABOVE ASSEMBLY





TOP



— RAISE UNIT POLE UP THROUGH PLATE ②, BEARING Ⓐ AND HOLD IN POSITION.

— PLACE INNER SPLIT RING ⑤ (HALF WITH TWO HOLES IN IT) DOWN INTO TOP OF BEARING IN THE SPACE BETWEEN THE NO. Ⓒ UNIT POLE AND THE INNER RACE OF THE BEARING - THE OUTER EDGE CLOSEST TO THE HOLES FACES UP!
LINE UP THE HOLES IN THE SPLIT RING HALF WITH THE TWO SET SCREWS IN THE TOP FLANGE OF THE BEARING (SLIGHTLY RAISING OR LOWERING OF UNIT POLE MIGHT BE NEEDED FOR PROPER VERTICAL ALIGNMENT)

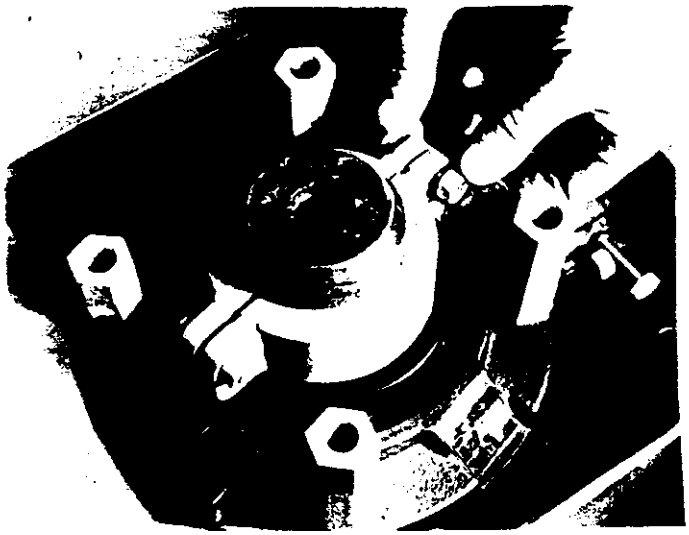
— ONCE IN LINE TURN TOP TWO SET SCREWS IN ENOUGH TO HOLD THIS RING HALF IN PLACE

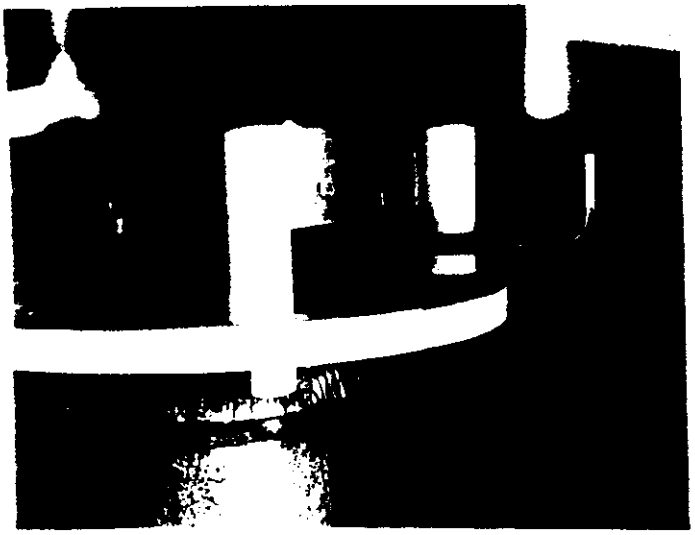
— <u>DO NOT</u> TIGHTEN SET SCREWS THROUGH TO UNIT POLE AT THIS TIME!

— DROP REMAINING SPLIT RING ⑤ (HALF WITHOUT HOLES) DOWN INTO BEARING OPPOSITE THE ONE WITH HOLES.

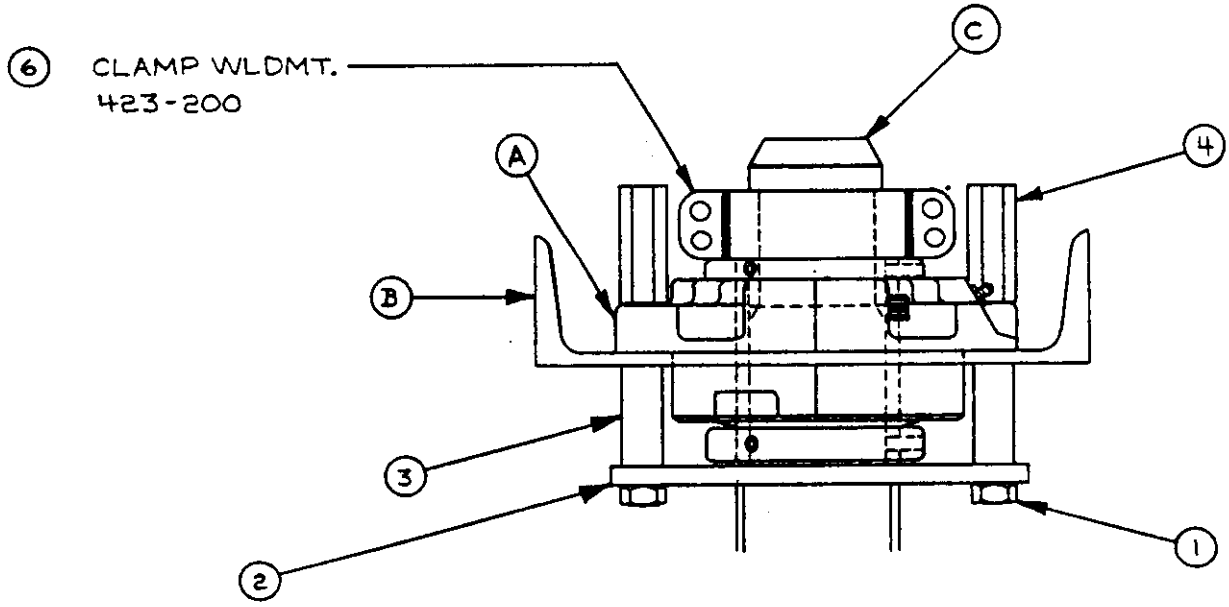
— LEAVE SET SCREWS AS IS - CONTINUE TO HOLD UNIT POLE UP!

— GO TO FOLLOWING PAGE.





TOP



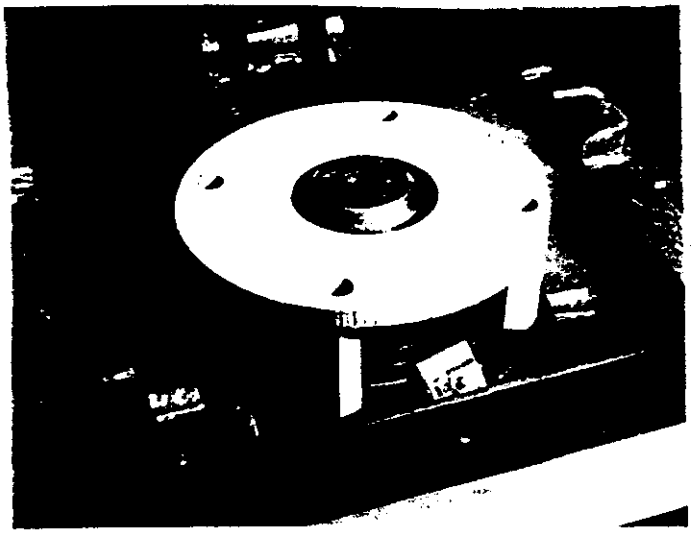
— PLACE THE TWO CLAMP WLDMT. ⑥ HALVES AROUND UNIT POLE Ⓒ BETWEEN TOP EDGE OF BEARING Ⓐ AND THE UPPER LIP OF THE UNIT POLE.

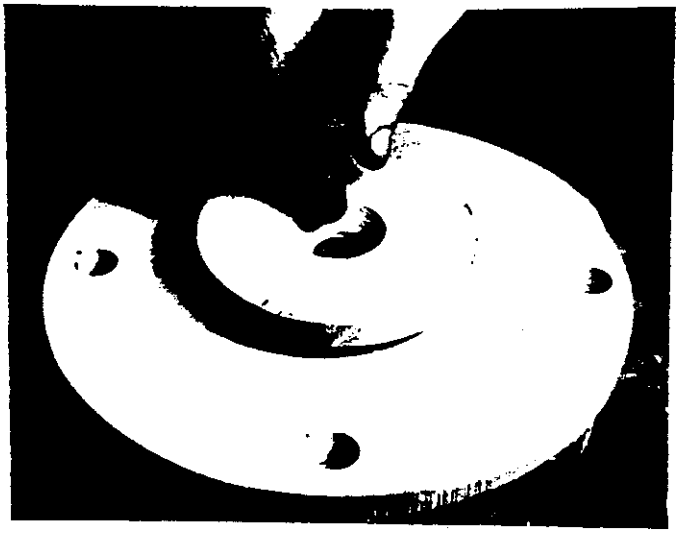
— BOLT CLAMP HALVES TOGETHER USING (4) 3/8"-16 THD. x 1½" LONG HEX BOLTS AND 3/8"-16 THD. ESNA STOP NUTS - TIGHTEN SO THAT THE CLAMP HAS JUST ENOUGH PLAY IN IT THAT YOU CAN TURN IT BY HAND ON THE UNIT POLE.

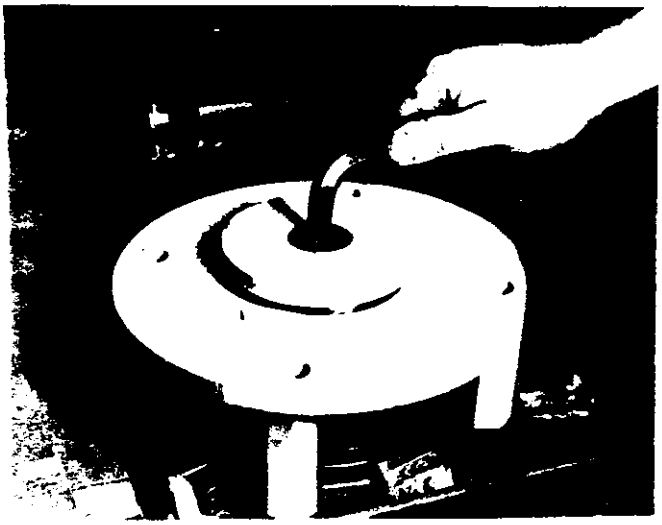
~ AT THIS TIME YOU CAN LET THE UNIT POLE Ⓒ DOWN TO HANG FREELY!

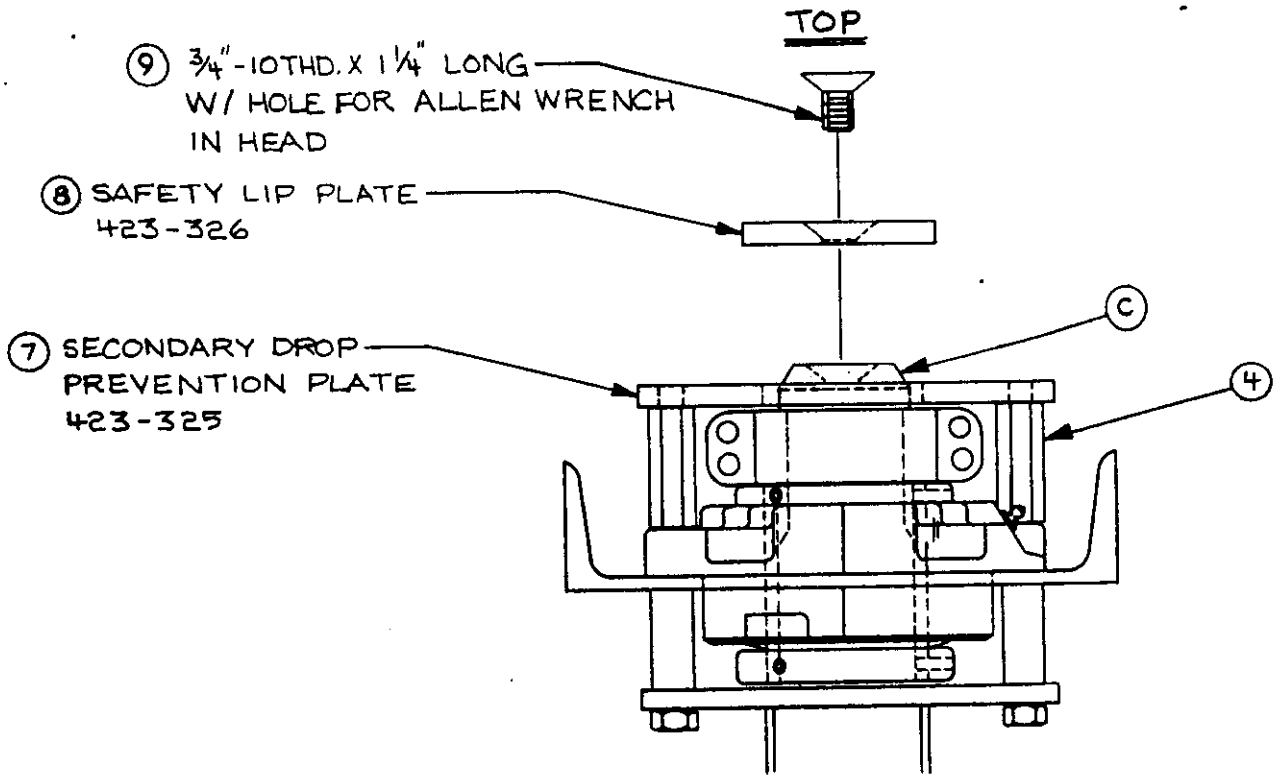
— TIGHTEN THE (4) 3/8" BOLTS HOLDING THE NO. ⑥ CLAMP HALVES THE REMAINDER OF THE WAY.

— TIGHTEN FOUR SET SCREWS (2 TOP - 2 BOTTOM) IN THE BEARING Ⓐ (TORQUE TO 408 INCH POUNDS) ~ (34 FOOT POUNDS)





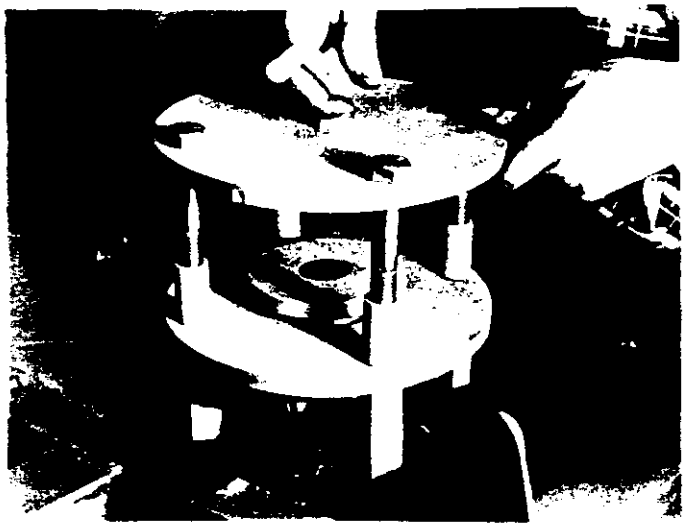




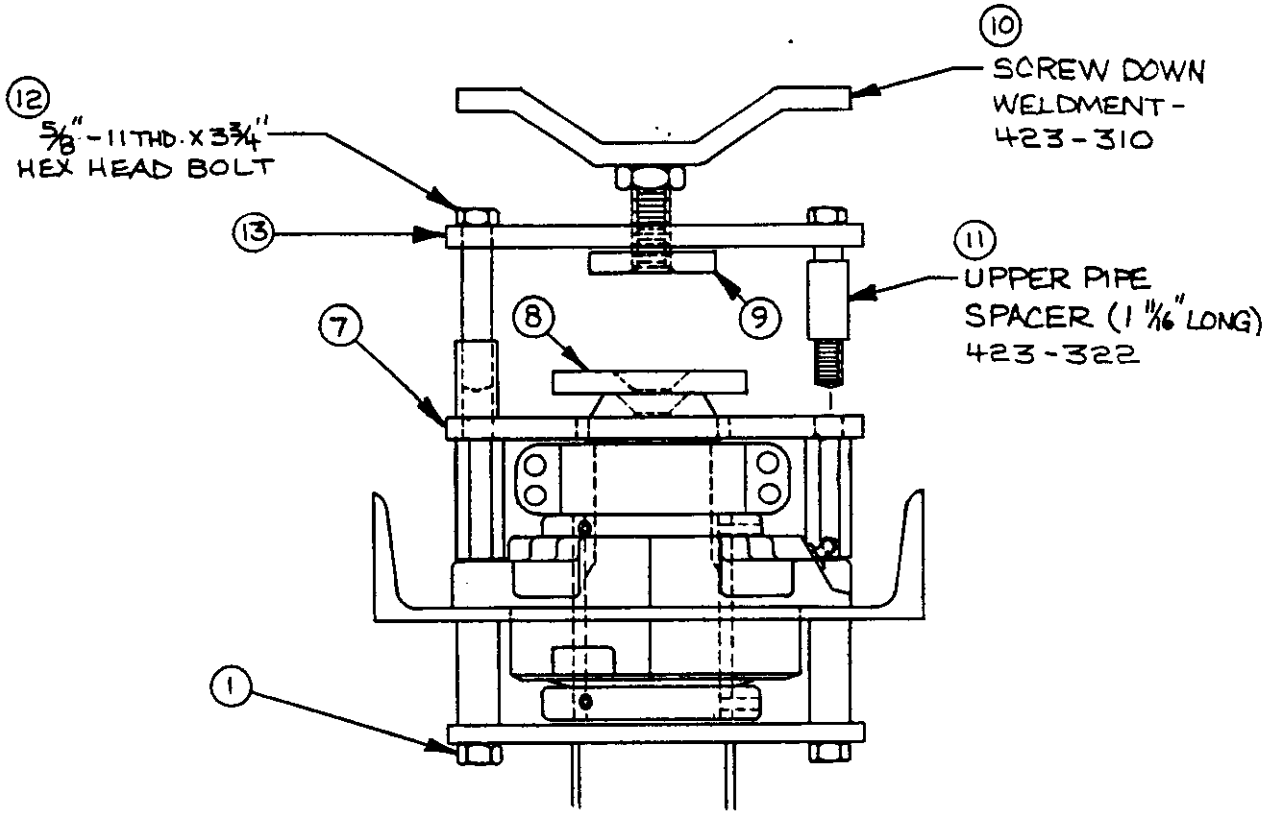
— PLACE SECONDARY PLATE ⑦ OVER UNIT POLE ⓒ REST PLATE ON TOP OF HEX COUPLERS ④ WITH THE (4) 21/32" PLATE HOLES LINED UP WITH THOSE IN THE COUPLERS. - NO BOLTING AT THIS TIME!

— TAKE NO. ⑧ SAFETY PLATE (WITH BEVEL ON HOLE FACING UP) AND PUT IT ON TOP OF UNIT POLE ⓒ LINE THE HOLE IN NO. ⑧ UP WITH HOLE IN THE TOP OF ⓒ

— USING A FLAT HEAD 3/4"-10THD. X 1 1/4" LONG BOLT ⑨ SECURE PLATE ⑧ TO UNIT POLE ⓒ WITH A 3/8" ALLEN WRENCH. (TORQUE TO 2,160 INCH POUNDS) ~ (180 FOOT POUNDS)



TOP



—PLACE (4) NO. ⑪ UPPER PIPE SPACERS OVER 21/32" HOLES ON TOP OF PLATE ⑦.

—PLACE SCREW DOWN WELDMENT ⑩ ON TOP OF PIPE SPACERS - ⑪ ~ LINING UP 21/32" HOLES IN PLATE ⑬ WITH THOSE IN NO ⑪ PIPE SPACERS.

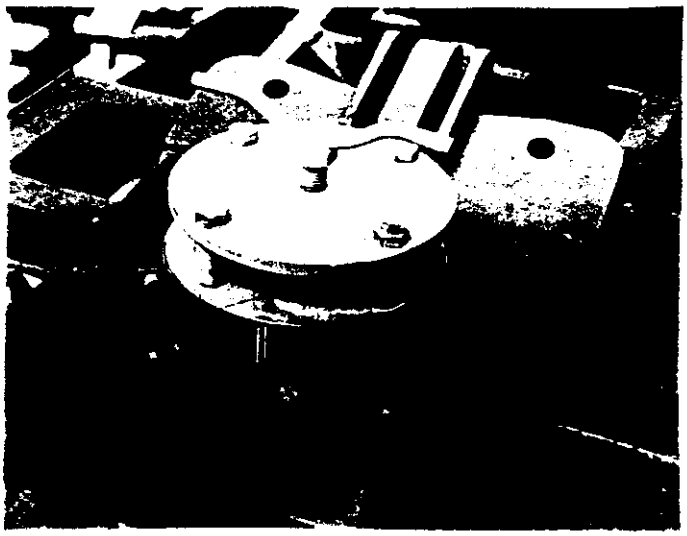
—USING (4) 5/8" - 11 THD. BOLTS X 3 3/4" LONG ⑫ - DROP BOLTS DOWN THROUGH NO. ⑬ PLATE, NO. ⑪ SPACER, NO. ⑦ PLATE, AND TIGHTEN THE (4) NO. ⑫ BOLTS INTO THE NO. ④ HEX COUPLERS WITH A 15/16" WRENCH. (1,320 IN. LBS.) ~ (110 FT. LBS.)

—TIGHTEN (4) NO. ① HEX BOLTS TO (1,320 IN. LBS.) ~ (110 FT. LBS.)

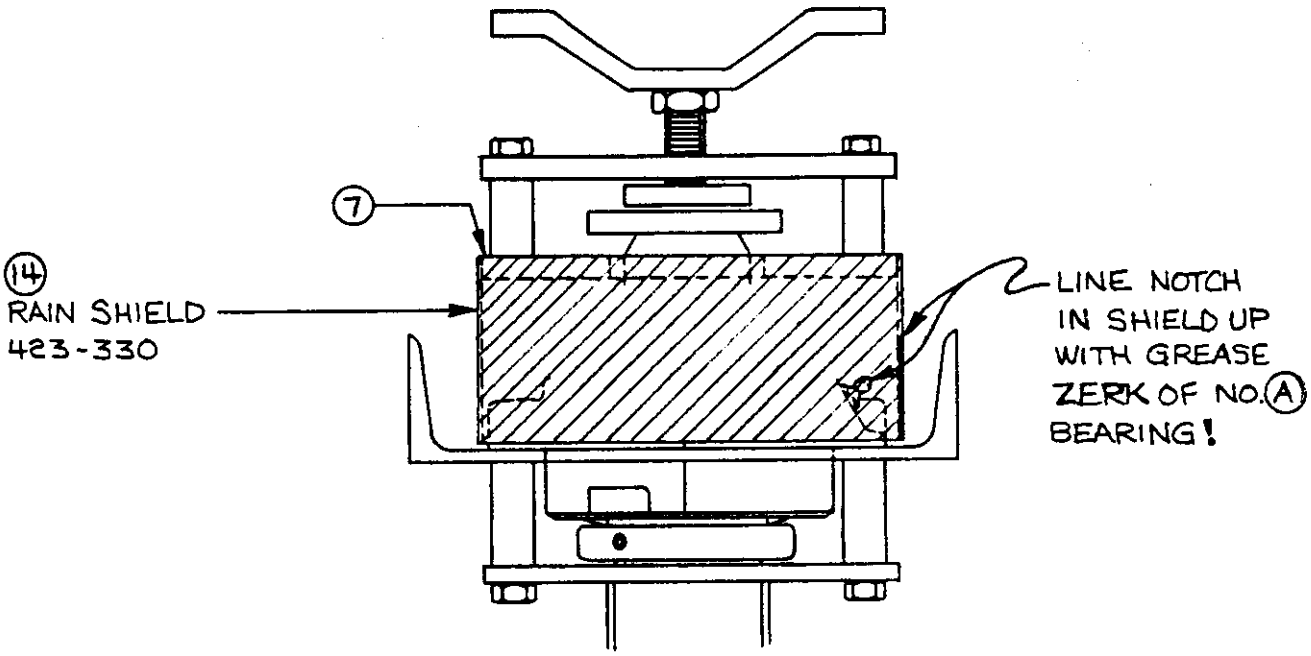
✱ NOTE:

—TO TRANSPORT YOUR "T.M.S." TURN THE HANDLE OF THE NO. ⑩ SCREW DOWN WELDMENT CLOCKWISE - RESTING PLATE ⑨ FIRMLY ON TOP OF SAFETY LIP PLATE ⑧.

—TO OPERATE YOUR "T.M.S" TURN THE HANDLE OF THE NO. ⑩ SCREW DOWN WELDMENT AS FAR AS IT WILL GO COUNTER - CLOCKWISE ~ DISENGAGING PLATES. ⑧ AND ⑨.



TOP



— TO MOUNT NO. ⑭ RAIN SHIELD ~ PLACE NO. ⑭ AROUND PLATE NO. ⑦ WITH TOP EDGES OF BOTH FLUSH WITH EACH OTHER.

— USING (2) ¼"-20 THD. BOLTS AND ¼"-20 THD. ESNA NUTS - FASTEN THE TWO FLANGES OF THE RAIN SHIELD ⑭ TOGETHER, CLAMPING IT ONTO THE NO. ⑦ SECONDARY PLATE.

★ NOTE:
THIS COMPLETES THE ENTIRE MODIFICATION/ASSEMBLY PROCEDURE. PLEASE FOLLOW THESE INSTRUCTIONS IN CHANGING OVER ALL (3) TOP SWEEPS!

FROM : ELIBRIDGE FAX NO. : 2174790103 Sep. 24 2004 11:17AM P1

Eli Bridge Company
800 Case Avenue
Jacksonville, IL 62650
Phone 217-245-7145
Fax 217-479-0103
Email EliBridge@aol.com

or: Hildebraind Rides

facsimile transmittal

To: Harlan Bast Fax: 954-781-3232

From: Patty Sullivan Date: 09/24/04

Re: Scrambler Sweep Repair Pages: 2

CC:

☐ Urgent ☐ For Review ☐ Please Comment ☐ Please Reply ☐ Please Recycle

Dear Harlan:

As promised attached are the procedures for repairing Scrambler Sweeps.

Please Call if there is anything else. Thanks!

Pres/CEO

Field Repair Procedure for Scrambler Sweeps

9/16/03
cc: Shop Office, CEO, Customer on Request

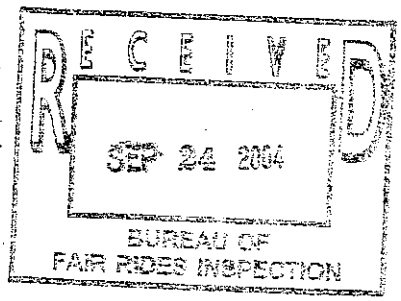
With wire brush or sander, clean the area around the area to be welded to remove paint, rust and dirt from the part.

With a grinder, clean/gouge out the area to be welded at least 1" on either side of the spot missing the weld.

Welding: Welding must be done by a welder certified to AWS D1.1 or equivalent.

Weld the cleaned area (spray arc) with .035 wire at 100-150 amps, speed 350 ipms, blending it in with the existing weld so the line of weld is solid.

Clean, prime and repaint.



Spoke w/ Hunter, says OK if EB has waiver #4 on this

ELI BRIDGE COMPANY

800 CASE
JACKSONVILLE, IL 62650-1493

TO: State of Florida FAX: 850-488-9023
Burea of Fair Rides Inspections

ATTENTION: Burea of Fair Rides Inspections

FROM: Greg McQueen FAX: 217-479-0103

SUBJECT: Red tag on Scrambler ride S/N = 235-64

DATE: 4/6/01 TIME: 1:00 PM

TOTAL PAGES: 2 CONFIRMATION REQUESTED: ____ PO # ____

MESSAGE:

Gentleman:
Mr. Fred Evick wanted me to fax a copy of the following letter in hopes it would clear up the matter of red-tagging his Scrambler ride. Please give me a call if you need more information.

Thanks!
Greg

PHONES: 217-245-7145 * 800-274-0211 * FAX: 217-479-0103

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS

Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY

INCORPORATED

800 CASE AVENUE

JACKSONVILLE, ILLINOIS 62650-1493

April 6, 2001

Fred Evick
8234 Highfield Ave.
Jacksonville, IL. 32216

Dear Mr. Evick:

As you discussed with Patty Sullivan, your Scrambler ride was trailer mounted by Specialty Mfg. and not by Eli Bridge Company. ASTM and Eli Bridge Company now recognize Specialty Mfg. as the manufacturer of record. Thus, our bulletin #4 only applies to Eli Bridge Company TMS's.

Sincerely,

Eli Bridge Company
Greg McQueen, Sec.-Treas.

PHONES: 800-274-0211 • 217-245-7145 • FAX 217-479-0103

04/06/2001

To: State of Florida
Bureau of Fair Rides Inspections
3125 Conner Boulevard, Suite N
Tallahassee, Florida 32399-1650

From: Fred Evick
8234 Highfield Av.
Jacksonville, Florida 32216

Re: red tag on scrambler ride serial number235-64

Dear Sirs,

The current shut down order for my scrambler has been addressed with Eli Bridge Company regarding bulliten #4. According to Ms. Patty Sullivan of Eli Bridge Company bulliten #4's application to my ride does not qualify due to that it is not an original "Eli Bridge Company TMS". Ms. Sullivan explained to me that "TMS" is a registered trademark name and that my scrambler was not trailer mounted by her company. Since my scrambler was trailer mounted by Specialty Mfg. (manufactures of the Chair Jet and other rides) (201-288-9367, 201-288-3560 or 973-565-0410 attention Ron Cooke) this company as a ride manufacturer is now responsible for the product liability of the scrambler ride serial number 235-64.

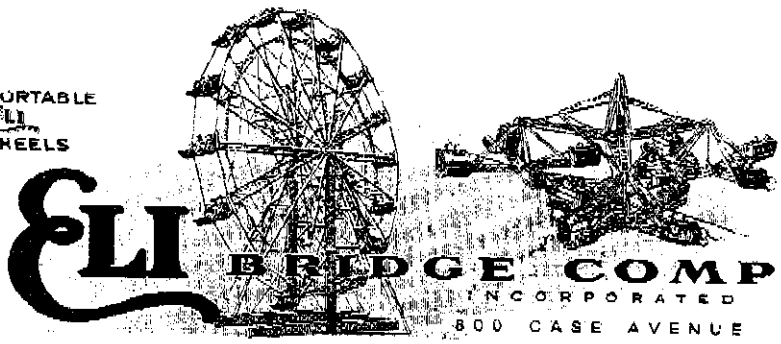
If you need to contact Eli Bridge Company regarding this matter Ms. Sullivan stated that while she is recovering from surgey at home that Greg at the office can assist (800-274-0211). Please contact me as soon as you can regarding this matter. Thank You

contact number: 904 343 8465 cell phone (Fred Evick)

Sincerley

Fred Evick

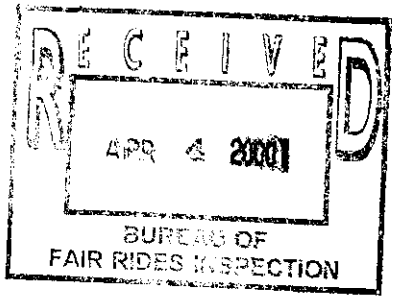
3/6/01 When ride was Red Tagged
Hunter spoke w/ Owner & engineer from ELI Bridge
Yes Ride needs upgrade
Evick called - said that they will send us a letter today - Sullivan's President
Need permit & inspection



ALL STEEL PORTABLE BIG ELI FERRIS WHEELS

Scrambler ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED
800 CASE AVENUE
JACKSONVILLE, ILLINOIS 62650-1493



4 April 2000

Mike Reinhart
Florida Inspector
Fax: ~~850-922-2330~~ 850-488-9023

Dear Mr. Reinhart:

Right after I talked with you on March 23, I immediately called Carl Dills. He was out of the office, but I left a message on his voice mail. I did not hear from him until a fax arrived yesterday.

His reference to the use of Klik-pins vs. R-pins (hairpin cotters) came from our fold-out Scrambler Inspection Check List, which I prepared some years ago.

On page 2, it says:

Klik-pins

Recommend Klik-pins be used where possible.
Klik-pins with one end of ring out of its hole should be thrown away.

On page 3, it says:

Hairpin cotters

Hairpins should snap in place with no looseness after installed.
Hairpins driven all the way in to big loop should be thrown away.

As I told you, this is a recommendation and not a mandatory requirement. A good R-pin can be a good safety device, and any inspector who finds a loose R-pin after it has been installed has every right to require that it be replaced.

Subject: **Eli Scramblers**
Date: Fri, 24 Mar 2000 07:59:25 -0500
From: Michael Rinehart <rineham@doacs.state.fl.us>
To: Ron Brooks <brooksr@doacs.state.fl.us>, Randy Fleck <fleckr@doacs.state.fl.us>, Jerry Callahan <callahj@doacs.state.fl.us>, Cliff Groscurth <groscuc@doacs.state.fl.us>, Brad Mosher <mosherb@doacs.state.fl.us>, Larry Cook <cookl@doacs.state.fl.us>, Allan Harrison <harrisa@doacs.state.fl.us>, Timothy Simpson <simpsot@doacs.state.fl.us>, Carlos Corvo <corvoc@doacs.state.fl.us>, Moe Hayes <hayesm@doacs.state.fl.us>, Gary Fisher <fisherg@doacs.state.fl.us>, Hunter Lyles <lylesh@doacs.state.fl.us>, Jerry Winters <winterj@doacs.state.fl.us>, Charlie Stegall <stegalc@doacs.state.fl.us>
CC: "Rommes, Isadore" <rommesi@doacs.state.fl.us>
BCC: "Dills, Carl" <carl.dills@kyagr.com>

The following letter, copied below verbatim, came 3/23/00 from Eli Bridge Company, signed by William C. Deem, Chief Engineer, and though it is a "recommendation", not a requirement that Klik-pins be used please keep it in mind during your inspections.. Mike.

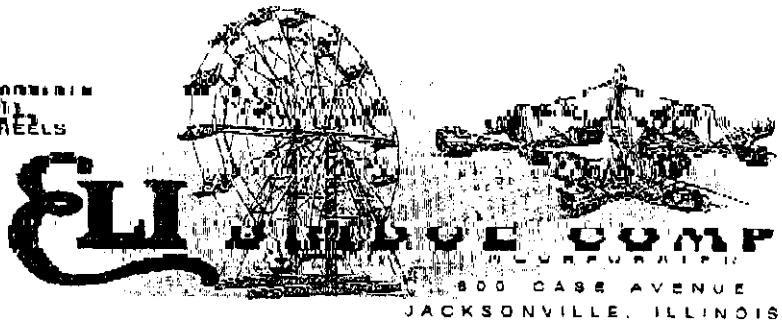
"For a number of years we used R rings, otherwise known as hairpin cotters, for assembling Scramblers. We found that too often those who were assembling the ride would hit the hairpin with a hammer to drive it on. Sometimes they were driven on so far that the hairpin was permanently spread to the point that it could no longer secure the pin to which it was attached. A safety device that does not work is often worse tan no safety device.

"An R-ring that will still snap firmly onto a pin is still a good device, and we have never sent out a bulletin prohibiting their use. However, we have found the Klik-pins to be much more reliable as safety devices. They are easier to install than R-pins, and in our experience are much less likely to become damaged.

"We do not recommend that R-pins be replaced with Klik-pins, but we have no objection to R-pins being used if they will snap firmly onto the pins.

"Sincerely,

"William C. Deem, Chief Engineer
"ELI BRIDGE COMPANY"



ELI STEEL PRODUCTS
FERRIS WHEELS
ELI POWER UNITS
ELI BRIDGE COMPANY
800 CASE AVENUE
JACKSONVILLE, ILLINOIS 62650-1493

23 March 2000

Amusements of Hamburg
Fax: 850-488-9023
Attention: Sandy

Gentlemen:

For a number of years we used R rings, otherwise known as hairpin cotters, for assembling Scramblers. We found that too often those who were assembling the ride would hit the hairpin with a hammer to drive it on. Sometimes they were driven on so far that the hairpin was permanently spread to the point that it could no longer secure the pin to which it was attached. A safety device that does not work is often worse than no safety device.

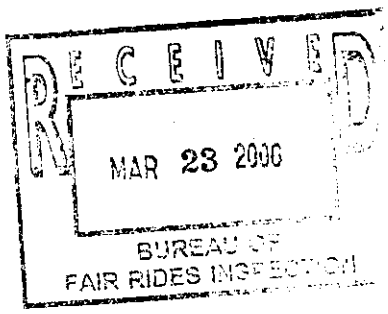
An R-ring that will still snap firmly onto a pin is still a good device, and we have never sent out a bulletin prohibiting their use. However, we have found the Klik-pins to be much more reliable as safety devices. They are easier to install than R-pins, and in our experience are much less likely to become damaged.

We do recommend that R-pins be replaced with Klik-pins, but we have no objection to R-pins being used if they will snap firmly onto pins.

Sincerely,

William C. Deem

William C. Deem
Chief Engineer
ELI BRIDGE COMPANY



Eli Scrambler

ALL STEEL PORTABLE BIG ELI FERRIS WHEELS

ELI BRIDGE

800... JACKSO...

Michael

This is your copy on Scramble FAX on Friday about Great American Amusements seat inserts. I did voice mail Izzy & let him know. I put a copy in Guppy file

6:45 AM Allan

Great Americas Amusements
Attention: Mr. Fred Evick
Fax: 904-964-3326
Reference: Scrambler Serial No. 235-9

Dear sir:

With regard to Scrambler Bulletin No. 9, dated November [illegible], this bulletin was issued as a mandatory requirement over five years ago. It is our understanding that you bought this ride under the expectation that it was in compliance with our bulletins, and discovering that the State of Florida will not allow you to operate so long as your Scrambler seats have fiberglass inserts puts you in a very tight situation.

It is contrary to our policy to set aside bulletin requirements, but as Chief Engineer I can appreciate your situation, and so I will authorize you to operate this Scrambler for this weekend, March 11 and 12, only, with the understanding that you will immediately place an order for the necessary cushion parts for your Scrambler.

We have materials on hand to make the cushions, but at the present time we have no completed parts in stock. On receipt of your purchase request we would immediately begin making them.

Our original concern which caused us to issue the bulletin was the difference in clearances, which we felt represented a hazard, based on our 42 years of experience with over 480 Scramblers.

. You must watch particularly the small children to be sure that they are securely seated in each seat, and be prepared to stop immediately.

Sincerely,

William C. Deem

William C. Deem
Chief Engineer
ELI BRIDGE COMPANY

529

ALL STEEL PORTABLE BIG ELI FERRIS WHEELS

ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED
800 CASE AVENUE
JACKSONVILLE, ILLINOIS 62650-1493

IMPORTANT:

TO: Florida Department of Agriculture FAX #: 904-488-9023

ATTENTION: _____

FROM: William C. Deem, P.E. FAX #: 217-479-0103

SUBJECT: Scrambler Serial No. 47-57

DATE: 3 May 1995 TIME: _____

TOTAL PAGES: 1 CONFIRMATION REQUESTED: _____ P.O. #: _____

MESSAGE:

Many years ago I conducted tests here at the factory to determine the effect on braking of the Scrambler if only one brake was used. In the normal operation the braking force applied by the brake cable is distributed equally to each brake by what we call the brake equalizer, so that half of the braking force goes to each brake. If the equalizer is not used and the brake cable is connected directly to one brake, the braking force on that brake is doubled. We found that the time to bring the Scrambler to a stop was not changed. The only consequence of operating in this way would be to increase the wear rate on that brake when compared to the two-brake operation. In our opinion, there is no safety hazard involved in the use of a single brake. We would recommend that the owner resume the two-brake operation as soon as he can, to promote longer life in his brake shoes.

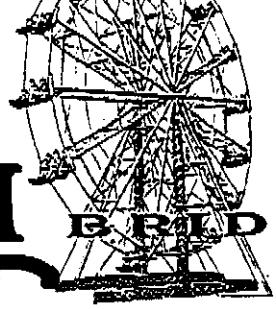
RECEIVED
MAY 03 1995

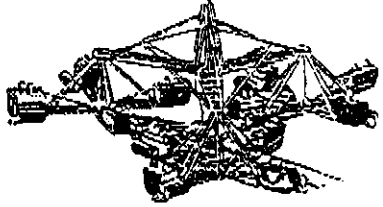
William C. Deem

PHONES: 800-274-0211 • 217-245-7175 FAX 217-479-0103

BUREAU OF
FAIR RIDES INSPECTION

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS





Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED
800 CASE AVENUE
JACKSONVILLE, ILLINOIS 62650-1693

Toll-free WATS line (800) 274-0211 is available in all 50 states
during normal business hours, 8 A.M. to 5 P.M., Monday through Friday, except holidays.

BIG ELI Scrambler® Bulletin No. 9

Applies to ALL Serial Numbers

DATE: November 16, 1994

SUBJECT: Scrambler® Seat Fiberglass Inserts

Fiberglass seat inserts are being manufactured and sold to owners of Big Eli® Scramblers®. These inserts are not manufactured by Eli Bridge Company. In our testing and many years of working with customers regarding their Big Eli® Scramblers®, we believe we have developed a seat design that has stood the test of time. Eli Bridge Company does not condone nor authorize the use of these fiberglass seat inserts on Big Eli® Scramblers® and believes that all who are using them ought to be warned not to use them and to promptly replace any in use with a seat cushion design meeting Eli Bridge Standards.

Very early in the history of the Scrambler® use, a Scrambler® owner suggested that we raise the front edge of the seat to provide a better feeling of security for the passengers. We investigated and found this to be a valuable improvement, it was immediately incorporated into our design, and we have continued to use this feature throughout the 39-year history of the Scrambler®.

The seat cushion we are currently supplying is 3-3/16 inches high on the back side, and the highest part of the seat cushion is 6-1/2 inches high on the front edge, measuring back from the rounded front edge of the cushion 1-7/8 inches from the front vertical surface of the seat cushion.

In the case of the fiberglass shells, they do not incorporate this raised front edge. Our investigation of these fiberglass shells leads us to conclude that they lower the security of the passengers.

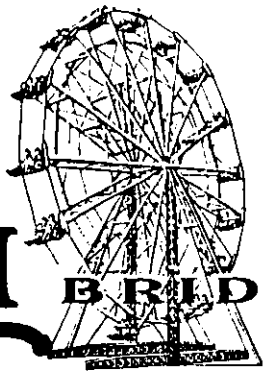
Therefore, it is mandatory that the use of these fiberglass seat inserts in Big Eli® Scrambler® be immediately discontinued.

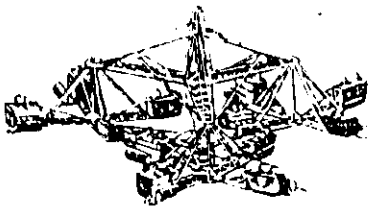
Lee Sullivan

Chairman of the Board
Eli Bridge Company

PHONES: 800-274-0211 • 217-245-7145 • FAX 217-479-0103

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS





Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED
800 CASE AVENUE
JACKSONVILLE, ILLINOIS 62650-1493

Toll-free WATS line (800) 274-0211 is available in all 50 states
during normal business hours, 8 A.M. to 5 P.M., Monday through Friday, except for holidays.

Scrambler® Bulletin No. 8

Applies to ALL Serial Numbers

DATE: March 15, 1993

SUBJECT: Weld cracks at the bottom of the center pole.

The method that has always been used to assemble the stationary center pole to the stationary base is as follows:

1. The bottom end of the stationary center pole is carefully machined to size.

2. The stationary base top and bottom 1/2" plates are line bored slightly smaller than the outside diameter of that part of the stationary center pole which fits inside the stationary base.

3. The stationary center pole bottom end is cooled with dry ice until the outside diameter has shrunk down smaller than the inside diameter of the holes bored in the stationary base.

4. The stationary center pole is then slipped into the stationary base all the way, and allowed to warm up to room temperature. At room temperature, the stationary center pole is firmly locked into the stationary base.

5. The entire assembly is then turned upside down, and the very bottom end of the stationary base is completely welded to the bottom plate of the stationary base.

PHONES: 800-274-0211 • 217-245-7145 • FAX 217-479-0103

Our first indication of any problem with this weld cracking occurred on a Scrambler which had been in service for nine years. Since that time there have been several others reported to us, but they still represent a very small percentage of the Scramblers in service. In each case the Scrambler had been in use for a number of years.

In analyzing the forces acting on this weld connecting the stationary center pole to the stationary base, there were two factors involved:

A. The weld was located between two very rigid structures. The pole was a 10 inch diameter tube with a 1 inch wall thickness, and the bottom plate of the stationary base was 1/2 inch thick and 60 inches wide. The molten weld metal, in cooling, wanted to shrink but could not because of the rigid parts it was connecting. This resulted in built-in shrinkage stresses that over time tend to relieve themselves by plastic deformation or by cracking.

B. The rotating structure was held on the stationary center pole with a tapered roller bearing at the top and bottom of the stationary center pole. It is the nature of tapered roller bearings, when used in pairs, that the normal radial loads produce thrust loads that want to push the two bearings away from each other. In the Scrambler application, the bottom bearing was located against the top of the stationary base. The top bearing pushed against a plate bolted to the very top of the stationary center pole. This thrust against this top plate produced a force acting to pull the stationary center pole out of the stationary base, and this was resisted by the interference fit between the stationary center pole and where it fit inside the stationary base, plus the weld on the very bottom of the pole.

These two factors appear to be responsible for any weld cracking which has been reported to us.

If there is any uprooting of the stationary center pole out of the stationary base, this allows separation between the two tapered roller bearings, and this then allows the top of the center pole to sway. This is usually the sign that a problem has developed. Swaying of the center pole will then allow the unit pole to dip closer to the ground until eventually it would strike the drive unit if the problem is not corrected.

Occasionally, the top hole of the stationary base has been found to be hammered out so that the pole is no longer tight in the hole, but our experience is that this has never happened until after the weld on the bottom has cracked out.

HOW TO CHECK TO SEE IF THERE ARE ANY CRACKS IN THIS WELD THAT CONNECTS THE STATIONARY CENTER POLE TO THE BOTTOM PLATE OF THE STATIONARY BASE

1. On a portable ground-model Scrambler, look underneath when the base section is on the ramp coming out of the trailer. Clean off the weld area thoroughly, and wire brush it if necessary to see the weld area clearly.

2. On a TMS Scrambler, the bottom of the base section can always be observed when the front end of the trailer is raised and connected to the tractor. Here again clean off the weld area thoroughly to check for cracks.

3. Inspecting a Scrambler permanently located in a park will be most difficult, since there would normally be no time when this part of the base section exposed to view. Somehow it is going to be necessary to make this inspection, and this may require dismantling the Scrambler and lifting or turning the base section so the bottom side can be viewed.

WHAT TO DO IF YOU FIND CRACKS

1. Measure the length of any crack and determine the location of each.

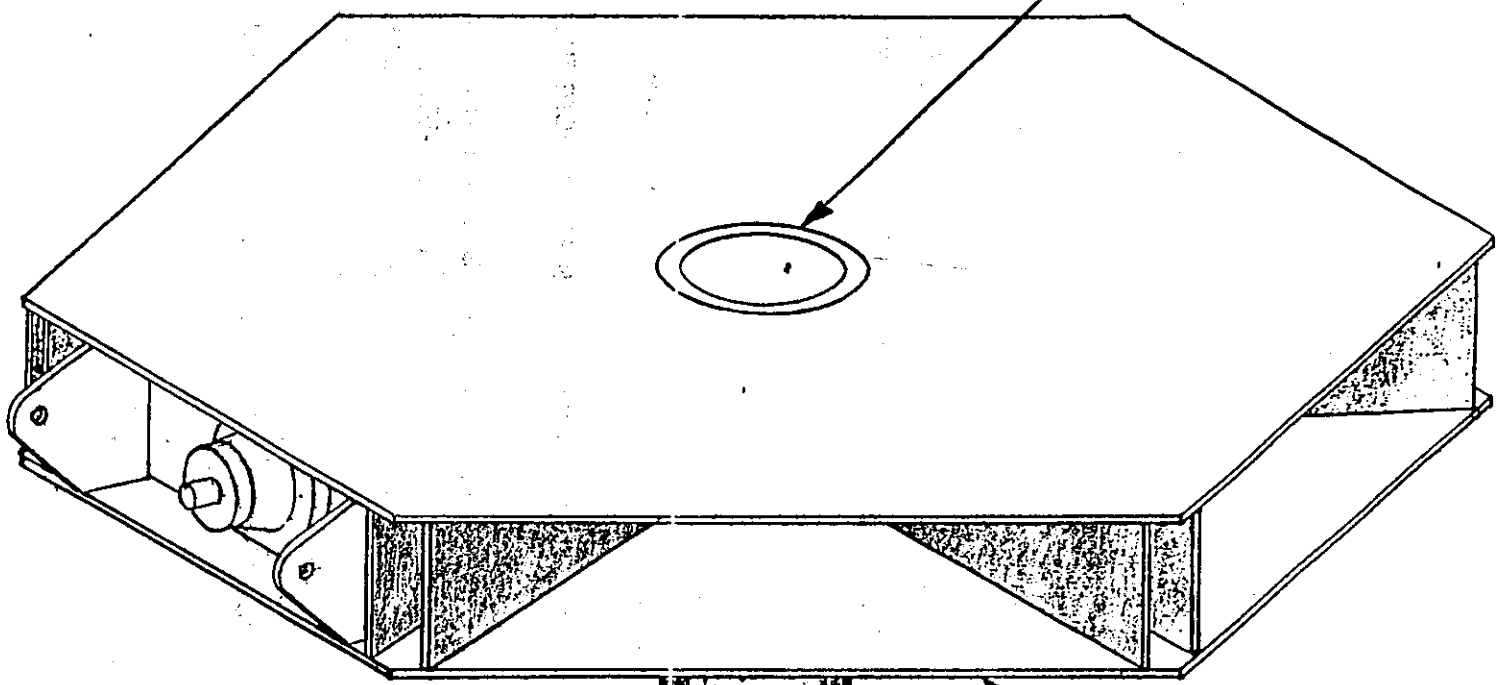
2. Contact Eli Bridge Company, and describe any cracks and where they are located.

3. Depending upon the nature of the problem, we will recommend a repair procedure. Where there is severe cracking resulting in weaving of the center pole, then it will be recommended that the entire base section (rotating and stationary base) be returned to the factory for rebuilding. In our established procedure, the entire unit is disassembled, beat out holes in the stationary base will be re-welded and re-bored to original dimensions, and the stationary center pole is built up and re-machined to original dimensions.

THIS INSPECTION IS CONSIDERED MANDATORY ON ALL SCRAMBLERS AND TMS SCRAMBLERS TEN YEARS OR MORE OLD.

ELI BRIDGE COMPANY

Lee A. Sullivan
Chairman of the Board



BOTTOM VIEW

ELI BRIDGE CO
JACKSONVILLE, IL 62650

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES

DECIMAL DIMS

ANGULAR DIMS

SCALE

BY | CHG | DATE

REVISIONS

ORIGINAL EQUIPMENT

THRU

TITLE

WELD INSPECTION ON GROUND MODEL SCRAMBLER AND TMS SCRAMBLER

DATE

DES

DRN

CHK

APPR

JOB

FILE

MODEL NO.

ASSEM

NUMBER OF PARTS

FILE NUMBER

DESCRIPTION

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS

Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED
800 CASE AVENUE
JACKSONVILLE, ILLINOIS 62650-1493

8 October 1991

Subject: CRACKS IN SCRAMBLER SEATS

A. Inside, outside, and back skins

1. These skins are made of 2024 Alclad aluminum.

2. Repairs to the skins cannot be made by welding, and is not authorized.

3. Most damaged areas can be repaired using pull-through rivets and standard repair parts with instructions available from Eli Bridge Company.

B. Front, middle, and back ribs

1. These ribs are made of 6061-T6 aluminum.

2. The major strength of each rib is developed by the rib flanges to which the inside and outside skins are riveted. The primary purpose of the face of the rib is to separate and support the flanges.

3. This type of aluminum is weldable.

4. Unless welding achieves full penetration along the face of the rib as well as in both flanges the full strength of the rib cannot be developed.

5. Our experience has been that any field welding of these ribs has not always achieved full penetration, and in some cases where the flanges were cracked through, there was no welding of the flanges.

6. Cracked or broken ribs must be replaced. Because the ribs are directly tied into the support structure, fasteners other than pull-through rivets are used in the structural connections. We believe that field repairs to Scrambler seat ribs should not be attempted, and that seats showing significant cracking in the seat ribs should be returned to the factory for repairs which will return the seat to its fully functional original strength.

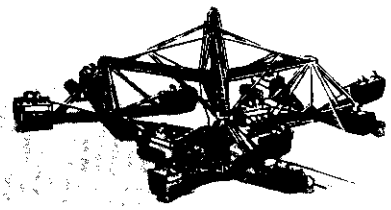
7. Because of the demonstrated uncertainty of the quality of field welds on Scrambler seat ribs, and after reviewing design criteria, it is the position of Eli Bridge Company that we do not authorize, recommend, encourage, or condone the use of welding for repair of cracked Scrambler seat ribs.

William C. Deem

William C. Deem, Engineer
ELI BRIDGE COMPANY

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS

AREA CODE 217 PHONE 245-7145



Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED
800-820 CASE AVENUE
JACKSONVILLE, ILLINOIS, 62650

August 12, 1976

URGENT WARNING

Dear Scrambler Ride Owner:

On June 2, 1976, it was reported to us that a Unit Pole had fractured on a Scrambler ride, just above the top end of the gusset extension plates. This was the result of being dropped on blacktop surface. It and the other two Unit Poles from that ride were immediately taken by Eli Bridge Company to a consulting engineering service in Urbana, Illinois, for testing and evaluation. We have not yet received the results of this evaluation.

Yesterday we were advised by a state ride inspector that a hairline crack was discovered in the Unit Pole of a 1961 model BIG ELI Scrambler ride, in the same area where the Unit Pole mentioned above had fractured. This is the first report since 1968 of a Unit Pole crack apparently resulting from normal operation.

As yet we do not know why a crack should have occurred, nor a suitable repair. We will not be able to approach these subjects until we receive the results and recommendations from the testing currently being conducted in Urbana.

In the mean time, you need to be aware of the possibility of a Unit Pole cracking or fracturing, and to remind you of the extreme hazard of a Unit Pole fracture. If the ride is being operated at the time of a complete fracture of the Unit Pole, this could allow the bottom sweep and the cluster of four (4) seats to drop suddenly to the ground with most serious results to the ride and passengers.

Your Unit Poles should be inspected very carefully every day for such cracks. If any cracks are found, even hairline cracks, the Unit Pole should be taken out of service immediately. DO NOT operate any Unit Pole that is cracked or that you suspect may be cracked. You should also keep in mind that if one of the Unit Poles is cracked, the other two have been operated under similar conditions.

For a limited period, we will make replacement Unit Poles available, in sets of 3, at half price. This is with the understanding that the old Pole, being replaced, would be returned to us (prepaid) for our inspection. Cash Price of one (1) Unit Pole (without gear) is $655.00 fob our factory. Under this limited offer, all 3 Unit Poles (without gears) can be purchased for $982.50 f. o. b. our factory, plus applicable tax--if any.

SAFETY BULLETIN

SECONDARY LATCHING DEVICE

for Seat Handlebar of

BIG ELI Scrambler ride.

In 1973 it became mandatory in the State of California that rides such as the BIG ELI Scrambler ride be equipped with secondary latching devices on the seats, in addition to the normal primary latch. It was intended that this secondary latching device prevent the handlebar from opening, or being easily opened, even if the primary locking device should fail to function.

In accordance with the California requirement, Eli Bridge Company developed and tested such a device. It was approved for use in California, and was made available to all owners of BIG ELI Scrambler rides operating in that State.

At the conclusion of the 1974 amusement season we contacted owners whose seats had been equipped in this manner for the past two seasons, asking to know their experience and comments. Based on the very favorable response received, starting with 1975 models (Serial No. 416) all new BIG ELI Scrambler rides have been equipped in this manner.

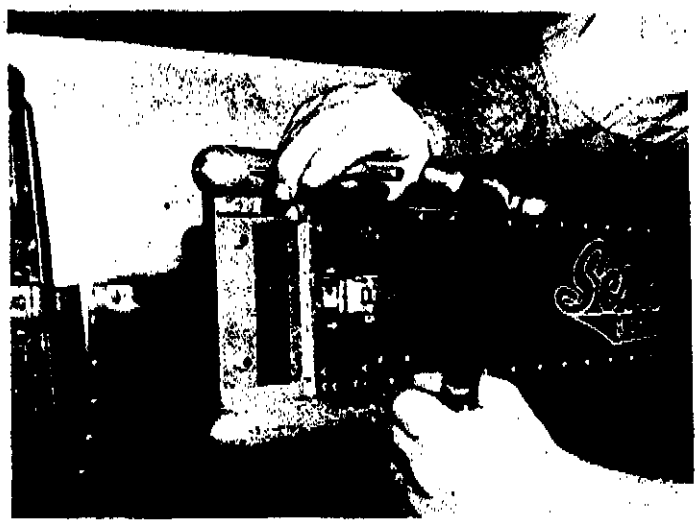
This secondary latching device can be easily added to any Scrambler ride that is equipped with aluminum handlebars. For the added protection of your passengers, we strongly urge you to make this modification to the handlebars and seats of your BIG ELI Scrambler ride.

Back in early 1973 we offered this modification kit complete, for 12 seats, at the price of $288.00 (f.o.b. our factory). The kit included 12 secondary latching devices, necessary hardware, drill bit, drill templates, and instructions for installation. To encourage your purchase, installation and use of this equipment on your BIG ELI Scrambler ride - we offer this equipment to you at the same price we were quoting back in 1973. However, this is a limited offer, for your prompt acceptance.

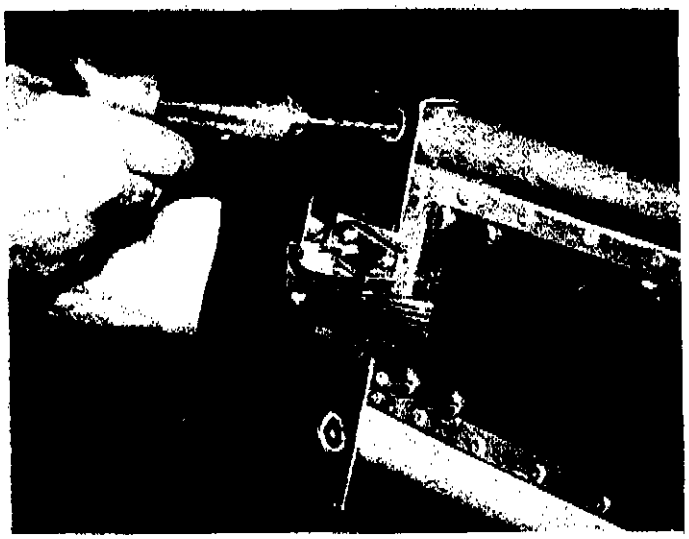
Installation is quite simple. In addition to the above, you will need a hand pop-rivet gun capable of setting 5/32" diameter rivets, and a hand drill. It is estimated that installation of all 12 secondary latching devices will require approximately 3 hours of your time.

Some older model Scrambler rides (1959 Model, Serial No. 101 or older) are still equipped with old-style steel handlebars. To use this secondary latch modificati these rides would also have to be equipped with aluminum handlebars. You will find aluminum handlebars quoted in your Scrambler ride Parts List.

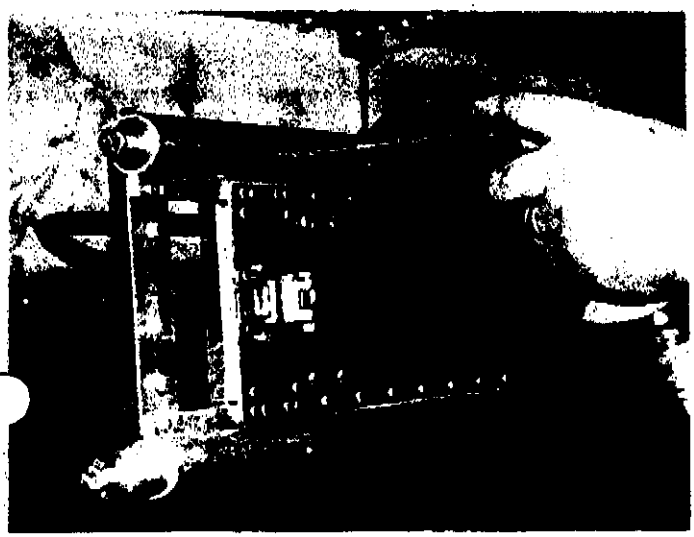
DIRECTIONS FOR INSTALLING A SECONDARY LATCH ON A SCRAMBLER RIDE SEAT



1



2

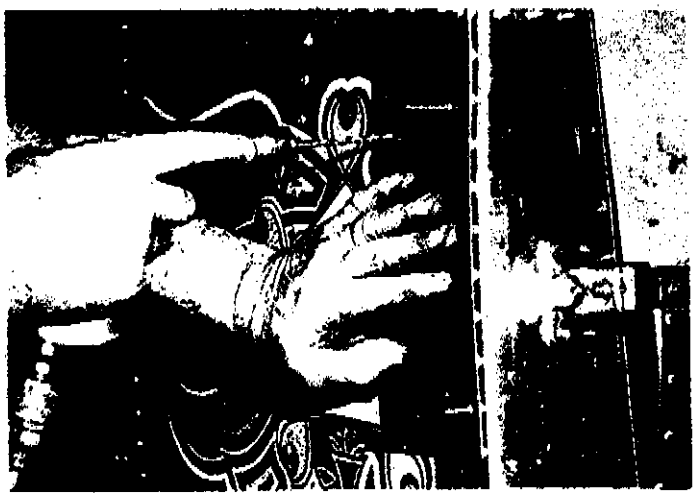


3

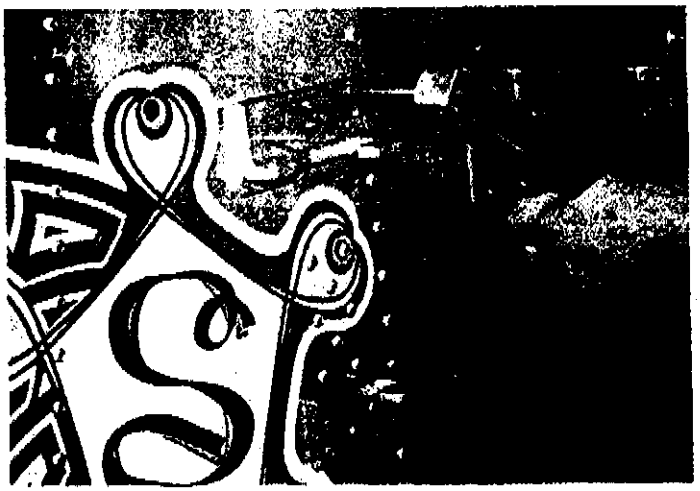
These instructions apply only to Scrambler seats equipped with aluminum handlebars.

1. Use a 5/32" punch to push out the roll pin holding each rounded knob in the end of the handlebar, as shown in Picture No. 1. Then remove the knobs.
2. Hook the handlebar drill template over the top of the handlebar and butt it against the outer end of the handlebar as shown in Picture No. 2. With a 3/16" drill, drill a hole through the front side of the tube at the top of the handlebar, and then do the same with the tube at the bottom of the handlebar. These two holes in the template are encircled in the Picture. CAUTION: DO NOT DRILL THROUGH THE BACK SIDES OF THE TUBES.
3. Each long plug has a 3/8" hex head bolt screwed in the end. Insert the plug into the tube of the handlebar, and shove it in until it is flush with the outer end of the handlebar. Turn the plug around until you can see the hole in the plug through the hole you have just drilled in the tube. Line up these two holes as well as you can. Insert the 3/16" drill all the way in and finish drilling through the back side of the tube, as shown in Picture No. 3. In this way the hole will be lined up all the way through. Install the round head, 10-24 screw, 1-¼" long, through the hole and secure it with a self-locking nut.
4. Lay the skin template against the side of the seat and locate it in position by inserting the stem of a rivet through the only hole that is in a corner of the template, and then insert the stem of the rivet through the hole in the rivet head in the top front corner of the seat. Line up the front edge of the template with the front edge of the seat, and insert the stem of a second rivet through the other hole in the front edge of the template and into the hole in the rivet head underneath the template. This locates the template accurately. There are four holes remaining in the template. Using a No. 20 drill, drill one of the holes into the seat skin, and slip a rivet through the template and seat skin to keep them lined up. DO NOT SET THIS RIVET. Then drill the second hole, which is near the first hole. See Picture No. 4. Repeat the procedure with the other two holes.
5. Remove the template and install the two brackets on the side of the seat. The top bracket is the long one, and the hook must be on the bottom side. On the bottom bracket the hook must be on the top side. The two holes located by the template for each bracket are for the top front and bottom rear rivet of each bracket. Set the two 5/32" rivets in each bracket. See Picture No. 5.

6. With a No. 20 drill, drill through the remaining four holes in the top bracket to locate matching holes in the seat skin, and then do the same with the three in the bottom bracket. Then install the 5/32" rivets.
7. Install the chain with the end link laid on top of the bracket and pointed straight out, away from the seat. The round head of the 10-24 screw (¾" long) and the washer go on the top of the chain link, and the self-locking nut goes underneath the bracket.
8. Install the handlebar bracket on the end of the handlebar with the two 3/8"-16 hex head bolts, 1" long, and be sure there is an internal lockwasher under the head of each bolt.
9. The locking pin will drop in place freely if all parts have been installed correctly.
10. This completes the installation of the secondary latch, and it is shown in Picture No. 6.



4



5

6

AREA CODE 217 PHONE 245-7145

ALL STEEL PORTABLE BIG ELI FERRIS WHEELS

Scrambler ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED
800-820 CASE AVENUE
JACKSONVILLE, ILLINOIS, 62650

TO: South Carolina Department of Labor
Columbia, South Carolina

FAX #: 803-734-9741

ATTENTION: Mr. Jim Cates

FROM: William C. Deem, P. E.

FAX #:

MAR 1992 RECEIVED DIVISION OF LICENSING

SUBJECT: Fiberglass insert in Big Eli Scrambler seats

DATE: 9 March 1992

TIME:

TOTAL PAGES: 3

CONFIRMATION REQUESTED:

P.O. #:

MESSAGE:

Some of our own requirements for the Big Eli Scrambler seat:

A. It is mandatory that there be a cushioned pad on the passenger's right.

B. The seat cushion must be 7 inches high at the front, and 3-1/2 inches at back.

C. There must be an absence of pinch points.

D. The seat cushion must be physically retained within the seat.

E. The seat cushion must be of such frictional surface to minimize sliding.

Fiberglass construction can be extremely variable in strength, depending on the resin typw and quantity, the thickness of the laminate, the orientation of the glass fibers in spray-up, mat, or woven form, and the amount of reinforcement.

We have no information about the strength of any fiberglass shell being marketed, nor the methods of manufacture. Furthermore, we have no control over any such manufacturing operation. There may or may not be inherent hazards in this

article.

Consequently, we cannot approve, recommend, or authorize the use of a fiberglass shell that may be made by others for use in Big Eli Scrambler seats. We are prepared to stand behind our own products, but we cannot be responsible for what others may or may not do.

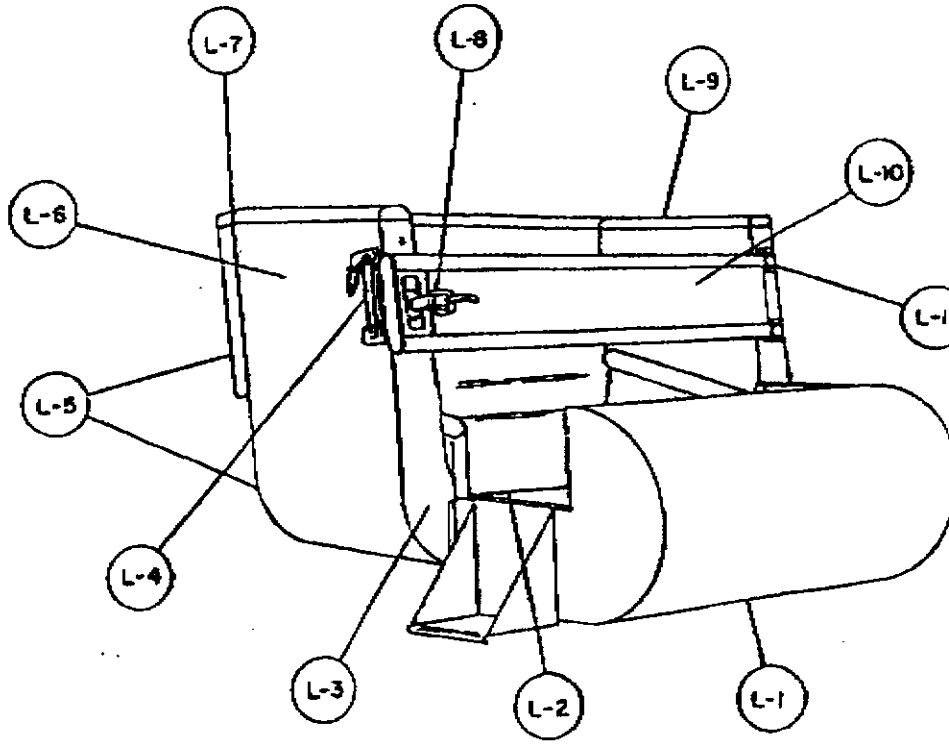
William C. Deem

William C. Deem
Registered Professional Engineer
Eli Bridge Company

L. SEAT

1. CRACKS OR RIVETS MISSING IN FOOTBOTTOM, WOOD BOARD IN BOTTOM OF FOOTBOTTOM.
2. LIP ON BOTTOM OF SEAT CUSHION EXTENDS UNDER LIP OF FOOTBOTTOM.
3. CRACKS IN FRONT RIB,
   WHERE HANDLEBAR STRIKES FRONT OF SEAT.
   WHERE HINGE BLOCKS ARE BOLTED ON.
   WHERE HANDLEBAR HINGE RUBBER BUMPERS ARE ATTACHED.
4. CALIFORNIA LATCH.
5. BACK SHEET RIVETS MISSING.
6. CRACKS OR RIVETS MISSING IN SEAT BODY, CRUSHED RIBS.
7. NO CRACKS WHERE BACK TOP TRAY CONNECTS TO END TOP TRAY, BOTH SIDES.
8. LATCH AND STRIKER ENGAGEMENT, ROLLER IN STRIKER FUNCTIONING.
   BENT OR CUT STRIKER.
   AT LEAST 1/4" ENGAGEMENT, WHERE SEAT STRUCTURE IS SOUND.
   CHECK FOR LATCH BODY AND SLIDING BOLT WEAR.
9. NO DRY ROT IN WOOD BOARDS, REMOVE BOARDS TO CHECK FOR CRACKS IN STRUCTURE UNDERNEATH.
   BOARDS SHOULD BE FREE OF SPLINTERS.
10. ON BACK OF HANDLEBAR, RUBBER BUMPERS IN PLACE.
    WARNING DECAL FULLY READABLE.
    LAP BAR BOLTS TIGHT AND BAR SWINGS FREELY.
    HANDLEBAR WEB NOT WORN THROUGH WHERE LAP BAR BUMPS.
11. NYLINERS AND HINGE PINS SNUG.

NO HOLES WORN THROUGH INSIDE SKIN UNDER SEAT CUSHION. REPAIR PATCHES TO BE MADE OF STRUCTURAL ALUMINUM, NOT STEEL OR SOFT ALUMINUM.
SEAT EQUIPPED WITH END CUSHION AT RIGHT END.
NO BROKEN AIR-LOCKS, IN SEAT, FOOTBOTTOM, OR STEP.



of 270 pounds. Total passenger weight on the Wheel: Six seats at 270 pounds for a total of 1,620 pounds.
4. Revolutions per minute: 7.0 RPM.
5. Direction of travel: Counterclockwise rotation when viewed from the operator's position.

The Little Eli Wheel (Trailer-Mounted):

1. Height restrictions: Passenger must be no more than 48" tall in order to ride. Very small children must be accompanied by a larger child.
2. Weight restrictions: None, except as limited by the available space in the seat. ASTM Code requires a load capacity of 90 pounds per person.
3. Passenger weight per seat: Three 90 pound persons for a total of 270 pounds. Total passenger weight on the Wheel: Six seats at 270 pounds for a total of 1,620 pounds.
4. Revolutions per minute: 7.0 RPM.
5. Direction of travel: Counterclockwise rotation when viewed from the operator's position.

The Standard Big Eli Scrambler:

1. Height restriction: Passenger must be a minimum of 48" tall in order to ride alone.
2. Weight restrictions: None, except as limited by the available space in the seat. ASTM Code requires a load capacity of 170 pounds per person.
3. Passenger weight per seat: Three 170 pound persons for a total of 510 pounds. Total passenger weight on the Scrambler: Twelve seats at 510 pounds per seat for a total of 6,120 pounds.
4. Revolutions per minute: 11.4 RPM.
5. Direction of travel: Center pole turns clockwise when viewed from above, and the unit poles turn counterclockwise.

The Deluxe Big Eli Scrambler:

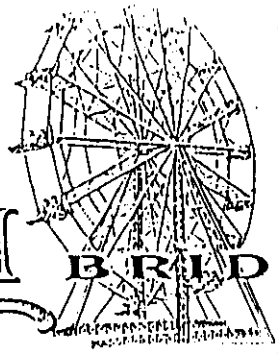
1. Height restriction: Passenger must be a minimum of 48" tall in order to ride alone.
2. Weight restrictions: None, except as limited by the available space in the seat. ASTM Code requires a load capacity of 170 pounds per person.
3. Passenger weight per seat: Three 170 pound persons for a total of 510 pounds. Total passenger weight on the Scrambler: Twelve seats at 510 pounds per seat for a total of 6,120 pounds.
4. Revolutions per minute: 11.4 RPM.
5. Direction of travel: Center pole turns clockwise when viewed from above, and the unit poles turn counterclockwise.

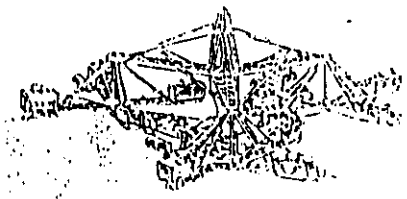
The T.M.S. Scrambler (Trailer-Mounted):

1. Height restriction: Passenger must be a minimum of 48" tall in order to ride alone.
2. Weight restrictions: None, except as limited by the available space in the seat. ASTM Code requires a load capacity of 170 pounds per person.
3. Passenger weight per seat: Three 170 pound persons for a total of 510 pounds. Total passenger weight on the Scrambler: Twelve seats at 510 pounds per seat for a total of 6,120 pounds.
4. Revolutions per minute: 11.4 RPM.

IED 1/15/92

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS





Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY

INCORPORATED
800-820 CASE AVENUE
JACKSONVILLE, ILLINOIS, 62650

8 June 1979

TO WHOM IT MAY CONCERN:

There have been brought to our attention perhaps three instances where the socket head shoulder screws holding the 138 tooth internal gear to the bottom side of the rotating base have loosened. In one case, all 12 shoulder screws backed out, the gear came completely loose, and dropped down. Since more than 450 Scramblers are in service, this has been a problem for no more than about 1% of them, so far as we know. We do not believe this is a high risk situation, but after first learning of these screws loosening, we have drilled the heads of the shoulder screws and secured them to each other in pairs with safety wire on all succeeding Scramblers, beginning with Serial No. 402 delivered in 1973.

We do recommend that where a customer finds ANY ONE of the screws loose, that the screws be removed one at a time, drilled with a .125" diameter hole through the head of the screw, .141" (9/64") down from the top of the head, be replaced and then safety wired in pairs of shoulder screws using three feet of 19 gage stove pipe wire. The safety wire should be installed in such a way that it will tighten if either, or both, of the screws start to back out.

We have never used safety wire on the bolts holding the six ball bearing pillow blocks supporting the three rotating base drive shafts. While we have no objection to this, it has not been our recommendation.

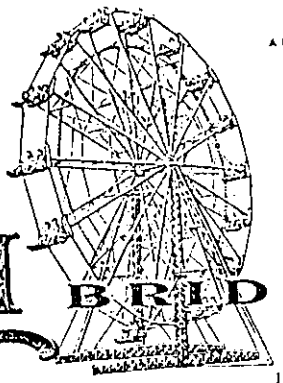
William C. Deem

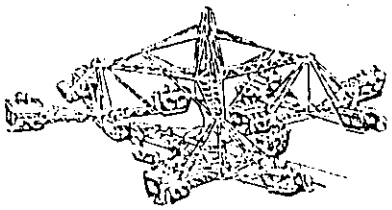
William C. Deem
Chief Engineer
ELI BRIDGE COMPANY

RECIEVED 1/15/92

AREA CODE 217 PHONE 245-7145

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS





Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED
800-820 CASE AVENUE
JACKSONVILLE, ILLINOIS, 62650

INSTRUCTIONS FOR REPLACING OIL SEAL IN SCRAMBLER PINION CASTING ASSEMBLY

The original seal used in the pinion casting assembly was a Chicago Rawhide "Perfect" oil seal Part No. 15245. The manufacturer discontinued that seal, and we could not find an interchangeable replacement from any other manufacturer. The closest seal in size was a Chicago Rawhide Part No. 15250. The original seal had an outside diameter of 3.066", and the replacement had an outside diameter of 3.130".

Therefore, to replace the seal it is necessary that the pinion casting assembly be disassembled and the casting re-bored to 3.125" $\pm$ .0015".

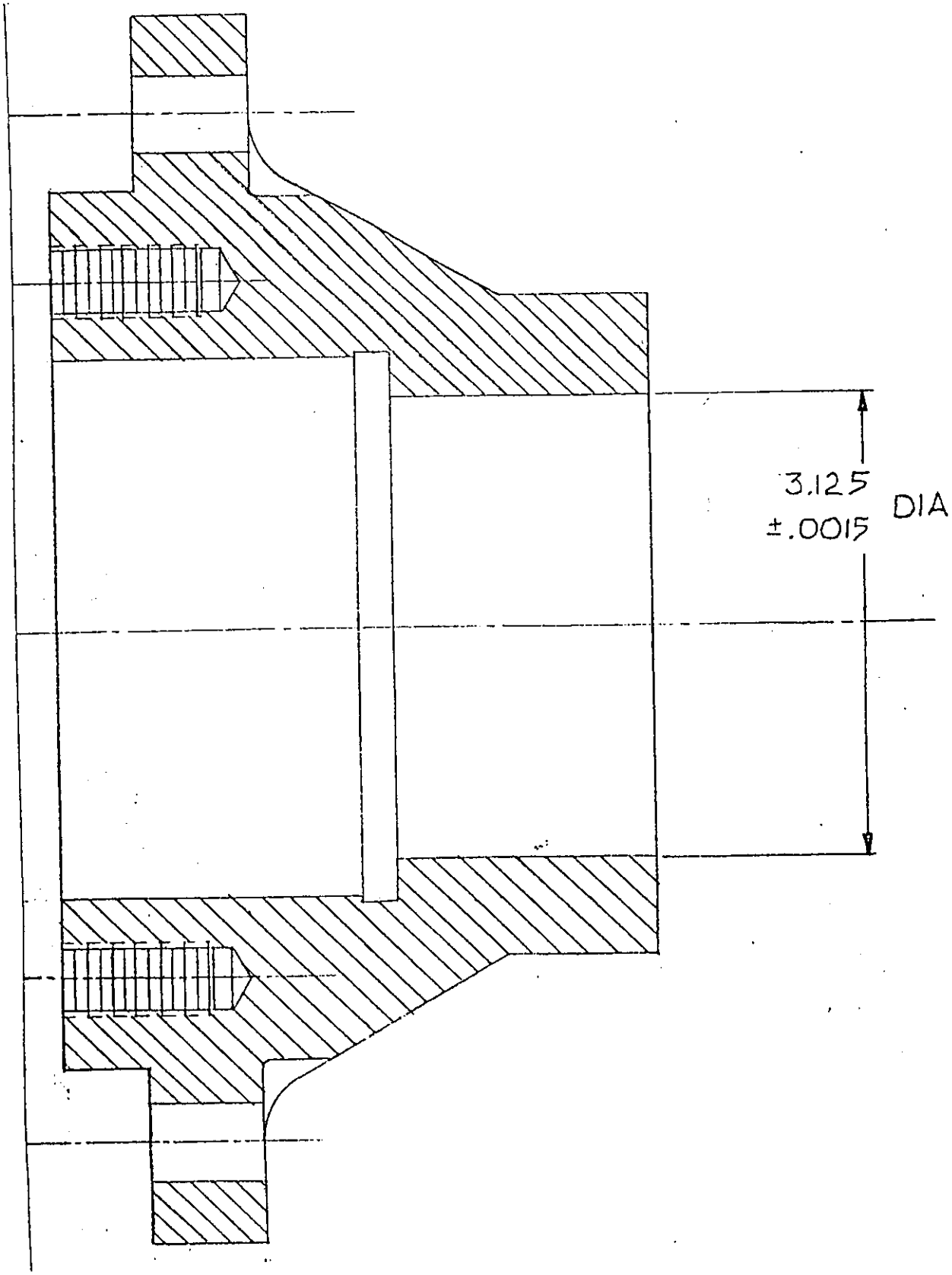
The following procedure should be used:

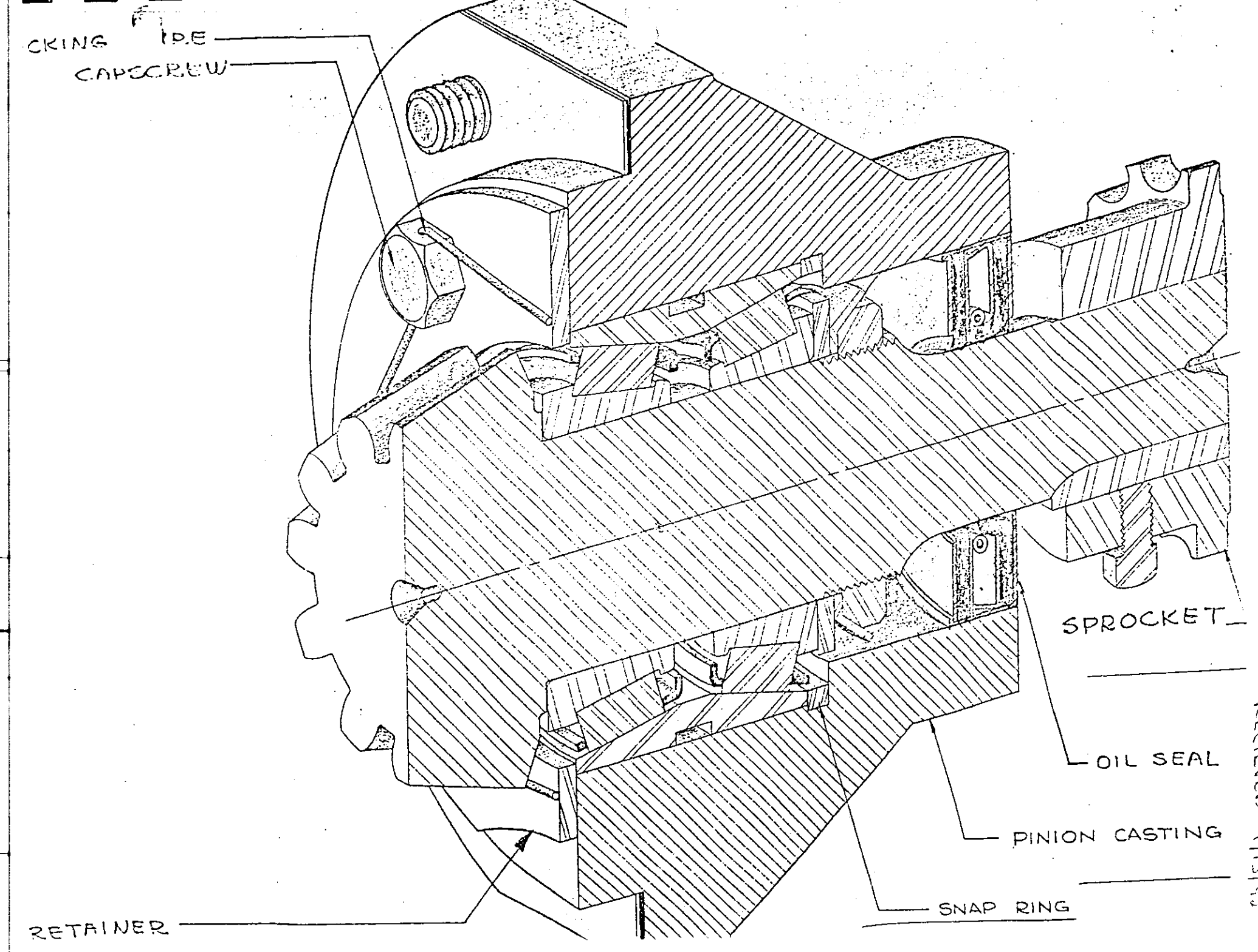
1. Remove the pinion casting assembly from the Scrambler, by taking out the six cap screws that secure it to the stationary base gear pot cover plate.
2. Remove the chain sprocket from the end of the shaft.
3. Remove the locking wire. It is 19 gage, dead soft iron wire, two feet long. When the time comes to replace it, thread the wire through the bolt heads so that loosening of the bolt will cause the wire to tighten, and then twist the ends of the wire together tightly with four turns to keep it from unwinding.
4. Remove the six cap screws that were wired together. This releases the flat ring bearing retainer so that it can be removed from the casting along with the bevel pinion gear, bearing, hardened washer, lock washer, and adjusting nut. All of these parts come out together and do not need to be disassembled.
5. The snap ring stays in the casting and is not to be removed.
6. The casting can then be re-bored to 3.125" $\pm$ .0015".
7. Then, re-assemble all the parts, and install it on the Scrambler

Special Machining Instructions:

The pinion casting was originally machined by gripping the casting at the small end in a three-jaw chuck. All the turned faces on the casting were finished from that one setup except for the facing off of the small end, and that was done after the rest of the machining was completed by reversing the casting in the chuck and gripping it on the large diameter locating shoulder. To re-bore the casting to the new larger diameter, grip the casting in a three-jaw chuck on the large diameter as if you were going to face off the small end. Check the original seal diameter with a dial indicator to be sure that the bore is running true before re-boring to 3.125" $\pm$ .0015".

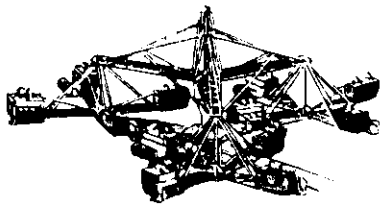
RECIEVED 1/15/92




CKING
P.E
CAPSCREW
SPROCKET
OIL SEAL
PINION CASTING
SNAP RING
RETAINER

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS

AREA CODE 217 PHONE 245-7145



Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED
800-820 CASE AVENUE
JACKSONVILLE, ILLINOIS, 62650

May 19, 1977

RE: Scrambler Ride Unit Poles

Dear Scrambler Ride Owner:

Last August 12th you were sent a letter warning about possible cracks in the Unit Poles of the BIG ELI Scrambler ride. We informed you that two such cases had been reported to us, that those Unit Poles had been secured and sent away for testing, and that we would be in contact with you again as soon as test results were received. At long last we have received and evaluated the report from the consulting firm in Urbana, Illinois.

A copy of "Conclusion Based on Examinations" is enclosed. The entire report is available for examination at our office.

As indicated by the enclosed, the hairline crack reported in our August 12th letter was not confirmed by this examination. So, the only crack/fracture that we definitely know about is the one that occurred on June 2, 1976, as the result of a Unit Pole being dropped from the back of a semi-trailer onto a hard ground surface. Although our letter of last August was sent to all owners of BIG ELI Scrambler rides, no further reports of cracked or fractured Unit Poles have been received.

You will notice that the opinion expressed by the enclosed indicates that the failure that did occur on June 2, 1976 was "the result of the application of a dynamic load when the unit was dropped and impacted the ground surface", not a failure resulting from normal operation. So, based on the examinations performed at Urbana, Illinois, and the lack of any substantiating reports of cracks on any other Scrambler ride, it would seem there appears to be no reason for further concern.

HOWEVER, the full report does include two recommendations which need to be specifically mentioned at this time:

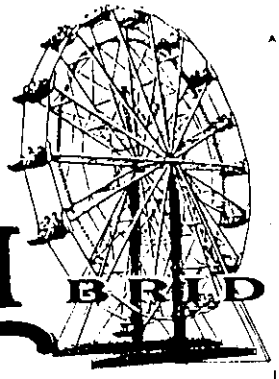
(1) The report does recognize that the material now being used in the construction of Unit Poles is superior to that which was used prior to 1969, with the recommendation that, "This practice should be continued and owners should be encouraged to replace the (unit) poles on their (older) model equipment if they have any reservations."

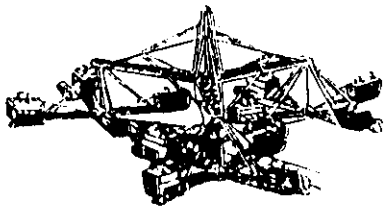
(2) With reference to the older style unit poles, the report further recommends, "Most importantly, extreme care should be exercised in loading, unloading, assembly and disassembly of the unit (pole). Impact loads, unnecessary and potentially harmful distortions, mishandling or other abuses of the poles must be avoided."

RECIEVED 1/19/92

AREA CODE 217 PHONE 245-7145

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS





Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY

INCORPORATED
800-820 CASE AVENUE
JACKSONVILLE, ILLINOIS, 62650

July 10, 1976

Dear Scrambler ride Owner:

RE: Removable Slip Clutch & Pinion Assembly for BIG ELI Scrambler ride.

Beginning with BIG ELI Scrambler ride Serial No. 92 (1959 model) all new Scrambler rides have been equipped with a Removable Slip Clutch and Pinion Assembly in the bottom sweeps. This has been a major improvement to the ride, permitting the clutch assembly to be removed from the sweep for easier replacement of the clutch disc or other clutch maintenance.

The removable slip clutch assembly was designed for long life and easier maintenance and can, with the slight modification that is necessary, be fitted to older model Scrambler rides. This is a modification that can be made "in the field", and many owners of earlier models have already made this conversion. If your Scrambler ride has not already been so modified then this letter is MOST IMPORTANT TO YOU.

Although the old style slip clutch assembly and drive shafts were discontinued as standard equipment seventeen (17) years ago we have, as a service to owners of these older model rides, continued to make repair parts for this obsolete clutch equipment available. We will continue to furnish clutch discs and other parts as long as our current limited stock will permit. However, circumstances beyond our resonable control make it necessary to inform owners whose rides were originally equipped with the older style clutches that certain castings and other parts will no longer be available.

It is therefore recommended, if you have not already done so, that you convert your Scrambler ride to the new style removable slip clutch assemblies at this time. You will find the items necessary for this conversion listed on page 16 of your current Scrambler Ride Parts List, as follows:

3 #24A1 000 Long Drive Shaft Group @ $377.75 each	$1,133.25
3 #RC-6018 Coupling Chain @ $6.70 each	20.10
3 #24A3 000 Removable Slip Clutch & Pinion Assy. @ $526.40 ea...	1,579.20
Total Cash Price, f.o.b. our factory	$2,732.55

We encourage that you purchase and install this equipment on your Scrambler ride at your very earliest convenience.

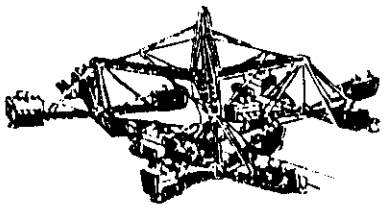
Very truly yours,
ELI BRIDGE COMPANY

Parts Department

RECEIVED 1/15/92

AREA CODE 217 PHONE 245-7145

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS



Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED
800-820 CASE AVENUE
JACKSONVILLE, ILLINOIS, 62650

August 15, 1975

RE: BIG ELI Scrambler ride, equipped with A/C gasoline motor power.

Dear Friend:

Of major concern to you and to us has long been the operator who overspeeds the Scrambler ride. Your operator may be doing this without your knowledge. We would certainly hope he is not doing it with your approval. Operating the Scrambler ride beyond recommended maximum speed can damage the equipment itself, and it can present circumstances that lead to passenger injury.

Even though the maximum operating speed of the gasoline motor unit is pre-set before the equipment leaves our factory, we do recognize that some operators find ways to by-pass this setting in order to operate the ride in excess of recommended capacities.

You should be interested in the facts that are outlined on the reverse side. The man who operates your Scrambler ride at excess speed is damaging your equipment; he is discouraging people from riding, or at least from riding the second time; and, in some cases, he is even injuring your customers. Many persons cannot take the excessive speed without getting bruises or even broken bones.

To avoid this overspeeding problem, some owners have replaced their gasoline motor with the electric motor unit. Others have been reluctant to do this because of the cost involved or because their gasoline unit is still serviceable. There are others who prefer the sound of the gasoline motor operating, feeling it provides "action advertisement" for the ride.

We are pleased to inform you that it is now possible to effectively limit the maximum operating speed of the gasoline motor unit - at very reasonable cost. The enclosed brochure will introduce you to an overspeed device that has been designed for this specific purpose. It measures the operating speed of the motor. If your operator cheats on the speed of the ride, with this equipment installed, the red warning light will come on and the gasoline motor will "shut down" until it comes back to recommended speed.

As you can see by the enclosed instructions, this is equipment that you can easily install. Your cost, f.o.b. our factory, is $325.00. We have these units in stock, available for prompt shipment following receipt of your firm order.

Very truly yours,
ELI BRIDGE COMPANY

Robert L. Garner

RLG/pc
Encl: 2

RECIEVED 1/15/91

W A R N I N G

The BIG ELI Scrambler ride should never be operated beyond the maximum recommended top speeds --

11.0 revolutions per minute of the center pole, when powered with gasoline engine;

11.4 revolutions per minute of the center pole, when powered with electric motor.

The following table will show what happens to the loads on the structural members, and the seats, when the speed is increased beyond the recommended maximums:

Center Pole Speed (R.P.M.)	Per Cent of Overload	Approx. force against end of Seat with 600 lb. passenger load
11.0	.0%	695 lbs.
11.4	7.4%	747 lbs.
12.0	19.0%	827 lbs.
12.5	29.1%	897 lbs.
13.0	39.6%	970 lbs.
14.0	61.9%	1,125 lbs.
15.0	85.9%	1,292 lbs.
16.0	115.0%	1,494 lbs.

Your operator may tell you that it "is necessary" to operate at 12 or 14 or 16 r.p.m. in order to give the customers a "good" ride, and that "it doesn't hurt the equipment". DON'T BELIEVE HIM. Look at the above figures. At the recommended maximum speed of 11 r.p.m., three 200 lb. passengers will exert a force against the end of the seat of approximately 695 lbs. But at 16 r.p.m. these same three people are exerting a force twice as great, equal to having six 200 pound people in the seat.

It is obvious from these figures that going above the recommended maximum speeds can very quickly put excessive structural loads on the Scrambler ride's load carrying members, loads for which they were not designed. But of even greater importance, this is very hazardous to the passengers.

You would not allow your operator to load four, five, or six 200 lb. adults into each seat of the ride, even if he could manage to squeeze them in. You know this would overload the ride. You know this would be dangerous for the passengers. You would prevent this from happening.

Keep in mind that operating the ride at faster than recommended speeds ALSO overloads the ride, almost as though your operator was putting additional people into every seat.

It has been demonstrated that excessive speeds are not necessary to get good business with the Scrambler ride. One Scrambler ride reportedly carried over one million passengers in a single year, and it was operating at less than the maximum recommended speed.

INSTALLATION OF OVERSPEED SWITCH FOR ALLIS-CHALMERS ENGINE

I INTRODUCTION

The Scrambler Overspeed Switch is an electronic sensor that mounts on the Scrambler Power Unit. It receives speed information directly off the ignition system. When the engine is run above the recommended speed, the Overspeed Switch momentarily shuts down the engine and lights the warning lamp. The switch has been designed to fit all Allis-Chalmers Generator Equipped Power Units that retain their original equipment. When properly installed and maintained, the Overspeed Switch will insure operation of your Scrambler within recommended RPM. Any attempt to overspeed the Scrambler beyond its rated maximum centerpole speed of 11 RPM will cause the warning light to go on and the engine to slow to the recommended speed.

II The following parts are needed for the installation:

1) one Overspeed Switch assembly with wiring harness (see Figure 1)
2) four 5/16 X 3/4"hex head bolts
3) four 5/16" Esna nuts
4) one lamp assembly with wire and sleeve (see Figure 2)
5) seven 5/32" pop rivets
6) three #8 plain washers
7) three 1/8" plastic wire clamps

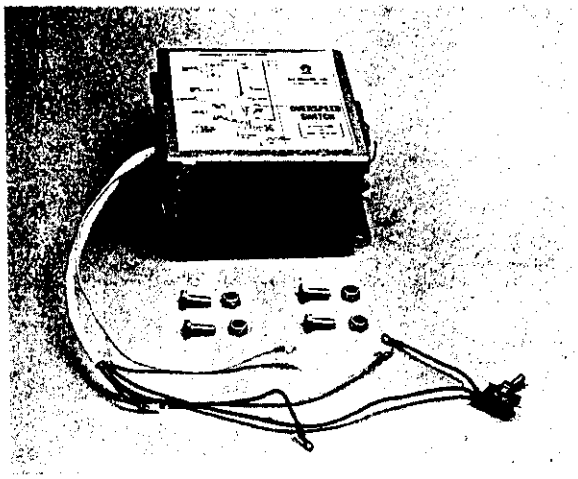


FIGURE ONE

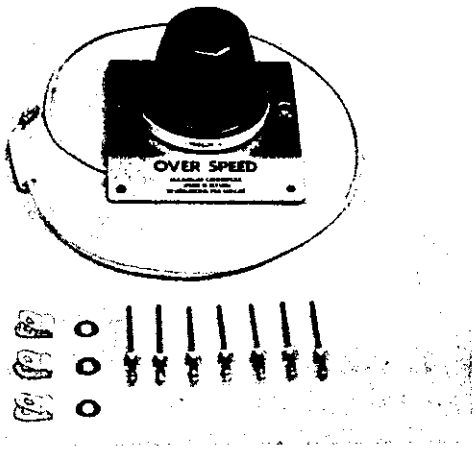


FIGURE TWO

III MOUNTING THE BOX

1) Locate the box on the Power Unit as shown in Figure three, with the top and side of the flange flush with the upper corner of the angle beam. Mark the four holes. Also see Figure Nine.
2) Centerpunch the marks on the angle beam. Drill first with a small drill like 1/8, then redrill with a 3/8 size.
3) File the burrs from the holes.
4) Bolt on the box. The wiring harness should face the engine.

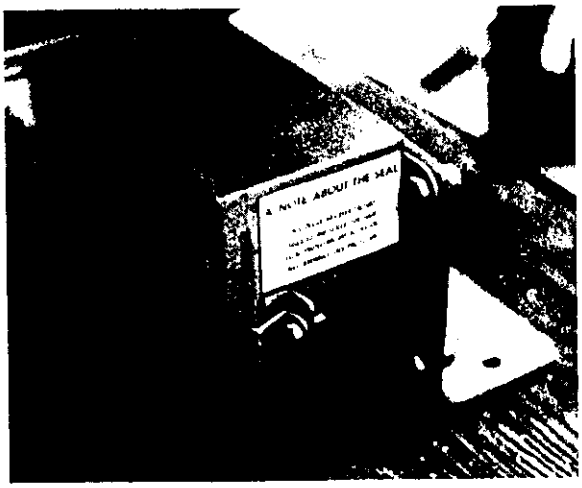


FIGURE THREE

IV MOUNTING THE LAMP

1) Use the paper template as shown in Figure 4 to locate two of the five lamp mounting holes. Centerpunch one corner hole and the off-center hole. Drill the corner hole 5/32" and the off-center hole 3/8".

2) The red warning lamp assembly has a wire protruding. Thread this wire thru the 3/8 hole in the engine cowling. Insert a rivet in the drilled corner hole. The part of the lamp mounting plate that reads "OVERSPEED, maximum centerpole speed, eleven revolutions per minute" should face the brake lever side, see Figure 5.

3) Drill out the remaining three corner holes using the lamp plate as a guide. Insert and set the four rivets.

4) Next, the yellow wire will be clamped in several places inside the hood to keep it away from the fanblades. Figure 6 shows the three locations of the clamps. An easy way to line up the holes is to drop a weighted string over the brake lever side of the hood. Lay it over the rivet that is 1-1/2" from the hood joint as shown. Pencil in this line down the side of the engine cover. Then, using the top and bottom hood bolts, locate the holes on the vertical pencil line using the dimensions from Figure 6. Centerpunch and drill the holes to 5/32".

5) Slip one of the plastic wire clamps on the yellow wire so that the hole is to the left of the wire, refer to Figure 6. Position the clamp behind the top hole. Make sure the wire lays along the inside of the hood. Insert a rivet from the outside and a washer on the back of the clamp. Set the rivet.

6) Do the same for the middle rivet, making sure that the wire lays smoothly along the inside of the sheet metal. The wire is exposed between the middle and bottom clamps. This path keeps it straighter.

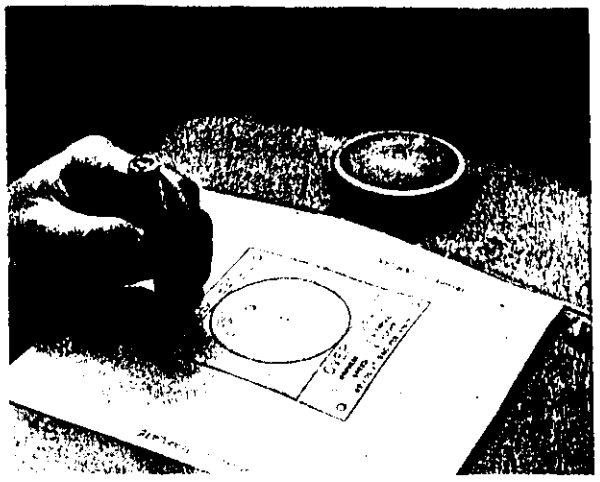


FIGURE FOUR

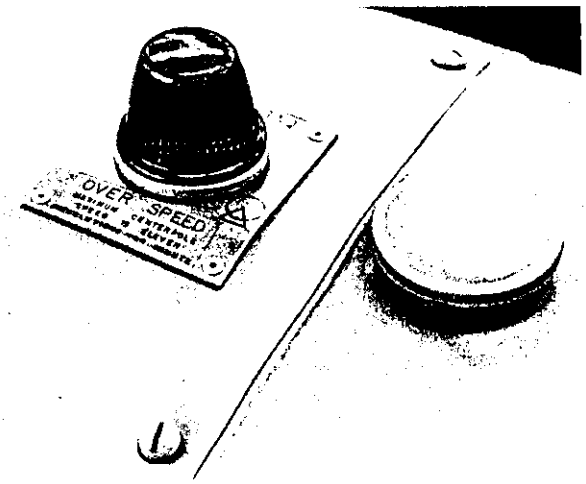


FIGURE FIVE

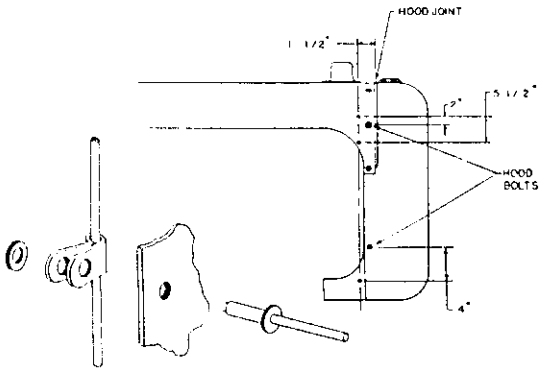


FIGURE SIX

7) Bring the yellow wire from the Overspeed Switch box up thru the small hole shown in Figure 7. Slip a clamp on it and rivet like the other two, at the bottom hole. The spade connector should be just above the clamp.
8) Connect the two yellow wires. Slip the insulating sleeve down over the joint. This joint permits the lamp to be unplugged for removal of the engine hood during servicing.

FIGURE SEVEN

V CONNECTING THE WIRING HARNESS

1) Temporarily disconnect the battery for this last section.
2) Find the larger of the two holes to the right of the ammeter. Drill it out to 1/2".
3) Insert the toggle switch attached to the red wire thru the hole from the back. The ON/OFF plate should be on the front, with the knurled nut over it. OFF should be down. Make sure the switch is off. Figure 8 shows the installed toggle switch.
4) Connect the short red wire from the toggle switch to the battery negative on the ammeter. This is the terminal closest to the battery. Also refer to the diagram on the Overspeed Switch box.
5) Connect the white wire to the same side of the starter button that is connected to the starter solenoid.
6) Loosen the nut holding the keyswitch so that the switch can be rotated for better access. Connect the black wire to the keyswitch terminal.

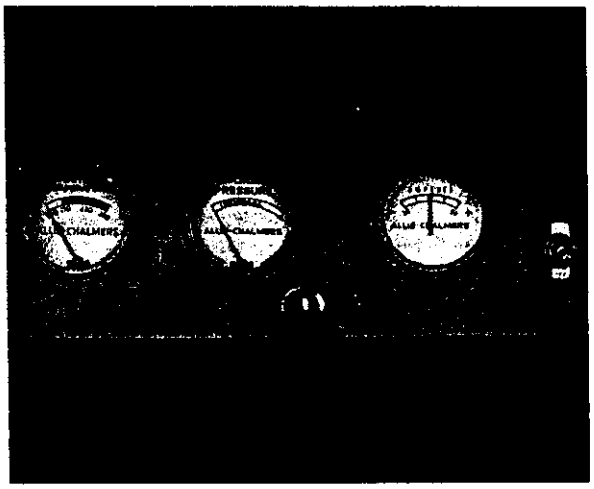


FIGURE EIGHT

7) Connect the green wire to one of the nuts on the temperature gage. This is a convenient grounding place.
8) Recheck all the wiring. All the connections need to be made for proper operation.
9) Reconnect the battery. The completed installation is shown in Figure 9.

VI TESTING

1) With the engine off, turn on the toggle switch. The warning lamp should come on.
2) Turn on the keyswitch and press the starter as you would normally do.
3) The engine should start and the warning lamp should go out. This is normal running. Dimness in the lamp indicates low battery. The engine won't start without full battery voltage.
4) To test overspeed, push the governor linkage on the instrument panel side of the engine. The warning lamp should light at overspeed, and the engine will stop firing. Releasing the linkage will return the engine to normal running. Continuous holding of the linkage will cause backfiring as the Overspeed Switch cuts in and out, causing possible damage to the engine block.

VII OPERATION

The only change in operating procedure is in turning on the toggle switch before starting the engine. This applies power to the Overspeed Switch. The engine will not start or run without it. The toggle switch should be turned off when the engine is shut down. If it is not, the warning lamp will light as a reminder.

If you have any questions, call ELI BRIDGE COMPANY at (217) 245-7145.

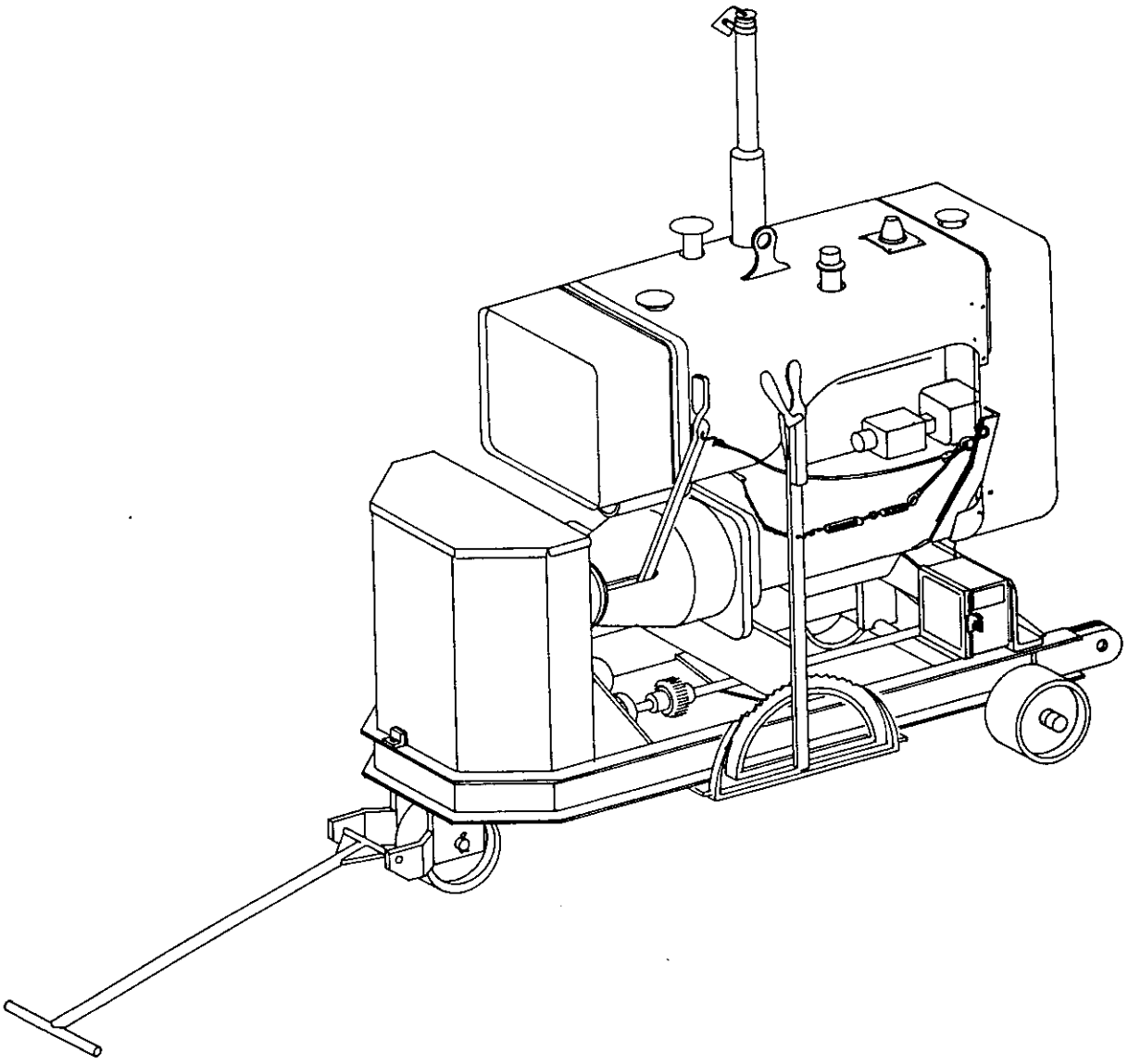


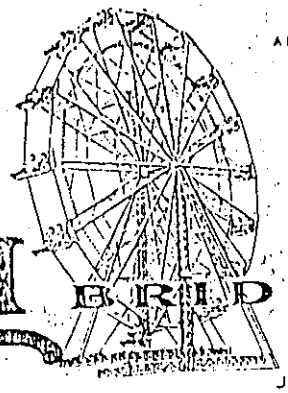
FIGURE NINE

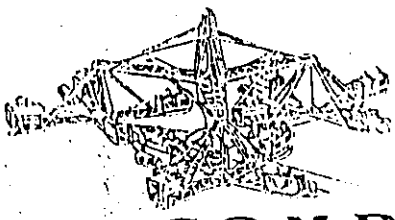
OVERSPEED SWITCH MOUNTED ON ALLIS-CHALMERS POWER UNIT

AREA CODE 217 PHONE 245-7145

RECIEVED 1/15/93

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS





Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY
INCORPORATED

JACKSONVILLE, ILLINOIS, U.S.A.

March 11, 1968

Dear BIG ELI Scrambler Ride Owner:

In limited instances it has been reported to us that a slight crack, and even a complete break, has occurred in one or more of the three Unit Poles of a Scrambler ride. When this happens it can be a severe hazard to any passengers who may be riding at the time.

In all cases known to us the crack or break has occurred immediately above the top of the four gusset plates of the Unit Pole. Due to the seriousness and similarity of this problem, we turned the matter over to an outside firm of consulting engineers for critical study and solution. Their investigation revealed that this failure is caused by operation of the ride at speeds in excess of that which is recommended by Eli Bridge Company.

This finding is further supported by the fact that, to date, the failure has occurred only on Scrambler rides that have been powered by gasoline motor. It seems operators have the ability to bypass factory-set speed limitation on gasoline motors and "goose" the ride to excess speeds, but have difficulty doing this when the ride is equipped with electric motor power. But there is no way to guarantee that this problem will not occur on electric motor powered Scrambler rides in the future.

To avoid this problem in the future, the consulting engineers have made two recommendations. First, DO NOT allow your operator to "goose" the ride to speeds in excess of those recommended by the factory (the centerpole of the ride should not turn more than 11 rpm when powered with gasoline motor, or, 11.4 rpm when powered with electric motor). Second, they have strongly recommended that all Scrambler rides presently in operation be equipped with additional gusset plates, as shown on the attached drawing. These extension to existing gusset plates are designed to give the Unit Poles proper strength and safety - even though a crack may have already begun to form immediately above the original gussets.

It has been plainly stated that this failure is caused by improper operation, not by a design failure. However, we do recommend and strongly encourage that you immediately add these extension gusset plates to your Scrambler ride - BEFORE you begin your 1968 season's operation. These plates can easily be installed in your own winterquarters, or by a local machine/welding shop.

RECIEVED 1/15/92

To further encourage this, Eli Bridge Company will make these extension gusset plates available to all Scrambler ride owners without charge --if ordered promptly. Your only cost of this shipment would be the transportation costs. We have these plates in stock, available for prompt shipment on receipt of your order.

An Order Sheet, with the extension gusset plates listed, and a postage paid envelope are enclosed for your convenience. Simply enter your name and address as to where the shipment is to be made, and return the Order Sheet to us. The plates will be shipped promptly. If you were already planning to order other parts at this time, do not hesitate to add those items to this same Order Sheet.

We believe you will find that these gusset plate extensions add to the appearance of the Unit Poles. As a matter of fact, we have already adopted this design for Unit Poles being furnished with new model BIG ELI Scrambler rides.

Do not delay, order and install these extension plates immediately. We will make these plates available on a "no charge" basis for a limited time only.

Yours very truly,

ELI BRIDGE COMPANY

Richard L. Garner

RLG:fn
Encl:
U.P.drawing
Order Sheet
envelope

MFG.: ELI BRIDGE CO
NAME: BIG ELI SCRAMBLER
TYPE: NON-KIDDIE

HISTORICAL

Operation and Maintenance DATA of

Big Eli Scrambler

ELI BRIDGE COMPANY
800 CASE AVENUE
JACKSONVILLE, ILLINOIS 62650
PHONE 217/245-7145

OPERATION AND MAINTENANCE OF BIG ELI SCRAMBLERS

Big Eli Scramblers first went into service in 1954. Nearly every Scrambler delivered since that time is still in service. From the beginning the Big Eli Scrambler was designed and built for easy operation, maintenance, and replacement of parts as needed. Eli Bridge Company has always been ready to help with any problems that occur. Owners and operators have called or written the factory about their problems of operation and maintenance, and through the years these problems have tended to be much the same. These suggestions cover those questions most frequently asked. This manual is divided into four parts: 1) Operation; 2) General Maintenance; 3) Seats; and 4) Lubrication. Each part is in alphabetical order, with cross-referencing to help you to find the information you need. Keep this manual handy, and it should help you to solve many of the problems that arise. If you have a problem that is not covered, do not hesitate to contact the factory.

OPERATION

Every operator should read and understand these instructions thoroughly before operating the Scrambler.

The Big Eli Scrambler Ride has been carefully designed and built with the safety of your passengers in mind. It will provide thrilling entertainment for your patrons if properly operated and maintained. As with any amusement ride, careless operation of the Scrambler can cause unnecessary risk to people. Proper maintenance of the Scrambler is essential. Passengers must not be allowed to misbehave.

Vigilance on the part of the operator can prevent accidents. The operator must watch the ride at all times, and refuse rides to any person that, in his opinion, might be in danger.

The operator must not become careless, because the Scrambler is a fast ride which involves high accelerations and decelerations, and any person leaving his seat when the ride is in motion is almost certain to be severely injured. Overspeeding can cause accidents. Do not exceed 11.0 rpm with a gasoline engine, nor 11.4 rpm with an electric motor drive.

ALCOHOL AND DRUGS. See "Drugs and Alcohol".

BALANCING THE PASSENGER LOAD.

Balancing the Scrambler is not important. Your passengers will get a greater thrill if other passengers are in seats on other unit poles, but the Scrambler itself will operate very well even though it is not balanced. With one seat fully loaded you will have just about the maximum out-of-balance condition possible. The slip clutch built into each bottom sweep compensates for this out-of-balance by slipping when the load on the gear teeth is the highest. Occasionally, the slip clutch squeaks as it slips, but if this happens it is merely the friction surfaces rubbing against each other, and is no cause for concern.

Check the slip clutches when the Scrambler is stopped and the brakes are set. Push on any seat, and it should require a good, hard push to slip the slip clutch, but you should be able to slip it.

There is a second way to observe the action of the slip clutches. The factory load test consists of putting 600 pounds in each of the 12 seats, bringing the ride up to full speed, and then braking it to a stop. Under this kind of loading condition, when the center pole is stopped as quickly as possible, the unit poles will continue to turn and come to a stop about 10 seconds after the brake has been applied. If the clutches are adjusted properly all three unit poles will stop turning at almost exactly the same time. If all 12 seats are empty, then the three unit poles should stop turning at the same time as the center pole.

A third way, and perhaps the easiest way, to observe the action of the slip clutches is to operate the Scrambler with no one in any of the seats. Bring it up to full speed, and then set the brakes quickly and firmly. All three unit poles should stop turning at the same time as the center pole stops. If any one of them keeps on turning, then the slip clutch is not adjusted tight enough. Tighten the clutch springs to a uniform height of 1-3/32", or tighter if necessary to get the unit poles to stop turning when the center pole does. Be sure to adjust <u>all</u> the springs on one slip clutch to the same height.

Humid weather may cause the slip clutches to tighten up a little, and normal wear may cause them to loosen a little, but frequent adjustment is not necessary.

Inspect them frequently to be sure that the clutch disks are dry and have no grease on them. Replace any greasy clutch disks you find; do not try to clean them.

<u>BRAKE OPERATION</u>.

The brakes are adjusted at the factory so that the Scrambler can be stopped from top speed in 2/3 of a revolution of the center pole.

When the Scrambler, with a full load of passengers is stopped quickly, the unit poles will continue to turn for a short time after the center pole has stopped. The brakes should be adjusted for a complete stop with a full load in at least 10 seconds. Do not make a practice of stopping rapidly, because a smoother stop will be easier on the Scrambler. However, you should know that your brakes are good, and you should check them each time you erect the Scrambler. A good way to stop the Scrambler is to pull back on the brake ratchet handle until the engine idles, but don't move it back so far that it begins to tighten the brake cable. Let the Scrambler slow down by itself for one revolution of the center pole, and then gradually tighten the brakes so that it comes to a complete stop in one more revolution of the center pole.

<u>DRUGS OR ALCOHOL</u>.

It is obvious that an operator who is under the influence of drugs or alcohol is a serious hazard to his passengers and under no circumstances should be permitted to operate the Scrambler.

It is extremely dangerous to allow anyone under the influence of drugs or alcohol to get on the ride, for they often attempt to stand up or to extend their arms from the seat. The seats pass each other at 50 MPH, and a hand outstretched from one seat cannot touch another seat, but can touch another outstretched hand from another seat. Such practices are likely to result in injuries to the passengers.

If any passenger misbehaves in any way, STOP THE RIDE IMMEDIATELY. Refuse rides to any person who might endanger himself or others.

ELECTRIC MOTOR SPEED. See "Speed of Operation".

GASOLINE ENGINE SPEED. See "Speed of Operation".

HANDLEBAR, LOCKED. See "Passenger Safety".

LATCHED HANDLEBAR. See "Passenger Safety".

LENGTH OF RIDE.

The main purpose of any amusement riding device is to please the passengers so that they will come back and bring their friends with them. Most operators find that the Scrambler should not be operated for more than 1-1/2 minutes, with each passenger load. Give your riders a chance to get used to the ride. Bring it almost to top speed and hold it there for most of the ride, then finish with a couple of revolutions at top speed. Changing the speed is the only way to give variety to the ride. However, the Scrambler does not change speed rapidly, but requires 15 to 20 seconds to reach top speed, so gunning the engine will have almost no effect on the motion. What does happen is that after the ride has been slowed, preparatory to gunning, the acceleration back to full speed will add nothing to the thrill of the ride. If you think you have a better system, we suggest that you take a ride on it yourself before using it on your customers.

LOCATION OF PASSENGERS. See "Passenger Placement".

LOCKED HANDLEBAR. See "Passenger Safety".

MOTION OF THE SEAT. See "Scrambler Motion".

OUT-OF-BALANCE LOADING. See "Balancing the Passenger Load".

PASSENGER PLACEMENT.

As the Scrambler picks up speed, the passengers will slide to their right against the end of the seat. This is caused by "centrifugal force" and is part of the appeal of the ride; however, a heavy person can exert a considerable amount of side pressure as a result. The actual side pressure each person feels is in proportion to his own weight. In addition to the side pressure his own weight causes, each passenger will experience the total of the side pressures of every passenger to his left.

Since the side pressures are directed to the right, as a general rule the heaviest person should be seated next to the outside, nearest the door opening, with lighter persons to his left.

1. A man should normally be seated to the outside with his lady seated to his left.
2. Children riding with parents should be seated to the far left and not between them.

Do not allow pre-school children to ride without a dependable adult. The child should be seated either on the lap of the adult or to the left of the adult, so that the child will not be squeezed. Children from 6 to 12 years can usually take care of themselves, but they should be watched very carefully by the operator. If the operator sees any tendency for a child to move about in the seat or to show that he is not holding on as well as he should, the operator should stop immediately and not continue the ride until he is certain that the child is secure. Children who do not follow the operator's instructions should be removed from the ride.

PASSENGER SAFETY.

The passengers can climb into the seats by themselves. With a large crowd, an extra man or two can help to keep the people moving. The handlebar on the seat will usually lock itself if the passengers do not do it. It does not need the attention of the operator in most cases, but the operator must not fail to observe whether all handlebars are locked, and lock any that are not already locked. But be sure that the lap bar in each seat swings freely, with no binding in the hinges.

The handlebar latches on the seats have been properly adjusted at the factory but may, after extended use and wear, require readjustment. A handlebar that does not latch is unsafe. Without the security of the handlebar, the passenger may, without realizing the consequence, lean forward or stand up, exposing himself to extreme danger of being thrown from the ride. Inspection of the latches is quick and easy. This is covered in the "seat" section.

The passengers must remain seated at all times while the Scrambler is in operation. Occasionally someone gets the idea to change positions in a seat with another person. It is almost impossible to change without opening the handlebar and at least one of the passengers standing. This is extremely dangerous and should never be tolerated. That is why the decal is placed on the back of each handlebar, which says, "CAUTION: While Scrambler is in Motion:

- Keep Handlebar Closed
- Do Not Stand Up"

PATH OF THE SEAT. See "Scrambler Motion".

PLACEMENT OF PASSENGERS. See "Passenger Placement".

PROCEDURE IN STOPPING THE RIDE. See "Brake Operation".

RIDE LENGTH. See "Length of Ride".

SCRAMBLER MOTION.

The main center pole turns in a clockwise direction, while the unit poles turn counterclockwise. This causes each seat to trace a "star" pattern back and forth across the operating circle. As each seat reaches the outside of the circle it comes to a dead stop. From a dead stop, it picks up speed so that by the time it is passing the center of the circle it is going about 25 miles per hour. This requires about 1.2 seconds, and by the time another 1.2 seconds have elapsed the seat has again come to a dead stop.

For normal operation the seat must move in its proper path. Watch the way one seat moves. If you were to look down from above, suppose that when the seat reaches the outside of the operating circle you call that the 12:00 o'clock position. The next time that that seat reaches the outside of the operating circle on that side it should be about in the 11:30 position. In other words, the place where one particular seat reaches the outside of the operating circle moves in a counterclockwise direction. If it does not, if you see that the seat is going directly back and forth to exactly opposite positions, or is in fact advancing in a clockwise direction, DO NOT OPERATE THE RIDE. YOU HAVE A CONDITION THAT MUST BE CORRECTED.

Also, if you see the passengers sliding from one side of the seat to the other, AND THEY ARE NOT TRYING TO DO SO, then this is another sign that something is wrong.

One or more of the following things may exist:

1. The Scrambler is being operated faster than 11 rpm with gasoline engine, or 11.4 rpm with electric motor.
2. The slip clutches are too loose, so that they cannot turn the unit poles properly.
3. The slip clutch disks have gotten grease on them from over-lubrication. This causes the slip clutches to function improperly.

Grease on the clutch disks can be very tricky. The clutch may appear to work normally for a long time, and then suddenly, right in the middle of a ride, start slipping excessively. There is no reason for grease to be on the clutch disks, but a careless operator with a little grease can ruin perfectly good clutch disks. If grease gets on your clutch disks do not try to clean them; replace them.

To repeat, whenever you see a seat advancing around the circle in a clockwise direction, stop the ride and do not carry any more passengers until after you have corrected the problem. (See maintenance information on the slip clutches.)

A Scrambler operating incorrectly in this way changes the whole "feel" of the ride. Instead of being directed just to the right end of the seat, the passengers may move to the left and forward as well. This will make the passengers feel insecure, and in fact it may put them in actual danger because this is not the normal way in which a Scrambler should operate. They learn to brace themselves to resist the normal forces, but sometimes do not know how to handle these strange forces.

SLIP CLUTCH ADJUSTMENT. See "Balancing the Passenger Load".

SPEED OF OPERATION.

Maximum speed in revolutions per minute of the center pole:

11.0 with gasoline engine
11.4 with electric motor

The Scrambler should NOT be operated at speeds in excess of those stated above. The forces acting on the Scrambler and its passengers rise sharply as the operating speed is increased. At speeds above the maximum rated speed these forces become DANGEROUS.

Operators are sometimes tempted to tamper with the throttle adjustment to increase the speed.

DON'T DO IT.

The speed of the Allis-Chalmers G-138 engine, used on Scramblers through Serial No. 414, is regulated by a governor. The maximum speed has been limited by installing a throttle stop and by cutting off the excess throttle rod after adjusting the maximum center pole speed to 11.0 RPM. If the throttle stop is in place and the throttle rod has not been extended and readjusted, the ride should not exceed rated speed using the combination brake-throttle control provided.

The Ford engine, used on Scramblers beginning with Serial No. 415, has a built-in governor that shuts the engine off when it has been over speeded. When this happens, the engine must be brought to a complete stop and the governor re-set.

WARNING: No governor-speed control system is foolproof. Any governor can be tampered with. Be on your guard against operators who try this.

Electric motor power units as furnished by Eli Bridge Company cannot be made to overspeed except by changing V-belt sheaves. Such tampering is difficult to conceal. If you anticipate using a different power unit at any time, do not fail to consult Eli Bridge Company regarding the horsepower capacity and the speed at which the power unit is expected to turn the Scrambler. In case of accidents involving injury of a passenger, speeds in excess of 11 RPM of the center pole when using a gasoline engine (11.4 RPM when powered with an electric motor) will be considered negligence on the part of the operator.

STANDING UP. See "Passenger Safety".

STARTING THE SCRAMBLER.

Do not put the ride into motion until the handlebar on each seat is locked, and the locking pin is inserted in the secondary latch.

BEVEL RING GEAR TEETH WEAR. See "Gears".

BLACKTOP FOUNDATION. See "Stationary Base".

BLOCKING UNDER BASE LEGS. See "Base Legs".

BLOCKING UNDER CENTER POLE. See "Stationary Base".

BOLTS FOR INTERNAL GEAR. See "Rotating Base".

BOLTS, HIGH TENSILE. See "Mast".

BOLTS LOOSE IN DRIVE UNIT BEARINGS. See "Drive Units".

BOTTOM BEARING RING PINS. See "Stationary Base".

BOTTOM SWEEPS.

Of all the pin connections on the Scrambler those connecting the bottom sweeps to the rotating base have the highest loads and are subjected to the greatest pounding as the ride operates Consequently, as the years of service build up, these pin holes are almost always the first ones to show wear. Eventually, you will want to tighten up these connections to eliminate the sloppy fit that develops from wearing the holes oversize. Eli Bridge Company stocks two sizes of oversize pins for use after the holes have been reamed out to a larger size. The original hole size is 1". The first oversize pin is 1-1/16" in diameter and is identified by a single groove cut in the side of the pin head. The largest oversize pin stocked is 1-1/8" in diameter and has two grooves cut in the side of the head. Do not attempt to use oversize pins unless the pin holes have been properly prepared by line-reaming using special equipment available from Eli Bridge Company.

Beginning with Serial No. 92, all new bottom sweeps were equipped with a removable slip clutch and pinion assembly, which was designed for long life and easy maintenance. This assembly can be fitted to all older Scramblers, with the slight modifications that are necessary, and many owners of earlier Scramblers have made this conversion. There is one problem that has shown up since this design was put in service, but it is due to improper maintenance. The clutch disk hub turns on a nylon sleeve bearing as the clutch slips. The Scrambler manual suggested limited lubrication of this bearing, but it appears that some operators have overdone it and have put in too much grease. Also, instead of using very sparing amounts of grease on the chain coupling attached to the clutch disk hub some operators apparently just stick a handfull of grease on the chain coupling without regard to what happens to it. The result of this over-greasing is that the grease sometimes gets on the clutch face. When this happens the operation of the slip clutch becomes very unpredictable. The slip characteristics can change while the Scrambler is operating, and this can be very dangerous to the passengers. (For a fuller explanation of this see "Scrambler Motion" in the OPERATION section of this manual.)

WARNING: DO NOT ALLOW GREASE TO GET ON THE CLUTCH DISKS. KEEP THEM CLEAN, DRY, AND FREE OF GREASE AT ALL TIMES. IF GREASE GETS ON THE CLUTCH FACES DO NOT TRY TO CLEAN THEM BUT REPLACE THE CLUTCH FACINGS. DISCONTINUE GREASING THE NYLON SLEEVE BEARING IN THE CLUTCH DISK HUB; LET IT RUN DRY. WIPE OFF ALL SURPLUS GREASE ON THE CHAIN COUPLING THAT CONNECTS THE CLUTCH DISK HUB TO THE BOTTOM SWEEP DRIVE SHAFT.

The design of the installation of the slip clutch and pinion on Scramblers up through Serial No. 91 gave reasonably satisfactory service, but reports from owners and operators indicated that replacement of parts was often quite difficult because of their location and because of rust "freezing" the parts together. There were numerous reports of bearing damage, wear of keys and keyways, clutch disk breakage, and failure of spline shafts. The new design attempted to eliminate most of these problems and at the same time make all parts more accessible and more easily replaceable. It has been used without change since 1960, and the reports from owners and operators indicate practically no trouble of any kind with this design.

The covers on the slip clutches sometimes get bent out of shape. This happens most frequently on the bottom cover, but also sometimes happens on the top, and is caused by mishandling the sweep. When the sweep is dropped so that the weight falls on the cover it sometimes is forced up against the slip clutch. In some cases where this has been observed there has been so much interference that the clutch has actually worn all the way through the cover. The clutch springs rub against the bent-up cover, and wear away the sides of the springs. When this happens the adjustment of the spring to a height of 1-3/32" has no real significance because the strength of the spring has been partially ground away. In order for the slip clutch to work properly the clutch springs must be adjusted to produce the proper squeeze on the clutch disk. Therefore, if you find the sides of any of the clutch springs worn away, replace them with new ones adjusted to a height of 1-3/32". It should be quite obvious when the clutch is dragging against a bent-up clutch cover; just turn the shaft and listen before you install the bottom sweep. If it is dragging you can hear it. If you do, then correct the situation. Do not allow it to drag.

With good springs all adjusted to the proper height of 1-3/32", there can still be a variation in the performance of a slip clutch. As the friction surfaces of the clutch disk wear in, the characteristics of the slip clutch can change, and so you must observe how the Scrambler behaves when it is carrying a passenger load. The factory load test consists of putting 600 pounds in each of the 12 seats, bringing the ride up to full speed, and then braking it to a stop. Under this kind of loading condition , when the center pole is stopped as quickly as possible, the unit poles will continue to turn and come to a stop about 10 seconds after the brake is applied. If the clutches are adjusted properly all three unit poles will stop turning at almost exactly the same time.

A second way to check the slip clutches is to bring the Scrambler up to top speed with no passengers in any of the seats, then set the brakes quickly and firmly. With no passengers, the unit poles should stop at the same time as the center pole. If you find that one or more of the unit poles continue to turn after the center pole is stopped, then the slip clutches are not adjusted tight enough. Check to be sure that

all the springs on each slip clutch are tightened to an overall height of 1-3/32". If the unit poles still continue to turn after the center pole has stopped, it will be necessary to tighten the clutch springs even more. Be sure to tighten all six springs on each clutch to the same height. This does not necessarily mean that all three slip clutches will be adjusted exactly the same. All three may be different from each other; the important thing is that they function in the same way. This method of testing the slip clutches with no passengers is by far the easiest way to check them.

The third method is also very easy, but may not tell you quite as much. With the Scrambler stopped and the brakes set, push on the back or front of any seat. It should take a good, hard push to slip the slip clutch, but you should be able to slip it. This is an excellent way of comparing the three bottom sweep slip clutches. If the three clutches are not adjusted to operate in the same way the differences will be quite obvious when a seat on each unit pole is pushed in this way.

Squeaking slip clutches are sometimes asked about. This is nothing more than the clutch disk slipping inside the clutch, and it is entirely normal. There has never been any indication that a squeaking clutch is a sign of trouble. However, clutches are sometimes reported to be jumping or "stuttering". This may be a sign of grease; replace the clutch facings; do not try to clean them. Also, be sure to clean away any grease on the cast iron pieces of the clutch, as well as the clutch hub.

The chain couplings on the bottom sweeps will give excellent service, but they must be in good alignment. Usually there is no difficulty with the coupling connecting the slip clutch to the long drive shaft, because it stays connected all the time. The coupling connecting the bottom sweep to the rotating base can sometimes give difficulty. When you wrap the chain around the two coupling halves it should fall in place easily without any forcing. There is a little clearance in the pin connection, and you can sometimes align the two coupling halves just by bumping the sweep to one side or the other. If still more adjustment is needed (and it rarely is), loosen the bolts holding the long drive shaft bearing right next to the coupling. There is a little adjustment available in the oversize bearing bolt holes, and this should be enough to bring the two coupling halves into alignment. Do not forget to tighten the bearing bolts when you are finished. A properly aligned chain coupling will have a coupling chain that can still be wiggled with the fingers after it has been connected. A bound-up chain is an indication of an improperly aligned coupling.

In the beginning it was anticipated that the coupling chain would wear out and have to be replaced much more frequently than the chain sprockets. Experience has shown that the reverse is true. If the chain is kept well lubricated so that it remains loose and limber it will outlast the sprockets. The sprocket teeth wear down where the rollers rub against them. As wear develops, the coupling becomes looser, so that there can be quite a bit of backlash, and this can cause pounding in the coupling which accelerates the wear. With an unbalanced load on a unit pole, as the loaded seat moves toward the outside of the operating circle it leads the drive, but after it reaches the outside it wants to stay there, and therefore lags the drive. This causes a reversal of the loading of the drive in the bottom sweep and this is the principal cause of wear of couplings, splines, clutches, gear teeth, and pin holes in the bottom sweeps. Backlash in the chain coupling puts additional burdens on

the drive members, and so it is important to replace the chain sprockets when the teeth get worn down. This reversal of loading occurs only on the bottom sweeps and on the rotating base drive shafts that couple to the long drive shafts in the bottom sweeps.

Sometimes operators call the factory to inquire about the pinion on a bottom sweep completely missing the gear on the bottom of the unit pole. What happens is that in traveling down the road the Sealmaster SF-47 bearing on the outer end of the bottom sweep turns over upside down. All that is necessary is to lever the entire bearing halfway around with a stick. Just be sure that the spherical outer race pivots about the grease fitting, or you may shear off the pin that positions the hole in the spherical outer race that is in line with the grease fitting.

As the Scrambler service life builds up, all of the pin holes in the entire structure will tend to loosen slightly. This will then allow the entire structure to settle down slightly to a lower level. Sometimes this goes so far that the steps on the seats hit the bottom sweeps as they pass over the top of them. To correct this, just add shims under the Sealmaster SF-47 bearing on the outer end of the top sweep. It will then be necessary to adjust the mesh of the pinion on the bottom sweep with the gear on the bottom of the unit pole. To bring these two gears closer to each other, add shims between the Sealmaster SF-47 bearing and the 12" channel on the outer end of the bottom sweep. If you do not make the same adjustment on all three top and all three bottom sweeps, then it would be wise to number the sweeps so that they are always used in proper pairs. If the same adjustment is made on all three top and all three bottom sweeps, then interchangability is not affected.

If it is necessary to adjust the mesh of the bottom sweep pinions and unit pole gears because of wear, add shims to the bottom sweep bearing as described above. If the mesh is too tight, then remove some of the shims.

BRAKE ADJUSTMENT. See "Brakes".

BRAKE BOTTOM BEARING. See "Bearings".

BRAKE CABLES. See "Brakes."

BRAKE DRUM GREASING. See "Spring Start Up", "Winter Storage".

BRAKE DRUM GROOVED. See "Brakes".

BRAKE RATCHET ADJUSTMENT. See "Power Unit".

BRAKE REMOVAL. See "Brakes".

BRAKE DRUM REVOLUTIONS PER MINUTE. See "Speeds".

BRAKES.

Tests have shown that the Scrambler can be stopped just about as quickly with one brake as with two. However, having both brakes connected provides an extra measure of safety in the event that either brake should fail for any reason. For safety, do not try to operate the Scrambler with only one brake.

The only adjustment on the braking system is the single turnbuckle in the long brake cable. How this is adjusted depends upon the individual preference of the operator, but it should be adjusted so that the Scrambler can be brought quickly and smoothly to a complete stop with the least amount of effort by the operator. The recommended adjustment is that the turnbuckle be tightened so that the brake ratchet handle in the fully braked position is toward the rear end of the ratchet teeth, so that the operator can lean on the handle and let his weight against the handle do most of the braking effort.

The brake cables do eventually wear out and have to be replaced. Sometimes brake cables are brought into the factory with cable clamps on them instead of the swaged fittings furnished on new cables. The cable clamps will not pass through the holes in the base legs, and so the operators then cut the holes out bigger, which weakens the base legs. Also, in cutting out the base legs, sometimes it is not done properly and it becomes possible for the brake cable to get snagged and locked up in the opening. When this happens the brakes will not work properly, and you may not be able to stop the Scrambler when it is necessary. Therefore, for safety, always use factory-built brake cables.

The brake shoes are self-adjusting and will continue to grip the brake drum as long as there is lining in the brake shoes. However, these brakes get a lot of use, and eventually the linings will have to be replaced. If they are not, the brake shoes will drag on the brake drum and wear grooves in it. If the grooves are not too deep, the outer and inner surfaces of the brake drum can be turned down on a lathe to recondition the surfaces. However, this is a precision machining operation, and not every machine shop could be expected to do it.

There is a bent spring that connects both the inside and the outside brake shoes together underneath the brake drum. If this spring is not there, the two brake shoes will not work together properly. You can feel it by reaching down underneath the brake shoes.

A short extension spring connects the brake lever to one of the vertical plates in the stationary base. This spring is extremely important; it must be there. If it is not there, two things will happen:

1. The brake shoes will drag all the time, and this means that the power unit will have to overcome this braking action to turn the ride. It usually is not a heavy braking effort, but it is enough so that extra loading is on the driving gears. Normally the large driving gears in the center pole last for many years, but this extra effort caused by a missing spring can completely wear out a set of gears in a very few months.

2. With no spring, you will find that the center pole cannot be turned counterclockwise. It may turn for just a few feet, and then lock up tight. It will still turn in the regular clockwise direction. Any time you observe this kind of lockup of the center pole, look at both brakes. You may find that one or both of the springs is missing. Do not operate the ride unless this #77 brake spring is on each brake.

Frequently, owners or operators call the factory inquiring about how to remove a brake drum or brake shoe. The entire procedure was fully described with photographs in the Scrambler Manual furnished with each ride, but it is apparent that many operators are never given the Manual to read. Therefore, to repeat the procedure, it is really quite simple. Just do the following steps:

1. Reach up under the brake drum to find the long 1/2" bolt that goes through the brake drum hub and the vertical shaft. The bolt is screwed into a self-locking nut that is fastened to the side of the hub. Using a socket wrench and an extension, back out the bolt and remove it from the hub.

2. Remove the small plate that is underneath the brake lever. It is fastened to the bottom plate of the stationary base with a single bolt, and its purpose is just to hold up the brake lever so that the brake shoes will not sag and wear crooked.

3. Next, remove the special screw in the very top of the vertical shaft. To get to it, remove the cover of the rotating base, and turn the rotating base so that one of the round holes is directly above the brake shaft. Sometimes the hexagon socket in the special screw gets filled with hard grease, and the socket cannot be seen. Clean it out, and remove the special screw with an Allen hexagon wrench.

4. With the screw out, the pinion can be lifted up off the shaft. However, it may be tight on the shaft and not come off easily. This does not matter; you do not need to take it off.

5. Screw a coarse thread 3/4" bolt into the top of the shaft, and use the bolt to lift the shaft out. THERE IS NOTHING ELSE HOLDING THE SHAFT IN PLACE.

6. With the shaft out, slide the brake drum, brake shoes, brake lever, and pivot pin for the brake lever all out to the side and all at one time.

With all of this out, you will have complete access to the top and bottom bearing housings if you should wish to remove them. Be careful when you remove the top one because it is heavy and can pinch fingers rather easily if it drops down after the last bolt has been removed.

All of this can be done while the Scrambler is erected, but of course it will be easier if it is dismantled.

flexible chain couplings are designed to be operated as much as three degrees out of line. It has always been recommended by Eli Bridge Company that the drive units follow the contour of the ground within this three degree limitation. How do you know if you are within that limit? By the way the couplings go together. After the drive units are pinned together and before you connect any chains to the couplings, turn the shaft in each drive unit by hand. If it turns freely so that the sprockets of the drive units on either side do not touch those on the shaft you are turning, then you are within the limit. However, if another shaft turns with the one you are turning, block up under the place where the two drive units come together until only the one shaft is turning. Just be sure that you do not block the drive units up so high that they are less than 3-1/2" from the bottoms of the unit poles.

A good coupling chain will be limber and flexible, with bright rollers. If a chain gets stiff so that it will not conform easily to the chain sprockets, and cleaning and lubricating it does not loosen it, then it should be replaced. Always keep extra connecting links on hand, because the coupling will be only as good as the connector for the chain.

CHANNEL RUNWAYS.

The five-inch channels that are supplied for use as runways for the center pole when it is ramped out of the trailer often get bowed. This is because the soil underneath was too soft to give proper support to the channels and they bowed down under the load. Actually a little bowing in these channels is not bad at all, because it enables you to slip them under the dolly wheels perhaps a little easier than if they were absolutely straight. However, with too much bow it will be difficult to slide the channel under both dolly wheels, and the center pole will tend to bury the channels, which will make rolling the center pole along the channels very difficult, if not impossible. Therefore, if you find that the bowing of the channels has reached the point where it is interfering with getting the center pole in or out of the trailer, then it is time to straighten them. This can be done quite easily under an arbor press, which you will find in almost any machine shop.

CHANNEL RUNWAYS BENT. See "Channel Runways".

CLEANING THE SEATS. See "Spring Start Up", "Winter Storage".

CLEARANCE AROUND THE RIDE. See "Clearances Required".

CLEARANCE FOR POWER UNIT. See "Clearances Required".

CLEARANCE OVER DRIVE UNIT. See "Clearances Required".

CLEARANCE OVERHEAD. See "Clearances Required".

CLEARANCES REQUIRED.

The Scrambler operates within a 52 foot diameter circle. However, the fence should never be closer than three feet from the ride, and preferably four feet, so that

no one outside the fence can reach in and touch one of the seats or passengers while the ride is operating. In the same way, it must be so that the passengers cannot reach out and touch anyone outside the fence, or the fence itself. Therefore, a space 60 feet by 60 feet is recommended for locating the Scrambler, if the power unit is placed in the corner of the square. On the other hand, if the power unit is to be located directly in front of the ride, then the depth of the lot must be increased to 69 feet to provide clearance for the power unit truck.

The Scrambler is not a high ride, but it is important that overhead clearance be maintained so that the lighting equipment will not strike any overhead obstructions. Standard mast lights have an overall height of 17 feet - 1/4 inch. Funnel lights have an overall height of 20 feet - 4 inches. Overall height of the gable lights is 13 feet - 7-1/2 inches.

Where the unit poles pass over the top of the drive units they must clear by at least 3-1/2 inches. The reason for this is that there is a little flexing of the center pole under an out-of-balance load. This is entirely normal and to be expected. However, space must be left so that the bottoms of the unit poles will not strike the drive units even when the center pole flexes.

The clearance between the seat steps and the bottom sweeps where they pass over each other has been kept to a minimum intentionally so that the seats are as close to the ground as possible and all passengers can step directly from the ground onto the seat steps. However, as the years pass, your assembly pins and pin holes will wear slightly, allowing the entire structure to settle. In a few instances it has settled to the extent that the steps have rubbed on the bottom sweeps as they passed over. This must not be allowed to continue, or it will cause expensive damage to the seats.

You can check this clearance easily by placing a seat directly above each bottom sweep, and then loading the seat with three adults. Check only one bottom sweep at a time (only one seat at a time is to be loaded). If you have interference it should show in this kind of test.

The clearance between the steps and the bottom sweeps on a new Scrambler is about two and one-quarter inches. If you have lost this clearance it is easily corrected.

Place 5/16" thick shims under the top sweep bearing on each top sweep. The shims are to go between the bearing and the top sweep. This will raise the unit poles and the seats, and give you the clearance you need.

After the unit pole has been raised, the bevel pinion gear on the bottom sweep will not mesh properly with the gear on the bottom of the unit pole. Use shims to make these gears mesh properly. A complete assortment of shims for this purpose can be obtained from Eli Bridge Company. These shims are placed between the bottom sweep main bearing and the bottom sweep. Be sure that the same thicknesses of shims are used on opposite sides of the bearing. Enough shimming should be done to allow only a very small amount of backlash in these gears. Your own judgment will have to prevail here. However, remember that these gears should NOT fit together tightly, but should have a very small amount of play.

OWNERSHIP RECORDS. See "Serial Number".

PAINTING INSIDE OF TIE RODS. See "Tie Rods".

PAINTING ROTATING BASE COVERS. See "Rotating Base".

PAINT REQUIREMENTS. See "Spring Start Up".

PARTS REQUIRED. See "Number of Parts Required".

PASSENGER CAPACITY. See "Rotating Base".

PHOSPHOR COATING. See "Lighting".

PIN BROKEN ON GABLE LIGHT. See "Lighting".

PINCHING FINGERS IN DOLLIES. See "Dollies for Center Pole".

PIN HOLES IN MAST. See "Mast".

PIN HOLES IN TIE RODS REAMED. See "Tie Rods".

PIN HOLES, OVERSIZE. See "Pins and Pin Holes".

PIN HOLES WORN. See "Rotating Base", "Unit Poles".

PIN IN SEALMASTER SF-47 BEARING OUTER RACE. See "Bearings".

PINION CASTING ASSEMBLY. See "Gears".

PINION KEYS. See "Rotating Base".

PINION SHAFT HARD WASHER. See "Gears".

PIN LOADS. See "Pins and Pin Holes".

PINS AND PIN HOLES.

Every assembly pin throughout the Scrambler has a diameter of 1". Almost all of them are the same length; there are six longer ones which connect the base legs to the stationary base, and three long pins which connect the mast to the rotating base. Because of the almost universal interchangeability of the assembly pins, in a portable operation each pin will eventually be used in every pin hole, so that it is subjected to high loads and low loads, depending upon the location. Consequently, in portable use there is very little wear on the 1" diameter of the pin, although both ends of the pin get spread and flattened from pounding it in and out of the joint. In a park location, there will be very little damage done to either end of the pin, but the pins used in the heavily loaded joints will show wear on the 1" diameter.

The mushroomed ends of every pin should be kept ground off, because of the danger of flying metal particles or chips when the pin is struck with a hammer. To check the wear on the diameter of the pin, a new pin can be as much as .003" less than 1", or .997", so you can establish how much wear there is on your pins by measuring them and comparing your measurements with those of a new pin. If you have no way of measuring, remove a pin from a tight joint and insert it in a joint that appears to be too loose. If you can observe that the joint is not obviously tighter, then this is a good indication that the pin diameter is worn down and should be replaced.

The pin holes are where the wear usually shows up. Eventually some of the pin holes may get so enlarged from wear and pounding of the pins in the holes that you will want to do something about it. Eli Bridge Company has equipment available for loan which will enable you to line ream the pin holes for oversized pins. The oversize pins come in two different sizes: 1-1/16" and 1-1/8". The 1-1/16" pins can be identified by the single ring cut in the side of the pin head, while the 1-1/8" pins have two rings cut in the head. Both sizes of oversize pins are stocked by the factory so that they are readily available, but you must specify what you want, because standard 1" pins will be sent unless otherwise requested.

It is necessary that the pin holes be line reamed or the interchangeability of the structural members will be affected. Therefore, if you decide to go to oversize pins contact the factory and use the proper equipment to do the job right. Do not ream to 1-1/8" if a 1-1/16" pin will tighten the pin connection.

The use of a single diameter assembly pin throughout the Scrambler was decided upon to keep to a minimum the number of extra pins an operator should have on hand and also to make it easier for him to assemble the ride. Any standard assembly pin can be used in 152 different places. However, because the structural loads in each one of these joints is not the same, some pin holes will obviously wear more than others. Experience has shown that wear develops in approximately the following order:

1. Bottom sweep connections to the rotating base show wear the quickest.

2. Seat sweep connections to the unit pole come next.

3. Next, seat sweep tie rods extending from the top of the unit pole to the outer end of each seat sweep.

4. Then, top sweep connections to the center pole mast.

5. Then, the connections of the drive units to each other, to the stationary base, and to the engine truck.

6. Seat brace tie rods, which extend from the top of the seat to the bottom of the unit pole, are next.

7. Seat connections to the ends of the seat sweeps very rarely have to be enlarged.

8. The factory records show very few top sweep tie rods or base legs having to have oversize pins installed.

Every pin "works" in its pin connection, some more than others. Unless every pin is safetied with a hairpin cotter or a Klik-pin it can "walk" right out of a joint. When this happens, structural members can get loose and this can cause severe injuries to passengers or even by-standers. Therefore, never operate the Scrambler unless each and every pin is secured in place with a hairpin cotter or Klik-pin that is in good condition and is properly installed on the pin. It does not make any difference which kind of safety device you use; both are stocked by Eli Bridge Company, and it is up to your own preference which kind you use. Either kind can be used in every location but one, and that is on the long pins which connect the mast to the rotating base. In this location only a hairpin cotter can be used.

To repeat, NEVER OPERATE THE SCRAMBLER UNLESS EVERY PIN IS LOCKED IN PLACE WITH A HAIRPIN COTTER OR A KLIK-PIN.

PINS KEYING BOTTOM BEARING RING. See "Stationary Base".

PINS, LOCKING WITH HAIRPIN COTTERS. See "Pins and Pin Holes".

PIN SHEARED IN SEALMASTER SF-47 BEARING. See "Top Sweeps".

PIN TO CONNECT ROTATING BASE TO MAST. See "Rotating Base".

POWER REQUIREMENTS. See "Lighting", "Three-wire Grounded Electrical Wiring".

POWER TAKE-OFF SHAFT. See"Power Unit".

POWER UNIT.

Check the power unit manufacturer's instruction manual for the proper servicing and maintenance of your power unit.

The following general rules can apply to many kinds of power units:

1. Every 8 hours of operation:

   A. Fill the fuel tank.

   B. Check the oil level.

   C. Check the radiator.

The following table will show what happens to the loads on the structural members when the speed is increased beyond the recommended maximums:

Center Pole RPM	Per Cent Overload
11.0	0%
11.4	7.4%
12	19.0%
12.5	29.1%
13	39.6%
14	61.9%
15	85.9%
16	115.0%

It is obvious from these figures that going above the recommended maximum speeds can very quickly put excessive structural loads on the Scrambler load carrying members, for which they were not designed. Not only is this dangerous to the structure, but of even greater importance it is very hazardous to the passengers. Many persons cannot take the excessive speeds without getting bruises or even broken bones. It has been well demonstrated that excessive speeds are not necessary to get good business with the Scrambler. One Scrambler reportedly carried over one million passengers in a single year, and it was operating at less than the maximum recommended speed.

Owners and operators sometimes inquire about the speeds of various parts of the Scrambler when powered by gasoline engine and by electric motor. The following table lists these speeds.

Location	Allis-Chalmers Gasoline Engine	Ford Gasoline Engine	Electric Motor
Center pole RPM	11.0	11.0	11.4
Unit pole RPM	13.8	13.8	14.3
Spur pinion turning center pole	108	108	112
Brake RPM	108	108	112
Bottom sweep drive shaft RPM	111.6	111.6	115.6
Drive unit drive shaft RPM	357	357	372
Engine truck drive shaft RPM	357	357	372
Engine truck bottom sheave RPM	1071	1071	1115
Fluid coupling no-slip RPM	1320.9	1678	1747

With an electric motor, the sheave size on the fluid coupling is a 6.0" pitch diameter, five-groove, quick-detachable unit for "B" section V-belts. The driven sheave down below is a five-groove, "B" section 9.4" pitch diameter sheave with a 1-1/16" bushing in it. The matched set of belts are 48" long.

With an Allis-Chalmers gasoline engine and the 10.6 Hydrosheave, the same sheave is used on the Hydrosheave as with an electric motor, and the sheave down below is a 7.4" pitch diameter, "B" section, five-groove sheave with the same 1-1/16" bushing. Use 38" V-belts, "B" section, in matched sets of five belts only. With the Ford gasoline engine and the Twin Disc 9.4 HSD fluid coupling, the same 6" pitch diameter sheave is used on the fluid coupling as on the Hydrosheave, and the sheave down below is a 9.4" pitch diameter. With the Ford engine use 46" belts in matched sets. Never use unmatched belts, because there are slight differences in length of belts, and unless they are matched in length each belt will not be carrying its full load, and this will cause some belts to wear out more quickly than others.

Proper output speed from either gasoline engine or electric motor depends on the V-belts properly tensioned so that they do not slip. If your belts are slipping, tighten them by raising the gasoline engine or the electric motor and shimming under the mounts: Never try to stop belt slippage by applying belt dressing.

SPLICED JUMPERS FOR MAST LIGHTS. See "Lighting".

SPLINE SHAFTS. See "Bottom Sweeps", "Rotating Base".

SPLIT-220 VOLT POWER. See "Three-wire Grounded Electrical Wiring".

SPRING MISSING FROM BRAKE LEVER. See "Brakes".

SPRINGS FOR CLUTCH, WORN. See "Bottom Sweeps".

SPRING START UP.

Before you start using your Scrambler in the spring, check it all over thoroughly to make certain that every part is in good condition and is ready for a full season's use.

Check over all of the structural members to see if there are any dents or bends that should be removed, any defective welds that should be repaired, or any places that are hammered and should be smoothed.

Go over all of the pins and grind off any mushroomed ends. Inspect every hairpin cotter or Klik-pin, and replace any that are defective.

Clean off all surplus grease, and be very careful to remove any grease on the brake drums BEFORE THE CENTER POLE IS TURNED, to keep the grease from getting on the brake shoes.

Be sure that all of the big gears are given a good coating of heavy grease that will not throw off. Drain and replace the oil in the engine truck transmission and the gear pot in the stationary base.

Check the V-belts on the engine truck to see that they are in good condition and are tight enough to pull the load. Tighten them by shimming if necessary.

On Scramblers through Serial No. 414, check the oil level in the Hydrosheave by turning it so the arrow is pointing up, and the oil is just ready to run out of the filling hole. Beginning with Serial No. 415, to be sure that the Twin Disc 9.4 HSD fluid coupling has enough fluid in it, it is wise to drain it all out and replace the fluid with 65 fluid ounces (two quarts, plus one fluid ounce) of Fyrquel 150 fire-resistant fluid made by the Stauffer Chemical Company of Westport, Connecticut.

(a) The metal frame of the building, where effectively grounded.

(b) A continuous metallic underground gas piping system.

(c) Other local metallic underground systems such as piping, tanks, and the like.

250-83 Made electrodes. Where electrodes described in sections 250-81 and 250-82 are not available, the grounding electrodes can consist of a driven pipe, driven rod, buried plate, or other device provided for the purpose of conforming to the following requirements:

(a) Plate Electrodes. Each plate electrode shall present not less than 2 square feet of surface to exterior soil. Electrodes of iron or steel plates shall be at least 1/4". Electrodes of non-ferrous metal shall be at least 0.06" in thickness.

(b) Pipe Electrodes. Electrodes of pipe or conduit shall be not smaller than 3/4" in size and where of iron or steel shall have the outer surface galvanized or otherwise metal coated for corrosion protection.

(c) Rod Electrodes. Electrodes of rods of steel or iron must be at least 5/8" in diameter. Approved rods of non-ferrous materials or their approved equivalent used for electrodes shall be not less than 1/2" in diameter.

(d) Installation. Electrodes should, as far as practicable, be embedded below permanent moisture level. Except where rock bottom is encountered, pipes or rods shall be driven to a depth of at least 8 feet regardless of size or number of electrodes used. Pipes or rods when less than standard commercial length shall preferably be of one piece. Such rods or pipes shall have clean metal surfaces and shall not be covered with paint, enamel, or other poorly conducting materials. Where rock bottom is encountered at a depth of less than four feet, electrodes shall be buried in a horizontal trench, and where pipes or rods are used as the electrode they shall comply with paragraphs 250-83 (b and c) and shall not be less than eight feet in length. Each electrode shall be separated at least six feet from any other electrode including those used for signal circuits, radio, lightning rods, or any other purpose.

250-84. Resistance. Made electrodes shall, where practicable, have a resistance to ground not to exceed 25 ohms. Where the resistance is not as low as 25 ohms, two or more electrodes connected in parallel shall be used. Continuous metallic underground water or gas piping systems in general have

a resistance to ground of less than 3 ohms. Metal frames of buildings and local metallic underground piping systems, metal wall casings, and the like, have in general, a resistance substantially below 25 ohms. It is recommended in locations where it is necessary to use made electrodes for grounding interior wiring systems, additional grounds, such as connections to a system ground conductor, be placed on the distribution circuit. It is also recommended that single electrode grounds when installed, and periodically afterwards, be tested for resistance.

THROTTLE CONTROL. See "Power Unit".

THROTTLE ROD. See "Power Unit".

THROTTLE STOP. See "Power Unit".

THROWOUT BEARING FOR CLUTCH. See "Power Unit".

TIE RODS.

If a tie rod is given reasonable care it will last for a great many years. In time, some of the tie rods will develop substantial wear in the pin holes, but reaming them out for oversize pins, as well as the pin holes to which they attach, will put them back in like-new condition provided the tie rods have been kept well painted and are not deteriorating from rust. The equipment for reaming is available from Eli Bridge Company.

Frequently, Scramblers brought into the factory have tie rods which are bent and never straightened, some broken and re-welded, and occasionally there is a tie rod completely home-made. These tie rods are extremely important structural members. Without every one of them the structure would not hold together properly. A bent tie rod will not fit properly, and will throw the structures out of line. A broken and re-welded tie rod is a very questionable thing, and it is the factory recommendation that a broken tie rod be discarded and replaced with a new one. A home-made tie rod may not be constructed of the same high quality materials used by Eli Bridge Company, and the strength originally designed into the Big Eli product may be missing in the substitute tie rod. Therefore, you are discouraged from trying to make your own tie rods.

All of the tie rods are hollow, and it is easy to paint the outsides, but the insides must be protected also to prevent rusting out from the inside. The best way to paint them is to pour a good grade of liquid primer in one end and let it run out the other. Keep doing this, rotating the tie rod to a new position each time, until you are sure that the entire inside surface of the tie rod has been prime painted.

TIGHT BLOCKING THE BASE LEGS. See "Base Legs".

TIGHT PILLOW BLOCKS. See "Bearings".

TIMKEN BEARINGS. See "Bearings".

TIPPING OF FLOATING GEAR BEARING. See "Gears".

TOOTHED WASHER WEAR. See "Gears".

TOOTH WEAR ON GEARS. See "Gears".

TOP BEARING COVER. See "Rotating Base".

TOP SPEEDS. See "Rotating Base", "Speeds".

TOP SWEEP BEARING FAILURE. See "Bearings".

TOP SWEEP BEARING RETAINER RING. See "Bearings".

TOP SWEEP PIN HOLES. See "Mast".

TOP SWEEPS. (See also "Bearings".)

The most critical problem that has ever shown up on the top sweeps has been the failure of a few Sealmaster SF-47 bearings, which are the large bearings that support each unit pole. This is thoroughly reviewed in the section on "Bearings".

A second problem concerns the change of mesh of the gears at the bottom of the unit pole when this same SF-47 bearing has its spherical outer race turn over upside down while the ride is being transported down the highway. This problem is also covered in the "Bearings" section.

A third problem concerns the shearing off of a pin below the grease fitting of this bearing. See the "Bearing" section.

The pin connections which attach the top sweep to the mast, and the top sweep to the top sweep tie rods, become worn in time, and may require line reaming for over size pins. The equipment for doing this properly is available from Eli Bridge Company.

As wear does develop in all of the pin connections, the whole Scrambler will tend to "droop" lower. Eventually, it may get low enough so that the steps on the seats rub against the tops of the bottom sweeps as they pass over each other. This can be easily corrected by raising up the Sealmaster SF-47 bearing on the outer end of the top sweep. Place shims under the bearing to hold it in its higher position, and re-tighten the bolts holding the bearing. This shimming may then require a change of shims on the bottom sweep SF-47 bearing in order for the proper gear mesh to be maintained. This is thoroughly covered in the section on "Bottom Sweeps".

TRANSFORMERS SHORTING OUT. See "Lighting".

TRANSMISSION GEARS. See "Gears".

TRANSMISSION GREASE LEVEL. See "Power Unit".

TRANSMISSION NOISE. See "Power Unit".

TUBS. Referred to as "Seats".

TURNBUCKLE FOR BRAKE CABLE. See "Power Unit".

TURNED DOWN UNIT POLE SHAFT. See "Unit Poles".

TURNOVER OF BEARING. See "Bottom Sweeps", "Top Sweeps".

TWISTING THE GABLE LIGHT PANELS. See "Lighting".

UNIT POLE BREAKAGE. See "Unit Poles".

UNIT POLE, CROOKED. See "Unit Poles".

UNIT POLE GUSSET PLATES. See "Unit Poles".

UNIT POLES.

Several years after the Scrambler went into service, an owner contacted the factory about a crooked unit pole on which the 90 tooth bevel ring gear fastened to it went in and out of mesh with the bevel pinion on the bottom sweep as the ride turned. This was the first such report and a factory representative went there to inspect the Scrambler. What had happened was that the unit pole had broken in two right above the four triangular plates at the lower end of the unit pole. The owner had had it re-welded, but the person who did the work did not get the two parts straight, and the pole ended up crooked.

The owner was advised to replace the pole, since straightening it did not seem to be a practical thing to do. However, Eli Bridge Company's principal concern was the breakage of the unit pole in the first place. In the design work on the Scrambler this location where the pole broke was one that received a great deal of attention and analysis, because it was determined to be one of the more highly stressed areas on the Scrambler. In addition to Eli Bridge Company analysis, the structure was proof tested by an outside consulting engineer, and his conclusion was that IF THE SCRAMBLER WAS OPERATED AT OR BELOW THE MAXIMUM SPEEDS RECOMMENDED BY THE MANUFACTURER THE STRESS LEVEL AT THIS LOCATION ON THE UNIT POLE WAS LOW ENOUGH TO BE NO PROBLEM. Therefore, on the basis of this proof test, it could be concluded that where a unit pole broke at this location it could be caused only by overspeeding.

The factory received reports of this kind of breakage on four unit poles over a period of a couple of years. At the time there were about 300 Scramblers in service, and so this meant that about four out of 900 unit poles were reported to have broken. It was felt that, because of the potential danger to the passengers, a design change was necessary to eliminate the problem. Gusset plates were developed to bridge over this higher stressed area, and the design was reviewed by the same firm of outside consulting engineers. With their approval of the design change, these

gusset plates, along with instructions for installing them, were sent at no charge to every Scrambler owner. Since the addition of the gusset plates, there have been no reports of unit pole breakage. Some owners were very slow about installing the gusset plates, and perhaps there are some Scramblers which still do not have them on the unit poles. If your Scrambler is not equipped with the gusset plates, get them on. If, for any reason, you do not have them to put on, contact the factory and they will be furnished to you at no charge if you have never previously received a set of the gusset plates. Otherwise, if you lost them you will be charged for the direct cost of making them, but it is very important that there be four of these gusset plates on every unit pole.

The mesh of the gear teeth on the 90 tooth bevel ring gear with the bevel pinion teeth requires that the unit pole be located in its proper position in relation to both the top sweep and the bottom sweep. Occasionally operators call the factory to find out why the two gears do not mesh at all, but are separated from each other so far that the ring gear passes completely above the bevel pinion. This is a very simple problem to correct. What has happened is that the spherical outer race of the Sealmaster SF-47 ball bearing pillow block on the outer end of the bottom sweep has turned over upside down. When this happens the sweep drops down farther on the unit pole and this causes the two gears to move away from each other. Turn the bearing over by levering it with a board, but be sure that the spherical outer race of the bearing is pivoted about the grease fitting, because there is a small pin under the grease fitting that keeps a hole in the race lined up with the grease fitting.

The mesh of the gears can also be affected when the Sealmaster SF-47 on the outer end of the top sweep is shimmed to a higher level to eliminate the seat steps dragging on the bottom sweep. The section on "Bottom Sweeps" covers the adjustments necessary when this occurs.

One Scrambler returned to the factory for service had had the ends of the unit poles machined down to a smaller diameter so that they could be used in smaller bearings in the top and bottom sweeps. This is a very dangerous practice. The sizes of all structural members and bearings on the Scrambler have been determined by structural analysis, and for an owner or an operator to reduce the size of a critical structural member or use a smaller bearing without even consulting the factory is a very foolhardy procedure. Do not do it.

It is inevitable that in time the pin holes on the unit poles will become worn and enlarged. There are 20 pin holes on each unit pole, and experience indicates that all of them may, in time, have to be enlarged for oversize pins. Do not try to do this without first obtaining the proper equipment from the factory so that all holes can be line reamed. You can go to either 1-1/16" or 1-1/8" diameter pins, but it is advisable to try to get by with 1-1/16" diameter first, and usually this will be quite enough to put the holes back in first class condition. Naturally, the holes reamed out on the unit poles must be matched by similarly reamed holes on the structural members which attach to them. The 1-1/16" pins are identified by a single ring cut in the side of the pin head, and the 1-1/8" diameter pins have two rings in the head.

UNIT POLE SHAFT, REDUCED IN SIZE. See "Unit Poles".

V-BELT GUARD. See "Power Unit".

V-BELTS REQUIRED. See "Speeds".

V-BELT TENSION. See "Power Unit".

VIBRATION OF DRIVE UNIT FLOOR. See "Drive Units".

VIBRATION OF ROTATING BASE COVER. See "Rotating Base".

WASHER WEAR IN PINION CASTING ASSEMBLY. See "Gears".

WATER IN ROTATING BASE. See "Rotating Base".

WEAR OF GEAR TEETH. See "Gears".

WEAR OF SPROCKET TEETH. See "Chain Couplings".

WEAR RATE IN PIN CONNECTIONS. See "Pins and Pin Holes".

WEAVING OF CENTER POLE. See "Stationary Base".

WEIGHT CARRIED BY CENTER POLE. See "Stationary Base".

WELD FRACTURE OF STATIONARY POLE. See "Stationary Base".

WET BALLASTS. See "Lighting".

WHEELS FOR DOLLIES. See "Dollies for Center Pole".

WINCH.

The winch gives generally good service if it is not mis-used. A few owners have ordered replacement drum shaft gears. This is the large gear that is attached to the winch drum itself. It gets broken or has teeth knocked out when extra heavy loads are put on it. One of the ways the winch can be overloaded is by not keeping the slack out of the cable when the center pole base section is headed down the ramp. When the base section rolls over the top and starts down the ramp it will hit the winch cable with a terrific jolt if there is slack in the cable. This can cause the cable to break, to pull out the end connection on the cable or break teeth out of the gear if the pawl is engaging gear teeth at the time.

Very likely some of the overloading that occurs on the winch is caused by its being used for jobs other than handling the Scrambler parts. It is to be expected that a winch would be needed from time to time around a carnival lot, but from the factory position there is no way to anticipate the kind of loads that might be put on a winch in this way.

SEATS

INTRODUCTION

Your Scrambler seats have been designed and built using advanced techniques developed by the aircraft industry as well as other industries to produce a high strength, low weight structure. They are precision built devices and need reasonable care to keep them in safe and attractive condition. Of all the parts of a ride, the seats are observed most closely by the public, and you should pay particular attention to the condition of the seats.

Handle the seats carefully because the aluminum has a very fine finish which is easily damaged. Scratches cannot be removed, so it is best to keep the scratches from getting on the seats in the first place.

The major strength of the Scrambler seat is in its aluminum sheet "skin" covering the outside and the inside. This is referred to as a "stressed skin" type of construction, and it produces a structure of maximum strength and maximum stiffness, for a minimum of weight. This kind of construction is widely used in many industries, such as aircraft, boats, and certain kinds of house trailers. It is well recognized for its efficient use of materials to produce high quality structures. It does require, however, reasonable maintenance to preserve these favorable characteristics, and the stressed skin construction of the Scrambler seat is no exception. Badly worn or missing rivets, or holes punched or worn in either the outside or inside "skins" reduce the strength of the seat. A properly maintained Scrambler seat must have all holes repaired with proper stressed skin type of patches that will replace the strength lost in the holes and that will prevent the growth of cracks that may be associated with the holes. Furthermore, all worn or missing rivets must be replaced. The strength of the seat depends on this being done.

The Scrambler seat, if given reasonable maintenance, can give year after year of excellent service, if the Scrambler is not operated beyond the maximum factory-recommended speeds of 11.0 revolutions per minute of the center pole when powered by a gasoline engine, and 11.4 RPM with electric motor. How does speed affect the seat? Assume, for example, that there are three 200 pound people in the seat. As the ride turns, the forces act to push the passengers to their right against the side of the seat. The seat is designed to withstand these forces safely within the maximum speeds set by the factory. The following table will show how the load against the side of the seat, because of these three people, increases as the speed of the center pole is increased:

Center Pole RPM	Total Load Against the Side of the Seat
11.0	695 pounds
11.4	746
12.0	826
12.5	897
13.0	970
14.0	1,126
15.0	1,292
16.0	1,469

If the seat structure is designed to withstand safely a load of 746 pounds and the ride is overspeeded so that the load is actually 1,469 pounds, this is not wise or safe use of the equipment. It can also be vary hazardous to the passengers. For example, at 16 RPM each 200 pound person pushes to his right with a force of 490 pounds. Many people cannot withstand forces of this kind. The seat structure will be subjected to forces and deflections that may render some of the built-in safety features ineffective. Overspeeding is doubly dangerous when the seat structure is not safely maintained. Never operate the Scrambler faster than 11.0 RPM with gasoline engine, or 11.4 with electric motor.

These suggestions for the care of your Scrambler seats are based on observations made by factory personnel, and calls and letters from owners and operators.

ADJUSTING HANDLEBAR. See "Spring Start Up".

ADJUSTMENT OF STRIKER. See "Handlebar".

AIR-LOC BREAKAGE. See "Footbottom".

AIR-LOC LOADS. See "Footbottom Straps".

AIR-LOC RECEPTACLE REPLACEMENT. See "Seat Body Structure".

AIR-LOC RECEPTACLES. See "Footbottom", "Step".

AIR-LOCS. See "Spring Start Up".

AIR-LOC STUD. See "Step".

ALUMINUM HANDLEBAR. See "Rubber Bumpers and Pads", "Handlebar".

ALUMINUM PIN CONNECTIONS, CORRODED. See "Seat Body Structure".

APPLICATION OF DECALS. See "Decals".

AUTOMATIC CLOSING OF HANDLEBAR. See "Rubber Bumpers and Pads".

BACK BLOCK. See "Wood Blocks".

BACK SHEET. See "Seat Body Structure".

BANGING SEAT. See "Seat Body Structure".

BENT LAP BAR. See "Lap Bar".

BOTTOM SWEEPS HIT BY STEPS. See "Step".

BOWED LAP BAR. See "Lap Bar".

BRASS SLIDING BOLT. See "Handlebar".

BUMPER FOR HANDLEBAR. See "Handlebar", "Rubber Bumpers and Pads".

BUMPER ON FOOTBOTTOM. See "Rubber Bumpers and Pads".

BUSHINGS, NYLON. See "Handlebar".

CAUTION DECAL. See "Decals", "Handlebar", "Spring Start Up".

CEMENTED UPHOLSTERING. See "Cushions".

CLEANING THE SEATS. (See also "Spring Start Up".)

In portable service it is quite difficult to keep oil, grease, and dirt off your equipment. However, after the ride is set up there is no reason why it cannot be cleaned.

Dirt and grease can be removed with a mild soap and water followed by a clear water rinse. Only a soft polishing cloth should be used because a coarse cloth will scratch the aluminum. Do not polish with a circular motion, but move back and forth in straight lines. If any scratches do develop they will be less noticeable when the polishing is done in this way rather than when a circular motion is used. If the aluminum surface becomes dull and oxidized it can be brightened by polishing with Never Dull Aluminum Polish, which is available from Eli Bridge Company.

Clean the upholstery with mild soap and water. Always keep dirt and trash out from under the seat cushion, because it causes rapid wear of the aluminum "skin" beneath the cushion board.

The plywood board in the footbottom can be removed for cleaning. There are two holes in the footbottom that are covered by the board, and they are there to make it easier for you to brush out any dirt or trash that accumulates in the footbottom.

CLEARANCE IN PIN CONNECTIONS. See "Seat Body Structure".

CORRODED PIN CONNECTIONS. See "Seat Body Structure".

CRACKED SEAT RIBS. See "Seat Body Structure".

CRACKS AROUND STRIKER. See "Seat Body Structure".

CRACKS IN FRONT RIB. See "Seat Body Structure", "Spring Start Up".

CRACKS IN TOP BACK TRAY. See "Seat Body Structure".

USHIONS. (See also "Spring Start Up".)

The earliest Scrambler seats had no pad on the right side, no upholstered sheet across the back, and the seat cushion was of flat construction so that the front edge of the cushion was no higher than the back. The first change was to raise the front edge of the seat cushion. This was suggested and tried out by the first Scrambler owner, and it was found to be a very worthwhile change. It greatly improved the ride characteristics, and gave a much greater feeling of security to the passengers. The second change was the introduction of the upholstered cushion on the right end. The motion of the Scrambler slides the passengers to their right, and there were some reports coming back to the factory of passengers who were not able to withstand these forces very well. The pad was made so that it could be added to earlier models which did not have it, and since its introduction there have been practically no reports of passengers having any more difficulties of this kind. The upholstered back sheet was developed because the bare aluminum sheet made black marks on people's clothing as they slid along the seat, and the upholstery material stopped that. Also, the bare aluminum could get very hot in the summer sun, and this upholstery material helped to hold down the temperature.

The seat cushion itself has gone through several modifications, but any of the designs will fit any Scrambler seat. The original padding was quite soft, compared to the present construction. The softer construction allowed the covering material to fold over in wrinkles, and then eventually the wrinkles would cut through. The firmer construction used at present has the padding material cemented to the wooden frame underneath, and then the upholstery material is cemented on top of that. In this way, the entire pad acts together, with no parts sliding over each other.

This cushion design has been subjected to a great deal of testing, and it is made the way it is so that it will be able to withstand the punishment it must take as the Scrambler operates. Frequently, cushions are brought into the factory, or are examined by factory representatives on the spot, and they are found to be of entirely different construction than that used by Eli Bridge Company. Do not change the design. Do not use a different kind of padding or cushioning unless you first consult with the factory. Do not fasten new material over the old without completely cementing the new to the old. A substantial part of the security of the passenger is due to the firmness of this seat cushion. A loose, soft cushion can be hazardous to the passengers.

Sometimes operators make their own wooden frame for the seat cushion. If this is not made correctly it may wear holes in the inside skin quickly, because it does not fit the interior of the seat properly.

Where the upholstery material is folded around the wooden frame, it is sometimes stapled so that the heads of the staples stick out against the inside skin. These staple heads can wear into the inside skin also.

The seat cushion needs the small aluminum lip which sticks out of the bottom edge the front side. Cushions are often found where this lip is completely worn away. Without this lip to fit under the edge of the footbottom, the seat cushion is not properly held in position. In most circumstances the cushion will remain where it is supposed to be, even if the retaining lip is not there, but there are conditions that can develop where the

cushion can move forward toward the footbottom, and this can be very frightening to passengers who may be riding at the time. Therefore, do not operate the ride unless every seat cushion has the lip on the front edge, and every one is under the lip of the footbottom.

For safety, every Scrambler seat should have a seat cushion in good condition and properly restrained by the footbottom, an upholstered end pad, and an upholstered back sheet.

DAMAGE TO OUTSIDE SKIN. See "Seat Body Structure".

DECAL, "CAUTION". See "Handlebar", "Spring Start Up".

DECALS. (See also "Spring Start Up".)

The decals prepared for use on Scrambler seats add a great deal to the attractiveness of the ride, if they are properly applied and maintained. Complete directions for applying these decals, along with a squeegee, are supplied when decals are ordered. Formerly Eli Bridge Company supplied varnish-applied decals, but in response to numerous requests from customers all orders are filled with pressure-sensitive, die-cut vinyl decals, requiring no varnish. The directions are as follows:

DIRECTIONS FOR APPLYING BIG ELI PRESSURE-SENSITIVE DECALS

1. Clean off the surface where the decal is to be applied, using Tide detergent and water. Rinse with clear water.
2. Add a handfull of Tide detergent to a five-gallon bucket of water. This will be used for conditioning the decal so it can be properly positioned.
3. Carefully strip off the backing from the decal. Take care that you do not stretch or tear the decal. After the backing has been removed, do not let the sticky surface fold over on itself or it will stick so tightly that the decal will be destroyed in trying to separate it.
4. Place the decal, sticky-side up, on a flat surface and sponge the sticky surface thoroughly with the Tide detergent and water solution prepared in step 2. The Tide solution provides lubrication so that you can shift the decal a little on the seat as you position it in place. Without the Tide solution, the decal will stick to whatever it touches and it cannot be moved.
5. Carefully place the thoroughly wetted decal on the seat. When it is properly positioned, squeegee the decal, beginning at the center and working all air bubbles and water out toward the edges.
6. The decals that go on the ends of the seats are die cut to fit over the rivet heads, and so they must be very carefully located.
7. This completes the installation of the pressure-sensitive decals.

Old decals can be removed with paint remover.

Some operators have reported that the decal on the footbottom wears off where it touches the seat cushion after the footbottom is folded. Others have reported that this will not happen if the decal and the seat cushion are dry when the footbottom is folded up.

The most important decal is the one on the back of the handlebar, which says,

"CAUTION: While Scrambler is in motion:
-Keep handlebar closed
-Do not stand up"

Every seat must have this information in full view of the passengers. Unless this information is where they can read it, you are not giving the passengers proper warning. If the decal is missing or un-readable, and the passengers open the handlebar and stand up, then you have not given them proper warning. Never carry passengers on the Scrambler unless every handlebar has this decal on it.

DECAL VARNISH. See 'Decals".

DECAL WEARING OFF OF FOOTBOTTOM. See 'Decals", "Footbottom".

DROPPING FOOTBOTTOM. See "Footbottom".

DRY STORAGE OF SEATS. See "Winter Storage".

END PAD. See "Cushions".

END PLUG FOR HANDLEBAR. See "Handlebar".

FLAT CUSHION. See "Cushions".

FLOORBOARD. See "Cleaning the seats", "Footbottom", "Spring Start Up".

FOOTBOTTOM.

The main structure of the footbottom has given good service through the years, but there have been some problems with some of the details of construction.

The end where the step is located has held up well, except for occasional problems with the Air-Loc quarter-turn fastener which connects the step to the footbottom. In some cases the Air-Loc stud wears an oversize hole in the step, and then it falls out and is lost. In others the Air-Loc receptacle on the footbottom gets broken. The receptacle is easy to replace, because it just involves installing two rivets. If the Air-Loc stud is lost from the step because the hole is too big, a patch with a smaller hole must be riveted to the step, and then a new Air-Loc stud with crosspin is installed.

The other end of the footbottom has had more problems. The earliest one was cracking of the flange of the end piece right where it joined the long angle across the top of the footbottom. A tapered piece was developed to spread the load more at that joint,

and this has generally been successful, but occasionally there are footbottoms which have cracks somewhere in this corner in spite of the corner reinforcement. If this tapered reinforcement, or parts to which it is attached, show any cracks or any rivets missing, repair or replace the cracked piece, or if only rivets are missing replace the rivets. It is important that this corner be structurally sound, because as the passengers enter and leave the seat they tend to twist the footbottom as they put their weight on the step, and if the corner is cracked in any way the twisting will tend to make the cracks grow larger and longer. The time to correct the situation is before a real structural problem has developed.

A second problem on that end of the footbottom concerns where the long strap is attached. The hole tends to get larger, and sometimes cracks develop around that corner. If you find any cracks, contact the factory for recommendations as to what should be done. It will help the factory to make proper recommendations if you could send along a picture to show what you have found, or if you cannot get a picture make a small sketch. The more you can describe what your problem is, the easier it will be for the factory to help you.

Frequently footbottoms are found where the lip which hangs up over the edge of the seat is almost completely worn away. Without this lip, there is nothing to hold up the footbottom except for the two Air-Loc quarter-turn fasteners which lock the footbottom to the front of the seat. If these fasteners are also missing, then there is great risk of the footbottom dropping down where it can strike the bottom sweep. This can be very hazardous to anyone riding in the seat. For safety, you need the retaining lip in good condition and hanging over the edge of the seat, and also you need both Air-Locs in good condition and fastened to the front of the seat. Here again it is recommended that you contact the factory for advice on how to solve the problem. Factory records show that on at least one occasion a Scrambler seat did not have the lip on the footbottom, did not have either Air-Loc holding the footbottom to the seat, and the footbottom did drop down to where it was hit by the bottom sweep. And there were people riding in the seat. Do not take chances; the footbottom must be firmly anchored in position.

The wooden board in the footbottom takes a lot of the punishment that would otherwise be inflicted on the aluminum skin underneath. It is a simple board, and as it wears out or rots out it can be lifted out and replaced easily. Without the board in place, it is common to find footbottoms badly buckled downward where the passengers have stood or braced their feet. This is particularly true where women have small heels on their shoes; such shoes exert great pressure and the wooden board needs to be there to distribute the load. Lifting up the board discloses two holes in the aluminum skin, which were put there to make brushing out the interior easier.

The decal on the front of the footbottom is reported to wear off rather rapidly where it touches the seat cushion after the footbottom is folded up into the seat. However, other operators say that this will not happen if the decal and cushion are both thoroughly dry before the seat is folded.

FOOTBOTTOM DROPPING. See "Footbottom".

FOOTBOTTOM FLOOR. See "Cleaning the Seats", "Footbottom", "Spring Start Up".

FOOTBOTTOM LIP. See "Footbottom".

FOOTBOTTOM REINFORCEMENT. See "Footbottom".

FOOTBOTTOM RUBBER BUMPER. See "Rubber Bumpers and Pads".

FOOTBOTTOM STRAPS. (See also "Footbottom".)

Each seat assembly has two footbottom straps which permanently connect the footbottom to the seat shell, and also act to locate and position the footbottom in the operating position and in the storage position. It is necessary for the holes at the ends of the straps to be exactly the right distance apart for the footbottom to position properly for operating. If the holes become worn and elongated, too much load is placed on the Air-Loc fasteners which anchor the footbottom to the front rib. Then with the weight of passengers getting in and out, the Air-Locs will be damaged, or the front rib of the seat may be damaged, or both. If this should happen, the fastening of the footbottom to the seat becomes uncertain and dangerous.

The straps are connected to the seat shell by 3/8-24 cap screws threaded into anchor nuts. The anchor nuts are attached to reinforced areas of the inside skins. In removing and replacing the cap screws from these anchor nuts, be careful not to cross thread or otherwise damage the nuts. Replacement of these anchor nuts requires opening up the outside skin, which is a difficult job.

The straps are attached to the footbottom with 3/8-24 cap screws and self-locking nuts.

It takes only a few moments to determine whether the holes are worn. If they are, and the footbottom does not fit up snugly against the front rib, then replace the footbottom straps.

FOOTBOTTOM TWISTING. See "Footbottom".

FRAME FOR SEAT CUSHION. See "Cushions".

FRONT RIB CRACKS. See "Seat Body Structure". "Spring Start Up".

FUNCTION OF WOOD BLOCKS. See "Wood Blocks".

GREASING GEARS TO REDUCE SEAT RUMBLE. See "Seat Body Structure".

HANDLEBAR.

Early Scramblers were fitted with welded steel handlebars, and some of them are still in service. There were two significant problems with the steel construction. One was the difficulty of maintaining a painted surface where the passengers rubbed their hands as they held on, and the second was the accumulation of moisture inside the hollow part of the handlebar. The moisture caused rusting of the interior, and as the ride operated the rusty water would sometimes come out on the passengers.

The aluminum handlebar construction eliminated both problems. It was ruggedly designed and has given excellent service since it was first introduced. In a very few cases the roll pins which connect the handlebar hinge blocks to the handlebar itself have become a little loose. Whenever looseness develops in this connection of the handlebar hinge plug to the handlebar it is the factory recommendation that the handlebar be replaced, or at least be sent back to the factory to see whether or not it can be salvaged. This is an extremely important connection, so do not take chances with it.

Basically the same handlebar latch (or lock) and striker set has been used since the Scrambler was first introduced, although there has been considerable modification. After the first year, the striker was changed to the next larger size in order to make adjustment easier. The pin for the latch handle was replaced with a bolt and self-locking nut. The sliding bolt in the latch was changed from a rounded end to a 45 degree beveled end, and the material was changed from brass to malleable iron for better wear. There had been a hole through the latch body for installing a padlock to prevent opening of the latch, but it was found that this hole could actually prevent the latch from closing, particularly after some wear had developed in the sliding bolt and where it slid in the latch body, and so the hole in the latch body was discontinued.

The handlebar striker is adjustable in and out. It should be set so that when the handlebar is closed gently without slamming it will still latch completely. The striker is held by a screw on the outside and another on the inside. If you do any adjusting of the striker be sure that the screws are thoroughly tightened when you are through, because loose screws could work out, the striker could fall off, and there would then be nothing to hold the handlebar shut. This could be extremely hazardous for your passengers, so be sure that these screws are always tight. A properly adjusted striker should be such that when the handlebar is closed there is still a very small amount of play between the rubber bumper on the back of the handlebar and the front of the seat.

The handlebars are all adjusted to latch properly at the factory. However, after a great deal of use some adjustments may be necessary. The latch should be slightly below center on the striker. If it is not, then loosen, but do not remove, the eight socket head cap screws on the hinge end of the handlebar. Position the latch in the striker and hold it there while you tighten the cap screws. The handlebar hinge pins turn in nylon bushings and should always be kept in good working condition or replaced.

Warning: If the handlebar is permitted to droop because of misalignment or worn nylon bushings, the sliding bolt will not be able to enter the striker cavity, and then will not latch, creating the hazard of an unlocked handlebar. Do not operate the Scrambler in this condition.

THE HANDLEBAR LOCK AND STRIKER TAKE A GREAT DEAL OF PUNISHMENT, AND AS A RESULT, SOME WEAR WILL SHOW UP IN THE MATING PARTS. UNRELIABLE LATCHING IS DANGEROUS. IF THE HANDLEBAR FAILS TO LATCH OR BECOMES UNLATCHED, THE PASSENGER WILL FEEL INSECURE. HE MAY LEAN FORWARD OR STAND UP, EXPOSING HIMSELF TO THE DANGER OF BEING THROWN FROM THE SEAT. INSPECT YOUR HANDLEBAR LOCKS CAREFULLY. REPLACE THEM WHEN THEY CAN NO LONGER BE ADJUSTED TO FUNCTION SAFELY.

The Scrambler seat is secured to the rest of the ride by the three pins on one side of the seat. As the ride turns, the forces which act on the seat cause it to flex slightly. The sliding bolt must engage the striker a minimum of 1/4" (one-quarter of an inch) for the latching of the handlebar to be safe, and this assumes also that the entire Scrambler seat is properly maintained, that no rivets are missing, that all holes are properly reinforced with stressed skin type patches, and that the Scrambler is not operated beyond the maximum speed for which it was designed (11.0 RPM of the center pole when powered by a gasoline engine, and 11.4 RPM with an electric motor).

It is very easy to check the amount of engagement. With the handlebar closed and latched, draw a pencil line on the front surface of the sliding bolt right next to the striker. Open the handlebar and measure the distance between the pencil line and the end of the sliding bolt.

Any time the length of engagement measures less than 1/4" then you should replace the handlebar lock. In the event that the seats are structurally sound and new, but the locks do not provide or exceed the minimum engagement, notify the factory immediately. Under no circumstances should you carry passengers in seats having less than minimum engagement.

Sometimes the bolt assembly wears in such a way that the sliding bolt extends out too far. If this happens to such an extent that the beveled face goes past the roller, permitting the flat surface of the bolt to strike the roller, both the lock and the striker can be damaged. Replace any lock in this condition.

The roller in the striker assembly should turn freely on its shaft. Sometimes a drop of oil will help to free a tight roller. If a tight roller can not be loosened up, it will cause rapid wear and should be replaced before it ruins the lock as well. Never carry passengers in a seat where the striker has no roller. Replace the striker first. Replace it also if the sides of the striker are badly bent out of shape, or worn and cut by the sliding bolt hitting because it was mis-aligned. Beginning with Serial No. 415, a 5/16" thick spacer has been added under the striker so that the roller pin lies within the sides of the striker, to prevent the pin from working out of the roller. These spacers can be added to any Scrambler seat beginning with Serial No. 17.

REMINDER: Proper latching is essential for safe operation. If you are unsure about any problem, consult the factory.

The handlebar must be prevented from swinging up and over center, so that it swings back and hits the seat sweep tie rod. The rubber handlebar stops do this if they are in good condition, but if they get cut or worn they will not be able to resist the handlebar swing, and as it swings back toward the tie rod it will bear against the heads of the screws which hold in place the two rubber handlebar stops. Without the rubber to act as a cushion and spring, the handlebar will strike the screws and drive them into the seat, tearing out the threaded fasteners inside the seat. Once they are torn out there is no way to repair them without completely taking apart the seat structure. Therefore, it is very important to keep the rubber handlebar stops in place and in good functioning condition.

The rubber bumper in the other end of the handlebar should be examined for damage, but since it first began to be used there has never been a report of trouble with it.

The hollow aluminum extrusion that makes up the top and bottom members of the handlebar has a round aluminum plug fastened in the end next to the latch on Scramblers through Serial No. 414. Occasionally, handlebars are seen with one or both of these round plugs missing. They should be replaced, because of the greater risk of someone getting hooked or snagged in the open tube, as compared with the closed, rounded end when a plug is there.

The lap bar assembly must be firmly attached to the back of the handlebar. Some of the screws occasionally work loose and fall out. In order for the lap bar to function properly, all screws must be in place and firmly tightened. There should be two small round rubber bumpers on each lap bar hinge block.

BE SURE A COMPLETELY READABLE "CAUTION" DECAL IS ON THE BACK OF EACH HANDLEBAR.

In 1973 the State of California required that there be a secondary latch on all Scrambler handlebars. This was developed and made available as a modification kit. After these secondary latches had been in service for nearly two seasons the Scrambler owners were asked for comments. The response was quite favorable, and because of that and because the secondary latch offers an additional measure of safety, the secondary latch was installed as standard equipment on all Scramblers beginning with Serial No. 415, and can be adapted to any earlier Scrambler equipped with aluminum handlebars.

HANDLEBAR ADJUSTMENTS. See "Spring Start Up".

HANDLEBAR, ALUMINUM. See "Rubber Bumpers and Pads".

HANDLEBAR HINGE. See "Spring Start Up".

HANDLEBAR HINGE PINS. See "Handlebar".

HANDLEBAR HITTING TIE ROD. See "Handlebar".

HANDLEBAR RUBBER BUMPER. See "Handlebar", "Rubber Bumpers and Pads".

HANDLEBARS, STEEL. See "Rubber Bumpers and Pads".

HANDLEBAR STOP. See "Rubber Bumpers and Pads", "Seat Body Structure".

HANDLING SEATS. See "Seat Body Structure".

HINGE FOR HANDLEBAR. See "Spring Start Up".

HINGE FOR LAP BAR. See "Lap Bar".

HINGE PINS. See "Handlebar".

HOLE IN LATCH BODY. See "Handlebar".

HOLES FOR DIRT REMOVAL IN FOOTBOTTOM. See "Footbottom".

HOLES IN INSIDE SKIN. See "Seat Body Structure".

HOLES WORN IN STRAP. See "Footbottom Straps".

INCLINED CUSHION. See "Cushions".

INSIDE SKIN. See "Seat Body Structure".

INSTRUCTION FOR APPLYING DECALS. See "Decals".

KIT FOR TOP BACK TRAY MODIFICATION. See "Seat Body Structure".

LAP BAR. (See also "Spring Start Up".)

The most common thing that shows up on the stainless steel lap bar is that it gets bent out of shape. This is surprising in view of how difficult it is to bend the ends of the lap bar when it is being manufactured. This bowing of the long straight section does not seem to affect the function of the lap bar, but it does cause some interference in the hinged ends. The aluminum parts rub on each other when this happens, and sometimes the wear is substantial.

The small rubber mushroom bumpers, for cushioning the lap bar to keep it from striking the handlebar in both the up and down positions, do not seem to stay in place very well. It is not known whether these bumpers just do not stay where they are supposed to or whether the passengers pick them off. There is not a great problem if these bumpers are missing, although eventually the lap bar may wear a hole through the handlebar where it is hit, and so it is advisable to keep these rubber bumpers on the lap bar. There are two of them on each end of the lap bar.

On the first lap bars that were delivered the pieces that were bolted to the handlebars had through-bolts with self-locking nuts on them. It was found that occasionally passengers would pinch their fingers because of the nuts being where they were, and so the design was changed so that the screws are threaded into drilled and tapped holes in the blocks. This is not as positive as the self-locking nuts were, and it is necessary to check these screws frequently to be certain that they are pulled tight. If part of these screws get lost, the lap bar could fall off. Therefore, since the lap bar is an essential piece of safety equipment, it is important that you check each one regularly to be certain that all screws are tight and the lap bar is functioning properly. In the factory final inspection of a new Scrambler, the lap bar must be loose enough to fall down of its own accord when the handlebar is closed; if it does not, then it is worked over until it does.

The lap bar has been an important addition to the Scrambler seat, and it has given an added measure of safety to the passengers, particularly to the small children. To do a proper job, it must be maintained well.

RUBBER BUMPER FOR HANDLEBAR. See "Handlebar".

RUBBER BUMPER FOR LAP BAR HINGE. See "Lap Bar", "Rubber Bumpers and Pads".

RUBBER BUMPER ON FOOTBOTTOM. See "Rubber Bumpers and Pads".

RUBBER BUMPERS AND PADS. (See also "Spring Start Up".)

There is a rubber bumper built into a recess on the locking end of the handlebar, so that as the handlebar closes this rubber bumper is what strikes the front of the seat instead of the handlebar itself. This rubber bumper has been used since the aluminum handlerbar was introduced. Early Scrambler s were equipped with steel handlerbars and there was no provision on that handlebar for a good bumper. In that case, a strip of adhesive-backed sponge rubber was stuck to the front of the seat where the handlebar hit, but in a short time the rubber strip would peel off and then the handlebar would strike the seat directly. Since the rubber bumper was built into the back of the aluminum handlebar there have been no problems reported with it.

On the other end of the handlebar there are two rubber blocks that are there to prevent the handlebar from swinging back over center and hitting the seat sweep tie rods. These rubber hinge blocks are easily replaced, but operators often neglect them until the rubber is completely worn away. Then the handlebar starts striking the screws which are there to hold the rubber hinge blocks. In a short time the handlebar drives these screws back inside the seat, tearing out the threaded fastener inside the seat, so that it becomes impossible to re-install the rubber hinge blocks. These blocks have to be considered as protective devices, that in protecting will be worn or cut away so that they must be replaced. It is much better to install the inexpensive rubber hinge blocks than try to repair the damage caused by the screws being drivin back inside the seat.

These rubber hinge blocks also serve to help the handlebar close automatically when the Scrambler starts turning, if the passengers have failed to latch it. There is a lot of wear on these bumpers, and you will probably find that they will cut through and need replacing in a fairly short time.

Sponge rubber pads are used on the front of the seat to cushion where the footbottom touches, and another pad is used on the back of the step to separate it from the footbottom. These pads help to prevent the parts from scrubbing against each other, but their most important function is to keep the parts from rattling against each other. Your Scrambler will be much quieter if you keep these rubber pads on the seats and steps than if you permit them to become lost.

Each hinge block on the lap bar has two round rubber bumpers on it, so that the handlebar is protected from the lap bar in both the up and down positions. Failure to keep all four rubber bumpers on each lap bar will cause the lap bar to wear into the handlebar.

There is a rubber bumper attached to the angle across the top of the footbottom, and it is on the end away from the step. This bumper is necessary only if the Scrambler is used portable. It cushions the lap bar when the seat is folded and prevents it from wearing into the footbottom.

RUBBER HANDLEBAR STOP. See "Rubber Bumpers and Pads", "Seat Body Structure".

RUBBING OF FOOTBOTTOM DECAL. See "Decals".

RUMBLING OF SEATS. See "Seat Body Structure".

SCREWS DRIVEN INTO SEAT. See "Rubber Bumpers and Pads".

SCREWS IN LAP BAR. See "Lap Bar".

SEAT BANG. See "Seat Body Structure".

SEAT BLOCKS. See "Spring Start Up", "Wood Blocks".

SEAT BODY STRUCTURE

The seat body structure is the main load carrying member of the seat, and the safety of the passengers requires that it be maintained in serviceable and safe condition. This requires that the inside and the outside skins be free from holes or cracks, that the three ribs which position the two skins be structurally sound, that the structure across the back of the seat be intact, and that the pin connections which support the seat be sufficiently strong.

One of the more critical areas is the inside skin. Factory inspections have disclosed numerous examples of the inside skins being deliberately cut open with a chisel in order to get at money which had dropped through a small hole worn in the skin. Operators who have done this have literally "cut the heart out" of the strength of the inside skin, with no thought for how they were weakening the seat. In other cases, operators have allowed trash to collect inside the seat and under the seat cushion. As the ride operates the wooden frame of the seat cushion, scrubbing against the trash, has worn holes through the inside skin. From the small holes worn through, cracks have developed that have enlarged the holes to very serious proportions.

In handling the seat in and out of a trailer, operators sometimes drop it and it usually falls on the rounded bottom corners at one end or the other. At the very least this wears off or breaks off rivets, and at the worst it buckles in the corners and cracks the ribs. Damage sustained by the outside skin in this kind of handling reduces the load carrying capability of the outside skin. Another kind of damage that occurs to the outside skin is due to failure to anchor the seats in the trailer. In traveling down the road, the seats bounce against each other, and the pin connection at the top of one seat bashes in the top of the other end of the seat next to it. This is not a heavily loaded part of the seat, but the damage could spread to a more critical area, and it certainly disfigures the seat. If the seats are adequately restrained in the trailer this will not happen.

On some earlier Scrambler seats the aluminum sheet riveted across the back below the back box lost rivets and became loose one at a time. This appears to be associate with passengers bracing their feet against the footbottom and pushing very hard against the back. Later Scramblers have more extensive fasteners connecting this sheet to the back rib. Rivets which are missing should be replaced without delay.

The top back tray connects to each end of the back rib. Frequently, the flange of this back tray is cracked out next to the rib. In order to check this it is necessary to remove the back wooden block. If you find any cracks there, you are strongly urged to obtain a modification kit from Eli Bridge Company. This kit includes a heavier back tray and all the necessary fasteners. Some states will not permit a Scrambler to operate if there are cracks present there, and Eli Bridge Company would share the view that any cracks should be removed, either by repair or by replacement.

There have been a few instances where the front rib has cracked next to the striker. This has occurred mostly in the earlier Scramblers that did not have an inside reinforcement behind the striker. Since the reinforcement has been added there have been no reports of cracks developing in that area. If you find any cracks around any of your strikers, see about having repairs made. A crack growing in the vicinity of the striker could cause the loss of a striker, with the great possibility of hazard to passengers because of a handlebar with nothing to latch it to.

If the rubber handlebar stops are not kept in good working condition, the handlebar swinging back over center can drive the screws, which hold the rubber stops, back inside the seat, breaking off the threaded plate nuts riveted inside the seat and starting cracks that may be very difficult to stop and reinforce.

The early Scrambler seats had Air-Loc receptacles attached to the front rib on the inside. From time to time these receptacles would break, and replacement was practically impossible. A few cut round holes on the bottom in the outside skin, made the replacement, and then covered the holes with circular patches riveted in place. Besides cutting into a primary structural member, this was not a practical procedure because later replacement would require the same procedure again. A modified front was developed for the seat, so that the Air-Loc receptacles were mounted outside of the seat shell, fully accessible for replacement if necessary. Factory records indicate that there are about as many broken and unrepaired Air-Locs in this new, accessible location as there were in the old location. This modification is available to all older Scramblers having the Air-Locs inside the seat.

Besides wearing holes in the inside skin, the seat cushion wears off rivet heads. Badly worn rivets should be replaced. The lip on the footbottom lies on top of the row of rivets along the front edge of the seat, and these rivets are often badly worn.

Occasionally reports reach the factory of the aluminum seat tabs becoming badly corroded. The surface of the tab appears to be made of many layers of paper, and the layers peel off quite easily. The reason for this kind of corrosion has not been established, but where it occurs, the pin connections should be replaced. In recent years the top pin connection on the seat has been made of plated steel, rather than aluminum.

The seats need to be as free of defects as you can make them. As with any other kind of mechanical device, when they are used a lot they will wear out, and if they are mishandled they will get damaged. The kind of wear and damage that can occur to a seat is so varied that it would be impossible to prepare instructions for the way all repairs should be made. The only thing that can be done in a manual of this kind is call your attention to some of the kinds of damage that can occur, and then encourage you to contact the factory for assistance in bringing the seats back to a safe and serviceable condition. Describe your problem fully and, if possible, send a photograph of what the problem is.

Operators occasionally have asked about rumbling of the seats. This is not always the fault of the seats; on some occasions this has been due to insufficient lubrication of the large gears driving the Scrambler in the center pole. If you observe rumbling and vibration of the seats, check the lubrication on these gears before you try to do anything else.

The pin connections of the seat to the seat sweep have a little built-in clearance so that the parts can be assembled easily. As the Scrambler turns, and as the direction of load changes, the seats shift from side to side within the pin connections, and the banging as the seat hits each end is quite audible outside the ride.

SEAT CUSHION RETENTION. See "Spring Start Up".

SEAT CUSHIONS. See "Cushions", "Spring Start Up".

SEAT LOADS. See "Introduction".

SEAT PADS. See "Rubber Bumpers and Pads".

SEAT STRENGTH. See "Introduction".

SECONDARY LATCHING. See "Handlebar".

SIDE LOADS IN SEAT. See "Introduction".

SKIN, INSIDE. See "Seat Body Structure".

SLIDING BOLT. See "Handlebar".

SLIDING BOLT MINIMUM ENGAGEMENT. See "Handlebar".

SOFT PADDING. See "Cushions".

SPONGE RUBBER STRIP. See "Footbottom", "Rubber Bumpers and Pads", "Step".

WOOD BLOCKS. (See also "Spring Start Up".)

Around the top of the seat are three wood blocks, referred to as the tab side block, the back block, and the outside block. On early model seats, these blocks were covered with upholstery material, and secured to the seats with wood screws. The screws worked loose and came out, so they were replaced by through bolts. The blocks seemed to rot in a short time, so the upholstery material was eliminated, and the blocks were painted instead. Then the side-to-side through bolts were changed to flat head screws going vertically through the blocks into anchor nuts attached to the aluminum trays below. This arrangement is in current use, and can be adapted to any of the earlier Scramblers.

The only purpose the seat blocks serve is to cover sharp edges of aluminum for protection, and to present a more attractive appearance. If the blocks become splintery, or cracked, or partly broken away, they will no longer protect the passengers from sharp edges. They may be a hazard themselves. And in such condition they certainly do not contribute to the appearance of the ride.

If the blocks are worn out, replace them. If they can be repaired, use plastic wood or a similiar material to fill cracks and repair them. When you paint them, remember: peoples' clothing will come in contact with each block. Make sure the paint will not rub off. Make sure you leave no "tears" to release wet paint on someone's clothing.

If the wood has rotted, replace the blocks. Rotted wood is no protection, and its continued use will only invite injury.

WOOD FRAME FOR SEAT CUSHION. See "Cushions".

WOOD FLOORBOARD. See "Footbottom", "Spring Start Up".

WOOD FRAME, WEARING IN SEAT. See "Seat Body Structure".

WOOD ROT. See "Footbottom", "Wood Blocks".

WORN HOLES IN STRAPS. See "Footbottom Straps".

WORN RIVET HEADS. See "Seat Body Structure".

WORN STRIKER. See "Handlebar".

LUBRICATION

BEARING SEALS BLOWN. See "Power Unit Truck Bearings", "Rotating Base Drive Shaft Pillow Blocks", and "Twin Disc Hydrosheave".

BOTTOM SWEEP DRIVE SHAFT BEARINGS.

The long drive shaft in each bottom sweep runs in three bearings. A self-aligning ball bearing flanged pillow block is at each end of the shaft and a nylon bearing is in the middle. All three of these bearings have grease fittings and they should be greased several times during the season.

The short shaft in the end of each bottom sweep turns in two more flanged pillow blocks, and there are grease fittings on each of these bearings. It should not be necessary to lubricate these two bearings oftener than once a season.

The clutch disc in the slip clutch turns on a nylon sleeve bearing. Older Scramblers are provided with a grease fitting to lubricate this bearing. There has been some indication that operators occasionally over-grease this bearing and the excess grease gets out on the clutch faces, ruining them. Therefore, on all new Scramblers this grease fitting will be discontinued and the nylon bearing will operate without lubrication. DO NOT LUBRICATE THIS NYLON BEARING. THIS APPLIES TO ALL SCRAMBLERS BEGINNING WITH SERIAL NO. 92, AND ALL OLDER ONES WHICH HAVE BEEN MODIFIED AND ARE NOW EQUIPPED WITH THE REMOVABLE SLIP CLUTCH AND PINION ASSEMBLY. The shaft just oscillates back and forth in the nylon bearing, and under these conditions it will operate quite well without lubrication.

BRAKE BEARINGS. See "Spur Pinion Shaft Bearings".

BRAKE SHOE PIVOTS.

Do not forget to grease the pivot pins for the brake shoes. The grease fittings are on pipe extensions that can be seen under the brake drum.

CLUTCH THROW-OUT LINKAGE.

The Ford gasoline engine became the standard power unit beginning with Serial No. 415. The throttle and clutch linkage with the brake ratchet handle requires occasional lubrication of its pivot points to maintain easy operation and minimize wear.

DRAIN PLUG. See "Gear Pot Bevel Pinion Bearings".

DRIVE UNIT DRIVE SHAFT BEARINGS.

Each drive shaft turns in three bearings. The Flangette bearing on each end is pre-lubricated at the factory. However, grease should be added once or twice during the season. There is a grease fitting in the stamping which holds the bearing.

The bearing in the middle of each shaft is similar to the one in the middle of the long drive shaft in each bottom sweep. Each of these bearings should be greased regularly. Grease these bearings through the holes bored in the drive unit cover board.

EXTENSION TO GREASE FITTINGS. See "Main Center Pole Bearings" and "Spur Pinion Shaft Bearings".

FLEXIBLE CHAIN COUPLINGS.

The rolls in the roller chains must be free to turn if the coupling is to work properly. Keep the chain clean and well greased. It is suggested that every time

a chain is removed it be cleaned in low-flammability solvent and then re-greased with clean grease. Use very little grease. Excess grease will be thrown off as the shafts rotate. If the rolls are properly cleaned and greased, they will be bright, but if they are dark and rusted then they are not free to rotate because of inadequate lubrication or because of such severe misalignment that there is binding of the chain by the two sprockets. Try to correct either situation when it develops so that the chains will last as long as possible. Do not try to lubricate these chains with oil because it will be thrown off quickly.

There is a larger chain coupling which connects the slip clutch to the bottom sweep drive shaft. While it is necessary to provide a little lubrication for this coupling, IT IS EXTREMELY IMPORTANT THAT IT NOT BE OVER-GREASED. Some operators, instead of removing the covers so they can get to the coupling properly, apparently just stick a handful of grease on the coupling by reaching up under the cover and expect the grease to distribute itself. What happens is that the grease gets thrown off where it can get on the clutch faces. When this happens it can quickly ruin the facings, causing erratic operation of the clutch. This can be dangerous, because it can change the whole character of the Scrambler ride and possibly make your passengers insecure. To grease this coupling, remove the clutch cover, work grease into the coupling chain all the way around, and then WIPE OFF ALL SURPLUS GREASE. NEVER USE OIL OR LIGHT GREASE WHICH CAN RUN OFF THE COUPLING.

GEAR POT BEVEL PINION BEARINGS.

The bevel pinion in the gear pot turns on a double roll tapered roller bearing. This bearing is lubricated by the oil in the gear pot and no further lubrication is needed.

To check the oil level in the gear pot, level the center pole base section, and then remove the access hole cover plate which is held by three bolts. The oil should reach just to the bottom of the access hole, so that any oil added will run out. Check the level after the gears have been idle for an hour or so, because the churning and heating caused by the gears in motion will make the oil expand to a greater volume than when it is cool.

Drain the oil and replace it once a year. During the breaking-in period it may need replacing sooner. The drain plug is just inside the access hole. Drain the gear pot when the base section is up on wheels, so that a pan can be slid underneath to catch the oil. Approximately 11 quarts of Texaco Multigear EP-90 is required, when replacing the oil.

GEAR POT OIL LEVEL. See "Gear Pot Bevel Pinion Bearings".

GEARS.

Your Scrambler was set up, operated, and checked at the factory before it was delivered to you. However, the gears did not have much running time. It is important that the gears be greased properly at all times. At the factory the gears were coated with Texaco Crater 5X Fluid Grease, which is a grease containing a solvent that evaporates, leaving a very tacky coating of grease that will not throw off or drop off as many greases do. Use plenty of this grease, and re-apply it

whenever the gears become dry. Regular grease can be used, but be sure that the gears do not become dry and start to wear. If there is any flaking of the cast iron gears in the base section then they are not being greased properly. Your gears should last many years if properly greased.

If your Scrambler is in heavy service, the gears will probably need re-greasing once a week. DO NOT USE A SOLVENT-BASED GREASE IN ANY OF THE BEARINGS OR IN THE GEAR POT.

The bevel gear at the bottom of each unit pole is entirely in the open and grease can be applied easily.

To grease the large gears in the base section, remove the cover from the rotating base. The bevel ring gear down below is not exposed anywhere, but you can grease it by coating the bevel pinions and turning the center pole. The bevel pinions will in turn distribute the grease around the circle. You can grease the large spur gears through the access holes. Only a few teeth of the large internal gear show in these holes, and the only way to grease them is to grease the spur pinions and the floating gear, and then turn the center pole. All of the teeth in the floating gear will pass by the access holes when you turn the rotating base.

Watch the oil level in the transmission of the power unit truck. Remove the overflow plug, and add gear oil until it runs out of the overflow. This transmission should be drained and refilled with new oil once a year. Use Texaco Multigear EP-90 grease, or equivalent.

GREASE FITTING EXTENSION. See "Main Center Pole Bearings" and "Spur Pinion Shaft Bearings".

HYDROSHEAVE. See "Twin Disc 9.4 HSD Fluid Coupling".

LEVEL OF OIL IN GEAR POT. See "Gear Pot Bevel Pinion Bearings".

LUBRICANTS.

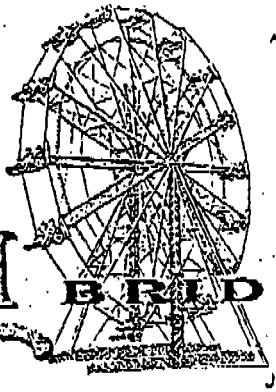
THE SCRAMBLER IS TO BE SERVICED WITH THE FOLLOWING LUBRICANTS:

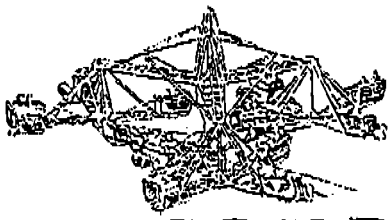
A. Bearings: Texaco Marfak Multipurpose No. 2 Grease.
B. Open Gearing: Texaco Crater 5X Fluid Grease.
C. Gear Pot and Engine Transmission: Texaco Multigear EP-90 Grease.
D. Hydrosheave (used through Scrambler Serial No. 414): Filled by the Twin Disc factory with SAE-10W oil.
Twin Disc 9.4 HSD Fluid Coupling (used beginning with Scrambler Serial No. 415): Filled by Eli Bridge Company with 65 fluid ounces (two quarts plus one fluid ounce) of Fyrquel 150, made by the Stauffer Chemical Co., of Westport, Connecticut. DO NOT USE OIL IN THIS FLUID COUPLING. IT REQUIRES FYRQUEL 150.

A lithium soap base grease is recommended. This type of grease will serve you the year round, and it will resist washing out of exposed bearings and gears longer than many types of grease. Any lithium soap grease can be used, but you should be sure that only lithium soap grease is used in the bearings, because some of the more common greases will not mix with this type of grease. The mixture may

AREA CODE 217 PHONE 245-7145

ALL STEEL PORTABLE
BIG ELI
FERRIS WHEELS





Scrambler
ELI POWER UNITS

ELI BRIDGE COMPANY

INCORPORATED
800-820 CASE AVENUE
JACKSONVILLE, ILLINOIS. 62650

12 April 1973

Dear Scrambler Ride Owner:

The State of California has placed a mandatory requirement on all Scrambler rides that operate in that State, requiring that every seat handlebar have a secondary latching device.

In accordance with the above requirement, Eli Bridge Company has developed such a device as shown in the enclosed photograph. It has been strength-tested at the factory, field-tested on a Scrambler ride, and has been approved by the State of California.

This secondary latching device can be added very easily to any Scrambler ride seat equipped with aluminum handlebars. Some of the earliest Scrambler rides may still be fitted with steel handlebars, and it is not designed to fit them. If you have steel handlebars we suggest you contact the factory for further information.

The foreman of our Scrambler ride seat fabrication department has estimated that an entire Scrambler ride could be modified with these secondary latches in approximately three hours.

The cost of this modification kit is $24.00 per seat, or a total of $288.00, f.o.b. our factory. This price includes all the parts, bolts, nuts, rivets, drills, drill templates, and instructions. You will need a hand pop-rivet gun capable of setting 5/32" diameter rivets, and a hand drill.

Although you are not located in California, we felt you should be notified of the above -- as you may play one or more locations in California during your normal season.

The above mentioned modification kit, for 12 seats, is available for reasonably prompt shipment, following receipt of firm order.

Sincerely yours,
ELI BRIDGE COMPANY

Lee A. Sullivan, Jr.
President.

SAFETY BULLETIN

SECONDARY LATCHING DEVICE

for Seat Handlebar of

BIG ELI Scrambler ride.

In 1973 it became mandatory in the State of California that rides such as the BIG ELI Scrambler ride be equipped with secondary latching devices on the seats, in addition to the normal primary latch. It was intended that this secondary latching device prevent the handlebar from opening, or being easily opened, even if the primary locking device should fail to function.

In accordance with the California requirement, Eli Bridge Company developed and tested such a device. It was approved for use in California, and was made available to all owners of BIG ELI Scrambler rides operating in that State.

At the conclusion of the 1974 amusement season we contacted owners whose seats had been equipped in this manner for the past two seasons, asking to know their experience and comments. Based on the very favorable response received, starting with 1975 models (Serial No. 416) all new BIG ELI Scrambler rides have been equipped in this manner.

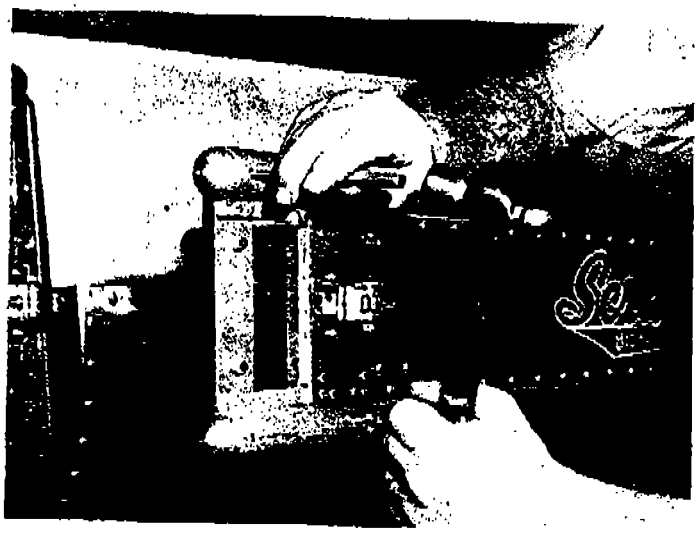
This secondary latching device can be easily added to any Scrambler ride that is equipped with aluminum handlebars. For the added protection of your passengers, we strongly urge you to make this modification to the handlebars and seats of your BIG ELI Scrambler ride.

Back in early 1973 we offered this modification kit complete, for 12 seats, at the price of $288.00 (f.o.b. our factory). The kit included 12 secondary latching devices, necessary hardware, drill bit, drill templates, and instructions for installation. To encourage your purchase, installation and use of this equipment on your BIG ELI Scrambler ride - we offer this equipment to you at the same price we were quoting back in 1973. However, this is a limited offer, for your prompt acceptance.

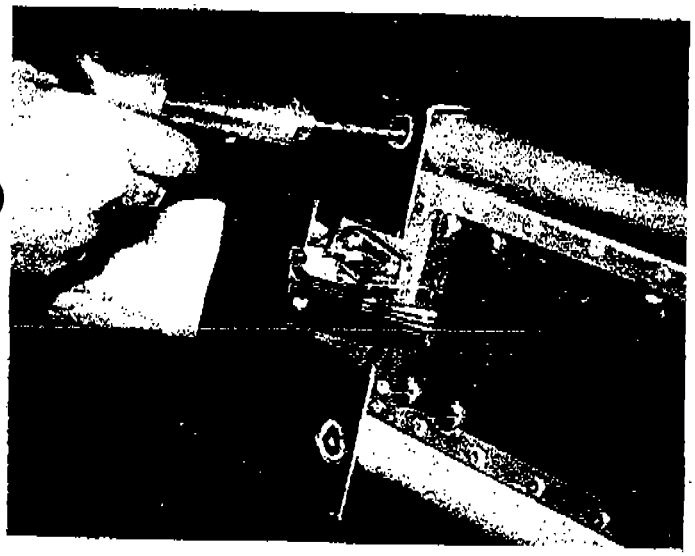
Installation is quite simple. In addition to the above, you will need a hand pop-rivet gun capable of setting 5/32" diameter rivets, and a hand drill. It is estimated that installation of all 12 secondary latching devices will require approximately 3 hours of your time.

Some older model Scrambler rides (1959 Model, Serial No. 101 or older) are still equipped with old-style steel handlebars. To use this secondary latch modificati these rides would also have to be equipped with aluminum handlebars. You will find aluminum handlebars quoted in your Scrambler ride Parts List.

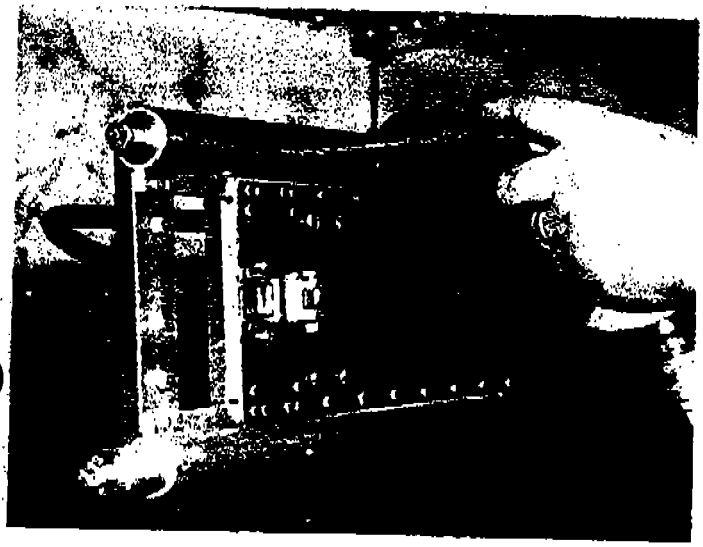
DIRECTIONS FOR INSTALLING A SECONDARY LATCH ON A SCRAMBLER RIDE SEAT



1



2

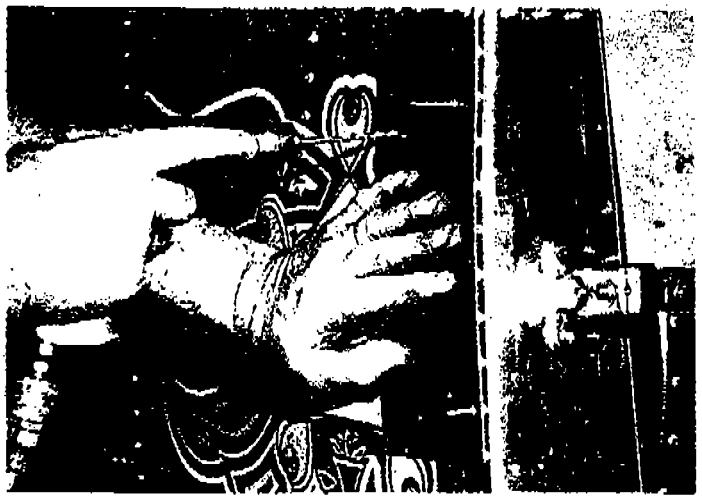


3

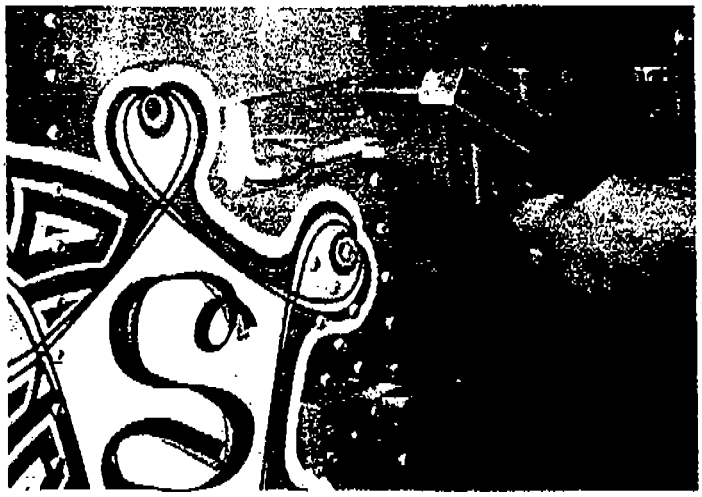
These instructions apply only to Scrambler seats equipped with aluminum handlebars.

1. Use a 5/32" punch to push out the roll pin holding each rounded knob in the end of the handlebar, as shown in Picture No. 1. Then remove the knobs.
2. Hook the handlebar drill template over the top of the handlebar and butt it against the outer end of the handlebar as shown in Picture No. 2. With a 3/16" drill, drill a hole through the front side of the tube at the top of the handlebar, and then do the same with the tube at the bottom of the handlebar. These two holes in the template are encircled in the Picture. CAUTION: DO NOT DRILL THROUGH THE BACK SIDES OF THE TUBES.
3. Each long plug has a 3/8" hex head bolt screwed in the end. Insert the plug into the tube of the handlebar, and shove it in until it is flush with the outer end of the handlebar. Turn the plug around until you can see the hole in the plug through the hole you have just drilled in the tube. Line up these two holes as well as you can. Insert the 3/16" drill all the way in and finish drilling through the back side of the tube, as shown in Picture No. 3. In this way the hole will be lined up all the way through. Install the round head, 10-24 screw, 1-½" long, through the hole and secure it with a self-locking nut.
4. Lay the skin template against the side of the seat and locate it in position by inserting the stem of a rivet through the only hole that is in a corner of the template, and then insert the stem of the rivet through the hole in the rivet head in the top front corner of the seat. Line up the front edge of the template with the front edge of the seat, and insert the stem of a second rivet through the other hole in the front edge of the template and into the hole in the rivet head underneath the template. This locates the template accurately. There are four holes remaining in the template. Using a No. 20 drill, drill one of the holes into the seat skin, and slip a rivet through the template and seat skin to keep them lined up. DO NOT SET THIS RIVET. Then drill the second hole, which is near the first hole. See Picture No. 4. Repeat the procedure with the other two holes.
5. Remove the template and install the two brackets on the side of the seat. The top bracket is the long one, and the hook must be on the bottom side. On the bottom bracket the hook must be on the top side. The two holes located by the template for each bracket are for the top front and bottom rear rivet of each bracket. Set the two 5/32" rivets in each bracket. See Picture No. 5.

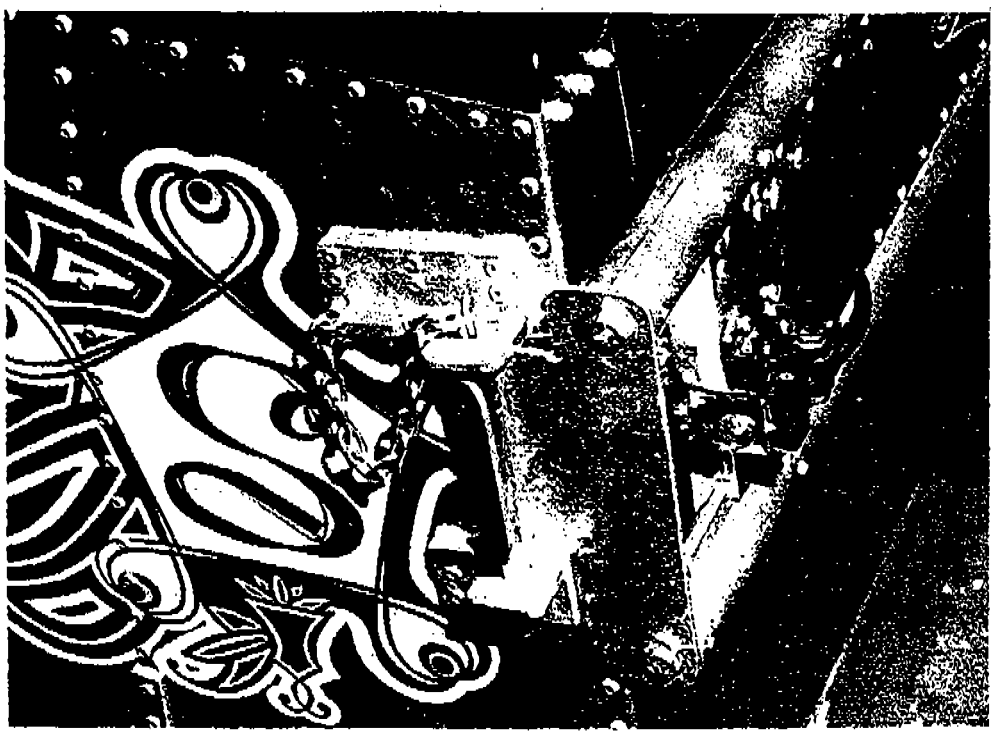
6. With a No. 20 drill, drill through the remaining four holes in the top bracket to locate matching holes in the seat skin, and then do the same with the three in the bottom bracket. Then install the 5/32" rivets.
7. Install the chain with the end link laid on top of the bracket and pointed straight out, away from the seat. The round head of the 10-24 screw (¾" long) and the washer go on the top of the chain link, and the self-locking nut goes underneath the bracket.
8. Install the handlebar bracket on the end of the handlebar with the two 3/8"-16 hex head bolts, 1" long, and be sure there is an internal lockwasher under the head of each bolt.
9. The locking pin will drop in place freely if all parts have been installed correctly.
10. This completes the installation of the secondary latch, and it is shown in Picture No. 6.



4



5



6