

MICHIGAN

OPERATORS MANUAL

No. 2115

MODEL 55 III TRACTOR SHOVEL

Information contained herein pertains to Machine Serial Numbers listed below:

55 III G. M. — 6BG 101 thru 6BG 999

55 III Waukesha — 6BA 101 thru 6BA 999

Data covering Machine Serial Ranges prefixed with designations 7BG, 8BG, 7BA, 8BA, etc. will be found contained in Supplements at rear of this Manual.

ALWAYS GIVE SERIAL NUMBER OF MACHINE WHEN ORDERING PARTS

Record Your Machine Serial Number and Engine Model Specification and Serial Number Here

Machine Serial _____

Engine Model _____

Engine Serial _____

**CLARK
EQUIPMENT**

CLARK EQUIPMENT COMPANY
Construction Machinery Division
BENTON HARBOR, MICHIGAN, U.S.A.
In Canada: Canadian Clark, Ltd., St. Thomas, Ontario

MICHIGAN

TO OWNERS

The purpose of this manual is to serve as a guide to the proper operation, lubrication and minor adjustment of the MICHIGAN Tractor Shovel. Study this manual carefully before starting or operating the machine the first time. Become familiar with all controls and procedures, and keep the manual on the machine for handy reference.

You have purchased this MICHIGAN Tractor Shovel with the expectation that it would give you long and faithful service. In its construction we have taken every precaution to see that you get an efficient, long lived, satisfactory machine. It is our sincere hope that you derive from its operation the full measure of value and utility which you looked forward to when purchasing it.

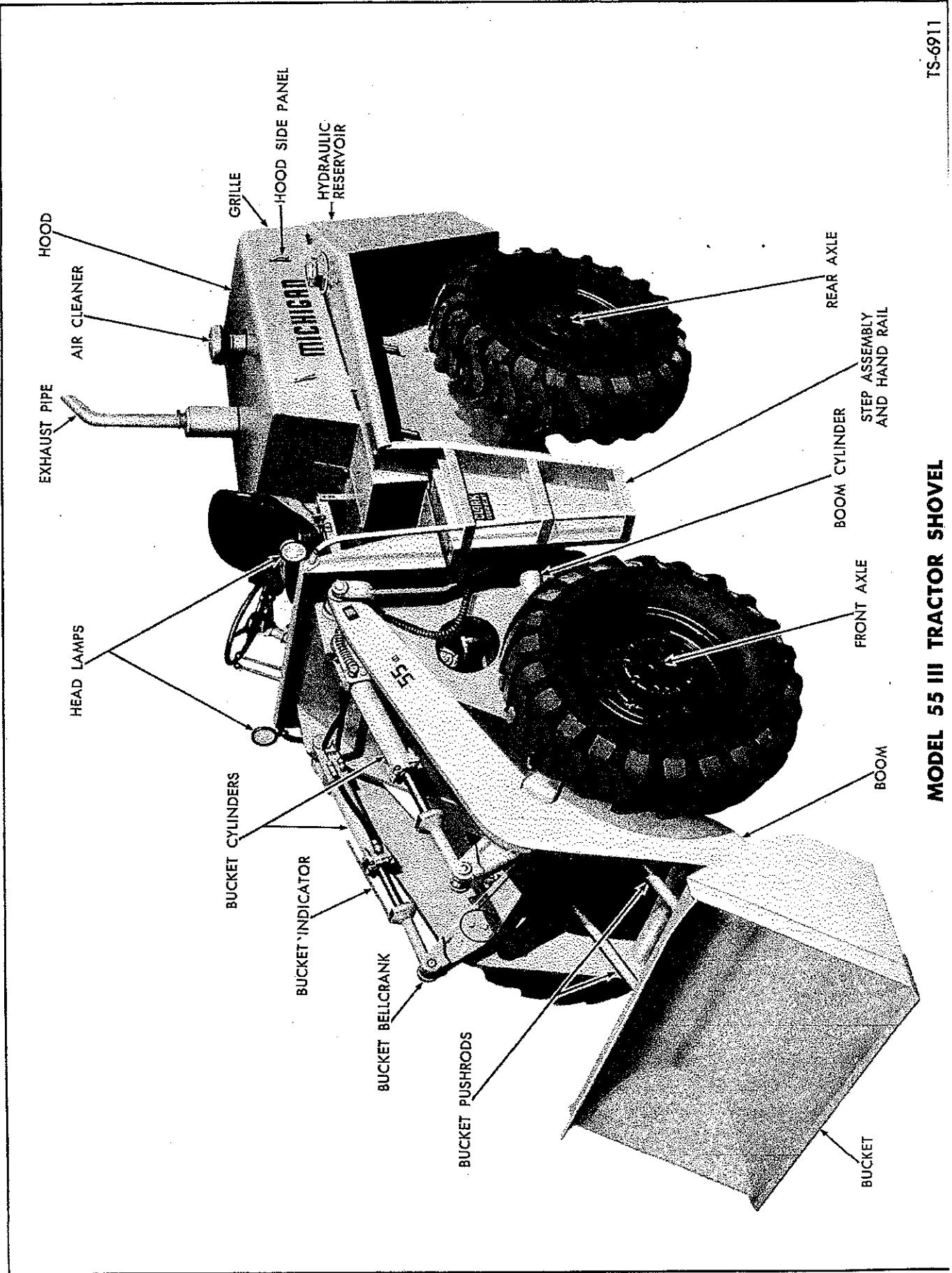
For these reasons, we take the liberty of suggesting that your MICHIGAN Tractor Shovel will always respond at its best with considerate treatment and care. The slight outlay in personal attention and cost required to give it regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated, will repay you many times in low cost operation and trouble-free service.

Whenever repair or replacement of component parts is required, only Clark-approved parts as listed in the applicable parts manual should be used. Use of "will-fit" or non-approved parts may endanger proper operation and performance of the equipment. The Clark Equipment Company does not warrant repair or replacement parts, nor failures resulting from the use thereof, which are not supplied by or approved by the Clark Equipment Company.

CLARK EQUIPMENT COMPANY
Construction Machinery Division
BENTON HARBOR, MICHIGAN, U. S. A.

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GENERAL DESCRIPTION

MICHIGAN Tractor Shovels are constructed for rugged, heavy-duty industrial and commercial applications. They are specifically engineered for maximum ease of operation to move the greatest amount of material in the shortest possible time.

Drive power is from the engine through a Clark torque converter having a 3.0-1 torque multiplication factor, to a power shifted, four speed, full reversing type transmission, to the axle assemblies. Universal slip-joint drive shaft assemblies are used between power transfer units.

Axle assemblies are Clark all wheel drive, rear wheel steer, full floating, spiral bevel ring gear and pinion, with further reduction provided by planetary gear sets within the wheel hubs.

The tractor shovel has four speeds in both forward and reverse. Effortless hydraulic power steering is provided, utilizing two double acting steering cylinders, one at each rear wheel.

Service brakes at each wheel are hydraulic actuated power assisted by a vacuum booster, with a cable controlled mechanical parking brake mounted on propeller shaft on rear drive-line.

Numerous quick-change attachments are available as optional accessory equipment, enabling one to increase the usefulness and productivity of the machine for a variety of different operations.

For more complete specifications refer to Specifications and Service Data on Page 52 of this manual.

DATA PLATES

Data plates and decals used throughout the machine aid in its safe and efficient operation; others give service instructions. Read all instruction plates before starting and operating the machine.

MACHINE SERIAL NUMBER PLATE

The machine serial number plate is mounted at left rear side of operator's compartment on cockpit panel, giving model number and serial number of machine. See Figure 1. Serial number

of machine also is stamped in one-half inch numerals on right-hand upper pivot assembly.



Fig. 1. Machine Serial Number Plate

IMPORTANT: ALWAYS GIVE SERIAL NUMBER OF MACHINE WHEN ORDERING PARTS.

TRANSMISSION OR TORQUE CONVERTER SERIAL NUMBER PLATE

The transmission serial number plate is located on left front side of transmission. The torque converter serial number plate is located on right side of converter. Both plates are identical except for model number and serial number stamped on each plate to properly identify the units. Plate is shown in Figure 2.

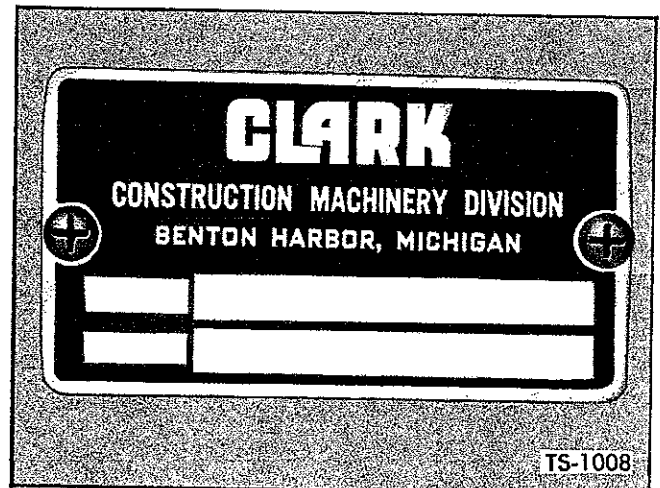


Fig. 2. Torque Converter or Transmission Serial Number Plate

LUBRICATION INSTRUCTIONS

ITEM	SHOVEL	DOZER	SCRAPER	CHECK	CHANGE	LUBRICANT
FRONT AXLE DIFFERENTIAL	X	X	X	50 HRS.	1000 HRS. - 6 MO.	SAE 90 EPGL
REAR AXLE DIFFERENTIAL	X	X	—	50 HRS.	1000 HRS. - 6 MO.	SAE 90 EPGL
FRONT AXLE PLANETARY HUBS	X	X	X	50 HRS.	1000 HRS. - 6 MO.	SAE 90 EPGL
REAR AXLE PLANETARY HUBS	X	X	—	50 HRS.	1000 HRS. - 6 MO.	SAE 90 EPGL
REAR AXLE WHEEL BEARINGS	—	—	X	—	1000 HRS. - 6 MO.	WB
REAR AXLE WHEEL BRGS. & CENTER STEER ARM BRGS. (Non-Driving Axles)	X	—	—	—	1000 HRS. - 6 MO.	WB
TORQUE CONVERTER & TRANSMISSION	X	X	X	8 HRS.	500 HRS.	HF
HYDRAULIC RESERVOIR	X	X	X	8 HRS.	1000 HRS.	HF
HYDROVAC	X	—	—	—	1000 HRS.	VCO
STEERING GEAR	X	X	X	50 HRS.	—	SAE 90 GL
FAN DRIVE GEAR BOX (Where Applicable)	—	X	—	50 HRS.	1000 HRS. - 6 MO.	SAE 90 GL
BUCKET LEVELER MASTER CYLINDER	X	—	—	50 HRS.	—	HF
BOOM POSITIONER MASTER CYL. (Optional)	X	—	—	50 HRS.	—	HF
BRAKE MASTER CYLINDER (Hydraulic & Air Over Hydraulic Brakes)	X	—	—	50 HRS.	—	BF
BRAKE MASTER CYLINDER AIR CHAMBER (Air Over Hydraulic Brakes)	X	—	—	—	1000 HRS.	HF
CONVERTER & TRANSMISSION OIL FILTER(S)	X	X	X	—	250 HRS.	—
STEERING SYSTEM OIL FILTER(S)	X	X	X	—	250 HRS.	—
ALL GREASE FITTINGS EXCEPT: PROPELLER SHAFT FITTINGS	X	X	X	—	8 HRS.	LBG
BRAKE CAMSHAFT FITTINGS	X	X	X	—	100 HRS.	LBG
	X	X	X	—	50 HRS.	LBG
HYDRAULIC SYSTEM BREATHER	X	X	X	REMOVE, CLEAN & REPLACE EVERY 50 HRS.		
TRANSMISSION BREATHER	X	X	X	REMOVE, CLEAN & REPLACE EVERY 50 HRS.		
AIR CLEANER(S)	X	X	X	SERVICE EVERY 8 HRS. OR OFTENER AS REQUIRED. SEE OPERATORS MANUAL FOR DETAILED INSTRUCTIONS		
ENGINE, FUEL & OIL FILTERS & ACCESSORIES	X	X	X	SEE ENGINE OPERATORS MANUAL FOR INSTRUCTIONS		

LUBRICANT KEY

LUBRICANT	DESCRIPTION	HF	AMBIENT TEMPERATURE RANGE	LUBRICANT TO BE USED		
				SAE GRADE	API CLASS	MILITARY SPECIFICATION
LBG	LITHIUM BASE MULTI-PURPOSE GREASE 0°F & ABOVE — GRADE 2 BELOW 0°F — GRADE 0	HF	ABOVE 0°F	10W	SMS	MIL-L-2104A, SUPP. 1 OR NEW MIL-L-2104B
EPGL	EXTREME PRESSURE GEAR LUBE — SCL TYPE					
GL	STRAIGHT MINERAL OIL GEAR LUBE		2)	TYPE A, SUFFIX A, AUTOMATIC TRANSMISSION FLUID		
BF	SAE 70R3, CLARK NO. 850487			TYPE A, SUFFIX A, AUTOMATIC TRANSMISSION FLUID		
WB	WHEEL BEARING GREASE			TYPE A, SUFFIX A, AUTOMATIC TRANSMISSION FLUID		
VCO	BENDIX VACUUM CYLINDER OIL			§Sequence Tested		

SEE APPLICABLE OPERATORS MANUAL FOR DETAILED INSTRUCTIONS



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Fig. 3. Lubrication Instruction Plate

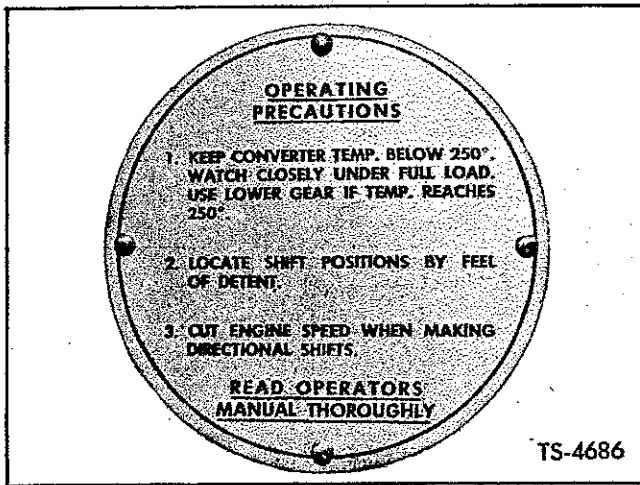


Fig. 4. Operating Precaution Plate

LUBRICATION INSTRUCTION PLATE

The lubrication instruction plate as shown in Figure 3 is located at right rear side of operator's compartment on cockpit panel. This plate provides a list of items to be lubricated on specific models, intervals of lubrication, and types of lubricant to be used. However, in addition to the lubrication instruction plate, it will be necessary to refer to the Lubrication Section in applicable Operator's Manual for location of lubricating points, capacities and detailed instructions pertaining to lubrication.

OPERATING PRECAUTION PLATE

The operating precaution plate as shown in Figure 4 is located in the center of the steering wheel. This plate provides a few precautions to follow during machine operation, and also reminds the operator to refer to the Operator's Manual for additional information that is necessary for proper operation of the machine.

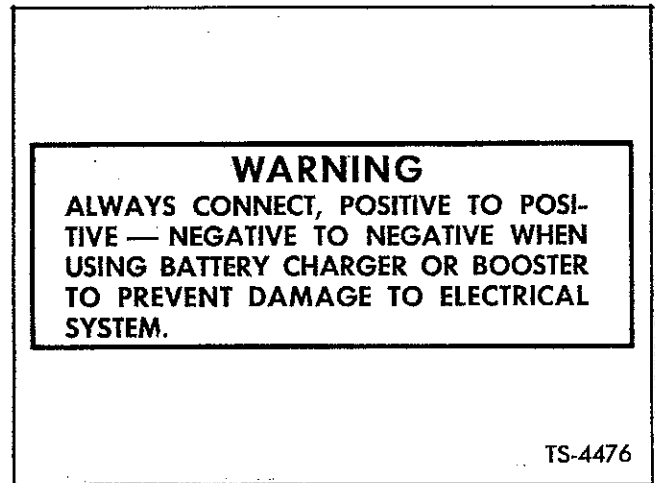


Fig. 5. Safety Wiring Decal

SAFETY WIRING DECAL

The safety wiring decal as shown in Figure 5 is located on right front panel in operator's compartment. This indicates that machine is equipped with an alternator having a negative grounded electrical system.

The alternator is a continuous output diode rectified alternating current (a.c.) generator that develops a continuous output of electrical energy at all engine operating speeds (high, low and idle). The trade name for this unit manufactured by Delco-Remy is "Delcotron". The output of the alternator is controlled by a transistorized voltage regulator.

Note: To prevent serious injury to personnel or extreme damage to electrical system components, it should be noted that information contained in this manual pertaining to electrical system components will emphasize certain precautions that must be followed when servicing the "Delcotron" charging system.

NOTES

PREPARATION FOR OPERATION

It is essential that the following points be checked with machine in level position before operating this MICHIGAN Tractor Shovel.

Refer to the Lubrication Charts to locate items referred to below.

1. Check entire machine for damage in transit or storage.
2. Check oil level in the following to specifications outlined in Lubrication Section.
 - a. Engine crankcase
 - b. Transmission case (with engine idling)
 - c. Front drive axle differential
 - d. Front drive axle planetary hubs
 - e. Rear drive steer axle differential
 - f. Rear drive steer axle planetary hubs
 - g. Hydraulic system reservoir
 - h. Steering gear
 - i. Brake master cylinder
3. Check cooling system to make sure radiator is filled and that radiator drain cock and engine block drain cock are closed. When there is danger of water freezing in the cooling system, use a reliable brand of permanent type anti-freeze according to manufacturer's instructions. For further information please refer to Operation and Maintenance Manual of engine manufacturer.
4. Check battery that plates are covered with water. Add only clean distilled water.
5. Check fuel level in tank. Handle fuel in clean containers. Use No. 2 Diesel fuel oil, Cetane 40 minimum for G.M. Diesel engines. For gasoline engines use gasoline of 75 Octane rating or higher.
6. Check that all drain plugs, drain cocks, filler openings, fuel lines, oil lines, hydraulic lines, cooling system and air cleaner connections are tight, and do not leak.
7. Check tire pressures. See Specifications Section for proper air pressure. Be sure valve caps are in place to prevent dirt, moisture and foreign material from damaging valve core.
8. Grease all lubrication points of the entire unit. Refer to Lubrication Section as a guide for location, type and quantity of lubricant.

NOTES

INSTRUMENTS AND OPERATING CONTROLS

Before operating a machine of this type it is essential that the operator become thoroughly familiar with the location and function of the various controls and instruments. Reference to, and study of the illustrations of the operator's compartment, controls, and instruments, together with the following paragraphs will aid in acquiring this information.

The operator should work slowly and carefully until he has become thoroughly accustomed to the machine. Speed and skill will be attained much easier if the necessary time is spent to acquire complete familiarity with the machine and its operation.

The terms "right-hand" and "left-hand" referred to below are determined by sitting in the operator's seat and facing toward front of machine.

INSTRUMENTS AND SWITCHES

All instruments and switches with the exception of the hour meter and foot operated horn switch are conveniently located on instrument panel at left front side of operator's compartment. The hour meter is bracket mounted inside the engine compartment on engine firewall at left side of machine. The foot operated horn switch is located at left side of front floorboard.

It is good practice to observe gauges frequently while working the machine. Each gauge serves as an important check point for operating conditions of torque converter and transmission, and of the engine and accessories. Do not operate machine if gauges are not functioning properly.

Figures 6 and 7 give identification of instruments and switches.

FRONT INSTRUMENT PANEL

Engine Temperature Gauge indicates temperature of engine coolant. Under normal operating conditions gauge should register between 165° F. and 185° F. If gauge indicates temperature to be at boiling point, idle engine, and add water to the cooling system. When temperature lowers, shut down engine and trouble shoot cooling system for cause of overheating.

Engine Oil Pressure Gauge indicates oil pressure in engine lubricating system. Under normal operation, at idle and governed rpm, gauge pressure is as follows.

	Idle	Governed RPM
G.M. Diesel	11 psi. min.	Approx. 45 psi
Waukesha Gas	15 psi. min.	Approx. 40 psi

If gauge fails to register within 10 to 15 seconds, stop engine immediately and determine cause.

Dash Lamp lights when light switch is pulled out to the first position.

Air Pressure Gauge indicates pressure in air reservoir for operating brakes. Gauge should read between 90 and 105 psi. Never operate machine with less than 60 psi pressure.

Torque Converter Temperature Gauge indicates temperature of fluid in torque converter and transmission lubricating system. When temperature approaches 250° F., or red portion of gauge, shift to a lower operating speed range.

Ammeter shows current flow to and from battery. Electrical current going from alternator to battery registers on the charge (+) side. Gauge will show discharge (—) when more electrical energy is being consumed than received from alternator.

Ignition Switch energizes all gauges and switches on instrument panel, and starting motor circuit. Turn switch to right for ON position.

Light Switch operates dash lamp, head lights and tail lights in first position, with addition of back-up lights in second position. Pull switch to operate.

Starter Switch energizes cranking motor to start engine. Press to operate; release when engine starts. Do not crank engine continuously for more than 30 seconds to avoid damage to cranking motor. Pause a few minutes between cranking cycles, if difficulty is encountered, to let windings cool. See Starting Procedure on Page 12.

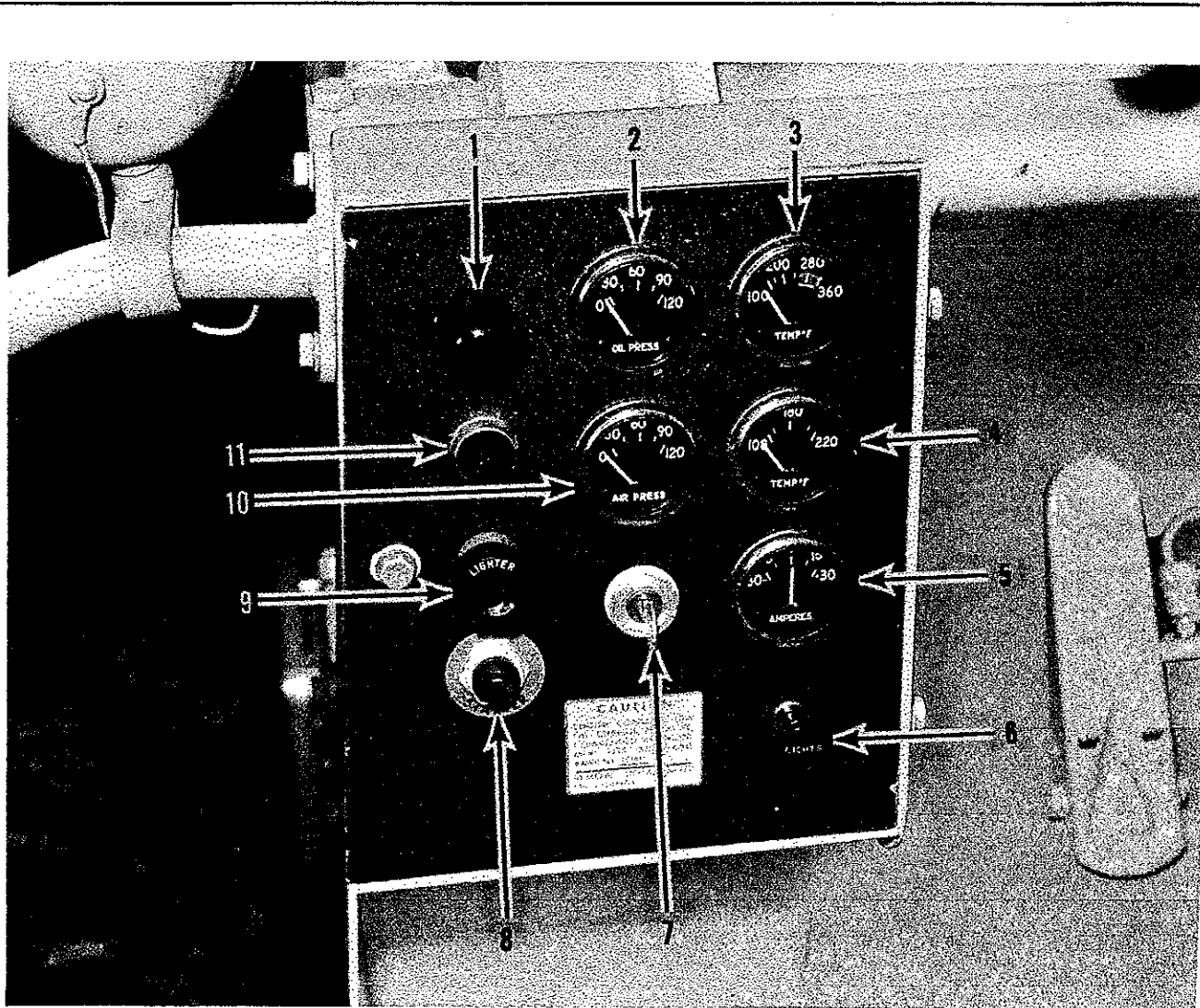
Cigarette Lighter is a push button type conveniently located on instrument panel. With ignition turned to the ON position, push lighter in to operate.

Reservoir Filter Warning Light – continued illumination of the warning light is an indication that the filter element located inside the hydraulic

reservoir is excessively plugged with foreign material and must be cleaned.

FRONT FLOORBOARD

Horn Switch is located on left side of front floorboard and is foot operated. Machine is equipped with an electric horn.



- | | | |
|---------------------------------------|--------------------|------------------------------------|
| 1. Dash Lamp | 5. Ammeter | 9. Lighter |
| 2. Engine Oil Pressure Gauge | *6. Starter Switch | 10. Air Pressure Gauge |
| 3. Torque Converter Temperature Gauge | 7. Ignition Switch | 11. Reservoir Filter Warning Light |
| 4. Engine Temperature Gauge | *8. Light Switch | |

*Starter and light switch positions are reversed on some machines. Refer to wiring diagrams.

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Fig. 6. Instrument Panel

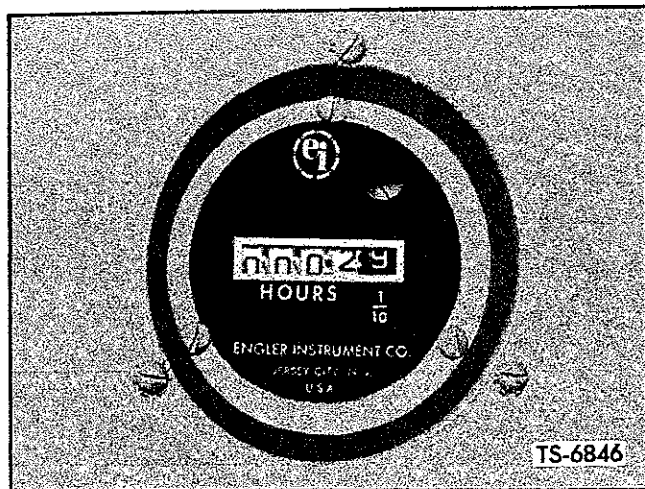


Fig. 7. Hour Meter

ENGINE COMPARTMENT

Hour Meter is bracket mounted inside the engine compartment on engine firewall at left side of machine. The hour meter indicates working time of machine in hours and tenths of an hour. Use this gauge to schedule lubrication and maintenance periods.

Choke Control Knob – Waukesha Gas is located on right side of operator. Choke regulates fuel-air mixture entering engine for easier starting and smoother running of a cold engine during the warm up period. Pulling choke control knob out restricts air, resulting in rich mixture. Choke should be used only in cold weather. When engine runs smoothly, discontinue use of choke.

OPERATING CONTROLS

All controls are conveniently located to provide maximum ease of operation of the machine.

The operator’s seat can be shifted forward or rearward to suit the individual. Move lever on left-hand side of seat forward, and shift seat to desired position.

If enclosed parking is not available when shutting down machine at end of shift, tilt seat forward over steering wheel and spread tarpaulin over operator’s compartment to give protection from inclement weather. A cab enclosure kit is available as accessory equipment.

Refer to Figure 8 for location and identification of operating controls.

Directional Shift Lever is top lever on steering column. This lever provides three positions, FORWARD, NEUTRAL and REVERSE to control direction of machine travel. Pushing lever into forward position engages FORWARD travel. Pulling lever into rear position engages REVERSE travel. Lever is in NEUTRAL when in its central position.

When shifting from FORWARD into REVERSE or vice versa, always decrease engine rpm and stop machine momentarily while making the shift.

Speed Range Lever is bottom lever on steering column. This lever provides three positions, LO, NEUTRAL and HI to control travel speed of the machine. Pushing lever into forward position engages LO speed range; pulling lever into the rear position engages HI speed range. Lever is in NEUTRAL when in its central position.

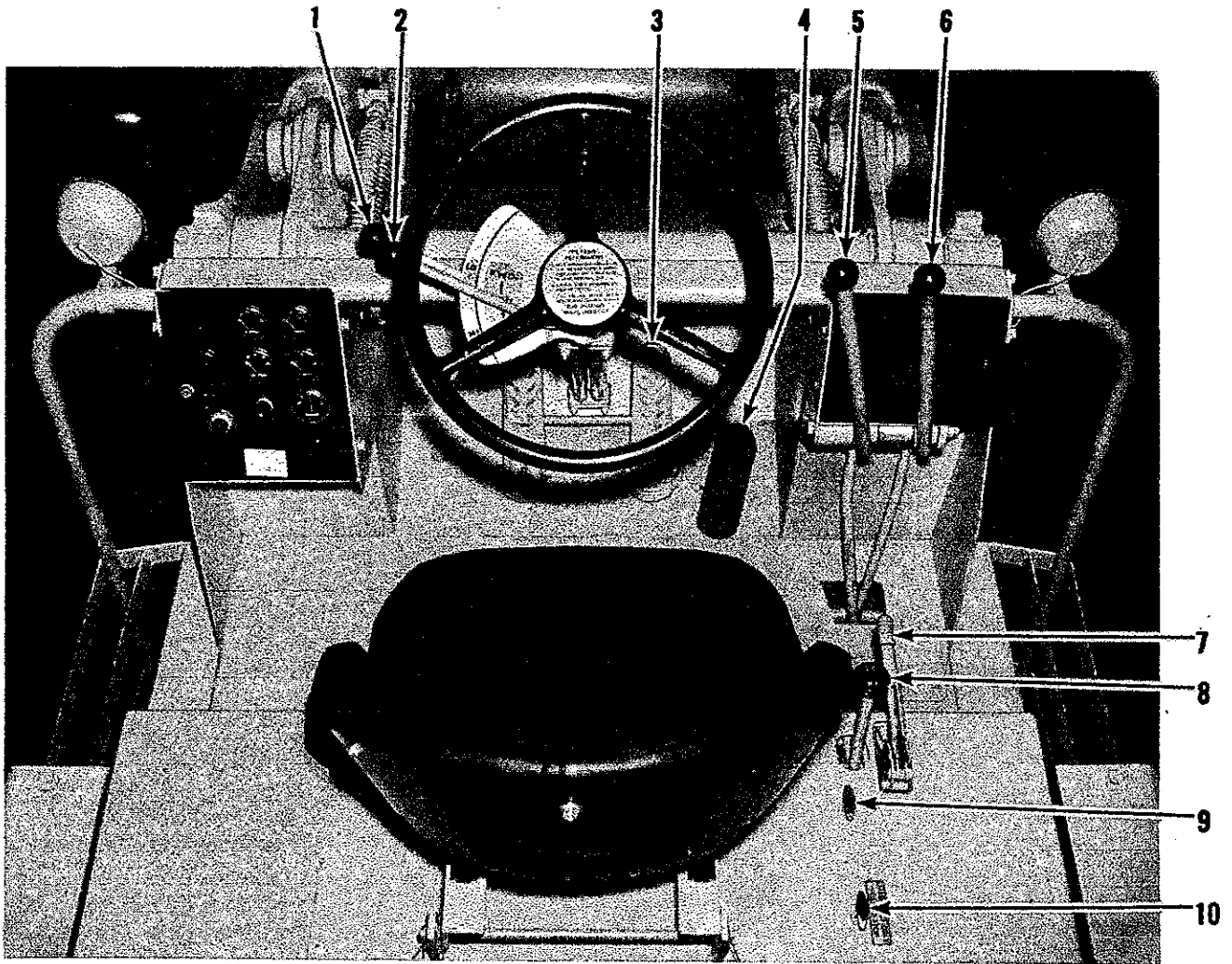
Speed range lever and range shift lever make available to the operator a choice of four speed ranges, providing selective power requirements for any operating condition. First and second speed ranges are obtained by shifting speed range lever into LO and HI when range shift lever is in WORKING RANGE; third and fourth are obtained by shifting into LO and HI with range shift lever in TRAVEL RANGE. See chart below.

Speed Range	Speed Range Lever	Range Shift Lever
1st	LO	WORKING RANGE
2nd	HI	WORKING RANGE
3rd	LO	TRAVEL RANGE
4th	HI	TRAVEL RANGE

Speed range and directional shift levers are so arranged that it is convenient to load in LO range FORWARD, and back away from pile in HI range REVERSE by gripping both levers at the same time. HI range should always be used when traveling machine for comparatively long distances without a load.

Observe torque converter temperature gauge when working machine. If gauge approaches 250° F., shift to a lower operating speed range.

Shifting from one speed range to another can be made at any time during the working cycle. Momentarily let up on accelerator when shifting



- | | | |
|---|-------------------------|---|
| 1. Directional Shift Lever | 4. Accelerator Pedal | 7. Parking Brake Lever |
| 2. Speed Range Lever | 5. Bucket Control Lever | 8. Range Shift Lever |
| 3. Brake Pedal | 6. Boom Control Lever | 9. Engine Fuel Shut-Off Control (G.M. Diesel) |
| 10. Engine Emergency (Air) Shut-Off Control (G.M. Diesel) | | |

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Fig. 8. Operating Controls

into HI speed range, and accelerate slightly when shifting into LO speed range.

Range Shift Lever is inner lever at right side of operator on seat support plate. This lever provides three positions, **WORKING RANGE**, **NEUTRAL** and **TRAVEL RANGE** to control high and low range of the transmission. Pushing lever into forward position engages **WORKING RANGE** (transmission low range). Pulling lever into the rear position engages **TRAVEL RANGE** (transmission high range). Lever is in **NEUTRAL** when in its central position.

Range shift lever and speed range lever make available to the operator a choice of four speed ranges providing tractive power requirements for any operating condition. HI or LO speed can be selected in both **WORKING RANGE** and **TRAVEL RANGE**.

WORKING RANGE should always be used when loading and dumping bucket. **TRAVEL RANGE** should always be used when driving machine from job site to job site; or from one portion of the job to another without a load.

Shifting from **WORKING RANGE** to **TRAVEL RANGE** or vice versa should be performed when machine is stationary, and with speed range and directional levers in **NEUTRAL**.

Boom Control Lever is the outer lever on right hand side of operator. This lever has four positions: **RAISE**, **HOLD**, **DOWN PRESSURE** and **FLOAT** to control boom operation. Each position can be distinctly felt by the operator as lever is moved.

To raise boom and bucket, pull boom lever backward to last detent position. Boom and bucket will raise in direct proportion to engine speed.

Push lever forward, one notch ahead of **RAISE** position, to **HOLD** (neutral) position. Placing boom lever in this position will stop and hold bucket at any height desired.

To lower boom and bucket, push lever forward one notch ahead of **HOLD** position, to **DOWN PRESSURE** position. Placing boom lever in this position will lower boom and bucket and provide penetration to dig below grade level.

Pushing lever all the way forward into detent located **FLOAT** position permits hydraulic oil to pass from the bottom of boom cylinders, through the control valve and into the top of the cylinders, keeping them free of air, and allowing the bucket to move freely following variations in grade level for back-dragging.

Always place boom control lever in **HOLD** (neutral) position before starting or shutting down engine. This lever will lower boom and bucket even though the engine has been shut down.

Bucket Control Lever is inner lever on right hand side of operator. This lever has three positions: **HOLD**, **CLOSE** and **DUMP** to control bucket operation.

To **DUMP** bucket, push lever forward. Release lever and it will return to **HOLD** (neutral) position, allowing bucket to remain in **DUMP** position.

To **CLOSE** bucket, pull lever backward into a detent position. Release lever and it will return to **HOLD** position, allowing bucket to remain in closed position.

Bucket may be stopped and held in any position of its dumping arc by releasing lever for return to **HOLD** (neutral) position.

Engine Fuel Shut-Off Control - G.M. Diesel is forward T-handle located at right side of operator. This control is used for normal engine shut down. After turning ignition switch off, pulling T-handle will manually position the injector racks in the no fuel position to shut down the engine.

Engine Emergency (Air) Shut-Off Control - G.M. Diesel is rear T-handle located at right side of operator. This control should be used only in an emergency or if normal shut down procedure fails to shut down the engine. Pulling T-handle will immediately cut off engine air supply at the air intake housing thus stopping the engine.

Note: Replace engine emergency (air) shut-off control in its original position and manually reset the latch assembly after each use at the air intake housing before attempting to restart the engine.

Parking Brake Lever applies brake on rear

