

MICHIGAN

OPERATORS MANUAL

No. 2006

MODEL 55A

Series II

TRACTOR SHOVEL

Information contained herein pertains to Machine
Serial Numbers listed below:

55A Continental — 3BCO101 thru 3BCO999,
4BCO101 thru 4BCO999,
5BCO101 thru 5BCO999

55A G.M. — 3BG101 thru 3BG999,
4BG101 thru 4BG999,
5BG101 thru 5BG999

Data covering Machine Serial Ranges prefixed with designations 6BG,
7BG, 6BCO, 7BCO, etc., and machines powered with optional power
plants 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.

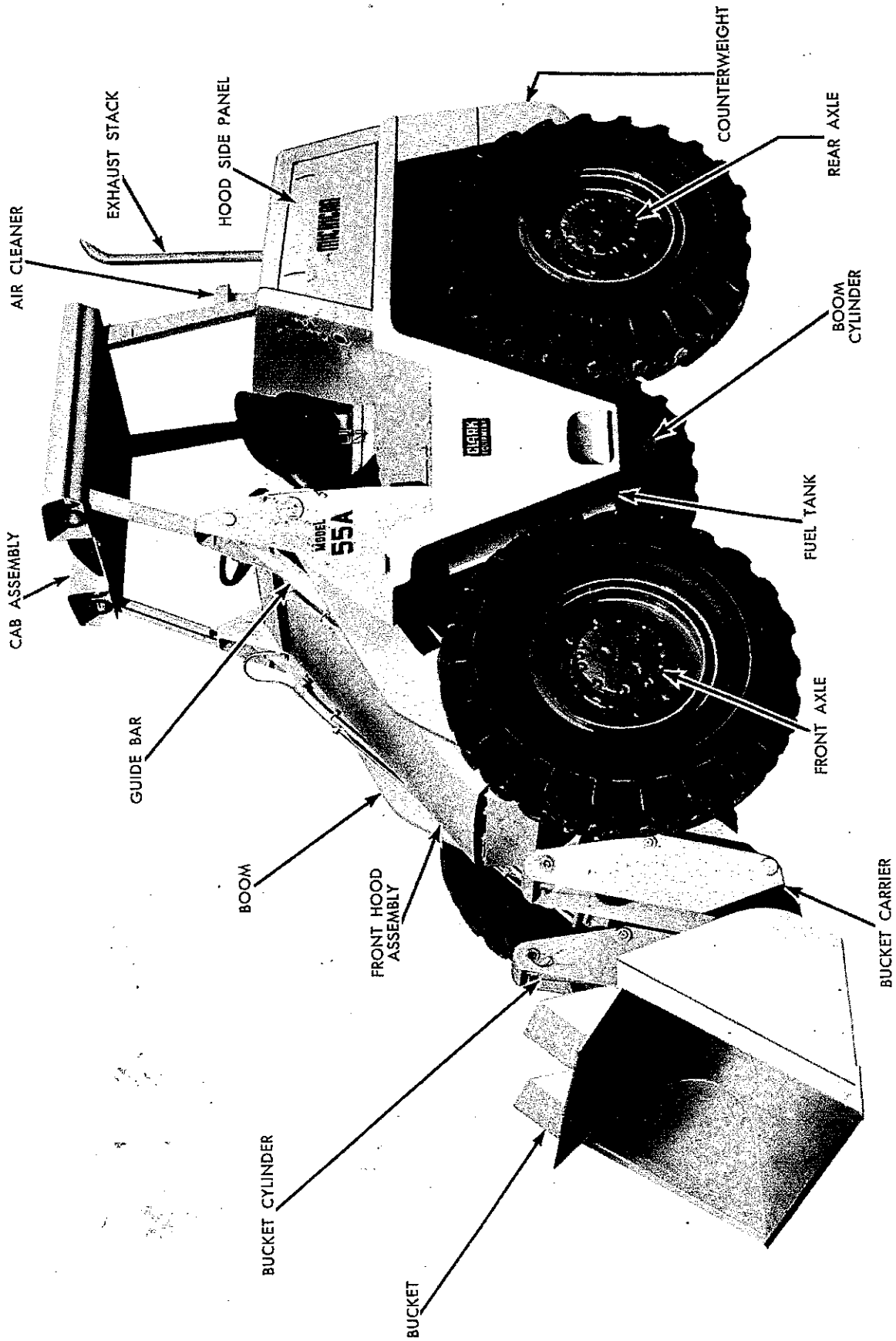
For these reasons, we take the liberty of suggesting that your MICHIGAN Tractor Shovel will always respond at its best with considerate treatment and care. The slight outlay in personal attention and cost required to give it regular and proper lubrication, inspection at stated intervals, and such adjustments 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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MODEL 55A SERIES II TRACTOR SHOVEL

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 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 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 shift ranges in both forward and reverse. Effortless hydraulic power steering is provided, utilizing two double acting steering cylinders, one at each rear wheel. Service brakes are hydraulic actuated by a two-stage master cylinder which doubles the line pressure approximately midway of the pedal stroke, assuring maximum braking effort. Parking brake is the external contracting band type operating on a drum mounted on the companion flange of the front axle differential.

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 55 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 front side of operator's compartment on upper pivot cap, giving model number and serial

number of machine. See Figure 1. Serial number of machine also is stamped in one-half inch numerals on top of front frame cross-member inside front hood assembly.

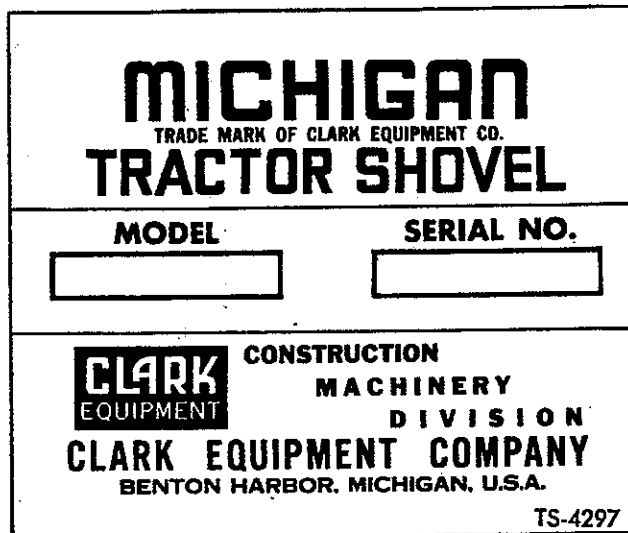


Fig. 1. Machine Serial Number Plate

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

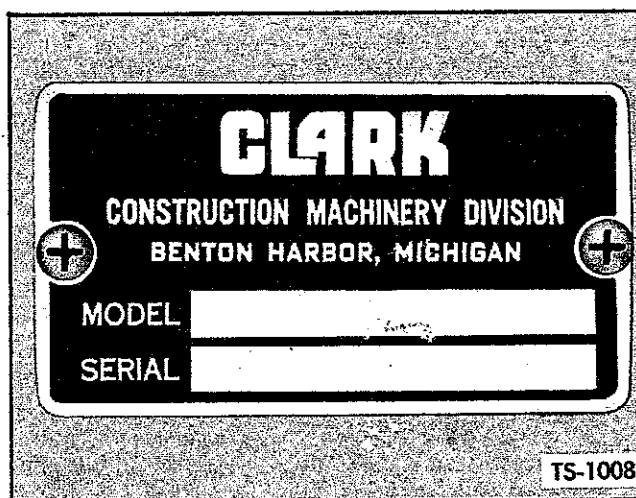


Fig. 2. Torque Converter or Transmission Serial Number Plate



**TRANSMISSION OR TORQUE CONVERTER
SERIAL NUMBER PLATE**

The transmission serial number plate is located on right front side of transmission. The

torque converter serial number plate is centrally located at top 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.

N O T E S

Lined area for notes, consisting of approximately 20 horizontal lines.

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 damages in transit or storage.
2. Check oil level in the following to specifications outlined in Lubrication Section:
 - a. Engine crankcase
 - b. Transmission case (COLD mark on dipstick)
 - c. Front axle differential
 - d. Front axle planetary hubs
 - e. Rear steer axle differential
 - f. Rear steer axle planetary hubs
 - g. Hydraulic system reservoir
 - h. Steering gear
 - i. Boom positioner master cylinder (optional equipment)
 - j. Brake master cylinder
 - k. Air cleaner (Continental Gas)
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 batteries 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 Diesel engines. Use gasoline of 75 Octane rating or higher for gasoline engines.
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.

INSTRUMENTS AND OPERATING CONTROLS

Before operating a machine of this type 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.

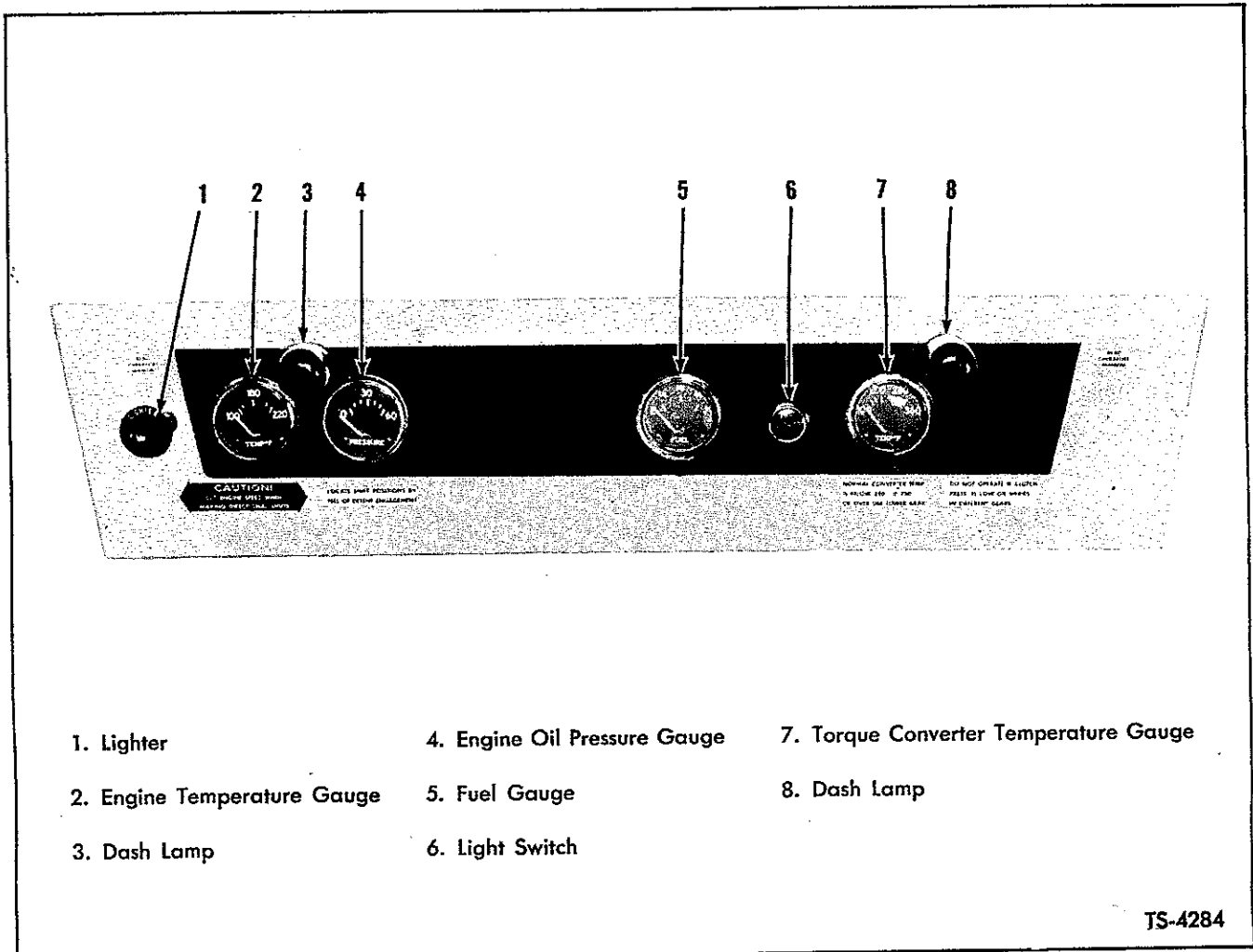
The terms "right-hand" and "left-hand" referred to below are determined by sitting in the operator's seat and facing toward front of machine.

INSTRUMENTS AND SWITCHES

All instruments and switches are conveniently located on the front instrument panel directly in front of the operator and on the side instrument panel at left side of operator. 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 3, 4 and 5 give identification of instruments and switches.



- 1. Lighter
- 2. Engine Temperature Gauge
- 3. Dash Lamp
- 4. Engine Oil Pressure Gauge
- 5. Fuel Gauge
- 6. Light Switch
- 7. Torque Converter Temperature Gauge
- 8. Dash Lamp

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Fig. 3. Front Instrument Panel

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.

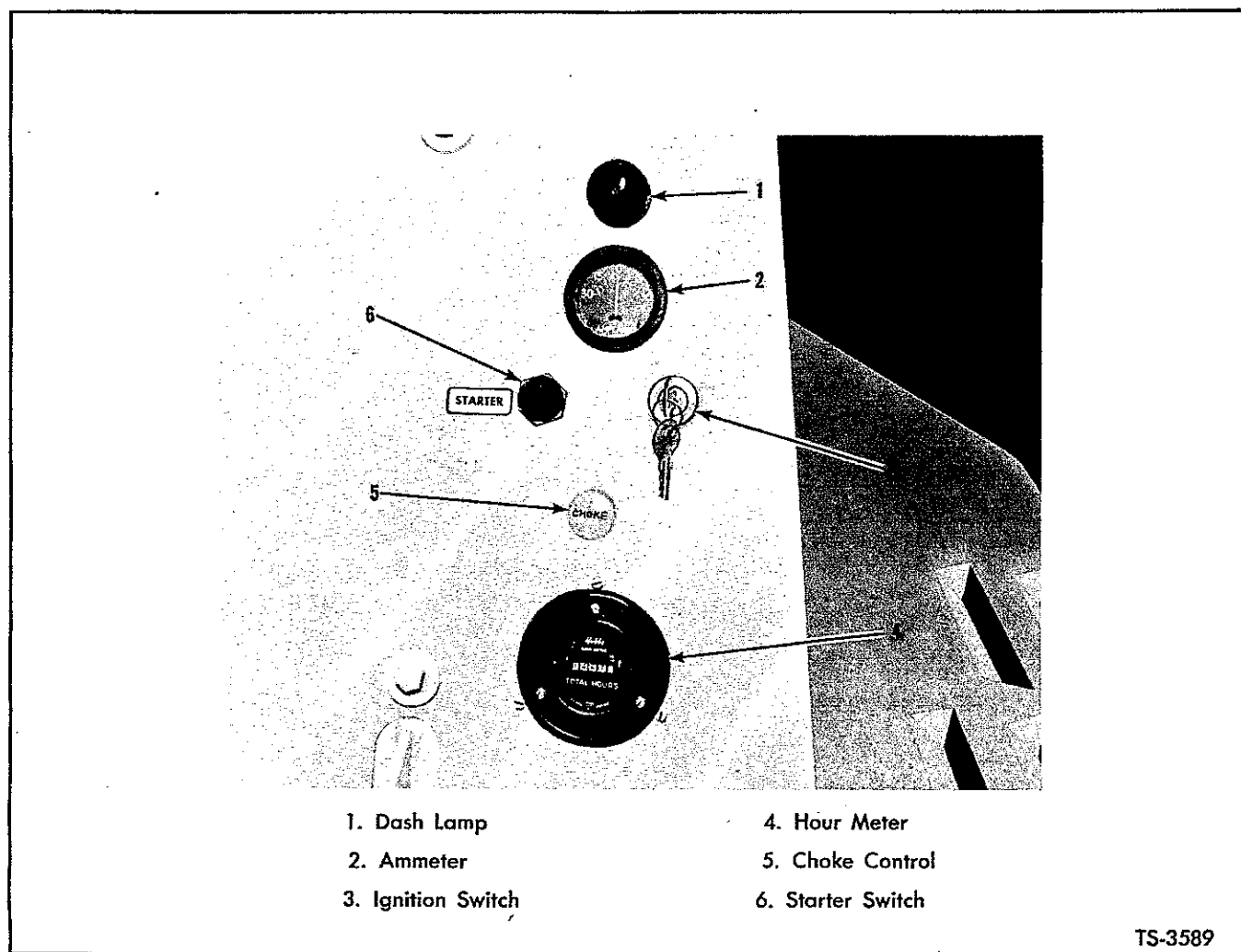
	Idle	Governed RPM
G.M. Diesel	11 psi min.	Approx. 45 psi
Continental Gas	15 psi min.	20-30 psi

Fuel Gauge indicates quantity of fuel in tank only when ignition switch is ON. When ignition switch is OFF, pointer drops back beyond "E" (Empty) mark.

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.

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

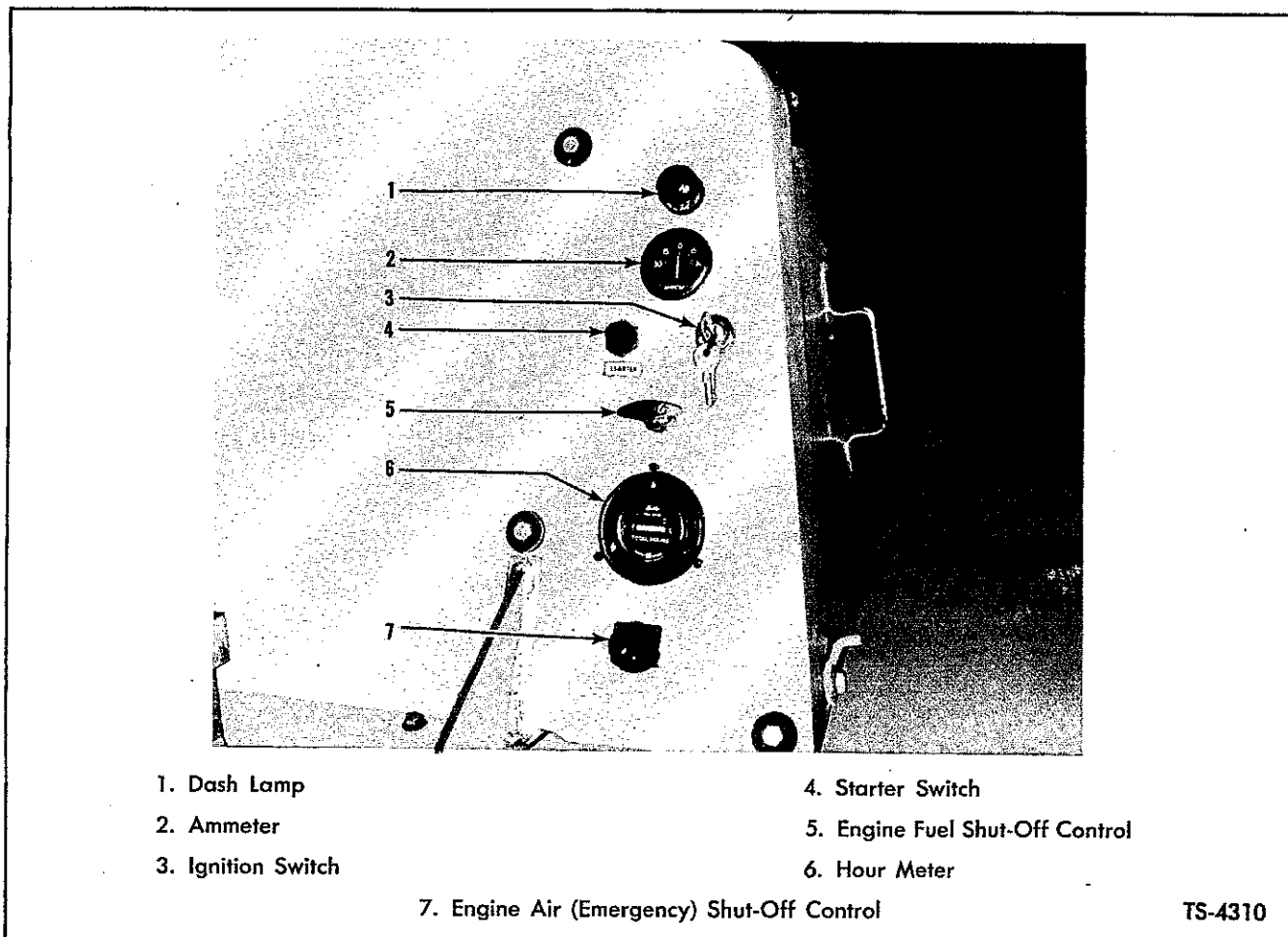
Cigarette Lighter is a push button type conveniently located on instrument panel. With ignition turned to the ON position, push lighter in to operate.



- | | |
|--------------------|-------------------|
| 1. Dash Lamp | 4. Hour Meter |
| 2. Ammeter | 5. Choke Control |
| 3. Ignition Switch | 6. Starter Switch |

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Fig. 4. Side Instrument Panel -- Continental Gas



- 1. Dash Lamp
- 2. Ammeter
- 3. Ignition Switch

- 4. Starter Switch
- 5. Engine Fuel Shut-Off Control
- 6. Hour Meter

- 7. Engine Air (Emergency) Shut-Off Control

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Fig. 5. Side Instrument Panel — G.M. Diesel

SIDE INSTRUMENT PANEL

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

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 11.

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

Hour Meter indicates working time of machine.

in hours and tenths of an hour. Use this gauge to schedule lubrication and maintenance periods.

Engine Fuel Shut-off Control — G.M. Diesel is upper T-handle or knob located on instrument panel at left side of operator. Use this control for normal engine shut down. After turning ignition switch OFF, pulling control will manually position the injector racks in the no fuel position to shut down the engine.

Engine Air (Emergency) Shut-off Control — G.M. Diesel is lower T-handle or knob located on instrument panel at left side of operator. Use this control only in an emergency or if normal shut down procedure fails to shut down the engine. Pulling control will immediately cut off engine air supply thus stopping the engine. Replace emergency control T-handle in its original position and manually reset latch assembly before restarting engine.

Choke Control – Continental Gas is knob located on instrument panel at left 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 knob 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 6 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.

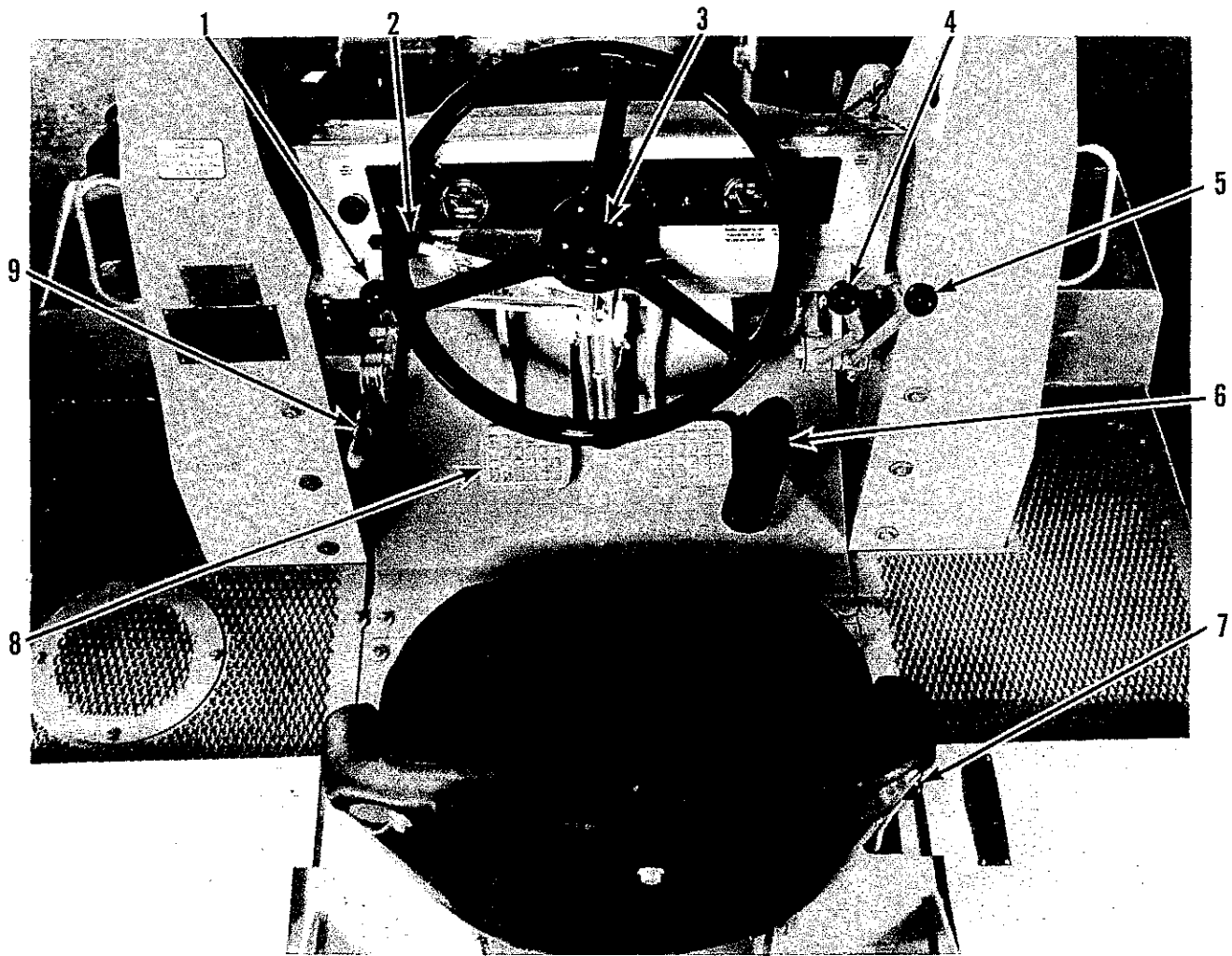
Observe torque converter temperature gauge when working machine. If gauge approaches 250° F., shift to a lower operating speed range.

Shifting from one speed range to another can be made at any time during the working cycle. Momentarily let up on accelerator when shifting into HI speed range, and accelerate slightly when shifting into LO speed range.

Range Shift Lever is 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.

In the WORKING RANGE position, this lever actuates a lockout control valve to automatically establish a NEUTRAL position in the transmission when the service brakes are applied. When in TRAVEL RANGE, the lockout control valve is disengaged; a transmission NEUTRAL can be obtained only by shifting the directional and speed range levers at the steering column.

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



1. Speed Range Lever

2. Directional Shift Lever

3. Horn Button

4. Bucket Control Lever

5. Boom Control Lever

6. Accelerator Pedal

7. Range Shift Lever

8. Brake Pedal

9. Parking Brake Lever

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Fig. 6. Operating Controls

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 the seat. 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.

Note: A hydraulic release, cam operated through a master cylinder is available as an optional accessory. This feature automatically stops the boom at a predetermined height adjustable at the master cylinder and cam. Where loading height is standard for a major portion of the work operation this feature has unique advantages.

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.

Push lever all the way forward into FLOAT position. In this detent position, hydraulic oil will pass from bottom of boom cylinders, through the control valve and into the top of the cylinders, keeping them free of air. FLOAT position also is used for back-dragging, allowing the bucket to move freely following variations in grade level.

The position directly forward of HOLD is DOWN PRESSURE, and is used to lower boom and bucket and to provide penetration to dig below grade level.

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 the seat. 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.

Note: A hydraulic release is actuated by a master cylinder in conjunction with the bucket indicator cam. Hydraulic release will occur automatically any time bucket is level relative to ground on return from full dump position.

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

Accelerator Pedal increases fuel supply to engine thus increasing its rpm.

Brake Pedal is so designed as to permit brake application with either left or right foot of operator.

Parking Brake Lever applies brake on forward drive line. To set brake pull lever up. To release brake push lever down and forward.

Horn Button is located in center of steering wheel.

OPERATING INSTRUCTIONS

After the machine has been properly checked, and the operator has familiarized himself with location and function of the various controls, the machine should be operated according to instructions in the following paragraphs.

SAFETY PRECAUTIONS

A careful and efficient operator of heavy equipment must be guided by simple and fundamental rules of safety. He must take the necessary precautions to insure the safety of others as well as himself, and must avoid careless operating habits which cause damaging accidents to machinery and equipment.

The use of this machine is subject to certain hazards that cannot be met by mechanical means, but only by the exercise of intelligence, care, and common sense.

The following are a few of the primary sources of injury to operators and other workmen.

1. Repairing and servicing equipment in dangerous positions.
2. Striking other persons or vehicles with the machine.
3. Unexpected violent tipping of the equipment.
4. Unexpected violent shocks or jars to the machine.
5. Uncontrolled traffic involving other vehicles.
6. Hazards from limbs of trees or overhead obstructions.
7. Leaving earth-moving or other equipment in dangerous positions, unattended.

In order to help prevent accidents the following safety rules should be observed at all times.

Do Not Leave Machine Unattended: Do not leave machine unattended with engine running. Always place directional and speed range shift levers in neutral, lower bucket, set parking brake, and shut down engine before leaving operator's seat.

Never Leave Machine with Bucket in Air: Never leave machine without first lowering bucket so that it rests on the ground. Make sure all control

levers are in neutral position and engine shut down.

Watch Bucket and Direction at All Times: Keep your eye on the load and always face or look in direction machine is traveling.

Avoid Greasy Hands and Floors: Keep hands, floors, and controls free from water, grease, and mud to insure non-slip control.

Never Get On or Off a Machine in Motion: Never get off or on a machine that is in motion. Positively in no case should anyone ride in the bucket, or on the outside of the machine.

Stop Machine to Lubricate or Adjust: Stop all operation and shut down engine when cleaning, adjusting, or lubricating the machine. Tie red WARNING tag on steering wheel and remove key from ignition switch.

Never Lift Bucket Over Ground Crew: Watch for ground crew and other workers on foot while machine is in motion. Never swing bucket over a truck cab. Sound horn as a warning when approaching ground crew, and before setting machine into motion.

Keep Brakes Properly Adjusted: At first signs of brake slippage, stop machine and adjust them promptly.

Never Transport Load with Bucket Fully Raised: The nearer the ground that the bucket is held, the better the stability, especially on slopes or when turning machine. Approximately 15 inches from the ground is best.

Bucket Position for Travel: Raise bucket approximately 15 inches off the ground and tip back to afford maximum visibility.

Always Set Brake to Hold Machine When Parked: Set parking brake lever when parking machine. If on a grade, block wheels.

Maintain Proper Tire Inflation: Check tire inflation pressure daily to provide best operation and longest tire life. If tires are hydro-inflated.

they should be checked at more frequent intervals, as there is less volume of air to provide cushioning.

Select Proper Speed Range: Operate machine at speeds consistent with conditions on the particular job. Extra caution should be used if roads are wet or icy.

Maintain Shovel Balance: Keep bucket close to the ground for balance when tractor shovel is traveling up a steep grade.

Do Not Use Bucket as a Brake: When going down a steep slope, do not use bucket as a brake.

Check Before Moving Shovel: Walk around machine to make certain that no one is in "danger area" before entering operator's compartment. Sound horn before moving machine.

Do Not Operate Machine Without Instruments: Each gauge on the instrument panel serves as an important check point for operating conditions of the machine. Do not operate machine if gauges are not functioning properly.

Be Courteous: Always give loaded equipment the right of way.

Portions of above safety precautions taken from Data Sheet D-256 by permission of National Safety Council.

STARTING PROCEDURE

PRE-STARTING CHECKS

Before starting engine at beginning of the work shift, or at any time machine has been shut down for adjustment or time-off period, perform the following checks.

1. Engine oil level
2. Engine air cleaner
3. Hydraulic system oil level
4. Cooling system
5. Fuel supply
6. Transmission fluid level (COLD mark on dipstick)

7. Tire pressures

Service units at this time if inspection indicates the necessity.

NORMAL STARTING

Caution: Walk around machine. Make certain that no one is in "danger area" before entering operator's compartment.

G.M. Diesel (Above 40° F.)

1. Set shift quadrant levers (directional and speed range) in NEUTRAL.
2. Depress and release accelerator to reset governor fuel shut-off lever in IDLE position.
3. Turn ignition switch ON; press starter switch firmly, and very lightly depress accelerator to feed additional fuel. Operate cranking motor no more than 30 seconds at a time to avoid overheating motor.

Caution: If engine fails to start, wait until cranking motor stops rotating before depressing starter switch. Serious damage to the cranking motor may result if this precaution is not complied with.

If the engine fails to start after four periods of cranking, refer to Operation and Maintenance Manual of engine manufacturer.

4. After engine starts, check oil pressure gauge. If no pressure is indicated within 15 seconds, shut off engine and determine cause.
5. Allow engine to reach operating temperature before driving machine.

Continental Gas

1. Set shift quadrant levers (directional and speed range) in NEUTRAL.
2. Turn ignition switch ON; press starter switch firmly, and very lightly depress accelerator to feed additional fuel. Operate cranking motor no more than 30 seconds at a time to avoid overheating motor.

Caution: If engine fails to start, wait until cranking motor stops rotating before depressing starter switch. Serious damage to the cranking motor may result if this precaution is not complied with.

If the engine fails to start after four periods of cranking, refer to Operation and Maintenance Manual of engine manufacturer.

3. After engine starts, check oil pressure gauge. If no pressure is indicated within 15 seconds, shut off engine and determine cause.
4. Allow engine to reach operating temperature before driving machine.

COLD WEATHER STARTING

MICHIGAN machines do not require extensive preparation for cold weather operation beyond addition of a permanent type anti-freeze to the cooling system, and a change of engine oil to a viscosity suitable for anticipated temperatures in which the machine is to operate. At temperatures below 32° F. a change of oil in the boom and bucket system to Type "A" Automatic Transmission Fluid will aid starting by reduction of resistance in the boom and bucket pump. Probably the most important item to insure prompt starting is proper maintenance of the electrical system, especially the batteries.

Batteries must be kept fully charged at all times, since in cold weather the capacity of a battery to deliver full power is greatly reduced. A fully charged battery at 15° F. is capable of delivering only 70% of its rated amperage, and at lower temperatures becomes even more inefficient. Service batteries weekly as follows:

1. Add distilled water to cover plates and separators but do not overfill. Overfilling causes dilution of the electrolyte, and sputtering during the charging cycle. This may result in battery freezing and corroded terminals.
2. Keep terminals clean and tight. Dirty or loose connections offer high resistance.
3. Keep vent plugs in place, and tight, to prevent entrance of foreign material into cells.
4. Check specific gravity regularly with a hydrometer, and recharge or replace batteries that continually show low reading.

Service other electrical components as follows:

1. Visually check all wiring for worn or cracked insulation and loose terminal connections.
2. Clean and tighten connections on cranking motor, generator, voltage regulator, solenoid switch, relays and sender units.

3. Clean and tighten external ground straps, and replace if badly frayed or corroded.
4. Clean and regap spark plugs, replacing those having cracked or chipped porcelain, or loose center electrodes.
5. Replace points and condenser in ignition distributor, and check for proper operation of automatic advance mechanism.
6. Check high tension leads between coil, distributor and spark plugs. Replace leads that are cracked or deteriorated, or show other signs of leakage.
7. Check ignition coil for opens or shorts, and replace if defective.

To avoid unnecessary cranking because of air locks in cold fuel oil, change fuel filters only when engine is hot; then start and run engine after filter change, and check that there is no fuel restriction nor leakage.

When not in use, machine should be parked or stored in a closed garage or building during cold weather to reduce cranking effort when starting a cold engine. It is particularly important in starting the engine, that it is not accelerated to governed speed, or a load applied until the oil has become warm enough to circulate to all bearing surfaces.

Cold starting procedure is as follows, after first placing all control levers in their NEUTRAL position.

If difficulty is experienced in starting engines, please refer to Operator's Manual of respective engine manufacturer for further trouble shooting procedures.

G.M. Diesel (When Colder Than 40°F.)

G.M. Diesels are not equipped with cold weather starting aids. However, starting fluid (pressurized can type) sprayed into air cleaner intake is recommended as engine is being started.

A fluid starting aid (capsule form) can be installed by any authorized G.M. Diesel Distributor.

1. Set all control levers in NEUTRAL position and turn ignition switch ON.
2. Depress accelerator to full throttle position.

3. Press starter switch firmly and simultaneously use starting fluid directed into air cleaner intake.

Do not operate cranking motor for more than 30 seconds at a time to avoid overheating motor.

Caution: *If engine fails to start, do not repress starter until cranking motor stops rotating. Serious damage to cranking motor may result if above procedure is not complied with.*

4. After engine starts, check oil pressure gauge. If no pressure is indicated within 15 seconds, shut off engine and determine cause.
5. Allow engine to warm up for a few minutes before driving or operating machine.

Continental Gas (When Colder Than 40°F.)

1. Set all control levers in NEUTRAL position and turn ignition switch ON.
2. Depress accelerator to partially open the throttle.
3. Press starter switch firmly and simultaneously pull choke control to enrich fuel-air mixture entering engine.

Do not operate cranking motor for more than 30 seconds at a time to avoid overheating motor.

Caution: *If engine fails to start, do not repress starter until cranking motor stops rotating. Serious damage to cranking motor may result if above procedure is not complied with.*

4. After engine starts, check oil pressure gauge. If no pressure is indicated within 15 seconds, shut off engine and determine cause.
5. Allow engine to warm up for a few minutes before driving or operating machine.
6. Release choke control when engine runs smoothly.

WARM-UP CHECKS

Hold engine at idle speed for approximately two minutes after starting; then while engine continues to warm up for the next few minutes perform the following checks:

1. Engine oil pressure gauge

2. Transmission fluid level (with engine idling)
3. Ammeter
4. Engine temperature gauge
5. Fuel gauge
6. Torque converter temperature gauge
7. Horn
8. Lights
9. Hydraulic system – boom and bucket control levers

Visually check for leaks at drain and fill plugs in axle assemblies, torque converter and transmission, and at hose couplings and fittings in hydraulic, fuel, air intake, brake and cooling systems. Correct all leaking conditions, and repair or replace gauges that are not functioning before continuing the operation of the machine.

PARKING AREA CHECKS

As a final check before leaving the parking area, set machine into motion and test the following:

1. Steering gear
2. Service brakes
3. Parking brake

Remember, the safety of the operator and other workmen, and the efficient operation of the machine depend upon the performance of all items in the check lists above. Service units at this time if inspection indicates the necessity.

SHUTTING DOWN ENGINE

It is important to idle an engine 3 to 5 minutes before shutting it down. This will allow lubricating oil and water to carry heat away from combustion chambers, cylinder head, bearings, and shafts.

Residual heat can damage many parts, ranging from valves to fuel pumps. The latter suffer from gums and deposits remaining after evaporation of the lighter ends. In addition, the physical stresses from expansion and contraction can cause distortion, permanent warping, and gasket

failures. In some cases, oil seals and cylinder sleeve seals suffer badly, although the results may not appear until much later.

IT IS GOOD PRACTICE TO IDLE ANY ENGINE LONG ENOUGH TO REDUCE EXTREME TEMPERATURES.

G.M. Diesel

To shut down a G.M. Diesel, turn ignition switch OFF; then pull engine fuel shut-off control out and hold until engine stops rotating. After engine stops running, replace control in its original position.

If after pulling control engine continues to operate, the engine emergency air shut-off control must be pulled to the out position. This control will trip the latch assembly securing air shut-off valve in air intake housing, thus starving off air to the engine and preventing further combustion of fuel to shut down engine. Replace emergency control in its original position and manually reset latch assembly before restarting engine. See Figure 7.

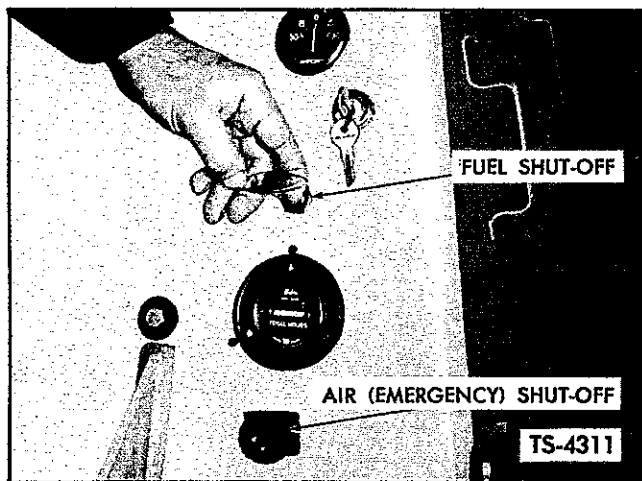


Fig. 7. Engine Shut-Off Controls — G.M. Diesel

Continental Gas

A Continental gas engine can be shut down completely by turning ignition switch OFF.

OPERATING TRACTOR SHOVEL

The steps below give proper procedure for setting machine into motion. Refer to Operating Controls Diagram, Figure 8.

1. Raise boom and bucket approximately 15 inches above ground by pulling backward on boom control lever.
2. Place directional shift lever in position for direction of travel desired. When shifting from forward into reverse, or vice versa, always decrease engine rpm, and stop machine momentarily while making the shift.
3. Select high or low speed range for operating machine. Speed range and directional shift levers are so positioned that it is convenient to load in low range forward, and back away from pile in high range reverse by gripping both levers at the same time.

High range should be used when traveling machine for comparatively long distances without a load.

A shift from low range to high range can be made when machine is in motion, by momentarily letting up on accelerator, making the shift, and again depressing accelerator.

When making a downshift, accelerate engine to synchronize engine and drive shaft speeds when transmission clutch re-engages.

4. Select by use of range shift lever the speed range desired — working range for all normal work operations; travel range for moving relatively long distances without load.

The range shift lever should be shifted only when machine is stationary, and with speed range and directional levers in neutral.

There are available to the operator a selection of four speeds in both forward and reverse directions. This is accomplished by use of range shift lever and speed range lever. In other words a choice of low or high speed is possible in both working range and in travel range.

5. Release parking brake.
6. Gradually apply pressure on accelerator pedal until desired travel speed is reached.

LOADING THE BUCKET

Place speed range lever in low and directional lever in forward position. Place range shift lever in working range. With bucket control lever,