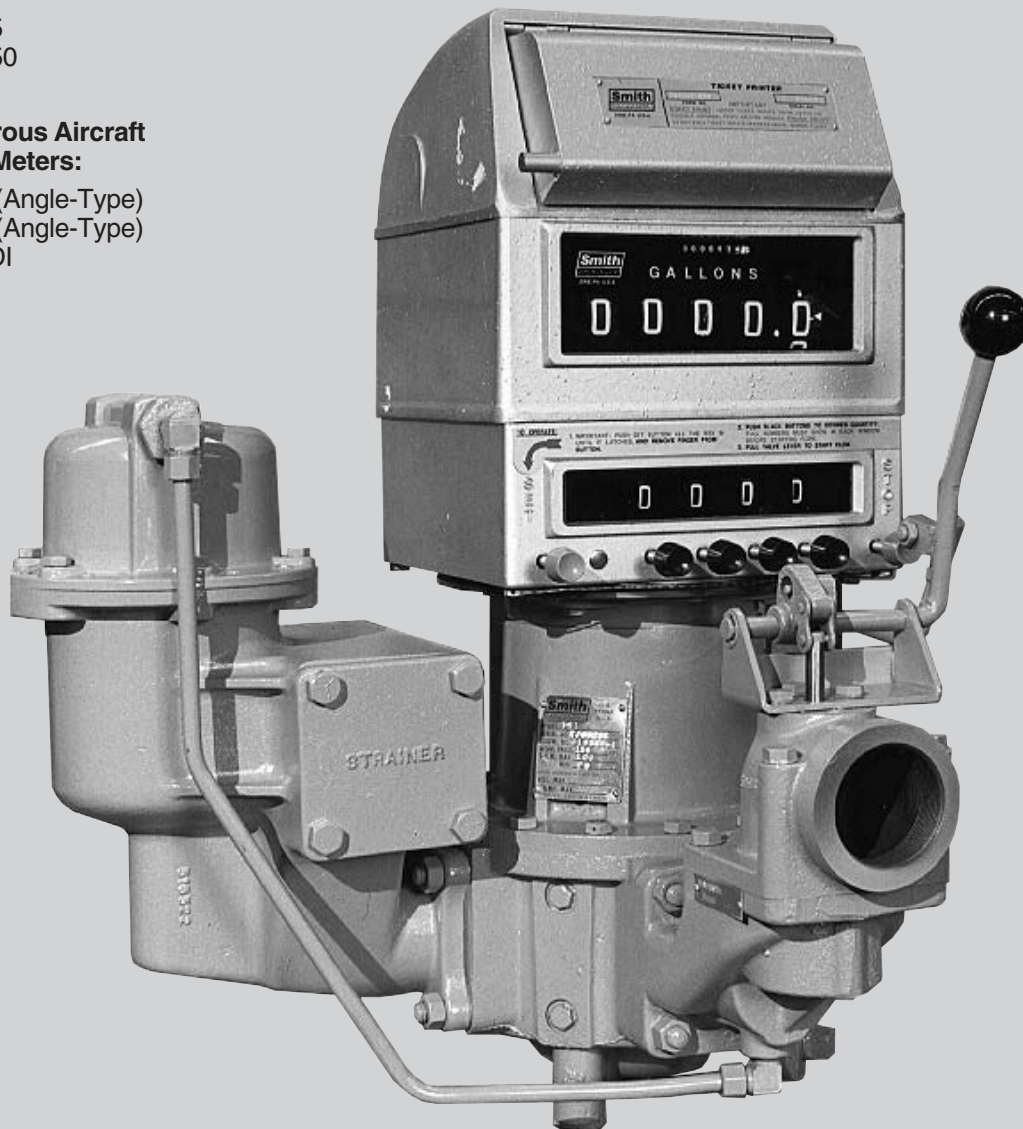


**Models:**

- T-11, I-75
- T-20, I-150
- T-40

**Non-Ferrous Aircraft Fueling Meters:**

- T-11-NF (Angle-Type)
- T-20-NF (Angle-Type)
- T-20R-3DI



### Contents

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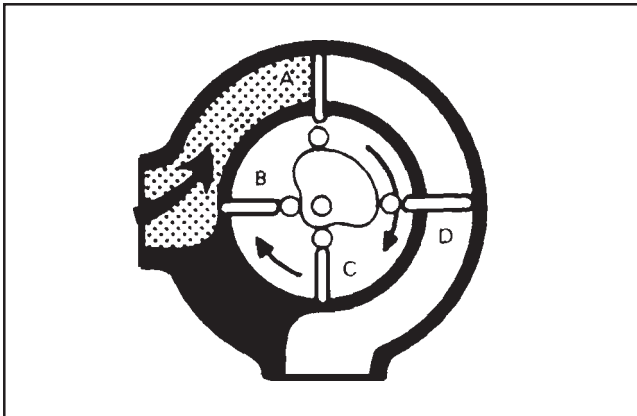
## Section 1 — Principle of Operation

These meters are of the rotary positive displacement type. The accurately-machined housing contains a rotor which revolves on ball bearings and carries evenly-spaced blades. As liquid flows through the meter, the rotor and blades revolve about a fixed cam causing the blades to move outward. The successive movement of the blades forms a measuring chamber of precise volume between two of the blades, the rotor, the housing, the bottom, and the top covers. A continuous series of these closed chambers is produced for each rotor revolution. Neither blades nor rotor contact the stationary walls of the measuring chamber.

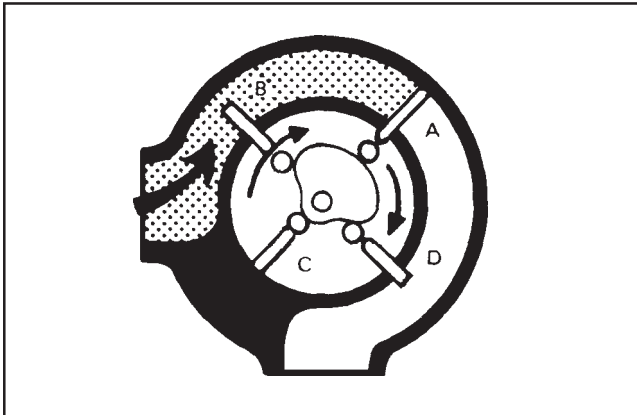
One of the outstanding features of the Smith meter principle is that the flow is literally undisturbed while it is being metered. Energy is not wasted by unnecessary bending of product.

**Figure 1**

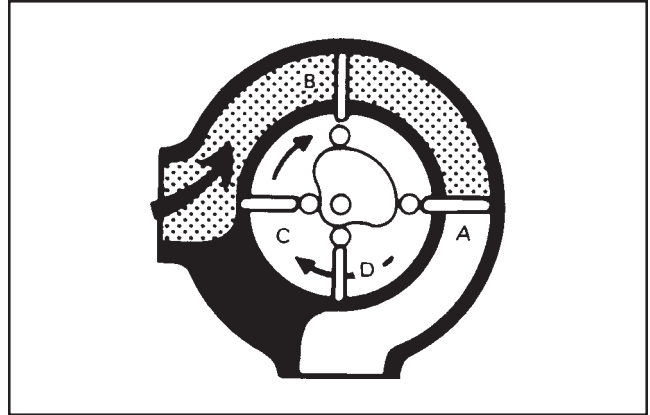
Unmeasured liquid (dark area) is shown entering the meter. Rotor and vanes are turning clockwise. Vanes A and D are fully extended forming the measuring chamber; Vanes B and C are retracted.



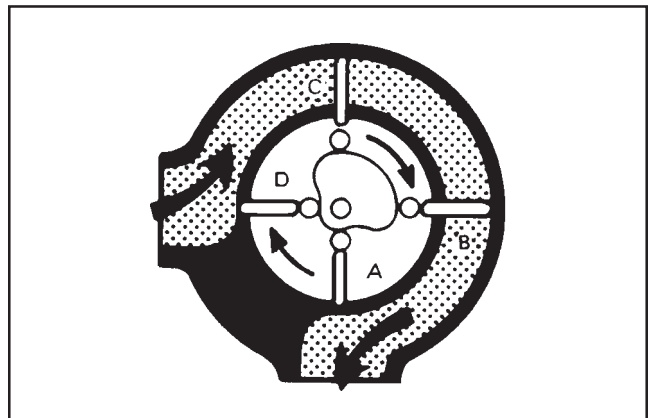
**Figure 1**



**Figure 2**



**Figure 3**



**Figure 4**

**Figure 2**

The rotor and vanes have made one-eighth revolution. Vane A is fully extended; Vane D is partially drawn back; Vane C is fully retracted; Vane B is partially extended.

**Figure 3**

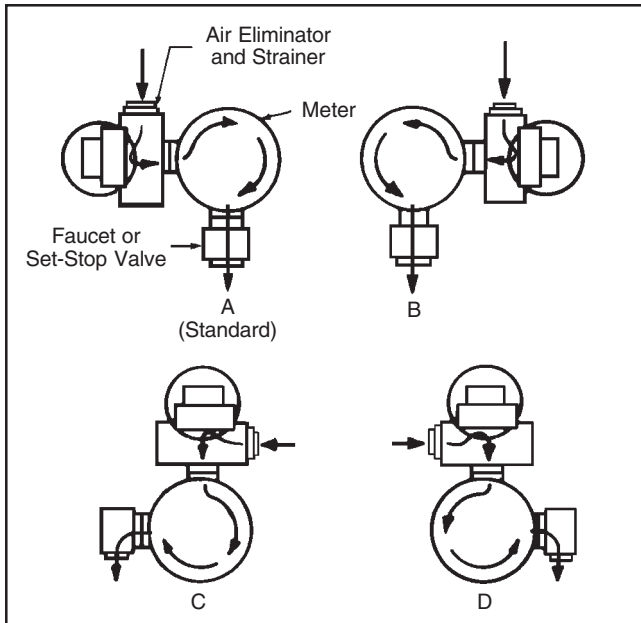
A quarter revolution has been made. Vane A is still extended and Vane B is now fully extended. An exact and known volume of new liquid is now in the measuring chamber.

**Figure 4**

A quarter revolution later, the measured liquid is moving out of the meter. A second measuring chamber has formed between Vanes C and B. Vane A has drawn back and Vane D is ready to be extended.

In one-half revolutions, two measuring chambers have formed and the third is forming. This cycle is repeated as long as liquid flows.

**Basic Arrangements**



**Figure 5**

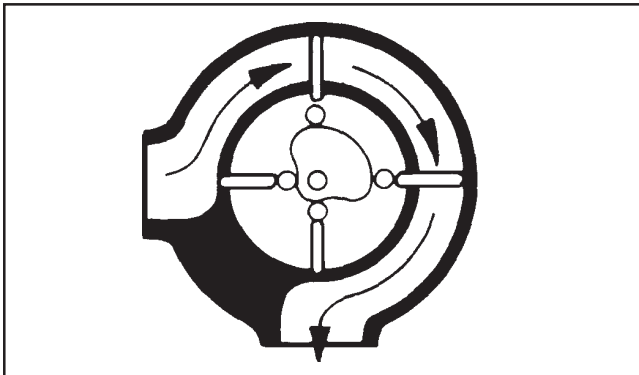
There is almost an unlimited number of arrangements possible with these meters when used with an air eliminator and faucet. The four most basic arrangements for tank truck installations are illustrated above.

Meters will be set up as indicated by Arrangement A unless otherwise specified.

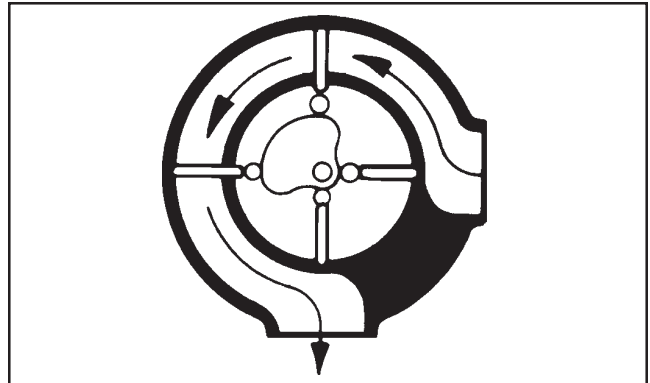
Meter inlet and outlet openings are identical in size and shape and are located 90° apart. Since the meter rotor will revolve in either direction, the meter may be reversed and a right-hand meter may be changed to a left-hand meter and vice versa simply by interchanging the inlet and outlet fittings and interchanging two gears located below the calibrator. See Figures 6, 7, and 8.

**Reversing Meter Rotation**

The calibrator and most Smith Meter accessories must be driven in a counter-clockwise rotation. Since the meter rotor will revolve in either direction, the meter may be reversed and a right-hand meter may be changed to a left-hand meter, and vice versa.



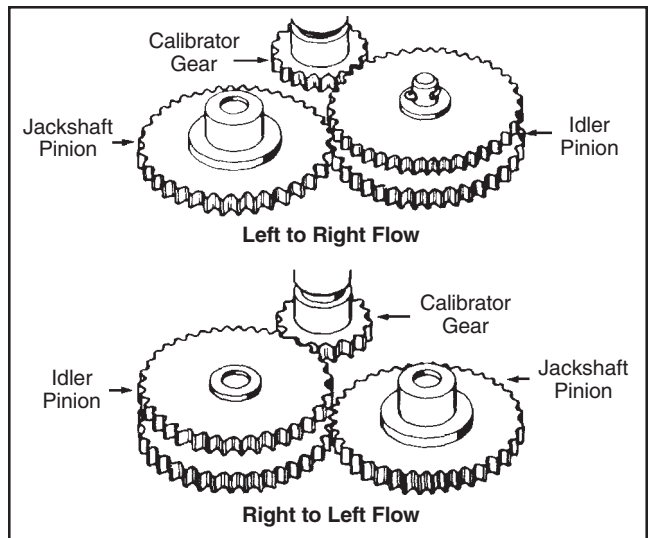
**Figure 6**



**Figure 7**

Unless otherwise specified, standard meters flow from left to right (Figure 6). To change flow from right to left (Figure 7), proceed as follows:

1. Remove counter(s) and calibrator from top of meter.
2. Remove and reverse the location of the jackshaft pinion and the idler pinion (dual) as noted in Figure 8.
  - The calibrator gear remains in its original position.
  - After switching gears, it will be noted that the jackshaft pinion no longer serves any purpose and may be removed if desired.
  - Replace washers and cotter pins.
3. Replace calibrator and counter(s).
  - Be sure calibrator gear and meter gear mesh properly before tightening adapter screws.



**Figure 8**

**WARNING!**  
**Thermal Pressure**

*Thermal expansion of liquid in this equipment can cause high pressure damage. A Thermal Pressure Relief Valve may be necessary in the system.*

### Start-Up

Fill system with liquid. Where hydraulic conditions require that the pump be operated, **extreme care** should be used in opening the valve at the meter.

In all instances, the air should be evacuated slowly from the meter and system.

1. Depress pushbuttons on counter, if provided, until a predetermined amount shows on the counter window.
2. With outlet closed, **slowly** open inlet valve.
3. Slowly open outlet valve until counter begins to register. Leave outlet valve in throttled position until all air is evacuated from the meter. (This process is necessary to remove air entrapped in the rotor.)
4. To fully open inlet and outlet valves, open valves slowly, pausing if counter operation is rough. Continue opening valves when operation becomes smooth.

### Operating Meter System

1. Depress pushbuttons on counter, if provided, until desired amount of product shows in window.
2. Place handle of set-stop valve in the “on” position.
3. Now product is flowing.
4. After the preset quantity has been delivered, the set-stop counter actuates the valve which then automatically closes.
  - Valve closure is in two stages with the first or partial closing occurring at a predetermined period, such as 7 gallons, 30 litres, etc. (depending on the maximum rate of flow) before the total quantity has passed through the meter. When the final quantity has been metered, the valve closes completely. This eliminates line shock and assures high accuracy.

### General Operating Information

Abrupt closure of valves in a system can create forces in excess of normal line pressure. This could result in damage to the meter and other equipment.

Before restarting product flow after an emergency shut-down, it is strongly recommended that the quantity remaining on the preset counter be verified for correctness by subtracting the delivered total on the Large Numeral Counter (LNC) from the initial quantity set into the preset counter. This is necessary to avoid a possible over delivery which could result in a product spill. The reason for this recommendation is that when the “emergency stop” button is pushed on the counter, the advancing mechanism is immediately raised off the counter wheels. If the right-hand wheel revolves through zero subsequent to this action, the second wheel will not transfer; thus, a ten-unit error will result.

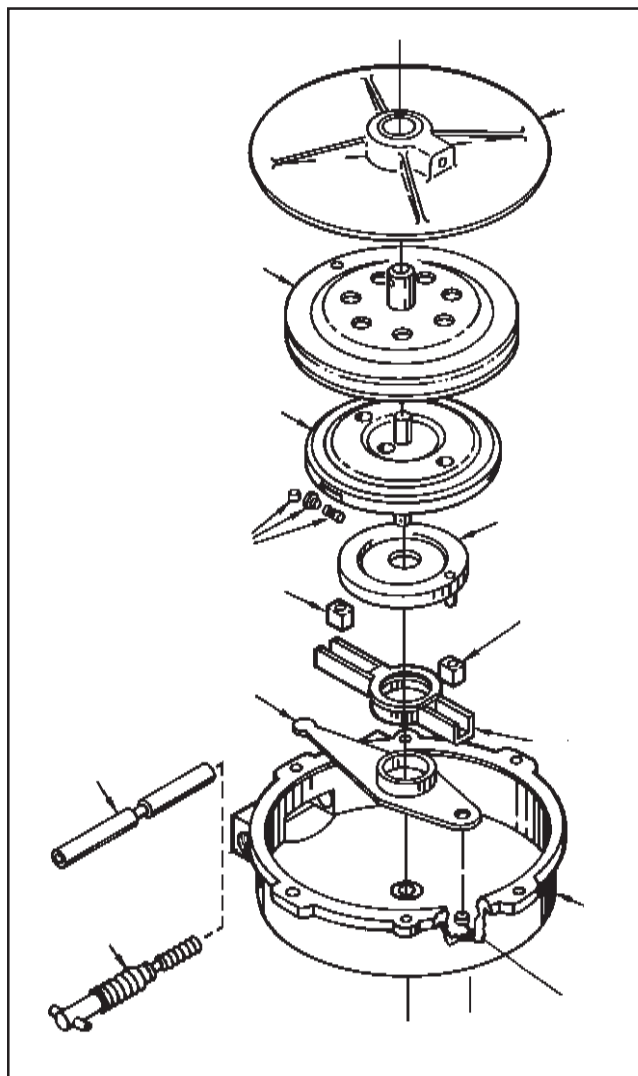
Counters or printers must not be reset when the meter is operating.

The ticket-securing pin in a printer head must be in the down or locked position when the meter is operating.

If accuracy or repeatability cannot be obtained, or if excessive noise is present, it is an indication that the meter should be disassembled for inspection and/or repair.

### Calibrator Adjustment

The clutch-type calibrator (Figure 9) utilizes two overriding clutches and an eccentric arm. By adjusting the amount of eccentricity, the calibrator can be made to vary any drive ratio between the meter and the register by a maximum total of 11 percent.



**Figure 9 — Clutch-Type Calibrator**

The calibrating means is used for adjusting for variations in operating conditions or differences in viscosity of product metered.

Built into the meter cover, and completely protected from dirt and other foreign matter, is the calibrator which provides means for final adjustment of the meter to secure

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## Section 3 — Operation (continued)

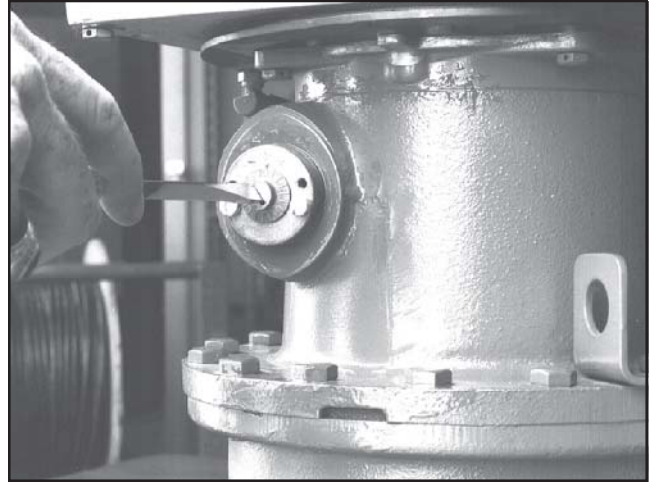
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the accuracy necessary in metering petroleum products. There are no special tools required to recalibrate the meter. The calibrator is under no pressure and there is no necessity to shut down the meter for adjustment. Simply remove the cap and turn the indexed scale (Figure 10) to the desired mark. The amount of product delivered by the meter increases when the calibrating dial is turned in a counter-clockwise direction and diminishes if the dial is turned in a clockwise direction. The dial is graduated to provide increments of adjustment approximately 1/20 of 1% (4 ounces in 50 gallons or 6 cubic inches in 50 gallons to each notch).

After the adjustment is made, the cap is replaced and can be sealed to prevent unauthorized persons from changing the adjustment.

To check calibrator for proper operation, remove calibrator from meter.

1. Calibrator should turn smoothly when top coupling is held and bottom coupling is turned counter-clockwise.
2. Uneven or rough operation indicates presence of burrs or foreign material.
3. Lack of torque or too much side play in shaft is indication of worn bearings.



**Figure 10**

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## Section 4 — Maintenance

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The meter calibrator should be kept lubricated by applying light oil (SAE 10) after approximately five hours of operation and then about twice a year.

The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacturer that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.

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