

**CABLE PRESSURE SYSTEMS**  
**LIQUID NITROGEN CYLINDERS**  
**DESCRIPTION AND USE**

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1. GENERAL

1.01 This section covers the description, gas withdrawal procedures, and precautions associated with the use of liquid nitrogen cylinders. The cylinders discussed in this section contain approximately 18 times as much nitrogen as the conventional 224 cubic foot nitrogen tank and are intended for use when large amounts of nitrogen or dry air are required. In many cases, liquid nitrogen cylinders can be used as a viable alternative to the Forced Air Restoration Method (FARM) equipment described in Section 644-200-030.

1.02 When this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 Although the cylinders described in this section are the Airco, Linde, and Air Products cylinders, it is not to imply that other suppliers of liquid nitrogen cylinders which meet the necessary requirements are not equally suitable.

1.04 The cylinders described in this section are designed and manufactured in accordance with Department of Transportation (DOT) Specification 4L.

1.05 Some typical uses for liquid nitrogen are as follows:

- Restore cable pressure in case of central office (CO) catastrophe
- Permanent pressure source for community dial office (CDO) in lieu of air dryer or bottle nitrogen
- Replace CO air dryer, in case of failure, until air dryer is repaired or replaced. Larger volumes (such as tank trucks) may be obtained if required
- Major splicing operation requiring a large volume of dry nitrogen
- As a buffering source used in major cable rearrangements, ie, under highways, streams, etc.

**NOTICE**

Not for use or disclosure outside the  
Bell System except under written agreement

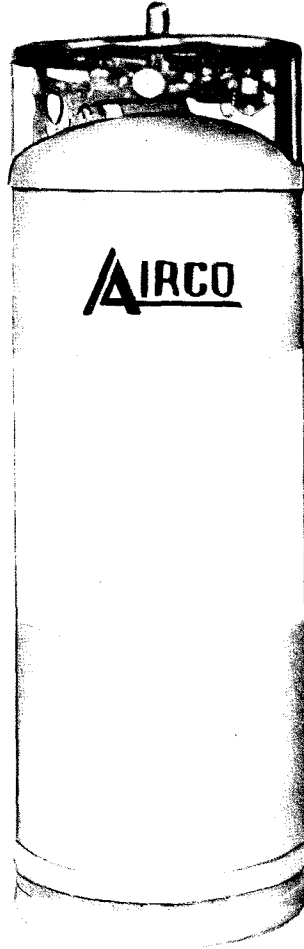
**2. DESCRIPTION**

**2.01** The portable liquid nitrogen cylinders described in this section consist of a stainless steel inner container encased within an outer carbon steel vacuum shell. The cylinder design includes an internal vaporizer which provides gas directly without the need of an external vaporizer.

**2.02** The principal characteristics and suggested reading and instruction material for each cylinder are listed in Table A. Typical portable liquid nitrogen cylinders are shown in Fig. 1, 2, and 3.

**2.03** The location and description of the various controls are shown in Fig. 4. A flow schematic for the same cylinders is shown in Fig. 5.

**2.04** To prevent the inadvertent operation of the valves used in conjunction with filling the cylinder, it is recommended that arrangements be made to have the vent valve and liquid valve handles removed by the supplier prior to delivery. See Fig. 4.



**Fig. 1—Airco Liquid Nitrogen Cylinder (Model No. ARLG-45)**

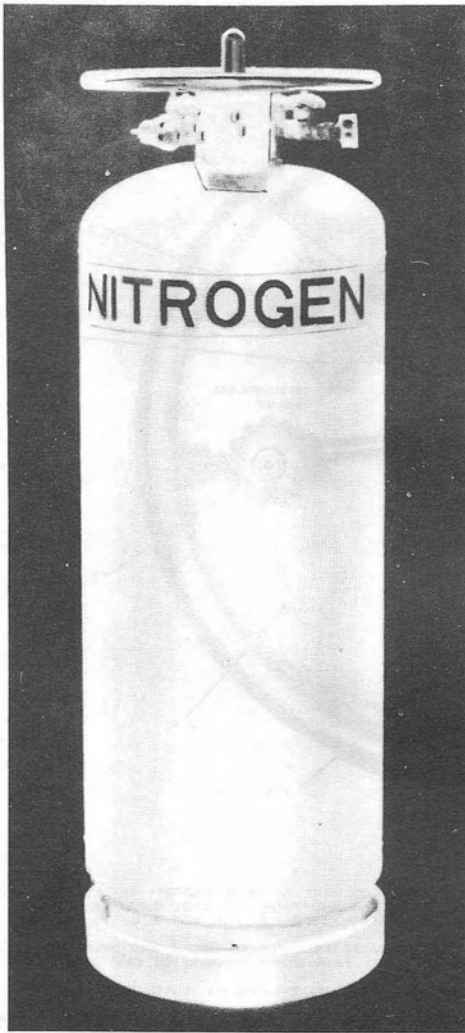


Fig. 2—Linde Liquid Nitrogen Cylinder (Model No. PGS-45)

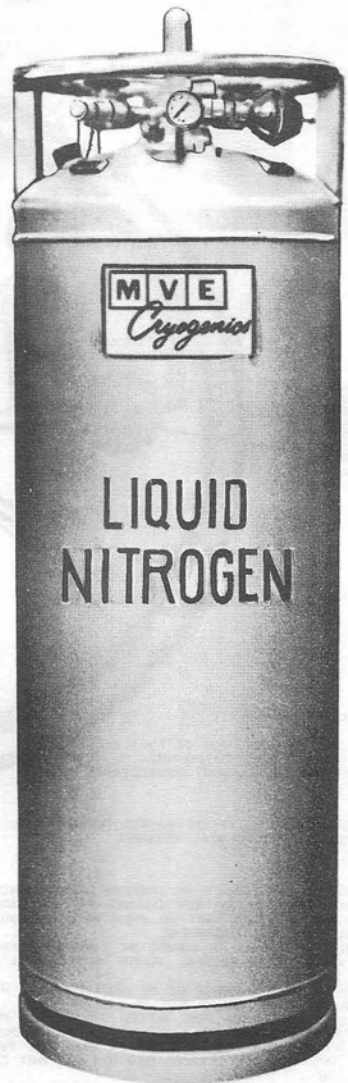


Fig. 3—Air Products Liquid Nitrogen Cylinder (Model No. VGL-1-160-L)

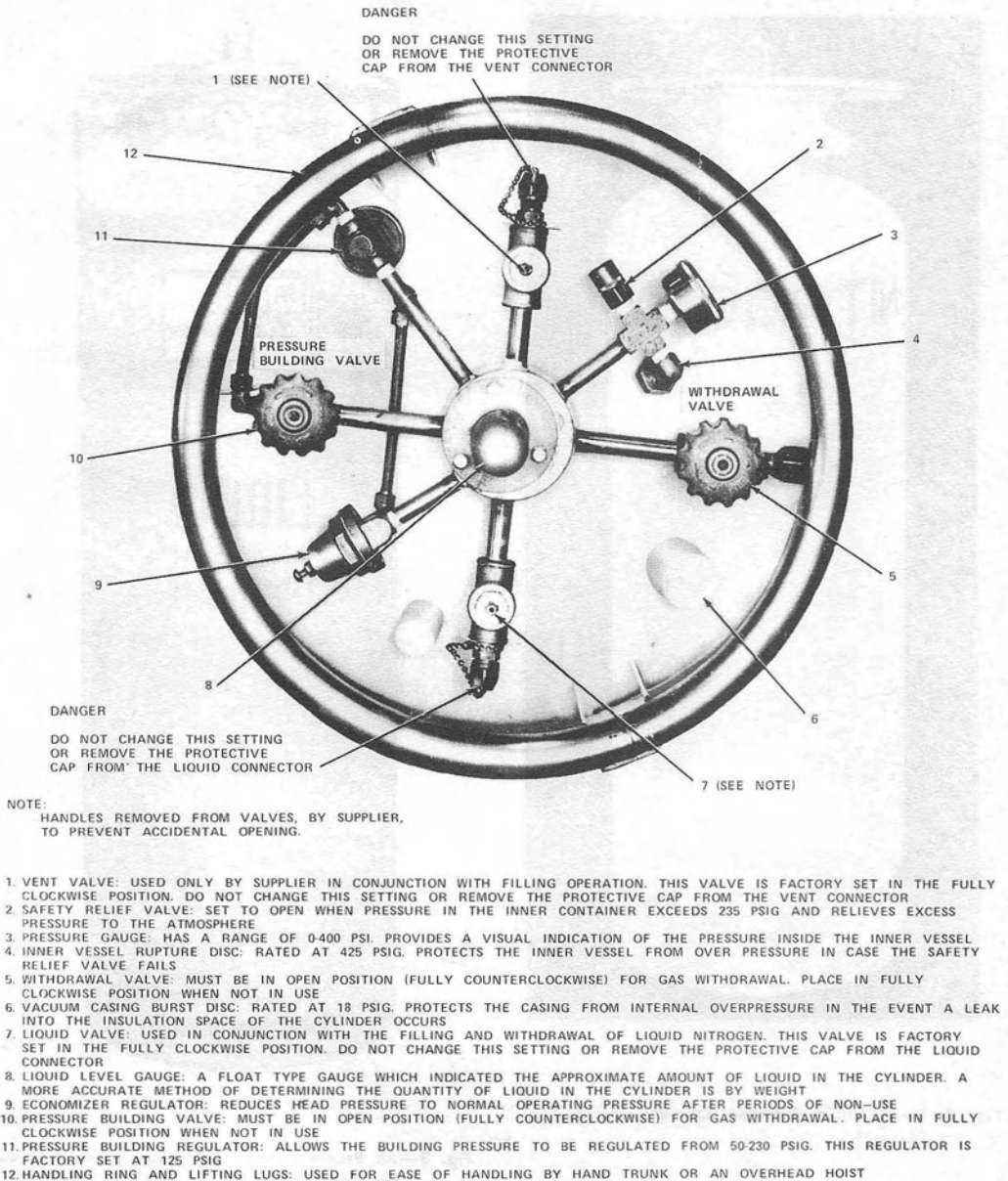
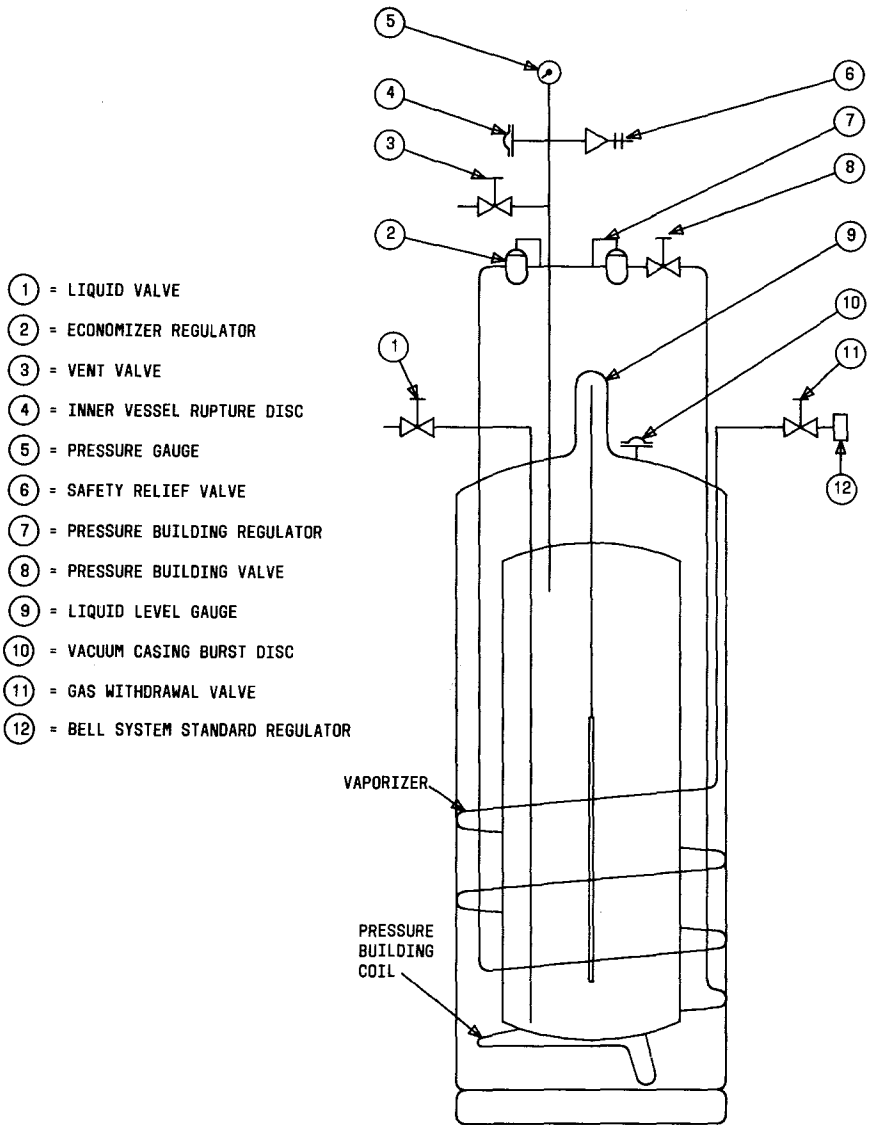


Fig. 4—Model No. ARLG-45 and VGL-160-L Liquid Nitrogen Cylinders (Location of Controls)



- ① = LIQUID VALVE
- ② = ECONOMIZER REGULATOR
- ③ = VENT VALVE
- ④ = INNER VESSEL RUPTURE DISC
- ⑤ = PRESSURE GAUGE
- ⑥ = SAFETY RELIEF VALVE
- ⑦ = PRESSURE BUILDING REGULATOR
- ⑧ = PRESSURE BUILDING VALVE
- ⑨ = LIQUID LEVEL GAUGE
- ⑩ = VACUUM CASING BURST DISC
- ⑪ = GAS WITHDRAWAL VALVE
- ⑫ = BELL SYSTEM STANDARD REGULATOR

VAPORIZER

PRESSURE BUILDING COIL

Fig. 5—Model No. ARLG-45 and VGL-160-L Liquid Nitrogen Cylinder (Flow Schematic)

### 3. HANDLING, TRANSPORTING, AND STORAGE

3.01 These cylinders are not intended to be transported by Telephone Company employees or stored on company premises. However, should it be necessary, the following techniques should be employed:

(a) Cylinders may be moved by attaching the hooks of a hoist to the lifting lugs at the top of the casing and placed in an upright position on a hand truck. ***The cylinder must not be transported or handled on its side.***

**Note:** It is recommended that a hand truck specifically designed for transporting cylinders be used. Hand trucks designed for this purpose are available from the cylinder suppliers.

(b) The cylinders must be secured to the hand truck frame, using a strap to maintain it in the upright position.

(c) Cylinders must be securely fastened before lifting or lowering with tail gates or elevators, or transporting by motor vehicle.

(d) At the job site, the cylinder must be placed on a firm and level surface free of obstructions and secured to a substantial support. (See Fig. 6.)

3.02 Liquid nitrogen cylinders ***must*** be stored in a well ventilated area. This is required because gas may escape from the cylinder after a period of time (paragraph 4.06) and results in the condition discussed in paragraph 5.02.

3.03 The storage area must not be an area where the cylinder might be struck or tipped over.

3.04 Nothing must be allowed on top of a cylinder.

### 4. GAS WITHDRAWAL PROCEDURES

4.01 Before attempting to withdraw gas from the cylinder, thoroughly read the precautions outlined in Part 5.

4.02 Cylinders described in this section are equipped for withdrawal of either liquid or dry nitrogen. ***This section describes their use for dry nitrogen withdrawal only.***

4.03 The Telephone Company must inform the cylinder supplier of the exact placing location. The selected location must have a firm and level surface and be situated adjacent to a support for securing the cylinder (Fig. 6). This location should not impede the flow of pedestrian or vehicular traffic.

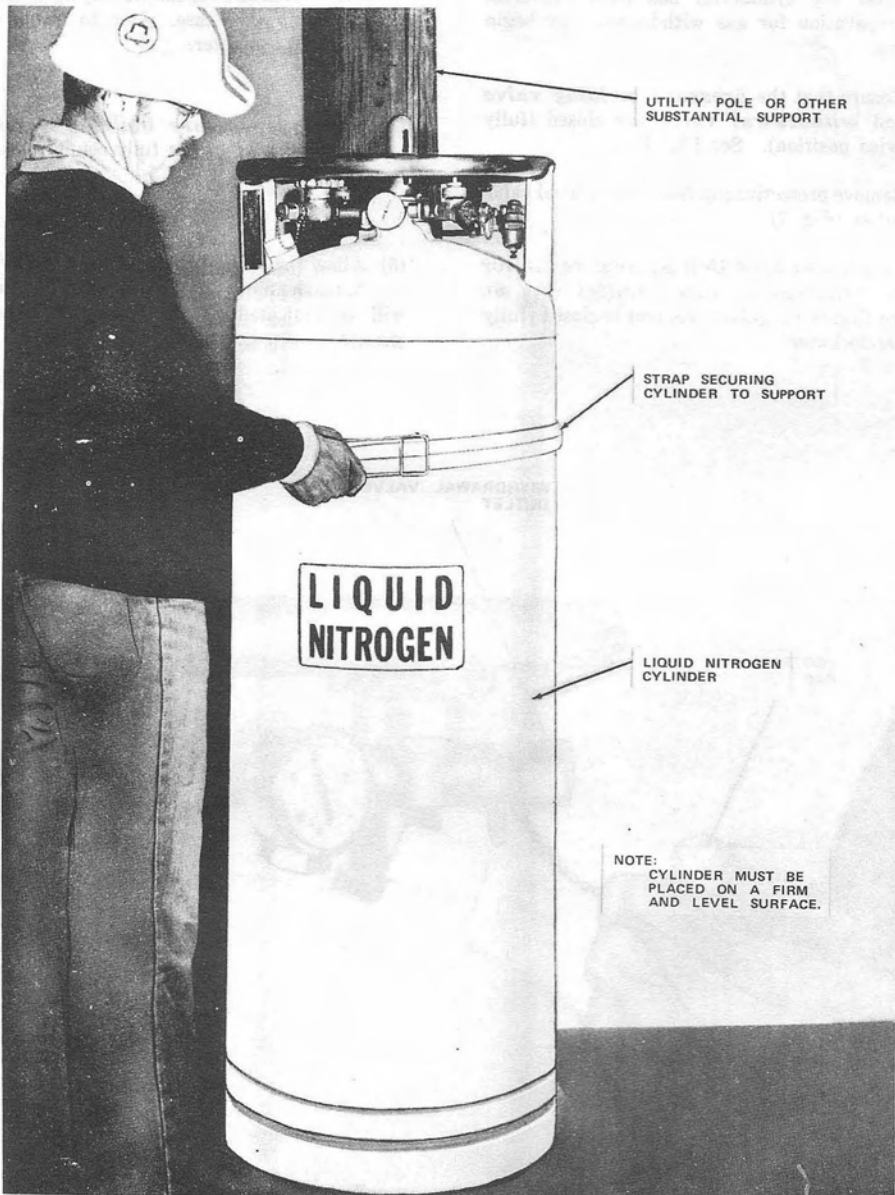


Fig. 6—Securing Liquid Nitrogen Cylinder to Utility Pole

4.04 After the cylinder(s) has been delivered, preparation for gas withdrawal may begin as follows:

- (1) Ensure that the **pressure building valve** and **withdrawal valve** are closed (fully clockwise position). See Fig. 4.
- (2) Remove protective cap from withdrawal valve outlet (Fig. 7).
- (3) Attach **standard Bell System regulator** to **withdrawal valve outlet** (Fig. 8). Ensure that the regulator control is closed (fully counterclockwise).

**Note:** Standard regulators may have left-hand threads; in this case, refer to Table A for appropriate adapter.

- (4) Open the **pressure building valve** and **withdrawal valve** fully counterclockwise. See Fig. 7.
- (5) Allow the operating pressure of the cylinder to reach approximately 200 psi. This pressure will be indicated on the **cylinder pressure gauge** shown in Fig. 9.

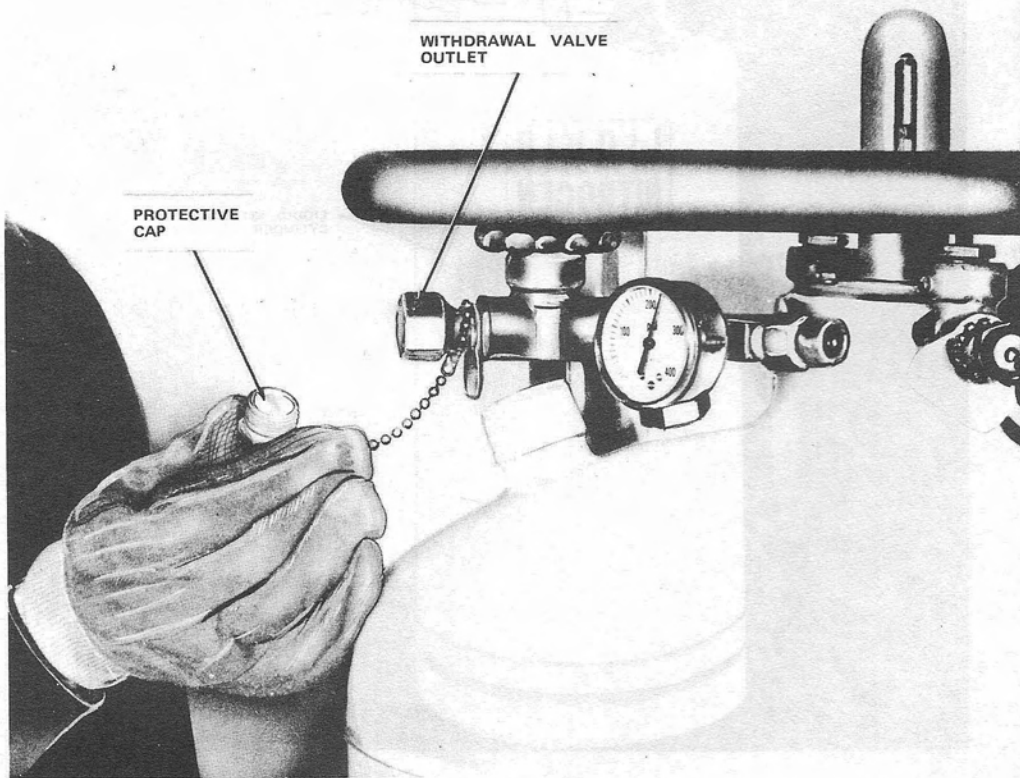


Fig. 7—Removing Protective Cap From Withdrawal Valve Outlet



(6) Adjust for the desired outlet pressure by turning the **regulator control** slowly clockwise (Fig. 9).

(7) Observe the **liquid level gauge** to determine the quantity of liquid in the cylinder.

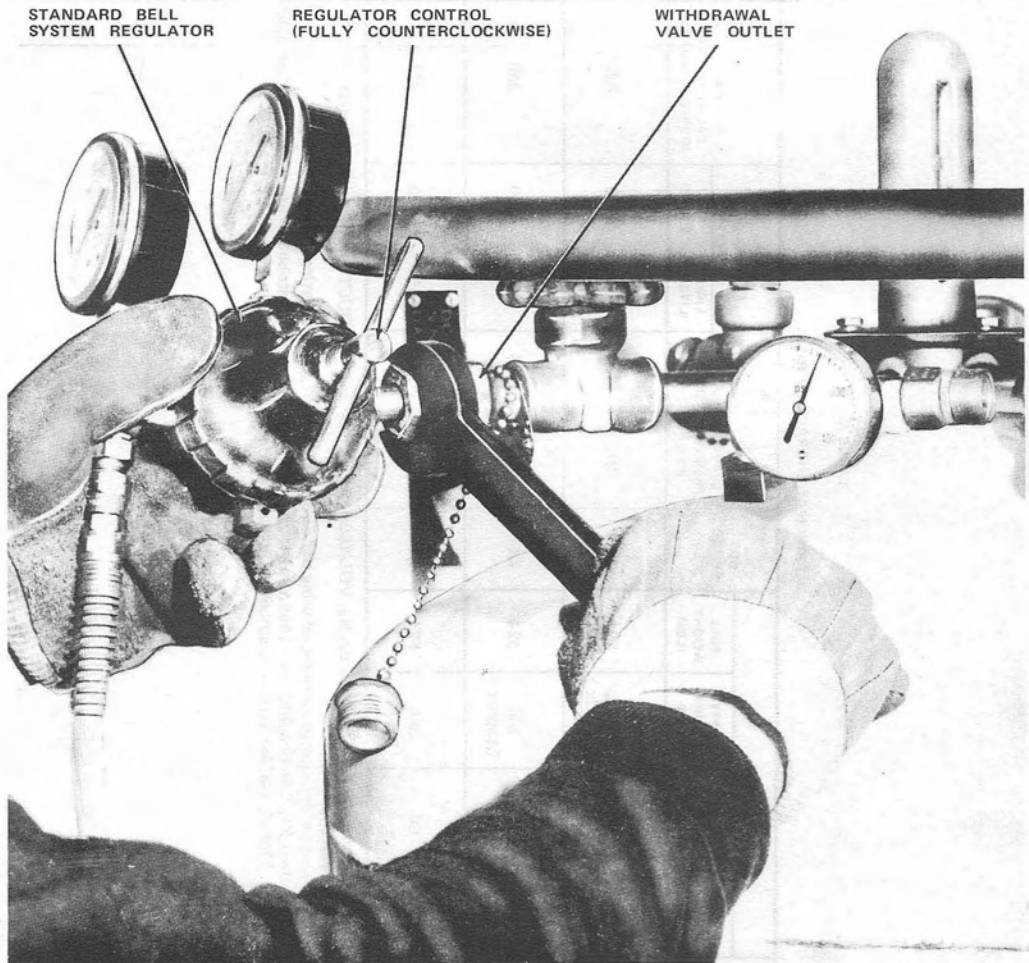


Fig. 8—Attaching Regulator to Withdrawal Valve Outlet

TABLE A  
PRINCIPAL CHARACTERISTICS

SUPPLIER AND CYLINDER MODEL NO.*	SIZE				DOT DESIGN SPEC.†	DOT SERVICE PRESSURE (PSIG)	SAFETY VALVE SETTING (PSIG)	STORAGE CAPACITY		GAS DELIVERY RATE (SCFH CONTINUOUS)	ADAPTORS REQUIRED‡	REFERENCE MATERIAL
	DIAMETER (INCHES)	HEIGHT (INCHES)	EMPTY WEIGHT (LBS)	FULL WEIGHT (LBS)				LIQUID (LITERS)	DRY (CU/FT)			
LINDE (MODEL NO. PGS- 45)	20	62	260 (Approx.)	524	L4	200	235	169	3640	250	GSA 580/555	¶
AIR PRODUCTS (MODEL NO. VGL-160-L)	20	60	260 (Approx.)	524	L4	212	235	165	3630	325	GSA 580/555	§

\* - Model No. ARLG-45 supplied by AIRCO and Model No. VGL-160-L supplied by AIR PRODUCTS are identical cylinders.

† - DOT = Department of Transportation

‡ - Adapters may be required for dry nitrogen withdrawal using standard Bell System regulators, having left-hand threads.

§ - Publications: Instructions For Safe Handling, AIG-100SA, ADC-2038, ADC-1188; Supplier Distributor Directory, CGA Pamphlet P-1.

¶ - Publications: F-9888, 3756-C, F-3536; Supplier Distributor Directory, Form 13-109F, and CGA Pamphlet P-1.

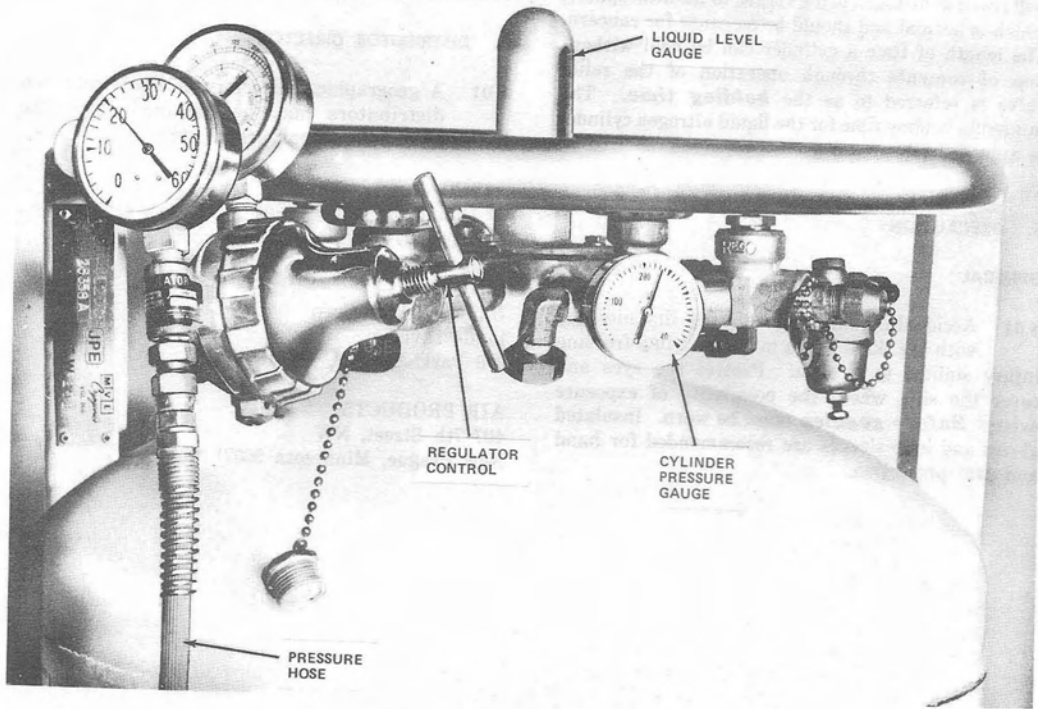


Fig. 9—Connections Completed

**4.05** If the flow rate from one cylinder is not adequate for a particular feed point, two or more cylinders can be manifolded together. The local distributor should be contacted for manifolding equipment and methods.

**4.06** During periods of no or insufficient withdrawal from cylinders in gas withdrawal service, heat will cause the pressure in the cylinder to increase above normal operating pressure. This will result in nitrogen being vented to the atmosphere, which is normal and should be no cause for concern. The length of time a cylinder can be held without loss of contents through operation of the relief valve is referred to as the **holding time**. The minimum holding time for the liquid nitrogen cylinder is approximately one day.

## 5. PRECAUTIONS

### GENERAL

**5.01** Accidental contact of escaping dry nitrogen with the skin or eyes may result in a freezing injury similar to a burn. Protect the eyes and cover the skin where the possibility of exposure exists. **Safety goggles** must be worn. Insulated gloves and long sleeves are recommended for hand and arm protection.

**5.02** Although dry nitrogen is nontoxic and nonflammable, it can cause asphyxiation when used in a confined area without adequate ventilation. Any atmosphere which does not contain enough oxygen can cause dizziness, unconsciousness, and even death. Dry nitrogen, being colorless, odorless, and tasteless, cannot be detected by the human senses and will be inhaled normally. Without adequate ventilation, the expanding dry nitrogen will displace normal air without warning. Refer to Section 620-140-501 for manhole venting procedures.

## 6. DISTRIBUTOR DIRECTORY

**6.01** A geographical directory of liquid nitrogen distributors may be obtained from the following suppliers (paragraph 1.03):

AIRCO  
70 Diamond Road  
Springfield, New Jersey 07081

LINDE  
Union Carbide Corp  
Linde Division  
270 Park Ave NY, NY 10017

AIR PRODUCTS  
407 7th Street, NW  
New Prague, Minnesota 56071