



**COMPENDIUM**  
**Of**  
**INDIAN STANDARDS**  
**On**  
**Domestic And Commercial Gas Burning**  
**Appliances**



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# 1. INTRODUCTION

The MED-23 Sectional Committee functions under the Mechanical Engineering Department of the Bureau of Indian Standards and is responsible for the formulation, revision, reaffirmation, and harmonization of Indian Standards relating to domestic and commercial gas burning appliances operating at pressure type gas supply systems.

Gas burning appliances are widely used in residential, commercial, and institutional environments for cooking, heating, and food processing applications. These appliances typically utilize gaseous fuels such as Liquefied Petroleum Gas (LPG), Piped Natural Gas (PNG), and Biogas. The safe and efficient utilization of these fuels requires appliances that are properly designed, manufactured, tested, and certified according to standardized technical specifications.

The scope of MED-23 covers a wide range of appliances including:

- a) Domestic gas stoves
- b) Built-in hobs
- c) Commercial cooking ranges
- d) Gas ovens and grillers
- e) Water heaters operating on LPG or PNG
- f) Biogas stoves
- g) Hot food cabinets and bain marie units
- h) Gas burners used in commercial kitchens
- i) Safety devices such as gas leak detectors and gas taps

Gas appliances are widely used in households, restaurants, hotels, catering establishments, hospitals, hostels, and industrial kitchens. Improperly designed appliances may result in serious hazards such as gas leakage, fire accidents, explosions, incomplete combustion, or carbon monoxide exposure. Therefore, the standards developed under MED-23 play a crucial role in ensuring operational safety, energy efficiency, durability, and uniform manufacturing quality.

The Indian Standards developed by the committee specify the design requirements, constructional features, safety provisions, testing procedures, marking requirements, and performance criteria for gas burning appliances and related accessories. These standards support regulatory safety frameworks and certification schemes such as the BIS certification (ISI mark) for gas appliances.

## 2. TYPES OF DOMESTIC AND COMMERCIAL GAS BURNING APPLIANCES

Gas burning appliances standardized under MED-23 can be broadly classified into several categories based on their function and application.

## 2.1 Domestic Gas Stoves

Domestic gas stoves are among the most widely used appliances in households. These appliances operate using LPG cylinders or piped natural gas supply systems and are used for cooking purposes. A domestic gas stove generally consists of burners, pan supports, control valves, gas inlets, and ignition systems.

Modern domestic stoves may include additional features such as:

Automatic ignition systems

Built-in hobs integrated with kitchen countertops

Flame failure safety devices

Energy-efficient burner designs

Domestic gas stoves must ensure stable combustion, controlled gas flow, and safe operation during continuous use.

## 2.2 Built-in Hobs

Built-in hobs are modern cooking appliances integrated into kitchen countertops. These appliances provide aesthetic design, ease of operation, and improved flame control. Built-in hobs typically include sealed burners, electronic ignition systems, and safety shut-off mechanisms.

These appliances are commonly used in modern residential kitchens and high-end commercial kitchens.

## 2.3 Commercial Cooking Ranges

Commercial cooking ranges are heavy-duty appliances designed for use in restaurants, hotels, catering facilities, and institutional kitchens. These appliances generally include multiple burners, grillers, ovens, and heating surfaces to support large-scale cooking operations.

Key characteristics include:

High heat output

Robust construction

Multiple burner configurations

Heavy-duty pan supports

These appliances must withstand continuous operation and high thermal loads.

## 2.4 Gas Ovens and Grillers

Gas ovens are enclosed cooking appliances used for baking, roasting, and grilling food. They typically consist of burners, insulated cooking chambers, temperature control systems, and ventilation arrangements.

Gas grillers are used for grilling food using direct flame or radiant heat. These appliances are widely used in commercial kitchens.

## 2.5 Gas Water Heaters

Gas water heaters are appliances designed to heat water using LPG or natural gas. These may be classified into:

## 2.6 Instantaneous water heaters

Storage type water heaters

## 2.7 Bulk water heaters

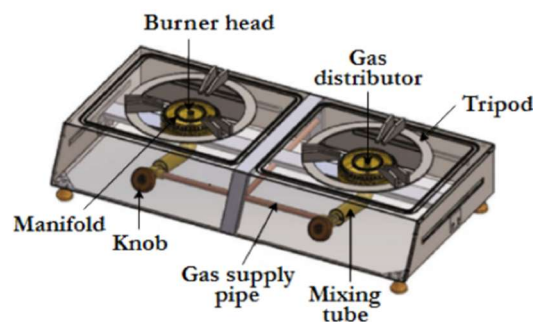
Gas water heaters provide rapid heating and continuous hot water supply. Proper combustion control and ventilation are essential for safe operation.

## 2.8 Biogas Stoves

Biogas stoves operate using gas produced through anaerobic digestion of organic waste materials such as cattle dung, agricultural residues, and food waste. These appliances support renewable energy utilization and are widely used in rural areas.

Biogas stoves require specialized burner designs to accommodate the different combustion characteristics of biogas compared to LPG.

# 3. IMPORTANT COMPONENTS OF GAS BURNING APPLIANCES



**Fig 1 Component of Gas Stove**

## 3.1 Burner

The burner is the primary component where gas combustion occurs. It mixes gas with air and produces a stable flame. Burners are typically manufactured from materials such as brass, aluminum alloys, or cast iron.

The performance of a burner depends on:

- a) Proper gas-air mixing
- b) Flame stability

- c) Uniform heat distribution

### 3.2 Injector (Nozzle)

The injector or nozzle is a small precision component through which gas enters the mixing tube. It regulates the gas flow rate and ensures the correct pressure and velocity required for proper mixing with air.

### 3.3 Mixing Tube

The mixing tube allows the gas to mix with primary air before reaching the burner ports. Proper mixing ensures efficient combustion and prevents incomplete burning.

### 3.4 Gas Control Valve

Gas control valves regulate the flow of gas from the supply source to the burner. These valves allow the user to control flame intensity and shut off the gas supply when necessary.

### 3.5 Pan Supports

Pan supports provide a stable platform for cooking vessels. They are typically made from cast iron or stainless steel and are designed to withstand high temperatures.

### 3.6 Ignition System

The ignition system initiates combustion of the gas-air mixture. Ignition systems may include:

- a) Manual ignition using matchsticks
- b) Piezoelectric spark ignition
- c) Electronic ignition systems

### 3.7 Safety Devices

Safety devices are incorporated to prevent accidents. These include:

- a) Flame failure devices
- b) Gas leak detectors
- c) Automatic shut-off valves

## 4. WORKING PRINCIPLE OF GAS BURNING APPLIANCES

Gas burning appliances operate based on the principle of controlled combustion of gaseous fuels. The objective is to achieve efficient combustion while ensuring safe operation and minimal emission of harmful gases.

The working process typically involves the following steps:

- 1) Gas is supplied from a cylinder or piped gas network through a pressure regulator.

- 2) The gas flows through the control valve to the injector.
- 3) Gas emerging from the injector mixes with air in the mixing tube.
- 4) The gas-air mixture reaches the burner ports.
- 5) Ignition produces a stable flame.
- 6) Heat generated from combustion is transferred to the cooking vessel or heating chamber.

Efficient combustion requires a proper air-fuel ratio, adequate mixing, and stable flame formation.

## **5. MANUFACTURING PROCESS OF GAS APPLIANCES**

The manufacturing of gas burning appliances involves a combination of metal fabrication, component manufacturing, assembly, and quality control operations.

The process begins with the fabrication of the appliance body using mild steel or stainless steel sheets. Sheet metal components are produced using cutting, punching, bending, and forming operations.

Burners are typically manufactured using casting or machining processes. Materials such as brass or aluminum alloys are commonly used due to their thermal resistance and durability.

After manufacturing the burners and other components, surface finishing operations are carried out. These may include powder coating, enamel coating, or polishing to enhance corrosion resistance and aesthetic appearance.

During the assembly stage, various components such as burners, gas valves, pan supports, ignition systems, and gas inlet fittings are installed. Careful alignment and fastening are necessary to ensure proper functioning.

Before dispatch, each appliance undergoes inspection and leak testing. These tests ensure that all joints and connections are gas-tight and that the appliance operates safely under normal conditions.

## **6. TESTING AND SAFETY EVALUATION**

Testing is a critical aspect in ensuring that domestic and commercial gas burning appliances comply with the safety, performance, and reliability requirements specified in the relevant Indian Standards. These tests are carried out to verify that the appliance operates safely under normal as well as abnormal conditions and does not pose any risk of gas leakage, fire hazards, or inefficient combustion. The testing procedures ensure that all components of the appliance function properly and meet the prescribed standards for quality and safety.

## 6.1 Soundness Test

The soundness test is conducted to ensure that the gas circuit of the appliance is completely leak-proof. In this test, the entire gas system including valves, joints, connectors, and pipelines is subjected to pressurization using air or gas at specified pressure levels. The appliance is then examined for any leakage using suitable detection methods such as soap solution or leak detection instruments. The formation of bubbles or any pressure drop indicates leakage. The appliance must not show any sign of leakage and should maintain pressure without any loss. This test is essential to prevent hazards such as gas accumulation, fire, or explosion during operation.

## 6.2 Flame Stability Test

The flame stability test is carried out to evaluate the behaviour of the flame under different operating conditions. The appliance is operated at varying gas pressures ranging from minimum to maximum levels, and external disturbances such as air drafts may be introduced. The flame is observed for stability, uniformity, and proper anchoring to the burner ports. During the test, any occurrence of flame lift-off, flashback, or extinction is carefully noted. A stable flame should remain steady and continuous without lifting or extinguishing. This test ensures safe combustion and prevents operational hazards associated with unstable flames.

## 6.3 Thermal Efficiency Test

The thermal efficiency test is performed to determine how effectively the appliance converts the energy of the fuel into useful heat. In this test, a specified quantity of water is heated in a standard vessel, and the temperature rise is measured along with the amount of gas consumed during the process. Based on these values, the efficiency of the appliance is calculated as the ratio of useful heat output to the total heat input from the fuel. The efficiency must meet the minimum requirements specified in the relevant standards. This test is important for ensuring energy efficiency, reducing fuel consumption, and improving the overall performance of the appliance.

## 6.4 Endurance Test

The endurance test is conducted to evaluate the durability and long-term performance of the appliance under repeated operating conditions. In this test, the appliance is subjected to continuous operation or repeated ON-OFF cycles for a specified duration. The performance of various components such as burners, valves, and control mechanisms is monitored throughout the test. Any signs of wear, deformation, malfunction, or performance degradation are observed. The appliance should continue to function properly without any failure or significant loss in performance. This test ensures that the appliance is capable of withstanding prolonged usage in practical conditions.

## 6.5 Safety Device Performance Test

The safety device performance test is carried out to verify the proper functioning of safety mechanisms incorporated in gas appliances, such as flame failure devices and automatic shut-

off systems. During the test, the flame is intentionally extinguished to simulate abnormal conditions, and the response of the safety device is observed. The device should automatically cut off the gas supply within a specified time to prevent gas leakage. The reliability and consistency of the safety mechanism are also evaluated. This test is crucial in ensuring that the appliance provides adequate protection against hazardous situations such as unburnt gas accumulation.

## **7. INDUSTRIAL AND DOMESTIC APPLICATIONS**

Gas burning appliances standardized under MED-23 are widely used across several sectors.

In households, gas stoves are used for daily cooking activities. The availability of LPG and piped natural gas has made gas cooking one of the most common cooking methods in urban and rural households.

In commercial kitchens such as restaurants and hotels, heavy-duty cooking ranges and gas ovens are used for large-scale food preparation. These appliances provide high heat output and reliable operation during continuous cooking operations.

Institutional kitchens in hospitals, hostels, and military establishments also rely on commercial gas appliances for efficient food preparation.

Gas water heaters are widely used in residential and commercial buildings for providing hot water for bathing and cleaning purposes.

Biogas stoves are particularly important in rural areas where organic waste can be converted into renewable fuel for cooking.

## **8. Difference Between LPG and PNG**

*(Based on IS 17153 and IS 4246)*

- a) LPG appliances (as per IS 4246) are designed to operate at a specified inlet pressure of 2.942 kN/m<sup>2</sup> (30 gf/cm<sup>2</sup>), whereas PNG appliances operate at much lower pressure, requiring different design considerations.
- b) LPG has higher calorific value, therefore appliances require lower gas flow rate, whereas PNG has lower calorific value, requiring higher volumetric flow for the same heat output.
- c) Due to higher energy content of LPG, injector jets are smaller and precisely calibrated, while PNG appliances require larger injector orifice size to allow more gas flow.
- d) LPG is stored in liquefied form under pressure in cylinders, whereas PNG is supplied in gaseous form through pipelines, leading to differences in appliance inlet design and connection systems.

- e) LPG being heavier than air, tends to accumulate near ground level in case of leakage, whereas PNG being lighter than air disperses upward quickly, influencing safety design requirements.
- f) LPG appliances require strict gas soundness limits (leakage  $\leq 0.06$  l/hr) as specified in IS 4246, due to higher risk of accumulation and explosion.
- g) LPG burners are designed to operate efficiently within a pressure range of 2.452 to 3.432 kN/m<sup>2</sup>, ensuring flame stability and proper combustion, whereas PNG burners are designed for stable combustion at lower pressures.
- h) LPG produces a more intense and concentrated flame, whereas PNG produces a softer and less intense flame, affecting burner design and pan support configuration.
- i) LPG appliances require less primary air for combustion, whereas PNG requires higher air-fuel mixing, impacting burner port design.
- j) In LPG appliances, gas consumption is controlled with tighter limits ( $\pm 8\%$ ), whereas PNG systems are designed for continuous flow regulation via pipeline supply.
- k) LPG systems require external pressure regulators, and as per IS 4246, regulators are not part of the stove itself, whereas PNG systems are directly connected to regulated pipeline supply.
- l) LPG appliances require cylinder-based installation and handling, whereas PNG appliances are designed for fixed installation with continuous supply, affecting overall appliance configuration.

## **9. Retrofitting of LPG Gas Stoves to PNG - Practices and Issues in India**

With the increasing adoption of Piped Natural Gas (PNG) in India, retrofitting of existing LPG gas stoves has become a common practice. Retrofitting generally involves modification of the appliance, primarily by changing the injector (nozzle) and sometimes the burner, to suit the lower pressure and different combustion characteristics of PNG. However, in many cases, this process is carried out by local technicians or shop owners in an unregulated manner, where only the nozzle is replaced without considering complete design requirements such as air-fuel ratio, pressure compatibility, and burner configuration. Such practices are often performed without adherence to relevant Indian Standards and without conducting necessary tests such as soundness test, flame stability test, and combustion performance evaluation. As a result, improper retrofitting may lead to incomplete combustion, formation of carbon monoxide, flame instability, gas leakage, and increased risk of fire hazards. Additionally, non-standard or old appliances are frequently modified without assessing their suitability for PNG operation. Therefore, retrofitting should be carried out only by authorized personnel following standardized procedures and proper testing to ensure safe, efficient, and reliable operation of gas appliances.

## 10. KEY STANDARDS UNDER MED-23

The MED-23 committee has developed several important standards covering gas burning appliances and related safety equipment.

Some important categories include:

- a) Domestic gas stoves and built-in hobs
- b) Commercial cooking ranges and ovens
- c) Gas water heaters
- d) Biogas stoves
- e) Gas leak detectors
- f) Gas taps and control valves
- g) Flexible gas hose assemblies
- h) Safety practices for LPG installations

These standards collectively ensure the safe design, manufacture, installation, and operation of gas appliances.

The following standards represent the core technical framework of the committee:

- a) IS 17153 - Domestic Gas Stoves and Built-in Hob for Use with LPG - Specification
- b) IS 17150 - Mini Domestic Water Heater for Use with Piped Natural Gas - Specification
- c) IS 4246 - Domestic Gas Stove and Built-in Hob for Use with Piped Natural Gas - Specification
- d) IS 15558 - Gas Operated Water Heaters - Specification
- e) IS/ISO 22702 - Gas Burning Appliances for Outdoor Use - Specification
- f) IS/ISO 9994 - Lighters - Safety Specifications
- g) IS 8749 - Multi Layer (Polyethylene–Stainless Steel) Stainless Steel Gas Hose Assemblies
- h) IS 17814 - Safety Devices for Gas Burning Appliances – Specification

### 10.1 IS 17153 - Domestic Gas Stoves and Built-in Hob for Use with LPG - Specification

Scope:

This standard specifies the requirements for domestic gas stoves and built-in hobs intended for use with Liquefied Petroleum Gas (LPG) operating under specified pressure conditions.

Description:

This standard covers the design, construction, performance, and safety requirements of LPG-based domestic cooking appliances. It includes provisions for materials, burner configuration, injectors, gas control valves, and pan supports. Performance requirements such as thermal efficiency, flame stability, and combustion characteristics are defined to ensure efficient fuel utilization. Safety aspects include gas tightness, prevention of leakage, and safe operation

under normal and abnormal conditions. The standard also specifies methods of testing, inspection procedures, and marking requirements to ensure product reliability and uniform quality.

## 10.2 IS 17150 - Mini Domestic Water Heater for Use with Piped Natural Gas - Specification

### Scope:

This standard specifies the requirements for mini domestic water heaters designed to operate on piped natural gas (PNG).

### Description:

This standard covers constructional features, performance requirements, and safety provisions for compact water heating appliances. It includes requirements for burner performance, heat output, and temperature control mechanisms. Combustion efficiency, emission control, and safe discharge of combustion products are addressed. Safety provisions include protection against overheating, flame failure, and gas leakage. The standard also includes testing methods for performance evaluation, endurance, and safety verification, ensuring reliable operation in domestic applications.

## 10.3 IS 4246 - Domestic Gas Stove and Built-in Hob for Use with Piped Natural Gas - Specification

### Scope:

This standard specifies the requirements for domestic gas stoves and built-in hobs designed for use with piped natural gas.

### Description:

This standard addresses the design and performance of PNG-based cooking appliances, considering differences in gas characteristics such as pressure and calorific value compared to LPG. It includes requirements for burner design, injector sizing, and gas control systems suitable for PNG operation. Performance criteria such as flame stability, combustion efficiency, and heat distribution are specified. Safety requirements include gas tightness, stable operation under varying supply conditions, and prevention of unsafe combustion. The standard also includes testing procedures and marking requirements.

## 10.4 IS 15558 - Gas Operated Water Heaters - Specification

### Scope:

This standard specifies the requirements for gas-operated water heaters used in domestic and similar applications.

### Description:

This standard covers both instantaneous and storage-type water heaters operating on gaseous fuels. It includes provisions for design, construction, heat output, and thermal efficiency. Safety requirements such as temperature control, flame failure protection, and prevention of gas leakage are included. The durability and performance of appliances are evaluated through endurance and functional tests. The standard also specifies requirements for marking, installation instructions, and maintenance guidelines to ensure safe and efficient operation.

### 10.5 IS/ISO 22702 - Gas Burning Appliances for Outdoor Use - Specification

Scope:

This standard specifies requirements for gas burning appliances intended for outdoor use.

Description:

This standard covers portable and outdoor gas appliances used for cooking or heating in open environments. It includes requirements for structural stability, resistance to wind effects, and safe combustion under outdoor conditions. Materials and construction suitable for environmental exposure are specified. Safety provisions include prevention of tipping, safe ignition systems, and control of gas flow. The standard also includes testing procedures to evaluate performance and safety under simulated outdoor conditions.

### 10.6 IS/ISO 9994 - Lighters - Safety Specifications

Scope:

This standard specifies safety requirements for lighters used for ignition of gas burning appliances.

Description:

This standard covers the design, construction, and performance of lighters to ensure safe operation. It includes requirements for flame height control, ignition reliability, and resistance to accidental ignition. Child safety provisions are included to prevent unintended use. The durability and performance of lighters are verified through testing under repeated usage conditions. The standard ensures that lighters are safe, reliable, and suitable for domestic and commercial use.

### 10.7 IS 8749 - Multi Layer (Polyethylene-Stainless Steel) Stainless Steel Gas Hose Assemblies

Scope:

This standard specifies requirements for multi-layer gas hose assemblies used for connecting gas appliances to the gas supply source.

Description:

This standard covers construction, materials, and performance requirements of hose assemblies designed for gas transmission. It includes provisions for mechanical strength, flexibility, and resistance to internal pressure. Safety requirements include leak tightness, resistance to rupture, and durability under repeated bending and usage. The standard also specifies testing methods and inspection procedures to ensure safe and reliable gas connections in domestic and commercial installations.

## 10.8 IS 17814 - Safety Devices for Gas Burning Appliances - Specification

Scope:

This standard specifies requirements for safety devices used in gas burning appliances.

Description:

This standard covers devices such as flame failure devices and automatic shut-off mechanisms that prevent hazardous situations. It includes requirements for design, response time, and operational reliability. The standard ensures automatic interruption of gas supply in case of flame extinction or abnormal conditions. Testing methods are specified to verify functional performance, durability, and safety effectiveness. The standard is applicable to safety components used in domestic and commercial gas appliances.

## 11. PUBLISHED STANDARDS UNDER MED-23

The standards developed under MED-23 can be broadly classified into following

Sl. No.	Standard Number	Title
8	IS 15558:2024	INSTANTANEOUS DOMESTIC WATER HEATER FOR USE WITH LPG — SPECIFICATION

TABLE 1 - PRODUCT SPECIFICATION

Sl. No.	Standard Number	Title
1	IS 17153:2025	DOMESTIC GAS STOVES AND BUILT IN HOB FOR USE WITH LPG — SPECIFICATION
2	IS 17150:2025	MINI DOMESTIC WATER HEATER FOR USE WITH PIPED NATURAL GAS — SPECIFICATION
3	IS 4246:2025	DOMESTIC GAS STOVE AND BUILT IN HOB FOR USE WITH PIPED NATURAL GAS — SPECIFICATION

4	IS 11241:2024	Portable Liquefied Petroleum Gas Appliances Operating with Vapour Pressure LPG — Specification
5	IS 8251:2024	Commercial Cooking Ranges Including Grillers for use with LPG — Specification
6	IS 17051:2024	Biogas Stove — Specification (Third Revision)
7	IS 17052:2024	PIEZOELECTRIC SPARK LIGHTER FOR GAS BURNING APPLIANCES — SPECIFICATION
10	IS 17053:2024	HOT FOOD CABINETS FOR USE WITH LPG — SPECIFICATION
11	IS 17054:2024	COMMERCIAL BURNING BURNERS FOR USE WITH LPG — SPECIFICATION
12	IS 17055:2024	MECHANICAL TYPE GAS LEAK DETECTOR FOR USE WITH LPG — SPECIFICATION
13	IS 17056:2024	DOMESTIC GRILLERS FOR USE WITH LIQUEFIED PETROLEUM GAS — SPECIFICATION
14	IS 17057:2024	BAINS MARIE FOR USE WITH LPG — SPECIFICATION
15	IS 17058:2024	BULK WATER HEATER FOR USE WITH LPG — SPECIFICATION
16	IS 17059:2024	GAS TAPS WITH OR WITHOUT FLAME FAILURE DEVICE — SPECIFICATION
17	IS 17060:2024	COMMERCIAL GAS BAKING AND ROASTING OVEN — SPECIFICATION
18	IS 1342:2019	FRYERS FOR USE WITH LPG — SPECIFICATION
19	IS 15558:2018	DOMESTIC STORAGE TYPE WATER HEATERS FOR USE WITH LPG — SPECIFICATION
20	IS 1342 (Part 2):2017	Utility lighters — Safety specifications
21	IS/ISO 23550:2011	Lighters — Safety specifications
22	IS/ISO 23551:2011	Corrugated Metal Flexible Safety Gas Hose Assemblies
23	IS 8749:2010	Multi Layer (Polyethylene-Stainless Steel) Stainless Steel Gas Hose Assemblies

TABLE 2 - TERMINOLOGY

<b>Sl. No.</b>	<b>Standard Number</b>	<b>Title</b>
9	IS 6480:2022	TERMS RELATING TO DOMESTIC AND COMMERCIAL GAS BURNING APPLIANCES

TABLE 3 - SAFETY STANDARD\

<b>Sl. No.</b>	<b>Standard Number</b>	<b>Title</b>
24	IS 12011:2022	CODE OF SAFETY PRACTICE FOR DOMESTIC LPG INSTALLATION

TABLE 4 - CODE OF PRACTICE

<b>Sl. No.</b>	<b>Standard Number</b>	<b>Title</b>
27	IS 16093:2013	Installation of gas based instantaneous water heaters
28	IS 4760:2002	Domestic cooking ranges including grillers for use with LPG

TABLE 5 - METHODS OF TEST

<b>Sl. No.</b>	<b>Standard Number</b>	<b>Title</b>
30	IS 13432:1992	Gas leak detector for use with low pressure liquefied petroleum gas