PB-236 479

PIPELINE ACCIDENT REPORT, COLUMBUS GAS OF WEST VIRGINIA, INCORPORATED, CHARLESTON, WEST VIRGINIA, DECEMBER 2, 1973

National Transportation Safety Board
Washington, D. C.

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This report contains Pipeline Safety Recommendations P-74-29 through P-74-36.

16. Abstract

At 3:30 p.m., on December 2, 1973, an explosion followed by an intense fire killed three persons, injured two others, and destroyed a house on the outskirts of Charleston, W. Va. Fire, fueled by natural gas which had saturated the soil, later rekindled briefly in the ground around the house. After the accident, two pit-hole leaks were found in the 2-inch gas main, operated at 39 psig, which served the area; the leaks were 11 feet from the house and 1 foot from the concrete driveway which led to the house. Gas company personnel later repaired both leaks without shutting off the gas main or interrupting service to any other customers.

The National Transportation Safety Board determines that the probable cause of the explosion and fire was the ignition, by an unknown source, of an accumulation of natural gas which had leaked from two corrosion holes in a nearby 2-inch gas main. Contributing to the intensity of the ensuing fire was the large amount of natural gas which had accumulated in the attic and between the original exterior walls of the house and a newer exterior brick veneer. Contributing to the accident was the fact that none of the victims reported previously detected gas odors to the gas company or to the fire department.

The report contains recommendations to the Office of Pipeline Safety, the ASME Gas Piping Standards Committee, and Columbia Gas of West Virginia, Inc., intended to prevent a recurrence of an accident of this type.

17. Key Words	18. Distribution Statement
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PIPELINE ACCIDENT REPORT

COLUMBIA GAS
OF WEST VIRGINIA, INC.
CHARLESTON, WEST VIRGINIA

DECEMBER 2, 1973

ADOPTED: AUGUST 21, 1974

NATIONAL TRANSPORTATION SAFETY BOARD
Washington, D.C. 20591
REPORT NUMBER: NTSB-PAR-74-4

FOREWORD

The accident described in this report has been determined to be a major accident by the National Transportation Safety Board under the criteria established in the Safety Board's regulations.

This report is based on facts obtained from an investigation conducted by the Safety Board. Cooperation during this investigation was received from the Office of Pipeline Safety, The West Virginia Public Service Commission, the West Virginia State Fire Marshal and Columbia Gas of West Virginia, Inc.

The conclusions, the determination of probable cause, and the recommendations herein are those of the Safety Board.

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NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D. C. 20591

PIPELINE ACCIDENT REPORT

Adopted: August 21, 1974

Columbia Gas of West Virginia, Inc.
Charleston, West Virginia
December 2, 1973

SYNOPSIS

At 3:30 p.m., on December 2, 1973, an explosion followed by an intense fire killed three persons, injured two others, and destroyed a house on the outskirts of Charleston, W. Va.

The local rescue squad, two fire departments, and gas company personnel evacuated the injured, extinguished the fire, and shut off gas to the building. Fire, fueled by natural gas which had saturated the soil, later rekindled briefly in the ground around the house.

Two pit-hole leaks were found in the 2-inch gas main, operated at 39 psig, which served the area; the leaks were 11 feet from the house and 1 foot from the concrete driveway which led to the house. Gas company personnel later repaired both leaks without shutting off the gas main or interrupting service to any other customers.

The National Transportation Safety Board determines that the probable cause of the explosion and fire was the ignition, by an unknown source, of an accumulation of natural gas which had leaked from two corrosion holes in a nearby 2-inch gas main.

Contributing to the intensity of the ensuing fire was the large amount of natural gas which had accumulated in the attic and between the original exterior walls of the house and a newer exterior brick veneer.

Contributing to the accident was the fact that none of the victims reported previously detected gas odors to the gas company or to the fire department. This was partially the result of the fact that the gas company's educational program submerged warnings and instructions within promotional material not heeded by the customer and did not inform the customer of the possible consequences of failure to report a gas odor to the gas company or to leave the premises.

FACTS

The Accident

Shortly before 3:30 p.m., on Sunday, December 2, 1973, two adults and three children were inside a single-story brick veneer house on Henson's

Branch Road, a narrow blacktopped street that winds upward between two steep hills on the outskirts of Charleston, W. Va. At 3:30 p.m., the house exploded; the roof was blown into the air and the front and back walls were blown into the yard. The roof fell back into the debris and an intense gas-fueled fire followed, which gutted the house. The ensuing blaze burned a telephone pole, melted a powerline, scorched trees, and kindled a brush fire on the side of the hill. Partially burned wall sections littered the front and back yard, and bricks were strewn on the road. (See Figure 1.)

Two of the children, blown out of the house by the initial blast and severly burned, ran up the road. One adult was pulled out of the burning debris by a neighbor, but the other adult and child could not be reached because of the intense heat. The local rescue squad, alerted by a neighbor, arrived at 3:35 p.m., wrapped the injured adult in sterile burn sheets, and transported her to the Charleston General Hospital. A second ambulance removed the two burned children to the same hospital.

The Pinch Volunteer Fire Department arrived at 3:50 p.m., and the Charleston Fire Department arrived at 4:28 p.m. Five thousand gallons of water from Scow's Run and Henson's Branch, two small streams closeby, were hosed onto the fire for an hour and a half to extinguish the flames. Very little fire was encountered in the cellar, but the entire first floor was ablaze. Thirty-foot flames melted the powerline to the house, and caused it to sag, short-circuit, and shower sparks on the people below. Blue, gas-fed flames, 8 to 10 inches high, were burning in the ground at the corner of the house next to the carport. These flames, once extinguished, flared again. At 6 p.m. the fire was extinguished, and the Charleston Fire Department left at 6:40 p.m. At 11:40 p.m., firemen returned to the site, because the gas-fueled fire at the corner of the house had reignited. The firemen saturated the area with water, extinguished the fire again, and left at 12:30 a.m.

The Columbia Gas Company of West Virginia (Columbia), the utility serving the area, was notified of the accident at 3:42 p.m., and a Columbia serviceman arrived 20 minutes later. The serviceman shut off the service-line valve at the curb box and the valve at the meter. Both the gas meter and regulator were later removed from the premises by Columbia.

Pipeline System

Columbia operated a 2-inch gas main along the north edge of Henson's Branch Road from its junction with a 3-inch main at the bottom of the hill to the house on top of the hill. A flood had washed out the section of line from its junction with the 3-inch main to Scow's Run. The washed-out section was replaced in 1961 with new steel, welded, coated, and wrapped pipe which was not cathodically protected. From Scow's Run to the top of the hill, the older bare steel main, which had been installed in 1948 through 1949, remained in service.

Figure 1. House demolished by natural-gas explosion, Charleston, W. Va.

The pipe was screwed together with thread and collar joints and was buried approximately 24 inches deep at the leak site. At one point on the main, about 50 feet up the hill from the accident, the pipe had less than 2 inches of cover. Both the new and the old 2-inch pipe were rated at 50 psig, and at the time of the accident supplied gas at 39 psig to regulators at each customer's house. The regulators reduced the gas pressure to 6 to 8 inches of water column for use inside the houses. A valve was installed on the 2-inch main at its junction with the 3-inch main at the bottom of the hill, almost 1,700 feet from the accident site. No other valve had been installed on the main.

Columbia had not received any service calls reporting trouble on the 2-inch gas main since 1969. At that time an "A" leak was discovered and repaired about 460 feet up the hill from the accident site. An "A" leak is the least hazardous of the three leak categories and repairs to this type of leak were made when repair crews were available, usually within 1 month after the leak report. A leak survey conducted by Columbia on October 3, 1973, indicated that no leaks existed on the 2-inch main. This leak survey was conducted by three Columbia employees who made bar test holes at 10- to 15-foot intervals along the main and then checked these holes for gas. Four house service calls had been made between December 2, 1972, and December 7, 1973, on Henson's Branch Road. Two of these calls involved defective meters, one involved replacing a 7-year old meter, and one involved a small leak in a bedroom space heater. None of the service calls concerned the house involved in this accident.

Events Preceding the Accident

When built 28 years ago, the house was a single-story dwelling with asbestos siding. In 1958, the owner added a two-car garage with a living room above. Originally there was a crawl space beneath the house, but no basement. Two or 3 years after the house was built, the owner hand-dug a basement and shored up the flooring with a steel beam and jacks, but the excavated earthen walls remained. In 1972, the owner added a brick veneer to the asbestos siding. The bricks were separated from the older siding by a 1- to 2-inch air space from ground level to the roof. The house had used gas service since it was first occupied. The owners had never called the gas company service department.

Columbia periodically enclosed a pamphlet titled Gaslight in the envelopes containing the monthly gas bills, as part of its customer awareness program. This "bill stuffer," mailed monthly, contained 3 gas safety messages a year in 1971, 1972, and 1973. It also discussed gas-equipment maintenance hints, food recipes, and items of general interest. (Reproductions of these pamphlets are included in the appendix.) The owner of the house involved in this accident stated that he had not known of this material.

In addition to the pamphlets, Columbia periodically used the local newspapers to advise the public to check their gas appliances, to practice safety in the home, and to ready their home and appliances for winter.

On Saturday, the day before the accident, the wife of the owner of the house smelled gas in the house and noticed excessive flame heights of the pilot light in the gas stove. When the owner came home, he thoroughly checked the appliances on the first floor and all of the gas piping in the cellar. He stated that he did not smell gas at that time and did not discover any gas leaks in the piping. The owner left for work on Sunday morning, and at noon a neighbor came to visit. She complained about the strong odor of gas which she encountered when she entered the house. Although the owner's wife thought it was sewer gas from the septic tank, she did go into the cellar and turned off the gas to all appliances except the furnace. No one notified either the gas company or the fire department about either the gas odors or the excessively high pilot light.

At 3:30 p.m., on the day of the accident, the weather in the Charleston area was an unseasonably warm 62°F. The wind was southerly at 6 knots. The temperature rose from 26°F at 5:35 a.m., to a high of 63°F at 2:55 p.m.

Postaccident Activities

Gas company personnel arrived at various times after 4 p.m. At 4:15 p.m., gas was turned off at the meter and the curb box. A bar-hole test over the 1-inch service line from the main to the meter regulator revealed no gas leakage. The 2-inch gas main was then bar-hole tested from the service line across the front lawn to the concrete driveway. Gas was found in the soil around the 2-inch main close to the driveway; readings of 100 percent in the lower explosive limits (LEL) were obtained at this location. (See Figure 2.) Three feet away from the house, at the corner where the house joined the driveway and carport, a 40-percent LEL reading was obtained. The reading was taken after the fire in the soil had been extinguished the first time.

Columbia's repair crew excavated the 2-inch main adjacent to the driveway and found two corrosion-type pit holes in the pipe. The pit holes were 4 to 5 inches apart, and each hole was individually clamped. Visual observation showed no further evidence of active corrosion on the 3-foot section of exposed pipe. (See Figure 3.) A magnesium anode was bonded to the pipe at the leak site as part of the repair procedure. The repairs were completed by 7 p.m., and the excavation was backfilled immediately. Service to other customers was not interrupted, and no mainline valves were closed.

At 7 p.m., when a Columbia serviceman tested the 1-inch service line from the gas main to the regulator, the line held 30 psig for 5 minutes with no pressure drop. The serviceman then tested the gas lines inside

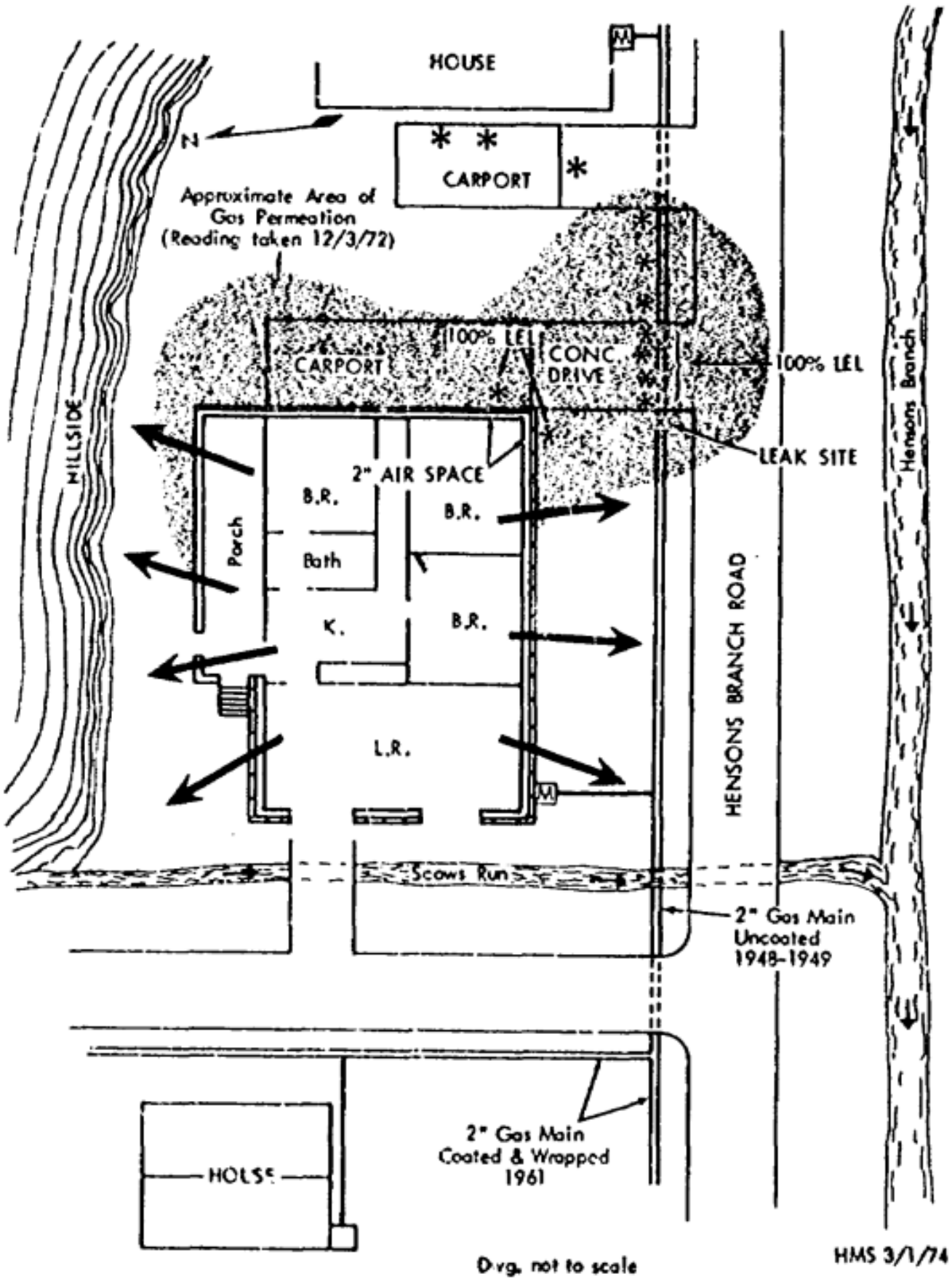


Figure 2. Accident site.

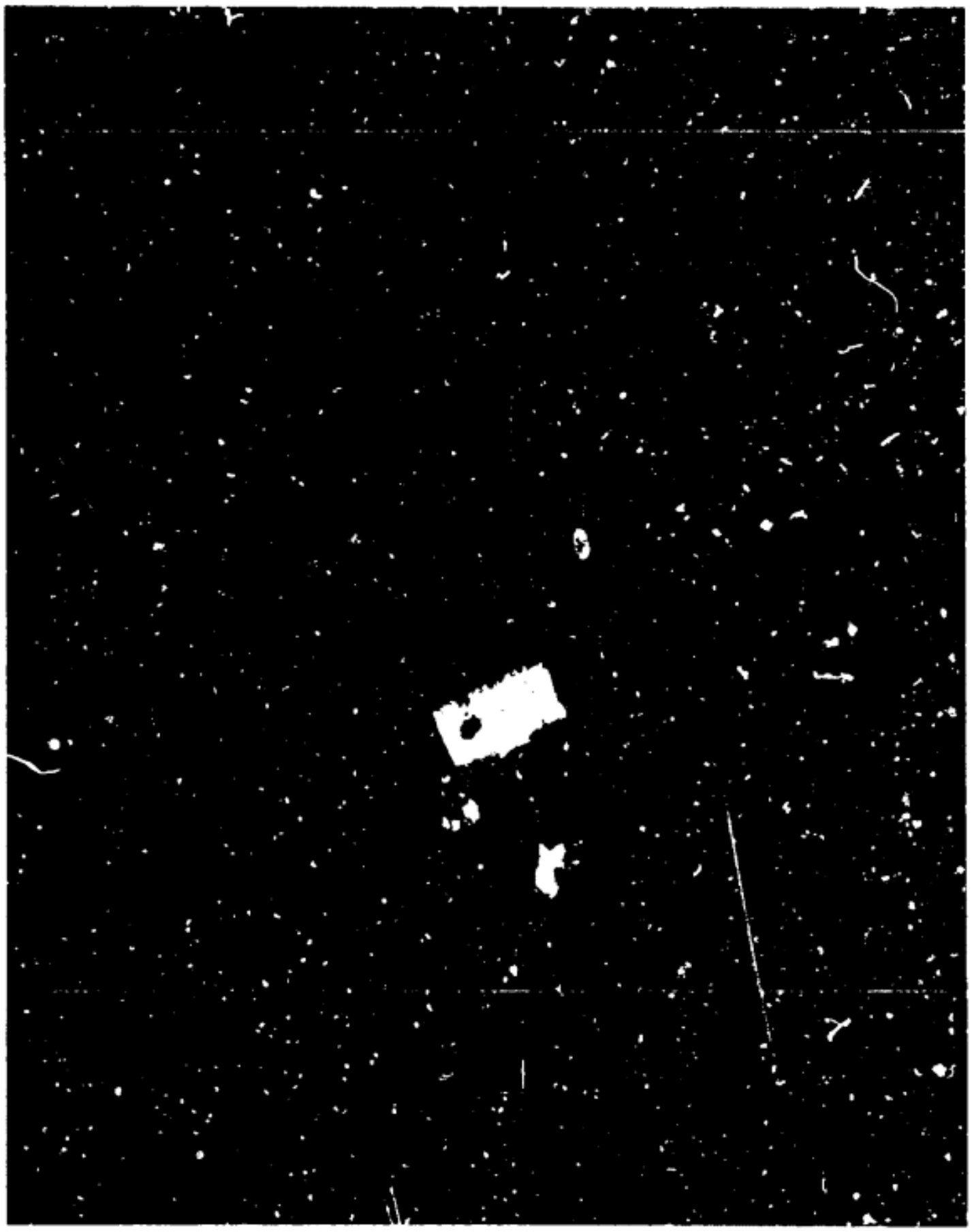


Figure 3. Clamps placed over the corrosion leaks on the 2-inch gas main after the explosion.

the house from the meter to a closed valve near the center of the house; this test included the line to the furnace. An initial pressure of 16 inches of water column and a final pressure of 14 7/10 inches of water column were observed over a 3-minute period. When the valve at the center of the house was opened and the test was reapplied, a failure was found where the service line screwed into a tee. The serviceman's report stated that the failure was "due to damage from fire and explosion." (See Figure 4.)

On December 24, 22 days after the accident, Columbia was notified of another gas leak at the accident site. A repair crew dug up the concrete driveway over the 2-inch gas main and found a small pit-hole leak 8 feet away from the two leaks found at the time of the accident. The leak was repaired with a clamp.

Tests and Research

Gas in the soil. On December 4, holes were drilled through the concrete driveway over the gas main and 100-percent LEL gas readings were obtained. Another 100-percent LEL reading was obtained at a hole drilled through the concrete carport close to the house. When the soil near the corner of the house at the carport was again checked for gas, a 100-percent LEL reading was again obtained. Readings taken at random intervals over the gas main up the hill to the neighboring house ranged from 100 percent to 10 percent LEL. Gas indications were also obtained on both sides of the macadam road, in front of the accident site, in the soil on the uphill side of the carport, and in the soil at the rear of the house.

On December 7, the Safety Board engaged an independent consulting firm to conduct additional tests and analysis on the gas found in the soil at the accident site. 1/ These tests showed gas still present at 5 percent LEL in the soil at the area of highest gas concentration, i.e., underneath the concrete floor of the carport. The consultant detected both commercial natural gas and swamp gas at several locations at the accident site. The consultant's report stated:

> "The commercial natural gas appears to be residual gas from a leak which was repaired approximately five days prior to sample collection. The swamp gas is probably being generated by decaying subsurface vegetation.
>
> * * * * * *
>
> "The 1.9% swamp gas concentration does not at this time constitute a hazardous condition. However, the site should be reinspected annually to insure that concentrations are not building to hazardous levels. In our opinion the 1.9% swamp gas did not

1/ Heath Consultants Incorporated, Special Investigation for National Transportation Safety Board, Washington, D. C., SP-295, December 7, 1973.

Figure 4. Failed 3/4-inch gas line in basement of house.

contribute significantly to the overall volume of gas present in the subsurface atmosphere. The 3.1% commercial natural gas appears to be the primary contributing factor in the overall spread and concentrations of combustibles. The concentrations were undoubtedly higher prior to repair of the leaks."

The soil. Soil samples taken at the leak site were sent to the Federal Highway Administration of the Department of Transportation for laboratory analysis. Tests showed that the soil consisted of a clayey silt, silt, and sand and had medium plasticity. The liquid limit was 35, the plasticity index was 15, the shrinkage limit was 16.1, and the shrinkage ratio was 1.84.

The regulator. Columbia tested the regulator which had been removed from the accident site and determined that it was operating within allowable tolerances. Under lockout conditions with a 39-psig regulator inlet pressure, the outlet pressure was 20.7 inches of water column. Under minimum gas flow conditions with 39-psig regulator inlet pressure, the outlet pressure was 18.5 inches of water column. Under maximum gas flow conditions with 39-psig regulator inlet pressure, the outlet pressure was 18.2 inches of water column.

Normal regulator outlet pressures for this area range between 6 and 8 inches of water column.

Gas odorization. Columbia conducted a gas-odorization test on gas samples taken on December 3, from the 2-inch main close to the accident site. The test was witnessed by personnel from the Gas Pipeline Safety Division of the Public Service Commission of West Virginia.

Gas odor was detectable with 0.28-percent gas in air. The Federal minimum safety standards in 49 CFR 192.625 require that the odor be readily detectable at a concentration of less than 1 percent gas in air.

Damage

One adult and one child died at the accident site, one adult died later at the hospital as a result of the fire, and two children suffered severe burns. The house was incinerated; the wooded hillside in back of the house and the trees and telephone pole in the front were scorched and blackened. (See Figures 5 and 6.) The walls of the house were blown out into the front and back yards. The double garage door was also blown outward, but no fire followed in that area. The fire had been concentrated in the upper portions of the walls which remained intact after the explosion. The top sections of the 2- by 4-inch studding were heavily charred, whereas some of the floor carpet and linoleum were relatively undamaged. Little evidence of fire was found in the basement, except for the area around some of the heating system ducts and an area underneath the living room above the broken tee.

Figure 5. 2-inch space between original exterior wall and newer brick veneer (after explosion).

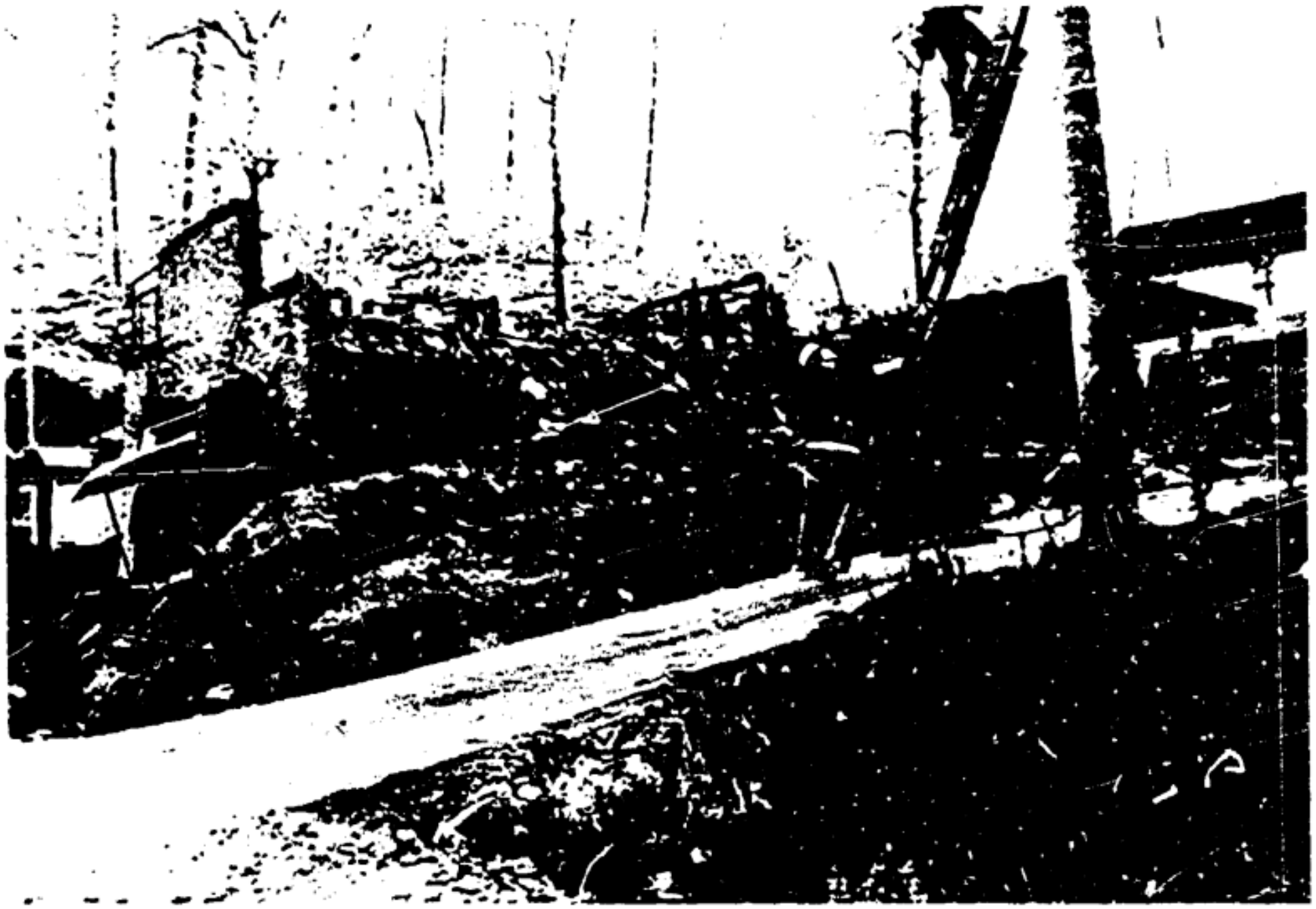


Figure 6. View of demolished house. Note scorched hillside behind house - picture taken facing north.

Applicable Standards

In 1948 and 1949, when the 2-inch gas main was installed, no Federal regulations existed for the design, constuction, operation, or maintenance of natural gas pipelines. The industrywide code in effect at that time was the American Standard Code For Pressure Piping, Power Gas and Air, Oil, District Heating, Refrigeration, Fabrication Details, Materials (ASA B31.1-1942). This code covered pipeline design, installation and testing, but not operation and maintenance.

The 1973 ASME Guide for Gas Transmission and Distribution Piping Systems, applicable at the time of the accident provides guidelines on how to comply with the Federal regulations. Parts of 49 CFR Part 192, "Transportation of Natural and Other Gas by Pipeline," pertinent to this accident are as follows:

"192.457 External corrosion control; buried or submerged pipelines installed before August 1, 1971.

(b) Except for cast-iron or ductile iron, each of the following buried or submerged pipelines installed before August 1, 1971, must not later than August 1, 1976, be cathodically protected in accordance with this subpart in areas in which active corrosion is found:

(3) Bare or coated distribution lines. The operator shall determine the areas of active corrosion by electrical survey, or where electrical survey is impractical, by the study of corrosion and leak history records, by leak detection survey, or by other means."

* * * * * *

"192.613 Continuing surveillance.

(a) Each operator shall have a procedure for continuing surveillance of its facilities to determine and take appropriate action concerning changes in class location, failures, leakage history, corrosion, substantial changes in cathodic protection requirements, and other unusual operating and maintenance conditions."

* * * * * *

"192.615 Emergency plans.

Each operator shall --

(d) Establish an educational program to enable customers and the general public to recognize and report a gas emergency to the appropriate officials."

* * * * * *

"192.721 Distribution systems; patroling.

(a) The frequency of patroling mains must be determined by the severity of the conditions which could cause failure or leakage, and the consequent hazards to public safety."

* * * * * *

"192.723 Distribution systems: leakage surveys and procedures.
(a) Each operator of a distribution system shall provide for periodic leakage surveys in its operation and maintenance plan.
(b) The type and scope of the leakage control program must be determined by the nature of the operations and the local conditions, but it must meet the following minimum requirements:
(1) A gas detector survey must be conducted in business districts, including tests of the atmosphere in gas, electric, telephone, sewer and water system manholes, at cracks in pavement and sidewalks, and at other locations, providing an opportunity for finding gas leaks, at intervals not exceeding one year.
(2) Leakage surveys of the distribution system outside of the principal business areas must be made as frequently as necessary, but at intervals not exceeding five years."

No ASME guidlines are presently available for any of the above parts of 49 CFR 192, except for Part 192.723. With regard to that part, the ASME Guide states that:

"Leakage survey procedures to meet the requirements of 192.723(b)(2) include:
(a) Gas detector surveys
(b) Bar test surveys
(c) Vegetation surveys
(d) Pressure drop surveys
(e) Soapsuds testing on exposed pipe and fittings."

ANALYSIS

Source of Gas

As gas leaked through the pit holes at 39 psig, it was prevented from venting to the atmosphere by the macadam road to the immediate south and by the concrete driveway to the immediate east. A large reservoir of gas built up and saturated the ground. Eventually, the gas flowed from the corrosion leaks up under the driveway and the concrete floor of the carport. As the trapped gas expanded, gas was forced through the soil into the air space between the original outer wall of the house and the newer brick veneer finish. 2/

2/ For a more detailed discussion concerning gas migration see the following reports previously issued by the Safety Board: Washington Gas Light Company, Natural Gas Explosions at Annandale, Va., March 24, 1972, NTSB-PAR-72-4; Northern States Power Company, Lake City, Minn., October 30, 1972, NTSB-PAR-73-1; Lone Star Gas Company, North Richland Hills, Texas, October 4, 1971, NTSB-PAR-72-3; Lone Star Gas Company, Fort Worth, Texas, October 4, 1971, NTSB-PAR-72-5; Atlanta Gas Light Company, Atlanta, Ga., August 31, 1972, NTSB-PAR-73-3; and Southern Union Gas Company, El Paso, Texas, April 22, 1973, NTSB-PAR-74-2.

The air space extended from ground level to the attic on all sides of the house. The original exterior walls, built to withstand the elements, were weathertight. Since the brick veneer was also weathertight, the air space provided a storage area for the gas. Very little gas probably leaked directly through the wall into the living areas of the house. Natural gas, however, being lighter than air, ascended within the air space and entered the attic. When enough gas accumulated in the attic and high up between the walls, additional leaking gas was displaced down into the living areas of the house. There, once the proper oxygen-gas mixture was attained, a lighted cigarette, a thermostat contact or an activated light switch probably triggered the explosion.

Many gas explosions are not followed by gas-fueled fires, because the initial blast consumes all of the available gas or leaves the oxygen-gas mixture too lean to ignite. In this accident, the intense gas-fed fire that followed the explosion is evidence that a large accumulation of gas existed, but was too rich to be consumed by the initial blast. After the detonation, with the roof, walls, and windows blown away, an oxygen supply was suddenly made available which supported the ensuing, intense fire. The fact that the fire in the soil at the corner of the house kept re-igniting and the high readings from the bar-hole tests around the periphery of the house are further evidence that a large amount of gas had accumulated at the accident site.

The threads in the 3/4-inch gas line in the basement probably broke during and not before the explosion. A blast strong enough to blow out the roof, walls, and double garage door could easily damage the gas pipe supports enough to pull the pipe partially out of its threaded tee.

Other evidence supports a conclusion that the broken threads at the tee were not a source of gas leakage before the explosion. Except for the wood joists directly over the broken pipe threads and except for the area around the air ducts, no evidence of burning was found in the basement. If gas from the broken tee had caused the explosion, the ensuing fire would have consumed everything in the cellar. If gas had seeped up from a leak in the cellar, it would have saturated the rug in the living room, and when the explosion took place that rug would have also been consumed. After the accident, the rug was intact, although soiled.

Furthermore, leaking gas was probably present in the house for at least a day before the explosion. The owner had checked all of the gas piping in the cellar on Saturday night and had found no leak nor any cause for alarm. His wife went to the cellar on Sunday to turn off the valves to the appliances. Even though she did not visually check the piping, she would certainly have heard gas hissing through a cracked thread at 18 inches of water column, or she would have detected an odor.

Detection of Gas Odors

There are a number of reasons why the gas that leaked into the house may not have caused greater concern to the occupants. The mercaptan odorant in the gas may have been partially filtered out as the gas flowed through the clayey, silty soil from the pit holes in the main to the house. In that case, gas that entered the house and accumulated would have been less readily detectable than gas directly out of the main or gas from a broken tee. In addition, when humans are exposed to an odorant at a higher than threshold level, they become less sensitive after a short time. This phenomenon, known as olfactory fatigue, may explain the fact that a few hours before the accident a neighbor entered the house and immediately detected a strong gas odor which the occupants did not smell.

Notification of the Gas Company

Gas odors had been detected by some of the people in the house at least 24 hours before the explosion, but nobody had notified either the gas company or the fire department. Additionally, the owner's wife noticed very high pilot lights in the gas appliances, and, as a result, she turned off the gas to the affected appliances. Very high pilot lights were unusual, because the gas pressure downstream of the regulator was normally 6 to 8 inches of water column (not 18 inches). 3/ Nevertheless, no one had reported any problem to the gas company. The owner's wife apparently believed that her efforts had removed the gas odor that had been detected. If the gas company had been notified, it is probable that they would have discovered the gas accumulation in the house and found the leaks in the main after they had checked out the house piping.

Serious questions thus arise whether the Gaslight bill stuffers adequately warned Columbia customers and whether the existing Federal regulations in 49 CFR Section 192.615(d) assure establishment of an effective educational program.

The safety messages in the Columbia bill stuffers might never have been taken seriously by the public. The general contents of the pamphlets and their design might have led the reader to conclude that the bill stuffer was just another advertisement to be discarded without its message being carefully considered. The nine Gaslight pamphlets which included safety information, distributed from April 1971 through October 1973, contained only two references to the need to report gas odors to the gas company. Both references were on the inside pages. One warning was placed under the heading, "Gas is not Dangerous, But Its Misuse May Be."

3/ Although the excessive height of the pilot light did not contribute to the accident, it should have been reported to the gas company. The Gaslight pamphlets, however, made no mention of excess pilot-light height as a reason to call the gas company.

This caption did not describe the explosion, fire, or asphyxiation that can result if the gas company is not called.

The Gaslight pamphlets, intended to fulfill the Federal requirement for an educational program, were more of a public relations program to enhance the corporate image than a program designed to warn gas users of the potential hazards and to insure effective action. The pamphlets were not adequate, because (1) the safety information was hidden in a mass of irrelevant detail, (2) the title "Gaslight" did not imply that the pamphlet contained an important warning, (3) the instruction to call the gas company did not warn of the explosion, fire, or asphyxiation which could result if the call was not made, and (4) one of the instructions was masked by a misleading caption. Also, mention of leaving the premises were tentative and indefinite. The nature of gas hazards is well known within the industry.

The Federal regulations in 49 CFR 192.615(d) provide little guidance about the contents and organization of an effective educational program. Requirements for specific items such as warnings or instructions printed on gas appliances and gas meters, company telephone numbers to call in time of emergency, etc., would probably serve better than a general requirement. The regulation should require that an educational program contain comprehensive warnings of the hazards arising from natural gas, instructions as to what to do when a gas leak is detected, and why such action is necessary.

One important reason for a detailed regulation is the apparent concern of gas companies that if natural gas is regarded as a dangerous product, then specific instructions will alarm the consumer. In its reports of pipeline accidents at Lake City, Minn., El Paso, Texas, and Annandale, Va., the Board discussed the notification problem. In the Annandale report, the Board recommended that the ASME Gas Piping Standards Committee develop guidelines to assist pipeline operators in educating customers and the general public in the proper action to take if gas leaks are detected. The committee is working to develop such guidelines. The intent of the Board's recommendation 1(b) in this report is that this field now be covered by detailed, enforceable Federal regulations.

Corrosion of Older Unprotected Pipelines

Federal regulations require that pipelines such as the 2-inch bare steel gas main involved in this accident must be cathodically protected in the known areas of active corrosion by August 1, 1976. Gas companies which operate thousands of miles of old mains and distribution systems thus are given time to get their pipelines into compliance. The Federal regulations also allow gas companies 5 years between gas leak surveys on distribution systems located outside of cities. No differentiation is made between old and new pipe.

Old, bare, unprotected pipe should be inspected for leaks more frequently than new, coated, protected pipe. It is difficult to say whether the pit-hole leaks in the 2-inch main would have been discovered if more frequent gas leak surveys had been required, since a leak survey was made over this system 2 months before the accident. Generally, however, more frequent gas leak surveys on older distribution systems discover more leaks. Corrosion leaks occur more often on older unprotected pipelines than on newer protected lines. Since one of the goals of pipeline safety is to reduce the number of leaks and, therefore, the number of accidents, old lines should be cathodically protected as soon as possible and gas leak surveys should be conducted much more frequently than every 5 years. In the time remaining between now and August 1, 1976, the deadline for cathodic protection, more corrosion leaks will undoubtedly occur on these old lines and, consequently, more accidents such as this one will occur. Changing the August 1, 1976, deadline for cathodic protection to an earlier date, however, is probably unrealistic, because by the time an amendment is made, the deadline would be at hand. On the other hand, a requirement for more frequent gas leak surveys on old lines could be initiated at any time and would help to locate leaks and to initiate their repair before additional accidents occur.

CONCLUSIONS

1. The source of the natural gas which had accumulated in the air space between the old and new walls of the house and in the soil near the house was two pit holes in the 2-inch gas main located 11 feet from the house.

2. The path of the leading gas into the building was underneath the concrete driveway and concrete floor carport.

3. The two leaks occurred because of corrosion of the bare, cathodically unprotected 2-inch gas main which served the neighborhood.

4. Corrosion type leaks of this variety will continue to be a problem until all of the older, bare pipelines have been cathodically protected and are checked for leakage frequently.

5. The owners of the house had detected gas odors on the day before the accident, but did not notify the gas company or the fire department.

6. Columbia's customer-education program was ineffective in alerting this customer to the hazards of natural gas, and did not meet the intent of 49 CFR 192.615(d) requiring the education of the public to recognize and report gas emergencies.

PROBABLE CAUSE

The National Transportation Safety Board determines that the probable cause of the explosion and fire was the ignition, by an unknown source, of an accumulation of natural gas which had leaked from two corrosion holes in a nearby 2-inch gas main.

Contributing to the intensity of the ensuing fire was the large amount of natural gas which had accumulated in the attic and between the original exterior walls of the house and a newer exterior brick veneer.

Contributing to the accident was the fact that none of the victims reported previously detected gas odors to the gas company or to the fire department. This was partially the result of the fact that the gas company's educational program submerged warnings and instructions within promotional material not needed by the customer and did not inform the customer of the possible consequences of failure to report a gas odor to the gas company or to leave the premises.

RECOMMENDATIONS

The National Transportation Safety Board recommends that:

1. The Office of Pipeline Safety of the Department of Transportation:

   (a) Amend 49 CFR Section 192.723 to require more frequent leak surveys on older, uncoated, and cathodically unprotected pipelines than required currently. (Recommendation No. P-74-29)

   (b) Amend 49 CFR Section 192.615(d) to better define the intent of a public education program to warn against the full range of hazards of natural gas, to require retainable and specific instructions and placards of how to detect hazards, what to do, and why action is necessary. (Recommendation No. P-74-30)

2. The American Society of Mechanical Engineers Gas Piping Standards Committee:

   (a) Develop guidelines to aid pipeline operators determine when to conduct leakage surveys on various types of pipe. These guidelines should take into account age of pipe, general condition of pipe, class location of pipe and metallurgy of pipe. (Recommendation No. P-74-31)

   (b) Develop guidelines to aid pipeline operators in determining areas of active corrosion as required by 49 CFR 192.457(b). (Recommendation No. P-74-32)

3. The American Gas Association (AGA):

Investigate the availability, economic feasibility, and practicability of gas vapor detectors currently manufactured and explore the possibility of their installation in manholes, conduits, basements, and other substructures for the automatic detection and reporting of natural gas vapors. If none are found acceptable, sponsor research to develop such a detector. (Recommendation No. P-74-33)

4. Columbia Gas of West Virginia, Inc.:

(a) Conduct more frequent leak detection surveys on those areas where the gas pipelines are old, uncoated, and cathodically unprotected. (Recommendation No. P-74-34)

(b) Initiate a more intense general public and gas customer information program as to the nature, characteristics, and hazards of natural gas and the steps to be taken when it is encountered. (Recommendation No.P-74-35)

(c) Initiate a thorough survey to determine the areas of active corrosion on the entire length of this 2-inch gas main from its junction with the 3-inch gas main at Bakers Fork and similar pipes in its system. Make excavations for the physical examination of these pipes when indicated by the survey and replace or repair the pipe where indicated. When finished, place these pipes under adequate cathodic protection. (Recommendation No. P-74-36)

BY THE NATIONAL TRANSPORTATION SAFETY BOARD

/s/ JOHN H. REED
Chairman

/s/ FRANCIS H. McADAMS
Member

/s/ ISABEL A. BURGESS
Member

/s/ WILLIAM R. HALEY
Member

LOUIS M. THAYER, Member, did not participate in the adoption of this report.

August 21, 1974

APPENDIX

TEN "GASLIGHT" BILL STUFFERS
SENT TO CUSTOMERS BETWEEN
APRIL 1971 AND OCTOBER 1973

Gas Works for You

When you purchase a new appliance, you want it to work for you. That is the reason most good cooks prefer a clean, modern, dependable gas range. Gas works for you. Gas cleans your oven better than you can. A gas range takes the guesswork out of cooking with its automatic top burner and programmed oven control.

The top burners are "instant-on," "instant-off," with 1001 shades of heat in between. This means less wasted heat before and after actual cooking. That's one of the keep-your-kitchen-cool features of a gas range. Then, too, only gas ranges let you broil with the oven door closed. And that's a keep-your-kitchen-clean feature of gas cooking. These features are gas range exclusives.

Now those are only two reasons to have a gas range working for you. But if you need one more, just remember that gas costs less too.

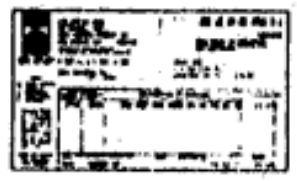
COLUMBIA GAS SYSTEM

—for clean, modern, dependable energy

Keeping the Records Straight

Your gas company provides an easy procedure to pay your gas bill which will help keep your account up to date. Each month you receive these items:

1. Your statement—

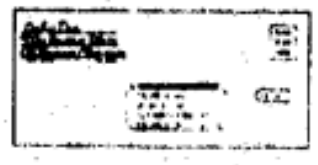


...which you should keep for your records when paying by mail; and which will be receipted when paying in person.

2. Your payment card—

...is to be returned with your payment when paying by mail or paying in person.

3. Envelope—



...with address window for convenience when paying by mail. Be sure address shows through.

This procedure is designed to make it easier for you and to help keep the records straight.

Super Gas Sniffer

Many times more sensitive than the human nose, Columbia's gas "sniffer" can detect one part of natural gas in a million parts of air. It can smell a tiny leak before it becomes a problem. "Sniffers" are always nosing about the gas company's lines to help maintain safe service for you. They are but one of a number of techniques for checking business districts, schools, public buildings, and residential areas on a regular basis.

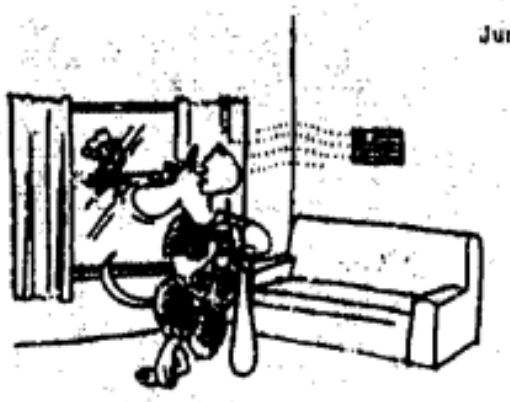
Betty Newton's Notes

Here's a recipe for a one-dish skillet meal that's easy to prepare, tasty but not too spicy, and economical. Betty Newton, your gas company's home economist, offers "Spanish Macaroni" as this month's Gaslig ht delight. We're sure you will like it.

SPANISH MACARONI

- 2 slices bacon
- 1 lb. ground beef
- 1 cup uncooked elbow macaroni
- 1 green pepper, diced
- 1 onion, minced
- ½ cup chili sauce
- 1 No. 2½ can (3½ cups) tomatoes
- 1 teaspoon salt
- ½ teaspoon pepper

Dice bacon; cook in skillet on thermostatic top burner at 325°. Add ground beef; brown well. Add remaining ingredients in layers, being sure the macaroni is well covered and dampened with tomato liquid. Cover; reduce temperature to 225° and cook for 30 minutes. Makes 4 to 6 servings.



Gas Air Conditioning Helps You to Keep Your Cool

When June arrives, those hot days of July and August can't be far behind. Longer days give us time to enjoy the many outdoor activities popular this time of the year. But after mowing the lawn, shopping when the temperature soars to nearly 100 degrees, or playing your favorite game, it's mighty enjoyable to come home to gas air conditioning.

With gas whole-house air conditioning you can keep doors and windows closed all summer long, keeping out dirt, noise and pollen. So you enjoy cleaner, quieter, healthier living. You feel more relaxed and sleep better with filtered, refreshing gas air conditioning.

With gas air conditioning your equipment lasts longer with minimum service.

To learn more, call your gas air conditioning dealer or the gas company.

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4

When You Need a Number in a Hurry

Do you have emergency telephone numbers written down in places you are "sure to remember", only to forget where they are when you need them? You are not alone if you do.

Although you can prepare your own, we have compiled a basic list that should be in every home.

It'll take only a few moments to fill in the blanks and place this page near your telephone. When you need a number in a hurry, a few moments now could be the difference then.

EMERGENCY TELEPHONE NUMBERS

FIRE STATION: _____

POLICE OR SHERIFF: _____

HOSPITAL: _____

FAMILY DOCTOR: _____

AMBULANCE: _____

GAS COMPANY: _____

_____ _____
(other)

2

gaslight

Gas Research Helps Protect Environment

Protecting our environment is the responsibility of all Americans. Research at Columbia Gas contributes to this effort. In a cooperative effort with an equipment manufacturer, Columbia Gas has developed an industrial liquid waste incinerator with a new burner design which works efficiently on many liquid wastes. Helping industrial plants protect our environment is another accomplishment in our constant search for efficient uses of the clean, modern fuel–natural gas.

1

Betty Newton's Notes

The first few warm days of summer whet your taste for cool, refreshing drinks. "Party Punch" is a delicious thirst quencher that's easy to prepare. And Betty Newton, your gas company's home economist, adds some "party punch pointers" that are great for *Gaslight* readers.

PARTY PUNCH

1 can (6-oz.) frozen concentrated lemonade, undiluted
1 can (6-oz.) frozen concentrated orange juice, undiluted
2 bottles (1 qt.) ginger ale or soda water
Ice
Fruit garnish, if desired

Combine all ingredients. Garnish with slices of fruit, strawberries or maraschino cherries.

Makes 16 half-cup servings.

PARTY PUNCH POINTERS

Quantity Proportions for Above Recipe:

6 cans (12-oz.) frozen concentrated lemonade, undiluted
6 cans (12-oz.) frozen concentrated orange juice, undiluted
24 bottles (1 qt.) ginger ale or soda water

Makes about 200 half-cup servings.

Ginger Ale or Soda: Chill well; always add just before serving.

Frozen Juices: When making large quantities the thawed juices may be mixed together in advance.

The Punch Bowl: Circle bowl with ring of smilax, ivy, blueberry or laurel leaves. Or cover sides of bowl with wire; tuck flowers and ferns into holes. Tie perky bow on ladle.

3

gaslight

Remember These Rules—Walk Safely to School

School is just ahead for millions of children, many of whom may have become careless about street safety during the carefree days of summer. Everyone—motorists and children—can help reduce the number of injuries which occur each school year between home and school. Motorists should observe school zone restrictions and watch for the safety patrols. Children should learn the following seven "Rules for Safe Walking" recommended by the Traffic Engineering and Safety Department of the American Automobile Association.

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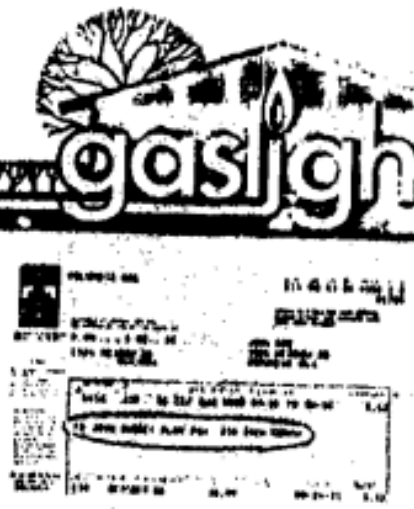
Gas Company Servicemen Get Woman's Viewpoint

Columbia's nearly 1,000 customer-servicemen have discovered they can analyze appliance problems better if they listen to the advice of someone who knows. That's the reason Home Economist Shirley Maxwell teaches classes for servicemen from the woman's point of view.

Servicemen, such as Donald L. Brechbiel of Parma, Ohio study the proper care and use of gas appliances so they can better serve nearly two million retail customers in seven states. The instruction takes place at the Columbia Gas System Service Corporation's Customer Service Training Center in Marble Cliff, Ohio.

Trained servicemen with the woman's point of view go a long way toward solving home makers' problems. And they are just another of the many services available from the company which provides you with the dependable modern energy—natural gas.



Reduce Winter Payments—Use Monthly Budget Plan

You have the opportunity this month to join the growing number of gas company customers who ease the strain of winter heating bills by using the Monthly Budget Payment Plan.

Instead of paying about two thirds of your total annual gas bill during the four coldest months, you can reduce winter payments substantially by arranging to pay the same amount for gas service all year, winter and summer.

Your gas company projects your gas usage for the coming year—based on past charges—divides by 12, and calculates your monthly payment to the nearest dollar. Each account is reviewed in April. If there have been abnormal weather conditions, your monthly payments are adjusted accordingly.

It is simple to join or to continue as a member. Begin now by paying the budget amount indicated on the accompanying bill.

Betty Newton's Notes

Tip to the housewives: This month's Gaslight recipe for "Superb Potato Salad" sounds so delicious you won't have any trouble getting your husband to peel the potatoes. The salad is bound to be superb.

SUPERB POTATO SALAD

- 1 envelope (1 tablespoon) unflavored gelatin
- ¼ cup cold water
- 1 cup boiling water
- ¼ cup lemon juice
- 2 tablespoons sugar
- 1 teaspoon salt
- ½ cup whipping cream, whipped
- 1 cup mayonnaise
- 3 hard cooked eggs, chopped
- 4 cups diced cooked potatoes
- 1 cup diced celery
- ¼ cup diced green pepper
- ¼ cup diced pimiento
- ¼ cup chopped onion
- ¼ cup chopped parsley
- 1½ teaspoons salt
- 8 stuffed green olives, sliced

Soften gelatin in cold water; add boiling water and stir until dissolved. Stir in lemon juice, sugar, and salt. Chill in refrigerator until mixture is partially set. Fold whipped cream into mayonnaise. Combine remaining ingredients, except olives, and fold into whipped cream and mayonnaise mixture. Fold potato mixture into partially set gelatin. Pour into oiled 6½-cup mold. Chill until firm. Unmold and garnish with olives. Makes 8 to 10 servings.

SUPERB POTATO SALAD

gaslight

Happiness in the Kitchen: Cooking with Gas— No Oven Cleaning

Creative cooking is fun, when you have a modern gas range that's easy to clean. Gas helps you prepare a meal that looks like you've slaved over it, but you really haven't. Just about all you have to do nowadays is set the controls properly. Then you can do something else, while your meal cooks perfectly and automatically.

The best part, of course, is that you don't have to clean the oven an, more. Gas does it better than you can . . . automatically, economically and faster, too.

A modern gas range is for people who love to eat and who love to cook—without having to clean the oven. Gas is the clean energy for a cleaner world. You can find out more about modern gas ranges from your gas company or appliance dealer.

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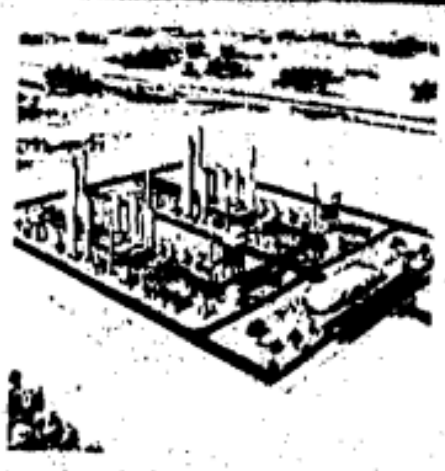
Good Maintenance Habits Everyone's Responsibility

Maintenance is something we can't leave up to the other fellow. Each of us must "do our own thing." Take natural gas, for instance. This form of energy is something we often take for granted because gas service is so dependable the year 'round. But natural gas, and the gas appliances in our homes, should be treated with respect and care. That's why it's important to keep everything clean—burners and controls on furnaces, wall or floor heaters and appliances. Especially important, be sure to keep an eye on the furnace filter. It needs to be cleaned or replaced periodically. It's up to you to practice good home maintenance habits all year long. If you have questions about the gas appliances in your home, just call your gas company. They'll know what to do about them.



New Plant to Produce Gas in Supply Building Program

As part of its diversified program to expand gas delivery capacity, Columbia has announced plans for a $35 million plant to convert imported petroleum liquids into pipeline quality gas. The plant, to be built in Ohio, is expected to begin operating by mid 1973. Though more costly than gas from conventional wells, supplies from the plant will be needed to supplement present supply sources in meeting sharply rising demands from customers for clean-burning gas.

Betty Newton's Notes

Betty Newton offers a change-of-pace recipe for *Gaslight* readers this month. You can make "Stuffed Zucchini Squash" the highlight of your meal the next time you have dinner guests. Meanwhile, why not please your family with it?

STUFFED ZUCCHINI SQUASH

- 4 medium-sized zucchini
- 3 cups soft bread crumbs
- ½ cup grated Parmesan cheese
- 1 small onion, minced
- 3 tablespoons minced parsley
- 1 teaspoon salt
- ¼ teaspoon pepper
- 2 eggs, beaten
- 2 tablespoons butter or margarine
- Parmesan cheese

Wash zucchini; cut off ends, don't pare. Cook in boiling salted water 5 minutes. Halve lengthwise; remove pulp with spoon; combine with bread crumbs, cheese, onion, parsley, salt, pepper and eggs. Fill zucchini shells; dot with butter, sprinkle with additional Parmesan cheese. Bake in gas oven at 350 degrees for 30 minutes. Makes 6 servings.

Efficiency in Home Heating Helps Conserve Natural Gas

You can conserve natural gas and save money by getting all the heat possible from every cubic foot of natural gas you buy.

Your home may be heated with an obsolete gas unit or with a gas burner in a converted coal furnace. Either may have served you faithfully through many winters. But major improvements in gas equipment performance and efficiency have been made in recent years.

Replacement of your present gas-fired heating plant with a new, compact gas-designed furnace may save floor space, improve your heating results and decrease your gas consumption.

It is necessary to conserve the use of this important natural resource.

You owe it to yourself to have a heating contractor inspect your gas heating system this summer so that appropriate improvements can be made before cool weather arrives this fall.

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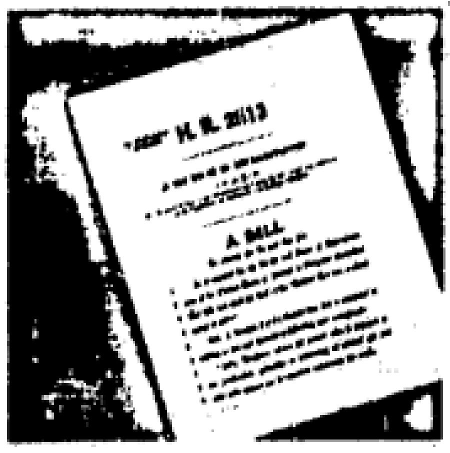
Customer's Line Inspection Part of Safety Procedures

A regular inspection of all customer-owned natural gas service lines is one of the continuing safety procedures of the Columbia Gas System. Gas company inspectors, using special detectors that enable them to check lines without digging or otherwi disturbing property, are at work daily throughout Columbia's seven-state operating area. The special inspection devices are capable of detecting as little as one part of natural gas in a million parts of air. This service and a similar program to inspect all Columbia-owned lines is a contributing factor to the excellent safety record of the Columbia Gas System which serves more than 1.8 million customers in its retail market area.



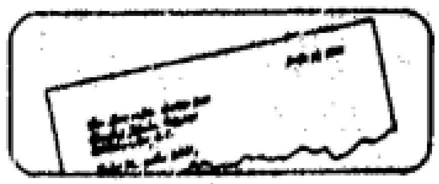
Support Legislation Needed To Encourage Exploration

Congress now has before it two bills that can help significantly to encourage the drilling programs needed to develop new gas supplies.

These measures (H.R. 2513 and S. 2467), known as the Sanctity of Contract Bills, will: 1) set more realistic standards for determining gas prices; and 2) assure gas producers that approved contract prices and other economic terms of contracts will not later be changed by the Federal Power Commission.

Passage of these bills before the present Congress adjourns can help reverse a four-year decline in exploratory well drilling by giving producers the economic incentive to invest in costly and risky drilling.

Write your Senators and Representatives today urging them to seek action on these bills, and in this way you can help overcome the energy crisis.



When Writing Your Congressman

When writing your Congressman to urge support for such issues as those advocated in Columbia's Action Program to help alleviate the energy supply shortage, here are a few pointers:

Address your letter to:

The Honorable ______________
(his or her name)

United States Senate
(or, House of Representatives)
Washington, D.C.

Write while an issue is timely, and be specific by naming the exact legislation.

Tell your story in your own words, explain the reasons behind your point of view, and be brief.

Volunteer any genuinely expert knowledge, but avoid threats and promises.

Be polite and respectful.

Sign your name and address.

If you do not know the names of the two Senators from your state and of the Representative from your Congressional district, contact your local newspaper or public library.

Every citizen has the right to write. Your views can and will help determine decisions which may affect your future.

Betty Newton's Notes

GRILLED TERIYAKI

1½ lbs. flank steak
3 tablespoons soy sauce
2 tablespoons salad oil
¼ cup soy sauce
½ cup finely sliced green onions
1 clove garlic, crushed
¼ teaspoon pepper
½ teaspoon ground ginger
1 tablespoon brown sugar

Remove fat and outside membrane from meat; score on both sides. Cut into 3 x 4-inch pieces diagonally across the grain, holding the knife at a 25 degree angle to the meat. Combine remaining ingredients and marinate steak in the mixture for 1 hour. (Slices may be rippled onto skewers.) Place steak on rack on preheated Gas grill. Broil on medium to low setting, about 4 minutes. Turn, broil 3 minutes on other side. Serve immediately. Makes 4 to 6 servings.

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Example: Actual Use Compared With Monthly Budget Payments

Budget Year	Monthly Actual Amount	Monthly Budget Amount
August	$ 3.84	$ 14.00
September	3.34	16.00
October	3.34	16.00
November	10.91	16.00
December	27.44	16.00
January	34.19	16.00
February	33.22	8.00
March	34.61	16.00
April	30.43	16.00
May	19.28	16.00
June	11.61	16.00
July	5.76	16.36
Total	$211.56	$211.36

Ease Your Winter Payments —Use Monthly Budget Plan

Many gas company customers take advantage of the Monthly Budget Payment Plan to ease the strain of paying winter heating bills. You, too, can reduce your winter payments by arranging to pay the same amount for gas service the year 'round. Your gas company projects your gas usage based on past charges. Each account is reviewed in April, and adjusted to reflect abnormal weather conditions. It is simple to join. Begin now by paying the budget amount indicated on the enclosed bill. If you have any questions, contact your local gas company office.

1

Think Safety When School Commences in September

When it comes to safety for school children, you can't repeat rules for safe walking too often. Classes will begin in September for millions of children, many of whom will be attending for the first time.

Motorists should observe school zone restrictions and watch for school safety patrols, made up of students who help their younger friends cross intersections safely.

Students can help reduce the number of injuries which occur each school year by following the seven "Rules for Safe Walking", recommended by the American Automobile Association and repeated this year for Gaslight readers.

- Cross only at crosswalks. Keep to the right in crosswalks.
- Before crossing, look both ways. Be sure the way is clear before you cross.
- Cross only on proper signal.
- Watch for turning cars.
- Never go into the roadway from between parked cars.
- Where there is no sidewalk, walk on left side, facing traffic.
- Carry or wear something white at night, to help drivers see you.

2

Gas Is Not Dangerous, But Its Misuse May Be

Like all forms of energy, natural gas must be used properly to assure its safety. Approximately four million homes and businesses in Columbia's seven-state service area use natural gas with confidence. Normal safety precautions by you and by your gas company help keep it that way.

Your senses can help you discover a gas leak should one occur. A distinctive odor has been added to natural gas so that even a trace of gas in the air can be detected. The odor disappears as the gas is burned.

So, if you smell a "gas odor," you may have a leak. Just call your gas company and say: "I smell gas at (address)." Then describe what you observe. In extreme cases, you may want to leave the premises and report from a nearby telephone.

In any case, an experienced gas company employee will take appropriate steps promptly. Just remember two things. Natural gas is not dangerous, but its misuse may be. And, if you smell gas, call us.

YOU AND THE ENERGY CRISIS

How would fuel shortages affect your way of life? Find out about the energy outlook and what you can do about it in Columbia's free booklet—"An Action Program to Help Solve the Energy Crisis." For a copy write:

ACTION PROGRAM
Columbia Gas System
P. O. Box 2318
Columbus, Ohio 43216

3

TV Specials Lead Off With Snoopy, Little Drummer Boy

Snoopy returns this fall to open a series of six entertaining television specials scheduled on NBC. This season's lineup includes a repeat of the Christmas favorite, "The Little Drummer Boy," to be followed by four new specials. The series is sponsored by gas companies through the American Gas Association.

The dates and times are:

November 12, 8 p.m. – "Snoopy's International Ice Follies."

December 20, 7:30 p.m. – "Little Drummer Boy."

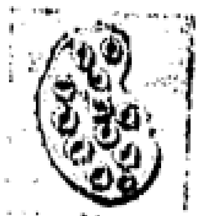
January 21, 8 p.m. – "The Incredible Flight of the Snow Goose."

February 1? 8:30 p.m. – "Country Western Hit Parade."

March 11, 8 p.m. – "Keep U.S. Beautiful."

April 1?, 10 p.m. – "Upon This Rock."

Betty Newton's Notes



BROILED HAM DINNER

1 1-lb. can German potato salad
1 ham slice, 1/2 to 3/4-inch thick
Whole Cloves
1 No. 303 can unpeeled apricot halves, drained
Apricot juice
1/3 C. brown sugar, packed
Maraschino cherries

Place potato salad in broiler pan. Broil under low flame for 10 minutes, 5 inches from flame. Slash fat on ham slice and stud with Cloves. Add enough apricot juice to brown sugar to make a paste. Place ham slice on grid and place grid over potato salad on broiler pan. Spread part of glaze on ham slice. Turn flame to high and broil for 8 minutes. Turn ham slice and brush with glaze. Put cherries in center of apricot halves and place them around ham slice. Brush fruit with glaze. Broil 6 minutes longer. Makes 4 servings.

BROILED HAM DINNER

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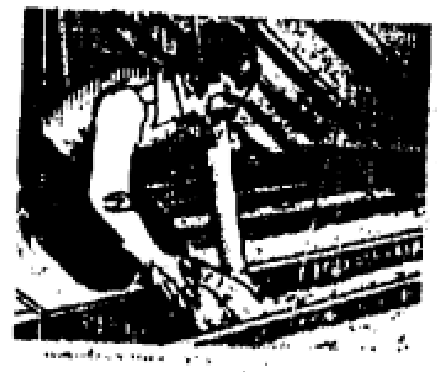


Handy Homeowners Can Save Money This Winter

A few moments of your time now following these hints can save you money during the coming winter months. You don't need to be a skilled craftsman, and it won't cost you a great deal of time or money.

Make your own storm windows—If your home does not have storm windows you can make your own by tacking, stapling or taping clear plastic to the inside or outside of windows and screen doors.

Insulate your home—A proper amount of insulation keeps heat from escaping and

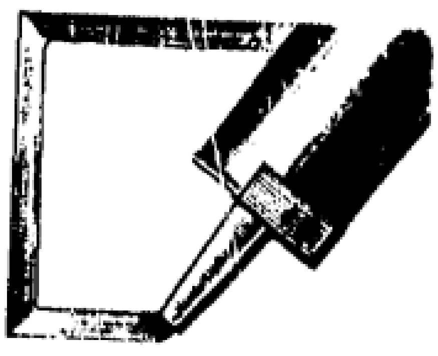
a house that has no insulation may lose as much as 3 1/2 times as much heat through the roof as one that has six inches of insulation between the roof rafters.

Seal Cracks and Crevices—Use weather stripping or caulk to prevent drafts and to stop heat from leaking out around doors and windows. Also fill cracks and crevices in the exterior surface of your home, especially under the roof.

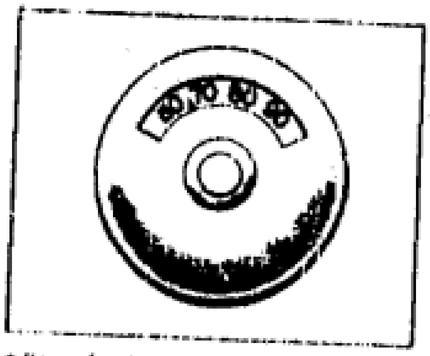
Check your heating system—If pilot light isn't lit, follow instructions on furnace or call your heating service company. Oil furnace blower and motor, if needed. Keep area around furnace clean and uncluttered. Be sure all radiators, grills, vents and registers are free of obstructions, turned on and producing heat when furnace is operating. Air leaks in ductwork can be repaired by using cloth adhesive tape.

Have furnace inspected—It is advisable to have your furnace or other heating device lubricated and inspected regularly by a heating service company before the heating season begins. A properly adjusted appliance will burn less gas.

When It's Cold Outside...



- When the sun is shining, open blinds and drapes and let the sun help heat the house. Other times, keep window coverings closed to reduce heat loss.
- Keep fireplace dampers closed when not in use or block the opening with a removable cover such as plywood or insulating board. Heat rises and an open chimney lets heat escape up the chimney.
- Keep opening and closing of outside doors to a minimum.
- Set the thermostat at the temperature desired and leave it alone. Keep TV sets and table lamps away from the area of the thermostat. A properly operating furnace will maintain the desired temperature.
- Find the coolest indoor temperature at which the house is comfortable. Heating costs increase about 3 per cent for every degree you set your thermostat above 70 degrees.



- Keep furniture or other obstructions from in front of heat outlets—especially forced air vents.
- Change or clean your furnace filter several times during the winter. A furnace with a dirty filter cannot operate at maximum efficiency.
- Turn off registers and radiators in rooms that aren't being used and keep door closed.
- Keep doors to unheated basements, garages and attics closed.
- A gas range should not be used to heat the kitchen. It was not designed for this purpose.
- Whenever your heating system doesn't seem to be operating properly, don't try to repair it yourself. Contact your heating service company.

Betty Newton's Notes

SAVORY LAMB STEW

2 tablespoons butter or margarine
1½ pounds cubed lamb shoulder
1 medium-sized onion, sliced
½ cup sliced celery
1 small clove garlic, finely chopped
1 medium-sized green pepper, sliced
2 cups water or bouillon
1½ teaspoons salt
¼ teaspoon pepper
2½ to 3 cups sliced potatoes
1½ cups sliced carrots
¼ cup flour
½ cup water

Melt butter or margarine. Add lamb and cook over low flame, stirring occasionally until browned on all sides. Add onion, celery, garlic and green pepper; cook 5 minutes. Add stock or bouillon, salt and pepper. Cover and cook 15 minutes. Add potatoes and carrots. Cook 45 minutes, or until vegetables are tender. Remove lamb and vegetables. Combine flour and water; blend. Add flour mixture to stock or bouillon mixture; blend. Cook over low flame, stirring constantly until thickened. Add vegetables and lamb. Approximately 6 servings.

SAVORY LAMB STEW

COLUMBIA GAS SYSTEM
–for clean, modern, dependable energy–

Columbia Gulf Transmission Company, a Columbia Gas System subsidiary, transports approximately half of the System's Southwest supply. Other supplies from that area are transported by five major non-affiliated transmission lines under long-term supply contracts.

THE SOUTHWESTERN GAS moves by pipeline through Louisiana, Mississippi, Tennessee and Kentucky to the West Virginia border where it is delivered to Columbia Gas Transmission Corporation, which in turn transports the gas to Columbia's seven-state marketing area.

The changes in Columbia's organizational structure primarily affect these local distribution companies which deliver the gas to your home. Beginning April 1, all Columbia distribution companies will be managed from Columbus, Ohio, but there will be no change in the corporate identity.

The more than one million Columbia customers living in Ohio, of course, are accustomed to having the headquarters of their local gas company located in Columbus. Columbia Gas companies serving Pennsylvania, New York and Maryland have been headquartered in Pittsburgh, Pa. and those serving West Virginia, Virginia and Kentucky have been headquartered in Charleston, W. Va.

The restructuring is necessary to improve the efficiency of the Columbia System in a period of rapidly changing business conditions and rising operating

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Columbia Gas System Will Reorganize

THE COLUMBIA GAS SYSTEM, one of the nation's largest natural gas systems, is changing its organizational structure, but the changes will in no way adversely affect the reliable supply of natural gas, the quality of service, or the personal concern for each customer's energy needs.

The Columbia System directly or indirectly serves some four million customers, or almost 10 per cent of all gas customers in the United States. The System is made up of the parent company, a service company and 17 operating subsidiaries. It engages in natural gas exploration, production, purchase, storage, transmission, research, and retail and wholesale sales.

Approximately 90 per cent of the Columbia System's yearly supply of more than 1.4 trillion cubic feet of natural gas comes from the Southwest. The remaining gas — slightly more than 10 per cent — comes from the Appalachian area.

costs. The utilization of electronic data processing facilities and modern communications equipment makes possible a degree of customer record centralization not previously attainable or economically feasible.

IN A SIMILAR MOVE, headquarters for Columbia Gas Transmission Corporation, which conducts production, transmission and storage operations for the Columbia System in the Appalachian area, will be centered in Charleston, West Virginia.

Wilmington, Delaware will continue to be the headquarters for the Columbia Gas System, Columbia Gas System Service Corporation, and the three System companies primarily responsible for developing new gas supplies.

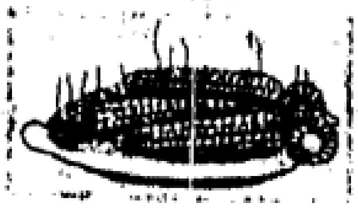
Columbia's goal is a more effective management organization dedicated to supplying the natural gas needs of four million customers at wholesale or retail from western Ohio to the Atlantic coast.

Call Us Before You Dig

OPERATORS OF excavation and ditching equipment occasionally dig up a natural gas pipeline. If you have work done on your property that involves digging, check first with the gas company to be sure of the gas line's location. With your cooperation, we can keep your gas service safe and dependable.

Betty Newt'n's Notes

ZESTY ROAST CORN



ZESTY ROAST CORN

6 to 10 ears sweet corn
1 cup butter or margarine, softened
2 tablespoons prepared mustard
2 teaspoons prepared horseradish
2 teaspoons salt
¼ teaspoon pepper
Chopped parsley

Husk corn and remove silk. Combine butter, mustard, horseradish, salt and pepper. Spread half of butter mixture on ears of corn. Wrap each ear loosely in heavy duty aluminum foil, sealing carefully. Place wrapped ears on preheated Gas grill and roast, using high flame, for 25 to 35 minutes. Turn occasionally. Serve with remaining butter mixture. Serves 4 to 6.

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Would You Prefer to Spread Your Winter Heating Costs Over the Entire Year?

Again this year Columbia Gas is offering its customers the opportunity to join its popular Budget Payment Plan and spread their cost of gas service evenly over a 12-month period.

Surveys show that the average household uses about two-thirds of its annual gas consumption during the four coldest winter months. These high bills can sometimes put a strain on the family budget.

Many thousands of our customers have already discovered the advantages of planning ahead and of easing the strain of high winter gas bills by paying the same amount for gas service each month.

Next month, Columbia will offer you the opportunity to join the Budget Payment Plan. Full details will be included in your next gas bill. It's easy to join. You simply pay the figure marked "Budget Amount" on your next gas bill.

Don't Wait Until Winter To Check Heating System

We all know hot summer days is the time for vacations, a cooling dip in the pool, frosty lemonade and an ice cream sundae. We also know it is hard to think about next winter's problem when the temperature is close to 100 degrees outside.

But what better time? The next month or two actually is the time to get ready for winter, especially if you had any particular heating problem last winter. Any heating system needs regular inspection and maintenance. The time to do something about it is when you aren't using it. That's now.

Economical Menu Planning

Recent increases in food prices have intensified public concern and interest in economical menu planning. The Extension Service of the U.S. Department of Agriculture prepares menus based on best buys offered by local markets. Copies of these menus are available free to consumers upon request from: Service, Room 541-A; Office of Communications, USDA; Washington, DC 20250.

Women Join Ranks of Meter Readers for Gas Company

More and more women are competently handling jobs which once were considered strictly for men. Your gas company, for example, has women engaged in dispatching, electronic data processing managing, and local accounting supervising.

The latest endeavor capably handled by women employees is that of meter reading. The first woman meter reader, Mrs. Betty Ford, of Ohio, was a telephone contact clerk for the Service Department in Columbus when the meter reading opening was announced. She applied and got the job.

The meter reader opening is a part of the company's program to assure equal opportunity in all areas. It is the company's policy to recruit and employ qualified personnel, and to provide equal opportunity for advancement of employees, including upgrading, promotion and training — all without discrimination as to race, color, religion, national origin or sex.

Betty Newton's Notes

PUMPKIN BARS

3/4 cup sifted flour
3/4 teaspoon salt
1/2 teaspoon baking soda
1/2 teaspoon nutmeg
1/2 teaspoon ginger
1/2 teaspoon cinnamon
2 eggs
1 cup brown sugar
1/4 cup salad oil
1/2 cup minced dates
1/2 cup chopped nuts
2/3 cup canned pumpkin

Mix and sift flour, salt, soda and spices. Beat eggs, add sugar gradually and beat well. Add oil, dates, nuts and mix. Add sifted ingredients alternately with pumpkin to egg mixture, mixing just enough to keep the batter smooth. Pour into a greased pan (9" x 9" x 2"). Bake in a preheated gas oven set at 350 degrees for 30 minutes. Cool 5 minutes, remove from pan and cool on cooling rack. Frost with confectioners' sugar frosting.

CONFECTIONERS' SUGAR FROSTING

1-1/2 cups sifted confectioners' sugar
1-1/2 tablespoons melted butter
1-1/2 tablespoons milk
1-1/2 teaspoons vanilla extract

Combine ingredients. Yield 2-2/3 doren.

COLUMBIA GAS SYSTEM
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problems in construction, design or performance in gas appliances, then alerts manufacturers so that corrective measures can be taken.

The program speedily ferrets out problem areas. Often problems can be spotted and manufacturers notified while the particular appliance model is on the assembly line and in time to make modifications and adjustments there as well as in models already installed in customer homes.

Columbia is cooperating in GAIN because we want to be certain that when you replace your present gas appliance with a new one it will conserve fuel, save you money, and be the best-working appliance you ever purchased.

If you smell gas...

Call the Gas Company!

This can hardly be said too often.

Under normal circumstances, natural gas is one of the safest forms of energy. But should a leak develop a dangerous condition exists that must be corrected.

As it comes from the earth, natural gas is odorless. So we put in an odorant that will tell you gas is in the air. If you smell a "gas odor," call the Gas Company right away. If the odor is very strong you may want to vacate the premises immediately, leaving the door open and call from a nearby phone.

Don't hesitate. If you smell gas, let us know at once.

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GAIN: It Works For You

Columbia Gas is helping make sure you get the most efficient gas appliances possible.

Our company is cooperating with the American Gas Association, the Gas Appliance Manufacturers' Association and 50 other gas companies across the nation in a program known as GAIN (Gas Appliance Improvement Network) that is designed to provide better consumer service and protection.

GAIN utilizes information obtained during gas company service calls to pinpoint

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MEET A GASMAN

Columbia Employee Becomes Clown to Make Others Laugh

Ron Culbertson, Columbia Gas employee (above), believes that by helping others you help yourself. He practices what he preaches by being a Shrine clown for Aladdin Temple--a philanthropic organization of Masons dedicated to providing medical care and facilities for crippled or severely burned children. "It's a marvelous feeling of satisfaction to make people, especially children, happy—to make them laugh," he said. "It can't help but make the world a better place in which to live."

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