
MERC/RI-77/1

# PLUGGING TECHNIQUES THAT SHOULD ALLOW MINING THROUGH WELLS



June 1977

Prepared for
UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

By
U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
MORGANTOWN ENERGY RESEARCH CENTER
Morgantown, West Virginia

# NOTICE

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FINAL REPORT
on
Contract No. J0166033
Plugging Techniques That Should Allow Mining Through Wells
(First Draft Submitted February, 1976)

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# PLUGGING TECHNIQUES THAT SHOULD ALLOW MINING THROUGH WELLS

by

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## ABSTRACT

Research carried out since 1971 on plugging oil wells penetrating minable coalseams has allowed for safe underground mining through wells and recovering heretofore unrecoverable coal reserves. Work conducted under this research has consisted of plugging 27 wells and mining through 7 of them. This report covers the day-to-day record of plugging 23 of these wells and mining through 6 of them.

## INTRODUCTION

The Morgantown Energy Research Center, Morgantown, W.Va., has been conducting research associated with mining through areas where oil and gas wells intersect producing and potentially minable coalbeds, and in developing methods of eliminating "well pillars" in the mines resulting in increased safety, improved mining efficiency, conservation of minable coal reserves, developing of more extensive use of longwall mining techniques, and simplification of mine ventilation systems. The goal of this research is to develop and demonstrate the safety and feasibility of an improved mandatory safety standard regulating the maintenance or elimination of coal barriers around oil and gas wells penetrating coalbeds.

Because of the danger to life and property in a coal mine if an oil or natural gas well should be intersected during mining operations, the current Federal Coal Mining Regulation[4/] requires that a 300 foot diameter barrier be established and maintained around oil and gas wells.

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[4/] Interim Mandatory Safety Standard for Underground Mines, section 317 (1), Federal Coal Mine Health and Safety Act (30 U.S.C. 87 (a), 30 CFR 75.1700).

No two wells are exactly the same due to the inherent inhomogeneity of the earths formations and the method by which each well has been completed. Because of this, each well must be considered individually to insure that it will be properly plugged and safe to mine through. Most of the wells that intersect coalbeds in the Appalachian area are now in essentially pressure-depleted reservoirs, and many of them have been plugged or abandoned. Leaving a 300-foot pillar around a well represents a substantial loss of a valuable natural resource and complicates the design of entryways, haulageways, and ventilating systems. Areas in which wells are drilled on close, irregular spacing (2.5 acres or less) can be completely unminable. Also, 300-foot pillars around wells in which the pressures exceed several hundred pounds per square inch could not contain the gas in the event of serious leaks. In the case of marginally productive reservoirs, it would be more satisfactory to permanently and safely plug the well below the coalbed, thereby permitting mining of the pillar.

Elimination of random well pillars would allow the use of longwall and shortwall mining systems (which are inherently safer than conventional mining techniques), improve the ventilation system to reduce hazards associated with methane, and simplify the haulage system. Additional advantages that increase safety are the elimination of abrupt changes of the mining cycle and improved roof conditions relative to those that exist when there are random pillars.

There are extensive mining operations in the Appalachian area as well as a high density of plugged, abandoned and low productive wells. In order to prove that wells could be properly plugged and safely mined through, many wells had to be plugged in cooperation with coal companies in different areas.

In August 1971, a well was plugged and mined through under a cooperative agreement between the Consolidation Coal Company and the United States Department of the Interior. This agreement gave the company an exception to the mandatory safety standard set forth in footnote 4/ and allowed the mining company to remove the entire barrier around the W. H. Allen Well 5 (S. Barrackman) located in Monongalia County, West Virginia.

The experiment was conducted under the direct supervision of personnel from the Bureau of Mines Morgantown Energy Research Center and involved the plugging of 4 wells and mining through one of them. The various techniques and procedures used were reported by Rennick and others5/.

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5/ Rennick, G. E., J. Pasini III, F. E. Armstrong, and J. R. Abrams. Demonstration of Safety Plugging of Oil Wells Penetrating Appalachian Coal Mines, BuMines TPR 56, July 1972, 23 pp.

Since this time, 23 additional wells located in Illinois, Ohio, Pennsylvania, and West Virginia, have been plugged under this experimental and demonstration program and six of these wells have been mined through with no adverse affects to the health and safety of the miners working underground.

## ACKNOWLEDGEMENTS

The authors thank the Directors of Mines and Minerals and their deputies of the States of Illinois, Ohio, Pennsylvania, and West Virginia, their state mine and oil and gas inspectors; and the management of AMAX Coal Company and Inland Steel Company of Illinois, North American Coal Corporation and the Southern Ohio Coal Company of Ohio, and Gateway Coal Company of Pennsylvania and Consolidation Coal Company in Pennsylvania and West Virginia; and Eastern Associated Coal Company of West Virginia and their engineers, safety coordinators and Directors;

and the Federal Mine Inspectors of the Mine Enforcement and Safety Administration (MESA); the U. S. Bureau of Mines state liaison officers; the officials of the U. S. Bureau of Mines, whose funding made this project possible;

and the various District Presidents of the United Mine Workers of America, their safety coordinators and committees;

and lastly, the miners themselves, without whose help and willingness to assist in proving the safety of mining through wells, this project could not have been conducted.

## INITIATION OF WORK

As the program on plugging has evolved, these procedures developed. They are:

(a) The process by which the Cooperative agreements between the Government and coal companies were expedited through completion, and

(b) Coal companies can petition for a mining permit under article 301-C of public Law 91-172, dated December 30, 1969.

Under (a), the agreement obligated both parties to meet certain requirements, and in return, the Director of the Bureau of Mines

granted an exception to the mandatory safety standards contained in section 317 (a) of the Federal Coal Mining Regulation4/ that required a barrier around the well. These agreements were used during the research period while developing the plugging techniques.

Under (b), the petition is made through the Mining Enforcement and Safety Administration (MESA) to the Secretary of the Interior. The Secretary causes an investigation to be made by MESA, and if an alternate method of achieving a satisfactory end result is found that in no way endangers the life of underground mining personnel, the petition is granted.

## MATERIAL, PLACEMENT AND PROCEDURES USED TO TEST WELL PLUG EFFECTIVENESS

In order to safely mine through a oil and gas well, it is necessary to know that the oil and gas formations penetrated by the well, will not leak hydrocarbons into the mine, once the well is intersected. For this reason, a tracer gas was used to check on the competency of the plug to seal the well.

Sulfur hexafluoride ($SF_6$) was used as the tracer gas. $SF_6$ being inert, is not present in the environment, and can be detected with a gas chromatograph in concentration as low as ½ part per billion. A steel gas cylinder Figure 1, with a timed release device is filled with $SF_6$ and lowered into the well by a well service logging truck.

Each cylinder is pressure tested at 600 psig with nitrogen, packed in ice, evacuated and injected with about 22 pounds, by weight, of $SF_6$ from a 100 pound commercial bottle. The timing device housing is hydraulically tested at 600 psig.

The cylinder is comprised of two sections, a tracer gas cylinder Figure 1 and a timed release device, Figures 2 and 3. The tracer gas cylinder is constructed of 3-inch I.D. J-55 tubing 14-feet 4-inches long. The top end piece is a machined 3-inch 10 rd. API male threaded blank and the bottom piece is a machined 3-inch 10 rd. API thread with a ¼-inch NPT tapped hole in the center and two 5/8-inch deep 10-32 tapped holes, positioned 180°, 1-15/32-inches from center. A ¼-inch brass valve, with the handle removed and the stem screw driver slotted, is installed into the ¼-inch NPT hole. On the top of the cylinder is a 3-inch 10 rd. API thread coupling, 3-inch 10 rd. thread to 2-inch 11½ thread swage and a 2-inch 11½ thread coupling that is used to lower the cylinder into the well.

On the bottom end is attached a timing device housing, 3-inch 10 rd. API thread by 2-inch 11½ thread swage, 2-inch 11½ thread coupling and a 2-inch 11½ thread by 4 foot long tailpiece with 3½-inch by 4-inches long slots, at 120°, located 4-inches from the top. The slotted tailpiece serves as a support for the cylinder and a means for the gas to escape into the wellbore.

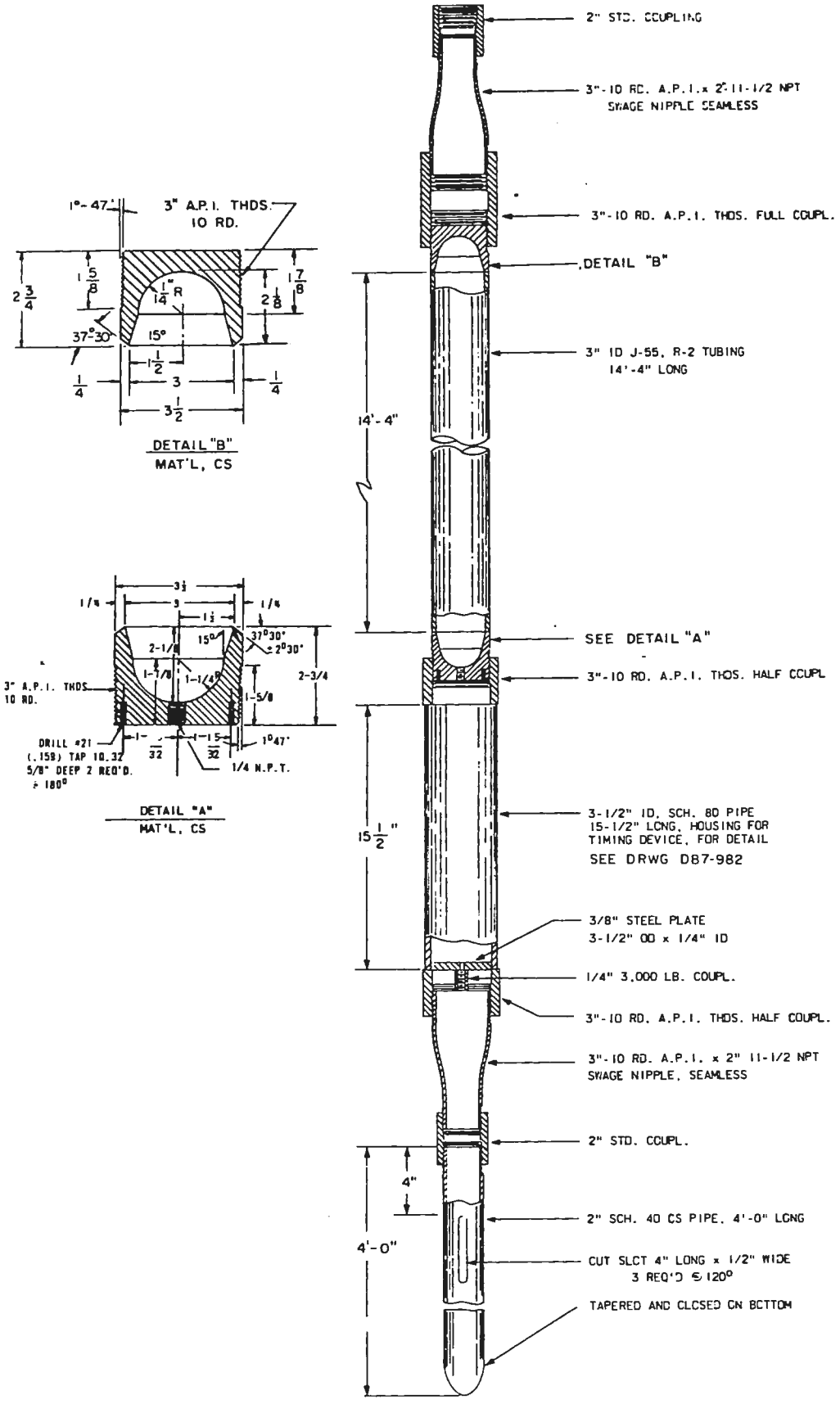


FIG. 1. - $SF_6$ TRACER GAS INJECTION CYLINDER

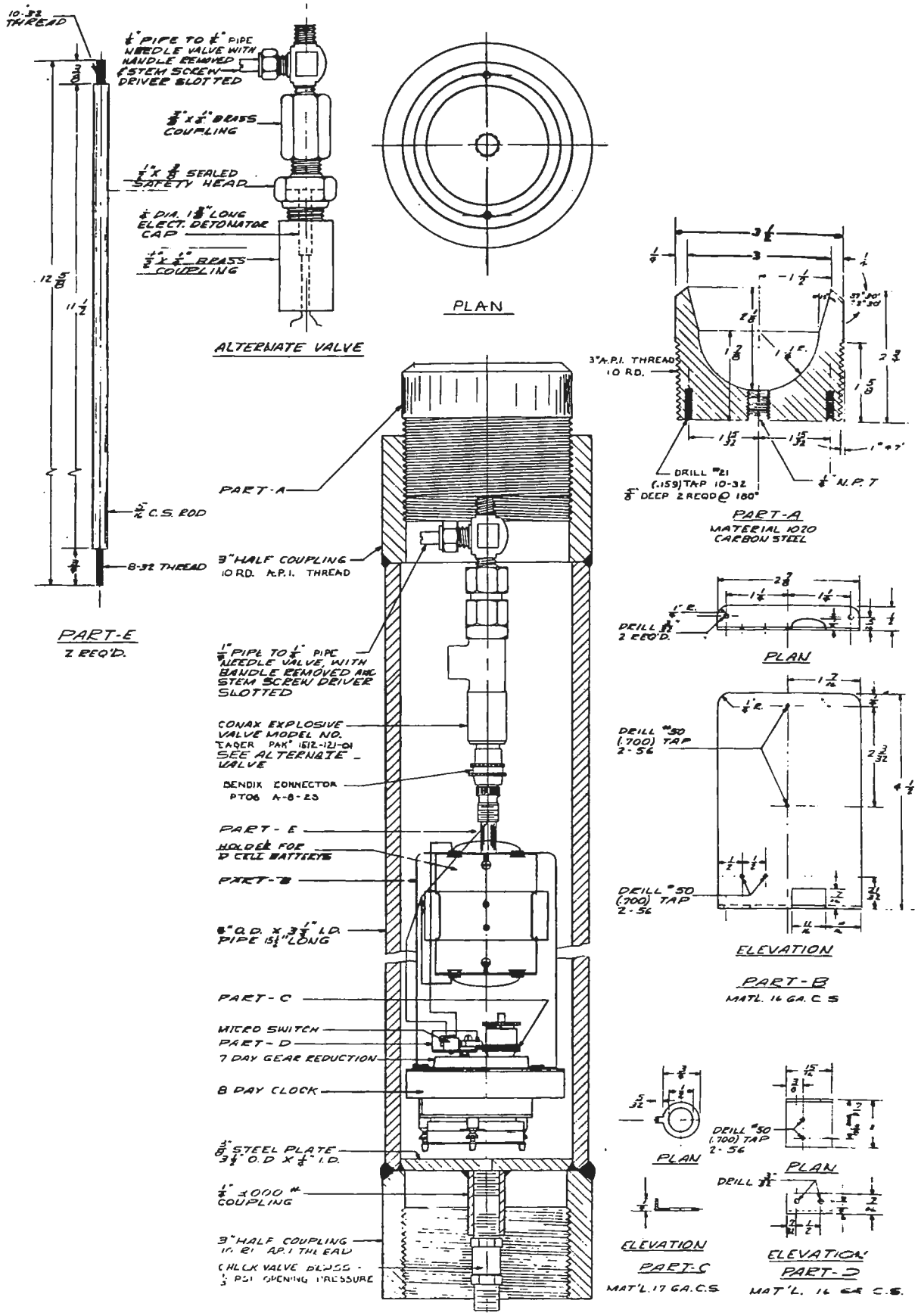


FIG. 2. – TIMING DEVICE FOR $SF_6$ TRACER GAS CYLINDER USING 7-DAY CLOCK TIMING DEVICE

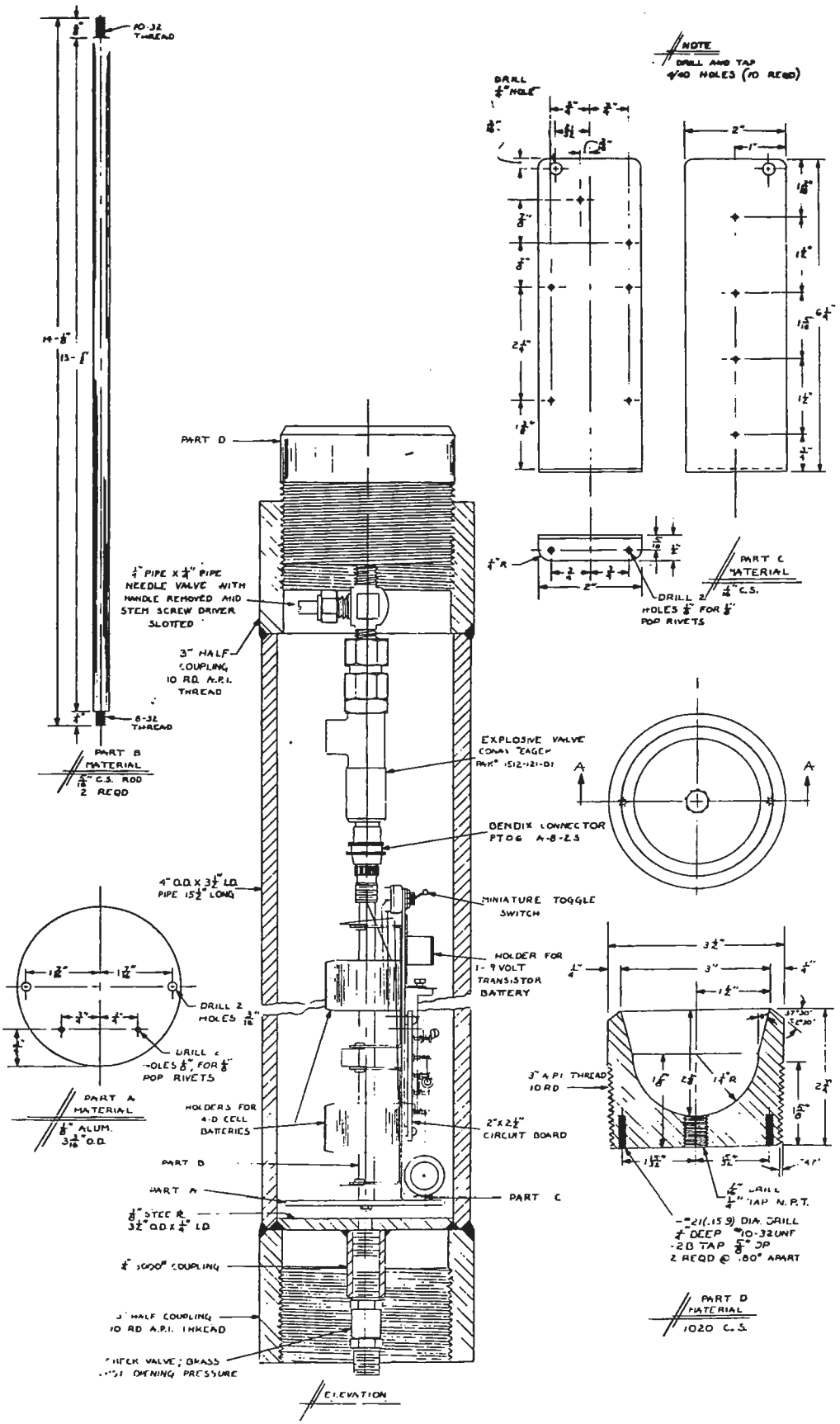


FIG. 3. – TIMING DEVICE FOR $SF_6$ TRACER GAS CYLINDER USING SOLID STATE TIMING DEVICE

There are two approved time release devices. One device Figure 2 is comprised of an explosive activated valve, 8-day clock with a 7-day turret, micro-switch, D cell battery holder, clock support rods, and a 3,000 psi, 1/3 psi opening pressure, brass check valve.

The other device, Figure 3, consists of a solid state timing and firing circuit that, when powered by 4D cell batteries, actuates an explosive valve.

Two types of explosive activated valves Figures 2 and 3, a commercially manufactured Conax[6/] valve and an alternate valve, have been used to release the $SF_6$ tracer gas. The first explosive valve was used on eight units. The cost of the first Conax valve encouraged development and use of the alternate valve. However, due to regulations pertaining to the transporting of explosives across state lines and their use in certain states, the use of a less expensive commercially manufactured explosive valve as shown in Figures 2 and 3 should be used.

The alternate valve is comprised of a DuPont E-106[6/] electric detonator mounted in the outlet end of a BS & B STA-KUL[6/], 1,000 psig @ 72° F., sealed type safety head. A 3/8-inch NPT by ¼-inch NPT brass female coupling is attached to the inlet end and a ½-inch NPT by ¼-inch NPT brass female coupling is attached to the outlet end. They allow assembly to the ¼-inch NPT tracer cylinder valve and serve as a safety shield for the explosive valve.

The timing device shown in figure 2 and 4 is an 8-day wind, 7-day turret clock, with an adjustable switch tripping device, that activates a micro switch, at a pre-determined time, utilizing two D cell batteries to energize the valve detonator. Two 5/16-inch diameter by 12-5/8-inch long carbon steel rods, threaded on each end, support the timing device. The solid state timing and firing circuit schematic shown in figure 5, and illustrated in figure 3 and 6 is a device that detonates a cap or explosive valve when the Silicon Controlled Rectifier (SCR) is triggered. This occurs when a 9 volt carbon zinc battery (B1) is discharged to approximately 5 volts. Having a load resister (R1) of 3900 ohms, the triggering time is about 7 days. Two 5/16-inch diameter by 14-1/8-inch long carbon steel rods, threaded on each end, support the timing device.

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6/ Reference to specific trade names does not imply endorsement by U. S. Government.

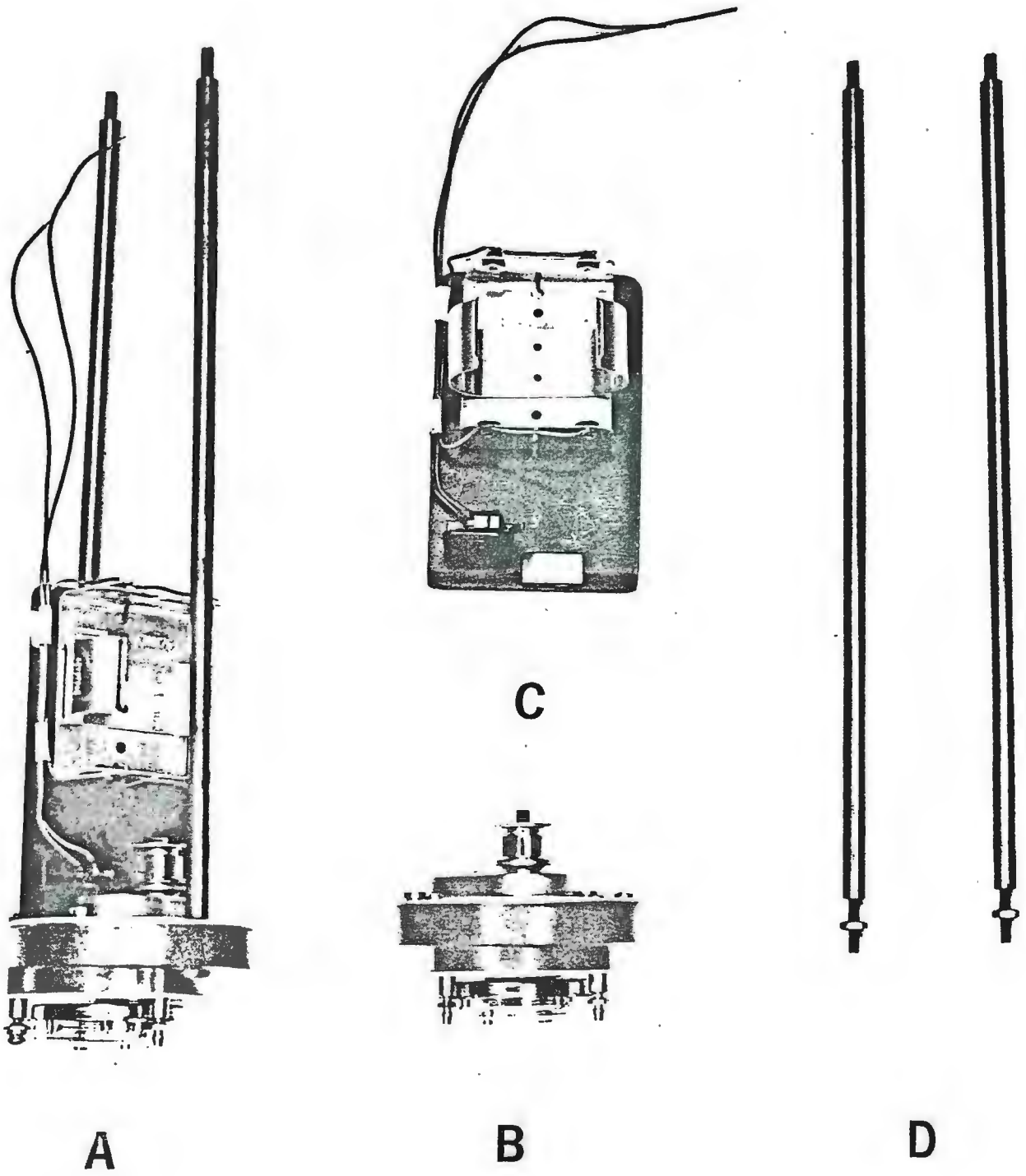


FIG. 4. - TIMING DEVICE COMPONETS USING 7-DAY CLOCK

Either device is housed in a 4-inch O.D. by 3-1/2-inch I.D. pipe 15-1/2-inches long Figure 2 and 3. A 3/8-inch steel plate, with a 1/4-inch hole and a 1/4-inch NPT 3,000 psi coupling welded in place to the bottom of the housing. Then a 3-inch 10 rd. API thread half coupling is welded on each end of the housing. A brass, 1/3 psi opening pressure check valve is installed into the 1/4-inch NPT bottom coupling to allow the $SF_6$ tracer gas to escape.

Assembly of the explosive valve, timing devices, and related accessories are done at the well site in the following sequence: (1). when using the 7 day turret clock, remove switch tripping device, to prevent damage to micro switch, and wind the clock. (2) check alternate explosive valve with a blasting galvanometer. (3) apply teflon thread tape on the 1/4-inch NPT $SF_6$ tracer cylinder valve and install a 3/8-inch by 1/4-inch NPT female brass coupling. Tape the explosive valve (sealed safety head) threads and install it into the 3/8-inch NPT female coupling. Run the valve wires through the 1/2-inch NPT by 1/4-inch NPT female brass coupling (Safety shield) and install it on the explosive valve (sealed safety head). Do not unshunt the alternate valve wires until they are ready to be connected. When using the commercial valve, install it directly on the teflon taped threads of the 1/4-inch $SF_6$ cylinder valve. (4) Screw timing device support rods, 10-32 thread end, into the tracer cylinder. (5) install and tape two (2) D cell batteries into battery holder. (6) check the micro switch and batteries with a test light. (7) set the switch tripping device to the desired time setting (Do not reset clock with wires connected, (8) one revolution equals seven days. (9) Connect and tape wires from the micro switch to the explosive valve.

The timing and firing circuit shown in figures 3, 5 and 6 is a solid state device and the setting sequence is as follows: (1) install fresh B1 9-volt carbon zinc battery; (2) install fresh B2 6-volt 4-D cell batteries (be sure that the B1 and B2 batteries are making good contact); (3) check light emitting diode (LED) with switch both on and off. If it is glowing, the B1 9-volt battery is not making good contact, the SCR is faulty or it has been prematurely triggered. (Note: replace SCR if repeating steps 1, 2 and 3 does not extinguish the LED.) (4) with the LED not glowing (switch on) turn the switch off and connect wires to the explosive valve. (5) turn switch to on position and firing circuit is set. (6) screw timing device support rods, 10-32 thread end, into the tracer cylinder and attach the timing and firing circuit.

To complete tracer gas cylinder; (1) apply teflon thread tape to inlet end of the check valve and install it into the timing device housing coupling. Be sure flow direction is out. (2) open the $SF_6$

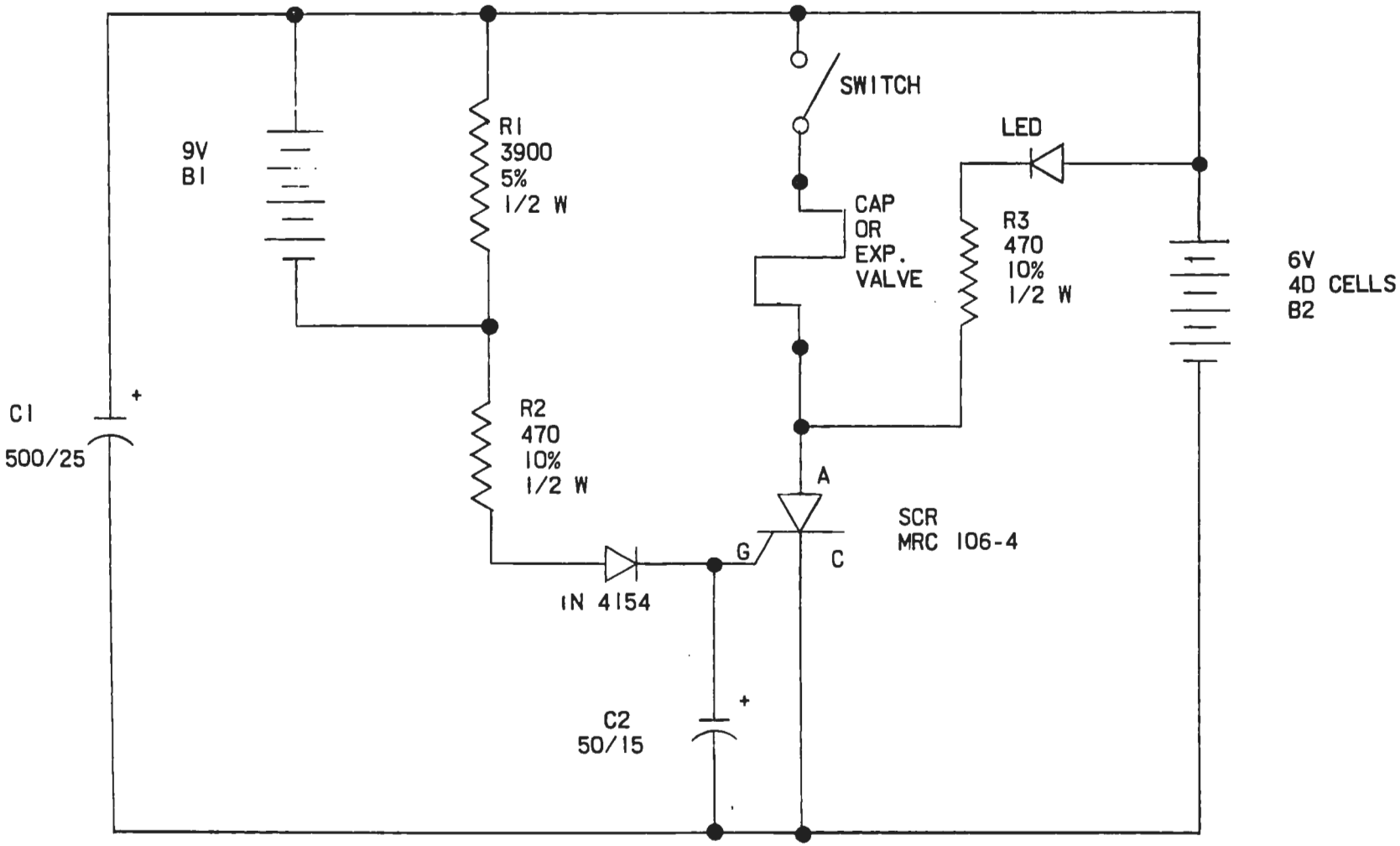


FIG. 5. - SOLID STATE TIMING AND FIRING CIRCUIT SCHEMATIC

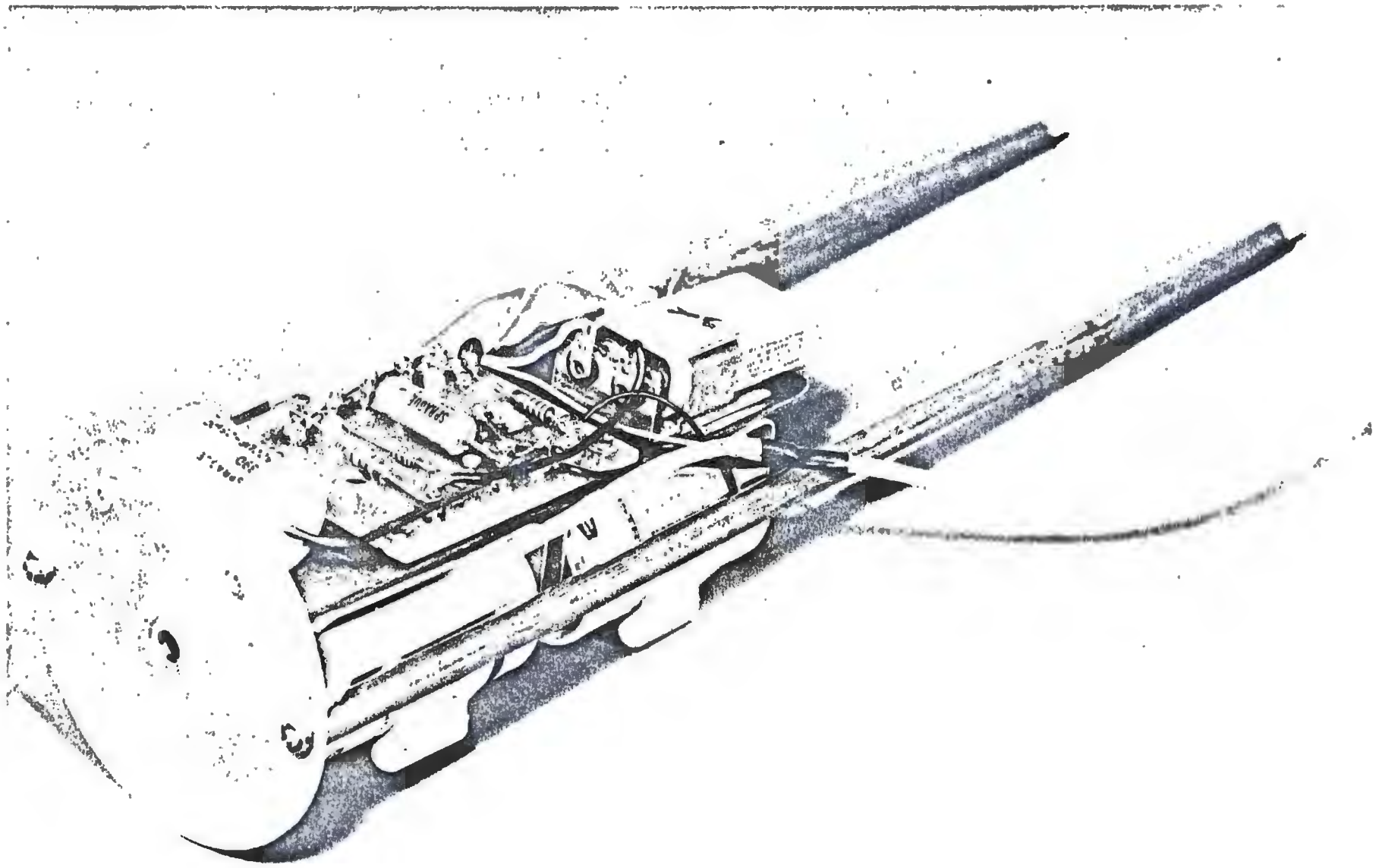

FIG. 6. - TIMING DEVICE USING SOLID STATE COMPONETS

tracer gas cylinder valve and check for leaks between the tracer cylinder and explosive valve with liquid leak detector. (3) check to be sure that wires are properly connected, cylinder valve open, and batteries and wires are secured before installing the timing device housing. (4) clean and apply teflon thread tape on the $SF_6$ tracer cylinder threads and install timing device housing (4"O.D. x 3-1/2" I.D. pipe 15-1/2" long). (5) as shown in figure 1, install a 3-inch 10 rd. API thread by 2-inch NPT thread swage, 2-inch coupling and 2-inch by 4-foot long slotted tailpiece on the timing device housing. (6) on top of the $SF_6$ tracer gas cylinder install a 3-inch 10 rd. API thread coupling, 3-inch 10 rd. API thread by 2-inch NPT thread swage and a 2-inch NPT coupling. Note: To eliminate possible premature firing whenlifting unit, attach a ground wire between the cylinder and well casing. The $SF_6$ tracer gas cylinder is now ready to be lowered into the well.

## WELL PLUGGING EXPANDING CEMENT

Various expanding cements were tested in the laboratory and from these tests, Chem Comp 6/ was picked to use in plugging. Additional tests were run using this cement to see if any change of properties occurred when mixed with various concentrations of Sodium Chloride (NcCl) brine. Four batches were mixed, each having a different brine concentration. In addition, each batch was subdivided into two samples; one sample being put in a glass bottle to observe the expansion and the other sample being put in a plastic bottle for lab analysis.

The glass bottles were marked A, B, C, and D, and are shown in figure 7. Samples A and B showed extensive glass cracking, while samples C and D showed minor glass cracking on the bottom and sides.

From the physical properties of the cement samples shown in Table 1, it was obvious that no detrimental effect from brine was evident, in fact the porosity showed a slight decrease as the brine concentration was increased.

TABLE 1 - PHYSICAL PROPERTIES OF EXPANDING CEMENT SAMPLES

| Property | | SAMPLE | | | |
|---|---|---|---|---|---|
| | | A | B | C | D |
| Brine concentration | NaCl, ppm | 10,000 | 30,000 | 70,000 | 100,000 |
| Brine | gal/sack | 5.20 | 5.20 | 5.20 | 5.20 |
| Sand grain density | gm/cc | 2.25 | 2.23 | 2.23 | 2.20 |
| Bulk density | gm/cc | 1.50 | 1.51 | 1.54 | 1.57 |
| Porosity | pct. | 33.10 | 32.10 | 31.00 | 28.80 |
| Effective air permeability, Md. | | 0.30 | 0.20 | 0.20 | 0.20 |


FIG. 7. - EXPANDING CEMENT SAMPLES SHOWING DAMAGE TO GLASS CONTAINERS AFTER BEING ALLOWED TO SET-UP

## GENERAL PLUGGING TECHNIQUES

Although each well presents different problems, the following plugging techniques, for the two well types described, are general enough to cover most plugging operations with modification. Modifications can only be done when the wells are being plugged.

Type I — Plugging Technique to Be Used in Old Oil and Gas Wells Which Have Never Been Plugged or Previously Plugged and Abandoned Wells which Have Been Cleaned Out To Their Total Depth

| See Figure 8 | | Description |
|---|---|---|
| 1A | - | Use these materials if state law requires. |
| 1B | - | Mechanical bridge plug or squeeze cementing device if possible (good wellbore for setting) |
| | - | Mandatory if formation is producing natural gas. This will prevent invasion of cement by gas (gas cutting). Gas cutting results in poor cement plugs (2) and (7C). |
| 2 | - | Expanding cement plug to seal off producing formation and shut off gas flow around production casing (3). |
| 3 | - | Production casing which could not be removed because of age or condition. |
| 4 | - | Fly-ash-gel7/-water slurry (approximately 14 pounds per gallon) for filler. Provides weighted fluid column in wellbore and fills void space. |
| 5 | - | Expanding cement plug to shut off possible gas flow from behind production casing (3) into wellbore above this point. |
| 6 | - | Fly-ash-gel-water slurry (14 ppg) for filler. Provides weighted fluid column in wellbore and fills void space. |
| 7A | - | When a presently non commercial, gas zone exists (7B) and (7C) are to be placed. |
| 7B | - | Mechanical bridge plug to shut off gas which could "gas cut" the expanding cement plug (7C) |
| 7C | - | Expanding cement plug to prevent gas from moving up wellbore |

7/ Bentonite. A mineral clay sold under various trade names.

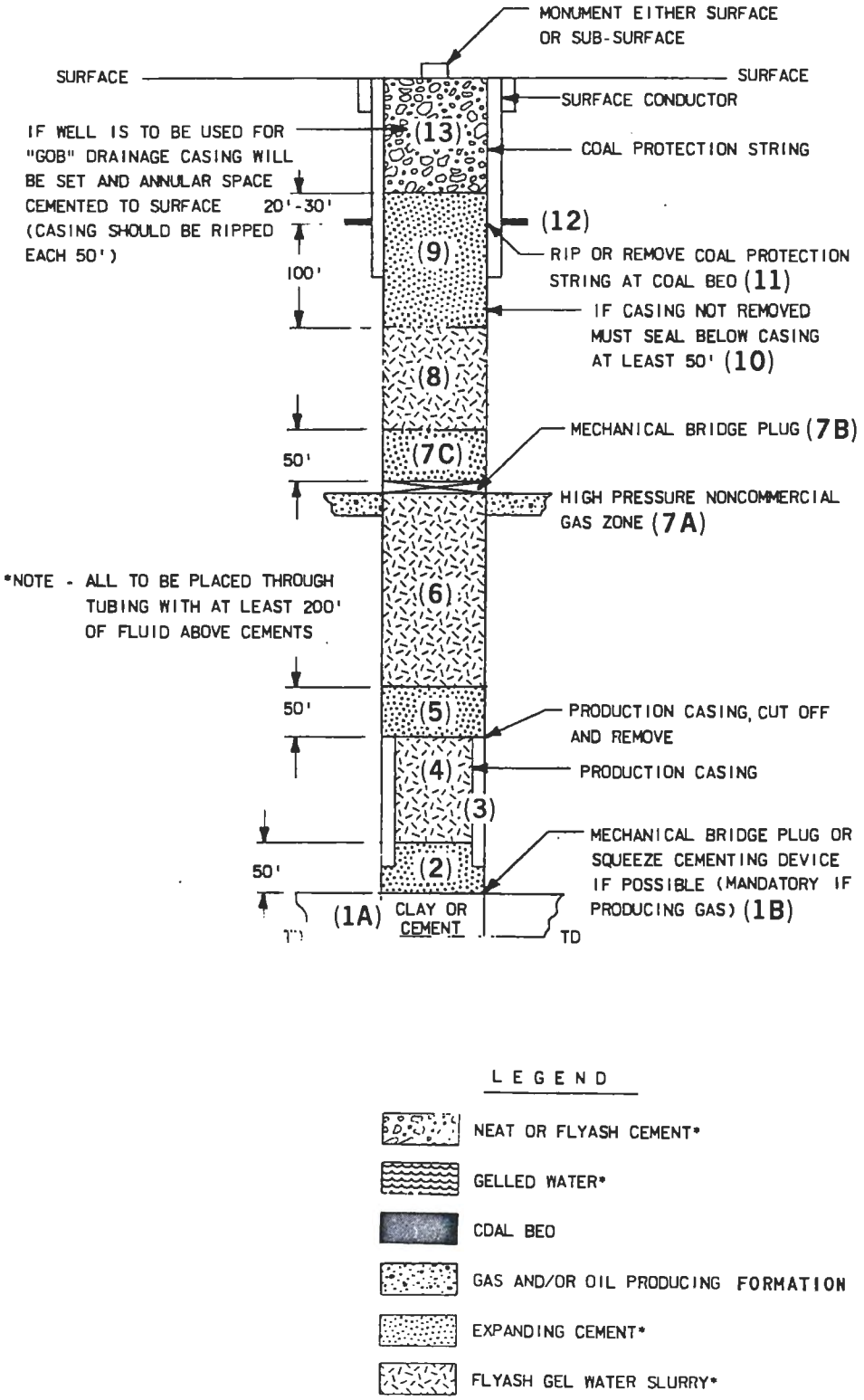


FIG. 8. – PLUGGING TECHNIQUES TO BE USED IN OLD WELLS WHICH HAVE NEVER BEEN PLUGGED OR PREVIOUSLY PLUGGED AND ABANDONED WELLS WHICH HAVE BEEN CLEANED OUT TO THEIR TOTAL DEPTH

8 - Fly-ash-gel-water slurry for filler and down hole pressure assist (see (4) & (6).

9 - This filler should be cut off about 100 feet below the lowest minable coalbed or beds and an expanding cement plug (10) placed from that point to approximately 20 feet above the coalbed.

- If more than one minable coalbed is present the same procedure should be followed for each coalbed with a space (filled with gravel) in the wellbore of 5-10 feet at the mid point between the minable coalbeds.

10 - If coal protective string of casing cannot be removed, the bottom of this casing must have an expanding cement plug not less than 20 feet thick placed below and up into the old casing not less than 10 feet.

11 - This casing must be riped or milled out to allow the cement to fill the annular space behind the casing. This should be done over the entire length of the expanding cement plug (9) when the casing is present.

12 - Coalbed (12)

13 - Neat or fly ash cement to fill open hole to surface (13)

- If well is used for "gob" drainage or other use casing will be set and annular space cemented to surface.

Type II Plugging Techniques to be Used When a Previously Abandoned Well Cannot be Cleaned Out To Its Total Depth

See Figure 9*** Description

1 - In this case the well must be reopened to a depth sufficiently below the lowest minable coalbed to allow the placement of the sulfur hexafluoride ($SF_6$) tracer unit with a mechanical bridge plug (4) set in a competent section of the wellbore (condition and position of plugs below this point unknown) (1).

***Not to be used when the well is within 1 mile (1,600 meters) of a Gas Storage Operation.

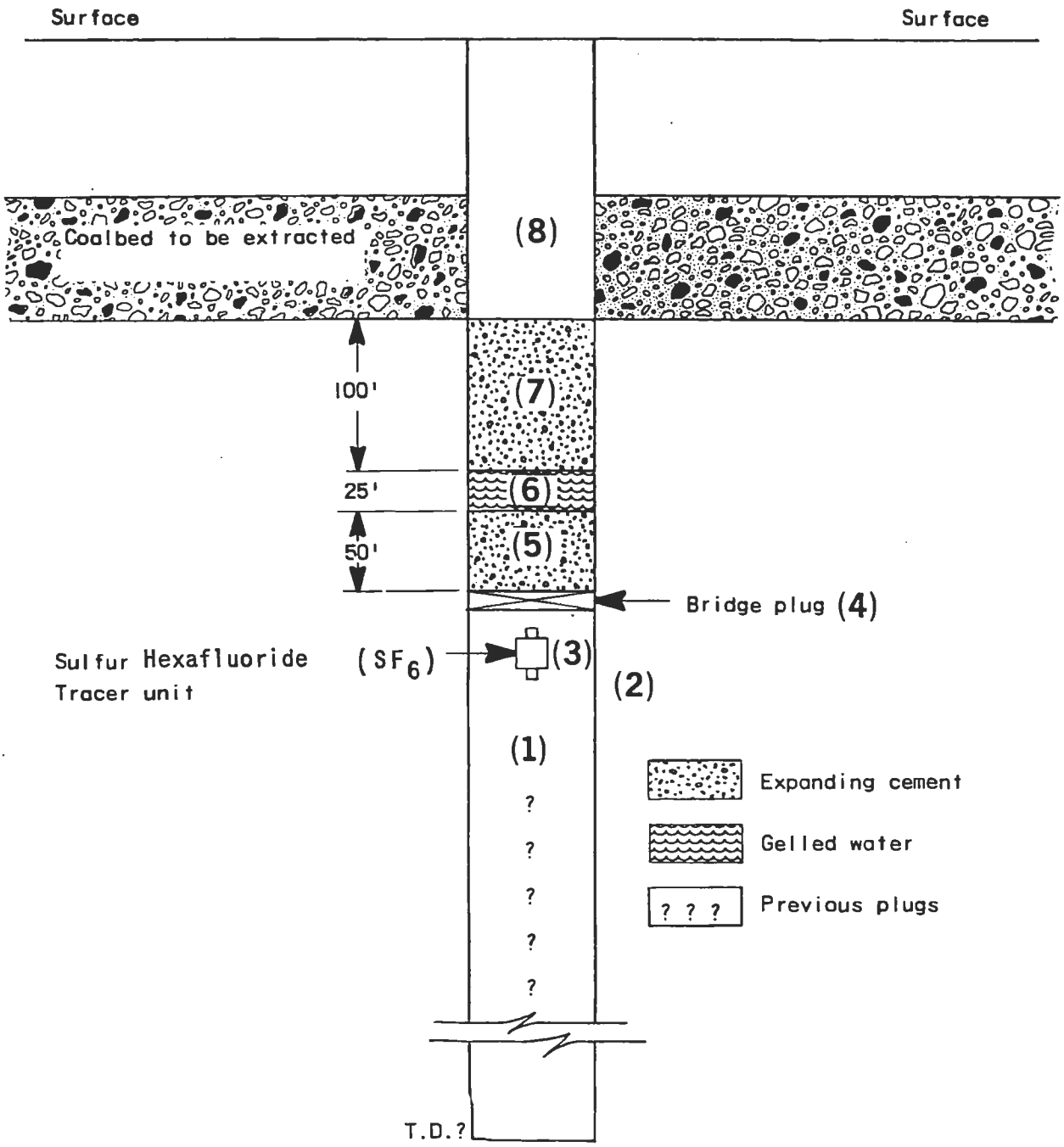


FIG. 9. - PLUGGING TECHNIQUES TO BE USED WHEN A PREVIOUSLY ABANDONED WELL CAN NOT BE CLEANED OUT TO ITS TOTAL DEPTH

2 - Wellbore could not be cleaned out below this point (2).

3 - Sulfur hexafluoride ($SF_6$) tracer unit required in these wells (this is the only safe highly detectable tracer available) to make sure plugs close wellbore below the mining operation (3).

4 - Bridge plug (4) set in competent section of wellbore shuts off gas from below (prevents "gas cutting" of cement), and provides a stable base for expanding cement plug (5).

5 - Expanding cement plug (5) (placed through tubing, with 200 feet or more of fluid in the wellbore above point (4) to "densify" cement plug).

6 - Gelled-water slurry (12 to 14 pounds per gallon) to fill wellbore and provide additional hydrostatic pressure down hole (6).

7 - Expanding cement plug below the coalbed or beds to be mined. Note: See items 9 & 10 under Figure 8, for multiple minable coalbeds and conditions where old "coal protective" string is in place.

8 - See Figure 8, item 13.

## MINING THROUGH WELLS

Since the inception of the program, a total of 7 wells have been either mined to or through. However, as stated previously in this report, the first well mined through was reported by Rennick and others5/. Of the remaining 6, two were in Illinois, one was in Ohio, and three were in West Virginia. Details of mining through or to 6 wells are given in the appendix following the individual well plugging discussion.

From two of these wells, after mining through, samples of cement were removed from the coalbed and their permeabilities and porosities were determined. In addition, samples were taken at the time of well plugging and measurements made. Results of these tests are listed in table 2 and show that a favorable reduction in permeability and porosity were obtained from pressure cementing.

TABLE 2 - PERMEABILITY AND POROSITY FROM PRESSURE CEMENTING

| Well and Sample Name | Permeability, md | Porosity, percent |
|---|---|---|
| Inland Steel Co. Well No. 1 | | |
| Surface sample | 6.0 | 36.8 |
| Mined out sample | 0.5 | 10.7 |
| Consolidation Coal Co. Haught Well No. 1 | | |
| Surface sample | 2.1 | 34.5 |
| Mined out sample | 1.5 | 31.2 |

## CONCLUSIONS

This work has demonstrated that low-pressure oil and/or natural gas wells intersecting coal seams can be plugged and safely mined through.

The use of a tracer gas, placed in the first productive zone below the coalbed when plugging, takes away any doubt that the well is adequately sealed before mining through.

Following is an outline of details that stand out for consideration in well plugging work.

1. To clean out wells that have casing or are suspected of having junk metal or casing in them, it is advisable to use cable tool rigs because of their versatility in clean out work.

2. If geophysical well logs have never been run in the well, it is imperative to run gamma ray, neutron, caliper, and casing-collar logs to accurately locate formations and minable coalbeds penetrated by the wells to obtain a record of the well casings, and to select mechanical bridge plug seating locations.

3. When a cement plug is placed at a producing formation a sufficient time should be allowed for cement to set up so that it will support tubing weight, thus allowing for accurate depth location of plug.

4. Any gas flow will cut the cement and render it ineffective as a plug, therefore, it is recommended that a mechanical bridge plug be set above the formation in a competent section determined from logs.

5. When pulling casing, sometimes considerable caving occurs.

The placing of drilling mud or cement plugs in the well before pulling the casing will prevent additional clean out work.

6. If one cannot perforate or rip casing and expects cement to get behind the casing for a positive seal, it is necessary to squeeze cement. There are numerous types and sizes of squeeze packers, cement retainers and cementers available to accomplish this.

7. There are low pressure high permeable zones present in many wells (thief zones, caves etc.) that will take well fluid and cement. It is worthwhile to circulate whenever possible before placing cement plugs. If circulation cannot be achieved, the use of lost circulation material may be in order, if not, cementing should be done in stages and each prior plug checked as cementing proceeds back up the hole.

8. Prior to assembling and placing the tracer gas units, the timing devices should be checked for one full time cycle. Upon assembling and preparing to place the tracer gas unit in the well, new, fully charged batteries should be installed in the timing device to insure proper operation.

9. It must be stressed that the use of $SF_6$ as a tracer gas to determine if a well has been properly plugged, is only effective in low-pressure wells. Low-pressure wells referred to in this report are wells having reservoir pressures well below 250 psi. When one is considering plugging a well suspected of having a reservoir pressure near 250 psi, the reservoir pressure and temperature should first be obtained. This is done to see if the $SF_6$ would be released, since the vapor pressure of $SF_6$ at $50^{o}F$. is about 240 psi.

## APPENDIX A - DETAILED FIELD LOGS FOR PLUGGING WELLS

RECORD OF PLUGGING, TRACER INJECTION AND MONITORING FOR TRACER LEAK IN AMEX COAL COMPANY'S TICE RISLEY WELLS 1 & 2, KEENSBURG, WABASH COUNTY, ILLINOIS. NOTE: DUE TO BOTTOM HOLE PRESSURES BEING IN EXCESS OF 250 PSI IN BOTH THESE WELLS, A RADIOACTIVE TRACER(KRYPTON 85) WAS USED INSTEAD OF SULFUR HEXAFLUORIDE ($SF_6$)

July 12, 1971

Morning

| | | |
|---|---|---|
| 11:00 | - | Ran cement retainer into TR #2 |
| 11:13 | - | Set retainer at 1,300 feet in TR #2 |

Afternoon

| | | |
|---|---|---|
| 2:45 | - | Ran dummy bomb to total depth (1,325') in TR #1 |
| 3:00 | - | Ran pressure bomb to 1,305 feet in TR #1 (to set over night) |
| 3:06 | - | Shut in TR #1 |
| 3:30 | - | Ran tubing with stinger for passing through cement retainer in TR #2 |
| 5:45 | - | Finished running tubing and put wellhead on TR #2 |

July 13, 1971

Morning

| | | |
|---|---|---|
| 11:05 | - | Pulled pressure bomb from TR #1 and read pressure (approximately 590 psi) |

Afternoon

| | | |
|---|---|---|
| 12:30 | - | Nitrogen truck on location |
| 2:45 | - | Started pumping nitrogen into TR #2 (wellhead pressure 590 psi) |
| 2:55 | - | Wellhead pressure 735 psi, injection rate 600 $ft^3$/min |
| 5:00 | - | Wellhead pressure 940 psi--50,000 $ft^3$ $N_2$ injected |
| 5:03 | - | Wellhead pressure 940 psi--started injecting Krypton 85 tracer, continued to inject $N_2$ at about 400 $ft^3$/min |

| | | |
|---|---|---|
| 5:11 | - | Tracer in well--started injection of 3,000 scf $N_2$ to displace tracer from tubing--injected 55,000 scf of nitrogen |
| 5:23 | - | Ready to cement TR #2 |
| 5:33 | - | Pumped 2.5 bbls of water to wet tubing |
| 5:35 | - | Start 4 sacks of cement to seal formation below cement retainer |
| 5:40 | - | Cement away--wellhead pressure 700 psi |
| 6:45 | - | Cement displaced from tubing with 5 bbl water @ wellhead pressure of 600 psi |
| | - | Dropped bar into cement retainer for final seal (pumped up to 1,000 psi at surface--retainer sealed) |
| 6:56 | - | Pulled stinger from cement retainer |
| 6:03 | - | Completed displacing 5 sacks of cement from tubing with 5 bbl water |
| 6:30 | - | Circulated to cut off cement at 1,240 feet and pulled 10 joints of tubing from well. |

July 14, 1971

Morning

| | | |
|---|---|---|
| 9:30 | - | |
| 11:30 | - | Pulled remainder of tubing from TR #2 |
| 11:30 | - | Started rigging up on TR #1 |

Afternoon

| | | |
|---|---|---|
| 12:43 | - | Set cement retainer at 1,235 feet (placed here to prevent pipe collapse) |
| 3:22 | - | Tubing run in TR #1 |
| 3:35 | - | Started injecting nitrogen @ 600 cfm |
| 3:40 | - | Wellhead pressure 700 psi @ 600 cfm |
| 4:03 | - | Wellhead pressure 575 psi with 15,000 $ft^3$ in--stepped up injection rate |
| 4:40 | - | Wellhead pressure 860 psi, 30,000 $ft^3$ $N_2$ injected |
| 5:05 | - | Wellhead pressure 860 psi, 45,000 $ft^3$ $N_2$ injected--started Krypton (tracer) injection |
| 5:10 | - | Tracer injection completed |
| 5:16 | - | 50,000 (total) scf nitrogen injected |
| 5:25 | - | 2 bbl water injected to wet tubing |
| 5:27 | - | Water in |
| 5:28 | - | Started pumping 8 sacks cement @ 500 psi |
| 5:36 | - | Cement away |
| 5:44 | - | Injected 5 bbl water to displace cement from tubing (500 psi) |
| 5:44 | - | Dropped bar to seal cement retainer (pumped up to 1,100 psi--retainer sealed) |
| | - | Opened wellhead--well back flowed water, tried pumping again, able to pressure up well, back flowed water again |

July 14, 1971

Afternoon--cont.

| | | |
|---|---|---|
| 6:12 | - | Decided to shut in well at 1,100 psi to allow cement to set |

July 15, 1971

Morning

| | | |
|---|---|---|
| 7:30 | - | Ran tests on well |
| | - | Ran sinker bar on steel line to determine if gas, water, and/cement were present. Water found at 170 feet, slushy cement at 1,038 feet |
| | - | Allowed some gas to escape from tubing (no tracer present) |
| | - | Blew down tubing only gas flowed tracer found at concentration of about 1/400 of that injected |
| | - | Decided cement retainer was set, pulled tubing and tried to pump through--could not |

Remainder of Morning

| | | |
|---|---|---|
| | - | Pulled tubing--6 joints contained cement (not all full) estimated 2.2 sacks cement lost (rate actual volume of casing below retainer 7 sacks; therefore, only lost about 1.2 sacks from below retainer. Probable cause of problem did not displace sufficient volume water to prevent gas from coming to surface through liquid, therefore, tubing contained gas which indicated pressure present although retainer was sealed. |
| | | Reran tubing to 1,233 feet |

Afternoon

| | | |
|---|---|---|
| 1:45 | - | Ran 6 sacks of cement with 3 percent NaCl on top of cement retainer |
| 2:00 | - | Cut off cement at 1,170 feet (circulated 15 bbl water) (measured top of cement with steel line at 1,168 feet) |
| 3:35 | - | Perforated pipe at 1,150 feet--4 holes 7/16" diameter |
| 4:30 | - | Started bullhead squeeze, pressured annulus to 1,500 psi wellhead, decided to pump only 26 sacks to fill casing |
| 5:02 | - | Cement away displacing with wiper plug |
| 5:13 | - | Wiper plug at 842' |

July 16, 1971

Morning

| | | |
|---|---|---|
| 9:33 | - | Started run to shoot 6 holes in casing |
| 9:43 | - | Shot 6 holes at 789-791' |
| 9:45 | - | Top of cement plug at 794' |
| 10:15 | - | Started squeeze with 20 sacks Hi Early cement, pumping pressure 600 psi |
| 10:21 | - | Surface pressure 500 psi |
| 10:23 | - | Surface pressure 450 psi |
| 10:26 | - | Shut in surface pressure 200 psi |
| | - | Started to displace wiper plug 500 psi surface |
| 10:28 | - | Surface pressure 550 psi |
| 10:30 | - | Surface pressure 600 psi |
| 10:31 | - | Surface pressure 650 psi |
| 10:32 | - | Surface pressure 700 psi |
| | - | Ran wiper plug to 780.5 (looks like good squeeze) |

Afternoon

| | | |
|---|---|---|
| 12:00 | - | Started swabbing TR #2 |
| | - | Trace of tracer encountered after swabbing TR #2, probably result of loss during injection. |

TRACER INJECTION DATA

July 13, 1971

4:15 p.m.- Injected approximately 300 mc Kr 85 into Tice-Risely No. 2 with about 3,000 scf $N_2$ as a carrier. This was done directly from a 250 scf high-pressure cylinder. The cylinder was repressured to 1,950 psi afterward to provide sufficient pressure for the next injection. The injection plumbing as well as the wellhead plumbing was checked for leaks (bubble method) at 500 psi before injection; none were detected. Injection of the tracer was followed with a 5,000 scf $N_2$ cushion. No leaks were detected after cementing.

July 14, 1971

4:30 p.m.- Injected approximately 400 mc Kr 85 into Tice-Risley No. 1 with about 4,000 scf $N_2$ as a carrier. Same injection procedure as No. 2. Blowback during cementing operation contained tracer of approximately 0.05% of the original concentration. Subsequent blowdown contained no tracer.

FIELD OPERATION NOTES, TICE-RISLEY NO. 2

July 16, 1971

10:00 a.m.- Well was swabbed and checked for presence of tracer; very slight show during swabbing operation, non residual. Well was then refilled with water and perforated with 10 shots between 791.5' and 799' (coalseam). Three shots top and bottom on 6" spacing and remainder on 15" spacing. Hole was again swabbed; slight show of tracer on last pull. No show of tracer at wellhead at 3:00 p.m.
Well shut in.

July 17, 1971

8:00 a.m.- Well shut in overnight, built up a few pounds of pressure (no gauge on well, estimate 304 psi). Slight show of tracer during swabbing. Liquid level 100' off bottom
Well shut in.

4:30 p.m.- Slight pressure buildup; no show of tracer.

July 18, 1971

8:40 a.m.- Same approximate pressure buildup, definite show of tracer during blowdown gradually increased to about 50 on X1 scale.
Well shut in again.

12:00 noon- Checked well again, pressure built up as before but no tracer show during blowdown. Well shut in.

July 19, 1971

- Pressure buildup as usual, 304 psi. No show of tracer during blowdown.
Well shut in.

FIELD OPERATION NOTES, TICE-RISLEY NO. 1

July 17, 1971

9:00 a.m.- Rigged perf. gun with same pattern as TR #2 except used 11 shots because of more coal. Went into hole, hit bottom at 732', cement apparently had moved up hole 50'. Moved drilling rig onto hole at 10:00 a.m. Spudded and bailed to 771'. Drilled from there, found plug at 778', drilled to T.D. of 785'. Apparently cementer neglected to flush lines before placing the plug. Rigged perf. gun again and fired shot at 2:55 p.m., 11 shots between 771' and 779'. Swabbed hole dry, no show of tracer.
Well shut in.

July 18, 1971

9:00 a.m.- No pressure buildup, no show of tracer. Swage loose in casing, valve may not have been closed tight on July 17.

4:30 p.m.- Same pressure buildup (est. 3-4 psi) no show of tracer.
Well shut in.

July 19, 1971

7:30 a.m.- Approximately same pressure buildup as TR #2, 3-4 psi, no show of tracer. Swabbed well at 8:00 a.m., no show of tracer. Liquid level at 300' off bottom (about 485' from surface). Moved rig off well, parked in field.

Monitoring of Tice-Risley wells 1 and 2 was done monthly through November of 1971. A record of the December monitoring and the plugging of both wells follows:

It rained the morning of December 14 and was extremely foggy and smoky in the area. The background reading fluctuated between 30-40 on the X100 scale of the sniffer a half mile from the wells and around the wells. When opening the wells the reading did not change. Due to the bad weather the service unit and tubing did not get on the Risley well 2 location until about 11:00 a.m. Snyder's rigs were all tied up so they used Harrison Well Service out of Mt. Carmel, Ill.

The background reading was 13 on the X1 scale of the sniffer before starting to fill with cement. The well was monitored during the displacing of water with cement. The reading fluctuated from 13 to 18 on the X1 scale. The well was cemented to surface with 120 sacks Hi-Early mixed 8 sacks per bbl (weight 15 lb.).

The plugging of well 2 was witnessed by Chuck Porterfield, Ray Billman, and Jack Osborne with Ayrshire and G. E. Rennick, U.S.B.M. (See Fig. A-1)

The service unit was moved to Tice Risley Well 1. Five sacks of Cal-Seal was placed on bottom (785 feet) pumped through tubing. The tubing was pulled to 729' and broke circulation to cut off Cal-Seal. The background reading was 14 and the reading was 17

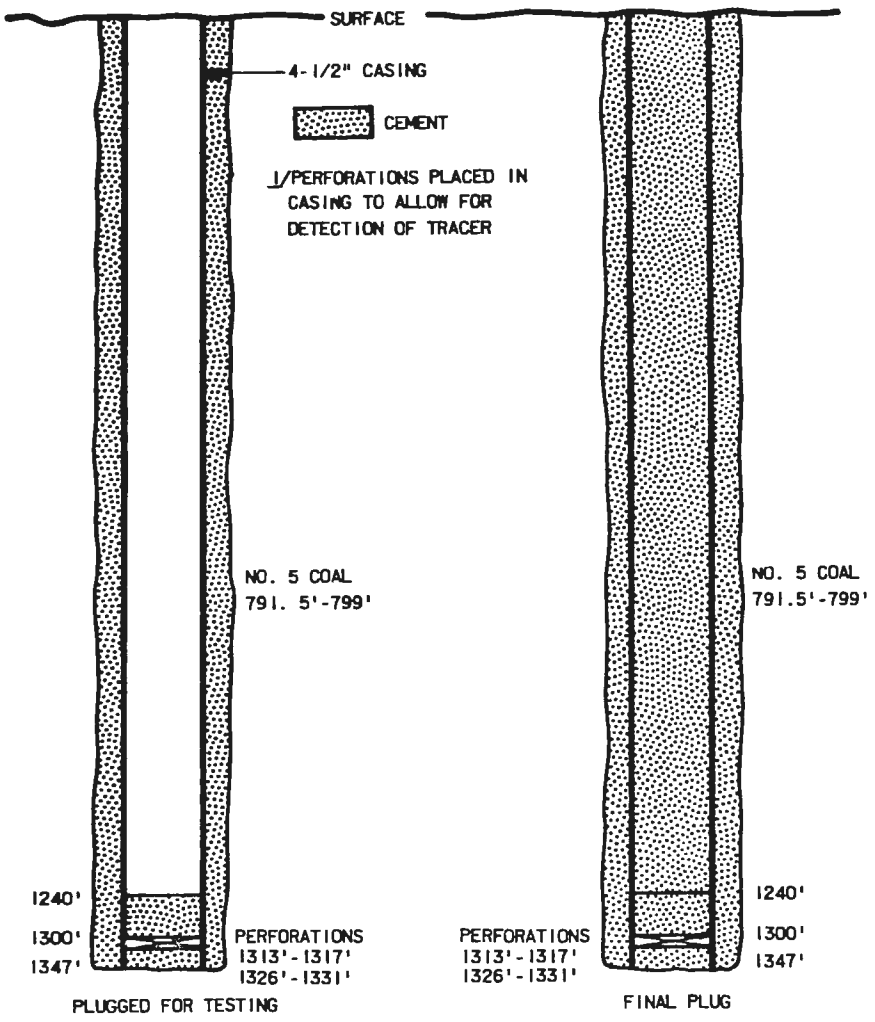


FIGURE A-1. - AMEX COAL CO. TICE RISLEY WELL NO. 2, KEENSBURG, WABASH COUNTY, ILLINOIS

when placing the Cal-Seal plug. December 15, 1971, found bottom at 738 feet. Perforated from 710-712, 2 shots per foot, using a shape charge 0.54 inch hole diameter. The reading after shooting was 14 on X1 scale of the sniffer.

Pumped water through perforations at surface pressure of 500-600 psi. Pumped in 86 sacks Hi-Early cement. This would put 20 sacks behind pipe. Shut in surface pressure was 400 psi.

The plugging of well 1 was witnessed by Cleo Spond, Inspector, Division of Oil and Gas, State of Illinois; Ray Billman and Jack Osborne with Ayrshire; and G. E. Rennick U.S.B.M. (see figure A-2).

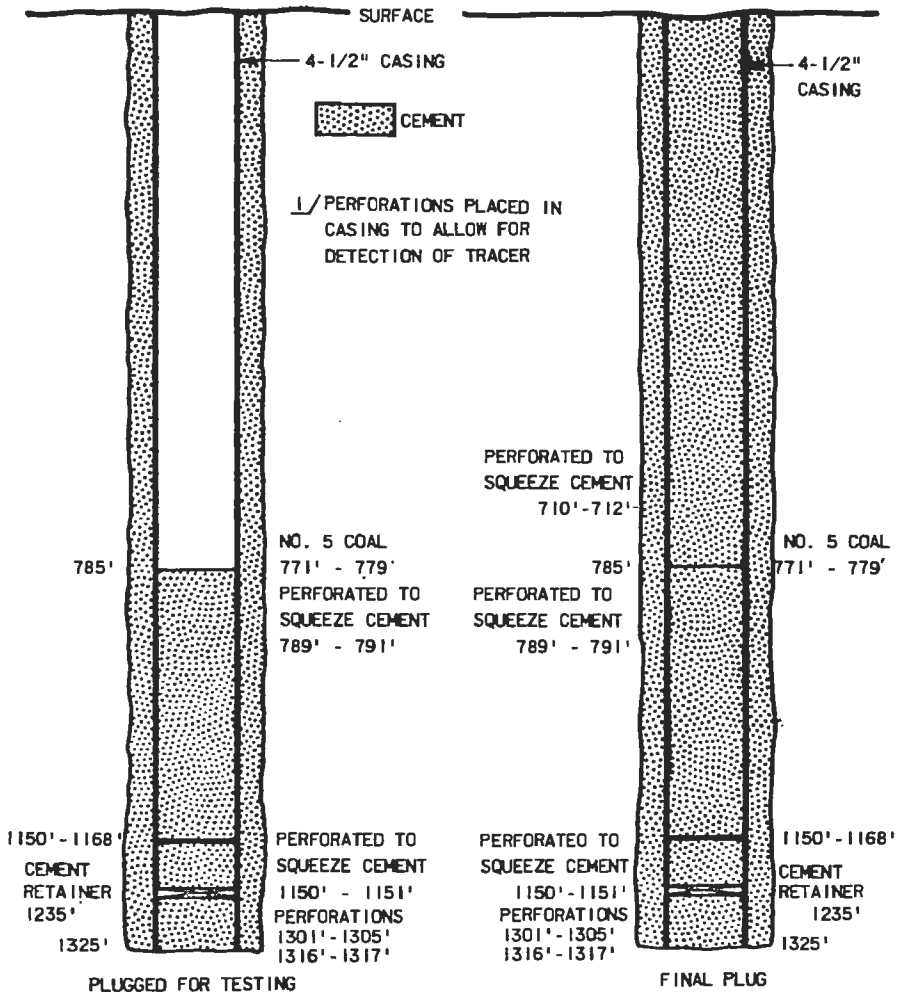


FIGURE A-2. - AMEX COAL CO. TICE RISLEY WELL NO. 1, KEENSBURG, WABASH COUNTY, ILLINOIS

RECORD OF CLEANOUT, LOGGING, TESTING, REPLUGGING, AND MINING THROUGH INLAND STEEL COMPANY'S WELL 1, SESSER, JEFFERSON COUNTY, ILLINOIS

April 25, 1974

Backhoe found cement 4 feet under surface. Set 5-inch pipe from 4 feet down back to 1 foot above surface, filled in around 5-inch pipe with backhoe. Dug 2 pits.
Rector and Stone, Drilling Contractor, Carmi, Illinois, moved in, 1970 Portadrill rigged up.
Drilled good cement (50-foot plug). Blew hole to bridge @250 feet. Cleaned out bridge, blew down to 260 feet. Compressor not working right, shut down at 7:00 p.m.

April 26, 1974

Hauled water to drill plug with 4-3/4-inch bit, plug not competent. Circulated down to 922 feet. Cutting samples taken every 30 feet (drill mud and cement), circulated till 6:30 p.m. Moved rig ahead, dug out cellar with backhoe, removed 5-inch pipe, welded 10-3/4-inch pipe on 10-3/4 casing, filled back in, moved rig over hole, cut 10-3/4-inch off at surface. Started reaming with 8-3/4-inch bit at 10:25 p.m.

April 27, 1974

Reamed and circulated hole to 920 feet at 3:55 a.m. Circulated and came out of hole at 5:20 a.m.

9:45 a.m.- Logging truck on location (Snyder, Grayville, Illinois). Ran caliper log first, hole bigger than thought, 10 to 11 inches, hole pinched at 725 to 735 feet. Ran gamma ray, neutron and casing collar log.
Had to spud through 725 to 735 feet. 10-3/4-inch casing at 156 feet.
Herrin No. 6 coal 724 to 733 feet.
Harrisburg No. 5 coal 760 to 765 feet.
Picked packer seat 770 to 780 feet (775 feet). Blew hole down to 550 feet. Looked like will make fluid; therefore, decided to set packer and then swab tubing. Will get 2-7/8-inch OD tubing, swab cups, etc. for a.m.
Shut down 7:00 p.m.

April 28, 1974

- Circulated hole. Tubing on location at 9:30 a.m. Stand drill pipe.
- Baker Oil Tools brought packer (Ken Koontz). Lynes expandable packer 7-5/8-inch OD will expand to 12 inches. Run packer on 2-7/8-inch OD tubing, 3 joints tail pipe below packer with swab stop. Set packer center of 54-inch rubber @ 774 feet, took 1,500 psi hydraulic pressure to shear pin. Swab hole down 500 feet at 3:30 p.m. Drive chain broke, could not fix, cut line, put on another drum, started swab again at 4:30 p.m. At 6:00 p.m. changed swab rubbers. 7:30 p.m. stopped swabbing, getting about 10 gallons.

Ran Bureau Bailer to 830 feet--fluid. Ran Bureau Bailer to 801 feet--no fluid. Ran Bureau 300 psi pressure bomb and set @ 800 feet.

Shut in 8:00 p.m.

April 29, 1974

- Made arrangements with GEO Engineering Laboratories for gas sample analysis. Checked wellhead pressure at noon--9 psi. Picked up logs. Went to Crossville to discuss plugging with Halliburton. Tentative program based on 10-inch hole, 875 to 750 feet, 125 feet-30 percent excess = 75 sks Class A with 2 percent CaCl, 750 feet to surface 750 feet + 30 percent excess = 450 sks.

7:00 p.m.- Pulled bomb. Surface gage pressure 11.6 psi. First 30 minute pressure was 0 until water reached the instrument maximum pressure after 23 hours--185 psi. The water was salty. The pressure recorded was equivalent to the head of water over the instrument.

Bled well down through wet test meter 11.6 psi to 0 in one hour, 121.5 cubic feet. Collected gas sample when bled down to 5.4 psi. Ran bailer until pinpoint fluid @ 430 feet. Shut well in at 9:00 p.m. Took sample to GEO Engineering Laboratories for analysis.

April 30, 1974

- Carey Niewold brought GEO Engineering sampler to well, reported no hydrocarbons in sample taken last night.

Less than 1 psi on tubing, opened up--one puff.

Ran bailer, found fluid level @ 415 feet, collected 2 GEO Engineering samples (counted as one for analysis). Discussed project with Ralph Banks and Dick Shockley, Inland Steel Company.

Ran bailer, fluid @ 405 feet. Collected water sample. Ran vacuum pump, pulled 20-inch vacuum on tubing, collected Bureau sample No. 2 at 3:25 p.m. Ran GEO sampler, collected GEO sample No. 3 at 10:25 p.m. Took samples to GEO lab at 11:55 p.m.

May 1, 1974

Found fluid @ 385 feet. Pulled 22-inch vacuum and collected sample no. 4 at 9:15 a.m. Ran GEO sampler, collected GEO sample No. 4 at 9:30 a.m. Took samples to GEO lab at 11:00 a.m.
Turned rental car in.

3:00 p.m.- Fluid @ 375 feet. Collected Bureau sample No. 5 after vacuum 25-inch at 3:10 p.m. Collected Bureau sample No. 6 after vacuum 27-inch at 3:13 p.m. Will take sample No. 6 back to Morgantown.
Shut well in at 10:30 p.m. Evacuated sample bottle.

May 2, 1974

12:30 a.m.- Took sample No. 7 (vacuum bottle when opened the well). Will take sample No. 7 to Morgantown.
Hung in mud on way out of lease. Two hours digging out

3:00 a.m.- Took sample No. 5 to GEO lab

7:00 a.m.- Unseat packer, pull tubing. Packer rubber in very good condition.

10:00 a.m.- Halliburton on site. Raining very hard, need Cat all day. Ran drill pipe, Halliburton did not bring calcium chloride, waited for engineer to get back--2:45 p.m. Mixed 160 lbs. CaCl with water.

3:21 p.m.- Pipe at 875 feet, mix and pump 75 sx Class A cement, 5.2 gal/sx = 15.6 lb/gal cement away.
Collected cement samples 1, 2, and 3 during

mixing. Pulled up 10 joints drill pipe, wait on cement. Tagged cement at 6:50 p.m. @ 770 feet. Satisfied good plug, pump pressure up and took weight. Cementing to surface was then continued from 769 feet.
300 feet plug 133 sx, samples 4 and 5
Pulled 9 joints, 200 feet plug 119 sx, samples 6 and 7
Pulled 8 joints, 270 feet plug 150 sx, samples 8 and 9

9:45 p.m.- Pulled out of hole, filled with 6 sx
Total cement used - 483 sx. Picked up sample bottles and report at GEO lab at 11:00 p.m.

May 3, 1974

At 6:45 a.m. checked well, cement down only about 15 feet. Met with Rector and Stone in Carmi at 10:00 a.m. They will top off well with cement, cut 4-foot pipe nipple off, drain pits and fill, restore surface and contact Dick Shockley, Inland Steel for his approval (See Figure A-3)
The following is a summary of gas samples collected during the test period. The packer was set below coal at 774 feet so that any gas coming in below the coal could be collected for analysis:

| Date | Time | Sample No. | Method | GEO Eng. Lab Sample No. | Depth Sampled |
|---|---|---|---|---|---|
| 4-29-74 | 7:40 p.m. | 1 | Well Press, purge bottle | | Surface |
| 4-30-74 | 8:15 a.m. | | Vacuum well purge | 1 | 400 feet |
| | 3:25 p.m. | 2 | bottle | | |
| | 3:35 p.m. | | Vacuum well purge | 2 | 400 feet |
| | 10:15 p.m. | 3 | bottle | | |
| | 10:25 p.m. | | | 3 | 390 feet |
| 5-1-74 | 9:15 a.m. | 4 | Vacuum well purge bottle | | |
| | 9:30 a.m. | | | 4 | 380 feet |
| | 3:10 p.m. | 5 | Vacuum well purge bottle | | |
| | 3:13 p.m. | 6 | Vacuum well purge bottle | | |

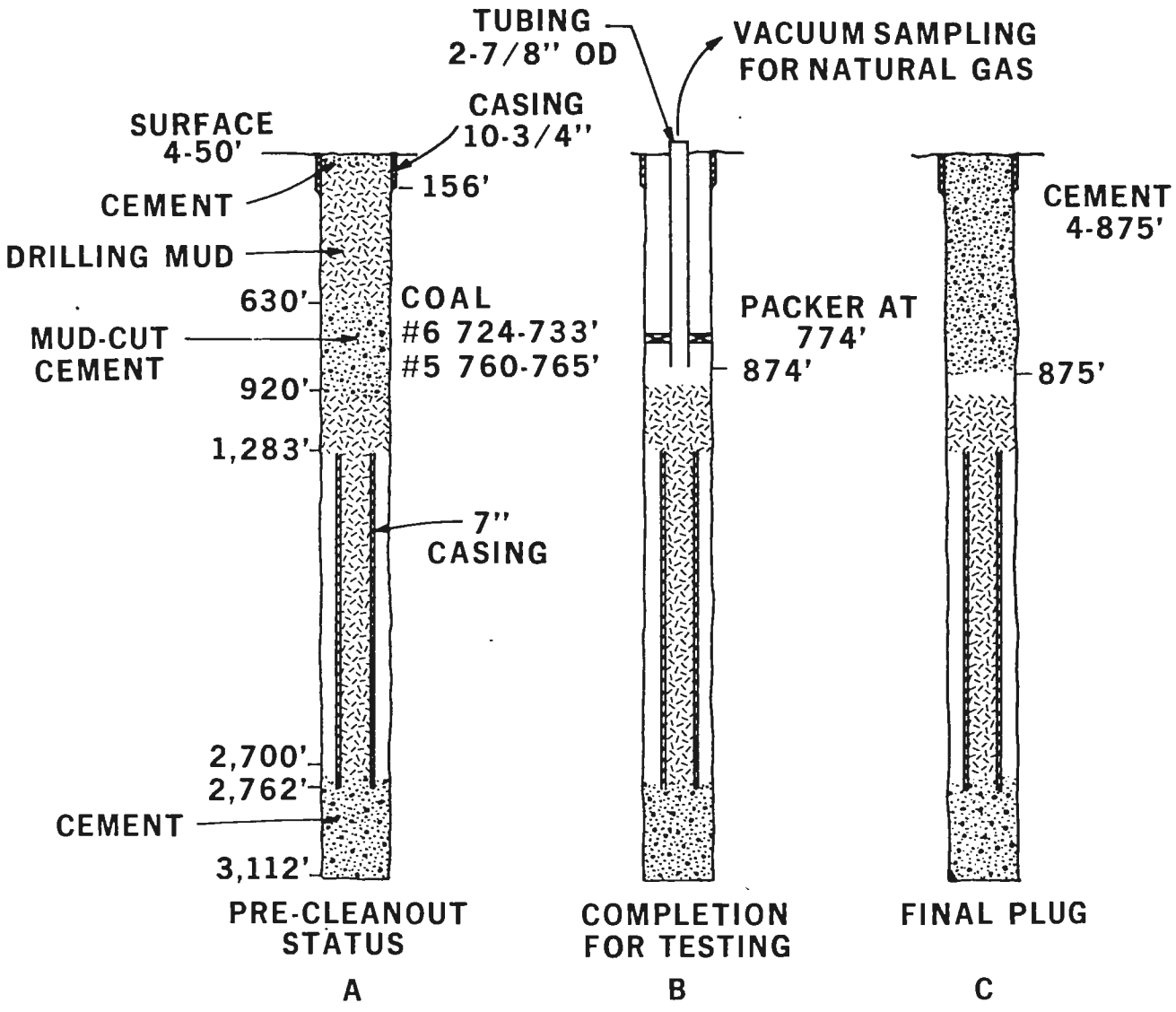


FIGURE A-3. - INLAND STEEL COMPANY WELL NO. 1

(REFERENCE NO. 43) U.S.B.M. ID NO. 11006010

JEFFERSON COUNTY, ILLINOIS

(AREA OF MINE - 9 RIGHT ENTRY OFF 1 MAINS WEST, INLAND MINE, SESSER, ILL.)

| | | | | |
|---|---|---|---|---|
| 5-2-74 | 12:30 a.m. | 7 | Well press, vacuum bottle | surface |

Bureau samples 1 through 5 and GEO samples 1 through 4 were analyzed by GEO Lab and showed no hydrocarbons present.

Bureau samples 6 and 7 were run on a Perkin-Elmer GC Model 154D, Thermal Conductivity Detector. A 4 feet ¼ inch O.D. column packed with DI 2 ethyl hexyl sebacate.

A trace of hydrocarbons were found in sample No. 6

Sample No. 6 analysis:

| | |
|---|---|
| Oxygen - $O_2$ | 18.27% |
| Nitrogen - $N_2$ | 81.59% |
| Methane - $CH_4$ | 0.12% |
| Ethane - $C_2H_6$ | 30.21 ppm |
| Carbon Dioxide - $CO_2$ | 0.02% |
| Propane - $C_3H_8$ | 17.26 ppm |
| Iso-Butane - $ic_4H_{10}$ | 24.00 ppm |
| Butane - $C_4H_{10}$ | 90.24 ppm |

No hydrocarbons were present in sample No. 7.

It was encouraging to see the interest taken in this project by the UMWA, Inland Steel Company, and the State of Illinois. The following is a list of people who visited the well at one time or another during the operation:

Kenneth Dawes, President UMWA, District 12

UMWA Safety Committee Inland Steel Company Mine

| | | |
|---|---|---|
| Terry Dees | Tony Kujawa | Larry Sample |
| Don Lappin | Russ Phillips | |

Inland Steel Company

| | | |
|---|---|---|
| Richard Shockley | E. H. Roberts | Jerry Zmudzinski |

State of Illinois

John Morthland, Department of Mines and Minerals

Tom Martin, Oil and Gas Division

This well was mined out July 27, 1974 on a regular mining cycle. Present during the mining out of the well besides the mining crew were Inland's safety director and safety engineer, an Illinois state mine inspector, a MESA mine inspector, and a petroleum engineer from MERC. There was no methane in samples of the atmosphere near the base of the coal.

The cement was in excellent condition and set-up very hard. Figure A-4 shows a section of cement removed from the coalbed. Permeability and porosity measurements were run on the cement removed in the mine and on samples collected from the mixer on the surface when it was pumped into the well through tubing.

| Cement | Permeability, md | Porosity Percent |
|---|---|---|
| Surface sample | 6.0 | 36.8 |
| Mined-out sample | 0.5 | 10.7 |

This listing shows the favorable reduction in permeability and porosity obtained from pressure cementing.

RECORD OF CLEANOUT, LOGGING, TESTING, REPLUGGING, AND MINING THROUGH INLAND STEEL COMPANY WELL NO. 4, SESSER, JEFFERSON COUNTY, ILLINOIS

January 6, 1975

- Drilling contractor (Dikor) started moving on location.

January 7, 1975

- Cat broke down. Finished rigging up at 9:00 p.m. and started to haul water. First load rear end went out on water truck.

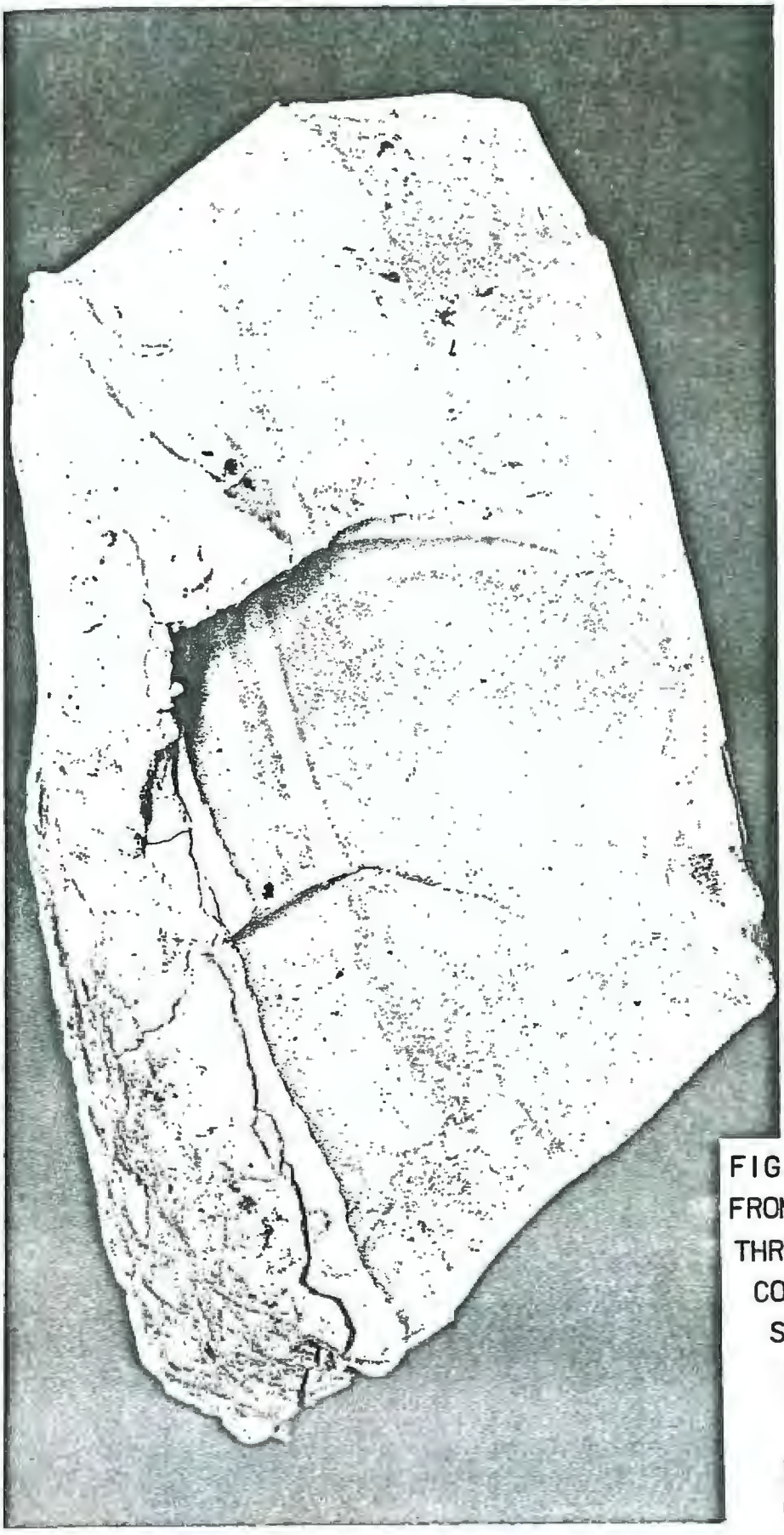

FIG. A-4. - CEMENT SECTION FROM THE SECOND WELL MINED THROUGH UNDER THE FEDERAL COAL MINE HEALTH AND SAFETY ACT OF 1969

Well: Inland Steel Co. Well 1

Location: Section 25, Township 4, Range 1 of the 3rd Principal Meridian, Jefferson Co., Illinois

Date Plugged: May 2, 1974

Mine: Inland Mine, Sesser, Illinois

Location in Mine: 9 Right Entry off 1 Mains West

Coalbed: #6 Coal

Date Mined Through: July 27, 1974

January 8, 1975

Fix truck on location, raining very hard all morning. Haul water ready to start, at 5:00 p.m. mud pump broke down. Got another pump (diesel) repiped. Started in hole at 9:30 p.m. Cement at 21 feet. Called Tom Martin, State Oil and Gas Inspector.

January 9, 1975

Drill cement 21-40 feet, 60-64 feet and 625-765, still in cement at 765 feet, circulated hole 9:00 a.m.--noon, wait on cat to pull logger in.
Logger on location at 1:30 p.m. (Snyder, Grayville, Ill.). Started to log at 2:30 p.m.--tool shorted out. Rebuilt cable head. Ran gamma ray, neutron casing collar, and caliper logs. Finish 6:40 p.m. Start blowing hole down.

January 10, 1975

At 2:00 a.m. hole blew down. Called Sam Williams (Dikor) having tubing cut down and threaded, be ready about 3:00 p.m. Called GEO Laboratories and discussed gas analyses beginning Sunday.
At 1:00 p.m. start up, go in blow hole down, heavy drill mud at 620 feet, difficult to blow out, hole tight at No. 5 coal. Tubing on location at 5:00 p.m. (3" line pipe). Run Lynes expandable packer 7-3/8 inch O.D. will expand to 12 inches. Run packer on 3" line pipe and set center of packer at 744.5 feet 8:00 p.m. Ran Bureau 300 psi pressure bomb set at 745 feet at 8:23 p.m.

January 11, 1975

Very cold, trouble starting wire line unit. At 9:30 p.m. pulled bomb.Pressure higher than 300 psi from heavy fluid. Run 2,500 psi bomb 745 feet at 11:15 p.m. Took gas sample from lubricator.

January 12, 1975

Very cold and high winds. Called Sam Williams at 7:30 a.m. to see if we can get pulling unit to bail and swab tubing. Over 3 hours to get wire line unit started. Fluid very heavy, line broke, pulled out, line broke close to instrument. Tubing full of fluid.
Gerald Raney (tool pusher) arrived noon. Will

get pulling unit early Monday. Will rent 2" bailer and fishing tools. Called GEO Laboratories at 3:30 p.m. No hydrocarbons in sample.

January 13, 1975

Called Joe Pasini to discuss progress. Bailing unit spent a.m. getting started (very cold) and splicing swab line. Arrive on location at 1:30 p.m. made two runs with overshot try to fish instrument, no luck. Swabbed and bailed tubing down. Collected two gas samples. Took one sample to GEO Laboratories at 8:00 p.m.

January 14, 1975

Ran swab fluid up about 20 feet. Bail fluid down. Vacuumed well 25 minutes, collected sample No. 3 for GEO Laboratories, also duplicate sample to take to Bureau.

11:00 a.m.- Took sample to GEO Laboratories.

1:20 p.m.- Well still on vacuum, run bailer about 2 gallon water. Vacuumed tubing, collected 2 more samples.

2:30 p.m.- Tried to pull tubing will have to circulate, no pump on location.

4:00 p.m.- Took sample No. 4 to GEO Laboratories. Returned rental car.

5:00 p.m.- Called GEO Laboratories, no hydrocarbons.

9:00 p.m.- Talked with tool pusher, will have to wait for cementer to pump tubing loose in morning. Called Tom Martin, Oil and Gas Inspector to tell him progress.

January 15, 1975

8:00 a.m.- Independent oil well cementing company on location.

9:00 a.m.- Rig up. Break circulation (450 psi), freed packer.

9:30 a.m.- Start out with tubing

11:45 a.m.- Out of hole

12:15 noon- Start in with tubing.

2:30 p.m.- Tubing at 760 feet. Broke circulation

3:00 p.m.- Mix and pump 100 sacks Class A cement with 160 lbs CaCl in 12 bbl water.

Pull tubing to 420 feet, broke circulation and went around 1-½ times, no cement return.

6:00 p.m.- Lower tubing cement at 556 feet, placed cement:
557 - 354 feet, displace w/5 bbl water
354 - 151 feet, displace w/3 bbl water
151 - surface, circulated cement then displaced w/1.3 bbl water

Total cement used - 425 sacks

8:15 p.m.- Pulled tubing. Filled 10-3/4 w/cement to surface, job complete (See Figure A-5)
Witness by Tom Martin, Illinois State Oil and Gas Inspector

10:00 p.m.- Called Tony Kujawa, not home in Springfield, told his wife would send him report.

This well was mined out July 14, 1975, on a regular mining cycle. Present during the mining out of the well besides the mining crew was a MESA mine inspector who received air samples of the atmosphere in the mine and pieces of cement from the well for testing. Laboratory tests showed no methane in the air samples.

RECORD OF PLUGGING AND MINING INTO NORTH AMERICAN COAL CORPORATIONS' L. R. USENICK WELL, RICHLAND TOWNSHIP, BELMONT COUNTY, OHIO

August 8, 1973

Installed clock and explosive mechanism on Bureau's tracer unit. Set clock at 9:15 a.m. for about 4 days.
Logging company (Shelwell Services, Inc.) were 5 hours late. Towed truck onto location with wrecker. Started into well 2:45 p.m.
Set Bureau tracer unit @ 898-876 feet
Set Gearhart Owens mechanical bridge plug at 858 feet
Could not get loose, broke cable at surface

August 9, 1973

Cut logging cable at top of setting tool with rope knife
Fished setting tool with overshot, plug was well set because it took hard pull and use of jars to break loose. Never did break the shear pin. Pulled plug out less bottom slips and rubber.

9:00 p.m.- Run Caliper tool twice. Wellbore still OK where plug was set, tried to locate a plug or retainer. Unable to get one less than 2 days.

August 10, 1973

Put 20 gal river gravel top of tracer unit. Put 3 sacks Calseal on top of gravel with dump bailer

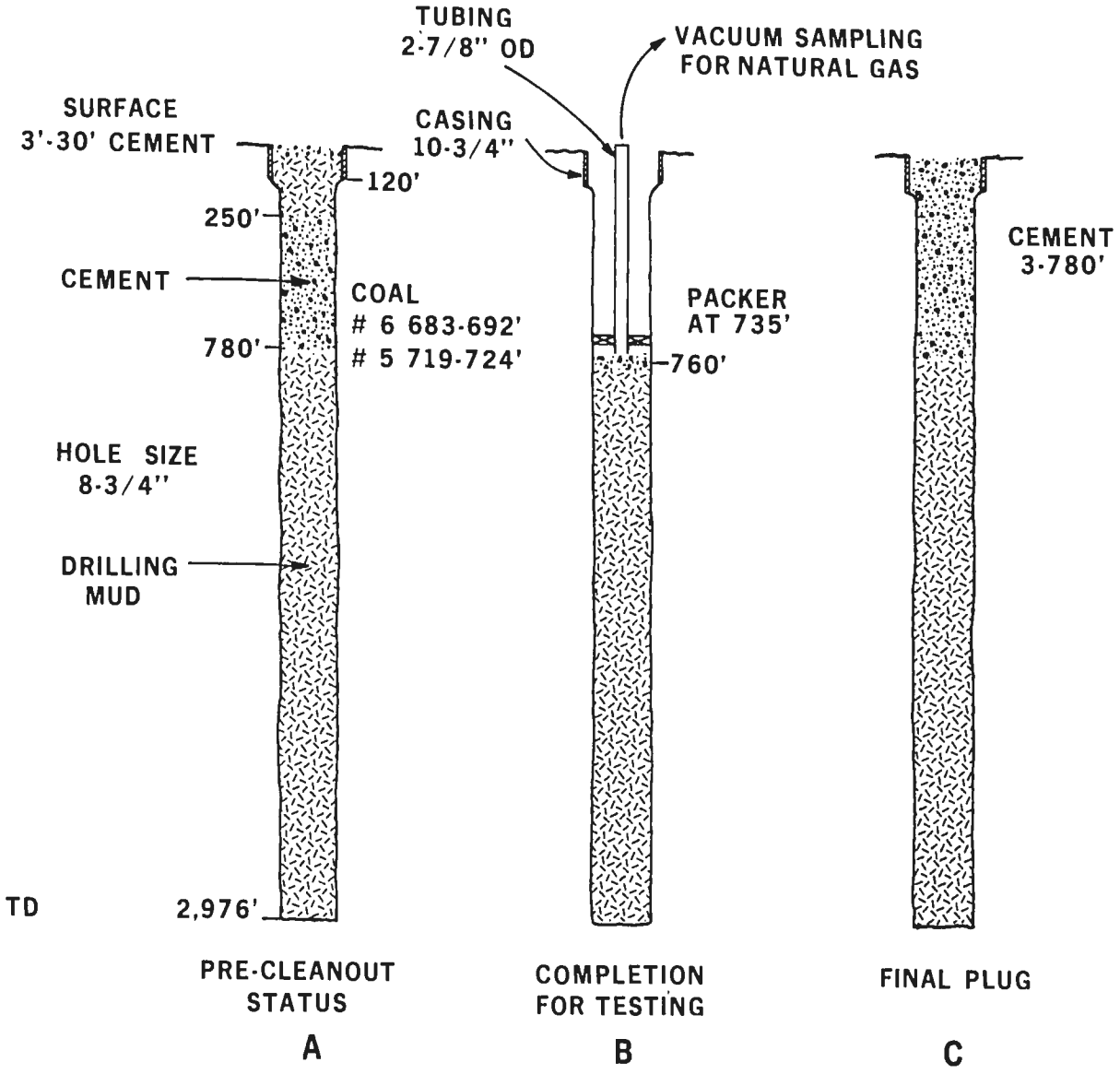


FIGURE A-5. - INLAND STEEL COMPANY WELL NO. 4

(REFERENCE NO. 58)

JEFFERSON COUNTY, ILLINOIS

(AREA OF MINE - 7 RIGHT EAST MAINS, INLAND MINE, SESSER, ILL.)

Perforated 6-inch casing with 4 shots @ following 6 locations: 710, 660, 600, 550, 500, and @ 450 feet
Ran 2-inch pipe to cement through, cement with 125 sacks expanding cement (Medusa) by Halliburton. Pulled tubing to 413 feet

7:00 p.m.- Circulated (no cement returns)
Run wire line, cement at 596 feet (cave zone somewhere took cement).

8:30 p.m.- Lowered 2-inch pipe to 590. Pumped 100 more sacks expanding cement
Pulled pipe to 413 feet, began circulating. Plugged somewhere, returns coming around 8-inch casing and between 6- and 8-inch casings. Pulled 2-inch pipe couple hundred feet and washed back down and then established circulation at 422 feet 11:15 p.m.
The contractor pulled the new 6-¼ inch casing (412 feet) which he had run when cleaning out the well. The new 8-inch was pulled up to 136 feet. Shelwell then ran gamma ray, neutron, caliper, and density logs. The hole badly caved, could not detect coal. It was cleaned out and 8-inch casing lowered to 188 feet.

August 14, 1973

Gamma ray and neutron logs rerun, did not repeat 8/11 logs. The Pittsburgh Coal (No. 9 coal) estimated to be 167-172 feet. Additional study and correlation data of the area would be required to be sure if this is exact.
Perforated old 8-inch casing with 4 shots each @ 400, 350, 300 and 250 feet. Obtained gas sample.

August 15, 1973

Ran 2-inch pipe to 420 feet for cementing. Pumped 250 sacks expanding cement (11 min). Pulled up 189 feet, circulated hole clean about 20 sacks excess.
Ran wire line, cement at 200 feet
Could not pull 8-inch casing (cemented in).

August 16, 1973

Bailed well dry, waited 45 min. Ran bailer, no water entering borehole. Collected gas sample. Federal mine inspector to collect sample once per week. (See Figure A-6)

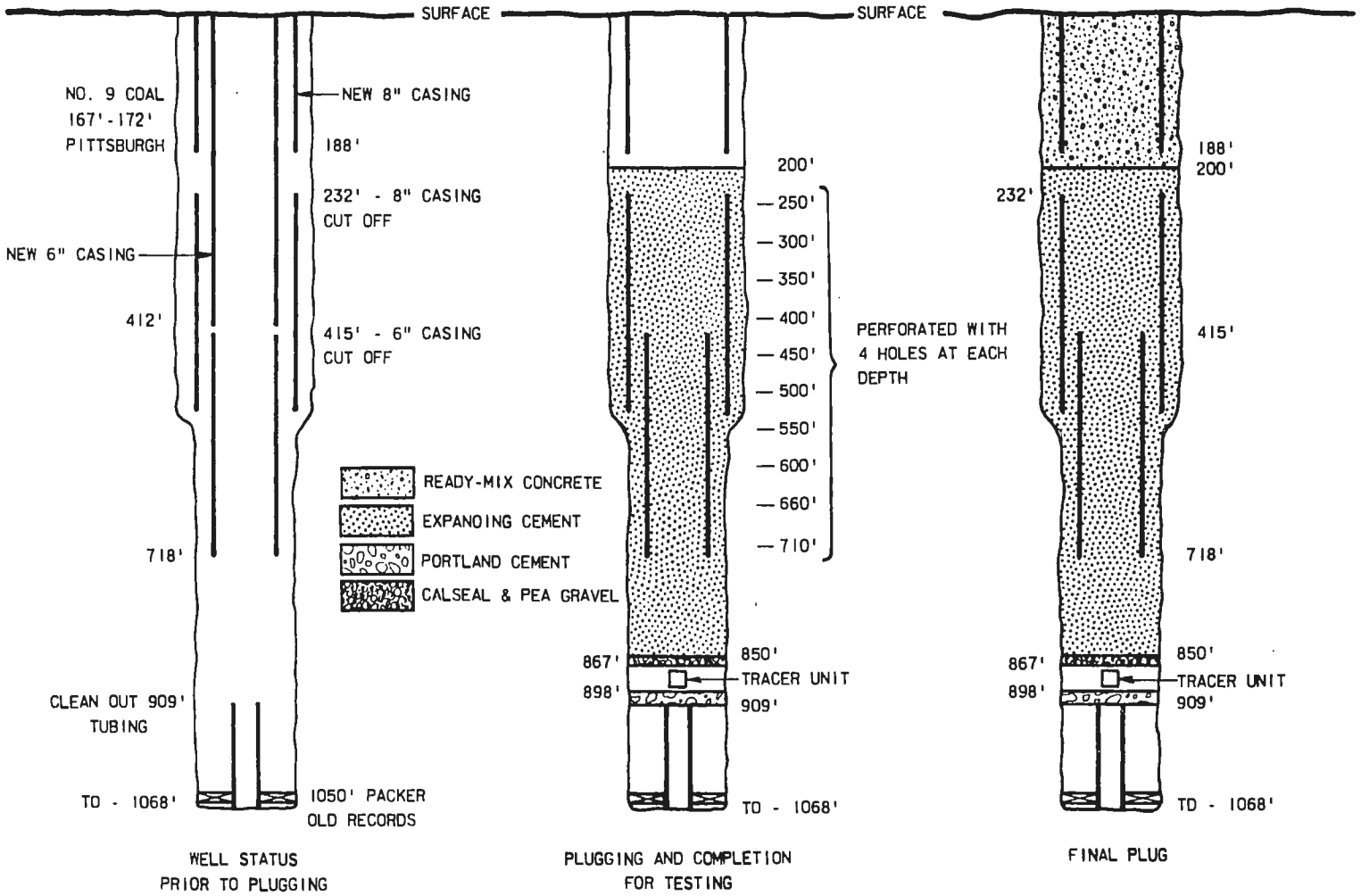


FIGURE A-6. - NORTH AMERICAN COAL CORPORATION OHIO DIVISION, L.R. USENICK WELL, BELMONT COUNTY, OHIO

Plugging work was witnessed by:

August 8, 9, 10, 1973

Rennick, Watts, Locke (Bureau)
Don Ward, Chief Engineer, North American Coal Corp.
Jim Brockwell, Engineer, North American Coal Corp.

August 8, 1973

Henry Roberts, Deputy Mine Inspector, Ohio Div. of Mines
Joe Zelek, Inspector, Ohio Division of Mines

August 9, 1973

Joe Zelek, Inspector, Ohio Division of Mines

August 10, 1973

Joe Zelek, Inspector, Ohio Division of Mines

August 14, 1973

Watts, Henry Roberts, Jim Brockwell

August 15, 1973

Watts, Joe Zelek, Jim Brockwell

August 16, 1973

Watts

The mining to the L. R. Usenick well occurred during a regular mining cycle on May 28, 1975. A record of the procedure follows:

May 27, 1975

A Joy 15 RU cutter, undercut the coal 10 feet into the face 16 feet wide. A boring machine then drilled 10 holes into the coal about 1½ inch diameter, these were tamped with explosive powder and set off. A loading machine then loaded out about 10 buggies. They mine the coal (5 feet) and take 1 foot of top by conventional mining. The well was not in this cut. The General Superintendent decided it would run too late to make another cut and they would get the roof bolted and continue the next day.

May 28, 1975

Stanley Kretoski, Supervisor Federal Coal Mine Inspector, checked the air flow at 18,000 cfm, also checked methane monitor on cutter. Machine broke down about one hour. Moved it to face and when undercutting it hit the well casing. It would not cut through the pipe, a cut was made up and down on both sides of the 8-inch casing. The cutter pulled enough coal out that the pipe could be seen about 5 feet in from the face. Two gas samples were taken from this opening in the coal. Holes were then drilled, tamped, shot and the coal loaded out, exposing 180° of the casing. One could see the very good cement job around the pipe all through the coalseam.

May 31, 1975

The 8-inch casing was cut off with pipe cutters at the roof and base of the coal and the section of pipe through the coal was removed, the pipe was full of cement and well set up.

May 28, 1975

The following people witnessed mining to the well:

Richard Dingey, Melvin Byers, and Robert Traylinek, Deputy Mine Inspectors, Ohio Department of Mines.

Also present to witness mining to the well were:

William Youst, Safety Committee and President UMWA, Local 2262
Charles Newell, Safety Committee Member
Dave Shreve, UMWA District 6 Safety Coordinator.

The following people with North American Coal Corp.:

Jim Brockwell, Assistant Chief Engineer
Sam Hansky, Superintendent No. 3 Mine
Maynard St. John, Assistant to Superintendent
William Dobbins, General Mine Foreman
Stanley Shultz, Section Foreman
Percy Hawkins, Division Safety Director
Frank Hansky, Safety Director No. 3 mine
T. J. Ward, Assistant Safety Director No. 3 mine

May 28, 1977.....cont.

The following people with MESA, District 8:
Stanley Kretoski, Supervisor Federal Coal Mine Inspector
Thomas T. Zirkle, Federal Coal Mine Inspector
Joe Yudasz, Federal Coal Mine Inspector

G. E. Rennick, Petroleum Engineer, Morgantown Energy Research Center

Seven wells belonging to the Southern Ohio Coal Company, Salem Township, Meigs County, Ohio, were cleaned out and plugged either to the surface or to the base of minable Clarion 4A coal. Four of these wells had tracer injection units installed while the remaining 3 were filled with expanding cement from TD to surface.

Hurley Nelson well 1 (Permit No. 1049) and Andrew Myers Well 1 (Permit No. 1248) were plugged in July 1972. The five remaining wells, Roy Stone Well 1 (Permit No. 1014), Roy Stone Well 2 (Permit No. 1172), Roy Stone Well 3 (Permit No. 1265), W. H. Lowman Well 3 (Permit No. 1372), and the Truman P. Brewer Well (Permit No. 1541 PP) were plugged in May 1973.

FINAL STATUS OF HURLEY NELSON WELL 1 (PERMIT NO. 1049)

Expanding cement from TD of 715' up to 459'. Tracer unit set at 459', top of unit at 432'. Expanding cement from 428 to 295 feet. Set 5½" casing at 281 feet and cemented in place. Drilled plug out of casing to previous depth of 281 feet. Ran string of 1-inch pipe to remove water. Well tested for show of tracer gas but none present. (See Figure A-7)

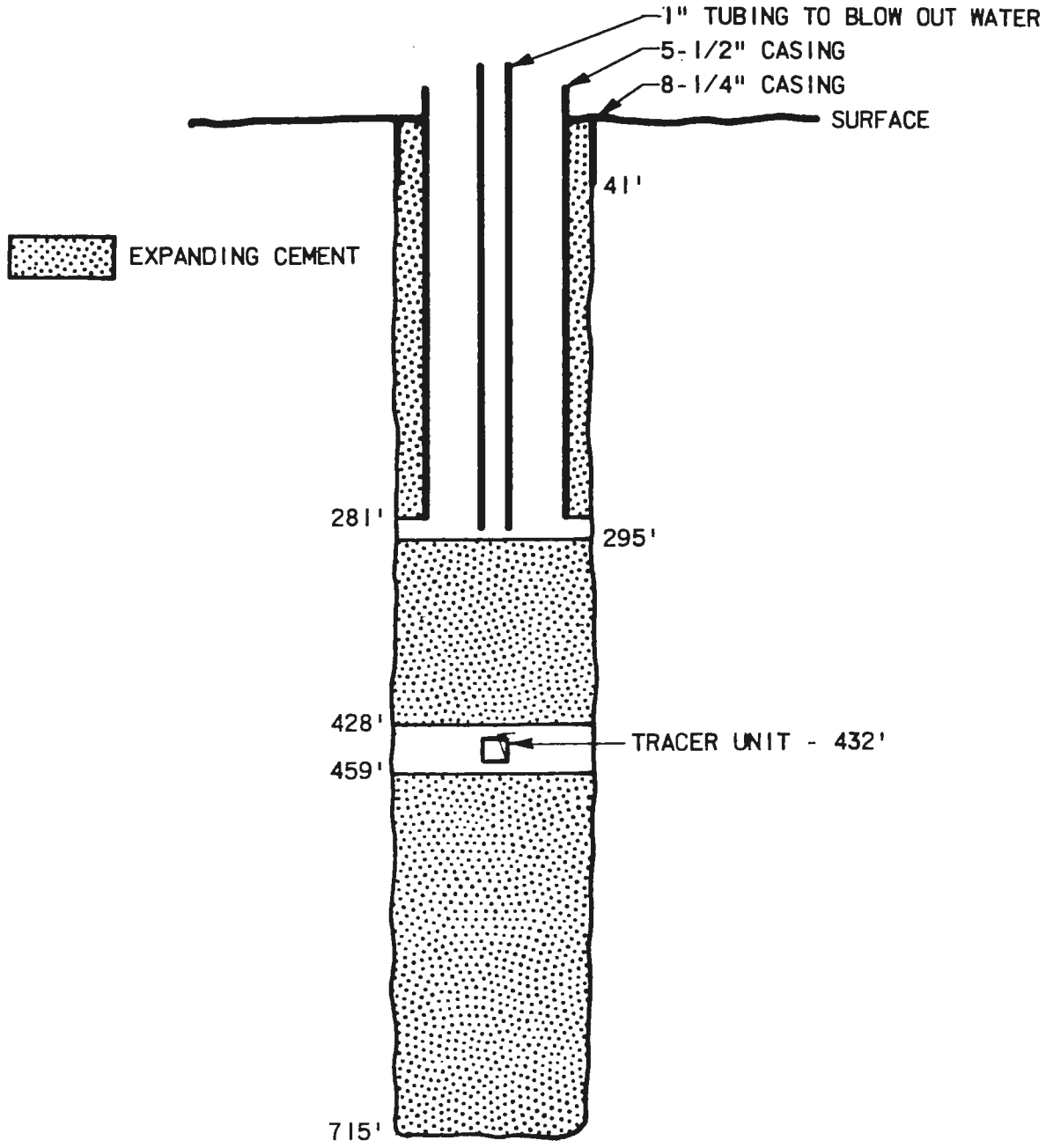


FIG. - A-7 - SOUTHERN OHIO COAL CO. WELL NO. 1049, SALEM TOWNSHIP, MEIGS CO., OHIO

FINAL STATUS OF ANDREW MYERS WELL 1 (PERMIT NO. 1248)

Expanding cement from TD of 417' to surface.

FINAL STATUS OF ROY STONE WELL 1 (PERMIT NO. 1014)

Expanding cement from TD of 360' to surface.

FINAL STATUS OF ROY STONE WELL 2 (PERMIT NO. 1172)

Expanding cement from TD of 650' to surface.

FINAL STATUS OF ROY STONE WELL 3 (PERMIT NO. 1265)

Expanding cement from TD of 602' up to 434'. Tracer unit set at 434'. Mechanical bridge plug set at 391'. Expanding cement on top of plug to 300'. Set 5½-inch casing at 298' and cemented in place. Drilled cement plug out of casing and opposite coal to 300'. Ran string of 1-inch pipe to remove water. Well tested for show of tracer gas, but none present. (See Figure A-8)

FINAL STATUS OF W. H. LOWMAN WELL 3 (PERMIT NO. 1372)

Well cleaned out to TD of 660' and reamed to 6¼". Tracer injection unit set in well and an open hole bridge plug set at a depth of 626 feet. The first expanding cement plug was placed on top of the bridge plug up to a depth of approximately 420'. After circulating excess cement from wellbore and cleaning up the hole, a second open hole bridge plug was set at a depth of 417' (top of first cement plug measured 419.5' by logger). Second expanding cement plug, was placed on top of bridge plug up to a depth of 352' (near bottom of coalseam). This was allowed to set overnight before running and cementing 346' of 5½" O.D. casing the next day. (See Fig. A-8).

NOTE: During May 1975, mining operations were carried out to within 45 feet of this well.

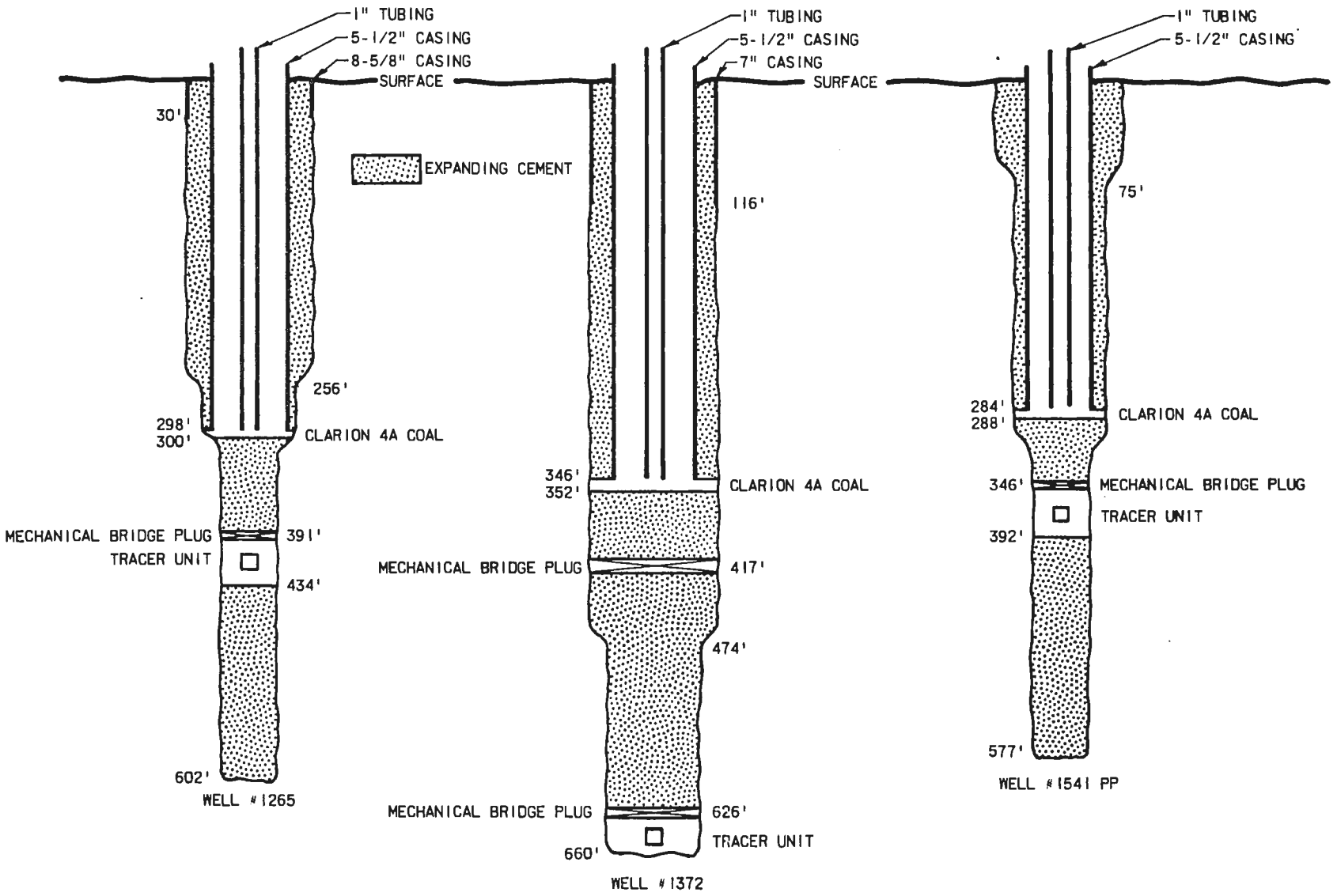


FIGURE A-8. - SOUTHERN OHIO COAL CO. WELLS 1265, 1372 AND 1541 PP, SALEM TOWNSHIP, MEIGS COUNTY, OHIO

FINAL STATUS OF THE TRUMAN P. BREWER WELL (PERMIT NO. 1541PP)

Well cleaned out to a depth of 577'. This indicated approximately 2' difference in surface elevation from previous cleanout depth of 575'. All depths were then corrected by this amount in original plugging plan. The first expanding cement plug was run the same day and cut off at 392'. The following day, the tracer injection unit was set into the wellbore and an open hole bridge plug set above the unit at a depth of 346'. The second expanding cement plug was placed on top of the bridge plug and cut off at a depth of 288', about one or two feet below the coal. Casing was then run into the wellbore and cemented to surface with expanding cement. Approximately 284' of 5-1/2 inch O.D. casing was used. (See Fig. A-8).

RECORD OF PLUGGING THE CONSOLIDATION COAL COMPANY'S CHRISTOPHER COAL DIVISION, F. M. RENNER WELL NO. 1, LOCATED IN PERRY TOWNSHIP, GREENE COUNTY, PENNSYLVANIA

The well was cleaned out to a depth of 968' and a tracer injection unit set with unit top at 942'. A mechanical bridge plug was set at 930' and 146' of expanding cement placed on top of the plug. Neat cement was then pumped in on top of the expanding cement up to a depth of 758 feet, and 8-5/8 inch casing was run to a depth of 750 feet and cemented in with a cement-fly ash-water slurry mix.

This well was plugged the latter part of June 1973. Monitoring of the well for tracer gas leakage continued for several months and as none was detected, the operating company used this well as a dewatering hole for a new mine shaft. (See Fig. A-9).

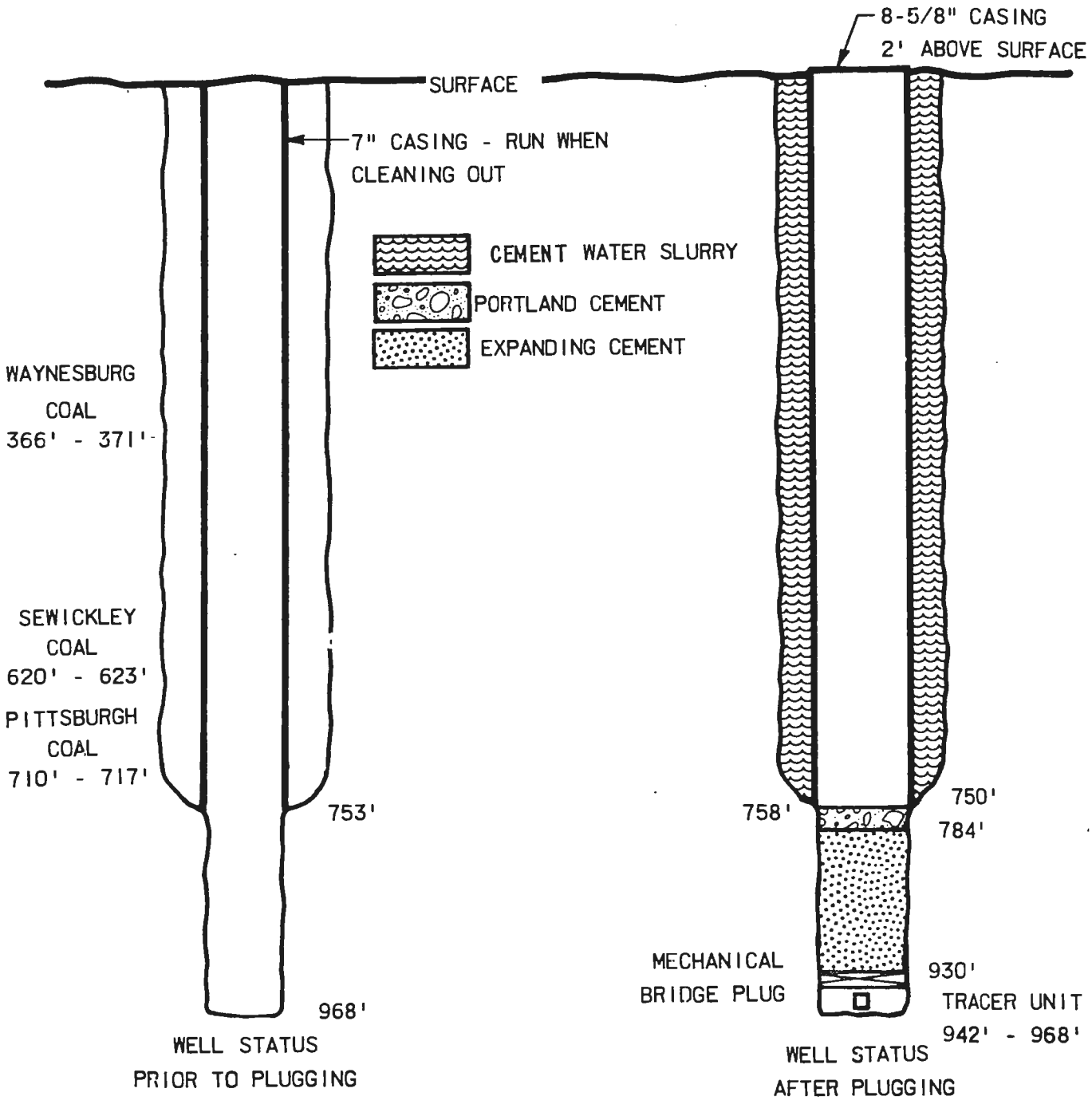


FIGURE A-9. - CONSOLIDATION COAL CO. CHRISTOPHER COAL DIVISION (DEWATERING HOLE) F.M. RENNER WELL NO. 1, PERRY TOWNSHIP, GREENE CO., PA.

RECORD OF PLUGGING CONSOLIDATION COAL COMPANY (BLACKSVILLE DIVISION) WELL 96, GREENE COUNTY, PENNSYLVANIA

Consolidation had a rotary on the well for about three days and could not clean out parted tubing in the hole. A cable tool rig then spent about a week fishing and cleaning out to 1077' where they suspect the 8-1/4" pipe was shot off. Since this is 350' below the Pittsburgh coal, it was decided to plug back from this point.

July 7, 1975

Basin survey logged well and set MERC tracer injection unit at 1077', top of unit at 1055', the clock was set for six days at noon. Basin tried to run 10 inch bridge plug but it would not go into the 10 inch where it had been shot at 690 feet. Decided to get brush plug, gravel and calseal. In dumping stone, it bridged up hole and took 3 hours to drill out. Had mandrel built up to 9-5/8 OD with weld.

July 8, 1975

Run built-up mandrel couple hours on the 10 inch. Tried running 10" bridge plug again, went without too much trouble and set it at 1055-1053, mixed 2 sacks calseal and placed on bridge plug with bailer. Perforated 1035-1050 feet w/60 shots, 1/2 inch holes, 4 jets per foot (collected gas sample--no tracer) ran 10" packer, trouble getting into 10" casing. Set packer at 1017.75 feet, circulated 40 bbl water, no pressure. Dowell pumped 50 sacks Medusa cement, displace tubing w/fly ash gel water. (Collect sample #1 Medusa). Packer did not seem to be set good. Pulled up 100 feet and circulated--no cement returns came out of hole.

July 9, 1975

Strung bailer in, found cement at 985 feet. Packer held enough that there should be at least 47 feet to a maximum at 78' of cement behind the pipe. The packer had one slip tore off, Consolidation took it to Parkersburg to be repaired. Ran mandrel, went right through, ran tubing for early start tomorrow.

July 10, 1975

Placed fly ash (2% gel) water slurry 10 ppg from 981-811'. Pulled tubing and ran 10" bridge plug and set at 820'. Placed 2 sacks calseal on plug to 815'. John Ifft, Pa. State Inspector visited location.
Perforated 814-804' with 40 shots. Spike Baine (Consolidation Safety Director) and Bill Calvey stopped by location.
Run 10" packer and set at 771.4'. Pumped 65 sacks medusa (sample No. 2). Unseat packer and pumped 85 sacks Medusa. Line plugged on Dowell truck (down 15 min.). Displaced cement and pulled tubing.
Packer had slip missing again (pulled 10" except one joint), out of hole--4:00 a.m., July 11, 1975.

July 11, 1975

Ran tubing, found cement at 657', set tubing at 639'.
CMI - (Morgantown, WV) hauled ready mix
Marts - (Fairview, WV) run through their pump
Pumped 12 cubic yards - pull 12 joints tubing (Sample #3)
Pumped 12 cubic yards - pulled 10 joints tubing
Pumped 6 cubic yards - pull remaining tubing (8 joints)
Pull the one joint of 10 inch
Cement about 15' down hole. Finish 2:00 p.m.
(See Figure A-10)

Witnesses:

July 7,1975

Consolidation- Tony Kitzmiller and Ray Henderson
MERC- Don Evans and G. E. Rennick
MESA- Paul Componation

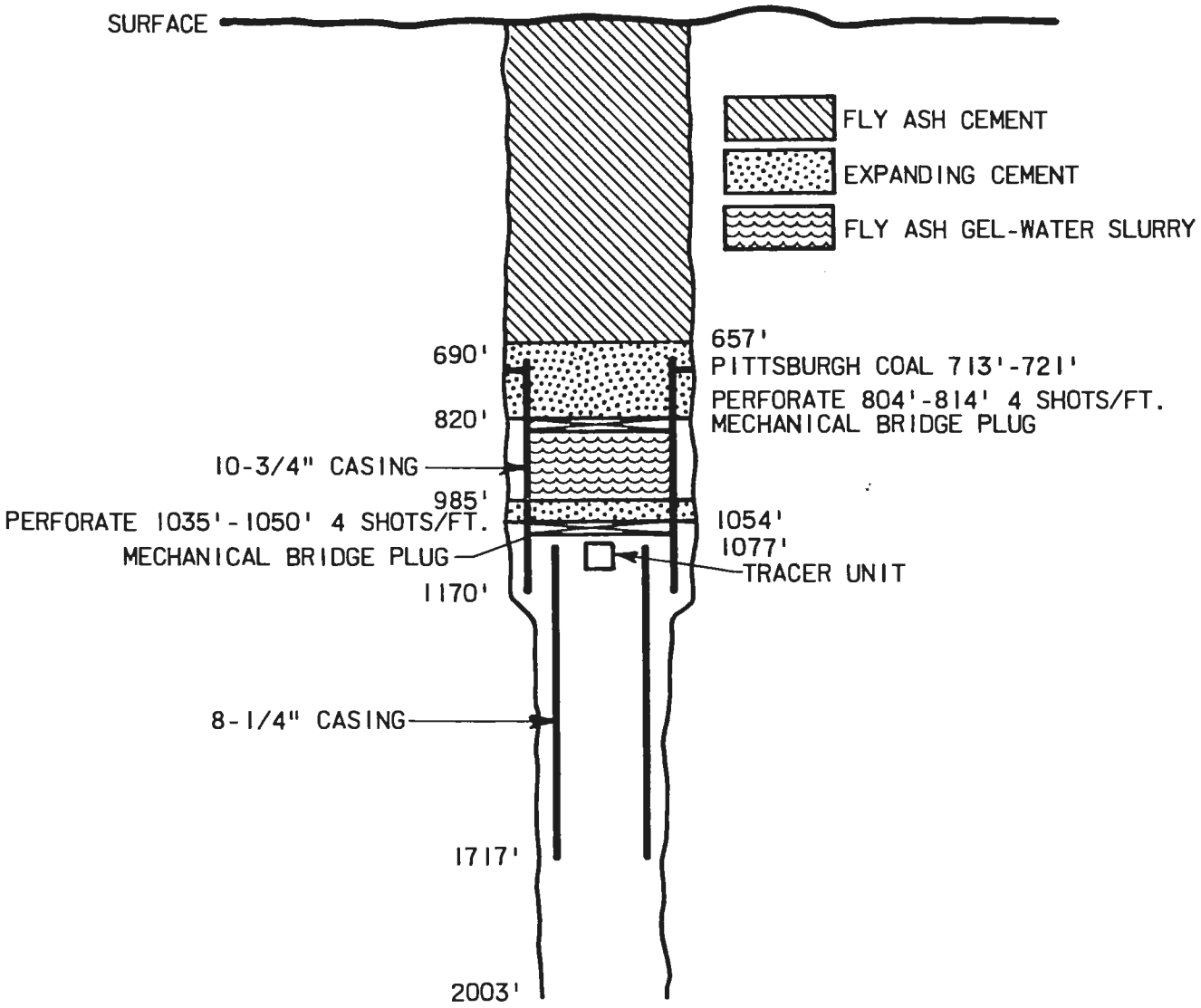


FIGURE A-10. - CONSOLIDATION COAL CO. BLACKSVILLE DIVISION, WELL NO. 96, GREENE COUNTY, PA.

Witnesses:

July 8, 1975

Consolidation- Tony Kitzmiller and Ray Henderson
MERC- G. E. Rennick
MESA- Paul Componation

July 9, 1975

Consolidation- Tony Kitzmiller
MERC- G. E. Rennick

July 10, 1975

Consolidation- Tony Kitzmiller and Ray Henderson
MERC- G. E. Rennick

July 11, 1975

Consolidation- Red Clovis
MERC- G. E. Rennick

This well is scheduled to be mined close to in about three months and mined out in two years.

GATEWAY COAL COMPANY, A. J. LIPPENCOTT WELL NO. 2, FRANKLIN TOWNSHIP, GREENE COUNTY, PENNSYLVANIA

October 12, 1975

Roughed out road to location and set 22 feet of 12-3/4" surface pipe with crane truck.

November 1, 1975

Grading location and moving some equipment in.

November 8, 1975

Moving more equipment on location.

November 9, 1975

Moving equipment and rigging up.

December 12, 1975

Cleaning out well from surface to 95 feet.

December 13, 1975

Cleaning out wood and cavings from 95' to 120' caving bad from 120' to 170'. Dozer 4 hours digging waste pit.

December 15, 1975

Cleaning out 170' to 395'. Wood and caving bad.

December 16, 1975

Cleaning out 395' to 620'. Drilled through cement or stone bridge from 545' to 570'.

December 18, 1975

Making repairs on drilling rig. Called John Ifft (State Insp.) 412-228-1942 and Gene Ruttle (MESA) 412-621-4500 Ext. 382. They want to know when we set the tracer unit.

December 19, 1975

Cleaning out 620' to 680' caving bad. Got stuck in hole.

December 20, 1975

Halliburton mudding up hole with 100 bags of gel and 250 lb. of gel flake. Cleaning out well 680' to 700'.

December 22, 1975

Cleaning out wood and run on to iron. Halliburton conditioning well. Due to extreme bad weather and the Holiday Season, work on the well will not commence again until December 29, 1975.

December 29, 1975

Cleaning out at 690', going slow.

December 30, 1975

Cleaning out at 695'. Tools sticking some.

December 31, 1975

Running 8" bit @ 692', hole still caving and tools sticking.

January 1, 1976

Tools still sticking, still at 695'.

January 2, 1976

Using 10" cherry picker but not gaining any footage. Measurement on cherry picker was 688'.

January 3, 1976

Ran 8" bit and cleaned out to 730'.

January 5, 1976

Tools dragging on something, maybe split pipe or wood, depth 738', weather very cold.

January 6, 1976

2:00 p.m. @ 778' Evening driller thought tools fell through couple of times, got to 797' but bailer only followed to 792'.

January 7, 1976

Put on twist bit worked to 797' 2:00 p.m. ran bailer (3 times) followed to 797' o.k. left twist bit on and continued running.

January 8, 1976

2:00 a.m. @ 811' Not working today because of snow and cold weather.

January 12, 1976

Ran tools to 811' bailer stopped 20' high. Ran tools again to 811' bailer still wouldn't follow. Basin survey, ran csg. collar locator hung two places, lot of junk starting at 716'. Ran caliper looks like on outside of pipe. Ran 10" cherry picker to 716'. The 688' meas. on cherry picker must have been wrong unless we have pushed junk down hole. Will build an impression block and run it first tomorrow to see what might be sticking up.

January 13, 1976

Layed down cherry picker. Run impression block to 715'. Come back up hole to 688' and worked block up and down Marks on the block indicate iron in the side of hole at

688' and some impression on bottom of block at 715'. Went to Cameron, W.Va. for 10" hollow reamer.

January 14, 1976

The hollow reamer they got was too big (13") and would not go in the hole. They went back to Cameron to exchange reamer. No one had returned to rig by 3:15 p.m. Truck brought backhoe about 11:00 a.m. Jack Stout and truck driver waited until about 2:15 p.m. and went to shop.

January 15, 1976

Brought 10" spud, 10" hollow reamer (dressed out to 11-½") and 8" hollow reamer. Took jars off top and put 10" hollow reamer w/long stroke on bottom. Tools stopped at 715'. Pulled up to 688' and ran. Pulled reamer. Marks on side. Ran 10" spud trying to dislodge iron at 688'.

January 16, 1976

Took off spud and long stroke, put on short stroke and hollow reamer. Ran from 688' to 718'. Tools not turning on bottom. Pulled out checked tools Ran back to 688' and worked tools down. Ran at 716' - 718' Pulled out. Tools shiny inside about 12". Ran impression block. No marks. Going to run cherry picker at 688' pull out and again at 718'.

January 19, 1976

Set brush plug @ 709'. Filled with rock to 700'. Shot well with 40 sticks of dynamite in a 6-½" shell 4' long with 125' primer cord. Running cherry picker @ 672' and 688'. Tools would go to 696' after shot. They are supposed to bring milling tool out tomorrow.

January 20, 1976

Running hollow reamer 696' to 716' (Pulled out a piece of mud and rock about 18" long) Ran bailer @ 716'. A few pieces of brush bridge. No iron yet 3:05 p.m. Milling tool on location at 4:05 p.m.

January 21, 1976

Running 10" cherry picker at 720' in depth when pulled out, marks all around inside of picker which measured 4-7/8". Going to get two sockets Bell and slip with slips from 4 to 5".

January 22, 1976

Ran socket with 4-7/8" slips @ 720' (picked up 3 small pieces of csg.) Bent spring on socket. Running 10" cherry picker now @ 720'. They will repair socket and run it tomorrow.

January 23, 1976

Cherry picker going to 723'. Broke spring retainer on slip socket. Will have Bell and slip socket Monday.

January 26, 1976

Bell socket and slip socket @ 723' to 727'. Didn't do any good. Ran 8" bit 723' to 727' Scraped about 5' on both sides of bit. Going to try and run 6" bit to get inside pipe.--6" bit went down along side of pipe. Ran to 750'.

January 27, 1976

Ran 6" bit to clean up cavings. Running 10" cherry picker. Ran about 3' to 730'. Cherry picker is catching on iron. Stem looks like it is rubbing iron about 20' up @ about 707'. Going to run slip socket later today. I asked Jones for them to measure in to get some better measurements. Jones and McKenzie worked tools from 730' - 700' tools worked free -- Cherry Picker takes hold but won't hold on.

January 28, 1976

Large boulder fell in hole from about 60' down. Had to drill it to bottom. Ran cherry picker, then 10" hollow reamer @ 730'. Couldn't feel any iron. Measured in and measurements appear to be within a foot.

January 29, 1976

Ran 10" cherry picker--got over fish about 21". Couldn't hold on. Changed from short stroke to long stroke jars on bottom. Bernard thought it might drive down better. Dale C. dozed the road and took dozer out. Curt Edgerton was here this morning.

January 30, 1976

Talked to Bob Chisler--He wants to start on tower Monday 2-2-76, and try drilling with 8" or 10" tools. Ran cherry picker and got in about 6" first run. Second run with cherry picker got 16" up in. Wouldn't hold

on. Started to run 10" bell socket. Took hold but jared loose in about 7 or 8 strokes. Bell Socket still grabs but won't hold on.

February 2, 1976

Not working--Too cold.

February 3, 1976

Will start working @ 3:30 p.m. Jones and McKenzie changed tools, put short stroke jars on top and bottom and 8" bit. Strung tools in @ 731'. Drilled with 8" bit to 750' along side of pipe. Bob Chisler wants to cave pipe.

February 4, 1976

Night tower drilled to 755'. Tools sticking. Took off short strokes and 8" bit. Put on long strokes and 10" cherry picker (bailer picked up @ 750'). Bob wanted them to run 6" punch but didn't do it. Jessie Miller and Terry Miller Day Tower (Jones and McKenzie) made run with cherry picker up in 10" at 731'--jumped off when I arrived at 1:30 p.m. Rig was down for repair. 3:15 p.m. ready to run cherry picker again.

February 5, 1976

Still at same depth. Put on 10" mill. Had to work on mill before run. No results. Put on 8" bit.

February 6, 1976

Talked to Bob Chisler. He said they put on and ran 10" bit to 770'. Put drill mill on and ran 2'. Pretty solid. Supposed to run punch on day tower.

February 7, 1976

Chisler shut down last night. Bolts stripped that hold carburetor, will not work today. Will call when fixed. We're starting to bail metal out of hole.

February 9, 1976

Worked on rig. Ran 6" punch, cherry picker and drill mill.

February 10, 1976

Morning tour got a joint of 8" and joint of 6-½" inside it. Rennick and Evans met in p.m. with Bob Chisler,

Jess Miller, Bernard Jones and Jim McKenzie, to discuss the job, have been down by pipe to 811' w/6" bit, down to 770' w/8" mill and punch. Pipe tore up pretty bad. Now have about 18" of 6-½" sticking up with collar on,probably split 8" collar hooking up also about 750'. Decide will run Bell socket over the 6-½" and try to jar another joint out. If we can we will fish pipe down as far as it has been torn up from working outside. If we get this, then run string 8" and try to clean out hole down through pipe. Bernard Jones strung in @ 767' with 8" Bell socket. Could not get on fish. There were iron marks up 18' on stem.

February 11, 1976

Jessie Miller ran Bell socket and cherry picker. Picked up sliver of pipe with thread. Bernard Jones ran cherry picker and hollow reamer dressed out to 13-½" looking for pipe up the hole. Working from about 755' to 767'.

February 12, 1976

J. Miller ran 6" punch and cherry picker. Box on stem cracked near end of tower. Three men from Pittsburgh were here 11:00 a.m. B. Jones replaced cracked stem and ran 10" bit @ 767'. Ran sand pump four times, recovered several pieces of casing and shale. Difference in measurements of drillers. J. Miller 776'; B. Jones 767'.

February 13, 1976

Ran 8" bit to 778' 6" punch @ 784' and 8" Bell socket. Run 10" Bell socket @ 775'. Takes hold but wouldn't hold on. Ran 6" twist bit to 791'.

February 14, 1976

Ran 6" twist bit @ 791'. Ran 8" bit to 791' and 10" bit to 791'. Ran cherry picker to 770' and got some small pieces of pipe. Ran 10" cherry picker @ 768'.

February 16, 1976

Ran cherry picker @ 768' (one small piece of pipe). Ran 8" bit @ 781', 10" cherry picker @ 781' and 10" hollow reamer @ 781. Ran 8" bit to 786'.

February 17, 1976

Drilling with 6" bit on iron and not going. Tried

running 6" punch some. Running 10" drill mill @ 786'. Seems to be bound up with iron. Also hitting iron up hole 5'-6'.

February 18, 1976

10" drill mill not going. Put on 8" bit and drilling at 792'. McKenzie drilling with 8" bit at 794'. Cut off about 40' of drilling line and strung in with 8" bit at 794' (rig floor). Took off 8" bit, put on 10" cherry picker. Picked up piece of 6-½" 2' long with thds. and thds. of 8" pipe.

February 19, 1976

Took off cherry picker put on 6" punch. It was going by pipe. Put on 8" Bell socket. No good and went back to cherry picker @ 796'. Picked up small crumpled piece of 8" pipe. Ran cherry picker but it stopped at about 783' (something came over in well) Ran 8" Bell socket--wouldn't hold on. Ran 10" Bell socket--no good. Put on 10" cherry picker.

February 20, 1976

Ran 10" cherry picker, not going. Put on 10" bit. Drilling on iron at 791' drilling on iron @ 795' with 10" bit. John Ifft visited rig.

February 21, 1976

Running 10" bit @ 797', not going. Put on 8" bit,no go. Put 10" bit back on. Drilling @ 802'.

February 23, 1976

Drilling with 10" bit (down by pipe) @ 806'. Drilling with 10" bit, small piece of iron in sand pump, @ 802'. Fresh marks on stem 18' up. Ran 10" hollow reamer to 807' came back up to 785' hit iron but wouldn't stay on. Ran 10" cherry picker to 807'.

February 24, 1976

Ran 10" cherry picker--no good. Ran 6" bit, then ran 10" bit @ 807', not going. Put on hollow reamer. Running from about 750' to 790'. Hitting on pipe @ about 790'. Ran 10" cherry picker to 807', hit nothing. Running 8" bit @ 807'. Talked to Bob Chisler and J. Miller and they suggested going on to 812' and drilling on with 6" bit to try and loosen pipe again.

February 25, 1976

Ran 8" bit, then ran 10" drill mill to 810'. Pipe come over in hole @ 790'. Ran 10" hollow reamer @ 790'. Over iron about 3'. Cut off 70' drilling line. Waiting on cherry picker and 10" bit that were taken in to be dressed. Got started about 5:30 p.m. Ran cherry picker @ 790'. Hit and fall off. Ran 10" Bell socket to 790', no good. Run hollow reamer @ 790'. Pipe entered reamer about 6". Curt Edgerton, MESA was out this a.m.)

February 26, 1976

Ran cherry picker then ran 8" bit, no go. Put on 6" twisted bit and started drilling @ 812'. It started going and at times would drop 10"-12". 6" sand pump and 6" bailer will stop from 795' to 823'. Can't go beyond 823' with 6" bailer. Stem marks indicate we are inside of pipe. (Lost bottom off 8" sand pump and did not find it.) Running 6" twisted bit from 795' to 825'. Bit will go to 850' but bailer only to 825'.

February 27, 1976

Swinging 6" twisted bit trying to get 5" and 6" bailer and 6" sand pump to go. Went to shop for tools. Brought out 6" mandrel and builtup 6" twisted bit. Ran 6" twisted bit and then 6" mandrel. Sand pump is running to bottom a little better. Picked up several pieces of pipe and collar thds. from 851' with 6" sand pump. While running 6" twist bit @ 850', tools swung and went to 900'. Ran 6" sand pump to 900'. Pump stopped at 790' and 823'. Bob Chisler called @ 9:15 a.m. and said they are looking for a 5" sand pump and are going to try and open up casing.

February 28, 1976

Cleaning out from 900' to 1015'. Bailer still stopping. Still getting iron.

March 1, 1976

Ran tools from 1015' to 1473'. Spliced on 1500' of sand line and put on a 3600' drilling line. Dale Chisler and helper helping put on lines and Dale C. dressing roadway with dozer. After drilling line was installed, ran 6" bit to 1473'. Ran 5-½" sand pump and got hung. Lost pump at approximately 835'. Fished out pump. Cleaning out with 6" bit @ 1478'. Still getting iron.

March 2, 1976

Bridged @ 1473'. Cleaning out 1478' to 1491'. Very firm with iron. Went to shop after sand pump bottom. Running 6" bit @ 1491' swung off and went to 1550'. Drilled to 1556'. (Ifft was out this a.m.)

March 3, 1976

Drilling on iron @ 1556'. Ran 5-½" sand pump. Lost sand pump about 200' off bottom (approximately 1350'). Tried to recover pump with spear and latch jack. Took latch jack to shop to have guides welded on it. Bob Chisler brought latch jack and 6" cherry picker out about 2:30 p.m. and started fishing for sand pump. Fished out sand pump and started drilling iron @ 1559'.

March 4, 1976

Drilling iron @ 1554'. Sand pump only goes to 824'-- Tools stop @ 824'. Drilling with 6" twist bit @ 1563'. Getting lots of iron out. Sand pump stuck @ about 824' worked 10 min. to get free. Tools swung off @ 1568' and went to 1684'. 1684'to 1688' were drilling iron.

March 5, 1976

Drilling from 1688' to 1695' Bridged. Cut off 120' sand line. 1695' to 1850' open hole. Drilling 1850' - 1853'. At 1853' tools swung off and went to 1882'. Running sand pump. Sand pump still stops at times from 795'-824'. Water level still staying about the same. Spliced on 1850' of 9/16" sand line.

March 6, 1976

Cleaning out 1882' to 1890'. Bailing mud. Cleaning out with 6" bit 1890' to 1898'.

March 8, 1976

Cleaning out 1898' to 1910'. Bridged cave hole. 1910' to 2062' open hole. Bailing mud. Cleaning out 2062' to 2098'. Took gas sample. Running 4-½" bailer. Curt Edgerton visited site a.m.

March 9, 1976

Cleaning out 2098'-2105' Working in caved hole. Getting some iron with sand pump. Tools caught at about 1900' coming out of well. Had to drill off and on back to 2105'. Cleaned out to 2116'. Lost sand pump and about 400' of line on bottom.

March 10, 1976

Fished out sand pump and line. Cleaning out and drilling on wood @ 2122'. Cleaning out from 2122' to 2128'. Show of gas in bailer. Water level about 50' from top.

March 11, 1976

Cleaning out from 2128' to 2650' Wood and cement bridge from 2116' to 2134'. Open hole from 2134' 2650'. Ran tools to 2650'. Too thick to drill. Waiting on more sand line. No more show of gas. Tools still drag coming out and going in some times at 1900'. Put on more sand line and cleaned out 2650' to 2651'.

March 12, 1976

Acts like we are going down beside pipe. Top of pipe about 2650'. Ran 6" cherry picker from 2651 to 2656'. Picked up 38" of 3" pipe. Collar on bottom. Called for 3" spear and combination socket to fish for pipe. Water level 175' from top. Talked to Bob Chisler about digging another mud pit as present pit is full.

March 13, 1976

Fished out 11 joints of 3" pipe (232'2"). Fished out 7 joints of 3" pipe (143'9"). Total 3" pipe recovered 376' to a T.D. of 3026'.

March 14, 1976

Called G. E. Moody, Chairman, Commission of Underground Mine Inspectors, at 7:00 p.m. to tell him that we will probably log the well and set one tracer unit Tuesday 3-16-76. He will not be able to come but will send Mine Inspector Tony Pawlosky.

March 15, 1976

Hole bridged at 2927'. Tried to run cherry picker and

6" bit. Not going. Tools sticking. Measured 5" bailer in and found bottom at 2929'. Plan to shut down and log tomorrow. Water level about 35' from top. John Ifft visited location.

March 16, 1976

Basin Survey ran gamma ray neutron, collar locator and caliper logs of well. Basin found T.D. 2938'. Dug waste pit and filled water tank for cementing tomorrow. Assembled $SF_6$ tracer unit and set clock for 6-½ days from 12 noon. Started in well with tracer unit at 12:20 p.m. Pin sheared on tracer setting tool and dropped the tracer unit in the well. Basin Survey ran a collar locator and found the tracer unit at 2916'. A second $SF_6$ tracer unit was assembled and set for 6-½ days from 2:15 p.m. This unit was set at 2896' at 4:20 p.m. On the second try, the bridge plug was set at 2890' at 5:50 p.m. The following people witnessed setting the $SF_6$ tracer units and bridge plug: Pete Wicks--J & L, Bob Thomas--J & L. Tony Pawlosky--Pennsylvania Department Environmental Resources, John Ifft--Pa. Oil & Gas Div. Curt Elder--PMRC, Vic Shine--U. M. W. A. International Safety Coordinator, Nick Andrusky and Frank Ruterford--Mine Safety Committee, Eugene Ruttle and Curt Edgerton--MESA Pgh. Pa., Joe Reid--MESA Wash. Pa., John Takacs--MESA Waynesburg, Pa., Jerry Rennick and Don Evans--ERDA, Mgtn., W.Va.

March 17, 1976

Eastman Whipstock ran directional survey of well with 3" gyro. Location of well at coal seam is 3.64 ft. S 8° 41' E of surface location. Ran 2878' of tubing to cement well. Work witnessed by: Joe Reid--MESA Wash. Pa., John Takacs--MESA Waynesburg, Pa., Curt Edgerton--MESA Pgh. Pa., Curt Elder--PMRC, Jerry Rennick and Don Evans, ERDA.

March 18, 1976

Halliburton pumped 50 bbl. of 10 lb. gel and barite, and ¼ lb. flo cele, per sack in well. 10:05 a.m. pumped 33 sacks of Medusa Chem-Comp expanding cement (14.7 lb/gal) from 2880' to 2780'. Pulled tubing to 2590' and pumped 16 sacks of Medusa Chem-Comp cement (14lb/gal) from 2590' to 2540'. Pulled tubing to 1725' and pumped 19 sacks of Medusa Chem-Comp cement (14lb/gal) from 1725'-1675'. Pulled tubing to 1510' and pumped 10 sacks of Medusa Chem-Comp cement (14lb/gal) from 1510' to 1470'. Pulled tubing to 1355' and pumped 13 sacks of Medusa Chem-Comp (14lb/gal) from 1355' to 1306'. Work witnessed

by: Curt Elder-PMRC, Gene Ruttle and Curt Edgerton--MESA, Pete Wicks--J & L, Tony Pawlosky Pennsylvania Department Environmental Resources, John Ifft--Pa. O. & G. Div., Jerry Rennick and Don Evans--ERDA. After completion of cementing operation John J. Hunter Pennsylvania Department Environmental Resources, member of a commission of underground mine inspectors arrived and discussed the plugging operation. Plugging job was shut down until 3-23-76 waiting on cementing packer.

March 19, 1976

Located cement in well at 1306'. Witnessed by Jerry Rennick--ERDA and Pete Wicks J & L.

March 23, 1976

Assembled $SF_6$ tracer unit and set the clock for 6-½ days at 8:15 a.m. Basin Surveys set tracer unit at 1306' at 9:55 a.m. Tried to run bridge plug at 10:15 a.m. but wouldn't go in top of 8" casing. Put 30 5 gal buckets (1 ton) of river gravel in well to cover over tracer unit. Ran 2" tubing in well to 1258'. Witnessed by: Pete Wicks--J & L, Tony Pawlosky--Pennsylvania Department Environmental Resources, John Ifft, Pa. O. & G. Div., Curt Elder--PMRC, Eugene Ruttle and Curt Edgerton--MESA Pgh. Pa., John Takacs--MESA Waynesburg Pa., Vic Shine--U.M.W.A. International Safety Coordinator, Nick Andrusky, Frank Rutherford and Don Shimek-- Safety Committee, Tom O'Brochta--Local President, Jerry Rennick and Don Evans--ERDA.

March 24, 1976

9:40 a.m.-Halliburton started pumping 40 sacks of Medusa Chem-Comp (14lb/gal.) from 1260' to 1130' Pulled tubing to 850' and pumped 257 sacks of Medusa Chem Comp (14 lb/gal.) from 850' to 585'. Witnessed by: Pete Wicks--J & L, Tony Pawlosky--Pennsylvania Department Environmental Resources, John Ifft--Pa. O & G Div., Curt Elder--PMRC, Nick Andrusky and Frank Rutherford--Safety Committee, Tom O'Brochta--Local President, Rodney Rodavich--Chuck Butera--J & L Mine Supt., Eugene Ruttle and Curt Edgerton--MESA Pgh., Pa., Jerry Rennick and Don Evans--ERDA.

March 25, 1976

9:00 a.m.-Run bailer to location of cement. Found cement at 590'. Witnessed by Pete Wicks--J & L and Jerry Rennick--ERDA. Set up cement job with Bob Chisler. Will order 600 sacks of Neat Cement with ¼ lb. Flocele

per sack blended into cement. Halliburton to be on location at 10:00 a.m. Chisler to bring 125 sacks of cement in case we need extra.

March 26, 1976

Ran 2" tubing to 585'. Halliburton on location and at 9:45 a.m. started pumping 280 sacks of Neat cement with Flocele (15 lb/gal.) Pulled tubing to 355' and pumped 320 sacks of Neat Cement with Flocele (15 lb/gal.) Set up and pumped 125 sacks of Neat Cement brought by Chisler, without Flocele. Total of 725 sacks of Neat Cement from 590' to 32'. Witnessed by Pete Wicks--J & L, John Ifft--Pa. O. & G. Div, Tony Pawlosky--Pennsylvania Department Environmental Resources, Jerry Rennick and Don Evans--ERDA.

March 29, 1976

Measured in with bailer and found cement at 32'. Pumped in 21 sacks of Neat Cement and set a joint of 3" tubing in hole with 6' above ground level as a marker. Well plugging complete. As weather permits and the waste pits settle, the surface will be restored and grass planted. Witnessed by Pete Wicks--J & L, John Ifft--Pa. O & G. Div. and Jerry Rennick--ERDA.

The following gas samples were collected and analyzed from top of the 12" casing before and during the plugging operation:

| Date | Time | $\%O_2$ | $\%N_2$ | $\%CH_4$ | $\%CO_2$ | ppb $SF_6$ |
|---|---|---|---|---|---|---|
| 3-8-76 | 2:45 p.m. | 22.53 | 77.35 | 0.07 | 0.05 | 0.00 |
| 3-11-76 | 2:30 p.m. | 22.27 | 77.67 | 0.02 | 0.04 | 0.00 |
| 3-16-76 | 3:55 p.m. | 22.57 | 77.38 | 0.00 | 0.05 | 0.00 |
| 3-19-76 | 8:55 p.m. | 21.86 | 78.03 | 0.07 | 0.04 | 0.00 |
| 3-23-76 | 2:30 p.m. | 21.84 | 78.12 | 0.00 | 0.04 | 0.00 |
| 3-24-76 | 3:15 p.m. | 21.77 | 78.09 | 0.11 | 0.03 | 0.00 |
| 3-25-76 | 9:15 p.m. | 21.81 | 78.14 | 0.02 | 0.03 | 0.00 |
| 3-26-76 | 8:45 p.m. | 21.96 | 77.98 | 0.01 | 0.05 | 0.00 |
| 3-29-76 | 11:05 p.m. | 21.79 | 78.17 | Trace | 0.04 | 0.00 |

Figure A-11 shows placement of all plugs in Lippencott well No. 2

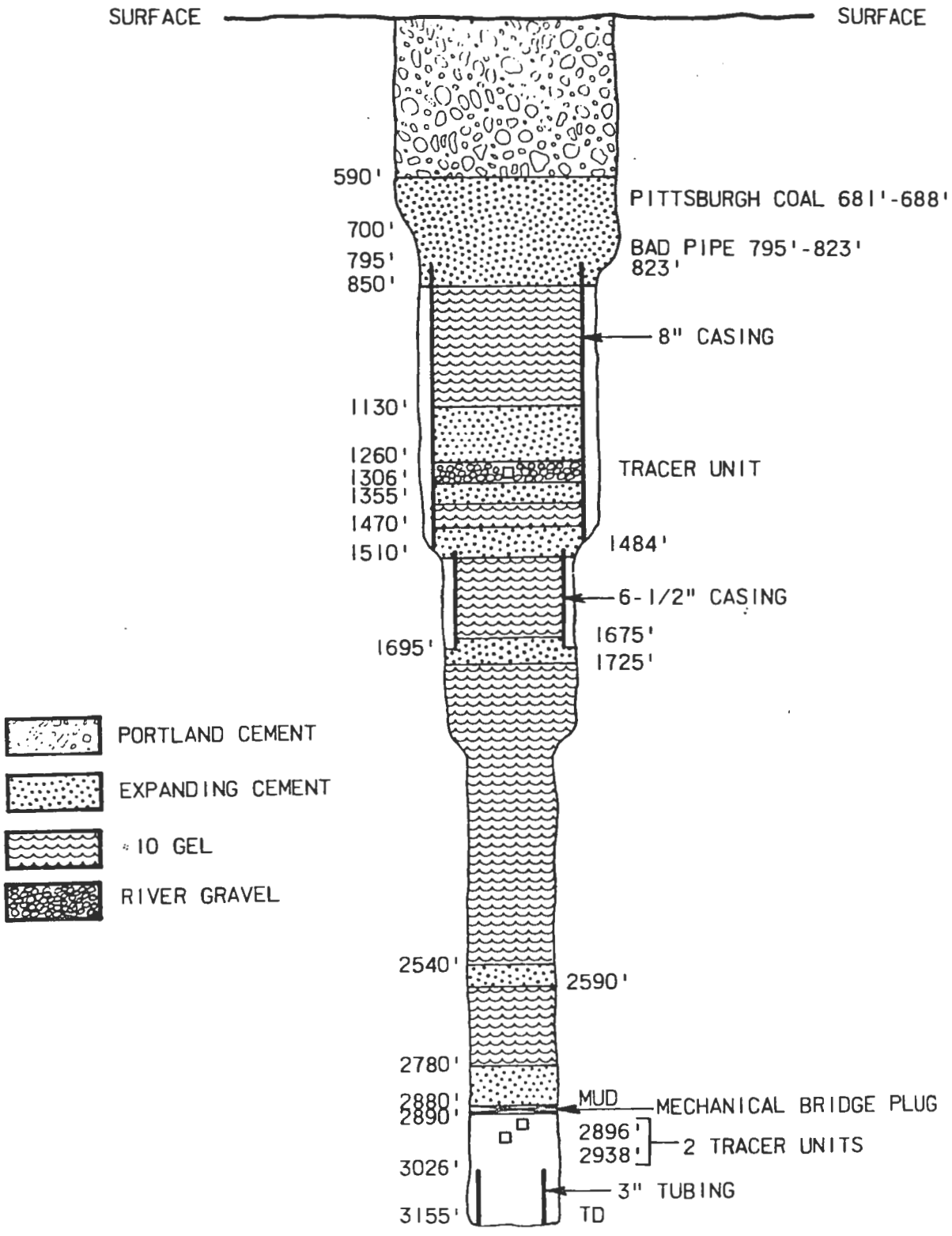


FIG. A-11 - GATEWAY COAL CO. A.J. LIPPENCOTT WELL NO. 2, FRANKLIN TOWNSHIP, GREENE COUNTY, PA.

RECORD OF PLUGGING MOUNTAINEER COAL COMPANY WELL NO. 550 (E. F. AMSLER NO. 1) PENETRATING ROBINSON RUN MINE NO. 95, 3 NORTH MAINS, EAGLE DISTRICT, HARRISON COUNTY, W. VA.

Consolidation Coal Company, using Chisler Brothers' Contractor cleaned the well out to 1,584 feet. Because of caving they had to run 936 feet of 8-5/8 inch casing as cleaning out progressed.

February 20, 1975

MERC had Eastman run a directional survey to 500 feet. At 470' the well was found to be 3.9' North 68° east of the surface location.

February 28, 1975

MERC had Basin Surveys run gamma ray, neutron, casing collar locator and caliper logs. The Pittsburgh Coal is from 458 to 468'. Two-inch tubing was run to 1,580'. Halliburton mixed and pumped 70 sacks Medusa (expanding cement). This should have yielded a plug from 143' to a maximum of 240'.

Tubing was pulled up to 1,331'. Halliburton mixed and pumped 880 sacks (74 lb/sx) fly ash with 2% aquagel-water slurry. No fly ash circulated. This job was witnessed by Bill Blosser (State Oil and Gas Inspector), Jim Davis, Roy Jarrett and Ray MAZZA (Consolidation), R. J. Watts and G. E. Rennick (MERC).

March 1-4, 1975

Tubing pulled, 8-5/8 inch casing pulled, and the 10 inch casing was ripped as follows:

| | |
|---|---|
| 490-497' | 1 cut |
| 475-482' | 1 cut |
| 460-470' | 2 cuts |
| 442-452' | 1 cut |
| 422-432' | 1 cut |
| 402-412' | 1 cut |

March 5, 1975

12:15 p.m. - Two-inch tubing run to 551 feet. Chisler Brothers

mixed and pumped 80 sacks Medusa (expanding cement)

3:00 p.m. - Tagged cement with tubing at 410'.
Vincent Supply brought 5 cubic yards of ready-mix fly ash cement; Chisler Brothers pumped it.
Pulled tubing, bailed water, found cement at 190'.

5:15 p.m. - Vincent Supply dumped 4 cubic yards ready-mix fly ash cement down the 10-inch casing.

5:45 p.m. - Cement down about 15 feet. They were to set marker and fill pipe March 6, 1975. (see Fig. A-12)
This job was witnessed by Woody Garrett (State Oil and Gas Inspector), Roy Jarrett (Consolidation) and D. M. Evans (MERC).

RECORD OF PLUGGING MOUNTAINEER COAL COMPANY WELL 509 (J. L. MURRAY) PENETRATING ROBINSON RUN MINE NO. 95, EAGLE DISTRICT, HARRISON COUNTY, WEST VIRGINIA

Mountaineer originally planned to clean this well out to TD. They spent several weeks cleaning out to below the Pittsburgh coal and found 10-inch casing opposite the coal. Because of caving, a string of 8-5/8-inch casing was run to 731'. In cleaning out down to where the 8-inch pipe was supposed to be, they thought they had hit it but started to make new hole about there also (803'). They collected sample cuttings and were definitely sure they were in new hole when they drilled the Big Dunkard sand at 990-1,002'. Figure A-13 shows the situation that we probably had, therefore we decided to fill back with cement all the way to base of coal.

June 28, 1972

7:37 a.m. - Set clocks on tracer unit
Length of tracer unit plus 3' tail pipe - 28.27'

8:55 a.m. - Basin Surveys, Inc., run unit in well and set on bottom (1,044')
Basin Surveys, Inc., set 8-inch open-hole plug at 996'.
Mixed 4 sacks Cal-Seal, placed on bridge plug with dump bailer (2 trips).
Cal Seal top at 980'.
Halliburton cemented back to 860' w/70 sx neat

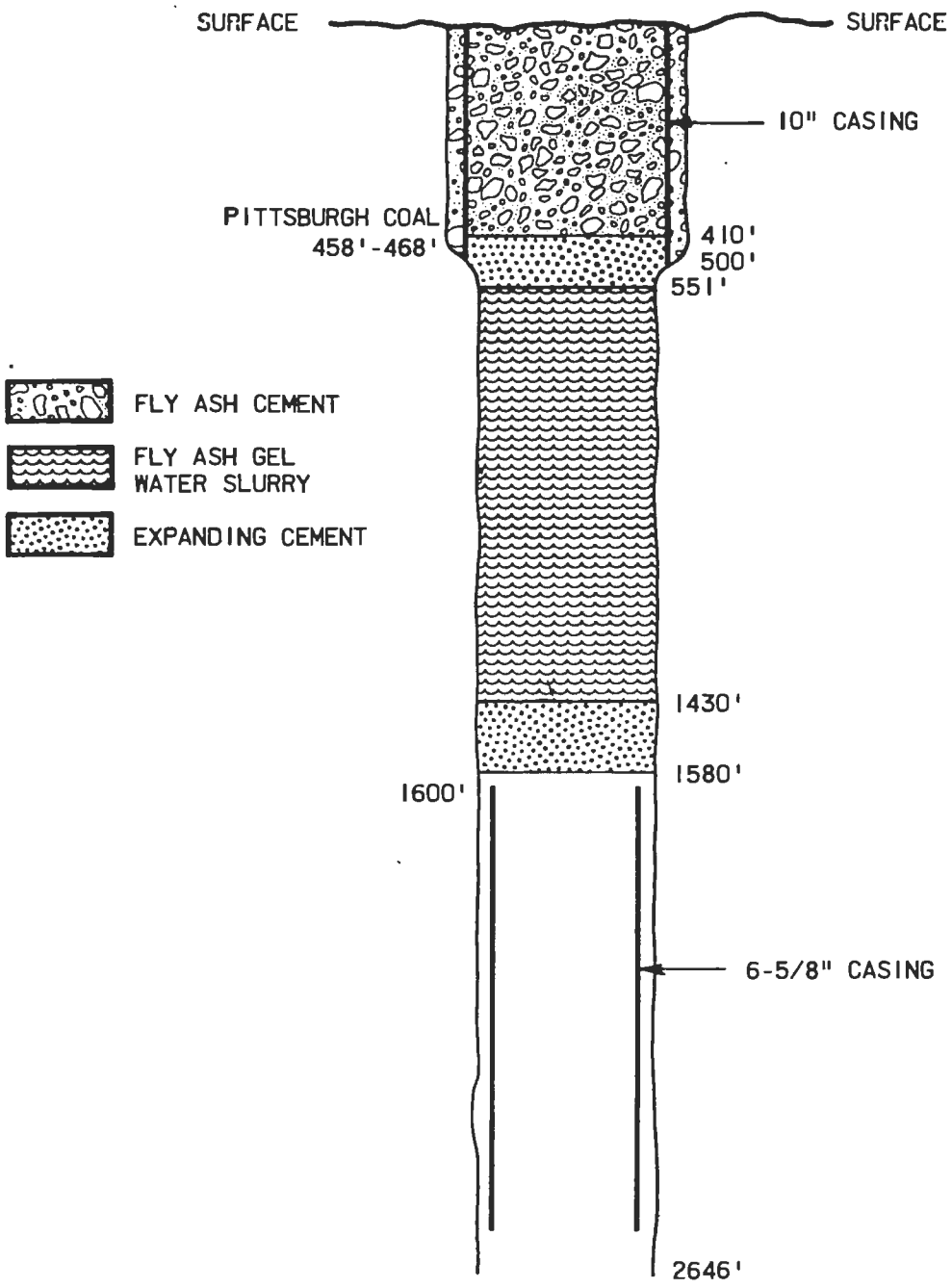


FIGURE A-12. - CONSOLIDATION COAL CO. MOUNTAINEER DIVISION, WELL NO. 550, ROBINSON RUN MINE NO. 95, EAGLE DISTRICT, HARRISON COUNTY, W.VA.

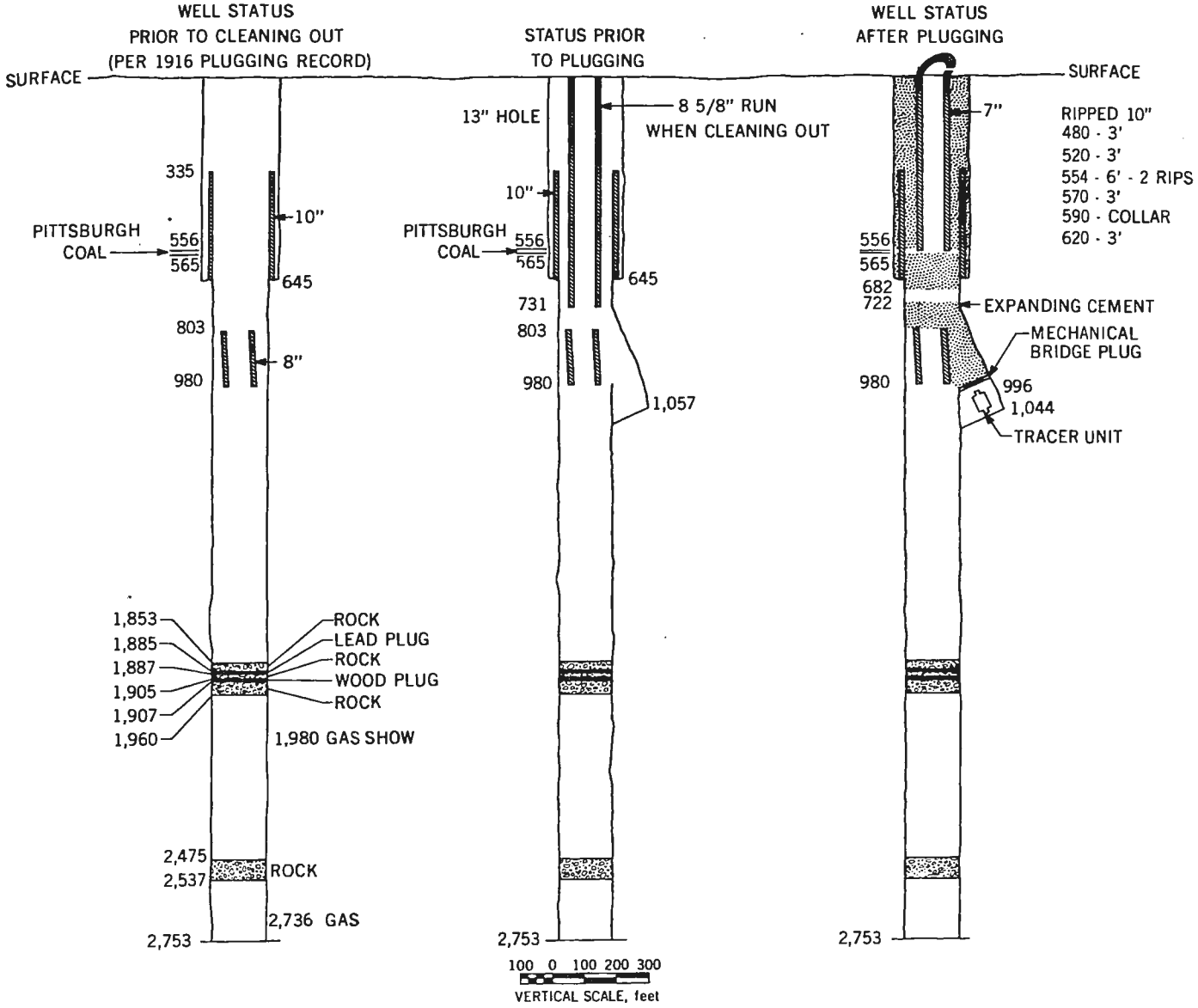


FIG. - A-13 - CONSOLIDATION COAL CO., MOUNTAINEER DIVISION WELL NO.509
EAGLE DISTRICT, HARRISON COUNTY, W.VA.

cement + 18% salt. This would normally fill up 237' (lot of caves), cemented with another 125 sacks plus 6 sacks salt top 722'. Pulled 4 jts. 8-5/8 to 611'.

June 29, 1972

Pulled remainder of 8-5/8 casing. Then ripped 10" following places 620, 590, 570, 554, 520, 480 about 3' long rips, except @ 554 ripped twice about 6' long. Run 682' 7" casing (6-1/2" ID)

July 8, 1972

Halliburton pumped in 100 sx cement 18% salt (expanding cement)
Pulled 7" casing to 565' and circulated cement out
Pulled pipe to 556' cemented with 500 sacks, got returns and pumped plug down.

July 10, 1972

Plug at 473'
Drill out (hard going)
After thru bottom of pipe went easy.

July 11, 1972

Dumped 20 gal. muriatic acid (15% HCl).
Set 1 hour, then bailed hole dry.
Grouted outside of 7" w/20 sx cement. Job complete.

Witness June 28 through July 10, 1972

Roy Jarrett (Mountaineer Coal Company)
G. E. Rennick (Bureau of Mines)

July 11, 1972

Dave Locke and Bud Core (Bureau of Mines)

Samples have been taken every day starting June 29, 1972, no tracer $SF_6$ has been detected.

Methane detector has been used every day starting July 12, 1972, with the following results.

| Date | Percent Methane |
|---|---|
| July 12, 1972 | 0.0 |
| July 13, 1972 | 0.0 |
| July 14, 1972 | 0.0 |
| July 15, 1972 | 0.32 |
| July 16, 1972 | 0.38 |
| July 17, 1972 | 0.10 |
| July 18, 1972 | 0.32 |
| July 19, 1972 | 0.32 |
| July 20, 1972 | 0.35 |
| July 21, 1972 | 0.30 |
| July 22, 1972 | 0.32 |
| July 23, 1972 | 0.30 |

Good indication the coal is exposed.

Samples are to be taken every day through July 26, 1972, then once a week for a month, then periodically, probably every couple of months.

Gas samples were taken from this well (Consolidation Coal Co. Well 509) and when analyzed showed the following:

| | |
|---|---|
| June 12, 1973 | 63.63 ppb $SF_6$ |
| June 14, 1973 | 34.46 ppb $SF_6$ |

June 18, 1973

- Roy Jarrett (Consolidation), Jim Davis (Continental Oil Co.), Rennick and Evans (USBM) ran plastic tubing to about 89'. Pulled vacuum and collected samples. A wire line was run and found bottom at 563 from approximate ground level, not over 2' water in hole. Installed swedge and valves on 7-inch casing and shut well in.

Analysis of Bureau Samples Taken June 18, 1973

| | | |
|---|---|---|
| $O_2$ | - | 18.07 percent |
| $N_2$ | - | 69.03 " |
| $CH_4$ | - | 12.43 " |
| $C_2H_6$ | - | .13 " |
| $CO_2$ | - | .32 " |
| $C_2H_4$ | - | trace |
| $C_3H_8$ | - | .02 " |

(Bureau Samples Continued)

Iso butane - 17.86 ppm

Butane - 9.09 ppm

$SF_6$ - 7,400 ppm

June 19, 1973

- No pressure on well. First sample 9,626 ppb $SF_6$
Second sample 1,144 ppb $SF_6$

It is theoretically possible the tracer could have permeated out without having been any leakage around the cement plug or through a faulty plug.

Recommend drilling 4-3/4" hole from 565' to 722'. Jet to original hole size from 682' to 722'. If needed, run a caliper to find packer seat in the 4-3/4" hole. Set packer on 2-inch tubing at about 600'. Install Bureau vacuum pump and sample for several weeks. If no gas other than $SF_6$, recement hole to 565' and allow coal company to mine through.

October 30-31, 1973

The Mountaineer Coal Co., using Marts Drilling Company's air-rotary rig, reopened well 509, to a depth of approximately 730' reference datum - top of first full joint of 7-inch casing or about 5' below original datum. Cement was initially tagged with the drill pipe at 560', and found to be in good condition to about 575'. From 575 to 660', the hole was relatively open with the air return showing a "mucky brown" material. No cement was found between 660 and 700'. From 700 to 727', the hole still drilled easily, and the return showed a thick material similar in appearance to a Calseal slurry. From 727 to 730', the cement was solid.

November 1, 1973

3-1/2 yards of neat cement were pumped down 724' of 2-inch tubing using Marts' mud pump (hole previously filled with water). Five joints (+14') of tubing were then pulled and 24 bags of Medusa cement were pumped down the tubing (bottom of tubing approximately 610'). Two more joints of tubing were pulled and the hole was flushed with water (bottom of tubing approximately

560'). Two distinct colors of cement were observed during the circulation period, presumably the neat cement followed by the Medusa. A fine black material was also returned with and immediately following the cement, presumably from the Pittsburgh coal.

November 2, 1973

The cement was tagged at 566' and supported the weight of the tubing. The hole was then unloaded with high pressure air and the tubing was removed. (see Fig. A-14).

Gas samples were taken on Oct. 31, Nov. 1, and Nov. 2, 1973. A sample taken from the air return with the drill stem at 730' showed 265 ppb SF6. Another on the same day from the annulus with half the drill pipe removed showed 7 ppb. The sample taken on Nov. 1, 1973, while the hole was being filled with water was 62 ppb. On Nov. 2, after the water had been unloaded and the tubing had been pulled, a sample was taken and was analyzed at 2 ppb.

MERC personnel observing the plugging were C. D. Locke and C. E. Whieldon. Mountaineer Coal Co. was represented by Jim Davis and John Sevine of Continental Oil Company.

MINING THROUGH OF WELL 509 IN CONSOLIDATION'S ROBINSON RUN NO. 95 MINE NEAR SHINNSTON, W. VA. ON AUGUST 31, 1974

August 31, 1974

12:50 a.m. - Messrs David Hardesty, W. Va. State Department of Mines; Franklin Smith, MESA: James Thompson, Edward Yeager, Jerry Slaughter, Douglas Feaster, Robert Vernon and "Lefty" Hutchinson, Consolidation; and G. E. Rennick and J. Pasini III arrived at the longwall section (two left panel) off of main north parallels. Following is the sequence of events prior to, during, and after the mining into and through of well 509:

1. 12:50 a.m. - Section well rock dusted. Return air volume measure at 27,450 scfm showing zero (0) methane ($CH_4$) present. Zero (0) $CH_4$ at face prior to initiating mining operation.

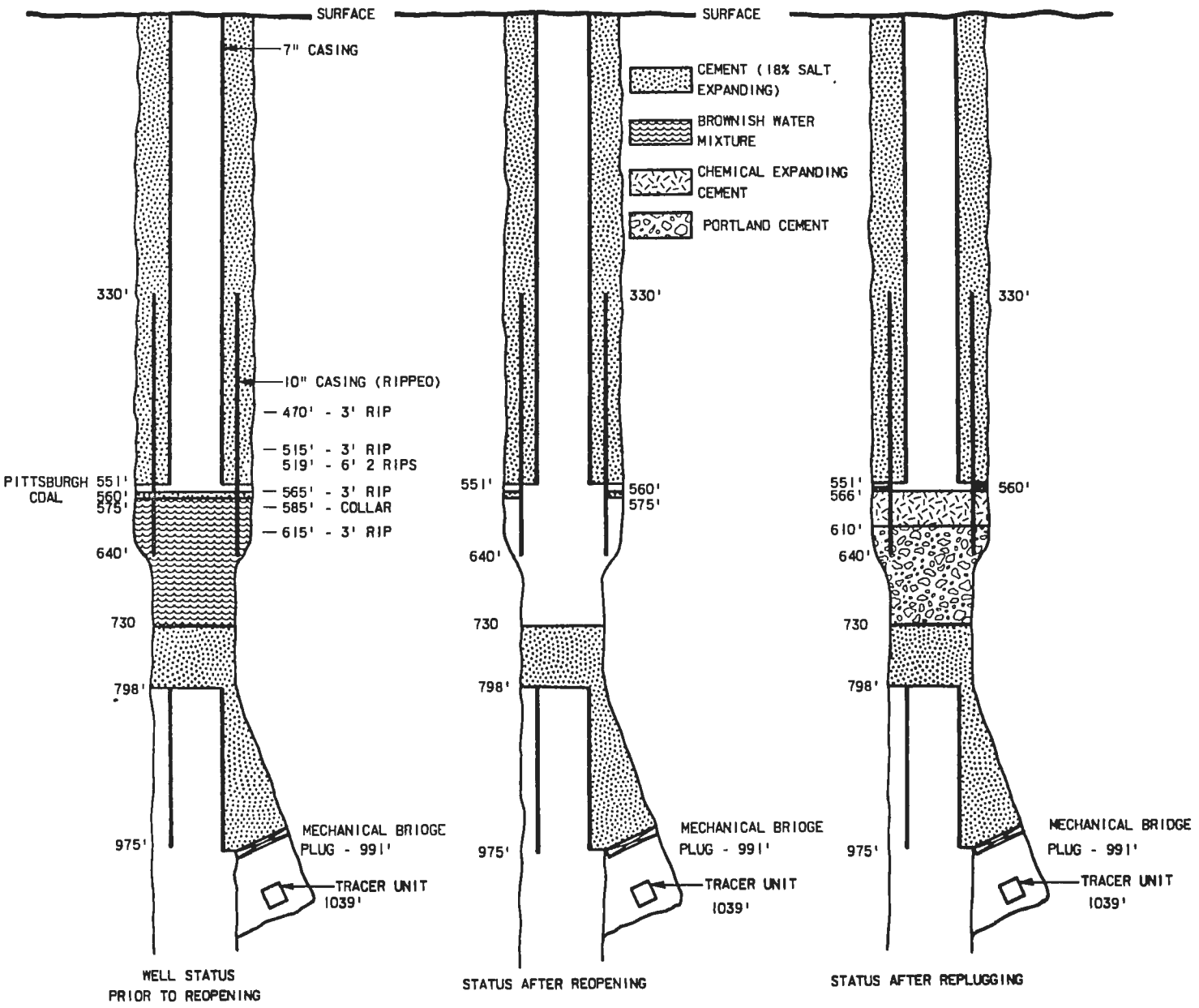


FIGURE A-14. - SECOND PLUGGING OF CONSOLIDATION COAL CO., MOUNTAINEER DIVISION, WELL NO. 509, EAGLE DISTRICT, HARRISON COUNTY, W.VA.

2. 1:10 a.m. - Started mining toward well (development of headgate entry). In take air volume 16,200 scfm.

3. 1:35 a.m. - Face advanced 15' in by last open cross cut. $CH_4$ concentration at face 0.1%. Tubing run to booster fan. Rock dusted entry (very white).

4. 2:00 a.m. - $CH_4$ concentration at face 0.1%. Roof bolting entry.

5. 3:00 a.m. - Continuous miner removed, entry rock dusted. Entry driven about 20'. $CH_4$ = 0.1% at face.

6. 3:25 a.m. - Entry driven about 28'. $CH_4$ = 0.1% at face.

7. 3:45 a.m. - Hit well casing (30' in by last open cross cut) (10" up from floor--dead center in entry). Water released from well through split in casing (took about 2 minutes). Methane concentration at well less than 0.1%. Continuous miner removed from entry. Took bottle samples of gas.

8. 4:00 a.m. - Cleaned ribs and floor of coal. Rock dusted. No $CH_4$ at well.

9. 4:25 a.m. - Opened casing (10") with continuous miner. 7" casing at roof of mine entry. Excellent cement around old casing (10") which had been ripped and cemented and around new casing (7") which is to be used for "Gob" drainage. No intake of air at well. $CH_4$ = 0.1%.

10. 4:27 a.m. - Proceeded to remove casing. Everything is O.K.

11. 5:00 a.m. - Completed removal of casing. Took additional bottle samples (gas) around well. No bubbles coming from casing in mine pavement. Good cement in and around pavement. Rock dusted area. (see Fig. A-15).

12. 5:27 a.m. - Left section.

PLUGGING OF DAN L. TOOTHMAN WELL 7, CLAY DISTRICT, MONONGALIA COUNTY, W. VA. (COOPERATIVE AGREEMENT WITH EASTERN ASSOCIATED COAL CORPORATION FOR MINING TO AND THROUGH, FEDERAL NO. 1 MINE, GRANT TOWN, W. VA.)

The well was plugged about 1,894' and was probably between 2,000 and 2,500' deep. This "hearsay" information may not be exact. The well was cleaned out to 1,332 feet by Chisler Brothers, which took about 10 days. The well was logged on Sept. 13, 1973, by Basin Surveys, Inc. and the casing was ripped every 20' (5' rip) from 1,318 to 1,060'.

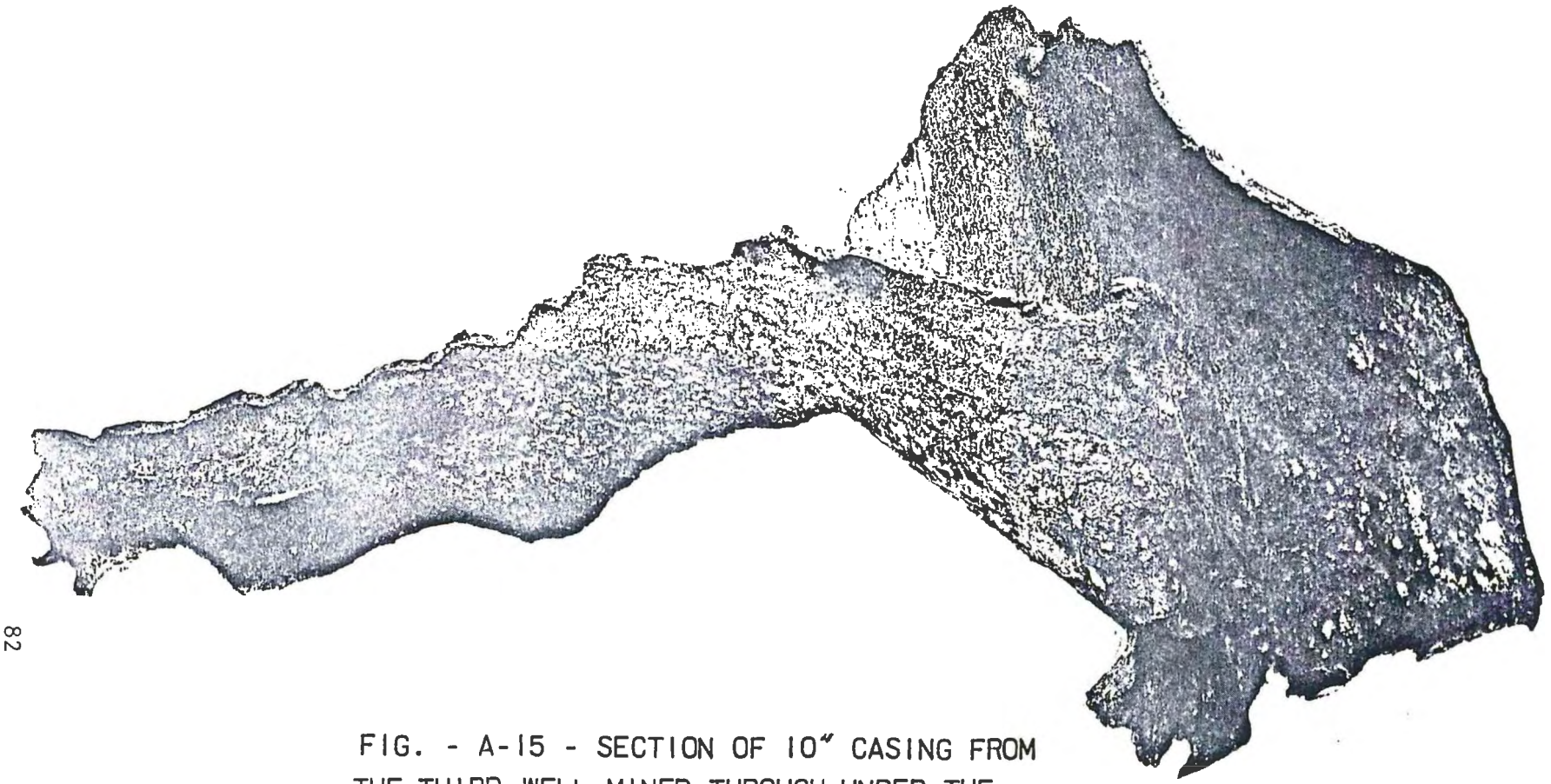

FIG. - A-15 - SECTION OF 10" CASING FROM THE THIRD WELL MINED THROUGH UNDER THE FEDERAL COAL MINE HEALTH AND SAFETY ACT OF 1969

Well: Mountaineer Coal Company Well 509

Location: Eagle District, Harrison County, W.Va.

Date Plugged: July 8, 1972

Mine: Robinson Run Mine 95

Location in Mine: Two Left Panel off Main North Parallels

Coalbed: Pittsburgh

Date Mined Through: August 31, 1974

September 17, 1973

Ran 2-inch tubing for cementing, could not get below 1,186'. Probably bridged with cavings. The hole had been caving below the coal. Set tubing at 1,185' and mixed and pumped 125 sacks Medusa (expanding cement) with Chisler Brothers' portable equipment. One sack of aquagel was pumped ahead of cement.

September 18, 1973

Checked cement fillup with tubing. Started taking weight at 970' and stopped at 1,005'. Set tubing at 998' and pumped in 24 cubic yards of ready-mix Portland cement, delivered by Fairmont Wall Plaster trucks--6 truck loads, 4 cubic yards per load, total of 540 sacks.

September 19, 1973

Checked cement fillup at 353'. Set tubing at 352' and pumped in 14 cubic yards of cement (four truck loads) equivalent to 378 sacks of cement. Circulated very good cement. Pulled tubing and job completed at 6:30 p.m. They will install marker and grout when they finish plugging Toothman well 14. (see Fig. A-16).

Job was witnessed by Terry Simpson, Eastern Associated Coal Co., and G. E. Rennick and C. E. Whieldon Jr. U.S.B.M.

PLUGGING OF D. L. TOOTHMAN WELL 14, CLAY DISTRICT, MONONGALIA COUNTY, W. VA., (COOPERATIVE AGREEMENT WITH EASTERN ASSOCIATED COAL CORPORATION FOR MINING TO AND THROUGH FEDERAL NO. 1, MINE GRANT TOWN, W. VA.)

Subject well was "cleaned out" by Chisler Brothers, General Contractors, to a depth of approximately 1,100' with completion of this phase on August 18, 1973. Drilling was ordered stopped by Eastern Associated Coal Corporation when a wooden plug was found in the hole. The wooden plug was encountered at approximately 1,050' and had been drilled/driven approximately 50' when drilling was stopped.

The well was logged (gamma ray, neutron, caliper, and casing-collar) and the Pittsburgh coal was picked at a depth of 878-886'. The sulfur-hexafluoride tracer-injection unit was assembled by Royal Watts and C. D. Locke and set at a depth of 1,061-1,090'. A 10-inch open-hole bridge plug was set at a depth of 1,013-1,015' and topped with one bag of Cal-seal cement. Logging and setting injection unit and plug were done by Basin Surveys on August 20, 1973.

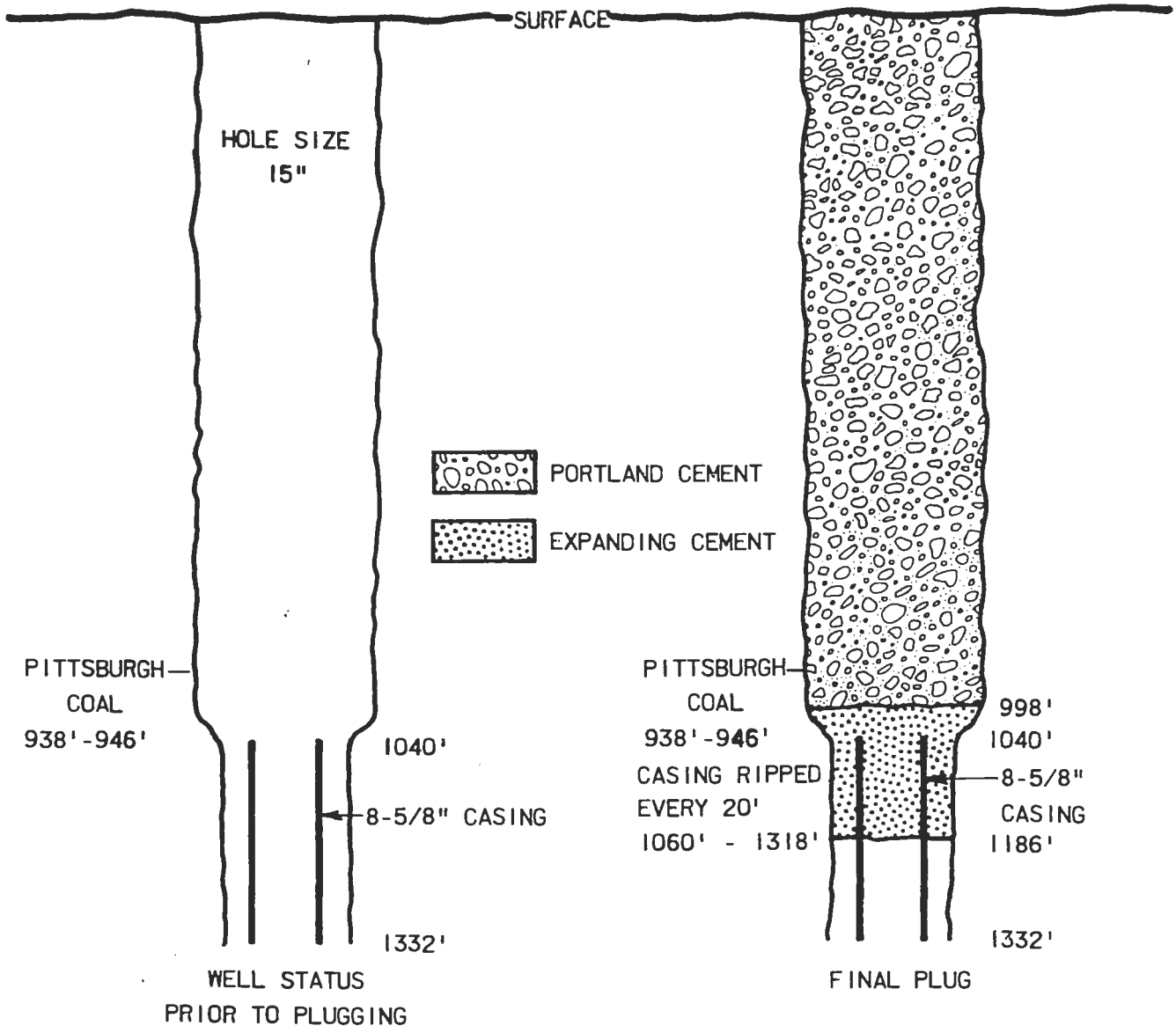


FIGURE A-16. - EASTERN ASSOCIATED COAL CORP. DAN L. TOOTHMAN WELL #7 CLAY DISTRICT, MONONGALIA CO. W.VA.

There was approximately 230' of 10-inch casing in the hole between the depths of 771 and 1,000'. This casing was ripped several times prior to cementing, with at least one rip through the entire length of the casing. On August 22, 125 bags of expanding cement was pumped (dumped) down 2-inch tubing (1,005'). Fifty bags were dumped in one batch and two joints of tubing were pulled. This was followed by 40-45 bags dumped down the tubing and one joint of tubing was pulled. The remainder of the cement was then dumped and two more joints of tubing were pulled and a quantity of water was then pumped to flush the tubing. Five more joints were then pulled to insure that the tubing was clear of the cement and additional water was pumped to make sure that there was no cement left in the tubing. Three samples of cement were taken for testing purposes.

August 23, 1973

- Tubing was lowered and the top of the cement was found at a depth of 767'. The cement was then drilled out to the bottom of the Pittsburgh coal (886') and 881' of a 2-inch tubing was hung in the well. This phase of work was completed on August 25, 1973. (see Fig. A-17).

- Gas samples were obtained on August 23 and August 24 1973. The timer on the tracer injection unit was set to release the gas around midday of the 24th.

The coal company representative during the plugging operation was Terry Simpson. The State of West Virginia was represented by William Blosser.

## FINAL PLUGGING OF EASTERN ASSOCIATED COAL CORPORATION TOOTHMAN WELL 14

This well was plugged back to base of Pittsburgh coal August 18, 1973, after Bureau's tracer unit was placed in well.

The Bureau's vacuum pump was connected to the well September 4, 1973, and samples were taken 2 to 3 times per week until October 5, 1973. No tracer ($SF_6$) was detected in any of the samples. The company did not call October 8; therefore, no one from the Bureau witnessed the plugging. The state inspector (Bill Blosser) was not present either. The following information was obtained from Dick Skidmore (Eastern Associated engineer) on October 9 by Rennick and Whieldon.

Ready-mix Portland cement, delivered by Fairmont Wall Plaster trucks, was pumped through tubing by Chisler Brothers. Twenty-eight cubic yards were pumped into well 14, October 8, 1973. Markers were grouted into well 14 and well 7 also. A gas sample was taken from the pipe marker on well 14 when filling with cement October 9, 1973.

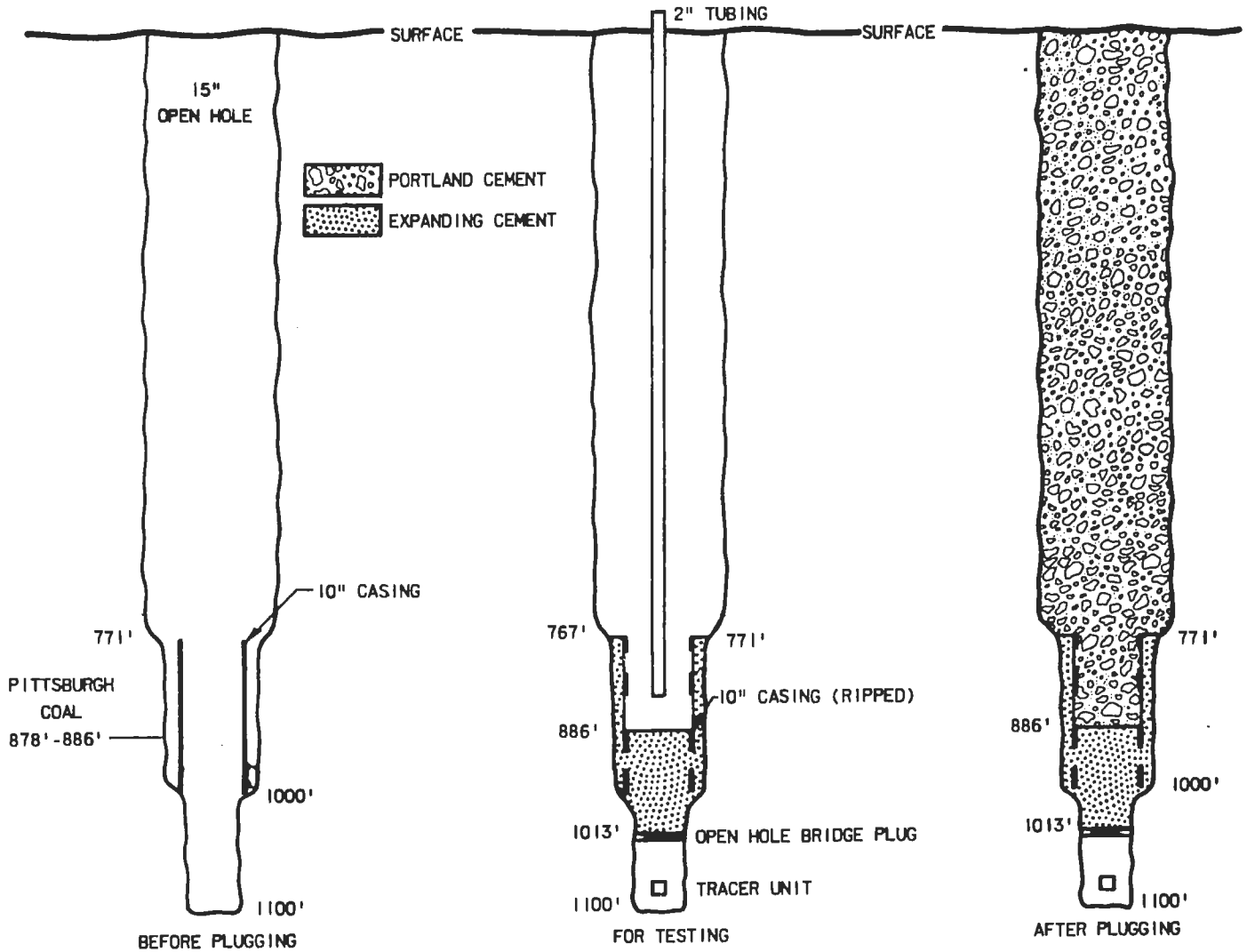


FIGURE A-17. - EASTERN ASSOCIATED COAL CORP. DAN L. TOOTHMAN WELL NO. 14, CLAY DISTRICT, MONONGALIA COUNTY, W.VA.

No tracer was detected in the sample.

On October 19, 1973, tracer gas was detected in the mine near the well, and the plan to mine through the well was cancelled. Cause of plug failure is unknown, but it is likely the result of insufficient uncased hole to accomplish an effective seal.

PLUGGING OF EASTERN ASSOCIATED COAL CORPORATION REF. WELL NO. 523, PENNZOIL PRATT TENNANT WELL 5, CLAY DISTRICT, MONONGALIA COUNTY, W. VA.

October 22, 1974

Grade road.

October 23, 1974

Start tearing down and dismantling engine house Belt Hall, Band Wheel etc. Called Eastern told them we needed permit and see about hauling rig out.

October 24, 1974

Take rig (angle iron) down and stack.

October 28, 1974

Move water tank in (210 bbl.), finish rig up, pulled rods, started tubing.

October 29, 1974

Finished pulling tubing (95 jts.) Run drill stem to bottom 1,977'. Couple hundred feet paraffin.

October 30, 1974

Bail water, dumped 2 drums drip gas and 1 drum solvent in well. Rig up to pull 5-3/16" casing. Worked pipe free.

October 31, 1974

Pulled 84 joints 5-3/16" 11 1/2 V THD. casing. Looked good about 1,844' total.

Hole bridged 300' off bottom.

November 1, 1974

Hauled 5" to Pennzoil yard. Cave 1,584'. Cleaned out 1,604'.

November 4, 1974

Put broken bottles in hole. Try get tools to work on heavy clay. Clean out to 1,634'.

November 5, 1974

Put 5" bit on. Clean out to 1,741'.

November 6, 1974

Clean out to 1,775'.

November 7, 1974

Clean out to 1,785'.

November 8, 1974

Clean out to 1,806'.

November 9, 1974

Clean out to 1,977'. Called basin to log November 11, 1974.

November 11, 1974

Basin survey - Run Gamma ray neutron caliper and casing collar logs. Set clock at 11:00 a.m. for 6-1/2 days. Tracer unit, anchor, top connection neasure 26.2'. Will be left in well on bottom 1,977'. Set unit 1:45 p.m. Set 6-1/4" Gearhart Owen mechanical bridge plug at 1,897' 2:34 p.m. Mixed 3/4 sx calseal--hit cave 100' from bottom--lost it. Mixed 3 sx neat cement put on top of plug with bailer, completed 4:00 p.m. Ordered 100 sx Medusa for tomorrow. Called Paul Garrett (State inspector) 6:50 p.m. Called Bill Blosser 6:55 p.m. (also State Insp.)

November 12, 1974

12:30 p.m. - Top of cement 1,887'. Run Tbg, Halliburton on location.
1:15 p.m. - Also sack cement, mixed 3 sacks gel (6%) ahead of cement. Mixed and pumped 48 sx Medusa (expanding cement). Pulled up about 150'. Mixed and pumped 50 sx Medusa, displaced 5.8 bbl water (broke circulation). Pulled tubing. Raining and very muddy, Halliburton left pumper on location for possible fly ash job Thursday. Called Eastman 6:00 p.m. set up for Thursday.

November 13, 1974

7:45 a.m. 200' down to fluid. Measured with bailer, cement at 1,500', sounded 6-5/8" casing and ripped at 1,480'. Pulled one joint. Ran knife check to see if got all 1,480'--O.K. Bill Blosser said should not have to cement cut off top since so close to plug. Decided to anyway. Dumped 5 sacks Medusa with bailer.

November 14, 1974

Measure in with bailer cement at 1,475' Eastman ran directional survey to 625'. The well at the coal is 3.29 feet S 4° 53' W of the surface location.

Drag bulk truck into location, very muddy and raining. Pumped into 7" try to get circulation (150 bbl), on vacuum. Pulled 7" up 4", run knife to bottom (pipe not parted) pulled 21' of 7" ran tubing to 1,475'. Mixed and pumped fly ash 8,624 lb with 10 bbl water with 240 lb. gel (slurry wt. 12.8 #/gal). Pulled 20 joints of tubing.

November 15, 1974

Pulled remaining tubing, pulled 20 joints 7" CSG. Run 36 joints tubing. Mixed and pumped 1,400 # fly ash with 380 # gel in 20 bbl water pull 10 joints tbg. Pumped 3,256 lb fly ash, 10 bbl water with 140 # gel. Pulled tubing, fly ash down about 300' in 7". Pull 5 joints 7".

November 16, 1974

Collected gas sample, no $SF_6$ tracer; tracer to be released tomorrow.

November 18, 1974

Pull 13 joints 7" (now at 631'). Heavy fluid at 300'. Pull 3 joints 7" (at 568') check fluid at 350'. Run knife, check for 8-5/8" pipe seems to be at 589'. Pull 1 joint 7" now at about 547' run 620 tubing, talked to Dick Skidmore (Eastern Associated Coal Corp.). May want to make well a gob vent, will not work tomorrow until they decide. Called State inspector told him we won't be working tomorrow.

November 19, 1974

Joe Pasini talked with Mr. Jackson. They will furnish casing and flapper valve and to set pipe about 100'

above coal. Called Chisler, ordered 70 sx Medusa for a.m.

November 20, 1974

Called Blosser (state insp.) 6:45 a.m., told him we will start plugging again today. Drag Halliburton and cement in 7:30-8:30 a.m. Mixed and pumped 70 sx Medusa cement. Pulled tubing up to 512' mix 3 sx gel with 12 bbl water pumped in. Pulled tubing and 3 joints 7" (at about 480'). Ran bailer, cement pickup 551' 11:00 a.m. Pull 27 joints 7". Run bailer cement set up at 530' (2:30 p.m.). Went to Pentress, got 7" nipple with 3-1" rods welded in for csg. shoe. Put it on 7" and start running back.

November 21, 1974

Finish run 7" total 23 joints set at 475' 7" from GL. Mix and pumped 300 sacks thixotropic cement (4% gel, 5% cacl. and 1/4#/sx. flocele). Broke circulation while pumping, pumped plug down, 12:45 p.m. Did not get cement returns. Fluid down outside of 7" 3' at 1:15 p.m.

November 22, 1974

Knock plug down from 460'to 495'. Bail water to 474'. Measured to cement on outside of 7" at 55'. Will be down till get cat to take cement into well to grout 7" to surface.

November 23, 1974

Run 1" pipe down side of 7" to 55'. Mixed and pumped 36 sx Medusa cement, fill to surface. (See Fig. A-18)

PLUGGING OF CONSOLIDATION COAL CO. (MOUNTAINEER DIVISION)
J. H. HAUGHT WELL NO. 1, BATTELLE DISTRICT, MONONGALIA COUNTY, WEST VIRGINIA

Met with Don Born of Consolidation on August 6 at well after looking at logs, the decision was made to set tracer unit at 2,891' and bridge plug at 2,850'. Tracer unit would only go to a depth of 2,549'. Tracer unit was pulled and withdrawn from hole. A 4-1/2" bit was run for 6 hours and made 80 additional feet.

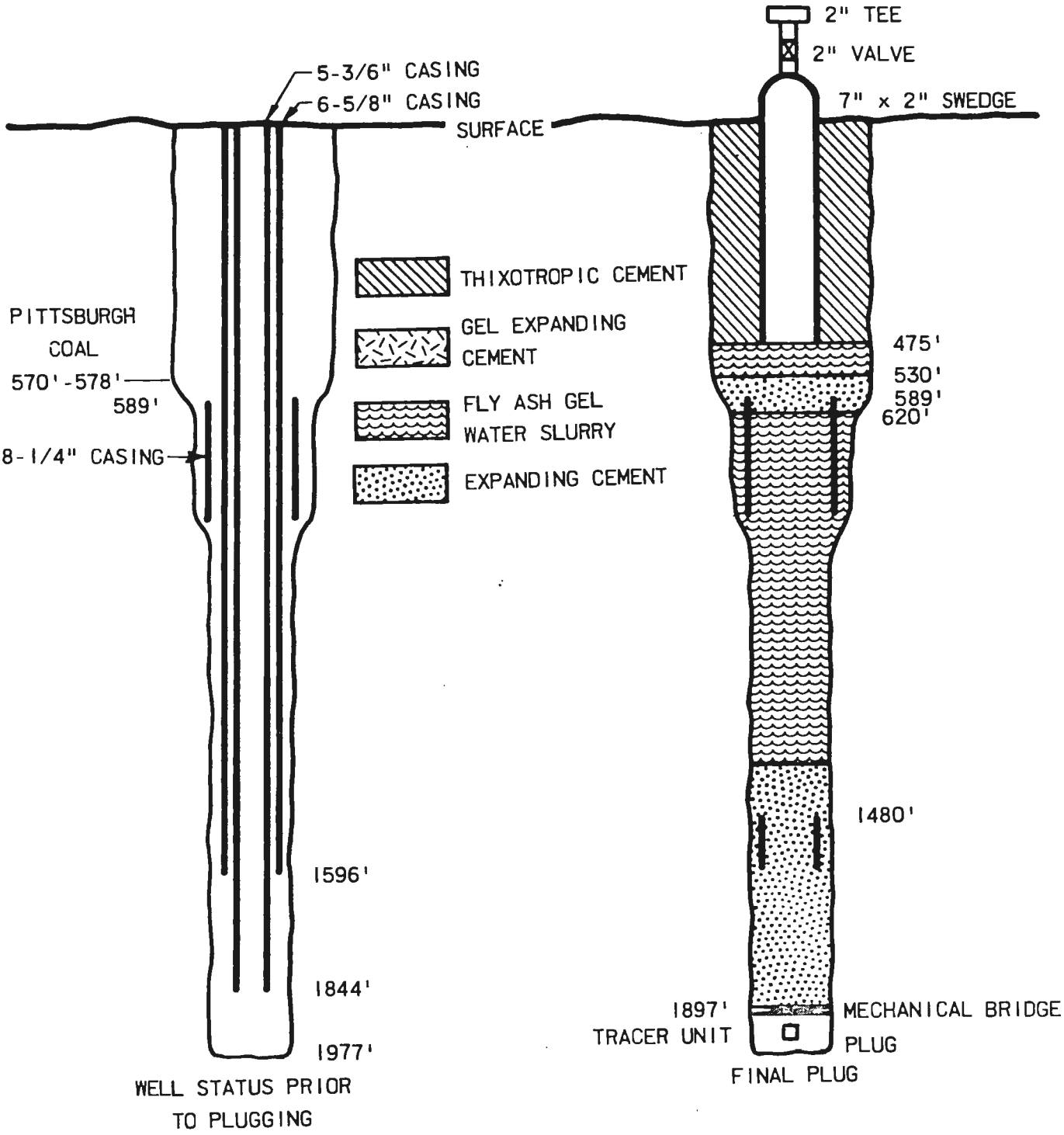


FIG. - A-18 - EASTERN ASSOCIATED COAL CORP.
PRATT TENNANT WELL NO. 5 CLAY DISTRICT,
MONONGALIA COUNTY WV

August 7, 1975

The 4-1/2" bit on rig tools ran all day and broke through obstruction about 8:00 p.m.

9:30 p.m. - Tools were down to 2,813'.

August 8, 1975

Cleaning out until 1:00 p.m. when tools broke through to bottom. Called Basin and set tracer unit clock for 6-1/2 days at 4:30 p.m. Basin arrived on location at 5:00 p.m. and tracer unit was run to a bottom depth of 2,882' with top being at 2,855'. Bridge plug size 4.65 to 5.75 inch, was set at 2,850' at 6:30 p.m. and bond log was completed at 8:00 p.m. Strung bailer in hole and mixed and ran 2 sacks of calseal on top of plug, which raised bottom to 2,840'. Ran tubing and finished at 3:00 a.m. on August 9, 1975.

August 11, 1975

8:00 a.m. - Touched bottom with tubing and found depth to be 2,845'. After removing 18' of tubing, a 2-foot sub was run, making tubing depth at 2,830' for cementing.

9:15 a.m. - Dowell was on location and pumped 12 bbls of water to clean tubing, and then pumped 25 sacks of Medusa cement. Cement was displaced from tubing by 11 barrels of water. Eight joints of tubing were pulled and 150 sacks of fly ash gel water slurry was pumped down well. Following displacement of slurry, the remaining 90 joints of tubing were pulled and rigging up to pull the 5-inch was completed.

4:00 p.m. - Rig started working the 5-inch.

August 12, 1975

It became necessary to cut the 5-inch and the cutting knife wore down. This necessitated renting a tool. Upon securing a new knife, tools were run back in and cutting at a depth of 2,300' was started at 3:00 p.m.

August 14, 1975

Eastman Whipstock ran a Gyro Directional survey at 25 foot intervals to a depth of 1,050'. Tried to uprip 5-inch and knife holder broke. Gave CONSOL engineer 14 mine sample bottles to start collecting one sample a day. Don Born called and said he would have Basin shoot 5-inch off tomorrow.

August 15, 1975

8:00 a.m. - Basin Survey on location. Ran tool in heavy fluid

and could not get below 2,230'. Shot the 5-inch at 2,226'--2 feet below a collar at 10:15 a.m. Started to pull pipe and at noon had 3 joints out and figured it should be up in the 7-inch. Collected sample from 5-inch at 1:10 p.m. and picked up Eastman Whipstock report. At the coal bed, the well is 7.06 feet south 9° 3' E of surface location.

August 18, 1975

Pulled remaining 5-inch casing and ran tubing. Dowell to be on site August 19 at 8:00 a.m. to pump 320 sacks of fly ash gel to within approximately 500' of ground surface and spot cement around 5-inch pipe cut off area. Attempt to pull 7-inch.

August 19, 1975

Larry Bayles, MESA Engineer, arrived at 11:25 a.m. Phil Tracy (driller) said that Dowell had run about 310 sacks of fly ash gel to ground surface and then cemented around 5-inch cutoff (30 sacks Medusa). No samples were taken. In afternoon, attempted to pull 7-inch but gained only about 1 inch stretch by 3:00 p.m.

August 20, 1975

Don Born informed Larry Bayles that tubing hung up where 5-inch pipe had been shot off. Bottom of tubing at 2,206' when 30 bags of Medusa were pumped (38' in open hole, 76' into 7-inch casing). Dowell people told Don Born that this procedure should be okay. Started to cut 7-inch pipe at 1,320', but had not parted. Hopes to pull to 975', set Medusa plug through the Pittsburgh coal, pull remaining pipe and finish filling hole with fly ash gel by Monday the 25th.
Driller didn't arrive until noon. Found hardened areas in fly ash gel inside 7-inch--difficult to get through. Don Born feels that too much fly ash gel was in the mixture due to change over in tanks during pumping operation.

August 21, 1975

No work at site.

August 22, 1975

Driller made another cut in 7-inch pipe at 1,135'. Will attempt to pull 7-inch if it can be broken free.

August 25, 1975

Tools hung in hole, socket at about 1,024'.

August 26, 1975

Dowell circulated water as tubing was run down hole. Seems there is a bridge at the coal seams (Waynesburg, Swickley and Pittsburgh) had 37' of 1-1/4 inch below the 2-inch. Got about 17' by tools and about 3 inches working on jars. Pulled tubing after mixing 6 sacks gel.

August 27, 1975

Spudding but not using much jar action. Line broke at noon, may be at socket. Strung up 6-inch tools and ran impression block twice. Went to a depth of 890'. Looks like hard fly ash on walls, so will arrange for a cherry picker in a.m.

August 28, 1975

Picked up some fly ash in cherry picker and saw where wire line had been in picker. Picked up center spear in Mannington and ran down well. About 8:00 p.m., recovered 8'of wire line. At 9:00 p.m., shut down for night but had another bite on spear.

August 29, 1975

Recovered 3 pieces of wire. Will run 2 joints 5-inch on 2-inch and wash over tools.

September 2, 1975

At 18' above tools, the 5-inch stopped and would go no further. Used 59 barrels of water but no luck. Pulled tubing and ran impression block, still wire. Ran blind box about 15 minutes, then re-ran impression block and found more wire. In this run, the wire was hole centered, so ran center spear and recovered about 15-16' of wire. Repeated with impression block and found more wire. Will run blind box with sharp edge in a.m.

September 3, 1975

Finally got wire off to the socket and got smaller blind box and cut wire around socket.

September 4, 1975

Cutting wire.

September 5, 1975

Ran joint of 5-inch on tools but wouldn't go down because of wire on shoulder. Shut down at 2:00 p.m. and will move rotary table in and try mill wire up and circulate around tools.

September 11, 1975

Started to mill and circulate with 5-inch casing. Deepened hole 9' using power tongs.

September 12, 1975

Pulled 5-inch casing out and found out that mill was completely worn down. Will try to obtain something harder.

September 16, 1975

Located tungsten carbide rods so will build up mill, move in drill pipe and hope to start up tomorrow.

September 17, 1975

Got 2-inch to use as drill pipe, however, water pump engine would not start.

September 18, 1975

Ran pipe in well and tried to mill, turning with power tongs. It was jumping and would not go, tongs also broke. Pulled out of hole and ran in 6-inch tools with blind box. Tried to drive 5-inch tools down well and finally got them moving down and drove them down about 100'.

September 19, 1975

Basin Survey ran caliper log to total depth of 1,148'. Pipe is parted about 962'. Ordered cement retainer that had to come from Dallas by plane. Will cement squeeze tomorrow.

September 20, 1975

Basin perforated a 3-foot section from 1,120 to 1,117' using 4 shots per foot. Cement retainer was set at 1,102' and tubing was run and set in retainer. Dowell pumped 50 sacks of Medusa cement. Pulled tubing out of retainer about 2' and pumped another 25 sacks of Medusa cement. Pulled tubing up to 975' and circulated cement. Evidently, holes in pipe at Pittsburgh coal and cement in squeeze job came back. Another possibility is that the pipe split when the retainer was set.

September 22, 1975

Getting a pipe ripper.

September 23, 1975

Cut the 7-inch at 780' and pulled out all but 200'. Ran tubing to 780'.

September 24, 1975

Pumped 600 sacks of cement down well and pulled tubing and remaining 7-inch casing. (See Fig. A-19).

NOTE: Mine sampling for $SF_6$ was started August 15 and has been continued five days a week since. There has been no $SF_6$ found.

Witness at various times:

Bill Blosser - W. Va. State Oil and Gas Inspector
Don Born - Chief Engineer, Mountaineer Coal Co.
Roger Duckworth - Engineer, Loveridge Mine
Howard Husk - Mountaineer Coal Co. Well Inspector
Larry Bayles - MESA engineer
G. E. Rennick - ERDA Petroleum engineer
D. M. Evans - ERDA, Petroleum engineering technician
C. E. Whieldon - ERDA, Petroleum engineering technician

MINING THROUGH OF THE J. H. HAUGHT WELL NO. 1 LOCATED IN BATTELLE DISTRICT, MONONGALIA COUNTY, W. VA.

The group of personnel (observers and miners) scheduled to mine into and through Well No. 4082 (J. H. Haught Well No. 1) entered the Loveridge Mine of Mountaineer Coal Company, Division of Consolidation Coal Company, Fairview, Marion County, W. Va., at 12:10 a.m. October 18, 1975. This group arrived in the 4 North Section at 12:40 a.m., where a preshift examination for hazardous conditions was made on the section by the section foreman and MESA Personnel. Highest methane reading obtained on a methanometer was 0.1% methane ($CH_4$).

The entry, from which the well was to be mined into and through, had been driven to within 30' of the well on the afternoon shift, October 17, 1975. Line brattice was being used to ventilate this entry and was carrying 34,000 cfm of air to the face. The line brattice was removed at 12:57 a.m. after installation of a Joy 2325-17.5 auxillary fan, exhausting through 16 inch rigid tubing installed to within 10 feet of the face. The auxillary fan was displacing 3,700 cfm of air. Mining toward the well was initiated at 1:06 a.m. Methane checks were made at 10 minute intervals and no more than 0.1% methane was found at the working face.

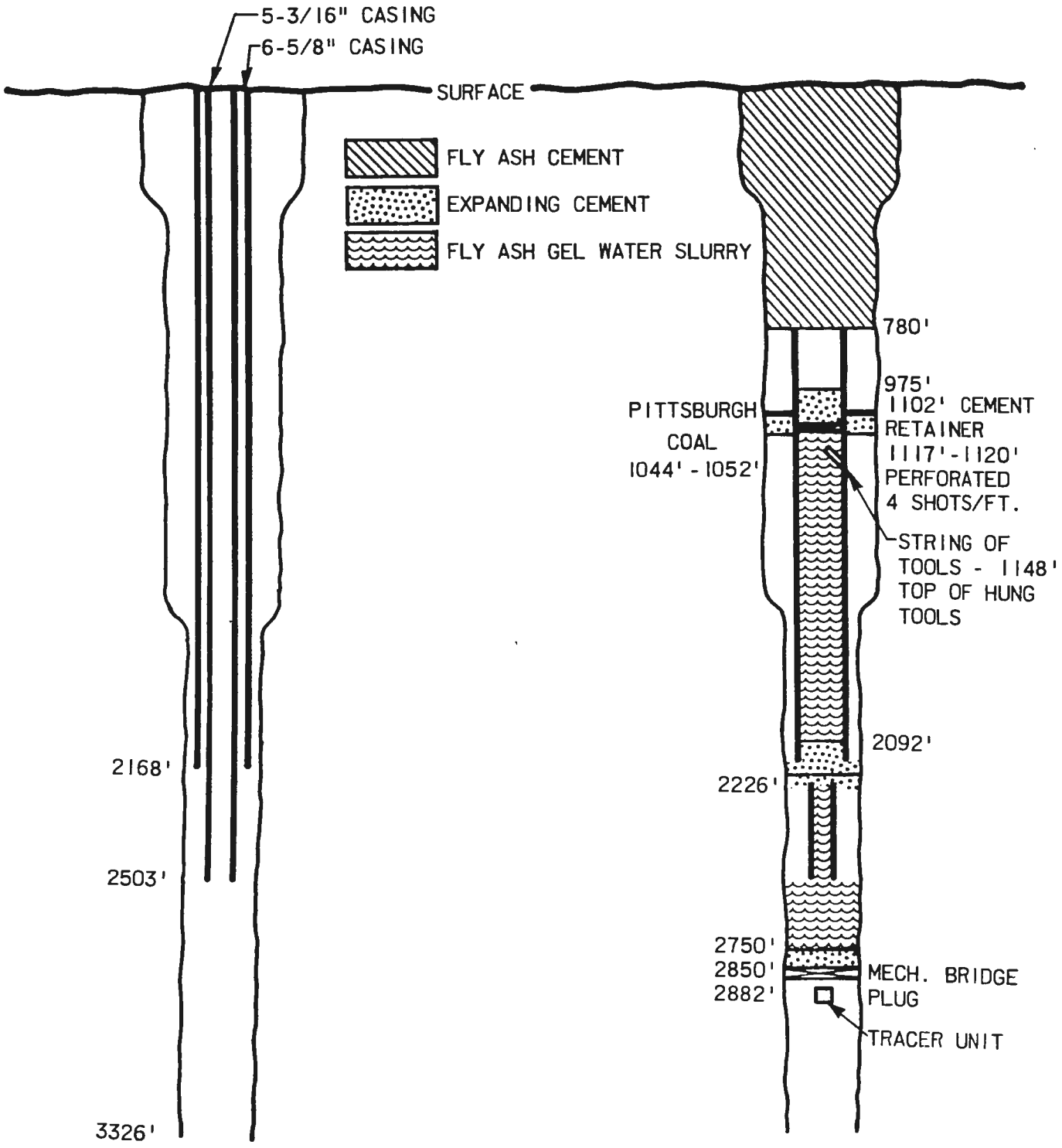


FIGURE A-19. - CONSOLIDATION COAL CO., MOUNTAINEER DIV, J.H. HAUGHT WELL 1, BATTELLE DISTRICT, MONONGALIA CO., W.VA.

The well casing was exposed at 2:11 a.m. and mining immediately stopped. The methane concentration in the vicinity of the well casing was determined to be 0.1%. Bottle samples were taken to determine if the sulfur hexaflouride ($SF_6$) tracer was present and analysis showed no $SF_6$ present. The casing was found intact. After the area was thoroughly examined, the decision was made to proceed, and at 2:20 a.m., the cement-filled casing was cut through with the twin borer continuous mining machine. Methane checks were again accomplished at the mine pavement and roof where the wellbore was; methane was found to be 0.1%. Bottle samples were again taken.

Larger "chunks" of very hard cement were removed from the casing for testing. It was interesting to note that the cement had to be "hammered out" of the casing and that the scale (rust) on the inside of the pipe was "stuck" to the cement samples.

The mining into and through operation was a success and the group of observers departed the section and the mine.

The section continued to operate and sometime before the entry was cut through, water and mud was detected coming from the rib about 15' in by the well. Further investigation determined that another well had been intersected. No casing was present and the hole was full of drill cuttings.

October 20, 1975

10:00 a.m. - Personnel entered the Loveridge mine to investigate the condition of the uncharted well. Methane checks were made in and around this well and no methane could be detected. The entry was very well rock dusted and air was flowing at 8,000 cfm in the entry. Bottle samples were obtained at the uncharted well and at the Haught Well to determine if the $SF_6$ tracer was present. No $SF_6$ was detected.

The group (October 20, 1975) agreed that the condition of the uncharted well did not present a hazard to the mining operations. Mine management agreed to make preshif and on-shift examinations for hazardous conditions around the uncharted well until it was in the "gob" (estimated to be within one week). When the well block is pillared, mining will proceed in such a manner that the uncharted well will be located in a pillar lift fender.

This uncharted well probably resulted from a lost hole condition when it was initially drilled. The rig was moved and a new-well drilled which was plugged and mined through. The drill cuttings filling the uncharted well did not show the presence of crude oil.

PLUGGING OF CONSOLIDATION COAL COMPANY (MOUNTAINEER DIVISION)
J. H. HAUGHT WELL NO. 3, BATTELLE DISTRICT, MONONGALIA COUNTY
WEST VIRGINIA

October 3, 1975

8:00 a.m. Basin Surveys on location. Equipment breakdown, but repaired by 12:30 p.m. Ran gamma ray neutron log. Found 5-inch casing to a depth of 2,519'. Fluid level in hole at 2,704'. Ran caliper log and set ERDA $SF_6$ tracer unit at 3,056.5'. Top of unit was at 3,030.1'. Set 4.625-inch bridge plug at 2,950' in depth. Used bailer to dump 2 sacks calseal on top of bridge plug. Will place cement plug October 4, 1975.

October 4, 1975

Don Born called and stated he was unable to get Dowell until October 6, 1975.

October 6, 1975

Ran 2,954' tubing, touched calseal at 2,941.6'. Pulled one 31.2 foot joint and substituted a 19.1 foot joint. Ran 18 barrels of 9 pound aquagel mix, followed by 25 sacks of Medusa cement. Should fill hole to 2,671'.

October 7, 1975

Pulled 2,390' of 5-inch casing and called Basin for collar and caliper survey.

October 8, 1975

Ran Eastman Gyroscopic Directional Survey, reading every 25' to a depth of 1,065'. The well at the Pittsburgh Coal is 13.23'south 41° 49' E of the surface location.

October 9, 1975

Ran tubing to 2,399' and Dowell ran 9 sacks aquagel and 40 sacks of cement.

October 10, 1975

Could not pull 7-inch casing. Ran in with casing ripper to 1,250'. Intend to set cement retainer at 1,160'. Made 4 rips at 1,256 and 1,198'.

October 13, 1975

Basin on location at 7:00 a.m. Set cement retainer in 7-inch at 1,160'. Perforated 1,064-1,073', one shot per foot. Pumped 10 barrels water ahead of cement squeeze mixture of 37 sacks of Medusa. Pulled out of cement retainer and pumped 58 sacks of Medusa inside casing. Pulled all but 310 feet of tubing. Waited 3 hours to feel cement and found top at 918' in depth.

October 14, 1975

Ray Henderson called and said they found the cement at 918', indicating a good squeeze job. Contractors pulling nipple would not hold and therefore they could not put a strain on the 7-inch. They intend to get steel nipple today and try to cut and pull some 7-inch casing. The casing was cut at a depth of 680'.

October 15, 1975

Ran tubing and pumped 14 cubic yards of ready mix 50 percent fly ash cement with 3 ounces retarder per 100 pounds cement. Pulled on 7-inch and pipe parted at 440' in depth where threads were corroded out. (see Fig. A-20)

Witnesses at various times:

Bill Blosser - W. Va. State Oil and Gas Inspector
Don Born - Chief Engineer, Mountaineer Coal Co.
Ray Henderson - Engineering Assistant to Vice President, Consolidation Coal Co.
Roger Duckworth - Engineer, Loveridge Mine
G. E. Rennick - ERDA, Petroleum Engineer
C. E. Whieldon - ERDA, Petroleum Engineering Technician
D. M. Evans - ERDA, Petroleum Engineering Technician

## MINING THROUGH OF THE J. H. HAUGHT WELL NO. 3 LOCATED IN BATTELLE DISTRICT, MONONGALIA COUNTY, WEST VIRGINIA

Personnel observing mining through operations at this well entered the Loveridge Mine of Consolidation Coal Company, Mountaineer Division, Fairview, Marion County, W. Va. at 12:05 a.m., June 19, 1976, and arrived on the 4 North section at 12:25 a.m. Upon arrival at the section, a pre-shift examination was made by the section foreman and a MESA Coal Mine Inspector.

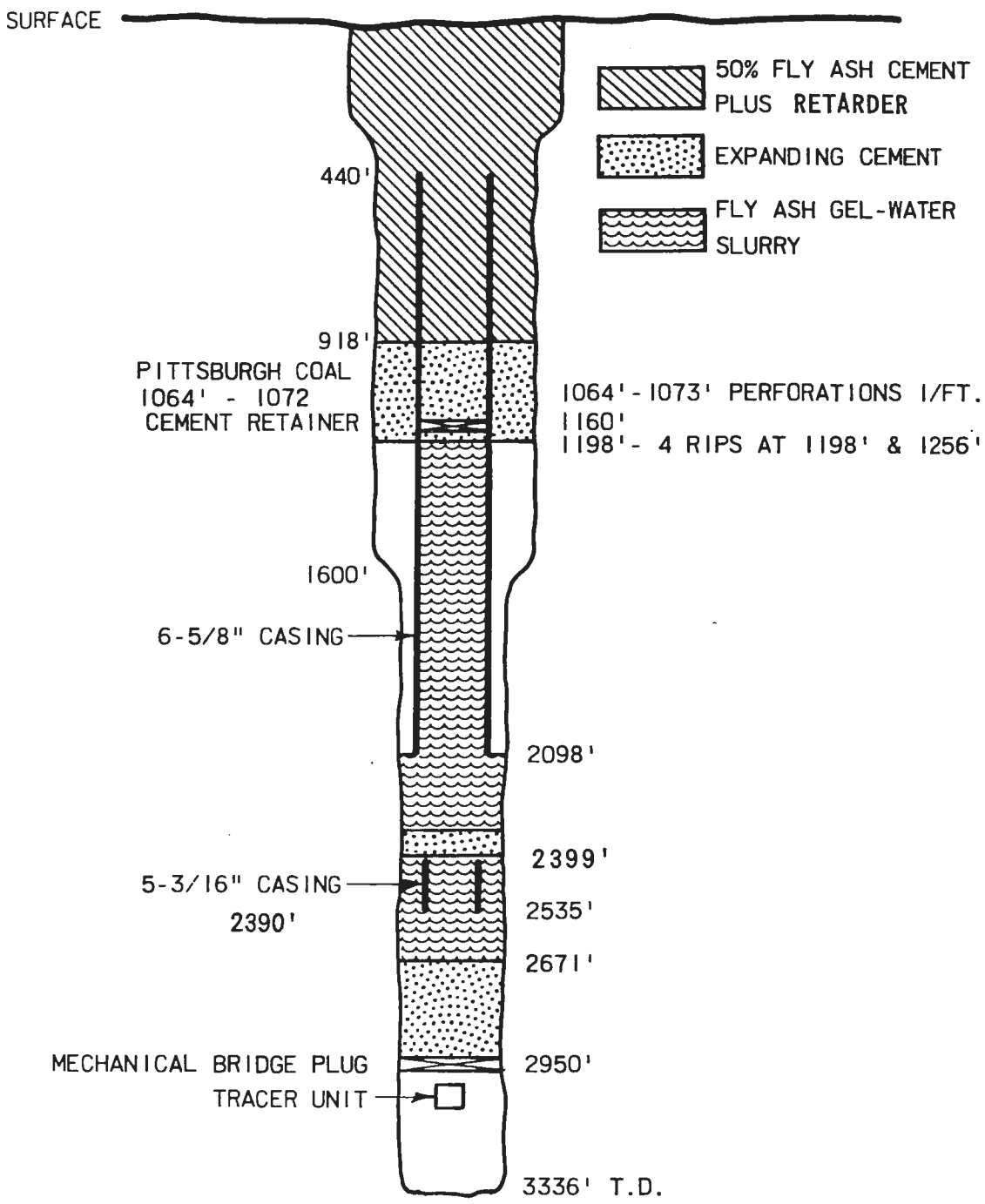


FIG. - A-20 - CONSOLIDATION COAL CO. MOUNTAINEER DIVISION
J. H. HAUGHT WELL NO. 3, BATTELLE DISTRICT,
MONONGALIA COUNTY, WV

The entry, in which the well was located, had been driven to within 55 feet of the well by the afternoon shift on June 18, 1976. Total intake air for the section was measured at 45,600 CFM by MESA personnel. The working face was being ventilated by a 15HP Joy auxiliary fan exhausting 6377 CFM through 16-inch rigid tubing. In addition, a second Joy auxiliary fan, 25HP, was arranged to sweep air across the coal being discharged from the twin borer continuous miner. This fan was exhausting 6551 CFM through 16-inch rigid tubing.

At 12:45 a.m., mining toward the well was begun. Checks for methane were made at the 15 HP fan discharge at less than 10 minute intervals. Methane was not detected above 0.2%. The entry was rock dusted after every 20 feet of advance, and kept clean of loose coal. Methane checks were also made alongside the twin borer continuous miner. Methane was found to run between 0.3% and 0.4% while mining. When within approximately 2 feet of the well, methane was monitered continuously, by MESA at the discharge of the 15HP fan. Not more than 0.2% was detected at any time while mining through the well.

The well casing was exposed and cut through at 3:35 a.m. Methane checks were made at the well and face area. Not more than 0.2% was detected. Mining was continued approximately 5 feet inby the well, at which point the section was idled.

An examination of the well was made. Loose chunks of cement and clay were pulled from the casing in the roof exposing a void in the cement. A pocket of 0.5% methane was immediately detected in the void. This was immediately diluted and rendered harmless, as no more than 0.2% methane could be detected any where in the area, and no more gas could be detected coming from the well.

Three bottle samples were collected for $SF_6$ analysis. One sample (P1556) was collected at the discharge of the 15HP fan when mining was 25 feet outby the well; one sample (P1557) when mining was 10 feet outby the well was collected at the 15HP fan discharge; and one sample (E427) from the well casing after mining through the well.

All persons involved in the operation were allowed to examine the well, and all agreed that the operation was a success.

The following people witnessed mining through the well:

Dale Morgan - West Virginia Department of Mines.

Also present to witness mining through the well were:
Donald F. Poland - UMWA Safety Coordinator
Wayne Conaway - Safety Committee
Wayne E. Parrish - Safety Committee

The following people with Consolidation Coal Co.:
Carl Emmel
James Howvalt - Section Foreman
Arley A. Simmons - Foreman

(Consolidation Coal Co. Cont.)

Tom Greaver - Foreman
Robert W. Varner - Safety Dept.
Paul Carter - Superintendent
Roger Duckworth - Mine Engineer
Joe Pachuta - Shift Foreman

The following United Mine Workers of America:

James A. Thrasher - Fire Boss
Eugene Evans - Electrician
Jack D. Akers - Miner Operator
Howard Brooks - Roof Bolter
William F. Oliver - Buggy Operator
Foster Efaw - Motorman
Glenn Yorko - Motorman
Roy A. Gower - Bolter Helper
John Beveridge - Loading Machine
Charles Chefren - Shuttle Car Operator
Darrell Kirk - Mechanic

The following people with MESA:
Paul H. Moore
Raymond Ash
Raymond Strahin

PLUGGING OF CONSOLIDATION COAL COMPANY (MOUNTAINEER DIVISION) TENNANT-HAUGHT WELL NO. 1, (REF. 4073) BATTELLE DISTRICT, MONONGALIA COUNTY, WEST VIRGINIA

October 23, 1975

Basin Survey ran neutron separate from gamma ray, also ran caliper log. Used tracer unit with Conax Explosive valve. Unit was 27.2' overall 22.6' to cover collar. Basin set tracer unit in tight hole, top of unit at 2,842'. Set mechanical bridge plug at 2,767'. Collected gas sample while logging. Tracer should be released evening of October 29, 1975. Placed two sacks calseal on plug with bailer.

October 24, 1975

Don Born called and said he could not get Dowell this date. Set up to put 100' plug Medusa at 7:30 a.m. on October 25, 1975.

October 25, 1975

Found calseal at 2,752.2'. Set tubing at 2,737'. Dowell on location at 8:00 a.m. Started to pump water to gain circulation at 8:35 a.m. At 8:50 a.m. broke circulation. Used 68 bbls water. Mixed and pumped 10 bbls water and 300# of mud gel which equaled 8 to 9# gel. Should fill 400' and collected sample. At 8:55 a.m., mixed and pumped 25 sacks of Medusa. At 8:57 a.m. cement away and sample collected. Displaced with 10 bbls of water. Finished the job at 9:00 a.m. Pulled 17 joints tubing to 2,201' and circulated 60 bbls of water. Very little gel showed. Pulled tubing.

October 28, 1975

Tried to pull 5-inch pipe and had no success. Decided to cut 5-inch at 2,222'. Still couldn't pull as 5 and 7 inch seem to be sanded together.

October 29, 1975

Tried to drive 5-inch down to free; also, pumped down between strings to free.

October 30, 1975

Pulled 2,200' of 5-inch. Ran 2-inch down to 2,062' where driller hit and assumed packer. Took well sample. Dowell arrived on location and pumped 18 sacks mud gel and 40 sacks Medusa. Pulled 10 joints of 2-inch. Will touch and measure depth in morning.

October 31, 1975

Don Born called and said no fill-up with gel and only filled up hole to 2,040' (22 feet). Tomorrow, Dowell will pump 20 sacks of mud gel with 1/4 pound additive per bag of gel of Cello-Flake. Hope to hold gel and cement. Results of caliper log show 6-inch too bad to pull. Will perforate or rip Monday below cement retainer and try squeeze job.

November 1, 1975

Dowell on location at 8:00 a.m. Forgot to bring Cello-Flake for use in mud. Engineer left at 8:15 a.m. and returned at 10:30 a.m. Tubing at 2,009' and cement at 2,011'. Pumped 52 bbls water, broke circulation, mixed and pumped 1,200# mud gel and 50# Cello-Flake.

Started at 10:55 a.m. Followed with 35 sacks Medusa with 25# Cello-Flake, displaced 1,750' tubing with 7 bbls water. Finished 11:20 a.m. Pulled 31 joints of tubing TD of 1,050'. Circulated hole with 45 bbls mud. Finished at 12:20 p.m.

November 3, 1975

Found cement at 1,855' in depth. Ripped 7-inch at 1,068'. Basin Surveys set cement retainer in 7-inch at 1,015'. Perforated 905-910' with 2 shots per foot (0.46" size). Will squeeze at 8:00 a.m. tomorrow.

November 4, 1975

Dowell on location 9:30 a.m. Started water circulation at 10:40 a.m. Went to 1,200#. Could not get circulation. Don Born decided to pull off of retainer and pump 70 bags Medusa down 6-5/8" casing.

November 5, 1975

Top of cement at 790'. Ripped casing at 350' Ran 2-inch tubing to 787' to cement to surface. Cement truck (6 yards--50% cement and 50% fly ash) with 3% retarder arrived 3:00 p.m. Brought second load same mix which brought cement to about 200'. Ripped pipe again at 200', but could not pull it. Shut down at 3:30 a.m. on November 6, 1975. (See Fig. A-21)

November 6, 1975

Picked up two mine samples from around Haught No. 1 Well.

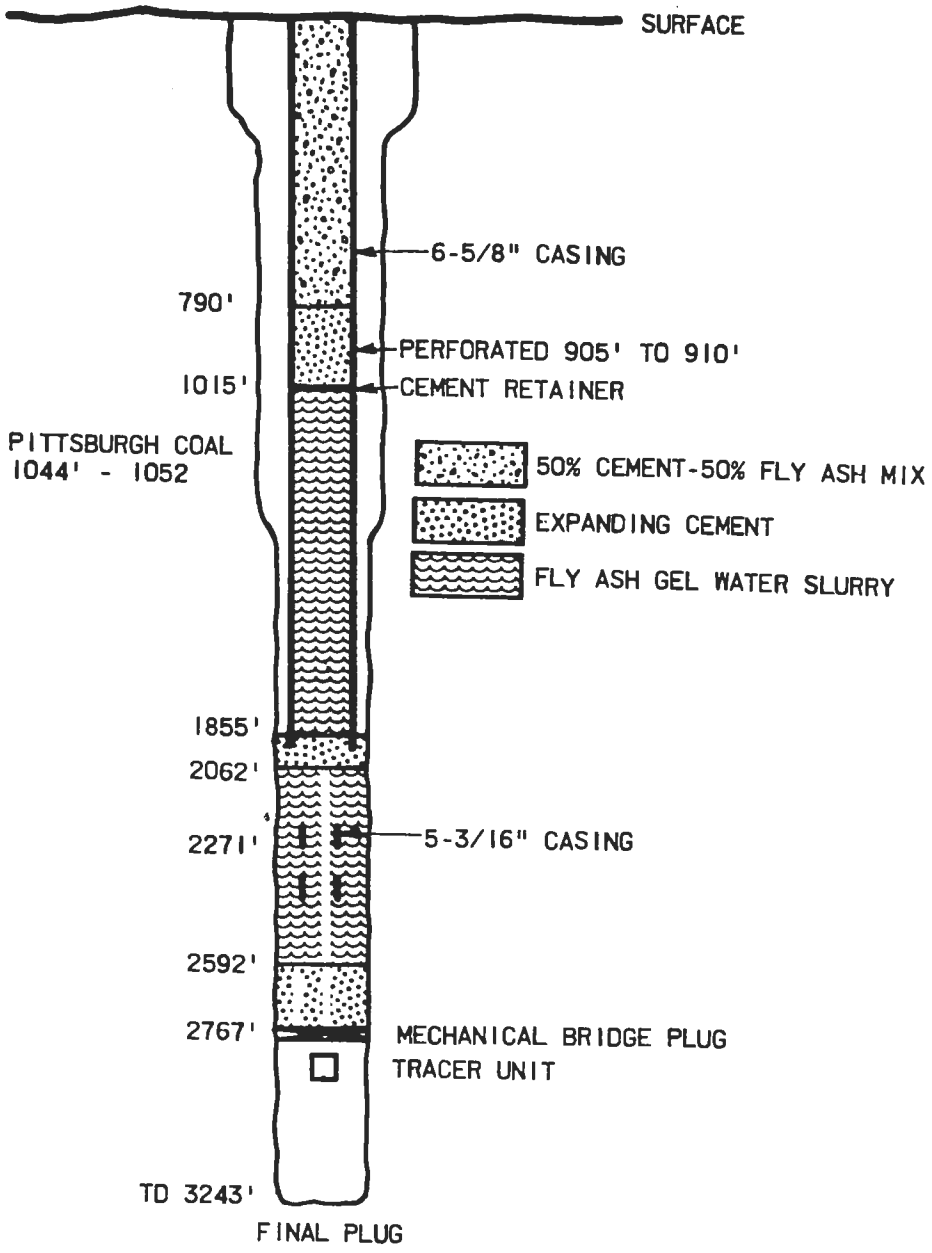


FIG. - A-21 - CONSOLIDATION COAL CO. MOUNTAINEER DIVISION TENNANT HAUGHT WELL NO. I, BATTELLE DISTRICT, MONONGALIA COUNTY, WV



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