CASE 1573: Southwestern, Inc. Oil Well Servicing application to make a "slim hole" completion for well in 32-26S-30E.

Case No.

1573

Application, Transcript,
Small Exhibits, Etc.

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May 22, 1959

Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Dear Ida:

May we please borrow a copy of Case 1573.

Thank you very much

DEARNLEY-MEIER REPORTING SERVICE, INC.

By Ada
Ada Dearnley

AD:sm

Transcript delivered May 25, 1959

Our Experience Assures Superior Service

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE NO. 1573
Order No. R-1379

THE APPLICATION OF SOUTHWESTERN,
INC. OIL WELL SERVICING FOR
PERMISSION TO UTILIZE THE "SLIM
HOLE" METHOD OF COMPLETION FOR A
WELL IN THE SQUARE LAKE POOL,
EDDY COUNTY, NEW MEXICO, USING
2-7/8 INCH O.D. TUBING AS A
SUBSTITUTE FOR CASING IN EXCEPTION
TO RULE 107 OF THE COMMISSION RULES
AND REGULATIONS.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on April 15, 1959, at Hobbs, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 27th day of April, 1959, the Commission, a quorum being present, having considered the application and the evidence adduced and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Southwestern, Inc. Oil Well Servicing, proposes to utilize the "slim hole" method of completion for a well drilled to an approximate total depth of 2966 feet and located in the NE/4 NW/4 of Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico, using 2-7/8 inch O.D. tubing as a substitute for casing in exception to Rule 107 of the Commission Rules and Regulations.

(3) That the applicant anticipates that the proposed "slim hole" completion method for said well will result in a considerable economic saving.

(4) That it does not appear that utilizing the "slim hole" method of completion for said well will cause waste or impair correlative rights.

(5) That the application should be granted.

IT IS THEREFORE ORDERED:

That Southwestern, Inc. Oil Well Servicing be and the same is hereby authorized to utilize the "slim hole" method of completion for a well located in the NE/4 NW/4 of Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico, using 2-7/8 inch O.D. tubing as a substitute for casing.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JOHN BURROUGHS, Chairman

MURRAY E. MORGAN, Member

A. L. PORTER, Jr., Member & Secretary

ir/

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

COPY

April 27, 1959

Mr. Clarence Hinkle
Hervey, Dow & Hinkle
P.O. Box 547
Roswell, New Mexico

Dear Mr. Hinkle:

On behalf of your clients, Humble Oil & Refining Company and Southwestern, Inc. Oil Well Servicing, we enclose two copies of each of the following orders issued April 27, 1959, by the Oil Conservation Commission:

Order R-1375 in Case 1632
Order R-1376 in Case 1633
Order R-1379 in Case 1573.

These cases were consolidated and heard on April 15th at Hobbs.

Very truly yours,

A. L. Porter, Jr.
Secretary - Director

bp
Encls.

Case 1573

Annex B PRODUCTION SLIM HOLE WELL

Our experience in this area has shown that these zones will produce sufficient gas, oil ratio for the well to flow naturally for several months after completion.

Should this method prove inadequate, and there is no natural flow, a removable wireline pump seat will be placed and a pump installed. The pump will be designed to pump through hollow rods.

Annex C WORK OVER SLIM HOLE WELL

There is presently available all the fishing tools, over shots, and other work over equiptment necessary to service a Slim Hole Completion well, including drill pipe, mills, jars, etc. All these tools are designed to work within 2" tubing and will be afforded plenty of working area in $2\frac{1}{2}$" tubing.

Annex D PLUGGING SLIM HOLE WELL

Plugging will be done through 1 13/16" drill pipe to a level where the $2\frac{1}{2}$" tubing can be cut. Thereafter, plugging will be done through the $2\frac{1}{2}$" tubing.

Cond 1573

Annex A PROPOSED SLIM HOLE COMPLETION

New 2½", J55 seamless tubing will be run to a depth of 2925' and cemented with 125 sacks to an approximate cement level of 2100'-2150'. Cement will be allowed to set up for 72 hours. After the cement has set up the tubing will be pulled to tension and set in a 8 5/8" to 2½" Braden Head type well head.

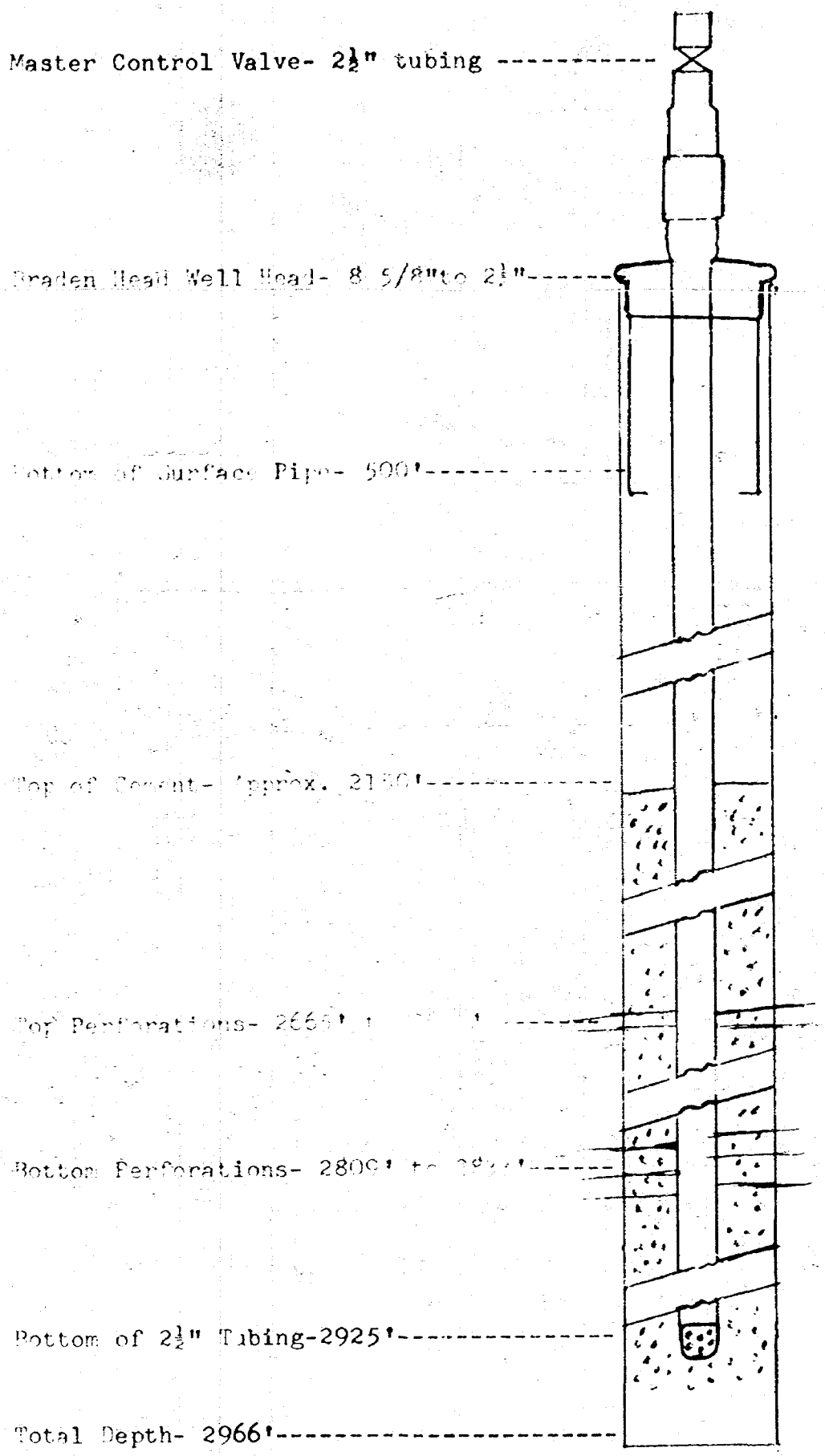
A correlation log will be run and the bottom zone perforated from 2809'-2833' with 2 shots per foot. This will leave 92' of tubing beneath the bottom perforation for sand and foriegn matter.

The bottom zone will then be treated with 250 gals. of Break Down Acid followed by 15,000 gals. of refined frac oil, and 15,000 lbs. of 20-40 sand. As soon as the bottom zone is treated 30-50 gals. of Jel will be pumped down the tubing to seal off the bottom zone. Perforations will then be made from 2665'-2670' at the rate of 4 shots per foot. This zone will be treated with 250 gals. of Break Down Acid to be followed with 10,000 gals. of refined frac oil and 10,000 lbs. of 20-40 sand.

Initial swabbing will be done before the Jel has broken down to determine the production of the top zone by itself.

Previous well completion in this area, including drilling, has cost $32,000 to $35,000 per well. Our present estimate of Slim Hole Completion is approximately $22,000.

Case 1573


Master Control Valve- 2½" tubing
Braden Head Well Head- 8 5/8"to 2½"
Bottom of Surface Pipe- 500'
Top of Cement- Approx. 2150'
Top of Perforations- 2665'
Bottom Perforations- 2800'
Bottom of 2½" Tubing-2925'
Total Depth- 2966'

No. 1-59

DOCKET: EXAMINER HEARING JANUARY 7, 1959

OIL CONSERVATION COMMISSION 9 a.m., Mabry Hall, State Capitol, Santa Fe

The following cases will be heard before Elvis A. Utz, Examiner:

CASES 1572 - 1580

CASE 1572: Application of Mrs. E. G. Woods for a dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of her Federal-Simon "A" Well No. 1 located in the NW/4 NE/4 of Section 29, Township 17 South, Range 32 East, Lea County, New Mexico, in such a manner as to permit the production of oil from an undesignated Yates oil pool and oil from the Maljamar Pool through parallel strings of tubing.

CASE 1573: Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for a well located in the SE/4 NW/4 Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico. Applicant proposes to utilize 2½ inch tubing as a substitute for casing in the above-described well.

CASE 1574: Application of The Texas Company for a non-standard gas proration unit. Applicant, in the above-styled cause, seeks an order establishing a 160-acre non-standard gas proration unit in the Tubb Gas Pool consisting of the W/2 NW/4, NE/4 NW/4, NW4 NE/4 of Section 31, Township 22 South, Range 38 East, Lea County, New Mexico, said unit to be dedicated to applicant's A. H. Blinebry NCT-3 Well No. 1 located 660 feet from the North and West lines of said Section 31.

CASE 1575: Application of The Texas Company for a dual completion. Applicant, in the above-styled cause, seeks an order authorizing it to dually complete its Henderson Well No. 5 located in the NW/4 NE/4 of Section 30, Township 21 South, Range 37 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Penrose-Skelly Pool and oil from the Paddock Pool through parallel strings of tubing.

CASE 1576: Application of Sinclair Oil & Gas Company for a salt water disposal well. Applicant, in the above-styled cause, seeks an order authorizing it to convert its dry and abandoned No. 2 State Lea 403 Well to a salt water disposal well in the Devonian formation, South Vacuum-Devonian Pool; said well is located 660 feet from the South and West lines of Section 22, Township 18 South, Range 35 East, Lea County, New Mexico.

CASE 1577: Application of Pure Oil Company for permission to install lease automatic custody transfer equipment. Applicant, in the above-styled cause, seeks an order authorizing it to install lease automatic custody transfer equipment to receive and measure the oil produced and marketed from the South Vacuum Unit located in Township 18 South, Range 35 East, Lea County, New Mexico. Applicant proposes to utilize positive displacement meters for measurement of the oil delivered to the pipeline.

CASE 1578: Application of Amerada Petroleum Corporation for a dual completion. Applicant, in the above-styled cause, seeks an order authorizing it to dually complete its Turner Well No. 1 located in the SW/4 SW/4 of Section 17, Township 20 South, Range 38 East, Lea County, New Mexico, in such a manner as to permit the production of oil from an undesignated Abo pool and oil from the Warren-McKee Pool through parallel strings of tubing.

CASE 1579: Application of Amerada Petroleum Corporation for a dual completion. Applicant, in the above-styled cause, seeks an order authorizing it to dually complete its Turner No. 2 Well located in the NW/4 SW/4 of Section 17, Township 20 South, Range 38 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Warren-McKee Pool and oil from an undesignated Connell pool through parallel strings of tubing.

CASE 1580: Application of Cities Service Oil Company for permission to install lease automatic custody transfer equipment. Applicant, in the above-styled cause, seeks an order authorizing it to install lease automatic custody transfer equipment to receive and measure the oil produced and marketed from its Government "B" Lease in Sections 3 and 10, Township 14 South, Range 31 East, Chaves County, New Mexico. Applicant proposes to utilize positive displacement meters for measurement of the oil delivered to the pipeline.

CONTINUED CASE

CASE 1516: Application of El Paso Natural Gas Company for two non-standard gas proration units and for the approval of one unorthodox gas well location. Applicant, in the above-styled cause, seeks an order establishing a 120-acre non-standard gas proration unit in the Jalmat Gas Pool consisting of the N/2 SW/4 and the SW/4 SW/4 of Section 4, Township 25 South, Range 37 East, said unit to be dedicated to the applicant's Wells Federal No. 3 Well located 1980 feet from the South and West lines of said Section 4. Applicant further seeks the establishment of a 200-acre non-standard gas proration unit in the Jalmat Gas Pool consisting of the SE/4 SW/4 of Section 4 and the NW/4 of Section 9, Township 25 South, Range 37 East, Lea County, New Mexico, said unit to be dedicated to the applicant's Wells Federal No. 11 Well located 430 feet from the South line and 2317 feet from the West line of said Section 4. Applicant further seeks approval of the unorthodox gas well location of the said Wells Federal No. 11 Well.

ig/

Case 1573

SOUTHWESTERN SW INC. OIL WELL SERVICING
J. T. "JIMMIE" HOLLIS, President — Fully Insured — Franks Double Drum Equipment
Phone 6-2051 if no ans. call 6-1721
1621 S. MAIN
LOVINGTON, N. M.

November 21,1958

A. L. Porter, Jr., Secretary Director
Box 871
Santa Fe, New Mexico

Subject: Requested permission for Slim Hole Completion

Dear Sir:

On November 17 of this year, we completed the drilling of a well in the Square Lake Pool, ~~SE/4, NW/4,~~ NE NW Section 32, T-16-S, R-30-E, Eddy County. The only possible commercial value of the well appears to be a five foot section of sand known locally as the Loco Hills Sand and a show of gas in the Preimere Sand (Basal Grayburg).

Because of the small chance of pay out we feel that normal completion methods would be exorbitant. Therefore, we would like permission to use the Slim Hole Method of completion, using 2½" tubing as casing. It is further requested, that we be allowed to present our case before the proper authorities at the earliest possible convenience.

An outline of our proposed method of Slim Hole Completion, production, work over, and plugging is presented in the attached annexes.

Yours truly,

T. J. Hollis

T. J. Hollis, President
Southwestern, Inc.

TJH/dfr

Docket Mailed
12-29-58 BP

Annex A PROPOSED SLIM HOLE COMPLETION

New 2½", J55 seamless tubing will be run to a depth of 2925' and eemented with 125 sacks to an approximate cement level of 2100'-2150'. Cement will be allowed to set up for 72 hours. After the cement has set up the tubing will be pulled to tension and set in a 8 5/8" to 2½" Braden Head type well head.

A correlation log will be run and the bottom zone perforated from 2809'-2833' with 2 shots per foot. This will leave 92' of tubing beneath the bottom perforation for sand and foriegn matter.

The bottom zone will then be treated with 250 gals. of Break Down Acid followed by 15,000 gals. of refined frac oil, and 15,000 lbs. of 20-40 sand. As soon as the bottom zone is treated 30-50 gals. of Jel will be pumped down the tubing to seal off the bottom zone. Perforations will then be made from 2665'-2670' at the rate of 4 shots per foot. This zone will be treated with 250 gals. of Break Down Acid to be followed with 10,000 gals. of refined frac oil and 10,000 lbs. of 20-40 sand.

Initial swabbing will be done before the Jel has broken down to determine the production of the top zone by itself.

Previous well completion in this area, including drilling, has cost $32,000 to $35,000 per well. Our present estimate of Slim Hole Completion is approximately $22,000.

Annex B PRODUCTION SLIM HOLE WELL

Our experience in this area has shown that these zones will produce sufficient gas, oil ratio for the well to flow naturally for several months after completion.

Should this method prove inadequate, and there is no natural flow, a removable wireline pump seat will be placed and a pump installed. The pump will be designed to pump through hollow rods.

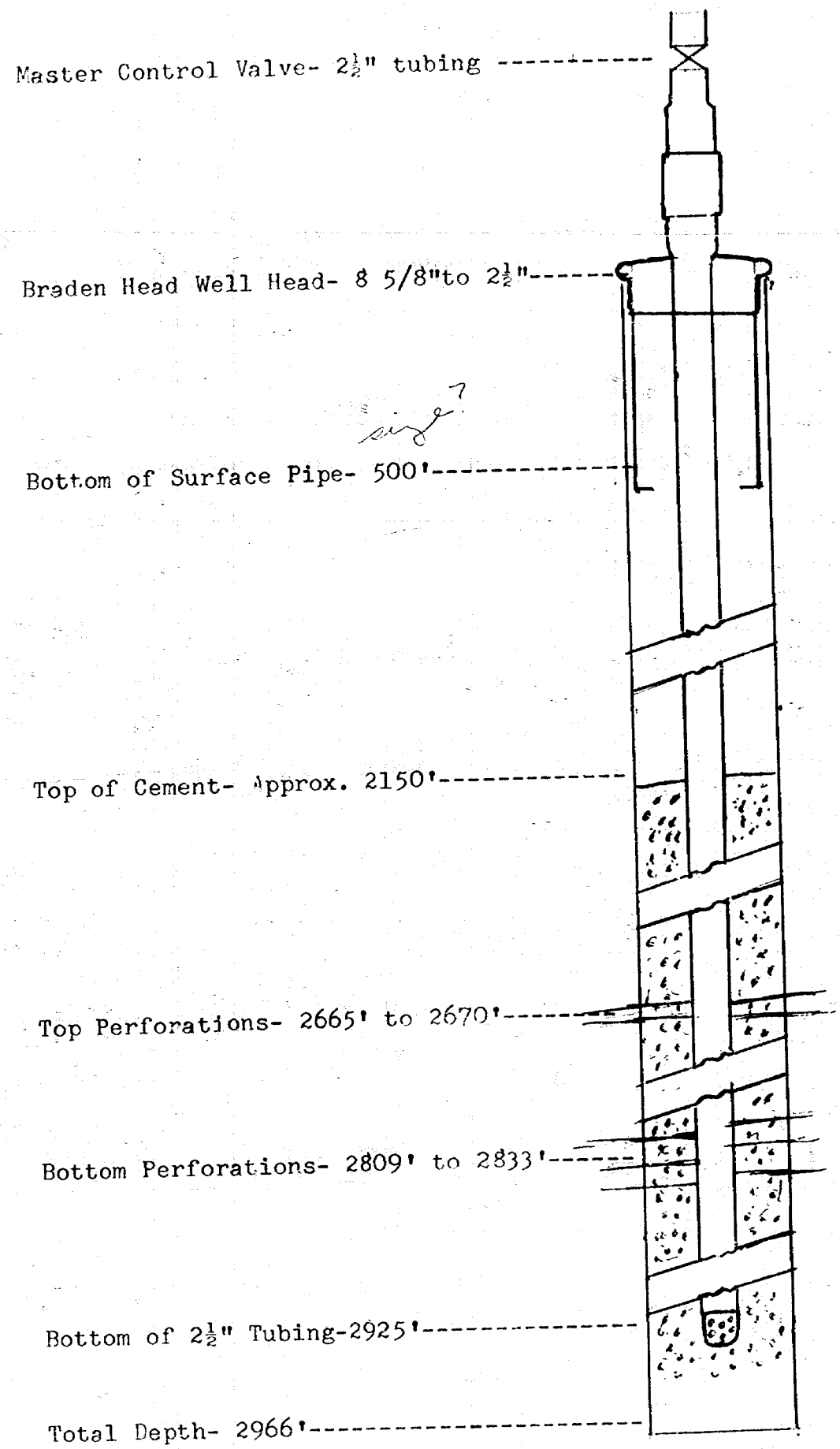
Annex C WORK OVER SLIM HOLE WELL

There is presently available all the fishing tools, over shots, and other work over equiptment necessary to service a Slim $H_o$le Completion well, including drill pipe, mills, jars, etc. All these tools are designed to work within 2" tubing and will be afforded plenty of working area in $2\frac{1}{2}$" tubing.

Annex D PLUGGING SLIM HOLE WELL

Plugging will be done through 1 13/16" drill pipe to a level where the $2\frac{1}{2}$" tubing can be cut. Thereafter, plugging will be done through the $2\frac{1}{2}$" tubing.

GRAPH OF PROPOSED SLIM HOLE COMPLETION



No. 13-59

DOCKET: REGULAR HEARING APRIL 15, 1959

Oil Conservation Commission 9 a.m., Hobbs Auditorium, 1300 East Scharbauer

HOBBS, NEW MEXICO

ALLOWABLE: (1) Consideration of the oil allowable for May, 1959.

(2) Consideration of the allowable production of gas for May 1959 from six prorated pools in Lea County, New Mexico; also consideration of the allowable production of gas from seven prorated pools in San Juan and Rio Arriba Counties, New Mexico, for May 1959.

CONTINUED CASES

CASE 1573: Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for a well located in the SE/4 NW/4 Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico. Applicant proposes to utilize 2½ inch tubing as a substitute for casing in the above-described well in exception to Rule 107.

CASE 1600: In the matter of the application of M. A. Romero and Robert Critchfield concerning the operation of gas prorationing in the Blanco Mesaverde Gas Pool and the ratable taking of gas from said Blanco Mesaverde Gas Pool in Rio Arriba and San Juan Counties, New Mexico, as well as from the Choza Mesa-Pictured Cliffs Gas Pool in Rio Arriba County, New Mexico.

CASE 1526: Northwestern New Mexico nomenclature case calling for an order for the extension of an existing pool in San Juan County, New Mexico.

(h) Extend the Angels Peak-Dakota Pool to include:

TOWNSHIP 26 NORTH, RANGE 10 WEST, NMPM
Section 2: NW/4

TOWNSHIP 27 NORTH, RANGE 10 WEST, NMPM
Section 35: SW/4

TOWNSHIP 28 NORTH, RANGE 10 WEST, NMPM
Section 27: W/2
Section 28: E/2

CASE 1618: Southeastern New Mexico nomenclature case calling for an order creating a new pool in Lea County, New Mexico:

(e) Create a new oil pool for Devonian production, designated as the Crosby-Devonian Oil Pool, and described as:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 21: SW/4

NEW CASES

CASE 1631: In the matter of the hearing called by the Oil Conservation Commission on its own motion to consider changing the date of the Regular Commission Hearing in June 1959 from the 17th to the 9th.

CASE 1632: Application of Humble Oil & Refining Company for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for its State "M" Well No. 14 to be located 1980 feet from the North line and 660 feet from the East line of Section 31, Township 22 South, Range 37 East, Eumont Gas Pool, Lea County, New Mexico. Applicant proposes to utilize 2-7/8 inch tubing as a substitute for casing in the above-described well in exception to Rule 107.

CASE 1633: Application of Humble Oil & Refining Company for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for its State "G" Well No. 19, to be located 580 feet from the South line and 1980 feet from the East line of Section 23, Township 21 South, Range 36 East, Eumont Gas Pool, Lea County, New Mexico. Applicant proposes to utilize 2-7/8 inch tubing as a substitute for casing in the above-described well in exception to Rule 107.

CASE 1634: Application of The Pure Oil Company for an order promulgating temporary special rules and regulations for the South Vacuum-Devonian Pool in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order promulgating temporary special rules and regulations for the South Vacuum-Devonian Pool in Lea County, New Mexico, to provide for 80-acre proration units and well location requirements. Applicant further seeks permission to shut-in its South Vacuum Unit Well No. 3-35 located in the NE/4 NW/4 of Section 35, Township 18 South, Range 35 East, Lea County, New Mexico, and transfer the allowable to its South Vacuum Unit Well No. 1-35 located in the SW/4 NE/4 of said Section 35.

CASE 1635: Application of Mapenza Oil Company for an exception to the requirements of Order No. R-1224-A. Applicant, in the above-styled cause, seeks an order authorizing an exception to the salt water disposal requirements of Order No. R-1224-A for its State No. 1-A Well, located in the SE/4 SE/4 of Section 14, Township 18 South, Range 37 East, Hobbs Pool, Lea County, New Mexico.

CASE 1636: Application of The Atlantic Refining Company for an amendment of Rule 115 of the Commission Rules and Regulations. Applicant, in the above-styled cause, seeks an order amending Rule 115 of the Commission Rules and Regulations insofar as said rule is related to required pressure rating of wellhead equipment.

CASE 1637: Application of The Atlantic Refining Company for an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and for the promulgation of special rules and regulations therefor. Applicant, in the above-styled cause, seeks an order combining the Allison-Pennsylvanian and the North Allison-Pennsylvanian Pools in Lea and Roosevelt Counties, New Mexico, and providing for the establishment of 80-acre proration units in said combined pool.

CASE 1638: In the matter of the hearing called by the Oil Conservation Commission on its own motion to consider the establishment of a procedure whereby amendments to unit agreements may be approved administratively.

CASE 1522: Application of General Petroleum, Inc., for an amendment to Order No. R-1299. Applicant, in the above-styled cause, seeks an order amending Order No. R-1299 to provide that any merchantable oil recovered from sediment oil shall not be charged against the allowable for wells on the originating lease, which amendment would revise Rule 311.

CASE 1639: Southeastern New Mexico nomenclature case calling for an order creating new pools and extending existing pools in Lea and Eddy Counties, New Mexico:

(a) Create a new oil pool for Tansil production, designated as the Custer-Tansill Oil Pool, and described as:

TOWNSHIP 25 SOUTH, RANGE 36 EAST, NMPM
Section 7: NW/4

(b) Create a new oil pool for Pennsylvanian production, designated as the East Hightower-Pennsylvanian Oil Pool, and described as:

TOWNSHIP 12 SOUTH, RANGE 34 EAST, NMPM
Section 30: NE/4

(c) Create a new oil pool for Delaware production, designated as the Querecho Plains-Delaware Oil Pool, and described as:

TOWNSHIP 18 SOUTH, RANGE 32 EAST, NMPM
Section 25: NW/4

(d) Create a new oil pool for Abo production, designated as the West Warren-Abo Oil Pool, and described as:

TOWNSHIP 20 SOUTH, RANGE 38 EAST, NMPM
Section 17: SW/4

(e) Create a new oil pool for Connell production, designated as the Warren-Connell Oil Pool, and described as:

TOWNSHIP 20 SOUTH, RANGE 38 EAST, NMPM
Section 17: SW/4

(f) Extend the Atoka Pool to include:

TOWNSHIP 18 SOUTH, RANGE 26 EAST, NMPM
Section 13: E/2 NE/4

(g) Extend the Bishop Canyon-San Andres Pool to include:

TOWNSHIP 18 SOUTH, RANGE 38 EAST, NMPM
Section 10: N/2
Section 11: NW/4

(h) Extend the Crosby-Devonian Gas Pool to include:

TOWNSHIP 26 SOUTH, RANGE 37 EAST, NMPM
Section 4: NE/4

(i) Extend the Culwin Pool to include:

TOWNSHIP 19 SOUTH, RANGE 30 EAST, NMPM
Section 1: NE/4

(j) Extend the Drinkard Pool to include:

TOWNSHIP 22 SOUTH, RANGE 38 EAST, NMPM
Section 17: SW/4

(k) Extend the Eumont Gas Pool to include:

TOWNSHIP 20 SOUTH, RANGE 37 EAST, NMPM
Section 23: N/2
Section 24: SE/4 & N/2

(l) Extend the Justis Gas Pool to include:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 13: SE/4

(m) Extend the Langlie-Mattix Pool to include:

TOWNSHIP 23 SOUTH, RANGE 36 EAST, NMPM
Section 4: NE/4

(n) Extend the Wilson Pool to include:

TOWNSHIP 21 SOUTH, RANGE 35 EAST, NMPM
Section 19: E/2
Section 20: SW/4

CASE 1640: Northwestern New Mexico nomenclature case calling for an order changing the designation of a pool and extending existing pools in San Juan and Rio Arriba Counties, New Mexico:

(a) Change the designation of the Otero-Graneros Dakota Pool in Rio Arriba County, New Mexico, to the Otero-Dakota pool.

(b) Extend the Tapacito-Pictured Cliffs Pool to include:

TOWNSHIP 27 NORTH, RANGE 4 WEST, NMPM
Section 29: E/2

(c) Extend the Blanco-Mesaverde Pool to include:

TOWNSHIP 31 NORTH, RANGE 13 WEST, NMPM
Section 25: S/2

(d) Extend the Angels Peak-Gallup Oil Pool to include:

TOWNSHIP 26 NORTH, RANGE 9 WEST, NMPM
Section 6: SW/4
Section 7: NW/4

TOWNSHIP 26 NORTH, RANGE 10 WEST, NMPM
Section 1: All
Section 2: NE/4

TOWNSHIP 27 NORTH, RANGE 10 WEST, NMPM
Section 28: SW/4
Section 29: S/2
Section 32: All
Section 33: W/2

(e) Extend the Bisti-Lower Gallup Oil Pool to include:

TOWNSHIP 24 NORTH, RANGE 10 WEST, NMPM
Section 2: SW/4

TOWNSHIP 25 NORTH, RANGE 10 WEST, NMPM
Section 19: S/2 S/2

(f) Extend the Horseshoe-Gallup Oil Pool to include:

TOWNSHIP 30 NORTH, RANGE 16 WEST, NMPM
Section 2: W/2 SW/4

TOWNSHIP 31 NORTH, RANGE 16 WEST, NMPM
Section 19: SW/4 & S/2 SE/4
Section 29: NW/4

(g) Extend the Verde-Gallup Oil Pool to include:

TOWNSHIP 31 NORTH, RANGE 14 WEST, NMPM
Section 16: SW/4 NW/4
Section 17: E/2
Section 20: E/2

(h) Extend the Angels Peak-Dakota Pool to include:

TOWNSHIP 26 NORTH, RANGE 10 WEST, NMPM
Section 3: N/2

TOWNSHIP 27 NORTH, RANGE 10 WEST, NMPM
Section 6: E/2 Section 9: W/2

TOWNSHIP 28 NORTH, RANGE 10 WEST, NMPM
Section 22: W/2

SUPPLEMENTAL DOCKET: EXAMINER HEARING FEBRUARY 4, 1959

Oil Conservation Commission 9 a.m., Mabry Hall, State Capitol, Santa Fe, NM.

The following case will be heard before Elvis A. Utz, Examiner:

CASE 1595: Application of John J. Dempsey Associates for the assignment of a minimum allowable to one gas well in the Fulcher Kutz-Pictured Cliffs Gas Pool, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order assigning a minimum allowable to one gas well in the Fulcher Kutz-Pictured Cliffs Gas Pool in order to prevent premature abandonment thereof, said well being the Hutchison Well No. 1 located 660 feet from the North line and 635 feet from the East line of Section 1, Township 29 North, Range 13 West, San Juan County, New Mexico.

No. 5-59

DOCKET: EXAMINER HEARING FEBRUARY 4, 1959

OIL CONSERVATION COMMISSION 9 a.m., Mabry Hall, State Capitol, SANTA FE

The following cases will be heard before ELVIS A. UTZ, Examiner:

CASE 1587: Application of Cabot Carbon Company for an oil-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing it to dually complete its J. L. Reed Well No. 2 located 660 feet from the North and East lines of Section 35, Township 13 South, Range 37 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the King-Wolfcamp Pool and King-Devonian Pool through parallel strings of 1½" tubing.

CASE 1588: Application of Atlantic Refining Company to commingle the production from several separate oil pools. Applicant, in the above-styled cause, seeks an order authorizing it to commingle the production from the Ellenburger, McKee, Fusselman, Montoya, Blinebry, Drinkard, and Queen formations on its State "Y" Lease comprising the N/2 NE/4 and the SE/4 NE/4 of Section 25, Township 25 South, Range 37 East, Lea County, New Mexico. Applicant proposes to separately meter the production from each formation except the Queen prior to being commingled.

CASE 1589: Application of Humble Oil & Refining Company for an exception to Rule 16 of Order R-586 and for an exception to Rule 303 of the Commission Rules and Regulations. Applicant, in the above-styled cause, seeks an order permitting the classification of a 48-degree gravity oil well as a gas well in the Tubb Gas Pool, said well being its dually completed State "V" Well No. 11 located in the NE/4 SW/4 of Section 10, Township 21 South, Range 37 East, Lea County, New Mexico. Applicant further seeks permission to commingle the liquid hydrocarbons produced from the Tubb zone of said State "V" Well No. 11 with Tubb oil produced from its State "V" Well No. 7 located in the SE/4 SW/4 of said Section 10. Applicant further seeks permission to commingle the Blinebry condensate produced from said State "V" Well No. 11 with the Blinebry oil produced from its State "V" Well No. 1 located in the SW/4 SW/4 of said Section 10.

CASE 1590: Application of Rex Moore for an order authorizing a gas injection project in San Juan County, New Mexico, and for the promulgation of special rules and regulations in connection therewith. Applicant, in the above-styled cause, seeks an order authorizing it to inject gas into the Gallup formation of the Bisti-Lower Gallup Oil Pool through its Scott No. 5 Well located 2115 feet from the South line and 2080 feet from the West line of Section 3, Township 24 North, Range 10 West, San Juan County, New Mexico. Applicant further proposes that special rules and regulations be promulgated to govern the above-described project, which rules would provide for the transfer of the allowable from the injection well to producing wells, transfer of allowables from wells which have

been shut-in for observation or to increase the efficiency of the project, operation of the wells on a net gas-oil ratio basis giving allowance for gas injected, and such other rules and regulations as the Commission deems necessary.

CASE 1591: Application of Angels Peak Oil Company for the assignment of minimum allowables to two gas wells in the Fulcher Kutz-Pictured Cliffs Gas Pool, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks an order assigning minimum allowables to two gas wells in the Fulcher Kutz-Pictured Cliffs Gas Pool in order to prevent premature abandonment thereof, said wells being applicant's Angels Peak Well No. 3 located 595 feet from the North line and 1240 feet from the East line of Section 11 and Angels Peak Well No. 5 located 285 feet from the North line and 1520 feet from the West line of Section 11, both in Township 28 North, Range 11 West, San Juan County, New Mexico.

CASE 1592: Application of Amerada Petroleum Corporation for an order extending the horizontal limits of the Bagley-Upper Pennsylvanian Gas Pool and for a non-standard gas proration unit. Applicant, in the above-styled cause, seeks an order extending the horizontal limits of the Bagley-Upper Pennsylvanian Gas Pool to include the E/2 of Section 33, and the NW/4 of Section 34, all in Township 11 South, Range 33 East, Lea County, New Mexico. Applicant further seeks the establishment of a 320-acre non-standard gas proration unit in said pool consisting of the NE/4 of said Section 33, and the NW/4 of said Section 34, to be dedicated to the applicant's State BT "M" No. 2 Well located in the SE/4 NE/4 of said Section 33.

CASE 1593: Application of The Texas Company for a non-standard gas proration unit. Applicant, in the above-styled cause, seeks an order authorizing a 241-acre non-standard gas proration unit in the Eumont Gas Pool consisting of the NE/4 of Section 5, Township 20 South, Range 37 East, and the S/2 SE/4 of Section 32, Township 19 South, Range 37 East, Lea County, New Mexico, said unit to be dedicated to applicant's J. W. Cooper Well No. 5 located 1668 feet from the North line and 1650 feet from the East line of said Section 5.

CASE 1196: Application of The Ibex Company for permission to expand its water flood project in the Artesia Pool, Eddy County, New Mexico, and for eight unorthodox well locations. Applicant, in the above-styled cause, seeks an order permitting the expansion of its Artesia Water Flood Project No. 2, authorized by Order No. R-966 in the Artesia Pool, Eddy County, New Mexico, to convert to water injection a well in the NW/4 NW/4 of Section 28 and a well in the SW/4 NE/4 of Section 28, both in Township 18 South, Range 28 East. Applicant further seeks approval of eight unorthodox well locations in Sections 21 and 28 of the aforementioned township.

CASE 1594: Application of The Ibex Company for permission to install three separate lease automatic custody transfer systems. Applicant, in the above-styled cause, seeks an order authorizing it to install three separate lease automatic custody transfer systems, one on its Welch Duke State Lease, one on its Resler Yates State Lease and the other on its McNutt State Lease, all in the Artesia Field, Township 18 South, Range 28 East, NMPM, Eddy County, New Mexico. Applicant further seeks permission to consolidate multiple tank batteries on said Resler Yates State Lease in exception to Rule 309 of the Commission Rules and Regulations.

CONTINUED CASE

CASE 1573: Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for a well located in the SE/4 NW/4 Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico. Applicant proposes to utilize 2½ inch tubing as a substitute for casing in the above-described well.

ir/

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 2-5-59

CASE NO. 1523 HEARING DATE 2-4-59

My recommendations for an order in the above numbered case(s) are as follows:

Continued until first Examiner hearing in March.

Docket mailed for March 25th hearing
to Howard Bratton
3-11-59
BP

Staff Member

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 3-25-59

CASE NO. 1523 HEARING DATE 3-25-59

My recommendations for an order in the above numbered case(s) are as follows:

This Case continued to the April 1st, 1959 Reg. hearing at Hobbs.

Elvis A. Utz

Docket mailed
4-3-59
BP

Staff Member

No. 10-59

DOCKET: EXAMINER HEARING MARCH 25, 1959

Oil Conservation Commission 9 a.m. Mabry Hall, State Capitol, Santa Fe

The following cases will be heard before ELVIS A. UTZ, Examiner:

CASE 1548: Application of Shell Oil Company for an amendment of Order R-1290. Applicant, in the above-styled cause, seeks an order amending Order R-1290 to eliminate the restriction requiring separate metering of production from each lease prior to commingling, since all interests are common except for small override on one lease and the holder of this interest has waived objection to commingling prior to metering.

CASE 1620: Application of Sunset International Petroleum Corporation for an oil-gas dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its SIPCO Kutz A Federal Well No. 1, located in the NE/4 SW/4 of Section 32, Township 28 North, Range 10 West, San Juan County, New Mexico, in such a manner as to permit the production of oil from an undesignated Gallup oil pool and the production of gas from the Angels Peak-Dakota Gas Pool through parallel strings of 2-1/16 inch Hydril tubing.

CASE 1621: In the matter of the application of Humble Oil & Refining Company for an order reclassifying the Four Lakes-Devonian (Oil) Pool in Lea County, New Mexico, as a gas pool.

CASE 1622: Application of Gulf Oil Corporation for two non-standard gas proration units. Applicant, in the above-styled cause, seeks an order establishing a 160-acre non-standard gas proration unit in both the Tubb Gas Pool and the Blinebry Gas Pool, each to comprise the SE/4 NW/4, NW/4 SE/4, and the N/2 SW/4 of Section 31, Township 22 South, Range 38 East, Lea County, New Mexico, and to be dedicated to applicant's Scarborough Estate Well No. 4 located 1980 feet from the North and West lines of said Section 31 which well is dually completed in the aforementioned pools.

CASE 1623: Application of Wellshire Development Company for an unorthodox oil well location. Applicant, in the above-styled cause, seeks an order authorizing an unorthodox oil well location in the Bisti-Lower Gallup Oil Pool for its Wellshire No. 1 Federal Well located 530 feet from the South line and 2110 feet from the East line of Section 35, Township 25 North, Range 10 West, San Juan County, New Mexico.

CONTINUED CASES

CASE 1573: Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for a well located in the SE/4 NW/4 Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico. Applicant proposes to utilize $2\frac{1}{2}$ inch tubing as a substitute for casing in the above-described well.

CASE 1590: Application of Rex Moore for an order authorizing a gas injection project in San Juan County, New Mexico, and for the promulgation of special rules and regulations in connection therewith. Applicant, in the above-styled cause, seeks an order authorizing it to inject gas into the Gallup formation of the Bisti-Lower Gallup Oil Pool through its Scott No. 5 Well located 2115 feet from the South line and 2080 feet from the West line of Section 3, Township 24 North, Range 10 West, San Juan County, New Mexico. Applicant further proposes that special rules and regulations be promulgated to govern the above-described project, which rules would provide for the transfer of the allowable from the injection well to producing wells, transfer of allowables from wells which have been shut-in for observation or to increase the efficiency of the project, operation of the wells on a net gas-oil ratio basis giving allowance for gas injected, and such other rules and regulations as the Commission deems necessary.

ir/

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 1-7-59

CASE NO. 1523 HEARING DATE 1-7-59

My recommendations for an order in the above numbered case(s) are as follows:

This Case continued until the next examiner hearing before

E A. [illegible]

E. S. [illegible]

1-22-59
Docket mailed by
Feb. 4th hearing date
Clarence Hinkle
B P

Staff Member

Annex A PROPOSED SLIM HOLE COMPLETION

New 2½", J55 seamless tubing will be run to a depth of 2925' and cemented with 125 sacks to an approximate cement level of 2100'-2150'. Cement will be allowed to set up for 72 hours. After the cement has set up the tubing will be pulled to tension and set in a 8 5/8" to 2½" Braden Head type well head.

A correlation log will be run and the bottom zone perforated from 2809'-2833' with 2 shots per foot. This will leave 92' of tubing beneath the bottom perforation for sand and foriegn matter.

The bottom zone will then be treated with 250 gals. of Break Down Acid followed by 15,000 gals. of refined frac oil, and 15,000 lbs. of 20-40 sand. As soon as the bottom zone is treated 30-50 gals. of Jel will be pumped down the tubing to seal off the bottom zone. Perforations will then be made from 2665'-2670' at the rate of 4 shots per foot. This zone will be treated with 250 gals. of Break Down Acid to be followed with 10,000 gals. of refined frac oil and 10,000 lbs. of 20-40 sand.

Initial swabbing will be done before the Jel has broken down to determine the production of the top zone by itself.

Previous well completion in this area, including drilling, has cost $32,000 to $35,000 per well. Our present estimate of Slim Hole Completion is approximately $22,000.

Case 1573

SOUTHWESTERN SW INC. OIL WELL SERVICING

Franks Double Drum Equipment

J. T. "JIMMIE" HOLLIS, *President*

Fully Insured

Phone 6-2051 *if no ans. call* 6-1721
1621 S. MAIN
LOVINGTON, N. M.

December 31, 1958

Mr. A. L. Porter
Box 871
Santa Fe, New Mexico

Dear Sir:

We wish to amend our application for our hearing set in January to read as follows:

Northeast Quarter (NE/4) of Northwest Quarter (NW/4); Sec. 32; T-16-S; R-30-E.

instead of Southeast (SE/4) of Northwest (NW/4).

Sincerely,

T. J. Hollis
President
Southwestern, Inc.

TJH/dfr

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE NO. 1573

TRANSCRIPT OF PROCEEDINGS

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE NEW MEXICO
Phone CHapel 3-6691

February 4, 1959

Page ________

NEW MEXICO OIL CONSERVATION COMMISSION

Mabry Hall

Santa Fe, NEW MEXICO

REGISTER

HEARING DATE Examiner February 4, 1959 TIME: 9:00 a.m.

NAME:	REPRESENTING:	LOCATION:
H P [illegible]	[illegible]	[illegible]
H J Frosst Jr	Atlantic Refg Co	Midland
John Ray Allen	Atlantic Refg Co	Roswell
L. C. White	[illegible]	Santa Fe, N.M.
[illegible] Christy	Cabot Carbon	Roswell
[illegible]	[illegible] Co.	[illegible]
J C Chapman	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Geo. [illegible]	Southern Union	Farmington
[illegible] J. Clute	Southern Union	Farmington
John B [illegible]	Texaco	Midland
Jason Kellahin	Kellahin & Fox	Santa Fe, N.M.
John Mason	El Paso Natural Gas	[illegible]
Joe M Daniel Jr	Cabot Carbon Co	Pampa, Texas
Nancy Royal	[illegible] Reporter	Santa Fe

NEW MEXICO OIL CONSERVATION COMMISSION

Mabry Hall

Santa Fe, NEW MEXICO

REGISTER

HEARING DATE Examiner February 4, 1959 **TIME:** 9:00 a.m.

NAME:	REPRESENTING:	LOCATION:
Jack M Campbell	Campbell + Russell	Roswell N M
Herbert D. Miller	Amerada Pet	Tulsa, Okla

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for a well located in the SE/4 NW/4 Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico. Applicant proposes to utilize $2\frac{1}{2}$ inch tubing as a substitute for casing in the above-described well.

CASE NO. 1573

BEFORE:

Elvis A. Utz, Examiner.

TRANSCRIPT OF HEARING

MR. UTZ: The hearing will come to order, please. I will announce the order in which we will take the cases up today. No. 1573, No. 1589, 1590, 1588, 1591, 1592, 1593, 1196, 1594, 1595, and 1587.

The first case on the docket this morning will be 1573.

MR. PAYNE: Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion.

MR. BRATTON: Howard Bratton, Hervey, Dow, & Hinkle, Roswell, New Mexico, appreaing on behalf of the applicant. I

would like to move, Mr. Utz, that the case be continued until the next Examiner Hearing before Examiner Utz.

MR. UTZ: Is there objection to the continuation of Case 1573 as requested? The case will be continued to the first Examiner Hearing in March. It will probably be the 11th.

MR. BRATTON: Thank you.

****

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, Joseph A. Trujillo, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me in Stenotype and reduced to typewritten transcript, that the same is a true and correct record, to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this 5th day of February, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph A. Trujillo
NOTARY PUBLIC

My Commission Expires:

October 5, 1960

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 1573, heard by me on Feb. 4, 1959.

Elvis A. Utz, Examiner
New Mexico Oil Conservation Commission

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
Phone CHapel 3-6691

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

Case No. 1573

TRANSCRIPT OF HEARING

January 7, 1959

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE NEW MEXICO
Phone CHapel 3-6691

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

Case 1573 Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for a well located in the SE/4 NW/4 Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico. Applicant proposes to utilize 2½ inch tubing as a substitute for casing in the above-described well.

Mabry Hall
Santa Fe, New Mexico
January 7, 1959

BEFORE:

Elvis A. Utz, Examiner.

TRANSCRIPT OF HEARING

MR.UTZ: The next case on the docket will be Case 1573.

MR. PAYNE: Case 1573, "Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion."

MR. HINKLE: Clarence Hinkle representing Southwestern, Inc. Oil Well Servicing. I would like to move that this case be continued to the next regular examiner hearing before the same examiner, which I am assuming to be next month, is that right?

MR. UTZ: Yes. Is there objection to the continuance of Case 1573 to the next examiner hearing before myself?

If not, it will be continued. That will probably be the

first part of next month sometime.

MR. HINKLE: All right.

****

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, JERRY MARTINEZ, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing was reported by me in Steontype and that the same was reduced to typewritten transcript by me and contains a true and correct record of said hearing, to the best of my knowledge, skill and ability.

DATED this 10th day of January, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Notary Public

My Commission Expires:
January 24, 1962

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 1573, heard by me on 1-7, 1959.

New Mexico Oil Conservation Commission, Examiner

BEFORE THE
OIL CONSERVATION COMMISSION
HOBBS, NEW MEXICO

IN THE MATTER OF:

Case Nos. 1573, 1632, 1633

TRANSCRIPT OF HEARING

APRIL 15, 1959

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
Phone CHapel 3-6691

I N D E X

BEFORE THE
OIL CONSERVATION COMMISSION
HOBBS, NEW MEXICO

IN THE MATTER OF:

Case 1573 Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for a well located in the SE/4 NW/4 Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico. Applicant proposes to utilize 2½ inch tubing as a substitute for casing in the above-described well in exception to Rule 107.

Case 1632 Application of Humble Oil and Refining Company for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for its State "M" Well No. 14 to be located 1980 feet from the North line and 660 feet from the East line of Section 31, Township 22 South, Range 37 East, Eumont Gas Pool, Lea County, New Mexico. Applicant proposes to utilize 2-7/8 inch tubing as a substitute for casing in the above-described well in exception to Rule 107.

Case 1633 Application of Humble Oil and Refining Company for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for its State "G" Well No. 19, to be located 580 feet from the South line and 1980 feet from the East line of Section 23, Township 21 South, Range 36 East, Eumont Gas Pool, Lea County, New Mexico. Applicant proposes to utilize 2-7/8 inch tubing as a substitute for casing in the above described well in exception to Rule 107.

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
Phone CHapel 3-6691

Hobbs Auditorium
Hobbs, New Mexico
April 15, 1959

BEFORE:

A. L. Porter, Jr.
Murray Morgan
Governor John Burroughs

TRANSCRIPT OF HEARING

MR. PORTER: The hearing will come to order, please. At this time, we will take the "slim hole" cases, Cases 1573, 1632 and 1633.

MR. HINKLE: If the Commission please, Clarence Hinkle, Roswell, representing the Southwestern, Inc. Oil Well Servicing and the Humble Oil and Refining Company. Cases 1573 and 1632 and 1633 are all substantially the same, the only difference being in the depth of the wells and the location of the wells. I would like to move at this time that all three cases be consolidated and that the record of the testimony taken apply to all three cases.

MR. PORTER: Is there objection to the Counsel's motion for consolidation of these three cases?

Mr. Hinkle, as I understand, this would be consolidation for the purpose of testimony only and there would be three separate orders issued?

MR. HINKLE: Yes, I think on account of the well locations and the depths of the wells, I believe that it would be better to issue three separate orders; however, the record would apply

to all three cases.

MR. PORTER: Let the record show that these three cases have been consolidated.

MR. HINKLE: We have one witness, Mr. J. E. Willingham, I would like to have him sworn.

(Witness sworn in.)

J. E. WILLINGHAM

called as a witness, having first been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name, please?

A I am J. E. Willingham.

Q By whom are you employed, Mr. Willingham?

A Humble Oil and Refining Company.

Q In what capacity are you employed?

A I am the Assistant Division Petroleum Engineer of the Western Division.

Q Are you a graduate engineer?

A Yes sir, I have a degree in Mechanical Engineering and a degree in Petroleum Engineering from Texas A & M.

Q What year did you graduate?

A 1942.

Q Have you practiced your profession since your graduation?

A Yes sir, I have.

Q State briefly to the Commission your experience as a petroleum engineer and engineer?

A Well, I went to work for Humble after the war in 1946 and I have been associated with field operations, equipment, drilling, corrosion, reservoir engineering, and I have had a general background in all the subjects that I'll discuss.

Q Has your experience been in the West Texas and New Mexico area?

A I have been in the West Texas area for a year and part of that time I was in the Southwest Texas Division.

Q Have you been closely associated in the last few years with the slim hole technique of drilling?

A Yes, sir, I have.

Q Can you briefly state to the Commission what your experience has been in that connection?

A In some of the workover techniques that I will discuss, I have performed workovers in the field at the well, I was the Southwest Texas Division Drilling Engineer associated with the slim hole drilling; I also supervised the corrosion, which will be brought out, and I was the Division Equipment Engineer, which covered much of the equipment that will be discussed.

Q Have you made a particular study of the slim hole technique?

A Yes sir, I have.

Q As applied to this area and West Texas and other areas?

A Yes sir, I have.

Q Have you published any reports or papers, or have there been any of your reports or papers published?

A Yes, I recently published an API paper entitled "Tubingless Completions" in the West Texas area. The "Tubingless Completions" referred to the 2-7/8 inch OD completion and slim hole.

Q Have you prepared, for the purpose of this case, a comprehensive report on slim completion, the technique in connection with it?

A Yes sir, we have it as an exhibit and it refers to all the techniques and equipment that are generally associated with the 2-7/8 inch completion.

Q Have you previously testified before the New Mexico Oil Conservation Commission?

A No, I haven't.

MR. HINKLE: Are the qualifications of the witness acceptable?

MR. PORTER: The witness' qualifications are acceptable.

(Thereupon, the document was marked as Humble's Exhibit Number One for identification.)

MR. HINKLE: If the Commission please, we have had

identified as Exhibit One the report to which Mr. Willingham has just referred to. I think each member of the Commission has a copy before them, as well as the staff members. Mr. Willingham has large copies of the exhibits or tables and graphs and plats that are shown in the exhibit here, and I am going to ask him now to refer to this Exhibit Number One of Humble's and to state in his own words, or give us a synopsis, a brief synopsis of the report without reading it in detail. At the conclusion of his testimony, we will offer this report in evidence. During his testimony, he will refer to the large plats which are the same as shown in Exhibit Number One.

MR. PORTER: Mr. Hinkle, do you have an extra copy, another copy of this?

A Yes sir, we have one right here.

MR. PORTER: I would like to ask you also, has this been published in any of the Oil Publications?

A No sir, part of it has, but this has not been published prior to this time.

MR. PORTER: Thank you, sir.

Q (By Mr. Hinkle) Mr. Willingham, proceed.

A Gentlemen, this book could be a week's discussion and therefore, I would like to summarize it, and briefly, in introducing it, the facts are this: That our increasing cost of the development of our wells in New Mexico, and combined with reduced allowables, have created a condition where the continued drilling

of wells in many areas is no longer justified due to the anticipated rate of return on our investment capitol. In an effort to reduce costs in similar situations in other parts of the country, the oil industry has resorted to the use of 2-7/8 inch OD casing. This might be called and could be called 2-1/2 inch tubing, but when you refer to casing, you refer to it by OD, so in this case we are asking for 2-7/8 OD casing. Under the present proration schedule, producing volumes may readily be obtained through much smaller tubular goods than has been the custom to employ in the past.

The history of slim hole dates for many years. We can most of us recall when we were drilling and setting 7-5/8 and 7-inch casing strings as the customary oil producing strings, and over the years, it has gradually gone to 5-1/2 and down to 5-inch, 4-1/2 and in some cases, 4-inch, and now we have reached the ultimate, we feel, in 2-7/8 inch OD casing. I believe it is imperative for us all to recognize that the conditions created by foreign oil and other forms of energy are actually threatening the survival of drilling operations in New Mexico for many areas. In order for the oil industry to remain competitive, it is necessary that we adopt techniques and equipment which will provide the highest rate of return. It wasn't until around six years ago that the development of wire-line tools for wire-line servicing and permanent type completion equipment was developed, and this is the reason that we consider 2-7/8 inch casing completions

a practical reality.

Now, by that, to explain it, several years ago the technique of setting your tubing on a packer and doing your workover work through this tubing was followed to reduce cost. There's no reason that this technique couldn't be applied to 2-7/8 inch casing also. There have been improvements of artificial lift equipment, such as pumpout subsurface hydrill, small sucker or hollow sucker rods and small type pumps, small gas lift valves and small mandrills and so forth.

There was initially some basic objections to the use of 2-7/8 inch casing, the first being the fear that we wouldn't get good wells from fracking with low rates on 2-7/8 inch casing. In order to evaluate this, during 1958, my company performed 70 frack operations, of which many were at low rates below 15 barrels per minute, in order to really evaluate what happened when you do frack with low rates down this tubing. The reason you frack with low rates is because of the friction lost going through these small casing strings, and my company found that there was no hindrance in the quality of the well with fracking at low rates. In other words, we got just as good as well fracking with low rates as we got at high rates.

Another objection was the fear that you couldn't drill the wells as fast and thereby it would cost you more money. We have found since that you can drill wells comparable in cost to conventional completions. In fact, there are indications for the

future of small rigs with three-men crews that will be able to drill the wells cheaper; however, that remains in the future.

The third thing was the objection that we wouldn't be able to produce volumes with artificial lift equipment that we could with our conventional completions. We have found through actual field application that we can produce volumes comparable to conventional completions in the same areas.

A review of the New Mexico Oil Conservation Commission rules indicated that 2-7/8 inch casing is in accordance with all the rules except 107-D, which states: 1, all flowing wells shall be tubed. 2, all gas wells shall be tubed. 3, tubing shall be set as near the bottom as practical and tubing perforations shall not be more than 250 feet above the top of the pay.

The wells we are proposing in the Eumont Field, as shown by the red arrow, as a basis of orientating everybody with what we have, these will be four 1,000-foot wells. These are theoretical calculations --

Q Mr. Willingham, may I interruot you?

A Yes, sir.

Q Can you refer to these exhibits, as you turn to them, by number?

A Yes sir, I can. The map is not in the book, the figure here is Figure 1 in the exhibit, shown after Page 2. There are several different ways to produce with artificial lift through 2-7/8 inch casing. Naturally, you can produce through the casing

without any small strings or any lift equipment when the well is flowing. The various methods we have, you can rodpump inside the 2-7/8 inch casing through a hollow rod pump, in other words, bringing the production up the hollow rod, or you can rodpump inside inch and a half tubing, upset tubing, you can use a hydraulic subsurface pump, or you can gas lift. In most cases to date, we have selected the Number Two, our hollow sucker rods to pump through as shown on this graph. For example, with theoretical calculations at 4,000 feet, which are the Eumont wells that we propose, you can produce better than 200 barrels per day. at 85 per cent pump efficiency. This is far greater than the allowable, so there is no reason to believe that these casing strings are going to limit our production.

This next figure, we are not showing all of this figure because this could go on for days if we go into all of this. This is Figure 7 in your book and it follows Page 9, it is right after Page 9. Gentlemen, this is the surface arrangement of equipment, and to explain basically what this typical arrangement would be, we would have 7-inch casing set and 2-7/8 inch, your 7-inch casing being your surface pipe and the 2-7/8 inch casing would be your string and would be set on a slip type packer at the wellhead. We could have an arrangement where we could pump up the hollow rod and cross over and go out through a flow line. Some people use this technique, using flexible hoses to produce from. However, this arrangement, we feel, is superior because there won't be any

chance of breakage and loss of oil, and all of this equipment is readily available, it is routine, the only difference from conventional equipment is it is much cheaper.

In order to really evaluate tubing completions , we must consider the workover operations. This is Figure 9 that follows Page 10. We will find, due to the necessity of changing our ways of working over wells, we are going to find that our workovers are going to be cheaper. In the past, whenever you complete a well, you spend a considerable part of the original investment, in fact, you, in some cases, you spend 50 or 60 per cent of your original investment working a well over. And I wanted to bring this to you to show you that you can work your well over much cheaper. For example, if we had two reservoirs and we wanted to abandon the lower one, all we would need is a wireline truck to set a plug on the setting nipple. Another way you could do it is you could go and set a plug on a wireline, you don't have to have a setting nipple. This means that you could abandon this lower formation for much less than you could with your conventional technique of moving the workover rig on. When we would abandon this zone in this manner, why we could perforate that upper reservoir and it would be in production and the only thing we use is a wireline truck.

Another method we could use is to use a dump bailer, wireline dump bailer, dump cement, abandon this lower formation and then be ready to perforate. Another method we could use in the

event of a casing leak, we could use a double packer patched tool that you could see the wireline to shut off the casing leak. Another method we could use, we could abandon the upper formation with a patched tooling through a perforating gun, perforate the lower interval, and with all four methods you can work the well over without a workover unit.

Q Mr. Willingham --

A Yes, sir.

Q --are these the only methods of workover, or the only techniques that are available or are there a lot of them?

A There are, I could stand here and talk for at least a week on the workover operations alone and the various tools that are available. That is, there are just hundreds and hundreds of different equipment that is available on the market today. This technique shows the use of a workover rig in which we have used --

Q What is the number?

A This is Figure 10 following Figure 9. This is using a workover rig and a small tubing string, and in recent years we have developed a technique of using low pressure squeeze techniques. The purpose of this technique is that you don't leave nodules in the casing where you can't get your wireline tools through, so we developed a jell-type cement which does not leave nodules and therefore you can work your wireline through after the job is over.

Another thing that we found in the fractured limestone reservoirs, that often we have a flowback and we have had to resort to a granulated plastic as a filter aid in obtaining your squeeze cement job. I know this is getting technical, but it is necessary to go over this to really explain why this operation has arrived. But in this example where we squeeze this reservoir off with low pressure techniques, we recess the cement out, pull the tubing out, and then we could go in and either re-perforate this formation or we could perforate above. Another technique would be to set the pipe above the formation, squeeze with the low pressure techniques, leave a plug in it, reverse it and be ready to perforate in the upper reservoir. This particular illustration is run on consolidated sands and doesn't apply to the New Mexico area. In the operations that I am thinking of is where sands are consolidated and this is to eliminate sand production.

This particular figure is Figure 12, follows Page 12. Gentlemen, the reason that this view graph is presented is first to give you some background. Many people are of the opinion that you have external, or that external casing corrosion is serious in the West Texas-New Mexico area when actually the real serious corrosion problem is internal. A survey of my company's casing failures in the West Texas-New Mexico area indicates that only 7.6 per cent of the failures were due to external corrosion and 54 per cent of them were internal corrosion. The reason I want to

bring this out is to show that internal corrosion can be controlled with 2-7/8 inch completions; external corrosion would be the same as you would have on your conventional well, you can control that by either cementing across the offending formation or use cathodic protection. The various means that we could control corrosion internally are this: For hollow sucker rod installations, you can either put the hollow sucker rod up the annulus, let's assume we were pumping the annulus, we could inject the inhibitor down the hollow sucker rod and let it flow back with the oil production, thereby controlling our internal corrosion of our pipe. Another method we could use if we were flowing the hollow sucker rod, we could leave the annulus packed off and leave a dead oil with an inhibitor inside of it. Another method we could use is inch and a half tubing inside the 2-7/8 inch tubing with small sucker rods inside of it. This would be similar to a conventional completion, and we could record pressures in our annulus between our inch and a half and 2-7/8 inch. Another type of completion is our hydraulic subsurface pumps where we could inject oil down the small tubing string with an inhibitor mixed, with the inhibitor flowing back up the annulus with the oil production. Another method would be the parallel string method where we use a sub-surface hydraulic pump where we pump treated oil down the 2-7/8 inch and produce up our inch and a half or inch and a quarter and these two strings would both be cemented in the hole. The last method I want to show is the gas lift. This isn't too popular a

method in this area because of the lack of gas, but you could put an inhibitor in your gas to lift.

This is Figure 14. Gentlemen, I wanted to explain this, that these figures are well cost reductions have actually been greater and in fact are substantially greater than this. However, we have adjusted these figures to reflect the savings that are directly attributable to the 2-7/8 inch casing. Now, some of the techniques that are associated with this cause a well, cause a reduction to be much greater than this. But basically, during 1958, we drilled twenty wells as a test program to evaluate this type of operation. We found that the average cost reduction directly attributable to the 2-7/8 inch casing averaged 16 per cent, but I want to reiterate that this is a very conservative figure and we don't want anybody to be misled by what we said. During the year, and after the first month or two after the turn of 1959, we arrived at the fact that this was a good economic tool and we started an extensive development program in West Texas. Currently, we have five 2-7/8 inch completions, we have five rigs running drilling more, we've got eleven locations waiting on rigs.

And generally, in conclusion, I wish to say that the future will result, in my opinion, in many other reductions in 2-7/8 inch completions due to the development of small portable rigs operating with one or two or three men, and the development of improved equipment for 2-7/8 inch casing though we have much good equipment available at the current time. But in summary, the results of our

operation is to indicate that 2-7/8 inch completions are a more economic tool for the oil industry and they should allow us to continue development operations in areas which we can't afford to develop at the present time.

Q Mr. Willingham, one or two questions. Why did you consider it necessary to obtain an exception to any of the rules of the Oil Conservation Commission to go ahead and engage in this sort of completion?

A Well, this is because of our Rule 107-D, which states that all flowing oil wells shall be tubed and all gas wells shall be tubed.

Q Completing wells under this slim hole technique, it might be a question as to whether or not that rule would be complied with, is that right?

A Yes sir, in some cases, if the well is flowing, for instance, a gas well, it will be produced directly through the 2-7/8 inch casing; in an oil well, it might be produced up the hollow sucker rod or it could be produced in the annulus instead of through the hollow sucker rod.

Q In the case of the hollow sucker rod instead of directly through the tubing, though, that would comply with the present rule?

A Providing you were pumping inside the hollow sucker rod, but if you pumped through the annulus, that would in a sense be voilating the intent of this rule.

Q So it is just a technicality then?

A Yes, sir.

Q Through the drilling program that Humble has carried on up to date and the surveys which have been made by you and others in the Humble organization, has the Humble Company performed any general policy with respect to the adoption of this method of completion?

A This method of completion is being used widely in my company at the present time. We have operations in Southwest Texas, Gulf Coast, North Texas and the Eastern Division, which includes the State of Louisiana, Alabama, Florida and so forth.

Q Are there any rules or regulations in Louisiana or Texas or any of the other States you operate, or have drilled in that would prohibit the completion of wells of this kind?

A No sir, there are not.

Q Do you have to obtain an exception or do they approve them as a matter of routine?

A They are approved as a matter of routine. In fact, in many cases, we are making dual and triple 2-7/8 inch completions; in fact, we run two strings of 2-7/8 inch and send them to different formations and in others, we run three strings of 2-7/8 inch and send them to three different formations.

Q I understood you to say that there's no greater corrosion problem presented with the slim hole technique than on larger holes, is that right?

A I can emphatically state that.

Q So corrosion is not a major problem any more in a slim hole than it would be in any other hole?

A That's right.

MR. HINKLE: That's all.

CROSS EXAMINATION

BY MR. PORTER:

Q Mr. Willingham, in general, your company uses seven-inch surface casing, generally speaking?

A Mr. Porter, that would vary according to the locality and in some cases, we use seven-inch, in some cases seven and five. I anticipate that before this is all over, we will start using five and a half inch surface casing as small rigs become available and we can drill, we can afford to drill with short, small bits and still come out ahead.

Q Are there any disadvantages to this method of completion that Humble would consider seriously as objections, or objectionable features?

A The only question that enters our minds is your fishing problem. In the event that you have say a parted hollow sucker rod string, and which we feel that they can be recovered, we have recovered them, that it is just a matter of learning to do our business differently with our various workover and fishing tools and so forth. We feel that the casing corrosion problem can be handled easily, though. I mean, if we had a casing, a hole in our

casing, there are many ways of repairing that hole.

Q Have you made calculations as to the savings in cost to Humble on these two particular wells in question here today?

A Well, Mr. Nutter, I would say this--I mean, excuse me, Mr. Porter, that if I were making an estimate, I would state it at 16 per cent, but we have actually had cost reductions that ranged as high as 45 per cent due to the techniques that we were required to use with 2-7/8 completions.

Q Your average is about 16 per cent, although you may have a wide variation?

A Now, the average that we say is directly attributable to the 2-7/8 inch completion; the well cost reduction has averaged from 15 to 45 per cent.

MR. PORTER: Anyone have any questions of Mr. Willingham? Mr. Nutter?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Willingham, are the wireline tools which are available, which you use through this 2-7/8 inch tubing as efficient as tools that you would use through normal size casing?

A In answer to your question, can you, in other words, can you abandon a zone as efficiently, I'll say you can, yes.

Q I had primarily in mind, Mr. Willingham, the case where you were completing a well, for instance, perforating and so forth?

A Well, in answer to that question, Mr. Nutter, I'll say this: That reservoir calculations, from a theoretical standpoint, bear out the fact that it doesn't matter, the depth of your penetration doesn't matter as long as you are fracturing because in fracturing, if you have a quarter of an inch penetration, it's good enough. But with these particular tools that we are using to perforate with, we have had quite a bit of penetration; in fact, we have had holes as large as, if I recall right, that were better than nine inches that were washed out, that were perforated through with our tubing guns and got, in this particular case, I believe we got an open flow potential of around fifteen million in a gas well.

Q In other words, you feel that--first of all, jet perforations or bullet shots through this tubing is not as powerful as the ordinary larger size jets or bullet perforations, is that correct?

A That would be generally true.

Q But you feel that the actual power of the shot is not so important as long as you make some penetration at all and then later frack that zone?

A Yes, sir. Now, I want to say this, Mr. Nutter: We have, for several years, been going through the tubing with tubing perforators and perforating our formation, even in our five and a half inch and seven inch casing and if that were an objection, it would have occurred long ago, and not only were we

perforating a much larger casing, but we were getting satisfactory results. We couldn't use bullet perforators in the 2-7/8 inch completions, however, we would stick to jet perforations, or we have to date.

Q How about the shots per foot, is there any difference in the shots per foot that you use in the slim hole as compared to the larger size hole?

A In recent years, the trend has been to less and less shots per foot, and my company has found out actually that the quality of our wells is much greater with the lower shots per foot and we believe that is due to the fracturing techniques, as you are putting more fractures out on the perforations, you are doing a better job, but normally, we have been shooting two shots per foot in our tubing in the 2-7/8 inch completions.

Q What is the normal procedure in the five and a half inch casing string?

A Well, a year ago it was four and six shots a foot; now it is one shot a foot or two shots a foot.

Q Do you think there's any correlation between these lower frack rates which you have mentioned and the smaller number of shots per foot?

A No sir, we don't because we frack in all different types of perforations.

Q And you still are of the conclusion that the lower frack rates are desirable whether you have larger or smaller

number of shots per foot?

A Yes, sir. I don't say they are desirable, I say they are just as good. The higher frack rate would be your limiting factor; in fracturing, that's the limiting factor.

Q Mr. Willingham, one of your sketches in here shows a sleeve being used to repair a casing leak; how would you detect that casing leak to start with?

A Well, there are several different ways that you could detect it; you could detect it from your operating pressure, you could detect it from temperature surveys, you could detect it from bottomhole pressure surveys. There wouldn't be any reason to believe that you couldn't detect it just as well as you could on a conventional well.

Q In a conventional well, you have a direct annulus pressure reading as well as a tubing pressure reading to compare if you have a pressure leak, don't you?

A However, now, in 2-7/8 inch completion wells through the annulus and the operation that we are using mostly, the hollow sucker rod with the dead oil in the annulus, we have a pressure on that, and the other, if we get an area, say we moved and drilled in an area with 2-7/8 inch completions and found that we were in a corrosive area, we would probably revert to the technique of inch and a half tubing so that we do do just what you said. The fact that it is economically--some of the light inch and a half pipe, you can set that as economically as you can the other

installations. The reason is you can use a smaller pumping unit due to the lighter rod string, which makes it as cheap.

Q Would you agree, Mr. Willingham, for practical purposes, that it is probably better to use a hollow sucker rod string of inch and a half tubing in that well than to use a conventional rod string and pump in the tubing?

A Mr. Nutter, I would hate to be tied down to that installation. Now, you can harnass a technique with so many rules that you can kill it, but what I am saying is that this type of operation is going to go fine until the final stages in which your fluid production is going to be at a rapid rate, then you might have to resort to the rod strings. I think what you say in general is --

Q For shallow wells on low allowable rates, or not producing too much fluid, is that what you referred to --

A Yes, sir.

Q --to use hollow sucker rods?

A Another good way is your subsurface hydraulic pump. Of course, you don't have a moving rod string.

Q Now, if you had this casing leak and you repaired it with this sleeve, what kind of a seal do you have there that this sleeve provides?

A You would have a--there are several different ways, it could be done with a Chevron packing or you could have just a rubber packing through expansion.

Q Now, would either section of the sleeve in this tubing cause any difference as far as running your pump or running your quarter --

A You could run a perforating gun through it, but could not run a pump through it; therefore, if it occurred above your producing interval, you would not use that technique to repair the casing leak. What you would do is you would use your low pressure technique to repair it and you would use pressure squeeze techniques and repair your hole that way.

Q In other words, you would depend on this cement to effect a seal and to prevent --

A Yes sir, like we do in a conventional well.

Q What size hole is normally drilled for a tubingless completion?

A To date, we have used 6-3/4 and 6-1/4; the trend has been more and more to 6-1/4, however, I anticipate that before many more months have passed, we'll be drilling 5-5/8, we have done some of that already.

Q Does this provide the same annular space, or what I'm trying to say is, does this provide as much area in the hole for a cement sheath around that tubing as is provided in the normal size hole with 5-1/2 inch casing?

A It would, approximately so; however, in some cases, we have reduced the hole through the producing interval and made the sheath smaller, but the secret to that--I see what you're

getting at, because certainly you have to have a cement sheath to stop communication, but the secret there is in making sure that your interval is centralized and your casing string is held away from the wall. That is very important and we do that.

Q You use centralized --

A Yes, sir.

Q --size casing?

A Yes.

Q What is the depth range that you would recommend slim holes?

A To date, our wells have ranged from 1500 to 4700 feet. And now--that's in the Western Division, in some in the Northern Division we have gone deeper, and I think as time and knowledge and experience comes, it will be deeper and deeper.

Q Mr. Willingham, is there any more danger of losing the hole in attempting to effect a slim hole type of completion than in conventional drilling?

A Yes sir, there would, it would be more of a hazard. I would be unrealistic if I said there wasn't, because you have less hole to work in. However, I want to answer that with a deliberate answer to bring out the economic picture. For example, if we took a field and we were going to drill five wells in it and we were able to take the saving that we got from those five wells and re-invested it at ten per cent, in ten years we could drill four of those five wells over.

Q At the end of ten years?

A Yes, sir.

Q In this little economic analysis in Figure 14, Mr. Willingham, you state that in the field, A, B, C, D and E, you have effected twenty slim hole completions?

A Yes, sir.

Q Did you lose any wells in those fields?

A We had one that we abandoned prematurely because we had lost some equipment in the hole; however, we had already tested the well and found that it wasn't worth the trouble of going in and trying to get the equipment out. Essentially, it was already a dry hole before we abandoned it, but we did have to abandon that one.

Q Are fishing jobs more difficult in a slim hole than in a conventional hole?

A I would say no, they are no more difficult, I would say that you could get into conditions where they would be more difficult; however, they are also much cheaper than they are in conventional fishing.

Q Would you recommend slim hole for wildcatting?

A No, normally we would not because of the limitations in running diameters. In other words, in your associated equipment, first of all, you have to set large casing strings so that you can set protective strings in the event you run into abnormal pressures, and normally, we would not use them in wildcats. However,

we have drilled wildcats and found out that we had a discovery and set 2-7/8 inch casing in it, but in this case I believe we set 8-5/8 inch surface pipe and drilled a large hole.

Q Is there any material in which you show the cementing program on one of these wells as compared to a conventional well?

A Basically, there is none except we have one sketch that shows the surface equipment we have used because of the fact when you--the pipe between your cementing trunk and your wellbore, which normally you don't worry about that little amount of cement or where you might get a little bit of fill-up in the tubing, and therefore we have made arrangements to be sure that that is cleaned and flushed out so that they don't get inside of your tubing.

Q Mr. Willingham, do you feel that the Commission or the operators should have any more concern over the advisability of using tubingless completions in one area as compared to another or in developed fields, fields in the stage or development, are they as good in one place as they are in another or are there any areas where they shouldn't be used?

A To date, we have avoided areas which we knew that we had severe paraffin problems. We have used them in areas where we had paraffin; however, where we had severe paraffin, we have avoided them, though that largely is due to salesmanship. We didn't want to use it and have some trouble, we tried to put it in places we considered a cinch to start with, and I think that

later on we will go to paraffin areas, but we don't have the experience now to say that it will operate inside of them, and we will have to find ways of treating paraffin, too.

Q You mentioned that there were ways of treating corrosion. Now, do you think that in highly corrosive areas, that this shouldn't be used?

A I would say that if you had a very corrosive area, you should be able to treat 2-7/8 inch completions every bit as easily as you could treat the larger except it won't take nearly as much material and it will be cheaper.

MR. NUTTER: I believe that's all, thank you.

MR. PORTER: Mr. Willingham, did you state that you had right now in the West Texas area completed 52 wells in this manner and I believe you are drilling 5 more and anticipate maybe 11 more at the present time?

A Yes, sir.

MR. PORTER: Have you run into any serious problems in producing this type of completion more than you would expect otherwise?

A We did have some trouble in one well in which we did not put a pump setting nipple in the bottom and we had to resort to a slim-type holddown, and we learned a hard, bitter lesson and we don't leave them out any more.

MR. PORTER: In general, you would say that it has proven satisfactorily?

A Yes, sir.

MR. PORTER: Anyone else have a question of Mr. Willingham?

GOVERNOR BURROUGHS: Would this be a definite factor in determining whether or not a well would be profitable in a restricted drilling acreage area?

A Yes, sir; in fact, we have been able--this is the way, how this got started: We took marginal properties that we couldn't afford to develop and determined a minimum cost well program for it and moved into this area and were able to develop it economically and made money out of it, and therefore, I think that the industry will find that this will open up drilling that in some cases has been left idle due to the fact that the rate of return is so low.

GOVERNOR BURROUGHS: In other words, it would make you a little happy with 40-acre spacing versus 80-acre spacing in some areas?

A I didn't come prepared to speak of that, but I think our past history will speak for itself, sir.

MR. PORTER: Do you have any further questions?

GOVERNOR BURROUGHS: No.

MR. PORTER: I would like to ask one more. When did you complete your first well in this manner in West Texas among these 52?

A We completed it, it was either in April or May of 1958 was when we first started.

MR. PORTER: About a year ago?

A Yes,sir.

MR. PORTER: Mr. Payne I believe has a question.

MR. PAYNE: Mr. Willingham, I believe you testified that the 2-7/8 inch OD casing was the ultimate in this type of completion. Did you mean by that that you should not use casing or tubing any smaller than that?

A We'll get into this problem, for instance, if we wanted to use 2-inch tubing, we get down to the point that our small string inside will be so small that we can't handle the fluid, and it could be in some cases we'll use 2-3/8, but I think that probably we'll standardize it on 2-7/8.

MR. PAYNE: In view of your answer, I would like to ask Mr. Hinkle a question. Mr. Hinkle, the Southwestern Oil Well Servicing application asks for 2-1/2 inch, it doesn't make clear whether you are talking about OD or not.

MR. HINKLE: I believe that Mr. Willingham testified right at the beginning of his testimony that these types of completions were referred to sometimes as 2-1/2 inch completions. Actually, when they, I think when Southwestern filed their application, they had in mind using 2-7/8 inch casing, but it is a common term in the industry to refer to the tubing as 2-1/2. Now, Mr. Willingham can explain that.

A Yes sir, that's right. Now, why they did this, I don't know, but the old timers started calling tubing in normal sizes of 2-1/2 inch casing by OD, and 2-1/2 inch tubing is

actually 2-7/8 inch OD.

MR. PAYNE: In other words, all three of these applications are asking for 2-7/8 inch OD?

A Yes sir, that's correct.

MR. PAYNE: Thank you.

GOVERNOR BURROUGHS: This is, of course, calling for a projected answer and I realize that, but with the savings that would accrue from associated techniques in this method of drilling, would you think that over the course of years, you might get to a point where you could make say an average of a fifty per cent saving in well completion jobs?

A No sir, I don't believe that, I don't think so. I would say that probably in what we are making now, you understand that this is a very difficult thing to say, what savings are attributed to this and what savings are due, what technique causes other savings, but I would say the average well cost reduction has been around 25 per cent, but we believe in being fair about it and in being conservative, we don't want to mislead anybody, and we say that 16 per cent is the average savings that is directly attributable.

GOVERNOR BURROUGHS: I am speaking about a figure that is a total figure, not necessarily directly attributable, but the overall savings.

A I would guess around 25 per cent.

GOVERNOR BURROUGHS: Around 25 per cent, thank you.

MR. PORTER: Mr. Fischer?

CROSS EXAMINATION

BY MR. FISCHER:

Q Mr. Willingham, have you tried a pattern, the drilling of these slim holes on any type of drive, either a gas drive or water drive, or have you carried the completing of the slim hole in any particular type of producing mechanism?

A Mr. Fischer, we, my company--I am talking about the Western Division--in the Western Division, we have used, probably we have had them in gas drives and dissolved gas drives, but in other parts of the company, we have completed them in all different types of reservoirs.

Q In speaking about shallow completions, say 5,000 feet or less, would these slim hole type completions be essentially or 100 per cent two string casing design wells where you would open two strings of casing?

A I would say that in most cases, in fact, about four of the majority of the cases, they will be two casing programs, the surface casing and the producing string.

Q As to cementing, if you didn't care to cement all in one stage, or couldn't, for some reason or other, could you two-stage this as --

A They don't make them that way, but there are other ways. You could put sliding sleeve mandrills or leave perforation seals. There are various methods of that nature, but generally

in the shallower wells, you don't have to bring cement all the way back; generally, you can, in some cases, you can't.

Q Basically, when you drill a large hole in the beginning, if you drilled a smaller hole, you couldn't --

A Well, I would say that you could get your cement pumps in there in the smaller hole as well as you could the larger hole providing you realized it was a smaller hole and slowed your pumps down.

Q We are still talking about shallow holes?

A Yes, sir.

Q In the Eumont, will you plan to drill some of these wells through and do you plan to protect your casing in salt sections?

A In answer to that question--now, I know that I am getting into a realm where I am talking without direct experience, but I'll say this: I can say from the bottom of my heart that salt sections do not cause corrosion. If it were true that you do have, then in the Gulf Coast area, you would have a problem to keep the corrosion out, and there is no reason to believe that this salt water section ought to cause corrosion. It is possible that if you have a lot of water in the salt section, you could have a current flowing down and leaving this salt section due to the conductivity of the formation, but cement isn't necessarily going to protect that because in most wells, they are cork-screwed and your pipe will be laying against your wall in places.

Q Possibly if you found, if you had a slim hole and you found out that your salt section, there was a chemical reaction or something, and that salt section was causing the corrosion, would you recommend to your company that they go to a different protection in that case?

A Yes sir, we probably would do either one of two things. I am sure that we would use cathodic protection, and in answer to your question, if we knew what was causing it was a section like that, we knew that was corrosive, I am almost sure we would put inch and a half tubing inside similar to a conventional completion. In that manner, you could tell when your casing leak occurred.

MR. FISCHER: Thank you, sir.

MR.PORTER: Anyone else have a question of Mr. Willingham? Mr. Hinkle?

MR. HINKLE: I would like to ask one more question. Do you consider the slim hole technique as a safe method of completion, that is, as far as handling high pressures is concerned, whether the 2-7/8 inch OD casing will withstand high pressures the same as other types of casing, larger --

A 2-7/8 inch tubing gives much more protection from internal burst ratings than conventional casing strings; the smaller the tubing, the higher the burst rating. In answer to your question, I know you are safer from that standpoint with 2-7/8 inch completions.

MR. HINKLE: That's all I have.

MR. PORTER: Anyone else?

The witness may be excused.

A Thank you.

(Witness excused.)

MR. HINKLE: If the Commission please, we have one other witness, whose testimony will be very brief, and that's Mr. Hollis of Southwestern, Inc., corroborate this testimony.

MR. PORTER: Would you have Mr. Hollis sworn, please?

MR. HINKLE: Mr. Hollis?

(Witness sworn in).

T. J. HOLLIS

called as a witness, having first been duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. HINKLE:

Q State your name, please?

A T. J. Hollis.

Q What is your position with Southwestern, Inc.?

A I am president and owner.

Q Is that company engaged in the slim hole drilling business to any extent?

A Not at the present time; we have this application before the Commission for the permission to do a slim hole.

Q You have heard the testimony of Mr. J. E. Willingham

in this case; do you agree with his testimony?

A Yes sir, I certainly do, I do whole-heartedly.

Q Have you had any independent experience with slim hole drilling that you would like to give for the benefit of the Commission?

A No sir, none other than the fact that I have been engaged for some number of years in well servicing and workovers. For the last twenty-five years, I have been engaged in production drilling in the State of Texas, Louisiana, Oklahoma and New Mexico. I have drilled several wells and I have worked over several wells with small rigs and small tools.

Q Mr. Hollis, in your application which you filed with the Commission in Case Number 1573, it has been advertised that you propose to utilize 2-1/2 inch tubing as a substitute for casing. What did you mean by that?

A I was proposing to use 2-7/8 inch tubing, generally speaking, the industry calls it, as an oil string.

Q It is often referred to as 2-7/8 and 2-1/2 inch tubing sometimes?

A Yes sir, it is quite commonly spoken of in the oil industry as that.

MR. HINKLE: That's all.

MR. PORTER: Any questions of Mr. Hollis?

You may be excused.

A Thank you. (Witness excused.)

MR. PORTER: Anybody else desire to present testimony in these cases?

Anyone have any comments, any statements to make?

Mr. Christie?

MR. CHRISTIE: I would like to make a statement, R. S. Christie for Amerada Petroleum. We believe Humble's presentation on slim hole drilling and operations is very timely. We need to explore every possible means to reduce the cost of exploration and development, this is one important advance in that direction, and we feel and believe that the Commission should grant these applications. Furthermore, if the present rules prohibit slim hole drilling pending a hearing, we think the rules probably should be amended so the hearing won't be required.

MR. PORTER: Anyone else have a statement?

MR. McPETERS: Kenneth McPeters representing John M. Kelly. We would like to support Humble and Southwestern in this case, and speaking of the New Mexico industry, we believe that this technique is better, better to rising costs in the oil industry.

MR. PORTER: Anyone else have a statement?

We will take the case under advisement.

At this time, we will recess the hearing until one o'clock so that you may get in ahead of the noon rush hour.

(Noon recess.)

****

MR. HINKLE: If the Commission please, the reporter has called my attention to the fact that he is missing the Exhibit Number One in the slim hole cases, which were consolidated. I would like to substitute this copy, which is the same, and offer it in evidence. Can we re-open those cases for that purpose? Somebody picked up his copy off the desk.

MR. PORTER: Is there objection to Mr. Hinkle's motion for entering this exhibit in the three consolidated cases of this morning?

Let the record show that this Exhibit Number One is part of the record.

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, JERRY MARTINEZ, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing were reported by me in Stenotype, and that the same was reduced to typewritten transcript by me and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

DATED this 15th day of May, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Notary Public

My Commission Expires:

January 24, 1962

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

Case No. 1573

TRANSCRIPT OF HEARING

MARCH 25, 1959

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE NEW MEXICO
Phone CHapel 3-6691

Page ________

NEW MEXICO OIL CONSERVATION COMMISSION

Mabry Hall

Santa Fe, NEW MEXICO

REGISTER

HEARING DATE Examiner March 25, 1959 TIME: 9:00 a.m.

NAME:	REPRESENTING:	LOCATION:
Roy A Baze	Humble	Midland, Tex
[illegible]	"	[illegible]
R.L. Elkins	Shell Oil	Roswell, N. Mex.
[illegible]	[illegible]	Santa Fe
Wayne R Hause	Ohio	Midland, Tex
E. B Mays	Sunset Intl Pet Corp	Denver Colo
Tom Popp	Sunset Intn.	Farmington N.M.
E L Fundingsland	Wellshire Dev. Co	Denver Colo
Bill Kastler	Gulf	Roswell
G. J. Savage	"	"
Don Walker	"	Ft. Worth
J.H. Hoover	"	Roswell
Nancy Royal	[illegible]	Santa Fe

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

Case 1573 Application of Southwestern, Inc. Oil Well Servicing for permission to make a "slim hole" completion. Applicant, in the above-styled cause, seeks an order authorizing it to utilize the "slim hole" method of completion for a well located in the SE/4 NW/4 Section 32, Township 16 South, Range 30 East, Square Lake Pool, Eddy County, New Mexico. Applicant proposes to utilize 2½ inch tubing as a substitute for casing in the above-described well.

Mabry Hall
Santa Fe, New Mexico
March 25, 1959

BEFORE:

Elvis A. Utz, Examiner.

TRANSCRIPT OF PROCEEDINGS

MR. UTZ: The hearing will come to order, please. The first case on the docket will be Case 1573.

MR. PAYNE: Case 1573, "Application of Southwestern Oil Well Servicing for permission to make a "slim hole" completion."

MR. BRATTON: If the Commission please, Howard Bratton of Hervey, Dow and Hinkle, Roswell, New Mexico, appearing on behalf of the applicant. I wish to move that this case be continued until the regular hearing of the Commission in April.

MR. UTZ: Is there objection to the continuance of Case 1573 until the April regular hearing? Without objection, it will be continued to the April 15th hearing in Hobbs.

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, JERRY MARTINEZ, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings were reported by me in Stenotype, and that the same was reduced to typewritten transcript by me and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

DATED this 26th day of March, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Notary Public

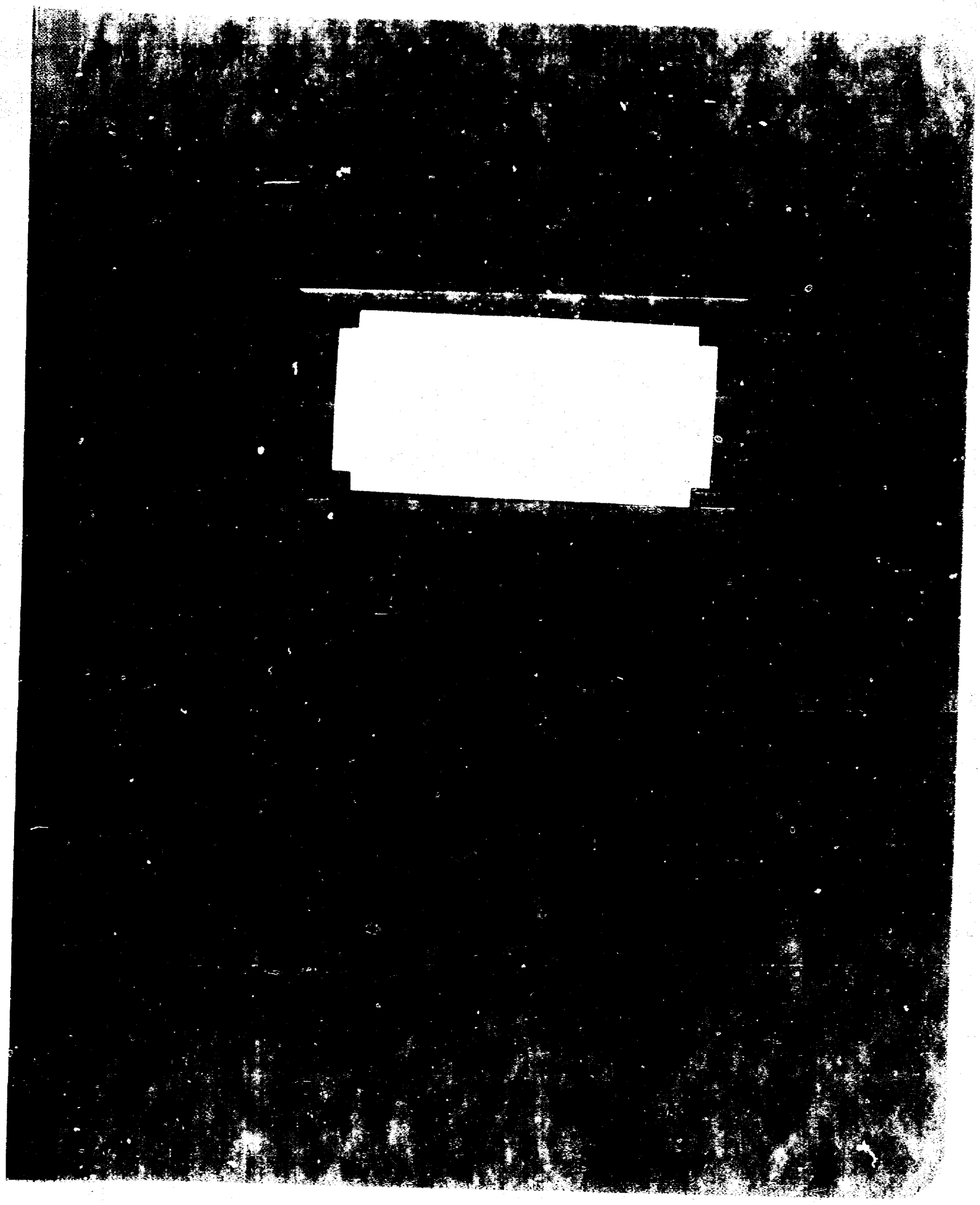
My Commission Expires:

January 24, 1962

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 1523, heard by me on March 25, 1959.

....., Examiner
New Mexico Oil Conservation Commission

DEARNLEY-MEIER & ASSOCIATES
General Law Reporters
ALBUQUERQUE, NEW MEXICO
Phone CHapel 3-6691



INTRODUCTION

An investigation has been made of the physical requirements of tubular goods employed in wellbores and in ordinary field operations. Under the current proration schedule and that which is anticipated for the foreseeable future, normal rates of production from a majority of wells may readily be obtained through smaller sizes of tubular goods than have been used in past well completions. There was no particular word definition assigned when the industry began substituting 5-1/2-inch OD casing with 2-3/8-inch OD tubing for the 7-inch OD casing with 2-7/8-inch OD tubing which had been regularly employed previously. The term "slim-hole" has been accepted in the past several years to denote the use of 5-inch or smaller casing rather than 5-1/2-inch casing although 2-3/8-inch OD tubing may be employed in either case. Slim-hole completions with 2-7/8-inch OD casing may be equipped with (1) hollow sucker rods, (2) non-upset tubing as large as 1-1/2-inch, or (3) with no tubing string.

A review of the New Mexico Oil Conservation Commission rules and regulations indicates that techniques and practices for slim-hole completions with 2-7/8-inch OD casing are in accord with all rules except 107 (d) which states:

1. All flowing oil wells shall be tubed,
2. All gas wells shall be tubed.
3. Tubing shall be set as near the bottom as practical and tubing perforations shall not be more than 250 feet above the top of the pay.

History

Until recently, the mechanical limitations previously associated with small bore completions were not compensated by the reduction in initial investment. The increasing interest in this style of completion is due in large part to the successful development of through tubing tools and equipment ordinarily used in permanent-type well servicing and workovers. Originally, small bore completions were considered to permit the drilling of wells at locations where ordinary wells would yield unattractively low rates of return under the present producing schedule. The success of these minimum cost wells, however, prompted the expansion of this program to all areas where it is practical.

Application

In flowing wells where tubing is not required, the maximum rate of production would be the same as from any ordinary well equipped with 2-7/8-inch OD tubing. Relatively lesser volumes may be obtained where flow must be restricted to smaller tubing , although equipment such as hydraulic subsurface pumps is commercially available to produce small bore wells at rates comparable to rates obtained from ordinary wells. The daily rates of production which may be obtained using various forms of artificial lift are shown graphically in Figure 1. Small bore wells are employed satisfactorily also, as injection wells in water flood operations.

DRILLING

Rig Selection

Contractors are not yet regularly equipped to drill and complete small bore wells and in some cases must charge premium rates for these

PRODUCTION vs DEPTH
ARTIFICIAL LIFT METHODS
2 7/8 INCH O.D. CASING COMPLETIONS

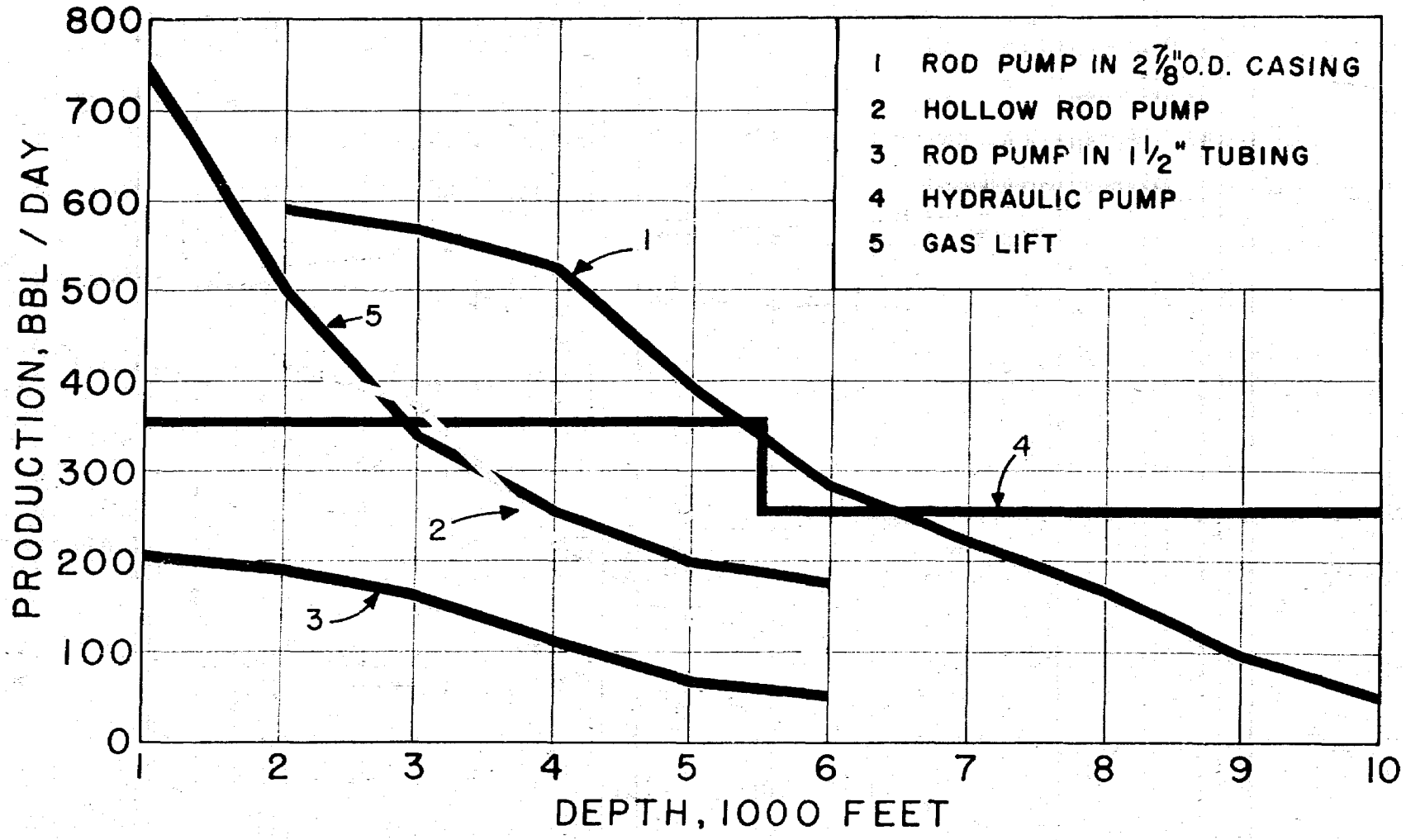


Figure 1

operations. Even greater economic advantages may be expected from 2-7/8-inch OD casing completions as smaller rigs become more readily available which will be fitted with equipment sized for this purpose. In this respect, consideration has been given wherever possible to the use of trailer-mounted or truck-mounted exploratory type rigs which are highly mobile and available at costs relatively lower than even the smallest ordinary rigs.

Hole Size

The optimum hole size to be drilled or the least expensive wellbore has been based on factors such as (1) rate of penetration, (2) bit life, and (3) thickness of cement sheath to surround the oil string casing. The size of the surface casing may be dependent on whether air drilling is to be employed, in which case it may be desirable to set a water shut-off intermediate casing. Where only water or mud are considered, 7-inch OD casing is adequate to permit the use of bits as large as 6-1/4-inches in the lower wellbore. A satisfactory hydraulics program may be prepared using 4-1/2-inch OD drill collars and 3-1/2-inch OD drill pipe in 6-1/4-inch hole. If larger sizes of wellbore can be drilled at lesser costs than 6-1/4-inch wellbore, the hole size may be reduced to 6-1/4 or 5-1/8-inches from a level of several hundred feet above the highest production interval anticipated in the wellbore to (1) permit improved penetration of perforators through a slimmer cement sheath, and (2) minimize the volume of cement required. In areas where a hole size of 5-1/8-inches can be drilled below the surface casing at an economic advantage, 4-inch OD drill collars may be employed on 2-7/8-inch OD drill tubing fitted with tool joint connectors.

Cementing Casing

Float collars, float shoes, guide shoes and automatic fill-up collars in sizes for 2-7/8-inch OD casing are commercially available. Latch-on type centralizers and scratchers for use with 2-7/8-inch OD casing may be obtained readily. Rotating scratchers have been employed to cover the anticipated production interval when mud is used to drill the well. The casing has been rotated during cementing whenever possible in order to obtain complete coverage and a uniform sheath. Scratchers usually have been omitted where water is used for the drilling fluid. Reciprocating scratchers may be used where rotation of the casing would present undesirable conditions in the wellbore.

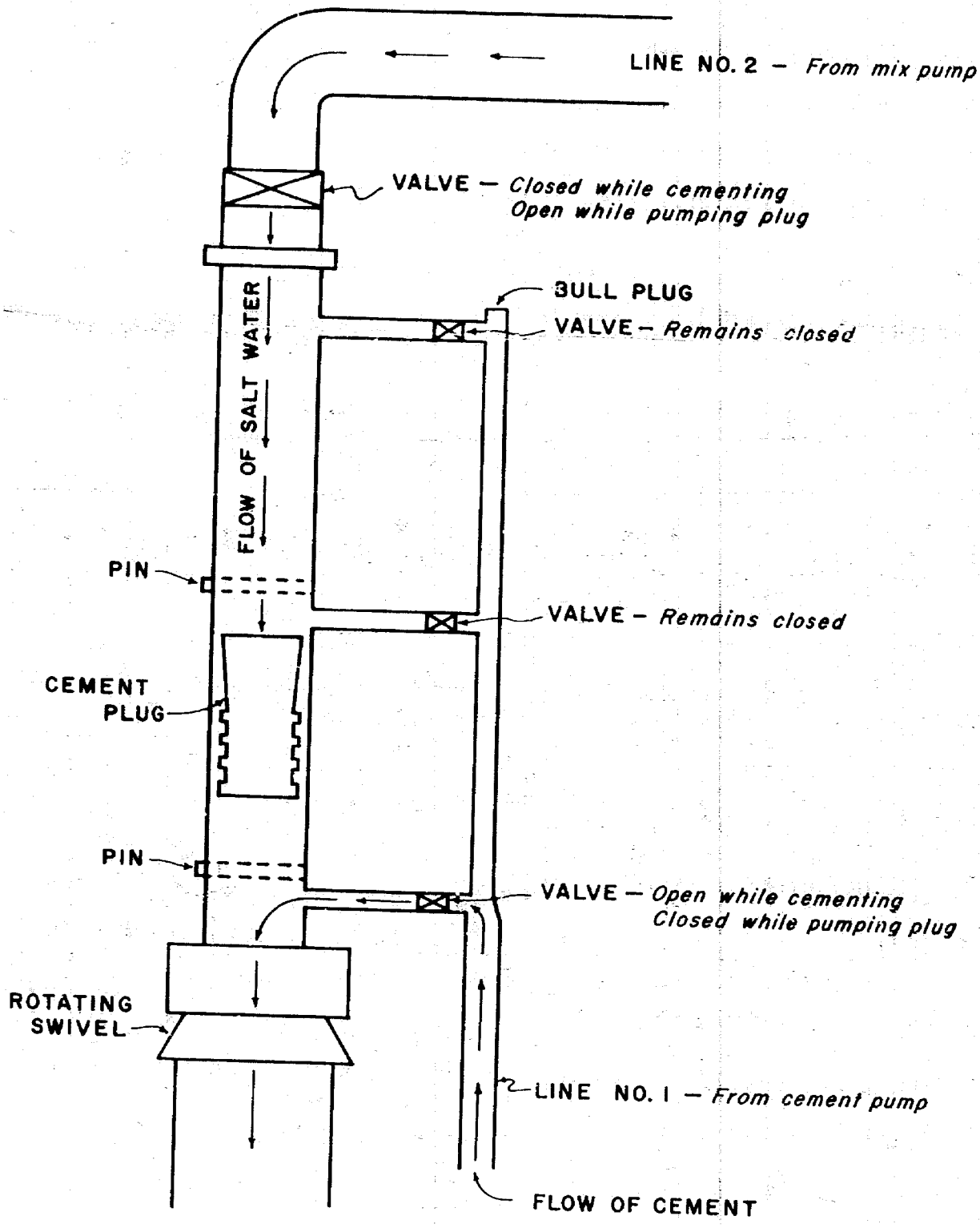
The success of subsequent work to be done in the reduced diameter casing will depend in part on the assembled condition of the string. Bending, mashing, or otherwise offset dimensions may seriously hamper the use of proper through-tubing tools and particular care should be exercised in handling the small diameter casing. Power tongs may be slowly rotated for at least the first three threads of cleaned and doped joints which are held as low as possible in the slips. Joints of 2-7/8-inch OD casing should be checked using an API drift to insure adequate tool passage. A 2.29-inch ID API 6-inch long seating nipple may be included in the 2-7/8-inch string at a distance above the anticipated perforated interval for seating a subsurface pump if desired.

Where excessive external corrosion or rod wear is anticipated, consideration may be given to the eventual replacement of the major portion of the 2-7/8-inch OD oil string casing. Centralizers for the casing

may be spaced at the top of the cement in addition to those normally employed at the float joint and through the productive interval of the well. If it is then desired to replace any casing section above the cement, the casing may readily be backed-off and the new section rejoined to the cemented casing which is positioned by the centralizers at this level.

One arrangement of surface equipment which may be employed in an efficient cementing procedure is illustrated in Figure 2. A single plug head is preferred because of its compactness, although a double plug container may be used as shown. Line 1 from the cement pump is used to place the cement in the casing and Line 2 from the mix pump is used while the plug is being pumped down. A minimum of down time is desired during cementing and Line 1 containing surplus cement should not be flushed until the plug is being pumped satisfactorily through Line 2.

Salt water may be employed to pump the plug into place. This medium is entirely satisfactory for subsequent perforating and will eliminate a round trip with small tubing to displace the fresh water or mud which otherwise would be required. Oil would be satisfactory as a pumping fluid except that service companies reasonably decline to measure oil in the open tanks on their trucks. Small tank trailers are available from some companies to eliminate this objection. Fine, granular salt, either sodium chloride or calcium chloride, may be mixed in pump truck tanks at a ratio of approximately 15 pounds per barrel of water if lease salt water is not available. To insure adequate solution, this operation should be done at least one hour prior to cementing. It is necessary to clean and flush the pumps and hopper after mixing the salt to prevent contamination



DOUBLE PLUG CONTAINER

(NOTE: *Similar hookup if Single Plug Head is used*)

Figure 2

of the cement.

Excessive pump pressures at high rates of plug placement may cause the casing to buckle or to be pumped up the hole. A special short length of 2-7/8-inch OD casing may be employed as the top joint while the plug is being pumped. When this joint, approximately 5 to 6 feet long, is removed immediately after the cement is in place, any tendency of the casing to buckle or otherwise deform will be corrected and the casing remains set in tension.

Although it is desirable to provide a uniform sheath of neat cement through all productive intervals in the wellbore, gel cement modified in accordance with local conditions, may be used to obtain the desired fill-up. Granulated plastic or similar bridging materials may be employed where severe lost circulation conditions are anticipated. The quantity of neat cement to be placed opposite the lower section of casing preferably should be prepared so that the entire volume of neat cement remains in the casing while the cement wiper plug is being released and this operation should be planned in order to be performed with minimum down time. These precautions will minimize exposure of a high water-loss cement to natural formations.

Wellheads and Surface Equipment

Several manufacturers offer relatively inexpensive wellheads and surface equipment for small bore completions. Arrangements shown in Figure 3, 4, and 5, consist of ordinary equipment modified to serve with the reduced sizes of tubular goods. It is anticipated that competitive

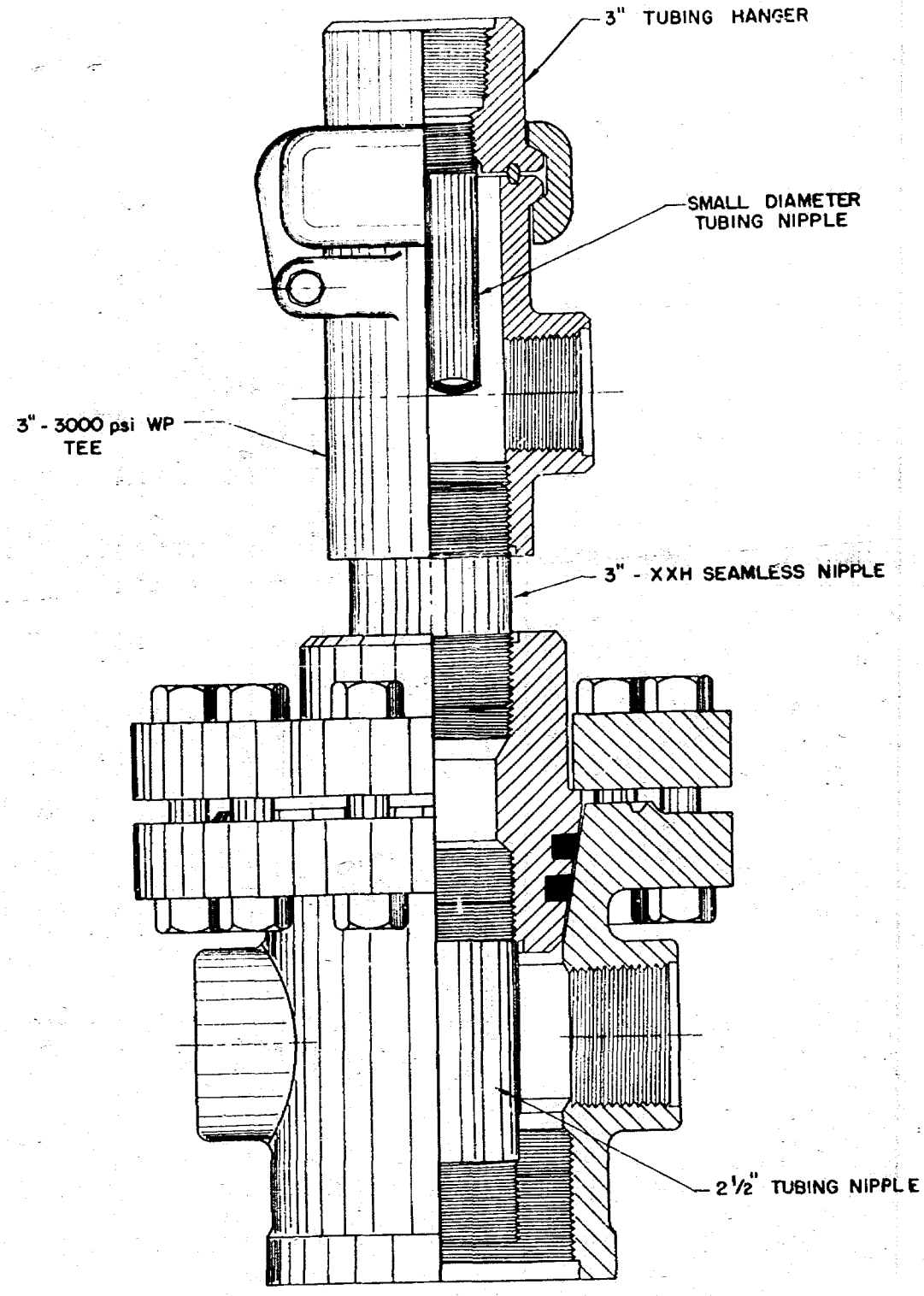
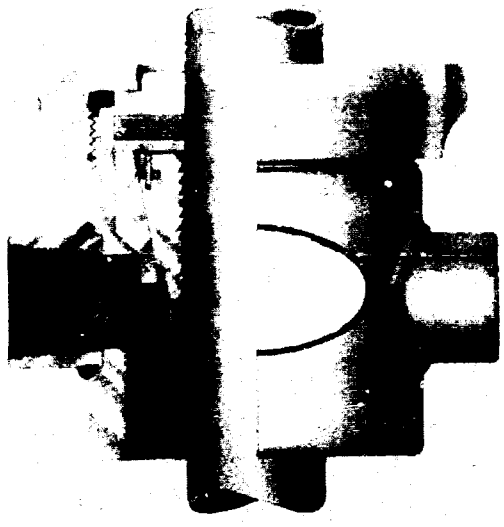
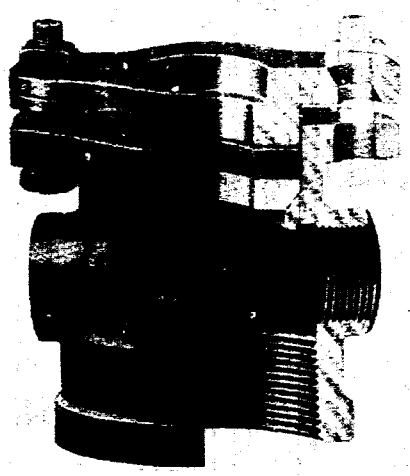

3" TUBING HANGER
SMALL DIAMETER TUBING NIPPLE
3" - 3000 psi WP TEE
3" - XXH SEAMLESS NIPPLE
2½" TUBING NIPPLE

Figure 3

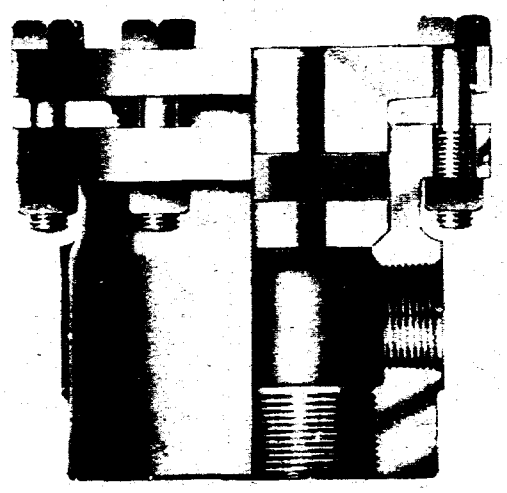


1000 PSI WOG
42,000 LB. LOAD

Figure 4



750 PSI
25,000 LB. LOAD



750 PSI
35,000 LB. LOAD

WELLHEADS

Figure 5

equipment will steadily become available from other manufacturers entering this line.

COMPLETION OPERATIONS

Logging

Formation logging tools for use in reduced hole sizes are offered by several service companies. All the services normally employed in any size wellbore except the dipmeter may be employed in holes having a diameter as small as 5-1/8-inches. The dipmeter may be used only in holes having a diameter of six inches or larger. Gamma ray and neutron surveys and collar logs may be run inside of 2-7/8-inch OD casing.

Perforating

Steel carrier through-tubing perforators to reduce casing splitting and eliminate debris are regularly available from service companies. Expendable through-tubing perforators may be employed where minor casing splitting and debris fill-up can be tolerated.

Fracturing

With the curtailment of allowed production and attendant tightening of economy within the domestic oil industry, it has been necessary to reduce costs where possible in drilling and producing operations. A practice of stimulating wells at low injection rates in a number of fields in its Western Division has been followed to reduce the expenditure necessary for fracturing pump trucks.

During the period from August 1, 1958 to January 1, 1959, fifty two fracture stimulation jobs at injection rates of 15 barrels per minute or less were performed in the New Mexico - West Texas area. These jobs in-

cluded 27 initial completions in eight fields and 25 jobs performed during workover operations in 17 fields. Potential tests of the initial completions averaged 91 percent of top allowable. Potential tests of the workovers averaged 67 percent of top allowable. The results of these stimulation jobs are considered normal, in view of the areas involved and high injection rates are not considered essential for successful well stimulation by fracturing. It is indicated that a "one-truck job" may be utilized for a 2-7/8-inch casing completion for the same costs and with results comparable to a "one-truck job" at an ordinary well.

PRODUCTION OPERATIONS

Flowing Wells

When an exemption is granted by the New Mexico Oil and Gas Conservation Commission, a naturally flowing well may be produced directly through the 2-7/8-inch OD casing. Tubings as large as 1-1/2-inch, non-upset may be employed if excessive (1) paraffin, (2) sand, (3) corrosion, or (4) other condition indicates it would be desirable to restrict the produced fluids to an inner bore. Such tubing will be installed only as a last resort since it is anticipated that a majority of these conditions may be handled in a routine manner using through-tubing tools currently available or small tubing as a well servicing string.

Artificial Lift

Artificial lift equipment employed for small bore completions as shown in Figure 6 is similar to that used in ordinary wells. In conformance with field practices in the areas of the 20 completions made in

ARTIFICIAL LIFT METHODS
2 1/2 INCH CASING COMPLETIONS

CAPACITY AT 4000 FOOT NET LIFT

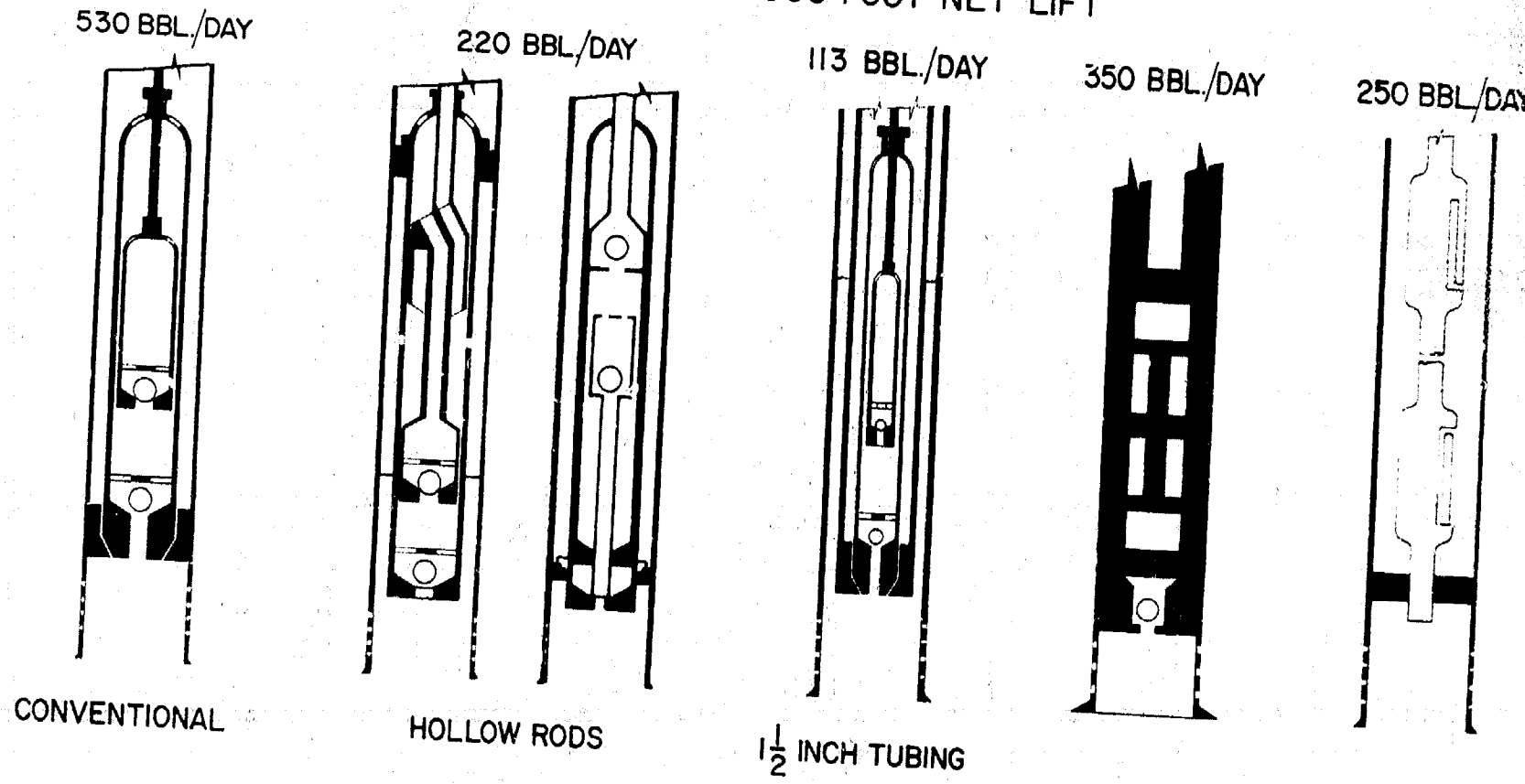
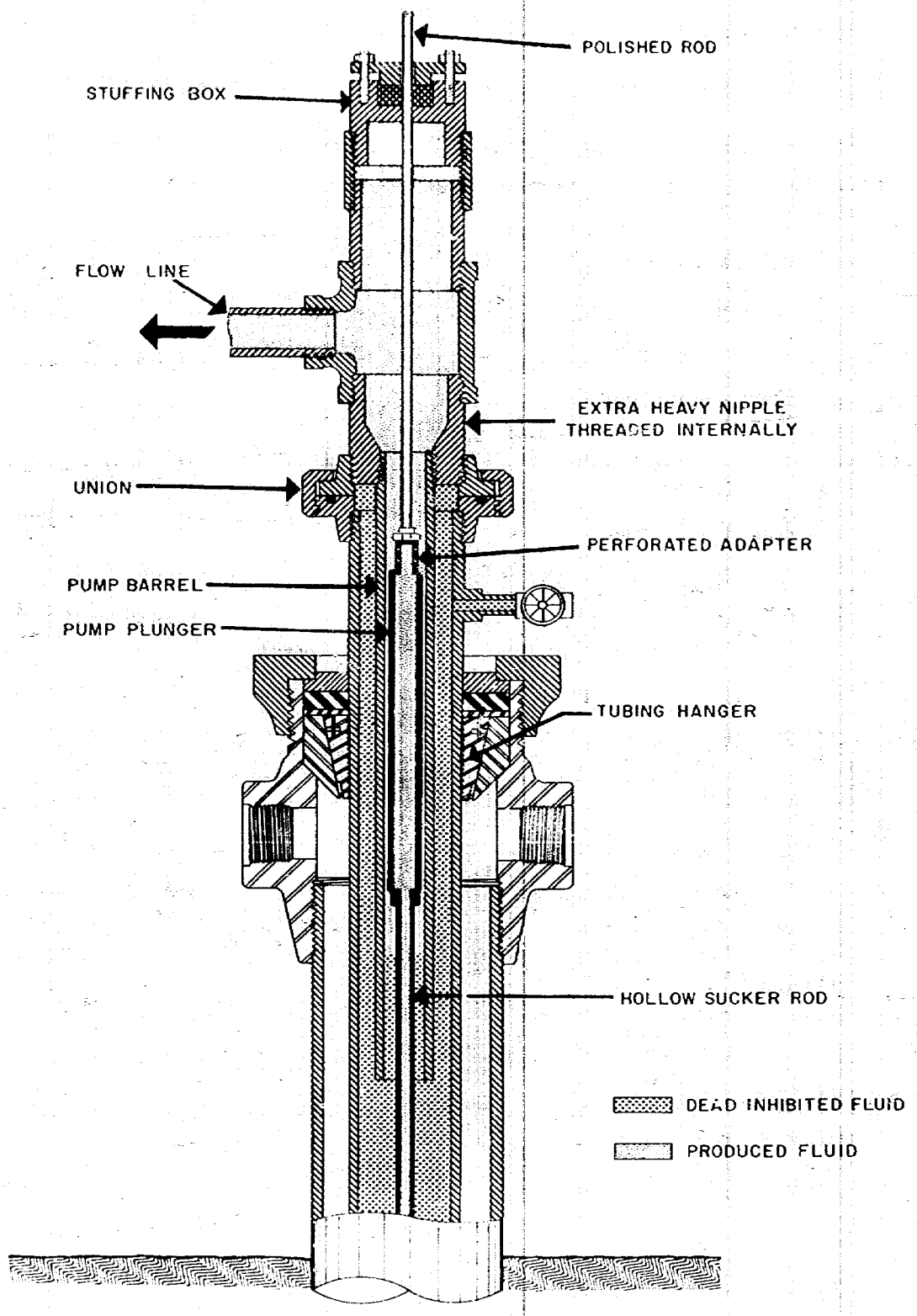


Figure 6

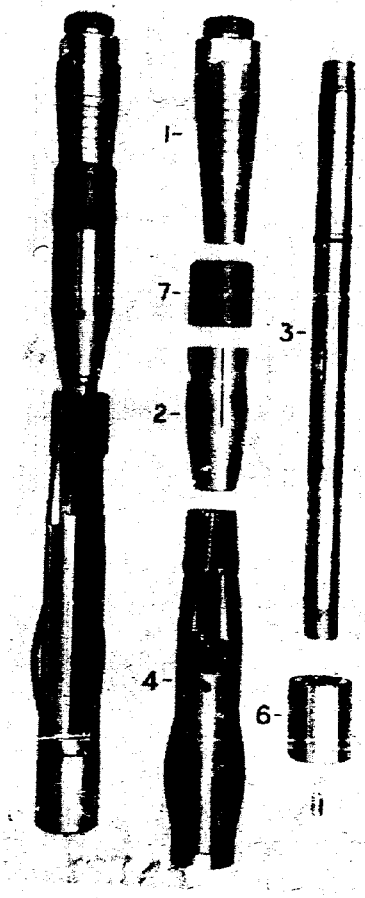
the West Texas area during 1958, these wells were equipped with beam-type pumping units. No mechanical difficulties have been experienced in any of these wells although an apperently limited rate of production of one or two wells may be due in part to the use of 3/4-inch OD upset tubing as sucker rods. Where increased rates of production are desired, consideration should be given to the use of larger tubing as sucker rods or hydraulic subsurface pumps. A special arrangement of equipment has been employed to eliminate the installation of flexible piping at the surface when hollow sucker rods are used with beam-type pumping units. As seen in Figure 7, a perforated adapter allows the produced fluids to pass from the 3/4-inch tubing into a pump barrel positioned at the top of the casing string. The fluid is then pumped through the pump tee into the flow line. A union connection is provided in the 2-7/8-inch OD casing below the level of the pump barrel suspension to facilitate the installation and removal of the assembly. This arrangement which has proven entirely satisfactory may be installed at approximately the same cost as flexible piping.

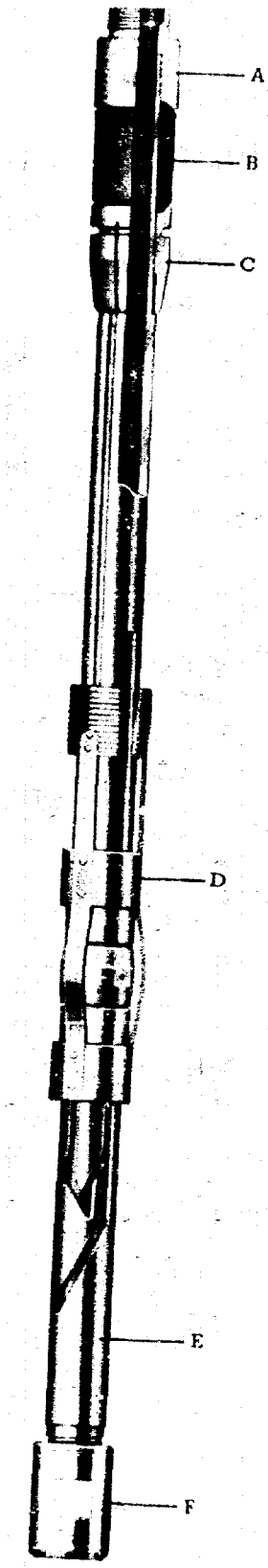
Conventional insert pumps for 2-7/8-inch tubing may be utilized in small bore wells. Usually no provision is made for gas venting when hollow sucker rods are employed in the packed-off annulus. However, if gas is a severe problem, a pump holddown may be employed to permit the annulus to remain opened for use as a gas vent, although pumping speed may be limited with this type arrangement. Typical mechanical holddowns for use in this arrangement include those shown in Figure 8.



METHOD OF ELIMINATING FLEXIBLE CONNECTION
WHEN USING HOLLOW SUCKER ROD

Figure 7





PUMP ANCHORS

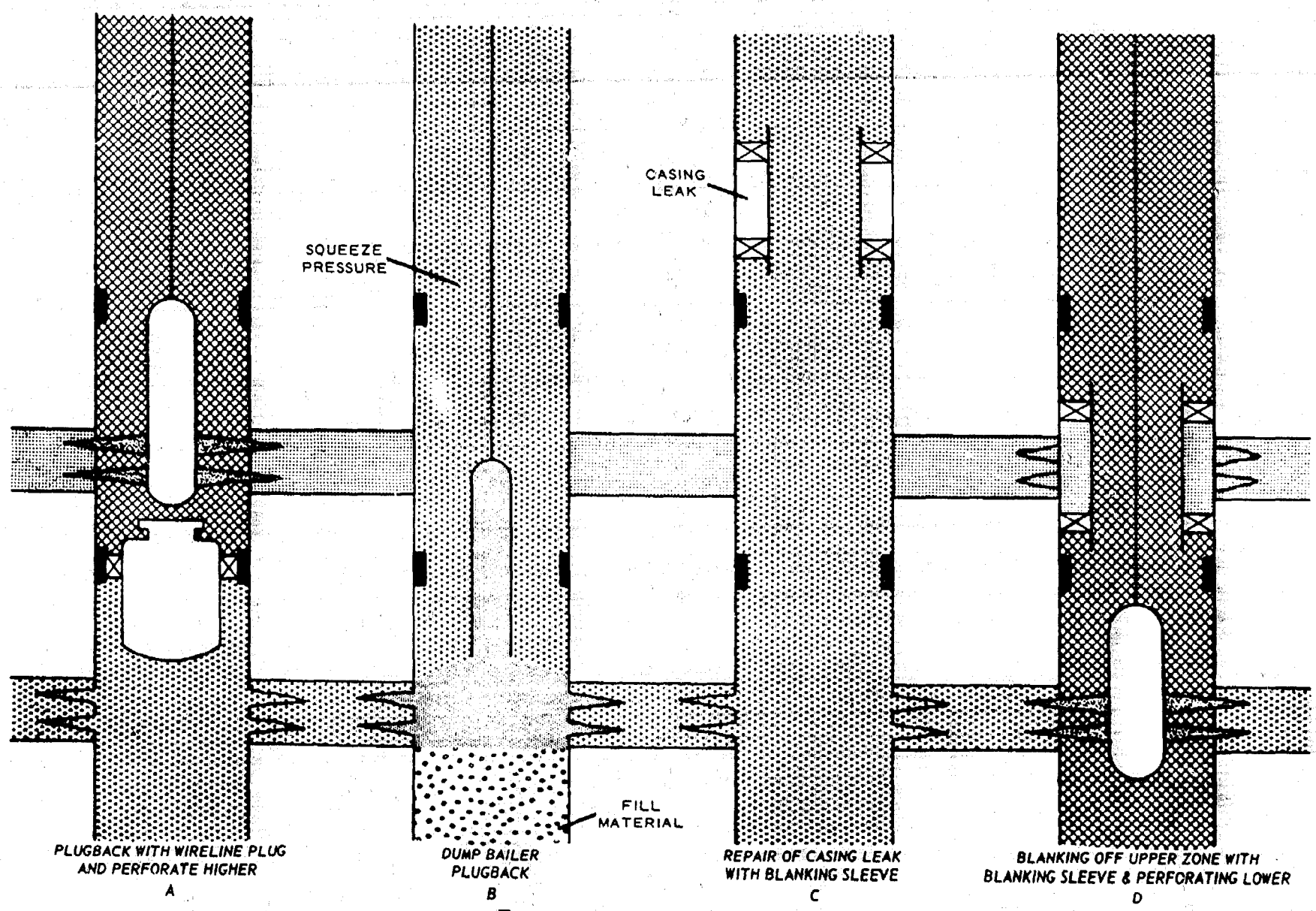
Figure 8

Although normal rod wear of the 2-7/8-inch OD casing will occur where beam-type pumping is employed, this may be minimized by the use of corrosion inhibitors or by mechanical devices such as nylon rod guides or by installations using colmonoy rod couplings. The tubing is cemented in tension which will eliminate tubing buckling and further reduce rod and tubing wear. Consideration should be given to provision for replacement of the oil string casing where extreme wear is anticipated. This may be accomplished as previously described if cement is placed only at the lower section of the casing which is fitted with a back-off joint and is adequately centralized to facilitate joining of the replacement section.

Workover Operations

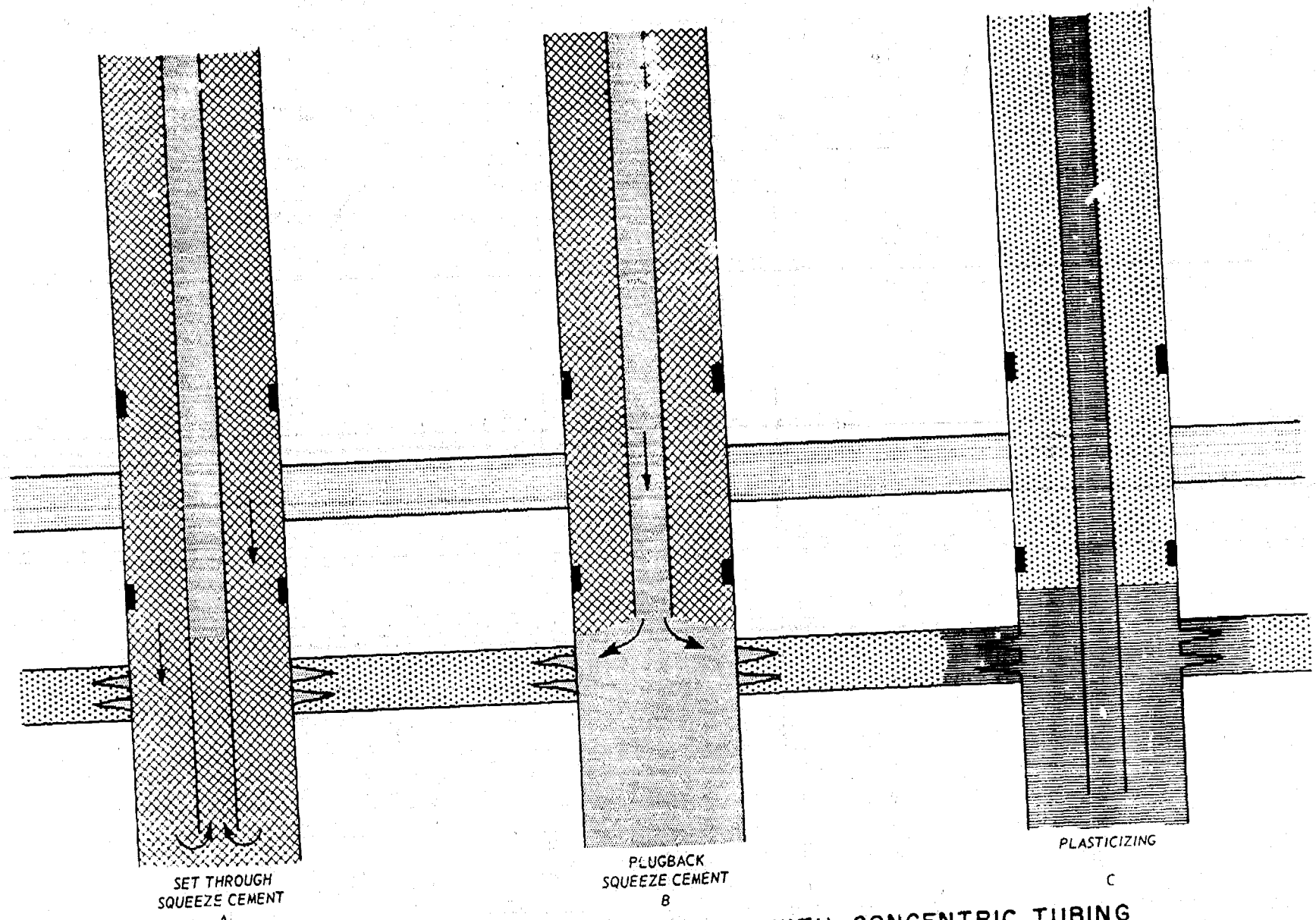
Only one workover has been performed in a 2-7/8-inch OD casing completion. In this operation a set of perforations was squeeze cemented through a macaroni string with low pressure techniques and the well was completed in a higher interval. Typical workover operations that may be conducted inside 2-7/8-inch OD casing are as follows:

1. Plugback with wireline plug and perforate higher. (Figure 9 A)
2. Dump bailer plugback. (Figure 9 B)
3. Repair of casing leak with blanking sleeve. (Figure 9 C)
4. Blanking off upper zone with a blanking sleeve and perforating lower. (Figure 9 D)
5. Set through squeeze cement. (Figure 10 A)
6. Plugback squeeze cement. (Figure 10 B)
7. Plasticizing. (Figure 10 C)



SERVICING SINGLE 2 7/8" O.D. COMPLETION WITH PTWC TECHNIQUES

Figure 9



SERVICING SINGLE 2 7/8" O.D. COMPLETION WITH CONCENTRIC TUBING

Figure 10

Corrosion Control

Corrosion of subsurface equipment in slim hole completions with 2-7/8-inch OD casing deserves serious consideration at both the engineering and the operating levels. Methods are available to control corrosion as an operating problem in New Mexico and certainly adequate effective control measures are available to eliminate corrosion as a major factor in considering the use of 2-7/8-inch OD casing.

Field records of the New Mexico-West Texas area indicate that most corrosion failures occur from internal attack. Figure 11 presents the results of a study of casing failures reported in the New Mexico-West Texas area from 1941 through 1958. Only eight of the failures or 7.6 percent were definitely attributed to external attack, whereas 57 or 54.3 percent were caused by internal corrosion.

It is generally agreed that the production of large volumes of highly concentrated salt waters containing high hydrogen sulfide and carbon dioxide concentrations is responsible for internal corrosion failures observed in the New Mexico-West Texas producing area. There are three effective means of countering this corrosive environment; (1) organic inhibitors, (2) protective coatings, and (3) alloys. Of these three measures, inhibitors have demonstrated conclusively their effectiveness in reducing rod and tubing failures. For an inhibitor to function effectively, there are two fundamental requirements: (1) the inhibitor chosen must form a tightly adherent protective film on the metal surface which is resistant to removal, and (2) mechanical means of placement of the inhibitor at those points where corrosion is occuring must be available.

With respect to the former requirement, laboratory tests are available to choose such inhibitors, and both laboratory and field re-

FIGURE 11

SUMMARY OF CASING LEAKS
WESTERN DIVISION
1941 - 1958

	Number	Probable Cause			
		Unknown	Mechanical	External Corrosion	Internal Corrosion
New Mexico	11	2	2	1	6
West Texas	94	15	21	7	51
Totals	105	17	23	8	57
% of Total Leaks	100	16.2	21.9	7.6	54.3

sults have indicated that such inhibitors adhere more tenaciously to a sulfide-filmed metal surface than to a sulfide-free metal surface.

Means of placement of the inhibitor are readily available in the 2-7/8-inch OD casing completions by either of two means. In a flowing well, a "formation inhibitor squeeze" technique is very effective; and in the rod pumped well, whether it is a conventional or hollow sucker rod installation, circulation of the chemical is equally effective. Figure 12 illustrates various types of completions in a 2-7/8-inch OD casing and paths of corrosion inhibitor flow.

To demonstrate the effectiveness of inhibitors in the treatment of typical wells pumping sour crude with high water percentages, the results of work in the Salt Flat Field of the Gulf Coast area are presented. Figure 13 shows a marked decrease in well maintenance cost as a result of the use of inhibitor to reduce rod and tubing failures.

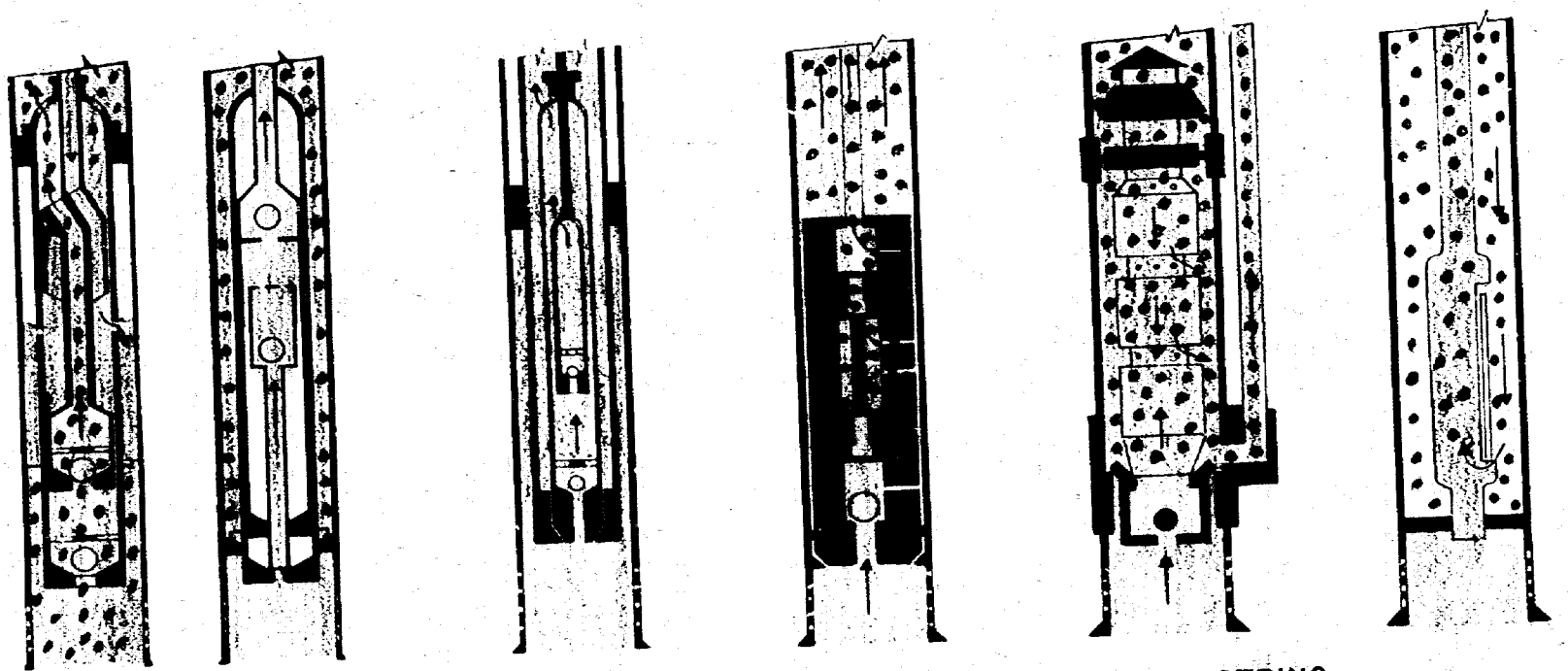
With respect to the accumulation of paraffin or salt incrustations in 2-7/8-inch OD casing completions, no faster rate of deposition is anticipated than with conventional installations. Due to the greater fluid velocities, there should be less tendency for the accumulation of such deposits. Use of circulating valves placed immediately above the pump in the hollow sucker rod installations provides a ready means for the circulation of hot oil or other paraffin dispersants and solvents. Methods currently being used for the application of scale inhibitors in conventional wells may readily be used in the 2-7/8-inch OD casing installations.

In gas lift wells, which are relatively few in number in New Mexico, inhibitors have had limited success; however, the use of plastic coated tubing for corrosion protection has been very effective.

METHODS PROVIDING PROTECTION FROM INTERNAL CORROSION IN WELLS PRODUCED BY ARTIFICIAL LIFT

$2\frac{7}{8}$ INCH OD CASING COMPLETIONS

Oil Production
Corrosion Inhibitor
Oil With Corrosion Inhibitor Added



HOLLOW RODS

$1\frac{1}{2}$ INCH TUBING

CONVENTIONAL

PARALLEL STRING

GAS LIFT

ROD PUMPS

HYDRAULIC PUMPS

Figure 12

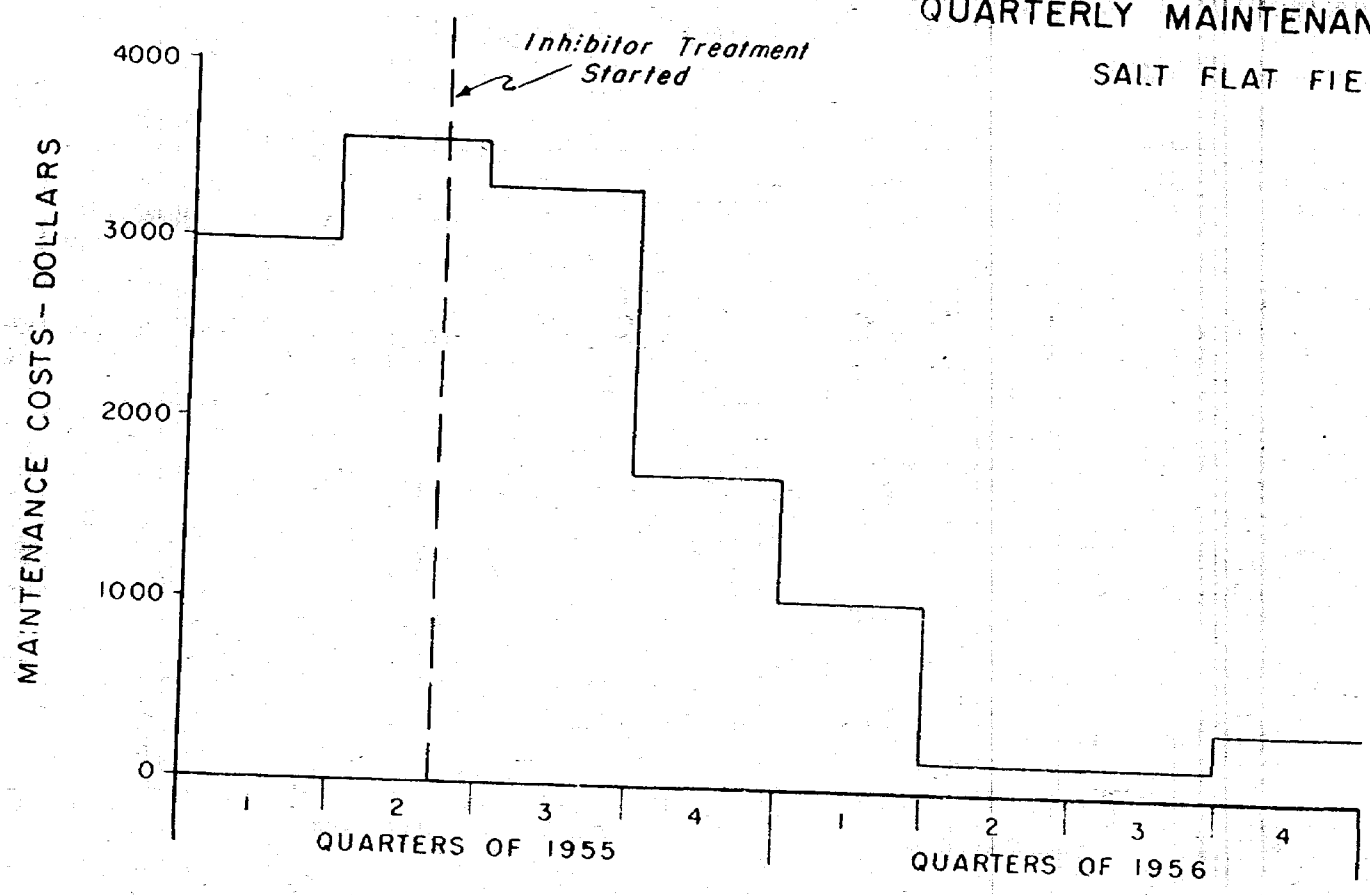

QUARTERLY MAINTENANCE COSTS
SALT FLAT FIELD
Inhibitor Treatment Started
MAINTENANCE COSTS - DOLLARS
4000
3000
2000
1000
0
1
2
3
4
QUARTERS OF 1955
1
2
3
4
QUARTERS OF 1956

Figure 13

For mitigation, the presently practiced method of loading the annulus with inhibited crude is very effective against internal corrosion of casing from acid gases in the vapor space because the vapor space is eliminated. Where the annulus cannot be sealed, the previously recommended circulation of inhibitor should provide very effective control. For those limited areas in which external attack is prevalent, cathodic protection has demonstrated its effectiveness in preventing such failures. Also, external corrosion can be minimized by cementing through the corrosive zone or through the use of a high alkaline mud in the uncemented section.

In summary, there appears to be no reason to anticipate a faster rate of corrosion, paraffin accumulation, or water scale depositions in a 2-7/8-inch casing completion than in the conventional installations. Recognized methods that are currently being employed to control corrosion, paraffin or scale in conventional wells are also applicable in wells using 2-7/8-inch OD casing as a producing string.

Economic Evaluation

Twenty wells with 2-7/8-inch OD casing were successfully completed during 1958 in five fields at depths ranging from 1500 to 3300 feet as shown in Figure 14. The final average cost was 16 percent less than the cost of wells completed by conventional methods. Due to the many changes in drilling and completing practices that have been made in recent months to lower costs, the reduction has been adjusted to reflect actual savings attributable to the new technique.

FIGURE 14

ECONOMIC ANALYSIS

2-7/8-INCH OD CASING COMPLETIONS

Field	Average Depth - Ft.	Number Completions	Reduction in Well Cost - ¢
A	2700	4	20
B	2800	2	13
C	2900	2	20
D	3300	3	16
E	1500	9	14
Total		20	
Average			16