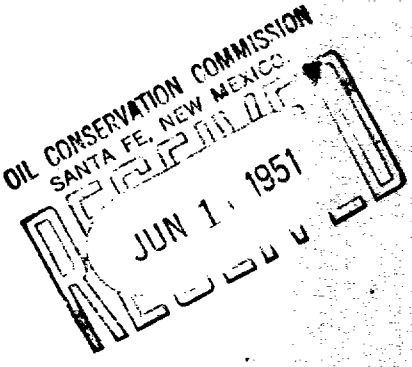
BEFORE THE

OIL CONSERVATION COMMISSION

MAY 22, 1951

Case No. 270



E. E. GREESON
COURT REPORTER
UNITED STATES COURT HOUSE
TELEPHONE 2-4547
ALBUQUERQUE, NEW MEXICO

BEFORE THE

OIL CONSERVATION COMMISSION

May 22, 1951

- -

Case No. 270: This is the application of Phillips Petroleum Company for 80-acre spacing for the Wolfcamp production discovered in the Bettie C. Dickinson No. 1-B well, Section 12, T.15 S, R.37 E.

MR. SPURRIER: The meeting will come to order. Case No. 270. MR. Graham, will you read the advertisement.

(Mr. Graham reads the notice of publication.)

MR. FOSTER: We are going to try to make this real short. I think we can run through it in a few minutes.

O. P. NICOLA,

having been previously duly sworn, testified as follows:

QUESTIONS BY MR. FOSTER:

Q Mr. Nicola, you prepared some Exhibits for us in this case, have you?

A Yes, sir.

Q You just go to the Exhibits and tell us what they are and what they represent?

A Phillips No. 1 is a plat showing the area surrounding the the Denton field and merely shows the outline of the proposed space area. Phillips Exhibit No. 2 simply shows that one unit involving different ownership would be required for the

for the formation in this field on the basis of present development. Exhibit No. 3 is a tabulation of the production history from the Wolfcamp reservoir beginning in June, 1950, and extending through March 1951, and as of March 31, 1951, this chart shows that there have been 152,000 barrels of oil produced, 333 barrels of water -- pardon me, change that to 1192 barrels of water and 44,421,000 cubic feet of gas. The gas oil ratio average for the field as of March, 1951 is 350 cubic feet per barrel.

Exhibit No. 4 is a graph on which has been plotted the number of producing wells, the total production of oil, the bottom hole pressures and the gas oil ratio. All of those factors plotted against time.

Exhibit No. 5 is a bar graph showing the tonnage of steel required for the drilling of two wells into this reservoir for an average of 253 tons per well.

Here also as in the Devonian we have estimated that by going to 80-acre spacing well, save the drilling of 42 wells for a total of 10,626 tons of steel. Also shown on the bar graph is the cost of completing two wells to the Wolfcamp for an average cost of $175,000.00 per well.

Q Trying to shorten this up, from your study and examination of the field, is it your opinion that one well will adequately drain and develop the 80-acres?

A In view of the small amount of information which we now have on this field, I would not wish to express an opinion

that one well will drain 80-acres. However, I think it is possible and it is our recommendation that the Commission establish an 80-acre pattern for a period of one year with a view to reviewing the data at the end of that time when more information is available.

We would also like to request exceptions as to location for all wells heretofore completed on a spacing pattern different from what we now advocate for this reservoir, namely, that wells be located in the northwest quarter and the southeast quarter of each quarter section. Also, we desire that the Commission grant exceptions as to locations for all wells now drilling to the Devonian on an off pattern location in case such wells may be plugged back and completed in the Wolfcamp reservoir.

Also for all wells, all Devonian wells which may be granted exceptions as to location by the Commission and I am referring to all Devonian wells which have now been completed it is requested that exceptions be granted for such locations as to Wolfcamp wells also.

The object of this request is in order that operators may take advantage of favorable Wolfcamp showings encountered in such twin Devonian wells.

We also request that in view of the information now available the Commission establish as an allowable for a well on an 80-acre unit the same allowable which is now granted for a 40-acre well with deep well adaptation. That is to say a

single allowable.

Q In barrels what would that be?

A 197 barrels a day.

Q For theWolfcamp?

A That is right.

MR. FOSTER: I believe that is all.

MR. SELINGER: Selinger with Skelly. I have one or two questions.

Q In recommending the pattern for Wolfcamp well it is your intention to permit the Wolfcamp wells to be on the same 40-acrs of each 80 acre unit as exists or will exist in the Devonian.

A That is oorrect.

Q And the same exceptions that will exist or exists for the Devonian will pass over to the Wolfcamp?

A That is right. That is my recommendation.

MR. SPURRIER: Anyone else wishes to question this witness.

MR. McCORMICK: I would like to ask Mr. Nicola what type of reservoir the Wolfcamp is?

A I would prefer - you mean what type of drive?

Q Yes.

A Well, I think right now it is similar to the Devonian. In other words, it is undersaturated. However, we don't have enough, really enough information.

Q It is not a water drive?

A I don't even have available any pressure information. I couldn't tell you. I don't know.

Q How big is the average producing section?

A Well, I would rather let our geologist -

MR. FOSTER: (Interrupting) The geologist can answer that.

MR. SMITH: The producing section varies somewhat from well to well from approximately 20 feet which has been shown on tests to the northern end of the pool. In the southern end of the pool there are streaks of pay occurring throughout about a 500 foot interval. Anyone of the streaks not exceeding 15 feet in thickness.

Q What would be the total affective pay in the south edge of the pool?

A The total effective pay.

MR. SMITH: The total effective pay in one well, the best well will not exceed one hundred feet.

Q What type of reservoir do you think it is?

MR. SMITH: Questionable if it is a water drive reservoir. The lithology in it varies from finely sucrose dolomite to a vugular limestone. We have no information yet to classify it as a water drive reservoir.

MR. McCORMICK: That is all.

MR. SPURRIER: Anyone have any further question? If not the witness may be excused.

MR. FOSTER: I WANT to ask one or two questions of Mr. Smith.

Q Would you recommend 80-acre spacing in this field?

MR. SMITH: I would, yes.

Q Do you have sufficient information at this time on which to base an opinion as to whether one well will adequately drain 80 acres in the field or not?

A That on the basis of present data is difficult to judge.

Q You can't say?

A Can't say. However, if drilled up on 80-acres -

Q (Interrupting) Sir?

A (Continuing) if drilled up on 80-acres we would soon have enough data to base a conclusion on.

Q But you would recommend that the Commission adopt the 80-acre spacing in this field?

A I would so recommend.

MR. FOSTER: I believe that is all.

MR. SPURRIER: Anyone have any further questions of this witness or either witness. If not the witnesses will be excused and we will take up case 274.

Do you have something, Mr. White:

MR. WHITE: I WANT to file an identical statement as we filed in the other case, 269.

(See Case 269 for copy of statement.)

MR. McKELLAR: Magnolia would like for the record

to show that we join in the Phillips 80-acre in the Wolfcamp. By going to 80-acres now we could possibly avoid confusion that we have in the Devonian. Go to 80 until we get enough data to justify some concrete educated conclusion to what we really have.

MR. SCOTT: I would like to make a statement for Shell. As far as Wolfcamp reservoir, we are favorable to 80-acre proration of rectangular shapes with the unit within the same section and with development on either 40-acre tract of the proration unit until the structure is defined and the limits of production established. We are agreeable to Phillips proposed allowable of single 40-acre allowable for each 40-acre proration unit for this reservoir. We would be opposed to any regulation which would prohibit development of a 40-acre tract in the event these 40-acres could not be included in a 40-acre proration unit of rectangular shape within the same section.

MR. HOWARD: R. E. Howard with Atlantic refining Company would like to concur in the recommendation of Phillips Petroleum Company for the 80-acre spacing in the Wolfcamp.

MR. BOSS: R. L. Boss, Gulf Oil Corporation. In regard to Gulf's attitude to the 80-acre spacing in the Denton Wolfcamp, Gulf is in accord with the proposed application provided the wells are drilled as twin locations in order to permit adequate evaluation of the Wolfcamp reservoir in the original well drilled on each unitl.

MR. SELINGER: We concur in the recommendation with respect to the Wolfcamp on the basis that Wolfcamp wells will be located on the same 40-acres that the Devonian wells are.

MR. SPURRIER: Anyone else?

MR. J. D. WHEELER: We would like to have the record show that Ohio supports Phillips recommendation for 80-acre in the Wolfcamp as has been proposed.

MR. SPURRIER: The record will aslo show that Mrs. Clayton's statement was also intended to be included in the record of this case.

(Statement copied in record of Case 269.)

Anyone else? We will take up the next case.

- - - - - - -

STATE OF NEW MEXICO)
: SS
COUNTY OF BERNALILLO)

I HEREBY CERTIFY that the foregoing and attached transcript of hearing in Case No. 270 before the Oil Conservation Commission on May 22, 1951, at Santa Fe, is a true record of the same to the best of my knowledge, skill and ability.

DATED at Albuquerque, this 7th day of June, 1951.

Ada Dearnley

ADA DEARNLEY, Reporter.

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

TRANSCRIPTION OF HEARING

CASE NO. 269 and 270

24 July 1951

(DATE)

Original

E. E. GREESON
ADA DEARNLEY
COURT REPORTERS
BOX 1302
PHONE 2-4547
ALBUQUERQUE, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION
July 24, 1951

CASES 269 and 270: (GENERAL NOTICE, Special Hearing July 25, 1951.) The Oil Conservation Commission by its orders R-74B and R-75-B, dated June 29, 1951, has granted a re-hearing in the applications of Phillips Petroleum Company in Cases 269 and 270. Case 269 relates to proration units and allowables for Siluro-Devonian common source of supply discovered in McAlester Fuel Company's J. M. Denton Well No. 1-A, SW SE 11-15S-37E, NMPM, and Case 270 relates to the application of Phillips Petroleum Company for an 80 acre proration units and allowables for the Wolfcamp common source of supply discovered in Atlantic Refining Company's Bettie C. Dickinson Well No. 1-B, NW SW 12-15S-37E, NMPM.

(Reporter's note: Proceedings in this matter were off the record, but the record should show that Cases 269 and 270 were continued, without objection, from July 25, 1951, until 10:00 o'clock August 7th.)

-o-o-

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I HEREBY CERTIFY that the foregoing and attached transcript of proceedings before the Oil Conservation Commission in Cases 269 and 270, held on July 24, 1951, is a true and correct record of the same to the best of my knowledge, skill and ability.

DATED at Albuquerque, New Mexico, this 4th day of August, 1951.

E. E. Greer
REPORTER

My Commission Expires: 8-4-52

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

TRANSCRIPTION OF HEARING

CASE NO. 269 and 270

24 July 1951

(DATE)

Copy

E. E. GREESON
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BOX 1302
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ALBUQUERQUE, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION
July 24, 1951

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(Reporter's note: Proceedings in this matter were off the record, but the record should show that Cases 269 and 270 were continued, without objection, from July 25, 1951, until 10:00 o'clock August 7th.)

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STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

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DATED at Albuquerque, New Mexico, this 4th day of August, 1951.

E. E. Treese
REPORTER

My Commission Expires: 8-4-52

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

TRANSCRIPTION OF HEARING

CASE NO. 269-270

August 7, 1951

(DATE)

E. E. GREESON
COURT REPORTER
UNITED STATES COURT HOUSE
TELEPHONE 2-0672
ALBUQUERQUE, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

- - - - - -

In re: Rehearing and argument continued from July 24 to August 7, 1951. Phillips Petroleum Company is applicant. Case 269 relates to proration units and allowables for Siluro-Devonian common source of supply discovered in McAlester Fuel Company's J. M. Denton Well No. 1-A (SWSE 11 - 15S - 37E); Case 270 relates to Phillips' application for 80 acre proration units and allowables for the Wolfcamp common source of supply discovered in Atlantic Refining Company's Bettie C. Dickinson Well No. 1-B (NWSW 12 - 15S - 37E.)

Cases No. 269 & 270

- - - - - -

TRANSCRIPT OF HEARING

August 7, 1951

R E G I S T E R

BEFORE:

Honorable Guy Shepard,
Member and Chairman, O.C.C.

Honorable R. R. Spurrier
Member and Secretary, O.C.C.

R. L. Hughston
Shell Oil Company

W. A. Scott
Shell Oil Company

Cecil R. Buckles
Sinclair Oil and Gas Company

D. D. Dale
Sinclair Oil and Gas Company

Roy O. Yarbrough
Oil Conservation Commission
Hobbs, New Mexico

O. P. Nicola, Jr.
Phillips Petroleum Company

E. H. Foster
Phillips Petroleum Company

C. P. Dimmitt
Phillips Petroleum Company

D. K. Spellman, Jr.
The Ohio Oil Company

J. D. Wheeler
The Ohio Oil Company

R. E. Howard
The Atlantic Refining Company

N. B. Winter
The Atlantic Refining Company

W. P. Tomilson
The Atlantic Refining Company

Stanley L. Smith
The Atlantic Refining Company

Glenn Staley
New Mexico Oil and Gas Engineering Commission

S. T. Silverstein

S. S. Schoerstein
Idaho Springs, Colorado

Jack M. Campbell
McAlester Fuel Company
Roswell, New Mexico

Vernon Turner
McAlester Fuel Co mpany
Magnolia, Arkansas

Kem E. Merren
McAlester Fuel Company
Magnolia, Arkansas

Travis R. Rowe
McAlester Fuel Company
Lovington, New Mexico

Jack W. Marshall
McAlester Fuel Company
Lovington, New Mexico

R. G. Carlin
Delhi Oil Corporation
Dallas, Texas

Alfred E. McLane
Delhi Oil Corporation
Dallas Texas

Elwin C. Hale
Piedmont, California

J. H. Crocker
Mid Continent Petroleum Corp.
Tulsa, Oklahoma

E. R. Burton
McAlester Fuel Company
Magnolia, Arkansas

Vilas P. Sheldon
Artesia, New Mexico

J. L. Briscoe
Roland Rich Wooley
Artesia New Mexico

G. E. Kendrick
El Paso Natural Gas Company

G. D. Simon
R. DeChicchis Consulting Firm

Jack Shier
Aurora Gasoline Company

H. H. Kaveler
Phillips Petroleum Company

E. L. Shafer
Continental Oil Company
Hobbs, New Mexico

Emmett D. White
Leonard Oil Company
Roswell, New Mexico

G. M. Andreen
Magnolia Petroleum Company
Dallas, Texas

Ollie J. Ford, Jr.
Magnolia Petroleum Company
Kermit, Texas

Foster Morrell
U.S.G.S
Roswell, New Mexico

E. E. Kinney
New Mexico Bureau of Mines
Artesia, New Mexico

George Graham
Oil Conservation Commission

L. C. White
Oil Conservation Commission

E. C. Iden
Continental Carbon Company
Albuquerque, New. Mexico

Harold B. Seligman
Continental Carbon Company
Amarillo, Texas

H. L. Ericsen
Continental Carbon Company
Amarillo, Texas

M. F. Shafer
Continental Carbon Company
Amarillo, Texas

Riss Madole
Aurora Gasoline Company

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Mr. SHEPARD: The meeting will please come to order. The next case is Cases 267 and 270. Will you read please, Mr. Graham?

(Mr. Graham reads the advertisement of the cases.)

MR. FOSTER: I would like to give the appearances that are here for the Phillips Petroleum Company. Mr. C. P. Dimmitt, Vice President in charge of production; Mr. H. H. Kaveler, Assistant to the Manager of the Production Department; Mr. O. P. Nicola, Proration Director; and myself E. H. Foster and Mr. R. N. Williams of Bartlesville, Oklahoma; G. R. Wright would have made an appearance here but he is ill, but I want the record to note his connection with the case in any event.

If the Commission please, it will not be our purpose this afternoon to attempt in any way to rehash the former testimony in this case. We think that the record as we made it in the original hearing was sufficient to support the Commission in finding that 80 acre spacing was desirable in the Wolfcamp and in the Devonian Pool, if the Commission chose to do so. Before I get under way here, I have got a little memorandum I would like to read to the Commission here that will, I think, fully outline our position on the motion for re-hearing in the two fields. And in that connection I might point out so far as the Wolfcamp is concerned, there seems to be very little controversy about it. There is no one here that oppose that. So, our main remarks will be addressed to the spacing that we think ought to be applied to the Devonian.

Now, we are in real earnestness about this situation

2. here. We think we ought to have 80 acre spacing in the field. Before I read a prepared statement here, I would like to introduce Mr. C. P. Dimmitt who is our Vice President of the Production Department, and in charge of all the production. He might have a few words he would like to say at this time. Mr. Dimmitt.

MR. DIMMITT: Thank you. To the Commission members I would like to say this. I think the case involved, which you are studying here now, involves a very basic principle that the industry must give more consideration to, and also, our regulatory bodies, regardless of whether it is about the Denton Pool of the State of New Mexico or any other state. It is one of the factors of developing structures, oil pools, in a scientific manner, and should be given more consideration than we have in the past. And, we are pleased to bring this to your attention here because we believe that it is one principle that you are not only interested in, that you are interested in from a hearing standpoint, but it is one principle that will result in better methods of operation and better ultimate recovery, in oil pools. Thank you.

MR. FOSTER: I have here with me Mr. R. N. Williams who is our Chief Proration Atterney out of the Bartlesville Office. I just want the Commission to see him. I don't want to call him as an expert or anything of that sort, but I do want you to know he is here.

In this statement I am going to read to the Commission, I have used the term "operators". in the pool down there, but I don't want anybody to get the impression I am attempting to

speak for any of the operators except Phillips Petroleum Company. As I view it, I think it would be beneficial for us to try and get an accurate picture of the nature of this hearing.

The Nature of this Hearing:

Neither the original application for 80-acre spacing in the Denton Pool nor the rehearing of that application now being considered should be looked upon as a contest between those in favor of the 80-acre spacing and those opposed to 80-acre spacing. This proceeding should be regarded as a conference represented by the oil and gas industry of the State, on the one hand, and the Oil Conservation Commission as the regulatory authority of the State of New Mexico, on the other hand, meeting in an effort to work out the problem of how to get more oil and gas from a pool for less money and with the use of less steel and by the drilling of fewer wells.

Now of course everybody has to play their part in this sort of thing so here is the role of the operator, and this proceeding is:

No one operator in a pool or field should be permitted to set a spacing pattern in the field best suited to his individual needs or desires. The best interests of all the operators, of all the royalty owners, including the State of New Mexico as a royalty owner, and of the public must be the criteria for determining a spacing pattern in any field. The producer is the

4.m

man who takes the stockholder's dollar and digs an oil well with it. He has the expectation of getting that dollar back, plus a profit. The producer acts in a dual capacity. He is, in a sense, a private and a public trustee. He is a private trustee in the sense that he must represent the best interests of his stockholders in seeing to it that the undertaking returns a profit. He is a public trustee in the sense that he must increase production at reduced cost in order to keep down the cost of the product to the ultimate consumer. One need not be a technical man, such as an engineer or a geologist, to understand these facts.

Therefore, I would like to say this, that we are not going to offer any highly technical testimony, we are trying to take a more practical approach to this problem, and see if we can't sell the Commission here on the idea that it is to the best interest of everyone to adopt a wider spacing pattern in the Denton field.

The royalty owner is one to whom a portion of the production is payable, either in kind or value. His role should be the same as that of the operator, that is, a public and a private trustee. The royalty owner should be regarded as a private trustee to the extent only of seeing that the ultimate in the recovery of oil and gas from the pool is had. He has the same duties and the same obligations as the operator in his capacity as a public trustee in that he should not insist upon a

program or a method of development of a field for its oil and gas content that leads to high cost of production which must be passed on by the operator to the consuming public.

In every proceeding having for its purpose the obtaining of wider well spacing, the royalty owner is generally found arrayed against the producer. The royalty owner generally feels that his best interest is served by closer well spacing. Nothing could be farther from the truth. If the royalty owner cannot profit by wider well spacing, neither can the producer. This fact is obvious, since any method of well spacing advocated by the producer which results in the loss of oil to the royalty owner results in a proportionately higher loss of oil to the producer. The self-interest of an operator would dictate that he not advocate a spacing pattern that would bring about a loss to himself or the royalty owner. It may therefore be reasonably assumed that when an operator advocates wider well spacing he is honest in his convictions about the matter and believes that wider spacing is to the best interests of himself and all others similarly situated, including the royalty owner.

I would like to add right there to the Commission that we don't plan to appear here in the role of being opposed to royalty owners. What we are going to try and do is convince this commission that the program we are advocating will be to the best interest to everyone in the field.

6.m **Economic Factors and Desires**

The operator in a pool is usually guided in his efforts in the production of oil and gas, and in the fixing of a spacing pattern, by the economics of the case. An operator cannot drill wells and produce oil or gas at a loss. The adoption of any spacing pattern which inures to the economic benefit of the producer likewise inures to the economic benefit of the royalty owner. However, in most instances, the royalty owner is motivated by a desire for more and more royalty payments, and is less and less concerned with the science and the economics necessary to be applied by the producer to the orderly and proper development of a pool. The producer should not be permitted to dictate a course of action by the regulatory body that is inimical to the royalty owner. Every producer should recognize that the interest of himself and the royalty owner is mutual, and most producers do recognize this. Any action on the part of the royalty owner which increases the cost of production to the operator directly contravenes the provisions of the Statute of the State of New Mexico, Section 69-213, which will later be quoted. Such action necessarily increases the cost of the products of the oil and gas to the ultimate consumer. Likewise, any evidence of a selfish attitude on the part of the royalty owner by way of securing smaller spacing of wells requires the drilling of unnecessary wells, creates fire and other hazards conducive to waste, and this violates the provision of

7.m

the Statute. It is the duty of the regulatory authority to bring into proper focus all conflicting interests in a pool or field. This can best be done by considering the problem objectively and without regard to the desires or emotions of the parties.

It is the duty of the regulatory body to see that no producer profits at the expense of the royalty owner or the general public. And it is the duty of the regulatory body to see that no royalty owner profits at the expense of the producer or the general public. The interest of the royalty owner and the producer is mutual to the extent that they should seek the best methods by which a pool or field may be efficiently and economically drained and developed. This point is concerned with more than just the primary methods for the recovery of oil and gas.

Now their statements there are based upon a declaration of public policy contained in the Statutes and I will quote the Statute a little bit later, I don't want to inject any legalistic angles in our presentation of evidence in this petition for rehearing, but I do want to call to the Commissions' attention the declaration of public policy of this State, as contained in the Statute, and to say to the Commission what we are trying to do we think is in keeping with that declaration of public policy. In other words, I want to get some of the bug-bears out of this 80-acre spacing problem. Our experience is, as soon as you mention 80-acre spacing to most people, they just start running. They think there is something inherently bad about it. We are

6.m

going to try and break down that theory.

Most producers regard pressure maintenance in the production of oil and gas as the long-range view. Primarily, recovery methods are regarded as the short-range view. Here again the interest of the royalty owner and the producer is mutual. At best, primary methods of recovery obtain only a small percentage of oil in the pool, less than 30% in most instances. Pressure maintenance methods substantially increase this percentage. The application of pressure maintenance is directly related to well spacing. That is, it is now conceded that wider well spacing more readily lends itself to pressure maintenance methods than does smaller well spacing. In deep pools, such as the Denton Pool, and under the reservoir conditions which obtain in this pool, the recovery of oil by primary methods is shortlived. If the ultimate in recovery of oil and gas in this pool is to be obtained, pressure maintenance must be resorted to. Since well spacing is directly related to the best results to be obtained by pressure maintenance, it is timely to consider the spacing pattern for the field. The field should not be allowed to be developed on 40-acre spacing under primary recovery methods with the expectation that the best results can be obtained in the application of pressure maintenance. If, for any reason, those now advocating 80-acre spacing in the Denton pool should be mistaken, this does not condemn the adoption of 80-acre spacing. This for the simple reason that resort to 40-acre

spacing can always be had, if, as and when it becomes evident that 80-acre spacing should not be the pattern in the field. On the other hand, if those who are advocating 40-acre spacing for the field, and there is only one producer who is doing this, should for any reason be mistaken, a resort to 80-acre spacing could never be had.

Therefore, I would like to say to the Commission it seems to me we are trying to get the cart before the horse, when we want to stand on this so-called 40-acre spacing, because whenever you once adopt the 40-acre spacing then if that should not have been the pattern in that field, and if the pattern should have been a wider one, you are then precluded from going into the proper pattern or wider pattern.

No spacing pattern gets oil out of the ground. All that a spacing pattern does is to determine the distance between wells, based upon some reasonable hypothesis. Rule 104 (b) of the Rules of the Oil Conservation Commission of the State of New Mexico provides:

"Each well drilled within a defined oil pool shall be located on a tract consisting of approximately 40 surface contiguous acres substantially in the form of a square in accordance with the legal subdivision of the United States Public Land Surveys or on a governmental quarter section or lot * * *."

This rule is of statewide application and applies only in the event the Commission does not fix a smaller or larger spacing pattern for the pool.

40.m This statewide rule does not take precedence over the statutory provisions relating to well spacing. Section 69-213, New Mexico Statutes 1941, Annotated, contains this provision:

"No owner of a property in a pool should be required by the Commission, directly or indirectly, to drill more wells than are reasonably necessary to secure his proportionate part of the production. To avoid the drilling of unnecessary wells, a proration unit for each pool may be fixed, such being the area which may be efficiently and economically drained and developed by one (1) well. The drilling of unnecessary wells creates fire and other hazards conducive to waste, and unnecessarily increases the production cost of oil and gas to the operator, and thus also unnecessarily increases the cost of the products to the ultimate consumer."

While the rule fixes 40-acre spacing as a statewide spacing pattern, the Statute recognizes that conditions may exist which will require, in the protection of public and private interests, a wider spacing pattern. And, in order to implement the spacing pattern in a pool or field, the same section of the Statute quoted above further provides:

"The pooling of properties or parts thereof shall be permitted, and if not agreed upon, may be required in any case when and to the extent that the smallness or shape of a separately owned tract would, under the enforcement of a uniform spacing plan or proration unit, otherwise deprive or tend to

deprive the owner of such tract of the opportunity to recover his just and equitable share of the crude petroleum and natural gas in the pool; provided, that the owner of any tract that is smaller than the drilling unit established for the field, shall not be deprived of the right to drill on and produce from such tract if same can be done without waste; but in such case, the allowable production from such tract, as compared with the allowable production therefrom if such tract were a full unit, shall be in ratio of the area of such tract to the area of a full unit."

Every operator must recognize that there is no virtue in any spacing pattern as such. Spacing is only one of many factors to be used in regulating the production of oil and gas from a given pool. Some pools or fields more readily lend themselves to development on 40-acre spacing than on 80-acre spacing, and vice versa. The chief difficulty in fixing a spacing pattern for a pool is that it can rarely be determined with any degree of accuracy what the pattern should be until after the pool has been fully developed. The matter of determining well spacing, therefore, becomes largely a matter of policy. It is true that the proper spacing can be determined under any set of assumed conditions. In the past in New Mexico, well spacing has been geared largely to production from shallow pools. A shallow pool is defined by Rule 55:

"Shallow pool shall mean a pool which has a depth range from 0 to 5000 feet."

12.m

Production of oil from a deep pool in the State of New Mexico is of fairly recent origin. In fact, the first production that you had from a deep pool in this state, was on March 1st of 1948, that is from a depth below 5000 feet. A deep pool is defined by Rule 18:

"Deep pool shall mean a common source of supply which is situated 5000 feet or more below the surface."

It must be self-evident to any producer that the definitions of a shallow pool and a deep pool are more or less arbitrary. And, of course, as to the matter of well spacing it must be still more evident to a producer that the enforcement of a 40-acre spacing pattern in every pool would be arbitrary and without excuse or justification on any ground.

I call the Commissions' attention to the fact that we are not asking for any permanent order for 80-acre spacing in this Denton pool, we are simply asking for a temporary order for a period of one year, and why anybody can object to that, I don't know.

The operators in the Denton Pool are not asking that the Commission adopt a permanent 80-acre spacing pattern for the field. Good faith requires that the spacing pattern be placed upon a temporary basis. In fact, there is no such thing as a permanent spacing pattern in an oil and gas field under the present regulatory setup. The Commission may, and in fact, it would be its duty to, if conditions required it, change the spacing pattern in any

field or pool. But, in order that there may be no misunderstanding about the position of the operators in this pool, a specific request for 80-acre spacing for a temporary period of one year has been made. The temporary nature of the order requested meets the argument made by the operator opposed to 80-acre spacing that once 80-acre spacing is adopted, always 80-acre spacing. Nothing could be farther from the truth. The operators who are sponsoring 80-acre spacing in this field do not want it, if, in fact, it should be adopted. But, as we have pointed out, the field will be completely developed before one gets that answer.

Now there are other questions here, such as the steel shortage, so we have a proposed solution.

Steel Shortage vs. 40-Acre Spacing in This Pool or Any Other Pool.

I don't want the Commission to get the idea my remarks are confined to the Devonian Pool, what I am saying here applies to any pool in the State.

A National emergency has been declared by the President of the United States. With the declaration of a National emergency came a declaration of a shortage of certain critical materials. Steel is on this list. There is no doubt that there is a shortage of oil field tubular materials. This situation calls for conservation of steel and the adoption of practices in the oil fields that will implement the conservation of steel. One way to save steel is to adopt wider well spacing. Eighty-acre

14.m

spacing requires the drilling of only one-half as many wells as is required by 40-acre spacing. The adoption of 80-acre spacing for the Denton Pool has been requested on a temporary basis. If, at the end of the one year temporary period requested, it can be demonstrated from additional information obtained in the development of the field that the reservoir conditions in the field are better adapted to 40-acre spacing than to 80-acre spacing, then the Commission can impose 40-acre spacing and no one will have been hurt, and, in the meantime, at least a temporary savings of steel will have been effected. On the contrary, if, at the end of the one year temporary period, it is then the judgment of the Commission that 80-acre spacing should be continued for another temporary period or made permanent, then to the extent that 80-acre spacing is perpetuated in the pool, a savings in steel will have been effected. If the deep pay in the Denton Pool proves to be as prolific as it is now thought to be, and if the National emergency should demand additional oil, then it will have been developed that the Denton Pool will be a good place to expend steel in satisfaction of meeting the additional requirements for oil for the National emergency.

Now we come to another very important point that is involved in this controversy, and that is the development of future reserves versus 40-acre spacing, and I think this directly concerns the State of New Mexico and any other state as far as that is concerned, where the matter is at issue.

15.m When drilling is comparatively shallow, development costs are relatively low. On the other hand, costs tend to climb with the development of deep reserves. It is shown in this record that the average cost for the drilling of four wells was $273,000 per well. This is a lot of money to put in a hole in the ground. It is true that these costs are determined on present-day inflated prices. It is likewise true that the relatively short term of payout is determined on the present-day inflated price which the producer receives for his product. It would be a short-range view to assume that present income can continue at the present inflated rates. In talking about development costs one is not just talking about the Bunton Pool. On any basis deeper drilling will be expensive, and the cost of developing a field is directly related to the spacing pattern. This is an obvious fact because the more wells an operator drills, the more money he must spend in drilling the wells. If, by enlarging the spacing pattern, the number of wells to be drilled to develop the field can be decreased, then drilling costs can be decreased. With a decrease in drilling costs will come a more rapid discovery of reserves. The best thought of the industry now is that future reserves will be found at increasing depths and, likewise, at increasing costs. Therefore, it is to the best interest of the State of New Mexico and of its people that drilling costs be held to a minimum in order to encourage the discovery of additional oil reserves at

greater depths. The adoption of 80-acre spacing will do this. And, likewise, the adoption of 80-acre spacing will more quickly determine the outer limits of production of a pool after discovery of production.

Now we are not so much concerned here with the adoption of 80-acre spacing. The application which the Commission has before it merely offers it as a means or way of adopting 80-acre spacing over here in a designated pool, but there are other ways this Commission can do it if they want to do it. All you have got to do is change Rule 104 and make it provide for 80-acre spacing in deep pools, that is all in the world you have got to do, so we don't care how you do it, we are not interested in the means this Commission may adopt to get the results we are making; but you can amend Rule 104 and simply provide for 80-acre pattern in these deep pools.

Now I am going to say this to the Commission, we have been operating over here under a kind of an antiquated system it seems to me. About sixteen years have gone by here since there has been any change in the rules here of regards to deep drilling. Now there hasn't been any need for changing, of course, up until you began to get deep production; but surely after this deep production development has started in this state, surely as a matter of policy, we think the Commission could very well adopt for deep pools 80-acre spacing for all deep pools to start with. Just like you have adopted 40-acre spacing for all pools in the state up to the present time.

17.m

Now that concludes my prepared statement, and I want to leave a copy of it here for the record, and if the Commissioners would like a copy of it to take with them and read, I have some extra copies I would like to pass around to the Commission.

Now with reference only to our witnesses, if the Commission please, Mr. Shepard.

MR. SHEPARD: You have witnesses?

MR. FOSTER: We will have one witness, that will be Mr. Kaveler, and we will put him on and have him sworn.

MR. CAMPBELL: May I make a preliminary statement before you start, Mr. Foster?

MR. FOSTER: Surely.

MR. CAMPBELL: I am Jack M. Campbell, representing the McAlester Fuel Company. I would like to state on behalf of the McAlester Fuel Company, which is the operator actively opposing 80-acre spacing in the Devonian zone of the Denton pool, with no appearance in case 270, relating to the Wolfcamp zone, that they do not carry the torch for 40-acre spacing, neither do they consider there is any magic about 80-acre spacing. We feel each common source of supply must be considered as a separate problem and we are sincere in our belief and our testimony at the last hearing and at this hearing will be intended to convince the Commission that in the Devonian formation of the Denton Pool, the erratic nature of the formation and the development of the field to date on a 40-acre spacing pattern will have -- changing to 80-acre spacing at this time -- will have an adverse effect

upon both the proper use of reservoir energy, and correlative rights of the lease or mineral owners in the field. We are particularly leery of 80-acre spacing with a double allowable in this field. Our testimony has indicated, and future developments in the field have convinced us further that to produce these wells at double allowable as sought in the application on an 80-acre pattern after the field has been developed to date on a 40-acre pattern would have an adverse affect upon reservoir energy and that in the last analysis is the job this Commission has before it, to prevent waste of oil and protect correlative rights of owners in the field.

I would also like to make one comment about the steel shortage. That is a matter of concern to every one in the oil business. As I stated at the last hearing McAlester Fuel Company and apparently a great many others in this field are willing to expend steel in 40-acre drilling because they are doing it. New wells have been started almost every week in that field on a 40-acre spacing.

The McAlester Fuel Company drilled the discovery well in this field. They spent well over three hundred thousand dollars in drilling the wildcat well. It was money that really went into a hole in the ground because they didn't know whether there was oil there or not. That company I am sure, just as surely as the Phillips Company believes to the contrary feels it would be improper in this field at this time to change

19mm

the spacing pattern to an 80 acre pattern, because as the Commission found after the original hearing, it would adversely effect drainage in the pool, and adversely effect reservoir energy in the field, and adversely effect correlative rights of owners in the fields.

The only testimony we will introduce today will be an effort to bring the record up to date insofar as the testimony of the original hearing relative to wells which have been started since the last hearing.

H. H. KAVELER,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. FOSTER:

Q Will you state your name to the Commission, please?

A My name is H. H. Kaveler, spelled K-a-v-e-l-e-r.

Q Where do you reside, Mr. Kaveler?

A I am residing in Bartlesville, Oklahoma. I am an employee of the Phillips Petroleum Company.

Q In what capacity?

A My present capacity is Assistant Manager of the Crude Oil Production Department.

Q And what is your occupation or profession?

A I am a graduate of the Missouri School of Mines in 1927 with a degree in Technical Engineering. I am a graduate of the University of Maryland, College Park, where I was granted the degree of Ph.D. in Chemistry. From 1927 to 1935 I was

29mm

a member of the faculty at the University of Missouri, at the University of Maryland, at the George Washington University, Washington D. C., and from 1935 to 1936 I was employed by the United States Bureau of Mines in Pittsburg, Pennsylvania. From 1936 to the present I have been an employee of the Phillips Petroleum Company, acting in various capacities as a Research Engineer, dealing with oil production problems as an Evaluation Engineer in their Department of Economics. And since 1941 I have occupied various positions in connection with crude oil production operations, leading to my present capacity as Assistant Manager of the Crude Oil Production Department. I might further state as a qualification that for the past 16 years my principle interest has been in the scientific proration of oil fields, and particularly dealing with the problems of waste, well spacing, pressure maintenance and unit operation.

Q Now, have you had occasion to become familiar with the Denton Pool?

A I have, Mr. Foster.

Q I believe we have two formations in that pool, the Wolfcamp and the Silure-Devonian?

A That is true.

Q And just as a preliminary step here for the record, at what depth is the Wolfcamp?

A About 11,000 feet.

Q And the Devonian?

A About 15,000.

Q And do you regard that as deep productions?

A In my opinion, these are deep pools.

Q Do you know when the--bear in mind the definition of what is a deep pool and what is a shallow pool in this state--you heard me read that awhile ago--do you know when the first deep production was discovered in this state?

A According to the records I have seen, the first so-called deep production in New Mexico occurred about the year 1948.

Q And since that time has there been an increase in deep production in this state?

A There has been. To my recollection there are four or five so-called deep pools in New Mexico at the present time.

Q Now, with regard to deep production in this state, Mr. Kaveler, is it your opinion that the unit designated as 40 acres in this state should, as applied to deep production, be changed?

A I think that the well spacing in each pool should stand upon facts developed in respect to each pool, and in particularly, referring to the Denton Pool, I think the facts dictate now there should be 80 acre spacing in both the Wolfcamp and the Devonian. If not on the permanent basis at least on a temporary basis until we have facts well determined which would lead to an intelligent, scientific basis of ultimate spacing.

Q How many wells are there in the Denton Pool now?

A My best recollection is about fourteen.

MR. SHEPARD: Producing wells?

22mm

MR. FOSTER: Producing wells.

Q Do you know how many present locations there are for other wells?

A To my knowledge about two or three.

Q Just two or three. Do you see any adverse effect that would be had as a result of the adoption of 80 acre spacing in the Denton Pool at this time?

A I can see no adverse effect whatever to the adoption of an 80 acre spacing program at this time. Simply by virtue of the outstanding fact if 80 acre spacing should be found to be improper from a conservation point of view, then always additional wells could be drilled. It would be my recommendation to this Commission that an 80 acre spacing order be promulgated at least on a temporary basis.

Q It is true that if you adopted 80 acre spacing in the field at this time, the way the field has developed, there will have to be some exceptions?

A That is true. And that occurs in the application of any well spacing program by any commission.

Q Would you say it would be better to have the exceptions than to have the field all developed in a 40 acre pattern?

A I would say it would be much better to grant the exceptions. Now, it might appear that the number of exceptions to be granted at this moment were large percentage-wise. But we must recognize this field may be large and there will be many more wells drilled.

Q How many wells?

23mm

A I don't know.

Q What approximately?

A I have no idea. The principal idea is a field has to be drilled before you determine its size?

Q Yes.

A So that in regard to the number that will ~~ultimately~~ be drilled, the number of exceptions now to be granted might in all probability be a small percentage of the total wells drilled.

Q Now, Mr. Campbell a moment ago in his statement--I want to pull this up a little bit-- referred to this so-called double allowable that might be had here in the Denton Pool in the event of 80 acre spacing. Do you see any relationship between the allowable and what the proper spacing pattern in the field should be?

A I think they are entirely separate and distinct issues and all Commissions recognize that in their regulations.

Q The allowable is determined on one basis, and what the proper spacing should be is determined on an entirely different basis, is that true?

A The allowable is to be determined from time to time on the basis of facts developed after the field is operated.

Q As a matter of fact market demand determines what an allowable should be?

A Yes, it does.

Q I mean other than what the reservoir condition is?

A Yes, that is true.

24mm

Q Now, Mr. Kaveler, you have over there on the table a machine set up. Will you tell us briefly what that is?

A Well, that is a mechanical demonstration of certain technical principles applied to the operation of oil fields which we have constructed in our company for the education of our own people, and which we have on occasion used to demonstrate certain technical principles to others interested in oil and gas.

Q I take it you are not one of those subscribing to the theory that the more wells you drill the more oil you get?

A That is true. It does not follow that more wells will produce more oil. There are abundant examples where many wells have led to decreased recovery rather than increased recovery.

Q Is that more likely to be true in deep production than in shallow production?

A It is.

Q Then what you are saying, there are many examples where a fewer wells are drilled the more oil you get?

A That is true, Mr. Foster.

Q That may sound a little paradoxical but it is true?

A That is true, yes, sir.

Q By the use of that machine can you demonstrate that fact to this Commission?

A I could if I might be permitted to make a few explanatory remarks before I demonstrate the machine. I think it would help

25mm

in its understanding.

Q You go right ahead.

A My recommendation in regard to the temporary 80 acre spacing order in the Hunton Field is based upon some technical conclusions as well as on some certain practical considerations that apply to a conservation program. I am mindful of the fact that, while Mr. Spurrier has a technical background, the Land Commissioner and the Governor may not have had an opportunity to investigate certain technical aspects of the production operation of oil, and my remarks may seem to go far a-field for the moment. I would like to take a layman's approach to the discussion of this problem to attempt to convey to you what in my opinion are the basic technical concepts. If one should ask what is the principal difficulty in bringing about a proper spacing in any oil field, I think one would be entitled to the opinion that the principal difficulty lies in a wide-spead misunderstanding of the technical problem, and a rather general misconception of what is involved. So, that a layman finds great difficulty in grasping what it is the technologists appear to be carrying on a great argument about. I should like to base this statement entirely on what is considered to be the most outstanding technical discovery in respect to oil production operation in the last twenty-five years. Surprisingly enough that proved technical conclusion is very simple. It simply involves this statement: That oil does not produce itself from the earth. Oil does not produce itself from the earth. Now, I think many

26mm

know that oil is found in rock. And I have brought with me here a piece of rock from Oklahoma which is the Shellback Sandstone, which is a typical example of the kind of rock in which oil is found. You may look at this and assume it is a solid piece of rock, but it isn't. It is a conglomeration, aggregation of sandstone. If you look in this apparently solid piece of rock--just imagine that it is bin of oranges or a basket of potatoes. Between the oranges or potatoes is empty space. In like manner, between these millions of sand grains is empty space. We call that a pore space of the rock. And in this pore space the oil accumulates. I have brought with me a piece of rock, the first being a sandstone and the other a limestone. You notice here a substantially different structure. The porosity developed in the limestone has an entirely different aspect than the porosity associated with the sand grains. Nevertheless, this is in the pore space of rocks like that in which oil is found.

Now, I have brought with me a bottle of crude oil, oil which is found by boring holes in rocks that have the property of porosity. Oil cannot be discovered except by the process of drilling.

Q That porosity. As familiar as I am with it, it kind of throws me. It is just holes in the rock, isn't it?

A Yes. Now, I have with me here a bottle of crude oil. Most people think of crude oil in terms of a 'gusher', the Hollywood notion of an oil field, where the oil spurts out

through the derrick and over the country side. That is what
27mm everyone wants, of course. It is from the notion of the 'gusher' that the layman draws the conception that crude oil produces itself out of the earth. But the fact is that oil doesn't produce itself out of the earth.

I can show you the equivalent of producing oil from the earth by taking the top off the bottle. And, lo and behold, oil doesn't spout forth from the bottle. I could recover it by tipping the bottle over and tipping out the oil, but it would be an entirely impractical matter to attempt to lift the earth up and pour the oil out of the rocks. Crude oil is incapable of pushing itself from this bottle. And in the same manner, it is incapable of pushing itself from the rocks. It follows, wells do not produce oil. That strikes the layman as an idiotic statement, but that is the fact.

You ask, how is the oil recovered? And the answer is that nature, in her wisdom, has placed with the crude oil a quantity of natural gas associated with the oil in the pore space of these rocks. In some cases nature has supplied a body of water associated with the oil. And it is the gas and the pressure of the water associated with the oil that is responsible for the production of oil. And that is all the proved technological conclusion amounts to.

Were it not for the pressure of gas or were it not for the pressure of water associated with the oil in these rocks, there could be no crude oil production. The function of a

well then is simply to provide the mechanical means whereby the gas associated with the oil has an opportunity to expand to a point of lower pressure. It is the expansion of the gas and the movement of the gas through the rock that causes the oil to be drifted into the well and produced. And having been drifted into the bottom of the well, the oil can be recovered from that point either by pumping or by natural flow.

Q That gas does not function as a result of the number of wells drilled in the pool, does it?

A The number of wells drilled has no relationship except--

Q To the force that produces oil?

A Another function of the gas in expelling oil from rock. Now, it is true wells are capable of draining a large area of the pool. One well, given sufficient time, could drain all of the gas energy or water energy from the pool and accomplish the production. There are no barriers in this rock. There are no fence posts which place limitations on the extent with which the influence of any one well could extend itself. The same manner with this rock. There are property lines on the surface of the earth, but these property lines extend only to the depth of the fence post.

Q What you are saying is there are no partitions down there like there are in a building or wing?

A There are no partitions in a common source of supply.

It leaves us finally with this conclusion, which a layman

29.mm

can arrive at, and that is simply this: When the pressure of the gas is gone from a pool, the oil production is gone; and if the pool be dependent upon water for its source of energy, when the pressure of the water is gone, the oil production is gone.

The Commission has undoubtedly had called to its attention the great East Texas Field where the energy which expels the oil from the rocks is due to a large body of water west of the pool. The Texas Railroad Commission, recognizing that as the source of energy, has for the past ten years fostered a program whereby the water produced from the formation has been returned to the formation. And the whole idea centered upon this important technical conclusion is that as long as there is pressure from the water or the gas only so long can there be production.

As we travelled through the oil-producing states and see the wells on the pump or stripper stage, we see those wells that have reached that point of low production only because the pressure necessary for the production is exhausted. In these fields great quantities of gas was wasted in years past and the result has been that the recovery of the oil from the reservoir has been a matter of only 30 per cent or less production.

Q I want to peg that down there, Mr. Kaveler. You mean if you had a hundred [redacted] in the reservoir, you get just thirty of it out?

30,mm

A If you rely simply on the natural force there.

Q That is what I am talking about.

A Without any effort to restore pressure or maintain it, the recovery is about 30 per cent or less and 70 per cent or more of the oil is left and not recovered. That has been the history of oil production in this country up until recent years.

Q Are you more likely to dissipate the producing energy of a reservoir by the drilling of more wells?

A It frequently happens that when too close a well spacing program is adopted, operators having found it necessary to recover their investment to drill unnecessary wells--because the production of oil in excessive oil-gas ratios there leads to waste. And there are many examples where the drilling of unnecessary wells have dissipated the reservoir structure to the point where less actual ultimate recovery has been obtained.

A few years ago I wrote a paper on the subject which was published in the 1950 volume of the Petroleum Institute and the examples are there given.

Q All right. Go ahead.

A Now, the statements that I have made to the Commission are illustrated in principle by the model. Some may say this model doesn't represent an actual oil field and they may point an accusing finger at the fact that this is only a mechanical replica of an oil field. But the fact is that

31mm all the technical processes I have just stated are here represented in truth without any magic being employed. I ask the Commission to look at the top part for a moment, and assume you are driving through this oil field. Here is the county road that comes over the field. You see this fence line. And see a well drilled there on this property. And you pass through the gate in the fence and you are on another man's property. And there is another well, and a stock tank, and an oil and gas separator on that property; and then you pass through another gate and fence line onto another property, and observe there too is a well. That is what most laymen observe. And that is the limit of their understanding of what constitutes an oil field.

Q That is as far as they can see?

A That is as far as they can see.

Q You experts can see a little further.

A In a sense. But in the drilling of the wells it is possible to take cores of the sand and recover portions of the earth in the subsurface, and possible to get samples of the oil and gas produced. And it is possible to reconstruct rather faithfully and accurately what it is that occurs in the subsurface that is responsible for production. So, if one could take the earth, like a cantaloupe, and cut it in half so that you could look at it, one would find that the oil and the gas produced from these wells lies in a lens of sand that is tilted up in the earth. This lens of sand was once a dome that extended over in an anticline with both its halves intact. But there was a fault and the fault caused

32.mm

this half to slip down. The top of this half is 6,000 feet and the top of the other half is 14,000 feet and has been drilled into with a dry hole here. We find on further observation that the top part of this particular reservoir is filled with gas and this part underlying this gas-cap substantially is filled with oil, which has been colored red for the purposes of this demonstration.

Q What are you talking about, gas-cap?

A We classify this as a cap over an oil-bearing section. Then we observe that the sandstone for the remaining part of its distance is filled with water; so that this land owner had the misfortune of having his well drilled to a part that contained neither oil nor gas but only salt water.

Now, as we look at this section we can say to ourselves it is evident why this farmer suffered the dry hole because the pool terminates. This sand body is sealed off by that fault. And another thing evident is that this farmer suffers the misfortune of having only gas beneath his land. But the real situation that exists can be demonstrated best by showing what happens in this field in the event that the man owning the gas well takes production from it. I am going to produce this gas well at this point, and mark on here for a reference the location of that original line; and so those in back can see I will put one mark back here. This man having drilled his gas well wishes gas to be sold. If you listen you can hear the gas coming out. Gas is being sold from beneath this

33mm

this lease in the common source of supply, and I think it is evident to the Commission that as a result of that man selling gas from his separate lease, there is a general drainage condition set up through which the pressure is lower here now than it is here, and the full part of the oil starts to move in response to that lower pressure point. So there is migration accordingly. But I would like to call your attention to something else, that is substantially important, and that is that the gas dissolved in this oil is bubbling out. Is leaving this oil and moving to the point of low pressure. Now, it isn't likely that this man owning the oil-bearing portion is losing oil by migration to the gas producer, but what is typically more important to the oil owner is that the gas, the very life-blood of his oil production, is being taken from his oil. So that a conflict exists between the two owners. They have a diversity of interests that cannot be reconciled so long as this property line is a basis for attempting to divide what is in fact contents of the common source of supply.

Q I want to ask this. The gas in the gas-cap, that doesn't help produce the oil?

A It could.

Q But it doesn't under general methods of production?

A Under general methods of production it doesn't.

Q What is the energy that helps produce the oil?

Is it the gas in solution?

34mm

A The gas in solution and it could be that gas in the gas-cap.

Q Yes.

A To show you this and as a real oil well, I will open this oil well and you can see the gas expands and lifts the oil to the surface.

Q Where is the gas shown to be expanding?

A You can see the bubbles here.

Q In that red tube.

A And you can see the gas-cap taking the oil and the oil is beginning to move below this original line. We will let the oil well run there for a minute and let it produce so that you can see that the production from this oil well is due to the pressure or expanding effect of the gas. That is the way oil fields function. There is nothing mysterious about this. There is nothing misrepresentative about it. That is the manner in which oil is recovered. This oil cannot produce itself from rock. Oil can be recovered only to the extent there is gas pressure or water pressure available to expel it from the well. And we can get quite nice production in the storage tank on this lease. The Commission will notice that not all the oil is recovered. Some is left back at this point. Now, in the usual oil field things don't operate this smoothly because this man owning the gas well is entitled to take something from the common source of supply, because while the oil man is producing oil this man is selling gas. I will open up some gas, and we will see what the consequence of that is.

35mm

The consequence of that man taking gas from that common source of supply is that this man's oil well ceases production as the gas bubbles out of the remaining oil and goes into this gas well. And there we have the usual type of American oil field. Not all of its recoverable oil is recovered. Substantially a large portion remains in the ground. Because the energy of production has been finished.

Q Are you saying the gas is going out of solution as a result of the production from the gas well?

A Yes.

Q Is that what stopped the oil well from producing?

A The taking of the gas from the gas-cap and taking of the gas from solution in the oil together resulted in the killing of that oil well. Now, this well is an entirely unnecessary well in this field. All of the gas should have been taken from this well and more oil could have been ultimately recovered and all of the gas would have been recovered. Now, to show you more oil would have been recovered if the gas energy had been conserved I am going to put some gas back into this gas well, use it for an injection well; and to show you by pressure maintenance, this is the act of maintaining pressure, by putting gas into the ground it is possible to restore that oil well.

Q Let me ask you this. You have been talking about the primary methods of recovery in the field up to this point?

A Yes.

Q Now are you talking about pressure maintenance?

16mm

A This is the act of pressure maintenance, which is often done after a field is exhausted, but is best done from the beginning of production.

Q Which spacing is best adopted to pressure maintenance, a smaller or larger spacing?

A I think it is evident to the Commission that had we another dozen wells between these two wells, the result would have been the same because in nowise has this recovery operation been dependent upon the number of wells drilled. All we need is a sufficient number of wells to define the field. We have drilled a dry hole here and here, and have two producing wells. And they have defined the fidd in that respect. Any other wells that are not directly useful to this proposition of gas expelling the oil are wasteful wells.

Q How can you get the most oil out of the field for the least money?

A By drilling a number of wells that are necessary to define the limits of the field; by drilling the number of wells that are necessary to take on an efficient production operation. And I would say that by instituting pressure maintenance operations that would bring the greatest ultimate recovery.

Q Do you have any examples in your experience where it has been proven that too many wells were drilled in a field?

A Well there are a number of examples that I could cite to the Commission. Most of them are a matter of public record.

Q Well, I know. But for this record will you cite some of them?

37mm

A In the Schuler Field in Arkansas, one hundred and forty-five wells were drilled to the Jones Sand to a depth of 7500 feet.

Q That would be deep production in New Mexico?

A That would be deep production in New Mexico. The wells were drilled on a pattern of one well to each 20 acres because it was thought at that time, in 1937 in Arkansas, that you couldn't have any wider spacing.

Q You mean they thought then one well wouldn't bring more than 20 acres?

A We thought so but we weren't permitted under Arkansas law to put more than 20 acres to a well. The field was unitized and from the first day of operation in 1941 under unitization, 100 of those wells were shut-in and closed in completely and the 9,000 barrels per day was produced from 45 wells. And at no time since 1941 have we ever produced more than 50 of the 145 wells at any one time to get the daily allowable. Since then 50 wells have been permanently closed down. It has been estimated about eight million dollars was expended in drilling unnecessary wells.

Q Of course, that eight million dollars had to come out of somebody's pocket?

A Yes, sir.

Q Where did it come from?

A Well it came from the lessee.

Q Where did they get it?

A They got it from selling crude oil and the crude oil people got it by selling gasoline to the general public.

Q You and I paid for the drilling of these unnecessary wells.

A Yes, sir.

Q The question here is 80 acre spacing down here in this Denton Pool--will it be sufficient to get the oil out of the ground or whether you have got to have 40 acre spacing. Now, it is evident isn't it, Mr. Kaveler, that somebody in this state or somebody in some other states, if you drill too many wells in this Denton Pool, the public has got to pay it?

A That is true.

Q The lessee won't pay it?

A That is true.

Q He will get it back by adding to the price of his product.

A I would like to say in addition to that general question, to say this to the Commission: That the matter of getting the most oil out of the ground involves a production operation. It involves the method in which pools are operated. It doesn't in any manner have anything to do with the number of wells drilled. In this little oil field we could have drilled 100 wells and wouldn't have gotten any more or less than we get with the two. Because the distinguishing feature of this exhibit is the manner of operation.

Q It is the way you operate instead of the number of wells that counts.

A That's right.

In east Texas it is a matter of putting water back into the ground to maintain pressure that is responsible for the recovery of oil, not the fact that there is one well to every five acres.

Q Isn't it a popular conception that the more wells drilled the more oil you get?

A That is a popular conception.

Q Is there any truth in that?

A None whatsoever.

Q As a matter of fact, just the reverse is true?

A That is correct.

Q You have mentioned the Schuler field where you could have saved the drilling of a large number of wells. Now, can you give me any other examples?

A Well, I think the general policy which the Texas Railway Commission has adopted of limiting the take of gas from fields in Texas illustrates that some steps must be taken to eliminate the effect of drilling unnecessary wells. In many fields in Texas wells are drilled which are unnecessary wells and a severe limitation on their production must be taken.

MR. SHEPARD: Let's take a five-minute recess.

(Recess.)

THE WITNESS: Mr. Foster, I wish to correct one statement I made.

MR. FOSTER: Yes, sir.

40mm

THE WITNESS: I believe the Wolfcamp is approximately 9,000 feet deep and the Devonian approximately 11,000.

MR. FOSTER: All right.

THE WITNESS: I would like further to say about the model, to save time, whereas I spoke about the model only in respect to the relationship between gas and oil and illustrated how this maintenance of gas pressure was responsible for the production of additional oil, the identical same statement could have been made to the Commission had we considered the movement of water from the structurally lower part of the reservoir upward. Water advancing under pressure through this field can expel oil in exactly the same manner as gas does. In fact the power of water would result in a greater recovery because water is a more efficient means of recovering oil. So, I don't want you to fall in error. If the Denton Pool turns out to be a water-drive pool. In the movement of water and the production of oil from it, water wells on the edge of the field will occupy the same element of importance as in the example I gave you of the movement of gas and the waste of gas through gas wells. I would like to say to the Commission insofar as the technical conclusion is concerned, that if the Commission looks at the means of getting the greatest ultimate recovery from the oil fields of this state, that the important thing is how is the field operated. The big question is not how many wells are drilled, because wells, from a technical point of view, are only part of the machine that utilizes the energy of production to enable the recovery of the oil. Now, that is the technical

aspect. I think there are practical considerations which, if I may be permitted, I will state now.

The practical considerations are that if the number of wells do not determine the ultimate recovery. And there are many examples of experience inthe American Petroleum Industry where that technical conclusion is verified by actual experience. The method of operating a pool is more important in deep pools than it is in shallow pools by the very nature of the conditions. The State of New Mexico I think, should be interested in adopting a wide spacing policy at least on a temporary basis for deep pools in order that the resources of the industry, whether they be moneyor whether they be the tangible steel resources, could be utilized to discover other deep pools.

As a practical matter I think it is of more importance to this state to have a large number of pools discovered than to have a large number of wells drilled in one pool.

Q Let me ask you how this wider spacing in this state would adversely effect the interest of a royalty owner.

A It cannot.

Q Would you say it would be beneficial to the royalty owner to the same extent it is beneficial to the operator?

A I would think so. One way that suggests itself immediately is that there are undoubtedly many deep pools remaining to be discovered in this state that are simply awaiting the opportunity and the means for restoration.

Q You think wider well spacing will more readily bring about

development of the deeper reserves of the state?

A It demands the development of these deeper pools-- why, is the fact that from an investment standpoint and from the standpoint that with the limited steel resources and the limited dollars that the industry has to invest, the industry can afford to develop the deeper pools after they are discovered so that a wider spacing policy on deep pools would, in my opinion, go a long way to fostering the development of the industry in the state. Furthermore, after deep pools are discovered and brought on production, pipelines in greater number and capacity will come to the state. There will be an increase market demand. And in that regard the royalty owner and operators in the state generally will benefit from the expansion of the oil industry.

So, that in my opinion, the acceptance of 80 acre spacing for deep pools would have a very beneficial influence in every direction.

Q What reason can you see for any complaint against this proposed 80-acre spacing in the Denton Pool on a temporary basis?

A Well, of course, it is a little hard for me to see. There could not be any basis. I was impressed at the last hearing by some of the royalty owners who were of the opinion, were the Commission to grant 80 acre spacing the development of the pool would be delayed. I think exactly the opposite is true.

Q How do you think that?

A In my opinion, 80 acre spacing creates the opportunities for a man to drill an offset in exactly the same manner as if

Q Smaller spacing?

A So that operators drilling on 80 create offsets on the next 80, which brings about an extension of development much more rapidly than would otherwise occur.

Q They will get where they are going more quickly?

A That's right.

Q You find out how wide or how long their field is quickly, don't you?

A That's right. Many of the royalty owners appeared not to understand that phase at the previous hearing. One little thing that impressed me about the owners that spoke at the last hearing were some that appeared to be on the edge of this pool, and had had that misfortune on other occasions, and were afraid they would be washed out before the wells came to their lands.

Q What do you mean by washed out?

A The likelihood is that the Devonian reservoir will be water-drive. It is almost all over this particular area of New Mexico. The likelihood is as a barrel of oil is taken from the top of the Devonian structure that a barrel of water will move in in its place. So those who have the misfortune of being on the edge of the water-oil boundary, will suffer by migration from their lands to the other parts of the field from which oil is taken. Now, if this field is drilled on 40 acres, there would result the drilling of a larger number of wells on top of the structure. And a larger number of wells would take a larger

44mm

quantity of oil and a larger quantity of water going into the edge. Wide spacing would bring the well to his land sooner and would cause a distribution of the take through the water where he would have a chance to get some production before the water moved past his land.

Q It would be a more equitable distribution of pressure.

A Yes. I have heard no statement, nor do I have in my possession any knowledge that 80 acre spacing would work adversely to any party.

Q Suppose there had been 80 acre spacing and the later development would demonstrate there should be 40 acre? Can you go back to 40?

A Yes. You can always drill a few more on the 40. I might say to the Commission, in the State of Texas and in the State of Louisiana we have been parties to the drilling of pools on 80 acre spacing in five instances under a pretty bitter opposition. But once the pool was developed, a sane condition of operation was brought about such that the royalty owners never offered any complaint. The fact is that once we get 80 acre spacing we will never go to 40. I will say to you with all the experience I can command from my experience and knowledge that once the 80 acre field is developed there never develops any reason for changing it. Nobody in the industry has ever found that 80 acre spacing once adopted has done anything other than promote conservation.

It isn't new, it is long established in the industry. There are 80 acre spacing orders in deep fields in Texas, Louisiana

45mm

and Oklahoma.

Q Now, this is just not something new that somebody has thought up overnight is it?

A It isn't.

Q Now, the royalty owners apprehension here, you think that just comes from lack of real information on the matter?

A Lack of understanding.

Q Just a lack of understanding.

A Yes, sir.

Q And the only way to convince them would be to go to 80 acre and let them try it once?

A That would be one way.

Q That would be one way to convince them. Do you see any objection to that?

A I do not.

Q If it doesn't work, you can go back to 40?

A That is true.

Q If you go to 40 and want to go to 80, you can never go on to 80?

A This is a one-way street we travel.

Q You have got to have it developed right the first time?

A That is correct.

Q You can cut a wider pattern and then go back and drill wells on 40 if you wish to?

A Yes, sir.

Q Now there is a severe steel shortage, isn't there?

A There is a steel shortage so far as the oil industry is

46mm

concerned. I think it is generally known that Petroleum Administrator for Defense the next to the fourth quarter of this year, has allocated to the oil industry about 29 per cent of the tonage of steel which the industry stated it would need if 43,000 wells were to be drilled in this year.

Q How much allocation of steel do you get?

A We get 29 per cent along with all the rest of them.

Q Along with the rest of them.

A Yes, sir.

Q Let me ask this final question. In your opinion would one well on 80 acres in the Devonian Pool sufficiently drain the 80 acres?

A In my opinion, one well drilled on the 80 acres would be more than necessary, it would be adequate to bring about an efficient drainage, and to bring about an early definition of the limits of the pool, and bring about an early development of all the land that will be found to be productive.

Q Would you recommend to the Commission, Mr. Kaveler, that an 80 acre rule be put into effect in this state with respect to the deep pool, not only the Benton but all the other pools?

A I would make that recommendation to the Commission.

Q State why.

A As a matter of policy.

Q You have a 40 acre spacing rule here?

A Yes, sir.

Q There is no basis for just changing a flat 40 acre spacing

rule here that applies to both deep and shallow pools?

A No, but I didn't want to leave the impression that this Commission humanly done an outstanding job. One of the outstanding facts in the oil industry is that in New Mexico they have always had a spacing plan which is conducive to the development of the resources of the state. Now, since 1948, when pools deeper than 5,000 feet have been discovered, I think the Commission might with equal wisdom adopt the spacing pattern with respect to deep pools that was as useful and as good as the 40 acre pattern they adopted in 1935. The Commission might well recall in 1935 when the 40 acre state-wide pattern was launched in New Mexico, it was a revolutionary thing and attracted the attention of the whole industry.

Q It is still a rather revolutionary thing as compared to some of the other states?

A Some of the more backward states.

Q That is what I am talking about, like Arkansas.

A Like Arkansas.

(Laughter.)

MR. FOSTER: You may cross examine.

CROSS EXAMINATION

MR. CAMPBELL:

Q I wonder if you would mind repeating your answer to the last question.

A Like Arkansas.

Q Dr. Kaveler, I believe you stated at the outset you were acquainted with the size of the Denton Pool in the Devonian

48mm

formation. I wonder if you would mind correcting your statement for the record with reference to the number of wells in that pool?

A Yes, I would. If you will tell me the correct number, I will adopt your statement.

Q Would it surprise you to know there are approximately eleven producing wells and 14 wells either being drilled or located?

A No, it wouldn't surprise me.

Q In other words, 25 wells rather than the 17 you suggested.

A I will take your word for it.

Q I would like to ask you just a few questions about your theory as to drainage, not that I would want to argue with you about it, but isn't it correct that there are even among the technical men in the industry those who still feel that more wells will bring more oil in ultimate recovery?

A Yes, there are some that have not been able to maintain pace with the development with the true facts. A misunderstanding.

Q In other words, there is some division of opinion even among technical men as to that point?

A If you wish to call them technical men.

Q You have written several articles refuting their ideas on it, so I presume they are technical men. I believe you also stated in your theory of drainage, one well in a reservoir if given enough time would ultimately drain the reservoir?

A That is correct.

Q Then any other well would be an unnecessary well, wouldn't it?

49mm

A No. I don't know who your advisers are because it would be foolish to drill only one well to an oil field, and I will tell you why if you would like to know.

Q I would like to know if one well would drain a field if given enough time?

A That is true. But it is very foolish to drill only one well in an oil field and there are reasons for it.

Q The depletion time is a factor isn't it?

A Not necessarily. A number of wells should be drilled in every field. Which will establish the limits of production so that all parties that have production will have an opportunity to share in production. That number of wells which also should be drilled which will satisfy the reasonable market demand for oil because occasions might arise when the market demand for oil would be in excess of the productive potential of one well, so more wells are needed to be drilled to meet the existing market demand. A sufficient number of wells should be drilled in order that there may be a uniform distribution of wells over the field. So that a productive energy process can be utilized most efficiently, and to insure that every separate lens within the common source of supply holding oil will be penetrated by at least one well.

Q I am interested in the last two statements; first, that there should be a sufficient number of wells to establish some uniformity to the field. Is that what the statement is?

A The wells drilled should be drilled uniformly throughout the field.

50mm

Q Wouldn't you say the existence of 25 wells on top of a structure in essentially a 40 acre pattern, and to impose 80 acre spacing toward the edge of the formation would give you that uniformity?

A No. The Commission has this problem. A pool is discovered, and people immediately jump in and drill offsets. Each has his motives. Oftentimes the matter isn't brought before the commission, and the Commission doesn't act on its own motion to bring about an early determination what the spacing should be or development, and that is the thing that has occurred in this pool and in many others. With the experience in this instance and in many others, this Commission and others have always stopped it before it was too late and have corrected this situation before it led to waste. That is what the proposals here advocate.

Q You take the position that situation hasn't yet arrived here?

A We take the position the Commission can still save this great and valuable pool.

Q I believe you testified with reference to this exhibit or model that there is a migration of oil to low pressure areas, is that correct?

A Yes, sir.

Q And the low pressure area is caused, is it not, by the drilling of a well into the reservoir, releasing pressure from the reservoir at the well.

51mm

A The taking of oil or gas or water.

Q And it is true, isn't it, that the more wells which are drilled in a particular area of a field--we are talking about well location not distance between wells--the more wells drilled in a particular area in the field, the lower the pressure becomes as the pressure is reduced from the wells in that area?

A That may be true.

Q Assuming it is true, more wells will not ultimately produce more oil, isn't it also true irregularity of the distance between wells, the location of the wells in the reservoir, is of the utmost importance in the distribution of energy?

A The distance between the wells?

Q The distance between the wells.

A It isn't critical. The Denton Pool, if it were a water-drive pool, as I suspect it will be, all the wells could be drilled along the model on the top here and it would accomplish the most conservative operation you could imagine.

Q You might have some difficulty with the people on the flank.

A No. We would give them credit for their oil. We would let them share in production.

Q You are talking about unitizing?

A No, I am talking about conserving the wells.

Q You are asking in this application a fixed pattern 80 acre spacing in a particular 40 in each quarter section.

A That would be my recommendation tothe Commission.

Q That isn't based upon what you feel would be the best way to develop this field?

52mm

A No, the best way to develop this field would be to drill in a wide pattern and then establish the limits, and then unitize the field and then use pressure maintenance operations.

Q How much surface area is covered by the long axis of this structure?

A This model?

Q Yes.

A That model is of the West Cement oil field in Oklahoma and it is a mile and a half from this point to this point ((indicating on the model.)

Q Then there would be a considerable number of wells even in 80 acre spacing drilled into this pay section?

A Yes. There is 2,000 acres in this field.

Q And if you are correct that oil tends to migrate to low pressure areas, if there were a particular portion of this pay section more densely drilled than another section, wouldn't the oil tend to migrate to that area?

A That depends on the allowable.

Q In your application you recommend a double allowable.

A I have recommended an 80 acre well be given twice the allowable of the 40 acre.

Q You want a double allowable for all wells in the field?

A All wells on 80 acres. I think the Commission will take into consideration that all wells with less than the attributable acreage--

Q You are adopting 80 acres to all wells now drilled or drilling?

53mm

A If they have the acreage to attribute to them.

Q And you did at the time of the last hearing?

A I think the plan could be worked out, yes.

Q Wouldn't the clustering of wells in the top of that structure cause the oil under a water-drive situation to migrate to that low pressure area?

A Not necessarily.

Q Why?

A I can explain it to you, Mr. Campbell, but I can't understand it for you. The proposition is simply this. That wherever a well is, and it withdraws oil and gas, there is a low pressure spot which is created in respect to the rest of the reservoir. And the oil will move in the direction of that low pressure spot. Now, there might be some wells clustered here, as you chose to speak of it. Wherever those wells are, the low pressure condition will be created, and the water will move up and the gas will move down and the oil will move to these points.

Q Then if you develop this field on 40 acres, as it has been up to this time essentially, and start at this point with wider spacing out toward the edge of the field, toward the water contact, isn't it true that the wells away from the top of the formation aren't going to get their fair share of the oil in the reservoir?

A They will get their fair share. That depends on the allowables set by the Commission.

Q You recommend that the wells on the top of the structure

be given an 80 acre allowable?

A If they are entitled to it.

Q Now, another question about this model. It assumes doesn't it, there is a uniform porosity and permeability in the structure?

A The model is built on the principle, but the assumption you infer, if an oil field exists there is a variation in the permeability and the porosity of the rock , and that is true. The fact that rock is heterogeneous and not homogeneous--

Q What does that mean?

A Heterogeneous means mixed up and non-uniform. The fact that it is doesn't vitiate the principle we have tried to present here. We have tried to present a basic principle which this model illustrates.

Q But the nice manner in which this model drains the oil could be effected certainly by a lack of uniformity or by an erratic structure with permeability variations, for instance, couldn't it?

A Well, for instance, out in nature. The Denton Pool could drain just as nicely. Nicely, just doesn't have much meaning in the technical sense.

Q We are trying to use layman's terms, Doctor.

A The oil will drain out of the Denton Pool just as nicely as it will drain out of here (referring to the model.)

Q Regardless of the permeability and the porosity?

A Yes, sir. That term permeability and porosity is just something technical people use to confuse lawyers.

55mm

Q Isn't it true in a water-drive field, the water will tend to go in the direction of the highest permeability?

A That depends on circumstances, and for your benefit, I will say yes.

Q Thank you. Now a few questions with reference to the steel situation. I presume you were acquainted with the operation of I believe the Petroleum Administrater for War in World War II?

A I was reasonably so.

Q Isn't it true at the time when the emergency was at its height and the Petroleum Administrator for War had actually issued an order -- which they haven't done yet in this respect -- that it was based on 40 acres?

A That is true. But I don't think that established a precedent in this crisis. Nor should any action in Washington be of any greater wisdom than what the State Commissions could exercise.

Q Do you confirm the statement that the purpose of the allocation of steel is to obtain the maximum recoverable reserves with the minimum of steel?

A Generally. I think you can also say that the steel available to the industry today is to be used to develop the petroleum resources of our country to the greatest extent. Whether that means reserves or intensifying drilling in one field or going out to try and find many fields, I leave that up to the Government.

MR. CAMPBELL: I think that is all.

MR. FOSTER: I have a bulletin put out by the Petroleum Administrator for Defense. It contains the four-point program

56mm

which they recommend on this steel matter. I would like to introduce that for the record. And just say it is an estimate of suggestion, they don't tell you what to do. They suggest that each state regulatory body extend the existing rules covering well spacing with a view toward reserves to permit drilling new wells farther apart where practicable and producing more from each well.

MR. SHEPARD: It will be admitted.

MR. FOSTER: I think that is all.

MR. SHEPARD: You have any further witnesses?

MR. FOSTER: No, that is all the witnesses we have.

MR. SHEPARD: Mr. Campbell, do you have any witnesses?

MR. CAMPBELL: I have a couple of Arkansas people.

MR. SCOTT: I would like to ask Mr. Kaveler a few questions, please.

MR. SHEPARD: Mr. Kaveler, we have someone to ask you a few questions.

CROSS EXAMINATION

By MR. SCOTT:

MR. SCOTT: My name is W. A. Scott of the Shell Oil Company.

Q Dr. Kaveler, we all appreciate the time and effort you took to explain this matter. It was very informative. But I would like to ask you one or two questions about it. First, wasn't this exhibit set up as a sand reservoir?

A No, sir. Not necessarily.

Q I thought you stated that--

A This exhibit was set up to explain a principle.

Q Yes.

A The principle that oil is produced only through the agency of compressed oil or compressed water associated with the oil in the rock. And you could put saw-dust in there and still control that principle.

Q Wasn't this model made on the assumption this reservoir was heterogeneous?

A No. It was made up on the proposition that it represented a common source of supply.

Q Well, when you manipulated your pressure there it appeared to me the way the model is made it was set up so you assumed even pressure interference, especially between the well up in the gas-cap and the oil well down structure.

A Of course, there is a pressure interference in all common sources of supply.

Q In other words, you assumed there was a good bit of pressure interference.

A I didn't assume, I simply demonstrated.

Q There is a good bit of communication between the two wells.

A Yes.

Q Is the Devonian reservoir composed of a dolomitic rock? Isn't it a limestone?

A Yes, there is a piece there.

58mm

Q Isn't it true in New Mexico and West Texas, in any limestone reservoir, you would find many variations in the limestone reservoirs?

A It is true all over the world.

Q Do you know conclusively that there is communication between the wells in the Denton-Devonian reservoir?

A Yes.

Q Do you know that conclusively beyond any doubt?

A Yes, in what we now recognise as the Denton-Devonian common source of supply.

Q I believe there has been some conflicting testimony as to that.

A That doesn't reflect upon my opinion.

Q Do you know what type of water-drive is now in effect in the Devonian reservoir?

A No.

Q Didn't your test,or exhibit, show more of what we call a solution gas drive type of reservoir?

A Yes, and the statements I made could have been made equally in respect to the function of water.

Q Do you think that the solution gas drive type of energy is in effect in the Denton-Devonian reservoir?

A I don't know.

Q Then, in effect this model isn't representative of the Denton-Devonian reservoir.

A It is representative of the Devonian and all other oil fields.

59mm

Q But the solution gas drive type of reservoir which it exhibits so well here, we don't know it is present in the Denton-Devonian reservoir.

A Mr. Commissioners, what Mr. Scott is getting at is, this model, if this model didn't have the gas-cap and had been just confined to an oil pay, then the only gas in the reservoir would be in the oil. There wouldn't be any gas-cap there. Then the production of oil would be due to the expansion of the gas like the gas comes out of a bottle of beer or Coca-Cola. Comes out of solution. Now, I don't know. We will have to wait awhile in the Devonian to get some history on the field to determine whether or not there is a gas-cap. To determine whether or not there is an extensive water-drive. So, the question you ask, Mr. Scott, is one that only the facts to be established in the future can establish.

Q Therefore, we don't know that the particular type of reservoir energy which you so ably showed us here is in fact-- I believe you did make the statement you thought water-drive might be in effect in the Devonian field but you have no prof.

A That is correct.

MR. SCOTT: That is all. Thank you.

MR. SHEPARD: Anyone else? If not we will hear from Mr. Campbell.

(Witness excused.)

60mm

VERNON TURNER,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. CAMPBELL:

Q Will you state your name?

A Vernon Turner.

Q By whom are you employed?

A By the McAlester Fuel Company.

Q You testified before this Commission at the original hearing in Case No. 269, did you not?

A That is true, Mr. Campbell.

Q I would like to get some information about this Denton field. Since the date of the last hearing has there been any additional well completions in the Devonian?

A Yes, sir, I believe there have been some five additional wells completed since the date of the last hearing.

Q Will you state briefly what wells have been completed?

A Atlantic Federal Jones No. 1, located in the SW SW OF Section 35; Atlantic State T-1, located in the SE SW of Section 2; McAlester-McClure B-1, located in the NW SE of Section 14; Ohio Denton No. 4 "B", located in the NE SW of Section 11; and Skelly State "F" No. 1, located in the NE NW of Section 2.

Q What then is the number of wells now completed in this field in the Devonian?

A I believe there are eleven.

Q Referring you now to the exhibit which is on the wall, on

61mm

left there, which has been marked Exhibit M-6, will you state what that is?

A That is an up-to-date north-south micro-log cross section showing the drill stem test results obtained on various wells in the field.

Q The wells completed since the last hearing are shown on the micro-log?

A Two of the wells.

Q Which are those?

A Atlantic State T-1 and McAlester McClure B-1.

Q Was one of the wells completed since the last hearing a well of the McAlester Fuel Company?

A Yes, sir.

Q Which well is that?

A The McAlester McClure B-1.

Q Where is it situated?

A On the edge of the south end of the field as presently developed.

Q Referring now to the exhibit in the center on the wall, which has been marked Exhibit M-7. Will you state what that is?

A That is a map of the Denton field area showing in red the proposed spacing pattern by Phillips Petroleum Company with the exceptions that will be necessary to that proposed spacing arrangement shown in blue. In other words, the blue shows the present location of drilling wells which are not in the southeast or northwest 40 of the quarter section.

62mm

Q Will you point out to the Commission on that exhibit the locations of wells that have been started or commenced since the last hearing?

A Gulf's Chamberlain D-3, which is a location of, I believe, now drilling.

Q That is a direct south offset to the Gulf Chamberlain No. 2, isn't it?

A It isn't a direct offset in that it isn't in the center of the 40.

Q But it is in the 40 immediately to the south of the Gulf Chamberlain No. 2. And it is also a 40 acre offset to a well to the east, isn't it?

A That is true. We have the location of the McClure B-1, which has been approved but actual drilling operations have not been commenced.

Q What other well has been commenced?

A Gulf State G-2 is located in the southwest southeast of Section 2.

Q That well immediately offsets to the south, the Gulf G-1-D well, and that well is now a drilling well.

A Yes, sir. This morning it was drilling 4,190 feet.

Q Now, what other well--is there an Ohio well in Section 1?

A Yes, sir. Ohio Denton No. 5, which is the west offset to the discovery well of the field.

Q 40 acre offset.

A This morning it was drilling below 380 feet.

63mm

Q That is also a 40 acre offset to the Ohio Denton No. 4 to the north?

A That is true.

Q And those wells have all been commenced since the original hearing?

A That is true.

Q And are there additional location to the north that have been approved but their wells have not as yet been commenced?

A Well, there is an approved location in the SE NE of Section 2 which is the McAlester State D-1.

Q And I believe there is a location in the SE of the NE of Section 14?

A That is true. McClure D-1.

Q And both of these are 40 acre offsetting well locations are they not?

A That is correct.

Q In other words, five wells, three of which have been commenced and two of which locations have been obtained for since the last hearing, all of them are 40 acre north, south or east offsets?

A That is correct. The total of the completed Denton wells, drilling wells, and location, twenty-five of these can be construed as direct offsets.

Q And not diagonals as the proposed pattern would suggest. Now, referring to Exhibit M-6, and to the McClure B-1, which has been completed since the last hearing, and is the well fartherest

4mm

south in the field, will you state what that micro-log shows as to permeability in that well?

A It shows a rather poor section in the Devonian pay, and the permeability is indicated to be rather erratic.

Q Was it necessary to acidize that well?

A Yes, sir. Following preparation, the well flowed only by head, wasn't capable of making its assigned allowable.

Q In your opinion, based on your present information and the production you have in that well so far, would it make a single allowable with a deep well adaptation?

A I question seriously whether it will make an assigned allowable from the present zone.

Q Now, what was the dip in structure from the well immediately north of that McClure B-1 to the McClure A-1 on top of the Devonian?

A From the McClure B-1 to the McClure A-1 there is a direct offset at 1330 feet and your dip is 636 feet.

Q In other words, 636 in a 1330 feet step up?

A That is correct.

Q If the dip continues at the same rate, what would be the effect if you step over the 40 and drill an 80 acre location?

A I question whether you would obtain a producing well at all. Probably be a dry hole.

Q And it still probably would have been necessary to go back and drill the location to the north?

A As a matter of self-protection.

Q Now, the wells you have previously had in the field, is there one well which you are now deepening?

A Yes, the McClure C-1, located in the NE NE of Section 14.

Q That is now producing from the Devonian, it was producing from the Devonian?

A No, sir. We drilled to the Devonian and ran a number of drill stem tests. We plan to take the well to the Ellenberger to 14,000 feet.

Q In other words, you are going to explore the possibilities of another producing zone?

A This morning it was drilling below 13,826 feet.

Q Considering the development in this field todate and assuming the application for fixed pattern, 80 acre spacing in the NE SW corner of each quarter section is approved, together with the double allowable which has been recommended with the deep well adaptation for the wells now producing in this field, what in your opinion will be the effect on this reservoir?

A Well, in spite of Dr. Kaveler's testimony, I would strongly feel that the permeability and pressure would be injurious to the reservoir.

Q In your opinion, would that cause waste of oil?

A It would cause underground waste.

Q Why would that be true?

A Well, you have high rates of flow in certain areas of the field which tend to create low pressure areas. A number of wells will not be capable of producing presently the double allowable in 40 acres without releasing so much gas and dissipating

66mm

the reservoir energy.

Q Do you know how long it takes a well on a 40 acre location with the present allowable and deep well adaptation, to pay out in that field?

A Approximately 15 months.

Q Even though it costs $270,000?

A That is correct.

Q In your opinion, is it necessary to have 40 acre spacing in that field to properly utilize the reservoir energy?

A As the field has been presently developed on 40 acre spacing, in order to allocate 80 acre units to each well already drilled, it will be necessary to include diagonal offsetting acres. And in my opinion, considerable dry acreage would be included in the field limits. Producing at double allowable would certainly dissipate the reservoir energy.excessively.

Q At the original hearing I believe you testified there were areas of low permeability in this reservoir that would not be drained by 80 acre spacing.

A I believe that is true. I think we have adequate evidence, at least in my opinion.

Q You also testified 40 acre spacing would result in more efficient drainage of the field? Is that still your opinion?

A Yes.

Q I believe you also testified the producing of these wells in a water drive field at a high rate could cause channeling, and by-passing of oil. Is that correct?

A I think that could be true. Or would probably travel in

67pp

the zones of high permeability, by-passing oil in the more dense streaks.

MR. CAMPBELL: That is all.

CROSS EXAMINATION

By MR. FOSTER:

Q Now, Mr. Turner, I want to ask you a question or two about this clustering up there. What is the point you are making about the clustering of these wells?

A Well, you have, I believe, those twelve either completed, drilling or locations in the north end of the field at the present time.

Q Yes.

A You have approximately the same number on the south end of the field. If you allocate acreage on which no wil is now drilled, certainly this area in the middle here will not have a well drilled on it.

Q Well, all you are saying there is the wider the spacing the fewer wells you drill. We all agree with that. You were talking about a clustering of wells up there being of some injury or something, bringing about some injury to the field or reservoir, weren't you?

A That is true. I have two wells in point here, Mr. Foster. The evidence was presented at the last hearing on the draw down of those two wells. If you would like to go back into this again--

Q No, I am trying to find out about these so-called clusterings of these wells resulting in some injury to the reservoir. How

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does that occur?

A All right. Under your proposal you plan to double the take from each of these wells that is now completed.

Q Let me correct you about that. We don't plan to double the take at all. We suggested to the Commission it give twice as much allowable to an 80 acre well as an 40 acre well. Whatever they fix it at, that would be it. That would have to depend on different considerations from the spacing pattern.

A But that was your recommendation.

Q Yes, sir. But what I am trying to find out about is how a clustering of these wells is injuring the reservoir?

A Well, the wells that are now completed, that is where you are going to take the oil out of the reservoir, is that true?

Q What is that?

A The wells that are now completed. That is where you are going to take the oil out of the reservoir?

Q Yes, that is true with respect to any well.

A All right. We think we have sufficient evidence to justify the opinion that a number of zones in the Devonian pay consists essentially of a closed system due to low permeability.

Q You are saying this is not all one common source of supply. That is what that language means, isn't it?

A I am saying, due to the variation in permeability and the erratic nature of the formation, I don't believe that one well to 80 acres will adequately develop it.

Q All right. Now just for the purpose of argument, I am going to agree with you but I want to get back to how the clustering of wells brings about any injury to the reservoir.

A All right. I believe certain zones in the reservoir are connected throughout the reservoir. Certain zones have high permeability. That is where your oil production is going to come from. If you have a zone that is essentially a closed system in one part of your field, and assuming you have a water-drive, and it is going to replace a barrel of oil which you take out of the reservoir, I believe the reservoir will encroach along the zones of high permeability and by-pass oil in the lower permeable veins.

Q Will that be caused by the so-called clustering of these wells?

A That would tend to aggravate that condition, yes, sir.

Q That would happen no matter where you drilled a well.

A If you have twice as many wells drilled into a reservoir, you certainly have less chance of leaving oil in the ground due to not developing a low permeability zone.

Q Well, that still don't satisfy my curiosity about the clustering of these wells. What do you mean by clustering of wells?

A Well, wells that have been drilled and developed on direct 40 acre offsetting tracts.

Q What?

A Wells that have been drilled and developed on direct 40 acre offsets.

Q You would have the same clustering on 80 acres wouldn't you?

70mm

A Well,--

Q You would have a clustering under that definition of it under 80 acre spacing wouldn't you?

A Not withthe exceptions we now have.

Q What I am driving at, Mr. Turner, is this. Under any spacing pattern, you have a clustering of wells.

A Well, if you feel--

Q Whether 10 acres or 20 or 40 or 80, you still have a clustering of wells, don't you?

A If this field had been developed on your longer pattern, you still would have some clustering of wells. You might have to get off the structure in order to do it.

Q Why not develop it on 80 acre spacing until we find out more about what the reservoir conditions are?

A Judge Foster, it has already been developed on 40 acres.

Q Not all of it.

A Twenty-five wells or direct offsets.

Q I understand that. But what is the extent of this pool?

A I don't know.

Q Hasn't it been estimated about 42 wells can be drilled in the pool?

A That may be true. I am not familiar with it. The pool may be defined on the south as of right now.

Q Well, do you think that the pool is all one common source of supply?

A I think there are zones in that reservoir that are interconnected throughout the reservoir. I think there are other zones

71mm

of low permeability that maybe connect two or three wells and maybe close up.

Q Under that statement do you think it is one common source of supply?

A Well, under the ordinary conception of an oil and gas reservoir, I say it is, yes. That is a condition you find in any reservoir.

Q You find tight spots in any oil field?

A Yes, sir. I don't believe to the same degree we have here, however.

Q What does the spacing of wells have to do with the rate of production?

A Well, I have been going under assumption that your recommendation for 80 acre spacing was accompanied by the request for double the present allowable for deep well adaptation.

Q I understand that is our application. But what does spacing have to do with the rate of production?

A Well, sir, our McClure No. 1, which was the discovery well, will not produce much in excess of the present allowable. Now, as far as spacing itself, that is a separate problem.

Q That's right. In other words, spacing doesn't have any relation to the rate of production.

A No, sir.

Q All right. Now, you would determine what the spacing pattern in this field is to be on an entirely different basis from what you would determine the rate of production on any individual well should be, wouldn't you?

A Yes, sir. But my contention is it is already developed on 40 acre spacing.

Q That doesn't make any difference. What I am talking about is whatever spacing pattern you have in the field, whether 40 or 80, the considerations for that determination are entirely different from the factors that would go into the rate of production for the wells.

A That is true.

Q And for that reason there would be no relationship between the spacing pattern and the rate of production.

A Except your attempt to tie the two together in your original application.

Q I understand that. But the fact that we recommend a double allowable for wells on 80 acres doesn't condemn 80 acre spacing.

A No, sir.

Q Not at all?

A That is a separate problem entirely.

Q That is a separate problem entirely, and something the Commission can control whichever way it wants to control, can't it?

A That' s right.

Q Whatever the rate of production ought to be can't determine what the spacing pattern should be? Isn't that correct?

A That is correct

Q All right. Now, you say there has got to be a lot of exceptions allowed in this field if we adopt 80 acre spacing?

A Examples or exceptions.

Q Examples or exceptions to the way we propose to develop the field.

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A Approximately half.

Q Let's say half of all wells drilled inthe field will have to be exceptions because of the present way the field has been defeloped. Would you say that would condemn the adoption of 80 acre spacing if otherwise it is shown?

A It would certainly bring into focus a number of problems, several of which I am not in a position--

Q I understand that, but does that condemn 80 acre spacing?

A No. But the effect of these other problems entering into consideration.

Q But there would be no relationship between the present pattern of development and what the proper pattern should be.

A Well, there has nothing that has happened since the last hearing that has changed my opinion on it, and what the spacing pattern should be.

Q I am not talking about that at all, Mr. Turner. I am sure of that. Your statement is correct. But what I am saying is, the fact that, you have developed the field, as you developed it, on 40 acre spacing doesn't within itself condemn the adopting of 80 acre spacing?

A No, sir. Except for these other factors--

Q Oh, I know there are other problems created.

A Yes, sir, and very important, too.

Q I understand that, but that doesn't condemn 80 acre spacing.

A I am sure it doesn't in your opinion.

Q I don't have any opinion about this. I am trying to get yours.

A I am trying to give it to you.

74mm

Q It doesn't condemn 80 acre spacing does it?

A That depends on the way you look at it.

Q Well, all right. Let me ask you this. If you adopt 80 acre spacing for this field and dri[illegible], as a matter of fact, one well won't sufficiently and adequately drain 80 acres, you can always go back and drill under 40, can't you?

A That would be true.

Q That is true, isn't it?

A Yes.

Q But if you develop this pool and continue to develop it on 40 acre spacing and then it should be determined that you should have been on 80 acre spacing, you can never drill 80 acre, can you?

A That would follow.

Q That is true isn't it?

A That would follow, yes.

Q All right. Now, I am not interested just in this Denton Pool. I am talking about a matter of principle in the application of it to spacing patterns on deep production. In other words, what you have got in this pool now is the result of the fact that probably you didn't have wider spacing provisions, is that correct?

A That is a problem for the Commission. I am not on the Commission.

Q No, that isn't a problem for the Commission in answering my question. But the problem we have got now in this field with the way it has been developed is due to the fact that you had only 40 acre spacing before.

A I assume that is true.

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Q In other words, if you had started out developing this field on 80 acre spacing you wouldn't have the problems that you have mentioned.

A I think, roughly speaking, a number of problems would have arisen, yes, sir.

Q Not the ones you are talking about. Maybe some other problems but you wouldn't have these.

A The question would still arise whether one well would adequately drain 80 acres.

Q I agree with you. But if you had started out originally in this field with 80 acre spacing, then you would not have all this problem of making these exceptions for these 13 or 14 wells you have there?

A No.

Q It would have cured that. And it would have also cured all th other problems that result from those wells being drilled on 40 acres.

A What do you mean by all the other problems?

Q You mentioned them.

A There is a multitude of problems involved in this thing.

Q I understand that, but if you had properly started in this field with 80 acre spacing, then you would not have the problems that grow out of thefact that you have wells located in 40 acre patterns and therefore have to make exceptions to them .

A Yes, sir, but--

Q That is true, isn't it?

76mm

A That is true. But we are not dealing in probabilities. We are dealing in realities and facts.

Q I know that. But it is a reality to look a little forward and not let the same thing occur again, if as a matter of fact we ought to go to 80 acre spacing. That is sound, isn't it?

A Yes, sir, I believe that is sound.

Q All right. With respect to applying 80 acres in this particular field, isn't the situation pretty much like this: It is a question whether you want to cut off both legs or just cut off one leg?

A I don't follow you there, I want to keep both of them.

Q Of course, you want to keep both legs. But suppose the Commission should decide they ought to adopt 80 acre spacing, in this field? Now, that brings about a large number of exceptions, that you spoke of. That is what I call cutting off one leg, is these exceptions; but if you want to adopt 80 acre spacing in this field then I'd adopt it and cut off one leg rather than amputate two or to cut off both by staying on 40.

A On this particular field I am not admitting--

Q I am not asking you to admit that. All I am doing is making an assumption here. We have a controversy between the parties as to whether we ought to adopt it or not. If you make the assumption you ought to adopt an 80 acre plan you would just be cutting off one leg.

A I am not making that assumption. You are making the assumption.

Q I am making the assumption. We could be right about this.

A You could be, but in our opinion--

Q That is what I am talking about. That is for the Commission to decide. But whether right about it or not, take this point, go ahead and adopt 80 acre spacing on a temporary pattern, how can you get hurt on that?

A The field is already developed on a 40 acre pattern.

Q I understand that. But how does it hurt you?

A Does Phillips want to unitise a productive 40 acre tract with a dry 40 acre tract?

Q Are you asking me that question?

A Well, I just made the statement. I don't believe you would.

Q It is obvious no one would want to do that, Mr. Turner.

A Geological testimony that will be presented later will adequately show the steep dips--

Q What adjacent 40 acre tracts are there there?

A Sir?

Q What dry tracts, 40 acre tracts, are there in this field?

A Going strictly on a dip basis, the 40 acre tract south of our McClure No. 1 is apt to be dry.

Q Is that the only basis?

A On what other basis would you go?

Q I don't know. I am asking you.

A There is an assumption.

Q Have you drilled any dry wells in that field?

A Yes, sir.

Q Where is it?

A The Walter A-1.

Q What offsets to the present wells are dry 40 acre offsets?

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A Well, I can't call them to your attention at the present time.

Q You don't know, do you?

A This Atlantic D-1 may well be a marginal well.

Q What do you mean marginal well?

A It may be close to the oil-water contact.

Q That wouldn't be dry.

A For all practical purposes it would.

Q Give me a definition of a marginal well.

A One that penetrated a very limited section of the pay which would not pay for the amount of pipe that would be required to complete it.

Q Is that your definition of a marginal well?

A In general terms yes.

Q And you had that definition in mind in answering my question there about that well being--

A No, sir. That is just off-the-cuff, so to speak.

Q Mr. Turner, do you subscribe to the public policy of this state as announced by the legislature that an operator in an oil field shouldn't be required to drill more wells than is necessary an efficiently and economically drain the pool?

A Mr. Foster, can you assure me that by developing this field or continuing to develop it on a 40 acre basis that enough additional oil will not be recovered to pay for those 40 acre locations, would be less than what would be produced on 80 acre spacing?

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Q Mr. Turner, if we could answer these questions we wouldn't have this controversy.

A That is correct.

Q I am asking you if you subscribe to the public policy of this state as announced by the legislature that an operator of an oil field shouldn't be required to drill more wells than is necessary to efficiently and economically drain the field?

A Naturally I would, yes, sir.

Q You subscribe to that?

A Yes, sir. But I think the Commission is very much interested in obtaining maximum oil recovery from the reservoirs of this state.

Q You subscribe to this declaration of public policy found in the statutes of this state that the drilling of unnecessary wells creates fire and other hazards in an oil field?

A Judge Foster, that is a point which I consider of minor importance.

Q Well, whatever weight you may give to it, do you subscribe to that policy?

A Well, if the drilling of one well to each 40 acre tract instead of drilling one well to every 80 acre tract would aggravate that situation, I would subscribe to it then.

Q It says here, "An operator shall not be required directly or indirectly to drill more wells than [redacted] to economically and efficiently drain the pool." Do you subscribe to that public policy of this state?

A You say unnecessary wells.

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I can't--we get back to the same point again. I don't know that one well to a 40 acre tract would constitute--

Q I don't either. But do you subscribe to this declaration of public policy?

A I have already stated I did.

Q Do you subscribe to the public policy of this state that the drilling of unnecessary wells "creates fire and other hazards conducive to waste, and unnecessarily increases the production cost of oil and gas to the operator"?

A That would certainly be true.

Q Do you also subscribe to the public policy of this state as declared in the Statute by the legislature that the increased cost to the operator also increases the cost of the product to the ultimate consumer?

A If the drilling of one well to each 40 acre tract constitutes that, yes, sir.

Q All right. Would you say that as a matter of public policy in this state you ought to drill only the necessary wells that have to be drilled in the field?

A I would subscribe to that, yes, sir.

Q Now, let me ask this question. If you can adopt a policy of this--strike that. This field here could have been developed on 80 acres, could it not, if you had started out in the inception with the discovery well?

A Well, then, the field could have been developed on 160 acre spacing or any other.

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Q It could have been developed on 80, could it not?

A Yes, it could.

Q Tell me how if you had started out originally in this field to develop on 80 acre spacing, how it would have resulted in any injury to anybody in the field?

A Well, the fact remains that the field wasn't developed on 80 acre spacing--

Q I understand that, Mr. Turner. And my question implied that I understand that. But tell me how, if you started out with the original discovery well in this field on 80 acre spacing that anybody would have been injured in this field?

A Well, why not drill just one well, and get everybody to agree to allocate such and such a percentage of this reservoir to every one around there and work it out in that manner.

MR. FOSTER: Yes, sir. I believe that is all.

REDIRECT EXAMINATION

By MR. CAMPBELL:

Q Mr. Turner, Judge Foster made reference to the problems we are faced with in reference to this reservoir. Until this application for 80 acres spacing was filed, you didn't have problems in this field, did you?

A None that I know of.

Q That is not your problem?

A No.

Q You are satisfied with the way this field has been developed on 40 acre spacing?

A Yes, sir.

Q Your company is willing to go ahead and develop on 40 acre spacing?

A Yes, sir.

MR. CAMPBELL: That is all.

MR. SHEPARD: Any further questions. Does anyone have a statement to make. Anyone else have a statement to make? You may be excused.

(Witness excused.)

KEM MERREM

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. CAMPBELL:

Q State your name please.

A Kem Merrem.

Q By whom are you employed?

A McAlester Fuel Company.

Q Did you testify at the original hearing in Case No. 269?

A I did.

Q I refer you to the exhibit on the wall marked M-8 and ask you to state what that is.

A That is our interpretation of the structure, on top of the Devonian. The contour interval is 200 feet.

Q Does that structure map bring up-to-date, based on information obtained since the last hearing, your knowledge of the structure?

A Yes, sir, it does.

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Q What additional control do you have now?

A On the east and the south.

Q Those are the wells--

A The Atlantic Dickenson A-2 and the McAlester McClure B-1.

Q State briefly what conclusions you draw from that structure map.

A Well the very steep dip on the south and the southeast. At the last hearing we had assumed the rate of dip to the southeast here to 1900 feet to the mile. Using an estimated top in this Atlantic Dickenson A-1 because at that time we had not reached the Devonian. We now have that top and it is lower than we estimated, and gives the rate of dip to the southeast to 2700 feet to the mile.

Q What in your opinion, would be the effect of 80 acre operational units, assuming in the situation we have here with the exception there would have to be some east-west or north-south operational units, what would be the effect on defining the exterior limits of the field?

A Take in 80 acre spacing and you would be very likely to have one 40 productive and the other dry.

Q As a geologist would you recommend to your company skipping over a 40 acre tract when the flanks dip so sharply?

A I certainly wouldn't.

Q At the original hearing you testified the information available indicated to you there was a wide variation in the permeability in the reservoir.

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A I still have that opinion and it is further borne out by our McClure B-1 the southern-most well, which at this time will not make the present allowable.

Q Is it still your opinion to properly develop this field to drill wells on 40 acre tracts?

A That is my opinion.

Q Is it your opinion that the drilling of wells on 80 acres tracts might cause waste in this field?

A It is.

MR. CAMPBELL: That is all.

CROSS EXAMINATION

By MR. FOSTER:

Q You say if you had 80 acre spacing you might drill out on an 80 acre tract and find one 40 dry and the other productive?

A That's right.

Q How do you know both wouldn't be dry?

A In that case I was referring--what Atlantic Dickenson A-2, suppose we had stepped out another 40 to the east. It would certainly be a dry hole because in all probability it is going to be a marginal well.

Q The Commission could handle that situation by just reducing the allowable if you had part of it dry.

A That's right. I feel certain at that depth, if you had half the present allowable, 295 barrels--

Q But after all the Commission decides what they are entitled to.

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A Yes, sir.

MR. FOSTER: That's all.

BY MR. WHITE:

Q If a certain number of the present wells cannot produce their regular allowables, and 80 acre spacing is adopted and double allowable given them, would that be more likely to lead to coning of the wells than on 40 acre spacing at half the allowable?

A Yes, and I would also like to add in answer to the question, I think on the flanks of the field, both on the south and east sides, where it is so steep, that when the wells are drilled that fairly close to the water, we are going to have that same low permeability. And in all probability they will not make the present allowable.

MR. WHITE: That is all.

MR. SHEPARD: Any further questions? If not, you will be excused.

(Witness excused.)

MR. SHEPARD: Any more witnesses, Mr. Campbell?

MR. CAMPBELL: No. Do you wish to make another statement, Judge?

MR. FOSTER: No, sir.

MR. CAMPBELL: I want to say just a few words. It seems to me there has been essentially no information introduced by the applicant in this case at this re-hearing with reference to this particular field that wasn't introduced at the last hearing. The only evidence as to additional data on this field has come from the McAlester Fuel Company, who believe this field should continue

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to be developed on 40 acre spacing. And these witness have testified in their opinion the additional information substantiates our previous views. Since the Commission apparently felt in the first instance Phillips Company had not justified the acception to the 40 acre pattern, which has been started, and introduced no additional evidence today, it occurs to us the Commission ought to continue in effect the order which it issued at the end of the last hearing.

MR. SHEPARD: Any other statements?

MR. HUGHSTON: Like Mr. Foster, we think these hearings should be more or less conferences, and we have a few comments to make. Both concerning 80 acre spacing generally and concerning the application to this particular field.

As a matter of bask principle, Shell is not opposed to 80 acre spacing in those cases in which the evidence as to formation conditions clearly shows that one well will adequately drain 80 acres and where it is clearly shown that an 80 acre pattern can be carried out doing equity to all lessees and mineral owners. It has been suggested here that the Commission might limit 80 acre spacing to deep fields hereafter discovered by providing in its general spacing rule that in such fields early development should take place on such a spacing pattern. Such an application, entirely prospective in nature, appeals to your speaker as the most sensible approach to such a matter and while he is not authorized to speak on behalf of the Shell Oil Company on such an application which was not within the scope of this call and was therefore not discussed with him, he feels that Shell Oil Company would probably support the same.

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What we are directly concerned with today is the application of 80 acre spacing to the Denton field. Let us therefore consider whether the evidence shows that in this particular field one well will adequately drain 80 acres and that an 80 acre pattern can be carried out so as to do equity to all lessees and mineral owners.

As to formation condition, we have acreage in this field, but as yet we have no producing wells. We thus have not accumulated any evidence of our own on which to base an opinion as to the adequacy, from a drainage standpoint, of 80 acre spacing in Denton. The evidence on this point has been conflicting, and it is, of course, for the Commission to decide such conflict.

We do direct attention to the fact that the evidence has shown that 40 acre wells show a high profitability so that 80 acre spacing is not required from this standpoint of economics in this particular field.

Since for years New Mexico has followed a 40 acre pattern as a standard, and since this field has been developed to date on such a pattern, it is our belief that no order should issue varying that pattern unless the evidence clearly shows that the purposes of conservation of oil and gas will thereby be promoted and protected, and unless it is also clearly shown that no inequity will result therefrom to lessees and mineral owners as regards their correlative rights. We feel that it has not been shown that the plan here proposed will not violate our correlative rights for the following reasons.

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It was first proposed that 80 acre preration units be established by including in one such unit two diagonal 40 acre tracts. We oppose such radical departure from conservation practices both because such plan has no basis under sound conservation and because such plan would violate our correlative rights as lessees, the correlative rights of other lessees similarly situated, and the correlative rights of mineral owners under tracts affected.

(a) Such Diagonal units are definitely contrary to the Commission's well founded policy, as laid down in its rules, that proration units shall be compact and as nearly as possible in the form of a square. This long established policy is but a sound statement of the conservation principle that the acreage attributable to a well should, as nearly as possible, represent the drainage area of that well.

(b) Under the diagonal unit plan, Section 2 eventually would have one more well than it would have if developed on rectangular 80 acre pattern and the formation of regular units in Sections 1 and 3 if and when these sections are developed would be prevented.

(C) In some cases the suggested diagonal units are not covered by the same basic leases and the creation of the units would require royalty owner joinder. In our own case, our 40 acres in the NW/4 SW/4 of Section 2 would be joined under the diagonal proposal with our 40 acres diagonally northwest in the SE/4 NE/4 of Section 3. Our 40 acres in Section 2 is State Land, whereas our 40 acres in Section 3 is privately owned

89mm To create such a unit, it would be necessary for both the State and these private owners to join therein. At the present time structural control in the field is not established. The State owned land in Section 2 appears to be favorably situated, but little is as yet known as to the unitisation under the diagonal plan could be effected, or that, if effected, the rights of all parties would be protected.

(d) To our knowledge such irregular, diagonal shaped units have no precedent in New Mexico, and justly so. Certainly the rights and investments of the various leasholders, royalty owners and mineral owners should not be jeopardised and discriminated against for the sake of a proration unit scheme which will not be equally just to every interested party, and which provides for units not representing the drainage area of the wells thereon.

If 80 acre spacing is adopted in this field the alternate to composing proration units of diagonal 40 acre tracts is to compose the units of two adjoining 40 acre tracts out of the same section so that the units will be rectangular in shape. If 80 acre spacing is adopted in this field, this is the proration unit plan that we favor. However, it is obvious that the fourteen (14) wells already drilled and the eleven (11) other wells already located have largely been located on a 40 acre spacing and that as to many of such wells, it is now impossible to form 80 acre rectangular units and that therefore many 40 acre exceptions would have to be obtained. We therefore think that 80 acre spacing in this field is now

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impracticable. An instance of a 40 acre tract as to which it would be difficult if not impossible to form a rectangular 80 acre unit out of the same section is Shell's NW of the SW OF Section 2.

Reference to the plat of Section 2 shews that Skelly's SW of th e NW of Section 2 is the only 40 acre tract in Section 2 with which our 40 acre tract in that section could be joined to form a rectangular 80 acre unit. This is by reason of the drilling that has already taken place in the Section.

Unless Skelly would agree to such unit, we would be unable to put our 40 acre in that section in an 80 acre unit.

Skelly has been approached as to its willingness to form such unit. Skelly has sufficient acreage so located that it could drill and own its own wells on its own acreage without joining in a unit with our 40. To join with us would also give Skelly an extra 40 which would require the creation of another jointly owned unit with another operator. Skelly has stated that it is not interested in joining in the formation of a unit with our 40.

We are thus in the position of owning a forty acre lease on State land and of being unable to obtain another operator with other lands in Section 2 willing to unitize with it. This lease was acquired under a Statewide rule permitting a well on each 40 acre tract. If 80 acres is now required for a well, we will be denied the right to drill on our 40 acre tract. Both

Shell as Lessee and this State of New Mexico as Lessor will lose the benefits for which the lease was granted, and a drilling right of long standing will be denied.

Even if a well is permitted on a 40 acre tract, a similar inequity will result if the allowable of that well, by reason of the field being on an 80 acre basis, is cut below what it would have been on the regular standard 40 acre pattern. Forty acres has long been the basis of unit allowable and is the basis upon which investments have been made. To reduce such allowable at this late date would be most inequitable and violative of correlative rights.

We might add that we are not the only operator in the field confronted with this problem of single 40 acre tract in a section.

We also think that part of the Phillips proposal which would restrict future well locations to the NW/4 and the SE/4 of each quarter section in the field would in this particular field prove inequitable; that

(a) Inasmuch as the structure is not defined and the limits of production are not definitely established, such a development pattern would probably lead to gross inequities between presently completed wells, and those wells which eventually will be completed; that

(b) It is evident, beyond any doubt, that the development to date in Sections 2 and 14 has folbwed a pattern of 40 acre spacing. In addition, and as is prudent, the majority of these

wells were located so as to gain as much pay section as possible; and that

(c) If exceptions are to be granted to presently completed or drilling wells, many of which were located to gain structural position, then it would seem that similar exceptions should be given to any future wells so that they too might be located at the most favorable position on the structure.

(d) It is difficult to conceive of the Commission making mandatory any set pattern of well locations in this field which would cause some operators to drill the less desirable of two locations on an 80 acre unit. Such would be the case if the proposed spacing pattern were to be applied to acreage on the flanks of the structure.

For the reasons above stated, it is our position that the 80 acre proration units with specified locations, as propdsed by Phillips, is inequitable, even if it be assumed (and we make no such assumption) that the evidence clearly shows that one well will adequately drain 80 acres.

We therefore respectfully submit:

1. That proration units composed of diagonal 40 acre tracts are violative of sound conservation practices and would result in gross inequities.

2. That the Phillips proposal as to designation of drill sites would violate the rights of operators as to future drilling.

3. That if 80 acre units are adopted, they should be rectangular in shape and confined to a particular section. If

93mm such plan is adopted, the owner of a 40 acre tract, upon showing that he cannot reasonably participate in the creation of an 80 acre unit, should be permitted to drill on his 40 acre tract, and the allowable of such well should not be reduced below what it would have been had a 40 acre spacing pattern prevailed.

What has been said so far is of particular application to the Denton Devonian field. As to the Denton Wolfcamp field our position is as stated at the first hearing on this matter. However, we wish to emphasize that if 80 acre spacing is adopted in the field, the owner of a 40 acre tract upon showing that he cannot reasonable participate in the creation of an 80 acre rectangular unit composed of lands within the same section, should be permitted to drill on his 40 acre tract, and the allowable of the well so drilled should not be reduced below what it would have been had a 40 acre spacing pattern prevailed.

MR. SHEPARD: Any other statements?

MR. BUCKLES: I represent the Sinclair Oil Company. The position of Sinclair in this 80 acre spacing has been heretofore announced to this Commission on other occasions. We are entirely in favor of 80 acre spacing where it can be done and the correlative rights of all parties adequately protected. In this present pod we do not believe correlative rights can be adequately protected should 80 acre spacing be ultimately granted by limiting the wells to the NW and SE of each quarter section. We think the operator should have the privilege of picking the better location on the 80 according to the structure, and thereby give

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both the royalty owner and the operator the benefit of protection of correlative rights, particularly in view of the fact that this pool being developed on a 40 acre spacing, that is flowing the wells in such a helter-skelter manner. Where these exceptions are allowed, that is throwing the offsets to a position where the correlative rights will not be adequately protected. So, with the allowance of such a spacing order on an 80 acre basis, we feel the operator should be given the right to select the position on the 80 for his location.

MR. SHEPARD: Anyone else?

MR. WHEELER: My name is J. D. Wheeler, representing the Ohio Oil Company. I should like to read a brief statement into the record outlining our position. The Ohio Oil Company would like to state to the Oil Conservation Commission of the State of New Mexico we are in support of Phillips application for 80 acre spacing with double allowable being granted to the well on 80 acre spacing. For wells in the Siluro-Devonian pool, for the reasons pointed out in the testimony, and particularly for the reasons that in this as in other deep fields to be discovered in the State of New Mexico, 80 acre spacing will enable field limits to be defined very rapidly. This is particularly desirable in order that reservoir engineering data and production statistics may be obtained from as large an area as possible in as short a time as possible; so that producing characteristics of the reservoir may be ascertained at the earliest possible time, enabling proper field rules and allowable schedules be set up for permanent operations. In these deep

fields where wells may cost in excess of a quarter million dollars, the State of New Mexico and individual royalty owners and operators all stand to benefit from an 80 acre spacing program. That will certainly carry more exploratory drilling and conserve steel and more quickly promote operators to assess their new reserves and make appropriate plans for their more efficient operation. If, subsequent to development on 80 acre spacing, it is deemed advisable for the Commission by the operators or by royalty interest to develop on 40 acres, a hearing may be called and the determination made whether 80 acre spacing is adequate for full development or whether additional drilling should be undertaken to develop on 40 acres. If one of these deep reservoirs is developed on 40 acre spacing and it later develops 80 acre spacing would have been adequate, it has cost the operator twice as much money as necessary and twice as much steel as necessary.

That has a real effect on many operator's exploratory program, which in turn effects royalty interest in New Mexico. For example, to drill the four remaining wells necessary to develop Ohio's lease to 40 acre spacing will cost one million dollars. With the same money and pipe, probably six wildcat wells could be drilled. It is obvious such a program could be highly beneficial to the state, and necessary since the result would be to uncover undiscovered oil reservoirs.

MR. CAMPBELL: Isn't it true, Ohio Oil Company since the last hearing has started an offset well which is a direct offset to the discovery well?

MR. WHEELER: We have started a well--

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MR. CAMPBELL: It is still a 40 acre direct offset to two other wells, isn't it?

MR. WHEELER: By virtue of the fact that--in other words, we wouldn't have any place to go even on 80 acres.

MR. CAMPBELL: That is what we are trying to bring out.

MR. WHEELER: It is a normal location on the proposed pattern.

MR. SHEPARD: Any further statements?

MR. ANDREEN: My name is G. M. Andreen, representing the Magnolia Petroleum Company. I will give my statement to the reporter and save him a little work.

MR. SHEPARD: Thank you very much.

MR. ANDREEN: Magnolia Petroleum Company believes that the proper and adequate spacing in any field should be determined by engineering studies of the reservoir performance. It is our desire, and we believe it the Commission's desire, to base permanent spacing orders on engineering testimony regarding the ability of one well to adequately and efficiently drain an area equivalent to the size unit requested. This is a sound policy, however, a certain amount of development and reservoir data must be available before the engineers can arrive at the proper well spacing. Reservoir Behavior History can only be acquired with the passage of time and development must continue during this time; therefore, there is a definite need for some policy concerning the establishment of temporary spacing orders to govern development whicle Reservoir Behavior Data are collected.

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It is a fact that it is always possible to go from a drilled density of one well per 80 acres to a density of one well per 40 acres. However, after development has progressed on one well per 40 acres basis for a period of time it is usually difficult and sometimes impossible to assign 80 acres to each drilled well, even though the reservoir studies indicate that complete development of the field on 40 acre spacing would cause overdevelopment and the drilling of wasteful wells.

The preceding indicates that in the initial phases of development of a field the spacing should be temporarily controlled on wide spacing until the reservoir studies can establish the spacing necessary to adequately drain the reservoir. From an engineering standpoint such a system should prevent the drilling of unnecessary wells. However, from an investment standpoint it is not reasonable to contend that the application of wide initial spacing to all reservoirs, regardless of depth is warranted. In the case of relatively low well costs, which are normally associated with the shallower depths, it is possible to overdevelop a field and still retain a favorable overall economic situation. However, when the normal well costs are high the margin of economic safety is greatly reduced. It is thought that the problem presented in the Denton Field could be avoided in future fields if some Statewide Policy perhaps on a depth bracket basis; were adopted to temporarily control on a wide spacing the initial development of deep fields. Such action would allow time for the collection and

analysis of reservoir performance history, and avoid overdevelopment. The savings in time, money, and material that should result could be used in the search for new fields. A well discovering a new field adds to the States' potential oil production and to its oil reserves both of which are necessary for any state to maintain or increase its stature among the oil producing states of this nation. An unnecessary well accomplishes nothing and is a waste of material goods.

The unqualified idea of more wells more oil is not compatible with modern engineering consideration of well spacing and reservoir performance. The establishment of allowables based on the ability of a reservoir to efficiently produce, plus encouragement of necessary pressure maintenance projects are the best methods available for increasing the ultimate oil production from a reservoir. After all, it is the energy available and not the number of wells that determines the amount of oil that will be produced.

I wish to emphasize again that Magnolia believes that well spacing in any reservoir should be based on engineering studies of the reservoir behavior and the suggested temporary controls are a means for gaining time to accomplish that purpose.

It is believed the preceding covers the background which has led to the problem present in the Denton pool. At the original hearing the Magnolia Petroleum Company supported the request for a temporary 80 acre spacing order of one years duration with drilling to be confined to the northwest and southeast quarters of each quarter section. Magnolia still feels that such an order

is warranted and again urges the Commission to issue such a finding. In our opinion the data presented in this case indicates a possibility that one well will drain 80 acres in the Wolfcamp Siluro Devonian reservoir. However, as far as we are concerned, the evidence is not yet conclusive enough to say that one well will drain 80 acres. Additional development and production history will be necessary to prove or disprove 80 acres as the proper and adequate spacing plan for the Siluro-Devonian reservoir. Very little information is available on the Wolfcamp reservoir and in my opinion it is impossible, at this time, to determine from reservoir performance any indication of the proper spacing. However, from the economic standpoint it appears expedient to develop the Wolfcamp reservoir on a wide spacing until sufficient data is obtained to prove what the proper spacing should be.

Since additional reservoir and production history is needed for both reservoirs in order to establish the proper spacing it is thought essential that future development be temporarily controlled to one well per 80 acres to allow time for the accumulation of sufficient data to definitely determine the area adequately drained by one well. It is our desire to avoid the drilling of what ultimately may prove to be unnecessary wells and in view of the current material shortage it would indeed be unfortunate should this field be overdeveloped when such a condition could be avoided.

In regard to confining locations to specific quarter sections,

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Magnolia is now drilling at approximately 11,000 feet on their Pope No. 1 well. This will be Magnolia's first well in the Denton Field. Because Magnolia has not had the benefit of production experience in this field, Magnolia has no comment to make on the allowables proposed for the wells on 80 acre units.

I would like to present the Commission with Exhibits 1, 2 and 3. They are attached to the copy of the statement there.

MR. SHEPARD: Any further statements? If not, this will be taken under advisement and we hope to hand down an order without any unusual delay.

Meeting is adjourned.

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STATE OF NEW MEXICO)
: SS.
COUNTY OF BERNALILLO)

I HEREBY CERTIFY that the foregoing and attached transcript of proceedings before the Oil Conservation Commission, in Cases No. 269 and 270, held on August 7, 1951, is a true and correct record of the same to the best of my knowledge, skill and ability.

DATED at Albuquerque, New Mexico, this 28 day of August 1951.

E. E. Greer
REPORTER

My Commission Expires: 8-[illegible]-52

[redacted]

Original

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

TRANSCRIPTION OF HEARING

CASE NO. 269-270

August 7, 1951

(DATE)

E. E. GREESON
COURT REPORTER
UNITED STATES COURT HOUSE
TELEPHONE 2-0872
ALBUQUERQUE, NEW MEXICO

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

- - - - - -

In re: Rehearing and argument continued from July 24 to August 7, 1951. Phillips Petroleum Company is applicant. Case 269 relates to proration units and allowables for Siluro-Devonian common source of supply discovered in McAlester Fuel Company's J. M. Denton Well No. 1-A (SWSE 11 - 15S - 37E); Case 270 relates to Phillips' application for 80 acre proration units and allowables for the Wolfcamp common source of supply discovered in Atlantic Refining Company's Bettie C. Dickinson Well No. 1-B (NWSW 12 - 15S - 37E.)

Cases No. 269 & 270

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TRANSCRIPT OF HEARING

August 7, 1951

R E G I S T E R

BEFORE:

Honorable Guy Shepard,
Member and Chairman, O.C.C.

Honorable R. R. Spurrier
Member and Secretary, O.C.C.

R. L. Hughston
Shell Oil Company

W. A. Scott
Shell Oil Company

Cecil R. Buckles
Sinclair Oil and Gas Company

D. D. Dale
Sinclair Oil and Gas Company

Roy O. Yarbrough
Oil Conservation Commission
Hobbs, New Mexico

O. P. Nicola, Jr.
Phillips Petroleum Company

E. H. Foster
Phillips Petroleum Company

C. P. Dimmitt
Phillips Petroleum Company

D. K. Spellman, Jr.
The Ohio Oil Company

J. D. Wheeler
The Ohio Oil Company

R. E. Howard
The Atlantic Refining Company

N. B. Winter
The Atlantic Refining Company

W. P. Tomilson
The Atlantic Refining Company

Stanley L. Smith
The Atlantic Refining Company

Glenn Staley
New Mexico Oil and Gas Engineering Commission

S. T. Silverstein

S. S. Schoerstein
Idaho Springs, Colorado

Jack M. Campbell
McAlester Fuel Company
Roswell, New Mexico

Vernon Turner
McAlester Fuel Co mpany
Magnolia, Arkansas

Kem E. Merren
McAlester Fuel Company
Magnolia, Arkansas

Travis R. Rowe
McAlester Fuel Company
Lovington, New Mexico

Jack W. Marshall
McAlester Fuel Company
Lovington, New Mexico

R. G. Carlin
Delhi Oil Corporation
Dallas, Texas

Alfred E. McLane
Delhi Oil Corporation
Dallas Texas

Elwin C. Hale
Piedmont, California

J. H. Crocker
Mid Continent Petroleum Corp.
Tulsa, Oklahoma

E. R. Burton
McAlester Fuel Company
Magnolia, Arkansas

Vilas P. Sheldon
Artesia, New Mexico

J. L. Briscoe
Roland Rich Wooley
Artesia New Mexico

G. E. Kendrick
El Paso Natural Gas Company

G. D. Simon
R. DeChicchis Consulting Firm

Jack Shier
Aurora Gasoline Company

H. H. Kaveler
Phillips Petroleum Company

E. L. Shafer
Continental Oil Company
Hobbs, New Mexico

Emmett D. White
Leonard Oil Company
Roswell, New Mexico

G. M. Andreen
Magnolia Petroleum Company
Dallas, Texas

Ollie J. Ford, Jr.
Magnolia Petroleum Company
Kermit, Texas

Foster Morrell
U.S.G.S
Roswell, New Mexico

E. E. Kinney
New Mexico Bureau of Mines
Artesia, New Mexicp

George Graham
Oil Conservation Commission

L. C. White
Oil Conservation Commission

E. C. Iden
Continental Carbon Company
Albuquerque, New. Mexico

Harold B. Seligman
Continental Carbon Company
Amarillo, Texas

H. L. Ericson
Continental Carbon Company
Amarillo, Texas

M. F. Shafer
Continental Carbon Company
Amarillo, Texas

Riss Madole
Aurora Gasoline Company

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Mr. SHEPARD: The meeting will please come to order. The next case is Cases 267 and 270. Will you read please, Mr. Graham?

(Mr. Graham reads the advertisement of the cases.)

MR. FOSTER: I would like to give the appearances that are here for the Phillips Petroleum Company. Mr. C. P. Dimmitt, Vice President in charge of production; Mr. H. H. Kaveler, Assistant to the Manager of the Production Department; Mr. O. P. Nicola, Proration Director; and myself E. H. Foster and Mr. R. N. Williams of Bartlesville, Oklahoma; G. R. Wright would have made an appearance here but he is ill, but I want the record to note his connection with the case in any event.

If the Commission please, it will not be our purpose this afternoon to attempt in any way to rehash the former testimony in this case. We think that the record as we made it in the original hearing was sufficient to support the Commission in finding that 80 acre spacing was desirable in the Wolfcamp and in the Devonian Pool, if the Commission chose to do so. Before I get under way here, I have got a little memorandum I would like to read to the Commission here that will, I think, fully outline our position on the motion for re-hearing in the two fields. And in that connection I might point out so far as the Wolfcamp is concerned, there seems to be very little controversy about it. There is no one here that oppose that. So, our main remarks will be addressed to the spacing that we think ought to be applied to the Devonian.

Now, we are in real earnestness about this situation

2. here. We think we ought to have 80 acre spacing in the field. Before I read a prepared statement here, I would like to introduce Mr. C. P. Dimmitt who is our Vice President of the Production Department, and in charge of all the production. He might have a few words he would like to say at this time. Mr. Dimmitt.

MR. DIMMITT: Thank you. To the Commission members I would like to say this. I think the case involved, which you are studying here now, involves a very basic principle that the industry must give more consideration to, and also, our regulatory bodies, regardless of whether it is about the Denton Pool of the State of New Mexico or any other state. It is one of the factors of developing structures, oil pools, in a scientific manner, and should be given more consideration than we have in the past. And, we are pleased to bring this to your attention here because we believe that it is one principle that you are not only interested in, that you are interested in from a hearing standpoint, but it is one principle that will result in better methods of operation and better ultimate recovery, in oil pools. Thank you.

MR. FOSTER: I have here with me Mr. R. N. Williams who is our Chief Proration Attorney out of the Bartlesville Office. I just want the Commission to see him. I don't want to call him as an expert or anything of that sort, but I do want you to know he is here.

In this statement I am going to read to the Commission, I have used the term "operators", in the pool down there, but I don't want anybody to get the impression I am attempting to

3.m speak for any of the operators except Phillips Petroleum Company. As I view it, I think it would be beneficial for us to try and get an accurate picture of the nature of this hearing.

The Nature of this Hearing:

Neither the original application for 80-acre spacing in the Denton Pool nor the rehearing of that application now being considered should be looked upon as a contest between those in favor of the 80-acre spacing and those opposed to 80-acre spacing. This proceeding should be regarded as a conference represented by the oil and gas industry of the State, on the one hand, and the Oil Conservation Commission as the regulatory authority of the State of New Mexico, on the other hand, meeting in an effort to work out the problem of how to get more oil and gas from a pool for less money and with the use of less steel and by the drilling of fewer wells.

Now of course everybody has to play their part in this sort of thing so here is the role of the operator, and this proceeding is:

No one operator in a pool or field should be permitted to set a spacing pattern in the field best suited to his individual needs or desires. The best interests of all the operators, of all the royalty owners, including the State of New Mexico as a royalty owner, and of the public must be the criteria for determining a spacing pattern in any field. The producer is the

4.m man who takes the stockholder's dollar and digs an oil well with it. He has the expectation of getting that dollar back, plus a profit. The producer acts in a dual capacity. He is, in a sense, a private and a public trustee. He is a private trustee in the sense that he must represent the best interests of his stockholders in seeing to it that the undertaking returns a profit. He is a public trustee in the sense that he must increase production at reduced cost in order to keep down the cost of the product to the ultimate consumer. One need not be a technical man, such as an engineer or a geologist, to understand these facts.

Therefore, I would like to say this, that we are not going to offer any highly technical testimony, we are trying to take a more practical approach to this problem, and see if we can't sell the Commission here on the idea that it is to the best interest of everyone to adopt a wider spacing pattern in the Denton field.

The royalty owner is one to whom a portion of the production is payable, either in kind or value. His role should be the same as that of the operator, that is, a public and a private trustee. The royalty owner should be regarded as a private trustee to the extent only of seeing that the ultimate in the recovery of oil and gas from the pool is had. He has the same duties and the same obligations as the operator in his capacity as a public trustee in that he should not insist upon a

5.m program or a method of development of a field for its oil and gas content that leads to high cost of production which must be passed on by the operator to the consuming public.

In every prodeeding having for its purpose the obtaining of wider well spacing, the royalty owner is generally found arrayed against the producer. The royalty owner generally feels that his best interest is served by closer well spacing. Nothing could be farther from the truth. If the royalty owner cannot profit by wider well spacing, neither can the producer. This fact is obvious, since any method of well spacing advocated by the producer which results in the loss of oil to the royalty owner results in a proportionately higher loss of oil to the producer. The self-interest of an operator would dictate that he not advocate a spacing pattern that would bring about a loss to himself or the royalty owner. It may therefore be reasonably assumed that when an operator advocates wider well spacing he is honest in his convictions about the matter and believes that wider spacing is to the best interests of himself and all others similarly situated, including the royalty owner.

I would like to add right there to the Commission that we don't plan to appear here in the role of being opposed to royalty owners. What we are going to try and do is convince this commission that the program we are advocating will be to the best interest to everyone in the field.

6.m Economic Factors and Desires

The operator in a pool is usually guided in his efforts in the production of oil and gas, and in the fixing of a spacing pattern, by the economics of the case. An operator cannot drill wells and produce oil or gas at a loss. The adoption of any spacing pattern which inures to the economic benefit of the producer likewise inures to the economic benefit of the royalty owner. However, in most instances, the royalty owner is motivated by a desire for more and more royalty payments, and is less and less concerned with the science and the economics necessary to be applied by the producer to the orderly and proper development of a pool. The producer should not be permitted to dictate a course of action by the regulatory body that is inimical to the royalty owner. Every producer should recognize that the interest of himself and the royalty owner is mutual, and most producers do recognize this. Any action on the part of the royalty owner which increases the cost of production to the operator directly contravenes the provisions of the Statute of the State of New Mexico, Section 69-213, which will later be quoted. Such action necessarily increases the cost of the products of the oil and gas to the ultimate consumer. Likewise, any evidence of a selfish attitude on the part of the royalty owner by way of securing smaller spacing of wells requires the drilling of unnecessary wells, creates fire and other hazards conducive to waste, and this violates the provision of

7.m the Statute. It is the duty of the regulatory authority to bring into proper focus all conflicting interests in a pool or field. This can best be done by considering the problem objectively and without regard to the desires or emotions of the parties.

It is the duty of the regulatory body to see that no producer profits at the expense of the royalty owner or the general public. And it is the duty of the regulatory body to see that no royalty owner profits at the expense of the producer or the general public. The interest of the royalty owner and the producer is mutual to the extent that they should seek the best methods by which a pool or field may be efficiently and economically drained and developed. This point is concerned with more than just the primary methods for the recovery of oil and gas.

Now their statements there are based upon a declaration of public policy contained in the Statutes and I will quote the Statute a little bit later, I don't want to inject any legalistic angles in our presentation of evidence in this application for rehearing, but I do want to call to the Commissions' attention the declaration of public policy of this State, as contained in the Statute, and to say to the Commission what we are trying to do we think is in keeping with that declaration of public policy. In other words, I want to get some of the bug-bears out of this 80-acre spacing problem. Our experience is, as soon as you mention 80-acre spacing to most people, they just start running. They think there is something inherently bad about it. We are

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going to try and break down that theory.

Most producers regard pressure maintenance in the production of oil and gas as the long-range view. Primarily, recovery methods are regarded as the short-range view. Here again the interest of the royalty owner and the producer is mutual. At best, primary methods of recovery obtain only a small percentage of oil in the pool, less than 30% in most instances. Pressure maintenance methods substantially increase this percentage. The application of pressure maintenance is directly related to well spacing. That is, it is now conceded that wider well spacing more readily lends itself to pressure maintenance methods than does smaller well spacing. In deep pools, such as the Denton Pool, and under the reservoir conditions which obtain in this pool, the recovery of oil by primary methods is shortlived. If the ultimate in recovery of oil and gas in this pool is to be obtained, pressure maintenance must be resorted to. Since well spacing is directly related to the best results to be obtained by pressure maintenance, it is timely to consider the spacing pattern for the field. The field should not be allowed to be developed on 40-acre spacing under primary recovery methods with the expectation that the best results can be obtained in the application of pressure maintenance. If, for any reason, those now advocating 80-acre spacing in the Denton pool should be mistaken, this does not condemn the adoption of 80-acre spacing. This for the simple reason that resort to 40-acre

9.m spacing can always be had, if, as and when it becomes evident that 80-acre spacing skhould not be the pattern in the field. On the other hand, if those who are advocating 40-acre spacing for the field, and there is only one producer who is doing this, should for any reason be mistaken, a resort to 80-acre spacing could never be had.

Therefore, I would like to say to the Commission it seems to me we are trying to get the cart before the horse, when we want to stand on this so-called 40-acre spacing, because whenever you once adopt the 40-acre spacing then if that should not have been the pattern in that field, and if the pattern should have been a wider one, you are then precluded from going into the proper pattern or wider pattern.

No spacing pattern gets oil out of the ground. All that a spacing pattern does is to determine the distance between wells, based upon some reasonable hypothesis. Rule 104 (b) of the Rules of the Oil Conservation Commission of the State of New Mexico provides:

"Each well drilled within a defined oil pool shall be located on a tract consisting of approximately 40 surface contiguous acres substantially in the form of a square in accordance with the legal subdivision of the United States Public Land Surveys or on a governmental quarter section or lot * * *."

This rule is of statewide application and applies only in the event the Commission does not fix a smaller or larger spacing pattern for the pool.

10.m This statewide rule does not take precedence over the statutory provisions relating to well spacing. Section 69-213, New Mexico Statutes 1941, Annotated, contains this provision:

"No owner of a property in a pool should be required by the Commission, directly or indirectly, to drill more wells than are reasonably necessary to secure his proportionate part of the production. To avoid the drilling of unnecessary wells, a proration unit for each pool may be fixed, such being the area which may be efficiently and economically drained and developed by one (1) well. The drilling of unnecessary wells creates fire and other hazards conducive to waste, and unnecessarily increases the production cost of oil and gas to the operator, and thus also unnecessarily increases the cost of the products to the ultimate consumer."

While the rule fixes 40-acre spacing as a statewide spacing pattern, the Statute recognizes that conditions may exist which will require, in the protection of public and private interests, a wider spacing pattern. And, in order to implement the spacing pattern in a pool or field, the same section of the Statute quoted above further provides:

"The pooling of properties or parts thereof shall be permitted, and if not agreed upon, may be required in any case when and to the extent that the smallness or shape of a separately owned tract would, under the enforcement of a uniform spacing plan or proration unit, otherwise deprive or tend to

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deprive the owner of such tract of the opportunity to recover his just and equitable share of the crude petroleum and natural gas in the pool; provided, that the owner of any tract that is smaller than the drilling unit established for the field, shall not be deprived of the right to drill on and produce from such tract, if same can be done without waste; but in such case, the allowable production from such tract, as compared with the allowable production therefrom if such tract were a full unit, shall be in ratio of the area of such tract to the area of a full unit."

Every operator must recognize that there is no virtue in any spacing pattern as such. Spacing is only one of many factors to be used in regulating the production of oil and gas from a given pool. Some pools or fields more readily lend themselves to development on 40-acre spacing than on 80-acre spacing, and vice versa. The chief difficulty in fixing a spacing pattern for a pool is that it can rarely be determined with any degree of accuracy what the pattern should be until after the pool has been fully developed. The matter of determining well spacing, therefore, becomes largely a matter of policy. It is true that the proper spacing can be determined under any set of assumed conditions. In the past in New Mexico, well spacing has been geared largely to production from shallow pools. A shallow pool is defined by Rule 55:

"Shallow pool shall mean a pool which has a depth range from 0 to 5000 feet."

12.m Production of oil from a deep pool in the State of New Mexico is of fairly recent origin. In fact, the first production that you had from a deep pool in this state, was on March 1st of 1948, that is from a depth below 5000 feet. A deep pool is defined by Rule 18:

"Deep pool shall mean a common source of supply which is situated 5000 feet or more below the surface."

It must be self-evident to any producer that the definitions of a shallow pool and a deep pool are more or less arbitrary. And, of course, as to the matter of well spacing it must be still more evident to a producer that the enforcement of a 40-acre spacing pattern in every pool would be arbitrary and without excuse or justification on any ground.

I call the Commissions' attention to the fact that we are not asking for any permanent order for 80-acre spacing in this Denton pool, we are simply asking for a temporary order for a period of one year, and why anybody can object to that, I don't know.

The operators in the Denton Pool are not asking that the Commission adopt a permanent 80-acre spacing pattern for the field. Good faith requires that the spacing pattern be placed upon a temporary basis. In fact, there is no such thing as a permanent spacing pattern in an oil and gas field under the present regulatory setup. The Commission may, and in fact, it would be its duty to, if conditions required it, change the spacing pattern in any

13.m field or pool. But, in order that there may be no misunderstanding about the position of the operators in this pool, a specific request for 80-acre spacing for a temporary period of one year has been made. The temporary nature of the order requested meets the argument made by the operator opposed to 80-acre spacing that once 80-acre spacing is adopted, always 80-acre spacing. Nothing could be farther from the truth. The operators who are sponsoring 80-acre spacing in this field do not want it, if, in fact, it should be adopted. But, as we have pointed out, the field will be completely developed before one gets that answer.

Now there are other questions here, such as the steel shortage, so we have a proposed solution.

Steel Shortage vs. 40-Acre Spacing in This Pool or Any Other Pool.

I don't want the Commission to get the idea my remarks are confined to the Devonion Pool, what I am saying here applies to any pool in the State.

A National emergency has been declared by the President of the United States. With the declaration of a National emergency came a declaration of a shortage of certain critical materials. Steel is on this list. There is no doubt that there is a shortage of oil field tubular materials. This situation calls for conservation of steel and the adoption of practices in the oil fields that will implement the conservation of steel. One way to save steel is to adopt wider well spacing. Eighty-acre

14.m spacing requires the drilling of only one-half as many wells as is required by 40-acre spacing. The adoption of 80-acre spacing for the Denton Pool has been requested on a temporary basis. If, at the end of the one year temporary period requested, it can be demonstrated from additional information obtained in the development of the field that the reservoir conditions in the field are better adapted to 40-acre spacing than to 80-acre spacing, then the Commission can impose 40-acre spacing and no one will have been hurt, and, in the meantime, at least a temporary savings of steel will have been effected. On the contrary, if, at the end of the one year temporary period, it is then the judgment of the Commission that 80-acre spacing should be continued for another temporary period or made permanent, then to the extent that 80-acre spacing is perpetuated in the pool, a savings in steel will have been effected. If the deep pay in the Denton Pool proves to be as prolific as it is now thought to be, and if the National emergency should demand additional oil, then it will have been developed that the Denton Pool will be a good place to expend steel in satisfaction of meeting the additional requirements for oil for the National emergency.

Now we come to another very important point that is involved in this controversy, and that is the development of future reserves verses 40-acre spacing, and I think this directly concerns the State of New Mexico and any other state as far as that is concerned, where the matter is at issue.

15.m When drilling is comparatively shallow, development costs are relatively low. On the other hand, costs tend to climb with the development of deep reserves. It is shown in this record that the average cost for the drilling of four wells was $273,000 per well. This is a lot of money to put in a hole in the ground. It is true that these costs are determined on present-day inflated prices. It is likewise true that the relatively short term of payout is determined on the present-day inflated price which the producer receives for his product. It would be a short-range view to assume that present income can continue at the present inflated rates. In talking about development costs one is not just talking about the Denton Pool. On any basis deeper drilling will be expensive, and the cost of developing a field is directly related to the spacing pattern. This is an obvious fact because the more wells an operator drills, the more money he must spend in drilling the wells. If, by enlarging the spacing pattern, the number of wells to be drilled to develop the field can be decreased, then drilling costs can be decreased. With a decrease in drilling costs will come a more rapid discovery of reserves. The best thought of the industry now is that future reserves will be found at increasing depths and, likewise, at increasing costs. Therefore, it is to the best interest of the State of New Mexico and of its people that drilling costs be held to a minimum in order to encourage the discovery of additional oil reserves at

16.m

greater depths. The adoption of 80-acre spacing will do this. And, likewise, the adoption of 80-acre spacing will more quickly determine the outer limits of production of a pool after discovery of production.

Now we are not so much concerned here with the adoption of 80-acre spacing. The application which the Commission has before it merely offers it as a means or way of adopting 80-acre spacing over here in a designated pool, but there are other ways this Commission can do it if they want to do it. All you have got to do is change Rule 104 and make it provide for 80-acre spacing in deep pools, that is all in the world you have got to do, so we don't care how you do it, we are not interested in the means this Commission may adopt to get the results we are asking; but you can amend Rule 104 and simply provide for 80-acre pattern in those deep pools.

Now I am going to say this to the Commission, we have been operating over here under a kind of an antiquated system it seems to me. About sixteen years have gone by here since there has been any change in the rules here of regards to deep drilling. Now there hasn't been any need for changing, of course, up until you began to get deep production; but surely after this deep production development has started in this state, surely as a matter of policy, we think the Commission could very well adopt for deep pools 80-acre spacing for all deep pools to start with. Just like you have adopted 40-acre spacing for all pools in the state up to the present time.

17.m

Now that concludes my prepared statement, and I want to leave a copy of it here for the record, and if the Commissioners would like a copy of it to take with them and read, I have some extra copies I would like to pass around to the Commission.

Now with reference only to our witnesses, if the Commission please, Mr. Shepard.

MR. SHEPARD: You have witnesses?

MR. FOSTER: We will have one witness, that will be Mr. Kaveler, and we will put him on and have him sworn.

MR. CAMPBELL: May I make a preliminary statement before you start, Mr. Foster?

MR. FOSTER: Surely.

MR. CAMPBELL: I am Jack N. Campbell, representing the McAlester Fuel Company. I would like to state on behalf of the McAlester Fuel Company, which is the operator actively opposing 80-acre spacing in the Devonion zone of the Denton pool, with no appearance in case 270, relating to the Wolfcamp zone, that they do not carry the torch for 40-acre spacing, neither do they consider there is any magic about 80-acre spacing. We feel each common source of supply must be considered as a separate problem and we are sincere in our belief and our testimony at the last hearing and at this hearing will be intended to convince the Commission that in the Devonion formation of the Denton Pool, the eratic nature of the formation and the development of the field to date on a 40-acre spacing pattern will have -- changing to 80-acre spacing at this time -- will have an adverse effect

18.m upon both the proper use of reservoir energy, and correlative rights of the lease or mineral owners in the field. We are particularly leery of 80-acre spacing with a double allowable in this field. Our testimony has indicated, and future developments in the field have convinced us further that to produce these wells at double allowable as sought in the application on an 80-acre pattern after the field has been developed to date on a 40-acre pattern would have an adverse affect upon reservoir energy and that in the last analysis is the job this Commission has before it, to prevent waste of oil and protect correlative rights of owners in the field.

I would also like to make one comment about the steel shortage. That is a matter of concern to every one in the oil business. As I stated at the last hearing McAlester Fuel Company and apparently a great many others in this field are willing to expend steel in 40-acre drilling because they are doing it. New wells have been started almost every week in that field on a 40-acre spacing.

The McAlester Fuel Company drilled the discovery well in this field. They spent well over three hundred thousand dollars in drilling the wildcat well. It was money that really went into a hole in the ground because they didn't know whether there was oil there or not. That company I am sure, just as surely as the Phillips Company believes to the contrary feels it would be improper in this field at this time to change

19mm the spacing pattern to an 80 acre pattern, because as the Commission found after the original hearing, it would adversely effect drainage in the pool, and adversely effect reservoir energy in the field, and adversely effect correlative rights of owners in the fields.

The only testimony we will introduce today will be an effort to bring the record up to date insofar as the testimony of the original hearing relative to wells which have been started since the last hearing.

H. H. KAVELER,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. FOSTER:

Q Will you state your name to the Commission, please?

A My name is H. H. Kaveler, spelled K-a-v-e-l-e-r.

Q Where do you reside, Mr. Kaveler?

A I am residing in Bartlesville, Oklahoma. I am an employee of the Phillips Petroleum Company.

Q In what capacity?

A My present capacity is Assistant Manager of the Crude Oil Production Department.

Q And what is your occupation or profession?

A I am a graduate of the Missouri School of Mines in 1927 with a degree in Technical Engineering. I am a graduate of the University of Maryland, College Park, where I was granted the degree of Ph.D. in Chemistry. From 1927 to 1935 I was

20mm a member of the faculty at the University of Missouri, at the University of Maryland, at the George Washington University, Washington D. C., and from 1935 to 1936 I was employed by the United States Bureau of Mines in Pittsburg, Pennsylvania. From 1936 to the present I have been an employee of the Phillips Petroleum Company, acting in various capacities as a Research Engineer, dealing with oil production problems as an Evaluation Engineer in their Department of Economics. And since 1941 I have occupied various positions in connection with crude oil production operations, leading to my present capacity as Assistant Manager of the Crude Oil Production Department. I might further state as a qualification that for the past 16 years my principle interest has been in the scientific proration of oil fields, and particularly dealing with the problems of waste, well spacing, pressure maintenance and unit operation.

Q Now, have you had occasion to become familiar with the Denton Pool?

A I have, Mr. Foster.

Q I believe we have two formations in that pool, the Wolfcamp and the Siluro-Devonian?

A That is true.

Q And just as a preliminary step here for the record, at what depth is the Wolfcamp?

A About 11,000 feet.

Q And the Devonian?

A About 15,000.

21mm

Q And do you regard that as deep productions?

A In my opinion, those are deep pools.

Q Do you know when the--bear in mind the definition of what is a deep pool and what is a shallow pool in this state--you heard me read that awhile ago--do you know when the first deep production was discovered in this state?

A According to the records I have seen, the first so-called deep production in New Mexico occurred about the year 1948.

Q And since that time has there been an increase in deep production in this state?

A There has been. To my recollection there are four or five so-called deep pools in New Mexico at the present time.

Q Now, with regard to deep production in this state, Mr. Kaveler, is it your opinion that the unit designated as 40 acres in this state should, as applied to deep production, be changed?

A I think that the well spacing in each pool should stand upon facts developed in respect to each pool, and in particularly, referring to the Denton Pool, I think the facts dictate now there should be 80 acre spacing in both the Wolfcamp and the Devonian. If not on the permanent basis at least on a temporary basis until we have facts well determined which would lead to an intelligent, scientific basis of ultimate spacing.

Q How many wells are there in the Denton Pool now?

A My best recollection is about fourteen.

MR. SHEPARD: Producing wells?

22mm

MR. FOSTER: Producing wells.

Q Do you know how many present locations there are for other wells?

A To my knowledge about two or three.

Q Just two or three. Do you see any adverse effect that would be had as a result of the adoption of 80 acre spacing in the Denton Pool at this time?

A I can see no adverse effect whatever to the adoption of an 80 acre spacing program at this time. Simply by virtue of the outstanding fact if 80 acre spacing should be found to be improper from a conservation point of view, then always additional wells could be drilled. It would be my recommendation to this Commission that an 80 acre spacing order be promulgated at least on a temporary basis.

Q It is true that if you adopted 80 acre spacing in the field at this time, the way the field has developed, there will have to be some exceptions?

A That is true. And that occurs in the application of any well spacing program by any commission.

Q Would you say it would be better to have the exceptions than to have the field all developed in a 40 acre pattern?

A I would say it would be much better to grant the exceptions. Now, it might appear that the number of exceptions to be granted at this moment were large percentage-wise. But we must recognize this field may be large and there will be many more wells drilled.

Q How many wells?

23mm

A I don't know.

Q What approximately?

A I have no idea. The principal idea is a field has to be drilled before you determine its size?

Q Yes.

A So that in regard to the number that will ultimately be drilled, the number of exceptions now to be granted might in all probability be a small percentage of the total wells drilled.

Q Now, Mr. Campbell a moment ago in his statement--I want to pull this up a little bit-- referred to this so-called double allowable that might be had here in the Denton Pool in the event of 80 acre spacing. Do you see any relationship between the allowable and what the proper spacing pattern in the field should be?

A I think they are entirely separate and distinct issues and all Commissions recognize that in their regulations.

Q The allowable is determined on one basis, and what the proper spacing should be is determined on an entirely different basis, is that true?

A The allowable is to be determined from time to time on the basis of facts developed after the field is operated.

Q As a matter of fact market demand determines what an allowable should be?

A Yes, it does.

Q I mean other than what the reservoir condition is?

A Yes, that is true.

24mm

Q Now, Mr. Kaveler, you have over there on the table a machine set up. Will you tell us briefly what that is?

A Well, that is a mechanical demonstration of certain technical principles applied to the operation of oil fields which we have constructed in our company for the education of our own people, and which we have on occasion used to demonstrate certain technical principles to others interested in oil and gas.

Q I take it you are not one of those subscribing to the theory that the more wells you drill the more oil you get?

A That is true. It does not follow that more wells will produce more oil. There are abundant examples where many wells have led to decreased recovery rather than increased recovery.

Q Is that more likely to be true in deep production than in shallow production?

A It is.

Q Then what you are saying, there are many examples where a fewer wells are drilled the more oil you get?

A That is true, Mr. Foster.

Q That may sound a little paradoxical but it is true?

A That is true, yes, sir.

Q By the use of that machine can you demonstrate that fact to this Commission?

A I could if I might be permitted to make a few explanatory remarks before I demonstrate the machine. I think it would help

25mm in its understanding.

Q You go right ahead.

A My recommendation in regard to the temporary 80 acre spacing order in the Denton Field is based upon some technical conclusions as well as on some certain practical considerations that apply to a conservation program. I am mindful of the fact that while Mr. Spurrier has a technical background, the Land Commissioner and the Governor may not have had an opportunity to investigate certain technical aspects of the production operation of oil, and my remarks may seem to go far a-field for the moment. I would like to take a layman's approach to the discussion of this problem to attempt to convey to you what in my opinion are the basic technical concepts. If one should ask what is the principal difficulty in bringing about a proper spacing in any oil field, I think one would be entitled to the opinion that the principal difficulty lies in a wide-spread misunderstanding of the technical problem, and a rather general misconception of what is involved. So, that a layman finds great difficulty in grasping what it is the technologists appear to be carrying on a great argument about. I should like to base this statement entirely on what is considered to be the most outstanding technical discovery in respect to oil production operation in the last twenty-five years. Surprisingly enough that proved technical conclusion is very simple. It simply involves this statement: That oil does not produce itself from the earth. Oil does not produce itself from the earth. Now, I think many

26mm know that oil is found in rock. And I have brought with me here a piece of rock from Oklahoma which is the Shellback Sandstone, which is a typical example of the kind of rock in which oil is found. You may look at this and assume it is a solid piece of rock, but it isn't. It is a conglomeration, aggregation of sandstone. If you look in this apparently solid piece of rock--just imagine that it is bin of oranges or a basket of potatoes. Between the oranges or potatoes is empty space. In like manner, between these millions of sand grains is empty space. We call that a pore space of the rock. And in this pore space the oil accumulates. I have brought with me a piece of rock, the first being a sandstone and the other a limestone. You notice here a substantially different structure. The porosity developed in the limestone has an entirely different aspect than the porosity associated with the sand grains. Nevertheless, it is in the pore space of rocks like that in which oil is found.

Now, I have brought with me a bottle of crude oil, which is found by boring holes in rocks that have the property of porosity. Oil cannot be discovered except by the process of drilling.

Q That porosity. As familiar as I am with it, it kind of throws me. It is just holes in the rock, isn't it?

A Yes. Now, I have with me here a bottle of crude oil. Most people think of crude oil in terms of a 'gusher', the Hollywood notion of an oil field, where the oil spurts out

through the derrick and over the country side. That is what
27mm everyone wants, of course. It is from the notion of the 'gusher' that the layman draws the conception that crude oil produces itself out of the earth. But the fact is that oil doesn't produce itself out of the earth.

I can show you the equivalent of producing oil from the earth by taking the top off the bottle. And, lo and behold, oil doesn't spout forth from the bottle. I could recover it by tipping the bottle over and tipping out the oil, but it would be an entirely impractical matter to attempt to lift the earth up and pour the oil out of the rocks. Crude oil is incapable of pushing itself from this bottle. And in the same manner, it is incapable of pushing itself from the rocks. It follows, wells do not produce oil. That strikes the layman as an idiotic statement, but that is the fact.

You ask, how is the oil recovered? And the answer is that nature, in her wisdom, has placed with the crude oil a quantity of natural gas associated with the oil in the pore space of these rocks. In some cases nature has supplied a body of water associated with the oil. And it is the gas and the pressure of the water associated with the oil that is responsible for the production of oil. And that is all the proved technological conclusion amounts to.

Were it not for the pressure of gas or were it not for the pressure of water associated with the oil in these rocks, there could be no crude oil production. The function of a

28mm well then is simply to provide the mechanical means whereby the gas associated with the oil has an opportunity to expand to a point of lower pressure. It is the expansion of the gas and the movement of the gas through the rock that causes the oil to be drifted into the well and produced. And having been drifted into the bottom of the well, the oil can be recovered from that point either by pumping or by natural flow.

Q That gas does not function as a result of the number of wells drilled in the pool, does it?

A The number of wells drilled has no relationship except--

Q To the force that produces oil?

A Another function of the gas in expelling oil from rock. Now, it is true wells are capable of draining a large area of the pool. One well, given sufficient time, could drain all of the gas energy or water energy from the pool and accomplish the production. There are no barriers in this rock. There are no fence posts which place limitations on the extent with which the influence of any one well could extend itself. The same manner with this rock. There are property lines on the surface of the earth, but those property lines extend only to the depth of the fence post.

Q What you are saying is there are no partitions down there like there are in a building or wing?

A There are no partitions in a common source of supply. It leaves us finally with this conclusion, which a layman

29.mm can arrive at, and that is simply this: When the pressure of the gas is gone from a pool, the oil production is gone; and if the pool be dependent upon water for its source of energy, when the pressure of the water is gone, the oil production is gone.

The Commission has undoubtedly had called to its attention the great East Texas Field where the energy which expels the oil from the rocks is due to a large body of water west of the pool. The Texas Railroad Commission, recognizing that as the source of energy, has for the past ten years fostered a program whereby the water produced from the formation has been returned to the formation. And the whole idea centered upon this important technical conclusion is that as long as there is pressure from the water or the gas only so long can there be production.

As we travelled through the oil-producing states and see the wells on the pump or stripper stage, we see those wells that have reached that point of low production only because the pressure necessary for the production is exhausted. In these fields great quantities of gas was wasted in years past and the result has been that the recovery of the oil from the reservoir has been a matter of only 30 per cent or less production.

Q I want to peg that down there, Mr. Kaveler. You mean if you had a hundred barrels in the reservoir, you get just thirty of it out?

30.mm

A If you rely simply on the natural force there.

Q That is what I am talking about.

A Without any effort to restore pressure or maintain it, the recovery is about 30 per cent or less and 70 per cent or more of the oil is left and not recovered. That has been the history of oil production in this country up until recent years.

Q Are you more likely to dissipate the producing energy of a reservoir by the drilling of more wells?

A It frequently happens that when too close a well spacing program is adopted, that operators having found it necessary to recover their investment to drill unnecessary wells-- because the production of oil in excessive oil-gas ratios there leads to waste. And there are many examples where the drilling of unnecessary wells have dissipated the reservoir structure to the point where less actual, ultimate recovery has been obtained.

A few years ago I wrote a paper on the subject which was published in the 1950 volume of the Petroleum Institute and the examples are there given.

Q All right. Go ahead.

A Now, the statements that I have made to the Commission are illustrated in principle by the model. Some may say this model doesn't represent an actual oil field and they may point an accusing finger at the fact that this is only a mechanical replica of an oil field. But the fact is that

31mm all the technical processes I have just stated are here represented in truth without any magic being employed. I ask the Commission to look at the top part for a moment, and assume you are driving through this oil field. Here is the county road that comes over the field. You see this fence line. And see a well drilled there on this property. And you pass through the gate in the fence and you are on another man's property. And there is another well, and a stock tank, and an oil and gas separator on that property; and then you pass through another gate and fence line onto another property, and observe there too is a well. That is what most laymen observe. And that is the limit of their understanding of what constitutes an oil field.

Q That is as far as they can see?

A That is as far as they can see.

Q You experts can see a little further.

A In a sense. But in the drilling of the wells it is possible to take cores of the sand and recover portions of the earth in the subsurface, and possible to get samples of the oil and gas produced. And it is possible to reconstruct rather faithfully and accurately what it is that occurs in the subsurface that is responsible for production. So, if one could take the earth, like a cantaloupe, and cut it in half so that you could look at it, one would find that the oil and the gas produced from these wells lies in a lens of sand that is tilted up in the earth. This lens of sand was once a dome that extended over in an anticline with both its halves intact. But there was a fault and the fault caused

32.mm this half to slip down. The top of this half is 6,000 feet and the top of the other half is 14,000 feet and has been drilled into with a dry hole here. We find on further observation that the top part of this particular reservoir is filled with gas and this part underlying this gas-cap substantially is filled with oil, which has been colored red for the purposes of this demonstration.

Q What are you talking about, gas-cap?

A We classify this as a cap over an oil-bearing section. Then we observe that the sandstone for the remaining part of its distance is filled with water; so that this land owner had the misfortune of having his well drilled to a part that contained neither oil nor gas but only salt water.

Now, as we look at this section we can say to ourselves it is evident why this farmer suffered the dry hole because the pool terminates. This sand body is sealed off by that fault. And another thing evident is that this farmer suffers the misfortune of having only gas beneath his land. But the real situation that exists can be demonstrated best by showing what happens in this field in the event that the man owning the gas well takes production from it. I am going to produce this gas well at this point, and mark on here for a reference the location of that original line; and so those in back can see I will put one mark back here. This man having drilled his gas well wishes gas to be sold. If you listen you can hear the gas coming out. Gas is being sold from beneath this

33mm this lease in the common source of supply, and I think it is evident to the Commission that as a result of that man selling gas from his separate lease, there is a general drainage condition set up through which the pressure is lower here now than it is here, and the full part of the oil starts to move in response to that lower pressure point. So there is migration accordingly. But I would like to call your attention to something else, that is substantially important, and that is that the gas dissolved in this oil is bubbling out. Is leaving this oil and moving to the point of low pressure. Now, it isn't likely that this man owning the oil-bearing portion is losing oil by migration to the gas producer, but what is typically more important to the oil owner is that the gas, the very life-blood of his oil production, is being taken from his oil. So that a conflict exists between the two owners. They have a diversity of interests that cannot be reconciled so long as this property line is a basis for attempting to divide what is in fact contents of the common source of supply.

Q I want to ask this. The gas in the gas-cap, that doesn't help produce the oil?

A It could.

Q But it doesn't under general methods of production?

A Under general methods of production it doesn't.

Q What is the energy that helps produce the oil?

Is it the gas in solution?

34mm A The gas in solution and it could be that gas in the gas-cap.

Q Yes.

A To show you this and as a real oil well, I will open this oil well and you can see the gas expands and lifts the oil to the surface.

Q Where is the gas shown to be expanding?

A You can see the bubbles here.

Q In that red tube.

A And you can see the gas-cap taking the oil and the oil is beginning to move below this original line. We will let the oil well run there for a minute and let it produce so that you can see that the production from this oil well is due to the pressure or expanding effect of the gas. That is the way oil fields function. There is/nothing mysterious about this. There is nothing misrepresentative about it. That is the manner in which oil is recovered. This oil cannot produce itself from rock. Oil can be recovered only to the extent there is gas pressure or water pressure available to expel it from the well. And we can get quite nice production in the storage tank on this lease. The Commission will notice that not all the oil is recovered. Some is left back at this point. Now, in the usual oil field things don't operate this smoothly because this man owning the gas well is entitled to take something from the common source of supply, because while the oil man is producing oil this man is selling gas. I will open up some gas, and we will see what the consequence of that is.

35mm

The consequence of that man taking gas from that common source of supply is that this man's oil well ceases production as the gas bubbles out of the remaining oil and goes into this gas well. And there we have the usual type of American oil field. Not all of its recoverable oil is recovered. Substantially a large portion remains in the ground. Because the energy of production has been finished.

Q Are you saying the gas is going out of solution as a result of the production from the gas well?

A Yes.

Q Is that what stopped the oil well from producing?

A The taking of the gas from the gas-cap and taking of the gas from solution in the oil together resulted in the killing of that oil well. Now, this well is an entirely unnecessary well in this field. All of the gas should have been taken from this well and more oil could have been ultimately recovered and all of the gas would have been recovered. Now, to show you more oil would have been recovered if the gas energy had been conserved I am going to put some gas back into this gas well, use it for an injection well; and to show you by pressure maintenance, this is the act of maintaining pressure, by putting gas into the ground it is possible to restore that oil well.

Q Let me ask you this. You have been talking about the primary methods of recovery in the field up to this point?

A Yes.

Q Now are you talking about pressure maintenance?

36mm

A This is the act of pressure maintenance, which is often done after a field is exhausted, but is best done from the beginning of production.

Q Which spacing is best adopted to pressure maintenance, a smaller or larger spacing?

A I think it is evident to the Commission that had we another dozen wells between these two wells, the result would have been the same because in nowise has this recovery operation been dependent upon the number of wells drilled. All we need is a sufficient number of wells to define the field. We have drilled a dry hole here and here, a d have two producing wells. And they have defined the fidd in that respect. Any other wells that are not directly useful to this proposition of gas expelling the oil are wasteful wells.

Q How can you get the most oil out of the field for the least money?

A By drilling a number of wells that are necessary to define the limits of the field; by drilling the number of wells that are necessary to take on an efficient production operation. And I would say that by instituting pressure maintenance operations that would bring the greatest ultimate recovery.

Q Do you have any examples in your experience where it has been proven that too many wells were drilled in a field?

A Well there are a number of examples that I could cite to the Commission. Most of them are a matter of public record.

Q Well, I know. But for this record will you cite some of them?

37mm

A In the Schuler Field in Arkansas, one hundred and forty-five wells were drilled to the Jones Sand to a depth of 7500 feet.

Q That would be deep production in New Mexico?

A That would be deep production in New Mexico. The wells were drilled on a pattern of one well to each 20 acres because it was thought at that time, in 1937 in Arkansas, that you couldn't have any wider spacing.

Q You mean they thought then one well wouldn't bring more than 20 acres?

A We thought so but we weren't permitted under Arkansas law to put more than 20 acres to a well. The field was unitized and from the first day of operation in 1941 under unitization, 100 of those wells were shut-in and closed in completely and the 9,000 barrels per day was produced from 45 wells. And at no time since 1941 have we ever produced more than 50 of the 145 wells at any one time to get the daily allowable. Since then 50 wells have been permanently closed down. It has been estimated about eight million dollars was expended in drilling unnecessary wells.

Q Of course, that eight million dollars had to come out of somebody's pocket?

A Yes, sir.

Q Where did it come from?

A Well it came from the lessee.

Q Where did they get it?

38mm

A They got it from selling crude oil and the crude oil people got it by selling gasoline to the general public.

Q You and I paid for the drilling of those unnecessary wells.

A Yes, sir.

Q The question here is 80 acre spacing down here in this Denton Pool--will it be sufficient to get the oil out of the ground or whether you have got to have 40 acre spacing. Now, it is evident isn't it, Mr. Kaveler, that somebody in this state or somebody in some other states, if you drill too many wells in this Denton Pool, the public has got to pay it?

A That is true.

Q The lessee won't pay it?

A That is true.

Q He will get it back by adding to the price of his product.

A I would like to say in addition to that general question, to say this to the Commission: That the matter of getting the most oil out of the ground involves a production operation. It involves the method in which pools are operated. It doesn't in any manner have anything to do with the number of wells drilled. In this little oil field we could have drilled 100 wells and wouldn't have gotten any more or less than we got with the two. Because the distinguishing feature of this exhibit is the manner of operation.

Q It is the way you operate instead of the number of wells that counts.

A That's right.

39mm In east Texas it is a matter of putting water back into the ground to maintain pressure that is responsible for the recovery of oil, not the fact that there is one well to every five acres.

Q Isn't it a popular conception that the more wells drilled the more oil you get?

A That is a popular conception.

Q Is there any truth in that?

A None whatsoever.

Q As a matter of fact, just the reverse is true?

A That is correct.

Q You have mentioned the Schuler field where you could have saved the drilling of a large number of wells. Now, can you give me any other example s?

A Well, I think the general policy which the Texas Railway Commission has adopted of limiting the take of gas from fields in Texas illustrates that some steps must be taken to eliminate the effect of drilling unnecessary wells. In many fields in Texas wells are drilled which are unnecessary wells and a severe limitation on their production must be taken.

MR. SHEPARD: Let's take a five-minute recess.

(Recess.)

THE WITNESS: Mr. Foster, I wish to correct one statement I made.

MR. FOSTER: Yes, si r.

40mm THE WITNESS: I believe the Wolfcamp is approximately 9,000 feet deep and the Devonian approximately 11,000.

MR. FOSTER: All right.

THE WITNESS: I would like further to say about the model, to save time, whereas I spoke about the model only in respect to the relationship between gas and oil and illustrated how this maintenance of gas pressure was responsible for the production of additional oil, the identical same statement could have been made to the Commission had we considered the movement of water from the structurally lower part of the reservoir upward. Water advancing under pressure through this field can expel oil in exactly the same manner as gas does. In fact the power of water would result in a greater recovery because water is a more efficient means of recovering oil. So, I don't want you to fall in error. If the Denton Pool turns out to be a water-drive pool. In the movement of water and the production of oil from it, water wells on the edge of the field will occupy the same element of importance as in the example I gave you of the movement of gas and the waste of gas through gas wells. I would like to say to the Commission insofar as the technical conclusion is concerned, that if the Commission looks at the means of getting the greatest ultimate recovery from the oil fields of this state, that the important thing is how is the field operated. The big question is not how many wells are drilled, because wells, from a technical point of view, are only part of the machine that utilizes the energy of production to enable the recovery of the oil. Now, that is the technical

41mm aspect. I think there are practical considerations which, if I may be permitted, I will state now.

The practical considerations are that if the number of wells do not determine the ultimate recovery. And there are many examples of experience inthe American Petroleum Industry where that technical conclusion is verified by actual experience. The method of operating a pool is more important in deep pools than it is in shallow pools by the very nature of the conditions. The State of New Mexico I think, should be interested in adopting a wide spacing policy at least on a temporary basis for deep pools in order that the resources of the industry, whether they be money or whether they be the tangible steel resources, could be utilized to discover other deep pools.

As a practical matter I think it is of more importance to this state to have a large number of pools discovered than to have a large number of wells drilled in one pool.

Q Let me ask you how this wider spacing in this state would adversely effect the interest of a royalty owner.

A It cannot.

Q Would you say it would be beneficial to the royalty owner to the same extent it is beneficial to the operator?

A I would think so. One way that suggests itself immediately is that there are undoubtedly many deep pools remaining to be discovered in this state that are simply awaiting the opportunity and the means for restoration.

Q You think wider well spacing will more readily bring about

42mm development of the deeper reserves of the state?

A It demands the development of these deeper pools-- why, is the fact that from an investment standpoint and from the standpoint that with the limited steel resources and the limited dollars that the industry has to invest, the industry can afford to develop the deeper pools after they are discovered so that a wider spacing policy on deep pools would, in my opinion, go a long way to fostering the development of the industry in the state. Furthermore, after deep pools are discovered and brought on production, pipelines in greater number and capacity will come to the state. There will be an increase market demand. And in that regard the royalty owner and operators in the state generally will benefit from the expansion of the oil industry.

So, that in my opinion, the acceptance of 80 acre spacing for deep pools would have a very beneficial influence in every direction.

Q What reason can you see for any complaint against this proposed 80-acre spacing in the Denton Pool on a temporary basis?

A Well, of course, it is a little hard for me to see. There could not be any basis. I was impressed at the last hearing by some of the royalty owners who were of the opinion, were the Commission to grant 80 acre spacing the development of the pool would be delayed. I think exactly the opposite is true.

Q How do you think that?

A In my opinion, 80 acre spacing creates the opportunities for a man to drill an offset in exactly the same manner as if

43mm the development was on 40.

Q Smaller spacing?

A So that operators drilling on 80 create offsets on the next 80, which brings about an extension of development much more rapidly than would otherwise occur.

Q They will get where they are going more quickly?

A That's right.

Q You find out how wide or how long their field is quickly, don't you?

A That's right. Many of the royalty owners appeared not to understand that phase at the previous hearing. One little thing that impressed me about the owners that spoke at the last hearing were some that appeared to be on the edge of this pool, and had had that misfortune on other occasions, and were afraid they would be washed out before the wells came to their lands.

Q What do you mean by washed out?

A The likelihood is that the Devonian reservoir will be water-drive. It is almost all over this particular area of New Mexico. The likelihood is as a barrel of oil is taken from the top of the Devonian structure that a barrel of water will move in in its place. So those who have the misfortune of being on the edge of the water-oil boundary, will suffer by migration from their lands to the other parts of the field from which oil is taken. Now, if this field is drilled on 40 acres, there would result the drilling of a larger number of wells on top of the structure. And a larger number of wells would take a larger

44mm quantity of oil and a larger quantity of water going into the edge. Wide spacing would bring the wall to his land sooner and would cause a distribution of the take through the water where he would have a chance to get some production before the water moved past his land.

Q It would be a more equitable distribution of pressure.

A Yes. I have heard no statement, nor do I have in my possession any knowledge that 80 acre spacing would work adversely to any party.

Q Suppose there had been 80 acre spacing and the later development would demonstrate there should be 40 acre? Can you go back to 40?

A Yes. You can always drill a few more on the 40. I might say to the Commission, in the State of Texas and in the State of Louisiana we have been parties to the drilling of pools on 80 acre spacing in five instances under a pretty bitter opposition. But once the pool was developed, a sane condition of operation was brought about such that the royalty owners never offered any complaint. The fact is that once we get 80 acre spacing we will never go to 40. I will say to you with all the experience I can command from my experience and knowledge that once the 80 acre field is developed there never develops any reason for changing it. Nobody in the industry has ever found that 80 acre spacing once adopted has done anything other than promote conservation.

It isn't new, it is long established in the industry. There are 80 acre spacing orders in deep fields in Texas, Louisiana

45mm and Oklahoma.

Q Now, this is just not something new that somebody has thought up overnight is it?

A It isn't.

Q Now, the royalty owners apprehension here, you think that just comes from lack of real information on the matter?

A Lack of understanding.

Q Just a lack of understanding.

A Yes, sir.

Q And the only way to convince them would be to go to 80 acre and let them try it once?

A That would be one way.

Q That would be one way to convince them. Do you see any objection to that?

A I do not.

Q If it doesn't work, you can go back to 40?

A That is true.

Q If you go to 40 and want to go to 80, you can never go on to 80?

A This is a one-way street we travel.

Q You have got to have it developed right the first time?

A That is correct.

Q You can cut a wider pattern and then go back and drill wells on 40 if you wish to?

A Yes, sir.

Q Now there is a severe steel shortage, isn't there?

A There is a steel shortage so far as the oil industry is

46mm

concerned. I think it is generally known that Petroleum Administrator for Defense the next to the fourth quarter of this year, has allocated to the oil industry about 29 per cent of the tonage of steel which the industry stated it would need if 43,000 wells were to be drilled in this year.

Q How much allocation of steel do you get?

A We get 29 per cent along with all the rest of them.

Q Along with the rest of them.

A Yes, sir.

Q Let me ask this final question. In your opinion would one well on 80 acres in the Devonian Pool sufficiently drain the 80 acres?

A In my opinion, one well drilled on the 80 acres would be more than necessary, it would be adequate to bring about an efficient drainage,and to bring about an early definition of the limits of the pool, and bring about an early development of all the land that will be found to be productive.

Q Would you recommend to the Commission, Mr. Kaveler, that an 80 acre rule be put into effect in this state with respect to the deep pool, not only the Denton but all the other pools?

A I would make that recommendation to the Commission.

Q State why.

A As a matter of policy.

Q You have a 40 acre spacing rule here?

A Yes, sir.

Q There is no basis for just changing a flat 40 acre spacing

47mm rule here that applies to both deep and shallow pools?

A No, but I didn't want to leave the impression that this Commission ~~has~~ done an outstanding job. One of the outstanding facts in the oil industry is that in New Mexico they have always had a spacing plan which is conducive to the development of the resources of the state. Now, since 1948, when pools deeper than 5,000 feet have been discovered, I think the Commission might with equal wisdom adopt the spacing pattern with respect to deep pools that was as useful and as good as the 40 acre pattern they adopted in 1935. The Commission might well recall in 1935 when the 40 acre state-wide pattern was launched in New Mexico, it was a revolutionary thing and attracted the attention of the whole industry.

Q It is still a rather revolutionary thing as compared to some of the other states?

A Some of the more backward states.

Q That is what I am talking about, like Arkansas.

A Like Arkansas.

(Laughter.)

MR. FOSTER: You may cross examine.

CROSS EXAMINATION

MR. CAMPBELL:

Q I wonder if you would mind repeating your answer to the last question.

A Like Arkansas.

Q Dr. Kaveler, I believe you stated at the outset you were acquainted with the size of the Denton Pool in the Devonian

48mm formation. I wonder if you would mind correcting your statement for the record with reference to the number of wells in that pool?

A Yes, I would. If you will tell me the correct number, I will adopt your statement.

Q Would it surprise you to know there are approximately eleven producing wells and 14 wells either being drilled or located?

A No, it wouldn't surprise me.

Q In other words, 25 wells rather than the 17 you suggested.

A I will take your word for it.

Q I would like to ask you just a few questions about your theory as to drainage, not that I would want to argue with you about it, but isn't it correct that there are even among the technical men in the industry those who still feel that more wells will bring more oil in ultimate recovery?

A Yes, there are some that have not been able to maintain pace with the development of the true facts. A misunderstanding.

Q In other words, there is some division of opinion even among technical men as to that point?

A If you wish to call them technical men.

Q You have written several articles refuting their ideas on it, so I presume they are technical men. I believe you also stated in your theory of drainage, one well in a reservoir if given enough time would ultimately drain the reservoir?

A That is correct.

Q Then any other well would be an unnecessary well, wouldn't it?

49mm A No. I don't know who your advisers are because it would be foolish to drill only one well to an oil field, and I will tell you why if you would like to know.

Q I would like to know if one well would drain a field if given enough time?

A That is true. But it is very foolish to drill only one well in an oil field and there are reasons for it.

Q The depletion time is a factor isn't it?

A Not necessarily. A number of wells should be drilled in ~~every~~ fields. Which will establish the limits of production so that all parties that have production will have an opportunity to share in production. That number of wells which also should be drilled which will satisfy the reasonable market demand for oil because occasions might arise when the market demand for oil would be in excess of the productive potential of one well, so more wells are needed to be drilled to meet the existing market demand. A sufficient number of wells should be drilled in order that there may be a uniform distribution of wells over the field. So that a productive energy process can be utilized most efficiently, and to insure that every separate lens within the common source of supply holding oil will be penetrated by at least one well.

Q I am interested in the last two statements; first, that there should be a sufficient number of wells to establish some uniformity to the field. Is that what the statement is?

A The wells drilled should be drilled uniformly throughout the field.

50mm

Q Wouldn't you say the existence of 25 wells on top of a structure in essentially a 40 acre pattern, and to impose 80 acre spacing toward the edge of the formation would give you that uniformity?

A No. The Commission has this problem. A pool is discovered, and people immediately jump in and drill offsets. Each has his motives. Oftentimes the matter isn't brought before the commission, and the Commission doesn't act on its own motion to bring about an early determination what the spacing should be or development, and that is the thing that has occurred in this pool and in many others. With the occurrence, in this instance and in many others, this Commission and others have always stopped it before it was too late and have corrected this situation before it led to waste. That is what the proposals here advocate.

Q You take the position that situation hasn't yet arrived here?

A We take the position the Commission can still save this great and valuable pool.

Q I believe you testified with reference to this exhibit or model that there is a migration of oil to low pressure areas, is that correct?

A Yes, sir.

Q And the low pressure area is caused, is it not, by the drilling of a well into the reservoir, releasing pressure from the reservoir at the well.

51mm

A The taking of oil or gas or water.

Q And it is true, isn't it, that the more wells which are drilled in a particular area of a field--we are talking about well location not distance between wells--the more wells drilled in a particular area in the field, the lower the pressure becomes as the pressure is reduced from the wells in that area?

A That may be true.

Q Assuming it is true, more wells will not ultimately produce more oil, isn't it also true irregularity of the distance between wells, the location of the wells in the reservoir, is of the utmost importance in the distribution of energy?

A The distance between the wells?

Q The distance between the wells.

A It isn't critical. The Denton Pool, if it were a water-drive pool, as I suspect it will be, all the wells could be drilled along the model on the top here and it would accomplish the most conservative operation you could imagine.

Q You might have some difficulty with the people on the flank.

A No. We would give them credit for their oil. We would let them share in production.

Q You are talking about unitizing?

A No, I am talking about conserving the wells.

Q You are asking in this application a fixed pattern 80 acre spacing in a particular 40 in each quarter section.

A That would be my recommendation tothe Commission.

Q That isn't based upon what you feel would be the best way to develop this field?

52mm A No, the best way to develop this field would be to drill in a wide pattern and then establish the limits, and then unitize the field and then use pressure maintenance operations.

Q How much surface area is covered by the long axis of this structure?

A This model?

Q Yes.

A That model is of the West Cement oil field in Oklahoma and it is a mile and a half from this point to this point ((indicating on the model.)

Q Then there would be a considerable number of wells even in 80 acre spacing drilled into this pay section?

A Yes. There is 2,000 acres in this field.

Q And if you are correct that oil tends to migrate to low pressure areas, if there were a particular portion of this pay section more densely drilled than another section, wouldn't the oil tend to migrate to that area?

A That depends on the allowable.

Q In your application you recommend a double allowable.

A I have recommended an 80 acre well be given twice the allowable of the 40 acre.

Q You want a double allowable for all wells in the field?

A All wells on 80 acres. I think the Commission will take into consideration that all wells with less than the attributable acreage--

Q You are adopting 80 acres to all wells now drilled or drilling?

53mm

A If they have the acreage to attribute to them.

Q And you did at the time of the last hearing?

A I think the plan could be worked out, yes.

Q Wouldn't the clustering of wells in the top of that structure cause the oil under a water-drive situation to migrate to that low pressure area?

A Not necessarily.

Q Why?

A I can explain it to you, Mr. Campbell, but I can't understand it for you. The proposition is simply this. That wherever a well is, and it withdraws oil and gas, there is a low pressure spot which is created in respect to the rest of the reservoir. And the oil will move in the direction of that low pressure spot. Now, there might be some wells clustered here, as you chose to speak of it. Wherever those wells are, the low pressure condition will be created, and the water will move up and the gas will move down and the oil will move to those points.

Q Then if you develop this field on 40 acres, as it has been up to this time essentially, and start at this point with wider spacing out toward the edge of the field, toward the water contact, isn't it true that the wells away from the top of the formation aren't going to get their fair sham of the oil in the reservoir?

A They will get their fair share. That depends on the allowables set by the Commission.

Q You recommend that the wells on the top of the structure

54mm

be given an 80 acre allowable?

A If they are entitled to it.

Q Now, another question about this model. It assumes doesn't it, there is a uniform porosity and permeability in the structure?

A The model is built on the principle, but the assumption you infer, if an oil field exists there is a variation in the permeability and the porosity of the rock, and that is true. The fact that rock is heterogeneous and not homogeneous--

Q What does that mean?

A Heterogeneous means mixed up and non-uniform. The fact that it is doesn't vitiate the principle we have tried to present here. We have tried to present a basic principle which this model illustrates.

Q But the nice manner in which this model drains the oil could be effected certainly by a lack of uniformity or by an erratic structure with permeability variations, for instance, couldn't it?

A Well, for instance, [illegible] nature. The Denton Pool could drain just as nicely. Nicely, just doesn't have much meaning in the technical sense.

Q We are trying to use layman's terms, Doctor.

A The oil will drain out of the Denton Pool just as nicely as it will drain out of here (referring to the model.)

Q Regardless of the permeability and the porosity?

A Yes, sir. That term permeability and porosity is just something technical people use to confuse lawyers.

55mm

Q Isn't it true in a water-drive field, the water will tend to go in the direction of the highest permeability?

A That depends on circumstances, and for your benefit, I will say yes.

Q Thank you. Now a few questions with reference to the steel situation. I presume you were acquainted with the operation of I believe the Petroleum Administrator for War in World War II?

A I was reasonably so.

Q Isn't it true at the time when the emergency was at its height and the Petroleum Administrator for War had actually issued an order -- which they haven't done yet in this respect -- that it was based on 40 acres?

A That is true. But I don't think that establishes a precedent in this crisis. Nor should any action in Washington be of any greater wisdom than what the State Commissions could exercise.

Q Do you confirm the statement that the purpose of the allocation of steel is to obtain the maximum recoverable reserves with the minimum of steel?

A Generally. I think you can also say that the steel available to the industry today is to be used to develop the petroleum resources of our country to the greatest extent. Whether that means reserves or intensifying drilling in one field or going out to try and find many fields, I leave that up to the Government.

MR. CAMPBELL: I think that is all.

MR. FOSTER: I have a bulletin put out by the Petroleum Administrator for Defense. It contains the four-point program

56mm which they recommend on this steel matter. I would like to introduce that for the record. And just say it is an estimate of suggestion, they don't tell you what to do. They suggest that each state regulatory body extend the existing rules covering well spacing with a view toward reserves to permit drilling new wells farther apart where practicable and producing more from each well.

MR. SHEPARD: It will be admitted.

MR. FOSTER: I think that is all.

MR. SHEPARD: You have any further witnesses?

MR. FOSTER: No, that is all the witnesses we have.

MR. SHEPARD: Mr. Campbell, do you have any witnesses?

MR. CAMPBELL: I have a couple of Arkansas people.

MR. SCOTT: I would like to ask Mr. Kaveler a few questions, please.

MR. SHEPARD: Mr. Kaveler, we have someone to ask you a few questions.

CROSS EXAMINATION

By MR. SCOTT:

MR. SCOTT: My name is W. A. Scott of the Shell Oil Company.

Q Dr. Kaveler, we all appreciate the time and effort you took to explain this matter. It was very informative. But I would like to ask you one or two questions about it. First, wasn't this exhibit set up as a sand reservoir?

A No, sir. Not necessarily.

57mm

Q I thought you stated that—

A This exhibit was set up to explain a principle.

Q Yes.

A The principle that oil is produced only through the agency of compressed oil or compressed water associated with the oil in the rock. And you could put saw-dust in there and still control that principle.

Q Wasn't this model made on the assumption this reservoir was heterogeneous?

A No. It was made up on the proposition that it represented a common source of supply.

Q Well, when you manipulated your pressure there it appeared to me the way the model is made it was set up so you assumed even pressure interference, especially between the well up in the gas-cap and the oil well down structure.

A Of course, there is a pressure interference in all common sources of supply.

Q In other words, you assumed there was a good bit of pressure interference.

A I didn't assume, I simply demonstrated.

Q There is a good bit of communication between the two wells.

A Yes.

Q Is the Devonian reservoir composed of a dolomitic rock? Isn't it a limestone?

A Yes, there is a piece there.

58mm

Q Isn't it true in New Mexico and West Texas, in any limestone reservoir, you would find many variations in the limestone reservoirs?

A It is true all over the world.

Q Do you know conclusively that there is communication between the wells in the Denton-Devonian reservoir?

A Yes.

Q Do you know that conclusively beyond any doubt?

A Yes, in what we now recognize as the Denton-Devonian common source of supply.

Q I believe there has been some conflicting testimony as to that.

A That doesn't reflect upon my opinion.

Q Do you know what type of water-drive is now in effect in the Devonian reservoir?

A No.

Q Didn't your test,or exhibit, show more of what we call a solution gas drive type of reservoir?

A Yes, and the statements I made could have been made equally in respect to the function of water.

Q Do you think that the solution gas drive type of energy is in effect in the Denton-Devonian reservoir?

A I don't know.

Q Then, in effect this model isn't representative of the Denton-Devonian reservoir.

A It is representative of the Devonian and all other oil fields.

59mm

Q But the solution gas drive type of reservoir which it exhibits so well here, we don't know it is present in the Denton-Devonian reservoir.

A Mr. Commissioners, what Mr. Scott is getting at is, this model, if this model didn't have the gas-cap and had been just confined to an oil pay, then the only gas in the reservoir would be in the oil. There wouldn't be any gas-cap there. Then the production of oil would be due to the expansion of the gas like the gas comes out of a bottle of beer or Coco-Cola. Comes out of solution. Now, I don't know. We will have to wait awhile in the Devonian to get some history on the field to determine whether or not there is a gas-cap. To determine whether or not there is an extensive water-drive. So, the question you ask, Mr. Scott, is one that only the facts to be established in the future can establish.

Q Therefore, we don't know that the particular type of reservoir energy which you so ably showed us here is in fact-- I believe you did make the statement you thought water-drive might be in effect in the Devonian field but you have no proof.

A That is correct.

MR. SCOTT: That is all. Thank you.

MR. SHEPARD: Anyone else? If not we will hear from Mr. Campbell.

(Witness excused.)

60mm

VERNON TURNER,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. CAMPBELL:

Q Will you state your name?

A Vernon Turner.

Q By whom are you employed?

A By the McAlester Fuel Company.

Q You testified before this Commission at the original hearing in Case No. 269, did you not?

A That is true, Mr. Campbell.

Q I would like to get some information about this Denton field. Since the date of the last hearing has there been any additional well completions in the Devonian?

A Yes, sir, I believe there have been some five additional wells completed since the date of the last hearing.

Q Will you state briefly what wells have been completed?

A Atlantic Federal Jones No. 1, located in the SW SW OF Section 35; Atlantic State T-1, located in the SE SW of Section 2; McAlester-McClure B-1, located in the NW SE of Section 14; Ohio Denton No. 4 "D", located in the NE SW of Section 11; and Skelly State "F" No. 1, located in the NE NW of Section 2.

Q What then is the number of wells now completed in this field in the Devonian?

A I believe there are eleven.

Q Referring you now to the exhibit which is on the wall, on

61mm

left there, which has been marked Exhibit M-6, will you state what that is?

A That is an up-to-date north-south micro-log cross section showing the drill stem test results obtained on various wells in the field.

Q The wells completed since the last hearing are shown on the micro-log?

A Two of the wells.

Q Which are those?

A Atlantic State T-1 and McAlester McClure B-1.

Q Was one of the wells completed since the last hearing a well of the McAlester Fuel Company?

A Yes, sir.

Q Which well is that?

A The McAlester McClure B-1.

Q Where is it situated?

A On the edge of the south end of the field as presently developed.

Q Referring now to the exhibit in the center on the wall, which has been marked Exhibit M-7. Will you state what that is?

A That is a map of the Denton field area showing in red the proposed spacing pattern by Phillips Petroleum Company with the exceptions that will be necessary to that proposed spacing arrangement shown in blue. In other words, the blue shows the present location of drilling wells which are not in the southeast or northwest 40 of the quarter section.

62mm

Q Will you point out to the Commission on that exhibit the locations of wells that have been started or commenced since the last hearing?

A Gulf's Chamberlain D-3, which is a location of, I believe, now drilling.

Q That is a direct south offset to the Gulf Chamberlain No. 2, isn't it?

A It isn't a direct offset in that it isn't in the center of the 40.

Q But it is in the 40 immediately to the south of the Gulf Chamberlain No. 2. And it is also a 40 acre offset to a well to the east, isn't it?

A That is true. We have the location of the McClure B-1, which has been approved but actual drilling operations have not been commenced.

Q What other well has been commenced?

A Gulf State G-2 is located in the southwest southeast of Section 2.

Q That well immediately offsets to the south, the Gulf G-1-D well, and that well is now a drilling well.

A Yes, sir. This morning it was drilling 4,190 feet.

Q Now, what other well--is there an Ohio well in Section 13?

A Yes, sir. Ohio Denton No. 5, which is the west offset to the discovery well of the field.

Q 40 acre offset.

A This morning it was drilling below 380 feet.

63mm

Q That is also a 40 acre offset to the Ohio Denton No. 4 to the north?

A That is true.

Q And those wells have all been commenced since the original hearing?

A That is true.

Q And are there additional location to the north that have been approved but their wells have not as yet been commenced?

A Well, there is an approved location in the SE NE of Section 2 which is the McAlester State D-1.

Q And I believe there is a location in the SE of the NE of Section 14?

A That is true. McClure D-1.

Q And both of those are 40 acre offsetting well locations are they not?

A That is correct.

Q In other words, five wells, three of which have been commenced and two of which locations have been obtained for since the last hearing, all of them are 40 acre north, south or east offsets?

A That is correct. The total of the completed Denton wells, drilling wells, and location, twenty-five of those can be construed as direct offsets.

Q And not diagonals as the proposed pattern would suggest. Now, referring to Exhibit M-6, and to the McClure B-1, which has been completed since the last hearing, and is the well fartherest

64mm

south in the field, will you state what that micro-log shows as to permeability in that well?

A It shows a rather poor section in the Devonian pay, and the permeability is indicated to be rather erratic.

Q Was it necessary to acidize that well?

A Yes, sir. Following preparation, the well flowed only by head, wasn't capable of making its assigned allowable.

Q In your opinion, based on your present information and the production you have in that well so far, would it make a single allowable with a deep well adaptation?

A I question seriously whether it will make an assigned allowable from the present zone.

Q Now, what was the dip in structure from the well immediately north of that McClure B-1 to the McClure A-1 on top of the Devonian?

A From the McClure B-1 to the McClure A-1 there is a direct offset at 1330 feet and your dip is 636 feet.

Q In other words, 636 in a 1330 foot step up?

A That is correct.

Q If the dip continues at the same rate, what would be the effect if you step over the 40 and drill an 80 acre location?

A I question whether you would obtain a producing well at all. Probably be a dry hole.

Q And it still probably would have been necessary to go back and drill the location to the north?

A As a matter of self-protection.

65mm

Q Now, the wells you have previously had in the field, is there one well which you are now deepening?

A Yes, the McClure C-1, located in the NE NE of Section 14.

Q That is now producing from the Devonian, it was producing from the Devonian?

A No, sir. We drilled to the Devonian and ran a number of drill stem tests. We plan to take the well to the Ellenberger to 14,000 feet.

Q In other words, you are going to explore the possibilities of another producing zone?

A This morning it was drilling below 13,826 feet.

Q Considering the development in this field todate and assuming the application for fixed pattern, 80 acre spacing in the NE SW corner of each quarter section is approved, together with the double allowable which has been recommended with the deep well adaptation for the wells now producing in this field, what in your opinion will be the effect on this reservoir?

A Well, in spite of Dr. Kaveler's testimony, I would strongly feel that the permeability and pressure would be injurious to the reservoir.

Q In your opinion, would that cause waste of oil?

A It would cause underground waste.

Q Why would that be true?

A Well, you have high rates of flow in certain areas of the field which tend to create low pressure areas. A number of wells will not be capable of producing presently the double allowable in 40 acres without releasing so much gas and dissipating

66mm the reservoir energy.

Q Do you know how long it takes a well on a 40 acre location with the present allowable and deep well adaptation, to pay out in that field?

A Approximately 15 months.

Q Even though it costs $270,000?

A That is correct.

Q In your opinion, is it necessary to have 40 acre spacing in that field to properly utilize the reservoir energy?

A As the field has been presently developed on 40 acre spacing, in order to allocate 80 acre units to each well already drilled, it will be necessary to include diagonal offsetting acres. And in my opinion, considerable dry acreage would be included in the field limits. Producing at double allowable would certainly dissipate the reservoir energy excessively.

Q At the original hearing I believe you testified there were areas of low permeability in this reservoir that would not be drained by 80 acre spacing.

A I believe that is true. I think we have adequate evidence, at least in my opinion.

Q You also testified 40 acre spacing would result in more efficient drainage of the field? Is that still your opinion?

A Yes.

Q I believe you also testified the producing of these wells in a water drive field at a high rate could cause channeling, and by-passing of oil. Is that correct?

A I think that could be true. Or would probably travel in

the zones of high permeability, by-passing oil in the more dense streaks.

MR. CAMPBELL: That is all.

CROSS EXAMINATION

By MR. FOSTER:

Q Now, Mr. Turner, I want to ask you a question or two about this clustering up there. What is the point you are making about the clustering of these wells?

A Well, you have, I believe, those twelve either completed, drilling or locations in the north end of the field at the present time.

Q Yes.

A You have approximately the same number on the south end of the field. If you allocate acreage on which no well is now drilled, certainly this area in the middle here will not have a well drilled on it.

Q Well, all you are saying there is the wider the spacing the fewer wells you drill. We all agree with that. You were talking about a clustering of wells up there being of some injury or something, bringing about some injury to the field or reservoir, weren't you?

A That is true. I have two wells in point here, Mr. Foster. The evidence was presented at the last hearing on the draw down of those two wells. If you would like to go back into this again--

Q No, I am trying to find out about these so-called clusterings of these wells resulting in some injury to the reservoir. How

68mm does that occur?

A All right. Under your proposal you plan to double the take from each of these wells that is now completed.

Q Let me correct you about that. We don't plan to double the take at all. We suggested to the Commission it give twice as much allowable to an 80 acre well as a 40 acre well. Whatever they fix it at, that would be it. That would have to depend on different considerations from the spacing pattern.

A But that was your recommendation.

Q Yes, sir. But what I am trying to find out about is how a clustering of these wells is injuring the reservoir?

A Well, the wells that are now completed, that is where you are going to take the oil out of the reservoir, is that true?

Q What is that?

A The wells that are now completed. That is where you are going to take the oil out of the reservoir?

Q Yes, that is true with respect to any well.

A All right. We think we have sufficient evidence to justify the opinion that a number of zones in the Devonian pay consists essentially of a closed system due to low permeability.

Q You are saying this is not all one common source of supply. That is what that language means, isn't it?

A I am saying, due to the variation in permeability and the erratic nature of the formation, I don't believe that one well to 80 acres will adequately develop it.

69mm

Q All right. Now just for the purpose of argument, I am going to agree with you but I want to get back to how the clustering of wells brings about any injury to the reservoir.

A All right. I believe certain zones in the reservoir are connected throughout the reservoir. Certain zones have high permeability. That is where your oil production is going to come from. If you have a zone that is essentially a closed system in one part of your field, and assuming you have a water-drive, and it is going to replace a barrel of oil which you take out of the reservoir, I believe the reservoir will encroach along the zones of high permeability and by-pass oil in the lower permeable veins.

Q Will that be caused by the so-called clustering of these wells?

A That would tend to aggravate that condition, yes, sir.

Q That would happen no matter where you drilled a well.

A If you have twice as many wells drilled into a reservoir, you certainly have less chance of leaving oil in the ground due to not developing a low permeability zone.

Q Well, that still don't satisfy my curiosity about the clustering of these wells. What do you mean by clustering of wells?

A Well, wells that have been drilled and developed on direct 40 acre offsetting tracts.

Q What?

A Wells that have been drilled and developed on direct 40 acre offsets.

Q You would have the same clustering on 80 acres wouldn't you?

70mm

A Well,--

Q You would have a clustering under that definition of it/under 80 acre spacing wouldn't you?

A Not withthe exceptions we now have.

Q What I am driving at, Mr. Turner, is this. Under any spacing pattern, you have a clustering of wells.

A Well, if you feel--

Q Whether 10 acres or 20 or 40 or 80, you still have a clustering of wells, don't you?

A If this field had been developed on your longer pattern, you still would have some clustering of wells. You might have to get off the structure in order to do it.

Q Why not develop it on 80 acre spacing until we find out more about what the reservoir conditions are?

A Judge Foster, it has already been developed on 40 acres.

Q Not all of it.

A Twenty-five wells or direct offsets.

Q I understand that. But what is the extent of this pool?

A I don't know.

Q Hasn't it been estimated about 42 wells can be drilled in the pool?

A That may be true. I am not familiar with it. The pool may be defined on the south as of right now.

Q Well, do you think that the pool is all one common source of supply?

A I think there are zones in that reservoir that are interconnected throughout the reservoir. I think there are other zones

71mm of low permeability that maybe connect two or three wells and maybe close up.

Q Under that statement do you think it is one common source of supply?

A Well, under the ordinary conception of an oil and gas reservoir, I say it is, yes. That is a condition you find in any reservoir.

Q You find tight spots in any oil field?

A Yes, sir. I don't believe to the same degree we have here, however.

Q What does the spacing of wells have to do with the rate of production?

A Well, I have been going under assumption that your recommendation for 80 acre spacing was accompanied by the request for double the present allowable for deep well adaptation.

Q I understand that is our application. But what does spacing have to do with the rate of production?

A Well, sir, our McClure No. 1, which was the discovery well, will not produce much in excess of the present allowable. Now, as far as spacing itself, that is a separate problem.

Q That's right. In other words, spacing doesn't have any relation to the rate of production.

A No, sir.

Q All right. Now, you would determine what the spacing pattern in this field is to be on an entirely different basis from what you would determine the rate of production on any individual well should be, wouldn't you?

72mm

A Yes, sir. But my contention is it is already developed on 40 acre spacing.

Q That doesn't make any difference. What I am talking about is whatever spacing pattern you have in the field, whether 40 or 80, the considerations for that determination are entirely different from the factors that would go into the rate of production for the wells.

A That is true.

Q And for that reason there would be no relationship between the spacing pattern and the rate of production.

A Except your attempt to tie the two together in your original application.

Q I understand that. But the fact that we recommend a double allowable for wells on 80 acres doesn't condemn 80 acre spacing.

A No, sir.

Q Not at all?

A That is a separate problem entirely.

Q That is a separate problem entirely, and something the Commission can control whichever way it wants to control, can't it?

A That' s right.

Q Whatever the rate of production ought to be can't determine what the spacing pattern should be? Isn't that correct?

A That is correct

Q All right. Now, you say there has got to be a lot of exceptions allowed in this field if we adopt 80 acre spacing?

A Examples or exceptions.

Q Examples or exceptions to the way we propose to develop the field.

73mm

A Approximately half.

Q Let's say half of all wells drilled inthe field will have to be exceptions because of the present way the field has been developed. Would you say that would condemn the adoption of 80 acre spacing if otherwise it is shown?

A It would certainly bring into focus a number of problems, several of which I am not in a position--

Q I understand that, but does that condemn 80 acre spacing?

A No. But the effect of these other problems entering into consideration.

Q But there would be no relationship between the present pattern of development and what the proper pattern should be.

A Well, there is nothing that has happened since the last hearing that has changed my opinion on it, and what the spacing pattern should be.

Q I am not talking about that at all, Mr. Turner. I am sure of that. Your statement is correct. But what I am saying is, the fact that, you have developed the field, as you developed it, on 40 acre spacing doesn't within itself condemn the adopting of 80 acre spacing?

A No, sir. Except for these other factors--

Q Oh, I know there are other problems created.

A Yes, sir, and very important, too.

Q I understand that, but that doesn't condemn 80 acre spacing.

A I am sure it doesn't in your opinion.

Q I don't have any opinion about this. I am trying to get yours.

A I am trying to give it to you.

74mm

Q It doesn't condemn 80 acre spacing does it?

A That depends on the way you look at it.

Q Well, all right. Let me ask you this. If you adopt 80 acre spacing for this field and drill, as a matter of fact, one well won't sufficiently and adequately drain 80 acres, you can always go back and drill under 40, can't you?

A That would be true.

Q That is true, isn't it?

A Yes.

Q But if you develop this pool and continue to develop it on 40 acre spacing and then it should be determined that you should have been on 80 acre spacing, you can never drill 80 acre, can you?

A That would follow.

Q That is true isn't it?

A That would follow, yes.

Q All right. Now, I am not interested just in this Denton Pool. I am talking about a matter of principle in the application of it to spacing patterns an deep production. In other words, what you have got in this pool now is the result of the fact that probably you didn't have wider spacing provisions, is that correct?

A That is a problem for the Commission. I am not on the Commission.

Q No, that isn't a problem for the Commission in answering my question. But the problem we have got now in this field with the way it has been developed is due to the fact that you had only 40 acre spacing before.

A I assume that is true.

75mm

Q In other words, if you had started out developing this field on 80 acre spacing you wouldn't have the problems that you have mentioned.

A I think, roughly speaking, a number of problems would have arisen, yes, sir.

Q Not the ones you are talking about. Maybe some other problems but you wouldn't have these.

A The question would still arise whether one well would adequately drain 80 acres.

Q I agree with you. But if you had started out originally in this field with 80 acre spacing, then you would not have all this problem of making these exceptions for these 13 or 14 wells you have there?

A No.

Q It would have cured that. And it would have also cured all th other problems that result from those wells being drilled on 40 acres.

A What do you mean by all the other problems?

Q You mentioned them.

A There is a multitude of problems involved in this thing.

Q I understand that, but if you had properly started in this field with 80 acre spacing, then you would not have the problems that grow out of thefact that you have wells located in 40 acre patterns and therefore have to make exceptionsto them .

A Yes, sir, but--

Q That is true, isn't it?

76mm

A That is true. But we are not dealing in probabilities. We are dealing in realities and facts.

Q I know that. But it is a reality to look a little forward and not let the same thing occur again, if as a matter of fact we ought to go to 80 acre spacing. That is sound, isn't it?

A Yes, sir, I believe that is sound.

Q All right. With respect to applying 80 acres in this particular field, isn't the situation pretty much like this: It is a question whether you want to cut off both legs or just cut off one leg?

A I don't follow you there, I want to keep both of them.

Q Of course, you want to keep both legs. But suppose the Commission should decide they ought to adopt 80 acre spacing, in this field? Now, that brings about a large number of exceptions, that you spoke of. That is what I call cutting off one leg, is these exceptions; but if you want to adopt 80 acre spacing in this field then I'd adopt it and cut off one leg rather than amputate two or to cut off both by staying on 40.

A On this particular field I am not admitting--

Q I am not asking you to admit that. All I am doing is making an assumption here. We have a controversy between the parties as to whether we ought to adopt it or not. If you make the assumption you ought to adopt an 80 acre plan you would just be cutting off one leg.

A I am not making that assumption. You are making the assumption.

Q I am making the assumption. We could be right about this.

77mm

A You could be, but in our opinion--

Q That is what I am talking about. That is for the Commission to decide. But whether right about it or not, take this point, go ahead and adopt 80 acre spacing on a temporary pattern, how can you get hurt on that?

A The field is already developed on a 40 acre pattern.

Q I understand that. But how does it hurt you?

A Does Phillips want to unitize a productive 40 acre tract with a dry 40 acre tract?

Q Are you asking me that question?

A Well, I just made the statement. I don't believe you would.

Q It is obvious no one would want to do that, Mr. Turner.

A Geological testimony that will be presented later will adequately show the steep dips--

Q What adjacent 40 acre tracts are there there?

A Sir?

Q What dry tracts, 40 acre tracts, are there in this field?

A Going strictly on a dip basis, the 40 acre tract south of our McClure No. 1 is apt to be dry.

Q Is that the only basis?

A On what other basis would you go?

Q I don't know. I am asking you.

A There is an assumption.

Q Have you drilled any dry wells in that field?

A Yes, sir.

Q Where is it?

A The Walter A-1.

Q What offsets to the present wells are dry 40 acre offsets?

78mm

A Well, I can't call them to your attention at the present time.

Q You don't know, do you?

A This Atlantic D-1 may well be a marginal well.

Q What do you mean marginal well?

A It may be close to the oil-water contact.

Q That wouldn't be dry.

A For all practical purposes it would.

Q Give me a definition of a marginal well.

A One that penetrated a very limited section of the pay which would not pay for the amount of pipe that would be required to complete it.

Q Is that your definition of a marginal well?

A In general terms yes.

Q And you had that definition in mind in answering my question there about that well being--

A No, sir. That is just off-the-cuff, so to speak.

Q Mr. Turner, do you subscribe to the public policy of this state as announced by the legislature that an operator in an oil field shouldn't be required to drill more wells than is necessary an efficiently and economically drain the pool?

A Mr. Foster, can you assure me that by developing this field or continuing to develop it on a 40 acre basis that enough additional oil will not be recovered to pay for those 40 acre locations, would be less than what would be produced on 80 acre spacing?

79mm Q Mr. Turner, if we could answer those questions we wouldn't have this controversy.

A That is correct.

Q I am asking you if you subscribe to the public policy of this state as announced by the legislature that an operator of an oil field shouldn't be required to drill more wells than is necessary to efficiently and economically drain the field?

A Naturally I would, yes, sir.

Q You subscribe to that?

A Yes, sir. But I think the Commission is very much interested in obtaining maximum oil recovery from the reservoirs of this state.

Q You subscribe to this declaration of public policy found in the statutes of this state that the drilling of unnecessary wells creates fire and other hazards in an oil field?

A Judge Foster, that is a point which I consider of minor importance.

Q Well, whatever weight you may give to it, do you subscribe to that policy?

A Well, if the drilling of one well to each 40 acre tract instead of drilling one well to every 80 acre tract would aggravate that situation, I would subscribe to it then.

Q It says here, "An operator shall not be required directly or indirectly to drill more wells than necessary to economically and efficiently drain the pool." Do you subscribe to that public policy of this state?

A You say unnecessary wells.

80mm

I can't--we get back to the same point again. I don't know that one well to a 40 acre tract would constitute--

Q I don't either. But do you subscribe to this declaration of public policy?

A I have already stated I did.

Q Do you subscribe to the public policy of this state that the drilling of unnecessary wells "creates fire and other hazards conducive to waste, and unnecessarily increases the production cost of oil and gas to the operator"?

A That would certainly be true.

Q Do you also subscribe to the public policy of this state as declared in the Statute by the legislature that the increased cost to the operator also increases the cost of the product to the ultimate consumer?

A If the drilling of one well to each 40 acre tract constitutes that, yes, sir.

Q All right. Would you say that as a matter of public policy in this state you ought to drill only the necessary wells that have to be drilled in the field?

A I would subscribe to that, yes, sir.

Q Now, let me ask this question. If you can adopt a policy of this--strike that. This field here could have been developed on 80 acres, could it not, if you had started out in the inception with the discovery well?

A Well, then, the field could have been developed on 160 acre spacing or any other.

81mm

Q It could have been developed on 80, could it not?

A Yes, it could.

Q Tell me how if you had started out originally in this field to develop on 80 acre spacing, how it would have resulted in any injury to anybody in the field?

A Well, the fact remains that the field wasn't developed on 80 acre spacing--

Q I understand that, Mr. Turner. And my question implied that I understand that. But tell me how, if you started out with the original discovery well in this field on 80 acre spacing that anybody would have been injured in this field?

A Well, why not drill just one well, and get everybody to agree to allocate such and such a percentage of this reservoir to every one around there and work it out in that manner.

MR. FOSTER: Yes, sir. I believe that is all.

REDIRECT EXAMINATION

By MR. CAMPBELL:

Q Mr. Turner, Judge Foster made reference to the problems we are faced with in reference to this reservoir. Until this application for 80 acres spacing was filed, you didn't have problems in this field, did you?

A None that I know of.

Q That is not your problem?

A No.

Q You are satisfied with the way this field has been developed on 40 acre spacing?

A Yes, sir.

82mm Q Your company is willing to go ahead and develop on 40 acre spacing?

A Yes, sir.

MR. CAMPBELL: That is all.

MR. SHEPARD: Any further questions. Does anyone have a statement to make. Anyone else have a statement to make? You may be excused.

(Witness excused.)

KEM MERREN

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

By MR. CAMPBELL:

Q State your name please.

A Kem Merren.

Q By whom are you employed?

A McAlester Fuel Company.

Q Did you testify at the original hearing in Case No. 269?

A I did.

Q I refer you to the exhibit on the wall marked M-8 and ask you to state what that is.

A That is our interpretation of the structure, on top of the Devonian. The contour interval is 200 feet.

Q Does that structure map bring up-to-date, based on information obtained since the last hearing, your knowledge of the structure?

A Yes, sir, it does.

83mm Q What additional control do you have now?

A On the east and the south.

Q Those are the wells--

A The Atlantic Dickenson A-2 and the McAlester McClure B-1.

Q State briefly what conclusions you draw from that structure map.

A Well the very steep dip on the south and the southeast. At the last hearing we had assumed the rate of dip to the southeast here to 1900 feet to the mile. Using an estimated top in this Atlantic Dickenson A-1 because at that time we had not reached the Devonian. We now have that top and it is lower than we estimated, and gives the rate of dip to the southeast to 2700 feet to the mile.

Q What in your opinion, would be the effect of 80 acre operational units, assuming in the situation we have here with the exception there would have to be some east-west or north-south operational units, what would be the effect on defining the exterior limits of the field?

A Take in 80 acre spacing and you would be very likely to have one 40 productive and the other dry.

Q As a geologist would you recommend to your company skipping over a 40 acre tract when the flanks dip so sharply?

A I certainly wouldn't.

Q At the original hearing you testified the information available indicated to you there was a wide variation in the permeability in the reservoir.

84mm

A I still have that opinion and it is further borne out by our McClure B-1 the southern-most well, which at this time will not make the present allowable.

Q Is it still your opinion to properly develop this field to drill wells on 40 acre tracts?

A That is my opinion.

Q Is it your opinion that the drilling of wells on 80 acres tracts might cause waste in this field?

A It is.

MR. CAMPBELL: That is all.

CROSS EXAMINATION

By MR. FOSTER:

Q You say if you had 80 acre spacing you might drill out on an 80 acre tract and find one 40 dry and the other productive?

A That's right.

Q How do you know both wouldn't be dry?

A In that case I was referring--what Atlantic Dickenson A-2, suppose we had stepped out another 40 to the east. It would certainly be a dry hole because in all probability it is going to be a marginal well.

Q The Commission could handle that situation by just reducing the allowable if you had part of it dry.

A That's right. I feel certain at that depth, if you had half the present allowable, 295 barrels--

Q But after all the Commission decides what they are entitled to.

85mm A Yes, sir.

MR. FOSTER: That's all.

BY MR. WHITE:

Q If a certain number of the present wells cannot produce their regular allowables, and 80 acre spacing is adopted and double allowable given them, would that be more likely to lead to coning of the wells than on 40 acre spacing at half the allowable?

A Yes, and I would also like to add in answer to the question, I think on the flanks of the field, both on the south and east sides, where it is so steep, that when the wells are drilled that fairly close to the water, we are going to have that same low permeability. And in all probability they will not make the present allowable.

MR. WHITE: That is all.

MR. SHEPARD: Any further questions? If not, you will be excused.

(Witness excused.)

MR. SHEPARD: Any more witnesses, Mr. Campbell?

MR. CAMPBELL: No. Do you wish to make another statement, Judge?

MR. FOSTER: No, sir.

MR. CAMPBELL: I want to say just a few words. It seems to me there has been essentially no information introduced by the applicant in this case at this re-hearing with reference to this particular field that wasn't introduced at the last hearing. The only evidence as to additional data on this field has come from the McAlester Fuel Company, who believe this field should continue

86mm to be developed on 40 acre spacing. And these witness have testified in their opinion the additional information substantiates our previous views. Since the Commission apparently felt in the first instance Phillips Company had not justified the acception to the 40 acre pattern, which has been started, and introduced no additional evidence today, it occurs to us the Commission ought to continue in effect the order which it issued at the end of the last hearing.

MR. SHEPARD: Any other statements?

MR. HUGHSTON: Like Mr. Foster, we think these hearings should be more or less conferences, and we have a few comments to make. Both concerning 80 acre spacing generally and concerning the application to this particular field.

As a matter of basic principle, Shell is not opposed to 80 acre spacing in those cases in which the evidence as to formation conditions clearly shows that one well will adequately drain 80 acres and where it is clearly shown that an 80 acre pattern can be carried out doing equity to all lessees and mineral owners. It has been suggested here that the Commission might limit 80 acre spacing to deep fields hereafter discovered by providing in its general spacing rule that in such fields early development should take place on such a spacing pattern. Such an application, entirely prospective in nature, appeals to your speaker as the most sensible approach to such a matter and while he is not authorized to speak on behalf of the Shell Oil Company on such an application which was not within the scope of this call and was therefore not discussed with him, he feels that Shell Oil Company would probably support the same.

What we are directly concerned with today is the application of 80 acre spacing to the Denton field. Let us therefore consider whether the evidence shows that in this particular field one well will adequately drain 80 acres and that an 80 acre pattern can be carried out so as to do equity to all lessees and mineral owners.

As to formation condition, we have acreage in this field, but as yet we have no producing wells. We thus have not accumulated any evidence of our own on which to base an opinion as to the adequacy, from a drainage standpoint, of 80 acre spacing in Denton. The evidence on this point has been conflicting, and it is, of course, for the Commission to decide such conflict.

We do direct attention to the fact that the evidence has shown that 40 acre wells show a high profitability so that 80 acre spacing is not required from this standpoint of economics in this particular field.

Since for years New Mexico has followed a 40 acre pattern as a standard, and since this field has been developed to date on such a pattern, it is our belief that no order should issue varying that pattern unless the evidence clearly shows that the purposes of conservation of oil and gas will thereby be promoted and protected, and unless it is also clearly shown that no inequity will result therefrom to lessees and mineral owners as regards their correlative rights. We feel that it has not been shown that the plan here proposed will not violate our correlative rights for the following reasons.

88mm It was first proposed that 80 acre proration units be established by including in one such unit two diagonal 40 acre tracts. We oppose such radical departure from conservation practices both because such plan has no basis under sound conservation and because such plan would violate our correlative rights as lessees, the correlative rights of other lessees similarly situated, and the correlative rights of mineral owners under tracts affected.

(a) Such Diagonal units are definitely contrary to the Commission's well founded policy, as laid down in its rules, that proration units shall be compact and as nearly as possible in the form of a square. This long established policy is but a sound statement of the conservation principle that the acreage attributable to a well should, as nearly as possible, represent the drainage area of that well.

(b) Under the diagonal unit plan, Section 2 eventually would have one more well than it would have if developed on rectangular 80 acre pattern and the formation of regular units in Sections 1 and 3 if and when these sections are developed would be prevented.

(C) In some cases the suggested diagonal units are not covered by the same basic leases and the creation of the units would require royalty owner joinder. In our own case, our 40 acres in the NW/4 SW/4 of Section 2 would be joined under the diagonal proposal with our 40 acres diagonally northwest in the SE/4 NE/4 of Section 3. Our 40 acres in Section 2 is State Land, whereas our 40 acres in Section 3 is privately owned

89mm To create such a unit, it would be necessary for both the State and these private owners to join therein. At the present time structural control in the field is not established. The State owned land in Section 2 appears to be favorably situated, but little is as yet known as to the unitization under the diagonal plan could be effected, or that, if effected, the rights of all parties would be protected.

(d) To our knowledge such irregular, diagonal shaped units have no precedent in New Mexico, and justly so. Certainly the rights and investments of the various leasholders, royalty owners and mineral owners should not be jeopardized and discriminated against for the sake of a proration unit scheme which will not be equally just to every interested party, and which provides for units not representing the drainage area of the wells thereon.

If 80 acre spacing is adopted in this field the alternate to composing proration units of diagonal 40 acre tracts is to compose the units of two adjoining 40 acre tracts out of the same section so that the units will be rectangular in shape. If 80 acre spacing is adopted in this field, this is the proration unit plan that we favor. However, it is obvious that the fourteen (14) wells already drilled and the eleven (11) other wells already located have largely been located on a 40 acre spacing and that as to many of such wells, it is now impossible to form 80 acre rectangular units and that therefore many 40 acre exceptions would have to be obtained. We therefore think that 80 acre spacing in this field is now

90mm impracticable. An instance of a 40 acre tract as to which it would be difficult if not impossible to form a rectangular 80 acre unit out of the same section is Shell's NW of the SW OF Section 2.

Reference to the plat of Section 2 shows that Skelly's SW of th e NW of Section 2 is the only 40 acre tract in Section 2 with which our 40 acre tract in that section could be joined to form a rectangular 80 acre unit. This is by reason of the drilling that has already taken place in the Section.

Unless Skelly would agree to such unit, we would be unable to put our 40 acre in that section in an 80 acre unit.

Skelly has been approached as to its willingness to form such unit. Skelly has sufficient acreage so located that it could drill and own its own wells on its own acreage without joining in a unit with our 40. To join with us would also give Skelly an extra 40 which would require the creation of another jointly owned unit with another operator. Skelly has stated that it is not interested in joining in the formation of a unit with our 40.

We are thus in the position of owning a forty acre lease on State land and of being unable to obtain another operator with other lands in Section 2 willing to unitize with it. This lease was acquired under a Statewide rule permitting a well on each 40 acre tract. If 80 acres is now required for a well, we will be denied the right to drill on our 40 acre tract. Both

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Shell as Lessee and this State of New Mexico as Lessor will lose the benefits for which the lease was granted, and a drilling right of long standing will be denied.

Even if a well is permitted on a 40 acre tract, a similar inequity will result if the allowable of that well, by reason of the field being on an 80 acre basis, is cut below what it would have been on the regular standard 40 acre pattern. Forty acres has long been the basis of unit allowable and is the basis upon which investments have been made. To reduce such allowable at this late date would be most inequitable and violative of correlative rights.

We might add that we are not the only operator in the field confronted with this problem of single 40 acre tract in a section.

We also think that part of the Phillips proposal which would restrict future well locations to the NW/4 and the SE/4 of each quarter section in the field would in this particular field prove inequitable; that

(a) Inasmuch as the structure is not defined and the limits of production are not definitely established, such a development pattern would probably lead to gross inequities between presently completed wells, and those wells which eventually will be completed; that

(b) It is evident, beyond any doubt, that the development to date in Sections 2 and 14 has followed a pattern of 40 acre spacing. In addition, and as is prudent, the majority of these

92mm wells were located so as to gain as much pay section as possible; and that

(c) If exceptions are to be granted to presently completed or drilling wells, many of which were located to gain structural position, then it would seem that similar exceptions should be given to any future wells so that they too might be located at the most favorable position on the structure.

(d) It is difficult to conceive of the Commission making mandatory any set pattern of well locations in this field which would cause some operators to drill the less desirable of two locations on an 80 acre unit. Such would be the case if the proposed spacing pattern were to be applied to acreage on the flanks of the structure.

For the reasons above stated, it is our position that the 80 acre proration units with specified locations, as proposed by Phillips, is inequitable, even if it be assumed (and we make no such assumption) that the evidence clearly shows that one well will adequately drain 80 acres.

We therefore respectfully submit:

1. That proration units composed of diagonal 40 acre tracts are violative of sound conservation practices and would result in gross inequities.

2. That the Phillips proposal as to designation of drill sites would violate the rights of operators as to future drilling.

3. That if 80 acre units are adopted, they should be rectangular in shape and confined to a particular section. If

93mm such plan is adopted, the owner of a 40 acre tract, upon showing that he cannot reasonably participate in the creation of an 80 acre unit, should be permitted to drill on his 40 acre tract, and the allowable of such well should not be reduced below what it would have been had a 40 acre spacing pattern prevailed.

What has been said so far is of particular application to the Denton Devonian field. As to the Denton Wolfcamp field our position is as stated at the first hearing on this matter. However, we wish to emphasize that if 80 acre spacing is adopted in the field, the owner of a 40 acre tract upon showing that he cannot reasonable participate in the creation of an 80 acre rectangular unit composed of lands within the same section, should be permitted to drill on his 40 acre tract, and the allowable of the well so drilled should not be reduced below what it would have been had a 40 acre spacing pattern prevailed.

MR. SHEPARD: Any other statements?

MR. BUCKLES: I represent the Sinclair Oil Company. The position of Sinclair in this 80 acre spacing has been heretofore announced to this Commission on other occasions. We are entirely in favor of 80 acre spacing where it can be done and the correlative rights of all parties adequately protected. In this present pod we do not believe correlative rights can be adequately protected should 80 acre spacing be ultimately granted by limiting the wells to the NW and SE of each quarter section. We think the operator should have the privilege of picking the better location on the 80 according to the structure, and thereby give

94mm both the royalty owner and the operator the benefit of protection of correlative rights, particularly in view of the fact that this pool being developed on a 40 acre spacing, that is flowing the wells in such a helter-skelter manner. Where these exceptions are allowed, that is throwing the offsets to a position where the correlative rights will not be adequately protected. So, with the allowance of such a spacing order on an 80 acre basis, we feel the operator should be given the right to select the position on the 80 for his location.

MR. SHEPARD: Anyone else?

MR. WHEELER: My name is J. D. Wheeler, representing the Ohio Oil Company. I should like to read a brief statement into the record outlining our position. The Ohio Oil Company would like to state to the Oil Conservation Commission of the State of New Mexico we are in support of Phillips application for 80 acre spacing with double allowable being granted to the well on 80 acre spacing. For wells in the Siluro-Devonian pool, for the reasons pointed out in the testimony, and particularly for the reasons that in this as in other deep fields to be discovered in the State of New Mexico, 80 acre spacing will enable field limits to be defined very rapidly. This is particularly desirable in order that reservoir engineering data and production statistics may be obtained from as large an area as possible in as short a time as possible; so that producing characteristics of the reservoir may be ascertained at the earliest possible time, enabling proper field rules and allowable schedules be set up for permanent operations. In these deep

95mm fields where wells may cost in excess of a quarter million dollars, the State of New Mexico and individual royalty owners and operators all stand to benefit from an 80 acre spacing program. That will certainly carry more exploratory drilling and conserve steel and more quickly promote operators to assess their new reserves and make appropriate plans for their more efficient operation. If, subsequent to development on 80 acre spacing, it is deemed advisable for the Commission by the operators or by royalty interest to develop on 40 acres, a hearing may be called and the determination made whether 80 acre spacing is adequate for full development or whether additional drilling should be undertaken to develop on 40 acres. If one of these deep reservoirs is developed on 40 acre spacing and it later develops 80 acre spacing would have been adequate, it has cost the operator twice as much money as necessary and twice as much steel as necessary.

That has a real effect on many operator's exploratory program, which in turn effects royalty interest in New Mexico. For example, to drill the four remaining wells necessary to develop Ohio's lease to 40 acre spacing will cost one million dollars. With the same money and pipe, probably six wildcat wells could be drilled. It is obvious such a program could be highly beneficial to the state, and necessary since the result would be to uncover undiscovered oil reservoirs.

MR. CAMPBELL: Isn't it true, Ohio Oil Company since the last hearing has started an offset well which is a direct offset to the discovery well?

MR. WHEELER: We have started a well---

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MR. CAMPBELL: It is still a 40 acre direct offset to two other wells, isn't it?

MR. WHEELER: By virtue of the fact that--in other words, we wouldn't have any place to go even on 80 acres.

MR. CAMPBELL: That is what we are trying to bring out.

MR. WHEELER: It is a normal location on the proposed pattern.

MR. SHEPARD: Any further statements?

MR. ANDREEN: My name is G. M. Andreen, representing the Magnolia Petroleum Company. I will give my statement to the reporter and save him a little work.

MR. SHEPARD: Thank you very much.

MR. ANDREEN: Magnolia Petroleum Company believes that the proper and adequate spacing in any field should be determined by engineering studies of the reservoir performance. It is our desire, and we believe it the Commission's desire, to base permanent spacing orders on engineering testimony regarding the ability of one well to adequately and efficiently drain an area equivalent to the size unit requested. This is a sound policy, however, a certain amount of development and reservoir data must be available before the engineers can arrive at the proper well spacing. Reservoir Behavior History can only be acquired with the passage of time and development must continue during this time; therefore, there is a definite need for some policy concerning the establishment of temporary spacing orders to govern development while Reservoir Behavior Data are collected.

97mm It is a fact that it is always possible to go from a drilled density of one well per 80 acres to a density of one well per 40 acres. However, after development has progressed on one well per 40 acres basis for a period of time it is usually difficult and sometimes impossible to assign 80 acres to each drilled well, even though the reservoir studies indicate that complete development of the field on 40 acre spacing would cause overdevelopment and the drilling of wasteful wells.

The preceding indicates that in the initial phases of development of a field the spacing should be temporarily controlled on wide spacing until the reservoir studies can establish the spacing necessary to adequately drain the reservoir. From an engineering standpoint such a system should prevent the drilling of unnecessary wells. However, from an investment standpoint it is not reasonable to contend that the application of wide initial spacing to all reservoirs, regardless of depth is warranted. In the case of relatively low well costs, which are normally associated with the shallower depths, it is possible to overdevelop a field and still retain a favorable overall economic situation. However, when the normal well costs are high the margin of economic safety is greatly reduced. It is thought that the problem presented in the Denton Field could be avoided in future fields if some Statewide Policy perhaps on a depth bracket basis; were adopted to temporarily control on a wide spacing the initial development of deep fields. Such action would allow time for the collection and

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analysis of reservoir performance history, and avoid overdevelopment. The savings in time, money, and material that should result could be used in the search for new fields. A well discovering a new field adds to the States' potential oil production and to its oil reserves both of which are necessary for any state to maintain or increase its stature among the oil producing states of this nation. An unnecessary well accomplishes nothing and is a waste of material goods.

The unqualified idea of more wells more oil is not compatible with modern engineering consideration of well spacing and reservoir performance. The establishment of allowables based on the ability of a reservoir to efficiently produce, plus encouragement of necessary pressure maintenance projects are the best methods available for increasing the ultimate oil production from a reservoir. After all, it is the energy available and not the number of wells that determines the amount of oil that will be produced.

I wish to emphasize again that Magnolia believes that well spacing in any reservoir should be based on engineering studies of the reservoir behavior and the suggested temporary controls are a means for gaining time to accomplish that purpose.

It is believed the preceding covers the background which has led to the problem present in the Denton pool. At the original hearing the Magnolia Petroleum Company supported the request for a temporary 80 acre spacing order of one years duration with drilling to be confined to the northwest and southeast quarters of each quarter section. Magnolia still feels that such an order

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is warranted and again urges the Commission to issue such a finding. In our opinion the data presented in this case indicates a possibility that one well will drain 80 acres in the Denton Siluro-Devonian reservoir. However, as far as we are concerned, the evidence is not yet conclusive enough to say that one well will drain 80 acres. Additional development and production history will be necessary to prove or disprove 80 acres as the proper and adequate spacing plan for the Siluro-Devonian reservoir. Very little information is available on the Wolfcamp reservoir and in my opinion it is impossible, at this time, to determine from reservoir performance any indication of the proper spacing. However, from the economic standpoint it appears expedient to develop the Wolfcamp reservoir on a wide spacing until sufficient data is obtained to prove what the proper spacing should be.

Since additional reservoir and production history is needed for both reservoirs in order to establish the proper spacing it is thought essential that future development be temporarily controlled to one well per 80 acres to allow time for the accumulation of suffiecient data to definitely determine the area adequately drained by one well. It is our desire to avoid the drilling of what ultimately may prove to be unnecessary wells and in view of the current material shortage it would indeed be unfortunate should this field be overdeveloped when such a condition could be avoided.

In regard to confining locations to specific quarter sections,

100mm I would like to present the Commission with Exhibits 1 and 3. Exhibit 1 shows the recommended spacing program under which the distance between wells is 1867 feet. Exhibit 2 shows what could happen if future drilling on 80 acres is not confined to specific quarter quarter sections. This situation would result if an operator attempted to make equi-distant offsets and as can be seen from Exhibit 2 it would be possible to have a distance of 3960 feet between wells. This is 226 feet further between wells than would exist on a regular spacing pattern of 320 acres per well. Exhibit 3 indicates what a regular 320 acre spacing plan would look like. Therefore in combination with a temporary 80 acre spacing order Magnolia recommends that drilling be confined to specific quarter quarter sections with provisions made for the granting of irregular locations after a hearing at which the testimony would prove that confiscation of property or waste would occur if the irregular well were not drilled.

It is possible that one of the reasons for the Commission denying the original application for temporary 80 acre spacing in the Denton Field was the abnormal units and the exceptions to off pattern wells that must be granted in order to establish temporary 80 acre development. I have already covered the reasons for the existence of this situation but it still remains a fact that the situation will not improve, and it is still possible to assign 80 acres to each well now in the field. Delaying or denying the application for a temporary 80 acre spacing order in the Denton Field could easily result in requiring unnecessary and wasteful wells.

101mm Magnolia is now drilling at approximately 11,000 feet on their Pope No. 1 well. This will be Magnolia's first well in the Denton Field. Because Magnolia has not had the benefit of production experience in this field, Magnolia has no comment to make on the allowables proposed for the wells on 80 acre units.

I would like to present the Commission with Exhibits 1, 2 and 3. They are attached to the copy of the statement there.

MR. SHEPARD: Any further statements? If not, this will be taken under advisement and we hope to hand down an order without any unusual delay.

Meeting is adjourned.

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STATE OF NEW MEXICO)
: SS.
COUNTY OF BERNALILLO)

I HEREBY CERTIFY that the foregoing and attached transcript of proceedings before the Oil Conservation Commission, in Cases No. 269 and 270, held on August 7, 1951, is a true and correct record of the same to the best of my knowledge, skill and ability.

DATED at Albuquerque, New Mexico, this 28 day of August 1951.

E. E. Greer
REPORTER

My Commission Expires: 8-4-52