Oral Testimony
Hearing - 7/16/53

BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

CASE 556: In the matter of the application of Phillips Petroleum Company for permission to effect a dual completion of its Fort Well No. 1, NE/4 NE/4 Section 34, Township 14 South, Range 37 East, NMPM, Lea County, New Mexico (in the Denton Pool), in such manner as to permit production of oil from the Devonian formation through existing casing perforations 12,536 to 12,710 feet, and oil from the Wolfcamp formation after perforating from 9680 to 9360 feet.

CASE 557: In the matter of the application of Phillips Petroleum Company for permission to effect a dual completion of its Fonzo Well No. 1, NW/4 NW/4 Section 35, Township 14 South, Range 37 East, NMPM, Lea County, New Mexico (in the Denton Pool), in such manner as to permit production of oil from the Devonian formation through existing casing perforations 12,456 to 12,680 feet, and oil from the Wolfcamp formation after perforating from 9590 feet to 9260 feet.

(contd next page)

TRANSCRIPT OF HEARING

_____
Date

BEFORE: Honorable Ed. L. Mechem, Governor
Honorable E. S. Walker, Land Commissioner
Honorable R. R. Spurrier, Director, OCC

STATE OF NEW MEXICO)
ss
COUNTY OF BERNALILLO)

I HEREBY CERTIFY That the within transcript of proceedings before the Oil Conservation Commission is a true record of the same to the best of my knowledge, skill, and ability.

DONE at Albuquerque, N. M., this _____ day of _____ 195____.

E. E. Greeson

My Comm. Ex.:
August 4, 1956

E. E. Greeson
Notary - Reporter

CASE 558:

In the matter of the application of Phillips Petroleum Company for permission to effect a dual completion of its Denton Well No. 12, SW/4 NW/4 Section 11, Township 15 South, Range 37 East, NMPM, Lea County, New Mexico (in the Denton Pool), in such manner as to permit production of oil from the Devonian formation through existing casing perforations 12,600 to 12,700 feet, and oil from the Wolfcamp formation after perforating 9590 to 9230 feet.

CASE 559:

In the matter of the application of Phillips Petroleum Company for permission to effect a dual completion of its Denton Well No. 13, NW/4 NW/4 Section 11, Township 15 South, Range 37 East, NMPM, Lea County, New Mexico (in the Denton Pool), in such manner as to permit production of oil from the Devonian formation through existing casing perforations 12,580 to 12,730 feet, and oil from the Wolfcamp formation after perforating 9580 to 9150 feet.

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MR. SPURRIER: We will move on to the next case on the docket.

I believe we can consolidate Cases 556 through 559. Without objection, we will try to do that.

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

(Off the record.)

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E. N. WASHBURN,

having been first duly sworn testified as follows:

DIRECT EXAMINATION

BY MR. PEACOCK:

Q Please state your name.

A E. N. Washburn.

Q And your address?

A Bartlesville, Oklahoma.

Q By whom are you employed?

A Phillips Petroleum Company.

Q For how long?

A I am working my twentieth year.

Q In what capacity?

A Engineer; petroleum engineer.

Q Have you testified before this Commission before?

A I have.

MR. PEACOCK: Is the Commission satisfied with Mr. Washburn's qualifications?

MR. SPURRIER: It is.

Q Mr. Washburn, for the record, we will be discussing the four wells concerned in the four cases Nos. 556 through 559. These wells will be generally denominated as the Fort No. 1, the Fonzo No. 1, the Denton No. 12 and the Denton No. 13. Are you familiar with these wells?

A Yes, sir, I am.

Q Are these producing oil wells at this time?

A Yes, sir.

Q From what formation do they produce?

A All four are presently Devonian wells.

Q At what depth is the Devonian formation?

A At approximately 12,500 feet.

Q How thick, measuring vertically, is the Devonian?

A In these wells in question: The Fort has approximately 147 feet of Devonian; the Fonzo has approximately 365 feet; and the Denton 13 has 948 feet; and the Denton No. 12 has about 620 feet. That is productive footage. It is approximately 200 feet more than that in the actual Devonian formation.

Q Are these presently flowing wells?

A They are.

Q Does the Wolfcamp formation lie above the Devonian formation in each of these wells?

A Yes, sir.

Q At what depth does the Wolfcamp lie?

A Approximately 9250 average.

Q How thick is the estimated Wolfcamp pay in the Fort No. 1?

A The productive footage is approximately 22 feet.

Q Do you have micro-log which reveals that information?

A We do.

MR. PEACOCK: I offer this micro-log in evidence

as Applicant's Exhibit 1.

Q Will you examine this micro-log section on the Fort No. 1 and, for the record, point out approximately the pay sands revealed by this micro-log in the Wolfcamp?

A The zone that we propose to perforate would be considerably more footage than the micro-log shows is actual porosity. We do that mainly so that we will get it all. The first zone is between 9645 and 9680, in which - it possibly goes below water-oil contact, and we have approximately five feet of porosity.

The second zone is 9580 to 9610, which contains approximately thirteen feet of porosity.

The third zone is 9500 to 9550, which contains approximately fifteen feet of porosity.

And the upper zone is 9360 to 9460, 100 feet of perforation for five feet of porosity. The porosity totals to about 38 feet.

But, based on examination of other cores from the Wolfcamp, we estimate about 22 feet, about two-thirds of that will be productive.

Q How thick is the Wolfcamp pay sand in the Fonzo and the Denton Nos. 12 and 13 wells?

A I don't have a micro-log of those wells. We estimate the footage in the Fonzo is about 35 feet of productive porosity, and that the two Denton wells will have probably

fifty feet of productive porosity.

Q Other than what you have told us about the conclusions of the Wolfcamp formation, is there any additional information that you have concerning the quality of the Wolfcamp formation in this area?

A You refer to its recovery?

Q Is it lime or --

A It is a lime, embedded with shale streaks.

Q Is it considered a tight formation in this area we are concerned with?

A Yes, it is considered tight.

Q What is the estimated total recovery from the Wolfcamp sand in the Fort No. 1?

A It is generally, from information that we have, we estimate recovery will be approximately 77 barrels per acre foot.

In the Fort well it would have a recovery of approximately 1700 barrels per acres.

Q And the Fort is on a 40-acre unit?

A 40-acre unit, which would give it a recovery of approximately about 68,000 barrels.

Q What would be the estimated total recovery from the Fonzo No. 1 well?

A I would estimate the Fonzo would have approximately 3000 barrels per acre, or about 120,000 barrels on a

40-acre unit.

Q Would the Denton No. 12 -- Do you have figures on the Denton No. 12 and 13?

A They would probably have a recovery of about 4500 barrels per acre, or about 180,000 barrels for the 40-acre unit.

Q What would a 12,000 foot well such as the four wells under consideration cost to drill?

A The Devonian wells are priced about $320,000 each.

Q Does that include storage, taxes and lease cost?

A No, it doesn't.

Q What would it cost to complete a well to the Wolfcamp formation on these four units under discussion?

A Based on the price of six Wolfcamp wells we have drilled in the Denton field, about $200,000.

Q Does that include storage, taxes and lease cost?

A No.

Q What would it cost to dually complete these four wells? That is, the Fort No. 1, the Fonzo and the Dentons 12 and 13, so that they could be produced both from the Devonian and the Wolfcamp formations?

A That price will vary. Probably thirty to forty thousand dollars.

Q Could it run slightly more or slightly less?

A It could run slightly more and with good success, it could be a little less.

Q The estimated total recovery from the Wolfcamp formation in the Fort No. 1 unit is - which you gave us a while ago - is that sufficient to pay back the drilling cost of another well completed to the Wolfcamp formation on that unit?

A No, sir, it isn't.

Q What can you say about the Fonzo No. 1 with relation to the estimated total recovery balanced against the drilling cost of a single well there?

A Considering lifting cost, royalties, production tax, income tax, and taking credit for depletion allowance, there possibly would be a break-even deal, not discounting your money that would be tied up for that period.

6b Q How long is the estimated economic life of the Devonian pay sand in this area?

A The Devonian is estimated to have a thirty to fifty year life. It may exceed that.

Q Now, these four wells which are now producing from the Devonian, are they flowing wells at this time?

A Yes, sir.

Q Is it your opinion they will continue to be flowing wells for as long as they are produced from the Devonian?

A No; they eventually would have to be artificially lifted.

Q Have you an opinion concerning the time at which artificial lifting methods must be applied to this Devonian sand?

A No, sir. I would say that it would be reasonable to expect the flowing life of the Devonian, most of the Devonian, will be flowing by the time the Wolfcamp is abandoned.

Q What is your opinion as to the economic life of the Wolfcamp in this area?

A The Wolfcamp in various studies has been estimated to be approximately ten years.

Q Is the Wolfcamp presently produced by flowing?

A Yes, sir.

Q Will it be able to be produced in that manner during the economic life of that Wolfcamp formation, or must artificial lifting means be applied there at some future date?

A Artificial lift will be required at a later date.

Q Therefore, is it your conclusion that the Wolfcamp will be depleted; that is, it will be at the end of its economic life before it is necessary to artificially lift the oil from the Devonian?

A That is a reasonable assumption; yes, sir, that's right.

Q Upon what do you base that?

A On various studies that we have made.

Q What is the difference in the bottomhole pressure between the Devonian and the Wolfcamp in the wells in this area?

A The Wolfcamp has approximately 3200 pounds and the Devonian has approximately 4500 pounds.

Q Will that pressure decrease as the fields are produced?

A The Wolfcamp pressure is declining at a faster rate than the Devonian.

Q Is the Wolfcamp and the Devonian oil corrosive?

A No; they are considered both sweet oil.

Q Is it considered that they will materially affect the seals which are placed outside the casing and at other places in dual completions?

A We wouldn't expect it to.

Q Has the Wolfcamp formation been sealed off from the Devonian in these four wells outside the casing?

A The wells have been cemented by two-stage cement jobs, using approximately six to eight barrels - I mean six to eight hundred bags - of cement.

In three casing temperature surveys, which were made after the second stage cement job, the cement was found between 2000 and 5000 feet.

In the Fort well 150 sacks were cemented and cir-

culated outside of the casing.

Q Is there any communication between the Devonian and the Wolfcamp in these wells?

A I can't answer that. We don't think there is.

Q Would an additional test for communication be made prior to the installation of any dual completion on these wells?

A That would be the standard procedure in dual completing a well, to run a retrievable packer to test communication outside the pipe before setting the permanent packer.

Q Will you explain what you mean by dual completion?

A The process of separating two zones by a form of packer and having a cross-over flow nozzle where you can arbitrarily produce either zone through either the annulus or the tubing.

Q What size casing is in each of these four wells?

A All have $5\frac{1}{2}$-inch casing.

Q What type of equipment is it proposed that would be used in dually completing these wells? That is, the equipment of what companies?

A We propose to use the Baker production packer and the Otis cross-over nipples.

Q Now, have you prepared exhibits which represent a true schematic cutaway view of the proposed dual completion

using Baker-Otis equipment?

A Yes, sir.

MR. PEACOCK: I would like to offer in evidence these schematic drawings as Applicant's Exhibits 2, 3, 4 and 5. Those are - There is one drawing for each of the wells under consideration.

MR. SPURRIER: Without objection, they will be admitted.

(Off the record.)

Q Will the methods shown allow oil to be flowed from both the Devonian and Wolfcamp formations in these wells without commingling?

A Yes, sir.

Q Is it proposed to measure the oil produced from each formation separately?

A It is.

Q Will you describe briefly the method proposed to perforate the casing to produce from the Wolfcamp?

A I previously covered that. Our geological department has picked four zones in each of the wells they would like to perforate and in order that we may get all the productive porosity in the well. Those four zones are shown on the left of each of the exhibits. It should be understood if any zone shows water, that that zone would be squeezed off. We may have one of the four zones squeezed

off. The first zone is possibly the water zone. It is the lowest zone.

Q Have you prepared an exhibit which represents a schematic cross section view of your dual completion equipment which would allow pumping from the top zone and gas lifting or flowing from the bottom zone of such a well?

A Yes, sir.

MR. PEACOCK: We would like to offer in evidence this Applicant's Exhibit 6.

Q Now, do all of these schematic drawings represent cutaway views of the proposed Baker-Otis dual completion equipment which we intend to use in dually completing these wells?

A The Baker-Otis equipment is the same. This combination on this last exhibit would not necessarily have to be used. There is all reason to believe that only one zone at a time would have to be artificially lifted in each of these four wells.

Q Is your reason for such belief that it is your opinion that the Wolfcamp will be depleted prior to the time that it will be necessary to pump the Devonian?

A That's right.

Q This Exhibit 6 represents a Kobe hydraulic pump. Is that the only type pump which may be used in a dual completion?

A No, sir. There is several combinations you could use if you had to artificially lift both zones at the same time. This is one.

Q Then you do not present this as the only possible means for artificially lifting oil from either or both zones?

A No, sir, although this arrangement is being used successfully in other wells, not by Phillips.

Q Can remedial work be done on a dual completion well such as squeezing and acidizing and other types of remedial work along those lines?

A Yes, sir.

Q How many dual completion wells does Phillips Petroleum Company have now?

A 122 dually completed wells.

Q How many of these dual completion wells are oil-oil?

A 51 at last count.

Q Does a dual completion represent a saving in steel?

A Yes, sir.

Q Over the drilling of two wells?

A In this case about 80 to 100 times.

MR. PEACOCK: That is all I have from Mr. Washburn.

MR. SPURRIER: Do you have another witness?

MR. PEACOCK: Yes, sir; I have two other witnesses.

MR. SPURRIER: Would you like to put them on now, or take the cross examination first?

MR. PEACOCK: Well, these other two will explain briefly the Baker-Otis equipment.

(Off the record.)

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CROSS EXAMINATION

BY MR. SELINGER:

Q Mr. Washburn -- For the record, my name is George Selinger, and I represent the Skelly Oil Company. -- Mr. Washburn, I didn't -- In your original testimony I didn't get quite the 50 some odd dual completions you have. Is that Phillips Petroleum Company, your operation?

A 51 oil-oil dual completions in all their operations.

Q Where do they lie mostly, just generally?

A There is about 25 of them in the Oklahoma area around the Ardmore area.

There are 37 of them in the West Texas area, and the remaining are in Louisiana and the Gulf Coast.

Q How many of your dual completions in Oklahoma are as deep as 12,000 feet?

A There is none of them I know of that deep.

Q Are there any 9000 feet, 9400 feet, in Oklahoma?

A No, sir.

Q Now, how many of your dual completions in West Texas are at 12,000 feet?

A I don't know the exact number. There is some.

Q Do you know of any that are at 9400 feet?

A Yes, sir.

Q Now, how many in Louisiana or the Gulf Coast of Texas are at 12,000 feet?

A The Gulf Coast is mostly around five and six thousand feet.

Q Do you have any dual completions at 12,000 feet in the Gulf Coast?

A I don't have any and I don't intend to have; no, sir, we don't.

Q You don't have any. Now, with respect to the Denton pool, you estimate you had 50 feet of effective pay inthe Wolfcamp in your Nos. 12 and 13 Denton; is that correct?

A Yes, sir.

Q Approximately. Now, to the east of - to the east on your twin wells drilled to the Wolfcamp, how many effective feet of pay do you have in those wells?

A I don't have that information here.

Q Is it more or less the same?

A The average for the field is about 53.

Q The average for the field is about 53, and these are 50.

A Yes, sir; approximately fifty feet. That is generous.

Q Well, then, insofar as Nos. 13 and -- 12 and 13 -- are concerned on the Denton lease, they are not below the average of pay thicknesses of the Wolfcamp producers.

A No, sir; they may be a little.

Q Now, you estimate you will recover 180,000 barrels of oil from each, approximately?

A Yes, sir.

Q You are saying those two wells will be uneconomic wells?

A No, sir; I am not.

Q Let's take the Fonzo well; you estimate you have 35 feet of effective pay in the Wolfcamp.

A Yes, sir.

Q Are there any offset wells to this well producing from the Wolfcamp?

A I believe there is one to the north. I don't have a map in front of me.

Q One to the north.

A My recollection is there is.

Q Do you know how much effective pay that well has in

the Wolfcamp?

A Not for sure; no, sir.

Q Is it more or less than what you estimate for your wells?

A I would estimate it approximately the same.

Q Is it a dual completion or a twin drilled well to the Wolfcamp?

A It is a twin well.

Q Who operates that?

A Magnolia.

Q I presume it is admitted there are no dually completed wells in the Denton pool; is that correct?

A That's right.

Q And this is the first attempt to secure dual completions for oil-oil in this field?

A The first to my knowledge.

7b Q Do you know how many Wolfcamp wells have been drilled in this field? If the latest records of the Commission indicate 96, is that approximately correct?

A I think it is.

Q In the neighborhood of 100 wells.

A I was thinking 93.

Q Do you know how many Devonian wells have been drilled?

A No, sir.

Q If the Commission records indicate 142, that is just about right?

A I have that information here. I can't find my information. I assume you're right.

Q That is all right. We can pass on and furnish that later. Now, all of the Wolfcamp wells that have been drilled have been drilled as twin wells to the Devonian, have they not?

A Yes, sir.

Q Now, with respect to the Fonzo No. 1. What is your opinion as to whether or not that is an economic well or an uneconomic well for the Wolfcamp?

A I would estimate the Fonzo was probably a break-even deal.

Q It isn't an uneconomic well in the sense of the term it will not pay back its drilling costs and operation?

A I don't think it would pay back its money if it was discounted.

Q You mean for profit and lease overhead. But I am talking about actual drilling cost and the cost of operations, physical field operations, and you are not saying to this Commission it will not pay that money back.

A It would probably be a break-even deal. It would probably pay the $200,000 back.

Q Are you figuring that 120,000 barrels at the latest price increase your company instituted?

A Yes, sir.

Q Now, Mr. Washburn, with respect to the actual mechanical means of dual completion, I believe you said all four of these wells are completed with 5½-inch OD casing; is that right?

A That's right.

Q And you estimate the flowing life of the Wolfcamp to be comparatively short, particularly as compared to the Devonian?

A Yes, sir.

Q Now, can you tell this Commission which of the horizons are producing water, if any?

A There is a little water being produced in each zone. The water in the Wolfcamp is more to the southeast.

Q Would you say that the Wolfcamp zone will eventually have more water productive each day as time goes on, rather than the Devonian?

A I would say the Devonian would probably produce more water.

Q To a larger extent than the Wolfcamp?

A Yes, sir.

Q Now, with respect to your 5½-inch casing, insofar as both zones produce, you will use the normal packer setting

and normal production of the deeper pay in the tubing, and the shallow pay between the annulus of the tubing and the casing?

A No, sir; I would flow the weak formation, the Wolfcamp, through the tubing, because I feel it will be the first to have to be pumped and we would be set for it.

Q And you would immediately have to set over a cross-over packer; is that correct?

A Yes, sir.

Q Would the likelihood of flowing be within the space of a year or two years, or three years, so far as the Wolfcamp is concerned?

A That will vary with the well. With the little section we have in the Fort, I would expect artificial lift to be required in one or two years. That is purely a guess.

Q When artificial lift is required, then you would use your diagramatic sketch, which is colored in yellow and red --

A I would continue to let the lower zone flow through the casing and with the conventional pump, pump the tubing.

Q How do you do that, pump one zone and flow the other, or is it necessary -- what is it necessary to do to the well mechanically?

A I don't know, other than setting artificial lift equipment.

Q Within your 5½-inch casing, what equipment would you have to put into the well - one string of tubing, two strings, or a macaroni?

A You will have several pieces. In the case shown, it would probably be a macaroni, Kobe conventional pump; or go to rods and put a conventional pump in, or go to the damper type pump, which is a hydraulic pump with a conventional engine.

Q When you go to rods, would you attempt to pump the oil from the 9400 foot or 12,000 foot --

A We are doing it every day.

Q In New Mexico?

A Just a little east of it, in West Texas.

Q Now, with respect to your gas lifting at 9000 and at 12,000 feet, have you made any estimates of the cost of gas injection for such gas lift?

A No, sir.

Q Can you tell this Commission whether or not such a means of operation is economic at those great depths?

A It would all depend on the allowable.

Q Well, suppose the present allowable.

A I mean on the -- Present production would be economical if that was the way you had to go.

Q What is the present allowable?

A In the Devonian?

Q No; the Wolfcamp.

A 170 barrels in the Wolfcamp.

Q Do you believe that any of those four wells will be top allowable wells?

A I can't answer that. All the Wolfcamp wells we have drilled so far have been. Possibly the two of them would be. The two Denton wells; and it is possible the other two might come in potential 170.

Q Have you figured -- Suppose that 170 barrels of oil allowable, have you estimated the volume of gas necessary to gas lift at a depth of 9000 and 12,000?

A When you have the artificial lifting of both zones, I believe - is that right?

Q Pick either one. If you want to use the first zone that ceases to flow, you can. Go ahead and do that if you desire.

A I haven't made calculations on the cost of gas lift.

Q At such depths with such pressures, would it take a comparably large or small volumeof gas?

A It would take approximately 2000 cubic feet per barrel, as a guess.

Q Total gas, or over and above formation gas?

A Over and above formation gas.

Q What is the total volume of gas necessary to lift a barrel of oil now in the field from the Wolfcamp?

A Well, that was in it, if that is what you are getting at. Total solution gas?

Q No. What is the average gas-oil ratio now?

A Around 300, I believe, for the -- Well, I have it here. The gas-oil ratio in the Wolfcamp is running about fourteen, sixteen hundred. And the Devonian is running about 700.

Q Now that you have given the information with respect to the Wolfcamp, let's assume you have to artificially lift both the Devonian and the Wolfcamp. How much gas would it take to produce the top allowable for both horizons, as your first premise, if you can answer that?

A I don't have those figures. It is feasible to gas lift at those depths because it is being done. But I am not limited to gas lift. I can go to rods or hydraulic pumps also.

Q Let's assume gas lift. Would you be able to recover 170 barrels from one horizon and the larger allowable from the other horizon on gas lift?

A No, sir, but it is doubtful when artificial lifting comes you would have that full allowable.

Q Now, your 5½-inch casing, what size strings would you use within the well bore?

A It would depend on what is the situation. You want to lift both zones, now?

Q Yes.

A I would probably run 2-inch tubing and -- Well, if I was going to use rod pumps, I would run 2½-inch tubing; an Otis dual pump, run 2½-inch tubing. If going to have hydraulic, I would put a conventional hydraulic pump in, a conventional Kobe, and run 3-inch tubing with three-quarter macaroni string. And if I had gas lift on the outside, I would run 1-inch on the outside of that.

Q With that equipment in the hole, would there be any restriction mechanically as to the amount of oil that could be produced?

A In the Kobe you have a capacity of 150 to 175 barrels. This depends on what the lift is. You have got it at the extreme, which is what you want, I assume. No bottomhole pressure existing. Probably 150 or 170 barrels through Kobe equipment. And on the gas lift side, have an area equipped through 4-inch tubing. In your annulus, if you want to throw your macaroni, you could gas lift 70 to 80 barrels a day.

Q Where would the point of greatest restriction be in an installation like that? In the first place, would

there be any points of restriction in the production of oil? I believe you answered yes.

A The lowest capacity would be your Kobe equipment.

Q Where would the points of greatest restriction be in that installation on a Kobe pump?

A I don't know what that word "restriction" means.

Q You said that the equipment would restrict the volume of oil that could be produced.

A Yes, sir; it would be in the conventional Kobe equipment.

Q Now, having the most favorable equipment in your well, could you tell this Commission, if dually completing these wells to the Devonian and Wolfcamp from now until the end of time insofar as productionwise is concerned, you would recover more or less oil if you twinned a well to each of the two formations? What is your considered opinion?

A Well, recovery --

Q Where would you recover the most oil? We are talking about the recovery of oil only.

A Recovery of oil, it wouldn't make any difference. I could do justas much -- the way I think the field will perform -- I could do just as good in a dual well as a twin well, just about.

Q Even though in the dual completion well you have

in your 5½-inch casing in one instance, I believe you said, an inch and a half and an inch and a quarter, and in another instance two inches and one and a half inches?

A I will have that at the time when the volumes being handled will be considerably less than they are now, at least in one zone.

Q So, in your opinion, the total recovery would not be any different between the dual completions and the twins drilled in these two horizons in this field? Is that your answer?

A Yes, sir; if the field performs like I think it will.

Q If you want to rework a singly completed well as compared to a dually completed well, what differences are there in such reworking, if any?

A There is a little more. It is more expensive in the dual well.

Q Would you lose any appreciable amount of oil every time you reworked a dually completed well, whether from one horizon to the other horizon?

A I don't see why you would.

Q You wouldn't be required to shut down production from the Devonian, for example, --

A Yes, I see what you are getting at. You would lose your allowable at that time.

8b

Q You would be shut down to the extent it takes to rework the Wolfcamp?

A Yes, sir.

Q If these are uneconomic wells as you say they are, and every time you shut down for the Wolfcamp production the other production is lost, or if you shut down for the Devonian to rework the Devonian well, whatever production is secured from the Wolfcamp is lost insofar as that deep production is concerned, if it isn't a top allowable well - is that correct?

A Yes, sir.

Q Do you anticipate any reworking of dually completed wells if the Commission permits you to dually complete these wells?

A There may be one reworking in the Devonian coming up, because we are completed low. As water encroaches, we will have to go back and complete in the top of the zone.

Q In your original testimony, you testified as to the bottomhole pressure of the Wolfcamp and the bottomhole pressure of the Devonian. What was that difference in bottomhole pressure?

A I believe about fifteen or seventeen hundred pounds.

Q Difference?

A Yes, sir.

Q And I believe you said the bottomhole pressure on

the Wolfcamp was declining more rapidly than the Devonian; is that correct?

A Yes, sir.

Q And therefore the 1700 pounds pressure differential will be markedly increased as time goes on; is that correct?

A I won't say markedly. It will be increased.

Q It will be increased from the difference of 1700 pounds, it will be more than 1700 pounds?

A Yes, sir.

Q In your installation picture you have given to the Commission, do you believe there is any danger about having so much pressure across your packers?

A No, sir, I don't. That testimony will come in later, on how much differential you can handle on a packer.

Q I am asking you as an engineer. You don't believe there is any danger of 2200 pounds pressure differential across the packer?

A We are using this packer in the Fort Stockton area with 9000 pounds across it.

Q Have you ever had any trouble with such packers with such pressures across?

A No, sir. That is one case I know of without trouble.

Q Have you ever had any packer leaking or failing?

A Yes, sir, but they can be detected.

Q How can they be detected here in this case?

A There is packer tests which should be run periodically, or can be run periodically, by shutting in and pressuring up both zones.

Q How often should those periodic tests take place?

A At any time you suspect a leak.

Q I will ask you one final question, Mr. Washburn. Would you, as a cautious operator, as I know Phillips is, in any way jeopardize the better formation, the Devonian, by any attempted dual completions, would you ever have any doubts as to protection of the Devonian formation from the Wolfcamp?

A Rephrase that. I don't catch it.

Q I will rephrase it. Do you think there is any doubt of no harm being done to the better formation, the Devonian, by your dual completion installation with the Wolfcamp?

A If we were afraid of damaging, we wouldn't have asked for this hearing at all.

MR. SELINGER: That's all.

(Off the record.)

MR. SPURRIER: We will recess until 1:30.

(Noon recess.)

MR. SELINGER: Mr. Spurrier, may I add, for the record, insofar as the number of wells completed in the Devonian, there are 66 completed in the Devonian and 48 completed in the Wolfcamp. I wanted the record to be correct to that extent.

I wanted to ask Mr. Washburn one more question.

Q I asked with respect to the north offset to the Fonzo and you said Magnolia had a twin Wolfcamp well as a north offset to the Fonzo. Isn't that true of the Fort No. 1, that Magnolia has a twin Wolfcamp north of that well also?

A That's right, sir.

CROSS EXAMINATION BY MR. MADOLE:

MR. MADOLE: Ross Madole, on behalf of Magnolia Petroleum Company.

Q Mr. Washburn, before we start on these particular facts, is the basis of Phillips' contention in these cases that the economics don't justify the drilling of twin wells?

A In this particular instance, yes, sir.

Q Is that the basis of your applications?

A Pertaining especially to Fort No. 1.

Q What is the basis with reference to the others?

A That we can recover as much oil by dual completing as we could by twinning and save money and critical material

doing it.

Q You have no fear of damage to the reservoir?

A No, sir.

Q Has that been Phillips' position in previous hearings before the Commission?

A No, sir; it hasn't.

Q What has been Phillips' position before the Commission at the other hearings?

A You mean before this New Mexico --

Q Yes, sir.

A I am not familiar. When I said no, sir, I was referring to Texas.

Q Isn't it true in previous hearings before the Commission Phillips has been opposed to dual completions generally unless the economics of the pool as distinguished from the well didn't justify the drilling of an additional well?

A I have never run into that testimony, as far as the State of New Mexico is concerned. I can't answer that.

Q I would like to refer to the record in Cases No. 92, 93 and 94 in relation to the Hobbs Pool, Lea County, New Mexico, and the application of Gulf Oil Corporation, for dual completions of oil-oil formations. Judge Foster, on behalf of Phillips, made this statement:

"We are not opposed to dual completions generally but we do think each one should stand on its own merits. I have a statement to present to the Commission.

"Under ordinary competitive peacetime operations, we believe the production of two oil reservoirs by means of a dual completion is in general unwise and should be definitely discouraged in almost all future instances. There
9 is little doubt in the vast majority of cases such practice will lend to smaller ultimate recovery of oil from at least one of the reservoirs involved. In addition, we feel added operating problems are numerous and dangerous, and far outweigh any savings that might be realized in the initial development cost.

"It is likewise perfectly obvious to us that producing oil through the annulus is inefficient and will certainly result in shortening the flowing life of the wells.

"We further believe with proper well spacing it is entirely possible to economically develop each producing oil reservoir in a field on an individual well basis, thus mostly eliminating the need for dual completions.

"There are some instances where extremely thin sand sections or rim reservoirs cannot be spaced in a manner to permit individual well development of each oil reservoir. Under such circumstances, if for this class of production, it is considered necessary dual completions might likely be the solution of the problem.

"When development is being carried on with conjunction of a plan of controlled pressure maintenance, there are undoubtedly certain other instances where dual completions might be amply justified.

"Dual oil-gas and dual gas-gas completions are not so susceptible to the many problems consistently found in dual completions of oil-oil wells.

"We therefore feel that the range of application is considerably broader and should be looked upon with greater general favor. However, it is suggested that even in this type of dual completion, each case should stand on its own merits.

"In conclusion, we would like to urge the Commission to adopt the policy of holding hearings and carefully checking each well application

for all types of dual completion and permits be issued only after suitable evidence has been received."

Now, there is no pressure maintenance in the Denton field, is there?

A No, sir.

Q Then, if your policy at that time is the same as now, then the only factor would be the factor of economics? Are you still in accord with that general statement?

A That is no longer Phillips' policy. I believe they believe in oil-oil dual completions. Would you tell me what date that bears?

Q I would be glad to, sir. The meeting was on the fifteenth of April, 1947, in the Coronado Room of the La Fonda Hotel, Santa Fe, New Mexico.

A There has been a considerable improvement in the technique of both manufacturers and the operators since that day.

Q You have no fear of reservoir damage by dual completions?

A No, sir.

Q Now, on your dual completions you testified Phillips Petroleum Company had 51 dual completions.

A They operate 51.

Q Are any of those in the West Texas fields?

A Yes, sir.

Q Where are they located?

A Most of them are in the TXL Field.

Q Is that a carbonated crude?

A Sir?

Q Is that a carbonated reservoir?

A Carbonated?

Q Yes, sir.

A I don't know what you mean by that.

Q A little sour.

A Yes, sir.

Q Have you had any experience which would indicate to you that dual completion is not effective in those fields that have a sour crude?

A We have none of those oil-oil wells there being dual pumped. We have several wells in one zone. The lower zone mostly, the Embar-Ellenberger. And we have no well trouble - no more trouble with those than ordinary single completions.

Q But you are having packer trouble?

A No, sir.

Q You have had no packer failures in those wells?

A We have had no packer failures once we get one set right.

Q When is your definition "when you get it set"?

A When we move the rig away.

Q When you move the rig away. Have you ever set a packer at 12,000 feet in those wells?

A No, sir.

Q Can you tell me that in a crooked hole, which necessarily you will have a floating hole, that you can set a packer at 12,000 feet without any danger of packer failure?

A I can't say it positively, but it is being done by you and by us.

Q I think we will put on testimony to refute the effectiveness of the packer. But I want to know your experience now. Have you had any field packer failures there? You said about single completions. Do you set packers in your single completions?

A Not this type of packer; no, sir.

Q You don't have any more because you don't have any in the single completions?

A Don't have --

Q -- any packer problems because you don't have any packers there, do you?

A No, sir.

Q Now, in these dual completions you say you don't have any more? Let's see how much -- how much packer failures you have experienced in your fields in West Texas?

A By packer failure you mean initial failure, or before the well is put on production?

Q I mean after production, while you are producing it, while you have a packer leak.

9b A We have no record in the Bartlesville office of such a failure - such a packer leak - after the well has been put on production.

Q How long have they been on production?

A The oldest one I can remember is probably three or four years.

Q Don't you know the average life of a packer at its best in corrosive crude of that nature is two and a half to three years? Is usually the maximum life of a packer.

A I certainly don't know that.

Q You don't?

A No, sir.

MR. PEACOCK: Mr. Spurrier, we testified here this oil from the Wolfcamp and from the Devonian isn't corrosive. Mr. Washburn has testified that the oil in the Wolfcamp and the Devonian isn't corrosive.

MR. MADOLE: That is his statement. We will prove otherwise.

Q Since you have gotten to that point, I will ask you how many grains of hydrogen sulfide is found in the

Devonian in the Denton field?

A In the gas? It is classified as sweet.

Q I didn't ask that. I asked how many grains you have got in it?

A If it is sweet, it is less than ten.

Q How about the Wolfcamp?

A I would say it is ten or less.

Q Have you ever run any tests for the hydrogen sulfide content of that pool?

A I have seen reports. I have seen refinery production reports on the evaluation of the Denton Devonian and the Denton Wolfcamp.

Q But you have made no actual test of the pool itself?

A No, sir.

Q Have you ever smelled any of it?

A I have on the batteries; yes, sir.

Q Did you smell any sulphur in it?

A No, sir.

Q Smelled as sweet as the growing flowers, did it?

A Yes, sir.

Q Do you have a paraffin in the production?

A Yes, sir; you have paraffin, especially in the Devonian.

Q High?

A It is classed as a paraffin intermediate base crude.

Q That will affect your dual completions, won't it?

A Paraffin is just like packer troubles. They are magnified considerably. If you recognize you haveparaffin, it can be handled. There are ways of handling it.

Q Then you recognize packer troubles?

A I was using it for your example.

Q Well, we certainly recognize it. Are you familiar with the Dollarhide Field in West Texas?

A No, sir.

Q You have never made any studies of that production?

A No, sir.

Q Or those dual completions?

A Nothing elaborate.

Q With reference to the Devonian, I think you have testified there is an effective water drive; is that correct?

A Appears to be one.

Q Now, in figuring these figures you gave as to the ultimate recovery, what was your efficiency rate that you used in the Devonian?

A I didn't give figures on recovery of the Devonian, I don't believe.

Q Well, have you made any calculation of the recovery in the Devonian?

A I could get them.

Q Well, you testified that these wells were going to last twenty or thirty years. You ought to have some - I don't want any details - but isn't it true that the efficiency rate used in the Devonian by the engineering committee is approximately 60%?

A I believe that's right.

Q Now, you did give some figures in the Wolfcamp?

A Yes.

Q As to recovery?

A Yes.

Q What efficiency rate did you use there?

A I used it only in a solution gas drive of about 25%.

Q Now, don't you find some evidence of a water drive exists in the Wolfcamp?

A There is indications of one being to the southeast part of the field.

Q You made a statement that there was some water found down there. Are you familiar with the C-115 reports to the effect that those wells in the southeast run from 29% to 75% water?

A Yes, sir.

Q That is some water, isn't it?

A Yes, sir.

Q Then, wouldn't that indicate to you that there was somewater drive to the southeast?

A I testified there probably was some water drive.

Q Then would that revise your estimate of the ultimate recovery - would that revise your estimate of the ultimate recovery in the Wolfcamp if a water drive developed rather than a solution gas drive?

A Yes, sir.

Q Then to the extent that the water drive developed and approached the water drive of the Devonian, then your figure of efficiency rate of recovery would be revised upward to a maximum of 60%, wouldn't it, assuming that the water drive developed?

A I don't think the water drive is effective and the fact is pretty apparent.

Q I didn't ask you - You can make your statement as to what you think. Assuming it did develop, then your figure used for ultimate recovery would have to be revised upward toward the 60%, wouldn't it, because that is the efficiency rate used on a water drive field? Is that right?

A It would be increased upward; yes, sir.

Q The effectiveness of water drive is yet to be determined. I will concede that. But now let's go into this recovery that you estimated. In the Wolfcamp Fort No. 1

you estimated a 22-foot effective pay area for recovery; is that right?

A Yes, sir.

Q Now, how did you just figure a 22-foot taken off of the 38 feet that by your own logs would indicate that there are at least 38 feet of all this dolomite you are going to perforate is effective pay sand? Area instead of sand. Excuse me. How did you arrive at 22 feet?

A We had to base that upon cores that had been made in other wells.

Q On a core analysis of these particular wells?

A No; these wells were never cored.

Q Which wells did you use?

A We used the engineering report, Atlantic Dickinson No. 12, I believe it is.

Q Where is that located, Mr. Washburn?

(Off the record.)

A It is Dickinson A-1, No. 1.

Q Where is it located?

A It is one of the early wells that was cored.

(Off the record.)

Q This well is in the northwest of the southwest quarter of Section 1, Township 15 South?

A Yes, sir.

Q When was that well originally brought in?

A I don't have that information.

Q Do you know the accumulative recovery from that well to date?

A No, sir.

Q If I told you according to the engineering report there has been 94,000 barrels produced from that well, would you quarrel with that statement?

A No, sir, I wouldn't.

Q Then the ultimate recovery is going to, if your well performs in the same manner as that well, it will greatly exceed 68,000 barrels, wouldn't it?

A I don't know what its recovery is per acre foot.

Q Well, I thought you used the same recovery data that was shown in their core analysis.

A No, sir. I say we took approximately - based on that well - we took approximately - we assumed two-thirds of the porosity had enough permeability to be productive.

Q Well, what porosity are you figuring on in that two-thirds?

A Approximately 6%.

Q Have you eliminated --

A I am using the micro-log. I beg your pardon. Where the micro-log shows porosity, using approximately two-thirds of that footage.

Q After using that two-thirds, what porosity factor are you cranking into your figures?

A Six percent.

Q Six percent. Then, if you pick the best porosity, the average of the entire area, figuring by the engineering committee as 6%, then if you pick just the best to base your figures on, you ought to increase your porosity, shouldn't you?

A No, sir.

Q Some of the wells have better than 10% porosity, don't they?

A Not to my knowledge.

Q Well, let's see. You know the location of the Magnolia Pope No. 1, or 6? No. 1 in the southwest southeast of Section 35. And No. 6 is in the northwest of the southeast of 26. One to the northeast and one to the southwest of this Fort and Fonzo. If the core date of the Wolfcamp pay of the Magnolia Pope No. 1 and No. 6 indicated an average porosity of 10.3%, would you quarrel with that figure?

A No. 6? Not if your data shows that; no, sir.

Q Well, it looks to me, Mr. Washburn -- I mean if you eliminate all your poor areas and take your best to figure your estimated ultimate recovery, that you ought to revise upward your porosity factor, wouldn't you?

A Not necessarily. That is the way I did it.

Q I know that, but we don't agree with your way of figuring.

A If we could assume that full 38 feet of porosity had sufficient permeability to be productive, we would still have a well less than a marginal well. We would never get our money back.

Q We are going to get to that, too. But let's figure with this 25%, your porosity factor of 6%, and figure it on 38 feet. What would be your recovery?

A Will you repeat that, please?

Q Let's assume our factor of - that your accepted factor of 25% efficiency rate of recovery, let's revize the effective pay zone from 22 to 38 feet and apply the factor you applied to the 22 feet, apply them to 38 feet. What would be the resulting figure of ultimate recovery?

A Approximately 136,000.

Q Sir?

A About 136,000.

Q Now, with reference to the economics of dually completing the Fort No. 1 and the Fonzo, is it the position of Phillips that the other operators go ahead and twin their wells, and then on their edge wells that they should be allowed to dually complete those because their edge wells might not pay them as much profit as they would

like to obtain? In other words, here in recent months Magnolia has twinned the north location from the Fonzo. Do you think that -- You think Magnolia is a fairly prudent operator, don't you?

A Yes, sir.

Q You think they came out with any such figures as those and then proceeded to twin that well?

A We never considered any of that. We merely asked for permission to dual ours. If you want to twin yours, that is your privilege.

Q Do you think we would have drilled a well if our figures indicated we wouldn't get back the cost of drilling it?

A No, sir, I don't.

Q No. Now, let's go to this $200,000 cost of these wells. I would like a little breakdown on that, more than what you have stated, that it is just a flat $200,000. On what is that based?

A On six Wolfcamps we have drilled.

Q With Atlantic?

A On our Denton lease.

Q With Atlantic?

A Yes, sir.

Q Is that the figure you and Atlantic settled on?

A That is the cost charge we have on it.

Q Is that the charge you made to Atlantic?

A That is the cost estimate that was approved by Atlantic; yes, sir. I believe that's right.

Q Now, this estimate - we want to know when the dollar changing started, when Atlantic started paying the bill. On what basis did you settle on those six wells?

A I don't know what you are getting at. I don't think I could answer --

Q Yes, I think you do. You divided up and figured up your cost and sent Atlantic a bill for their proportionate share of the cost, didn't you?

A I never looked at the bill we sent Atlantic. I looked at the bill in our office.

10b Q Will you look at the bill you gave Atlantic and furnish us that information as to the actual bill presented Atlantic on those six wells, because your $200,000 figure is in excess of fifty to sixty thousand over the average cost of these wells. I don't know what difficulties you experienced.

A The Denton No. 11 cost $195,000; the Denton No. 14 cost $212,000. Those are the last two we drilled. Rounded out, as I said, approximately $200,000.

Q We are doing a lot of rounding. Let's get down to -- You say you based your $200,000 on these six wells.

Now you say you did it on two wells.

A Well, if the Commission requires them, we have the price of the six wells. I used them, and the other ones are a year or so old. I used thelast figures, the 11 Denton and the Denton 14.

Q Used the figures on all six or the last two?

A The last two.

Q On the last two. Did you have any mechanical difficulty in completing those two wells?

A None that I know of.

Q Would you be willing to furnish the Commission with the cost on which you and Atlantic settled for these six wells for the Wolfcamp?

A If the Commission so desires, we certainly would.

Q Well, if we desire, would you so furnish it?

A Well, now, you are getting into -- I can't answer that. I don't know what the policy is on letting figures out.

Q Well, you present some figures here to let yourself into dual completion. You ought to let some more figures out to show the basis on which you are asking for it.

A I don't know what this is getting us at, quite frankly.

Q You know what I am getting at. You know $200,000 is high for those wells.

A We think a Wolfcamp well drilled today would cost $200,000. That is my statement.

Q If our figures on Pope No. 8 are far below that figure, then how do you account for the great difference between the cost of your wells -- Just how do you figure the cost of your wells, figure overhead and profit?

A It is cost of equipment, tangible and intangible values, and it does have some lease foremen and salaries in there for a month or two. But it is a minor item.

Q Actual cost of drilling equipment and completing the well?

A Yes, sir.

Q In your statement with reference to the Wolfcamp, you made the statement it was a tight formation. What is your definition of "tight"?

A Permeability of 10 milledarceys or less.

Q Did you take into consideration the vertical fractures in that formation?

A No, sir.

Q They have vertical fractures in the Wolfcamp in the Denton field do they not?

A Yes, sir.

Q That figure can't be calculated, but it would in-

crease the permeability over-all, wouldn't it?

A Yes, sir, to some extent. I still believe you would class it as a tight formation.

Q Now, with reference to that, do you classify the Devonian as a tight formation in the Denton field?

A No, it is intermediate. We can't say it is -- No, I don't know that.

Q Now, on this -- Your experience in packer failures, I think you said -- I don't want to misquote you -- You did refer to dual completions at ten or twelve thousand feet in the Gulf Coast area?

A I never said that; no, sir.

Q Would you estimate that? You made some reference to the Gulf Coast area. What reference did you make?

A To the fact that we had dual oil-oil, dual completions in the Gulf Coast area is about all I said. But they weren't deep.

Q But you wouldn't be apprehensive of dual completions at ten or twelve thousand feet in the Gulf Coast area?

A I am not familiar with the Gulf Coast area. I know it is different from this hard rock country. I can't answer that.

Q Where are you familiar - with what area - the West Texas area?

A Primarily West Texas.

Q The Dollarhide - is it a sweet crude in the Devonian-Silurian over there?

A I don't have that at my fingertips; I don't know.

Q Now, with reference to your testimony that when you go to artificial lift, what bottomhole pressure in the Wolfcamp did you estimate - did you estimate at what point that you will have to go to artificial lift?

A I can't answer that. We know that artificial lift is coming up, maybe in two years, maybe three years, maybe sooner. I understand there are some on the pump now.

Q There are eleven of them, aren't there? The figure of eleven given you as the number of wells on the artificial pump at this date, that would be pretty well in line with your information?

A Yes, sir.

Q Isn't it true that your pressures in the Wolfcamp indicate that most of the wells will go to artificial lift of some kind in not quite a year or two, but in a matter of months?

A I don't think so.

Q What pressure do you calculate they will go to artificial lift? What pressure? What bottomhole pressure?

A 1000 pounds, in the vicinity of 1000 pounds. I had better say I don't know. I don't know.

Q That would be refuted by the fact that they are on pump and the average pressure is about 3200 pounds?

A Yes, sir; that's right. There is eleven on the pump. There is some others flowing at 3200 pounds. So I don't know when the others will go.

Q Will the oil capacity of artificial lift be decreased if water is produced in the formation?

A The rates I gave were approximate capacities at near depletion pressure.

Q With no water?

A With no water. Fluid capacities in other words.

Q There will be some water?

A There is a possibility of that; yes.

Q Then that water will reduce the capacity, won't it, the oil capacity there?

A Naturally.

Q Have you made any analysis of water found in the Devonian or Wolfcamp in the Denton field?

A No, sir, I don't -- We make a very small amount of water, but it has never been analyzed.

Q There is some gyp or lime deposits there, aren't there?

A There are other fields with gyp. That can be

handled like paraffin; if you recognize you have got gyp, you can take care of it.

Q How can you?

A By down hole treatment or by proper selection of equipment that you are using, the artificial lift you use.

Q All of them have got to have some metal, haven't they?

A Yes.

Q And it is going to have a reaction on that metal, isn't it?

A Well, I wouldn't avoid pumping a well because it had a little gyp.

Q No, Idon't advocate your pumping it, but I advocate pumping it in two different holes so that you won't make any communication in different formations in the event you have packer failure. I am not opposing your pumping your wells any way you want to, but I do oppose your pumping them out of the same well bore.

A With Kobe equipment, or hydraulic equipment, I could service that pump much easier than you could do it with rods, or just as easy as a single well.

Q Are you making that statement to this Commission, that you can do a work over job in a dual completion as easy as any single completion?

A I can pull rods on pumps out of the zone that is

being pumped as easy as I could --

Q How about the pressure down in your Devonian? You have got to keep that pressure down, haven't you, to hold that in the formation?

A Well, you are going to choke that off.

Q Choke it off. Okay. I have no further questions.

MR. MADOLE: I would like to reserve the opportunity to cross examine if, as to these packer tools, that I understand they are going to testify about it, if the manufacturers are proposing to testify and don't know what the actual operations of those tools in the field are, because we would like to go into that. But it is premature until such time as the evidence with reference to the tools to be used in the completion of these dual completions.

MR. SPURRIER: Are there any other questions of the witness?

CROSS EXAMINATION BY MR. NESTOR:

MR. NESTOR: My name is E. W. Nestor of Shell Oil Company.

Q There is one point I would like to figure out from your testimony on workovers. If I understood you, you expected to have only one workover possibly during the life of your Wolfcamp wells; is that right?

A I don't believe I made that statement concerning the Wolfcamp. I was talking of the Devonian.

Q There was some statement made -- That is what I mean, the Devonian.

A Yes, sir.

Q Now, when you are going to work over the Devonian, how do you propose to do that?

A Well, the way we would do it today wouldbe to mud it off and squeeze the lower zone and perforate.

Q You would have to pull the dual completion equipment out of the hole and put mud over both formations and proceed. Now, in doing that work, don't you figure that an additonal risk of damage to the Wolfcamp formation, which you have already specified as tight? Now, you are going introduce mud into that formation. What effect do you suppose that will have on your ultimate recovery?

A It all depends on how clean you get it.

Q Now, you just testified it is tight, and I believe you would normally figure, once you have acidized such a tight formation, one of the things you don't want to do is get any fluids back in there again.

A Yes, sir.

Q So, even though the Wolfcamp formation itself didn't require any work at the time, if it is necessary --

which it probably is -- to work over the Devonian formation, then you are going to have to kill the Wolfcamp, and then have to bring it back in, with some possibilities that your Wolfcamp zone won't be as good as it was originally.

A That is a possibility.

Q Are you acquainted with the flowing bottomhole pressure on the west side of the pool, currently? In round figures? Or would you estimate the flowing bottomhole pressure?

A What zone?

Q Wolfcamp.

A About 3200 pounds.

Q On the west side?

A Well, frankly, I can't answer that.

Q That figure is possibly fairly accurate for the east side. But in the west side, in the area where you are proposing to do this work, I am satisfied you will find it averages well under, possibly 2900 pounds or even less. That is all based on the cooperative survey which the Oil & Gas Committee ran in April. They
llb have actually run some pressures since then.

There is another question along that line. Of course, you said you didn't believe you could answer at what bottomhole pressure it would require artificial lift

on the west side. Would you agree, if the wells on the west side are having difficulty and requiring swabbing operations currently at pressures of 24 and 25, would you assume they are getting pretty close to the point where lift would be required?

A Yes, sir.

Q That actually is the case on some of those west side leases. But I think there is a danger that probably the flowing bottomhole pressure of about 2300 pounds will be as low as will sustain the flow on that side.

There is one thing that concerns me too in your comment on the Devonian. I think you mentioned you expected the Devonian would probably flow for at least ten years. Now, did you - or would you state to the Commission you believe your Fort No. 1 will flow for ten years, from the Devonian, that is?

A I think that it will. I will tell them that.

Q Actually, the bottomhole pressures there are about 4400 pounds and you don't know what the critical pressure is there yet. But pressures are dropping and -- How much pay does that well have?

A The Fort in the Devonian?

Q Yes.

A Approximately 150 feet; 147 is what I used.

Q That is good. Roughly, what would the average

thickness for the Devonian be in the Denton?

A Around 900 feet or 1000 feet or 1000 feet.

Q No, that is -- Just the average for all the wells, including the rim wells, probably be somewhere around 600 pounds maybe. As the water comes in, do you not envision that your Fort 1 well there will make water?

A As it comes in, yes.

Q There is a strong possibility you will have to install artificial lift in that well quite a bit before some of your better wells.

A Yes, sir.

Q Such as theDenton 12 and 13. Just roughly, what do you figure is your average operating net income from a barrel of Wolfcamp oil?

A Approximately, after all costs?

Q All costs.

A Between a dollar twenty-five and a dollar and a half.

Q I wonder -- Do you suppose you could outline that for us?

A I don't have that data here. I base that on experiences of payout of other wells in that area.

Q That seems considerably lower than some of the figures we have on that. I wonder if that isn't a bit pessimistic in view in particular of your January price

hike. You still believe it would be roughly that figure?

A That has been my experience in other studies of this nature.

Q Do you suppose you could show the Commission how that figure is arrived at, fairly quickly?

A I don't have the information - the data I need to work with here. My tables, my discount tables, - Let's start out with oil at a dollar fifty-eight plus twenty-five. We take 7/8 of that. That is working interest.

Q Two dollars and fifty-eight cents plus a quarter.

A Yes. Multiply by 7/8, you get a working interest, and we would have about 7½% production tax, or 7.3, I believe it is, to deduct. And then we would have lifting cost, which we would estimate at about $3000 per year per well. Now, then, we have to --we can charge off our intangibles on this first year and we can take depletion allowance and we can take -- we wouldn't have any equipment -- we could depreciate the wellhead equipment.

Q The tangible.

A The tangible part. And after that we would have to figure how our income tax would be at about 52%. Find out what taxable income after that. Then deducting our taxable income from our -- We would multiply by 52% to get our tax, and deduct it from our income, after lifting costs.

Q In other words, you have taken the tax provision

in that? That includes that?

A Yes, sir.

Q Now, there is one other question which concerns me on the west side there where the Wolfcamp pressures are dropping. I believe you testified that the present differential in bottomhole pressures between the Wolfcamp and the Devonian zones is 1700 pounds.

A Approximately.

Q Is that the figure? Actually, the figures on one of the west side leases, and which were taken again from this April survey, from the cooperative survey, showed within just a few pounds of 2000 pounds on two west side wells. One of them is a mile from the Fort and another is less than a mile from the Denton 13, about a half mile.

A Yes.

Q And more or less in a similar stratigraphic position, west flank wells, more or less similar to the flank position of your wells. I thought I would make that point. It does run some higher than 1700 and something, which you would know. Recent pressures indicate it is now over 2100. Since April another 100 pounds of differential has entered the scene. It is quite alarming the differential that is established between the two zones.

A That is bottomhole pressure. It isn't necessarily the differential across the packer.

Q That's right. You could figure roughly 900 pounds as would be a logical figure to assume for the difference in datum.

A Yes.

MR. NESTOR: I believe that is all, Mr. Spurrier.

MR. SPURRIER: Anyone else have a question of Mr. Washburn?

MR. WHITE: I would like to ask one question. I don't believe it has been brought out here very particularly.

How many packer failures have you had on the 51 dual completions after they went on production?

A We had one packer failure in the Embar-Ellenberger field, which was put in - one of the earliest packers we put in - but it was later identified and we corrected it immediately.

MR. WHITE: But that is the only one you know of?

A That is the only one I am aware of, in West Texas, now.

MR. WHITE: That's all.

MR. SELINGER: What depth was the packer?

A Between the Tubbs and the Embar.

MR. NESTOR: There is one further discussion

there on the oil-oil duals in the TXL Field. That is one of the places where you have them in West Texas which you might consider as comparable here. There is one bit of information which might cast, leave, an erroneous impression in someone's mind there. You were questioned as to the length of time the packers had been installed in some of those wells, and I think you stated around three or four years.

A Yes.

MR. NESTOR: Now, I would like for you to clear up for the Commission that that isn't necessarily true for many of those wells in the TXL, is it?

A Our Zeta No. 1 is one of the oldest, approximately three years.

Q Which zone is that?

A It is -- I have got it here in my books somewhere. It is the Embar-Ellenberger and the Silurian, I believe.

Q Ellenberger?

A I beg your pardon. Ellenberger is the zone being pumped.

Q And you think the other is the Silurian?

A Yes, sir.

Q And how long has that well been completed as a dual?

A Approximately three years to the best of my knowl-

edge.

Q What part of the structure is that well, do you know offhand?

A No, sir.

Q I believe prior to the very late 1951 that there weren't any Ellenberger-Fusselman duals in any part of the south zone of the TXL structure. Maybe three. Phillips didn't have any. I may be in error. That is one of the points that concerned me I wanted to get cleared up. There were three wells dualed in the south zone but I believe none were Phillips operated. I thought you made most of them there in 1952. '52, I believe you will find most of the dualing was done.

MR. PEACOCK: Is it still your opinion that was three years?

A I can't be positive. I am recalling from memory.

MR. NESTOR: It sounds like most of the dualing occurred there in late '51 or early '52, which would be about a year old. The specific well you mentioned, I am not sure of either.

MR. SPURRIER: Do you want to have your testimony sworn to, Mr. Nestor?

(Laughter.)

MR. NESTOR: I was just asking. He threw out something I thought was erroneous. I may be wrong.

MR. SPURRIER: Does anyone else have a question of Mr. Washburn? If not, the witness may be excused. We will take a ten minute recess.

(Witness excused.)

(Recess.)

———o———

MR. PEACOCK: I want to call Mr. C. C. Taylor to the stand, please.

C. C. TAYLOR,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. PEACOCK:

Q Will you state your name, please, sir?

A C. C. Taylor.

Q Your address?

A 1610 Bedford Drive, Midland, Texas.

Q By whom are you employed, Mr. Taylor?

A Baker Oil Tools, Incorporated.

Q How long have you worked for them?

A Thirteen years.

Q In what capacity are you working for them at this time?

A I am district manager of West Texas and New Mexico.

MR. PEACOCK: I should like to qualify this witness to testify concerning Baker dual completion equipment. Is the Commission satisfied with his qualifications to so testify?

MR. SPURRIER: I would judge he is qualified.

Q Does Baker Oil Tools, Incorporated, make equipment used in dual completion of wells, that is, oil-oil completions?

A Yes, sir; we do.

Q What is the equipment that your company makes?

A We manufacture a retainer production packer with accessory equipment for production purposes.

Q What is the purpose, briefly, of this equipment?

A The purpose of this equipment is to provide a means of isolating a single zone or multiple zones within the bore of the casing, or the liner.

Q I see, Mr. Taylor, you have brought along a scale model of your equipment, and I propose now to have you explain and demonstrate to the Commission, briefly, what your equipment is and how it works. Will you do so?

A Yes, sir, I will.

Briefly, this is a Baker retainer production packer, Model 415-D-4.

12b

This packer, with its accessory equipment, is to segregate or isolate any zones that may be desirable. The

packer itself consists of a setting sleeve. This is the setting sleeve. It consists of an upper slips, a cone, expanding rings; a lead seal, a synthetic packing element, and your lower slips and a junk pusher and a flapper valve installed.

This packer is made of drillable cast iron material. We can set this packer as the operator desires, either on the electric wire line through the medium of a power setting tool. We can set the packer on tubing, or on a drill pipe; as I say, whichever may be desirable.

When we set the packer, if we set it on tubing or drill pipe through the medium of auxiliary equipment, if on tubing or drill pipe, you pull at approximately thirty to thirty-five thousand pounds pull. To properly set your upper slips and to back off your packing element and expand the expanding gas rings out against the walls of the casing. The lower slips are then set and the upper slips set and your packing element and everything squeezed together in this manner to isolate the zone.

When we set it on the wire line, which is an electric line, the same line you perforate with, we place a powder charge in a pressure chamber, which, as I say, is a medium for collapsing the tool and back off the packing element. In this particular tool the powder

charge burns and discharges its gas and from there on the operation is a hydraulic operation, of course, which we call a pressure E-3 setting assembly.

We have set this packer and we are ready to go back into the casing. And then we use the auxiliary equipment. We have this packer set with your clean bore through it. Your flapper valve is closed in that position to keep pressure from below in the event of pressure from below.

We make this equipment up on the tubing, which consists of the auxiliary packing equipment, what we call tubing seal nipples. They have chevron seals working downward to hold pressure from below. And chevron seals working upward to hold pressure from above.

We have in this particular case a Baker cross-over flow tube, which is this - from here down is the Baker cross-over flow tube, with an inner tube and the outer tube. We have a locater sub that mates with a corresponding set in the top of this packer.

If we go back in the hole with the tubing, to assure you these seals are positioned in the bore of the packer, we can set as much weight down on this packer as is practicable to put down on the tubing. If you want to put 50,000 pounds of weight, it's all right. But if you are in large casing, such as 7-inch, with 2-inch

tubing, you might kink or bend the tubing with that much weight down.

This auxiliary equipment is the combination of Baker Oil Tools, Incorporated, and Otis Equipment Company. You can back in with the tubing, your flapper valve opens, your seals are then positioned in the bore of the packer, and you confirm that you are in the bore of the packer by setting a weight of your tubing down.

I believe from there that Otis will explain their --

MR. PEACOCK: I now propose to have the Otis equipment man testify and then I think cross examination could well be directed to the two of them, because the questions will probably relate to both their equipment.

MR. SPURRIER: Very well.

(Witness excused.)

———o———

DON TAYLOR,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. PEACOCK:

Q State your name, please.

A Don F. Taylor.

Q Your address?

A Dallas, Texas.

Q By whom are you employed?

A Otis Pressure Control, Incorporated.

Q For how long have you worked with them?

A Some thirteen years.

Q In what capacity do you now work for them?

A I am the manager of the Special Services Division for Otis Pressure Control.

MR. PEACOCK: Is the Commission satisfied Mr. Taylor is qualified to speak concerning Otis equipment used in dual completions?

MR. SPURRIER: It is.

Q What is the name of the equipment your company makes for dual completions?

13 A We make several tools for dually completing oil wells. The one in question here is the Otis Type H selective cross-over nipple assembly.

Q What is the purpose of this tool?

A The purpose of this tool is to be used in conjunction with an oil well packer placed above the upper formation for separating and controlling the flow of two zones, and utilizing the tubing casing annulus from that point to produce one zone and the internal bore of the tubing to produce the second zone.

Q Now, you have brought along examples of some of your equipment, have you not?

A Yes, sir.

Q Would you demonstrate those to the Commission at this time?

A I would be glad to do that.

This selective cross-over nipple assembly we have here sets on top of the Baker packer and tubular equipment, and it is run on the tubing string at the time the tubing is run into the hole, not before that. As you see, this item here, this nipple, has no control in it. Normally, in your completing practices your two zones will be commingling while you are running your tubing. There is no way to prevent that unless conditions exist which will overcome this flapper valve area here.

At the time this is landed, I think most of you are familiar with the fact that there must be another packer placed between your formations so that your isolation of your lower zone formation from your upper zone will be complete, and a seal between the casing and the tubing effected so that the lower zone production is directed through the bore of the tubing. At that time, and when the tubing is landed, this condition occurs.

The lower zone is then in the tubing and the upper zone is trying to enter the tubing from between

the two packers. And at that time, if you will glance down here, I think I have some prints here if you would like to show them that --

Q Well, are these the reproductions of what we have there?

A I believe those are faithful reproductions with the extent that they don't show some of the detail of the packer arrangements; but essentially they do.

MR. PEACOCK: We would like to introduce these, then, as Applicant's Exhibit 7.

MR. SPURRIER: Without objection, they will be received.

A Gentlemen, if you will glance at the drawing there - and I think you can look at this exhibit or item on display here and correlate the two - you will see down here at the bottom of the page a set of ports beneath the Baker packer, where the upper zone - which allow the upper zone to come in through an annular space between the flow tube and the tubing seal nipples. I want to bring that out at this time so that you will fully understand the path of the two fluids up to this point right here where my hands are, which is the lower portion of the Otis cross-over nipple assembly.

The upper zone fluid, then, comes up underneath the seal nipples and on the outside of the inner flow

tube, and up this channel right here.

Beneath the outer case of the nipple assembly, and on up above, are some horizontal ports that will come out in a diagonal direction from the tubing bore. The upper zone can enter the tubing at this point some four to six inches above the horizontal ports coming out from the tubing into the tubing casing annulus.

That condition exists at the time the casing is landed. From this time on, with your normal well completion practice on the surface, the tubing hanger and casing hanger will correspond to raise and control the device at the surface. We can then, either under pressure or no pressure, install by means of a wire line - what we call a wire line operation - the subsurface control, which will then separate the two zones and direct either zone you desire into the tubing casing annulus.

By means of this you will then produce simultaneously both zones; one through the casing and one through the tubing. Production from the casing wing and the production from the tubing out the normal Christmas tree head.

This tool I have in my hand, and shown in the sketch distributed to you, is known as the cross-over choke. The word "choke" is used colloquially in our

business as a sub-surface control which backs off and seals and directs the flow.

This tool operates in this manner: It has a locking device on it, and is dropped into the tubing, at which point it seals in a locking - locking itself - so that in the upper movement of that tool, that tool is locked into place.

13b I am going to ask your indulgence. The packing on this has been intentionally chipped so that we won't have to get up with a hammer and drive it in and out. But if you will visualize that tool is in that position during the productive life of the well, and is then what we called crossed over - the crossed over position then allows the lower zone, coming up the internal bore of the tubing, to impinge on this bottom of this control by means of the bore of the choke being sealed up, and the upper rings sealing the internal bore of the tubing, and the flow of the lower zone. Directed out through these ports.

I think, if you look on your diagram there, you can see the ports. And from that time on, the lower zone in this particular installation is directed up the tubing casing annulus and out the casing wing valve.

The upper part has a somewhat different path; comes up the little annular crevice in the carcass of

the nipple assembly until it hits these ports here. And they are not external. Covered by a steel sheet. The upper zone fluids hit this mandrill. The nozzles go up or down by means of the packing and plug in the choke, and are then directed into the choke bore; and from there on come right up to the surface through the tubing.

If at any time in the productive life of the well you desire for any reason to change that flow, the wonderful advantage this tool performs is the fact that you can then extract this choke and replace it with another, which has the hollow bore through it all the way down, and it changes the set of the packing to a point below these ports. And the lower zone then is forced through the bore of the packing right on up the tubing. And the upper zone fluid is then forced into here. It can no longer go into the bore of the choke. It is then forced out this point here into your tubing casing annulus.

And with this installation now in place here, you have what we call a regular flow condition for a dual completion. In other words, you normally carry the upper zone up the tubing casing and the lower zone through the tubing.

I think that about covers it. The advantages to this tool are that you can work over each zone as you wish, while producing the other, by the simple means of

a wire line operation.

Q I have a couple of more questions I would like to ask both Mr. Charles Taylor and Mr. Don Taylor.

Mr. Charles Taylor, the equipment you have demonstrated and explained to the Commission, could that be used in a 5½-inch casing for an oil-oil dual completion with the producing zones at approximately 9200 feet and 12,000 feet?

A Yes, sir; it can be.

Q Could either of the zones or both zones be pumped with your equipment installed in the casing?

A You can only, with that installation, pump one zone.

Q With this installation?

A You can pump either zone through your tubing, either the upper or lower zone.

Q Yes.

A But to my knowledge, with that particular installation you cannot pump both zones.

Q Do you have equipment, types of installations, with which both zones can be pumped?

A We do not have that equipment. That equipment is available, I understand.

Q What differential and pressure between the upper and lower zones will these packers sustain without

leaking?

A We have tested this particular packer to 9500 pounds per square inch at 350 degrees Fahrenheit temperature.

MR. WHITE: Did it stand the test?

A Sir?

MR. WHITE: Did it stand the test?

A Yes, sir; it stood the test.

Q Now, Mr. Don Taylor, is the equipment which you have demonstrated to us here today the nature and type which could be used in a $5\frac{1}{2}$-inch casing, a dual oil-oil completion with pay zones at 9200 feet and 12,000 feet?

A Yes, sir.

Q Is the type of choke which you have demonstrated the kind which would be used when both zones are flowing?

A Yes, sir.

Q Do you have equipment with which one or both zones could be pumped?

A The present equipment could be adapted to pump one zone through the tubing by means of an appropriate setting nipple and exchanging the appropriate sub-surface choke to throw the desired zone into the tubing, and allow the other zone to be flowed out the casing. By that

means you can pump one zone and flow the other.

Q Does your company have equipment which could be used in an installation where both zones are pumped?

A Yes, sir.

Q And is it used today for that purpose?

A Yes, sir.

Q In oil-oil dual completions?

A Yes, sir.

Q Mr. Charles Taylor, would you repeat, if you have not already -- I mean if you have already said so -- would you repeat whether or not you would recommend the installation of the packers in a well such as the type I asked you about, approximately - you don't have to say within so many feet -- What I want to know is will one packer be placed between the two zones and another packer in the upper pay zone?

14 A Yes, sir. One packer will be beneath the two zones and one above.

Q You mean between the two zones and one above?

A One between the two zones and one above.

Q Does the equipment which you have demonstrated here prevent commingling of the oil produced from two different pay zones when properly installed?

A Yes, sir; it does.

Q What are these?

A Those are the seal nipples. These are the chevron seals.

Q Is that the usual number of seals you would recommend for installation in the type of well of which I spoke to you a while ago?

A We suggest a flow tube that has twice this many seal rings. In other words, we have both to offer for sale; one with double seals, or this particular one with single seals.

Q With a pressure differential of 1700 or 2000 pounds between the two pay zones, what would you recommend on the number of seals there?

A I would recommend two sets of seals. They cross over the flow tube with two sets of seals with a hanger type flow tube.

Q Do your service men assist and advise the operators in the installation of your equipment?

A Yes, sir; our service men assist and advise in the installation.

Q Do they actually do the installation?

A They only assist and advise in the installation.

Q Do your service men, Mr. Don Taylor, assist and advise?

A We do.

Q What do you actually do in the installation?

A If the operator wishes us to, we will assist and advise in the installation.

MR. PEACOCK: No further questions.

MR. SPURRIER: Does anyone have a question of either of the Mr. Taylors?

MR. SELINGER: Yes.

MR. SPURRIER: Mr. Selinger.

BY MR. SELINGER:

Q Mr. Taylor with Baker: How many installations do you have of Baker retainer packers in 5½-inch casing? That is, your whole assembly installed in 5½-inch casing wells. Do you have any?

A We have made in the -- Do you mean this particular hookup?

Q Yes.

A This identical arrangement?

Q Yes.

A The best of my recollection, we have made approximately 45 installations in the past year and a half.

Q Where were they mostly?

A They were in the Goldsmith Field of Ector County; in the Wheeler Field. I believe that is in Winkler County. I'm not sure. Maybe borders on Winkler in Ector. In the Pegasus Field. In the Benadum Field. In Upton County. In

the Pinwell Field in Ector County.

Q That is all 5½-inch casing?

A Well, we have made a number of 5½ --

Q Let's start over. I am asking just about installations in 5½-inch wells, not 7-inch.

A I can't answer the exact number. I don't know the exact number.

Q What I want from you is whether or not you have any installations in 5½-inch casing.

A Yes, sir; we have.

Q Do you know where they are?

A Yes, sir.

Q Just roughly.

A I know a number are in the Pegasus Field.

Q That is 5½-inch casing?

A That is 5½-inch casing; in the Pegasus Field. And in the Wheeler Field they have 5½-inch casing. In the Benadum Field of Upton County they have 5½-inch installations.

Q Do any of those installations of yours go as deep as 12,500?

A Yes, sir.

Q Which one?

A In the Pegasus Field, I believe it is; to the best of my knowledge; 12,800.

Q Now, are you talking about a Baker retainer pro-

duction packer with a special change-over head - is that what you are talking about?

A Yes, sir.

Q And that has been designed to replace the by-pass collar of your regular change-over flow tube? Is that what you are talking about?

A Yes, sir; that's correct.

Q And you say it has been manufactured and used and tested in 5½-inch OD casing wells?

A Yes, sir.

Q Who is R. D. McBrine with your company?

A R. D. McBrine was district manager of West Texas and New Mexico.

Q Would he know whether or not in West Texas the Baker retainer production packer for 5½-inch casing was tested and used in the wells in the West Texas district? Would he know that?

A Yes, sir.

Q Now, your installation you're talking about - with respect to flowing wells, is that correct?

A We install the packers --

Q I am saying you are talking about installations of packers in flowing wells?

A Well, I am talking about the installation of packers.

Q Regardless whether flowing or artificial lift or pumping?

A Yes, sir.

Q And so far as packers are concerned, it makes no difference which type of production, by what means you secure your production, the packer has nothing todo whether it is flowing or artificial lift or pumping; is that correct?

A No, sir.

Q Well, then, what is this installation you are talking about? Which method of production?

A Well, this particular one in question here is the isolation of two zones. And we are talking about the exact installation here, which is flowing.

Q Now, with respect to your 5½-inch size well, the installation you are talking in West Texas was with respect to flowing?

A To the best of my knowledge, they were flowing.

Q As a matter of fact, all the installations you are talking about in West Texas are confined to flowing conditions, are they not?

(No response.)

Q If you don't know, we will go on. But I am asking whether or not you know if they are confined to flowing conditions.

A I believe at the initial installation they were confined to flowing.

Q Now, if artificial means is to be employed after the initial flowing stage, is there any change in the set-up of those wells for production purposes? From the change over of natural flow to artificial lift.

A We do not make pumping equipment or artificial lift equipment.

Q Then your testimony is confined to the equipment you have with respect to flowing wells; is that correct?

A Yes, sir.

Q Now, Mr. Taylor, I will get to you, with the Otis. Do you want to say something, Mr. Peacock?

MR. PEACOCK: That wasn't the impression I got from the gentleman's testimony.

14b

MR. SELINGER: Well, the witness can take care of himself. That's what he said. If he has something else to say, I will be glad to hear it.

A I will be glad to renew it. I am not familiar with it.

MR. PEACOCK: You did testify you don't know what type production methods are used in all those wells, didn't you?

MR. SELINGER: I asked him if he didn't know, to

say so and we would go on. And he said so far as he knew, it was confined to flowing wells.

A Our equipment is confined to flowing wells. This equipment here is confined to flowing wells. The auxiliary equipment would be of someone else's manufacture.

MR. SELINGER: Thank you, Mr. Taylor. That is all -- That's what I understood you to say.

Q Now, Mr. Taylor with the Otis.

Your equipment is used with respect to what type of production, whether flowing or artificial lift or pumping?

A This equipment can be used in any type of production you mentioned.

Q Is it used for 5½-inch casing?

A Yes, sir.

Q To what extent have you tested your equipment in 5½-inch casing with respect to depth?

A Oh, we have made so many installations it is hard to recall just exactly how many.

Q I didn't ask how many. I just asked as to the depth.

A We test -- Let me answer the question this way: We test the cross-over nipple assembly, each one of them, at the time we assemble them in our plant in Dallas, with

a hydrostatic head.

Q I believe you misunderstood my question. I am referring with respect to depth only. To what extent has your equipment been used, to what depth?

A It goes to any depth that there is an oil well that has a dual completion in it.

Q Then answer the question correctly, Mr. Taylor. Point out the specific well to the furthest depth you have had your equipment installed.

A I believe Pegasus is a good example of that. I don't recall just how deep it is. I doknow we have several dual completions. I don't know whether oil and oil in the Pegasus Field --

Q Let's take that. Is there anything deeper than Pegasus in Texas you know of?

A Yes, sir; there are deeper wells in Texas than Pegasus.

Q That your equipment has been used in in $5\frac{1}{2}$-inch?

A Yes, sir.

Q In which fields? I won't put the wells. Which fields?

A Well, there again I don't believe I am qualified to say which wells in which fields.

Q All right. We will go on. Now, that installation you have there is for flowing, did you say?

A No, sir; I said it was adapted and could be adapted to any kind of production that would carry the flow through that nipple assembly.

Q Now, what, in addition to that equipment, can you tell this Commission is necessary for artificial lift from one or two zones?

A Well, in the Otis equipment there is nothing that we furnish in this setup that is required additionally. There are manufacturers, other manufacturers' equipment, that can be placed in your tubing string and other types of artificial lift that can be placed on the tubing and on the surface to produce an oil well.

Q In addition to the Baker people and the Otis people, it is necessary for other equipment people to come in and give the Commission the complete picture?

A No, sir; it is the standard pumping equipment, standard lifting equipment. If you prefer to define gas lift as artificial lift --

Q That instrument is prepared for gas lifting purposes?

A It can be adapted to it.

Q Is it right now adapted to it?

A No, sir.

Q What else do you have to use with it?

A You have to use additional equipment with it.

This machine, as you call it, right here, directs the flow of the fluids of each zone.

Q What other equipment do you have to put in that?

A You must put on there, if going to gas lift, put on the appropriate gas lift equipment.

Q Who manufactures that equipment?

A There are several manufacturers of that. Kamco manufactures some of it.

Q Let's stop at Kamco. Do you know whether or not the Kamco people recommend the use of their equipment for 5½-inch casing at a depth of 12,000 feet?

A I am not prepared to say.

Q You don't know?

A No.

Q Those people are located in Houston, are they not?

A Their field offices are all over.

Q Their main office is in Houston?

A I don't know, frankly.

Q In addition to the Kamco people, who else?

A Oh, I will refer you to the composite catalog.

(Laughter.)

Q If you don't know there are other people.

(Laughter.)

A I don't recall anyone in particular that comes

in mind.

Q Here is a chance to give other people some free advertising.

MR. SPURRIER: Strike that.

Q Now, with respect to pumping, what other devices are necessary for pumping a well with the adaptability of your equipment there?

A Oh, if you would envision pumping that well from the specified depth, you would simply add a setting nipple at the time the pump was on the - with certain specifications it would be full opening so that we could get our wire line tools to this nipple assembly.

Q You have to run through the macaroni string inside the casing and tubing?

A You can but it isn't necessary.

Q You can pump these wells through this instrument you have there?

A With a rod string you can pump that tubing with no additional tubing equipment except with a setting nipple and the rod string and the pump and the surface equipment.

Q For both zones?

A No.

Q What do you have to do for both zones?

A For both zones we manufacture a two-zone pump.

Q Yes.

A You must pull out all this equipment.

Q Yes.

A You must take out the top packer, or you may adapt the setting nipple for the two-zone pump to set at some point above this upper packer and take production from both zones as you will from whatever elevation you desire.

Q Now, Mr. Taylor, from what depth have you utilized the Otis two-zone pump?

A I believe we have an installation now at an average depth of about 8000 feet. I say an average depth. The lower zone is somewhat lower and the upper zone is somewhat - pumped from somewhat higher. If you got the depths and ran them both together, it would come our right close to 8000 feet.

Q Is your instrument restricted as to the maximum ability of fluid ?

A The two-zone pump?

Q Yes.

A It is restricted only by the mechanical lifting devices attached at the surface.

Q And naturally within the $5\frac{1}{2}$-inch casing there is more restriction than within a 7-inch casing; is that

correct?

A Let's put it this way. If the intake of the pumps can be placed opposite or near the perforations in the casing, then we can take as much oil as one - either of the zones will give up - or your surface equipment will allow you to pump - move the plunger of our pumps.

Q Will you go over that explanation again?

(Laughter.)

Q I don't see how it can be right, but I may be a little dense.

A You may have equipment which will exceed the capacity of the well to produce oil, or oil and water, or oil and gas.

Q Yes.

A In that case you would definitely pump off. Your pumps would be operating inefficiently through no fault of their own.

Q Yes.

A Simply moving a greater length or capacity than the zones have a capacity to give up.

Q You mean if the Wolfcamp and the Denton field was capable of producing 1000 barrels and the Devonian capable of producing 1000 barrels, you could produce one thousand barrels from each horizon?

A If you had the proper rod string and surface equip-

ment to do it with.

Q Could you do it in $5\frac{1}{2}$-inch casing?

A Not 1000 barrels.

Q How much could you produce, total fluid? You know the mathematical calculations as to the maximum volume of the equipment.

A Yes.

Q Now, with this installation, your $5\frac{1}{2}$-inch casing, maximum, and $2\frac{1}{2}$ or $1\frac{1}{2}$ and $1\frac{1}{4}$, now, what would be the maximum fluid that could be produced?

A Well, that is a question that is eliminated even when you calculate it. It isn't a question of how much we can produce so much as it is a question of satisfying the producer of an allowable, and the ability of the oil zone to give it up. In other words, we have pumps in the ground now that are not producing the proper amount of fluid in that the surface equipment has not been redesigned or reinstalled, of whatever it is, to increase the length of the stroke necessary to give the oil to satisfy the deeper allowable. In other words, the operator is taking what he can get with his surface equipment at the time the pumps are put in. If you have a long enough stroke and you can get that stroke and the oil zone has the capacity to follow that plunger up to the full length of its stroke -- Do you follow me?

Q Yes, I follow you. Go ahead.

A Then you can take that amount of production with a certain pump efficiently.

Q Suppose, as has been testified by Mr. Washburn of Phillips, the Wolfcamp in the particular well is a very uneconom ic well, very small capacity well, do you think your instrument there could successfully operate in an instance where the Wolfcamp is a low producing capacity and the Devonian was a top allowable well?

A I think that we could bring the equipment to bear that would satisfy the operation.

Q Now, I want to ask you, Mr. Taylor, with respect to the total recovery of oil. Presumably a well has all the installations. Now, you can take it in three classifications, flowing, gas lifting and pumping of both horizons. Now, your well on 5½-inch casing, having the equipment of both Baker and Ctis and others in the matter of flowing, would you recover more oil by a single completion rather than a dual completion under flowing conditions?

MR. PEACOCK: Objection. I don't believe the gentleman has qualified himself to answer that.

MR. SPURRIER: Does the witness wish to answer?

A I don't believe I am qualified to answer that. We manufacture the equipment.

Q Are you an engineer, Mr. Taylor?

A May I finish?

Q Yes.

A And we have it for sale for those who want to use it. We will work with those that desire to use that. And if in our estimation it isn't a feasible application, we will so recommend. The mechanics of your depletions, we have never gone into.

15b Q Mr. Taylor, are you an engineer by profession?

A Yes, sir.

Q Have you made any study of oil recoveries brought about by installation of your equipment?

A No, sir. That is up to the oil companies and I don't believe we have ever asked them for that information.

Q I believe you, in answer to a question from Mr. Peacock, said a number of instances the producer-operator goes to you for advice as to the installation of packer equipment suited to his particular purpose.

A Yes, sir; he goes to us with the idea he has in mind how much money he wants to spend.

Q Suppose I am Operator A and I come to you for equipment for a well in the Denton Pool on $5\frac{1}{2}$-inch casing. Would you recommend I utilize such an installation under dual completion practices under 9500 and 12,000 feet, or recommend I drill a single well for such a production?

A We make no recommendations of that kind. We recom-

mend only as to the equipment we have available.

Q As an engineer, what would your recommendation be?

MR. PEACOCK: Mr. Taylor isn't qualified to answer that. I object.

A I don't want to answer that. I'm not qualified on that.

MR. SELINGER: He said he didn't want to answer it. It is all rightwith me.

MR. SPURRIER: Let's take a ten minute recess.

(Recess.)

———o———

MR. SPURRIER: Mr. Selinger.

MR. SELINGER: I want to ask Mr. Taylor of Baker --

Q In this proposed installation of packers at 9500 and 12,500 feet, where would you set the two packers? About what approximate depth?

A That would be entirely up to the operator.

Q Do you have any recommendation where that should be?

A No, sir.

Q Have you looked at the Phillips exhibit as to the depth they state where they are going to put it?

A Well, as far as we would be concerned, that would be entirely up to --

Q What is the depth indicated on that exhibit?

A 9150 on the upper packer and 9250 on the lower packer -- No; wait a minute. 12,215 on the lower packer and 9,150 on the upper packer.

Q Now, if the lower zone fails to produce, how would that oil get up that 3000-foot string?

A If the lower zone failed to produce?

Q Yes, sir.

A I suppose they would artificially lift the zone if the lower zone failed to produce.

Q I mean if the lower zone quit flowing. I will put it that way. If the lower zone quit flowing, how would that oil get up the 3000-foot separation between the upper packer and the lower packer?

A You could confine the lower zone to your tubing or your annulus, either way you desired to.

Q Suppose you have to pump it?

A I don't know about pumping it.

MR. SELINGER: That's all.

MR. MADOLE: I want to ask one question or two here.

Q Mr. Charley Taylor, does your jurisdiction of your district extend over into the Dollarhide Field of West Texas?

A Yes, sir, it does.

Q Have you assisted and advised in any other dual completions of Magnolia wells in that area?

A Yes, sir; we have run our packers in the Dollarhide.

Q Are you familiar with how many wells you have dually completed for Magnolia in that field?

A No, sir; I'm not familiar with the number.

Q Isn't it approximately twelve wells?

A I couldn't say; I couldn't say.

Q Are you familiar with the packer failures on those dually completed wells?

A No, sir.

Q You haven't been called out for repair work or advice on the repair?

A I don't know those particular wells and I am not familiar enough to say if we were called out on those wells or not.

Q But they have had packer failures in those wells, haven't they?

A I couldn't say they were packer failures. I don't know if they were packer failures or communication behind the pipe or between -- by the cement job-- or tubing failures.

Q But you did have communication, didn't you?

A Yes, sir; I believe that's correct.

Q Now, with reference to these packers, what do you state is the average life of one of these packers in a hole, assuming comparable conditions we are talking about as represented by the Denton Field?

A I don't know the average life. I don't know whe-

ther packers -- I have been back in West Texas -- I know of packers that have been in wells since 1947, I believe. I do not know exactly what the life of the packer will be.

Q Those are your good jobs. Let's talk about some of the bad jobs. What is the estimated life in some of those?

A Actually, I believe the life of the packer will be as long as the life of the well equipment, your tubing equipment, for instance.

Q Do you all have any written guarantee of that?

A No, sir; I sure wouldn't have. No, sir.

Q I would like to present you a few bills if you do.

Do you, Mr. Don Taylor? Are you familiar with the failures in the Dollarhide Field of dual completions?

A No, sir.

Q Have you supervised, or advised - whatever you do - with reference to those completions?

A No, sir.

Q You have never had any experience in the Dollarhide Field?

A No, sir, I haven't.

Q You are aware some of your equipment is installed there?

A I am aware of the fact that there is some of our equipment in the field.

Q Does your company have a written guarantee?

A No, sir. We guarantee against defects in workmanship and material on the surface. We do everything to assist you once it goes into the ground.

Q Once it goes into the ground, do you help pay for the cost of it where it won't work?

A No, sir.

Q Have you had any experience in the Shafter Lake area?

A A little.

16 Q Are you acquainted with any equipment failures or packer failures due to dual completion wells in that field?

A Yes, I am acquainted to this extent: where we have used our equipment to dually pump in the Shafter Lake.

Q Is this by pump or by artificial lift?

A By pump.

MR. MADOLE: That's all.

MR. SPURRIER: Does anyone else have a question of either of the Mr. Taylors?

MR. PEACOCK: There is one other question I think Mr. Charles Taylor might have had an opportunity - or did not fully explain as to his equipment on these pumping operations. And I would like to ask you this. Is this the type of equipment that you have demonstrated to us here, the type that would be used in a pumping operation?

A Yes, sir.

Q If the well were pumped?

A Yes, sir.

Q Either one or both zones.

MR. SELINGER: I would like to object to the question because on interrogation of Mr. Taylor for Baker, he said he knew nothing about the pumping part of it. I dropped any cross examination about pumping. If you are taking it up, I will interrogate further.

MR. PEACOCK: I asked if this was the type of equipment that would be used. Is there any change in this equipment necessary - if the well ceased flowing of its own accord, would they have to come to you and buy something else when they install the pump?

A No, sir, they wouldn't.

MR. SELINGER: Mr. Taylor, with respect to that, if both zones had to be produced by pump, would there be any additional equipment necessary in the well? I asked you a while ago, and if you are going to answer Mr. Peacock that way, I will ask about two zones --

MR. PEACOCK: I asked if they would have to come to him and buy any more equipment and he said no.

MR. SELINGER: That is the point. This gentleman doesn't handle that equipment. He told me he had nothing to do with the pumping part of it.

A That's right.

MR. SELINGER: Can you answer the question, Mr. Taylor, if both zones have to be pumped what additional equipment is necessary in addition to the packers you have?

A I don't know what additional equipment is necessary.

Q How do you know additional equipment is necessary?

A There isn't any of our equipment required additional.

Q You mean insofar as the packers furnished by Baker are concerned, it requires - it makes no difference whether pumper or flowing or artificial lift?

A No, sir.

MR. PEACOCK: That is all we were trying to show, I think.

MR. SELINGER: I will take it one step further.

Q Is it possible to pump both zones without the use of any of the Baker equipment?

A I am sure it is.

MR. MACEY: You mean any more packer equipment?

MR. SELINGER: No; any Baker equipment. The witness just said yes, he felt sure it was.

MR. SPURRIER: Anyone else? Do you have any further witnesses?

MR. PEACOCK: That is all we have.

MR. MADOLE: We have one witness, if the Commission please.

MR. SPURRIER: If there is no further questions of the Taylors, we will excuse them.

(Witnesses excused.)

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EARL G. THURMAN,

having been first duly sworn, testified as follows:

DIRECT EXAMINATION

BY MR. MADOLE:

Q State your name, please.

A Earl G. Thurman.

Q Are you a graduate engineer?

A Yes, sir.

Q What school did you attend?

A Oklahoma University.

Q What degree do you hold?

A B.S. in Petroleum Engineering.

Q When were you graduated?

A January 1950.

Q Since that time by whom have you been employed?

A Magnolia Petroleum Company.

Q At what location have you been stationed?

A At Kermit, Texas.

Q In your capacity as petroleum engineer with Magnolia, have you had experience in the Dollarhide Field?

A Yes, sir.

MR. MADOLE: I didn't ask the Commission. Will you accept his qualifications?

MR. SPURRIER: We will.

Q Where is the Dollarhide Field located?

A In the southwestern part of Andrews County, Texas.

Q Magnolia has dually completed wells in that field?

A Yes, sir.

Q Also, we might add, for the record, it is in New Mexico also. We have never been fortunate enough to produce oil therefrom.

From what formations are the wells completed?

A Magnolia dual well completions are completed in the Devonian and Silurian formations.

Q What is the approximate depth of the two formations?

A TheDevonian is an average depth of about 7500 feet and the Silurian 8300 feet.

Q What type drive is present in the field?

A The Devonian formation is a depletion type drive and the Silurian is a moderately strong water drive.

Q Are you familiar with the hydrogen sulfide content of these two formations?

A There have been numerous tests run in those two formations. The approximate hydrogen sulfide content of

the Devonian gas is about 600 grains per hundred cubic feet, and the Silurian is about 1000 to 1200 grains per hundred cubic feet.

Q How many dual completions does Magnolia have in the field?

A Twelve.

Q What type of equipment is utilized in that operation?

A Baker and Otis.

Q Could you -- In your last three years of experience -- Could you outline to the Commission the existence of any cases of communication between zones as a result of packer failure or otherwise, in the field?

A Yes. Dual completions were first started in the latter part of 1947, and really began in earnest in 1948. And Magnolia has completed twelve.

Since that time, we have experienced twelve packer leaks. I won't say packer leaks, communications, on seven wells. Five of the original twelve wells have never had communication. Of the twelve communications, it is my opinion nine of them have been the result of packer element failures and two side-door choke failures and one hole in the tubing.

Q Has that, in your opinion, caused damage to the reservoir?

16b A Well, we have made a thorough investigation to determine whether that has occurred. And we believe in two

instances we can attribute communication between the Devonian and the Silurian being a direct result of damage to the Silurian reservoir.

Q Are you through?

A I was going to add a little more and explain how it was determined.

We had two top allowable wells dually completed and flowing when communication occurred. And unfortunately it isn't always possible to detect communication at the instant it occurs. Maybe a month or several months. But before communication was detected, the wells began to pump water. We worked over and corrected communication. And after the workover, the water percentage increased to about as high as 86% on the two wells, and our production decreased almost half. And we had to install lifting equipment.

It is my opinion the communication resulting in the Silurian formation, which is the strong water drive, charging the depletion Devonian reservoir to such an extent that water was coned into the Silurian formation prematurely, which, in my opinion, has shortened the life of two of those wells.

Q Do you agree with Mr. Washburn's statement it is easy to detect failures or other instances of communication between two formations?

A No; not entirely. I have run a number of packer

leakage tests and on occasion it is very easy to detect a leak. On other occasions it has been very difficult. We have resorted to the bottomhole pressure bomb on some occasions, and have not been able to detect communication, yet we knew we had communication by the gas-oil ratio and the bottomhole pressure performance.

In one case the Silurian charged the Devonion zone reservoir pressure about 500 pounds. That was indication enough we had communication between the Devonian zone and the Silurian, for the Devonian zone was charged to such an extent you could determine from surface equipment or the bottomhole pressure bomb test.

Q Are workovers of this nature difficult?

A We have found workovers at Dollarhide to be difficult and costly and hazardous too. It is necessary, since the Silurian zone is the higher pressure zone, - that wasn't brought out, but it is quite a bit higher pressure than the Devonian - it is necessary to mud up and use water to kill it. Whenever you do this, the upper pressure zone acts as such zone and takes mud and water. And when you put the well back on production, it has been our experience two or three months swabbing and fooling around is required to get back in production.

Q I haven't brought out from you the pressures, the pressure differential. Will you outline for us that informa-

tion?

A On November 1st, 1952, the latest pressure figures I have, the Devonian reservoir had a pressure of 1970 pounds. The Silurian reservoir at that same date had a pressure of 3151 pounds, approximately. That is an absolute pressure differential of about 1181 pounds bottomhole pressure.

So acting is an oil column of about the third gradient of about 940 pounds across the packer.

Q Substantially less than in the - than is the differential in the Denton Field?

A Yes, sir.

Q Does Magnolia have any dual wells artificially lifting in the Dollarhide Field?

A Yes; we have five dual gas lift installations.

Q Has there been any problems with that artificial lifting equipment?

A Unfortunately there is a problem. And we have had some specific problems. We have used gas lift entirely to lift both zones of the dual wells. Since theSilurian zone in the wells in which we have dual gas lift equipment produces water, we have had a particularly harrassing problem of scale formation forming in our tubing and gas lift valve. And this has not only reduced the amount of production we have been able to lift because of the decrease in the effective tubing area size, but has also resulted in

having to pull the well on several occasions, increasing workover costs. We have not been able to handle the volume of oil from our dual gas lift installations we had hoped to do initially.

MR. MADOLE: I have no further questions.

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CROSS EXAMINATION

BY MR. PEACOCK:

Q Mr. Thurman, is the type of packer installed in the wells in the Dollarhide Field the same type as has been demonstrated here?

A Yes, sir.

Q Were you present at the installation of these packers?

A Some of them.

Q At what time have these wells been dually completed,-- You mentioned '47 and '48 -- all twelve completed then?

A They were completed over the interval from late 1947 to late 1951.

Q Did you say there were twelve of these?

A Yes, sir.

MR. MADOLE: Twelve failures in seven wells. Not all twelve wells.

Q Oh. Well, you did, then, have packer failures in

not all twelve?

A Yes, sir.

Q But you did in seven of the wells?

A Yes, sir; that's right.

Q When did the first of these failures occur?

A About the middle of 1948.

Q Why did Magnolia continue installing them?

A We had -- That was really before my time. I don't believe I could answer that question.

Q Have they installed any since your time?

A No; I don't believe they have.

Q Then, you are not actually --

A I mean drilled the wells. I mean actually drilled the wells since my time. That is what I mean by that.

Q Has your experience been limited to this one field?

A Not entirely. I have had some experience in the Pegasus Field.

Q About how much?

A About three months.

Q Is Magnolia presently dually completing any wells in the Pegasus?

A Yes, sir.

Q In the light of their experience in the Dollarhide Field, with all these packer failures, why do you think they continue to install and dually complete these wells?

A It wasn't the recommendation of the engineering department, and that is all I could say.

(Laughter.)

Q You say it was or it wasn't?

A It wasn't.

17 Q Are you familiar with any of the Magnolia operations at places other than the Dollarhide and Pegasus?

A Not personally.

Q Does your company to your knowledge have any policy against oil-oil dual completions?

A No; to my knowledge they don't.

Q Does it have any oil-oil dual completions?

A Yes.

Q Do you know where?

A Dollarhide, Pegasus; the only ones I am acquainted with. I understand we have some in South Texas.

Q Do you have communication between the two zones in the Dollarhide, the one in particular you spoke of you had the great difficulty in locating? Could that have been communication around the outside of the casing?

A No, sir.

Q Have you had any experience with communication on the outside of the casing?

A No, sir; not to my knowledge.

Q Is that well still leaking?

A No, sir.

Q Did you get it fixed?

A Yes, sir.

Q It wasn't impossible, was it, then?

A No, sir.

Q Mr. Thurman, are you aware of Magnolia's having obtained a special order from the Railroad Commission of Texas on February 26th, 1951, granting them permission to dually complete the Lux No. 6 well in the East Abell-Waddell and Abell-Silurian-Montoya Fields in Pecos County, Texas?

A No, sir.

Q Are you aware of the fact that your company, Magnolia, on March the 12th, 1951, obtained a special order from the Railroad Commission of Texas, granting it permission to dually complete its Russel No. 7 well in the Falfurrias Field in Jim Wells County, Texas?

A No, sir.

Q Are you aware your company, Magnolia Petroleum Company, on November 13th, 1951; August 4th, 1952; February 25th, 1952; August 2nd, 1951; October 13th, 1952 --

MR. MADOLE: Are these all oil-oil completions?

MR. PEACOCK: No, sir; all dual completions.

MR. MADOLE: That is what I thought.

Q October 8th, 1951; March 23rd, 1953; and August 4th, 1952, obtained special orders from the Railroad Com-

mission of the State of Texas, authorizing it to dually complete wells?

A No, sir.

MR. PEACOCK: That is all we have, Mr. Spurrier.

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REDIRECT EXAMINATION

BY MR. MADOLE:

Q Just one question. Did I understand those are oil-oil completions?

MR. PEACOCK: Not all of them. You want to know which ones are?

MR. WHITE: There has been no evidence introduced there have been any so far.

MR. MADOLE: The man said he didn't know anything about them. I think they are gas-oil completions. I think we will skip it and go on with the witness.

MR. PEACOCK: If you want the information, we have it here.

MR. MADOLE: I don't care.

MR. SPURRIER: I don't care.

Q Mr. Thurman, there was reference to dual completions in the Pegasus Field. We have only one dual completion there; is that correct?

A To the best of my knowledge that is correct; yes, sir.

Q Are you familiar with the fact that the direct offset to that dual completed well is a dually completed well?

A No, sir.

Q You are not familiar with the fact that we protested that application?

MR. PEACOCK: Objection.

A I am familiar with the fact that we protested it; yes, sir.

Q Are you familiar with the fact that we protested the application for dual completion as a diagonal offset to that well prior to the time we drilled it?

A I don't know on that.

Q This is the third well drilled in the Pegasus Field on dual completion, isn't it?

MR. PEACOCK: Mr. Spurrier --

A I believe that's correct.

(Off the record.)

MR. MADOLE: I have no further questions.

MR. SPURRIER: Does anyone have a further question of Mr. Thurman? If not, the witness may be excused.

(Witness excused.)

MR. SPURRIER: Is there any further comment in this case?

MR. SELINGER: I would like to make astatement,

if statements are in order, as to our position for Skelly Oil Company.

We don't have a fixed policy of opposing dual completions as such. However, we don't look with much favor on such completions. We originally opposed Gulf's application in Cases 92, 93 and 94, as some of the members of the Commission may well know. We did it on the grounds that all the equipment had to be under the most ideal conditions in order for it to function 100%.

Now, in my attempted cross examination I attempted to show the Commission in a 5½-inch casing well you had to put in all this equipment. Now, the applicant brought the Otis and Baker people, and we found out there was additional equipment that had to be put in, depending upon the stage of the development. You have not only this equipment, but have two macaroni strings that had to be in there. And it became evident with all that equipment in a 5½-inch hole you just weren't going to recover that oil through that well as compared with a single completion from the Wolfcamp.

As to the Otis and Baker people, we believe their equipment is good and will continue to buy it, and we think they have good equipment. But we question the accuracy of their equipment at depths of 12,500 feet. That is not saying five years from now we won't accept it, or

two years hence. We will accept the equipment just like the oil industry generally will accept all progressive equipment.

And I think in this case in the Denton Field that when you take into consideration a well can be drilled to the Wolfcamp and a well can be drilled to the Devonian, and from Phillips' own testimony they failed to show economically they cannot drill separate wells to each of the formations. And for that reason and that reason alone we think they should be denied their application for dual completions in the Denton Pool.

MR. MADOLE: I think Magnolia's position in this case is clear. The only observation I would like to make, without getting into a further argument, is the economics as testified to by Mr. Washburn as to the cost of these wells. On the testimony of Mr. Selinger and as assessed by Mr. Washburn, it was brought out that the taxes on this recovered oil, the income tax, is deducted. Well, if that is true, then as you all know, anybody drilling oil wells to save dollars, you apply the saving rather to the $200,000,
17b you won't have but a $98,000 cost in your well. If you put it on one side, you ought to take it off the other.

For that reason, I don't think the economics of this dual completion have been justified.

MR. SPURRIER: Anyone else before Mr. Peacock sums

this up.

MR. NESTOR: I have a statement for the Shell Oil Company in Cases 556 to 559, inclusive, and I will have a copy for the court reporter.

The Oil Conservation Commission of the State of New Mexico has previously stated that it has yet to be convinced of the soundness of oil-oil dual or multiple completions as a general practice in New Mexico and has denied all previous requests for such completions. Most recent examples were Order Number R-78 in Case Number 274, Order Number R-79 in Case Number 275 and Order Number R-233 in Case Number 426. It is Shell's understanding that the principles heretofore controlling the Commission's action with reference to oil-oil dual or multiple completions have been (1) that such completions do not assist it in the performance of its duty of conservation of oil and gas and the protection of correlative rights except in the instance where one of the affected pools will not justify development on its own merit, and (2) that such completions are more apt to result in waste and violation of correlative rights than ordinary completions in the following respects:

1. Oil-oil dual completion often results in the abandonment of one or both zones at a time when there is a reserve therein that would be produced under normal single zone completions. This is because workovers of dual comple-

tions are more expensive than workovers of ordinary completions and will on the average occur at least twice as often, and risk of damage to each reservoir occurs whenever a workover occurs though the occasion therefor may have involved only one of them.

2. Artificial lift in dual completions where production from both horizons must be lifted simultaneously is not as efficient or as practical as in ordinary completions. It seems probably that both the Devonian and Wolfcamp zones at Denton will require artificial lift at the same time. Recent data indicate that eleven Denton Wolfcamp wells are now on artificial lift and that artificial lift installations are pending in at least eight additional wells. This total figure of nineteen wells represents 37 per cent of the 51 field wells.

3. Annular flow is less efficient than flow through tubing and consequently waste of reservoir energy occurs when an oil zone is flowed through the annulus.

4. The danger of communication of reservoir fluids from one zone to another which exists in any well is greatly increased in a dually completed well. This is true because in a dual completion both reservoirs are opened into a single well bore and separated only by a packer which is subject to deterioration with age and exposure to the reservoir fluids.

5. The Oil Conservation Commission of the State of

New Mexico is without sufficient engineers and technical employees to act as a policing group in the checking of packer tests and in the preventing of damage resulting from careless dual completion operations.

It is Shell's opinion that such principles are sound and should continue to be the basis for action by this Commission with reference to requests for oil-oil dual completions. Shell Oil Company therefore respectfully requests that the Commission deny the applications of the Phillips Petroleum Company in Case Numbers 556, 557, 558 and 559, and this even though Shell Oil Company is a part owner with Phillips Petroleum Company in the Fort 1 and Fonzo 1 wells involved in Cases Numbered 556 and 557.

MR. SPURRIER: Anyone else?

MR. JOHNSON: J. P. Johnson with the Atlantic Refining Company.

The Atlantic Refining Company concurs with the Phillips Petroleum Company in their application to effect four dual oil-oil completions in the Denton Field. Atlantic has 50% interest in two of the wells in this application; namely, Phillips' Denton 12 and 13 wells now completed in the Devonian reservoir. In addition to interest in these two wells, Atlantic is owner and operator of 22 wells in the field, and has an interest in 32 wells operated by other companies.

Dual oil-oil completions between the Devonian and Wolfcamp pools are recommended from the standpoint of mechanical feasibility. Atlantic has had experience with numerous dual completion operations and found them to be mechanically and economically feasible.

Atlantic is of the opinion that the paramount consideration here is whether the production can be separated effectively, and the evidence presented on behalf of Phillips Petroleum Company and our past experience indicates it can be done. It is believed proper maintenance and separation of production can be insured by the Commission by appropriate rules and regulations calling for periodic checks to be performed by the operator.

MR. SPURRIER: Anyone else?

MR. CHRISTIE: R. S. Christie of Amerada.

I just wanted to note our position which we have stated before.

While we have no direct interest in these cases, we are still opposed to oil-oil dual completions as a general principle.

MR. SPURRIER: Anyone else?

MR. SPELLMAN: B. K. Spellman for the Ohio Oil Company.

The Ohio is opposed to the granting of Phillips' application for dual oil-oil completions in the Denton Field.

We do not believe the reservoirs are the type which would justify dual completions, and therefore it would be better conservation practice to continue single completions in each reservoir.

MR. SPURRIER: Anyone else? Mr. Peacock.

MR. PEACOCK: To add to what the gentleman from Atlantic so well stated, I would like to say this: First of all, Shell's interest in these two wells he mentioned is one plus percent. It is less than 2%.

(Laughter.)

MR. PEACOCK: We believe that we have presented testimony in evidence to this Commission which proves that dual completion of wells in the Fonzo, Fort and Denton 12 and 13 wells is feasible and practicable. Every company here that has opposed us has dually completed wells. And although they are not here in New Mexico in oil-oil, most of them have oil-oil completions outside of the State of New Mexico.

The equipment which we demonstrated to the Commission is of the type that the Commission has approved for use in dual completions in gas-oil production in this state. And it is our position that this type of equipment will be as effective in preventing commingling and communication in an oil-oil dual completion as it is in a gas-oil dual completion.

Now,we have this further argument applying to the

Fort and Fonzo wells, which I admit doesn't apply to the Denton No. 12 and 13. We could drill twin wells there and pay them out, but could not do so in the Fort and Fonzo No. 1. The Fort will not pay back drilling costs - the Fonzo will not pay back drilling costs. The Fort, we will break even. That is according to the estimates of our engineers. That is the way we determine whether we will or will not drill wells. The same as every company determines the matter.

The Fonzo and Fort won't be drilled and it will result in this, that the oil will lie there in the Wolfcamp formation and it won't be produced under these two 40-acre units. The royalty owners will losetheir royalty. I don't believe any of them could maintain an action against us successfully for failure to drill wells to the Wolfcamp formation in either the Fonzo or Fort 40-acre tracts. They would have to prove that a reasonably prudent operator would drill such a well, and no court in this state will hold a reasonably prudent operator will drill a well where he will lose money or where he will just exactly make back what he spends.

Only one other item here I would like to bring to the attention of the Commission. There are no oil-oil dual completions in this state. TheCommission has had, under its powers, has had the opportunity to study these oil-oil

dual completions, and it has not determined they are not feasible. And it has continued to permit completions, dual completions for gas-oil production. Now, if there were an oil-oil dual completion available for study to this Commission, it could, as a result of its study and as a result of the information which would be available to it, which is not available to it at this time, - those oil-oil completions lie outside this jurisdiction - it would be in a better position to regulate the production of oil from two zones out of the same hole.

Now, I think that all the propononents and opponents of these applications have agreed in the past few years there have been very - at least some improvement - in the equipment for dual completions. Now, Mr. Selinger said his company might in two years change its mind on this dual completion --

MR. SELINGER: Or in five years.

MR. PEACOCK: Or in five years. That is a recognition of the fact that this type of equipment is being improved.

MR. WHITE: But this exhibit is dated 1951; 5-24-51.

MR. SPURRIER: That is the Otis equipment.

18 MR. PEACOCK: Well, Phillips is in that position now. We are willing to try and see, and we urge the Commission to grant these applications.

MR. SPURRIER: Does anyone else have a comment in this case? If not, we will take the case under advisement and move on to the nomenclature cases.

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