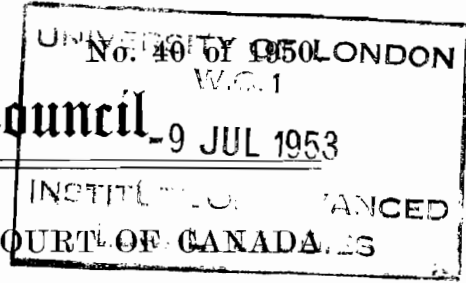


GC1g16

2, 195-

In The Privy Council



ON APPEAL FROM THE SUPREME COURT OF CANADA

BETWEEN :

MINERALS SEPARATION NORTH AMERICAN
CORPORATION,

Appellants

—AND—

NORANDA MINES, LIMITED,

Respondents.

RECORD OF PROCEEDINGS

VOLUME 3

PAGES 485—689

BIRD & BIRD,
5-11 Theobald's Road,
London, W.C.1,
Appellants' Solicitors.

LAWRENCE JONES & CO.,
Winchester House,
Old Broad Street,
London, E.C.2,
Respondents' Solicitors.

In The Supreme Court of Canada

ON APPEAL FROM THE EXCHEQUER COURT OF CANADA

BETWEEN :

NORANDA MINES, LIMITED,

Appellant;

— AND —

MINERALS SEPARATION NORTH AMERICAN
CORPORATION,

Respondent.

APPEAL CASE

— VOLUME 3 —

HOLDEN, MURDOCH, WALTON, FINLAY & ROBINSON,
Solicitors for Appellant.

SMART & BIGGAR,
Ottawa Agents for Solicitors for Appellant.

EWART, SCOTT, KELLEY & HOWARD,
Solicitors for Respondent.

30722

UNIVERSITY OF LONDON
W.C.1.
-9 JUL 1953
INSTITUTE OF ADVANCED
LEGAL STUDIES

OTTAWA, NOVEMBER 21ST, 1944
MORNING SESSION

CLIFFORD B. PURVES, Re-examination by Mr. Robinson:

HIS LORDSHIP: You were about to commence your re-examination, Mr. Robinson.

MR. ROBINSON: Yes, my Lord.

THE WITNESS: My Lord, there is one slight error in fact which I would like to correct in my testimony. That is in answer to your question about the preparation of ammonium xanthate on page 516
10 of the record. My answer to your question—

HIS LORDSHIP: 663. Q.—Let me just look at it. A.—It is in answer to your question 300Y, about two-thirds of the way down the page. I say there:

“One has first to make xanthic acid by the ordinary method and then neutralize it with ammonia, and then ammonium xanthate is obtained.”

664. Q.—“One has first to make xanthic acid by the ordinary method and then neutralize it with ammonia?” A.—Yes.

665. Q.—“And then ammonium xanthate is obtained”?
20 A.—The facts are that one has first to make xanthic acid or sodium xanthate.

666. Q.—To make xanthic acid of sodium? A.—I am sorry, my Lord; one has first to make sodium xanthate.

667. Q.—One has first to make—A.—Or potassium xanthate, of course, by the ordinary method and then to make—

668. Q.—And then neutralize it with ammonia? A.—There is one intermediate step which I missed out and that is to make the disulphide. That is a very simple process.

669. Q.—First to make—A.—Sodium xanthate.

30 670. Q.—By the ordinary method? A.—Yes.

671. Q.—You have to use disulphide in that process, do you not? A.—Carbon disulphide, yes, and then in the second process it really means making what is called xanthogen disulphide, to give the technical word, which has not been gone into in detail. Then it is the xanthogen disulphide which is treated with ammonia.

672. Q.—Oh, I see. A.—I implied the ammonia operated on the xanthic acid instead of on the disulphide of the xanthic acid. That is what the correction amounts to. I think it is more for accuracy than to alter the sense of my answer.

40 673. Q.—Well, all that my question was directed to was whether you could make a xanthate directly? A.—Exactly

674. Q.—With ammonium. A.—That stands. One cannot do that. One has to go through the xanthic acid. I have another

For Defendant—Dr. Purves—~~Case~~^{PE}—Examination

correction, my Lord, which is on page 572. It is my answer to question 561 where I am asked whether carbon tetrachloride can be used in producing xanthate. The answer is:

“No, you cannot. If you use carbon tetrachloride, you wander off into that ortho-thiocarbonate series which are left off that chart.”

The word “thio” should be deleted.

675. Q.—Ortho-carbonate? A.—Ortho-carbonate series. There is no sulphur in the system.

10 676. Q.—In which? A.—There is no sulphur in the reaction mixture so we cannot get a thio derivative. It would have given thiocarbonate if we had used thio-alcohol. The other matter of importance is that I was asked on page 557 about the analysis at question 497 at the foot of the page where I was unable to say specifically—

677. Q.—“Can you say whether any of the authors indicate that they analyzed the substance that they produced which they called ammonium xanthate?” A.—Yes, and I was unable to quote references specifically on that point. I should like to add that these
20 references are given in exhibit D-61. I have them here in court. The first reference is—

678. Q.—That is to the analysis of the substance? A.—To the specific analysis of the ammonium ethyl xanthate; crystalline ammonium ethyl xanthate and crystalline ammonium amyl xanthate have both been thoroughly analyzed and I can quote references. The first reference is in Debus in Liebig’s Annalen, volume No. 72. The year is 1849. The analyses there are on pages 8 and 9. They seem to be completely analyzed. The other reference is also in the Annalen, volume 84, page 338. I think the author there is also
30 Debus. I should check that reference.

These analyses are very old, my Lord, and at that time they were not sure of the atomic weights of carbon, oxygen and sulphur. So that the formula given has not the same number of carbon atoms. They had not been kept at that early date. The analyses are given, but they were interpreted on a different atomic weight table.

HIS LORDSHIP: 700. Q.—You did, of course, make the general statement? A.—Yes, I did.

701. Q.—When a scientist said that he had found a certain substance, it was almost mandatory that he should check it through
40 analysis? A.—Yes.

702. Q.—Before it could appear in a reputable journal? A.—Yes. And these two references give the specific details which my friend asked for on that point as regards crystalline ammonium xanthates.

703. Q.—Is the crystalline quality an essential quality of a true xanthate? A.—I would not say so, my Lord. The physical state varies. Many of the simpler xanthates are crystalline.

For Defendant—Dr. Purves—Re-Examination

704. Q.—The simpler xanthates? A.—Yes. It varies, of course.

705. Q.—You gave an example yesterday of cellulose xanthate not being a crystalline salt? A.—That is quite true, my Lord. It is not crystalline, and then in other cases—

706. Q.—And I suppose starch xanthate? A.—It would not be crystalline, no. It depends a great deal on the particular combination of R and M.

707. Q.—Oh, yes. A.—It varies with that a great deal.

10 708. Q.—You mean if you were going to identify different classes or groups of xanthates, you might have to do it by distinguishing them from the point of view of whether they were crystalline in character or not? A.—They could be classified in that way, my Lord.

709. Q.—Is there a clear distinction between those that form crystals and those that form, as you call them, shreds or something like that? A.—No, I do not think so. The fibrous ones, my Lord—

710. Q.—I meant the fibrous ones. A.—It is a characteristic property of all cellulose derivatives, but is not so usual among other series of simpler xanthates.

20 711. Q.—Are there any of the simpler xanthates that are fibrous in nature rather than crystalline? A.—I do not think so. A great many of the simpler ones have not been crystallized. They are amorphous derivatives. Sometimes they are oils. That classification of physical properties cuts across the chemical constitution, if you understand what I mean.

712. Q.—You cannot, for instance, define a group according to their chemical nature and subdivide that by reference to physical properties? A.—No sir, I do not think that could be done, my Lord. The two classifications cut across each other, if you under-
30 stand what I mean.

713. Q.—If one group were described as crystalline in character, that would exclude those that were fibrous in character? A.—Yes, on that basis. Quite so, my Lord. It is really a matter of definition again, because a great many cellulose derivatives, even though we organic chemists call them fibrous, are amorphous and non-crystalline. When they are examined by X-ray methods, the X-ray experts will tell us they are very often extensively crystalline on that very small scale. So that the whole thing is a matter of degree.

40 714. Q.—They might be crystalline and cling together in the form of fibres? A.—Precisely. In fact, in general, that is what a fibre is. It is a crystalline body in which the individual crystals are all connected together and are so small that they cannot be distinguished by ordinary methods. But in general, the classification according to physical properties, even in simpler xanthates, would cut across their chemical constitution.

For Defendant—Dr. Purves—Re-Examination

HIS LORDSHIP: All right, Mr. Robinson.

MR. ROBINSON: 715. Q.—Dr. Purves, when you were speaking to his Lordship in connection with the making of ammonium xanthate, when you were correcting the first answer which you corrected, you spoke of making sodium xanthate and then xanthic acid, and you mentioned potassium. I am not sure that the reporter caught that.

HIS LORDSHIP: 716. Q.—When you referred to sodium xanthate, you did not necessarily have to start with sodium xanthate. You could make potassium xanthate? A.—Exactly.

10 717. Q.—As an alternative? A.—Yes, sodium or potassium.

MR. ROBINSON: 718. Q.—I just was not sure whether that fact was clear on the record. Then, Dr. Purves, one rather small point: My friend gave you a formula for cellulose to which you agreed, $C_6H_{10}O_5$, the whole thing taken X times? A.—Yes.

719. Q.—That is with brackets around it and X after it? A.—Yes.

720. Q.—I wonder if you would mind relating that formula to the formula of cellulose given on Exhibit D-87. I have a copy of Exhibit D-87 here which I will hand to you. A.—Thank you. The
20 formula for cellulose which our friend gave, was $C_6H_{10}O_5$.

HIS LORDSHIP: 721. Q.— $C_6H_{10}O_5$? A.—Yes.

722. Q.—All X times? A.—All X times. And on D-87, under 13, we have the same formula given in a structural way. Then underneath the structure we have [$C_6H_7O_2(OH)$, three times]. That is exactly the same as my friend's formula. We have indicated that it is to be taken many times by the symbol N instead of the symbol X which you use. So it means that they are identical.

723. Q.—It is identical with formula No. 13 on Exhibit D-87? A.—Yes. And I believe also that the formula for the cellulose
30 radical, if my memory serves me right, was given as $C_6H_7O_2$ in your transcript, taken X times, and that corresponding with formula 14 on the chart, with N for X.

MR. ROBINSON: 724. Q.—You were speaking yesterday of solubility, but I am not sure that you made it clear what the limit, if you like, between solubility and insolubility in chemical language is. Perhaps I can put it this way. How soluble or to what extent would a chemical compound have to be soluble in water for it to be described as soluble? A.—My Lord, I would put that value, for practical operating reasons in organic chemistry at something of the
40 order of a few tenths of 1 per cent; from there, of course, up, right on, we would call a compound soluble.

HIS LORDSHIP: 724a. Q.—You mean it is partly soluble? A.—Well, if it takes a lot of water to dissolve a material, say a few tenths of 1 per cent, that perhaps meant that it took 500 parts of water to dissolve it. If it took any less water than that, I would say that it was soluble in water or in whatever solvent was used.

For Defendant—Dr. Purves—Re-Examination

MR. ROBINSON: 725. Q.—Another thing. To what extent would a chemical compound have to be soluble in water for it to form anions and cations in solution? A.—Well, that takes the word “soluble” out of the working range of the practical organic chemists down into the range where physicists work, because those anions and cations depend on sensitive electrical tests.

HIS LORDSHIP: 726. Q.—I suppose those terms “anions” and “cations” are more applicable to physics than to chemistry? A.—Yes, they are, my Lord.

10 727. Q.—Because you speak of those where there is an electrical current? A.—Exactly. And there those sensitive electrical methods mean that they can be detected at relatively speaking very great dilutions—I would say at least a fiftieth of one per cent or a hundredth of one per cent. In fact, I feel sure it is very much less, because the best tests for the purity of the most carefully purified distilled water are those electrical tests for anions and cations. They use them to find out whether a given sample of distilled water has picked up any carbonic acid. Just by exposure to the air, for example, it will at once register in those anions and cations tests.

20 MR. ROBINSON: 728. Q.—You have spoken of dilution—I have forgotten how you put it—that you could have a very dilute solution, and then you spoke of the formation of anions and cations. But I am not sure that the way your answer was expressed was quite in terms to meet the question that I was putting to you, and that is: To what extent would a chemical compound have to be soluble if you were going to form anions and cations in solution at all? A.—Oh, a very slight extent. I would say that it would be easily detected at say two-one-hundredths of one per cent.

30 729. Q.—If a compound is soluble to the extent of two-one-hundredths of one per cent—A.—Yes, that is one-fiftieth of one per cent, that is the same thing.

730. Q.—Then what is the situation? A.—Then there would be no difficulty in determining that it formed or did not form anions and cations in solution.

HIS LORDSHIP: 731. Q.—It would only require a small degree of solubility to be present in order to determine whether it would form anions or cations in solution?

MR. ROBINSON: That is the point I had in mind, my Lord.

40 THE WITNESS: Yes. And I am being exceedingly conservative in my figure of one-fiftieth of one per cent. In practice it might be vastly less.

HIS LORDSHIP: 732. Q.—So that when you speak of a compound as being soluble, it does not necessarily mean that it is all dissolved in water? A.—Not necessarily, no.

733. Q.—Does it mean that it is all capable of being dissolved in water? A.—Yes, that is the implication.

For Defendant—Dr. Purves—Re-Examination

734. Q.—You might have to use more water? A.—You might have to use more water. That is the implication if a thing is said to be soluble.

MR. ROBINSON: 735. Q.—It is simply a question of how much water in proportion to the amount of the product you are prepared to use? A.—Yes, that is the point really.

736. Q.—If you put 10 grams of something in 100 cc. of water and one-tenth of a gram dissolves, then you know how much water you have got to use in order to dissolve the whole 10 grams? A.—Yes;
10 you have got to use a great deal more water.

737. Q.—When you were speaking of ammonium xanthate yesterday, were you or were you not including in your remarks the tri-methyl-phenyl ammonium xanthates and the tetra-methyl ammonium xanthates which are referred to on Exhibit D-61? A.—No, my Lord. When I spoke of ammonium xanthates that was in connection with their preparation.

738. Q.—What I want to know is whether the remarks that made apply—it is not a question of looking at the transcript, Dr. Purves, because my difficulty is that the transcript speaks continu-
20 ously of ammonium xanthate. What I am wondering about is, did you or did you not intend those remarks to apply to the tri-methyl-ammonium xanthate and the tetra-methyl ammonium xanthate? A.—No, my Lord not at all. The tri-methyl-phenyl ammonium hydroxide and the tetra-methyl ammonium hydroxide are strong alkalis and will form xanthates directly, just like caustic soda.

HIS LORDSHIP: 739. Q.—Oh, they will form xanthates directly? A.—Yes, they will form xanthates directly. They are strong alkalis.

740. Q.—Those compounds of ammonium will form xanthates directly? A.—Yes. They are strong alkalis. So there is that
30 distinction, that ordinary ammonium itself will not form xanthates directly, but tetra-methyl and tetra-phenyl ammoniums, which are strong alkalis, will form them directly.

MR. ROBINSON: 741. Q.—You said just a moment ago tetra-phenyl. Did you mean tri-methyl phenyl? A.—Tetra-methyl and tri-methyl-phenyl. It was a slip.

HIS LORDSHIP: Tri-methyl-phenyl ammonium is one? A.—Yes.

742. Q.—And tetra-methyl ammonium is the other? A.—Yes.

743. Q.—You say these are both strong alkalis? A.—Yes.

744. Q.—And will form xanthates directly? A.—Yes.

40 745. Q.—And in that way are to be distinguished from ammonium, which will not form xanthates directly? A.—Yes.

MR. ROBINSON: 746. Q.—How may we describe those compounds in relation to ammonium? A.—They are substituted ammoniums in which the four hydrogen atoms in the ammonium, which is NH_4 , are replaced by those other groups, either by four methyls or by three methyls and a phenyl.

For Defendant—Dr. Purves—Re-Examination

HIS LORDSHIP: 747. Q.—But they are different things from ammonium? A.—Yes, they are different things, because ammonium itself is a very weak alkali and those substitutions may turn the substituted ammonium into very strong alkalis. I think that was also mentioned in the transcript; my memory is that it is.

MR. ROBINSON: I think you stated it in some other connection.

HIS LORDSHIP: 748. Q.—I suppose one might infer that it is the inclusion of the other elements in those compounds that makes it possible for the compounds to form xanthates directly? A.—One
10 would imagine so, my Lord.

749. Q.—That is a conclusion that might reasonably be drawn from that? A.—Yes. The replacement of the four hydrogens in ammonium in general by other radicals of, say, the alkyl or aryl class makes the materials strong alkalis instead of being weak alkalis, and xanthate formation seems to be connected with that.

MR. ROBINSON: 750. Q.—Dr. Purves, my friend asked you some questions about the effect of the presence of water during the xanthate reaction, and you told us of the effect on the yield of xanthate. Is there anything else you can tell us about the effect of the
20 presence of water during the formation of xanthate?

HIS LORDSHIP: That would be water in the alcohol?

MR. ROBINSON: I was not particularly limiting it to water in the alcohol, my Lord. It might arise in that way or in some other way.

751. Q.—If water is present during the xanthate reaction, what I would like to know is whether you can tell us anything about the effect of that presence of water, that is anything more than you said yesterday when you spoke of the effect on the yield of xanthate? A.—No, I can't add a great deal more on that, except to state what
30 I said yesterday, that the water and the alcohol will compete for the other reagents.

752. Q.—For what purpose will they compete? A.—They are going to compete to see which will get most of the carbon disulphide and the caustic potash.

753. Q.—If the water gets it, what happens? A.—Then you have got more impurity, for example, in your mixture and less xanthate. So the more water, the more impurities you have, and your xanthate yield will go down, as I explained, and you are going to have more trouble all around in the preparation.

40 HIS LORDSHIP: 754. Q.—Is that because the water is likely to contain impurities? A.—Well, there is the side reaction between water and carbon disulphide and caustic potash which gives those materials of the tri-thio-carbonate class; so that the more water, the more caustic and carbon disulphide will be used up in making those tri-thio-carbonates, so that naturally the alcohol yielding the xanthate

For Defendant—Dr. Purves—Re-Examination

is going to make less xanthate and you are going to get less xanthate in a solution which has got more tri-thio-carbonates. I think that is substantially the position.

MR. ROBINSON: 755. Q.—Would that be true if the water were distilled and accordingly perfectly pure water? I ask that because his Lordship asked whether the impurities arose out of some impurities in the water. Or does it arise simply from the presence of water, even perfectly pure water? A.—Well, it arises out of the presence of water there as such.

10 HIS LORDSHIP: I gathered that from Dr. Purves' answer to my question.

MR. ROBINSON: I was not sure whether that had been made clear.

756. Q.—If you put water and carbon disulphide and, let us say, caustic soda together without anything else, would there be a reaction? A.—Oh, yes. That is the reaction which I have been mentioning. That is the reaction which gives you the tri-thio-carbonates and similar substances.

20 757. Q.—Whereas— A.—You get no xanthate there, because that is the extreme, you have left all the alcohol out of your mixture.

758. Q.—You get no xanthate there, and the other extreme is where you have no water. Where you have no water but you have alcohol, then what happens? A.—That is going to give you xanthate, with a very small amount of impurities.

HIS LORDSHIP: 759. Q.—Did I understand you to say that if you put the caustic soda—or potash, did you say?

30 MR. ROBINSON: 760. Q.—That does not make any difference? A.—No.

HIS LORDSHIP: 761. Q.—If you put that with the disulphide and the water you would not get xanthates? A.—No.

762. Q.—You would get tri-thio-carbonates? A.—Yes, exactly.

MR. ROBINSON: As I understand the position, my Lord, two of the ingredients are common. You assume always carbon disulphide and caustic soda. If to those two you add water you get tri-thio-carbonates; if, on the other hand, to those two you add alcohol, you get xanthates.

40 HIS LORDSHIP: 763. Q.—You need the alcohol to have the salt resulting from the mixture of the acid and the metal? A.—Yes. The alcohol supplies the radical R in the xanthate, the radical R—that could be related to E-3 in Exhibit D-57.

MR. ROBINSON: 764. Q.—But the competition arises when you are mixing those two reactions up. That is, you take the two ingredients that are common, the carbon disulphide and the caustic alkali, and you put with them alcohol and water? A.—Yes.

For Defendant—Dr. Purves—Re-Examination

765. Q.—That brings about the competition that you spoke of? A.—Yes.

HIS LORDSHIP: 766. Q.—The alcohol has to work harder to produce the xanthate than it would have to do if it were alone? A.—Yes.

MR. ROBINSON: 767. Q.—The water is trying to take these other two ingredients away to make tri-thio-carbonates? A.—Yes.

768. Q.—What are the physical characteristics of potassium or sodium tri-thio-carbonates? A.—They are yellow salts.

10 769. Q.—The tri-thio-carbonates? A.—Yes.

770. Q.—Yellow salts, did you say? A.—Yes, yellow crystalline materials that are soluble in water.

HIS LORDSHIP: 771. Q.—How do they differ from the xanthates? A.—The xanthates when they are pure are very nearly colourless, white, and they are also soluble in water. They differ a great deal chemically, of course, in their chemical reactions.

MR. ROBINSON: 772. Q.—I think you have outlined those chemical differences. You did that at another time. Now, you were asked some questions yesterday about the solubility of cellulose
20 xanthate, but you were speaking generally. You simply used the expression “cellulose xanthate” throughout the discussion.

MR. GOWLING: I think my friend is leading the witness into an answer here which I do not know the witness wants to give. He certainly did not give it yesterday along the line that my friend is indicating.

MR. ROBINSON: I submit I have not led the witness into anything yet.

HIS LORDSHIP: But it looked as if you were going to.

MR. GOWLING: Perhaps I should say that I was afraid my
30 friend might lead.

MR. ROBINSON: 773. Q.—My point is this, Dr. Purves. You spoke yesterday of cellulose xanthate generally. All I would like to know is whether there would be any difference in this respect between sodium cellulose xanthate and potassium cellulose xanthate. A.—Is that in respect of solubility?

774. Q.—In respect of solubility. A.—Well, I mentioned I think yesterday that the sodium and potassium xanthates are very similar indeed in all their properties, so that I would not expect any great difference at all between the solubility of a sodium cellulose
40 xanthate and a potassium cellulose xanthate. One might be twice as soluble as the other one—I could not say which—or it might be three times, but it certainly would not be one hundred times more soluble or anything like that. They would be in the same order of magnitude.

For Defendant—Dr. Purves—Re-Examination
 For Defendant—Dr. Purves—Re-Cross-Examination

HIS LORDSHIP: I understand the question was directed to a comparison of the solubility of cellulose xanthates with that of other xanthates.

MR. ROBINSON: No, my Lord. If your Lordship understood the question that way I misled you. The point was that yesterday throughout the discussion he simply used the expression cellulose xanthate without specifying any metal. I was simply asking him now whether there would be any difference between the solubility of sodium cellulose xanthate on the one hand and potassium cellulose
 10 xanthate on the other hand. It is to that question the witness directed his answer.

HIS LORDSHIP: I understand.

MR. ROBINSON: Thank you, Dr. Purves.

RE-CROSS EXAMINATION by Mr. Gowling.

MR. GOWLING: I have a couple of questions arising out of the re-examination.

800. Q.—Dr. Purves, if you mix an alkali with carbon disulphide and water you said you get tri-thio-carbonate? A.—Yes.

801. Q.—Is it not true that you also get some other carbonate?
 20 A.—Yes, I think I mentioned there were other substances. Tri-thio-carbonate is the dominant product, but you would also get sodium sulphide, hydrogen sulphide. That is the gas which gives bad eggs their characteristic odor.

802. Q.—You get two-thirds tri-thio-carbonate and about one-third of other carbonates? A.—Yes, there is a long list of those other salts. Their proportions will vary according to the exact conditions of your experiment.

803. Q.—With respect to the question which his Lordship asked you as to the physical form of xanthates, is my understanding correct
 30 that xanthates made with the alkali metals would be regarded as crystalline xanthates? A.—In a great many cases that is true.

HIS LORDSHIP: 804. Q.—Xanthates made with alkali metals would be crystalline? A.—That is too sweeping a statement. There may be exceptions, but certainly the lower xanthates like amyl and ethyl and so forth are usually crystalline when the salt is sodium or potassium.

805. Q.—Then, would it be more precise to say that xanthates made with alkali metals usually crystalline in character? A.—Yes, are usually crystalline.

40 MR. GOWLING: 806. Q.—Xanthates made with any alkali metal—with the lower alcohols are crystalline? Would that be right? In other words, it is the lower alcohols you are referring to,

For Defendant—Dr. Purves—Re-Cross-Examination

not the lower metals, in qualifying the statement I made? A.—Yes. My difficulty is to answer a question like that one would have to go through the whole list and see if there were any exceptions.

807. Q.—Let us say any alkali metal used with the ethyl radical; would that be a crystalline xanthate? A.—Yes, I can say precisely that is because I know sodium ethyl xanthate is crystalline and so is potassium.

HIS LORDSHIP: 808. Q.—Those two are crystalline? A.—I know those two, yes. There I can say as a rule the sodium and
10 potassium salts are very likely to crystallize.

809. Q.—Are very which? A.—Very very likely to crystallize, and frequently do, but to spread that out into a universal dogmatic statement is something I cannot do.

MR. GOWLING: 810. Q.—My broad question is due to my ignorance of chemistry, Dr. Purves. I was attempting to confine it to such of the alkyl radicals as ethyl, or something close to it.

HIS LORDSHIP: 811. Q.—Radicals such as ethyl, methyl, amyl, butyl and propyl? A.—Yes, most of those are crystalline.

812. Q.—Most of those would be crystalline? A.—But as you
20 move up the series and R becomes bigger and bigger it gets a bigger and bigger percentage of the whole mass, and in physical properties it is known to grade off closer and closer to the hydrocarbon from which R was derived, so that by the time you get up to C_{16} or C_{19} I am not prepared to state then that there the potassium salts would be crystalline. They might be oils. That is my difficulty in generalizing.

813. Q.—But they would be crystalline up to a certain stage and then might become oil? A.—That might depend on the exact nature of the radical R. It really all depends on R.

30 814. Q.—On R? A.—Yes.

MR. GOWLING: 815. Q.—If you use tri-methyl-phenyl ammonium hydroxide to form the xanthate do you get ordinary ammonium xanthate? A.—No. Instead of getting the sodium salt of the xanthate or potassium salt you would come out with the tri-methyl-phenyl ammonium salt. That would be the salt part of the molecule just as sodium is the salt part if you use caustic soda.

816. Q.—I am not sure whether you were qualifying the answers you gave me yesterday as to solubility, but I am told that ordinary glass is to a great extent soluble in water on the basis of your answers
40 given this morning. Am I correct in that? A.—No, when you come down to physics, you see, it is the case in a great many reactions, where we are trying to keep out impurities which very often alter the course of the reaction, we have to use hard glass because soft glass gives enough anions and cations to upset the reaction, but there again, you see, what we are dealing with is right down in the range which interests physicists rather than chemists.

For Defendant—Dr. Purves—Re-Cross-Examination

817. Q.—My point is if you take a substance and find that it requires a great length of time and a large volume of water to dissolve it, or to have any dissolution at all, you would regard that as substantially insoluble rather than as being soluble? A.—Yes, as a practical organic chemist I put that limit as a practical thing a few tenths of 1 per cent, so speaking as an organic chemist for practical preparative purposes you would regard things like glass as insoluble but a physicist might come along with sensitive electrical tests and show where glass has got solubility.

10 HIS LORDSHIP: 818. Q.—Perhaps the solution of the glass would be the result of a physical action of the electrical current and not through the effect of water by itself? A.—I think, my Lord, it is the effect of the water because if we use soft glass it turns the water very slightly alkaline which can be detected by electrical methods, but I do not want to claim that glass is soluble because the order of solubility, the order of magnitude, is so low that it interests physicists and in general it does not interest chemists.

20 819. Q.—The extent of solubility is so slight that for practical chemical purposes it is not soluble? A.—It is not soluble. The trouble is the word “soluble” is usually used with regard to the use that is going to be made of the information. That is my difficulty, and why I set an arbitrary limit of a few tenths of 1 per cent.

MR. GOWLING: 820. Q.—I have one more question, Dr. Purves. I should like to refer to this Debus paper which you mentioned a few moments ago.

HIS LORDSHIP: Which paper?

30 MR. GOWLING: The Debus paper. Can you calculate from that paper the percentages of carbon and hydrogen in ammonium di-thio ethyl carbamate?

HIS LORDSHIP: You had better repeat that.

MR. GOWLING: 821. Q.—Can you calculate it as it is done in that paper for xanthate? A.—That is this formula here?

40 822. Q.—This one here, I think. A.—Well, I think I explained that in this calculation—this article is 1852 so that when they are calculating you will have to give carbon an atomic weight of 6 instead of 12. Then, sulphur will also be half, 16 instead of 32 and oxygen will be 8 instead of 16. Hydrogen stays the same. On that basis the formula has to be adjusted.

823. Q.—Would you compute ammonium di-thio ethyl carbamate in the same way? A.—That is simply ammonium ethyl xanthate? Is that not right?

823. Q.—I do not think so. The formula which has been given to me is $C_2 H_5 NH. C.S.SNH_4$. A.—That is not the formula of ammonium ethyl xanthate.

For Defendant—Dr. Purves—Re-Cross-Examination

824. Q.—That is the formula of the ammonium di-thio ethyl carbamate.

HIS LORDSHIP: Carbamate?

MR. GOWLING: I did not pronounce it very clearly, my Lord.

THE WITNESS: Do you wish me to take this formula and calculate the percentages?

825. Q.—Yes, in the same way; you are just after the percentages of carbon and hydrogen? A.—Because that is not ammonium ethyl xanthate.

10 826. Q.—It is not? A.—You realize that?

827. Q.—Yes, I knew that. I am asking you to use the method of calculation contained in the paper. A.—This is going to take a little time.

HIS LORDSHIP: Perhaps we can recess for 10 minutes. Court recessed for 10 minutes.

—On resuming:—

MR. GOWLING: I think, my Lord, we now have it. I think that Dr. Purves is now able to give his answer. I have asked Dr. Purves to calculate the amount or the percentage of carbon
20 and the percentage of hydrogen in ammonium di-thio-ethyl carbamate according to the formula used by Debus in his paper, giving as the formula for ammonium di-thio-carbamate $C_2H_5NH.C.S.SNH_4$.

828. Q.—Have you the answer for that? A.—Yes, I have got the answer to that. My calculation, taking this as a modern formula and applying present-day atomic weights to the carbon, hydrogen, sulphur and nitrogen and oxygen. I come out with 26.1 per cent carbon and 7.25 per cent hydrogen.

829. Q.—I understand that in this paper, the theoretical per-
30 centages of carbon and hydrogen in the xanthate formula given are 25.9? A.—I calculated that too.

830. Q.—For carbon, and 6.45 per cent for hydrogen. A.—Yes.

831. Q.—So that it is quite possible that Debus had a carbamate and not a xanthate? A.—Yes. I did not notice that ambiguity. My Lord, I should like to analyze the lead salt, calculate through that with modern atomic weights.

832. Q.—I am only interested in finding out whether Debus knew whether he had xanthate or not; and on the material in his article and following the method that he used for making his calculations, he could not know definitely that he had xanthate?
40 A.—You infer that this analysis is ambiguous, that it fits the xanthate analysis but also fits the carbamate?

833. Q.—That is what I wanted to establish. A.—That is true. And of course, in that case a competent chemist goes on to further analyses which are not ambiguous.

For Defendant—Dr. Purves—Re-Cross-Examination

834. Q.—That is as far as we want to go. A.—So to complete the point it would really be necessary to take the analysis that he gives later on for the derivative.

835. Q.—The point is that Debus did not go on. He stopped at the analysis of carbon and hydrogen. A.—I am by no means certain of that. If your Lordship will permit me to read this sequence down below —

836. Q.—That is as far as I want to go, my Lord. If the witness want to carry it further, I have no objection. A.—In the
 10 continuation — and I am translating from the German, my Lord — he goes on: “When the small stability is considered and the difficulty this offers in obtaining this body in a pure condition, then the difference between the found and the calculated results is understandable.” The difference is not great. His analysis is 1.1 per cent high in carbon, which is slightly outside the modern limits of tolerance in analyses. Then his hydrogen is slightly high; it is .37 per cent high, which is just on the range of what is accepted today. But he is disturbed about these discrepancies. Then he goes on: “In order to obtain complete certainty about the
 20 decomposition of these substances, the lead salt was prepared by precipitating its solution with dilute acetic acid with a dilute solution of lead acetate,” and the analysis of the lead salt was then undertaken to check the point and clear up the ambiguity which you have mentioned. Then he comes to details of his analysis. Then he says, “The other behaviours of the precipitate agreed completely with those of lead xanthates.” So the matter would really hinge on whether the analysis as lead xanthate really is lead xanthate; and it would clear up the ambiguity in which the author stands with regard to the analysis of the radical ammonium salt.
 30 That I think is the translation, so it would really depend on calculating his lead salt.

837. Q.—Do you know how carbamate would come out of that calculation? A.—I am not at all sure about that except that I do not think — he might have a lead carbamate there. That might give him the ammonium salt. I have not carried out those calculations.

838. Q.—I do not think it is necessary to go any further, Dr. Purves, unless you wish to do so. I was informed that it was not a very reliable application of this, that is why I put the
 40 question to you. A.—The point I would wish to make is that the author himself recognizes that the analyses we have made are not quite convincing.

HIS LORDSHIP: 839. Q.—So he might not have had a xanthate? A.—Yes. So he, on the ground of slight doubt as to whether he got a really pure material, went on and prepared a lead salt and analyzed that. He does not specifically point out that this analysis

For Defendant—Dr. Purves—Re-Cross-Examination

found two dissimilar compounds. Is that the point you wished to make?

MR. GOWLING: Yes.

THE WITNESS: Because if you wish me to do so, I can check the analysis of his lead salt. But he did go through the accepted procedure of analyzing his material. His analysis checked, but it was ambiguous, so he went further still and prepared a standard derivative of what he thought was a xanthate and he analyzed that.

MR. GOWLING: Thank you, Dr. Purves.

10 MR. ROBINSON: My Lord, I think it would perhaps be useful if Dr. Purves would check the analysis of the lead salt.

840. Q.—Do I understand that you think that, from what is in the publication itself, you can arrive at a more definite conclusion about whether or not the man had a xanthate, than that which you have now arrived at? A.—Yes.

MR. GOWLING: The point here is that there is no analysis of the lead salt.

MR. ROBINSON: I am asking Dr. Purves.

20 841. Q.—Perhaps, Dr. Purves, the most satisfactory thing to do would be for you to read that article? A.—Well, I did read the relevant portion.

842. Q.—You are satisfied. From the article as it stands there, can you make any further calculations which will satisfy you one way or another as to whether this man had xanthate or not?

MR. GOWLING: I do not see that any further calculation made by Dr. Purves will help the situation at all, unless the author indicates in the publication that he made the tests and set forth the results in the article, my Lord. I do not see that this is going to get us any farther.

30 MR. ROBINSON: The point is this, my Lord. I understand from Dr. Purves that he spoke of making some further calculations on the basis of the lead salt.

MR. GOWLING: I have no objection.

MR. ROBINSON: He agreed on the basis of the calculation my friend put to him.

HIS LORDSHIP: The question is as to whether or not this man had a known xanthate.

40 MR. ROBINSON: What I had in mind was this, my Lord. If, solely from the information given in that publication, Dr. Purves can say for certain one way or another whether that man had xanthate, that is a question we are interested in getting answered.

MR. GOWLING: We are also interested in whether this man knew he had xanthate.

MR. ROBINSON: We may be. But we are interested in whether he had a xanthate.

For Defendant—Dr. Purves—Re-Cross-Examination

MR. GOWLING: I do not agree with the proposition as it is put. I think it is perhaps a little irregular at this stage. We were confronted with a publication on a certain basis, and it was my purpose to find out how good this publication is.

HIS LORDSHIP: Yes; and I think you have demonstrated through this witness that the author was not absolutely sure whether he had xanthate or not.

MR. GOWLING: Exactly.

MR. ROBINSON: That is what I wanted to clear up, whether
10 that really is the position; because I am by no means clear from what Dr. Purves said, that that is the result.

MR. GOWLING: My friend put the publication in. He should have established that in his re-examination. My friend put it in. I did not put it in. I submit that I was entitled to cross-examine on the very positive way in which it was put in, which I did. I have cleared up the point I had in mind, but I certainly have no objection if your Lordship thinks it should be pursued further. However, I cannot see the point of it at this stage.

THE WITNESS: There is one thing, my Lord, which I should
20 like to mention. My translation which has gone into the record is just a sight translation.

HIS LORDSHIP: 843. Q.—It is pretty accurate, though. A.—I think it is quite accurate. But in case there is any question on that, I should like to read the phrase before the analysis of the lead salts: “The other behaviours of the precipitate”—that is, the lead salt — “agreed completely with those of lead xanthate,” to be sure that on that point my translation is accurate.

MR. GOWLING: I have no quarrel with the translation, my
30 Lord. A further translation can be put in, if it is required, at any stage.

MR. ROBINSON: The point that is in my mind still, my Lord, is that the matter seems to be left in some doubt. If by further calculations made—of course, solely on the basis of what is in that article—the witness can clear the point up one way or another, I think it would be distinctly useful to your Lordship for that to be done. Perhaps he cannot. If he cannot, then that is the end of it. That is what I wanted to find out.

MR. GOWLING: Clear what point up? My friend asked him to clear up a point without stating the point.

HIS LORDSHIP: It is a question of what the point is. If the
40 point is not so much whether the author had a xanthate, but as to whether he knew he had a xanthate and imparted that knowledge to the world—

MR. ROBINSON: Well, my Lord, I think there are two purposes.

For Defendant—Dr. Purves—Re-Cross-Examination

HIS LORDSHIP: What was the purpose of the publication?

MR. ROBINSON: To impart, I presume, knowledge about ammonium xanthate.

HIS LORDSHIP: About ammonium xanthate.

MR. ROBINSON: What I had in my mind is that if the publication gives certain information which, if looked at by a chemist today, will demonstrate one way or another —

HIS LORDSHIP: And the chemist has to experiment to find out?

MR. ROBINSON: No. I am speaking of information on the
10 face of the publication. That is the only point I have in my mind. I was left in some doubt by the way in which Dr. Purves dealt with that, as to whether there is any more relevant information regarding the question of whether or not the compound there described was, in fact, ammonium xanthate, which the witness can extract from the face of the document. I am not sure whether there is or whether there is not, and that is what I would like to know; and I think it would be useful to your Lordship.

HIS LORDSHIP: I am not just sure. I do not think I should stop you from that.

20 MR. ROBINSON: If there is such information.

HIS LORDSHIP: I will allow that to be pursued, subject to my reservation as to its relevancy.

MR. ROBINSON: Yes, my Lord.

HIS LORDSHIP: Which is a matter that I am not just sure about at this moment.

MR. ROBINSON: Yes. It is simply clearing up a question that has been perhaps left hanging in the air. If this witness can add anything more which would be useful to your Lordship, on the basis of the document as it stands, I think it might be useful for
30 your Lordship to have that information.

HIS LORDSHIP: At the moment I do not see its relevancy, but I am not sure about it.

MR. GOWLING: My objection to the continuation of any further examination by my friend on this point will be noted, will it?

HIS LORDSHIP: Oh, yes. It may be that any further examination on this is quite irrelevant.

MR. GOWLING: Yes, my Lord.

HIS LORDSHIP: It having been established, as I understand it,
40 that this author was not sure whether he had xanthate or not.

MR. GOWLING: That is right, my Lord.

HIS LORDSHIP: Maybe he had xanthate. If it is relevant to know whether he had xanthate or not, then I think perhaps you should be allowed to pursue your question, Mr. Robinson.

For Defendant—Dr. Purves—Re-Cross-Examination

MR. ROBINSON: Yes, my Lord.

HIS LORDSHIP: So I reserve my judgment on the matter of relevancy, and allow you to proceed subject to that; and subject to Mr. Gowling's objection that whether he had xanthate or not, the fact is irrelevant.

MR. ROBINSON: Yes, my Lord.

844. Q.—Dr. Purves, is there any more relevant information which you can extract from that publication as it stands, on the question of whether or not this man, in fact, had ammonium xanthate? A.—Well, my Lord, the method he used is one used in other cases to make ammonium xanthates, and it is the one which I described this morning.

MR. GOWLING: Dr. Purves will have to go into that and explain it. That is the point. I am not prepared to accept this general statement. My friend introduces the document. It has been studied by the witness.

THE WITNESS: Yes.

MR. GOWLING: And this should all have been dealt with in chief, if it was to be dealt with at all.

20 THE WITNESS: In that case, perhaps I might eliminate my remarks with the flat statement of the author which I have already read into the record, saying that "the other properties of the precipitate agreed completely with that of lead xanthate" which was his confirmatory derivative and point out that though his analysis found lead xanthate, they are ambiguous, so we are reduced to his own flat statement that the other properties agree complete with lead xanthate and that the analysis checked that lead xanthate formula, and the xanthate formula. I think that is about all that I can extract from the document usefully at the present time,
30 my Lord.

MR. ROBINSON: Thank you, Dr. Purves; that is just what I wanted to clear up. There is one other thing which my friend spoke of in his re-cross-examination. He was asking you about the physical properties of certain xanthates. In connection with one of your answers you spoke of compounds; you spoke of going up in the series, and you spoke of compounds containing 16 and 19 carbon atoms. What would those be called?

MR. GOWLING: I also object to that question, my Lord, or any further questions.

40 MR. ROBINSON: My Lord, it was a question which was raised by my friend in re-cross-examination of this witness after my re-examination was finished. My friend re-cross-examined, and he asked some questions about the physical properties of certain xanthates. In one of those answers Dr. Purves spoke of a compound — and he had spoken of going up in the series.

HIS LORDSHIP: Yes.

For Defendant—Dr. Purves—Re-Cross-Examination
For Defendant—R. L. Bennett—Examination-in-Chief

MR. ROBINSON: And he got up to two compounds which he mentioned containing 16 and 19 carbon atoms. I should like to know what they are called.

HIS LORDSHIP: Where you might have an oil.

MR. ROBINSON: Yes. I should like to know what they are called because to us, as laymen, such a thing as C16 means nothing.

HIS LORDSHIP: I assumed they were all alkyls.

MR. ROBINSON: Yes. But I should like to know specifically
10 what the term alkyl radical with 16 carbon atoms is.

HIS LORDSHIP: Oh, I see.

THE WITNESS: The name of that radical would be cetyl, my Lord. That was on the exhibit.

HIS LORDSHIP: D-61.

THE WITNESS: That was up in that range.

MR. ROBINSON: That is the information I wanted. Thank you, Dr. Purves.

HIS LORDSHIP: 845. Q.—Would that be an oil? A.—I could
not say, my Lord, whether it is specifically an oil or not. That is
20 the range in which I get uncertain about predicting things.

846. Q.—As to crystallinity? A.—Yes.

MR. ROBINSON: 847. Q.—When you say “that”, are you speaking of the xanthate or the radical? You used the word “that”? A.—The xanthates containing radicals in that upper range.

HIS LORDSHIP: And as to when they cease to have their crystal qualities.

MR. ROBINSON: That was the point. I simply wanted to know by name what compound he was referring to. He has cleared that up.

30 THE WITNESS: It is not a question of ceasing to have crystal properties; but I cannot predict and cannot be sure.

HIS LORDSHIP: 848. Q.—You cannot be sure whether they will or will not have crystal properties? A.—Yes; in any specific case.

MR. ROBINSON: Thank you, Dr. Purves. I will now call Mr. Robert L. Bennett.

ROBERT L. BENNETT. Sworn. Examined by Mr. ROBINSON:

1. Q.—Mr. Bennett, you are an employee of the defendant, Noranda Mines, Limited? A.—Yes, I am.

40 2. Q.—And you are employed in what capacity there? A.—I am employed as a metallurgist.

For Defendant—R. L. Bennett—Examination-in-Chief

3. Q.—Engaged in what sort of work? A.—Engaged in flotation work, principally.

4. Q.—Would you indicate what your previous training has been? A.—In general?

5. Q.—Yes. A.—I graduated in 1935 in chemical engineering in the University of British Columbia, and subsequently was employed until about 1937 as a metallurgist with the Premier Gold Mining Company at Premier, British Columbia. The work there consisted of flotation test work and operating work in the mill,
10 as well as some assaying work. In 1937 I returned to the University of British Columbia where I did some work on the chemistry of flotation, and obtained my Master's Degree from that University in 1938.

6. Q.—You obtained your Master's Degree in what? A.—In chemical engineering. After a short time at Premier as Chief Assayer, and a year's post-graduate work at the Carnegie Institute of Technology in Pittsburg, and a few months at the Pioneer Gold Mines as assayer, I came to Ottawa in 1940.

7. Q.—I am sorry to interrupt you, but what were you doing,
20 or rather what subjects were you instructing in at the Carnegie Institute? A.—I was instructing in Chemistry or assisting in the Chemistry Department.

8. Q.—I am sorry to have interrupted you, but I wanted to get that. A.—That is all right. In 1940 I came to the Bureau of Mines here at Ottawa where I was employed until early in 1942. The work there consisted principally of flotation testing on ores from different parts of Canada. In 1942 I went to the Canada China Clay and Silica Company. My position there was as a chemist, and subsequently in 1942 I went to Noranda Mines and
30 I have been employed there since.

9. Q.—How would you say your knowledge of chemistry compared with that of the average metallurgist? A.—My academic training has been largely in chemistry. I think perhaps my chemical training has been greater than that of the average metallurgist.

10. Q.—Have you read the patent in suit, Mr. Bennett? A.—Yes, I have read the patent.

11. Q.—I understand that at the end of August or the beginning of September you carried out some flotation tests at Noranda?

HIS LORDSHIP: When was that?

40 MR. ROBINSON: From August 29th until September 2nd, my Lord.

HIS LORDSHIP: Of this year?

MR. ROBINSON: Of this year, 1944.

12. Q.—You carried out some tests at Noranda on the properties of certain reagents as flotation agents or reagents. What reagents did you test?

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: Reagents as flotation agents?

MR. ROBINSON: As flotation agents or reagents. I understand that the words are indifferently used.

THE WITNESS: I tested several reagents in a series of tests which were made. I can itemize those. The first one was a purified cellulose, sodium cellulose xanthate.

HIS LORDSHIP: 13. Q.—Purified what? A.—Purified sodium cellulose xanthate, my Lord. The second one was a crude sodium cellulose xanthate. The third was a preparation made according
10 to paragraph 7 of the patent.

14. Q.—A preparation made according to paragraph 7? A.—Of the patent in suit. The fourth reagent tested was really two reagents or preparations made according to the terms given in bulletin No. 2. That, I believe, has an Exhibit number.

HIS LORDSHIP: What is the exhibit number of Bulletin 2?

MR. ROBINSON: Exhibit G-3 in Dr. Gregory's evidence.

HIS LORDSHIP: 20. Q.—That was your fourth? A.—That was the fourth. The fifth was a sample of commercial sodium ethyl xanthate.

20 21. Q.—Any others? A.—Those are all the reagents which I tested.

MR. ROBINSON: 22. Q.—That is, which you tested in that period that you spoke about? A.—That is correct.

HIS LORDSHIP: 23. Q.—Those five reagents? A.—Those five.

MR. ROBINSON: 24. Q.—I understand that representatives of the plaintiff were present while those tests were carried on. Who were they? A.—Mr. Trotter and Mr. Chapman were present while I made these tests, and they observed the operating procedure throughout the tests as well as the preparation of the reagents which
30 I used.

25. Q.—Did they observe all the preparations of all the reagents? A.—They observed substantially all the preparation, except the first part of the preparation described in paragraph 7. There is some time required to carry out that preparation, so we started it several days before they arrived.

26. Q.—What was done with the products which you obtained as a result of these tests? A.—The products of the tests, which my Lord will understand to be the concentrates and tailings from each test, were sampled, and samples of these products were sent to
40 Ledoux and Company. They are a firm of assayers in New York.

27. Q.—On what basis were Ledoux and Company chosen? A.—We discussed these tests—

28. Q.—When you say "we", whom do you mean? A.—Perhaps I should say I. Mr. McLachlan was present at the time. I discussed these tests with Mr. Trotter and Mr. Chapman, and I believe

For Defendant—R. L. Bennett—Examination-in-Chief

we reached an agreement that Ledoux' assays would be satisfactory.

29. Q.—That is, they would be accepted by both? A.—They would be accepted by both.

30. Q.—Were those assays made? A.—These assays were made by Ledoux in due course and we received assay certificates from Ledoux and Company.

31. Q.—You might say if these (showing documents) are the assay certificates, in which case they might be filed. A.—Yes, these are the assay certificates.

10 EXHIBIT D-89A: Filed by } Two assay certificates from
89B: Mr. Robinson } Ledoux and Company, dated
October 13, 1944 and October
17, 1944.

MR. ROBINSON: 32. Q.—You prepared tables of the results of your tests, I understand? A.—Yes.

33. Q.—One of those tables is already in as Exhibit D-59, Mr. Bennett, if you will identify D-59 and the sheet which I now hand you as these tables, then the sheet which I now hand you can be put in as a new exhibit. A.—Yes, D-59 is the first sheet of this
20 table, and this new sheet that you have handed me is the second sheet of this table.

MR. ROBINSON: The point is, my Lord, that the tables came on two sheets, one of which has already been filed, as Exhibit D-59. I would like now to put in the other sheet. I think it would be more convenient if this second sheet were marked D-59A.

HIS LORDSHIP: That would be all right.

30 EXHIBIT D-59A: Filed by } Results of Flotation Tests
Mr. Robinson } made at Noranda, Que. Aug.
29—Sept. 2, 1944 by R. L.
Bennett. Table II.

MR. ROBINSON: 34. Q.—Mr. Bennett, could you tell us something about the general procedure which you followed in the tests of which you have spoken? A.—The general procedure followed throughout all of the tests shown on these two sheets is the procedure which I normally use in making flotation tests at Noranda. It has been designed to give results which are quite comparable to results in the mill itself. In point of fact it does give results quite comparable.

35. Q.—Did you record what you did in those tests? Did you
40 make a record of what you did in those tests, apart from those tables? A.—The original data was received in a laboratory note-book, as well as a description of the procedure used, a much more detailed description.

36. Q.—Perhaps you would identify that (showing book) as the note-book? A.—Yes, that is the laboratory note-book which I used.

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: 37. Q.—Was that made at the time? A.—That was made in the presence of Mr. Trotter and Mr. Chapman, for the most part, and any material which I recorded in it while they were not around—that is, I would sometimes write up experiments afterwards, that evening, perhaps—I believe they examined that and also made a copy of this book at the same time.

EXHIBIT D-90: Filed by } Laboratory note-book used by
 Mr. Robinson } Mr. Bennett.

MR. ROBINSON: 38. Q.—Mr. Bennett, is the circuit which you
10 use at Noranda an acid or an alkaline one? A.—The circuit is alkaline—quite alkaline, in fact.

HIS LORDSHIP: 39. Q.—Quite alkaline? A.—Quite alkaline.

MR. ROBINSON: 40. Q.—What about the ore used in the tests recorded on your tables Exhibits D-59 and D-59A? A.—These tests were run on ore which was taken from the regular feed to the flotation plant. The tests on sheet 1 were all run on one sample of ore; and the tests on the second sheet, that is D-59A, were all run on a separate sample of ore taken from the feed to the mill.

41. Q.—You have one sample for one group and another sample
20 for the other group. The one sample for the one group, I suppose you broke that up and started with different parts of that sample for the individual tests in each group? A.—Yes. I might elaborate slightly on that, my Lord. When a series of tests are started we will—I will—take a sample of perhaps one hundred pounds in weight—

HIS LORDSHIP: 42. Q.—Of what? A.—Of ore to the mill.

MR. ROBINSON: 43. Q.—You say “ore to the mill”? A.—Feed ore going into the plant itself. That sample will then be thoroughly mixed up.

30 HIS LORDSHIP: 44. Q.—You mean ground? A.—No; mixed up, stirred.

MR. ROBINSON: 45. Q.—To what degree of fineness has it been crushed at that stage? A.—The largest particles of the sample at that stage would be of the order of perhaps five-eighths of an inch.

46. Q.—Quite coarse? A.—Quite coarse material, yes. It has been crushed, but it has not yet been ground.

HIS LORDSHIP: 47. Q.—And that is thoroughly mixed?
A.—That is thoroughly mixed, yes. From this large pile of ore separate smaller portions are cut out, dipped out with a scoop.
40 Each portion weighs of the order of perhaps six or seven pounds. These separate portions are then used in conducting each of the tests shown and numbered on the Exhibit D-59.

48. Q.—Apart from the collecting reagents which are listed in column 2 of the two tables, what was the position as regards other operating conditions and reagents in the tests recorded on the tables?

For Defendant—R. L. Bennett—Examination-in-Chief

A.—These tests we designed to study the effect of variation in the collecting reagent. Therefore all other variables in the tests were kept exactly the same. The amount of sodium carbonate used in each test was the same, the amount of pine oil used was the same, the times were the same. So that in effect the only variable between one test and another is in this collecting reagent used or in the amount of the collecting reagent used.

49. Q.—That is in column 2? A.—Column 2.

50. Q.—What about the origin of these collecting reagents?

10 HIS LORDSHIP: What do you mean by a collecting reagent?

MR. ROBINSON: That is the expression which is used at the heading of column 2 on the table, Exhibit D-59.

51. Q.—Perhaps you might explain to his Lordship what the term “collecting reagent” means? A.—It has been found in flotation that certain reagents cause a froth.

HIS LORDSHIP: 52. Q.—Those are called frothing reagents? A.—Yes. They may have slight collecting properties, which I will describe presently, or they may have moderately strong collecting properties. When I use the term “collecting” I refer to the ability

20 of the reagent to assist the mineral to float in the froth. That is, if a frother alone is used, some of the mineral will float. If a collecting reagent is used as well as the frother, then other minerals will float as well, we will increase the amount of mineral floating in the froth.

MR. ROBINSON: 70. Q.—I was asking about the origin of these collecting re-agents? A.—The re-agents which I have termed “collecting re-agents”, in the table were all prepared by myself with the exception of the sodium ethyl xanthate shown in test No. 17 on D-59, and in tests 23, 27, and 30 on D-59A.

71. Q.—Where did the sodium ethyl xanthate come from? 30 A.—The sodium ethyl xanthate was obtained from a previously unopened drum of sodium ethyl xanthate in the mill stock, the normal re-agent which we use.

HIS LORDSHIP: 72. Q.—The defendant uses sodium ethyl xanthate? A.—We use sodium ethyl xanthate, my Lord.

MR. ROBINSON: 73. Q.—For instance, at 12 on D-59 there is a reference to sodium cellulose xanthate. How did you prepare that? A.—The sodium cellulose xanthate, which is marked “crude” in test No. 12, was prepared according to directions given to me by Dr. Purves.

40 HIS LORDSHIP: 74. Q.—13 is marked the same way. A.—13 is the same re-agent, my Lord. A different quantity was used in the test.

75. Q.—You used double the quantity? A.—That is right.

MR. ROBINSON: 76. Q.—What about 15 and 16, the ones that are marked “purified”? A.—The purified sodium cellulose xanthate

For Defendant—R. L. Bennett—Examination-in-Chief

which was the re-agent tested in tests No. 15 and 16 was prepared from the crude sodium cellulose xanthate which I mentioned previously. That preparation was also laid out for me by Dr. Purves.

77. Q.—What interval elapsed between the completion of the preparation of both the crude and the purified sodium cellulose xanthates and their use by you in the tests that are recorded? A.—Those re-agents were used within twenty-four hours of preparation.

78. Q.—What about the product referred to at 18 and 19 in exhibit D-59? A.—The reagent there is marked on D-59 as the product of paragraph 7 of the Keller patent. That was a preparation made as indicated in paragraph 7 of the patent in suit.

79. Q.—On exhibit D-59A 21, for instance, under collecting reagent is "stanol D". What was that? A.—Stanol D is the preparation made according to directions given in exhibit G-3, I believe it is.

HIS LORDSHIP: 80. Q.—Bulletin No. 2? A.—Bulletin No. 2.

81. Q.—Which, if I recall, was said to be the same thing as natrola.

20 MR. ROBINSON: Stanol and natrola.

THE WITNESS: That preparation was made with the quantities set out in D in the stanol section of the bulletin.

MR. ROBINSON: Your Lordship will find that on page 11 of exhibit G-3. There are a number of formulae giving different amounts and different ingredients, and the witness is directing himself to D.

82. Q.—With reference to the stanol D at 21 you have a note under it, "no external heat" and at 22, "boiled". Can you explain those notations? A.—Yes. There were two preparations made up with the amounts of ingredients shown under this D preparation in 30 bulletin 2. The first one, which I have marked, "no external heat", was made by simply placing the three ingredients together and shaking until the caustic soda had disappeared.

83. Q.—In what? A.—They were placed in a flask under a reflux condenser as is indicated in bulletin No .2.

84. Q.—And then shaken together? A.—That is correct. The reagent which was used in test No. 22 is marked "stanol D boiled." That was made in exactly the same way as stanol D except that there was external heat applied, and when the mixture started to boil 40 that boiling was continued for fifteen minutes. The bulletin, as I remember it, states to shake until the caustic soda is dissolved—perhaps if I could refer to the bulletin—

85. Q.—Here is a copy of it. A.—At the top of page 11, my Lord. The directions given are "shake until dissolved." That refers to the caustic soda, of course, because the other two ingredients

For Defendant—R. L. Bennett—Examination-in-Chief

are liquids. “And digest under a reflux condenser until the caustic soda has disappeared.” There is some ambiguity there, so that to be pretty sure—

86. Q.—What is the ambiguity? A.—The ambiguity is that the first instruction is to shake until dissolved and the second instruction is to digest until the caustic soda has disappeared, so there is some confliction because the caustic soda does disappear to begin with. However, in order to be sure that we were following out the intention of this instruction—heated this preparation under a reflux
10 condenser and caused it to boil for a period of fifteen minutes. The caustic soda had disappeared seven or eight minutes before the conclusion of heating. However, the heating was continued somewhat longer.

HIS LORDSHIP: 87. Q.—How do you mean it disappeared? A.—That is it had gone into solution or had reacted. The term “digest” may mean to heat. It is sometimes used in that sense, and if that is the meaning in this case we must heat this preparation as I did.

MR. ROBINSON: 88. Q.—Then, what were the differences
20 between the preparation of, let us say, the reagent of Nos. 21 and 22 apart from the fact that one was made without external heat and the other was boiled? A.—May I have that question again?

89. Q.—I am sorry. What were the differences in the preparation of the reagents of the stanol D's mentioned at 21 and 22 on exhibit D-59A apart from the fact one was made without external heat and the other was boiled? A.—There were no differences.

90. Q.—Now, what can you say about formula D on page 11 of the bulletin compared to the other formulas with regard to the question of boiling? A.—Formula D contains a little carbon disulphide
30 as any of the preparations which are alphabetically named there. therefore, preparation D would have as high a boiling point as any of these stanol preparations.

91. Q.—Why is that? A.—Because the boiling point of carbon disulphide is quite low. It is lower than the boiling point of denatured alcohol. Consequently in a mixture of the two the large proportion of carbon disulphide will cause the boiling point of the mixture to be lower.

92. Q.—Now, I notice that in both groups of tests there are two entries which are marked “nil” under the collecting reagent.
40 What is the explanation of that? A.—Those are tests which were run with exactly the same procedure as the other tests but with the omission of the collecting reagent, that is, pine oil was used as a frothing reagent and the other reagents were the same as the other tests.

HIS LORDSHIP: 93. Q.—By way of illustration do I understand you to say that in tests 12 and 13 you used sodium cellulose xanthate

For Defendant—R. L. Bennett—Examination-in-Chief

and then in test 14 you did not use those collecting reagents?
A.—That is correct, my Lord.

94. Q.—But used pine oil as a mineral frothing agent? A.—Pine oil only.

MR. ROBINSON: 95. Q.—Had you used pine oil in the other tests, that is, for instance, with the sodium cellulose xanthate?
A.—The pine oil which was used in test 14 was the same amount as used in all tests. That is, all the variables were the same in all tests except for the amount and kind of collecting agent used.

10 HIS LORDSHIP: 96. Q.—In test 14 you used pine oil by itself; in tests 12 and 13 you used the same quantity of pine oil but added sodium cellulose xanthate? A.—That is correct.

MR. ROBINSON: 97. Q.—What was the purpose of these blank or nil tests? A.—These blank tests were included in the series to give a basis of comparison as to the effectiveness of the reagents which were being tested; that is, with pine oil alone, which is almost entirely a frother in its action, we had got a certain recovery of copper minerals. A good collecting reagent will increase that copper recovery.

20 HIS LORDSHIP: 98. Q.—Was pine oil in the original flotation process as invented in 1905 or 1906? Was pine oil the chief mineral frothing agency that was used? A.—I understand that it was used quite a bit in the early days of flotation also.

MR. GOWLING: If I may interject I think the first agent was oleic acid.

MR. ROBINSON: My impression agrees with my friend.

HIS LORDSHIP: Pine oil came later.

MR. GOWLING: Pine oil came somewhat later.

MR. ROBINSON: Somewhere around 1910 was my impression.

30 HIS LORDSHIP: But it was a common mineral frothing agent for quite a long time prior to this invention?

MR. ROBINSON: Yes, there is no disagreement about that. It was a perfectly well known frothing agent for ages, relatively speaking, before anything that is in controversy here appeared. There is perhaps one other general point about these tables that you might explain to us.

HIS LORDSHIP: 99. Q.—Would the same apply, for example, to test No. 20? A.—20 is a test which was run in exactly the same way as test 14.

40 100. Q.—In exactly the same way as test 14? A.—Yes.

101. Q.—Using pine oil by itself? A.—That is correct.

102. Q.—Without the presence of either a xanthate or the product described in paragraph 7 of Keller's patent? A.—That is correct, my Lord.

For Defendant—R. L. Bennett—Examination-in-Chief

MR. ROBINSON: 102. Q.—Why did you run two blank tests? In other words, I notice 14 and 20 on exhibit D-59 and then 24 and 31 on exhibit D-59A? A.—Two tests are shown in D-59. They were run for two reasons.

HIS LORDSHIP: 104. Q.—May I just get that? A.—Those numbers are 14 and 20.

MR. ROBINSON: Your Lordship will notice the numbers run consecutively right on through D-59A.

THE WITNESS: These tests 14 and 20 were run in duplicate
10 for two reasons, first as a check on the copper recovered with no other reagent than pine oil, no other collecting reagent than the pine oil; secondly, to determine if there had been any appreciable change in the ore as it was lying there in the laboratory. Ore does change somewhat in flotation characteristics. These tests were run in sequence from 12 to 20.

HIS LORDSHIP: 105. Q.—I suppose that is the reason for the difference in the results? A.—That is one reason for the difference in the results.

MR. ROBINSON: I was asking about 14 and 20. We have not
20 come to recovery. Until recovery has been explained—

HIS LORDSHIP: Maybe you had better go ahead. This might be a convenient time to break.

MR. ROBINSON: Yes. Incidentally, my Lord, instead of nil these tests are very often called blank tests. I simply say that because the word is apt to be used both by me and the witness.

HIS LORDSHIP: The witness has explained their nature. Adjournment.

AFTERNOON SESSION
MONDAY, NOVEMBER 2ND, 1944
2.30 P.M.

30

ROBERT L. BENNETT, Examination-In-Chief resumed:

HIS LORDSHIP: All right, Mr. Robinson.

MR. ROBINSON: 106. Q.—Before lunch you spoke of the sample you took from the feed to the flotation plant and you spoke of the extent to which it was ground. Perhaps the way it may have given us a misapprehension of what eventually happens. Did you grind it any further after that, that is, having got your head sample did you grind it further? A.—Yes. The head sample was a sample of this crushed ore, my Lord.

40 HIS LORDSHIP: 107. Q.—Under its first crushing? A.—Under its first crushing.

108. Q.—And mixed with— A.—It is the usual Noranda ore which we concentrate in the concentrator. That was mixed up and,

For Defendant—R. L. Bennett—Examination-in-Chief

as I think I said, smaller samples were cut out from this larger portion. The size of the largest particles was of the order of five-eighths of an inch, I think I said. The first step in conducting the flotation test is to grind that coarse sample of ore in a small laboratory mill. That reduces it to pulp. The size of the particles in that resulting pulp are very much finer than the crushed ore. They are of the order of 80 mesh perhaps.

HIS LORDSHIP: That was the mesh of the powders that I saw in the bottles. They are ground to 80 mesh.

10 MR. ROBINSON: Yes, I think they are. I thought it might have been left a little bit unclear. Nobody said anything about grinding. We all understand it happens but there was nothing on the record to show that it did.

109. Q.—What flotation plant is that which you speak of, from the feed to the flotation plant? A.—That is the flotation plant or concentrator at Noranda Mines.

110. Q.—I think there are a couple of other general points or explanations of these charts that it might be useful to give before we go to the work to which they are really directed. The first thing is I
20 wonder if you would explain to his Lordship the tenth column on both charts, what is the meaning of that and why it is there? A.—The tenth column is titled “alkalinity as lbs. of Na_2CO_3 per ton of tailing solution.”

111. Q.—Which is— A.— Na_2CO_3 is sodium carbonate. That is used to give an alkaline pulp.

HIS LORDSHIP: 112. Q.—And that is added to the pulp? A.—Sodium carbonate is one of the reagents which is used in each test. The same amount is used in each test.

113. Q.—To produce the same amount of alkalinity in the pulp?
30 A.—It will produce the same amount of alkalinity in the beginning provided all other conditions are exactly the same. There may be slight changes in dilution or in the ore itself, and so on, which may affect the alkalinity figure, but as you notice in column 10 those figures vary from .98 to .72 at the bottom. That is on D-59. Those are extreme values. If the dilution of the pulp was exactly the same in all cases that figure would not vary at all, all other things being equal.

MR. ROBINSON: 114. Q.—In spite of these variations I understand there is the same amount of sodium carbonate in each case?

40 A.—The same amount was added in each case so that the alkalinity during the flotation test is substantially the same.

115. Q.—What is the significance, if any, of the variation in the figures in column 10 between the high and the low? A.—It has been the experience at Noranda Mines and I have checked that myself, that alkalinity must be kept above a certain minimum figure, which is

For Defendant—R. L. Bennett—Examination-in-Chief

about .7 on this scale shown in column 10, that is, .7 pounds of sodium carbonate per ton of solution.

116. Q.—So your last figure there is about at the minimum?

HIS LORDSHIP: What is that? Oh, yes.

MR. ROBINSON: Perhaps you might repeat that answer. Is your Lordship clear on it?

HIS LORDSHIP: Yes.

MR. ROBINSON: I wonder if the reporter would read the answer. (Reporter reads):

10 “It has been the experience at Noranda Mines, and I have checked that myself, that alkalinity must be kept above a certain minimum figure, which is about .7 on this scale shown in column 10, that is, .7 pounds of sodium carbonate per ton of solution.”

HIS LORDSHIP: 117. Q.—Per ton of tailing solution you have got? A.—Yes. Perhaps I can explain the use of that word there. Alkalinity determination is made after the flotation proper is completed.

118. Q.—After the concentration of the valuable minerals? A.—Yes, my Lord, after the froth has been removed.

20 MR. ROBINSON: 119. Q.—Why do you do it then and not earlier? A.—A matter of convenience more than anything else.

119. .—What significance, if any, have the variations in alkalinity above your limit of .7 pounds per ton of tailing solution? A.—Variations above .7 do not have any appreciable effect on the recovery of the mineral in which we are interested. It has been found that if alkalinity is lower than .7 there is sometimes a tendency for recovery to drop off.

HIS LORDSHIP: 120. Q.—I understood you to say that at Noranda you keep your pulp very alkaline? A.—Yes, my Lord; this
30 is a measure of the alkalinity in laboratory flotation tests.

121. Q.—You never allow it to go below .70? A.—No, my Lord.

MR. ROBINSON: 122. Q.—Perhaps you would turn to column 3 on exhibit D-59. There is column 3 and column 3a. Perhaps you might explain that.

HIS LORDSHIP: Column 3 only.

MR. ROBINSON: Column 3 and 3a.

HIS LORDSHIP: There is not a column 3a on D-59.

MR. ROBINSON: There is no 3a on D-59 but there is on D-59a. It is just an explanation of these columns that I thought it would be
40 useful for your Lordship to have.

THE WITNESS: Going back first to column 2. Column 2 is the name of the reagent used in both sheets of the exhibit. On column 3 on both sheets is the title, “Lbs. of collecting Reagent per ton of ore.” That is a measure of the amount of reagent shown in column 2 which

For Defendant—R. L. Bennett—Examination-in-Chief

was used in each test. Then in column 3a you will notice on test 21, for example, the first figure is .45 in column 3. That is the pounds of stanol D preparation which were used per ton of ore.

MR. GOWLING: I do not understand that statement just made by Mr. Bennett as to the amount of stanol D used.

THE WITNESS: I said that was the pounds of stanol D preparation used per ton of ore. Then, to arrive at the figure .08 in column 3a I have assumed the maximum possible conversion of the sodium hydroxide used in the stanol preparation into sodium ethyl xanthate.

10 HIS LORDSHIP: 123. Q.—Is column 3a a mathematical computation? A.—Column 3a is a mathematical computation.

124. Q.—Equivalencies— A.—In this case from the figure .45 in column 3.

MR. ROBINSON: 125. Q.—You say the maximum possible conversion of sodium hydroxide; conversion to what? A.—Conversion to sodium ethyl xanthate.

126. Q.—Then, column 3a represents a maximum, does it? A.—Column 3a represents a maximum of sodium ethyl xanthate which could have been present in that particular test.

20 HIS LORDSHIP: 127. Q.—Could have been what? A.—Which could have been present in that particular test.

128. Q.—Oh, included in the .45? A.—Both figures are expressed as pounds of reagent per ton of ore.

128A. Q.—Yes. A.—.08 would be the maximum amount of sodium ethyl xanthate in that .45.

129. Q.—That is, the .45 includes the .08? A.—That is correct, my Lord.

130. Q.—And you calculate mathematically that in .45 pounds of stanol, for example, there are .08 pounds of sodium ethyl xanthate?
30 Is that right? A.—I calculate that is the maximum amount that theoretically could be there.

131. Q.—That could be there? A.—Yes.

132. Q.—But is it there? A.—In my opinion, my Lord, yes.

133. Q.—Is the xanthate there? A.—In my opinion that is the maximum that could be there, and the xanthate is there, yes.

134. Q.—What is the rest of it? A.—In the stanol preparation there is a certain amount of excess alcohol used, and that, of course, is part of the .45.

40 HIS LORDSHIP: 150. Q.—So that in the .45 there is only a very small amount of sodium ethyl xanthate? A.—The maximum amount would be eight-forty-fifths, roughly one-sixth.

MR. ROBINSON: 151. Q.—Perhaps you would explain why that column is there at all, taking tests 21, 22 and 23 together, explain the significance of that column 3a, or perhaps I should say the purpose

For Defendant—R. L. Bennett—Examination-in-Chief

of it? A.—If we consider tests 21, 22 and 23, you will notice, my Lord, that in column 3a I have shown .08 for both Stanol D without external heating and for Stanol D boiled; and in test 23, under column 3, I have shown .08 pounds of commercial sodium ethyl xanthate used.

152. Q.—And that last .08 that is in column 3 against sodium ethyl xanthate, is that a calculated or a determined amount? A.—That is a measured amount.

HIS LORDSHIP: 153. Q.—That is an actually weighed amount? A.—Yes.

10 MR. ROBINSON: 154. Q.—Am I right that the purpose of column 3a was to show the relation between the xanthate content of Stanol D used and the sodium ethyl xanthate actually used? A.—Yes.

HIS LORDSHIP: 155. Q.—Then tests 25, 26 and 27 are on the same basis? A.—On the same basis exactly, except that a somewhat larger amount was used throughout the three tests.

156. Q.—And similarly with regard to tests 28, 29 and 30? A.—Yes, my Lord.

157. Q.—Did you arrive at the computations in column 3a in tests 21 and 22 after you had had the results of those tests and the
20 results of the test in 23? A.—No. The tests were actually run in sequence. The computation was made before the test was run.

158. Q.—What was the purpose of the computation in column 3a? A.—Because it was desirable to compare sodium ethyl xanthate in test 23 with sodium ethyl xanthate which is the active agent of Stanol D.

HIS LORDSHIP: I cannot understand that.

THE WITNESS: They had to be based on the same amount; the tests, to be comparable, should be based on the same amount of reagent, the same amount of collecting reagent added.

30 HIS LORDSHIP: 159. Q.—Does it mean that what is left in the Stanol had no effect as a reagent? A.—I perhaps should not answer that without consideration of the results of the tests.

MR. ROBINSON: 160. Q.—Perhaps I might clear this up by putting something general. As I understand the position—I am not relating this to Stanol or xanthate or anything else—if you have one substance—

MR. GOWLING: I wish my friend would not lead the witness.

MR. ROBINSON: I am not.

161. Q.—May I take another shot at this, Mr. Bennett? How
40 did you determine for tests 21 and 22 how much Stanol D you should use, having regard to test 23—what weight of Stanol, perhaps it would be better to ask, because column 3 is expressed in weights. I am not sure that the point is quite clear yet. A.—Consider test 23 first—

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: 162. Q.—You made it afterwards, though?
A.—Yes, but we will perhaps consider it first. The .08 is a purely arbitrary figure. In running flotation tests it is quite common to use .05 pounds per ton, .1 pounds, .2 pounds, and this choice of .08 is quite arbitrary. I know that that is in the range of concentration of sodium ethyl xanthate which is normally used. Then without regard to tests 21 and 22 for the moment, if we simply take the amounts of reagents used in compounding Stanol D, the chemical equation for the formation of sodium ethyl xanthate shows us that the sodium
10 hydroxide required for preparation of Stanol D is present in the least amount, that is that the alcohol and the carbon disulphide are present in excess. Then using that amount of sodium hydroxide as a basis for our calculation, we can calculate the amount of sodium ethyl xanthate which should theoretically be formed from that amount of sodium hydroxide, that is assuming that all the sodium hydroxide reacts to form sodium ethyl xanthate. Then we know from that calculation the percentage of possible sodium ethyl xanthate in Stanol D, and that percentage is eight-forty-fifths, by calculation. Is that perhaps a little clearer now?

20 HIS LORDSHIP: It is a little over my head.

MR. ROBINSON: 163. Q.—I am not sure that it is clear yet, Mr. Bennett. It is clear perhaps up to a point, but the last few steps, I think, are the steps which give us difficulty, that is the steps in your calculations or the steps in the processes which you go through. First of all, what is it you are after? Why do you make the calculation at all.

HIS LORDSHIP: That is what I want to know, what the purpose of column 3a was.

30 THE WITNESS: That must be explained in terms of the Stanol preparation, which contains sodium ethyl xanthate together with excess alcohol. The alcohol, as a matter of experience, is inert in flotation; it has some frothing effect.

HIS LORDSHIP: 164. Q.—It is inert in flotation? A.—Yes.

165. Q.—And the balance between the .45 and the .08, is that alcohol in excess? A.—It is largely alcohol, my Lord.

166. Q.—It is inert in the flotation process? A.—That is correct, my Lord.

40 MR. ROBINSON: 167. Q.—I am not sure yet, Mr. Bennett, that you have quite made that clear. Why are you interested in column 3a? Why do you want it at all? What are you after? A.—Suppose, for example, that instead of Stanol D we had some other collecting reagent, perhaps dissolved in alcohol. It would not be correct to compare .08 pounds of sodium ethyl xanthate with the total quantity of that other solution, because of the inert character of the solvent. We must compare the reagents on the same basis as applied to the active ingredient.

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: 168. Q.—Then am I to understand that you made your calculation that in the .45 pounds of Stanol the most there could be of sodium ethyl xanthate is .08? A.—That is correct.

169. Q.—And then am I to understand that in test 23 you used .08? A.—That is correct, my Lord.

170. Q.—As your total collecting reagent? A.—That is correct.

MR. BIGGAR: It is really vice versa, my Lord. Having decided to use .08 of sodium ethyl xanthate, the problem was to find out how to make an equivalent amount of Stanol.

10 HIS LORDSHIP: That is what I want to know, which it was.

171. Q.—Which was it? Was it that process, or did you arrive at the amount of the sodium ethyl xanthate from this given quantity of Stanol and then use the calculated amount of sodium ethyl xanthate in test 23 to see how the results checked with your calculation? A.—No. Mr. Biggar has put it correctly. In running the series of tests we decided first that we would use .08 of sodium ethyl xanthate.

172. Q.—Then you had to figure out how much Stanol you would have to use in order to employ as an active collecting
20 reagent in that Stanol .08 of the sodium ethyl xanthate? A.—That is right.

173. Q.—So you determined upon the .08 first? A.—That is correct.

174. Q.—And arrived at the calculation of the quantity of Stanol to be used later? A.—Yes, my Lord.

175. Q.—And then you ran your test with that quantity of Stanol? A.—Yes.

176. Q.—First without employing heat and then with boiling? A.—Yes.

30 177. Q.—And then you ran your test with the .08 sodium ethyl xanthate by itself? A.—That is correct, my Lord.

MR. ROBINSON: 178. Q.—I see that in test 23 you used .08, in test 27 you used .14, and in test 30 you used .20. On what basis did you select those quantities? A.—Those are quite arbitrary concentrations of reagent which cover the normal range of amount of collecting reagent used.

179. Q.—When you say the normal range, you mean normal in what? A.—In Noranda, the Noranda concentrator.

40 180. Q.—Now I am going to something more general and I hope it may be less difficult to explain. When you are making a flotation test and you are interested in the recovery of, say, one metal, what are the products that you get at the end of the test?

HIS LORDSHIP: You are speaking now of a flotation test where you are interested in the recovery of one metal?

MR. ROBINSON: Yes, my Lord.

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: That would be a selective flotation, would it?

MR. ROBINSON: I am not sure. My understanding is that it would not be, at least in the sense that it has been used before, but perhaps we had better find out from Mr. Bennett.

181. Q.—I was assuming, Mr. Bennett, the case where you had an ore and you had one metal that you were interested in recovering, not an ore where you had three or four metals, all of which you were interested in recovering. In the first case, where you had only one metal, would that be selective flotation? A.—Not
10 if there is only one metal in which you are interested, with nothing else but gangue.

HIS LORDSHIP: 182. Q.—Of course, then it is a simple ore? A.—Yes.

183. Q.—I am not thinking of a simple ore; I am thinking of a complex ore. There would be nothing selective in taking off one metal where it is a simple ore? A.—No. The word is used perhaps loosely. Differential flotation, by contrast, usually means recovery of two metal-bearing concentrates or metalliferous mineral-bearing concentrates. Selective flotation may mean that, or it may
20 mean also a selection of one mineral into one concentrate.

184. Q.—I understand that the sense in which Mr. Higgins used the term was the latter sense. A.—I do not recollect his exact statement.

185. Q.—That if there were several valuable minerals in the ore — say copper and zinc — you might want to use an agency that would take off the copper by itself and leave the zinc, and then run it through the machine again and use perhaps another agency that would take off the zinc. A.—That would be termed selective flotation also.

30 186. Q.—That would be selective flotation? A.—Yes.

220. Q.—What about the case where you are interested in the recovery of only one metal, or one metalliferous mineral to describe it more accurately? A.—Are you speaking with regard to the use of this word “selective”?

HIS LORDSHIP: Will you keep track of that question?

MR. ROBINSON: I am sorry, my Lord, I did not quite follow that — keep track of this question that I just asked?

HIS LORDSHIP: What is the difference, when you speak of a metalliferous mineral?

40 MR. ROBINSON: And a metal?

HIS LORDSHIP: Yes. Does not the flotation process just take off the metal?

THE WITNESS: No.

MR. ROBINSON: 221. Q.—Perhaps it might be well if you would just give us a general explanation of that at this stage. A.—Yes.

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: 222. Q.—As I understand it, the ore is made up of the two things, the gangue which is a worthless mineral — it is a mineral, I suppose? A.—Yes.

223. Q.—And the valuable minerals? A.—That is correct.

224. Q.—That is, the valuable minerals such as metal? A.—In general, metals as such, as elements, are not recovered to any large tonnage by flotation. It is usually the metalliferous mineral, sulphide usually of the metal.

225. Q.—The metalliferous mineral? A.—Yes, containing the
10 metal in chemical combination.

226. Q.—That is recovered by the froth flotation method? A.—Yes. In some cases elementary metals are recovered, but that is not the understanding usually.

227. Q.—And it is the smelter that recovers the metals out of the metalliferous mineral? A.—Yes, my Lord.

MR. ROBINSON: When you use that term “metalliferous minerals” what sort of things are you talking about, relating them, for instance, to Noranda ore? A.—In Noranda ore the metalliferous minerals are, principally, a copper sulphide, and an iron sulphide which is called pyrite, and a second iron sulphide which is
20 called pyrrhotite. These three metalliferous minerals are present in far greater extent than gangue, in the sense of a siliceous gangue. So that the purpose of concentration at Noranda is, first of all, to recover the copper-bearing minerals.

HIS LORDSHIP: 228. Q.—Oh, yes. I understand it now. A.—That is, they are metalliferous minerals in the sense that they carry the mineral copper.

229. Q.—Yes. A.—And at Noranda the gangue would not. Perhaps I should not say “gangue”, but the tailing of the con-
30 centrator itself contains not only gangue minerals such as silicates but to a much larger degree this mineral pyrrhotite, which is itself a metalliferous mineral.

230. Q.—Which is a metalliferous mineral? A.—Yes. But it is not desired to recover that in the flotation operation.

231. Q.—Which you do not bother to recover in the flotation operation? A.—No.

232. Q.—So it goes into the tailings? A.—It goes into the tailings.

233. Q.—That is not, strictly speaking gangue, because that
40 contains metalliferous minerals? A.—Gangue has in addition non-metalliferous mineral.

234. Q.—You say gangue has in addition non-metalliferous mineral? A.—Yes, quite often.

MR. ROBINSON: 235. Q.—What are these? Into what chemical class do these copper and iron sulphides that you have in the Noranda ore fall? A.—They are all sulphide minerals.

For Defendant—R. L. Bennett—Examination-in-Chief

236. Q.—I am looking at it more from a chemical point of view. Speaking generally, how would they be described chemically? A.—As a chemical class, I do not know that I can go much beyond that. We speak of them as metal sulphides.

HIS LORDSHIP: Would that be as opposed to oxide? A.—As opposed to oxide minerals and silicate minerals. Those are other large classes of minerals based on a chemical classification.

MR. ROBINSON: 237. Q.—When you are interested in the recovery of one metal, and you carry out flotation, what product
10 do you get at the end of your flotation? A.—The flotation test produces two products, a concentrate and a tailing. Those two products together comprise the head to that particular flotation process. There is substantially no loss of material in conducting a test. Therefore the concentrate and the tailing weights, when added together, must equal the head weight. In column 5, on Exhibit D-59, test 12, for example, the weight of the concentrate was 36 grams.

HIS LORDSHIP: 238. Q.—Just a minute. A.—That is the first figure in column 5.

20 239. Q.—Yes. A.—The weight of the tailing in that test was 2,915 grams. The sum of those two weights is 2,951 grams, which is the head.

MR. ROBINSON: 240. Q.—Speaking generally, Mr. Bennett, what is the purpose of flotation concentration? A.—The purpose of flotation concentration is to get as much as possible of the metalliferous mineral or minerals in which you are interested into the concentrate, and leave as little as possible, of course, in the tailings; and at the same time bring up as little as possible of the gangue minerals or the sulphide minerals in which you are not
30 interested. You want as much metalliferous mineral in the concentrate and as little gangue as possible.

241. Q.—There seemed to be some difficulty a moment ago when you mentioned this word “gangue”. Perhaps it might be useful to decide on the sense in which you use that term, so that we will not run the chance of getting confused? A.—Yes. In my use of the word I restrict myself to oxides, silicates, and minerals of that type.

HIS LORDSHIP: I beg your pardon?

THE WITNESS: To oxides, silicates, and minerals of that type.

242. Q.—Do you do that, or do you restrict it to non-metalli-
40 ferous minerals? A.—In a sense, my Lord, it is the same.

243. Q.—Should it be restricted, or may there be included in the gangue metals that are valueless? A.—The word “gangue” I believe has an economic consideration also.

244. Q.—I understood Mr. Higgins to use it in the sense that gangue would include the worthless minerals. I was not sure whether

For Defendant—R. L. Bennett—Examination-in-Chief

he meant by that to include in the grouping of “worthless minerals” the minerals that were non-metalliferous as well as the minerals that were metalliferous but carried metals that were of no value. A.—I am not sure on Mr. Higgins definition myself, my Lord, but the word “gangue” has that economic consideration of the worth of the metalliferous mineral or other mineral in it.

245. Q.—I understood Mr. Higgins to make the distinction between them, that the gangue was the worthless stuff? A.—Yes.

246. Q.—And the purpose of flotation was to separate the
10 valuable minerals from the worthless minerals? A.—That is correct, yes.

247. Q.—And that everything was gangue that was worthless. I do not think there was any elaboration as to whether he included any minerals that were in the gangue class, or whether there was any distinction between metalliferous minerals and non-metalliferous minerals. A.—It is a very difficult word to define. At times one thing which is gangue one place might not be gangue in the other, in the sense of being worthless.

MR. ROBINSON: 248. Q.—Mr. Bennett, you mentioned the fact
20 that you had iron sulphide in your ore. Perhaps it might make the explanation easier if you took iron sulphide as an example and explained why it is treated in one way or another, however it is treated? A.—Yes. The mineral pyrrhotite, which is one of the iron sulphides in Noranda ore, is worthless under present conditions. If gangue is used in that sense of “worthless mineral”, pyrrhotite would be part of the gangue, one of the gangue minerals.

HIS LORDSHIP: 249. Q.—Would it not be more correct to apply to the residue, after the concentration of the copper, the term “tailings” rather than the term “gangue”? A.—Yes. Tailing is quite
30 correct.

250. Q.—Because tailing would include what everybody would regard as gangue? A.—Yes, my Lord.

251. Q.—And would also include the metalliferous minerals that you do not bother about or do not want to recover? A.—Yes.

252. Q.—And therefore might be worthless: and therefore gangue, from that point of view, if you relate gangue to worthlessness? A.—Yes. I can restrict myself to that use of the word gangue in speaking of one particular operation such as Noranda.

MR. ROBINSON: 253. Q.—Then “tailings” is, I think you
40 agreed with his Lordship, a general word. I am looking for a word we can use without running the chance of confusion.

HIS LORDSHIP: 254. Q.—“Tailings” would be perhaps a better word to use than “gangue”? A.—Tailing is one product of any unit flotation operation. It may not necessarily be a worthless product.

255. Q.—For instance, it may in the second operation be the head? A.—Certainly.

For Defendant—R. L. Bennett—Examination-in-Chief

256. Q.—And in the second operation break itself up into concentrates and still further tailings? A.—Yes.

257. Q.—And so on, until it is uneconomic to continue the process or to attempt to recover any more valuable metals out? A.—Yes.

258. Q.—Or metalliferous minerals? A.—That puts the position very clearly, I think.

HIS LORDSHIP: All right, Mr. Robinson. You were dealing with column 5, I think.

10 MR. ROBINSON: Yes. And then I was going on from that to the general purpose of flotation concentration.

HIS LORDSHIP: Yes.

MR. ROBINSON: And what they were trying to do.

259. Q.—Perhaps you might just summarize that, Mr. Bennett, and tell us what the purpose of any flotation operation is, and what you are aiming at, however high you may set your sights? A.—Yes. Restricting myself to a single unit operation where only the two products, concentrate and tailing, are produced, the purpose of flotation is, first of all, to get as much as possible of the metalliferous
20 mineral—let us say of copper sulphide—into the concentrate and at the same time—

HIS LORDSHIP: 260. Q.—I suppose the very term implies that? A.—Yes, certainly. And at the same time as little as possible of the gangue minerals.

MR. ROBINSON: 261. Q.—Where? A.—For this particular operation. In the concentrate.

262. Q.—Yes, in the concentrate.

HIS LORDSHIP: 263. Q.—May I ask this question: Does the frothing agency also attract some of the gangue in the frothing
30 process? A.—The frothing agent will vary in the extent to which it brings up mineral into the gangue. That is true.

264. Q.—It might bring some of the gangue along with it? A.—Yes, as well as the metalliferous mineral.

MR. ROBINSON: 265. Q.—Why is it that you want to get as little of the gangue as possible into the concentrate? A.—the gangue when brought up into the concentrate simply increases the bulk of the concentrate, without adding any more of the desirable mineral.

266. Q.—What is the relevance of that fact? A.—In general, in smelting it is desirable to keep the bulk of the material smelted
40 as low as possible. The smelting, of course, is a subsequent operation to recover the metal from the mineral.

267. Q.—Why do you want to keep the bulk down as low as possible?

HIS LORDSHIP: 268. Q.—I suppose freight would have something to do with it? A.—In some cases.

For Defendant—R. L. Bennett—Examination-in-Chief

MR. ROBINSON: 269. Q.—How about smelting charges?
A.—The smelting charges may have to be larger.

HIS LORDSHIP: 270. Q.—Smelting charges are based on the poundage or tonnage of the concentrate? A.—Yes. I was thinking of the charges in the sense of the weight of the charge.

MR. ROBINSON: 271. Q.—I meant the expense. A.—Oh, I see.

272. Q.—The expense or cost. A.—The costs would, generally speaking, go up as the bulk of the concentrate is increased.

10 273. Q.—That would be the ideal or, if you like, Utopian concentration of, let us say, copper sulphide ore? A.—The ideal concentration of an ore such as that would be the recovery of all the copper mineral into the concentrate and at the same time the recovery of no other mineral in the concentrate. In such an ideal operation, the grade of the concentrate would be the highest possible grade with that particular copper mineral. By grade I mean—

274. Q.—Yes. Perhaps you might explain that term. A.—I am referring to the assay. For instance, on D-59, column 7 is headed “% Copper to Assay.” That should be corrected to read
20 “% Copper by Assay.”

MR. ROBINSON: I do not know whether it has been corrected in your Lordship’s copy. It should read “by Assay”.

HIS LORDSHIP: It is “To Assay” here. Shall I make that correction? Shall I change the “to” to “by”?

MR. ROBINSON: Yes, my Lord. It is a clerical mistake. That applies also to D-59a.

THE WITNESS: Yes. The same mistake has occurred in D-59a.

HIS LORDSHIP: Then I will also make that change in D-59a.

30 THE WITNESS: In such an ideal concentration we would, of course, recover 100 per cent of the copper mineral and have the highest possible grade of concentrate. Contrasted to the ideal concentration, we can take the case where there is no concentration. There again the percentage of copper recovered in the concentrate would be 100 per cent. By “no concentration,” I simply mean recovery of the whole bulk of the material in the froth. That again is a hypothetical case. We would recover 100 per cent of the copper, it is true, but there would be no concentration because the grade of the concentrate would be identical with the grade of the material
40 with which you started.

275. Q.—You would not have eliminated anything? A.—No, you would not have eliminated anything.

276. Q.—You would not have eliminated anything by the flotation process? A.—That is right. In practice, the results fall somewhere between these two extremes.

For Defendant—R. L. Bennett—Examination-in-Chief

MR. ROBINSON: 277. Q.—What result does a concentration operation, in general, have to give, in order to be useful? I mean, speaking perfectly generally. A.—Speaking generally, it means first of all, giving high recovery of copper or other mineral in which you are interested, in the concentrate.

HIS LORDSHIP: 278. Q.—Is that necessarily so? A.—Generally speaking, yes. In a simple flotation test, for example, if only 50 per cent of the metalliferous mineral in which you are interested was recovered in the concentrate, that would probably be an uneconomic
10 test.

279. Q.—That would be uneconomic? A.—An uneconomic flotation, yes; that is, you could not afford to throw away 50 per cent.

280. Q.—But you would not have got that much before you had your concentration by froth flotation, would you?

MR. ROBINSON: Without flotation, what recovery would you get?

HIS LORDSHIP: 281. Q.—You might not have got any? A.—Oh, yes. You would have the whole of it, but you would have no concentration. You might have to, say, smelt the whole of the material.

282. Q.—Then you would have to smelt all of the ore? A.—Yes; all of the ore.
20

MR. ROBINSON: 283. Q.—But your recovery would be what? A.—In the case of smelting of the ore, the recovery would be about 100 per cent.

HIS LORDSHIP: 284. Q.—That would have meant the smelting of the ore? A.—Certainly; which would possibly be uneconomic. It depends on the case.

285. Q.—Quite possibly. There just would not be any alternative in many mines, unless they were very rich in their copper
30 content. A.—Yes. That is really the criterion.

286. Q.—Many mines have been made possible or developed only by the froth flotation process, is that not so? A.—I believe that is the case, my Lord.

MR. ROBINSON: 287. Q.—What about this hypothetical 50 per cent recovery? When I say “50 per cent recovery”, I want to be sure that I am using the word aright there. I mean where you recovered from the concentrate; that is, there you recovered by smelting the concentrate, 50 per cent of the mineral that was found in the original ore. Is that what is meant by that? Am I using
40 “recovery” in the right way? A.—No. In smelting the whole of the ore—it is by way of contrast—you would recover essentially all of the metalliferous minerals.

HIS LORDSHIP: 288. Q.—All of the copper? A.—Practically all; essentially all. In the combined operation of flotation concentration, with only 50 per cent recovery with the smelting of that con-

For Defendant—R. L. Bennett—Examination-in-Chief

concentrate, there you would recover somewhat less than 50 per cent of the material in the heads; and that, offhand, would be uneconomic.

MR. ROBINSON: 289. Q.—I wanted to be sure that I was using the word “recovery” appropriately. It is the metal recovered by smelting, the percentage of the metal present in the original ore which you recover by smelting the concentrate. Is that recovery? A.—Not as used in column 9. That is simply per cent recovered in the flotation concentrate.

HIS LORDSHIP: Perhaps you had better come to column 9 now.
10 290. Q.—Column 9 speaks of “percentages copper recovered in concentrate.” A.—That is correct.

MR. ROBINSON: What does that mean? A.—That just means that much of the copper originally present in the head sample, was reported or was recovered in the concentrate. The rest of it went into the tailing.

HIS LORDSHIP: 291. Q.—The rest of it went into the tailing? A.—Yes.

MR. ROBINSON: 292. Q.—How was it recovered from the concentrate? A.—It was not recovered from the concentrate, it
20 was recovered in the concentrate.

293. Q.—In the concentrate, yes. A.—It would have to be recovered from the concentrate as a metal by smelting.

294. Q.—I see.

HIS LORDSHIP: 295. Q.—And the smelting would recover practically 100 per cent of the copper that was in the concentrate? A.—Smelting recoveries are quite high.

MR. ROBINSON: 296. Q.—I see. I was going to step too far ahead. But in examining flotation test results, at what information about those results do you look first? A.—I would look first at
30 the figures in column 9, for example, which show the percentage of copper recovered in the concentrate. That is the recovery figure. If that figure was very high, that might be a good test. If it was very low, the chances are that it indicates the reagent is a very poor reagent.

HIS LORDSHIP: 297. Q.—Or it might be a positively bad one? A.—Or it might be a positively bad one, yes.

MR. ROBINSON: 298. Q.—You spoke of the recovery being very low. With reference to what do you determine that? A.—That would be determined with reference to the same standard test,
40 usually. If one is working on a given ore you have arrived at a standard test which tells you what you can do with certain reagents. Then, if another reagent is substituted for one of those the result of such a test will tell you whether the new reagent is better or worse than the standard reagent.

For Defendant—R. L. Bennett—Examination-in-Chief

320. Q.—Assuming that having looked at the recovery figure you find it is fair—I do not mean very good and certainly not very bad—with relation to the standard, what information about the results of the test would you next look at? A.—I would next consider the grade of the concentrate.

HIS LORDSHIP: 321. Q.—Grade? A.—Grade; that is shown as a percentage of copper by assay.

322. Q.—A percentage of copper by assay? A.—Grade is a term generally used to mean the percentage of copper, for example,
10 by assay.

MR. ROBINSON: 323. Q.—It is all very well to say that grade means percentage of copper by assay but perhaps in terms that are easier for us to follow what do you mean by grade? What is it an indication of? A.—A grade or assay is a figure which is determined by an assayer and tells you the percentage of that particular element which is—

HIS LORDSHIP: 324. Q.—Taking copper, let us say. A.—Taking copper the grade would be the percentage of copper in a particular product.

20 325. Q.—The percentage of the total weight or of the concentrate? A.—Of any product, my Lord.

326. Q.—Whether it is concentrate or tailings? A.—Yes, that is right—or heads.

MR. ROBINSON: 327. Q.—In column 7 does the high figure indicate a better or worse grade? A.—A high grade is also a high assay. A high figure indicates, of course, a better grade than a lower figure.

327. Q.—Why is it that you look at the grade only after you have considered the recovery?

30 HIS LORDSHIP: You have to recover it first before you can assay it; is that it?

MR. ROBINSON: Well, I was really putting this to Mr. Bennett. I was really saying if somebody handed you a sheet and said, “here are some tests I have made”, and you wanted to find out whether they were any good or not, what they showed, what they proved, how would you go about it? How would you go about evaluating the information on a table?

HIS LORDSHIP: What would you look at first?

40 MR. ROBINSON: He said, “I will look at the recovery first”, and then he said, “I will look at the grade”.

328. Q.—Now I am asking you, Mr. Bennett, why you look at the grade after the recovery? Why do you look at the recovery first and not the grade? A.—The grade of copper in the concentrate can very often be increased by returning that concentrate to another flotation operation without sacrificing appreciably the recovery of copper.

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: 329. Q.—For example, there might be some gangue in the concentrate which, if subjected to another flotation process, you would get rid of some of that gangue? A.—That is correct, without losing an appreciable amount of copper.

330. Q.—And that would raise the grade of your concentrate? A.—Yes, without materially affecting the recovery.

MR. ROBINSON: 331. Q.—Having looked at a result, as I assume, and found that the recovery was fair, that is, it was at the most very little better than your standard, what conclusion
10 would you then draw from the grade figures as to the value or otherwise of the flotation reagent that had been under test? A.—If two reagents gave approximately the same recovery, and it was a fair recovery, and one of those reagents gave a higher grade than the other, that reagent which gave the higher grade would probably be a better reagent than the one which gave the lower grade.

332. Q.—Perhaps I had not quite that in mind. As I say, I am assuming a recovery that is not substantially different from your standard recovery. What would the information which you would obtain from the grade figures tell you about whether you
20 would be interested in that reagent or not? A.—If the recovery figures were comparable and the grade figures were also comparable the reagents are equivalent. Then, of course, if the grade is lower with the same recovery the reagent which gives that lower grade is very much poorer.

333. Q.—If somebody came along to you with a sheet showing the results of tests on ore in which you were interested and the standard was the reagent which you were then using and the other one was some new reagent what would your conclusion about that new reagent then be in the circumstances that you mentioned,
30 that is, where you find it gives you the same grade, substantially the same recovery and substantially the same grade? A.—The chances are that no improvement could result from the use of such a reagent over the standard reagent.

HIS LORDSHIP: 334. Q.—That is solely from the point of view of recovery and grade, but there might be other factors which might be of importance, such as time of recovery and cost of recovery and all that sort of thing? A.—There might be factors such as the cost of the reagent, for example.

335. Q.—Or you might recover it in one process instead of
40 two or three processes, or are these tests all separate individual processes? A.—These tests are each quite separate from every other test, yes, but the tests themselves are identical except that different reagents are used.

MR. ROBINSON: 336. Q.—When you say “different reagents”—
A.—Different collecting reagents. That is, the tests were designed

For Defendant—R. L. Bennett—Examination-in-Chief

to investigate the relative recoveries and grades with these various reagents.

HIS LORDSHIP: 337. Q.—In one process? A.—In one single flotation process. They are the simplest possible type of flotation test.

338. Q.—But not in a series of processes to show how much you would ultimately get out of it by using a particular collecting agent? A.—No.

MR. ROBINSON: 339. Q.—For an ore where you are interested
10 in the recovery of one metal only what conclusions can be drawn from tests of flotation reagents, as his Lordship said, one process as distinct from tests in a series of processes? A.—I wonder if I could have that question again?

MR. ROBINSON: Would the reporter read the question?

(Reporter reads):

“For an ore where you are interested in the recovery of one metal only what conclusions can be drawn from tests of flotation reagents, as his Lordship said, one process as distinct from tests in a series of processes.”

20 MR. ROBINSON: That should have been “carried out as his Lordship said one in process as distinct from tests” —

HIS LORDSHIP: Series.

MR. ROBINSON: 340. Q.—As distinct from those carried out in a series of processes? A.—The subsequent series of processes are largely mechanical operations, and I don't know that they have so much bearing on the evaluation of a given reagent.

HIS LORDSHIP: 341. Q.—I suppose your real test of the value of a given reagent is what it does in the first process? A.—That is the case, yes.

30 342. Q.—These tests were carried out on that assumption? A.—Yes. That is, if you do not get your copper in the first flotation you are not likely to get it any later. That is speaking generally, of course.

343. Q.—If you get it in a certain percentage in the first process you will not increase that percentage by subsequent processes? A.—You certainly cannot increase that.

344. Q.—You are likely to decrease the percentage in subsequent processes? A.—Yes, my Lord.

MR. ROBINSON: 345. Q.—Now, turning to the chart, Exhibit
40 D-59, you were telling us this morning why your blank tests were run in duplicate?

HIS LORDSHIP: Were run in duplicate?

MR. ROBINSON: In duplicate; that is the two blank tests, one at 14 and one at 20 in D-59.

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: That is in D-59a.

MR. ROBINSON: In D-59 there was one test at 14 and one at 20 and in D-59a there was one at 24 and one at 31. In each group of tests blank tests were run, as I think Mr. Bennett expressed it this morning, in duplicate.

HIS LORDSHIP: Run in duplicate?

MR. ROBINSON: I think when he said in duplicate he meant two tests were run in the group.

346. Q.—Perhaps you had better explain that. I am really
10 adopting the witness' term. A.—I am sorry if I misled you. There were two tests in which pine oil was used as the only collecting reagent. The two tests were 14 and 20. One was a check on the other.

347. Q.—Now, you explained why the two were run. It had something to do with possible alterations in the ore during the course of the tests?

HIS LORDSHIP: Not during the course of the tests but in between tests.

MR. ROBINSON: When I said in the course of the tests I had
20 in mind from the beginning of the first to the end of the last, during the course of the series of tests.

348. Q.—I notice that the figure given in column 9 in test 14, the recovery figure, is 70.5 while that in test 20 is 61.8. Can you explain to us how that difference arises, what is responsible for that difference? A.—There are various factors which may cause differences in results of recovery. There is a slight alteration in the ore itself as it stands in the room.

349. Q.—Alteration of what nature? A.—The ore tends to oxidize slightly.

30 HIS LORDSHIP: 350. Q.—As it is standing? A.—As it is standing, yes. Noranda ore is a very heavy sulphide ore, as I think I mentioned earlier. There is very little silicious material in it—containing silicates. Because of the type of the ore there is a tendency for the ore to be reacted on by the oxygen of the air and it becomes oxidized slightly.

MR. ROBINSON: 370. Q.—And the effect of that oxidation is what? A.—The effect of the oxidation is to make it somewhat more difficult to treat by the flotation process. We do not get quite as high recoveries, or we may get similar recoveries and lower grades
40 when the ore is in that oxidized condition.

HIS LORDSHIP: 371. Q.—Is that generally true of the froth flotation process, that it operates better in the case of sulphide ores than in the case of oxide ores? A.—The froth flotation process in general, my Lord, works particularly well only on sulphide ores.

For Defendant—R. L. Bennett—Examination-in-Chief

372. Q.—Oh, it works particularly well only on sulphide ores?
A.—Yes.

373. Q.—And that would be known to metallurgists and chemists? A.—I believe so, my Lord.

MR. ROBINSON: 374. Q.—Then, to put it shortly, what does the difference between the recovery figures in tests 12 and 20 indicate?
A.—The difference in recovery there is a difference of 70.5, in test 14, column 9, as against 61.8 in the same column, test 20, that is a drop of some 8 per cent. Using the principles which I was mentioning
10 a short time ago as to evaluation [of the results of a flotation test, I would say that test 20 was slightly poorer in its result than test 14. There is not a great difference, however.

HIS LORDSHIP: 375. Q.—Would not that be regarded as a considerable difference? A.—There has been a slight increase in grade at the same time, which tends to compensate. It is very difficult to evaluate tests when both recovery and grade are varying, unless several tests are run.

MR. ROBINSON: 376. Q.—Is the particular variation in grade that you see between tests 14 and 20—that is, 15.91 to 16.19—
20 particularly significant? A.—There is less increase in grade than there is loss in recovery. That is, I would place less importance on that change in grade.

377. Q.—This loss in recovery, what was in your view responsible for it? A.—As I say, there are several factors, but one is the slow oxidation of the ore. That shows itself in a slight drop in alkalinity, in column 10.

HIS LORDSHIP: 378. Q.—Would that have a corresponding result? A.—The oxidation of the ore would tend to cause a slight drop in alkalinity.

30 379. Q.—Why? A.—Because of the formation of sulphates and other oxidation products from the sulphides of the ore. These are formed in rather minute amount.

380. Q.—I do not follow how a drop in alkalinity is caused. A.—The oxidation would tend to form a slightly acid condition in the circuit, but the pulp is still quite alkaline. The slight acid formation would tend to drop the alkalinity slightly in the pulp, but it still remains quite alkaline.

MR. ROBINSON: 381. Q.—I notice that you have an alkalinity of .84 in test 14 and .72 in test 20.

40 HIS LORDSHIP: 381. Q.—This oxidation of an ore will tend to produce acidity in the ore pulp? A.—Speaking of Noranda ore, sulphide ore, yes.

MR. ROBINSON: 382. Q.—And it is that acidity then which has to do with the alteration in the alkalinity? A.—That would be expected to cause some drop in alkalinity, yes.

For Defendant—R. L. Bennett—Examination-in-Chief

383. Q.—If you will look at Exhibit D-59a, at the figures in tests 24 and 31, you will see that the recovery is 87.9 in test 24 and 86.4 in test 31, while the grade is changed from 13.89 in test 24 to 12.63 in test 31. What, if anything, is indicated to you there as to what has been happening? A.—In these two tests, the grade has dropped from the grade in test 24 to a lower grade in test 31, and at the same time the recovery has dropped slightly, there is a 1.5 per cent drop in recovery.

384. Q.—Is that a significant drop in recovery? A.—It has got
10 to the range where it is hardly significant. Very small differences are not particularly significant.

385. Q.—Comparing the differences between test 24 and 31 and the differences between tests 14 and 20, what conclusion do you arrive at about what was happening to the ore during the series of tests on Exhibit D-59a? A.—I think the same remarks which I made with regard to the series in D-59 would apply here, as the alkalinity has also dropped slightly. The recovery is lower and the grade is lower as we go from test 24 to test 31.

386. Q.—Would they apply to the same extent? A.—There
20 may be a greater drop in D-59.

HIS LORDSHIP: That is, the rate of oxidation is getting less? A.—That is right, my Lord.

387. Q.—In the later tests?

MR. ROBINSON: 388. Q.—Less in 59a. A.—Yes.

HIS LORDSHIP: 389. Q.—Less as between tests 31 and 24 than between tests 20 and 14? A.—Yes, I think that is the case. There are two quite separate ore samples, of course.

—Court adjourned at 4.05 o'clock p.m. to meet Wednesday, November 22nd, at 10.30 o'clock a.m.

30

OTTAWA, NOVEMBER 22ND, 1944.
MORNING SESSION

ROBERT L. BENNETT, Examination resumed by MR. ROBINSON

HIS LORDSHIP: Mr. Robinson.

THE WITNESS: My Lord, I have read the transcript of yesterday's proceedings, and I notice that at page 650, in my answer to Q. 152, I have left an incorrect impression with the Court. That statement should be a measured amount rather than a weighed amount. And because of the reporting as pounds per ton of ore, there is of course a very simple arithmetical calculation to convert a
40 measured amount, or the weighed amount in cases where it was weighed, such as sodium ethyl xanthate, into that ratio.

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: 390. Q.—You would know the weight of it, I suppose? A.—Yes. The experiment involves other measurement besides an actual weighing—a measurement of volume, and so on.

MR. ROBINSON: 391. Q.—Mr. Bennett, you told us yesterday that tests 12 to 20 on Exhibit D-59 were run in sequence. What is the position with regard to tests 21 to 31? A.—There were also run in sequence, subsequently to tests 12 to 20.

392. Q.—How much time elapsed from the beginning of the first test in each group—when I speak of group I am considering one
10 group as being exhibit D-59 and the other as being D-59a—how much time elapsed between the beginning of the first test and the end of the last test in each group, just roughly? A.—In the series of tests No. 12 to 20, exhibit D-59, the elapsed time was, I believe nine hours.

393. Q.—And in the other? A.—In the other series the elapsed time was about five hours.

394. Q.—You were referring yesterday to column 10, that is the alkalinity column. Is sodium carbonate, that is, Na_2CO_3 , a collecting agent? A.—No, that is not a collecting agent.

20 HIS LORDSHIP: What was that?

MR. ROBINSON: Sodium carbonate, my Lord. The chemical formula Na_2CO_3 appears at the head of column 10 in each table, exhibit D-59 and D-59a.

HIS LORDSHIP: The question is simply whether sodium carbonate is a collecting reagent?

MR. ROBINSON: Yes, my Lord.

HIS LORDSHIP: 394. Q.—May I ask, was there any particular reason for running off tests with these particular reagents only? A.—These were the reagents which I was testing, my Lord. I do
30 not know that I particularly understand the question.

395. Q.—These were the only reagents you were testing? A.—In these inter-party tests, that is correct.

396. Q.—What was the reason for confining the tests to these particular reagents? A.—The choice of reagents, I believe, was at the request of counsel.

MR. ROBINSON: 397. Q.—Now, Mr. Bennett, looking at exhibit D-59, can you tell us what conclusion you draw from that table about sodium cellulose xanthate as a collecting reagent? Referring to the tests in which sodium cellulose xanthate was used,
40 which are 12, 13, 15 and 16, you will notice, my Lord, that in all of those tests the figure shown in column 9 is quite low.

HIS LORDSHIP: 398. Q.—The more you used of the cellulose xanthate the worse the results were? A.—Yes, my Lord. It has a positively depressing effect on the copper minerals.

For Defendant—R. L. Bennett—Examination-in-Chief

399. Q.—It has what? A.—It has a depressing effect on the copper minerals. I mean by that, that when I tested this reagent out as a possible collecting reagent I found in fact that it was not a collecting reagent but it had this depressing effect and seemed to prevent the copper minerals from coming up into the froth.

400. Q.—It prevented the copper minerals from being brought up with the froth? A.—That is my conclusion from these results.

MR. ROBINSON: 401. Q.—Perhaps you can tell us in a little more detail how it is you arrived at that conclusion taking into account
10 test 14 as well as tests 12, 13 15 and 16, to which you have referred?
A.—Yes. You will notice, my Lord, in test 14, which was run with the pine oil only—it was run with the same amount of pine oil of course, as these other four tests which we are speaking of—the recovery was 70.5 in test 14. That is achieved solely by the slight collecting effect in the pine oil itself.

HIS LORDSHIP: 402. Q.—As a frothing agent? A.—That is correct, my Lord. And, as I think I pointed out before, all frothing agents in practice have some measure of collecting effect as well.

403. Q.—What is the difference between a collecting effect and
20 the effect that a frothing agent has? Is it not all a collecting effect?
A.—No, my Lord. The term arose quite early in the work on flotation. It was found that certain agents such as pine oil, for example, produced a froth and also brought up small amounts of a metalliferous mineral into that froth.

404. Q.—So that it is not every frothing agent that has the effect of attracting metalliferous minerals into the froth? A.—I should say that they all have it to a greater or less degree in commercial practice, but an agent which has the frothing power predominating would be classed as a frothing agent. There are certain other agents
30 which have widely different characteristics and which are grouped as collecting agents, and their characteristic is that they increase recovery of metalliferous mineral in the concentrate.

405. Q.—And they might or might not be frothing agents as well? A.—They might or might not be frothing agents as well, my Lord.

406. Q.—Pine oil would be a frothing agent? A.—It would be classified as a frothing agent.

407. Q.—And a collecting agent? A.—No, it would not be generally classed as a collecting agent in a practical sense.

40 MR. ROBINSON: Because?

THE WITNESS: Because, the recoveries obtained with pine oil alone are generally not as good as with pine oil plus some other agent which would be the collecting agent.

HIS LORDSHIP: 408. Q.—That would be so, for example, with some of the xanthates if the plaintiff's contention is correct? A.—That is the case, my Lord.

For Defendant—R. L. Bennett—Examination-in-Chief

409. Q.—The xanthates are not claimed to be frothing agents?
A.—I have had no experience with them as frothing agents; I never noticed that they formed any froth.

410. Q.—The claim is that they are an improvement upon the frothing agents, in that they result in a greater recovery of metalliferous minerals. That is the claim. A.—Under the classification which I am using I would call a xanthate which had that effect of increasing recovery a collecting reagent.

411. Q.—But would there be any frothing agents which would
10 also be collecting agents? A.—There are some frothing agents which also have quite strong collecting properties.

412. Q.—Such as? A.—Some of the distillation products of coal, coal tars.

413. Q.—One was named, I think, by Mr. Higgins, cresol?
A.—Cresol has some collecting properties, yes, my Lord.

MR. ROBINSON: 414. Q.—Now, Mr. Bennett, would you compare tests 12 and 13 and let us know whether there is anything useful that you can say as a result of that comparison? A.—In test 13 twice the amount of reagent was tested.

20 HIS LORDSHIP: 415. Q.—Twice the amount was used? A.—Yes, my Lord, twice the amount was used.

MR. ROBINSON: That appears from what?

THE WITNESS: That appears from column 3. The effect of that increase in amount was not only to lower the recovery of mineral in the concentrate, as shown in column 9, but also to lower the grade of copper in the concentrate, as shown in column 7.

416. Q.—And then comparing tests 12 and 13, on the one hand, and tests 15 and 16 on the other hand, what can you tell us? A.—The same effect shows up in tests 15 and 16. As the quantity of reagent
30 was increased, both recovery and grade were dropped, so that test 16 is poorer on both these considerations than test 15.

HIS LORDSHIP: 417. Q.—Would it also be a conclusion that the purer the cellulose xanthate the worse it works from the point of view of recovery of metalliferous minerals? A.—That is a justifiable conclusion, my Lord, from tests 12 and 15.

MR. ROBINSON: 418. Q.—From these results do you conclude that sodium cellulose xanthate is a useful reagent in flotation? A.—I would conclude from these results that sodium cellulose xanthate had no use in flotation.

40 HIS LORDSHIP: That, I suppose, would be putting it mildly?

THE WITNESS: Well, I have only tested it to a certain amount, my Lord. I am putting it as mildly as I can.

HIS LORDSHIP: I suppose within the authorities that is all you need to show, that it was not useful?

For Defendant—R. L. Bennett—Examination-in-Chief

MR. ROBINSON: Yes, my Lord.

HIS LORDSHIP: Because in addition to novelty there must be utility?

MR. ROBINSON: Yes.

HIS LORDSHIP: 419. Q.—Are you able to say whether it was generally known to metallurgists that a cellulose xanthate would not work successfully and would not be useful in connection with the froth flotation concentration of ores?

MR. ROBINSON: My Lord, I am not sure whether your Lordship
10 asked whether it was generally known or is generally known.

HIS LORDSHIP: Whether it was generally known.

MR. ROBINSON: I was wondering to period your Lordship was directing that question.

HIS LORDSHIP: Perhaps as this witness was not a metallurgist at the time, he could not answer that.

MR. ROBINSON: That is why I was wondering to what period your Lordship was referring.

HIS LORDSHIP: The time of the application.

THE WITNESS: I can only speculate, of course, my Lord, as
20 to what any one metallurgist would know at that time. But with that in mind I would think he would have to test it before he could find that out, whether it would work or would not work.

HIS LORDSHIP: 420. Q.—You think that even going back to—what was it, 1925?

MR. ROBINSON: 1923, my Lord, the application.

HIS LORDSHIP: 421. Q.—You think that, even going back to 1923, a metallurgist would have to test it? A.—I think that would be the case, my Lord, yes.

422. Q.—It was known for its use in connection with rayon in
30 1923? A.—I believe it was quite widely used for that purpose even as far back as 1923.

MR. ROBINSON: 423. Q.—Now, Mr. Bennett, looking still at exhibit D-59, can you tell us what conclusion you draw with regard to the product of paragraph 7 of the Keller patent in flotation? A.—The results of tests 18 and 19 when considered in relation to the blank tests 14 and 20 indicate to me, my Lord, that this product is substantially inert as a flotation collecting reagent.

HIS LORDSHIP: 424. Q.—Inert as a collecting reagent, as opposed to a frothing agent? A.—That is correct, my Lord. That
40 is shown by the fact that those recoveries shown in tests 18 and 19, of 69.8 and 62.3, are—

425. Q.—Are slightly better in percentage? A.—Actually they fall between the two blank tests.

For Defendant—R. L. Bennett—Examination-in-Chief

MR. ROBINSON: 426. Q.—The two blank tests being? A.—70.5 and 61.8, shown in tests 14 and 20.

HIS LORDSHIP: 427. Q.—Would it not be fairer to compare them with test 20 than with test 14? A.—They could be compared with something a little closer to 20 than to 14, my Lord, because of the possible fall in recovery.

428. Q.—Because of the time factor? A.—Yes.

429. Q.—Which apparently had something to do with the difference between the results in test 20 and the results in test 14? A.—The
10 gradation seems to be in the same direction right through. That is, we start with 70.5 in test 14 and drop to 68.8 in test 18, and 62.3 in test 19 and 61.8 in test 20.

430. Q.—And you say that the product referred to was substantially inert as a collecting reagent? A.—That would be my conclusion from these two tests 18 and 19. There is a still further reason for making that statement. You will notice, my Lord, that the grades shown in column 7 for tests 18 and 19 are both lower than the grades of the tests in which pine oil alone was used.

431. Q.—The percentages of recovery are slightly higher, but
20 the grades are— A.—Somewhat lower.

MR. ROBINSON: Perhaps you might make it easier to follow on the record, Mr. Bennett, by referring to figures?

HIS LORDSHIP: Yes, that would be better.

THE WITNESS: I will try to do that. The grades in the two blank tests 14 and 20 are 15.91 and 16.19, whereas the grades in the two tests with this product of paragraph 7—

MR. ROBINSON: 432. Q.—That is tests 18 and 19? A.—The grades there are 13.35 and 13.21.

433. Q.—His Lordship mentioned frothing in connection with
30 this product of paragraph 7. Did you observe whether it had any frothing action—or frothing property would be a more accurate way of putting it? A.—This product had no frothing property.

HIS LORDSHIP: 434. Q.—So that the product in paragraph 7 would not be a frothing agent? A.—It would not be a frothing agent.

435. Q.—It was added to a frothing agent? A.—No, my Lord. It was added to the flotation cell before addition of any frothing agent, so that I judged by the lack of change in the pulp in the cell, that there was no frothing effect due to this agent.

436. Q.—It was added to the pulp before the frothing agent was
40 added? A.—Yes, my Lord.

437. Q.—Did you observe its effect on the pulp? A.—Yes. It had no frothing effect on the pulp in the cell, and there was no apparent increase in the amount of copper minerals in the froth, as compared to pine oil alone, after the frothing agent was added.

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: 460. Q.—The only frothing agency that was used in this test was pine oil, was it? A.—That is correct.

MR. ROBINSON: 461. Q.—You spoke of there being no apparent increase—I have forgotten how you put it—in answer to the question I asked you a moment ago? A.—No apparent increase in the amount of mineral in the froth.

HIS LORDSHIP: 462. Q.—That would show by the test? A.—That would show certainly as a result of the test.

463. Q.—Can you tell while the test is going on whether the
10 mineral is coming up? A.—You can get a rough idea of the amount of mineral coming up.

464. Q.—It would only be a rough idea? A.—A very rough idea, my Lord.

MR. ROBINSON: 464. Q.—Did you make any observations with regard to the brightening? A.—There was no apparent brightening, no greater brightening than with the pine oil alone.

HIS LORDSHIP: 465. Q.—I beg your pardon? A.—There was no more brightening with this reagent than with the pine oil alone.

MR. ROBINSON: 466. Q.—Brightening of what? A.—Perhaps
20 I should explain the term “brightening.”

HIS LORDSHIP: 467. Q.—Yes. A.—Most sulphide minerals have a rather characteristic lustre. When these minerals come up into a froth, that characteristic lustre shows itself as what is sometimes termed a brightening. The pulp itself obscures the true colour of the minerals, and it is not until coming up more or less free of the other minerals in the ore that they show their true colour. That is sometimes termed brightening.

468. Q.—And the pulp that you used was, I think you said, a very alkaline pulp? A.—Quite alkaline my Lord, yes.

30 469. Q.—And I think you said that in the ore you were treating the metals would be copper, and then some iron in various forms? A.—The mineral which we were interested in floating in these particular tests was only copper.

470. Q.—It was only copper. Were there other minerals in the mixture such as silver, lead, zinc and so on? A.—There is a very small amount of gold and of silver; but the pulp consists principally of the three minerals which I mentioned yesterday.

471. Q.—Was there any lead? A.—There was no lead.

472. Q.—There was no lead at all in the ore at Noranda?
40 A.—No.

MR. ROBINSON: 473. Q.—What is the significance of brightening? A.—Brightening in itself is of no use in flotation. It simply indicates that you are possibly getting a recovery of this metalliferous mineral; that is all.

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: 474. Q.—You say that is all that it means?
A.—That is all it means, my Lord.

475. Q.—It simply means that you see in the concentrate, or is it in the froth— A.—In the froth, my Lord.

476. Q.—You see in the froth this bright appearance which is an indication to you that the froth has succeeded in collecting the valuable metals? A.—At least some of the valuable minerals.

477. Q.—At least some of the valuable minerals or metalliferous minerals? A.—Yes; at least some of the particular minerals which
10 cause this brightening.

478. Q.—Which shines.

MR. ROBINSON: 479. Q.—What in general are these minerals in your ore? A.—In our ore, chalcopyrite?

HIS LORDSHIP: 480. Q.—It would shine? A.—It would shine with that particular lustre.

MR. ROBINSON: 481. Q.—What is the chemical name of the ore? A.—chalcopyrite is a copper-iron sulphide.

HIS LORDSHIP: 482. Q.—It is a copper-iron sulphide? A.—Yes, my Lord. It is a sulphide containing one atom of copper, one atom
20 of iron and two atoms of sulphur in the molecule.

483. Q.—Two atoms of sulphur? A.—Yes.

MR. ROBINSON: From the question his Lordship asked you a moment ago, I think it might be useful if you would tell us whether there is any difference—at least at the stage that you are talking about where you have got a froth in your machine—between the concentrate and froth.

HIS LORDSHIP: Oh, yes.

MR. ROBINSON: That is something that arose in one of his Lordship's questions.

30 HIS LORDSHIP: Yes. I made a mistake in my first question about its being in the concentrate. I meant in the froth.

MR. ROBINSON: 484. Q.—What I was wondering, or what I wanted to know from Mr. Bennett, was whether there was any difference between the concentrate and the froth, when considering things at that stage? A.—Yes. The froth is that phase in the flotation cell which is carrying the concentrate.

HIS LORDSHIP: 485. Q.—Yes. That is, the metalliferous metals are concentrated in the froth? A.—Yes.

MR. BIGGAR: Or should be, my Lord.

40 HIS LORDSHIP: Yes. Assuming a perfect froth.

THE WITNESS: Assuming that you are getting concentration.

HIS LORDSHIP: 486. Q.—You said that the ore at your mine had one atom of copper and one atom of iron, did I understand

For Defendant—R. L. Bennett—Examination-in-Chief

you to say, and two atoms of sulphur? A.—The particular copper mineral?

487. Q.—The copper mineral that you were speaking of. A.—The particular copper mineral chalcopyrite has that.

488. Q.—Chalcopyrite? A.—Yes, my Lord.

489. Q.—That is the chemical composition of it? A.—That is right, my Lord.

MR. ROBINSON: 490. Q.—Is it the chemical composition or the mineral name for it—chalcopyrite? A.—Chalcopyrite is the mineral
10 name for it.

HIS LORDSHIP: 491. Q.—Chalcopyrite is the mineral name of it, and the chemical composition is what you were giving? A.—I was giving the chemical composition of that particular mineral.

492. Q.—That would be a sulphide ore? A.—That is a sulphide ore.

493. Q.—It would be a mineral that comes out of a sulphide ore? A.—Yes.

494. Q.—I suppose the same mineral could come out of oxide ore. They are not necessarily the same? A.—A sulphide ore means,
20 I take it, an ore in which the valuable minerals are present in the form of sulphides.

495. Q.—That is what a sulphide ore means? A.—Yes.

496. Q.—An ore in which the valuable minerals are found in the form of sulphides? A.—Yes. In general that is the case, my Lord. An ore is always a combination of different minerals which may have widely different classifications, different types of minerals.

500. Q.—Would it be possible for an ore—then, what is an oxide ore? A.—An oxide ore, say an oxide ore of aluminum, would be an ore in which the mineral bauxite, which can be given the
30 formula Al_2O_3 is the valuable mineral.

501. Q.—I do not quite grasp that as to what is the essential difference between a sulphide ore and an oxide ore? A.—The difference perhaps should be approached from the angle of the mineral first of all.

502. Q.—Oh, that is the approach? A.—Yes, my Lord.

503. Q.—With certain minerals? A.—There are sulphide minerals, carbonate minerals, and so on.

504. Q.—Can a mineral be oxide and carry copper? A.—A mineral can be a sulphide mineral and carry copper.

40 505. Q.—Can it be an oxide and carry copper? A.—There are copper oxide minerals, yes, my Lord.

506. Q.—I do not quite understand then how you draw the distinction from the point of view of the minerals? A.—It depends on the classification of the valuable mineral in the ore how the ore

For Defendant—R. L. Bennett—Examination-in-Chief

itself is described. If the valuable mineral is a sulphide that in general would be called a sulphide ore. If the valuable mineral is a carbonate that might be called a carbonate ore.

507. Q.—I am thinking perhaps from the point of view of a valuable metal, say copper. A.—Yes, my Lord.

508. Q.—I suppose copper could be present in a sulphide ore as well as in an oxide ore? A.—Yes.

509. Q.—Now, from the point of view of the presence of the same valuable metal, what is the difference between a sulphide ore
10 containing that metal and an oxide ore containing that metal?
A.—It is purely a classification based on the chemical constitution of the minerals.

510. Q.—Containing the metal? A.—Containing the metal in general

MR. ROBINSON: I wonder whether it might not be helpful if you would say what you mean by “mineral” on the one hand and “ore” on the other hand. Perhaps that may be the difficulty.

HIS LORDSHIP: No, I have got the distinction between the mineral and the metal.

20 MR. ROBINSON: I was putting it the mineral and the ore, my Lord.

HIS LORDSHIP: No, what I want to get first of all is what is the difference between sulphide and oxide?

MR. ROBINSON: I simply wondered in the explanation of that difference whether Mr. Bennett had made it perfectly clear what the difference was between mineral on the one hand and ore on the other hand.

HIS LORDSHIP: Yes.

MR. ROBINSON: 511. Q.—Perhaps it might be useful if you
30 would— A.—An ore—

HIS LORDSHIP: 512. Q.—Start off with the contention of the defendants’ opening that there was a distinction between oxide ores and sulphide ores. That is the first difference. What is that difference? A.—It is a difference of classification, of course, my Lord. The classification is based on the mineral in the ore. If the mineral is a sulphide mineral, or largely a sulphide mineral, we would speak of a sulphide ore. If the mineral is an oxide mineral, or largely an oxide mineral, we might speak of an oxide ore.

513. Q.—Now you are speaking in each case of metalliferous
40 mineral? A.—Always metalliferous mineral.

514. Q.—Now we bring it down to the minerals. What is the difference between a sulphide mineral and an oxide mineral? A.—A sulphide mineral is a chemical compound in crystalline form containing sulphur.

For Defendant—R. L. Bennett—Examination-in-Chief

515. Q.—Containing sulphur? A.—Yes—in chemical combination, of course.

516. Q.—Containing sulphur in chemical combination? A.—Yes, my Lord.

517. Q.—What does an oxide mineral contain? A.—An oxide mineral contains in the same sense oxygen.

518. Q.—And no sulphur? A.—And no sulphur, in general, yes.

519. Q.—The difference in the chemical constitution of the two
10 minerals is that the sulphide mineral contains sulphur and the oxide mineral contains oxygen? A.—Yes, that is right. We must always distinguish rather carefully between “mineral” and “ore”, but I think that distinction is made.

520. Q.—And the ore gets its name of sulphide or oxide depending upon whether the major constitution of the ore is one kind of mineral or the other? A.—Yes, my Lord.

MR. ROBINSON: 531. Q.—Does a sulphide contain oxygen? A.—A sulphide does not contain oxygen, no.

HIS LORDSHIP: 522. Q.—You gave the chemical composition
20 of one type of sulphide mineral? Yes.

523. Q.—Then, is that mineral in a sense the outer covering of the metal? It is spoken of as a metalliferous mineral? A.—No, by “metalliferous mineral” I mean a mineral which is a chemical compound.

524. Q.—Oh, it is a chemical compound. A.—Yes, containing a metal in chemical combination.

525. Q.—A metal in chemical combination with some other chemical? A.—Yes, chemical atoms.

MR. ROBINSON: 526. Q.—Which way do metals generally
30 occur, in chemical combination or as free metal? A.—The greatest tonnage of metal is in combined form in ores.

527. Q.—When you say “combined”—A.—Chemical combination as minerals.

HIS LORDSHIP: 528. Q.—Oh, it is in chemical combination? A.—Yes.

529. Q.—That means it cannot be separated by physical means? A.—No, my Lord.

MR. ROBINSON: 530. Q.—When you have a metal in an ore
40 that can be separated by physical means is there any term that is used generally to describe metal in that state of ore? A.—Yes, a metal present in the form of an element is spoken of as “native.” We speak of native copper and native gold, for example.

531. Q.—That simply means if you break the thing down enough physically it is there as such? A.—Exactly.

For Defendant—R. L. Bennett—Examination-in-Chief

HIS LORDSHIP: 532. Q.—I imagine in the form of a nugget; that would be an illustration? A.—Yes, exactly; in that case the metal could be separated by purely physical methods.

532A. Q.—Would that be the same as “free”? A.—Free is used in the same sense, yes.

MR. ROBINSON: 533. Q.—Will you tell us what conclusion is to be drawn from this table, exhibit D-59a, as to the value of stanol?

HIS LORDSHIP: Excuse me, Mr. Robinson, I have the conclusion from the witness that in his opinion the product of paragraph
10 7 of the Keller patent was substantially inert as a collecting agent?

THE WITNESS: That agrees with my conclusion.

534. Q.—What would that mean as to its usefulness or otherwise? A.—It would have no use as far as I conclude from the tests in front of me.

MR. ROBINSON: 536. Q.—I was going to ask you, Mr. Bennet? what conclusion you draw from exhibit D-59a as to the value of the product described on those tables as stanol D as a flotation agent
A.—The conclusion I would draw from exhibit D-59a is that stanol D gives as good results in flotation as sodium ethyl xanthate.

20 HIS LORDSHIP: 536. Q.—Give as good results—A.—Give as good results as sodium ethyl xanthate, and also—

537. Q.—That would not be exceptional if it is said to be the same thing. A.—No. I do not think I have made that statement, my Lord.

538. Q.—No, you have not made it.

MR. ROBINSON: I did not hear your Lordship's question.

HIS LORDSHIP: That would not be an exceptional thing to find if stanol and xanthate mean the same thing.

MR. ROBINSON: 539. Q.—Is there anything further that you
30 want to say in general about that with relation to the table?
A.—Yes—

540. Q.—By way of explanation? A.—Yes, that the preparation which was boiled gave the same results as the preparation without external heating. That is, the usefulness was not impaired by boiling.

541. Q.—Perhaps you could explain that conclusion by reference to the figures in the table? A.—Yes, considering sets of figures, first 21, 22 and 23; in those tests the recoveries obtained were 97.2, 97.2 and 97.7, which are very close to each other. At the same time there
40 was no substantial change in grade as shown in column 7. The grades vary from 3.67 per cent copper to 4.00 per cent copper.

HIS LORDSHIP: 542. Q.—That is, the sodium ethyl xanthate effected a slightly higher percentage of recovery of copper in the concentrate and the grade was slightly less? A.—Yes. In the second series of tests, No. 25, 26, and 27, the recoveries are again

For Defendant—R. L. Bennett—Examination-in-Chief

substantially the same, and there has been very little change in grade as from one test to another. Again the sodium ethyl xanthate gives a slightly lower percentage recovery in the concentrate and a slightly lower grade of copper. In the next series of tests, No. 28, 29 and 30, the recoveries are the same within a tenth of a per cent. and again there has been very little change in grade. All of these tests, of course, give quite superior results to the results obtained in tests 24, and 31.

MR. ROBINSON: 543. Q.—Which are the tests—A.—In which
10 pine oil alone was used.

HIS LORDSHIP: Perhaps we might take an adjournment now.
—Court recessed for ten minutes.

On resuming:

MR. ROBINSON: 560. Q.—What is the purpose of evaporating a solution? A.—Evaporation may have several purposes. One purpose is to remove a solid from the liquid.

HIS LORDSHIP: 561. Q.—Or would it be the other way round? A.—Or conversely. It depends on the way you are looking at it.

562. Q.—Would it not be to get rid of the liquid from the mass
20 and leave the solid behind? A.—That is correct, my Lord.

MR. ROBINSON: What is the purpose of cooling or refrigerating a solution? A.—Again, refrigeration is a very general term. But it may be used to inhibit further organic reactions—for instance, if you are making organic preparations.

HIS LORDSHIP: 563. Q.—Which result in heat in the course of the reaction? A.—Yes. In some reactions it is undesirable to have heat. It is also used, particularly in organic work, to cause precipitation of some material which is in solution; that is, to recover a larger amount of that solid than would otherwise be possible.

30 564. Q.—Would you mind explaining just what you mean by “precipitation”? That term is very familiar to you, no doubt, but it is not to me. A.—Yes. I am sorry, my Lord, but I use these terms sometimes without thinking. Speaking of a material in solution, such as sugar in water, let us say, if that solution is cooled down or refrigerated, as the temperature drops we will reach a point where the sugar will precipitate out of solution as a solid.

565. Q.—That is, I suppose “precipitate” means “fall down”? A.—Fall down to the bottom of the container.

566. Q.—That is what is meant by precipitation? A.—That is
40 correct, my Lord. That is one meaning. There are other meanings.

567. Q.—Yes. A.—But in general that is correct.

MR. ROBINSON: 568. Q.—You say that you reach a condition where it will precipitate. How do you describe the condition of the

For Defendant—R. L. Bennett—Examination-in-Chief

solution just before you have reached the point of precipitation?
A.—The solution at that point would be said to be saturated.

HIS LORDSHIP: 569. Q.—Saturated? A.—That is correct. As the solution is cooled below that point, the solution itself still remains saturated, but the solid material starts coming out of it.

MR. ROBINSON; 570. Q.—What does “saturated” mean?
A.—“Saturated” means that it will hold in solution all it possibly can hold at that particular temperature.

571. Q.—Does the saturation vary with temperature? That is,
10 does the possible amount of material that can be held in solution vary with temperature? A.—Nearly all substances are more soluble at higher temperatures. Therefore the amount of material which can be held in solution at a high temperature is much greater than the amount of material which can be held in solution at a lower temperature.

HIS LORDSHIP: 571. Q.—Is “holding in solution” the same as “holding in suspense”? A.—No. Solution is rather difficult to define.

572. Q.—Yes. A.—But I think my analogy of a solution of
20 sugar and water may perhaps clear up that difficulty. The sugar simply disappears as a solid when it goes into solution.

573. Q.—And all parts of the total are the same? A.—Yes; if the solution is mixed up, of course.

574. Q.—If it is thoroughly mixed up? A.—Yes.

MR. ROBINSON: 575. Q.—Whereas what is the position if it is in suspension? A.—If it is in suspension, then instead of one apparently homogeneous liquid, you have not only a liquid but also solid particles suspended in the liquids itself.

HIS LORDSHIP: That is what I am getting at. Is that the same
30 as in the solution. A.—No. That is quite different. That is in suspension.

576. Q.—You mean it has not been dissolved? A.—No, my Lord. Muddy water, for instance, would be called a suspension of fine particles of clay and other materials in the water; whereas a solution of sugar in water, which appears quite homogeneous, is called a solution.

MR. ROBINSON: 577. Q.—What about the familiar milk of magnesia? A.—Milk of magnesia is a good example of a suspension.

HIS LORDSHIP: 578. Q.—Suspension indicates that the solid
40 substance has not been dissolved? A.—Yes. That is correct, my Lord.

579. Q.—I understand the phrases a little better now.

MR. ROBINSON: They are difficult phrases to understand, my Lord. The difficulty is that, with these technical people they are

For Defendant—R. L. Bennett—Examination-in-Chief

so much a matter of everyday usage to them, they use them without thinking about the laymen to whom they are speaking.

HIS LORDSHIP: Yes. I understand.

MR. ROBINSON: 580. Q.—On the basis of what you have told us, what is the relation between evaporation and refrigeration?
A.—In the two examples which I have given, of evaporation to recover a solid or refrigeration to precipitate out a solid, you are attempting in both cases to separate the solid from the liquid.

HIS LORDSHIP: 581. Q.—The purpose is the same, but the
10 methods are different? A.—The methods are quite different, my Lord, yes.

MR. ROBINSON: 582. Q.—What is the proportion of 160 degree proof alcohol? A.—The percentage of water is 26.5 per cent.

583. Q.—Have you examined the laboratory record book, which is exhibit K-20?

HIS LORDSHIP: Whose book is that?

MR. ROBINSON: It is one of the plaintiff's laboratory record books, my Lord.

THE REGISTRAR: K-20 is not filed; or perhaps it is filed but
20 it has not yet been furnished to me.

MR. GOWLING: It is right here, my Lord.

MR. ROBINSON: 584. Q.—Have you examined that book?
A.—Yes. I have examined it.

HIS LORDSHIP: Whose laboratory book is that? Is that Keller's?

MR. ROBINSON: Well, it is not Keller's, my Lord. It is a laboratory record book of the plaintiff's San Francisco laboratory.

HIS LORDSHIP: And not exclusively Keller's book?

MR. ROBINSON: No. That is the laboratory in which Keller
30 was working.

HIS LORDSHIP: Oh, yes.

MR. ROBINSON: And it records tests which are relevant to this action. But it does not appear from the evidence that Keller himself put anything into that, or wrote anything into that book.

HIS LORDSHIP: Oh, it is the laboratory book.

MR. ROBINSON: There is evidence, for instance, that Lewis—
40 who, your Lordship will remember, was working in that laboratory—made various flotation tests and recorded them in the notebook. Apparently the practice was that some tests were recorded in the laboratory book and some were not. Lewis has two or three notebooks which are produced, and which are in evidence here. Those notebooks were really the books in which he did his rough work as he was doing a test. Then certain of the tests about which rough notes appear in Lewis' notebook were then entered, in full and cleanly, in the laboratory record book.

For Defendant—R. L. Bennett—Examination-in Chief

HIS LORDSHIP: Oh, yes.

MR. ROBINSON: The laboratory record book is a book containing the record of a great many different flotation tests.

MR. GOWLING: Might I just interrupt there to clear up one point?

MR. ROBINSON: Yes.

MR. GOWLING: I was just going to add that this laboratory record contains notes of what was being done by a number of men in the laboratory.

10 MR. ROBINSON: Yes. I am sorry I omitted that. I did not mean to confine it to Lewis.

MR. GOWLING: No. I did not think you did.

HIS LORDSHIP: There would be a number of persons who may have made tests.

MR. ROBINSON: As I understand it, there were different people who were doing flotation tests, among them Lewis; and such of their tests as were considered of a desirable nature, were entered in the laboratory record book.

MR. GOWLING: That is right.

20 HIS LORDSHIP: Is the whole of the book in?

MR. ROBINSON: The book which your Lordship has in front of you is in evidence as a whole.

585. Q.—What conclusion, Mr. Bennett, can you draw from that examination of exhibit K-20, as to the value of potassium tri-thiocarbonate as a flotation agent?

HIS LORDSHIP: The value of what?

MR. ROBINSON: Potassium tri-thiocarbonate as a flotation agent.

30 THE WITNESS: I can draw no conclusion, my Lord, from examination of that book, as to its value as a flotation agent.

MR. ROBINSON: 586. Q.—Have you any knowledge of the solubility of cellulose xanthate in water? A.—Yes, I have.

587. Q.—Can you tell us what it is? A.—I made some rather carefully purified potassium cellulose xanthate some months ago, and added one gram of that material to 100 cc's of distilled water.

588. Q.—Cc's being what? A.—Cubic centimetres.

40 MR. GOWLING: May I just interrupt my friend for a moment? In connection with tests of this nature, I think it has been customary to give the other side notice if it is going to be introduced. I may be anticipating difficulties that will not arise. I wondered if this was something outside of the general run of tests.

MR. ROBINSON: It is simply an experiment along the lines that I have indicated.

For Defendant—R. L. Bennett—Examination-in-Chief
 For Defendant—R. L. Bennett—Cross-Examination

MR. GOWLING: An ordinary chemical experiment?

MR. ROBINSON: An ordinary chemical experiment. You were saying, Mr. Bennett—

HIS LORDSHIP: 589. Q.—You added one gram to 100 cubic centimetres of water? A.—Yes, my Lord. Sunstantially all of that one gram of the potassium cellulose xanthate dissolved in the 100 cubic centimetres of water.

MR. ROBINSON: 590. Q.—What sort of water? A.—Distilled water.

10 591. Q.—What conclusion do you draw from that? A.—I would conclude from that that this preparation which I tested was soluble to approximately one per cent in water.

592. Q.—Thank you, Mr. Bennett.

CROSS-EXAMINED BY MR. GOWLING:

593. Q.—I understand that you tried the agent described in paragraph 7 of the patent on Noranda ore? A.—That is correct, my Lord.

594. Q.—And Noranda ore is not a lead ore nor is it a lead-zinc ore? A.—No. It is not a lead ore nor a lead-zinc ore.

20 HIS LORDSHIP: It is not a lead ore nor a lead-zinc ore.

MR. GOWLING: That is right, my Lord.

595. Q.—Referring to exhibit G-3, which was been called bulletin No. 2, would you tell me why you selected Stanol D for the purpose of making the tests which you have mentioned here? A.—Stanol D contains as much sodium ethyl xanthate as the other lettered preparations in that bulletin.

30 HIS LORDSHIP: 596. Q.—It contains as much which? A.—As much sodium ethyl xanthate as the other lettered preparations in that bulletin.

MR. GOWLING: 597. Q.—As a matter of fact, does not Stanol D produce more xanthate than the other mixtures set forth in that bulletin? A.—It probably will produce more than the lettered preparations, with the exception of G, which would produce approximately the same amount.

598. Q.—Do you know how much more xanthate would be produced by Stanol D than by the other preparations set forth in this bulletin? A.—Offhand, I would say it would be in the ratio of the weight of caustic soda used, my Lord. In Stanol A, for instance,
 40 one gram of caustic soda is specified. In Stanol D—I believe that should be 5 grams.

599. Q.—In Stanol A it should be 1 gram and in Stanol D it should be 5 grams with respect to the item caustic soda? A.—That is right.

For Defendant—R. L. Bennett—Cross-Examination

HIS LORDSHIP: Is that clear on the exhibit?

MR. GOWLING: Oh, yes. It would be correct on the exhibit, because we filed one of the original bulletins.

THE WITNESS: I think that was just a typing error on my copy.

MR. ROBINSON: I think the error came up because of the photostat. You filed the original. Have you not the photostat?

MR. GOWLING: I am sure we filed either the original or a photostat, G-3.

10 HIS LORDSHIP: I have just forgotten whether it was the original bulletin or a photostat. I think the one I looked at was a typewritten copy.

MR. GOWLING: In any event, here is the original which was marked in New York.

THE REGISTRAR: G-3?

MR. GOWLING: Yes.

THE REGISTRAR: This is the original sent to us; I mean, this is the exhibit.

20 MR. GOWLING: Yes. I believe the arrangement at that time was that photostatic copies were left with the commissioner and the originals left with counsel on the understanding that they would be available at the trial. I think that the original, my Lord, would be much easier to read, although the one which the registrar has appears to be a photostatic copy of the one which I now produce. I think the witness is using a typewritten copy.

THE WITNESS: Yes. That is how my error arose. It was a "three" on my typewritten copy.

HIS LORDSHIP: Was this to be put in?

MR. BIGGAR: This is the original from which this photostat which has been marked in New York has been made, I imagine.

30 HIS LORDSHIP: Is the photostat not just as good?

MR. GOWLING: Yes, my Lord.

MR. BIGGAR: As a matter of fact, there is not doubt about the photostat which was marked in New York. Stanol D is very clearly 5 grams.

MR. GOWLING: The marking of the photostat was by arrangement between counsel.

MR. BIGGAR: It is quite all right.

MR. ROBINSON: It is simply that negatives are horrible things to read.

40 MR. BIGGAR: This is a very easy negative to read, but whichever is your preference—

HIS LORDSHIP: This photostat is quite easy to read.

MR. GOWLING: Yes, my Lord. I was simply suggesting if you would like to keep the original with the photostat it would be quite in order to do so.

For Defendant—R. L. Bennett—Cross-Examination

MR. BIGGAR: If it becomes important to refer to it perhaps we can put it in afterwards, but in the meantime we will just look at it and see whether there is any difference between our photostats and the original.

MR. GOWLING: I am simply making the statement that the photostat was taken from the document. The confusion arose through Mr. Bennett using a typewritten copy in which there appears to have been an error. Incidentally the typewritten copy was not supplied by us, my Lord.

10 HIS LORDSHIP: But it is quite clear that the stanol D has 5 grams of caustic soda?

MR. GOWLING: Yes, my Lord.

THE WITNESS: I was misled slightly then.

HIS LORDSHIP: That appears from the photostat which was put in as Exhibit G-3.

THE WITNESS: I was misled slightly in my previous answer because I said — I gave as much as all except G. That should have been E and G because they both have this 5 grams.

MR. GOWLING: 625. Q.—Can you compare stanol D with
20 stanol A and state the relative amount of xanthate in those two mixtures? A.—You refer to the maximum theoretical xanthate which could be formed.

626. Q.—Yes, I think it is easier to calculate it on the theoretical basis. A.—If my memory serves me rightly I think it is about —

627. Q.—Perhaps I can help you by saying we have calculated that at 3.91 per cent for A and 18.74 per cent for D? A.—Yes, that is of the order of maximum possible xanthate formation, assuming that all the caustic soda reacts.

30 HIS LORDSHIP: 628. Q.—Would it be that there is roughly five times as much? Q.—That is correct.

629. Q.—In stanol D? A.—It would be, I think, exactly five times as much.

630. Q.—Pardon? A.—Theoretically it would be exactly five times.

MR. GOWLING: 631. Q.—So that you can calculate the amount of xanthates for purposes of comparison by the grams of caustic soda in the various mixtures, that is, if stanol D has 5 grams and stanol B has 1 gram of caustic soda you would expect stanol D
40 to have approximately five times as much xanthate as stanol B? A.—I would expect it to have five times the theoretical amount of xanthate provided the alcohol and carbon disulphide are both present in sufficient quantity or in excess of that required to react with the caustic soda and form xanthate.

For Defendant—R. L. Bennett—Cross-Examination

632. Q.—Did you test the other stanol mixtures besides D? A.—Yes, I have made flotation tests with two of the other stanol preparations. They were run in much the same way as those on Exhibit D-59a and confirmed the results.

633. Q.—Which others did you test? A.—I think I tested stanol A and stanol C.

634. Q.—I observe that the numbers of the tests on exhibits D-59 and D-59a commence with No. 12. Does that mean that you made eleven other tests which are not shown on these charts?

10 A.—There were eleven other tests made before these series were run. They were also made in the presence of Mr. Trotter and Mr. Chapman, but because of an error on my part in the calculation of the amount of stanol to be used I discarded those tests or did not report them.

635. Q.—Just to have it clear on the record would you state what the miscalculation was? A.—The miscalculation was I used ten times as much of the stanol as I had intended to. That is an error which can arise rather easily because of the method of measurement used.

20 636. Q.—At page 638, question 86 of yesterday's testimony you made this statement in answer to a question of my friend, Mr. Robinson.

“However, in order to be sure that we were following out the intention of this instruction I heated this preparation under a reflux condenser and caused it to boil for a period of fifteen minutes.”

To what instructions were you referring in that answer? A.—I am referring to the instructions on the top of page 11. I think the pages are the same on my copy. The instructions given there are:

30 “Shake until dissolved and digest under a reflux condenser until the caustic soda has disappeared.”

637. Q.—You are therefore giving the word “digest” a meaning equivalent to “boil”? A.—Under some circumstances that meaning may be attached to the word “digest.”

638. Q.—Where do you get the instructions which tell you how long to boil it? A.—The instruction is to digest until the caustic soda has disappeared.

639. Q.—Do you happen to know how long Martin boiled it? A.—I have no idea how long Martin boiled it.

40 640. Q.—That is, if Martin had boiled it or had performed this test at all you do not know what steps he took? A.—I presume he followed his instructions and digested until the caustic soda had disappeared.

641. Q.—Would you express an opinion on how stanol D would work in flotation if it were boiled for several days? A.—I have not tested stanol D in that respect.

For Defendant—R. L. Bennett—Cross-Examination

642. Q.—How did you know how much stanol D to use in this test?

HIS LORDSHIP: In which test?

MR. GOWLING: In the tests reported on exhibit D-59a, my Lord.

THE WITNESS: The basis for the amount of stanol D used was the choice of that arbitrary amount of sodium ethyl xanthate shown as .08 in test 23. I wished to run comparison tests in which at least that amount of sodium ethyl xanthate was present
10 as a result of the reaction of these materials in the preparation of the stanol.

643. Q.—Did you finish your answer? A.—I think that is finished, yes.

644. Q.—So that as a result of your present day knowledge about the use of xanthate you are able to calculate how much stanol would be required? A.—No, I think not.

645. Q.—Is there anything — A.—The equation on page 12, which is a correct chemical equation for the formation of potassium ethyl xanthate.

20 HIS LORDSHIP: 646. Q.—Correct equation for what? A.—Correct chemical equation showing the formation of potassium ethyl xanthate.

647. Q.—Potassium — A.—Potassium ethyl xanthate, yes.

MR. GOWLING: 648. Q.—But the bulletin does not suggest how much of it to use? A.—The bulletin does not.

649. Q.—As a matter of fact, did you not test these stanol mixtures to see how much xanthate they produced in order to determine how much to use? A.—No, I did not test them with that in mind.

30 650. Q.—Oh, I thought you had said the reason you used the amount of stanol shown was because you first calculated how much stanol you would require and then used the amount of stanol necessary in order to have that much xanthate present in the pulp? A.—I used enough stanol to give at most .08 pounds per ton of sodium ethyl xanthate. The amount of stanol which was used could not have given more sodium ethyl xanthate than the .08. It might have given less.

651. Q.—Should you not have said “at most” instead of “at least” in that answer?

40 HIS LORDSHIP: 652. Q.—Which is it? A.—At most.

653. Q.—That is, you did not want to have any more sodium ethyl xanthate in the stanol than you had in your test with the sodium ethyl xanthate by itself? A.—No. That would be an unfair test on the stanol. This is perhaps going over the other way a little bit because I feel there could not be any more than that .08 there and there might be less.

For Defendant—R. L. Bennett—Cross-Examination

654. Q.—You were satisfied there could not be any more than .08 of sodium ethyl xanthate in the stanol which you used? A.—I am quite satisfied on that point, my Lord.

MR. GOWLING: 655. Q.—You required at least several times as much stanol as you would potassium xanthate?

HIS LORDSHIP: Potassium?

MR. GOWLING: 656. Q.—As potassium ethyl xanthate to treat a given amount of ore? A.—In the tests shown it was roughly .45 to .08, yes.

10 HIS LORDSHIP: Did you make any tests with potassium ethyl xanthate?

MR. GOWLING: I should have said sodium ethyl xanthate, my Lord.

657. Q.—You would require even larger amounts of the other stanols to do the same work? A.—You would require more of the other stanols.

658. Q.—Did you calculate the cost of using stanol D as compared with sodium ethyl xanthate for the purpose of carrying out flotation work? A.—No, I did not.

20 659. Q.—If you used stanol D at Noranda Mines in preference to sodium ethyl xanthate it is a fact, is it not, that it would cost you in the neighbourhood of many thousands of dollars more per year? A.—If that was the case that, of course, would have to be taken into consideration.

660. Q.—Do you not think it would run even into hundreds of thousands of dollars? A.—The cost of a reagent is one consideration, yes, in adopting it.

30 661. Q.—What I have in mind is if you were to attempt to do with stanol D what you are now doing with sodium ethyl xanthate would it not cost Noranda Mines something over \$100,000 a year more? A.—I have no idea as to how much more.

662. Q.—You could not even by mental arithmetic calculate whether my figure is accurate? A.—No, because it involves the mass production of stanol and the cost of the ingredients, and so on.

663. Q.—I thought I had given a conservative figure. Would it be too much to ask you in the noon hour to see if you could do a little mental arithmetic and see if I am speaking in figures of the general order? A.—I will see what I can do, yes.

40 HIS LORDSHIP: 664. Q.—Do you know what the cost of each substance is? A.—The cost of these reagents depends on the amount you are buying.

665. Q.—Which is the more expensive, sodium ethyl xanthate or stanol? A.—I don't know.

MR. GOWLING: 666. Q.—I think it is something you could calculate very readily by taking the market prices from a current chemical catalogue? A.—Yes, I could do that.

For Defendant—R. L. Bennett—Cross-Examination

667. Q.—In fact, I will lend you a catalogue at noon hour for the purpose of making the calculation. It is a trade journal called Canadian Chemistry and Process Industries. A.—I think the figures quoted in there would be quite reasonable for this purpose.

668. Q.—I am just trying to get a rough estimate of the extra cost using stanol D as compared with sodium ethyl xanthate. When you mixed these stanol ingredients did you obtain any stanol crystals? A.—You are referring to stanol D?

669. Q.—Yes. A.—No, that was a solution.

10 670. Q.—So at no time were stanol crystals produced in this reaction? A.—No, that is right.

671. Q.—As far as bulletin 2 is concerned it simply gives instructions to mix the ingredients mentioned there which Martin refers to as stanol, and it happens to contain some xanthate in solution? A.—That is my feeling with regard to bulletin 2, yes.

HIS LORDSHIP: 672. Q.—Stanol contains xanthate in solution? A.—Yes, stanol contains xanthate in solution.

MR. GOWLING: 673. Q.—That is some xanthate? A.—Some xanthate.

20 674. Q.—At page 652 in answer to question No. 163 you stated that column 3a on exhibit D-59a must be explained in terms of the stanol preparation which contains sodium ethyl xanthate together with excess alcohol. In using the term, “excess alcohol” had you in mind something in the bulletin which refers to the alcohol as being an excess, or did you simply have in mind there was more alcohol in the mixture than would be required to dissolve the caustic soda? A.—There is more alcohol in the preparation stanol D than can react with the caustic soda to form xanthate.

30 675. Q.—Just why did you use the term “excess alcohol” in that answer? A.—Because it is excess over the amount which will react in the way I have mentioned.

676. Q.—Would you regard it as excess with respect to stanol because of something you find in the bulletin? A.—I don't know that I quite understand.

678. Q.—The point being that Martin simply tells you to mix these ingredients but he does not suggest there is any excess of alcohol, does he, in his mixture called stanol?

40 MR. BIGGAR: Surely my friend should direct himself to what the paper says. I mean the paper says what it says.

MR. GOWLING: I am just giving the witness an opportunity to clear up a statement he made yesterday which I cannot find any sound basis for in the bulletin.

HIS LORDSHIP: That question is where?

For Defendant—R. L. Bennett—Cross-Examination

MR. GOWLING: It is the second to the last line, question 163 at page 652. Your Lordship had interjected a question there about column 3a and the witness refers to an excess of alcohol in stanol, and I did not understand why he used the term "excess alcohol" when he is referring to a mixture called stanol. I do not see any objection to the witness answering why he used the term.

HIS LORDSHIP: No, I do not see any objection.

THE WITNESS: The equation which is shown on page 12 shows a reaction which forms potassium ethyl xanthate. Potassium ethyl xanthate is very similar to the sodium ethyl xanthate. From this equation or a similar equation with sodium ethyl xanthate it is possible to calculate the excess alcohol over that required to react and form potassium or sodium ethyl xanthate.

679. Q.—It might be excess in respect of xanthate? A.—It will be excess in respect of the xanthate reaction.

MR. GOWLING: 680. Q.—Is there any excess of anything else in the terms in which you are using the word "excess"? A.—There is a small excess of carbon disulphide in stanol D, I believe, using the word "excess" in that same sense.

20 681. Q.—So that the only constant ingredient is caustic soda? A.—The only constant ingredient —

682. Q.—I should have said the only definite ingredient in which there is no excess? A.—I do not understand the question, I am afraid.

683. Q.—There cannot possibly be an excess of caustic soda according to the definition which you have given of the word "excess"? A.—After these constituents are added together and the reaction has taken place I would not expect any excess of caustic soda, still on the same basis.

30 684. Q.—I presume you have studied the patent in suit, Mr. Bennett? A.—Yes.

685. Q.—Do you believe that Anaconda slimes could be successfully treated as set out in this patent? A.—I have no experience whatever with Anaconda slimes.

686. Q.—You could tell pretty much from the facts set forth in the patent about these slimes whether they could be successfully treated, couldn't you? A.—I think the test speaks for itself. It would lead me to that conclusion.

40 687. Q.—What I want you to do is express an opinion as an expert as to whether Anaconda slimes could be successfully treated as set out in the patent? A.—Bearing in mind the example given in the patent — may I look at it?

688. Q.—You may have a look at that copy if you like.

HIS LORDSHIP: You are referring to paragraph 9, are you?

MR. GOWLING: Yes; paragraph 9, my Lord.

For Defendant—R. L. Bennett—Cross-Examination

HIS LORDSHIP: Of the patent.

MR. GOWLING: Yes.

700. Q.—The treatment of Anaconda ores is also referred to in paragraphs 13, 15 and 16? A.—Perhaps I could number these consecutively.

701. Q.—Those paragraphs refer to Anaconda slimes or Anaconda ores of various natures. From your knowledge of the type of ore produced at Anaconda and the facts set forth in this patent, would you say whether those Anaconda ores could be suc-
10 cessfully treated as set out in the patent?

MR. ROBINSON: Which paragraph are you referring to?

MR. GOWLING: Any that the witness cares to mention with respect to Anaconda ores.

MR. ROBINSON: It is just what I wanted to know to which paragraph his answer was directed.

MR. GOWLING: He can direct it first to paragraph 9, if he wishes.

HIS LORDSHIP: He has referred to paragraph 9, 13, 15 and 16.

MR. ROBINSON: I know the general paragraphs, but I was
20 asking which one the witness was directing his attention to.

MR. GOWLING: I am going to ask the witness to answer the same question with respect to each of them.

HIS LORDSHIP: Perhaps you could direct his attention to paragraph 9.

THE WITNESS: The tests, if they have been well carried out — and I presume they have — would lead you to expect that you would get much the same results as set out in the patent in a flotation operation.

MR. GOWLING: 702. Q.—Would those results be regarded as
30 satisfactory from a practical standpoint? A.—Without a knowledge of the particular ore, it is rather difficult to say. The results are not bad results. They might be quite good. I would have to have a standard comparison.

703. Q.—Anaconda, though, is a fairly well known general type of ore, is it not? A.—I do not happen to know it myself.

HIS LORDSHIP: 704. Q.—You do not happen to know it yourself? A.—I have not done any work on it.

MR. GOWLING: 705. Q.—Do you know of any ores which are of the same general type as Anaconda? A.—There are quite a few
40 ores in the southwestern states, I believe, which are similar to Anaconda; but I have no particular experience with them, of course, either.

706. Q.—Would you think that the tests set forth in paragraph 13, 15 and 16 could be carried out successfully as reported in the patent?

For Defendant—R. L. Bennett—Cross-Examination

MR. ROBINSON: The witness is now directing himself to paragraph 13?

HIS LORDSHIP: Paragraphs 13, 15 and 16.

MR. GOWLING: I think he can deal with the three at once.

THE WITNESS: I would be prepared to make that statement, with the reservation of my lack of knowledge of comparable results, at the same time.

MR. GOWLING: 707. Q.—The recovery looks to you to be fairly good, does it not? A.—The recoveries are quite fair, yes.

10 708. Q.—What about the San Francisco ores which are mentioned in paragraph 11? Are you familiar with that type of ore? A.—No. I am not familiar with that ore.

709. Q.—From your knowledge of that ore, could you say —

HIS LORDSHIP: He says he is not familiar with that ore.

MR. GOWLING: 710. Q.—He says he is not familiar with that ore, but I was saying from his experience with ores of that general type; would you express an opinion as to whether the tests recorded in the patent could be successfully carried out? A.—I expect this test could be duplicated of course.

20 MR. ROBINSON: What do you mean by “this test”?

THE WITNESS: This test on San Francisco mines ore.

MR. BIGGAR: Is that paragraph 13?

MR. GOWLING: Paragraph 11.

711. Q.—Would you think that the same process mentioned of this type could be carried out successfully in a practical utilization of the process? A.—Yes. I would expect those results could be extended to a practical operation.

712. Q.—And those results look pretty fair? A.—They are not particularly good by modern standards. That is what my diffi-
30 culty is.

713. Q.—In other words, in the last fifteen or twenty years, the results obtained from flotation has greatly improved? A.—Yes, particularly on this type of ore, because we would use other agents.

714. Q.—Yes. That is what I had in mind. But bearing in mind the limitations in 1923, would you not agree with me that those are pretty fair results obtained from the tests shown in this patent? A.—I must talk, of course, my Lord, without any knowledge of the results on this particular ore that were being obtained at that time.

40 715. Q.—Yes. I am not trying to tie you down to San Francisco ore. But you are a man of considerable experience in this art, and would you not recognize that as a type which is fairly general throughout this continent? A.—It appears to be a lead-zinc ore containing some silver.

For Defendant—R. L. Bennett—Cross-Examination

716. Q.—Would you not think that the results shown there should be regarded as fairly good?

HIS LORDSHIP: As at that time?

MR. GOWLING: As at that time, yes.

THE WITNESS: The recoveries were probably quite fair as at that time, yes. For this type of flotation, sodium cyanide is almost universally used now, and that throws me off a bit looking at this type of test, because it has a very improving effect on the lead concentrate.

10 HIS LORDSHIP: 717. Q.—It is difficult to look back. A.—It is very difficult, particularly for myself, my Lord.

718. Q.—But looking back as far as you can, you have come to the conclusion that paragraph 11 shows fairly good results? A.—The results appear to be quite fair, yes.

MR. GOWLING: 719. Q.—Does the use of amyl xanthate produce good results when used in a flotation process?

HIS LORDSHIP: The use of which?

MR. GOWLING: Amyl xanthate, my Lord.

20 720. Q.—Does the use of amyl xanthate produce good results when used in a flotation process? A.—Are you referring to any particular material?

721. Q.—Let us say either potassium or sodium. A.—Yes. Those reagents are good flotation reagents.

722. Q.—Do they work any differently from a potassium or sodium ethyl xanthate? A.—Speaking generally, they work somewhat better.

723. Q.—Do they react any differently in the pulp or just a little better than the ethyl xanthate? A.—The application of the reagent is, of course, based on the test results or the results obtained
30 in the mill plant.

724. Q.—And the cost of the reagent, I presume? A.—And the cost of the reagent. Amyl, I believe, is somewhat more expensive than ethyl.

725. Q.—But produces slightly better results? A.—But produces somewhat better results.

726. Q.—The point I had in mind is that the amyl and the ethyl xanthates made with the potassium and sodium metals react in very much the same way in the pulp? A.—They have the same function in flotation.

40 727. Q.—That is what I had in mind, and produce what I would call similar results, with your qualification that the amyl produces slightly better results. A.—Yes; as a general thing it does.

728. Q.—And you use them both in exactly the same manner? A.—Yes.

For Defendant—R. L. Bennett—Cross-Examination

MR. GOWLING: My Lord, I am now about to embark upon another branch which may take over five minutes.

HIS LORDSHIP: Then this might be a good time to adjourn.
(Court adjourned at 12.55 p.m. until 2.30 p.m.)

AFTERNOON SESSION
OTTAWA, NOVEMBER 22ND, 1944

ROBERT L. BENNETT. Cross-Examination resumed :

HIS LORDSHIP: Mr. Gowling.

MR. GOWLING: 729. Q.—Mr. Bennett, you were going to do
10 a little calculating during the noon recess. Have you finished?
A.—Yes, I have finished that calculation.

730. Q.—Can you give me the figures that I requested?
A.—Could I have the question repeated, Mr. Gowling? You spoke
of so much per year, or something like that.

731. Q.—What I was endeavouring to ascertain is the extra
cost which would be entailed by using stanol at Noranda as com-
pared with sodium ethyl xanthate or sodium amyl xanthate? A.—I
made certain calculations with quite a few assumptions, my Lord.
20 The cost of the stanol preparation as it is shown in exhibit D-59a
is about 4 to 5 cents per pound. The current price of sodium ethyl
xanthate is about 14 cents per pound. On the basis of a com-
parison of .45 of the stanol with .08 of the sodium ethyl xanthate
the difference in cost per ton is of the order of 4 cents per ton of
ore treated.

732. Q.—Roughly what would that figure be in a year, using
the chart if you wish, of the tonnage treated which has been filed?
I am not sure of the exhibit number. A.—I think the order of the
difference is tens of thousands of dollars. Is that the way the
original question was put?

30 734. Q.—I think I suggested it would exceed \$100,000. A.—It
is of the order of tens of thousands.

HIS LORDSHIP: 734. Q.—Tens of thousands? A.—With those
assumptions in mind, of course.

MR. GOWLING: 735. Q.—You mentioned this morning you had
tried stanols A, C and D, and that the tests with A and C con-
firmed some results to which you referred. Can you tell me what
results you had in mind? A.—I had in mind the general conclu-
sions which I drew from exhibit D-59a which is the table of results
of flotation tests in which the reagent stanol D and sodium ethyl
40 xanthate were tested.

736. Q.—That is, that you were making a test to determine
the amount of xanthate present? A.—No. I was making a test

For Defendant—R. L. Bennett—Cross-Examination

with, as I remember, A and C stanols to see if they behaved under similar circumstances in the same way as stanol D behaved.

737. Q.—How much of A and C did you use in these tests?
A.—I used approximately five times the amount of A and C that I used of D.

738. Q.—And if it requires five times as much D to accomplish the same purpose—

HIS LORDSHIP: Pardon?

MR. GOWLING: 739. Q.—Five times as much D, or approximately five times as much D, to accomplish the same purpose as sodium amyl xanthate—

HIS LORDSHIP: Sodium ethyl xanthate.

MR. GOWLING: 740. Q.—Sodium ethyl xanthate, it would require about 25 times as much of stanol A or C to do the same work as sodium ethyl xanthate? A.—That is right, I believe.

741. Q.—Would I be correct in saying that you were really testing stanols and using them because of their xanthate content? A.—No, I was testing them on the basis of equal maximum possible xanthate content.

20 742. Q.—Yes, but I mean what you were doing was testing them really as xanthate rather than as stanol? You were not trying to see if stanol would work; you were testing them because you knew the xanthate in the solution would work? Is that not right? A.—Of course I knew that sodium ethyl xanthate would work in flotation, yes, and from bulletin No. 2 it was evident to me that these preparations contained a certain amount of sodium ethyl xanthate as well as other constituents which I considered to be inert in flotation. Therefore, the tests were run on equal xanthate content.

30 HIS LORDSHIP: 743. Q.—Perhaps I should not interrupt but would it not follow from your conclusion, that everything that was in stanol that was not sodium ethyl xanthate was inert? A.—That would be substantially the case, yes, my Lord.

MR. GOWLING: 744. Q.—That was not considered to be the situation in 1923, was it, or can you form any opinion on that? A.—I am afraid I cannot offer much evidence about the situation in 1923.

40 745. Q.—Take, for instance, stanol A. I understand there is about 3.91 per cent of xanthate in that solution. Would the remainder be about 90 per cent alcohol with about 2 per cent carbon disulphide? A.—The remainder would be approximately 90 per cent denatured alcohol, yes, plus some carbon disulphide.

746. Q.—You mentioned you had carefully examined the plaintiff's notebook, exhibit K-20, and I presume you also examined the Keller and Lewis notebooks? A.—I have examined those notebooks, yes.

For Defendant—R. L. Bennett—Cross-Examination

747. Q.—Those are exhibits K-14 —

HIS LORDSHIP: Keller's notebook is what?

MR. GOWLING: We call them the Keller and Lewis notebooks, my Lord.

HIS LORDSHIP: Oh, Keller and Lewis.

MR. GOWLING: The Keller notebook is No. K-12 and the laboratory notebooks referred to as the Lewis books are 14, 15, 16 and 23.

HIS LORDSHIP: K?

10 MR. GOWLING: K-14, 15, 16 and 23, my Lord.

748. Q.—From your study of those notebooks would it be apparent to you that all of the Keller and Lewis tests are not recorded in this laboratory notebook, K-20? A.—I believe there are some tests in the laboratory notebooks, exhibits 14, 15 and 16—

HIS LORDSHIP: 749. Q.—That is in the Lewis notebook? A.—In the Lewis notebooks, yes, my Lord, which have not been entered into exhibit K-20.

MR. GOWLING: 750. Q.—Mr. Bennett, we have heard quite a bit about cellulose xanthate. Dr. Purves said he had given you
20 instructions to prepare it without stating how it was prepared, and I think you stated you had prepared it according to the instructions of Dr. Purves, but we have not yet had a description of the method employed. I would like you to explain just how you prepared the cellulose xanthate which you used in your tests, and for that purpose you may follow your notebook. A.—I believe the procedure is recorded in some detail in the laboratory notebook.

HIS LORDSHIP: That is in your tests 12, 13 15 and 16.

MR. GOWLING: I am handing the witness his notebook, exhibit D-90.

30 THE WITNESS: Do you wish me to read from the notebook?

751. Q.—Yes, you may have to elaborate somewhat on the description here for the benefit of his Lordship but you can read substantially from your notebook, making such additional comment as may be required. Explain the details necessary for the production of the cellulose xanthate followed by you.

HIS LORDSHIP: Are you speaking of the crude or purified? Does it make any difference?

MR. GOWLING: First of all I think it comes out as crude cellulose xanthate, and it is those details which I wish to clear up,
40 my Lord.

THE WITNESS: On page 5 of exhibit D-90 is recorded the start of the preparation of crude cellulose xanthate.

760. Q.—You start by giving the reagents used? A.—Yes. The reagents used are, first, cellulose.

For Defendant—R. L. Bennett—Cross-Examination

761. Q.—Would you describe the cellulose and why you selected that particular type? A.—The cellulose is described as, “air-dried cotton linters obtained from Pulp and Paper Research Laboratory, McGill University, Montreal.” That particular sample of cellulose was handed to me by Dr. Purves. The second reagent used was caustic soda, technical grade.

762. Q.—What does that term signify? A.—That term signifies that it is not C.P.—not chemically pure. It would be the ordinary grade of caustic soda which would be used in the preparation of this
10 crude cellulose xanthate.

The note goes on: “From previously unopened sealed bottle, labelled ‘2 lbs. caustic soda—Canadian Laboratory Supplies Limited’, purchased from latter company. Seals marked ‘L.R.J.’”

763. Q.—I am interested in the time it takes to prepare this, so you might also state the various time factors involved. A.—The notation in the margin of the notebook is “10 a.m.”

764. Q.—That was on Tuesday, August 29? A.—Tuesday, August 29. Continuing: “To 10 grams cotton linters contained in a
20 250 cc. glass stoppered bottle, added 200 cc. 18 per cent caustic soda solution at room temperature of 23 degrees centigrade. (Caustic soda solution: 92 grams caustic soda dissolved in 410 cc. distilled water.) The bottle was placed on a rolling table for one hour—”

765. Q.—What is a rolling table? A.—A rolling table is a rotating belt which is in a horizontal plane and on which this bottle was placed.

766. Q.—What was the purpose of doing that? A.—The purpose of doing that was to keep the cellulose agitated and stirred up in the solution of caustic soda. “The bottle was placed on a rolling
30 table for one hour at room temperature, after which the contents was suction-filtered through a sintered-glass filter funnel.”

767. Q.—Perhaps you had better explain that filtering process? A.—Yes. A sintered-glass filter funnel is a funnel with a rather porous glass plate at the bottom of it, and that is placed over a flask which is partially evacuated, and that process sucks the liquid out of this material or preparation into the flask, and leaves any solid material on top of the sintered-glass plate. Continuing: “The clear caustic filtrate was discarded. The residue was pressed between blotting papers to a weight of 29 grams.”

768. Q.—What is the caustic filtrate? A.—The caustic filtrate
40 is the caustic soda solution mentioned above, after it had been mixed up with the cellulose and filtered out through the sintered-glass plate. Continuing: “The pressed residue was shredded with a pair of scissors to crumbs of about one-tenth inch maximum size. These were placed in a 250 cc. glass stoppered bottle, which was stoppered and replaced on the rolling table at 12 noon.”

For Defendant—R. L. Bennett—Cross-Examination

769. Q.—That is, it took two hours for the preliminary preparation that you have just described? A.—The total time was two hours up to that point. The actual time of reaction or exposure of the cellulose to the caustic soda would be two hours. Yes, that is right. Then the intervening pages are not pertinent to this preparation.

770. Q.—I think page 27 is the next relevant page there? A.—Yes. We go from that page to page 27.

771. Q.—This is two days later? A.—This is August 31, 10 a.m.

10 772. Q.—That is two days later? A.—That is correct; 48 hours. The note is: "After ageing the alkali cellulose for 46 hours, the bottle was opened and 2.55 cc. carbon disulphide (described p.7) added."

773. Q.—That is the carbon disulphide which is mentioned in the previous page to which we have referred? A.—That is correct. Continuing: "The bottle was then restoppered and returned to the rolling table for three hours. After this treatment, the bottle was evacuated for fifteen minutes, using a water pump to remove any excess carbon disulphide."

20 That step in the preparation consisted of placing a stopper in this bottle through which led a glass tube, and the tube was connected to a vacuum pump, which I have described here as a water pump. It is that type of vacuum pump. The purpose of it, as noted here, is to remove any excess carbon disulphide. Continuing on with the notebook:

"16.9 grams 18 per cent caustic soda solution and 76.4 cc. distilled water were then added, and the preparation stirred for about an hour, until all the crumbs had dissolved. The final preparation was an exceedingly viscous clear solution."

30 HIS LORDSHIP: 774. Q.—The note says "until all the crumbs had dissolved." Crumbs of what? A.—The sodium cellulose was the preparation before carbon disulphide was added. That sodium cellulose was in the form of crumbs. It had been shredded by means of a pair of scissors.

That is the end of the preparation of the crude cellulose xanthate.

MR. GOWLING: 775. Q.—And that was completed at what hour on August 31? A.—That would be about 2 p.m.; very close to that.

776. Q.—Yes. A.—The new heading in the notebook is:

40 "Preparation of Purified Cellulose Xanthate." The time is 2.30 p.m., in the margin. The note reads:

"25.1 grams of the above preparation—"

The above preparation refers to the crude cellulose xanthate.

"— was very slowly poured into about 200 cc. methyl alcohol, while stirring. The last portions of the crude cellulose

For Defendant—R. L. Bennett—Cross-Examination

xanthate were washed into the alcohol with 20 to 30 cc. of water. The cellulose xanthate coagulated in the form of a thin, semi-continuous filament, of pale-greenish colour.”

I might say, my Lord, that the colour of the crude cellulose xanthate was rather orange. Continuing:

10 “The alcohol became pale orange colour. The coagulated material was treated with the methyl alcohol for 10 to 15 minutes, and the alcohol then decanted off. Two additional treatments with alcohol were made. The third washing with alcohol was only slightly coloured. The product was washed once with ether, pressed between blotting papers, air-dried 10 to 15 minutes, then cut into small plates with a pair of scissors. These flakes were treated again with methyl alcohol, which did not become discoloured, and finally with ether, after which they were air-dried for about an hour, and then placed in a closed bottle. The product was pale-greenish in colour and weighed 3.0 grams.”

That, I think completes that preparation of the purified cellulose xanthate.

20 777. Q.—That process of making cellulose xanthate would be a very troublesome and complicated one, as compared with the preparation of either potassium or sodium xanthate.

MR. ROBINSON: Sodium ethyl xanthate?

MR. GOWLING: Sodium ethyl xanthate or potassium ethyl xanthate.

THE WITNESS: It differs considerably from the preparation of sodium ethyl xanthate.

30 MR. GOWLING: 778. Q.—Would you not say that it was very much more troublesome and complicated to make than sodium or potassium ethyl xanthate? A.—I would not say it was more troublesome to make than a chemically pure sodium ethyl xanthate.

779. Q.—Let us say commercial sodium ethyl xanthate, the kind that you use in treating your ore at Noranda? A.—It is more complicated than the preparation of crude sodium ethyl xanthate.

HIS LORDSHIP: 780. Q.—I beg your pardon? A.—It is a somewhat more complicated procedure than the preparation of crude sodium ethyl xanthate.

MR. GOWLING: 781. Q.—Is it the crude that you use at Noranda? A.—It is a commercial product, yes.

40 782. Q.—What I want you to do is to compare the preparation with the commercial product, sodium ethyl xanthate; my point being that I think it is very much more complicated to prepare this cellulose xanthate than sodium ethyl xanthate? A.—Comparing one laboratory preparation with another, it is somewhat more complicated, yes.

For Defendant—R. L. Bennett—Cross-Examination

HIS LORDSHIP: 783. Q.—When you say “somewhat more complicated,” what do you mean? A.—Well, there are great degrees of complication, my Lord, particularly in organic preparations. Some are very complicated.

MR. GOWLING: 784. Q.—When did you first think of using cellulose xanthate for this test?

MR. BIGGAR: I think I could tell you that. It was when the witness met me in August, my Lord.

THE WITNESS: I was trying to find the date.

10 MR. GOWLING: If the witness wants to say that he made the test on instructions from counsel, that answer will be quite satisfactory.

THE WITNESS: Well, that is, I think, the case.

HIS LORDSHIP: 785. Q.—In August, 1944. A.—I cannot fix the date exactly.

MR. GOWLING: 786. Q.—In other words, you did not get the idea of trying cellulose xanthate out of the patent? A.—No.

787. Q.—And cellulose xanthate is not something that you would select for flotation from a reading of the patent, is it? A.—I find it very difficult to answer that question, because I know of the
20 use of sodium ethyl xanthate which is quite good.

788. Q.—Yes. But I am asking you if, on reading the patent, as a practical, experienced man in this art, it would occur to you to use cellulose xanthate in the flotation process? A.—I would have to know what year I was reading the patent, and then speculate, of course.

789. Q.—Well, I would prefer you to speculate as to 1923. But suppose you were to read the patent for the first time when you became involved in this mining industry?

MR. BIGGAR: Does your Lordship think that a proper question?

30 HIS LORDSHIP: Suppose you were to read it now that it has expired—would not that be a proper question?

MR. BIGGAR: I should doubt whether it was proper to ask any witness what the patent would suggest to him. I mean, he is being asked to interpret the patent.

MR. GOWLING: No, my Lord. I am putting a hypothetical case.

HIS LORDSHIP: No, Mr. Biggar, he is putting a hypothetical case as to whether it would occur to him to experiment with the cellulose xanthate.

40 MR. BIGGAR: If your Lordship thinks it is proper, I have no objection.

HIS LORDSHIP: I mean, I do not see that it is not proper, at the moment.

MR. BIGGAR: Perhaps I had better make my point clear. It seems to me, my Lord, that to ask a question of that kind is really

For Defendant—R. L. Bennett—Cross-Examination

to say, "Does the patent suggest the use of cellulose xanthate?" In other words, "Do you interpret the patent as suggesting the use of cellulose xanthate?"

MR. GOWLING: That is not the question at all.

HIS LORDSHIP: I do not think so, Mr. Biggar.

MR. BIGGAR: Very good, my Lord.

HIS LORDSHIP: I would not take that view. At the moment I see nothing improper about the question.

MR. BIGGAR: Very good, my Lord.

10 MR. GOWLING: I am simply asking the witness if, as a practical man, after reading this patent—

HIS LORDSHIP: A practical metallurgist.

MR. GOWLING: A practical metallurgist.

MR. BIGGAR: And chemist.

HIS LORDSHIP: And chemist.

MR. GOWLING: Mr. Bennett has been qualified both as a metallurgist and a chemist.

HIS LORDSHIP: Yes.

20 MR. GOWLING: I am asking him if, after reading this patent, it would occur to him to use cellulose xanthate in a flotation process.

HIS LORDSHIP: Yes.

THE WITNESS: I think from a reading of the patent I would perhaps try out this preparation described in the specification, first of all.

MR. GOWLING: 785. Q.—Yes. A.—And after I found certain results with that—and depending, of course, on my training as a chemist and the frame of mind I was in at the time—I can see no reason why I would not be tempted into exploring other xanthates. That is a very difficult question to answer, Mr. Gowling.

30 786. Q.—Yes. You have said quite frankly that you would first try potassium xanthate or sodium xanthate? A.—Yes; the preparation as given for that material.

HIS LORDSHIP: 787. Q.—After reading the patent? A.—After reading the patent.

MR. GOWLING: I am trying to be very fair with the witness, my Lord. He is an expert in this field, and has training in chemistry as well as in metallurgy. I understand from Mr. Bennett that he now says that he would first try potassium or sodium xanthate.

HIS LORDSHIP: Yes.

40 MR. GOWLING: 788. Q.—Now what I should like to know is whether, after finding—as I understand you would—that you would recover 97.9 per cent of the metal by using potassium or sodium xanthate, there would be any object in trying cellulose xanthate. First perhaps I should ask you if I am correct in saying that by using

For Defendant—R. L. Bennett—Cross-Examination

potassium or sodium xanthate your recovery would be about 97.9 per cent as indicated on exhibit D-59a? A.—We are speaking, of course, still of 1923 and what I think might be the case at that time.

789. Q.—Yes, what would be the recovery then? Would it be very high? A.—It would probably be of somewhat the same order, yes.

790. Q.—Then if you found that you were getting something of that order out of potassium or sodium xanthate, would there be any object in trying cellulose xanthate, knowing as you would, being
10 a chemist, that it is this complicated to make it, and no doubt much more costly? A.—In the first experiments on a reagent, I do not think the cost would concern me very much. I would want to find out, first of all, whether the thing would work.

791. Q.—Do you see any reason for conducting further experiments if you find that potassium and sodium xanthate will give you recovery of this order, and you know that the cost of cellulose xanthate is high and the procedure for making it complicated? Would there be any reason for going any further? A.—Yes. I think there would. Speaking as an experimentalist now, I would want to go
20 beyond that.

HIS LORDSHIP: 792. Q.—Am I to take it that you would say you might get better results from cellulose xanthate? A.—Well, I would not know, my Lord; and I would like to conduct experiments to find out.

MR. GOWLING: 793. Q.—Would you know what cellulose xanthate would cost in comparison with potassium and sodium xanthate? A.—Well, generally, the first part of an investigation does not take into account the cost.

794. Q.—I know. I am not asking you to deal with the problem
30 as a scientist. I am asking you to deal with the problem as a practical man at the Noranda mines.

HIS LORDSHIP: A practical metallurgist.

MR. GOWLING: A practical metallurgist at the defendant's mines. I have been told that the cost of production of cellulose xanthate in this process would be very much higher than the cost of production of potassium or sodium xanthate.

795. Q.—Am I right on that, Mr. Bennett? A.—A purified cellulose xanthate would undoubtedly be more expensive, prepared as I have prepared it. I cannot say about the crude cellulose xanthate.

796. Q.—I am also informed that, from a practical standpoint,
40 you must have substantial amounts of the xanthate, or rather of your reagents, on hand, and store them for considerable periods. Am I right on that? A.—Yes. We do that.

797. Q.—And sometimes you must have those transported to you from remote sections where they are prepared? A.—Yes.

For Defendant—R. L. Bennett—Cross-Examination

798. Q.—And you are aware of the difficulty of not only making cellulose xanthate but also of storing it and shipping it? A.—If I am aware of all those things?

799. Q.—Yes. Are you aware of that? Dr. Purves testified as to those difficulties, and I wondered if you were also aware of them. A.—I think honestly, trying to put myself in the position of a metallurgist—

HIS LORDSHIP: 800. Q.—And a chemist? A.—And a chemist, I might, and might not have heard of cellulose xanthate—it would
10 seem very doubtful that I had heard of sodium ethyl xanthate—because cellulose xanthate had in 1923 achieved some commercial use.

MR. GOWLING: 801. Q.—Then after taking all these factors into consideration, as a practical man, I do not think you would want to use cellulose xanthate after trying potassium or sodium xanthate, would you? A.—As a practical metallurgist, if I were pressed for time—I might have a lot of other work to do; this is all, of course, pure hypothesis.

802. Q.—All right. A.—That would depend entirely on my frame of mind at the time.

HIS LORDSHIP: 803. Q.—You do not wish to answer the
20 question? A.—I find it very difficult to answer, my Lord, because of the difficulty of transposing myself back in time some ten or fifteen years.

MR. GOWLING: 804. Q.—Even to-day, would you use cellulose xanthate in preference to potassium or sodium xanthate, if it would work? A.—If it would work?

805. Q.—Yes. Suppose it would produce the results. You would not use it to-day, would you, in view of the cost of shipping and storing? A.—No, I would not.

806. Q.—Is cellulose xanthate a colloid? A.—I believe cellulose
30 xanthate could be classed as a colloid.

807. Q.—Do you know whether or not in 1923 colloids were avoided in the flotation art? A.—I could not say for certain.

808. Q.—You mentioned this morning that you had succeeded in dissolving some cellulose xanthate in distilled water. Would you mind telling me how long it took you to dissolve it? A.—It was of the order of five or ten minutes, I think; quite a short time.

809. Q.—What was the percentage that you dissolved in the water? A.—Substantially all of that one gram went into solution.

810. Q.—Did it make a true solution or would it be proper to
40 call it a colloidal solution? A.—It would be a colloidal solution.

HIS LORDSHIP: A colloidal solution means what?

MR. GOWLING: 811. Q.—Would you explain to his Lordship what is meant by a colloidal solution? A.—My Lord, in the example which I gave this morning of sugar dissolved in water, the theory is

For Defendant—R. L. Bennett—Cross-Examination

that the sugar molecules are present as individual molecules mixed up with the molecules of water. In a colloidal solution, the molecules are extremely large; for example, the cellulose molecule. Those molecules may also be present in the solution as molecules, mixed up still with the molecules of water, and a solution of that type is spoken of as a colloidal solution. That has somewhat different properties than a solution of sugar and water.

HIS LORDSHIP: 812. Q.—Would it mean that there would be two molecules clinging to one another instead of each molecule being
10 separated by a water molecule? A.—Not necessarily, my Lord; it has, I believe, more to do with the size of the individual molecules.

MR. GOWLING: 813. Q.—Do you know anything about ammonium xanthate? A.—I know very little about ammonium xanthate.

814. Q.—You never tried to make it? A.—I never tried to make ammonium xanthate.

815. Q.—That will save us both a lot of trouble. Would you mind just giving me very briefly the method you followed in computing the saving as between the use of sodium xanthate and stanol?
A.—Putting it as briefly as I can, my Lord, I took the quantities of
20 reagents given under D in exhibit G-3, and converted those into a pound basis.

816. Q.—Do you mind giving the pound figures you arrived at? A.—Yes. 100 cc. of alcohol is proportional to 81 pounds of alcohol. 10 cc. of carbon disulphide is proportional to 12.6 pounds of carbon disulphide; and 5 grams of caustic soda is proportional to 5 pounds of caustic soda.

Therefore, the total weight of the preparation on its new basis is 98.6 pounds. Then, from the pounds of each reagent and the currently quoted price of the reagent as of 1944, I believe, I worked out the
30 cost of each of these separate items, 81 pounds of alcohol at so much, and so on.

825. Q.—Can you just give us the particulars for the record, Mr. Bennett? A.—81 pounds of alcohol at 11 cents a pound; 5 pounds of caustic soda at 3 cents a pound; 12.6 pounds of carbon disulphide at 6 cents a pound. The cost of the alcohol in this 98.6 pounds of stanol would be \$8.90. The cost of the carbon disulphide would be 76 cents. The cost of the caustic soda would be 15 cents. The total of those three is \$9.81.

MR. BIGGAR: 826. Q.—How much? A.—\$9.81, which represents
40 the cost of 98.6 pounds. Then I have said that the cost, therefore, is about 10 cents a pound. On the basis of .45 pounds of stanol D preparation being required per ton of ore the cost of the stanol would be 4½ cents per ton of ore approximately. Sodium ethyl xanthate used at the rate of 8/100ths of a pound per ton of ore and costing 14 cents a pound would be approximately 1 cent per ton.

For Defendant—R. L. Bennett—Cross-Examination

MR. GOWLING: I think that is all we need, Mr. Bennett. Thank you, Mr. Bennett.

HIS LORDSHIP: We will have a recess now for ten minutes.
—Court adjourned for a ten minute recess.

HIS LORDSHIP: 827. Q.—There are one or two questions that I should like to ask Mr. Bennett. Are you familiar with the history of the froth flotation process of concentrating mineral ores prior to the date of the application for the patent? A.—I have some knowledge of that from reading, yes.

10 828. Q.—With regard to oxide ores, did the froth flotation process work effectively with oxide ores? A.—There were perhaps two types of flotation processes that might be considered separately. The early flotation was an oil flotation in which no froth appeared. That has been superseded.

829. Q.—That was superseded? A.—Yes.

830. Q.—Did that create no froth? A.—The early process created no froth, some of the first processes.

831. Q.—And how did that work with oxide ores? A.—I don't think it was particularly successful, my Lord.

20 832. Q.—And coming to the froth flotation? A.—The same would apply.

833. Q.—When you say, “not particularly successful”, what do you mean exactly? A.—You asked me about the development of the flotation process. I would have difficulty in speaking of specific ores.

834. Q.—I am speaking of oxide ores, as against sulphide ores? A.—That is my impression, that they were difficult to treat.

835. Q.—That oxide ores were difficult to treat? A.—Yes. Of course, each ore is different from each other ore.

30 836. Q.—I quite appreciate that. You might have to use one frothing agency with one ore and a different frothing agency with a different ore? A.—Yes, that is correct.

837. Q.—I suppose that would depend to some extent on the constituent elements of the various ores from the point of view of what metals were contained in them? A.—Particularly in the early days of flotation, as I understand, it was a matter more than it is now of getting a particular reagent combination for each particular ore.

40 838. Q.—Just confine yourself for the moment to the difference between oxide ores and sulphide ores. Am I to understand that it was difficult to treat oxide ores effectively with the froth flotation process? A.—In general, my Lord; I know it is still difficult to treat oxide ores. It is more difficult than to treat sulphide ores.

839. Q.—I am trying to keep you to the process as it was at the date of the application for the patent? A.—The only inference I can draw is because it is now difficult it must have been somewhat difficult then also.

For Defendant—R. L. Bennett—Cross-Examination

840. Q.—More difficult then than now? A.—Possibly so, my Lord.

841. Q.—Was there a search going on at the time to do something to the oxide ores that would render them capable of being dealt with by a froth flotation process, such as using some sulphidizing agent? A.—Sulphidizing agents were investigated particularly in the flotation of oxide ores.

842. Q.—Then, I may take it that in the froth flotation process there was considerable difference between the effectiveness of the process in dealing with sulphide ores on the one hand and oxide ores on the other? A.—Yes, I think that is the case.

843. Q.—It was more difficult? A.—It was more difficult.

844. Q.—To deal with oxide ores? A.—Yes, my Lord.

845. Q.—Did the froth flotation process work effectively at all with oxide ores? A.—I really could not say. I could not give a detailed answer on that. In general it is my understanding that at that time the froth flotation process was applied with less success to oxide ores. Oxide ores, of course, embraces quite a large class.

846. Q.—I quite understand that. Would that knowledge of the difference in the effectiveness of the process as between sulphide ores on the one hand and oxide ores on the other be general knowledge to skilled metallurgists and chemists employed by mining companies? A.—The metallurgist who was working with a variety of ores would no doubt have that knowledge, yes.

847. Q.—And would a chemist employed by a mining company have that knowledge too? A.—I would not think a chemist would.

848. Q.—May I just get the real difference between a skilled metallurgist and a skilled chemist? A.—The term “chemist” in the mining industry is applied more particularly to an assayer who is concerned almost entirely with running analyses, and he may or may not have much knowledge of the ore concentration processes.

849. Q.—But the metallurgist would be the person who would know about the froth flotation process of concentration? A.—A metallurgist who was concerned primarily with ore concentration processes.

850. Q.—He would know the difference in the effect of the process on sulphide ores on the one hand and oxide ores on the other? A.—I think probably he would.

851. Q.—You think probably he would? A.—Yes.

852. Q.—Then, there is one other question which has been raised but I do not think it was put to you. I understood you said you had read the whole of the specification in question in this suit? A.—The specification of the patent in suit, yes, my Lord.

853. Q.—May I direct your attention to paragraph 6 of the claims and the term, “alkaline xanthate”. Would that term strike

For Defendant—R. L. Bennett—Cross-Examination

you as being an exact expression? A.—With my present knowledge it is not an exact expression.

853. Q.—Not an exact expression? A.—Not an exact expression.

854. Q.—When you say, “not an exact expression” what exactly do you mean by that? A.—There is some contradiction in those two words, “alkaline xanthate.”

855. Q.—A xanthate is what? A.—A xanthate?

856. Q.—Yes, in regard to alkaline. A.—A xanthate is neutral.

857. Q.—Pardon? A.—A solution of xanthate.

10 858. Q.—A xanthate is neutral? A.—Of pure xanthate is neutral.

859. Q.—So if you use the term “alkaline” in relationship to “xanthate” there is a contradiction in terms? A.—Yes, there is a contradiction, my Lord.

860. Q.—What would that indicate to you as to what would be meant by “alkaline”, that is to yourself, knowing that the two words together are a contradiction? A.—I would come to that phrase after reading through the rest of the patent.

20 861. Q.—You would look at the preceding paragraphs of the patent? A.—Yes, I might be puzzled as to his use of the word “alkaline” in the specification.

862. Q.—And then being puzzled you would look back through the preceding paragraphs? A.—Yes.

863. Q.—Having looked back through the preceding paragraphs what would you, as a metallurgist, think was meant by the term “alkaline xanthate”? A.—The term “alkaline” has been used in reference to the circuits, I think in some cases, at least.

864. Q.—That would be an appropriate term to apply to a circuit? A.—Alkaline would be quite correctly applied.

30 865. Q.—You have either an acid circuit or an alkaline circuit or a neutral circuit; it would be an appropriate term to apply to a circuit? A.—Certainly.

866. Q.—Would it be an appropriate term to apply to a substance that was itself neutral? A.—No, that is where the contradiction comes in.

867. Q.—So you would arrive at the conclusion that the term “alkaline” was not an appropriate term to use in connection with xanthate? A.—That, in effect, would be my conclusion.

30 868. Q.—Then, you would have to find some meaning for the term “alkaline”? A.—Yes.

869. Q.—What meaning would you find, following through that mental process? A.—If I read through the claims rather carefully I would notice he used “alkali-metal” in claim 5, and that would perhaps rule out the use of the word “alkali metal” as a substitute for alkaline.

For Defendant—R. L. Bennett—Cross-Examination

For Defendant—R. L. Bennett—Re-Examination

870. Q.—Why? A.—If he meant alkali metal in the claim immediately below I find difficulty in knowing why he did not use that term. He is speaking about rather similar substances, “an alkali-metal salt of an ethyl-sulphur derivative of carbonic acid” which might be an alkali metal xanthate.

871. Q.—Would it be anything else? A.—Yes, there are other ethyl-sulphur derivatives of carbonic acid.

872. Q.—Pardon? A.—There are other ethyl sulphur derivatives of carbonic acid.

10 873. Q.—Are there other salts of ethyl sulphur derivatives of carbonic acid than alkali-metal salts? A.—Oh, yes, my Lord.

874. Q.—Would it be a fair interpretation of “alkaline” to think of it as a short way of describing alkali-metal salts, etc., that is a short way of describing the substance as described in claim 5? A.—No, I think not.

875. Q.—Well, xanthate is a short way of describing some of the other substances referred to in paragraph 5, is it not? A.—Xanthate is one of quite a few alkali-metal salts of ethyl sulphur derivatives of carbonic acid.

20 876. Q.—But it is a salt of an ethyl sulphur derivative of carbonic acid, is it not? A.—Yes, that is correct.

877. Q.—So that it is a short way of saying it, one word, for what is said in the previous paragraph in a number of words? A.—Yes, although the description in claim 5 is a little wider.

878. Q.—Mr. Higgins in his evidence said that he took the term “alkaline xanthate” to mean the same as “alkali xanthate”. Then I think on cross-examination he said that when he used the term “alkali xanthate” he meant “alkali-metal xanthate”. Would that be a reasonable interpretation to make of the term “alkaline xanthate” in view of the fact that on the face of it “alkaline” is an inappropriate term to use in connection with xanthate? A.—That is one possible interpretation.

30

879. Q.—Is it a reasonable interpretation to take? A.—Yes, I think that would be reasonable.

880. Q.—A reasonable interpretation? A.—Yes.

HIS LORDSHIP: You are finished your cross-examination, Mr. Gowling?

MR. GOWLING: Yes, my Lord.

RE-EXAMINATION BY MR. ROBINSON :

40 MR. ROBINSON: 881. Q.—Mr. Bennett, there are two things that I think rise out of the questions that his Lordship was asking you. You were discussing the expression, “alkali-metal salt” of an ethyl sulphur derivative of carbonic acid” which appears in claim 5.

For Defendant—R. L. Bennett—Re-Examination

You said it was a little wider than "xanthate". I wonder if you could indicate by reference to exhibit D-57 in which of the boxes in the E line the compounds falling within the expression, "alkali-metal salts of an ethyl sulphur derivative of carbonic acid" would fall? In how many of those boxes would you find such compounds?

HIS LORDSHIP: You are speaking of the boxes in the E line?

MR. ROBINSON: Of exhibit D-57.

HIS LORDSHIP: I am sorry, I did not quite follow your question. Perhaps the reporter could read it.

10 MR. ROBINSON: I think not. It might be clearer if I put it again because I have found a way of putting it more clearly.

882. Q.—In which of the boxes in the E line on exhibit D-57 would you find compounds which are within the definition "alkali-metal salt of an ethyl sulphur derivative of carbonic acid" used in claim 5? A.—Yes, with the understanding that M in this case stands for an alkali metal and R in the formula stands for an ethyl radical.

HIS LORDSHIP: Stands for an alkyl radical?

MR. ROBINSON: Ethyl, my Lord.

20 THE WITNESS: We are restricted to this particular claim.

MR. ROBINSON: We have restricted it to alkali and we have restricted it to ethyl.

HIS LORDSHIP: Oh, yes, in claim 5.

THE WITNESS: Then all those compounds in the E line with the exception of E-6 which has no organic radical whatever, would fall under claim 5.

MR. ROBINSON: 883. Q.—Whereas the xanthates appear in the E line where? A.—The xanthates appear in the E line as E-3.

HIS LORDSHIP: 884. Q.—And only in E-3? A.—Only as E-3.

30 885. Q.—But the salts referred to in claim 5 would appear in each of the boxes in the E line with the exception of E-6? A.—E-6, my Lord.

MR. ROBINSON: 886. Q.—There is one point which I think is non-contentious but which I should have asked the witness about in chief which I would like to direct one question to with your Lordship's permission. I do not think it is a question on which my friend and I will disagree. Is potassium ethyl xanthate or sodium ethyl xanthate oleaginous?

MR. GOWLING: I don't know the meaning of the word.

40 THE WITNESS: They are not oleaginous.

HIS LORDSHIP: 887. Q.—That is, they do not create oil? A.—They are not oily in physical characteristics.

MR. ROBINSON: 888. Q.—Does an ore from any mine remain the same for flotation purposes over a period of years? A.—It is very unlikely that it would remain the same.

For Defendant—R. L. Bennett—Re-Examination

HIS LORDSHIP: What is the question?

MR. ROBINSON: 889. Q.—Does an ore from a given mine remain the same for flotation purposes over a period of years? You said — A.—It is very unlikely that it would remain exactly the same.

HIS LORDSHIP: 890. Q.—That is, even when it is freshly taken out of the crust of the earth? A.—Yes, that is correct.

891. Q.—At certain depths it might be different from other depths? A.—I think Mr. Robinson was speaking of the matter of
10 time. I may have misunderstood the question.

MR. ROBINSON: 892. Q.—What I had in mind was this, Mr. Bennett. You have a mine and at a particular time it is yielding or getting out of it an ore which reacts in a particular way to flotation. Is it likely that the ore from that mine that you get out ten or twenty years later will react the same way or differently? A.—It may be quite a different ore as far as reaction in flotation process.

HIS LORDSHIP: 893. Q.—What would be the reason for that? A.—A mine, my Lord, consists sometimes of several ore bodies, to
20 take one example. An ore from one section of the mine will be quite different from the ore from another section of the mine.

894. Q.—The veins — A.—The veins or ore bodies will be different.

895. Q.—Might be quite different in the same mine? A.—And it is quite often the case that the ore at the surface of a mine close to the ground is quite different from ore deeper down.

896. Q.—That is what I had in mind as an example. A.—That is one example.

MR. ROBINSON: 897. Q.—Mr. Bennett, my friend asked you
30 some questions which he related to exhibit D-59a, to the recoveries, for instance, of 97.9 per cent obtained with stanol D and as I understood it he asked you what the recoveries would be likely to have been in 1923? I am not sure whether my friend intended to direct his question or you your answer to Noranda, but I would be glad if you would tell us when the Noranda Mine started? A.—It was subsequent to 1923, I believe.

898. Q.—Do you know when?

MR. GOWLING: It was 1929 or 1930.

HIS LORDSHIP: It would certainly be later than 1923.

40 MR. GOWLING: Oh, I am quite sure it was around 1929 or 1930.

MR. ROBINSON: I was not sure where the matter was left, whether as a result of your question it appeared that the answer related to Noranda.

For Defendant—R. L. Bennett—Re-Examination

MR. GOWLING: I really asked Mr. Bennett an opinion, I think.

MR. ROBINSON: 899. Q.—How old were you in 1923? A.—Twelve, I believe, Mr. Robinson.

HIS LORDSHIP: 899A. Q.—You would have very little knowledge of it at that time but you may have acquired some knowledge of it since? A.—I would say no knowledge whatsoever at that time.

MR. ROBINSON: 899B. Q.—Can a compound form anions and
10 cations in a colloidal solution? A.—Yes, it can. Soap is an example of that, my Lord—ordinary soap—which forms a sodium ion and a large stearate ion. Soap is a colloid.

HIS LORDSHIP: 900. Q.—Soap is a colloid? A.—Yes.

MR. ROBINSON: Thank you, Mr. Bennett.

HIS LORDSHIP: If you are ready to begin with another witness, we could go on for another half hour, unless you would prefer not to do so.

MR. BIGGAR: That is our last witness, my Lord. We have no further witnesses.

20 HIS LORDSHIP: Mr. Bennett is your last witness?

MR. BIGGAR: He is our last witness.

HIS LORDSHIP: I thought you might possibly have some more witnesses?

MR. BIGGAR: No.

HIS LORDSHIP: My suggestion at noon about sitting until 4.30 was simply directed to the advisability of not getting too far into next week with the hearing of evidence.

MR. BIGGAR: Quite so, my Lord.

30 HIS LORDSHIP: So that counsel might have all the time they would require for argument.

MR. BIGGAR: Yes, my Lord. All the further evidence that we proposed to give, my Lord, was that I intended to put in some of the correspondence in 1923 to which I did not refer in opening. They are less important than the ones to which I did refer, but they fill in the gaps, as it were.

HIS LORDSHIP: Would you prefer to wait until morning?

MR. BIGGAR: I can list them now, my Lord; and my friend, I think, has them ready.

40 MR. GOWLING: I gave Mr. Robinson several of them just now. I think I will have any more that may be referred to.

MR. BIGGAR: If your Lordship would like to take a few minutes to note these documents, I can indicate what they are.

HIS LORDSHIP: Yes. Perhaps we might do that.

For Defendant—R. L. Bennett—Re-Examination

MR. BIGGAR: The letters, my Lord, are dated. Perhaps it would be better to give the opening and closing words, or I can read the list of the dates.

HIS LORDSHIP: Are these in as exhibits?

MR. BIGGAR: No, my Lord.

HIS LORDSHIP: They are not in yet?

MR. BIGGAR: No, my Lord.

HIS LORDSHIP: Then perhaps if you will give me from whom and to whom the letters are written, and the dates, it will serve the
10 purpose.

MR. BIGGAR: Very good, my Lord. The first one is dated April 28, 1921.

MR. GOWLING: Would my friend mind giving us the production number at the same time?

MR. BIGGAR: Yes. I will give that at the same time. It is production No. 243, from Quigley, an employee of the plaintiff, my Lord, to Nutter, whom you have heard of.

HIS LORDSHIP: That will be exhibit D-91.

20 EXHIBIT D-91: Filed by } Letter dated April 28, 1921, J. V.
 Mr. Biggar. } Quigley to E. H. Nutter.

MR. BIGGAR: The next one, my Lord, is a telegram of May 25, 1923, from the plaintiff company to Nutter. That is production No. 215.

EXHIBIT D-92: Filed by } Telegram dated May 25, 1923,
 Mr. Biggar. } from Minerals Separation to E. H.
 } Nutter

HIS LORDSHIP: Yes. That is exhibit D-92.

MR. BIGGAR: The next is another telegram, of July 5, 1923, to
30 Morrow. Well, it is really to the Anaconda Copper. That would be the easier way to put it.

HIS LORDSHIP: That will be exhibit D-93.

EXHIBIT D-93: Filed by } Telegram dated July 5, 1923, E.
 Mr. Biggar. } H. Nutter to B. S. Morrow, Ana-
 } conda Copper.

MR. GOWLING: What is the production number of that, please?

MR. BIGGAR: The production number is 266. The next is a telegram dated August 6, 1923 from Lewis to Nutter. The production number is 229.

HIS LORDSHIP: That will be exhibit D-94.

40 EXHIBIT D-94: Filed by } Telegram dated August 6, 1923,
 Mr. Biggar } C. P. Lewis to E. H. Nutter.

MR. BIGGAR: The next is on the same date, my Lord, a night letter from Nutter to Lewis. It is production No. 230.

For Defendant—R. L. Bennett—Re-Examination

HIS LORDSHIP: That will be exhibit D-95.

EXHIBIT D-95: Filed by } Night letter dated August 6, 1923,
Mr. Biggar. } from E. H. Nutter to C. P. Lewis.

MR. BIGGAR: The next is a letter of the 8th August, 1923, from Morrow—Anaconda will do, my Lord, although it is a letter signed by Morrow, to Nutter. It is production No. 232.

HIS LORDSHIP: That will be exhibit D-96.

EXHIBIT D-96: Filed by } Letter dated August 8, 1923, from
Mr. Biggar. } Anaconda Copper to E. H. Nutter.

10 MR. BIGGAR: The next, my Lord, is a letter of August 30, 1923, from Nutter to the plaintiff company. It is production No. 236.

HIS LORDSHIP: That will be exhibit D-97.

EXHIBIT D-97: Filed by } Letter dated August 30, 1923,
Mr. Biggar. } from E. H. Nutter to Minerals
Separation.

MR. BIGGAR: Then there is a telegram of the 5th of September, 1923, from the Great Western Electro Chemical Company to Nutter, which is production No. 239.

HIS LORDSHIP: That will be exhibit D-98.

20 EXHIBIT D 98: Filed by } Telegram dated September 5,
Mr. Biggar. } 1923, from Great Western Electro
Chemical Company to E. H.
Nutter.

MR. BIGGAR: Then there are some additional telegrams dated September 4, 5, and 6, that are all produced under the production number 273, my Lord. Those my friend will have the difficulty of straightening out. I could give the details from my copies of them, but the order may be different, and it may be better to put those in in the morning.

30 HIS LORDSHIP: You say you will put those in in the morning in order to give each its appropriate number.

MR. BIGGAR: Yes, my Lord. We will get that straightened out before we begin tomorrow morning.

HIS LORDSHIP: Very well.

MR. BIGGAR: They are all, however, productions produced as No. 273. They are all together.

HIS LORDSHIP: Quite so. You wish to break them up and give them separate exhibit numbers.

40 MR. BIGGAR: Yes, my Lord. Then I also want to put in the patent that is referred to, the patent of Perkins and Sayre.

HIS LORDSHIP: Which is that?

MR. BIGGAR: The United States patent of Perkins and Sayre. No, my Lord; I beg your pardon. It is Perkins alone.

HIS LORDSHIP: And the number is what?

For Defendant—R. L. Bennett—Re-Examination

MR. BIGGAR: The number is 1364304, and the date is January 4, 1921.

HIS LORDSHIP: That will be exhibit D-99, unless you want to leave three numbers.

MR. BIGGAR: It does not matter a bit, my Lord, I do not think. These will have to be rearranged afterwards. I mean, some of this correspondence has been put in in San Francisco, some in New York and some here.

HIS LORDSHIP: We can mark the telegrams with whatever
10 number comes along in the morning.

MR. BIGGAR: Yes, my Lord.

HIS LORDSHIP: Then this will be exhibit D-99.

MR. BIGGAR: Yes. It is the sixth of the patents cited in schedule 1 of the particulars of objection.

HIS LORDSHIP: Oh, yes. Are there other patents?

MR. BIGGAR: This is the only one, I think, my Lord, that is really relevant enough to trouble you with. That is all the documentary material.

20 EXHIBIT D-99: Filed by } United States patent No. 1364304,
Mr. Biggar. } Perkins.

HIS LORDSHIP: Then you are going to put in those telegrams in the morning.

MR. BIGGAR: I will put in the telegrams in the morning and supply your Lordship with a copy of the patent.

HIS LORDSHIP: Then you are not summing up?

MR. BIGGAR: That was the intention; because I really have not heard my friend argue it yet.

HIS LORDSHIP: No. Then you will follow the practice that has been the one that has prevailed in this court, notwithstanding
30 the rule?

MR. BIGGAR: Yes, quite, my Lord.

HIS LORDSHIP: So you do not sum up at this stage any more than Mr. Gowling summed up at the end of his case.

MR. BIGGAR: No. I think it would be more useful if we postponed subsequent discussion.

HIS LORDSHIP: In the morning you will put in the extra telegrams?

MR. BIGGAR: Yes, my Lord.

HIS LORDSHIP: And that will be the close of the defendant's
40 case.

MR. BIGGAR: That will be where our case closes.

HIS LORDSHIP: Then if there is any rebuttal, it will be put in.

MR. GOWLING: Yes, my Lord. I will then put in our rebuttal evidence.

For Defendant—R. L. Bennett—Re-Examination
Rebuttal

HIS LORDSHIP: Then there is no object in proceeding any further this afternoon, I do not suppose.

MR. GOWLING: I do not think so, my Lord.

HIS LORDSHIP: Then we will adjourn until 10.30 in the morning.

(Court adjourned at 4.15 o'clock p.m. until 10.30 o'clock a.m. Thursday, November 23, 1944.)

OTTAWA, NOVEMBER 23RD, 1944
MORNING SESSION

HIS LORDSHIP: You were going to put in some additional
10 telegrams, I think, Mr. Biggar?

MR. BIGGAR: Yes, my Lord, I was; but as a matter of fact, I have had the opportunity of considering further overnight, and I do not think they add anything. I have spoken to my learned friend and he is quite satisfied also, so that we can omit them.

HIS LORDSHIP: So that you are omitting the telegrams?

MR. BIGGAR: Yes.

HIS LORDSHIP: They were the telegrams of September 4, 5 and 6.

MR. BIGGAR: That is right. They really do not add anything
20 significant, one way or another to the correspondence.

HIS LORDSHIP: Then you close your case?

MR. BIGGAR: That is it, my Lord. I am handing the Registrar a copy of the Perkins' patent, to which I referred your Lordship. It is Exhibit D-99.

THE REGISTRAR: That is the last Exhibit. You did not file it last night.

MR. BIGGAR: It is not marked yet.

HIS LORDSHIP: Oh, yes. That is the United States Perkins' Patent. That is the sixth patent in the schedule of objections.

30 MR. BIGGAR: Yes, my Lord.

HIS LORDSHIP: That is Exhibit D-99.

MR. BIGGAR: Yes, my Lord. And that is the defendant's case.

HIS LORDSHIP: Rebuttal, Mr. Gowling?

REBUTTAL

MR. GOWLING: As my friend has stated, my Lord, the other telegrams to which he referred yesterday do not appear to throw any further light on this particular point; but there are a few additional documents in our affidavit of production relating to

Rebuttal

what has been called the Anaconda situation, and I should like to file those. As your Lordship will recall, there have been a number of letters filed relating to tests of a xanthate at Anaconda.

HIS LORDSHIP: Yes.

MR. GOWLING: There are some additional letters, a report of a test and a telegram which we think are necessary in order to see the whole picture.

HIS LORDSHIP: That is, the defendant having raised the Anaconda situation by putting in some of them —

10 MR. GOWLING: That is right.

HIS LORDSHIP: — you are rebutting that by putting in some other documents so that the Anaconda situation may be fully before the Court?

MR. GOWLING: Yes, my Lord. It is to give the whole picture of the Anaconda situation.

HIS LORDSHIP: Then you are filing what?

MR. GOWLING: The first document is our production No. 221. That is a supplemental report of tests on Anaconda ore.

HIS LORDSHIP: What is the date of that?

20 MR. GOWLING: There is no date on this, my Lord.

HIS LORDSHIP: It is undated?

MR. GOWLING: Yes. But it gives the dates on which the tests were made.

HIS LORDSHIP: Oh, yes.

MR. GOWLING: And they are actually in June, 1923.

HIS LORDSHIP: That will be exhibit P-100.

EXHIBIT P-100: Filed by } Supplemental report of tests on
 } Anaconda ore.

30 MR. GOWLING: The next document is production No. 224. That is a letter dated July 21, 1923.

HIS LORDSHIP: From whom to whom?

MR. GOWLING: It is from Great Western Chemical to the plaintiff company.

MR. BIGGAR: That is Keller Exhibit 29, my Lord. That would be K-29.

MR. GOWLING: I did not know that had already been marked.

HIS LORDSHIP: That is already in.

MR. GOWLING: Yes, my Lord. My learned friend has pointed out that is K-29.

40 HIS LORDSHIP: All right. That is already in.

MR. GOWLING: Yes, my Lord. So that will not be put in as an Exhibit at this time.

HIS LORDSHIP: No. It is already in.

Rebuttal

For Plaintiff—A. H. Higgins—Recalled

MR. GOWLING: Yes, my Lord. Then I find that the next production to which I intended to refer, No. 227, is in as K-31.

MR. BIGGAR: What is the date of that?

MR. GOWLING: That is a telegram dated August 3, 1923, from Nutter to Lewis.

MR. BIGGAR: That is Exhibit K-31.

MR. GOWLING: The next one, my Lord, is No. 228; that is our production number.

MR. BIGGAR: That is Exhibit D-80.

10 MR. GOWLING: My friend informs me that is Exhibit D-80, my Lord.

HIS LORDSHIP: Yes. What is it?

MR. GOWLING: It is a letter from Nutter to Lewis.

MR. BIGGAR: From Lewis to Nutter.

MR. GOWLING: From Lewis to Nutter, my Lord, of August 4, 1923.

MR. BIGGAR: That is right.

MR. GOWLING: These have been put in at different times, my Lord, and not in numerical order. No. 231 is a letter dated
20 August 7, 1923, from Lewis to Nutter. That will be Exhibit P-101.

EXHIBIT P-101: Filed by } Letter dated August 7, 1923,
 } Mr. Gowling } Lewis to Nutter.

HIS LORDSHIP: That is Exhibit P-101.

MR. GOWLING: Yes, my Lord. Then the other one to which I intended to refer has already been put in, so I need not mention it.

MR. BIGGAR: What is that?

MR. GOWLING: It is No. 235.

MR. BIGGAR: That is Exhibit K-36.

MR. GOWLING: I would now like to recall Mr. Higgins.

30 HIS LORDSHIP: Before you do that I was going to ask if it was the practice in Rebuttal for counsel to open the Rebuttal.

MR. GOWLING: No, my Lord. It has not been the custom of the Court. I think the reason for calling Mr. Higgins will be apparent. There are two or three items which I thought might be cleared up, which were raised on the examination of the last witness. We wish to call Mr. Higgins in order to do that.

HIS LORDSHIP: I just asked with regard to the practice, because I am not familiar with it, as you know.

40 MR. GOWLING: It may be helpful for your Lordship to know that the other purpose in calling Mr. Higgins is to answer the attack which has been made on the patent.

HIS LORDSHIP: I would assume that.

For Plaintiff—A. H. Higgins—Recalled

MR. GOWLING: By way of Martin, largely—Martin's alleged invention.

HIS LORDSHIP: I would assume that would be the case.

HIS LORDSHIP: Then, you are recalling Mr. Higgins?

MR. GOWLING: Yes, my Lord.

ARTHUR HOWARD HIGGINS, recalled, examined by MR. GOWLING.

1. Q.—You have already been sworn and testified in this case?

A.—Yes. I have.

10 2. Q.—Would you endeavour to clear up any doubt there may be about the difference between oxide ores and sulphide ores by expressing your opinion on this subject?

MR. BIGGAR: To that I must object. My friend has given a good deal of evidence on that subject in opening.

HIS LORDSHIP: In opening?

MR. BIGGAR: Yes, in the Commission evidence. He examined his witnesses in chief in San Francisco on that subject.

MR. GOWLING: I did not know it had even been touched.

MR. BIGGAR: Yes, it is dealt with at length. I can give you
20 the references.

HIS LORDSHIP: One of the attacks you make on the patent is that the inventor knew that his invention would not work on oxide ores.

MR. BIGGAR: Yes, and I base that exclusively on my friend's evidence; I have not given any evidence about it.

MR. GOWLING: I thought Mr. Bennett had testified as to the difference between oxide and sulphide ores.

HIS LORDSHIP: It is true he did but he did that in response to questions of mine.

30 MR. GOWLING: If the distinction between the two ores is clear to your Lordship I have no desire to press the question but I have one further question on the subject which I submit I am entitled to ask.

HIS LORDSHIP: I thought Mr. Bennett had made the distinction between sulphide and oxide ores pretty clear.

MR. GOWLING: Yes, my Lord. I am not acknowledging my friend is correct in his objection to the question because as I pointed out in opening a great deal of the evidence was taken on Commission for the purpose of rebuttal, and there is no reason that I can see why
40 I should not supplement my rebuttal evidence.

HIS LORDSHIP: I must say I would be inclined to agree with that view.

MR. BIGGAR: My Lord, that is a view that I think I can show your Lordship is not supported at all. As I pointed out in the course

For Plaintiff—A. H. Higgins—Recalled

of the early part of the trial—and my friend agreed with it—he had to decide whether he was going to use that evidence or not.

HIS LORDSHIP: I quite agree that is so. If a witness were called he would be confined in his evidence to the evidence in opening.

MR. BIGGAR: Oh, it goes much further than that.

His Lordship: And then the same witness could be called to give evidence in rebuttal.

MR. BIGGAR: It goes much further than that, my Lord.

HIS LORDSHIP: But when evidence is taken on commission I
10 can see a certain amount of difficulty in separating what belongs to the opening and what belongs to rebuttal.

MR. BIGGAR: That is quite so, my Lord.

HIS LORDSHIP: And it may be that notwithstanding that difficulty, counsel has to solve it in the best way he can.

MR. BIGGAR: As a matter of fact, as your Lordship will observe in the report of the third day's proceedings, that point was put and concurred in by my friend. However, as far as this point is concerned I think my friend is concurring and the only point here is that the
20 only evidence which has been given on the subject is by my friend's witnesses in San Francisco and in answer to your Lordship's questions here. We have not given any evidence about it at all. I understand my friend is concurring with the suggestion I make that it is not, therefore, rebuttal.

MR. GOWLING: I am not concurring in my friend's suggestion, but I shall not press the question, my Lord.

HIS LORDSHIP: I suppose the Commission evidence all went in on one page and counsel agreed that they should not take the time to read it all, but I suppose that in reality it goes in in his proper place.

MR. BIGGAR: No, my Lord, that was the point that was made
30 in opening, that if it goes in as part of the plaintiff's case it is part of the plaintiff's case.

MR. GOWLING: In either opening or rebuttal.

MR. BIGGAR: No, no, not at all.

MR. GOWLING: That was certainly my understanding.

HIS LORDSHIP: I expressed some doubt as to what happened to the evidence, for instance, relating to Martin if no evidence relating to Martin was adduced by the defendant, and I think we sort of left it up in the air.

MR. GOWLING: It may have been, my Lord.
40

MR. BIGGAR: Perhaps it will arise again, but my friend is not pressing this question so that we need not debate it.

HIS LORDSHIP: No. I must say I am not too clear as to the situation.

For Plaintiff—A. H. Higgins—Recalled

MR. BIGGAR: We will deal with it if and when it becomes important.

HIS LORDSHIP: I am not just quite clear.

MR. GOWLING: I would like it clear on the record that my understanding was that all of the Commission evidence is going in.

HIS LORDSHIP: Went in, yes, that is clear.

MR. GOWLING: And that part of that evidence was evidence in rebuttal. I thought I made it perfectly clear, my Lord.

HIS LORDSHIP: That is rather my general recollection of the
10 situation, that it all went in and was applicable in its proper place.

MR. GOWLING: Yes, and I thought my friend had subscribed to that.

HIS LORDSHIP: I have a general recollection to that effect.

MR. GOWLING: Perhaps I could read my friend's comment. He is replying to me. This is at page 242.

“The other remark that I think I ought to make at this
time is a comment on my friend's statement that part of the
evidence is evidence in reply and not appropriate to be read at
this moment. Of course, my friend has got to select whether
20 he is going to use it or not.”

I had certainly understood from my friend he was agreeing with my view that it would be put in at the proper place.

HIS LORDSHIP: That is not entirely clear because he put you to your election as to what you were putting in.

MR. GOWLING: Yes, and I thought I had made it clear I was putting it all in.

HIS LORDSHIP: Some by way of opening and some by way of rebuttal.

MR. GOWLING: The question which I would like to have
30 answered, and which I would press to have answered, and on which I believe there is nothing in the Commission evidence, has to do with your Lordship's statement yesterday and evidence which was given by my friend. I should like to preface that with this statement that my friend in his opening stated at page 384 as follows—he is dealing with sub-rules 3 and 4, and this is the last sentence of the paragraph which I am going to read.

“The point is this that they knew that these reagents they were proposing were of no value with oxide ores.”

HIS LORDSHIP: Would not work with oxide ores.

40 MR. GOWLING: My friend put in evidence to that effect.

MR. BIGGAR: No, no.

MR. GOWLING: I think perhaps your Lordship asked the question.

For Plaintiff—A. H. Higgins—Recalled

HIS LORDSHIP: It struck me that neither the plaintiff nor the defendant had asked Mr. Bennett anything on either oxide ores or that phrase "alkaline xanthate."

MR. GOWLING: The question I was going to ask, since it had come up—

HIS LORDSHIP: So that the only evidence that Mr. Bennett gave on that subject was in reply to questions put to him by the court.

MR. GOWLING: Yes, my Lord.

10 HIS LORDSHIP: Does that change the situation as regards rebuttal?

MR. BIGGAR: No, my Lord, I do not think so at all. The reason we did not go into it with Mr. Bennett was that we did not think that Mr. Bennett, being twelve years old in 1923, could give us any real information in regard to the situation then.

HIS LORDSHIP: He was asked a question as to whether he was familiar with the history of the process.

20 MR. BIGGAR: I never suggested that we were going to give any more evidence. I was quite satisfied with the evidence that had been given by my friend's witnesses—and it was given quite early in their evidence, in their direct evidence.

HIS LORDSHIP: I would think that in view of the fact that that arose in the course of the defendant's case, it does not matter whether it arose out of cross-examination or out of a question asked by the court. I would be inclined to allow it.

MR. BIGGAR: Would your Lordship allow me to refer your Lordship to the evidence that was given by the inventor, whose knowledge is the point? Mr. Higgins cannot displace the knowledge that the inventor said he had.

30 MR. GOWLING: We are not attempting to displace that.

MR. BIGGAR: I asked the question whether my friend is going to contradict his own witness.

MR. GOWLING: I certainly am not.

HIS LORDSHIP: I do not suppose so.

MR. BIGGAR: But that appears to be the position.

HIS LORDSHIP: Perhaps Mr. Gowling had better put the question. Mr. Higgins need not answer for a moment, until I hear what the question is.

40 MR. GOWLING: There would have been two questions ordinarily, but if my friend wishes to say that Mr. Keller stated that this process could not be used in 1923 on oxide ores—

MR. BIGGAR: I did not say that. I said that it was no good with oxide ores.

For Plaintiff—A. H. Higgins—Recalled

MR. GOWLING: Then I would ask permission to put this question. I was going to ask Mr. Higgins if as a matter of fact it was possible to separate ores in 1923 by the use of the froth flotation process.

HIS LORDSHIP: And in the case of oxide ores.

MR. GOWLING: Yes, in the case of oxide ores only.

HIS LORDSHIP: That is a perfectly proper question, I think.

MR. BIGGAR: Mr. Keller's evidence is that oxide ores were the subject of the flotation process at the time.

10 MR. GOWLING: Oxide ores are not oxidized ores.

MR. BIGGAR: Both Mr. Keller and Mr. Wilkinson gave evidence to that effect, and I submit my friend cannot rebut his own witness.

HIS LORDSHIP: I understand this question is directed to oxide ores as opposed to sulphide ores.

MR. BIGGAR: Quite so, my Lord. And the evidence that I am referring to is directed to oxide ores and not sulphide ores. And I submit my friend cannot contradict his own witnesses. If he is satisfied with the evidence that his own witnesses have given, there is no purpose in asking Mr. Higgins to confirm it. If he is not
20 satisfied—

HIS LORDSHIP: But the point, as I understand it, is directed to another matter, as to whether prior to the patent oxide ores could be separated by the flotation process.

MR. BIGGAR: My Lord, the flotation process was applied to them and the witness Keller says that one kind of oxide ores was easy to float. If your Lordship will allow me I will turn to the evidence, for it is a matter of considerable importance that my friend should not be allowed to contradict the witnesses that he has called.

MR. GOWLING: I have no intention of contradicting my
30 witnesses.

MR. BIGGAR: If your Lordship will allow me, I will refer to Mr. Keller's evidence first.

HIS LORDSHIP: At page 384 of our proceedings, Mr. Biggar, you say: "The point is this that they knew that these reagents they were proposing were of no value with oxide ores."

MR. BIGGAR: Quite so, my Lord. That was the point. I based it on their evidence, which is quite clear.

HIS LORDSHIP: As I understand it, there is no dispute about that.

40 MR. BIGGAR: I do not know, my Lord, whether there is any dispute. I gathered from my friend's question that he was now proposing to ask whether oxide ores were floated in 1923, but the evidence given at San Francisco makes it perfectly clear that they were.

For Plaintiff—A. H. Higgins—Recalled

MR. GOWLING: I do not think it makes it clear, my Lord. I understood my friend was going to read the passage.

HIS LORDSHIP: The whole point is whether in the existing flotation process oxide ores could be dealt with satisfactorily.

MR. BIGGAR: And as I have told your Lordship, I think the evidence makes it perfectly clear that they could.

MR. GOWLING: I do not think that is so, my Lord.

MR. BIGGAR: And I do not see how my friend can now bring evidence to contradict that.

10 MR. GOWLING: If my friend would first draw our attention to the passage containing evidence to which he refers, it would help our discussion.

MR. BIGGAR: With your Lordship's permission, I will refer to that evidence.

HIS LORDSHIP: That would be helpful, because it is one of the attacks that you make upon the patent.

MR. BIGGAR: Quite so, my Lord. It is on this evidence that it is based. And when we begin on it I think I had better call your Lordship's attention to all of it.

20 HIS LORDSHIP: Then perhaps you had better do that now.

MR. BIGGAR: I am taking Keller first, and the first passage is on page 113 of his evidence. I will colour both points, since they are both here. This passage runs from question No. 41 to 64:

“Q. 41.—Now, in this entry, Mr. Keller, you have mentioned ‘sulphidizing agent.’ What did you mean by a sulphidizing agent? A.—A sulphidizing agent, to my mind, was an agent that covered oxide ores or oxidized mineral particles with a sulphide film.

30 Q. 42.—Why did you want to get a sulphide film on the mineral particles? A.—Because I knew that sulphide film particles would attach themselves better to the oil-covered air bubble.

Q. 43.—And so float better? A.—And consequently float better, that is correct.

40 Q. 44.—You have said ‘oxide ores or oxidized mineral particles.’ Was a sulphidizing reagent necessary on both types of materials? A.—It is absolutely essential on materials which are thoroughly oxidized in larger quantities. On surface oxidized material, however, even smaller quantities of sulphidizing material seem to aid flotation.

Q. 45.—In what forms does copper ore, for example, generally come? A.—Well, perhaps the largest deposits of copper are mixed sulphide ores, such as chalcopyrite, chalcocite, boronite. Many of these deposits of sulphide minerals have oxidized parts

For Plaintiff—A. H. Higgins—Recalled

on the surface, and on going down from the surface one is apt to encounter mixed oxide-sulphide minerals.

Q. 46.—What other forms is copper often found in? A.—In metallic forms.

Q. 47.—Aren't there other copper ores other than boronite, chalcocite, and—what is the other one you mentioned? A.—Chalcopyrite.

Q. 48.—And Chalcopyrite? A.—No, I think that covers sulphides, generally speaking.

10 Q. 49.—How about oxides, carbonates and silicates? A.—That of course is the second part of the question, isn't it?

Q. 50.—Yes. A.—Oxides occur as red copper oxides, which is relatively easily floated, and black copper oxide, so-called melaconite, which is floated with more difficulty. Carbonates are relatively easily floated after sulphidization. Silicates—

Q. 51.—What are some of the carbonate ores? A.—Malachite and azurite.

20 Q. 52.—And silicates? A.—Silicates, so-called chrysocolla. These are floated with relative difficulty, owing to the valuable tenor.

Q. 53.—'Valuable tenor?'

BY MR. SMART: "Variable,' you mean?"

BY MR. COHEN: Q. 54.—Variable tenor? A.—Variable tenor of copper mineral dissolved in solid solution siliceous matrix.

Q. 55.—In what form does copper ore occur most frequently? A.—In sulphide form.

30 Q. 56.—Very much more frequently in sulphide? Is that not correct? Is that so? A.—It is. Oxidized surface deposits are exhausted quickly. The sulphide reserves are generally larger.

Q. 57.—Consequently do I understand you to say that you sought for a sulphidizing agent—that one of the reasons why you sought for a sulphidizing agent was for the treatment of non-sulphide ores? A.—It started with that conception first.

Q. 58.—Do sulphide ores ever need sulphidization in the flotation process? By that I mean treatment with a sulphidizing agent? A.—They do respond to certain sulphidizing agents.

40 Q. 59.—Why is that? A.—Because in grinding, oxide films are formed—or I had better say oxide films—

Q. 60.—In grinding sulphide ores? A.—Sulphide ores—oxide films are formed.

Q. 61.—And grinding is a necessary prerequisite for flotation? A.—It is.

For Plaintiff—A. H. Higgins—Recalled

Q. 62.—It is elementary, isn't it, that for a sulphidizing agent you must have a compound or mixture containing sulphur—preferably as much sulphur as possible? A.—I am not so sure of that, but they have to contain—sulphur in considerable quantity is necessary.

Q. 63.—Necessary by definition. Isn't that so? A.—Yes.

Q. 64.—Now, was this entry concerning the mixture of carbon disulphide and alcoholic potash your first search for a sulphidizing agent? A.—No, it wasn't."

10 Next I would refer your Lordship to questions 445 to 447, which begin at the bottom of page 165:

"Q. 445.—Did xanthate appear to work on sulphide ores? A.—It did.

Q. 446.—Did it appear to work on oxide ores? A.—No, it did not work on oxide ores.

Q. 447.—What conclusion did you draw from those facts? A.—That the action of xanthate is different from the action of a sulphidizing agent."

20 The point about flotation had already been covered, and I am covering both points now, my Lord.

Your Lordship will find one other question that is somewhat relevant to the point, at page 199:

"XQ. 655.—. . . As a matter of fact, xanthate turned out not to be a sulphidizing agent in a flotation process? A.—That is correct.

Your Lordship will find a similar point made in Wilkinson's examination, which precedes Keller's examination in the binding. This point is made in the very early part of Wilkinson's direct examination, at the bottom of page 21:

30 "Q. 99.—Sodium sulphide. A.—Sodium sulphide was generally used for a chemical effect on the surface of the mineral particles in case they should be oxidized and not so easily floated as they would be otherwise. It would react on oxidized minerals to form a very thin film of sulphide which would then be floated by ordinary methods of the patents then in use."

I draw your Lordship's attention particularly to those words, "ordinary methods of the patents then in use."

Then at the top of the next page:

40 Q. 100.—Was it used very much? A.—It was used quite a bit in places where the values were almost exclusively in oxidized minerals. It had a certain modifying effect on the pulp too, but it was not employed for that so much as for its chemical effect. It was not a frothing agent."

So I submit, my Lord, that that evidence makes the two points.

HIS LORDSHIP: What was Keller by occupation?

For Plaintiff—A. H. Higgins—Recalled

MR. BIGGAR: Keller was the inventor, my Lord.

HIS LORDSHIP: But by occupation?

MR. BIGGAR: He is described as an assayer.

HIS LORDSHIP: And what was the occupation of Wilkinson?

MR. BIGGAR: He describes himself as being a metallurgist. On page 3 he says he is a member of the American Institute of Mining & Metallurgical Engineers. He appears to have been employed in making tests by the plaintiff company, my Lord.

This is what he says. Your Lordship will find it at page 5, 10 beginning at the answer to question 17:

“A.—I was employed in testing ores for flotation mostly on a small scale, and then I was sent out into the field to start up practical flotation plants on the basis of the results obtained in the testing work.”

Then he goes on in the answer to Q. 19, to give his experience at Butte in 1912, first of all in a mine that is named, then in Colorado in 1913, another mine in California in 1914, then in starting up chemical flotation plants in Mexico and getting them running; then in Michigan with the Calumet and Hecla Company, then in Colorado 20 and so on—a very wide and long experience in flotation in advance of 1923.

HIS LORDSHIP: Yes.

MR. BIGGAR: It is Q. 15, on page 108, my Lord, that shortly describes Keller.

HIS LORDSHIP: As an answer.

MR. BIGGAR: He puts it this way. He is asked at Q. 15: “What was your occupation, what was your work there with the Shannon Company?” The answer is:

30 “A.—As chemist, metallurgical chemist, and I resigned and went to Douglas, Arizona, where I worked for approximately one year with Cole & Company.”

Then further down:

“My work consisted chiefly in investigations on metals such as tungsten, molybdenum, vanadium, and some rare metals like platinum, and so forth. At the end of 1917—or at the beginning of 1918, rather, I was offered a position as metallurgical chemist and assayer with Minerals Separation in San Francisco, and I retained that position until September, 1943 . . .”

I am not arguing the case now, my Lord—

40 HIS LORDSHIP: Oh, no.

MR. BIGGAR: The only point I am making is that those two witnesses called and examined in chief by my friend covered completely not only the point I made in opening, that this material covered by the patent was not applicable to oxide ores, but that oxide ores were the subject of flotation at the time.

For Plaintiff—A. H. Higgins—Recalled

HIS LORDSHIP: And Wilkinson says that oxidized ores were not so easily floated as they would be otherwise. Then as I understand it, Keller puts it on the basis of relativity of flotation.

MR. BIGGAR: Of course, we need not examine it in detail, but it is perfectly clear, in my submission, that the witnesses called by the plaintiff and examined by them in chief in San Francisco, have covered not only the point I made in opening, but also the point to which my friend now wants to direct evidence without there having been any evidence on the point of subject offered by the defendant.

10 HIS LORDSHIP: Except yesterday.

MR. BIGGAR: In answer to your Lordship.

HIS LORDSHIP: Where your witness said that it was difficult to float oxide ore.

MR. BIGGAR: I do not remember that, my Lord. At all events, it did not conflict with the evidence given by the plaintiff's witnesses, and my friend really is in a dilemma here.

MR. GOWLING: Oh, no.

MR. BIGGAR: Either his question is directed to the contradiction of his own witnesses or it is directed to the confirming of them. If
20 it is directed to confirming them, then it clearly is not rebuttal. If it is directed to contradicting them, then it is not only not rebuttal, but quite inadmissible by reason of its being an opportunity to contradict them.

HIS LORDSHIP: My question was directed to Mr. Bennett as a metallurgist.

MR. BIGGAR: Yes, my Lord. I am really not putting it on that ground.

HIS LORDSHIP: Keller is an assayer, I understand—a chemist rather than a metallurgist.

30 MR. BIGGAR: A metallurgical chemist, my Lord. I am afraid these gradations may be difficult to follow.

HIS LORDSHIP: Well, a metallurgical chemist. But as I understand it, this specification is addressed to metallurgists.

MR. BIGGAR: Yes. Well, as a matter of fact, that was not the evidence, if I may interrupt your Lordship there. Mr. Bennett's evidence at one stage was that the people who really understood that were the people who were operating flotation plants.

HIS LORDSHIP: Yes.

MR. BIGGAR: Whatever you call them.

40 HIS LORDSHIP: All right. We will put it that way—metallurgists who were working on flotation processes, because there would be some metallurgists in the mine who would not be working on the flotation process.

MR. BIGGAR: Yes, my Lord.

For Plaintiff—A. H. Higgins—Recalled

HIS LORDSHIP: My question was directed to the ascertainment of what would be known to a metallurgist engaged on the flotation processes, as to the efficacy of the process on oxide ores as against sulphide ores. It was not directed to the knowledge of the inventor as to what the effect of his product was on an oxide ore or a sulphide ore.

MR. BIGGAR: I am afraid I should not, at the moment, argue that question, my Lord. I am really concerned only with the admissibility or otherwise of the question my friend is proposing to ask; and as I say, my submission on that point is that it is inadmissible on two grounds: First, that it is not rebuttal to anything the defendant has said; any evidence elicited even by your Lordship being consistent with the evidence that my friend's witnesses gave in San Francisco.

HIS LORDSHIP: Well, is that so? You say that Keller said that oxide ores could be floated?

MR. BIGGAR: Yes, my Lord. He said in terms that one was easily floated, what he called red oxide ores, and the other varieties which he named were not.

HIS LORDSHIP: He said those were more difficult?

MR. BIGGAR: Yes.

HIS LORDSHIP: So it is all put on the basis of relativity. I shall consider your objection, Mr. Biggar, but allow the question.

MR. GOWLING: Will your Lordship hear me on the objection? It will clarify the point, I think.

HIS LORDSHIP: Yes.

MR. GOWLING: My friend's argument illustrates—

HIS LORDSHIP: I beg your pardon, Mr. Biggar. Were you through?

MR. BIGGAR: Your Lordship ruled. I have nothing more to say.

HIS LORDSHIP: All right. I withdraw my ruling.

MR. BIGGAR: I beg your pardon? I thought your Lordship had ruled.

HIS LORDSHIP: I withdraw my ruling, Mr. Biggar. If you have anything more to say, go ahead.

MR. BIGGAR: No. I have said my piece. I have stated those grounds on which I think it is inadmissible.

HIS LORDSHIP: All right. I will withdraw my ruling and I will hear what Mr. Gowling has to say.

MR. BIGGAR: Would your Lordship like to confirm your recollection by reference to page 752, where your questions to Mr. Bennett are recorded?

HIS LORDSHIP: I seem to have got myself into an awful mess.

For Plaintiff—A. H. Higgins—Recalled

MR. GOWLING: I do not think so, my Lord.

HIS LORDSHIP: Perhaps angels should not rush in—

MR. BIGGAR: They have to rush in sometimes, my Lord—all of us.

HIS LORDSHIP: I suppose so. You say the reference is page 752.

MR. BIGGAR: It is towards the bottom of the page, my Lord.

HIS LORDSHIP: Oh yes—"with less success to oxide ores."

MR. BIGGAR: That was, my Lord, as I pointed out, quite
 10 consistent with the evidence given by the plaintiff's witnesses; so that my friend is put in the position of either seeking in rebuttal to confirm the evidence of his own witnesses or he is seeking in rebuttal to contradict his own witnesses.

MR. GOWLING: My Lord, I am not seeking to do either. This whole point arises, I submit, because there has been an attempt by my friend to divorce the answers from the context in which they were given. The entry in the note book which is referred to in the first line that my friend read, is in this note book which is in evidence,
 20 K-12, and it shows very clearly that Mr. Keller was seeking a sulphidizing agent, the whole purpose being that you sulphidize oxide ores before you can float them. Once they are sulphidized, they become in the nature of a sulphide ore. If my friend wishes it, I shall be glad to qualify my question by asking the witness if it was possible in 1923 to separate oxide ores by the froth flotation process before first sulphidizing them. I shall be glad to restrict it in that way. But that is the whole confusion, between oxide ores and oxidized ores.

HIS LORDSHIP: That really is what I was perhaps stumbling towards in my question.

30 MR. GOWLING: That is the whole point. I submit that the evidence is quite clear on that point and that my question therefore is quite proper.

HIS LORDSHIP: I have taken your objections into consideration, Mr. Biggar, and will allow the question to be put, and will give the matter further consideration as to what effect shall be given to the answer.

MR. BIGGAR: I beg your pardon, my Lord.

HIS LORDSHIP: I will give the matter further consideration as to what effect I shall give to the answer. But in the meantime I
 40 think it is a matter of importance and will allow the questions to be put.

MR. GOWLING: I think it is important, my Lord; and considerably more leeway is allowed when there is no jury.

HIS LORDSHIP: Quite so.

MR. GOWLING: No one is being fooled here.

For Plaintiff—A. H. Higgins—Recalled

HIS LORDSHIP: Nevertheless, as I understand it, the rules of evidence are more strictly applied in patent cases in this court than they appear to be in some other cases.

MR. BIGGAR: The difficulty, really, is this, my Lord—

HIS LORDSHIP: I can see the difficulty.

MR. BIGGAR: If my friend starts out to make a new case in rebuttal, you have really got to proceed and retry the whole issue.

HIS LORDSHIP: I can see the difficulty.

MR. BIGGAR: If my learned friend will now re-state his question,
10 and your Lordship will rule on its propriety, then the witness can answer it.

HIS LORDSHIP: Yes.

MR. GOWLING: 3. Q.—In 1923 was it possible to separate oxide ores by the froth flotation process without first subjecting them to the action of a sulphidizing agent?

HIS LORDSHIP: I think that is a proper question.

THE WITNESS: It was not possible.

MR. GOWLING: I should now like to ask the witness—do not
20 answer this until it is ruled on, Mr. Higgins—if that was a matter of common knowledge in 1923.

HIS LORDSHIP: That is proper, I think.

MR. GOWLING: To persons skilled in this art.

HIS LORDSHIP: To persons skilled in the art. That is a proper question, I think.

THE WITNESS: Yes, it was.

HIS LORDSHIP: 4. Q.—Was it known to all skilled metallurgists? A.—My Lord, in my opinion it was known to every metallurgist who was dealing with flotation.

MR. GOWLING; 5. Q.—The question of colloids came up
30 yesterday. Were colloids used in flotation in 1923? A.—No, they were not. They were avoided like poison. A good many articles were written about that time and a little while before on the evils of having colloids present in the froth flotation process.

HIS LORDSHIP: 6. Q.—And you are now speaking of the froth flotation process as it was known in 1923 and immediately prior to the alleged invention? A.—Yes, my Lord.

7. Q.—You say that colloids were avoided? A.—Yes, my Lord, they were.

8. Q.—In froth flotation processes? A.—Yes, my Lord.

40 MR. GOWLING: Another question which arose during the examination of the defendant's witnesses had to do with the distinction made between xanthates formed with heavy metals and those formed with what we might call light metals. I should now like to ask the witness the names—

For Plaintiff—A. H. Higgins—Recalled

MR. BIGGAR: The same objection, my Lord. We have given no evidence about that.

MR. GOWLING: I had not finished the question, my Lord. I was going to ask the witness to name the heavy metals, or what he would regard as the heavy metals. I thought Dr. Purves had testified on that point, my Lord.

HIS LORDSHIP: That is a distinction between —

MR. GOWLING: The heavy metal xanthates and the lighter metal xanthates.

10 HIS LORDSHIP: I have no recollection of that.

MR. ROBINSON: So far as my recollection goes, Dr. Purves said not a word on that subject.

HIS LORDSHIP: Mr. Gowling, I may have missed it, but I have no recollection of that. But I would not want to —

MR. GOWLING: What brought the question to my mind primarily, my Lord, was the large chart which was filed by my friend through Dr. Purves and on which Mr. Higgins, incidentally had been previously cross-examined.

HIS LORDSHIP: That is Exhibit D-57.

20 MR. GOWLING: Whatever the number is. It has on it M for any metal.

HIS LORDSHIP: M for any metal?

MR. GOWLING: Yes, my Lord. And during the course of the examination of Dr. Purves a distinction was made between different classes of metal. I cannot put my finger on that reference just now, but I had that noted at the time for the purpose of rebuttal evidence.

MR. ROBINSON: My Lord, I cannot remember any evidence on that. But if the question of distinction between some sorts of
30 metal and another arose at all, it arose simply in general.

HIS LORDSHIP: Qua metals.

MR. ROBINSON: To illustrate some discussion.

HIS LORDSHIP: I do not recall any distinction being made between metals from the point of view of their weight.

MR. GOWLING: I shall be glad to look up the reference.

MR. ROBINSON: And certainly not having any reference to xanthates, if your Lordship sees the distinction.

HIS LORDSHIP: I do not recall it, Mr. Gowling.

MR. GOWLING: We will find the reference, my Lord, and have
40 it after the noon adjournment, if we may have that opportunity.

HIS LORDSHIP: Perhaps it would do everybody good to have a recess of ten minutes.

—At 12:00 o'clock the Court took recess.

For Plaintiff—A. H. Higgins—Recalled

MR. GOWLING: My Lord, I have found the passage which I had in mind when I asked that question. I had drawn Dr. Purves' attention at page 566 to a statement by my learned friend, Mr. Biggar, to the effect that:

"If you have even hundreds in the formula D-12, you have fifty times as many hundreds and therefore at the lowest 5,000 included in E-3."

This was referring to the large chart, my Lord. The witness answered:

10 "Yes. That in general is the situation, because it is a question of permutations and combinations, my Lord. We can vary R within wide limits. There are about fifty metallic elements and metal like groups like ammonium which are known, so that we have fifty times on the combination basis. Those are the possibilities."

My submission is that in reply surely I am entitled to break down those fifty metals into the groups. The witness referred specifically to the groups. I was only interested in the heavier metals. Your Lordship will remember that alkali metals have been dis-

20 cussed. There was one reference to the formation of copper xanthate.

HIS LORDSHIP: Yes.

MR. GOWLING: There was a reference to lead xanthate.

HIS LORDSHIP: Copper xanthates, calcium xanthates, cobalt xanthates.

MR. GOWLING: Yes, my Lord, and I simply want the witness to break them up into groups as to what comes within the heavy group.

HIS LORDSHIP: There was no differentiation between light metals and heavy metals except there was the reference to

30 ammonium.

MR. GOWLING: Yes, my Lord. I may be improperly describing them as heavy metals, but the alkali group of metals was defined, and I am asking the witness what else there is besides the alkali group.

HIS LORDSHIP: The alkali metal group was defined as including five metals, I think.

MR. GOWLING: Yes, my Lord, among them being potassium and sodium.

HIS LORDSHIP: Potassium, sodium, and —

40 MR. BIGGAR: Caesium, lithium and rubidium.

MR. GOWLING: In order to avoid asking the witness to name all the others or break down the group as Dr. Purves refers to it in general, I was trying to have him identify only what I would refer to as the heavy metal group, having taken that word out of

For Plaintiff—A. H. Higgins—Recalled

a very elementary memorandum. I do not see what the objection is to the question.

MR. BIGGAR: I am not sure that I should object to the question, but the occasion is a good one to call attention to the fact that the transcript has a clerical error in it at page 566.

HIS LORDSHIP: 566?

MR. BIGGAR: Dr. Purves is reported as saying in part of his answer to question 512:

10 "There are about fifty metallic elements and metallic groups like aluminium which are known."

The word "aluminium" ought to be "ammonium". It corresponds to the note on the chart 57.

HIS LORDSHIP: But my recollection is that he did say "aluminum." I am not sure.

MR. BIGGAR: As a matter of fact, my friend, Mr. Robinson, tells me that on the following day Dr. Purves intended to call your Lordship's attention to that mistake but forgot to do so. It was during the time that Dr. Purves was under examination that he mentioned that mistake, but there is no great importance so far as
20 this question of heavy and light metals is concerned. There is no doubt in my mind that Dr. Purves was referring to the fifty metallic elements. Aluminium is not a metallic group. It is one of the metals. It is a metallic element.

HIS LORDSHIP: I remember Dr. Purves making some reference to ammonium.

MR. BIGGAR: Oh, he did make some reference to ammonium.

HIS LORDSHIP: To aluminium.

MR. BIGGAR: Aluminium is a metallic element with an atomic weight of 26.97. There is no doubt about that, but I do not think
30 there is any difference of opinion about what the heavy metals are.

MR. GOWLING: I do not think there is either, my Lord.

MR. BIGGAR: If that is what you want to get, let us get it because it is a pure scientific point and perhaps we had better clear it up.

HIS LORDSHIP: Might I suggest I have looked at some of the copies of the transcript, and they are very well done but there are errors. I am assuming that counsel will get together and correct those.

MR. GOWLING: We have never had any difficulty in the past,
40 and I am sure there won't be.

MR. BIGGAR: There won't be the slightest difficulty.

HIS LORDSHIP: It is just to have a correct copy. I would like to have a notation of the corrections.

MR. BIGGAR: Yes, my Lord.

For Plaintiff—A. H. Higgins—Recalled

MR. GOWLING: I may say, your Lordship, that I think your Lordship and also my friend appreciate the difficulty of counsel keeping track on the meaning of the technical witnesses. I have limited my general questions in reply down to the very minimum. As your Lordship can see I am only trying to clear up one or two points which might be helpful to your Lordship and may have some bearing. I should like the witness to explain briefly what is meant by the heavy metal xanthates or heavy metals.

MR. BIGGAR: Heavy metals.

10 MR. GOWLING: Yes, heavy metals.

HIS LORDSHIP: 10. Q.—Yes? A.—The heavy metals in general are such things as lead, zinc, copper, mercury, tin, nickel, cobalt, and so forth. I should except from that classification the alkali metals, sodium and potassium, and the other three, caesium, lithium and rubidium. I should also except —

11. Q.—From the point of view they are not heavy metals? A.—No, they are light metals, and the same with calcium, barium and strontium, and also aluminium and magnesium. Those are both light metals.

20 MR. GOWLING: 12. Q.—That is the general description? A.—That is the general description.

HIS LORDSHIP: What is aluminium?

MR. GOWLING: Aluminium would be a light metal, my Lord.

HIS LORDSHIP: 13. Q.—Did you mention that? A.—Yes, that is a very light metal.

MR. GOWLING: 14. Q.—Did you say whether or not that was an alkali? A.—No, I did not. It is not an alkali.

HIS LORDSHIP: 15. Q.—It is not an alkali metal? A.—It is not.

30 MR. GOWLING: I understood Dr. Purves to suggest that most of the xanthates from these metals were soluble. I would ask the witness not to answer in case my friend wishes to make some objection, but I was going to ask him if in his opinion xanthates formed from these heavy metals are soluble?

HIS LORDSHIP: That is, xanthates formed from the heavy metals?

MR. GOWLING: Whether they are soluble.

40 MR. BIGGAR: I think I should interpose an objection, my Lord, because the only evidence about the solubility of some of these heavy metals has already been given by my friend in chief.

HIS LORDSHIP: Mr. Robinson opened the question of solubility in the evidence here.

MR. BIGGAR: Of cellulose xanthate only, was it not?

HIS LORDSHIP: You opened the question of solubility generally.

For Plaintiff—A. H. Higgins—Recalled

MR. ROBINSON: I think not. The way that question arose was that my friend, Mr. Gowling, in cross-examining Dr. Purves asked him the meaning of the word "soluble". He then went on to ask a specific question about the solubility of cellulose xanthate and Dr. Purves said he was not sure about that. Then Mr. Bennett in chief said he had ascertained that cellulose xanthate—he had, in fact, dissolved a certain amount of cellulose xanthate in water but that, in my recollection, is the only evidence that there was on the solubility, either generally or specifically, in the defendant's
 10 case. The only evidence brought in chief by the defendant was directed specifically to the one question of whether cellulose xanthate would dissolve in water. According to my recollection certainly not in chief, and according to my recollection not in cross-examination, was there any evidence from Dr. Purves or Mr. Bennett on the question of the solubility specifically of other compounds. There was a general question as to what "soluble" meant which was raised by my friend on cross-examination of Dr. Purves.

MR. GOWLING: I cannot quarrel with my friend's explanation, but I had certainly questioned Dr. Purves about the solubility of
 20 materials and I had in mind asking this question in reply at that time, in rebuttal. I do not see what serious objection there can be to an answer of that nature. It is one question which I thought arose out of the examination of the defendant's witnesses and which was not cleared up on the record. Could this question be answered subject to my friend's objection?

HIS LORDSHIP: I think that is more a borderline question than the previous ones. I think perhaps that would be the best disposition of it.

MR. GOWLING: It can be answered subject to my friend's
 30 objection, and if it is not proper I am sure it can be settled on argument.

16. Q.—Would you answer the question, Mr. Higgins? A.—May I have the question, please?

HIS LORDSHIP: As to whether heavy metals are soluble.

MR. GOWLING: 17. Q.—As to whether heavy metal xanthates are soluble. I think I put it, "xanthates formed with heavy metals." There is evidence xanthates can be formed with the heavy metals and the question was whether those xanthates would be soluble?
 A.—No, those heavy metal xanthates are not soluble in the sense
 40 which a metallurgist would describe them. Copper xanthate, for instance, is one of the most insoluble compounds known to the chemist, but some of the others might give you a very very slight solution, certainly not enough to be of use in the flotation process as a soluble agent.

18. Q.—I am going to turn now to an examination on questions arising out of the defence based on Mr. Martin's work. Mr. Higgins, do you know —

For Plaintiff—A. H. Higgins—Recalled

HIS LORDSHIP: I know so little about that because that is all in the documents and in the Commission evidence.

MR. GOWLING: Yes, my Lord; it has been put in in the Commission evidence and has been referred to by my learned friend. The references have been mainly to a document called bulletin No. 2.

HIS LORDSHIP: Oh yes, bulletin No. 2, that is right.

MR. GOWLING: Which was filed.

HIS LORDSHIP: In which stanol, for example, is mentioned.

10 MR. GOWLING: Yes, my Lord. Mr. Higgins is now, I may say, testifying as to facts. I propose to go through this in more or less chronological manner because I think to open up by a discussion of the bulletin and then jump back and forth to events before and after would be rather confusing to your Lordship.

MR. BIGGAR: I want to point out that there is only one piece of evidence that we have given with regard to Martin.

HIS LORDSHIP: With regard to Martin.

MR. BIGGAR: Only one piece of evidence, and that is that stanol D had produced certain results at Noranda.

20 HIS LORDSHIP: Oh, at Noranda. Was there not some evidence that it had been used at some other place?

MR. BIGGAR: No, we gave no evidence of any kind with regard to Martin except the tests that are described in exhibit D-59a. Of course, there is no objection to my friend dealing with that evidence.

HIS LORDSHIP: That evidence has got two purposes, one of which I suppose would be with regard to the defence — do you call it anticipation?

MR. BIGGAR: Yes, that is what we agreed to call it.

30 HIS LORDSHIP: Should the plaintiff not be in a position to give the history of the matter?

MR. BIGGAR: As a matter of fact, that has been dealt with in the evidence taken in New York and San Francisco.

HIS LORDSHIP: That is where I am at a disadvantage at the moment.

40 MR. BIGGAR: Because you have not heard the whole thing read, but the point is that is a subject that I do not think my learned friend has any possible justification for going into further than the one point which was dealt with by the defendant. All the other evidence on the subject of Martin has been adduced by the plaintiff. In my submission it is perfectly clear on the cases that a plaintiff who gives some evidence in support of an issue cannot give only part of it, and then, having heard what the defendant says, give some more of it.

For Plaintiff—A. H. Higgins—Recalled

HIS LORDSHIP: That is quite clear, but in respect to all the evidence relating to Martin, that appearing in the Commission evidence, all of that evidence would have been given in rebuttal if the witness had appeared.

MR. BIGGAR: Not if I had been conducting the case for the plaintiff, my Lord.

HIS LORDSHIP: But if the plaintiff confined himself — and I suppose he could — to two things, (1) just file the patent and (2) give his evidence of infringement, that is, use by the defendant,
10 that would be a sufficient opening.

MR. BIGGAR: It would be a sufficient one, my Lord, but almost a suicidal one.

HIS LORDSHIP: It might be at that.

MR. GOWLING: That is the chance I took.

HIS LORDSHIP: It might be unwise to do and it might be a proper opening, and then wait for the attack.

MR. BIGGAR: As a matter of fact, that is the reason why the rules are so specific on the particulars of objection to a patent, and the general rule — I won't say the invariable rule — here has
20 been to open the full plaintiff's case in view of the objections that are being made to the patent. As a matter of fact, in England the practice goes so far that I once asked one of the leaders of the patent bar what happened when they had rebuttal evidence. He said, oh, we never have rebuttal evidence. The case is always exhausted on the plaintiff's case and the defendant's case unless there is some matter of extraordinary surprise or something of that kind." His first answer was that they never had rebuttal evidence.

HIS LORDSHIP: But that is strictly with the presumption of the validity in favour of the patentee.

30 MR. BIGGAR: Yes, my Lord.

HIS LORDSHIP: The patentee could follow the course suggested and then bring up all his heavy artillery against the contention of the defendant.

MR. BIGGAR: That is perfectly true, but I will put it this way. The plaintiff has chosen not to do that. He has brought up his San Francisco artillery; he has brought up his New York artillery and now he is proposing to bring up his London artillery in rebuttal. I do submit, your Lordship, that is really a way of
40 recommending the trial of the issues because the whole case of the defendant has been directed and based, with the exception of exhibit D-59, on the evidence that the plaintiff has given. In my submission it is quite out of the question for my friend to start out to make a new case on his London reinforcements.

HIS LORDSHIP: My difficulty is that looking at the Commission evidence and considering Mr. Gowling's method of approach he made the barest possible case —

For Plaintiff—A. H. Higgins—Recalled

MR. BIGGAR: I would not say it was as bare as possible but it was not very heavily clothed.

HIS LORDSHIP: He merely confined his explanation to the terms of the patent. Basically that was it.

MR. BIGGAR: As far as Mr. Higgins is concerned that is true, my Lord.

HIS LORDSHIP: Then he put in the Commission evidence.

MR. BIGGAR: In full.

HIS LORDSHIP: And all of the Commission evidence went in
10 and there was a discussion relating to the Commission evidence. Ordinarily I suppose he would have picked out what was referable to the opening.

MR. BIGGAR: He cannot do that.

HIS LORDSHIP: I should have put it this way, that he would have read at that time that portion of the evidence that was opening evidence.

MR. BIGGAR: Yes, my Lord; then I would have cross-examined.

HIS LORDSHIP: Then you would have read the cross-examination.

20 MR. BIGGAR: Is your Lordship's comparison quite fair? What we are really comparing is two alternative ways of giving evidence, one by Commission and one by calling witnesses.

HIS LORDSHIP: Yes.

MR. BIGGAR: Suppose my friend had had his witnesses here. Then I would have cross-examined those witnesses not only on what my friend proved by their direct evidence but generally.

MR. GOWLING: But they would not have been called in opening; I would not have called them in opening.

20 MR. BIGGAR: As a matter of fact, these witnesses were all called in opening. If they were not called in opening then my friend should not have put in their Commission evidence at all. He did not have to put this evidence in in bulk. If the Commission evidence did not support his opening, if Wilkinson did not support his opening case he need not have put in Wilkinson.

HIS LORDSHIP: Any of it.

MR. BIGGAR: I am taking it witness by witness, my Lord. If Keller did not support his opening case he did not need to put him in. If Williams did not he would not have put him in. If Gregory did not he would not have put him in. I have no quarrel
40 with that at all.

HIS LORDSHIP: Or hold it all back.

MR. BIGGAR: Or hold any of it back. He put in the evidence of each of these four witnesses, but not all four together. He did put them in all together but the effect of what he did was to put

For Plaintiff—A. H. Higgins—Recalled

in the evidence of each of these four witnesses severally because they presumably supported the case he was making as plaintiff. If he called these witnesses for the purpose of supporting the plaintiff's case and they had been here in corpore or had limited it to that part of the evidence given on Commission which was directed as supporting the plaintiff's case then I would have cross-examined them generally just as I did. I would not have had to because I could have let them go. I mean I need not have cross-examined them but the obvious course for me to take would have
 10 been to cross-examine them in exactly the same way as they were cross-examined in San Francisco or New York, together with some of the subjects that perhaps there was not any cross-examination on in New York and San Francisco because it had already been covered by direct.

Now, Mr. Higgins was the fifth witness whom my friend called in support of his opening case. We had to cross-examine the other witnesses who talked about Martin—that was on the commission. Mr. Higgins was not asked to give the same kind of evidence in chief as the other witnesses were in San Francisco, and consequently that
 20 was the end of my friend's case. Now in my submission he cannot possibly go back and support the case he made in San Francisco and New York through the four witnesses whose evidence he has chosen to put in, by a witness called to rebuttal. The leading case on this is an old one—not quite one hundred years old, but almost.

HIS LORDSHIP: That is, on the point that you cannot divide your case?

MR. BIGGAR: That is it, my Lord. Your Lordship is familiar with that. It is *Jacobs v. Tarleton*, (1848) L.J., Q.B., at 194. The judgment, which is a very short one, was given by Lord Denman,
 30 C.J. It is only twenty lines and perhaps your Lordship would like me to read it? The Court reserved judgment, and then the judgment is expressed in this way:

“Lord Denman, C.J., subsequently, in this term, delivered the judgment of the Court.—The question in this case was whether the learned Judge was right in refusing to allow a witness of the name of Lawrence Levi to be called by the plaintiff in reply, upon the trial of the issue, whether a bill of exchange had been indorsed to him, the plaintiff, or not. The issue was single, and the onus of proof was upon the plaintiff. He might
 40 either rely upon a prima facie case, or go into all the evidence had he to confirm the prima facie case; but we think that he was not entitled to rely in the first instance upon a prima facie case upon that issue, and afterwards, when that prima facie case was called in question by the defendant, to call other evidence to confirm his prima facie case.”

And this is perhaps the significant part of the judgment:

For Plaintiff—A. H. Higgins—Recalled

“It was not proposed to call Levi to contradict”

That word is in italics.

“any statement made by the defendant’s witnesses, but to add a fact”

Those words “add a fact” also are in italics.

“tending to confirm the plaintiff’s prima facie case. This, we think, he was not entitled to do, if objected to, and that the learned Judge was right in refusing to allow him to call the witness.”

10 HIS LORDSHIP: Wasn’t that the case on a promissory note?

MR. BIGGAR: They gave evidence to prove the hand-writing of the endorser of a bill of exchange, my Lord, and then the defendant gave evidence to show that the endorser was really worthless and, inferentially, could not have given value; and then the plaintiff sought to recall his witness for the purpose of showing that—well, at all events the purpose proposed was to deal with that question of his ability to give value. This case is considered as the leading case on the point I am making.

As your Lordship will find, my friend was quite deliberate in
20 the choice that he made in this case not to open this subject with Mr. Higgins when he called him. Your Lordship will find the discussion at page 236 of the proceedings in this Court. At page 235, at the bottom, my friend had said:

“We have to be prepared for the possible appearance of Mr. Martin, and considerable of our commission evidence was taken to meet any evidence that might be introduced through him. That is a substantial part of the commission evidence in reply, so it does not seem appropriate to read it at this moment.”

That statement ends at the top of page 236. On page 242, calling
30 attention to that statement after the discussion had gone on, I intervened and made first one remark, and then this:

“The other remark that I think I ought to make at this time is a comment on my friend’s statement that part of the evidence is evidence in reply and not appropriate to be read at this moment. Of course, my friend has got to select”

The word I used was no doubt ‘elect’.

“whether he is going to use it or not.”

Then your Lordship said that you understood it was all in and I replied that it was all in; your Lordship then repeated your understanding that it was all in, and Mr. Gowling replied: “Yes, my
40 Lord.” Then your Lordship raised the question of what would happen if no evidence was given to which this commission evidence would be relevant. At the top of page 243, your Lordship asked:

“If some of it is not in answer to anything raised in the defence what is the position of it then?”

For Plaintiff—A. H. Higgins—Recalled

HIS LORDSHIP: That is what my difficulty was.

MR. BIGGAR: Yes. I will just read a little from there on:

“MR. BIGGAR: That is the difficulty. I do not know.

MR. GOWLING: That is the chance we take. There is some doubt in my mind. I am of the opinion that the evidence is in whether we want it in or not. I fully realize the position that it may not be in until you ask to put it in.”

Then your Lordship raises the question as to what would happen to all the evidence taken on the commission relating to what Martin might say, if Martin were not called at the trial, and at the top of page 244, your Lordship says “I am not clear on that”—that was on the point of eliminating from the record evidence relating to what Martin might say. Then my friend Mr. Gowling said:

“I may say my friends can prove part of their Martin case, and perhaps the whole Martin case, on documentary evidence, so that I really do not think that problem will arise.”

Then, reading on:

“HIS LORDSHIP: I am just taking that as an illustration.

MR. GOWLING: That is a perfect illustration except in this case by reason of the fact we have been facilitating each other on proving certain facts—I have no doubt my friends can introduce their case on Martin without too much difficulty. Most of the evidence will be relevant and what is inadmissible your Lordship would have the privilege of striking out if you see fit.

So my friend faced the difficulty he might be in if he wanted in rebuttal to give evidence on the Martin case that he had already made adequately in the commission evidence. And in my submission, to allow evidence of that kind in rebuttal, when the only evidence that we have given consists of the tests in exhibits D-59 and D-59a, would be really to start a new trial on fresh evidence.

Mr. Williams’ evidence, for example, was, so far as my observation went—my friend may have a different view about it—wholly directed to Martin. Dr. Gregory’s evidence was directed to other points besides Martin. If my friend had desired to make the very narrow opening that your Lordship suggested—I mean, simply prove that patent, which proves itself, and call witnesses to show the admissions made by the defendant on exhibit M-2—that is to say, if he had been satisfied to put in the patent and put in the infringement, he might have done so. But he deliberately, in my submission, in view of what I have read, elected to take the other course, and his present proposal would mean beginning a new trial on a fresh set of facts.

HIS LORDSHIP: What do you say, Mr. Gowling?

For Plaintiff—A. H. Higgins—Recalled

MR. GOWLING: My Lord, I have opened patent cases in this way before; and I have never heard a patent case opened in this court otherwise than as I did it.

HIS LORDSHIP: I should think it would be the proper and correct method of opening. I made that remark previously, when the question arose before.

MR. GOWLING: I have never heard a patent case opened otherwise in this court.

MR. BIGGAR: Except by me.

10 MR. GOWLING: I do not think I have ever heard my friend deal with the defence in opening.

HIS LORDSHIP: The English practice apparently is different, but I always thought it elementary that you do not anticipate the defence.

MR. GOWLING: Yes, my Lord. My learned friend may at times have indicated very briefly the nature of the attack which is going to be made on that patent—for perhaps a matter of ten or fifteen minutes—but not in an elaborate opening.

20 HIS LORDSHIP: The method of your opening was perfectly proper, there cannot be any dispute about that. But what about the Commission evidence that you put in?

MR. GOWLING: Perhaps I should first dispose of the case that my friend cited, *Jacobs v. Tarleton*. That is not a patent case, as your Lordship knows. It is authority for the proposition as stated—

HIS LORDSHIP: That you cannot split your case.

MR. GOWLING: That is right, my Lord. But we are not splitting our case in any way. There are two cases before your Lordship. We sue the defendant for infringement of our patent, and the defendant in effect sues to impeach our patent.

30 HIS LORDSHIP: That is really what he does.

MR. GOWLING: There is not any doubt about it, my Lord.

HIS LORDSHIP: I suppose in the attack on the validity of the patent, as a defence to your action for infringement, he would be entitled to a declaration.

40 MR. GOWLING: Yes, my Lord. My friend, or any defendant, I should say, as a matter of convenience would no doubt first answer the plaintiff's case and then proceed to introduce the defendant's case attacking the patent. My Lord, it is so elementary that I cannot suggest any argument to say that surely the plaintiff is then entitled to meet the attack thereby made on this patent.

HIS LORDSHIP: But you put all the—

MR. GOWLING: We put all the cards on the table.

HIS LORDSHIP: I do not know whether you were so interested in putting all the cards on the table. You opened in a perfectly

For Plaintiff—A. H. Higgins—Recalled

proper way, but in your opening you introduced all of the Commission evidence.

MR. GOWLING: I can explain that situation, my Lord.

HIS LORDSHIP: That is the real point that Mr. Biggar makes.

MR. GOWLING: It is very simple. May I just refer for a moment to the defendant's pleading? The defendant in its pleading alleges that Martin was a prior inventor, that our invention of the Keller patent was known or used before it was invented by Keller, by other persons, among them being Martin. Knowing that we
10 would have to meet this Martin evidence, we naturally took the appropriate steps. Incidentally, the defendant also set up a man named Luckenbach, and we went to the trouble of obtaining a commission to examine witnesses in England to beat Luckenbach, because, as your Lordship will understand, we had no alternative.

HIS LORDSHIP: You had to meet those possible attacks.

MR. GOWLING: Yes, we had to meet those possible attacks. As your Lordship knows, if a witness is outside the jurisdiction of the court, we cannot bring him back to the court. A commission is at best a poor substitute for having a witness brought to the court.
20 But I am the one who is embarrassed by having commission evidence, not my friend, because it obliges us to give away the plaintiff's answer to the defendant's attack.

Now, as to the Commission evidence, the view that I expressed in opening was, that we had no power over it. The Commission was issued by this Court. It is directed to a Commissioner, who was made a commissioner by this court, to take evidence, and the Commission was returned to this court. The fact that my friend's office and ours may have adopted some informal practice about marking exhibits is not significant.

30 HIS LORDSHIP: In other words, you did not put the Commission evidence in as evidence.

MR. GOWLING: No, because it was in.

HIS LORDSHIP: It became evidence on the return of the commission to the court by the officer whom the court appointed to take the evidence.

MR. GOWLING: That is right, my Lord. I thought your Lordship understood my position clearly when I stated that the evidence is before the court whether we want it in or not.

HIS LORDSHIP: Yes.

40 MR. GOWLING: I also endeavoured to make clear to your Lordship that it would be used for its proper purpose, and indicated clearly that it was practically all evidence in rebuttal.

HIS LORDSHIP: And I think there was some discussion to the effect that it would be practically impossible to separate what would be solely applicable to opening and what would be applicable to rebuttal if a particular line of attack were made on the patent.

For Plaintiff—A. H. Higgins—Recalled

MR. GOWLING: Yes.

HIS LORDSHIP: It was all in, but my difficulty was whether the plaintiff should read that portion of it applicable to his opening, and the defendant read that portion that was applicable to his attack on cross-examination, and then as to what would happen to the residue of the evidence is that residue had no bearing on any attack that was made. It would all be in, it would all be there.

MR. GOWLING: It is there, my Lord, but perhaps some of it would be irrelevant. It is just like any other evidence before the
10 court which turns out to be irrelevant. And I mentioned that we were—I do not know whether we are stuck with it, but we are certainly faced with whatever is in the Commission evidence. We cannot avoid it.

HIS LORDSHIP: Strictly speaking, following the rights that are given to you as the owner of the patent, you could not take the position that none of it must be looked at.

MR. GOWLING: No, my Lord, and I did not take that position. I suggested that to read the Commission evidence in a manner which, strictly speaking, would perhaps have been correct—that is
20 for us to read that portion applicable to the opening, and my friend to read the portion applicable to his defence, and then we to read what is applicable to reply—or, as is sometimes done, to read the whole thing in opening—would have only given your Lordship a lot of facts before your Lordship had been prepared to understand them. As I said, much of this Commission evidence was taken in contemplation of Mr. Martin being present at the trial. But Mr. Martin is not here. We had undertaken with my friends to produce Mr. Higgins. He has not yet been examined on questions of fact. He was examined on the opening of our case as an expert, but there is
30 no reason why a witness cannot serve two functions before this court. He is now called for examination on questions of fact arising out of the pleadings. My friend says Martin was a prior inventor to Keller; and he has filed Bulletin No. 2—

MR. BIGGAR: Oh, no; you filed Bulletin No. 2.

HIS LORDSHIP: Bulletin No. 2 is exhibit G-3 in Gregory's evidence, as I recall it. Gregory was an officer of the plaintiff, who was examined for discovery by the late Mr. Smart, I think.

MR. BIGGAR: Yes, my Lord.

HIS LORDSHIP: And then it was agreed that that examination
40 for discovery should be regarded as Commission evidence.

MR. GOWLING: Yes.

HIS LORDSHIP: That would mean, of course, that you had called Gregory as your witness.

MR. GOWLING: No; as a matter of fact, the situation is this, that Mr. Smart told the plaintiff's solicitors that it would be in order

For Plaintiff—A. H. Higgins—Recalled

to use Dr. Gregory's evidence as though he were called as a witness at the trial. The matter was arranged somewhat informally, but there was no doubt about the fact that we were to be permitted to use Dr. Gregory's evidence as though he were present at the trial.

HIS LORDSHIP: So he became your witness.

MR. GOWLING: Yes. And I suggested as a convenient way of carrying out the arrangement made between our offices that his evidence be treated as Commission evidence. Arrangements for counsel to go to New York for the taking of the evidence were made
10 over the telephone, and counsel were present there at the appointed time, but the Commission evidence was taken on the authority of a commission from this court, and we have no power over that. The only question is whether we should have specified in opening and read what we regarded as relevant to the opening, and left for reply the portions that we considered relevant to that stage of the case, or whether we should have as a matter of convenience dealt with it in argument.

HIS LORDSHIP: This particular evidence was introduced in the course of examining Dr. Gregory for discovery.

20 MR. GOWLING: Yes.

HIS LORDSHIP: Then you make him your witness.

MR. GOWLING: Yes.

HIS LORDSHIP: And he, I suppose, deals with matters that are not exclusively confined to meeting any defence?

MR. GOWLING: That is right, my Lord. He made statements that I have no doubt my friends will use as part of their case. But once we agree that that evidence may be used before the court, either party may use it, particularly if it is to be considered as Commission evidence.

30 HIS LORDSHIP: Yes, of course.

MR. GOWLING: The evidence was taken at the instance of the late Mr. Smart. He had the right to examine Dr. Gregory for discovery, and pursuant to the rules he took that examination, and the arrangement was not made until some time later.

HIS LORDSHIP: That of course gave him some advantage, in that he could cross-examine.

MR. GOWLING: Yes. Later on we made the arrangement so that we would not have to bring Dr. Gregory from New York to Ottawa, he being a man on in years who would have found it incon-
40 venient to travel up here. Evidence that he would have given here would have been largely along the lines of the discovery evidence, and for that reason we asked my friends to permit us to use Dr. Gregory's evidence; and the understanding was that if we were to use it they too could use it. My friends, of course, could have used it in any event.

For Plaintiff—A. H. Higgins—Recalled

HIS LORDSHIP: Yes, they could have used it all or any portion of it.

MR. GOWLING: Yes. I thought your Lordship quite understood my position as to the Commission evidence, that it is before the court for its proper purpose. If it is reply evidence, it goes in as reply or is considered as reply.

MR. BIGGAR: During the luncheon adjournment your Lordship might like to look at two rules of the Exchequer Court which may be relevant, namely, rule 18(2) and rule 169.

10 HIS LORDSHIP: Mr. Gowling, the evidence that you have in mind is evidence of fact?

MR. GOWLING: Strictly evidence of fact, my Lord.

HIS LORDSHIP: A history of the Martin work?

MR. GOWLING: Yes. In his pleadings, my friend has set up Mr. Martin as a prior inventor, and I presume he is not abandoning that defence. He has also said that Bulletin No. 2 is a publication that anticipates our patent. I propose to show what Bulletin No. 2 really is and how it came to be issued.

20 HIS LORDSHIP: Bulletin No. 2 was introduced in the course of examination on discovery?

MR. GOWLING: It was filed during the course of examination on discovery by Mr. Smart, my Lord.

HIS LORDSHIP: It was marked as G-3 at the trial.

MR. GOWLING: Yes. It was filed by the late Mr. Smart on the taking of the discovery evidence. And, as your Lordship remembers, Mr. Bennett testified as to certain tests which were made with materials mentioned in that bulletin.

—At 1.10 o'clock p.m. Court adjourned to 2.45 o'clock p.m.

AFTERNOON SESSION

30 OTTAWA, NOVEMBER 23RD, 1944

HIS LORDSHIP: Have you any reply to make to Mr. Gowling's argument, Mr. Biggar?

MR. BIGGAR: I do not think my friend Mr. Gowling had completed his submission.

HIS LORDSHIP: Oh, I beg your pardon. Had you, Mr. Gowling?

40 MR. GOWLING: Well, my Lord, I doubt if I can add anything further. I thought that your Lordship had understood my position as stated in opening, that all of the Commission evidence is before the Court to be used for its proper purpose; that is if it is evidence which would ordinarily be considered as evidence-in-chief, it would be considered as such, and if it is evidence which should be con-

For Plaintiff—A. H. Higgins—Re-Examination

sidered as evidence in answer to my friend's attack on the patent, it would be considered as rebuttal evidence.

HIS LORDSHIP: I must say that that was my understanding of the matter.

MR. GOWLING: Yes, my Lord. And the chance we took in taking this reply evidence or rebuttal evidence in advance of the trial was that we thereby disclosed a lot of evidence to the defendants which they might not otherwise have been able to obtain, or at least they might have had difficulty in anticipating what our
10 case would be. So if there is any embarrassment, it is to the plaintiff and not to the defendant, my Lord. I do not see that there is anything further I can add. I am satisfied myself that the evidence we are now submitting is an answer to the defendant's attack on the patent, and that it is quite proper evidence in rebuttal, my Lord.

MR. BIGGAR: I do not know whether my learned friend has given your Lordship a wrong impression, that he was under any difficulty about a choice. There were two of these witnesses, Williams and Gregory, whose evidence I think I am being quite
20 accurate in stating, was directed only to possible defences, that there was not a word in Williams' that was not related to Martin, and that there was not anything in Gregory that was not related to Martin or to the laches.

HIS LORDSHIP: Then the evidence of those two witnesses was properly rebuttal evidence.

MR. BIGGAR: That was properly rebuttal evidence if my friend wanted to so treat it. I mean, there was no obligation then to put it in. I will come to the point of the position of the evidence. The other two witnesses were in this position. They both gave
30 some evidence that would have been perfectly admissible as part of the plaintiff's case to establish the importance of the invention and the fact that Keller had made it.

HIS LORDSHIP: That, of course, would be presumed in the patentee's favour.

MR. BIGGAR: I was going to say that the named inventor, Keller, was the person who made tests; a great deal of Keller's evidence is directed to the inquiries he made, the various tests that he made, the various note books that he made entries in, and so forth, starting from a point earlier than September 22, 1918,
40 and running throughout 1923. And as your Lordship has observed, almost all the correspondence on which we have relied for the purpose of certain defences has been the correspondence that was introduced on those examinations, some of it in Gregory and Williams; but I think all the 1923 correspondence, which is the important correspondence, was introduced in the course of examination of either Wilkinson or Keller. Now, my friend could, as

For Plaintiff—A. H. Higgins—Re-Examination

your Lordship says, have limited his case to the proof of the patent and of the infringement. He chose not to do that.

HIS LORDSHIP: That is my difficulty, as to whether he really did choose.

MR. BIGGAR: Yes, my Lord, he did. That, I think, is quite clear on the rule. The evidence is not part of the record until it is tendered.

HIS LORDSHIP: Until it is tendered; that is quite true. From the point of view of time, it was tendered, all of it, whether it had
10 to do with the explanation of the invention or whether it had to do with the meeting of an attack or possible attack on the invention. It was all tendered, from the point of view of time, during the plaintiff's opening.

MR. BIGGAR: It was put in as part of the plaintiff's case; yes, my Lord.

HIS LORDSHIP: No. I am not so sure of that. That is not my understanding. From the point of view of time it was put in during the plaintiff's opening of the case.

MR. BIGGAR: Oh, I asked my friend quite early on whether
20 he was going to use that Commission evidence as part of his case or not, because something he said early on suggested the possibility of his not doing so, and he said that he was.

HIS LORDSHIP: All of it was going in.

MR. BIGGAR: This was long before he put it in. There is no doubt about that. As a matter of fact, as I say, he put in a great deal of it that had nothing to do whatever with the defence or with any possible defence. I mean, there was no suggestion on the pleadings, I think, that would justify any of it as part of the defence or rather, as an answer to the defence. It was directed to
30 the kind of evidence such as the use of the invention, the experiments that had been made to develop it, and so on. I did not really follow the suggestion that my friend put it in when he did in exactly the same way as if he put none of it in and waited until it was necessary. He put it in as part of the case which we had to meet, and it would have been perfectly open —

HIS LORDSHIP: He put it in as part of the case, undoubtedly.

MR. BIGGAR: Which we had to meet, my Lord.

HIS LORDSHIP: No. Part of it was put in in answer to an attack which you were making.

MR. BIGGAR: Oh, it may have been directed to that, my
40 Lord; but it was put in at the trial, and we could not disregard any part of it. I should like to make my position clear, if I may. Suppose my friend had opened the case narrowly, my Lord. We would have had quite a different case to meet. I mean, we would have directed our evidence in a wholly different way. We would

For Plaintiff—A. H. Higgins—Re-Examination

have given our evidence in its proper order, without regard to anything that the plaintiff had said. I mean, we would have had before us, to meet, a *prima facie* case on the patent and a *prima facie* case on the infringement. That would have led us into a completely different direction of our evidence that we were led into by my friend making all this part of his evidence or part of his case.

HIS LORDSHIP: If it has no bearing on it, it would have made it more difficult to make your case.

10 MR. BIGGAR: We would have done it in quite a different way, and we could have made objections with regard to the rebuttal of an entirely different character from the character of the objections that we can now make with regard to the rebuttal. We took the case as my friend made it, with the Commission evidence, and met it.

HIS LORDSHIP: I do not quite see how you can really say that the plaintiff is breaking up his rebuttal.

MR. BIGGAR: Not breaking up his rebuttal; I do not say that.

HIS LORDSHIP: Is that not what it is?

20 MR. BIGGAR: No, my Lord, not breaking up his rebuttal. As a matter of fact, if he did not put that Commission evidence —

HIS LORDSHIP: The answer to the attack made on the patent is no part of the plaintiff's case whatsoever?

MR. BIGGAR: Not if he did not want to use it, my Lord.

HIS LORDSHIP: So it cannot be a division of the plaintiff's case.

MR. BIGGAR: That is what it is, my Lord, because he made a case which we have to meet.

HIS LORDSHIP: I see that.

30 MR. BIGGAR: If I may ask your Lordship to imagine a situation which has not arisen, that my learned friend proved the patent and the infringement and stopped and told your Lordship nothing more than the contents of the patent and the fact of infringement —

HIS LORDSHIP: Then if there were no more evidence he would get judgment in his favour.

40 MR. BIGGAR: Exactly; judgment would go if there was no more evidence. Now, the defendants would have led evidence in support of such of the defences as they could support by evidence and none of this Commission evidence would have gone in at all because there would not have been anything to rebut. We would not have been able to make all the points that I opened here. I would have had to abandon some points that I might have been able to make, but none of this evidence would have gone in because none of it would have been rebuttal.

For Plaintiff—A. H. Higgins—Re-Examination

MR. GOWLING: I wonder if my friend is quarrelling about the use of the terms "reply" or "rebuttal." I do not think there is any misunderstanding. I have been using the term as applying to evidence to meet the defendant's case against the patent.

HIS LORDSHIP: Are you drawing a distinction between reply and rebuttal?

MR. GOWLING: No, I was not. I don't know whether my friend is or not. Perhaps the words may be technical. They have never been considered such by this court. When I used the terms
10 "reply" and "rebuttal" I meant in answer to the defendant's case. I do not think there is any misunderstanding but I do not want it left on the record as though there is.

MR. BIGGAR: But your Lordship sees that we have directed our evidence on the basis of all this Commission evidence being part of the plaintiff's case. I am sure our evidence would not have taken the same position. That was my concern early in the trial when I first raised the question of the Commission evidence because I wanted to know what direction the defendant's case ought to take, what evidence the defendants ought to lead, and that having been
20 put in that determined the kind of evidence that the defendants led. If the whole thing is based on that there are a great many things I should not have proved at all if the Commission evidence had not been part of the plaintiff's case. There might have been other things I would have proved that I have not proved though I expect that at least part of this evidence would be put in as part of the plaintiff's case, but the defendant's case might have been worlds different if this had not been put in.

HIS LORDSHIP: Well, it is all in.

MR. BIGGAR: Put in as part of the plaintiff's case which I
30 had to meet.

HIS LORDSHIP: The only case you had to meet was the validity of the patent and the infringement.

MR. BIGGAR: I am sorry, my Lord, I have not made myself clear. A great deal of the evidence that my friend put in as part of his case was evidence that I could use against the patent and did not require to give initially by witnesses called by me. If my friend had not put it in then I could have given so much evidence as I thought advisable in support of the defences I have raised, and a great deal of the Commission evidence would have been
40 inadmissible in rebuttal. It was admissible in opening.

HIS LORDSHIP: Why would it be admissible in opening and not be admissible in rebuttal? I can understand why it would not be admissible in rebuttal, a good deal of it, and a good deal of it is left in that position of being irrelevant evidence.

MR. BIGGAR: Because the plaintiff can always anticipate defences if he likes; there is no rule that prevents him doing so.

For Plaintiff—A. H. Higgins—Re-Examination

HIS LORDSHIP: That is true, but I must say that my training—and perhaps I am dealing with it subjectively—has been not to anticipate.

MR. BIGGAR: No doubt, my Lord, but as a matter of fact any plaintiff is perfectly free to anticipate if he likes.

HIS LORDSHIP: He certainly would not be if there were a strict adherence to the necessity of having proof and pleadings coincide with one another.

MR. BIGGAR: Perfectly true, my Lord, but the defendant has
10 to meet the case made, the evidence given.

HIS LORDSHIP: If you had the rules, for instance, that still apply in some of the American states and that always applied previously in England you were never allowed to adduce proof outside of the pleadings. That belonged to your opening, as I understand it.

MR. BIGGAR: Of course, the difference in the rule about cross-examination has existed as between England and the United States but, of course, in the United States and in the province of Quebec—

HIS LORDSHIP: The cross-examination rule in the province of
20 Quebec is quite different.

MR. BIGGAR: I think that the broader cross-examination rule has always been in effect in England.

HIS LORDSHIP: I agree with you.

MR. BIGGAR: But there has never been any suggestion at any time that a plaintiff was not entitled if he desired—and it is often desirable—to anticipate defences, but once he has anticipated defences he is not entitled to strengthen them by rebuttal. There is, of course, the stronger thing that it is not a contradiction of any evidence given by the defendant. He is entitled to contra-
30 dict anything the defendant has said. I do not mind that a bit. I make no objection to that.

HIS LORDSHIP: How would you have got Bulletin No. 2 before the court?

MR. BIGGAR: I would have read such passages from Mr. Gregory's evidence as were required for the purpose as part of my case.

HIS LORDSHIP: Quite so. Then if you had followed that course, and that is the only introduction of Bulletin No. 2—that is the way it got introduced—would the plaintiff not be entitled
40 to adduce all the facts as to how that bulletin came into existence and relating to the bulletin in rebuttal?

MR. BIGGAR: You mean if there had been nothing else?

HIS LORDSHIP: If Bulletin No. 2 had come before the court in the manner we are now studying.

For Plaintiff—A. H. Higgins—Re-Examination

MR. BIGGAR: If the Commission evidence had not gone in, if Gregory's evidence had not gone in and Williams' evidence with regard to his relations with Martin had not gone in —

HIS LORDSHIP: The Commission evidence is all in; it is put in.

MR. BIGGAR: I say it was put in as part of the case that the defendant had to meet, my Lord.

HIS LORDSHIP: Suppose there had been no agreement as to the use of the examination for discovery of Gregory; you could have put in as part of the defendant's case only those passages
10 that related to this exhibit G-3.

MR. BIGGAR: I could have limited myself.

HIS LORDSHIP: You could have limited it yourself to that. Then, if you had done so, the plaintiff could have put in all or any part of the examination.

MR. BIGGAR: Of course, I might prove the bulletin probably by Martin, for example. You see the reason my friend put in that examination for discovery was that if he refrained from putting it in he had to take the chance of my putting in some of it. Suppose
20 I had refrained from putting in any of it and had given my evidence some other way; he could not have put in one word of Mr. Gregory's evidence.

HIS LORDSHIP: When was this agreement first arrived at as to the use of the examination for discovery?

MR. BIGGAR: It was made in this way. Mr. Smart was cross-examining Mr. Williams and he said —

HIS LORDSHIP: On Commission?

MR. BIGGAR: On the Commission, yes, and he said, "Now, there are certain questions" — I am stating my instructions, your Lordship — oh, about Gregory, my Lord?

30 HIS LORDSHIP: I am speaking now only about Gregory because the Commission evidence stands on one footing. It is returned to the court by an officer of the court.

MR. BIGGAR: Yes, my Lord, but it is not a part of the record of the trial at all until it is offered in evidence.

HIS LORDSHIP: That seems to be so, too.

MR. BIGGAR: That is under rule 169.

HIS LORDSHIP: On that I am not just clear. When a party takes out an order for the examination of a witness on commission has he got any choice about whether the evidence goes in or not?

40 MR. BIGGAR: Yes, my Lord.

HIS LORDSHIP: Has he?

MR. BIGGAR: Oh, yes; as a matter of fact, rule 169 makes this provision, that either party may offer this evidence taken on commission.

For Plaintiff—A. H. Higgins—Re-Examination

MR. GOWLING: We discussed that in opening, and as your Lordship will recall, I did not agree with my friend's proposition, but I am not going to re-argue it unless your Lordship wishes.

MR. BIGGAR: Your Lordship sees that the position under the rule is that whichever party asks for the issue of an order for a commission to take the evidence of any witness that order is executed by the commissioner to whom it is addressed. The evidence is taken and returned to the court. Then, when it has been filed in court either party may ask the court. It is not the party
10 taking the commission to whom the right is limited. It is either party may then use that evidence.

HIS LORDSHIP: The court may empower any party in any such case or matter to give such deposition in evidence then.

MR. BIGGAR: Quite so, and it is not in evidence until it has been tendered by the party. Your Lordship sees what my friend might have done would have been not to tender it as part of his case. Your Lordship understands that. I mean that there was no obligation on him to put it in in evidence when he did.

HIS LORDSHIP: Your contention being that under the rule the
20 court may empower him to do so.

MR. BIGGAR: That is it, but I mean also there was no obligation on him to do so.

HIS LORDSHIP: There may be some argument as to whether that is a matter to be covered by the Commission order.

MR. BIGGAR: It is not, my Lord. I have the orders before me and they are silent. I have looked at the Commission orders. The Commission simply directs that the plaintiff be at liberty to issue and that the Commission include the examination for discovery of Gregory — this is the New York one — and that the
30 Commission be directed to Augusta P. Boos, and that the costs be costs in the cause to the successful party.

HIS LORDSHIP: And nothing in the Commission order itself with regard to empowering —

MR. BIGGAR: Nothing in the Commission order, and that is equally true of the San Francisco Commission which was a separate order. So that you see my friend might have, as your Lordship has pointed out, restricted his case to a very narrow case and put in none. Then, as I say, we would have directed our evidence probably in quite a different way, and possibly with different witnesses.
40 We certainly would not have put in our evidence as we did. Then, I do not say that in this case we would have liked but we could have, if we had liked, asked your Lordship to allow us to introduce the evidence of Williams, Keller, and Wilkinson.

HIS LORDSHIP: Not Gregory.

MR. BIGGAR: Then, with regard to Gregory we are in a different position. We could have put the whole of it in if we had

For Plaintiff—A. H. Higgins—Recalled

liked because we can put in the whole of the examination. We could have put in part of it.

HIS LORDSHIP: Any part, yes.

MR. BIGGAR: In which event since the plaintiff is a corporation my friend can put in the rest.

HIS LORDSHIP: Or any part of it under our rule.

MR. BIGGAR: Yes, I think your Lordship is right. But the rest they can put in is not merely that which is relevant to the portions that the opposite party uses. The right of the party
10 whose witness is examined extends to any other part of it irrespective of its connection with the part used by the opposite party.

HIS LORDSHIP: May put in and use the remainder of the examination of the officer or any part of it as evidence on the part of the corporation — Rule 138.

MR. BIGGAR: Yes. Then, if we did use the evidence at all and did not give any evidence which entitled the plaintiff to rebut by giving the evidence that these witnesses gave then the Commission evidence would not have gone in at all.

HIS LORDSHIP: Then you say that in reality Mr. Gowling
20 put in the evidence with regard to stanol, exhibit G-3 as part of his case?

MR. BIGGAR: Undoubtedly, my Lord, because there he did it more deliberately even than that, if possible, because with regard to that he had, when the evidence was taken, no right to put it in. I mean he had to depend on our using it.

HIS LORDSHIP: He had no right unless you put in some part of it.

MR. BIGGAR: That is what I was going to say, that he had no right to put it in. His right to put it in depended on our use
30 of part of it and if, for example, we had proved those of the facts contained in that evidence in some other way he would not have had the opportunity or right at any time to put that in.

HIS LORDSHIP: That is why I should like to know at what time the agreement was made with regard to the use of the examination for discovery of Gregory.

MR. BIGGAR: On the 11th of March of this year.

HIS LORDSHIP: When was the Commission evidence taken?

MR. BIGGAR: I will have to get your Lordship the correspondence file. I thought it was here.

40 HIS LORDSHIP: When was the Commission evidence taken?

MR. BIGGAR: I have the date. It was taken in April in San Francisco —

MR. FINLAY: February 1st and 2nd, in New York.

HIS LORDSHIP: Who were examined in New York?

For Plaintiff—A. H. Higgins—Recalled

MR. BIGGAR: Gregory and Williams.

HIS LORDSHIP: Pardon? —

MR. BIGGAR: Gregory and Williams.

HIS LORDSHIP: Williams on Commission?

MR. BIGGAR: Well, it was both in the same order. I mean the one order covered the examination of Williams for use at the trial and Gregory on discovery.

HIS LORDSHIP: Yes, but one was evidence on Commission and the other one was —

10 MR. BIGGAR: They were both in the same order.

HIS LORDSHIP: One was for the Commission evidence and the other was for the examination for discovery.

MR. BIGGAR: Yes, my Lord, I think that is right.

HIS LORDSHIP: That is my recollection, and that took place in February?

MR. BIGGAR: That took place in February.

HIS LORDSHIP: And then Keller and Wilkinson were examined on Commission in —

MR. BIGGAR: In April.

20 HIS LORDSHIP: When was the arrangement made as to the use for the examination for discovery?

MR. BIGGAR: In March, my Lord, in between those two sets of examinations. I have not got the whole correspondence file but in the meantime I can refer your Lordship to a letter of which I have an extra copy.

HIS LORDSHIP: I guess these shortcuts do not pay after all.

MR. BIGGAR: Not very much, my Lord. I have a letter written by Mr. Smart to Ewart Scott on the subject of Bulletin No. 2, and under date of the 11th March, 1944, he says:

30 “It would be sufficient for my purpose to have an agreement that this bulletin (Martin No. 2) was received by Mr. Ballot during the year 1915, but I think Mr. Cohen stated that he was prepared to admit that it was received by Mr. Ballot some time during the month of October, 1915. The reporter may not have taken this down in view of the amount of conversation that was proceeding at the time. In any event I should be glad to know whether you will make this admission. If it is made, I should be glad to agree that Dr. Gregory’s evidence should be put in as part of your case.”

40 I can get the rest of the letters in a moment. I am going to read your Lordship the answer from the plaintiff’s solicitors which is dated on March 18th after seven days’ consideration.

“Referring to the second paragraph of your letter of the 11th instant we are now instructed to say that we are willing to

For Plaintiff—A. H. Higgins—Recalled

stipulate that Mr. Ballot, who was in London in the latter half of 1915, was sent a copy of Bulletin No. 2 after its receipt by Mr. Higgins on September 14th, 1915, probably in Dr. Gregory's letter to him of September 17th, 1915 (defendant's exhibit on discovery No. 10) and that Mr. Ballot did not receive any copy of Bulletin No. 2 at any earlier time."

That is as far as I can carry it at the moment.

HIS LORDSHIP: So you could have put that exchange of letters
10 in and put Bulletin No. 2 in in that way.

MR. BIGGAR: As part of our case, yes.

HIS LORDSHIP: So you were not under any prejudice as far as the arrangement with Mr. Gowling was concerned.

MR. BIGGAR: Your Lordship will find that when Mr. Gowling came to the Commission evidence at page 235 —

HIS LORDSHIP: Would you mind waiting for a moment and I will get my copy so I can follow along with you.

MR. BIGGAR: I do not want to read too much of this but the situation really becomes very clear when you look at the passages
20 that occurred in the discussion of counsel. I have been completely misled if it is now contended that they do not form part of the plaintiff's case. Your Lordship sees at the top of page 235 Mr. Gowling says:

"My Lord, Mr. Higgins is the only witness being called by the plaintiff in the opening of this case. Before closing our case, I would like to have the Commission evidence considered as having been read into the record, and I would like to include with the Commission evidence the examination on discovery of Dr. Gregory. That is being treated as Commission evidence
30 through the kindness of my friends."

MR. GOWLING: May I say I am quite positive I said, before closing "the" case. My friend may have misunderstood it.

MR. BIGGAR: I am only reading what is in the transcript.

HIS LORDSHIP: I do not think it matters whether it is "the case" or "our case".

MR. GOWLING: I do not think my friend misunderstood what I had in mind.

MR. BIGGAR: I am sorry, but I never had the remotest idea you were putting it in on any other basis than as part of your case.
40 I would have directed the defendant's case in quite a different way if I had not understood this was all part of your case.

MR. GOWLING: I do not think that matters in any event when the entire statement relating to this evidence is read.

HIS LORDSHIP: I think the statement must be read in its entirety, Mr. Biggar. I know the difficulty occurred to me in con-

For Plaintiff—A. H. Higgins—Recalled

nection with the matter. It is difficult to separate what relates to the plaintiff's case in opening and what would properly be rebuttal by the plaintiff. Mr. Gowling said it was virtually impossible to do so.

MR. BIGGAR: He said he did not think the point would arise, but I can assure your Lordship that as far as I was concerned I had not the remotest suspicion that this evidence was being put in otherwise than as Mr. Gowling is there reported to have stated, as part of his case. I would have taken the most violent objection to any other method of introducing it because I would have liked to know
10 on what basis it was before your Lordship. It is stated in terms there that it was to be taken as having been read as part of our case, according to the report, and that was the way I understood it. It made just a revolutionary difference.

HIS LORDSHIP: I do not quite see how it made a revolutionary difference.

MR. BIGGAR: Because then, my Lord, I could have said, "I can object when it is tendered later to its not being rebuttal and have nine-tenths of it struck out."

HIS LORDSHIP: You have still got that right because all reser-
20 vations were made as to admissibility.

MR. BIGGAR: Well, your Lordship overcomes me.

HIS LORDSHIP: Perhaps that is as to admissibility but not on the question of whether it is opening or rebuttal.

MR. BIGGAR: Your Lordship overcomes me. I had no idea at all that having regard to the way it went in—

HIS LORDSHIP: All the evidence went in. I must say I was puzzled as to what portion of it was going in as opening and what was going in as rebuttal. I must say I was puzzled.

MR. BIGGAR: I was sorry there has been that misunderstanding,
30 my Lord, but Mr. Gowling said, "that is the chance we must take I am of the opinion that the evidence is in whether we want it or not."

HIS LORDSHIP: I feel this, that if the evidence had gone in without any attempt having been made to take a shortcut, if it had been put in in the ordinary way, the plaintiff confining himself to what was opening, or perhaps a little more than a bare opening, and the defendant reading other portions, then the plaintiff would have been in the position of putting in as rebuttal not only commission evidence but any other rebuttal evidence, and then he would not have been dividing his rebuttal. It seems to me that in reality,
40 having regard to the run of the events, the question is whether he divided his rebuttal.

MR. BIGGAR: I cannot agree with your Lordship on that.

HIS LORDSHIP: Anticipating the defence was in reality no part of the plaintiff's opening case. He did not have to do that.

For Plaintiff—A. H. Higgins—Recalled

MR. BIGGAR: Would your Lordship suggest that, for example, the examination of Mr. Higgins with regard to what is meant by “alkaline xanthate” was not anticipating part of the defence?

HIS LORDSHIP: It might be that, but it might also be an explanation of a term used in the patent.

MR. BIGGAR: Your Lordship will remember that the rules on this point are extremely strong. I do not know if I might direct your Lordship’s attention to those words. If I had had any idea that this commission evidence was not part of the plaintiff’s case, I
10 certainly would have cross-examined Mr. Higgins on any points to which his attention had been directed. Your Lordship sees what Rule 18(2) says:

“Except by special leave of the Judge”

That really means in cases of surprise or something of that kind.

“and on such terms as the Judge may impose, the party entitled to begin shall not adduce evidence in rebuttal on any point upon which any witness called by him in opening was examined in chief, nor shall he be allowed to recall any witness already called by him in opening for examination in rebuttal upon any point
20 upon which such witness has been previously cross-examined.”

You see, my Lord, if I had had the slightest idea that my friend was not using all this commission evidence as part of his case, I could have cross-examined Mr. Higgins on the points dealt with in the commission evidence with which I was not satisfied, but I preferred as a matter of discretion to refrain from doing that.

HIS LORDSHIP: I suppose that objection could be met by allowing you to do that.

MR. BIGGAR: It is no good to me now, my Lord.

HIS LORDSHIP: Why?

MR. BIGGAR: Because our witnesses have gone. They have
30 been examined, cross-examined and re-examined. We have given all our evidence. I had an opportunity on the footing of Mr. Higgins having been called as part of the plaintiff’s case, and I understood my friend to say that the commission evidence was going in as part of his case. On that understanding the trial took the course it did. I cannot put it more strongly, my Lord than that there is no precedent that I have ever heard of for a plaintiff splitting his case.

HIS LORDSHIP: The whole issue is whether he is splitting his rebuttal.

MR. BIGGAR: I cannot agree with your Lordship’s statement
40 there. It is not a question of splitting the rebuttal, but of splitting his case, the opening case.

HIS LORDSHIP: On that I must disagree with you. I think it is a matter of splitting the rebuttal rather than of splitting the case, because it was not part of the plaintiff’s case to anticipate the defence.

For Plaintiff—A. H. Higgins—Recalled

MR. BIGGAR: I would refer your Lordship again to the principle in *Jacobs v. Tarleton*. The plaintiff there did not need to give the evidence that he did give. He anticipated one possible defence, and it was held that he must not anticipate another. If he wanted to prove that the plaintiff was a holder for value without notice, then he should have given that evidence, but he confined himself to part of the defendant's case, that the endorser did not endorse, and it was held that having anticipated that defence he could not anticipate another.

10 HIS LORDSHIP: It is very unfortunate that this misunderstanding has arisen between counsel. But taking the view that I do, that the commission evidence was introduced as a short-cut so that it would all be before the Court and my general understanding, whether correct or incorrect, being that appropriate portions were to be properly regarded as applicable to the case on opening, and other parts to be regarded as rebuttal, leaving in the air those portions that would be irrelevant because the defendant has not adduced evidence that those portions were designed to meet, I cannot think that the plaintiff is really splitting the rebuttal.

20 MR. BIGGAR: My Lord, the plaintiff is not splitting the case he had to make; he is splitting the case he chose to make. Phipson has put the point very clearly—

HIS LORDSHIP: May I ask you this first: You say you are now prejudiced by the course that has been taken.

MR. BIGGAR: Exactly, my Lord.

HIS LORDSHIP: On the ground that you would have cross-examined Mr. Higgins on certain matters?

MR. BIGGAR: Yes.

30 HIS LORDSHIP: And you say that now your witnesses have gone?

MR. BIGGAR: One of them at least, my Lord.

HIS LORDSHIP: One is still present?

MR. BIGGAR: Yes.

HIS LORDSHIP: The other one would be available, I suppose?

MR. BIGGAR: As a matter of fact, my Lord, we are getting into the realm of imagination. I do not know.

40 HIS LORDSHIP: I think it is within the power of the Court to deal with some of these matters. My inclination is to allow Mr. Gowling to proceed with his examination on the facts relating to this bulletin. Then, if you still feel you have been prejudiced I will allow you to cross-examine Mr. Higgins.

MR. BIGGAR: I do not suppose your Lordship could prevent me from cross-examining him.

HIS LORDSHIP: No; you may cross-examine him, of course; and in the course of your cross-examination you may put to him the

For Plaintiff—A. H. Higgins—Recalled

questions that you would have put to him in cross-examination before. Then I will allow you to recall your witnesses.

MR. BIGGAR: Mr. Higgins has had the benefit of my opening statement, so he knows now exactly what points I have taken. That is knowledge which he did not have when he was in the box before. I do not think the situation can be repaired in that way, my Lord.

HIS LORDSHIP: I am going to assume that that will have no effect upon Mr. Higgins.

MR. BIGGAR: I am not suggesting that he would deliberately
10 change his evidence. What I am suggesting is that it will colour it, because he knows exactly the points that I have taken.

HIS LORDSHIP: Now—

MR. BIGGAR: When your Lordship was cross-examining witnesses, did your Lordship tell them exactly the object of your cross-examination?

HIS LORDSHIP: No, but very often the witness saw it more clearly than I did.

MR. BIGGAR: This witness has had the benefit now of knowing just what our stand is. May I call your Lordship's attention to the
20 evidentiary rule for the purpose of protecting the defendant?

HIS LORDSHIP: Who in this case is also in the nature of a counter-plaintiff.

MR. BIGGAR: No, I do not agree with your Lordship. The defence that we have raised here is a statutory defence. The Patent Act says that a patentee cannot succeed on an invalid patent, and our defence to the claim of infringement is strictly within what is permitted by the Act.

In Phipson, the last edition which is in the Library, which is the 8th edition, at page 37 — and I will not read it all, because it
30 would be unnecessarily long — in the passage which leads up to *Jacobs v. Tarleton*, he begins in black letters: "Where one or several issues. Splitting a case." He says:

40 "Where there is a single issue only to be tried, the party beginning must exhaust his evidence in the first instance, and may not split his case by first relying on *prima facie* proof, and when this has been shaken by his adversary, adducing confirmatory evidence. Where there are several issues, any one of which lies upon the plaintiff, he may, at his option, either (1) go into his whole case (both original and rebutting) in the first instance; or (2) as is more usual, merely adduce evidence on those issues which lie upon him, reserving the right to call rebutting evidence should his opponent make out a *prima facie* case. Thus —"

Then he goes on with a libel action, and so on. Then after quoting the case, ten lines down:

For Plaintiff—A. H. Higgins—Re-Examination

“The rebutting case, however, may not in general be divided any more than the original one.”

Then in the next paragraph, again in black letters “Evidence in Reply and Rebuttal”, and then following that in italics, “Must not be confirmatory,” we find:

“Evidence in reply, whether oral or by affidavit, must, as a general rule, be strictly confined to rebutting the defendant’s case and must not merely confirm that of the plaintiff. Thus —”

And he gives some examples.

10 HIS LORDSHIP: That is at page what?

MR. BIGGAR: That is at pages 37 and 38, of Phipson, my Lord. Then he says that that is in the discretion of the Judge, and he adds, on page 38: “and confirmatory evidence in rebuttal will generally be allowed when the party tendering it has been misled.” That is, misled by something the defendant has done, or taken by surprise. There is the position, my Lord.

HIS LORDSHIP: What about the rule of Phipson, Mr. Gowling?

MR. GOWLING: My Lord, that rule in Phipson, my submission is, does not apply in a case of this kind. That is where there
20 is a single issue before the Court. Here there are two issues, one as to the infringement of the patent — which is presumably valid, as I stated in opening — and the other is that the defendants, after answering the claim for infringement, have invariably then presented their case attacking the patent, after which, I am sure I am safe in saying —

HIS LORDSHIP: It would also be a defence. It is a defence to the infringement.

MR. GOWLING: Yes. But as a matter of convenience, the defendant presents his defence to the infringement and at the same
30 time, without getting up and saying, “I am now attacking the patent” presents the evidence attacking the patent.

HIS LORDSHIP: Putting in two things at the same time.

MR. GOWLING: Yes, two things at the same time; which does not alter the fact, my Lord, that there are two issues before the Court.

HIS LORDSHIP: There is only one issue before the Court, and that is whether there has been an infringement; and if the plaintiff has not valid letters patent, there has been no infringement.

MR. GOWLING: That is right, my Lord.

40 HIS LORDSHIP: There is really only one issue before the Court.

MR. GOWLING: When I said there were two issues, my Lord, I was simply taking the position which I submit has always been taken in this Court in patent cases. The plaintiff opens very much as I have done.

For Plaintiff—A. H. Higgins—Re-Examination

HIS LORDSHIP: That was quite proper.

MR. GOWLING: Yes. The defendant then submits whatever evidence he wishes in order to prove the patent to be invalid, and the plaintiff is then invariably allowed to answer the defendant's case. Now, I do not like these misunderstandings with my friend —

HIS LORDSHIP: I am exceedingly sorry that they have arisen, and I think that they are misunderstandings.

MR. GOWLING: Yes, my Lord.

10 HIS LORDSHIP: I must say that my general understanding of the situation was that although all of the evidence was put in at the one time, that portion of it which was referable to the opening would be part of the opening, and that part which was referable to rebuttal, part of the rebuttal.

MR. GOWLING: Yes.

HIS LORDSHIP: Although it was all put in at the one time.

MR. GOWLING: Yes, my Lord.

HIS LORDSHIP: That is my general understanding of the situation.

20 MR. GOWLING: Yes, my Lord. Your Lordship will remember that my friend Mr. Biggar appeared with Mr. Scott and myself in your office. I should like to say — and I am sure my friend will not contradict me — that we appeared in your Lordship's office at his request — my friend's request; the reason being that he had approached Mr. Scott and myself in the Library, suggesting that we find some way of avoiding the reading of the testimony in the beginning of the case, the Commission testimony.

MR. BIGGAR: Yes. If I had not suggested that it would have all been read through as part of the plaintiff's case.

30 MR. GOWLING: No. It would not have all been read through. We were prepared, although we certainly did not look forward to it, to attempt to analyze this Commission evidence in the opening of our case, pointing out to your Lordship what we wished to put in in opening and what we considered as reply. But as I think I made clear in opening, it was almost impossible to segregate it at that time, as we did not know whether Mr. Martin would appear. That was the reason I said we took some chance in taking this evidence in advance as we were not sure what case had to be met, but we adopted the course of not reading the Com-
40 mission evidence or attempting to divide it, because of my friend's suggestion, with which we readily agreed, that we make some arrangement with your Lordship to avoid it.

I do not think my friend is going to be very seriously prejudiced by what has happened. As I suggested, certainly as far as I am concerned, I have attempted to conduct this Case in the

For Plaintiff—A. H. Higgins—Re-Examination

manner in which other patent cases have been conducted in this Court for many years, and I am very sorry that this misunderstanding has arisen, both because of your Lordship's position and because of the relationship between my friend's office and my own, as well as Mr. Scott. Your Lordship's suggestion that my friend be permitted to cross-examine Mr. Higgins falls right within the ambit of rule 300 which, as your Lordship knows, entitles you to deviate from the rules whenever your Lordship sees fit. Perhaps if your Lordship sees fit, all further evidence could be taken subject
10 to objection.

HIS LORDSHIP: I think that is a useful suggestion, and we may proceed with the examination of Mr. Higgins, subject to Mr. Biggar's objection.

MR. GOWLING: 19. Q.—Mr. Higgins, do you know R. B. Martin —

HIS LORDSHIP: I think perhaps it might be desirable to go on a bit beyond 4 o'clock today.

MR. GOWLING: Yes, my Lord.

HIS LORDSHIP: Perhaps we might now recess for ten minutes.

20 MR. GOWLING: Very well, my Lord.

—At 3:55 P.M. Court took recess.

MR. GOWLING: 20. Q.—I think I was just about to ask you, Mr. Higgins, whether you know R. B. Martin, the author of Bulletin No. 2 which was filed as exhibit G-3? A.—Yes, I do.

21. Q.—When and where did you first meet Mr. Martin? A.—I met Mr. Martin first during the last two or three days of February or the first two or three days of March in 1915 at the office of Minerals Separation Limited in New York.

22. Q.—Was there anyone else present at the time you met
30 him? A.—Yes, to the best of my recollection at the first meeting there were present Mr. Ballot and Mr. Salinger.

HIS LORDSHIP: 23. Q.—Who? A.—Ballot.

MR. GOWLING: 24. Q.—What was the other name? A.—Salinger, and I believe Dr. Gregory was also there.

25. Q.—Who are Dr. Gregory, Mr. Ballot and Mr. Salinger? A.—Mr. Ballot and Dr. Gregory were directors of Minerals Separation Limited, Mr. Ballot being chairman.

HIS LORDSHIP: 26. Q.—Of Minerals Separation Limited? A.—Yes.

40 27. Q.—That is the English company? A.—Yes, my Lord. Mr. Salinger was the purchaser of ores for Beer Sondheimer and Company.

MR. GOWLING: 28. Q.—On whose instructions were you acting? A.—On Mr. Ballot's instructions.

For Plaintiff—A. H. Higgins—Recalled

29. Q.—What particular instructions were given to you in so far as they relate to Mr. Martin? A.—I am not quite sure whether there wasn't a second meeting at which Mr. Salinger was absent but I was told Martin had some inventions he desired to sell.

30. Q.—Do not say what you were told. I would simply like to know the instructions which were given to you. A.—The instructions were to examine certain inventions Martin had and see whether they had any value.

31. Q.—Did you know anything of Martin's relationship with
10 Minerals Separation Limited? A.—Yes, I know the contracts that were made with Minerals Separation Limited and the American Syndicate.

32. Q.—Were they the contracts filed as exhibits W-1 and W-2? A.—Yes.

MR. GOWLING: The witness has already seen these documents, my Lord, so I thought it would save time not to bring them up again.

33. Q.—Did you follow the instructions which were given to you? A.—I did.

20 34. Q.—How did you carry out those instructions? A.—By providing a lab for Martin to work in and supervising the work as far as I could, seeing everything that he did.

35. Q.—I would like you to go back a step, Mr. Higgins, and let me know where you saw Martin before that time? A.—Before February, 1915?

36. Q.—No, before you provided the laboratory to which you referred. A.—I did not see him again until about the 1st of June, 1915. The laboratory was not fitted up entirely for another two or three weeks.

30 37. Q.—Prior to the fitting up of the laboratory did Mr. Martin make any disclosures to you as to the inventions?

MR. BIGGAR: Is that admissible, my Lord?

HIS LORDSHIP: I wonder — whether he made any disclosures to him —

MR. GOWLING: I am simply asking the question whether Martin made disclosures to Mr. Higgins as to Martin's inventions.

HIS LORDSHIP: He was instructed to investigate this.

MR. GOWLING: Yes, my Lord, and to investigate them he would have to obtain disclosure first, the point being that Mr.
40 Martin is set up as a prior inventor. Therefore I am introducing this evidence to show what inventions, if any, were made by Martin.

38. Q.—Were any of Martin's inventions disclosed to you? A.—Yes.

39. Q.—When and where did that take place? A.—I received from him Bulletin No. 1 and certain specifications relating to his inventions.

For Plaintiff—A. H. Higgins—Recalled

40. Q.—Was that the first disclosure which was made to you of his inventions? A.—I do not think so. I believe I had a conversation with him and Mr. Williams prior to the time that I received those documents.

41. Q.—Who was Mr. Williams? A.—Mr Williams was the patent attorney for Minerals Separation Limited and the American Syndicate.

42. Q.—Is he still alive? A.—Yes, he is.

43. Q.—Did you make any notes at that conference? A.—Yes,
10 I did.

44. Q.—Can you identify your notes if they are now produced to you? A.—Yes, I can.

45. Q.—These are the plaintiff's production No. 4. A.—Yes, those are my notes.

MR. BIGGAR: That is one of the objections we have already made to the Commission, my Lord. It is the same type of objection, that the information which Mr. Higgins or anybody else got from Mr. Martin in a conversation is not admissible against us.

HIS LORDSHIP: Not admissible against the defendant.

20 MR. BIGGAR: Against the present defendant, yes, my Lord.

MR. GOWLING: In the particulars of objection filed by my friend, paragraph 5(D) it says:

“The invention of Rutherford B. Martin (if in fact an invention) was made available to the public before October 23, 1924, by its disclosure in the year 1915 or subsequently to Dr. S. Gregory, A Howard Higgins, W.A.B. Waling and other persons employed by or associated with the plaintiff company.”

I am asking Mr. Higgins what was disclosed to him at that time.

30 MR. BIGGAR: We have not given any evidence about that, my Lord.

MR. GOWLING: Does my friend abandon that defence?

MR. BIGGAR: Certainly; I have only given evidence with regard to Bulletin No. 2. That is the only thing there has been reference to, and some tests made in accordance with Bulletin No. 2.

MR. GOWLING: Then I will revise the question.

HIS LORDSHIP: So far Mr. Higgins has referred only to Bulletin No. 1?

40 MR. GOWLING: Yes, my Lord. That really came a little later and I took him back a step because I just observed that paragraph in the particulars which I had previously overlooked.

46. Q.—Mr. Higgins, at that meeting were the contents of Bulletin No. 2 disclosed to you? A.—No.

47. Q.—Was anything that is found in Bulletin No. 2 disclosed to you? A.—Yes, I believe there is something there.

For Plaintiff—A. H. Higgins—Recalled

HIS LORDSHIP: Pardon?

THE WITNESS: I believe there is some of it in Bulletin No. 2.
48. Q.—I did not quite understand that answer—some of what?

MR. GOWLING: The witness stated some part of the contents of Bulletin No. 2 were disclosed to him at that meeting in 1915 in the office of Mr. Williams.

HIS LORDSHIP: Oh, yes.

MR. GOWLING: 49. Q.—Just what was disclosed to you at that meeting which you might now find in Bulletin No. 2?

10 MR. BIGGAR: I object to that because I think the witness is speaking about a discussion in March. Bulletin No. 2 was not dated until the 15th of August, and I think the evidence is that it did not reach Mr. Higgins until some time in September. Therefore, conversations between the witness and Mr. Martin in March are hardly relevant.

HIS LORDSHIP: I did not quite understand the answer that was made. Would the reporter mind reading those questions.

Reporter reads:

20 “47. Q.—Was anything that is found in Bulletin No. 2 disclosed to you? A.—Yes, I believe there is something there.

HIS LORDSHIP: Pardon?

THE WITNESS: I believe there is some of it in Bulletin No 2”.

THE WITNESS: Some of the notes that I made at the end of February or the beginning of March.

HIS LORDSHIP: 60. Q.—That is, something that was disclosed to you in February, 1915? A.—Yes.

61. Q.—Subsequently appeared in Bulletin No. 2? A.—Yes.

30 MR. GOWLING: I think the witness should be allowed to state what if anything that is found in Bulletin No. 2 was disclosed to him at that meeting in February.

HIS LORDSHIP: Yes.

MR. GOWLING: He stated that he had been instructed to make an investigation of Martin’s invention, and it was done pursuant to a contract.

40 MR. BIGGAR: My Lord, there is a wide difference between what my friend is now asking and what is, in my submission, the only relevant point, even if it extends to Bulletin No. 2, and that is that what we are putting forward is that the invention or as much information as is contained in Keller’s specification was made available to the public—that is, to Minerals Separation Syndicate (1913) Limited, the then predecessor of the plaintiff—by the circulation of Bulletin No. 2 in the latter part of August. Now my friend is directing himself to what are obviously confidential communications

For Plaintiff—A. H. Higgins—Recalled

between two employees of Minerals Separation Syndicate (1913) Limited or, rather, I think from what Mr. Higgins said one was an officer of Minerals Separation Limited, the English company. At all events, the two things are as far apart as the poles. What we say is that the information Keller gave was all in a document of August 15 communicated to the companies.

MR. GOWLING: My friend said "Keller," and I think he meant to say "Martin."

MR. BIGGAR: No, I meant Keller, that everything that was in
10 Keller was in that Bulletin communicated to the companies in 1915. Now, we have not said a word about any confidential communications—if they are confidential as I suppose—between employees of those companies, and I submit it is pure hearsay.

MR. GOWLING: Is my friend abandoning the defence that Martin was a prior inventor to Keller and relying solely on Bulletin No. 2 as a publication?

MR. BIGGAR: As a disclosure to the public, that is to say to the Minerals Separation people, both companies, of as good information as is contained in Keller's specification. And then we rely also, as
20 your Lordship will remember, on the public use. But this is quite a different thing, upon which we have given no evidence at all.

MR. GOWLING: My friend has pleaded Rhetherford B. Martin as a prior inventor, and I now ask my friend whether or not he is relying on that plea. If he is, I submit I am entitled to show what if anything Martin invented.

MR. BIGGAR: I confine myself to Bulletin No. 2. That shows what Martin had found and communicated to these people.

MR. GOWLING: Bulletin No. 2 was a mere incident in Martin's
30 life.

MR. BIGGAR: Surely my friend is not now, without any cross-examination of our witnesses, going to say that Bulletin No. 2 does not mean what on its face it means. The interpretation of Bulletin No. 2 is not for a witness, it is for the Court; and my friend cannot direct any questions to this witness with a view to modifying the clear meaning of Bulletin No. 2 by reference to something that was told to this witness six months earlier.

HIS LORDSHIP: The meaning of Bulletin No. 2 could be made the subject of argument, I suppose.

MR. GOWLING: I asked my friend's witnesses if they knew Mr.
40 Martin, and they did not. I recall particularly that Mr. Bennett said he did not know, for instance, how Mr. Martin had boiled his stanols, and a number of other things relating to this bulletin. If my friend says that this Bulletin discloses an invention by Martin, and that Martin made that invention before Keller, my submission is that I am certainly entitled to show what if anything Martin really invented.

For Plaintiff—A. H. Higgins—Recalled

HIS LORDSHIP: And you would do that by giving evidence of what he disclosed?

MR. GOWLING: That is right, my Lord. My friend undoubtedly knows I am going to argue that Martin was merely experimenting, and never made an invention. If Bulletin No. 2 had been published in a scientific journal, that would have been an entirely separate defence. If my friend will rely on Bulletin No. 2 solely on the ground that it is a publication, then this line of questions is perhaps wrong; but if my friend still says that Mr. Martin made this invention before
10 Mr. Keller, then I submit that I am entitled to have the witness tell your Lordship what invention if any was actually made by Mr. Martin.

MR. BIGGAR: I do not want to be tied down too much, but what I rely on is Bulletin No. 2 as having shown that Martin had the same information in 1915 as Keller had in 1923. I am not excluding the possibility of my being able, by reason of the character of Bulletin No. 2 and its distribution, to say it was a printed publication. But the word "printed" in the appropriate section of the statute has never been interpreted.

20 HIS LORDSHIP: Is there some significance in the words that you have put within brackets in paragraph 5 of the Particulars of Objection, namely, "if in fact an invention"? You are not excluding the contention that it is not an invention?

MR. BIGGAR: We are not excluding the contention. We are not obliged to come down on one foot or the other in that respect.

HIS LORDSHIP: If by chance you choose to stand on one foot rather than on the other, why should not Mr. Gowling be permitted to go on with his questions?

MR. BIGGAR: Because, my Lord, we are saying that in 1915
30 Martin had the same information as Keller had in 1923. We do not care whether even Keller is an inventor. The point really is that whatever information Keller had in 1923, equivalent information was possessed by Martin in 1915, and that that information was communicated to the public—if we cannot use Bulletin No. 2 as a printed publication, there is the possibility that it may be a printed publication.

HIS LORDSHIP: You say that it was communicated to a number of persons, including Mr. Higgins?

MR. BIGGAR: There is English authority for suggesting that
40 in order to support his patent a patentee must give some evidence that his invention, his useful process or whatever it is, was not known or used by others before he made his invention. The probable answer to that under our statute is that the patent is made prima facie a valid patent.

HIS LORDSHIP: And the grant is in respect of a new and useful improvement.

For Plaintiff—A. H. Higgins—Recalled

MR. BIGGAR: Exactly.

MR. GOWLING: I think I am still in the same position, my Lord, so long as my friend leaves in paragraph 4, which sets up Martin as a prior inventor.

MR. BIGGAR: My friend has forgotten that he is on rebuttal and that we are not concerned now with anything except the evidence the defendant has given.

MR. GOWLING: My friend suggests that Bulletin No. 2 discloses an invention that Martin made in 1915.

10 HIS LORDSHIP: You may proceed, Mr. Gowling.

MR. GOWLING: Thank you, my Lord.

62. Q.—Mr. Higgins, I was asking you if by reference to your notes, or by relying on your memory, you could tell us what invention, what alleged invention disclosed in Bulletin No. 2 —

HIS LORDSHIP: “What alleged invention”?

MR. GOWLING: Yes, my Lord. I am not admitting it is an invention.

63. Q.—Mr. Higgins, I was asking you if by reference to your notes, or by relying on your memory, you could tell us what
20 invention, what alleged invention disclosed in Bulletin No. 2 was disclosed to you at your meeting with Mr. Williams. A.—The disclosure at the meeting with Mr. Williams includes all the disclosures in Bulletin No. 2, in substance, except grabanol.

64. Q.—Would you name the substances which were mentioned to you at that conference? A.—Colura, which was afterwards called kotrix in Bulletin No. 2, reconstructed oil, which covers minola, cinol, arenol and nitrola or natrola, which is the same as stanol.

100. Q.—Did you make notes which indicate the nature of
30 those products? A.—Yes, I did.

MR. BIGGAR: Has your Lordship ruled as to the propriety of this from the point of view of rebuttal?

HIS LORDSHIP: Yes.

MR. BIGGAR: I did not know.

MR. GOWLING: 101. Q.—Did anyone else make notes at that meeting as to what took place? A.—Yes, Mr. Williams did.

102. Q.—Were any arrangements made with Mr. Martin to test and demonstrate his invention? A.—Yes. That was the chief thing that he had to do, demonstrate their value.

40 103. Q.—What facilities were placed at Mr. Martin’s disposal? A.—He drew up lists of things he wanted in the way of apparatus and chemicals, and they were purchased for him; and I also obtained a number of ores for him to work with.

For Plaintiff—A. H. Higgins—Recalled

104. Q.—There is a document filed as Exhibit G-1, which is the plaintiff's production No. 5, and I think it is entitled "Martin's list of chemicals." Can you identify that document, Mr. Higgins?

MR. BIGGAR: What is the number of that, G what?

MR. GOWLING: G-1. It is our production No. 5.

MR. BIGGAR: That is an Exhibit.

THE WITNESS: Yes. That is a document Martin drew up. Naturally there were other things that he wanted, and he drew up additional lists, but that is substantially what it was. I notice
10 that it is to Dr. S. Gregory, Managing Director, Minerals Separation, American Syndicate (1913) Limited. Dr. Gregory was a Director of both Corporations.

HIS LORDSHIP: He was a director of both Corporations.

MR. GOWLING: Yes. That is the present plaintiff.

HIS LORDSHIP: And there was the English Corporation?

MR. GOWLING: Yes.

HIS LORDSHIP: And still is?

THE WITNESS: Minerals Separation Limited; yes, it still
exists.

20 HIS LORDSHIP: 105. Q.—And he was also a Director of the present plaintiff? A.—Yes.

MR. GOWLING: 106. Q.—I now produce plaintiff's production No. 8. Can you identify that?

MR. BIGGAR: Is that a new one?

MR. GOWLING: It is a letter from Mr. Martin to Dr. Gregory.

MR. BIGGAR: I really must object, my Lord, to letters addressed by Martin to anybody who is not a party to this action.

MR. GOWLING: That has been put in under our arrangement.

MR. BIGGAR: Well, it was subject to admissibility. I am
30 objecting to that.

MR. GOWLING: Oh, I see. Well, it could be perhaps accepted.

HIS LORDSHIP: What is the nature of it? Oh, yes, that was clearly understood.

MR. BIGGAR: It is a letter from Martin.

HIS LORDSHIP: From Martin to whom?

MR. GOWLING: To Dr. Gregory, my Lord, asking for further materials with which to work.

HIS LORDSHIP: Does this witness know anything about that?

MR. GOWLING: Yes, my Lord. It was handed to this witness.
40 I laid the foundation for it.

HIS LORDSHIP: Then wherein does it differ from the document, Exhibit G-1?

For Plaintiff—A. H. Higgins—Re-Examination

MR. GOWLING: I was laying the foundation for it in this way, my Lord, that the witness had stated that facilities were placed at Mr. Martin's disposal to prove his invention.

HIS LORDSHIP: Yes.

MR. GOWLING: I do not recall just how far I went with that, but I shall be glad to continue it to show the foundation for this letter.

HIS LORDSHIP: He asked for one list of chemicals.

MR. GOWLING: Yes — which has already been identified.

10 HIS LORDSHIP: As G-1.

MR. GOWLING: Yes.

HIS LORDSHIP: And then the witness identifies that list which was a request from Martin?

MR. GOWLING: Yes.

107. Q.—How did that Exhibit G-1 come to your knowledge? A.—It was given to me by Dr. Gregory, who told me to look into it and see whether it was reasonable; and if it were I could order the chemicals.

20 108. Q.—What was your position at that time with respect to Martin? Were you his superior? A.—I was the chief metallurgist for Minerals Separation Limited, and Martin was really under my wing to see that he got everything that he wanted, and show me the results of his invention.

109. Q.—And was this production No. 8 ever handed to you? A.—Oh, yes; I am sure it was.

110. Q.—By whom? A.—By Dr. Gregory.

MR. GOWLING: Would that be marked, my Lord, subject to my friend's objection?

30 HIS LORDSHIP: I will note Mr. Biggar's objection to its admissibility. I do not at the moment see any difference between it and G-1.

MR. BIGGAR: I may have omitted properly to make objection to G-1, but I was not intending to forfeit any right.

HIS LORDSHIP: Oh, no. That will be Exhibit P-102.

MR. GOWLING: Yes, my Lord.

HIS LORDSHIP: It was a second list?

MR. GOWLING: That is a second letter requesting further material, written by Mr. Martin to Dr. Gregory.

40 EXHIBIT P-102: Filed by { Letter from Martin to
Mr. Gowling { Gregory, May 25, 1915.

111. Q.—I think I asked you one question which was not answered, Mr. Higgins, as to the general nature of the disclosure which was made at that meeting with Mr. Williams and Mr. Martin, by Mr. Martin?

For Plaintiff—A. H. Higgins—Re-Examination

HIS LORDSHIP: In February, I think.

MR. GOWLING: It was in February.

HIS LORDSHIP: February or March.

THE WITNESS: The last two or three days in February or the first two or three in March, I am not certain which.

HIS LORDSHIP: 112. Q.—Of 1915? A.—Yes, my Lord.

MR. GOWLING: 113. Q.—Can you explain generally the nature of the inventions disclosed to you at that time?

HIS LORDSHIP: The nature of the disclosures?

10 MR. GOWLING: Yes, my Lord. I shall not call them inventions, because I do not concede that they were inventions.

HIS LORDSHIP: Yes.

MR. GOWLING: I will ask the nature of the disclosures.

MR. BIGGAR: Would your Lordship think it is proper to go widely into it, and go into a whole lot of other things?

HIS LORDSHIP: No. This is only in respect of Bulletin No. 2.

MR. GOWLING: I shall be very pleased to restrict it to that, my Lord, but the witness has not given any indication as to the technical nature of the disclosure which was made, which I think
20 is necessary for your Lordship to have.

HIS LORDSHIP: I suppose he may give evidence of any disclosure relating, for example, to Bulletin No. 1.

MR. BIGGAR: All these flotation reagents, my Lord, I think that the witness has referred to are flotation reagents mentioned and described in Bulletin No. 2.

HIS LORDSHIP: Yes, Bulletin No. 2. Then I think the question might be a proper one if it relates to disclosures relating to what was contained in Bulletin No. 2.

MR. GOWLING: Yes, my Lord.

30 HIS LORDSHIP: I do not think you can go farther afield than that.

MR. GOWLING: Yes, my Lord.

114. Q.—Then would you answer the question, Mr. Higgins, as to what there is in Bulletin No. 2 that was disclosed to you at that first meeting with Mr. Martin?

HIS LORDSHIP: Yes, that is proper.

THE WITNESS: All the agents mentioned in Bulletin No. 2, with the exception of grabanol.

MR. GOWLING: 115. Q.—What was the nature of those
40 substances? A.—They are very different in nature. They had one very common characteristic. There was sulphur of one kind or other in each one of them.

116. Q.—Were they all substantially the same? A.—No. Kotrix was an inorganic substance. Minola, Cinol and Arenol were

For Plaintiff—A. H. Higgins—Re-Examination

what might be called reconstructed oils; that is, oils in which he had managed to get some sulphur into the composition of the oil by distilling it over sulphur. Grabanol was supposed to be organic. Stanol was supposed to be an organic sulphide of some kind or another.

117. Q.—Have you any particular notes with respect to stanol?

A.—Yes.

118. Q.—It was then called, I think you said, nitrola? A.—Yes.

HIS LORDSHIP: Nitrola, did you say?

10 MR. GOWLING: 119. Q.—Was it natrola or nitrola? A.—I have both down here. I got it “natrola” first and then “nitrola” afterwards. I think that was due to the difficulty of understanding western speech.

120. Q.—What was the nature of the notes you made with respect to that? A.—It was an organic sulphide, from alcohol or starch, with a polysulphide in presence of an organic sulphide such as CS₂. I put a question mark after that. Floats without oil. Can be prepared from molasses. Not very good with an oil. Tendency to select MoS₂. That is molybdenum sulphide, the mineral
20 molybdenite. Then follows the formula or prescription: 100 c.c. C₂H₅OH (best cheap alcohol containing water in records); 25 c.c. CS₂; 5 grams NaOH. Off at the side there is the word “exothemic.” Then there are two lines running up to the 100 c.c. alcohol, indicating that there was a proposal to substitute CH₄—that is methane gas—for the alcohol, and also a proposal to substitute molasses for the alcohol. Then I have got that nitrola crystallizes out from water. That is all I have about stanol or nitrola or natrola.

121. Q.—And were the chemicals requested by Martin supplied to him? A.—Yes, they were.

30 122. Q.—And was he provided with a place to do his work? A.—Yes.

123. Q.—Would you explain what provision was made in that respect? A.—On the upper floor were three rooms, one of which we used for an office.

124. Q.—Where was this, Mr. Higgins? A.—It was known as the Kelly & Kelly Building, 12th Street near Vernon Avenue, Long Island City, New York.

125. Q.—I am sorry to have interrupted you in describing the accomodation which was made available to Mr. Martin. A.—One
40 large room was the laboratory where we set up the stills and that kind of thing for making the agents; two smaller rooms, one of which was used as an office and the other for chemical balances. Downstairs there were, I believe, two testing machines for doing the flotation tests. Oh, yes, I am certain there were two. One was the Janney machine and one was the Mineral Separation machine. I believe in the basement there was some crushing apparatus to crush ore.

For Plaintiff—A. H. Higgins—Re-Examination
 For Plaintiff—A. H. Higgins—Recalled

In fact, I have a recollection of laying some of the cement myself for the foundations of the crushing machine.

HIS LORDSHIP: Would this be a convenient time to adjourn, Mr. Gowling?

MR. GOWLING: It would, my Lord.

HIS LORDSHIP: Then we will adjourn until tomorrow morning at 10.30.

—Court adjourned at 4.50 P.M. until 10.30 A.M. Friday, November 24, 1944.

10 OTTAWA, NOVEMBER 24th, 1944
 MORNING SESSION

ARTHUR H. HIGGINS, recalled, examination resumed by MR. GOWLING.

HIS LORDSHIP: Mr. Gowling.

MR. GOWLING: 126. Q—Mr. Higgins, I have here the plaintiff's production No. 12, which is known as Martin Bulletin No. 1. Can you identify that? A—Yes, I can.

HIS LORDSHIP: Martin Bulletin No. 1?

MR. GOWLING: Yes, my Lord. This is one which preceded
 20 Bulletin No. 2, which has already been filed. This is to continue the story as to any alleged inventions made by Martin.

MR. BIGGAR: Your Lordship understands my objection to these things that have, so far as I can see, not only no relevance to any evidence given by the defendant, but no relevance to the issues in the case.

MR. GOWLING: If my friend has abandoned Martin as a prior inventor, this may be irrelevant, but so long as Mr. Martin is set up as a prior inventor I think this evidence should go on record. And I understand it is all being taken subject to objection, so no
 30 harm can be done.

HIS LORDSHIP: I would not like at this stage to decide upon its relevancy.

MR. GOWLING: No, my Lord. When the case is finally closed it may be that this will turn out to be quite irrelevant and unnecessary. But I have arrived at the Supreme Court on previous occasions without evidence that I felt I should have had and I do not want to take any chances, my Lord. I am dealing with the case on the basis of the pleadings.

HIS LORDSHIP: I will allow your examination to go on, subject
 40 to the objection, and the relevancy of it can be considered later. Is this document to be an exhibit?

MR. GOWLING: This should be marked as an exhibit, my Lord.

For Plaintiff—A. H. Higgins—Recalled

EXHIBIT P-103: Filed by	{	Martin Bulletin
Mr. Gowling		No. 1.

127. Q—I think you mentioned yesterday that this bulletin was received when you came back from Wilmington? A—Yes, it was.

128. Q—I now produce to you the plaintiff's production No. 10, which is stated to be your copy of Martin's draft patent specification. Can you identify that and state what it is? A—Yes, I recognize this as the copy that I had by certain markings on it.

10	EXHIBIT P-104: Filed by	{	Copy of Martin's
20	Mr. Gowling		draft patent specification.

HIS LORDSHIP: 129. Q—Did I understand you to say, Mr. Higgins, that you recognize it by some markings on it? A—Yes, my Lord.

MR. GOWLING: I am going to ask the witness to explain those in a moment, my Lord.

130. Q—When was this received, Mr. Higgins? You might state it with reference to Bulletin No. 1, if you like? A—With Bulletin No. 1, in the early part of June, 1915.

131. Q—What are those notes on this document to which you have just referred? A—They are my notes. The ink notations were made as a result of a discussion with Martin as to the meaning of the specification. The blue pencil underlining is the remarks I wished to point out to Martin during the discussion a few days later.

132. Q—Did you discuss the document with Martin, did you say? A—Yes, I said so, I did.

133. Q—Did you then give Martin some further instructions? A—I don't know whether they were further instructions. I may have reminded him we wanted to know exactly what he was selling to us, that this did not disclose it very well and that he had better make some and show us exactly how it worked.

134. Q—Were the markings made on the document before or after you discussed it with Martin? A—The blue pencil markings were made before I discussed it with Martin.

135. Q—What would they indicate? A—Things that I wanted explained some way or other. I couldn't understand most of it.

136. Q—What were the other markings that you referred to, in ink? A—Those are what I made as a result of the discussion with Martin about these blue pencil underlined sentences.

137. Q—Was Martin by this time provided with a laboratory from which to do his work? A—Yes, he was.

138. Q—And was he given a free hand to work in the laboratory? A—Oh, yes, perfectly free.

For Plaintiff—A. H. Higgins—Recalled

139. Q—Do you know whether he did any work in the laboratory after you received that document? A—Yes, he did; I saw him do it, most of it.

140. Q—What was the nature of the work? A—Oh, for a month or perhaps a little longer he was preparing the agents that he proposed to use in this document on page 2. Then he tested them on ores. I had Mr. Walling test them, and I made some tests myself. That would bring us up to about the end of July or perhaps the beginning of August, middle of August.

10 HIS LORDSHIP: 141. Q—Of 1915? A—Yes, my Lord.

MR. GOWLING: Yes, my Lord, this took place during the year 1915.

THE WITNESS: After that he made a more specific examination of Anaconda ore to see how he could apply his reagent to it and improve the working. After that he went on with various other ores, and he made one or two other investigations which we applied for patents for.

142. Q—Did you see any of those agents that Martin had made? A—Yes.

20 143. Q—Did you see him make any of them? A—Yes, I saw him making them. Some of them I watched rather carefully, and others I did not.

150. Q—What about stanol? Did you see stanol made? A—Yes, I saw stanol made.

151. Q—Would you describe how Martin made stanol? A—To the best of my recollection he put in the alcohol first and then the carbon disulphide and shook them up, got them mixed together; then he put in the caustic soda and the water. The water was generally somewhere near 500 cc's or the total liquid, I should say,
30 about 500 cc's—into a flask somewhere smaller than this.

152. Q—That is this water jug? A—A flask about 5 or 6 inches in diameter. That was put on to a wire gauze and underneath that a bunsen burner was lit. The flask was fitted with a reflux condenser and the thing was thoroughly boiled. I have seen one boiling for three days. They were not all boiled for three days but they were all boiled for a considerable period. He finished up with a muddy liquid, could not see through it, of a pale brown or deeper brown. I remember perfectly well there were six or eight of those in a row on a particular shelf in the downstairs laboratory where the testing machines were. They were put there
40 for anybody's use, Walling's or mine or his own.

153. Q—Did you make any tests yourself of these agents of Martin's? A—Yes, I did.

154. Q—And also you state you saw Martin make tests? A—I saw Martin make tests.

For Plaintiff—A. H. Higgins—Recalled

155. Q—What was the result of those tests? A—They were perfectly negative. Neither Martin nor Waling nor I found the least use in stanol.

HIS LORDSHIP: 156. Q—Pardon? A—Not the least use in stanol but we did find use in kotrix and reconstructed oil.

MR. GOWLING: 157. Q—Were there any chemistry books available in the laboratory? A—Yes, there were a good many.
 10 There was Thorpe's Dictionary of Applied Chemistry; there was Ritcher's Organic Chemistry; there was also Jeffrey Martin's Applied Chemistry which did not confine itself entirely to inorganic materials but also extended to organic materials.

158. Q—You mentioned some work having been done on Anaconda ore. When was that work completed? A—If you will let me have Bulletin No. 2.

159. Q—Perhaps we will come back to that later. For the moment you might say that was the next bulletin you received. Would it be No. 2? A—Yes, No. 2 followed; that is the patent
 20 specification.

160. Q—That is the one which has been filed as exhibit G-3. When was this bulletin No. 2, exhibit G-3, received by you? A—The 14th August, 1915—no, the 14th of September, pardon me.

161. Q—What is the date of the bulletin? A—August 15, 1915.

162. Q—From whom did you receive the bulletin? A—Directly from Mr. Martin.

163. Q—On whose instructions was it prepared? A—It was part of the general instruction to report everything he did.

30 164. Q—You had better state who gave those instructions? A—I did.

165. Q—Did you discuss Bulletin No. 2 with Martin? A—I did. I pointed out to him there were great variations in the preparation—

MR. BIGGAR: May I intervene again? Surely conversations between this witness and Martin are not evidence against us.

MR. GOWLING: That is a point of law for argument, I think

MR. BIGGAR: There must be some limit.

HIS LORDSHIP: If what Martin disclosed to him is admissible
 40 at all then I do not quite understand why conversations with Martin are not admissible also.

MR. GOWLING: Yes, my Lord. I was going to avoid having the witness give any record of what was said to him.

HIS LORDSHIP: Of course, I don't know how you can avoid that and still get the disclosures.

For Plaintiff—A. H. Higgins—Recalled

MR. GOWLING: We have these documents, my lord—and I was going to confine evidence of that nature as to Martin's disclosures to the documents and not allow this witness to repeat what Mr. Martin had said.

HIS LORDSHIP: That is your point, is it?

MR. BIGGAR: It is the conversations. I have already objected to the documents as not rebuttal.

HIS LORDSHIP: But it seems to me there might be a distinction.

MR. GOWLING: Yes, my lord. I do not want to be taken as
10 agreeing that this would offend the rule against receiving hearsay evidence but as I say I am not going to ask Mr. Higgins to repeat anything which Mr. Martin said to him. However, I think I am quite within my rights to ask Mr. Higgins to say what instructions he gave to Mr. Martin.

HIS LORDSHIP: Yes.

MR. GOWLING: And as a result of that what happened?

HIS LORDSHIP: Yes.

MR. GOWLING: 166. Q—As the result of the receipt of this
20 Bulletin No. 2, Mr. Higgins, what was the next document which was prepared? A—I found there were so many formulae in this document—

HIS LORDSHIP: 167. Q—In this document—which document? A—Bulletin No. 2.

MR. GOWLING: 168. Q—Exhibit G-3. A—That I came to the conclusion they could not all be equally effective in flotation and asked Martin to put into a book for reference the best of each one of them.

169. Q—Did you receive from Martin any such book? A—I did.

30 170. Q—I now produce to you plaintiff's production No. 100-a, which was filed as exhibit G-4. Can you identify that book? It is already in evidence. A—Yes, I identify this as the book given to me by Martin for use in the laboratory some time before the 21st October, 1915.

HIS LORDSHIP: The Registrar brings to my attention that exhibit G-4 is a number of pages. Perhaps that is all there is in the book.

MR. GOWLING: I observe there are only a few pages completed at the beginning of this book. As a matter of fact, it just goes to
40 page 17. There are some blank pages in between and very little on intervening pages.

HIS LORDSHIP: What is in as G-4 is a photostatic copy of the relevant pages.

MR. GOWLING: Yes, my Lord. Mr. Robinson has just pointed
10 out to me that by arrangement photostatic copies were filed of every

For Plaintiff—A. H. Higgins—Recalled

page on which writing appears. I thought it would be advisable to have the witness see the original book with which he is familiar.

HIS LORDSHIP: 180. Q—That is, Martin put down in the book certain notations showing what was most useful in each of the preparations contained in Bulletin No. 2? A—Yes, with one exception. There is one entry in my handwriting, which is the only one dated. It is from that date that I can tell you that the book must have been produced before that date.

10 Mr. GOWLING: 181. Q—What was the next bulletin which Mr. Martin furnished to you? A—No. 3.

182. Q—This is plaintiff's production No. 13, my Lord. Can you identify the copy of the bulletin which you received? A—Yes. This is the bulletin I received.

183. Q—And who gave that to you? A—Mr. Martin.

184. Q—Can you say when you received that? A—Yes. I received that on the 28th of September, 1915.

185. Q—How can you place the date? A—I have marked the receipt on the copy that I was using; probably on the others too, but I am not certain about that.

20 186. Q—Are there any other notes on the bulletin? A—Yes. There is a note. "Addendum with details of reagent preparation and reagents not mentioned in this report, requested." I had seen Martin do a great many tests on this ore, and on reading it through I found he had left out a great many of them, so I asked him to furnish another report filling up all the gaps and putting in everything that he had experimented with.

187. Q—Which ore had you in mind just now when you spoke of work on a certain ore? A—That was the Anaconda Copper Company's ore, I believe. Yes, "Mill feed to flotation plant", stated
30 on the first page, the beginning of the sentence.

188. Q—Then was there a further report given?

HIS LORDSHIP: Was that one put in?

MR. GOWLING: I am sorry, my Lord. That should be marked as an Exhibit.

THE REGISTRAR: That will be Exhibit P-105.

EXHIBIT P-105	Filed by	}	Bulletin No. 3.
	Mr. Gowling		

MR. GOWLING: Then did you receive another report after that, Mr. Higgins? A—I did. I received No. 4 next.

40 189. Q—Can you identify No. 4? A—Yes. That is a copy of the report. Martin used to give me five copies.

190. Q—That is production No. 15. When did you receive that, Mr. Higgins? A—On the 22nd of October, 1915.

191. Q—Does it mention stanol? A—On page 9 it mentions stanol and says that it is not satisfactory for this ore.

For Plaintiff—A. H. Higgins—Recalled

192. Q—And what ore was he referring to there? A—The Anaconda Copper Company's ore feed to flotation plant.

MR. GOWLING: I should like to have Bulletin No. 4 marked as an Exhibit, my Lord.

THE REGISTRAR: It will be Exhibit P-106.

MR. BIGGAR: Bulletin No. 4? Is that not in?

MR. GOWLING: Not Bulletin No. 4, Mr. Biggar.

MR. BIGGAR: Perhaps it is not. No, it is not.

HIS LORDSHIP: Then that will be Exhibit P-106.

10 MR. GOWLING: Yes, my Lord.

EXHIBIT P-106: Filed by { Bulletin No. 4.
Mr. Gowling }

MR. GOWLING: 193. Q—I now produce plaintiff's production No. 104, which is a letter dated December 11, 1915, from yourself to Mr. Williams, Mr. H. D. Williams. Can you identify that letter and state to what it relates?

MR. BIGGAR: No, he does not state what it relates to, surely.

MR. GOWLING: No. You identify that letter, Mr. Higgins?

HIS LORDSHIP: Letter from whom to whom?

20 MR. GOWLING: From Mr. Higgins to Mr. H. D. Williams.

MR. BIGGAR: What is the date of it?

THE WITNESS: 11th December, 1915.

MR. BIGGAR: I cannot hear you.

MR. GOWLING: 11th of December, 1915.

THE WITNESS: That is a letter I wrote to Mr. Henry D. Williams.

MR. GOWLING: Q—I see attached thereto a document. What is that document? A—The document is a rough draft of Martin's kotrix, and the reconstructed oils.

30 194. Q—You mean a rough draft specification? A—For Mr. Williams, yes.

195. Q—Who prepared that draft?

MR. BIGGAR: I dislike intervening, my Lord; but surely a communication from this witness to his solicitor enclosing documents that this witness prepared, cannot be evidence against us.

MR. GOWLING: That again, is a question of law, my lord.

HIS LORDSHIP: His statement?

MR. GOWLING: Yes, my Lord.

40 HIS LORDSHIP: I do not just at the moment quite see the relevancy of it.

MR. GOWLING: I perhaps might have prefaced that question with one asking whether he had a conversation with Martin before sending this letter.

For Plaintiff—A. H. Higgins—Recalled

196. Q—Did you, Mr. Higgins? A—I did, yes.

197. Q—And did Mr. Martin produce anything to you, or perhaps it would be sufficient for you to state whether that letter was written as a result of the conversation? A—Yes, it was. I pointed out to Martin that his draft specification was completely a mystery both to myself and the patent agent and that I had recast it, and asked him whether that was a description of his invention, and he agreed with me, and I sent it off to Mr. Williams.

MR. BIGGAR: That has nothing whatever to do with stanol,
10 my Lord.

HIS LORDSHIP: The memorandum relates to—

MR. GOWLING: The inventions of Martin, my Lord. The significance of this will appear in a moment, I think.

HIS LORDSHIP: Yes.

MR. GOWLING: I should like to mark this letter as an exhibit.

THE REGISTRAR: Exhibit P-107.

MR. BIGGAR: Your Lordship understands that they relate to kotrix and reconstructed oils?

HIS LORDSHIP: Yes. Kotrix and reconstructed oils.

20 EXHIBIT P-107: Filed by
Mr. Gowling } Letter dated December
11th, 1915, from A. Howard
Higgins to H. D. Williams.

MR. GOWLING: Were patent applications for Martin's inventions then prepared? A—They were.

198. Q—Did you assist in their preparation, or was that left to Mr. Williams? A—Only to the extent of giving him that rough draft. I do not think I assisted him any further. It is possible he may have asked me one or two questions on the subject.

199. Q—Were those final drafts returned to you or sent to Mr.
30 Martin? A—Undoubtedly they were sent to both of us.

200. Q—Did you discuss the final drafts with Mr. Martin?
A—Yes, I did.

201. Q—Did he make any complaint about them? A—No. I asked him whether they had got everything in that he was selling to us of any value.

202. Q—And were patent applications filed for everything which was covered by this disclosure?

MR. BIGGAR: The disclosure of kotrix and reconstructed oils.

MR. GOWLING: The disclosure of kotrix and reconstructed oils.

40 HIS LORDSHIP: Yes. Those are the only ones we have.

THE WITNESS: Yes.

MR. GOWLING: Were any other patent applications filed covering Martin's inventions? A—Not other than those contained in the five specifications which he handed over in June, 1915. There

For Plaintiff—A. H. Higgins—Recalled

were other inventions of Martin's which came later which were patented.

203. Q—Was stanol ever patented? A—No.

204. Q—Did you discuss the patenting of stanol with Mr. Martin? A—I did. I told him that there was nothing of value in it to patent.

205. Q—As a result of your conversation with Martin, was a patent application filed for stanol? I think you have already said "No"? A—I have.

10 206. Q—Did Martin do any further work after the filing of these patent applications? A—Yes, he did, but I do not think he ever used stanol again.

207. Q—When was the last time that you heard about stanol? A—In Bulletin No. 4, until some time in the middle of 1923.

208. Q—And what was the nature of the further work being done by Martin between 1915 and 1923? A—It consisted in applying his inventions to various ores which needed improvement in the froth flotation process.

209. Q—Did Martin issue further bulletins after that?
20 A—Yes, he did.

210. Q—How many? A—Oh, they ran up to No. 88, as far as I remember.

211. Q—Was an index of those bulletin prepared by Martin? A—Yes. A couple of years later, I think it was, he found that he had not numbered the first dozen or so—perhaps 15, and he decided he had better make an index and have those first ones numbered so that they could be easily traced by number.

212. Q—I have here plaintiff's production No. 99, or, I should say, a photostatic copy of it. I also have the original which bears
30 some marks on it. If my friend will agree, I should like to tender the photostatic copy, which is clearer than the original in this case.

MR. BIGGAR: You have satisfied yourself that they correspond?

MR. GOWLING: Yes, we have; and the photostat does not show the marks which were made by other persons on the original.

MR. BIGGAR: I do not see how you could avoid that if it was photographed.

MR. GOWLING: The photostat is an old one which was taken before the marks were made. I just noticed that somebody marked on the original.

40 HIS LORDSHIP: What do you call that?

MR. GOWLING: It is entitled, "Index to reports of R. B. Martin bulletins Nos. 1 to 72 inclusive.

213. Q—Can you identify that as a copy of Martin's index? A—Yes. That is a copy of Martin's index.

For Plaintiff—A. H. Higgins—Recalled

THE REGISTRAR: That will be Exhibit P-108.

EXHIBIT P-108: Filed by Mr. Gowling	}	Index to report of R. B. Martin, Bulletins Nos. 1 to 72 incl.
--	---	---

MR. GOWLING: 214. Q—Did those bulletin represent work being done by Martin?

MR. BIGGAR: Oh, oh.

MR. GOWLING: I will withdraw that question, my Lord.

215. Q—What were those reports intended for, as far as you
10 were concerned, Mr. Higgins? A—To make a complete record of
the work done in the laboratory.

216. Q—Were they prepared pursuant to your instructions?
A—They were.

217. Q—And do you know what agents Martin was using during the period from 1915 to 1923? A—Oh, a good many; but of the flotation agents which he sold to us in 1915, there was only two which he used—kotrix and reconstructed oil. They figured largely in his work during the next three or four years.

HIS LORDSHIP: 218. Q—What kind of agents were they?
20 A—Kotrix was a sulphidizing agent.

219. Q—Kotrix was a sulphidizing agent? A—Yes. Reconstructed oil was a mineral frothing agent.

MR. GOWLING: 220. Q—Was this work confined to any particular ore? A—No. He tried it on several—I think a good many ores.

221. Q—And when did you last see any tests made with or use made of stanol? A—Sometime about the end of the year; it must have been in October or earlier.

HIS LORDSHIP: 221. Q—What year are you now speaking of?
30 A—1915. I think if I may have Bulletin No. 3 I can give you the approximate time.

MR. GOWLING: 222. Q—Very well. I hand you Bulletin No. 3. A—Some time before the 20th of September, 1915.

223. Q—You mentioned a name, that of Mr. Waling, I think perhaps you had better say who Mr. Waling is. A—Mr. Waling was my assistant metallurgist.

224. Q—Is he still alive? A—No, he is dead. He has been dead a good many years.

224A. Q—Do you know when he died? A—I should think it
40 was in the influenza epidemic of 1918 or 1919, I have forgotten which.

224B. Q—Were patents secured for everything which Martin and you regarded as of any value? A—Yes, they were.

MR. GOWLING: Your witness, Mr. Biggar.

For Plaintiff—A. H. Higgins—Recalled

MR. BIGGAR: My Lord, I understand that any cross-examination now will be subject to your Lordship's ruling, and without prejudice to my maintenance of the objections that I have advanced to the giving by this witness, at this stage, of the evidence he has given.

HIS LORDSHIP: Any objection to that?

MR. GOWLING: That is my understanding, my lord, that that is the basis on which this witness is being cross-examined. Could I also suggest that, to keep matters open, that if the cross-examination goes beyond this subject-matter that has come up by way of rebuttal, I would not like to be taken as consenting to it going beyond. It is going as far as your Lordship wishes to go, on your Lordship's order of yesterday, which I submit your Lordship was entitled to make.

HIS LORDSHIP: What about the statement made by Mr. Biggar yesterday that he has been prejudiced through the misunderstanding that has arisen? I said that if he felt he had been prejudiced he might cross-examine Mr. Higgins, and I went further and said that he might recall witnesses or call witnesses so that he would not be prejudiced in any way.

MR. GOWLING: Yes, my Lord, and I agreed, I think, that that was the basis on which all this further evidence should be taken.

HIS LORDSHIP: Yes.

MR. BIGGAR: Perhaps I should add, my lord, that quite independently of the propriety or the admissibility of the evidence that has been given by my friend through this witness at this time, my right of cross-examination generally is not in any way limited. I mean, my friend might have recalled Mr. Higgins, sworn him and not asked him a single question.

HIS LORDSHIP: Why would he have done that?

MR. BIGGAR: I say he might have done that, but if he had done so I would have had an unlimited right of cross-examination at this time. My right of cross-examination is not limited—

HIS LORDSHIP: You mean it is not limited to material in rebuttal?

MR. BIGGAR: And not limited to material which is without prejudice by reason of the evidence that the witness has given in chief.

HIS LORDSHIP: Mr. Gowling, what limitation can be imposed on the right of cross-examination?

MR. GOWLING: We do not attempt to impose any limitation.

HIS LORDSHIP: You cannot.

MR. GOWLING: No, I do not think so, my Lord. I think my friend is correct on that. I have not looked up cross-examination with respect to rebuttal evidence particularly, but I think my friend has certainly stated the rule correctly.

For Plaintiff—A. H. Higgins—Recalled

For Plaintiff—A. H. Higgins—Cross-Examination

HIS LORDSHIP: I think so. So you may proceed with your cross-examination as a matter of right.

MR. BIGGAR: Exactly, my Lord.

HIS LORDSHIP: Without limitation as to scope.

MR. BIGGAR: Quite so, my Lord.

HIS LORDSHIP: I think that is quite clear. No conditions are imposed as to the scope of the cross-examination.

MR. BIGGAR: Your lordship will forgive me if I am not prompt in my cross-examination, in the circumstances.

10 —The Court recessed at 11.20. On resuming at 12.05 p.m.—

CROSS-EXAMINED BY MR. BIGGAR:

MR. BIGGAR: Thanks to your Lordship's kindness, I think I can shorten the re-examination considerably.

225. Q—Mr. Higgins, in 1929 I think you had some Stanols made up, including Stanol D, and that certain analyses were made?

A—Yes, that is so.

226. Q—That was done under your direction, and I think you found that in Stanol D there was 19.6 per cent of sodium ethyl xanthate? A—Yes, that is so.

20 227. Q—You said, I think, in the course of your evidence at some time that colloids were—

HIS LORDSHIP: Avoided like poison, I think was the statement.

MR. BIGGAR: 228. Q—I have here a list of the reagents that were used, according to a publication that I have, in the year 1923, and I shall name some of them to you. Pine oil is not a colloid, is it? A—No.

229. Q— CuSO_4 —that is copper sulphate, is it not? A—That is copper sulphate.

230. Q—That is a colloid? A—No, that is a crystalloid.

30 231. Q—And sulphur? A—No, that is not a colloid, the way it is usually used in flotation, because that would be used not as sulphur per se, but as a compound of sulphur.

232. Q—All the others in this list—I do not know whether you know the document; it was published in 1926 by the Colorado School of Mines, and prepared by Arthur J. Weinig and Irving A. Palmer. Do you know those authors? A—Yes, I believe I have seen the document at some time or other, but not recently.

40 233. Q—Here they just give sulphur and the quantities that were used, and it does not say anything about its being a sulphur compound. Sulphur might be a colloid, might it? A—Not in the flotation process, we do not use sulphur.

234. Q—What about wood creosote? A—That is not a colloid.

235. Q—And cresylic acid? A—That is not.

For Plaintiff—A. H. Higgins—Cross-Examination

236. Q—And soda ash? A—That is not.

237. Q—And nitre cake? A—That is not.

40 238. Q—And sodium silicate? A—That may give you some colloid; it depends upon how you use it. If you put it into an acid it will give you a colloid, but I don't think I know of a single case where it is used except in an alkaline circuit.

239. Q—It is a colloid when it goes into the circuit, is it not? A—It depends on what degree of dilution you make.

10 240. Q—My instructions are that sodium silicate is in fact used in the form of a colloid. Would you say that it was not? A—Not in the operation of the flotation process.

241. Q—You mean that it is not used? A—No, I say not in the operation of the flotation process.

242. Q—I say, it is used for flotation purposes in the form of a colloid? A—It is a colloid before you put it in, but when it is operating in the process it cannot be a colloid.

243. Q—But at the time that you put it in it is a colloid? A—Yes, I think it would be fair to call it one.

244. Q—Coal tar? A—No.

20 245. Q—Naphthalene? A—No.

246. Q—Sodium sulphite? A—No.

247. Q—Thiocarbanilid? A—No.

248. Q—I find that of all those whose names I have given, the largest quantity used in 1923 was 699,066 pounds, that was of sulphur, and the quantity of sodium silicate used was 153,580 pounds. Would you disagree with those figures as representing the approximate proportions of the largest quantity of any reagent that was used in 1923 and the quantity of sodium silicate? A—I would agree with those figures, but sulphur is not used in flotation as
30 sulphur.

249. Q—I gathered that. I am only getting the proportions. The largest one, apart from sulphur, appears to be pine oil, of which there was used in 1923, 392,287 pounds. That equally is not a colloid? A—No; that is a mineral frothing agent.

HIS LORDSHIP: 250. Q—Are all these reagents mineral frothing agents? A—No, my Lord, they are not.

251. Q—Some are merely frothing agents? A—Some are mineral frothing agents and some are what I call flotation agents; sometimes they may be classed as collecting agents, but I prefer
40 to call them just agents, they are not mineral frothing agents. When I call them agents, they are distinct from mineral frothing agents. These can be divided into two classes, mineral frothing agents and others.

252. Q—There were some frothing agents that were not mineral frothing agents, were there? A—Well, you can take a

For Plaintiff—A. H. Higgins—Cross-Examination

thing like a solution of glue: That makes a nice froth, but it is not a mineral frothing agent.

253. Q—A mineral frothing agent was so-called because it served two functions: it created bubbles in the pulp and rose to the top in the form of a froth? And then certain agents had also the property or capacity of attracting or causing to be affixed to the air bubbles valuable metalliferous minerals, and they rose with the air bubbles to the top into the froth; and the agents that had those two properties were called mineral frothing agents? A—Yes,
10 my Lord.

MR. BIGGAR: 254. Q—I may come back to that Mr. Higgins. Now, you had to do with the preparation of Mr. Keller's 'specification. Did you also have to do with the preparation of Mr. Lewis'? A—No, I did not, and I had very little to do with the preparation of the Keller specification.

HIS LORDSHIP: 255. Q—Pardon? A—I had very little to do with the Keller specification.

MR. BIGGAR: 256. Q—I did not ask you that, if you would not mind answering my question. You had nothing to do with the
20 preparation of Mr. Lewis'? A—No.

257. Q—What was Mr. Lewis' function? He was a fellow who actually carried out practical tests with flotation, was he not? A—Yes.

258. Q—That was his chief duty. Would you call him a metallurgical chemist? Would that be a fair description of him? A—I think I would prefer to call him a metallurgist acting in froth flotation processes.

259. Q—That is to say, a practical metallurgist? A—Yes.

260. Q—And can you tell me how much water you add to
30 your ground up ore to make the pulp that is dealt with in the flotation circuits? A—Usually 4 of water to 1 of ore; it varies a little bit one way or the other.

261. Q—It may vary up and down but that is the order of the figure; it is several times but not very many times the amount? A—Yes.

262. Q—That is in weight, I suppose, of the ore and of the water, not in volume? A—No, that is in weight.

HIS LORDSHIP: 263. Q—Some of the water is used in the final grinding process? A—Yes.

40 264. Q—Is that included in the 4 to 1? A—Yes, that is made up afterwards so as to run about 4 to 1.

265. Q—And the 4 is inclusive of what is contained in the final grinding process? A—Yes, that is included.

MR. BIGGAR: 266. Q—Just to make it clear so there is no doubt about the point, when you get your pulp ready for treatment

For Plaintiff—A. H. Higgins—Cross-Examination

in the circuit there is about 4 parts of water to one part of ore by weight. A—Yes?

267. Q—That is what I understood. Now, in the earlier flotation days—because after all we have got to go into pretty ancient history here, perhaps twenty odd years ago—there were two methods of flotation, were there not, what is called bulk oil flotation, or was called bulk oil flotation, and what was usually the film flotation method? A—In 1923 was that?

268. Q—I say at some time. I am not tying you to any
10 particular date, but there were those two methods of flotation?
A—Yes. I think bulk oil flotation died about 1898 or earlier. Film flotation was kept up a little bit longer until perhaps 1908.

HIS LORDSHIP: 269. Q—Did you say 1898? A—Yes, my Lord, that was when the bulk oil process died.

270. Q—I understood the froth flotation process was not
invented until about 1905? A—The bulk oil flotation was an entirely
different process. Instead of using about 2 pounds a ton or less
than 2 pounds a ton of oil the bulk oil process used one ton of oil to
one ton of ore, and sometimes as much as 3 tons of oil to one ton of
20 ore.

271. Q—Was it a froth flotation process? A—Oh no, not anything like it. I could explain further if your Lordship wished.

MR. BIGGAR: 272. Q—Did not the film flotation process carry
on rather longer? I find what appears to be a reference to a patent to
a man named DeBavay, having taken a patent on the film flotation
process as lately as 1909? A—That is only a year later, but the
DeBavay process did not last long. The fact that a man takes
out a patent does not mean to say that it is worth anything.

273. Q—Oh, you do not need to argue that with me. I think
30 you can assume some knowledge about patents among us.

HIS LORDSHIP: Fortunately for some of the persons present.

MR. BIGGAR: 274. Q—That film flotation process disclaimed
the use of oil, did it not? I mean that was not the basis of it
whereas it was of the bulk flotation? A—I have seen the DeBavay
process run on a large scale in Australia, and he was using oil. He
was using crude kerosene, a light oil. He smeared the mineral with
a very small quantity. If it was a film process it would work ac-
cording to the patentee without any oil at all. It was later dis-
covered there was a certain amount of oil in the ore, natural hydro-
40 carbon, and that was making it work, but that never went into
practice.

275. Q—There was no froth in either of these film flotation
processes.—

HIS LORDSHIP: 276. Q—Either in the oil or film? A—Oh,
yes, DeBavay made considerable froth but he was very careful to

For Plaintiff—A. H. Higgins—Cross-Examination

destroy that before he fed it onto his sheet of water, so as to avoid infringement.

MR. BIGGAR: 277. Q—Was there no froth at all in the bulk flotation process? A—No.

278. Q—And it was the process you spoke of early in the trial that was begun about 1905 that is what is now called the froth flotation process? A—Yes.

279. Q—Did that entirely supersede the bulk oil flotation process? A—Scarcely because the bulk oil process was dead years
10 before the froth flotation process was discovered.

280. Q—The bulk oil process was the first of the three? A—Yes.

281. Q—And then the film flotation where the froth was suppressed or not used and finally the froth flotation process which you spoke of as having begun in 1905? A—Not quite; the first one was the bulk oil. Then the film flotation and the froth flotation were more or less contemporaneous.

282. Q—Were more or less contemporaneous, I see, but the film flotation you think ceased to be used before 1910? A—Yes.

20 283. Q—I find a reference to a bulk oil flotation patent granted to a man named Chapman as late as 1934. Do you know of that? Perhaps I can recall it to you. That is what I infer from this paragraph which I will read you, not as an authority, your Lordship knows, but just to make the witness understand what I am referring to.

30 “Processes such as described, in which no gas was introduced into the system to form a froth, are usually classified as bulk oil flotation. Attempts to revive such practices were made periodically, recently in connection with concentration of non-sulfides. One of the latest patents of this type was issued to Chapman in 1934 (1,968,008) and deals with the concentration of phosphate by agitating a thick alkaline pulp with reagents (oleic acid, fuel oil) to form loosely bonded aggregates of phosphate minerals which are subsequently removed on the slime end of a modified table.”

A—That process I know and it is not a bulk oil process. Nobody would describe it as such unless they were not in possession of the facts or unless they did not know something of the processes that preceded froth flotation, for instance. It is a statement which is
40 entirely erroneous.

284. Q—You mean that so far as this involves the statement that Chapman's was a bulk oil process it would be inaccurate? A—Absolutely inaccurate.

HIS LORDSHIP: 285. Q—Was the introduction of air into the pulp necessary for the creation of the froth? A—Oh, yes, my Lord.

For Plaintiff—A. H. Higgins—Cross-Examination

286. Q—Always? A—Agitation does that or else it is blown in through pipes.

287. Q—Agitation serves the purpose of introducing air through the pulp? A—Yes, my Lord.

288. Q—Or you can have it introduced some other way? A.—Yes.

289. Q—But the introduction of air is necessary to the formation of froth? A—Yes, absolutely necessary.

MR. BIGGAR: 290. Q—Are there other flotation processes
10 than those to which I have referred which have been used since 1910 or are in use now? A—Not to my knowledge.

291. Q—Now, it refers there to “non-sulfide ores” in that passage that I read to you. One of the examples given in the patent is of a non-sulfide ore, is it not? That is the example which is given about paragraph 19. I can give you the exact paragraph. It is paragraph 19 referring to Chinese graphite ore. That is not a sulfide ore, is it? A—It is not, but graphite and the metallic minerals like copper and silver are classified in froth flotation processes as—

292. Q—Would you mind confining yourself to the answer to
20 the question I asked?

HIS LORDSHIP: I think you should try to make your answer as responsive as possible.

MR. BIGGAR: 293. Q—That Chinese graphite ore is not a sulfide ore? A—No.

294. Q—Now, I want to ask you whether you agree that for chemical purposes ammonium is not dealt with as one of the alkalis that behaves in the same way as alkali metals? A—Yes, I agree with that.

295. Q—Oh, I am sorry; did I put it the reverse way? What
30 I mean is that it is a substance which for chemical purposes is dealt with as having the same qualities as an alkali metal? A—Only in inorganic reactions.

296. Q—Now, I am going to carry that a little further. Well, I cannot carry it very much further right now because the book to which I want to refer the witness is not here. Dealing with another subject altogether I have a recent book, 1936, which is called “Organic Chemistry”. Is it usual in books of that kind to do as this author seems to do, to refer only to cellulose xanthate of all xanthates? A—No, not in my experience; I have not a great knowledge
40 of organic chemistry books but the one I know, Richter, is rather the reverse.

297. Q—I was interested in that. The book is a book called Organic Chemistry, a brief introductory course by James Bryant Conant, President of Harvard University, formerly Sheldon Emery Professor of Organic Chemistry at Harvard University, revised with

For Plaintiff—A. H. Higgins—Cross-Examination

the assistance of Max Tishler, Ph.D., published by Macmillan and Company, New York, in a revised edition in 1936. When you look at the index, as I did as you can imagine with some interest for the word "xanthate", you find only one reference to it at page 166. At page 166 the only xanthate dealt with is cellulose xanthate which it refers to as having been used in a major industry in the manufacture of artificial silks in the past few years and refers to the production having been 200,000,000 pounds. Would you say that is a reasonable view for a man to take who is a man of Mr. Conant's distinction
 10 in 1936 in writing a book of that kind on organic chemistry— A—I think perhaps it would be because an organic chemist is not really interested in flotation processes. He would not know, probably, that any such thing as xanthate was used in the flotation process. I can quite understand it would not be of any interest to him.

298. Q—Would you say there was any other commercial use of any xanthate now even except in the artificial silk industry and in flotation— A—Those are the only uses I know of.

299. Q—Those are the only uses you know.

HIS LORDSHIP: 300. Q—Such as in rayon in the case of
 20 cellulose xanthate and in respect to flotation processes? A—Yes, my Lord.

MR. BIGGAR: As a matter of fact, there are other things like the growing of certain plants, and so on.

HIS LORDSHIP: Some kind of culture was referred to.

MR. BIGGAR: Viticulture.

THE WITNESS: I think those are more or less paper proposals like the use of it as a rubber accelerator and the use for printing calico, but I think they are only suggestions that do not go into practice.

301. Q—Well, lacking the chemical book that I wanted to refer to do you know the Treadwell book on Qualitative Analysis which has gone through several editions and been published in a translation from the original Treadwell, a German? A—Yes, I know that book but I have not seen it for many years.

302. Q—I have got it now. I need only refer you to the table of contents. I find this, that Part 1 of the book deals with general principles. Then, Part 2 of the table of contents has this heading, "Reactions of the metals (cations)", and then underneath that "Group V (Alkalies)", and then successively dealt with at pages
 40 which are referred to are potassium, sodium, ammonium and magnesium. Then there is a section on the separation of the metals of group V and then it goes on in group IV to the alkaline earths and gives page references to where the general characteristics of reactions of that group are dealt with. It then deals specially with calcium, strontium, barium, and the separation of the metals of group IV, and spectroscopic analysis. Would you agree with that method

For Plaintiff—A. H. Higgins—Recalled

of dealing with ammonium with those alkali metals and alkaline earths? A—For the special purposes to which the book is directed I would agree with it.

303. Q—And, as a matter of fact, the actual analysis is generally carried out by an electrolytic method, is it not, the formation of cations and anions in solution? A—No, you could not do that and get metallic potassium or metallic sodium. You could get metallic copper and you could get metallic silver. That is the usual way of doing copper and silver.

10 320. Q—Those are dealt with there. And then after dealing in Part III with the “reactions of the acid constituents (anions)” they go on to deal with the division of the acids into groups. That covers some 200 odd pages. Then in Part IV there is a discussion of the subject “Systematic analysis”; and finally in Part V, which is headed “Reactions of Some of the Rarer Metals”, we come to Group V (Alkalies), and it deals specially with caesium, rubidium and lithium, and their detection. Would you agree with that? A—I would agree with the book entirely, but it is for a different purpose. It is for the analysis of a material to find out what chemicals are
20 in it.

321. Q—I beg your pardon? A—It is to find out what elements are in the material. It is an entirely different classification from the classification accepted in theoretical organic chemistry.

321A. Q—It is from the practical point of view of qualitative analysis. A—It depends merely on the insolubility of different materials.

322. Q—That is perfectly true, because the groups the book deals with are grouped by reference to their solubility. A—Yes.

323. Q—And that is the reason they are dealt with in this
30 way in the book by Treadwell. Now that I have it, I can tell you by whom it is translated and what edition it is. It is the 8th edition, 1929, and it says “translated and revised by William T. Hall, S.B.” What does “S.B.” mean? Does it mean “Bachelor of Science”? A—Bachelor of Science, I should think.

324. Q—I suppose so. Continuing: “Associate Professor of Analytical Chemistry, Massachusetts Institute of Technology.” He is dealing there with groups of metals by reference to their solubility, and that is the reason that the alkalies are dealt with under group V, because they are the most soluble of the metals. The actual
40 course is then to deal, as I indicated before, with Group IV, the next most soluble alkaline earths, and then he goes on to deal with Group III, Group II and Group I, in descending order of solubility, as far as metals are concerned. A—Yes.

324A. Q—So there is, at all events, in qualitative analysis, a justification for dealing with ammonium together with the other

For Plaintiff—A. H. Higgins—Recalled

alkali metals? A—Yes; limited to analytical chemistry, it is perfectly correct to say so.

325. Q—And as a matter of fact, ammonium, just like the metals themselves, is found in compounds in nature, is it not? I have a reference here in “A Textbook of Mineralogy” written by a man named Edward Salisbury Dana, Professor of Physics and Curator of Mineralogy, Yale University, in 1916, in which at page 523 he refers to the following minerals. At the beginning of the list is mascagnite which is described as “Ammonium sulphate, 10 $(\text{NH}_4)_2\text{SO}_4$.” It is stated to occur “Usually in crusts and stalactitic forms. Occurs about volcanoes, as at Etna, Vesuvius, etc.” Would you agree with that? A—If Dana says so, I would agree with it.

326. Q—Then he goes on and deals with taylorite, for which he gives a rather elaborate formula. Then he goes on to thenardite, which he describes as “Anhydrous sodium sulphate, Na_2SO_4 ” which is a compound very closely related to our caustic soda, is it not? A—No. That is the sulphate, I think, from the formula you read out.

20 327. Q—Yes, it is the sulphate. I say it is closely related to caustic soda. A—No. The caustic soda has been neutralized.

328. Q—Oh, I know. I do not say it is the same compound at all. A—It is a sodium compound, if that is what you want.

329. Q—Yes, it is a sodium compound. And that is said to be found in nature “In orthohombic crystals, pyramidal, short prismatic or tabular.” Then he describes it as “White to brownish. Soluble in water. Often observed in connection with salt lakes.” Then the next one following immediately is what is called apthitalite, which is described as “Arcanite, $(\text{K.Na})_2\text{SO}_4$.” That would be 30 a potassium compound, would it not? A—The same mineral could equally be a sodium compound, without any potassium whatever.

330. Q—But this is potassium, is it not, because it has a K in it? A—Yes, but the K with a dot, and then Na means that you get any kind of mixture, pure potassium running through mixtures of potassium and sodium to pure sodium.

331. Q—What I am getting at is that you could get your potassium out of that mineral Apthitalite? A—Yes.

332. Q—And that is described as— A—Provided it is there.

333. That is described as “Rhombohedral; also massive in 40 crusts. Colour white”, and so on. What I am pointing out to you is that there is, apparently, even from a metallurgical point of view, some relation to ammonium, potassium and sodium, having regard to the fact that in this metallurgical book, when they are listing these things, they put those three in a single group with taylorite, whatever that is, a more complicated compound. Would you agree

For Plaintiff—A. H. Higgins—Recalled

For Plaintiff—A. H. Higgins—Cross-Examination

with that way of dealing with those three things? A—No, I would not agree with it. It is not a metallurgical book, you know.

334. Q—It is not a metallurgical book? A—Exactly.

335. Q—It is a “Text book of mineralogy”? A—That is a distinct branch of science; very distinct.

336. Q—Oh, I did not know that there were these qualifications. Mineralogy then, is something different from metallurgy? A—Yes.

337. Q—I thought it was only wider. A—No. It is a section
10 of geology.

338. Q—You mean mineralogy is a section of geology? A—Yes, and it is a separate subject. It is a very complicated subject. And those things you read out to me are very rare minerals. I have never seen them, yet I have studied mineralogy.

339. Q—But you have never seen those particular minerals. Perhaps you have not visited the craters of Vesuvius, where the mascagnite is referred to or the shores of Lake Balkhash in Central Asia where thenardite is referred to? A—I have not; and if you
20 had got there, I think you would find it would take you a month or two to find any.

HIS LORDSHIP: We will adjourn now until 2:20 p.m.
—Court adjourned at 12:50 p.m. until 2:20 p.m.

AFTERNOON SESSION

ARTHUR H. HIGGINS. Cross-examination by MR. BIGGER resumed:

MR. BIGGAR: 340. Q—Mr. Higgins, I may have led you into a slip of the tongue the other day when I was asking you about the difference, if any, in the significance of the expression “alkali xanthate” and “alkali metal xanthate.” Does the definition of “alkali”
30 not include ammonium and, for example, calcium? A—No.

341. Q—Under no circumstances? A—Not in my opinion.

342. Q—I am going to refer you first on that point, so that there will not be any misunderstanding about it—

HIS LORDSHIP: What were the two substances?

MR. BIGGAR: I asked if it did not include ammonium and calcium. It is the hydroxides of both, my Lord.

343. Q—Does that change your answer, Mr. Higgins—directing the question to the hydroxides? I did not think so. A—No.

40 344. Q—No. I am going to refer first, and ask you whether you disagree with the definition of the word “alkali” given in the

For Plaintiff—A. H. Higgins—Cross-Examination

40 Oxford English dictionary, commonly referred to as O.E.D. where, under No. 6, followed by the words "Mod. Chem."—which no doubt means "modern chemical"—

MR. ROBINSON: Modern chemistry.

MR. BIGGAR: Modern chemistry or chemical. This is the definition given.

HIS LORDSHIP: Of "alkali"?

MR. BIGGAR: Of "alkali", yes, my Lord. The definition is:

10 "A series of the compounds called bases with well marked—characters analogous to, and including soda, potash and ammonia; they are highly soluble in water, producing caustic or corrosive solutions, which neutralize strong acids, turn vegetable, yellows to brown, reds to blue and purples to green; in the decomposition of a compound they are relatively electro-positive."

And continuing in the next somewhat smaller print:

20 "In its most restricted but most usual sense, it is applied to four substances only, hydrate of potassium (potash), hydrate of sodium (soda), hydrate of lithium (lithia), and hydrate of ammonium (which may be supposed to exist in the aqueous solution of ammonia. In a more general sense it is applied to the hydrates of the so-called alkaline earths, (baryta, strontia and lime)."

345. Q—Lime would be calcium, would it not, in some form—
A—Calcium oxide is lime.

346. Q—Yes. That is the end of the parenthesis.

"And to a large number of organic substances both natural and artificial, (called) alkaloids and ammonium bases."

Do you disagree with that? A—Obviously I do.

30 347. Q—You obviously do? A—Yes.

348. Q—That is the English dictionary, the greatest authority. That particular volume, my Lord, was published in 1888.

HIS LORDSHIP: As early as that?

MR. BIGGAR: Yes, my lord. It went over years and years.

349. Q—Is tetra methyl ammonium hydroxide an ammonium base? A—Yes. It is an ammonium base, but—

40 350. Q—It is an ammonium base. That was really all I wanted. I now refer you to the American dictionary that I have always supposed to be an authority, the Century Dictionary. This particular volume appears to have been published in 1889 and republished in 1895, and the third definition of "alkali", after dealing with the original one, and certain plants is as follows:

"3. Now—"

It says, referring no doubt to the present.

For Plaintiff—A. H. Higgins—Cross-Examination

“—any one of various substances which have the following properties in common: solubility in water; the power of neutralizing acids and forming salts with them; the property of combining with fats to form soaps; corrosive action on animal and vegetable tissue; the property of changing the tint of many vegetable colouring matters, or turmeric from yellow to brown.” And then continuing in the smaller print:

10 “In its restricted and common sense the term is applied only to the hydrates of potassium, sodium, lithium, caesium, rubidium, and ammonium.”

You observe that is the restricted sense. The passage goes on:

“In a more general sense it is applied to the hydrates of metals of the alkaline earths, barium, strontium, calcium and magnesium, and to a large number of organic substances, both natural and artificial, described under alkaloid.”

And the word “alkaloid” is in italics. The rest of it reads:

“Alkalis unite with saponifiable oils to form soap.”

You still disagree with the Century dictionary? A—For the reason that it classifies—

20 360. Q—You do disagree, do you? A—I disagree; there is a very serious reason for disagreeing in both those.

361. Q—The fact is you do disagree with those authorities? A—Absolutely.

362. Q—Let me refer you to a third, a scientific one, Hutchinson’s Technical and Scientific Encyclopedia. It was published by Hutchinson & Company in London, which you are familiar with. Perhaps you know the publication because I understand it is a comparatively recent one? A—No, I only know a very few of the publications that are published.

30 363. Q—This is the definition of alkali followed by “(chem)”, no doubt meaning chemical.

HIS LORDSHIP: A term in chemistry.

MR. BIGGAR: Or something of that kind. It just says “chem”.

“A compound which on solution in water yields two types of ions, one of which must be the hydroxyl ion and the other may be any metallic ion or equivalent compound radical. E.g. sodium hydroxide, slaked lime or calcium hydroxide, ammonium.”

40 Do you disagree with the scientific one? A—I thought it said “chemical.” Did it not say it was “chemical”?

364. Q—It is called a Technical and Scientific Encyclopedia, edited by C. F. Tweney and I. P. Shirshov? A—Yes, I disagree with that.

365. Q—You disagree with it? A—I do.

For Plaintiff—A. H. Higgins—Cross-Examination

366. Q—I think that the discussion of these goes on in this Technical and Scientific Encyclopedia with a large number of formulae, but I do not think it adds anything to what I have read which is the beginning of it.

HIS LORDSHIP: I hope I do not have to read all these textbooks.

MR. BIGGAR: No, my Lord. I ought to point out that the passage I have read is the first six lines at the beginning. I have not picked it out from the middle of the thing. It is from the first
10 six lines at the beginning. I ought to refer to the two volume edition of the O.E.D. to bring it up to date because that was published at Oxford at the Clarendon Press in 1933.

HIS LORDSHIP: That is the shorter?

MR. BIGGAR: That is the shorter; what it is called is the Shorter Oxford English Dictionary. There the fifth of the definitions—and I will call your attention to the earlier ones if it is going to be relevant but we are dealing with a chemical case—is prefixed by the same provision, “chem” in brackets immediately following the figure 5. The definition goes on:

20 “A series of bases, analogous to, and including soda, potash, and ammonia, highly soluble in water, producing corrosive solutions, which neutralize strong acids, and turning vegetable yellows to brown, reds to blue, and purples to green.”

The date given following that in figures is 1813. I suppose we can say you disagree with that,

THE WITNESS: Yes.

367. Q—So that your disagreement extends from 1889 to 1933. Now, tell me why you disagree with those four which I would have regarded as the most significant authorities I could have called your
30 attention to? A—Two of them, the Oxford Dictionary and the one following that—I have forgotten its name—

HIS LORDSHIP: Century.

THE WITNESS: Century dictionary—spoil their classification by throwing in alkaloids. Alkaloids are by no means alkalis. They also refer to the caustic action of the ammonia which is extremely slight. The caustic action of sodium and potassium hydroxide is sufficient that less than 1 per cent in solution will skin your fingers. You can never do that with ammonia, even the strongest ammonia.

MR. BIGGAR: 368. Q—You mean it is not a strong alkali?
40 A—It is not caustic in that sense; it does not skin the fingers.

369. Q—You would say it was not a strong alkali? A—It is not.

370. Q—Is it a weak alkali? A—Yes.

HIS LORDSHIP: 371. Q—But the ammonia is not caustic?
A—No, it is not caustic in the sense that sodium and potassium are.

For Plaintiff—A. H. Higgins—Cross-Examination

As I say, you can easily skin your fingers by rubbing a little 1 per cent or less solution—

MR. BIGGAR: 372. Q—We do not want to get on to the definitions of other words. We are dealing with the definition of alkali and the witness agrees that ammonia is an alkali but not a strong alkali. That is the position as stated in his last answer. Now, you were going to tell us—

HIS LORDSHIP: 373. Q—Is that correct? A—Yes, generally it can be considered to be an alkali.

10 MR. BIGGAR: 374. Q—Any other reasons for disagreeing? A—With these definitions?

375. Q—I say what other grounds of disagreement with these authorities have you got? A—Well, one, they are not authorities on chemical subjects; they are only authorities on words and the use of words. Murray put into his dictionary every possible use of word he could find, whether it was used in a correct sense or not.

376. Q—Well, he gives the chemical definition. That is true of the Century and it is true certainly of the Technical Encyclopedia? A—I know nothing about those two men who compiled that.
20 They may have been scientists or they may have been what might be called philologists.

377. Q—Let me go back a moment because there is no other definition, mind you, given in the Technical and Scientific Encyclopedia, but let us look for shortness at the other definitions that are given in the Shorter Oxford.

“1. Orig. A saline substance obtained by lixiviating the calcined ashes of marine plants; soda-ash.

2. Bot. The plant saltwort (*Salsola Kali*) 1578.

3. Any substance having the characteristics of soda, 1612.

30 4. Comm. Any form of alkaline substance, as common soda, caustic soda, caustic potash, etc., used in commerce or the arts, 1822.”

Then there is “5, chem.”, the one I referred you to. Now, you cannot suggest, can you, that any of the other definitions, of which there are only six, could be used in any scientific sense nowadays? A—It would not be of any use nowadays; they would be wrongly used.

378. Q—They may have been properly defined as of their dates but the chemical sense is the one that I read you first, and
40 with that I gather that you disagree as including soda, potash and ammonia? A—Yes, with that one I disagree.

379. Q—You were giving some reasons for your disagreement with these definitions and I do not want to stop you from giving these grounds of disagreement in full. A—As far as I remember I have given them fully.

For Plaintiff—A. H. Higgins—Cross-Examination

HIS LORDSHIP: 380. Q—Pardon? A—As far as I remember I have given the objections in full.

381. Q—Would you mind stating what your main reason for disagreement is, state it again? A—(1) that they are not scientific books; (2) that the alkalis mentioned are not all caustic in their action; (3) that they include alkaloids, things like morphia which is undoubtedly without any caustic action and should not be include as an alkali in any case.

MR. BIGGAR: 382. Q—Mr. Higgins, do you know the term,
10 “caustic alkali”? A—Yes.

383. Q—Does that term mean those alkalis that are caustic? A—Yes, I think so. It does to me.

384. Q—It is quite a well known term to define the particular ones among the alkalis which are caustic? A—Yes.

MR. BIGGAR: That is all, my Lord.

HIS LORDSHIP: 385. Q—Is the quality of being caustic common to all alkalis? A—It is common to the hydrates of the alkali metals like sodium, potassium, lithium, caesium and rubidium to the best of my knowledge and belief but it is not a property of
20 ammonia.

386. Q—Being caustic is not a property of ammonia? A—No, my lord.

MR. BIGGAR: I have no more.

HIS LORDSHIP: Have you any re-examination?

MR. GOWLING: I have just one question, my Lord, that I would like to ask the witness.

387. Q—Is graphite ore an oxide ore? A—It is not.

HIS LORDSHIP: 388. Q—What kind of ore is graphite ore? A—Graphite ore is a native element.

30 389. Q—Pardon? A—A native element; it corresponds very well with native copper. It was always included in the early flotation patents because of its high metallic lustre and its response to froth flotation treatment, and it has since then been generally conceded it is one of the metalliferous minerals that can be treated by froth flotation.

390. Q—I think you said in answer to Mr. Biggar that it was not a sulphide? A—It is not sulphide, it is not oxide, it is simply carbon, an element, without anything else.

391. Q—You can have an ore that is neither a sulphide ore
40 nor an oxide ore? A—Yes, my Lord; there is another one in the patent Calumet & Hecla. That was an ore in which copper was present as metallic copper. It is still mined to a considerable extent and treated by flotation.

392. Q—I think you may have said before but in reference to alkali metals was it alkali earths or alkaline earths? A—They are usually called alkaline earth metals.

For Plaintiff—A. H. Higgins—Cross-Examination

393. Q—And what is the difference between alkaline earth metals and alkali metals? A—Alkali metals are very much more caustic in their action than alkaline earth metals. They are very much more soluble in water. Calcium hydrate is only very slightly soluble in water.

394. Q—You mean that metals are more soluble in water than earths? A—The hydrates of the metals are very much more soluble in water than alkaline earths which are only very slightly soluble. That is why instead of using a solution of lime in the treatment of
10 Anaconda slimes they use a paste, or they might have diluted it a bit further and used what we call milk of lime. Lime will not go into solution so it stays as a suspension making a white slimy substance.

MR. BIGGAR: Would your Lordship allow me a question that I really forgot?

HIS LORDSHIP: Yes.

MR. BIGGAR: 395. Q—Mr. Higgins, Martin to whom your evidence in chief was directed, filed, did he not, a patent application in the United States Patent Office which made claims which were held to conflict with those contained in the Keller patent? A—Yes.

20 396. Q—And in that proceeding there was evidence taken on both sides? A—Yes.

397. Q—Mineral Separations North America Limited, the plaintiff, opposing the right of Martin to obtain the patent that he asked for? I mean opposed the allowance of his application? A—Not exactly opposing; the Americans call it interference.

398. Q—I know, but there are two parties to every interference and one party was Martin who was asking for a patent and the other party was Minerals Separation North America Limited, the plaintiff, which was opposing the granting of that patent?
30 A—Not opposing; the patent office themselves insist on the action.

399. Q—But I fancy Minerals Separation— A—One on each side.

420. Q—They were in opposite directions, and the plaintiff undertook to call a lot of evidence which was directed to showing that Martin was not entitled to the patent. A—The patent at issue, yes.

421. Q—That was in 1929, was it not? A—As far as I remember, it was.

422. Q—And as a matter of fact, Martin in that proceeding
40 was setting up his invention of 1915, was he not? A—Yes.

423. Q—Do you know how long before the evidence was taken the interference was directed? A—No, I cannot tell you from memory.

424. Q—Well, we have the file so we can put that in.

MR. ROBINSON: It is in.

For Plaintiff—A. H. Higgins—Cross-Examination

MR. BIGGAR: Oh, yes. It appears, my Lord, from an exhibit we have.

MR. ROBINSON: K-47.

THE WITNESS: It will be in the file wrapper.

MR. BIGGAR: Oh, yes. That is not the interference filed.

425. Q—Can you tell me what the result of the interference was? A—Yes.

426. Q—He was refused his patent, was he? A—Yes.

HIS LORDSHIP: 427. Q—He was refused? A—Yes. Keller
10 was given a patent.

MR. BIGGAR: 428. Q—Keller was given a patent and Martin was held to be disentitled to a patent on his then application because the process had been in operation already, before he filed his application, for two years. Was that not it? A—Yes. That is my recollection of it.

429. Q—Thank you. I just wanted to get that formal point cleared up.

MR. GOWLING: No questions, my Lord.

HIS LORDSHIP: Have you any other witnesses to call in re-
20 buttal?

MR. GOWLING: No, my Lord. I am not calling any further witnesses.

HIS LORDSHIP: Mr. Biggar, I stated yeste'day that I would allow you to recall any of your witnesses, and I think I went so far as to say that you might call any other witnesses to meet the evidence adduced by Mr. Higgins.

MR. BIGGAR: Yes, my Lord.

HIS LORDSHIP: So that you might not in any way be pre-
judiced by the course that was taken in connection with the com-
30 mission evidence and the examination evidence.

MR. BIGGAR: Quite so, my Lord. But, as a matter of fact, I am not going to find myself under any necessity of taking advantage of the privilege which your lordship accorded me. However, I should like to put in some additional correspondence to indicate the resignation of Martin from the employ of the plaintiff company for the purpose of asserting his rights in respect of his invention in 1915. Some of that correspondence is already in, but there has been some of it that has been produced by the plaintiff which I should like to put in, merely in view of what Mr. Higgins has said.

40 HIS LORDSHIP: Yes. You are putting that in.

MR. GOWLING: Of course, my lord, the filing of this is subject to all the proper objections, if there are any that are hearsay or happen to be inadmissible as evidence.

HIS LORDSHIP: Oh, yes. But am I to understand, Mr. Biggar, that you are not calling any additional witnesses?

MR. BIGGAR: I am calling no additional oral evidence; no my Lord.

HIS LORDSHIP: Or recall any of the witnesses that you called?

MR. BIGGAR: No, my Lord.

HIS LORDSHIP: But you wish to put in some documents?

MR. BIGGAR: Yes, my Lord.

HIS LORDSHIP: All right, Mr. Robinson.

MR. ROBINSON: The first is a letter dated June 3, 1926, from Martin to Gregory.

10 THE REGISTRAR: That will be Exhibit D-109.

EXHIBIT NO. D-109	Filed by	{	Letter dated June 3, 1926, from Martin to Gregory.
	Mr. Robinson		

MR. ROBINSON: The next is a letter of the same date from Roberts, or from Minerals Separation to Martin.

HIS LORDSHIP: That is from the plaintiff to Martin?

MR. ROBINSON: Yes, my lord, from the plaintiff to Martin.

HIS LORDSHIP: That will be Exhibit D-110.

20 EXHIBIT D-110 Filed by

Mr. Robinson	{	Letter dated June 3, 1926, Minerals Separation to Martin.

MR. ROBINSON: The next is a letter of June 5, 1926, from Martin to Mr. Roberts, the secretary of the plaintiff.

HIS LORDSHIP: That will be D-111.

EXHIBIT D-111: Filed by	{	Letter dated June 6, 1926, Martin to Roberts.
Mr. Robinson		

MR. ROBINSON: The next is a letter of June 7, 1926, from the plaintiff to Martin.

HIS LORDSHIP: That will be D-112.

30 EXHIBIT D-112: Filed by

Mr. Robinson	{	Letter dated June 7, 1926, plaintiff to Martin,

MR. ROBINSON: Then there is a letter of June 12, 1926, from Martin to the plaintiff.

HIS LORDSHIP: That will be D-113.

EXHIBIT D-113: Filed by	{	Letter dated June 12, 1926, Martin to plaintiff.
Mr. Robinson		

MR. ROBINSON: Then there is a letter of June 14, 1926, from the plaintiff to Martin, which will be Exhibit D-114.

HIS LORDSHIP: Yes.

40 EXHIBIT D-114: Filed by

Mr. Robinson	{	Letter dated June 14, 1926, plaintiff to Martin.

MR. ROBINSON: Then there are two other letters which the plaintiffs have not been able to produce at the moment, but they

will have them to-morrow. I can give the identification of them now.

HIS LORDSHIP: Two other letters?

MR. ROBINSON: Yes.

HIS LORDSHIP: You can perhaps indicate what they are.

MR. ROBINSON: I can give your Lordship the identification, I think.

HIS LORDSHIP: And then when they are produced they can be put in. They can be given their numbers now.

10 MR. ROBINSON: Yes, my lord. I think that would be the most convenient method.

MR. GOWLING: That is quite satisfactory.

MR. ROBINSON: The first of those two is a letter of June 28, 1926, from Martin to Nutter. That is No. 168 on the plaintiff's affidavit of production.

HIS LORDSHIP: That will be Exhibit D-115.

MR. ROBINSON: Yes, my Lord. The next is a letter of July 6, 1926, from Nutter to Martin, which is No. 169 on the plaintiff's affidavit.

20 HIS LORDSHIP: Yes. That will be Exhibit D-116.

MR. ROBINSON: Yes. It is No. 169 on the plaintiff's affidavit. That is all, my Lord.

HIS LORDSHIP: Then that concludes the evidence?

MR. BIGGAR: All the evidence, my Lord.

HIS LORDSHIP: We might recess for ten minutes, and then the plaintiff is called on first. Is that the usual practice? What is the usual practice?

MR. BIGGAR: The usual practice is for the plaintiff to begin the argument, then for the defendant to follow, and for the plaintiff
30 to have a final reply.

MR. GOWLING: Would your lordship like to discuss that first before adjournment?

HIS LORDSHIP: I was not just sure what the practice was in these cases with the presumption of validity of the patent in your favour, and yet the onus of proof of infringement upon you.

MR. GOWLING: Yes, my Lord. Your lordship will remember that in my opening statement I pointed out our position in that respect and mentioned that there is a presumption in favour of the validity of the patent, and that I had therefore proposed to
40 explain the patent in our opening case and prove infringement, but not to deal with the question of validity. I suggested at the end of our evidence that my closing of the case should be postponed until after the defence was completed.

HIS LORDSHIP: At the closing of your opening.

MR. GOWLING: That is right, my Lord. I have perhaps not always used the term "closing" or opening" correctly. But I meant that after the evidence had all been filed or tendered in Court, I still feel as I did in opening, that the closing of my case should consist in arguing the question of infringement. Your Lordship may wonder why I was not prepared to do that at the end of the plaintiff's evidence; that is, after we finished with Mr. Higgins. The reason was this. As your Lordship will remember, during the course of the trial, two of our claims specifically mentioned potassium xanthate.

HIS LORDSHIP: What is that?

MR. GOWLING: Two of our claims specifically mentioned potassium xanthate.

HIS LORDSHIP: I thought there was only one.

MR. GOWLING: That is right, my Lord.

HIS LORDSHIP: That was claim 8.

MR. GOWLING: Yes, my Lord. I am sorry. I had another point in mind. I really meant there were two of our claims about which I might have some slight difficulty in dealing with the question of infringement.

HIS LORDSHIP: It would not be a matter of difficulty so far as claim 8 is concerned.

MR. GOWLING: No, my Lord.

HIS LORDSHIP: You would not have any case at all.

MR. GOWLING: That was the situation we were in at the end of our case. I would not like to say that I agree with that, my Lord.

HIS LORDSHIP: I am speaking now exclusively of claim 8.

MR. GOWLING: Yes. It seemed obvious, my Lord, that our case on those claims which are not obviously infringed, would to some extent depend on the evidence of my friends concerning terminology, and any success which I might have on cross-examination. That is one reason why I felt in this case particularly—and I have felt the same in other cases—that it is a little unfair, or perhaps I should not say unfair, but it is a little improper for the plaintiff to close his case immediately after the evidence has been tendered. It may be a prima facie case, but further evidence may come out on cross-examination.

HIS LORDSHIP: Apparently while there is a rule calling on counsel for the plaintiff to argue at the end of the opening and the defendant to argue at the end of the defendant's case, I understand it has never been followed.

MR. GOWLING: It has never been followed in any case I have been in. I have never closed a case after putting in my own evidence, and I do not recall of any case that has been closed with argument in which I have been acting for the defendant. I think the rule has been more honoured in the breach than anything else.

HIS LORDSHIP: That is what I understood from counsel, that while it was there in black and white, as far as the summing up is concerned, it has never been followed.

MR. BIGGAR: As I indicated to your Lordship, it has been the practice for the cases to be opened by the plaintiff and defendant and then argued at the end.

HIS LORDSHIP: Then what has been the practice as far as counsel's argument at the end is concerned?

MR. GOWLING: That is a point on which I think there has
 10 been, perhaps, some difference. In the last two cases that I recall
 in which I appeared for the plaintiff, I simply argued the question
 of infringement and did not deal with the validity of the patent.
 Then the defendant would deal with the attack on the patent, after
 which the plaintiff would have the right to answer that attack. The
 defendant in that case would have the last word on the question of
 validity and the plaintiff the last word on the question of infringe-
 ment. I had rather anticipated in opening my case that that followed
 practice would be followed. I think my friend has in mind that the
 proper course would be for me to deal with the question of validity
 20 in closing my case. However, my Lord, I do not think that is the
 advisable procedure. I would prefer to wait until my friend attacks
 the patent and completes his attack. His opening statement, of
 course, gives us a fairly clear conception of his case; but I would not
 want to be placed in the position of answering the opening statement
 and then having my friend reply to that with additional material
 which I would be unable to answer. And in order to get my argu-
 ment in in a coherent way and deal with all points at once, it seems
 to me that it would be preferable, both from the standpoint of the
 Court and counsel, for me to confine the closing of my case to the
 30 question of infringement.

HIS LORDSHIP: Confine it to what?

MR. GOWLING: Confine my present argument to the question
 of infringement.

HIS LORDSHIP: Oh, yes.

MR. GOWLING: That is, I will for the moment assume validity
 of the patent and deal with the question of infringement. Then if
 your Lordship desires it, counsel for the defendant could then continue.
 I perhaps should not say "continue". Counsel for the defendant
 could then deal with the attack on the patent and answer my al-
 40 legation of infringement. Then your Lordship would have the
 complete attack on the patent and I would answer the complete
 attack on the patent, after which my friend would reply on the
 question of validity. Then if any reply was necessary on infringe-
 ment, I think I would have the right to do so. There may be some
 advantage in having the last word, although I have never felt that
 that was of very great advantage to either counsel. I think the
 main thing is to get the case before your Lordship in the most con-

venient manner, and it is not very material to me how it is conducted in that respect, but I would prefer to deal with it along those lines if your Lordship could see fit to handle it in that manner.

HIS LORDSHIP: I am not familiar with the practice which has prevailed in this Court. This is my first patent case. But offhand, it would strike me that what you suggest is the logical course to follow. However, I should like to hear from Mr. Biggar.

MR. GOWLING: Yes, my Lord.

MR. BIGGAR: I would suggest that your lordship consult the
10 Registrar and the records of the Court. I think the Registrar will have no difficulty in indicating to your lordship from the records of the Court, what the practice of the Court has been.

HIS LORDSHIP: Well, has it been uniform?

MR. BIGGAR: I think it has been uniform.

THE REGISTRAR: Not quite uniform.

MR. BIGGAR: Not quite.

HIS LORDSHIP: This strikes me as being a logical way of doing it. Is there any particular reason why it should not be done that way?

MR. BIGGAR: If your Lordship likes to do it that way, all
20 right. As a matter of fact, if my friend wants to do it that way, we have nothing to add to my opening, so my friend might just as well go along and argue his case.

MR. GOWLING: That would help matters a great deal.

HIS LORDSHIP: I do not know about that, Mr. Biggar. I mean, if you can assist the Court beyond what you have—

MR. BIGGAR: I have made all the points that we are going to raise. I may not have cited everything I am going to cite in view of what my friend says, but that is a different thing.

HIS LORDSHIP: If you can add anything to what you have
30 stated in your opening, I should be glad to hear it, because it might be the effect of certain evidence—

MR. BIGGAR: My Lord, the substance of the case, as it stands now, I stated either post hoc or by prospect in my opening, which is the proper course in an opening. So that my friend really knows all the points upon which the defence rests now.

HIS LORDSHIP: I was just wondering. For instance, you indicated certain sub-rules, and then you outlined your contentions as to the respects in which the patent infringed those rules. Then
40 here and there you indicated that you would bring evidence in support of such and such a contention.

MR. BIGGAR: Yes; and your Lordship has heard that.

HIS LORDSHIP: And that is all covered.

MR. BIGGAR: We have really no new points to bring up.

HIS LORDSHIP: There may be no new points, but the effect of certain evidence, for instance.

MR. BIGGAR: I indicated what the character of it would be in opening, my Lord.

HIS LORDSHIP: Yes.

MR. BIGGAR: And it was just as I anticipated. There is nothing we can add until we know what my friend has to say.

HIS LORDSHIP: That is one of the points. Am I to understand that Mr. Biggar would have the last word on the attack on the patent?

MR. GOWLING: Well, yes. In these circumstances, my Lord,
10 I would not only deal with the question of infringement, but I would answer completely my friend's opening statement.

MR. BIGGAR: That is right. My friend will have the reply.

MR. GOWLING: Then I would have the reply.

HIS LORDSHIP: You would have the reply?

MR. GOWLING: Yes, on my friend's statement.

MR. BIGGAR: That is quite right.

MR. GOWLING: I do not think that the reply in this Court is one that usually lasts very long. I know as between my friend and myself, we usually find we have all exhausted our material.
20 There may be a few odd points which may surprise both of us.

HIS LORDSHIP: There is a lot of leeway.

MR. BIGGAR: Yes.

HIS LORDSHIP: Then it does not, apparently, make a great deal of difference.

MR. GOWLING: No, I do not think so, my Lord; and in view of my friend's statement that he has put his case in.

HIS LORDSHIP: That in substance he has made his case.

MR. GOWLING: Yes.

HIS LORDSHIP: Then I think we will adjourn now and I will
30 call on you to deal with the whole case from both the infringement point of view and in reply to Mr. Biggar's argument. Then Mr. Biggar can make his comments after that.

MR. BIGGAR: Yes, my Lord. It may be that I am going to ask your Lordship to let my friend, Mr. Robinson, deal with part of it, but there will be no duplication.

HIS LORDSHIP: Yes, I would be very glad to have that. Are you ready to go on? There has been a tremendous volume of material. I am wondering whether Mr. Gowling is ready to organize his whole argument or whether we might not really gain
40 time by adjourning now until Monday.

MR. GOWLING: I can assure your Lordship that time will be saved by doing that.

HIS LORDSHIP: I would be rather inclined to think it might really save time. Then, we shall adjourn now until 10:30 a.m. on Monday.

—Court adjourned at 3.25 o'clock p.m. to meet Monday, November 27, at 10.30 o'clock a.m.

EXHIBIT D-84

No. 835,120.

PATENTED NOV. 6, 1906.

H. L. SULMAN, H. F. KIRKPATRICK-PICARD & J. BALLOT.

ORE CONCENTRATION.

APPLICATION FILED MAY 29, 1905.

2 SHEETS—SHEET 1.

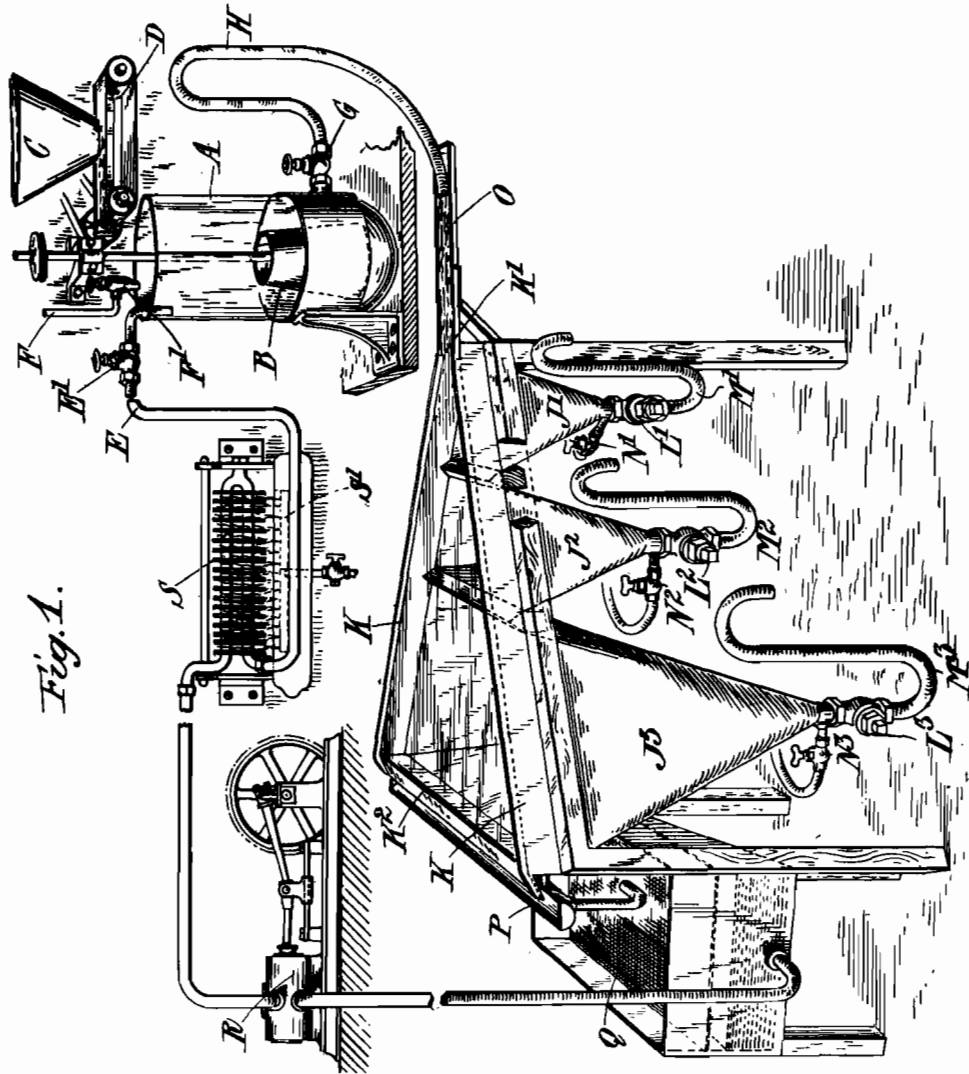


Fig. 1.

Witnesses
 J. M. Kunkers
 M. B. Hayes.

Inventors
 Henry Livingstone Sulman,
 Hugh Fitzgala Kirkpatrick-Picard and
 John Ballot.
 by Knights Bros
 Attys.

No. 835,120.

PATENTED NOV. 6, 1906.

H. L. SULMAN, H. F. KIRKPATRICK-PICARD & J. BALLOT.

ORE CONCENTRATION.

APPLICATION FILED MAY 29, 1905.

2 SHEETS—SHEET 2.

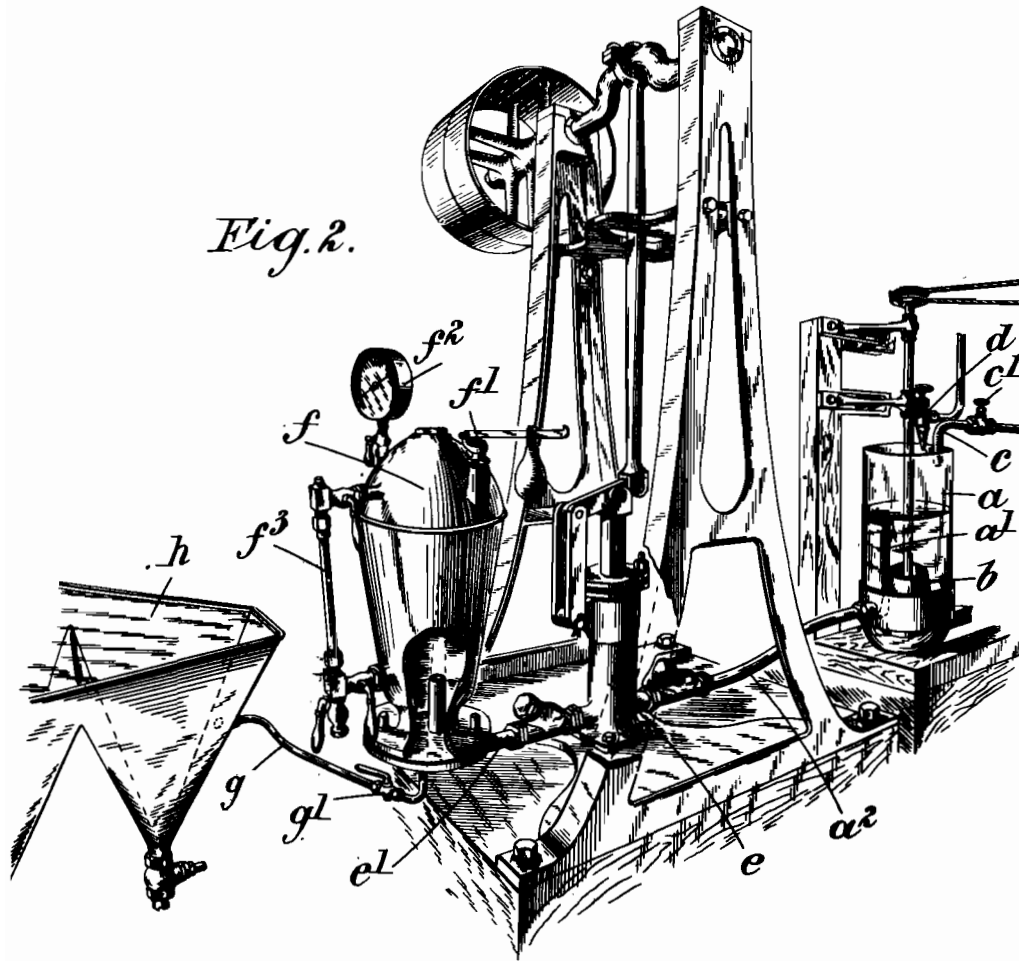


Fig. 2.

Witnesses
 A. Knight
 H. A. Simms

Inventors
 Henry L. Sulman
 Hugh F. Kirkpatrick-Picard
 John Ballot
 by Thayer & Gos
 Attorneys

UNITED STATES PATENT OFFICE.

HENRY LIVINGSTONE SULMAN, HUGH FITZALIS KIRKPATRICK-PICARD,
AND JOHN BALLOT, OF LONDON, ENGLAND.

ORE CONCENTRATION.

No. 835,120.

Specification of Letters Patent.

Patented Nov. 6, 1906.

Application filed May 29, 1905. Serial No. 262,386.

To all whom it may concern:

Be it known that we, HENRY LIVINGSTONE SULMAN, HUGH FITZALIS KIRKPATRICK-PICARD, and JOHN BALLOT, subjects of the King
5 of England, residing in London, England, have invented certain new and useful Improvements in Ore Concentration, of which the following is a specification.

This invention relates to improvements in
10 the concentration of ores, the object being to separate metalliferous matter, graphite, and the like from gangue by means of oils, fatty acids, or other substances which have a preferential affinity for metalliferous matter
15 over gangue.

In the process described in the previous United States patent, No. 777,273, granted to A. E. Cattermole, an amount of oil vary-
20 ing from four per cent. to six per cent. of the weight of metalliferous matter present is agitated with an ore pulp, so as to form granules which can be separated from the gangue. In the previous United States patent, No. 777,274, granted to A. E. Cattermole and
25 others, a similar method of separation is employed, oleic acid being produced *in situ* in the ore pulp.

We have found that if the proportion of oily substance be considerably reduced—say
30 to a fraction of one per cent. on the ore—granulation ceases to take place, and after vigorous agitation there is a tendency for a part of the oil-coated metalliferous matter to rise to the surface of the pulp in the form of a
35 froth or scum. This tendency is dependent on a number of factors. Thus the water in which the oiling is effected is preferably slightly acidified by adding, say, a fraction of one per cent. up to one per cent. of sul-
40 furic acid or other mineral acid or acid salt, the effect of this acidity being to prevent gangue from being coated with oily substance, or, in other words, to render the selective action of the oil more marked; but it
45 is to be understood that the object of using acid in the pulp according to this invention is not to bring about the generation of gas for the purpose of flotation thereby, and the
50 proportion of acid used is insufficient to cause chemical action on the metalliferous minerals present. Again, we have discovered that the tendency for the oily substance to disseminate through the pulp and the ra-

pidity with which the metalliferous matter becomes coated is increased if the pulp is
55 warmed. The formation of froth is assisted by the fine pulverization of the ore, and we find that slime mineral most readily generates scum and rises to the surface, while
60 larger particles have less tendency to be included in the froth. The proportion of mineral which floats in the form of froth varies considerably with different ores and with
65 different oily substances, and before utilizing the facts above mentioned in the concentration of any particular ore a simple preliminary test is necessary to determine which oily
substance yields the proportion of froth or scum desired.

The following is an example of the applica-
70 tion of this invention to the concentration of a particular ore. An ore containing ferruginous blende, galena, and gangue consisting of quartz, rhodonite, and garnet is finely powdered and mixed with water containing
75 a fraction of one per cent. or up to one per cent. of a mineral acid or acid salt, conveniently sulfuric acid or mine or other waters containing ferric sulfate. To this is added a
80 very small proportion of oleic acid, (say from 0.02 per cent to 0.5 per cent on the weight of ore.) The mixture is warmed, say, to 30° to
40° centigrade and is briskly agitated in a cone mixer or the like, as in the processes
85 previously cited, for about two and one-half to ten minutes, until the oleic acid has been brought into efficient contact with all the
mineral particles in the pulp.

When agitation is stopped, a large proportion of the mineral present rises to the sur-
90 face in the form of a froth or scum which has derived its power of flotation mainly from the inclusion of air-bubbles introduced into the mass by the agitation, such bubbles or
95 air-films adhering only to the mineral particles which are coated with oleic acid. The minimum amount of oleic acid which can be used to effect the flotation of the mineral in
the form of froth may be under 0.1 per cent. of the ore; but this proportion has been
100 found suitable and economical.

If the ore were crushed to ninety mesh to the linear inch, (half of which ore will pass through one hundred and fifty mesh sieve,) the froth may contain about seventy per cent.
105 to eighty per cent. of the metalliferous matter

present in the ore. This froth is removed from the pulp by spitzkast, upcast, skimming, draining, or otherwise. After subsidence the oil-coated metalliferous matter removed as
5 froth is separated from any liquid which may have accompanied it and treated with a dilute solution of caustic alkali, which removes the oleic acid in the form of a solution of soap.

If desired, the oleic acid used in the first
10 instance may be produced *in situ* in the pulp by decomposing a dilute soap solution with mineral acid, as described in the previous patent, No. 777,274, cited above. The oleic acid or other fatty acid forming the coating
15 on the metalliferous matter which produces the froth may give rise to insoluble soaps on the surface of the metalliferous matter if soluble lime, iron, or other salts are present in small quantity during the production or on
20 the breaking down of the froth with alkali. Such insoluble soaps are difficult to remove and are capable of adhering to air and causing flotation, much the same as the fatty acids do.

The metalliferous matter which did not
25 form part of the froth (generally the larger particles) remains in admixture with the gangue in the pulp. To recover this, the pulp is distributed in a thin layer on a shaking-table, convex buddle, or the like, where-
30 on the mineral is exposed to a free-air surface, which exposure may be increased by the application of air-blast or air-jets or the like and thereafter brought onto the edge or surface of liquid, whereby the metalliferous matter floats and is separated from the gangue,
35 which sinks, as described in the specification of our previous United States application Serial No. 246,637, filed February 20, 1905.

The proportion of mineral recovered in the
40 froth and that recovered by table flotation may be considerably varied; but, generally speaking, the froth will separate the slime mineral while the larger particles are re-
45 covered by the latter method.

In the accompanying drawings, Figure 1 is a diagram in perspective illustrating one form of apparatus suitable for carrying this invention into practice, and Fig. 2 represents
50 in perspective an apparatus for carrying out a secondary step in the process.

Referring to Fig. 1, a mixing vessel A (of which there may be any number in series) is provided with a rotatable stirrer B. Crushed
55 ore is fed from a hopper C into the vessel by a band D. A pipe E, controlled by a tap E', delivers circuit-water to the vessel, and oleic acid or other oil is introduced through the pipe F and tap F'. The outer cock G from
60 the vessel A communicates through a swan-neck pipe H with the froth separating apparatus. In passing from the frothing apparatus A to the spitzkasten (say between O and K) the pulp may, if desired, be run in a thin
65 layer over a smooth slightly-inclined plane.

The froth-separating apparatus comprises several (say three) pointed boxes J' J² J³, which open at the top into a horizontal channel consisting of side walls K. The channel has a narrow inlet K' and spreads out to a
70 wide outlet K². The pointed boxes J' J² J³ have fullway-cocks L' L² L³ at the bottom, leading to swan-neck discharge-pipes M' M² M³. An upcurrent of water may be led in at the bottom of each box through a tap N' N² N³.
75

The boxes are all filled with circuit-water. The pulp from the vessel A is distributed horizontally from the flat trough O through the inlet K'. The heavy sands and coarser particles of mineral sink into the first box J',
80 from which they are led to a shaking-table, convex buddle, or the like, to be treated as above described. The middlings or medium sands fall into the box J², and if they contain
85 any mineral may be removed for further treatment by agitation. The upcurrent of water from the taps N' N² prevents the deposition of any slime in these boxes. The fine sands or gangue slimes settle in the last
90 box J³, from which they are discharged to waste or further treatment.

The slime mineral in the form of froth or scum floats from the liquid and is carried by the stream over the outlet K² into a launder
95 P and thence to a filter Q, where the metalliferous matter is removed from the circuit-water, which is returned to the vessel A by a pump R. The circuit-water may be brought to the proper temperature by passing it
100 through a heater S, having a burner S', before admitting the water to the vessel A.

An alternative method for the recovery of any sunk oiled metalliferous matter which may be deposited in the second and third
105 spitzkasten is as follows: The products suspended in circuit liquor are removed from the spitzkasten and placed in a vessel in which they are submitted to an additional pressure of air or other gas of from, say, one
110 to two atmospheres or over. On relief of such pressure the bubbles of air or other gas so generated throughout the mass at once sweep to the surface thereof all the metalliferous matter in the form of a froth which can
115 be separated as before. This idea is not claimed broadly in this case, but forms the subject-matter of an application filed by us on January 9, 1906, Serial No. 295,326.

Referring to Fig. 2, a mixing vessel a (of which there may be several in series) is provided with a rotatable stirrer b. Crushed ore or similar finely-divided mineral is fed into the vessel a. A pipe c, controlled by a tap c', delivers circuit-water to the vessel,
120 and in cases where oil is used the oil is introduced through the pipe d in quantity sufficient to produce a thin coating of oil on these mineral particles for which oil has an affinity.

The pulp mixed with oil escapes over the

lip of the discharge-conduit a' and passes through the pipe a^2 to a pump e . Hence the pulp is pumped through discharge-pipe e' into the closed chamber f , which is constructed to withstand a considerable internal pressure and is provided with a safety-valve f' , the pressure-gage f^2 , and a gage-glass f^3 to indicate the level of the pulp in the chamber. An outlet-pipe g , having a cock g' , leads to a series of spitzkasten h , filled with circuit-water.

The operation is as follows: The cock g' is closed. Pulp is pumped into the chamber f , which contains air or other gas, and the pumping is continued until the pressure in the chamber rises to, say, fifty to one hundred pounds per square inch. The pressure is sufficient to cause the air or other gas to be dissolved to a considerable extent in the pulp. After the lapse of a few minutes for the due solution of the compressed air or a portion of it by the pulp or the liquid the cock g' is opened and the pulp is discharged into the open spitzkasten h , where the liquid is of course under atmospheric pressure. The pulp e may be stopped during this discharge. The whole of the mineral to which air bubbles are attached—say the oiled mineral—at once rises to the surface as a coherent scum or froth. A surface current of water is maintained in the spitzkasten, and the floating material is thus removed and separated from the gangue, which remains sunk or suspended in the liquid.

The nature and arrangement of the apparatus used may be varied without departing from this invention.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The herein-described process of concentrating ores which consists in mixing the powdered ore with water, adding a small proportion of an oily liquid having a preferential affinity for metalliferous matter, (amounting to a fraction of one per cent. on the ore), agitating the mixture until the oil-coated mineral matter forms into a froth, and separating the froth from the remainder by flotation.
2. The herein-described process of concentrating ores which consists in mixing the powdered ore with slightly-acidified water, adding a small proportion of an oily liquid having a preferential affinity for metalliferous matter (amounting to a fraction of one per cent. on the ore), agitating the mixture until the oil-coated mineral matter forms into a froth and separating the froth from the remainder by flotation.
3. The herein-described process of concentrating ores which consists in mixing the powdered ore with slightly-acidified water, adding a small proportion of an oily liquid having a preferential affinity for metalliferous matter (amounting to a fraction of one

per cent. on the ore), warming the mixture, agitating the mixture until the oil-coated mineral matter forms into a froth and separating the froth from the remainder by flotation.

4. The herein-described process of concentrating ores which consists in finely powdering the ore, mixing it with slightly-acidified water, adding a small proportion of an oily substance having a preferential affinity for metalliferous matter (amounting to a fraction of one per cent. on the ore), warming the mixture, agitating the mixture until the oil-coated mineral matter forms into a froth, separating the froth from the remainder by flotation, and removing the oily coating from the mineral.

5. The herein-described process of concentrating ores which consists in mixing the powdered ore with water, adding a small proportion of oleic acid amounting to 0.02–0.5 per cent. on the ore, agitating the mixture until the oleic acid has been brought into efficient contact with the mineral and has formed a froth therewith, and separating the froth from the remainder by flotation.

6. The herein-described process of concentrating ores which consists in mixing the powdered ore with water containing a fraction of one per cent. of sulfuric acid, adding a small proportion of oleic acid amounting to 0.02–0.5 per cent. on the ore, agitating the mixture until the oleic acid has been brought into efficient contact with the mineral and has formed a froth therewith, and separating the froth from the remainder by flotation.

7. The herein-described process of concentrating ores which consists in mixing the powdered ore with water containing a fraction of one per cent. of sulfuric acid, adding a small proportion of oleic acid amounting to 0.02–0.5 per cent. on the ore, warming the mixture to 30°–40° centigrade, agitating the mixture until the oleic acid has been brought into efficient contact with the mineral and has formed a froth therewith, and separating the froth from the remainder by flotation.

8. The herein-described process of concentrating ores which consists in finely powdering the ore, mixing it with water containing a fraction of one per cent. of sulfuric acid, adding sufficient oleic-soap solution to produce oleic acid amounting to 0.02–0.5 per cent. on the ore, warming the mixture to 30°–40° centigrade, agitating the mixture until the oleic acid has been brought into efficient contact with the mineral and has formed a froth therewith, separating the froth from the remainder by flotation, filtering off the froth and removing the oleic acid therefrom by treatment with an alkali.

9. The process of concentrating powdered ores which consists in separating the mineral from the gangue by coating the mineral with oil in water containing a small quantity of

oil, agitating the mixture to form a froth, and separating the froth.

10. The process of concentrating powdered ores which consists in separating the mineral
5 from the gangue by coating the mineral with oil in water containing a small quantity of oil, warming the mixture, agitating the mixture to form a froth, and separating the froth.

11. The process of concentrating powdered
10 ores, which consists in separating the mineral from the gangue by coating the mineral with oil in water containing a small quantity of oil, and a quantity of acid insufficient to cause chemical action on the metalliferous minerals
15 present, agitating the mixture to form a froth, and separating the froth.

12. The process of concentrating powdered
20 ore which consists in separating the minerals from gangue by coating the minerals with oil in water containing a fraction of one per cent. of oil on the ore, agitating the mixture to cause the oil-coated mineral to form a froth, and separating the froth from the remainder
of the mixture.

25 13. The herein-described process of concentrating ores which consists in finely powdering the ore, mixing it with water contain-

ing less than one per cent. of sulfuric acid, adding sufficient oleic-soap solution to produce oleic acid amounting to 0.02-0.5 per
30 cent. on the ore, warming the mixture to 30°-40° centigrade, agitating the mixture until the oleic acid has been brought into efficient contact with the mineral and has formed a
35 froth with the finer mineral, distributing the mixture on the surface of a current of water running over columns of water, so that the coarser minerals and sands, the finer sands and the gangue slimes successively deposit
40 out while the froth is floated away by the current, filtering off the froth and removing the oleic acid therefrom by treatment with an alkali and separating the coarser mineral
45 from the sands by exposing them alternately to air and water.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY LIVINGSTONE SULMAN.

HUGH FITZALIS KIRKPATRICK-PICARD.

JOHN BALLOT.

Witnesses:

GEO. J. B. FRANKLIN,

T. J. OSMAN.

Disclaimer in Letters Patent No. 835,120.

DISCLAIMER.

835,120.—*Henry Livingstone Sulman, Hugh Fitzalis Kirkpatrick-Picard, and John Ballot*, London, England. ORE CONCENTRATION. Patent dated November 6, 1906. Disclaimer filed March 28, 1917, by the assignee, *Minerals Separation, Limited*.

"Your petitioner, therefore, for the purpose of complying with the requirements of the law in such case made and provided, and of disclaiming those parts of the thing patented which your petitioner does not choose to claim or hold by virtue of said Letters Patent No. 835,120, does hereby disclaim from claims 9, 10 and 11 of said Letters Patent No. 835,120, any process of concentrating powdered ores excepting where the results obtained are the results obtained by the use of oil in a quantity amounting to a fraction of one per cent. on the ore."

[*Official Gazette, April 3, 1917.*]

DISCLAIMER

835,120.—*Henry Livingstone Sulman, Hugh Fitzalis Kirkpatrick-Picard, and John Ballot*, London, England. ORE CONCENTRATION. Patent dated November 6, 1906. Disclaimer filed June 27, 1922, by the assignee, *Minerals Separation North American Corporation*.

"Your petitioner therefore for the purpose of assuring disclaimer of those parts of the thing patented which your petitioner does not choose to claim or hold by virtue of said Letters Patent, if such parts have not been already fully disclaimed, does hereby disclaim, as of March 28, 1917, as well as of to-day, from claims 9, 10, and 11 of said Letters Patent No. 835,120 any process of concentrating powdered ores excepting where the results obtained are the results obtained by the use of oil in a quantity amounting to a fraction of one per cent on the ore."

[*Official Gazette July 11, 1922.*]

EXHIBIT D-85

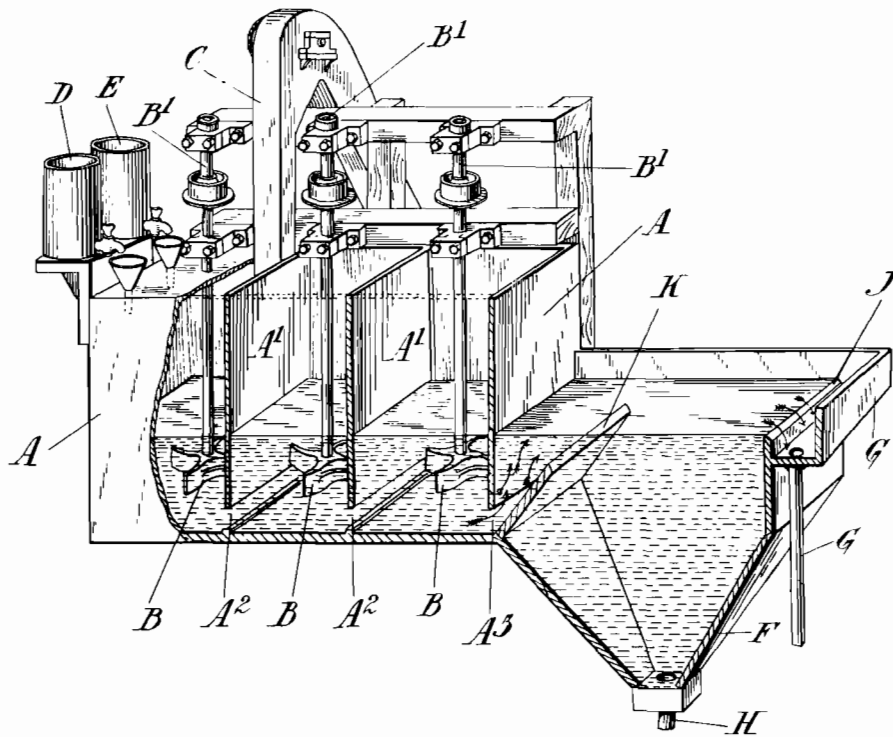
H. L. SULMAN, H. H. GREENWAY & A. H. HIGGINS.

ORE CONCENTRATION.

APPLICATION FILED APR. 30, 1909.

962,678.

Patented June 28, 1910.



Witnesses
 J. W. Shynkoop,
 613 Melton

Inventors,
 Henry Livingstone Sulman,
 Henry Howard Greenway and
 Arthur Howard Higgins,
 By
 Knight & Co.
 Attorneys.

UNITED STATES PATENT OFFICE.

HENRY LIVINGSTONE SULMAN, HENRY HOWARD GREENWAY, AND ARTHUR HOWARD HIGGINS, OF LONDON, ENGLAND.

ORE CONCENTRATION.

962,678.

Specification of Letters Patent. Patented June 28, 1910.

Application filed April 30, 1909. Serial No. 493,207.

To all whom it may concern:

Be it known that we, HENRY LIVINGSTONE SULMAN, HENRY HOWARD GREENWAY, and ARTHUR HOWARD HIGGINS, subjects of the King of England, residing at London, England, have invented certain new and useful Improvements in Ore Concentration, of which the following is a specification.

This invention relates to the concentration of ores, the object being to separate certain constituents of an ore such as metallic sulfids from other constituents such as gangue when the ore is suspended in a liquid such as water.

According to this invention the crushed ore is mixed with water containing in solution a small percentage of a mineral-frothing agent, (that is of one or more organic substances which enable metallic sulfids to float under conditions hereinafter specified) and containing also a small percentage of a suitable acid such as sulfuric acid, and the mixture is thoroughly agitated; a gas is liberated in, generated in, or effectively introduced into the mixture and the ore particles come in contact with the gas and the result is that metallic sulfid particles float to the surface in the form of a froth or scum, and can thereafter be separated by any well known means. Among the organic substances which in solution we have found suitable for use as mineral-frothing agents with certain ores are amyl acetate and other esters; phenol and its homologues; benzoic, valerianic and lactic acids; acetones and other ketones such as camphor. In some cases a mixture of two such mineral-frothing agents gives a better result than a single agent. The above mentioned mineral-frothing agents are all more or less effective in the presence of an acid such as sulfuric acid and are given as types but are not intended to form an exhaustive list of suitable organic substances which may be used in this manner and for these objects. On the other hand there are many organic compounds which in solution will not effect the result described, such as some sugars, dextrin, saponin, albumen, ox gall, etc., and a simple test is required in the case of varying ores or materials to determine which organic compound is most suitable.

The following is an example of one method of carrying this invention into effect:—

Water containing a small percentage of sulfuric acid in solution, say from .2% to 0.5%, and containing in solution a small quantity say 0.1% of one of the foregoing organic substances (say amyl acetate) is, with finely pulverized ore, introduced into an agitating apparatus, in the proportion of say 3 parts by weight of water to 1 part by weight of ore. The agitation is carried out in such a way as thoroughly to disseminate air through the mixture which is thereafter discharged into a spitzkasten. It is found that a coherent froth or scum floats on the surface of the water in the spitzkasten. This froth contains a large proportion of the metallic sulfids but is substantially free from gangue. Any well known means may be employed for collecting the froth. If desired the tailings can be re-treated by the same process with or without the addition of fresh quantities of the organic materials referred to. The action may in some instances be improved by heating the mixture.

The accompanying drawing is a diagrammatic view in perspective illustrating one form of apparatus partly broken away suitable for use in this process. (The apparatus itself forms no part of this invention.)

Several agitation vessels A are placed in series. These may conveniently be large vats separated by partitions A¹ having openings A² at the bottom so that the liquid may pass from one to another. Each vessel is provided with a rotatable stirrer B which is conveniently of the form shown in the drawing. Each stirrer is carried on a spindle B¹ rotated at a high speed by any convenient means. Crushed ore or similar finely divided mineral is fed into the first vessel A through any convenient ore-feeding device such as C, and water is also fed into the vessel A. A small proportion of acid, such as sulfuric acid, may be introduced into the water from the feeding vessel D, and a small proportion of one or more other soluble substances which enable metallic sulfids to be floated by air under the conditions hereafter specified, may be introduced from the feeding vessel E. The liquid containing ore in suspension is vigorously agitated in the agitation-vessels and escapes at the outlet A³ highly charged with air.

A settling apparatus consisting of one or

more spitzkasten F, is placed immediately at the outlet from the agitation apparatus. As shown in the drawing, the spitzkasten F has a launder G to receive the floating froth which passes away through the outlet G¹. The liquid and the sunken material pass out through the outlet H at the bottom of the spitzkasten. The level of the liquid in the spitzkasten is slightly above the lip J. Within the spitzkasten is placed an inclined baffle or guide-plate K, which may be made adjustable, extending upward from below the inlet A² and arranged to direct the stream of ore-particles and air-bubbles toward the surface of the liquid in the spitzkasten.

Hitherto many proposals have been made for the wet concentration of ores involving the addition to the liquid in which the ore is suspended of an immiscible liquid. For example in the patent granted to Cattermole, Sulman & Picard, United States No. 777274 dated December 13th, 1904, is described a process of ore concentration in which metalliferous particles were coated with a thin film of a fatty or resin acid or a phenol or a cresol by introducing the alkaline compounds of these materials into an acid liquid whereby these materials were liberated in an immiscible or insoluble condition and adhered to the mineral particles. In another known process the powdered ore suspended in water, preferably acidified, is mechanically brought to the surface whereby the particles are exposed to the air and it is found that the metalliferous particles float on the surface while the gangue sinks. In this known process the selective flotation of the metalliferous particles is not due to the metalliferous particles being coated with a selective agent, that is to say, the selective flotation is due to the properties of the metalliferous particles themselves when exposed to air or other gas and brought onto the edge or surface of water preferably acidified.

The present process differs from the two before mentioned types and from other known concentration processes by the introduction into the acidified ore pulp of a small quantity of a mineral-frothing agent *i. e.*, an organic compound in solution of the kind above referred to and by the fact that the metalliferous particles are brought to the surface in the form of a froth or scum not by mechanical means but by the attachment of air or other gas bubbles thereto.

In the frothing processes hitherto known the substances used to secure the formation of a mineral-bearing froth has been oil or an oily liquid immiscible with water. According to this invention the mineral-frothing agent consists of an organic compound contained in solution in the acidified water.

We do not confine ourselves to the pro-

portions above given, the best proportion can in each case be easily determined by trial.

It is well known that certain of the organic substances we have referred to are not soluble in water in all proportions and that if used in excess might partly remain insoluble in the acidified water and might become mechanically affixed to the metalliferous particles of the ore. We disclaim any such use of these substances and only claim them in such amount as will enable them to dissolve in the acidified water.

What we claim as our invention and desire to secure by Letters Patent is:—

1. The hereindescribed process of concentrating ores which consists in mixing the powdered ore with water containing in solution a small quantity of a mineral-frothing agent, agitating the mixture to form a froth and separating the froth.

2. The hereindescribed process of concentrating ores which consists in mixing the powdered ore with water containing in solution a small quantity of an organic mineral-frothing agent, agitating the mixture to form a froth and separating the froth.

3. The hereindescribed process of concentrating ores which consists in mixing the powdered ore with slightly acidified water containing in solution a small quantity of a mineral-frothing agent, agitating the mixture to form a froth and separating the froth.

4. The hereindescribed process of concentrating ores which consists in mixing the powdered ore with slightly acidified water containing in solution a small quantity of an organic mineral-frothing agent, agitating the mixture to form a froth and separating the froth.

5. The hereindescribed process of concentrating ores which consists in mixing the powdered ore with water containing in solution a small quantity of a mineral-frothing agent, agitating the mixture and beating air into it in a finely divided state so as to form froth and separating the froth.

6. The hereindescribed process of concentrating ores which consists in mixing the powdered ore with water containing in solution a small quantity of an organic mineral-frothing agent, agitating the mixture and beating air into it in a finely divided state so as to form a froth and separating the froth.

7. The hereindescribed process of concentrating ores which consists in mixing the powdered ore with slightly acidified water containing in solution a small quantity of an organic mineral-frothing agent, agitating the mixture and beating air into it in a finely divided state so as to form a froth and separating the froth.

8. The hereindescribed process of concentrating ores which consists in mixing the

powdered ore with slightly acidified water containing in solution a small quantity of an organic mineral-frothing agent, heating the mixture, agitating the mixture and beating air into it in a finely divided state so as to form a froth and separating the froth.

9. The hereindescribed process of concentrating ores which consists in mixing the powdered ore with slightly acidified water containing in solution a small quantity of an organic amyl compound, agitating the

mixture to form a froth and separating the froth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY LIVINGSTONE SULMAN.

H. HOWARD GREENWAY.

ARTHUR HOWARD HIGGINS.

Witnesses:

WALTER J. SKERTEN,

E. C. WALKER.

Exhibit—W-3.

EXHIBIT—W 3

(Williams' notes of conference with Higgins and Martin
on March 6, 1915)

R. B. MARTIN'S COMPOUNDS

- | | | | |
|-----------|--|--|------------------------|
| Calura | Reagent to balance acidity of | | |
| | 13 lbs. sulphur | | Mix dry and boil in |
| | 13 lbs. CaO (Lime) | | water, about 2-oz. to |
| sulphides | $1\frac{1}{2}$ Na ₂ CO ₃ | | 1 gallon add 6 gallons |
| | $\frac{1}{4}$ Na OH | | per ton of ore. |
- 10 Lime, sulphur, and NaOH
Polysulphide formed (Limestone) (more expensive)
By applying CaCO₃ or Na₂CO₃ oil will balance
the solution. Calcium sulpho hydrate is formed.
-
- Usually run it in pot into a cold pulp
standing in air forms scum, but ordin-
arily does not deteriorate on cooling.
-
- Used with pine oil, coal tar aromatic hydrocarbon
for example creosote oil, reconstructed stove oil.
-
- Reconstructed stove oil (Reconstructed petrol.)
- 20 Petroleum distillate heavier than Kerosene 38°
distillate. Distil it over sulphur. Produces a
denatured oil This may also be done as to pine
oil. 5 pounds of sulphur to 100 pounds of oil.
-
- Hydrula.
Reconstructed pine oil and resin and caustic soda
boiled in water. Forms polysulphide and colloid
Alternative
- | | | | |
|----|--------------|------------------------|---------------|
| 30 | 25 cc — 95% | reconstructed pine oil | |
| | 5 grain — 4% | Resin | May be varied |
| | 5 grain — 1% | NaOH | |
-
- Hydrula is a frothing agent $\frac{1}{4}$ pound to ton of
ore preferably $\frac{1}{4}$ pound of straight stove oil.
May be made up and sold.
-
- Natrola* is Organic sulphide. From alcohol or starch
in presence of carbon bisulphide. Gives froth and
floats without oil. Can be made from molasses.
- | | | |
|----|--|--|
| 40 | 100 cc. alcohol (not absolute, figs.
—containing water) | |
| | 25 cc. carbon bisulphide | |
| | 5 grams NaOH | |

Exhibit—W-3.

Exhibit—W-2.

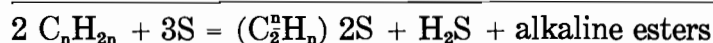
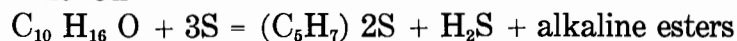
Works well with hydrula

Exothermic reaction.

May be made from methyl alcohol. Thiocarbonate or molasses replaces alcohol.

Will crystallize out and crystals can be shipped, dissolving readily in water.

Pine Oil



10 Endicott Hotel, Schuyler 800.

Keller Ex. No. 3 bx.
William T. Smart
20 Feb. 1930

Keller
Ex 34 for
edent

EXHIBIT—W 2

C O P Y

EMPLOYMENT AGREEMENT

20 AGREEMENT made the sixth day of March One Thousand nine hundred and fifteen between MINERALS SEPARATION AMERICAN SYNDICATE (1913) LIMITED, a corporation organized and existing under the laws of Great Britain and having an office or place for the transaction of business situated at 62 London Wall, London, England, (hereinafter called the Company, which designation shall also include its successors), of the one part and RHETHERFORD B. MARTIN of Salt Lake City, Utah (hereinafter called the Employee), of the other part, WHEREBY IT IS MUTUALLY AGREED as follows:

30 1. The Company shall employ the said Employee and the said Employee shall well and faithfully serve the Company as metallurgist and engineer for the period of one year, under the direction of its Chairman or other executive officers, devoting his entire time, energy and skill to the services of the Company and the promotion of its interests; and shall perform from time to time such work as said Chairman or other executive officers shall request and at such places as he or they shall direct, the reason-

Exhibit—W-2.

able travelling expenses of said Employee to be paid by the Company. Said work shall be done and said service performed in a manner satisfactory to the Company.

2. The Employee further agrees, for the payments to be made him, as hereinafter set forth, to disclose and assign to the Company all inventions, improvements and discoveries made, conceived, developed, or completed by him while thus employed relating to the treatment of ores or tailings, flotation concentration or reagents, or relating in any manner to the business of the
10 Company, and that he will from time to time, upon request of the Company, make application through the patent attorneys of the Company for letters patent of the United States and any and all other countries for such inventions, improvements and discoveries, and assign forthwith all such applications and the letters patent thereon to the Company or to such person or persons, corporation or corporations, as it shall designate, and he hereby authorizes the company to take out foreign patents upon its own application or the application of such person or persons, corporation or corporations, as it shall designate for said inventions, improvements and
20 discoveries, should the Company elect so to do, in any country or countries where such procedure is lawful, all necessary costs and expenses of making said applications and assignments and procuring such letters patent to be borne and paid by the Company; and without charge for his services beyond the payment therein provided for, at any and all times before or after the termination of this employment to give the Company and its attorneys all reasonable assistance in preparing said applications and in drawing the claims thereof, and from time to time, on request, to execute all papers and do all things that may reasonably be required in
30 order to protect the rights of the Company and vest in it and its assigns the inventions, improvements, discoveries, applications and letters patent herein provided for and give to the Company and its assigns the full benefit thereof. Time actually spent by the Employee on such work at the request of the Company after the termination of this employment shall be paid for by the Company at the rate specified in Clause 3 of this Agreement. And the said Employee further agrees that he will not at any time, either while in the employ of the Company or thereafter, divulge or communicate to any person or persons, corporation or corporations, other
40 than the Chairman or directors of the Company, or any agent or attorney authorized or appointed by the Company, any trade or business secrets, operations or processes of the Company, or any of the affairs of the Company, or matters relating thereto which have or may come to his knowledge in pursuance of such employment.

3. The Company agrees to pay the Employee at the rate of Five thousand (\$5000.) dollars per year and at the same rate

Exhibit—W-2.

for any part of a year while this agreement is in force, which payment shall be in full for all services rendered and the assignment of all said inventions, improvements, discoveries, applications and letters patent herein provided for. The employment herein provided for shall commence March 15, 1915, and terminate March 15, 1916.

4. No change in the salary of the Employee shall be made, except by mutual consent, while this agreement is in force, but, if any such change is made, or if the character of the service performed is changed, the Employee shall continue to be bound by all of the provisions of Clause 2 of this Agreement.

Signed, sealed and delivered by the Company and the Employee the day and year first above written.

(Sgd.) MINERALS SEPARATION AMERICAN
SYNDICATE (1913) LTD.

By S. Gregory
Director

(Sgd.) RHETHERFORD B. MARTIN

20

STATE OF NEW YORK

COUNTY OF NEW YORK

} ss. :

(SEAL)

On this 6th day of March, 1915 before me personally appeared RHETHERFORD B. MARTIN, to me known and known to me to be the individual described in and who executed the foregoing agreement, and acknowledged to me that he executed the same for the uses and purposes therein set forth.

30

(Sgd.) HARRY C. LEWIS
Notary Public, Bronx, Co. No. 36
Certificate filed in New York
County No. 88

(SEAL)

Exhibit—W-1.

EXHIBIT—W 1

AGREEMENT made and entered into this sixth day of March One Thousand Nine Hundred and Fifteen between MINERALS SEPARATION, LIMITED, a British corporation, having an office or place for the transaction of business at 62 London Wall, England, (hereinafter called the Company, which designation shall include its successors and assigns) of the one part and RHETHERFORD B. MARTIN, of Salt Lake City, Utah, (hereinafter called Martin) of the other part.

10 WHEREAS an employment agreement has this day been entered into by and between Minerals Separation American Syndicate (1913) Limited and Martin.

AND WHEREAS Martin has heretofore invented what he believes to be valuable inventions and improvements in flotation processes and reagents and is the sole owner of said inventions and improvements and the right to patent the same, and all rights therein and thereunder except a shop right to the Utah Copper Company.

NOW, THEREFORE, it is mutually agreed as follows:

20 Martin is to promptly disclose to the Company all inventions and improvements heretofore made by him relating to the treatment of ores or tailings or flotation concentration or reagents for the use and benefit of the Company and its associated companies and its and their licensees to the full end of the option hereinafter granted, and to Mr. Henry D. Williams of New York for the purpose of enabling patent applications to be drawn for such of said inventions or improvements as the Company may desire to protect by patent applications in all or any parts of the world and Martin shall execute all necessary documents for the preparation filing and prosecution of said patent applications and obtaining patents

30 thereon, such patents to be obtained in the name of said Martin. The Company shall have the sole right and option to purchase all such inventions, improvements, patent applications and patents for the sum of Five Thousand (\$5000.00) dollars, such option to be declared upon by the Company as to their intentions within the period of one year from the day and year first above written, the payment of such sum, however, to be optional to the Company until three months after the decision of the Supreme Court of the United States in the suit of the Company and another against Hyde; if said option has not been exercised and such sum has not

40 been paid as above provided, the said inventions, improvements, patent applications and patents are to remain the property of Martin without repayment by him to the Company for any expenses theretofore paid in connection therewith by the Company and the Company shall be released from further obligations or

Exhibit—W-1.

payments in connection therewith. Martin shall not during the period above set forth disclose said inventions or improvements or file any other applications for patents therefor than as above provided. Martin will execute such documents as may be necessary to make the above option of record in the United States Patent Office.

If, in the opinion of the Company, Martin's reagents, modified oils or other chemicals useful for flotation concentration of ores can be successfully and profitably manufactured as a patented flotation oil or reagent; the Company will do their best to form a corporation for such manufacture or to arrange with a suitable corporation or group for the manufacture of the same and the Company will pay Martin twenty five per cent. (25%) of the net profits received by the Company therefrom.

Signed, sealed and delivered by the Company and Martin the day and year first above written.

(Sgd.) MINERALS SEPARATION, LIMITED

(Sgd.) By S. GREGORY
Director

20 (Sgd.) RHETHERFORD B. MARTIN (SEAL)

STATE OF NEW YORK }
COUNTY OF NEW YORK } ss. :

On the 6th day of *March*, 1915 before me personally appeared RHETHERFORD B. MARTIN, to me known and known to me to be the individual described in and who executed the foregoing agreement, and acknowledged to me that he executed the same for the uses and purposes therein set forth.

30 (Sgd.) HARRY LEWIS.

Exhibit—G-1.

EXHIBIT—G 1

— C O P Y —

MINERALS SEPARATION AMERICAN SYNDICATE
(1913) LTD.Sole Agents
Beer, Sondheimer & Co.
61 Broadway, New York.Chief Engineer
Edward H. Nutter
Merchants Exchange
Building
San Francisco.

10

NEW YORK, March 19th, 1915.

Dr. S. Gregory, Managing Director,
Minerals Separation American Syndicate (1913), Ltd.,
61 Broadway, New York City.

Dear Sir:—

In accordance with your request, I beg to submit the attached list covering the necessary experimental laboratory equipment for the immediate purpose of performing such work that may be essential in the furtherance of the several applications for patent now under consideration. This equipment will take care of adapting the
20 new processes that I have called to your attention to the various ores that you may have in mind.

We should obtain one of Janney's Glass Side Laboratory Flotation Machines. This machine may be secured through the Mine & Smelters Supply Company, New York City, for about \$50.00.

Another important item might be mentioned in the way of providing the laboratory with one gallon samples of the numerous commercial oils for the purpose of reconstruction, also a sample of molasses from Cuba would not be looked upon with disfavor as
30 a prospective organic matter for the production of Stanol.

Yours very truly,

(Sgd.) R. B. MARTIN,
Research Chemical Engineer.