IN THE

DISTRICT COURT OF THE UNITED STATES

FOR THE EASTERN DISTRICT OF PENNSYLVANIA.

No. 1491.

CHURCHWARD INTERNATIONAL STEEL COMPANY

vs.

BETHLEHEM STEEL COMPANY,

Defendant,

and

CARNEGIE STEEL COMPANY,

Intervenor.

Proofs on Final Hearing.

CHARLES NEAVE,
CLARENCE D. KERR,
for Defendant.

R. V. LINDABURY,
HENRY P. BROWN,
D. ANTHONY USINA,
for Intervenor.

F. P. WARFIELD,
L. A. WATSON,
for Plaintiff.

Lawyers' Book Pig. Co., 925 Walnut St.

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IN THE

District Court of the United States,

FOR THE EASTERN DISTRICT OF PENNSYLVANIA.

IN EQUITY.

No. 1491.

On Letters Patent Nos. 845,756 and 868,327.

CHURCHWARD INTERNATIONAL STEEL COMPANY

vs.

BETHLEHEM STEEL COMPANY, Defendant, and CARNEGIE STEEL COMPANY, Intervenor.

Philadelphia, Pa., Monday, May 28, 1917, at 10 o'clock A. M.

Before HON. OLIVER B. DICKINSON, *J.*

Present:

CHARLES H. DUELL, Esq.,
FREDERIC P. WARFIELD, Esq., and
HOLLAND S. DUELL, Esq., representing the Plaintiff.

CHARLES NEAVE, Esq., and
CLARENCE D. KERR, Esq., representing the Defendant.

R. V. LINDABURY, Esq.,
HENRY P. BROWN, Esq., and
D. ANTHONY USINA, Esq., representing the Carnegie Steel Company, Intervenor.

It is agreed between counsel for the respective parties that the testimony be taken stenographically by Charles F. Phillips and T. Roy Phillips, and thereafter reduced to typewriting and filed of record in the cause, and that the costs for taking said testimony be taxed as part of the costs in the case.

THE COURT: Is there any occasion to have the case opened?

MR. WARFIELD: Just a preliminary statement, if the Court please. This is a patent suit, in equity, on two patents. I hand up and offer in evidence the printed Patent Office copies of the two patents in suit, under a stipulation between the parties as to their competency, as duly certified copies of the originals.

THE COURT: Is this the case in which there was a license or assignment or something or other made by or to the Carnegie Steel Company?

MR. WARFIELD: That is one of the factors in the case, if the Court please.

THE COURT: I see they are named here now as a defendant. Did they interpose?

MR. WARFIELD: They petitioned to intervene, and that petition was granted.

MR. LINDABURY: There is a motion this morning to amend.

MR. WARFIELD: We will come to that presently. There is a preliminary matter which I intended to take up first with the Court.

We refer to the interrogatories filed on behalf of the defendant, certain of which are in the language of the claims of the patent in suit, and which state all the facts necessary for a determination of the question

of infringement, and state them catagorically and affirmatively. So that we have, then, the patents in suit before the court, and the facts as to infringement.

THE COURT: Is this a final hearing, or a motion for a preliminary injunction?

MR. WARFIELD: A final hearing, if the Court please. There is, however, an important matter in this case, and a question as to the method of procedure, emanating from the defendant, and at the suggestion of the defendant, the Bethlehem Steel Company, with which the plaintiff is in agreement, by which it appears possible to materially lighten the labors of the Court, and the time and expense of both parties herein. Since that has been suggested by Mr. Neave I think possibly he will prefer to state it to the Court.

MR. NEAVE: It is merely this, your Honor, that the defendant's witnesses will testify, as I told Mr. Warfield, that nearly all of the steel that is alleged to have been sold here in infringement of the patent, was sold to the United States Government. Only a very small part of it was sold to others. That brings up definitely and sharply the question as to whether this defendant is liable for these sales.

My suggestion to Mr. Warfield in the hope of being able to shorten the trial, was that after he had made his opening and proofs which he has to put in, I would put on the stand a witness who would testify as to the fact that I have stated, that nearly all of these sales were to the Government. We will put in evidence the Government contracts as between the Government and the defendant, and we then suggested to Mr. Warfield, subject to your Honor's approval, that there should be a preliminary hearing on that point, because it will take care of nearly all of the points of the case.

THE COURT: Is the fact in controversy?

MR. NEAVE: The fact of the sale is not in controversy. At least he takes my word for that. But I wish to put in evidence the contracts between the defendant and the Government. That will only take a moment.

THE COURT: The thought in my mind was this: Why can't you shorten it still more?

MR. NEAVE: We can.

THE COURT: If that fact is not in controversy, you can just stipulate the fact, or, if counsel on the other side, or they may not care to go that far, stipulate that the witness if produced would testify to such and such facts. That *prima facie* establishes the facts, and if there is nothing introduced upon the other side, follow it up with your contracts, and then we have that feature of the case before the Court.

MR. NEAVE: Then, an order might be entered to take care of that preliminarily.

MR. WARFIELD: If the Court please, the fact as to the sale of the Government is not in controversy. I accept Mr. Neave's statement as to that, as I accept any of his statements. But the character, the qualifications and conditions surrounding it—

THE COURT: Wouldn't that be disclosed by the contracts?

MR. WARFIELD: Partially, and only partially.

THE COURT: What I had in mind,—counsel have these facts, and the bearing points of the facts in their minds. Now, if it can be put in the shape that it is stipulated that a witness or witnesses if called by the defendant would testify to such and such facts, then

you get it all in a nut-shell. If they are required to be picked out of the testimony, it takes longer to get them upon the record, and it takes longer for anyone reading the record to get it into their mind, because counsel can go directly to the point. Why cannot that be done? Mr. Neave, you just state it, that it is agreed that the witness if produced would testify to such and such facts.

Mr. Warfield: I think, if the Court please, we cannot go quite so far as that. This is a rather important and from many standpoints a somewhat complicated case, and if we are to make a record which will partially or substantially dispose of all necessarily contested points, a witness or witnesses should be called on behalf of the defendant and subjected to cross-examination, so that we can make up a record on those points or on that point, as to be helpful to the Court, and to any other Court before whom this case might come. I think we can do it fully as quickly and more effectively by having an actual witness called.

The Court: You cannot do it otherwise, except by agreement, but I think the sooner counsel appreciate the spirit of having equity cases tried as if at law the better, and when you are trying a case at law, the more you eliminate matters not in controversy, and get down to the controverted points, the better the case is tried, and the better it is defended, and the better it is decided.

Mr. Warfield: Quite so, your Honor.

The Court: The trouble in trying patent cases,—we all get into the position as if we were merely sitting here taking depositions. Of course, under the old

practice, when the facts were developed before the real bearing points of the fight were appreciated by counsel on either side, you had to cover the whole ground, and you had to cover every point, because you were in the position that somebody could go over the record you had made and if they found a weak spot in it they would make that the fighting point. But now you are here, selecting your own points of real conflict, and why not get right down to it at once?

MR. WARFIELD: Quite so, your Honor. This, however, is only incidentally a patent matter.

THE COURT: It cannot be done unless counsel concur in it. Of course, you have your case in mind. I haven't because I don't know what it is.

MR. WARFIELD: I would be very glad to concur in it if the Court, knowing all the facts, thought it was necessary.

THE COURT: I understand you do not feel you can concur in that. So go ahead and develop the facts.

MR. WARFIELD: I would like the Court to understand my viewpoint, lest I should not seem open to a suggestion from the Court.

THE COURT: Do not disturb yourself about that feature of it. You know your case. I do not. It is your right, in the first place, to have it, and that ends it. In the second place, of course I would defer to your judgment of what is the proper thing to do, because you know and I do not. Call your witness, and we will get right at it.

PRELIMINARY EVIDENCE ON BEHALF OF THE DEFENDANT.

EDWARD O'CONNON ACKER, having been duly sworn, was examined and testified as follows:

By MR. NEAVE:

Q1. You have been connected with the Bethlehem Steel Company, the defendant, for over twenty-five years, have you not?

A. For over twenty-eight years.

Q2. You are a metallurgist and an engineer of the company?

A. Yes, sir.

Q3. You have caused an examination to be made of the books and other records of the company, have you not, to determine the amount of nickel chrome vanadium steel sold by the defendant to the United States Government for war material between October 29th, 1909, and June 23rd, 1914?

A. I have.

Q4. Am I right in understanding that such examination showed that during this period 4,626.69 tons of nickel chrome vanadium steel were sold to the United States Government for war material, and that out of this total quantity 4,149.49 tons were made by the defendant and the balance purchased from the Carnegie Steel Company?

A. Yes, sir.

Q5. Of this amount of steel that was made by the defendant 4,146.86 tons were projectiles, were they not?

A. They were.

Q6. The contracts under which these projectiles were sold to the Government are the ones that I now

show you, are they not, with the exception of a contract of June 22nd, 1909, for 2100 twelve-inch shells, which you have not in your possession at the moment?

A. They are.

MR. NEAVE: Defendant offers in evidence one of the contracts, being dated August 23rd, 1910, to be marked, "Defendant's Exhibit A," all of the contracts being exhibited to plaintiff's counsel and this one only being offered in evidence as it is agreed between the parties that they are all in substantially similar form, subject to later inspection of all of them.

(Contract dated August 23rd, 1910, above referred to marked as requested, "Defendant's Exhibit A, May 28-1917, C. F. P.")

(It is agreed that the contract marked "Defendant's Exhibit A" may be removed from the files, to be kept in the custody of defendant's counsel, and to be exhibited to plaintiff's counsel upon request, in connection with the other projectile contracts listed during Mr. Acker's testimony.)

By MR. NEAVE:

Q7. Two of the contracts are dated in 1909, namely, April 12th, 1909, and June 22nd, 1909. Were the sales under these contracts made prior or subsequent to July 1st, 1910?

A. Subsequent.

MR. WARFIELD: Doesn't that call for a conclusion?

MR. NEAVE: Oh, no.

MR. WARFIELD: I must object to the form of the question.

By Mr. Neave:

Q8. Were the deliveries made prior or subsequent to July 1st, 1910?

A. Subsequent to July 1st, 1910.

Q9. Were the shells billed out under these contracts prior or subsequent to July 1st, 1910?

A. Subsequent to July 1st, 1910.

Q10. The tonnage covered by these two contracts was 1,088.7 tons, was it not?

A. Yes, sir.

Q11. That steel which the defendant purchased from the Carnegie Company, 57 tons were sold to the United States Government prior to July 1st, 1910, and the balance subsequent to that date? Is that true?

A. Yes, sir.

Q12. Then, apart from the few tons of the material stated above, the dates of the sale of which you have stated, when were those sales?

A. They were sold in 1911 and 1912, the earliest contract being November 9th, 1910.

Q13. There is also a contract of January 28th, 1914, with the United States Government for fourteen-inch projectiles. Have any deliveries been made under that contract?

A. They have not.

Q14. In addition to the steel sold to the United States Government, about which you have testified, did the defendant sell any other nickel chrome vanadium steel from October 29th, 1909?

A. 175 tons were sold for Argentine warships in 1912, which were purchased from the Carnegie Steel Company.

Q15. How about your merchant steel?

A. 1.37 tons were sold to the Autocar Company for gears.

Q16. Now we have covered all the nickel chrome vanadium steel which was sold by the Bethlehem Steel Company for war material between October 29th, 1909, and June 22nd, 1914, and all of the merchant material of that kind sold?

A. Yes, sir.

Q17. From October 29th, 1909, to date?

A. Yes.

Cross-examination.

By Mr. Warfield:

XQ18. Do these contracts with the Government set forth all the specifications imposed by the Government as to the material to be used in filling such contracts?

A. No; they do not.

XQ19. Will you state what the other specifications not appearing in these contracts are? As to the material to be used my question is limited to.

A. The material is specified to be steel, and the specifications are based largely on the performance of the projectiles rather than on their composition.

XQ20. These contracts in all instances set forth that the Government is not to be held liable for any patent claims, as to infringement or otherwise? That is correct, is it not?

A. I think it is. The contracts are here.

XQ21. There were no agreements or specifications not appearing in the contracts which you have produced which in any way altered this understanding as between the parties?

A. I did not understand that.

The Court: Wouldn't that have to appear, or otherwise the fact would be controlling? You wouldn't have to negative that, would you?

MR. WARFIELD: No, if the court please, but I think it is well to negative that fact.

By MR. WARFIELD:

XQ22. I state to you that there were no conditions imposed by the Government as to patent claims or patent infringement outside of those specifically set forth in the contracts?

A. Not that I know of.

XQ23. You were in a position to know the facts if there had been anything outside of the written contracts, were you not?

A. I am not sure.

XQ24. Were you in general charge of this matter for the Bethlehem Steel Company at the time the contracts were taken?

A. No; I was not in general charge. I was merely in an advisory capacity as to the materials and the method of manufacture. I had not seen the contracts when we did the work.

XQ25. Can you state the specific dates of delivery under each one of these contracts from your records?

A. I haven't that information with me.

MR. WARFIELD: I shall be satisfied if that can be supplied later by counsel, if necessary.

MR. NEAVE: Very well.

By MR. WARFIELD:

XQ26. In the papers offered as an exhibit in connection with the contract produced by you there is first a printed form filled in in typewriting, an executed contract for projectiles. That is correct, is it not?

A. Yes.

XQ27. And next specifications for armor piercing projectiles for the United States Navy annexed thereto and made a part thereof?

A. Yes, sir.

XQ28. On page seven of the printed copy of the specifications, under Section 40, sub-section (f), it is stated "That the Government shall not be held liable on account of the use by the contractor of the designs, patents, processes, or inventions of any party whatsoever in the manufacture of the projectiles." That is the statement in the contract, is it not?

A. I believe it is.

XQ29. And that was the understanding between the parties?

A. I don't know anything about that. I know the specifications were a part of the contract.

XQ30. You recognize this paper as the duly executed contract between the Government and the Bethlehem Steel Company?

A. Yes.

XQ31. You know of nothing that would in any way modify, qualify, waive or otherwise affect this subsection (f), Section 40, on page seven of the specifications for armor piercing projectiles?

A. I do not.

MR. NEAVE: For the purpose of the record it is noted that the various contracts between the defendant and the United States Government for the sale of projectiles made of the steel complained of are dated as follows: April 12th, 1909; June 22nd, 1909; August 23rd, 1910; August 30th, 1910; November 11th, 1910; October 10th, 1911; November 15th, 1912; and January 28th, 1914.

MR. NEAVE: I do not know how your Honor would prefer to have your record stand. Mr. Warfield and I thought at this point it might be well to enter an order as part of the record that this matter may be taken up for preliminary decision.

This evidence shows that the total sales to the Government of this war material was about 4,500 tons, and that the only material other than war material sold by the defendant in this period was 1.3 tons, and the sales to foreign Governments were 175 tons. So you see by far the larger part of the steel in controversy is the 4,500 tons. The rest of it is inconsiderable, and I should suppose the parties could take care of that between themselves without troubling the court, if this matter of sales to the Government is determined.

May I read the brief order that we have been talking of, subject to your Honor's approval?

> "It appearing from the preliminary proofs taken in open court in this case that a major part of the steel in controversy sold by the defendant during the period of alleged infringement was war material sold and delivered to the United States Government, now, at the suggestion of both of the parties hereto, it is
>
> Ordered, that the question of law as to whether or not the defendant is, upon the facts presented, liable in this case with reference to its past sales to the Government, be argued and determined prior to proceeding with a trial of the case on the questions of validity and infringement of the patents in suit, which questions are hereby reserved and are not to be prejudiced by this order."

THE COURT: What do you mean by that? That we will thresh this all out beforehand without hearing the other controversy between you?

MR. NEAVE: On the validity and the scope of the patents. That is a very long, very complicated and very difficult matter, dealing with met-

allurgy, and we will have a large number of experts testifying here, and it seems as though it was an imposition on the court to put that burden on the court when we have only a small amount of steel in controversy outside of this Government steel. It is my own hope and belief that the decision on this Government question may render the further trial of the case unnecessary, although, of course, neither side is willing to say that definitely at the moment.

This question, as your Honor probably has in mind, of the liability of a private contractor in sales to the Government is now before the Supreme Court in two cases on certiorari. It has been decided several times in this Circuit. The Court of Appeals here recently in two cases—

THE COURT: That is what was in my mind. The logic of the situation would be, then, to hold this until we get that light. I do not see what advantage it would be to rule it here and then have the whole matter brushed aside. I do not see that you could successfully enter into any arrangement of that kind unless you take a whole dose and not part of it. I do not see where it is going to help you any to nibble at the carcass.

MR. NEAVE: I should suppose, your Honor, that you would hold this question for determination, because that is just what the Court of Appeals here has done in two recent cases, to await the decision of the Supreme Court.

THE COURT: In a matter of that kind counsel know what is ahead of them. I do not. I submit myself to the judgment of counsel, if you are in accord upon it, and will follow any practical

method of disposing of the controversy upon which you might agree.

MR. NEAVE: I think that what is in Mr. Warfield's mind is more a practical method, not of disposing of the controversy, but of holding onto it until after the decision of the Supreme Court.

THE COURT: I understand you are in accord on that. Mr. Warfield, does your thought go to the extent of merely tying this whole matter up on this preliminary question until we get a deliverance?

MR. WARFIELD: Substantially so, your Honor, unless it should be so clear to your Honor upon consideration of the facts, as produced by this record, that those facts are so radically distinguished from the questions now in controversy before the United States Supreme Court as to demand or justify an instant—

THE COURT: Mr. Warfield, I have, so far as my mind is concerned, some very clear cut notions on just this proposition, but that is not the real situation that confronts you.

MR. WARFIELD: Our point is, your Honor, that we wish to have this case put in shape so that after the Supreme Court has spoken the controversy, or so much of it as we—

THE COURT: I mean practically. I do not see that you can do but one thing or the other. You cannot do part of one and all of the other, because that don't help you any. You either have to decide to practically continue this case until that question is disposed of, and then make an order on this motion in accordance with that, and

I understand the situation is that if the contention of the other side is sustained, the quantity of dispute, putting it that way, that you have over the remaining shipments is reduced to such a degree that you can probably dispose of it without a trial. I assume that is the thought you have in mind.

MR. WARFIELD: That is the thought, and I think that is correct, your Honor.

THE COURT: You are right at the dividing of the ways. Whether or not any doubt there may be as to the soundness of the defendant's position upon this question justifies you in holding this other dispute open to await that event, or go on and take it because there is no advantage to us to make a mere preliminary ruling here other than to hold the question in the case.

MR. WARFIELD: The point is this, as we view it, irrespective of what the Supreme Court may hold in the Cramp case or in the Marconi vs. Simon case, this matter will necessarily be considered in this case and will be the main determining factor in this case, and we wish to put it in shape so that after the Supreme Court has spoken there may be as prompt a decision of this matter, if it is held until then, as I think the court very properly would be inclined so to hold it, we could have then a practically instant decision upon the point, and that we may then on that point, without the necessity of going through a long complicated trial on technical matters, have an appeal, so that we may take this case up to the Court of Appeals and to the Supreme Court, if necessary, on those facts, unless the Supreme Court, of course, makes such a pronouncement as to obvi-

ously and clearly dispose of this case on its own facts. That is the only point I am questioning now,—leaving the case in such shape that we may have prompt action on this, necessarily, the major and controlling feature.

THE COURT: The United States has not intervened here, has it? I assume it has not.

MR. WARFIELD: No, your Honor.

MR. NEAVE: Your Honor, in order to bring the matter to a focus I now move that the case be continued until after the decision of the Supreme Court. The last suggestion of Mr. Warfield, that he wants to have the matter in shape for instant decision on the part of your Honor, it seems to me your Honor will wish your recollection refreshed at that time as to what the facts are, and what the law and decisions have been in the cases, and you may make a decision on the facts of the case in the light of the decision of the Supreme Court in the Cramp case and the Marconi case, both of which cases are there on certiorari right now. So that I suppose that now we have the facts on the record, and we won't have to call any more witnesses on this point. We have the facts on the record of the Government contracts showing exactly what the Government transactions were. The case, then, if stopped now would be in a position to be taken up promptly after the decision of the Supreme Court.

THE COURT: If that motion is made on behalf of both of you I will make an order in accordance with it.

MR. WARFIELD: That is satisfactory to us,

with the understanding that the continuance is a continuance as to this particular point.

THE COURT: I do not know that you need, as far as that is concerned, make any other order than that the court takes this motion under consideration and continues the case.

MR. WARFIELD: That is satisfactory to us.

THE COURT: Until this can be decided as a question in limine.

MR. WARFIELD: And that thereafter it may be taken up at the convenience of the court, with such speed as may be practicable.

THE COURT: Counsel will know when to move, and as soon as that question is disposed of we will argue this question. If it is the opinion of counsel that it is decisive of this case an order can be made in accordance therewith. If in the opinion of counsel there is anything in the facts of this case which will differentiate it from the cases ruled, then you can have an argument upon that question. I suppose the further thought is that if the ruling is against you that you can go up—

MR. WARFIELD: On that point.

THE COURT: —on a very short record upon that point.

MR. WARFIELD: Preserving our other rights.

THE COURT: That would preserve your other rights, because if the ruling here is against you and you succeed in reversing it on appeal, the reversal would necessarily be accompanied with a procedendo. So it seems to me that you are all

fully protected. The only thing is just the conservation of time. You may go ahead and develop your whole case now, and have everything in your case, so that an adjudication would be final as to the whole controversy, or you can take it up—well, as a question in limine. That would hold the situation.

Mr. Warfield: We are glad to have your Honor's statement on that point, because from our viewpoint in reading the rules and the practice—of course, that practice is somewhat new, and we were not quite clear as to the question of specific right of appeal on a preliminary question under such conditions. We think we should have.

The Court: If the ruling is against you—hold on a moment. It would not necessarily be final, because you would have the right to go ahead as to the remainder of the contract.

Mr. Neave: They would have the right, your Honor, but it would seem to me that the ——

The Court: I am assuming that the practical situation is that this question disposes,—if the ruling is agsinst you,—that there is not enough left in the case to make it worth your while to do other than adjust your differences with the other side.

Mr. Warfield: Which makes us quite open to the suggestion made by counsel for the defendant that it will then be possible to adjust our differences, which is substantially the same point, your Honor. But assuming the ruling were against us, and if that were a controlling point in the case, it would certainly seem that it was not necessary to

go into the entire technical facts of the case in order to get a final decree and go up on appeal.

THE COURT: I am assuming that the equity rules which control us here are sufficiently mobile to enable us to put ourselves in the position in which we would be under the State practice, where a man files a bill in equity in a proceeding which is the proper subject of an action at law. The defendant can raise that question if he pleases. If he does not choose to raise it, it is eliminated and it is out of the case. If he does raise it, the requirement of the Pennsylvania statute is that it must be ruled by the court as a question in limine and the case remanded to the law side of the court, if such is the conclusion reached, or the motion dismissed if the case is one of which the court has jurisdiction as a proceeding in equity. That is, I mean on the Chancery side of the court. I will make the order in such a form as it amounts to nothing more than a continuance of this case.

MR. WARFIELD: That is satisfactory.

THE COURT: So that both of you will be protected. On reflection I do not see that anything more is required than that we do continue the case. Why wouldn't that leave every possible question open, and therefore be the most ample protection that you could have on each side.

MR. NEAVE: I should think that would be entirely satisfactory.

MR. WARFIELD: That is the understanding as between the parties.

THE COURT: It is understood between you that if that ruling does not dispose of your contro-

versy—I mean upon this branch of your case—that then either side can set this case down for argument upon this point.

Mr. Neave: Yes.

Mr. Warfield: That is satisfactory.

The Court: We will mark the case continued, then, by agreement, with leave to either party to set the case down for argument upon motion to enter the order which counsel has put of record.

Mr. Warfield: Before that is done, if the court please, there is one point in reference to Mr. Lindabury and Mr. Usina, counsel for the Carnegie Steel Company. We made a motion which is noticed for hearing this morning to amend our bill subsequent to the intervention of the Carnegie Steel Company.

As I view that matter, that is also a matter which would be merged in the final disposition of this case on the statutory defence of the Government use possibly, and, therefore, need not be taken up at this time unless counsel wish that it should be done. So far as we are concerned, the pleadings, not technically and as a matter of law, which we wish now to have incorporated in the bill, state and imply what amounts to false representations, and we are not insistent upon having that upon the record unless it ultimately becomes necessary.

Mr. Lindabury: There is no objection to having it on the record if they wish to put it there, but they should either proceed on their motion, I think, or withdraw it, with leave to renew it if they wish, of course. We are here to answer a motion. I

cannot quite see why it would not be just as well that it should not be made now. I have no objection.

THE COURT: I do not see any occasion to withdraw it with leave to renew it, unless the question is to be disposed of, or counsel on one side or the other want it disposed of. It seems to me the practical disposition of it is just to continue it along with the other.

MR. LINDABURY: Well, it comes to the same thing.

THE COURT: It comes to the same thing.

MR. LINDABURY: I haven't any objection to its being treated in that way, if it is their desire.

THE COURT: Of course, you having been brought here to answer that motion, you have your right to ask that it be disposed of, and that you be not brought back at another time, but inasmuch as this other matter, as I understand it, may be decisive of this question as well as every other question, it would seem to be the practical thing to just generally continue the case and continue that motion.

MR. LINDABURY: I would be very sorry to be brought back again just on that motion, which is the only thing that I am concerned in. It seems to me it could be rather quickly and easily disposed of. Nevertheless, I do not care to insist, if counsel on the other side prefers to postpone it.

MR. WARFIELD: It is a mere matter of convenience to the court. It may not be necessary for the court to consider it at all. We say that we

are willing to dispose of it in the way of a continuance, or willing to press it.

THE COURT: We will make a further order, that the motion of the plaintiff for leave to amend the bill is also continued.

MR. LINDABURY: I trust counsel will consider as far as he can my convenience in fixing the date for renewing it.

MR. WARFIELD: Oh, yes. We do that in every case.

Adjourned.

IN THE
DISTRICT COURT OF THE UNITED STATES,
FOR THE EASTERN DISTRICT OF PENNSYLVANIA.

IN EQUITY.

No. 1491.

On Letters Patent Nos. 845,576 and 868,327.

CHURCHWARD INTERNATIONAL STEEL COMPANY, Plaintiff,

vs.

BETHLEHEM STEEL COMPANY, Defendant, and CARNEGIE STEEL COMPANY, Intervenor.

Philadelphia, Pa., Wednesday, September 10, 1919, 10 A. M.

Before HON. OLIVER B. DICKINSON, *J.*

Present:

F. P. WARFIELD, Esq., and
L. A. WATSON, Esq., representing the Plaintiff.

CHARLES NEAVE, Esq., and
CLARENCE D. KERR, Esq., representing the Defendant.

D. ANTHONY USINA, Esq., and
HENRY P. BROWN, Esq., representing the Carnegie Steel Company, Intervenor.

PLAINTIFF'S EVIDENCE.

MR. WARFIELD: I offer in evidence a duly certified copy of the certificate of incorporation of the plaintiff.

MR. NEAVE: I reserve my right to object to it after an inspection of the document. I have never seen it.

THE COURT: Leave is granted to the plaintiff to submit a duly certified copy of the certificate of incorporation of the plaintiff, and the evidence is taken subject to the objection, and in compliance with this condition.

MR. WARFIELD: We also offer in evidence original copies, duly recorded in the United States Patent Office, having been submitted for the inspection of counsel for the defendants, the Bethlehem Steel Company, assignments from James Churchward, Patentee, to the plaintiff, of patent No. 868,327 in suit, and from James Churchward, patentee, also from the Titanium Steel Company, of patent No. 845,756, in suit.

We already have of record the copies of the patents in suit, and we are quite willing to make the stipulation desired by the defendant, it being principally for the benefit of the defendant, as to the use of printed Patent Office copies and publications, waiving, so far as it is possible, all formalities in that regard.

(It is agreed between counsel that the offer of printed Patent Office copies of the patents in suit is sufficient.)

Mr. Warfield: Plaintiff's counsel states that he will make the usual and any proper stipulation as to printed Patent Office copies throughout.

I understand, in strict compliance with the rules of court, the reporter taking the notes has been appointed by the court the reporter for that purpose, and that the costs will be taxed as costs of the suit.

The Court: Yes.

Mr. Warfield: The interrogatories, if the court please, which are on file, and which have been answered by the defendant, the Bethlehem Steel Company, coupled with the testimony already taken, we think sufficiently establishes the question of infringement, so far as the status of the case is concerned at present, at least unless and until we should come to the necessity for an accounting. We have the patents in evidence, and we have proved the title.

(Plaintiff rests.)

DEFENDANT'S EVIDENCE.

HARRY TIMOTHY MORRIS, having been duly sworn, was examined and testified as follows:

By MR. NEAVE:

Q1. You live in Bethlehem, Pennsylvania, do you not?

A. Yes.

Q2. You are about 49 years of age?

A. Yes.

Q3. You are a metallurgical engineer for the Bethlehem Steel Company, one of the defendants in this suit?

A. I am.

Q4. What have been your training and experience in the manufacture of steel?

A. I graduated from the Lehigh University, your Honor, in 1891, with the degree of Mechanical Engineer. I entered the employ of the Bethlehem Steel Company, or the Bethlehem Iron Company it was at that time, in 1895, and have been with them ever since. From about 1900 to 1911 I was superintendent of the Armor Plate Department, except in the year 1908, when I was superintendent of the Saucon Plant, which was producing rails and structural steels.

In about 1912, and from then until the middle of 1915, I was connected with the Ordnance Department of the Bethlehem Steel Company, and spent a large part of my time abroad in connection with the work in the Ordnance Department.

In the latter half of 1915 and the year 1916 I was connected with the manufacture of ammunition for foreign governments, which our company was conducting.

In 1917 I was superintendent of the Projectile De-

partment or departments. There were three departments.

In 1918 and until July of 1919 I was Consulting Engineer of the Bethlehem Steel Company, and since July of this year I have been Metallurgical Engineer of the Bethlehem Steel Company.

Q5. In testifying in this case Mr. Acker stated that between October 29, 1909, and June 23, 1914, 4,626.69 tons of nickel chrome vanadium steel was sold to the Government for war material, of which 4,149.49 tons were made by the defendant and 477.20 tons were made by the Carnegie Steel Company. He also testified that an additional 175 tons made by the Carnegie Company was sold to the Argentine Government, and 1.37 tons were made and sold by the defendant for merchant material, between October 29, 1909, and October 29, 1915. Have you caused a further examination to be made to verify those figures?

A. I have.

Q6. Please produce in tabulated form a statement showing the various kinds of nickel chrome vanadium material the Bethlehem Steel Company has sold during the period in question, stating the intended uses of the material, the tonnages and the analyses of each kind of material.

A. I produce such a statement. It reads as follows:

Various Kinds of Nickel-Chrome-Vanadium Material Sold by the B. S. Co. Between Oct. 29, 1909, and June 23, 1914, as War Material and Between Oct. 29, 1909, and Oct. 29, 1915, as Merchant Material.

	Analyses.					
Use.	Carbon.	Manganese Mn.	Nickel.	Chrome.	Vanadium.	Tonnage.
Projectiles	.62-1.02	.08-.47	1.82-3.21	2.08-3.40	trace to .42	
	Avg.-.768	Avg.-.25	Avg.-2.42	Avg.-2.52	Avg.-0.17	4019.19
Sighting hoods and periscope guards	.422-.424	.55-.60	2.42-2.60	.79- .98	.20- .27	2.30
Gun shield plates	.41 -.47	.42-.46	3.14-3.25	1.17-1.29	.22- .26	.25
Specially treated plates for conning tower tops, etc. (Carnegie)	.....	.31-.42	3.58-3.64	1.32-1.86	.22- .25	661.43
Automobile gears	.53	.37-.42	3.29-3.32	1.16-1.32	.21- .24	1.37
		Total.....				4684.54

By Mr. Neave:

Q7. In this tabulated statement there is an item of 661.43 tons of material that you apparently purchased from the Carnegie Company. From what source did you get the analyses of these specially treated plates purchased from the Carnegie Company?

A. We got the analyses from the Bureau of Ordnance, Navy Department. Our purchases from the

Carnegie Steel Company were inspected and accepted by the Bureau of Ordnance at the Carnegie Works, and we made no direct analysis. We made no analysis of this material when it was received at Bethlehem.

Q8. How was this material billed to you by the Carnegie Company? How was it described?

A. Described as special treatment plates.

Q9. You have no direct knowledge of the analyses of those plates?

A. No, sir.

Q10. All the knowledge you have comes from the letter of the Bureau of Ordnance dated December 4, 1915?

A. Yes, sir.

MR. NEAVE: I offer that letter in evidence. It is marked "Defendant's Exhibit B."

By MR. NEAVE:

Q11. What was the average chrome and carbon contained in the projectiles which are referred to in your analysis on the tabulated statement?

A. I examined this with reference to the content of chrome. The projectiles which contained 2.51 chrome, or more, were 51.696 per cent. of the whole lot, and they average 2.58 chromium. The projectiles that were 2.50 or less in chromium were the balance of 100 per cent. or 48.304. They averaged 2.45 per cent. of chromium. The average of the entire lot in chromium was 2.52. The average carbon was .768, or about .77 carbon.

Q12. Did the defendant, the Bethlehem Steel Company, sell any nickel chromium projectiles without vanadium, and if so, will you give the tonnages by years and the ranges of analyses?

A. I have a tabulation here, which answers your question. It reads as follows:

Ni. Cr. projectiles without vanadium made and sold 1904 to 1918 incl.

Year	Weight sold Gr.Tons	Carbon L.	Carbon H.	Carbon Av.	Manganese L.	Manganese H.	Manganese Av.	Nickel L.	Nickel H.	Nickel Av.	Chrome L.	Chrome H.	Chrome Av.
1904	40.79	.600	1.02	.769	.09	.27	.182	2.35	3.78	2.63	2.01	2.90	2.4
1905	37.72	.740	1.02	.888	.20	.34	.240	2.25	3.38	2.54	2.01	2.59	2.3
1906	7.22	.605	1.00	.825	.18	.30	.230	1.75	2.77	2.46	2.10	2.96	2.4
1907	2.32	.785	.90	.862	.16	.30	.220	2.54	2.97	2.69	2.16	2.70	2.4
1908	139.44	.640	1.04	.835	.17	.33	.225	2.30	2.68	2.47	2.10	2.85	2.4
1909	20.84	.606	.90	.763	.15	.28	.220	2.27	2.55	2.42	2.35	2.71	2.5
1910	5.94	.714	.84	.775	.24	.30	.270	2.27	2.48	2.33	2.42	2.57	2.4
1911	68.06	.628	.85	.718	.18	.33	.240	2.37	2.68	2.48	2.40	2.63	2.5
		.494	.86	.657	.17	.41	.270	2.48	3.28	3.05	1.40	1.89	1.6
1912	3.63	.678	.84	.743	.19	.27	.240	2.35	2.44	2.39	2.42	2.54	2.4
		.504	.86	.636	.20	.39	.290	2.94	3.29	3.04	1.51	1.85	1.6
1913	666.86	.478	.76	.635	.10	.45	.280	2.92	3.74	3.05	1.42	1.87	1.7
1914	543.57	.612	.79	.703	.20	.45	.310	2.94	3.08	3.01	1.36	1.84	1.7
		.492	.76	.617	.12	.47	.280	2.90	3.56	3.02	1.11	1.53	1.2
1915	21.76	.504	.86	.636	.20	.39	.290	2.94	3.29	3.04	1.51	1.85	1.6
1916	None												
1917	598.72	.500	.84	.580	.18	.51	.290	2.90	3.64	3.15	1.00	1.45	1.1
1918	3587.18	.500	.84	.596	.15	.66	.340	2.90	3.61	3.13	1.00	1.68	1.1
		.500	.85	.668	.17	.58	.320	3.20	3.94	3.54	1.96	2.38	2.1

By Mr. Neave:

Q13. Mr. Acker in his testimony stated that the defendant, the Bethlehem Steel Company, had a contract with the Navy Department for projectiles dated January 26, 1914. Were any projectiles delivered under this contract, and did they contain vanadium, and what, if any, difficulties were had in connection with passing the Government specifications?

A. There were 2400 projectiles, 14-inch caliber, contracted for in this contract. They were divided into five lots for the firing test. Each of these lots was tested and failed, 17 shells having been tested to

represent the five lots. Four of these lots were submitted for an additional test, and they all failed, 13 additional projectiles having been tested as a second or re-test of the shells. There were no deliveries made on this contract, and the contract was finally cancelled.

Q14. There was vanadium put in all of these projectiles?

A. Vanadium in all those shells.

Q15. And there was chromium and nickel also in those shells?

A. Yes, they were chromium nickel vanadium shells.

Q16. Of the 30 projectiles that were fired, how many were effective?

A. Only three.

Q17. What do you mean technically by "effective"?

A. The projectiles contain a cavity which is intended to carry a high explosive, and if after the projectile has passed through the armor plate in the firing test, that cavity is unexposed, and if there is no crack in the wall of the shell, so that the high explosive in the cavity would still be contained in the solid cavity, it is called "effective."

By The Court:

Q18. Let me see if I understand that. The idea is to make sure that that high explosive will come into operation after penetration?

A. Yes, sir.

By Mr. Neave:

Q19. You said no deliveries were ever made under this contract of January 26, 1914, and that the con-

tract was finally cancelled. Was there a later contract from the United States Navy for shells under the same specifications?

A. Yes, sir. A contract for 1800 14-inch shells.

Q20. Were any shells or projectiles delivered under that contract, and what composition were they?

A. Those shells were made of nickel chrome steel, without vanadium. They were also divided into lots of 500 for firing tests, and the first lot was passed and accepted. In the meanwhile the war came on and the Navy Department or the Government did not need for its uses any 14-inch shells, they needed small ammunition, and we suspended work on the balance of the contract at the instance of the Government.

Q21. But the one lot that was completed was accepted? Is that so?

A. Yes.

Q22. About 500 in that lot?

A. Yes, sir.

Q23. Do you know how it happened that no vanadium was used in making projectiles under this last contract?

A. We had come to the conclusion, after having experimented with nickel chrome vanadium in various kinds of product, that it was not of any value, and further we had come to the conclusion that it was introducing a detrimental element in the steel, and we decided to abandon the use of vanadium in connection with nickel chrome steels.

Q24. What was the tonnage of alloyed steels manufactured and sold by the Bethlehem Steel Company during the years 1910 to 1914, inclusive?

A. I have prepared a statement of that. Here it is. It reads as follows:

Total Shipments of Alloyed Steels.	
1910	41883.28
1911	38538.75
1912	38968.12
1913	23732.07
1914	24507.39
Total	167629.61

By Mr. Neave:

Q25. What was the tonnage of alloyed steels containing vanadium manufactured and sold by the Bethlehem Steel Company during 1910 to 1914, inclusive?

A. I have prepared a statement of that. Here it is. It reads as follows:

Total Shipments of Alloyed Steels containing Vanadium.	
1910	780.02
1911	1507.70
1912	1182.03
1913	1927.94
1914	629.55
Total	6027.24

By Mr. Neave:

Q26. These 6027 tons are included in the total of some 167,000 tons in your next preceding answer?

A. Yes, sir.

Q27. And this figure of 6027 tons includes all of the steels made and sold by the Bethlehem Company, whether or not containing also nickel and chromium?

A. Yes, sir. Many of them contained no nickel or no chromium.

Q28. What were the elements used in making the alloyed steels, to your knowledge, prior to November 1, 1906?

A. All steels contain, by nature of their manufacture, carbon, manganese, silicon, phosphorus and sulphur. In addition to that, I had knowledge of the use of copper, aluminum, molybdenum, tungsten and vanadium, nickel and chromium. Usually the silicon, manganese and aluminum were added for the purpose of acting as dioxidizers or scavengers.

Q29. Scavengers?

A. Scavengers, as we say in steel making, cleaning up the bath, and the other elements mentioned were added for various purposes, for various results we expected to get in the way of hardness or toughness, or something of that kind.

Q30. For about how long prior to November 1, 1906, had you known of commercial alloyed steels containing these ingredients?

A. I had known by conversation and by talk with engineers and steel manufacturers the use of most of those alloys at least since 1901. Some of them I have known of earlier, for example, nickel I have known of since 1888, and chromium I have known of since about 1897. Now I first personally heard vanadium talked about in 1900 or 1901.

Q31. As an ingredient of alloyed steel?

A. Yes, sir.

Q32. Have you been able to find any material manufactured by the defendant, the Bethlehem Steel Company, sold to anyone as nickel chrome vanadium steel for war material between October 29, 1909, and June 23, 1914, or for merchant material between October 29, 1909, and October 29, 1915?

A. No. Our steels were always sold as nickel chromium steels.

Q33. Since June 23, 1914—that is the date of the Churchward contract—has the Bethlehem Steel Company manufactured and sold any nickel chrome vanadium material for any purpose?

A. Yes. I found a record of having sold some rough machined air flasks for torpedoes since that date.

Q34. That was the only instance?

A. That is the only instance I found.

Q35. What was the tonnage of this nickel chrome vanadium for air flasks? What tonnage was made and what tonnage was sold?

A. We made about 995 tons of ingots and sold 95 tons of finished material. I may say, your Honor, that the air flask is a thin walled forging, and in hollow forgings where the walls are so thin the heat requirements of forging to keep the metal soft require a very thick wall, so that we only intended to make out of 995 tons of ingots about 153 tons of finished material, but, as a matter of fact, we got 95 tons.

Q36. What tonnage of gun shields of nickel chromium vanadium did you make and what percentage was sold?

A. We made 11 tons of ingots and shipped one quarter of a ton of finished product.

Q37. Did you manufacture any nickel chrome vanadium conning tower tubes?

A. We attempted to manufacture conning tower tubes from nickel chrome vanadium steel and made 330 tons of ingots for that purpose.

By The Court:

Q38. What is a conning tower tube?

A. A conning tower must be put in communication with the rest of the ship by means of cables, etc., that go down through the decks and the tube is forged heavy steel protection which surrounds those communications. I think I had stated that we had made 330 tons of ingots, but we were never able to ship a finished tube. The ingots either cracked in forging, or if we got the forging made we could not pass them on the tensile requirements, so that we never shipped a nickel chrome vanadium conning tower tube.

Q39. All the material was scrapped, was it?

A. All the material was scrapped.

Q40. In what year was it you made these 330 tons of material for conning tower tubes?

A. I do not remember that exactly, but speaking from memory, it was about 1909 or 1910. I am not quite sure about that.

Q41. From your experience in all this work, what do you regard as the most important factor in the manufacture of armor piercing projectiles?

A. I regard the proper method of heat treatment as by far the most important factor, and further than that, the devising of methods and apparatus for precisely duplicating that heat treatment on shells of any given composition, or on projectiles of any given composition.

Q42. What is the relative importance of the composition and of the heat treatment in the manufacture of projectiles?

A. Necessarily you have got to start with something in the way of composition. We have got to start with steel, so far as our experience goes, but we have made in the past 15 years projectiles of steel which varied about from .50 to 100 in carbon, and

from .10 to .60 in manganese, and from 1.75 to 3.75 in nickel, and from 1 to 3.40 in chromium, and we have been able to make successful projectiles from all those compositions by adapting heat treatment to them, and without the heat treatment we could not have made anything successfully. The heat treatment is the vital part of the manufacture.

Q43. What was the standard armor plate composition used by the Bethlehem Company prior to November 1, 1906, and when did you begin to use the composition?

A. Our standard composition with which we tried to work was from .28 to .40 of carbon. We tried to keep low in manganese, and would not accept anything that went above .65, although we did not like it to go anywhere near .65. We kept our steel between 3% and 4% of nickel and between 1.50 and 2% of chromium. We began to use this composition in 1897.

Q44. What were the circumstances under which you first investigated the use of vanadium as a steel making element?

A. In the summer of 1904 I was sent abroad to England and Germany and other countries.

Q45. Sent abroad by the Bethlehem Steel Company?

A. By the Bethlehem Steel Company, and among other commissions that were entrusted to me was the investigation of the use of vanadium in the works of Vickers at Sheffield and in the works of Krupp at Essen, Germany. I visited both of those places. I talked with Mr. Douglas Vickers, who was the operating director of the Company in Sheffield. He said that they had been using vanadium and had obtained some interesting results from it, but he did not tell me much

about it. He was not very communicative. At Krupps I talked with Mr. Emil Ehrensberger, the managing director of the works, and found that they had used vanadium in a great many different kinds of steels, and I made notes in my pocketbooks which I carried at both of those works, which notes I have here. I made these notes when I made the visits, and I finally wrote a letter from Essen, Germany, to Mr. Archibald Johnston, our general superintendent. I have that letter here. It is dated October 4, 1904. I think I had better read from my notebook, what I jotted down at the time of my visit to the Sheffield Works of Vickers.

"Vanadium." That is the heading. "Some experiments had been made in crucible steel. None in open hearth. They had not amounted to much."

That is about all the information I got from Mr. Douglas Vickers.

I jotted down, as a result of my visit to the Krupp Plant, and my conversation with Mr. Ehrensberger, the following notes:

"Mr. Ehrensberger said they make 260 alloys of crucible steel. Said they used nickel chrome crucible steel for tires and for axles." These notes are necessarily brief. I will read them:

"Vanadium alloy, to make .20 per cent. alloy.

See 'London Engineer' of September 2, 1904, for claims of 'New Vanadium Alloys, Ltd.', Aug. F. Wiener, Managing Director.

Mr. Ehrensberger says that the vanadium alloy must be oil tempered and annealed after forging, and then the fibre obtained is not as good as nickel chrome."

Another note:

"Saw photos of the fibre."

"For alloys of vanadium"—I am still quoting Mr. Ehrensberger—"costing extra above ordinary steel, 210 marks per ton."

"The elastic limit, the tensile strength and the drop test are not so good as for nickel chrome alloys costing only 84 marks (excess) per ton."

This has reference to the drop test from two blows. The drop test is the drop of a heavy body on a piece of steel, "170 degrees, and broken." That meant to me that the steel subsequently broke after two blows, bending through 170 degrees.

Now, for "nickel chrome alloy, costing extra 150 marks per ton."

"For this nickel chrome alloy the elastic limit is greater and drop test bends under nine blows to U shape"—that is, 180 degrees—"without breaking."

"Mr. Ehrensberger called in Mr. Schilling, metallurgical engineer, who said that they used alloys of vanadium .20 in razor steel and milling cutters. This vanadium displaces tungsten entirely. The remainder of the composition being the same. When used in any steel .20 vanadium displaces the nickel and chrome also."

That is the end of my notes on vanadium.

I can also read from the letter which I wrote on October 4, which is practically a repetition of that.

THE COURT: What year?

THE WITNESS: 1904.

By MR. NEAVE:

Q46. You had better read that on the record.

A. "They make 260 different alloys of crucible steel, using Nickel, Chromium, Vanadium, Tungsten, Molybdenum, etc. as alloys depending on the use to which the material is to be put.

Automobile axles are made of Nickel Chrome Steel cemented for 12 hours on the journals. Tires are also made of Nickel Chrome Steel where the specifications demand very high qualities and long life. The gun steels are all of crucible steel.

The alloy of Vanadium which they use in 0.20 of 1 per cent. When Vanadium is used it replaces Tungsten (as in tool Steel) or Nickel and Chromium as in the other special steels. High Carbons are used running from 1.00 to 2.00%—the latter for dentists instruments. They are not enthusiastic about Vanadium on account of cost and say that by making high Nickel alloys (with Chromium also) which increases the cost of ordinary steel by 150 marks per ton (instead of 210 marks per ton increased cost when the 0.20% Vanadium is used) they can get much better results in Tensile, Elastic, Stretch and drop-test than with the Vanadium steel. The claim of the Vanadium alloy people that the Vanadium steel requires no treatment after forging, is refuted by Mr. Ehrensberger who says that oil tempering and annealing is necessary. He showed us some photographs of fractures of treated and untreated Vanadium steel made from experimental forged test bars of about 1¼" square and the best fracture was not as fibrous as our own Nickel Chrome Armor Steel. There is an article in the 'London Engineer' of Sept. 2, 1904, signed by Aug. F. Wiener, Managing Director of the 'New Vanadium Alloys Co.' of London, which shows some of the claims of the promoters. This is the only information about Vanadium which we have obtained on this trip. I am sure that the Whitworth people in Manchester use Vanadium in their Milling-cutters as do also Krupp.

It is of course used only in crucibles, where loss is guarded against by crucible sealed air tight by the fluxing of an ordinary clay placed between the lid and the pot."

The rest of this deals with something else.

Q47. Were the projectiles which were subsequently made and sold by the Bethlehem Company made from crucible steel?

A. Up to this present date, do you mean?

Q48. Yes. The ones that you have been testifying about as containing vanadium?

A. Not all. They were made of crucible steel until about two years ago—I don't know the exact date—when we began the manufacture of projectiles in an electric furnace, and there have been some projectiles quite recently made of open hearth steel. Further than that, I think some of the earlier projectiles, along about 1904, were made of open hearth steel. I am not quite sure about that.

Q49. My impression was that all the nickel chrome vanadium projectiles were made of crucible steel?

A. All the nickel chrome vanadium projectiles were made of crucible.

Q50. You have referred to and read from two note books. You made the entries yourself in those note books?

A. These are my own books, and that is my handwriting, yes.

Q51. You made the entries on the dates that they purport to bear?

A. I made the entries on the evenings of those visits.

Q52. This letter, or the report, rather, that you made to Mr. Johnston, of October 4th, 1904, is this the original report that you have before you?

A. No, sir; that is not the original. I was in Germany. I could not talk German. These matters were confidential. I wrote the original letter in my own hand with pen and ink. It was a long letter, and I therefore made no copy. When I came home, because the letter deals with a great many subjects, I obtained the letter from Mr. Johnston and had copies made in my own office for filing under different subjects. I then returned the letter to Mr. Johnston, but unfortunately I cannot find the original now. I believe that the letter was lost in a fire which destroyed our main office in February, 1906.

Q53. Where did you get this copy from?

A. That copy I got from my own private files in the Armor Plate Department. That is in a different part of the Works from the main office.

Q54. It is one of the original copies, is it?

A. It is one of the original copies made on my return either in the latter part of 1904 or the beginning of 1905.

Mr. Neave: In order not to unduly and unnecessarily burden the record I will not put in evidence the note books and the whole of the report unless counsel for the plaintiff so requests, but the note books and the whole report are handed to plaintiff's counsel for their examination.

Mr. Warfield: I will do that later.

By Mr. Neave:

Q55. After your return from Europe in 1904 what did you do regarding the use of vanadium in steel?

A. I felt that I would like to try vanadium, notwithstanding that I got rather an unfavorable report on it from both the Vickers and the Krupp Works. I thought perhaps I could do better than they did. I was developing at that time an uncemented armor plate of nickel chrome, and I had been impressed by the large amount of talk and literature concerning vanadium, and thought I would like to try it, and I urged our company to allow me to make an experiment. I began urging upon my return in 1904, an experiment using vanadium with nickel chrome steel. I continued through the whole year 1905, but it was not until the latter part of 1905 that my company would warrant my going ahead with an experiment that would cost so much money and promised so little results.

I find in one of my works note books, books that I usually carried in my pockets every day in the works and jotted down stuff, a reference under the date of January 12th, 1906, headed, "Conference, E. O'C. Acker, Maunsel White, and H. T. Morris."

By The Court:

Q56. That is yourself, is it?

A. That is myself, yes, sir. I have a column marked "Composition No. 1," another column marked "Composition No. 2," and after the No. 2 composition I have marked "H. T. M.'s proposition," and the composition under that column reads this way: "Carbon, .40 to .50. Aim, .45. Manganese, .20 to .30. Silicon, .06 or below. Phosphorus, .03. Sulphur, .03. Nickel, 3.75 to 4.25. Chrome, 1.75 to 2 per cent. Vanadium, .33 per cent."

I also have the original requisition which I sent

as superintendent of the Armor Department to the Superintendent of the Open Hearth Department, dated January 13th, 1906, to Mr. James Rawle, calling for one ingot on experiment number 166, and in the column marked "Composition" I have marked "special composition No. 2." Then, this requisition goes on to order an ingot 18 inches by 90 inches, weighing 48,000 pounds, and it has been filled in in the Open Hearth Department after the ingot was cast with the ingot number 70,547.

I say here, "Please give us this ingot as soon as possible, without reference to the program for service armor plates ingots."

This requisition was evidently issued on verbal authority from my general superintendent. Two days later, however, the equipment order came out for the manufacture of four armor plates covered by experiment No. 166. That original equipment order was typewritten in copying ink and manifolded, and this is the original of the manifolded copies that were sent out to the various departments.

I have also the original melter's record of the Open Hearth Department, dated March 28th, 1906, covering the casting of this ingot No. 70547, which was made on my requisition of January 13th, recording also the constituents that entered into the charge and the constituents that were used as recarbonizing, and giving a lot of other data—giving the composition of the various elements in the charge and the composition obtained, and the time of pouring, and the various data such as is usually kept in an open hearth furnace. This is the original record of that. I also have a book in which is recorded the history of the plate, a book taken from our Armor Plate Department, one of

their standard forms of record, in which the history of all plates is kept, showing the composition of the ingot, the size, the weight, the date received, and the history of all treatments. This particular book is marked "Miscellaneous Book No. 6," and pertains to experimental plates, not the regular plates. In this book will be found a complete record of the composition as reported to me of that ingot 70,547, and also a complete record in my own hand, beginning with March 28th, 1906, and lasting through—it is pretty well blurred—it is written in pencil—lasting through to May of 1906, showing the various treatments that I gave to this plate, and the various analyses that I got from the plate after it was forged, the results from test bars, and so forth.

That plate was manufactured and carried through to completion—I say that plate. I mean that ingot. That ingot was manufactured into two plates, both of which were stamped with the ingot number, 70547, and one of them was stamped B-1 and the other B-2, to show there were two plates made from that same ingot. One of these plates was made without cementation, according to the process I was developing, and the other was made with cementation. The plate that was non-cemented was tested at our proving ground at Reddington by gunfire. There were eight shots fired at the plate, running from June, 1906, to July, 1906.

This blueprint is printed from the original tracing made as a matter of record after different tests.

In addition to this first plate made in 1906 I also made two other nickel chrome vanadium experimental ingots in 1907, the latter part of 1907 and the early part of 1908, of substantially the same composition,

in which I hoped to develop something different or something improved over this first plate.

This first plate stood a very good test. It stood a test quite equal to any of the non-cemented plates or any of the service plates that we had been making. But, as this report will show, as soon as we attempted to raise the velocities of the attack materially above the Government specifications the plate was perforated, and therefore in view of the fact that the addition of this small amount of vanadium to this plate had raised the cost $100 per ton, and the further fact that the plate was only equal, not superior, to the plates without vanadium, we did not continue the manufacture of nickel chrome vanadium armor plates.

I might say that I submit here also the melter's records for the other two ingots that were made on November 9th, 1907, and February 15th, 1908, all of these being the original records.

By Mr. Neave:

Q57. What was the other date?

A. The first melter's record is dated March 28th, 1906.

Q58. Have you given the compositions of these plates?

A. I do not think I have.

Q59. What were they?

A. The ingot cast on March 28th, 1906, had the following composition, as entered in my book at that time in the Armor Department: Carbon, .495. Manganese, .31. Silicon, .018. Phosphorus, .029. Sulphur, .024. Nickel, 3.88. Chromium, 1.96. Vanadium, .25.

Q60. Did the others differ?

A. The others had the same elements, and no other elements, but they differed somewhat. They were substantially like this.

Q61. You might state what the analyses of the others were, too?

A. The ingot cast on November 9th, 1907, had the following composition: Carbon, .488. Manganese, .29. Silicon, .04. Phosphorus, .022. Sulphur, .029. Nickel, 3.00. Chromium, 1.89. Vanadium, .38. The ingot cast on February 15th, 1908, had the following composition: Carbon, .456. Manganese, .29. Silicon. .09. Phosphorus, .024. Sulphur, .029. Nickel, 3.42. Chromium, 2.68. Vanadium, .40.

Q62. What was the cost of vanadium in March, 1906?

A. I have here and submit the original requisition of the Open Hearth Department, dated January 13th, 1906, for 190 pounds of vanadium in ferro vanadium, and I have and submit a typewritten carbon copy of the original order placed in response to this purchase requisition by our central purchasing department, of January 17th, 1916, with E. J. Lavino Company, Bullitt Building, Philadelphia, in which is ordered 200 pounds of vanadium, 45 to 50 per cent., "as per your letter of January 15th," $5 per pound for vanadium contained in the alloy.

Q63. Do you happen to know what vanadium sells for now?

A. I do not. I understand it is very close to $5 a pound now, having been lower before the war, but I cannot tell the exact price, I do not know.

Mr. Neave: The requisition of January 13th, 1906; the equipment order of January 15th, 1906; the melting sheets L563, dated March 28th, 1906; D1591, dated November 9th, 1907; L1287 dated February 15th, 1908; the analysis records and records of the tests of the plates at Reddington,

to which the witness has referred, and which he has produced, are handed to counsel for the plaintiff for their examination, and it is agreed, subject to correction, that the extracts which the witness has read from these records may be received in evidence with the same force and effect as though the original records were themselves put in evidence, and the same stipulation is made with reference to what the witness read from the report to Mr. Johnston, and his two note books as to his trip to England and Germany. Counsel for defendant will put in evidence any portion of these papers that counsel for plaintiff may subsequently indicate they desire.

MR. WARFIELD: I do not care for the originals. I am willing to accept copies. But I have not yet had time to examine them. I reserve my objections to the copies as though they were originals.

Cross-examination.

By MR. WARFIELD:

Q64. How long did you say the Bethlehem Steel Company had been manufacturing a nickel chrome product, armor plate or otherwise, prior to the time of your trip to Europe?

A. We began manufacturing nickel chrome armor plate in 1897.

Q65. And you continued up to 1904?

A. Armor plate?

Q66. Yes.

A. We have continued it ever since.

Q67. But you had continued it from 1897 to 1904?

A. We made armor plate in every year. Are you speaking of armor plate?

Q68. The question was originally as to nickel chrome armor plate or other product, but we will limit it to armor plate. I simply want to bring out the fact that you were continuously making a nickel chrome armor plate from 1897 to 1904.

A. Oh, yes.

Q69. Could you give me an approximate idea as to the quantity of such nickel chrome armor plate manufactured during that period?

A. It would have to be approximate. I have not informed myself on the matter. But as a guess, which I think would be verified as correct within ten or fifteen per cent., thirty to forty thousand tons of armor plate.

Q70. During the period?

A. From 1897 to 1904. That is your question, isn't it?

Q71. Yes.

A. Of course, there has been a great deal more than that made since that time.

Q72. It was in 1904 that you went to Europe?

A. Yes, sir.

Q73. And you went there principally for one purpose?

A. Oh, no. I went there for a great number of purposes.

Q74. To get as much information as you could with regard to alloy steels? Was that the general purpose?

A. That was one of my commissions. The purpose that was probably chief among all, if there was any commission that had more weight than others, was to investigate electric furnaces in France and gas engines in Germany. I was on a general roving commission. I spent about three months in Europe.

Q75. But one of the things you wanted to do was to get as much information as you could with regard to the practical use abroad of vanadium as an alloy in alloyed steels? Is that correct?

A. Yes.

Q76. And for that reason you conducted the researches as to which you have testified at Sheffield and at the Krupp Works in Germany?

A. I would hardly call them researches. They were simply conversations.

Q77. Investigations and conversations?

A. Yes.

Q78. From the practical standpoint you got very little result either at Sheffield or at Krupp? That is correct, is it not?

A. Practically I got very little result as far as the actual compositions showed.

Q79. And after you came back you conducted the experiments of your own with nickel chromium vanadium steel?

A. Yes, sir.

Q80. After you came back you conducted some experiments of your own as to the manufacture of nickel chrome vanadium steel?

A. Armor plate, yes.

Q81. And it is fair to say, as a general proposition, that those experiments were not satisfactory or did not disclose a satisfactory result?

A. They were satisfactory, but they did not show any improvement over nickel chrome armor plate.

Q82. It did not show any improvement which induced you to proceed with the manufacture of nickel chrome vanadium steel?

A. Exactly, yes.

Q83. Or to make the results of those experiments public?

A. To make them how?

Q84. They did not show results that would induce you to make those results public?

A. Oh, no.

Q85. You did not print them in any way?

A. I think, as far as that goes, the more successful they had been the less public I would have been likely to make them.

Q86. As a matter of fact, in this instance after those experiments were made the matter became and was, as a result of the experiments, a dead issue?

A. Well, no. The experiments, as you will note, extended over several years. I gave up the use of vanadium very reluctantly. I wanted to use it. I wanted to make it go.

Q87. But you gave it up because you could not make it go, as a matter of fact?

A. I didn't know how.

Q88. You did not give it up because of the high price of vanadium?

A. I did not give it up on that account. I had a great deal of opposition from my company always on account of the high price of vanadium. But that was not worrying me.

Q89. The first experimental ingot was made at about what time? I do not remember the exact date.

A. It was cast on the 28th of March, 1906.

Q90. And the second one was when?

A. In the latter part of 1907. I have forgotten the exact date.

Q91. There was a gap of about a year and a half between the two?

A. Yes, sir.

Q92. You have specified certain alloys which you stated were known in and to the art as alloys to be used for special steels or alloyed steel prior to 1906?

A. Yes, sir.

Q93. And as I took a hurried memorandum, you referred to carbon, manganese, silicon, phosphorus, sulphur, copper, aluminum, molybdenum, tungsten, vanadium, nickel and chromium? Is that correct?

A. Yes, sir.

Q94. Did I get them all?

A. I think so.

Q95. I am not trying to test your memory. Of course, it would be very easy for one to slip up, but that is not the question. There was some discussion of Cobault as an alloy of steel, was there not, prior to 1906?

A. I think there was also of Titanium. I refrained from mentioning those and some other elements, because my knowledge of the use of those elements was entirely hearsay. That is, hearsay to such an extent that I was not sure they were being used, or how they were being used.

Q96. I was not reflecting upon the fullness of your answer. I simply want to bring out the fact that the art did know and did discuss these other elements. You specify cobalt and Titanium. The list might and could and should also include boron, cerium uranium, platinum and sodium? That is true, is it not?

A. I have no doubt, because practically all the metallic elements in the catalogue have been used in some way.

Q97. And some discussion even of telurium, and even thorium, was there not?

A. I would suppose so. At least, I would not oppose it.

Q98. That is to say, up to 1906 there had been various suggestions as to all these various alloys, and various suggestions as to different percentages of an alloy to be used under given conditions? That is correct, is it not?

A. I imagine so, yes.

Q99. As a matter of education, and as a function of your daily work, you were generally familiar with the state of the art, both the historical and literary art and the commercial art of this country, were you not, before you went to Europe?

A. Yes. Particularly with reference to such steels as might have been brought out experimentally in connection with the manufacture of armor plate.

Q100. You were specially interested in armor plate and the manufacture of armor plate?

A. Yes.

Q101. And through and by your trip to Europe, insofar as it was possible, you brought yourself in contact with the best learning and the best thought of Europe on the subject of these alloyed steels?

A. Well, no; I cannot say that. Only so far as the best learning and the best thought obtained in the particular works where I was visiting. I did not attempt to come into contact with any professors or men that might not be found in the works. My main object was to visit the practical men.

Q102. You had gotten in touch with the professors through their printed work?

A. Yes.

Q103. And you wanted to get the practical side?

A. I wanted to know from people who had actually done the work in the shops or in the mills what

they had done. At least, their results. I did not expect to find anybody willing to give exactly what composition they were using, but I did expect, particularly in the case of Ehrensberger, because we were licensees of the Krupp firm in making nickel chrome armor—I did expect him to tell me anything that he had discovered that would have improved the quality of armor plate.

Q104. Sheffield, of course, is the center of the steel industry of England, or was at that time?

A. Yes; I think you might say that. There were other centers, but I think perhaps Sheffield is the most important center.

Q105. It is certainly an important center?

A. Yes, sir.

Q106. And the same applied to the Krupp Works, so far as Germany and Central Europe are concerned?

A. Yes. I think it would be fair to say that the Krupp Works were the most important works in Germany, although there were others important. But the main thing about the Krupp Works is that we were licensees of the Krupps, and had a right to know anything that they had learned in the manufacture of armor plate.

Q107. You were, then, in a specially favorable position for getting full information as to what they knew?

A. Yes, sir.

Q108. When you say licensees of Krupps, so far as armor plate is concerned, does that cover the manufacture of nickel chrome armor plate, which you said you were manufacturing between 1897 and 1904?

A. That is just what it does cover, yes. The manufacture of nickel chrome armor plate.

Q109. So that you went to the party from whom

you had taken a license to manufacture this nickel chrome steel to get further information as to other alloys and further developments?

A. Yes.

Q110. If they had any?

A. Yes.

Q111. I take it the question is practically answered, but it is certainly a fair statement that no metallurgist, no matter how experienced on the practical side or on the scholastic side, could predict with any degree of positiveness in 1906, the date which we have been inquiring about, what the result would be of the addition of a certain amount of any one of these alloys, and I think you have numbered some sixteen or seventeen, to steel containing one or more of such alloys in given percentages? Is that correct?

A. It depends on what the given percentages were. If he had a steel containing a certain number of alloys whose behavior he knew, and was going to add to that same steel some other alloy, it would only take him an experiment or two to be able to predict what that would do.

Q112. He could not predict it without an experiment?

A. Well, he might.

Q113. He would be taking a chance, would he not, if he did?

A. Yes. He could at least form an opinion. He could not positively predict, but he could form an opinion that would probably be very correct.

Q114. As a matter of fact, this question of forming an opinion of what alloys in given percentages are going to do on alloyed steels, or what the effect is going to be by using that percentage of alloys, is a very fascinating and intellectual problem, is it not?

A. Yes; it is fascinating.

Q115. And a good deal of a puzzle also?

A. The men in the mills who have to account for the expense of running their departments are not likely to let the fascination of the subject lead us into any very wild experiments.

Q116. You cannot afford to gamble on it?

A. No.

Q117. So that, as a matter of fact, you want to know from actual results before you are going to feel that you have got anything on which you can depend as a practical commercial matter, or you did at that time? Is that correct?

A. Yes. I felt this. I felt that I had a better armor plate than Ehrensberger, in the fact that I had an uncemented armor, which you will note involved a little higher carbon than the cemented armor in the main body of the plate, and I thought that if I had beaten him to that, which I thought I had—perhaps I was mistaken—I might beat him to it in the development of vanadium also. So that while he did not give me any very encouraging report about his using vanadium, I thought perhaps I could do something better than he did.

Q118. You did not succeed on the question of the vanadium. I did not understand whether you considered you succeeded in using the uncemented or not.

A. Yes. That is another story. I succeeded as far as the ballistic resistance is concerned, but I had to put in so much strain in the process of chilling the plate, owing to the fact that the face was not higher in carbon than the main body, I had to put so much strain in the face of some of these plates, that after they got aboard the ship and were there for a year or more they developed what we call spalls—large

areas of flaking off—without any apparent reason, and that was the reason we had to abandon the non-cemented armor. Not a reason connected with the proving fire, but a reason connected with the behavior of the steel after it spent two or three winters on the ship. That is one of the things that I could not predict in advance. I did not forsee that.

Q119. For the purposes of the record, cementation has to do with the carbon?

A. Cementation, as I used it, had to do with the absorption of carbon in one face of armor plate, so as to render that face higher in carbon than the rest of the plate. "Cementation" is also used in another sense, but that is the sense in which I was using it.

Q120. But the only point I want to bring out is that it might be considered as an intellectual problem during the operation of making nickel chrome armor plate?

A. Yes.

Q121. The things should be combined, but may be considered intellectually quite separate?

A. I think so.

At 1 o'clock P. M. a recess was taken until 2 o'clock P. M.

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2 o'clock P. M.

Present: Parties as before noted.

HARRY TIMOTHY MORRIS, recalled.

Cross-examination resumed.

By MR. WARFIELD:

Q122. Did you state, in substance, Mr. Morris, that the Bethlehem Steel Company has not manufactured this nickel chrome vanadium steel since 1914?

A. I do not think that I stated that, but that is practically so.

Q123. You stated that you filled the last of the Government contracts, which is in evidence, and it was called to your attention?

A. Yes.

Q124. And since that time you had not made the nickel chrome vanadium steel?

A. That is true.

THE COURT: Is it important for us to know what time in 1914 the cessation occurred?

MR. WARFIELD: I was going to take that up.

By MR. WARFIELD:

Q125. Approximately, as of what date would that cover?

A. I am not prepared to give the exact date. The shells that were made to supply the 14-inch projectile contract of 1914, some of them were manufactured in 1914, and none of those were shipped.

Q126. It was about the time of the making of the contract between the Churchward Company and the Carnegie Company that you discontinued, was it not?

A. No. I think that it will be found that we discontinued the manufacture of any nickel chrome vanadium steel, which we succeeded in selling a great many months before that time.

Q127. You knew of the contract between the Churchward Company and the Carnegie Company, in accordance with which certain rights under these patents were assigned to the Carnegie Company, did you not?

A. No. My first knowledge of anything of that kind does not date back more than two years. I do not remember when I first heard of it.

Q128. When I speak of you, I speak of the Bethlehem Steel Company. It was known by the Bethlehem Steel Company that that contract of assignment was made?

A. It is quite probable it was known to some of the officers of the Bethlehem Steel Company. I cannot speak for them. I do not know.

Q129. Very good. Who decided upon the abandonment, as you stated, of the manufacture of nickel chrome vanadium steel?

A. So far as the use in armor plates was concerned, it was decided by Mr. Johnston and myself, I finally agreeing to it. I fought for a long time against the abandonment of vanadium in armor plate steel, because I thought I could do something with it, but I finally had to agree that we could not do anything with it. So far as projectiles are concerned, I don't know. I have always understood that it was an agreement reached by Mr. Acker and our management, Mr. Acker at that time being directly responsible for the projectiles.

Q130. So far as your knowledge is concerned, then, the fact of the assignment contract between the Churchward Company and the Carnegie Company may or may not have been a contributing factor in inducing the Bethlehem Company to discontinue the use of nickel chrome vanadium steel in war materials. Is that true?

A. So far as my knowledge is concerned, I am depending entirely on the impressions that I have had in the past. I do not think that that assignment contract had anything to do with the matter.

Q131. You cannot testify?

A. I cannot testify of my own personal knowledge.

Q132. Then, my statement is correct, that that may or may not have been a factor?

A. Yes, it may be stated that way.

Q133. You stated a somewhat recent quotation of vanadium as at $5 a pound?

A. I stated that I could not give an exact figure of the present price of vanadium, but that I was under the impression that it was costing or had cost since the war about $5 a pound. I do not know whether that is true or not.

Q134. I meant to say "about." I assumed that was approximate.

A. I never took the pains to verify that. I have heard it stated that that is so.

Q135. Do you know, approximately, what the price of vanadium was in 1914?

A. No, I have not any idea except the general understanding that it was probably a good deal lower at that time than it had been some years previously.

Q136. In the natural course of development of the vanadium industry, the price decreased?

A. Yes. I have been given to understand that the production of vanadium had increased considerably and the processes had correspondingly decreased in cost.

Q137. And during the period of the great war, between the middle of 1914 or the summer of 1914 and the end of 1918, the price of vanadium increased materially, did it not?

A. I understand so.

Q138. As a result of the war conditions?

A. Yes, as every other kind of metal.

Q139. And you know, do you not, that the manufacture and production of vanadium at the present time is of considerable importance in the steel art?

A. I also understand that. I don't know.

Q140. Do you know whether the Bethlehem Steel Company, or any of its officials, are at the present time interested to a material extent in the production of vanadium in the vanadium market?

A. I don't know anything about that. I read something in the newspapers a few weeks ago, though, indicating that such was the case.

Q141. You have discussed the relative importance of composition and heat treatment as bearing upon the final quality and efficiency of alloyed steel?

A. Yes, sir.

Q142. Does the heat treatment impart quality to an alloyed steel, or does it simply bring out the quality inherent in the steel, and make it useful?

A. That is a rather difficult question to answer. If you make one article of lead and another of alloyed steel, I do not know of any heat treatment that would bring out qualities in the lead piece that you could get in the steel, but there are certain qualities in alloyed steels, particularly those where chromium is used, that render those steels absolutely valueless, without proper heat treatment.

Q143. It is a fair statement, is it not, that all the heat treatment does is to bring out and possibly fix and make useful the quality inherent in the steel?

A. That is a fair statement of a part of a fact.

Q144. Then, it is further a fair statement to say that you could not by the heat treatment make a poor steel into a good one, but you could by the heat treatment possibly destroy the value or fail to bring out the value of a good steel?

A. By the absence of heat treatment you could fail to bring out the value of a good steel, and by the

heat treatment you could also improve the quality of a poor steel. It depends entirely on what you mean by "poor steel."

Q145. I think you stated it fairly when you said, of course, you had to have steel as the basis for the heat treatment?

A. Yes, in the case of projectiles.

Q146. And in the case of armor plate?

A. Sure.

Q147. In the case of any of these alloyed steels?

A. As far as we know, there is no metal out of which a satisfactory armor plate or projectiles could be made except steel of some composition.

Q148. And it is also a fact that while you say the heat treatment is the most important, the heat treatment is, nevertheless, secondary and something imposed upon the steel for the purpose of bringing out qualities which are in the steel, or which may be brought out by the heat treatment?

A. Yes. The answer to that is just as if you asked me which is the more important to human life, the lungs or the heart. I don't know. They are both necessary.

Q149. And the character of the heat treatment varies in accordance with the particular composition of a given ingot?

A. Yes, sir.

Q150. And is it always possible to forecast with accuracy the heat treatment which should be used and which can most efficiently be used in connection with any particular composition of alloyed steel?

A. No, sir. My experience has been that it is usually necessary to experiment, and that is the reason I feel that a composition stated without any heat

treatment is not an exposition of a method of manufacture.

Q151. And it is also a fact that what might seem a comparatively minor change in the percentages of the various elements of alloyed steel might necessitate or require considerable change in heat treatment necessary to bring out the best qualities of the steel.

A. That depends on the particular elements which you are considering. A change, for instance, of .25 points, .25 of one per cent. carbon, is a very much more important change than a change of .25 per cent. in the nickel. In other words, what you are speaking about are comparatively unimportant variations.

Q152. No. I said what might seem a comparatively minor change in the percentages.

A. "What might seem so" depends entirely on which element is varied.

Q153. And the carbon is one element, the variation in which necessitates a variation in the character and the various steps of the heat treatment?

A. Yes, sir.

Q154. How about the other elements? Take, for example, tungsten.

A. I am not familiar with tungsten.

Q155. Molybdenum?

A. In practically all armor plate there is no molybdenum. I can speak more particularly about carbon, manganese, nickel and chrome.

Q156. How about the manganese?

A. I always assume that in the range of composition which we use in armor plate, the variation of about ten points of manganese would require about the same change in temperatures of heat treatment as a variation of one or two points of carbon.

Q157. The differences of nickel or chromium or vanadium would be expected to require changes in the heat treatment, would they?

A. Within certain limits. I do not think that a variation of ten points in vanadium would require much change in heat treatment, but there is a limit, and a very low limit, in vanadium where, if you increase it, you make bad steel, which is not susceptible to any heat treatment. A variation of ten points in chromium would require much more change than a variation of ten points in nickel, the chromium being more of a sensitizer of steel than nickel.

Q158. I think you laid down as a general rule—of course, there are always exceptions to all rules—that given a change which is a substantial or material change in the percentage of alloys and alloyed steel, the only safe way to do is to find out what the best heat treatment is before you proceed with the manufacture of any quantity?

A. That is the only way I know, if it is a new composition.

Q159. In making the tests of nickel chrome vanadium armor plate to which you have referred as having been made in 1906, 1907 and 1908, if my memory is correct, did you use substantially the same heat treatment that you had used in your prior nickel chrome armor plate?

A. Yes. I used substantially the same in the sense that I varied it in the same way as I would for carbon. I do not recall making any particular change so far as the vanadium content was concerned, because the vanadium content was very low.

Q160. You stated you have been familiar with the various elements used as alloys for alloyed steel, citing

copper, aluminum, molybdenum, tungsten, vanadium, nickel, chromium and manganese. Take, for example, copper. Within what percentage of ranges have you been familiar with the use of copper in this relation?

A. Up to about .50.

Q161. From?

A. From .05, a low figure.

Q162. From .05 to 1.50?

A. No. From .05 to .50.

Q163. Did you find material changes in steel as a result of this change in the proportion of copper?

A. No. We were not able to detect changes. That particular steel was rolled into rails. It did not have extended heat treatment such as we give to armor plate.

Q164. You have in mind some particular steel?

A. Yes.

Q165. In answering this question?

A. Yes.

Q166. Not any extended series of investigation as to the effect of copper upon alloyed steel?

A. No.

Q167. As a general proposition, is copper supposed to be a beneficial element, or as a general proposition is copper a beneficial element in alloyed steel?

A. I have never used it for the purpose of benefiting alloyed steel. As I say, this copper that I have in mind was put up to .50 with the object of seeing whether it would deteriorate the rails, and it did not.

Q168. What did you find?

A. We did not find any evidence of it up to .50.

Q169. In tool steel copper is not a desirable element, is it?

A. No, sir.

Q170. And there has been quite some of a scien-

tific controversy as to the effect and results of adding copper to alloyed steel, has there not?

A. I understand there has.

Q171. Which still is more or less unsettled?

A. Yes, sir.

Q172. The same applies to quite a number of other elements?

A. That is true.

Q173. Any man who attempts to assume that he knows any considerable part with any surety of the results which will follow from the introduction of these various elements in various quantities and in various relations is assuming quite a bit, is he not?

A. Yes, I think he is, unless he has had the experience with certain combinations.

Q174. And it is wise, from a scientific standpoint, that he should stick rather closely to the results of his experience with specific and stated combinations, is it not?

A. I have always considered it so in my practice.

Q175. Of course, your experience with the art, both the literature of the art and the practical side of the art, has brought you in touch with many statements which you would characterize as "loose," and that were too broad as to the effects of the various elements?

A. I have seen a number of statements that I feel I would have that opinion about.

Q176. You would want to know just exactly what the composition was and how the steel was treated and what the results were before you would accept necessarily the accuracy of such a statement?

A. Yes, sir.

Q177. You said something as to an increase of $100 per ton in connection with the cost of the plate from the ingot, No. 70547?

A. Yes, sir.

Q178. Was that a total cost of $100 or an excess of cost of $100 per ton?

A. $100 per ton.

Q179. How much vanadium did you add per ton?

A. We added 445 pounds of ferro vanadium and obtained 11.4 tons of plates.

Q180. Some of the vanadium disappeared in the manufacture?

A. Yes.

Q181. And that $100 per ton was the cost of the ferro vanadium added to the melt?

A. Yes, sir.

Q182. At the then price of about $5?

A. $5 per pound of contained vanadium.

Q183. That is, ferro vanadium is sold on the basis of contained vanadium?

A. Yes, sir. That particular ferro vanadium was ordered as you will see by the requisition, to contain about fifty per cent. vanadium. In other words, the contained vanadium would be fifty per cent. of the total.

Q184. The analyses which you have given of the various kinds of nickel chromium vanadium material sold by the Bethlehem Steel Company between October, 1909, and June, 1914, as war material, with reference also to merchant material, represent analyses prepared for you and under your direction?

A. It represents the results of my own search of the original chemical laboratory records of heats that we used.

Q185. So that they may properly be taken as your own testimony?

A. Yes, sir.

Q186. Are you or were you familiar with the sub-

ject matter prepared for answers to certain interrogatories addressed to the Bethlehem Steel Company in this case as to the composition of steel manufactured by it?

A. Interrogatories addressed by whom?

Q187. By the plaintiff to the defendant. That is a technical term. "Interrogatory."

A. I do not exactly understand your question.

Q188. Very well. I will read you the question and the answer. "Interrogatory No. 4: Has the defendant,"—that is, the Bethlehem Steel Company—"subsequent to October 29, 1909, and prior to October 29, 1915, manufactured for any purpose an alloy composed of steel combined with small proportions of nickel, chromium, vanadium and manganese? A. The defendant has not manufactured any steels which, in addition to the iron, contained only manganese, nickel, chromium and vanadium; it has, however, manufactured steel containing small proportions of manganese, nickel, chrome and vanadium."

A. I am not familiar with that question, nor the answer.

Q189. The same subject matter is involved in the analyses as to which I have just questioned you. You have listed the alloys under these analyses as carbon, manganese, nickel, chrome and vanadium. Can you state whether any other elements were present in this steel?

A. There was present some silicon and some phosphorus and some sulphur. No other.

Q190. No others?

A. There may have been a little arsenic. None others. There were none present in sufficient quantities to be determined. There were none others intentionally added.

Q191. Were the sulphur, phosphorus and silicon intentionally added or present as impurities in the steel?

A. The silicon was probably, part of it at any rate, intentionally added. The sulphur and phosphorus were not intentionally added.

Q192. You say the silicon was probably intentionally added. You know silicon usually occurs as an impurity?

A. Yes. Part of the silicon may have been added.

Q193. And part of it may not have been added?

A. Yes.

Q194. You do not know whether part of it was added or not?

A. No, sir.

Q195. The analyses on which the various tabulations were introduced during the taking of your direct-examination were made by whom, if you know?

A. The analyses were made in our chemical laboratory. I do not know who the actual chemist was who made them. I found them of record in the laboratory.

Q196. You simply have taken the records of those analyses as they appear on your record books?

A. Yes, sir.

Q197. And made, I assume, in due course of business?

A. Yes.

Re-direct-examination.

By Mr. Neave:

Q198. Prior to 1914 did the Bethlehem Steel Company manufacture and sell some alloy steels containing vanadium which did not also contain either chromium or nickel? That is, did they make alloy steels containing vanadium which were not chromium nickel vanadium steels?

A. Oh, yes, many tons.

Q199. What was omitted? The nickel or the chromium, or both?

A. Well, usually the nickel was omitted.

Q200. When did the Bethlehem Steel Company begin making and selling such alloy steels as, for instance, chrome vanadium steels?

A. I am not prepared to answer that exact date.

Q201. About when? Do you know within a certain range of time?

A. In order to answer that I would like to refresh my memory. I think in the latter part of 1905 or the beginning of 1906.

Q202. Do you know of chrome vanadium steels having been made by others at or prior to that time?

A. I cannot say that I can exactly locate definite chrome vanadium steels. At that time I was under the impression that chrome vanadium steels were being made. I cannot say that I could produce the instances.

Q203. But it was a matter of common knowledge to you at that time?

A. Yes.

Q204. Without having a knowledge of each particular steel?

A. Yes, sir.

Q205. In and since 1914 has the Bethlehem Steel Company continued to make vanadium alloy steels which are not chrome nickel vanadium?

A. Yes, sir.

Q206. And is still making such vanadium alloy steels?

A. Yes, sir.

Q207. You said in cross-examination that you had seen statements in the patent art literature regarding

alloy steels which could be characterized as "loose." Have you any particular instances of what you had in mind as "loose" statements?

A. Well, I consider most of Mr. Churchward's compositions very loose made to us in his early relations with us.

Q208. In your direct-testimony you gave the analyses of the nickel chrome projectiles which you had been manufacturing for the last fifteen years, and also gave the analyses of the standard armor plate composition used by the Bethlehem Steel Company prior to November, 1906. In both of those cases you gave the ingredients as carbon, manganese, nickel and chromium. In giving the analyses of the experimental ingot you made after you returned from Europe, you mentioned not only these four ingredients as to which I have just referred, but also silicon, phosphorus and sulphur. Were these ingredients, silicon, phosphorus and sulphur also in the materials in which you said the analysis showed the four ingredients only?

A. Oh, yes. The reason that I gave those ingredients in the description of the composition of my experimental armor plate was that I was reading it just as it was written at the top of the page in the book. I read everything that was there.

Re-cross-examination.

By Mr. Warfield:

Q209. You were asked about the dates of your knowledge of the manufacture in this country, as I remember, of chrome vanadium steel?

A. Yes.

Q210. You were uncertain as to such dates?

A. Yes.

Q211. You could not name any specific instances?

A. No, sir.

Q212. You were then asked if it was a matter of common knowledge and I understood you to say "Yes."

A. Yes.

Q213. But you do not want your testimony to stand like that, do you?

A. I do not know why not.

Q214. If you were uncertain as to the dates, and you could not give any specific instances, you could not be certain as to common knowledge prior to any date?

A. Except that the trade papers on both sides of the ocean, technical magazines, for two or three years previous to that were full of talk about vanadium, page after page of it, chrome vanadium particularly.

Q215. Chrome vanadium?

A. Yes.

Q216. Were they full of talk about it with reference to its possibilities or to actual manufacture and sale?

A. They were full of talk about it with reference to experiments and tests said to have been made on actual steels that had been made.

Q217. But you cannot be definite as to the dates?

A. No. It would be a matter of time to refer to those publications. I could furnish the dates. I simply have not loaded my mind up with it today.

Q218. And the basis of your testimony is as to what you remember of what you saw or read in some publications?

A. Yes, sir.

Q219. And you cannot give me the names of those publications now?

A. Yes. The London Engineer. There were references to it in the Iron Age of this country, and in journals of certain of our technical societies. I cannot just give you the names. The journal of the British Iron Steel Institute on the other side, and a certain technical society on this side, I cannot just remember whether it was the Mining Engineers, or which.

Q220. I take it that the files of those papers, many of them, are still accessible?

A. Yes, sir.

E. O'C. Acker, heretofore sworn, recalled.

By Mr. Neave:

Q1. You are the same Mr. Acker who has already testified in this case?

A. Yes, sir.

Q2. You were connected actively with the Bethlehem Steel Company, the defendant in this case, from January 15, 1889, to September 1, 1917, were you not?

A. I was, yes.

Q3. Now you are retired on a pension?

A. Yes.

Q4. Generally, what were your duties during the period you were there?

A. The first 13 years I was Superintendent of the heat treatment department including the heat treatment of gun forgings and armor plate. The next four years I was Assistant General Superintendent, and from that time on I was Metallurgist. That is, from 1906 until 1917.

Q5. You were in court this morning when Mr. Morris was testifying?

A. I was.

Q6. Do you recall the interview he said he had

with you and with others in the early part of 1906 about this experimental plate he talked of?

A. I was.

Q7. Do you remember whether that matter was brought to your attention prior to that meeting in the fall of 1906?

A. I do not remember. Of course, we talked of vanadium armor plate from time to time, but when it was started I do not remember.

Q8. Did you follow through the whole of this experimental plate ingot with the various plates cast from it that Mr. Morris testified about here?

A. I did.

Q9. And is what he said in accordance with your recollection?

A. It is.

Q10. It appears that the Bethlehem Steel Company at one time used chrome nickel vanadium alloy in the manufacture of projectiles. Did you have anything to do with starting the use of that particular alloy in the manufacture of projectiles?

A. I did.

Q11. It was you who started it?

A. Practically. Of course, I consulted with the authorities of the company.

Q12. Do you remember when the first batch of that material was made for projectiles?

A. Either in November or December, 1907.

Q13. And the projectiles got on the market the next year?

A. I presume so. I did not follow those particular ones.

Q14. Can you tell me the circumstances under which you added the vanadium to your composition in making these projectiles?

A. We had made nickel chrome projectiles for several years before this, and of course all this time the matter of vanadium was talked about in the metallurgical world. I first heard of it in Sheffield in August, 1902, in connection with nickel. The next thing that I specifically remember is an interview with a gentleman from Peru, who had a mine which produced the material.

Q15. Vanadium?

A. Vanadium. This interview was in the fall of 1904. He recommended it. He said it was good in all steel; it was even good in simple steel without alloys. He said it was also good in armor plate and projectiles. During the course of our talk together I ordered a certain amount from him. That was delivered in November, 1904. We paid $10 a pound for it. It was ordered in case we wanted to go ahead with the experiment. The exact disposition of it I cannot remember. Of course, projectiles always gave trouble. It is a troublesome proposition. There are so many different steps, each of which may be essential. Our idea was to add to the nickel chrome steel the amount of vanadium that was then commonly added to vanadium steel, which at that time was about a quarter of one per cent. We took our usual mixture of .75 carbon, 2 1-2 per cent. nickel, and 2 1-2 per cent. chromium, and added a quarter of a per cent. of vanadium to it, in the hopes that it might improve the product.

Q16. Were your hopes realized?

A. Well, it was hard to say at that time, because of the conditions under which projectile manufacture was changing. The designs were changing. So that while we had as much trouble with the projectiles as we had before we used it, yet the different designs were keeping you from telling what was the cause.

But finally when we decided to abandon it, we were having so much trouble, and we did not at first know what to ascribe it to—we thought it might be the heat treatment, and we varied the heat treatment. We varied the mixture. That is, we used more wrought iron in it, and we tried one thing and another, and never suspected the vanadium was causing the trouble. Then we finally had some chemical investigations made, believing that vanadium was the trouble, and the chemist reported that the vanadium was causing a double carbide of vanadium and chromium, which was interfering with the structure of the metal and caused segregation. That was in the contract of 1914, the 14-inch projectile.

Q17. You mean that that analysis was made with reference to those projectiles?

A. Yes, sir. It was not made at that time, but subsequently. But it was made on projectiles made under that contract.

Q18. During the time that you were using the chrome nickel vanadium alloyed steels you changed the heat treatment, did you, often, in order to attempt to get a better result?

A. At times. Not decidedly. We made slight changes. Because there was not very much change to make.

Q19. Who was it, what individuals were they, that decided to give up the use of the chrome nickel vanadium alloy in projectiles?

A. I think you might say the general superintendent, who has charge of the whole works.

Q20. Who is he?

A. At present it is R. A. Lewis, but he was not general superintendent at that time. I think it was Mr. W. F. Roberts.

Q21. Did you confer with him about the matter?

A. Well, we were practically at a standstill, because we had all these projectiles on hand that we could not get in condition to be accepted, and about that time I withdrew my activity from that department.

Q22. Did you ever get those projectiles accepted?

A. There was one lot of them accepted. I am not sure whether they were all nickel chrome vanadium or whether there was a part of them nickel chrome vanadium.

Q23. What became of the rest?

A. The rest were condemned.

Q24. That means scrapped?

A. It might mean scrapped or it might mean being used for target shells.

Q25. What does that mean? What are target shells?

A. Target shells are shells used by the Navy to fire at a target, without reference to being armor plate. They are ordinarily made of ordinary common steel castings.

Q26. When did you first hear anything about an agreement being made between Churchward Company, or Churchward, and the Carnegie Steel Company?

A. Well, I don't remember that. I cannot answer that question.

Q27. Did your discontinuance of the use of chrome nickel vanadium steels in the manufacture of projectiles have anything to do, or was it affected in any way, by that contract, so far as you know?

A. No. After that agreement we would have been more apt to have used it than ever, if it was valuable,

on account of our relations with the Carnegie Company.

Cross-examination.

By Mr. Warfield:

Q28. What are the relations of which you speak with the Carnegie Company as of the period of 1914 and on?

A. I said on account of our relations. I meant our agreeable business relations.

Q29. My question was what were those relations, the relations which tended to that result?

A. Well, I cannot say exactly what the relations were, because I do not know anything about the inside workings of the company.

Q30. You mean necessarily something more than being just on friendly terms, because simply being on friendly terms does not justify one company using the assets in the nature of patented inventions belonging to another company. That is true, is it not?

A. That is true, but I do not think we seriously considered that patent as an asset.

Q31. You have been speaking both as to dates and as to compositions, as I take it, largely from memory?

A. Yes; but memory which is very certain, because I have had direct oversight of it for a number of years.

Q32. How long since you have been actively with the Bethlehem Steel Company?

A. I left practically the first of September, 1917.

Q33. If there should appear any discrepancy as between your testimony as to dates, shipments, and so forth, and the testimony given by Mr. Morris, which he has stated as based on information taken from the books of the company, which should be accepted?

A. His should, because he has made a longer study and a more careful study of it. Mine was rather preliminary at the beginning of the suit.

Q34. You understand that is no reflection on you. Can you state the analyses of the projectiles made under what you have called the 1914 Government contract, N. C. V.?

A. It was the same as our previous composition. I should say about 65 to 90 carbon, 2 1-2 per cent. nickel, 2 1-2 per cent. chromium, about .25 manganese, and we added .25 vanadium.

Q35. And used substantially the same heat treatment as you had used before?

A. Substantially.

Q36. Apparently you did not know and do not know how to account for the difference in the results obtained by these projectiles as compared with previous projectiles?

A. They were more difficult to test on account of the changing of specifications, and on account of their larger size.

Q37. What changes in specifications were there?

A. The old specifications required projectiles to be fired at normal impact, and the new specifications required an impact of ten degrees from the normal.

By Mr. Neave:

Q38. You might explain what is meant by that.

A. I mean one struck the plate square and the other was ten degrees off from the normal point.

By Mr. Warfield:

Q39. So that those were matters involving something more and something different than the composition of the steel?

A. They only involved the quality of the material practically.

Q40. What you would call higher duty projectiles?

A. Exactly.

HARRY TIMOTHY MORRIS, heretofore sworn, recalled and examined and testified as follows:

By MR. NEAVE:

Q1. I forgot to call attention to the fact that the figures that you have given as to the quantities of chrome nickel vanadium steels that have been sold by the Bethlehem Steel Company do not exactly agree with the quantities that were stated by Mr. Acker in his testimony given in this case two years ago. While the discrepancy is not large, I would like to know how you explain it and how you arrived at the figures which you gave?

A. As I recall it, there were two cases of discrepancy, one in the tonnage of projectiles shipped and the other in the tonnage of steel purchased from the Carnegie Steel Company. In the case of the tonnage of projectiles shipped, I went over the original records of the Crucible Steel Department for all the years concerned, and found that frequently they made heats of steel where no vanadium was used. In other words, they would run out of their stock of ferro vanadium and make projectiles just the same without vanadium. Of course, those projectiles, projectiles made from those ingots, had no vanadium in them, and I made a corresponding reduction in the figures. In the case of the other discrepancy, the material purchased from the Carnegie Steel Company, I found from the records of the Armor Plate Department, the shipment records, that apparently in reducing pounds to long tons there

had been an error made. That is the only way I can account for the discrepancy, which is a very small one, a matter of 9 tons, I think. At any rate, I carefully checked the figures that I could get from the shipment records of the Armor Plate Department, and divided those figures in pounds. Those records were kept in pounds. I divided them by 2240. The records of the Armor Plate Department certainly show the number of tons that I finally recorded.

Cross-examination.

By Mr. Warfield:

Q2. Do I understand that in manufacturing in accordance with the program as called for, nickel chrome vanadium steel in some instances, through lack of sufficient stock of vanadium on hand, you would run off a plain nickel chrome steel?

A. Yes, sir. That was done.

Q3. Would there be anything to show, in the case of a given projectile, under those circumstances, whether it belonged to the nickel chrome vanadium class, or the particular period during which the vanadium had not been included?

A. In the case of shells sent for ballistic test we kept a record of the heat numbers of the ballistic shells. They were given a number by the purchasers—that is, by the Army or Navy. Opposite to that number we kept the record of the heat number. So that when I speak of shells having been tested, nickel chrome vanadium shells having been tested, we know whether they were heats which the Crucible Steel Department's records showed had had vanadium added or not.

Q4. The shells sent for ballistic tests, those were ballistic tests by the Government?

A. Yes, sir.

Q5. To determine the acceptability of a block of which those particular shells were samples? Is that correct?

A. Yes, sir.

Q6. Which class of shells or projectiles were sent for such ballastic tests—the nickel chrome vanadium or the nickel chrome?

A. By far, the largest portion of the sales covered in that period from 1909 to 1914 were nickel chrome vanadium shells.

Q7. And the ones that were sent for ballistic tests were the nickel chrome vanadium shells?

A. There were some shells—some of those groups were represented by one or more shells which had no vanadium.

Q8. Some of those that were sent for ballistic tests?

A. Yes, sir.

Q9. Was there anything, so far as the Government was concerned, to show what the composition was?

A. The Government had a record of the compositions of these shells as nickel chrome shells.

Q10. In the cases where they were nickel chrome shells?

A. In every case.

Q11. Based upon the Government's own analysis?

A. We made a submission to the Government of the compositions of the shells that constituted a group. The Government had a laboratory there and made check analyses. However, the Government never reported to us the results of their check analyses. I do not know whether the Government analyzed these shells or not. As a matter of fact, I do not think as a rule—so far as my knowledge goes, I have no knowl-

edge of their ever having taken a check analysis on the shells. However, they maintained regularly a chemist in the chemical laboratory at Bethlehem, and he may have done so.

Q12. The omission of vanadium, as I understand, was only in the cases where the stock of ferro vanadium was exhausted?

A. Yes, sir.

Q13. And when that stock of ferro vanadium had been repleted, or when you had ferro vanadium again, you continued to make the nickel chrome vanadium steel?

A. Yes, sir.

Re-direct-examination.

By Mr. Neave:

Q14. The material that you purchased from the Carnegie Steel Company was all used for war material and not for merchant or other uses, was it not?

A. It was all used for war material, yes, sir.

Re-cross-examination.

By Mr. Warfield:

Q15. Do you mean it was used for war material, or that it was sold to the United States Government for use by it as war material?

A. Naturally, the Bethlehem Steel Company could not use any of this product as war material. The Bethlehem Steel Company cannot go to war.

Q16. All the steel here in question which was purchased from the Carnegie Company was after some shaping and working sold to the United States Government?

A. Yes, sir.

Re-direct-examination.

By Mr. Neave:

Q17. After being worked up by you to the proper shapes and sizes, and so forth?

A. Yes, sir.

Q18. The materials sold to the United States Government were sold as chrome nickel or nickel chrome steel, even though they contained the vanadium also, were they?

A. No.

Q19. I thought that you said it was always sold to the Government as nickel chrome—the projectiles?

A. The material furnished to the United States Government, and bought from Carnegie, was inspected by the United States Government at the works of the Carnegie Company. So that we had no occasion to call it by any composition.

Q20. I confused you by bringing my last question immediately after the Carnegie matter. I was not then thinking of the material that you bought from Carnegie, but of the projectiles that you sold to the Government. They were sold as nickel chrome, were they?

A. Absolutely, yes, sir.

Q21. Even though they contained vanadium?

A. Yes, sir.

Re-cross-examination.

By Mr. Warfield:

Q22. Do I understand you to say that projectiles were sold to the Government as nickel chrome without informing the Government that there was vanadium in them?

A. So far as I know the Government had no information to that effect.

Q23. Didn't you say that you furnished analyses to the Government of the steel in these projectiles, and you did not know whether the Government supplied check analyses or not?

A. I found no record of projectile submissions to the Government which mentioned any vanadium.

Q24. You found no what?

A. No record of a submission. I mean the sheet which gave the list to the Government inspector of the number of shells in a group, and the heat numbers of that group.

Q25. You did not, then, as a matter of fact, submit to the Government the analyses of the particular projectiles which went forward for ballistic tests?

A. We submitted the analyses of all the shells in the lot before any ballistic tests were chosen. The Government has the right to choose any shell in the lot. For instance, if a lot is to consist of 500 shells, our practice was to submit about 530 or 540 shells to the Government as constituting lot No. 1 of contract so and so. The Government came along and designated certain of those shells as the ones which were to be sent to the proving ground for ballistic test. If those shells passed, 500 out of the 530 or 540 were selected by the Government and stamped with the serial number of the Government, the heat number no longer appearing on them.

Q26. That is, the Government selected the shells which were to be tested?

A. Absolutely.

Q27. And taken as typical of the lot, and in accordance with which the lot was to be accepted or rejected?

A. Yes, sir.

Q28. The point I am trying to get at is your in-

ference in answer to the question of counsel for defendant, that the Government was not informed and did not know that there was vanadium present in these steels. They were sold as nickel chrome steel? Is that correct?

A. Yes, sir. The only knowledge I have on that is in the copies of the submission sheets that I have found, and I have never found any vanadium mentioned on any of these submission sheets.

Q29. Do you infer from that, that the Government did not know that these were nickel chrome vanadium shells?

A. I infer from that, that the Government did not know officially that they were nickel chrome vanadium shells.

Q30. Then, you did not submit the analysis with the submission sheet, and you did at no time supply the Government with the analysis?

A. We supplied the Government with analyses, yes.

Q31. Those analyses would have shown that vanadium was present if it was present, would they not?

A. Neither was there any silicon or phosphorus or sulphur shown in the analysis.

Q32. But the analysis did not show the vanadium?

A. None that I have seen.

Q33. Do you know the reason for withholding that information from the Government?

A. I do not.

Q34. You knew at that time that Mr. Churchward had patents covering nickel chrome vanadium steel, did you not?

A. At which time?

Q35. At the time you were making these submissions to the Government? You knew prior to 1910?

A. I should like to differentiate between myself and the Bethlehem Steel Company. You understand that I personally knew nothing about these submissions at the time they were made. I knew nothing about the projectile manufacture until 1917.

Q36. But the Bethlehem Steel Company at that time knew about the Churchward patents?

A. It may be so. I don't know. I did not know personally about the Churchward patents until many years after they were issued.

Q37. But you knew about the work that Mr. Churchward had done, some of which he did at the works of the Bethlehem Steel Company?

A. I certainly did, but I never supposed that it would result in applying for a patent.

RADCLYFFE FURNESS, having been duly sworn, was examined and testified as follows:

By MR. NEAVE:

Q1. You live in Jenkintown, Pennsylvania?

A. Yes.

Q2. And you are assistant superintendent of the Nicetown Plant of the Midvale Steel Company?

A. I am.

Q3. What has been your experience in the manufacture of alloyed steels?

A. I went to the Midvale Steel Works in June, 1891; was in the melting department fom 1891 until 1909; in 1909 I was detached from the melting department and put in charge of the research department. I was there for a little over six years. The last part of that time was devoted to the manufacture of armor piercing projectiles principally.

Q4. Has the Midvale Company manufactured and sold any nickel chrome projectiles?

A. Yes. A large number.

Q5. Approximately how many?

A. Something over 40,000.

Q36. That is 40,000 projectiles.

A. 40,000 projectiles.

Q7. About how many tons would that be?

A. Something over 22,000 tons.

Q8. Was vanadium present in any of these projectiles?

A. No, sir.

Q9. These projectiles were sold to the United States Government and accepted?

A. Yes, sir. All of them. We never had a lot rejected.

Q10. Why didn't you use vanadium in your nickel chrome projectiles?

A. We had perfect faith in nickel chrome, and experiments that we had conducted where we introduced vanadium did not give us any encouragement to put it in. In fact, quite the contrary. We felt that it would be bad.

Q11. Did you ever have nickel chrome projectiles rejected by the Government?

A. We had a failure on the first test. But we never had a lot rejected.

Q12. What range of composition has the Midvale Company had for the nickel chrome projectiles?

A. From .55 to .75 carbon; manganese, from .20 to .35; nickel, from 3 to 4; chromium, from 1.75 to 2.75.

Q13. These are percentages?

A. These are percentages.

Q14. Did you know of nickel chrome steel in and prior to 1906?

A. Nickel chrome steel prior to 1906?

Q15. Yes.

A. Yes.

Q16. Had you made any yourself prior to that time?

A. Nickel chrome?

Q17. Yes.

A. Quantities.

Q16. How far back did that go?

A. I made nickel chrome steel first in 1896. I made nickel chrome projectiles in 1896.

Q19. What were the ranges of carbon, manganese, nickel and chrome used in commercial nickel chrome steels prior to 1906, as you knew them?

A. Carbon, from .06 to 1.50; manganese, .50 and below; chromium, from .75 to 2.75; nickel, from 3 to 4.

Q20. In a self-hardening steel is the effect of the addition of vanadium to remove or prevent brittleness?

A. In my opinion it increases the brittleness.

Q21. Is this the same result if vanadium is added to the nickel chrome steel?

A. I believe so, without any question.

Q22. When did the Midvale Company first add vanadium to a steel containing nickel and chromium?

A. December, 1906.

Q23. Did the Midvale Company ever put out any material made of chrome, nickel and vanadium?

A. That was an experiment.

Q24. That was experimental only?

A. That was experimental.

Q25. Do you remember the analysis of that experiment?

A. I have the original melting order for that here.

Q26. Can you give us from that what the analysis was?

A. Carbon, .26. Manganese, .75. Silicon, .14. Chromium, 1.82. Nickel, 3.56. Vanadium, .42. Tungsten, .77.

Q27. Your work in this regard was experimental only, was it?

A. This was experimental entirely.

Cross-examination.

By Mr. Warfield:

Q28. This composition that you have given us was on what you call an experimental plate?

A. An experimental ingot made in a crucible.

Q29. And that experiment was not, from your standpoint, satisfactory?

A. It gave us no encouragement to use vanadium. That experiment gave us no encouragement. There were other experiments made.

Q30. This experiment did not show satisfactory results?

A. There were other experiments made which bore it out also.

Q31. The Midvale Steel Company is defendant in a suit brought by the Churchward International Steel Company, the plaintiff in this case, on these same patents here in issue, is it not?

A. I have heard so, yes, sir. I have heard so.

Q32. Based upon the manufacture by the Midvale Company of nickel chrome vanadium steel?

A. So I have heard.

Q33. Can you state when the steel shown on this mixing order, which is dated December 3d, 1906, was finally tested?

A. Shortly after that. I cannot state the exact date when it was tested. As soon as that ingot would be rolled and the critical temperature determined, treated, the tests were made upon it.

Q34. This is the original mixing order?

A. Yes, sir.

Q35. The steel had to be mixed and go through the various processes of melting and manufacture and so forth, did it not?

A. Yes, sir.

Q36. And so it was some time thereafter?

A. I can give you the date when it was tabulated, I think. (Referring to memorandum.) I find no date on the record of the treatment of that. I have the record here, but no date.

Q37. Then, you don't know when—

A. I beg your pardon. The critical temperature was determined on 12-19-06.

By Mr. Neave:

Q38. Your record shows that?

A. Yes.

By Mr. Warfield:

Q39. What does that mean, "Critical temperature determined"?

A. We obtain the critical temperature to enable us to go ahead and treat the piece.

Q40. Thereafter the steel was treated?

A. The test pieces were treated right off at once.

Q41. Then what was done?

A. Test bars rolled and broken from pieces which had been treated.

Q42. These tests were all tests for physical characteristics?

A. Physical characteristics.

Q43. There were no commercial tests in any commercial form?

A. These are commercial tests.

Q44. Commercial tests of steel in the shape in which it would be used commercially?

A. These are commercial tests.

Q45. What were you trying to find out—what kind of steel? What was the purpose of making these tests?

A. They were trying to find out the advantage of adding vanadium.

Q46. You say "they." Was it done by the Midvale Company or done by yourself personally?

A. It was done by the Midvale Company's Research Laboratory.

Q47. What connection did you have with it personally?

A. With this personally?

Q48. Yes.

A. I was not in the research laboratory at that date.

Q49. So you had nothing to do with this?

A. Nothing to do with that experiment.

Q50. Did you yourself make any of these records?

A. No. I made none of these records.

Q51. Did you see any of them made?

A. Yes.

Q52. Which ones?

A. That one that you are showing me there—that you have there.

Q53. The one headed "82-1"?

A. Yes.

Q54. You saw this particular record made?

A. I happened to see the man writing that up, being in the laboratory about that time. I came over

to see what was going on as regards the vanadium material.

Q55. Where did you get this particular record for presentation here?

A. From our records in the Research Department.

Q56. How do you know this is the same record that you saw a man making, whenever that was?

A. Because I have referred to that sheet on which that was a number of times since. Afterward when I was in charge I had occasion to look at that.

Q57. Your information, then, is based on what you gathered from these records and what you have been told by other people as to what happened as a result of that experiment?

A. As a result of that experiment?

Q58. Yes.

A. No. Not entirely.

Q59. On what else?

A. On having treated pieces of similar composition.

Q60. Subsequent to that date?

A. Subsequent to that date.

Q61. In the endeavor to produce a good and merchantable nickel chrome vanadium steel?

A. No, sir.

Q62. What endeavor?

A. In the endeavor to find out whether there was any advantage to add vanadium to nickel chrome steel.

Re-direct-examination.

By Mr. Neave:

Q63. What was your conclusion?

A. That it was not.

RICHARD CUSTER, having been duly sworn, was examined and testified as follows:

By MR. NEAVE:

Q1. Where are you living now?

A. Philadelphia.

Q2. What is your occupation?

A. Development engineer for the Midvale Steel Company.

Q3. You were formerly superintendent of the Armor Plate Department of the Homestead Works of the Carnegie Steel Company, were you not?

A. Yes, sir.

Q4. When did you leave there?

A. I resigned there on the 23d of May, this year.

Q5. How long had you been there?

A. I had been with the Company a total of almost 17 years. I went with the Carnegie Steel Company in August, 1902.

Q6. During how much of that time, or what portion of that time, did you have to do with the manufacture of armor plate?

A. Nine years.

Q7. The last nine years of that period?

A. Yes.

Q8. Did the Carnegie Company ever add vanadium to nickel chrome steel?

A. Yes, sir.

Q9. At the time when you left the Carnegie Company this year, were they still adding the vanadium, making a nickel chrome Vanadium steel?

A. No, sir.

Q10. When did the Carnegie Company stop making nickel chrome Vanadium steel?

A. On plates, on nickel chrome deck plate of, I

think, two inches and less, we stopped in August, 1914. On heavier material they have used none since September, 1917.

Q11. Since discontinuing these Vanadium additions, and up to the time you left the employ of the Carnegie Company, did that company continue to make nickel chrome plates for decks and turret tops without any Vanadium?

A. Yes, sir.

Q12. In what quantities, do you remember?

A. At the time I left we would have made about twenty-three or twenty-four thousand tons.

Q13. Of the nickel chrome without the Vanadium?

A. Yes, sir.

Q14. How did the quality of these nickel chrome plates, without the Vanadium, compare with the quality of the nickel chrome Vanadium plates?

A. They were of better surface; they were more readily treated; their bending qualities were better, and the ballistic results were better.

Q15. Did you have anything to do with the determination as to whether or not to discontinue the use of Vanadium?

A. In this way, that the first heat that was made was at my request, without Vanadium, about February, 1914. That heat was taken to Indian Head and tested. The results were all right, and we came back, and to verify them we made six more heats. Then we took one plate from each heat and took them to Indian Head and tested them also. The matter was then submitted to the president of the Company and the then general superintendent of the Homestead Steel Works, as well as Dr. Unger and Mr. Balsinger, and Mr. A. A. Corey, Jr., also, and myself, and at a meeting we had to talk over the matter—

Q16. A. A. who and yourself?

A. Corey.

Q17. Then you talked over the matter?

A. And decided finally to discontinue its use.

Q18. For the reasons that you have specified, because you found you got better results with the other?

A. Found we got better results, yes, sir.

Q19. What tonnage of nickel chrome Vanadium steel did the Carnegie Company manufacture commercially before June 23, 1914; have you those figures?

A. That would be about eighteen or nineteen thousand tons, perhaps a little bit more; in the neighborhood of 19,000 tons.

Cross-examination.

By Mr. Warfield:

Q20. Which steel is more expensive to manufacture; nickel chrome Vanadium steel or nickel chrome steel?

A. That is a pretty hard question for me to answer, because I never delved into costs. It was not part of my work. But I can say this, that on account of the fact that we had less rejections with the nickel chrome steel, that is to say, we got more out of each heat that we made, and not having the cost of the Vanadium to put in, I would say that the nickel chrome would be less expensive. I have no figures on that.

Q21. The cost of the Vanadium, then, is necessarily a factor?

A. Oh, sure; whatever it would cost, yes.

Q22. You would consider it an important factor?

A. No.

Q23. Was not the cost of Vanadium an important factor during the war period, from 1914 to 1918?

A. We were not using it during that time.

Q24. Not at all?

A. No. Wait a moment; there was one contract that we had, a foreign contract, that was sold as nickel chrome Vanadium steel, and in which we continued to use Vanadium until completed. That was an Italian contract.

Q25. When was that contract completed?

A. I will have to guess at that and say about 1916, because I am not very clear. It was a contract that ran a long time, and I believe was finished about 1916.

Q26. Can you state how much steel, how many tons of steel, that covered, that Italian contract?

A. No, I cannot. I cannot answer that.

Q27. But it was a large contract?

A. Yes.

Q28. You do not know what the price of Vanadium, or Ferro-Vanadium, was at varying times between 1910 and 1918?

A. The highest I remember was that Ferro-Vanadium was, I think, $4 a pound, and afterwards as low as $2. That is only my recollection. I am not clear.

Q29. As a matter of fact, you have no positive knowledge on that subject?

A. Not absolutely, no, but about four and about two were about the two high and low points.

Q30. Are your statements as to what has been done at the Carnegie Company founded upon your recent examination of records of the Carnegie Company, or are you simply speaking from memory?

A. From an examination of the records.

Q31. When?

A. In the early part of this year.

Q32. For what purpose did you examine those records at that time?

A. We expected, and we were notified to prepare such information as we had at hand for a case of this kind, which was to come up later.

Q33. For this Bethlehem Steel case?

A. Yes, sir.

Q34. Who notified you?

A. I believe Mr. Little; yes.

Q35. Where are you now employed?

A. Midvale Steel Corporation; Steel and Ordnance Company.

Q36. You made such memoranda, then, in the early part of this year? Have you the memoranda with you on which you are now basing your testimony, or are you speaking from memory as of to-day?

A. No, Mr. Holman has it, I understand.

Q37. But, so far as you are concerned at this moment, you are speaking from memory, are you?

A. Yes, sir.

LOUIS J. HOLMAN, having been duly sworn, was examined and testified as follows:

By MR. NEAVE:

Q1. You live in Homestead, Pa., and are superintendent of the armor plate department of the Homestead Works of the Carnegie Steel Company?

A. I am.

Q2. How long have you been engaged in the manufacture of armor plate with that company, and in what capacities?

A. I have been engaged with them for 13 years, and probably ten days. I came there on the 1st of September, 1904. I was then a schedule clerk, in which

I scheduled the treating of armor and protected deck plating, and I was that about five years, almost six years; about five years and ten months. Then I was made general foreman of the press shop, in charge of all forging and production of protected deck plate. I was in that position about two years and seven months. I was then appointed assistant superintendent, in charge of the press shop, with practically the same duties, and after about seven or nine months I was made assistant superintendent of the armor department. I was in that position about five years and nine months, I believe, and I have been superintendent of the department about three months, a little over.

Q3. It is a fact, is it not, that the Carnegie Steel Company at one time made and sold alloy steels containing nickel, chrome and Vanadium?

A. Yes, sir.

Q4. Do they still make and sell nickel chrome Vanadium steels?

A. Not armor nor protected deck plate.

Q5. Do they any, so far as you know?

A. Not to my knowledge.

Q6. But you have personal knowledge of the armor and deck plate?

A. Yes, sir; I have not of the other.

Q7. When was it that you stopped adding Vanadium to nickel chrome steel for armor or deck plate?

MR. WARFIELD: There is no use continually throwing in that phrase, Mr. Neave, because it does not mean anything. He has not said they stopped adding Vanadium to chrome steel. I do not want the Court to get the impression that they take some steel and throw Vanadium at it.

(Question withdrawn.)

By Mr. Neave:

Q8. Before we get to that, did the Carnegie Company make nickel chrome steels?

A. Yes, sir.

Q9. Did the nickel chrome steels vary from the nickel chrome Vanadium steel in any respect except that Vanadium was added to the latter?

A. The nickel chrome steel, as used and manufactured in the armor department, is practically the same now as it was when we added Vanadium, but we do not add the Vanadium. There are slight changes in analysis, composition.

Q10. In my question a moment ago I spoke of adding Vanadium to the nickel chrome steel. Is that a correct expression, and does it correctly state what you did at one time?

A. I think so, yes.

Q11. When did you stop adding Vanadium to nickel chrome steel?

A. On plates three inches and under in gauge we stopped about September—no, in June, 1914; around about the middle of the year 1914.

Q12. That is for the deck plates?

A. Yes, that is for plates three inches and under in gauge.

Q13. How about the heavier plates?

A. The heavier plates, which we call turret tops, we stopped adding Vanadium in September, about September, 1917. We discontinued it then.

Q14. Did you ever use nickel chrome Vanadium for armor plate as distinguished from deck plate or turret tops?

A. We did not.

Q15. Mr. Custer said something about having furnished some nickel chrome Vanadium steel on some for-

eign order, Italian order I think it was; did you know anything about that?

A. Yes, they were orders that were in the department at that time.

Q16. At what time?

A. In June, 1914, and we continued to fill that order. That is an exception I should have made.

Q17. You continued to make shipments on that order until it was completed?

A. On that order with the Vanadium. Outside of that we did not use it.

Q18. Since you discontinued the use of Vanadium have you continued to make nickel chrome plates for deck and turret tops?

A. Yes, sir.

Q19. And also continued to make armor plate, I suppose, of nickel chrome?

A. Yes, sir.

Q20. In what quantities have you made the nickel chrome plates for the deck and turret tops?

A. About 28,000 tons.

Q21. How does the quality of these nickel chrome plates without Vanadium compare with the quality of the plates with Vanadium?

A. I think they are better without the Vanadium?

Q22. Did you have anything to do with the determination to discontinue the use of Vanadium in the Carnegie plant?

A. Not any more—only in this way: I was actively looking after the production of tonnage, and I found it very troublesome to get tonnage out when they were adding Vanadium, and I advocated the dropping of Vanadium, as I thought that that interfered with the production in tonnage, and, therefore, it interfered with my work.

Q23. Do you remember what was the tonnage of nickel chrome Vanadium steel that the Carnegie Company manufactured commercially before June 23, 1914?

A. As nearly as I can remember, from records that I have seen, it is about 19,000 tons.

Q24. Do you happen to recall what the price of Vanadium was in 1914 and 1915?

A. 1915, I recall that that was about the last that we purchased it, and we were then paying from $2.10 to $2.50 a pound. That was contained Vanadium. We bought it in the ferrous state.

No cross-examination.

Mr. Neave: The defendant offers in evidence a copy of the agreement between the Churchward International Steel Company and the Carnegie Steel Company, which agreement is dated June 10, 1914.

It is agreed that this is the agreement that was referred to in the complaint as the agreement of June 23, 1914. It is further agreed that this copy offered in evidence may be received with the same force and effect as the original duly proved, subject to correction should error be made to appear, plaintiff reserving and saving all its just exceptions.

Adjourned until Thursday, September 11, 1919, at 10 o'clock a. m.

IN THE
DISTRICT COURT OF THE UNITED STAES,
FOR THE EASTERN DISTRICT OF PENNSYLVANIA.

CHURCHWARD INTERNATIONAL STEEL COMPANY,

Plaintiff,

vs.

BETHLEHEM STEEL COMPANY,

Defendant.

SECOND DAY.

Philadelphia, Pa.,
Thursday, September 11, 1919, 10 a. m.

Before HON. OLIVER B. DICKINSON, *J.*

PRESENT: Parties as before noted.

DOCTOR HENRY M. HOWE, having been duly sworn, was examined and testified as follows:

By MR. NEAVE:

Q1. Dr. Howe, you are a metallurgical engineer?

A. Yes.

Q2. Residing at Bedford Hills, New York?

A. Yes, sir.

Q3. Will you please state what has been your experience in connection with the manufacture of iron and steel, and what positions do you now hold?

A. I have been interested actively in the manufacture of iron and steel since 1871 continuously with

the exception of five years when I was engaged in the metallurgy of copper. In that connection I have been made Honorary Member of eleven scientific or technical societies—five in this country and six in Europe. I am a Fellow of six scientific societies. I have been President of the American Society for Testing Materials for four terms, of the American Institute of Mining Engineers of the International Association for Testing Materials, of the Alumni Association of the Massachusetts Institute of Technology for three terms, and of the Jury of Awards on Mines and Mining at the Chicago Exposition of 1893. I am the Honorary Vice-President of the Iron and Steel Institute of Great Britain—one of three, I should say. A Life Member of the Council of the International Association for Testing Materials. The late Emperor of Russia made me a Knight of the Order of St. Stanislaus of the Second Order with the Star of the First Order. The President of the Republic of France has made me a Knight of the Legion of Honor of France. I have received five gold medals for my metallurgical work, two American and three British, and I am a Doctor of Laws of Harvard and of Lafayette College, a Doctor of Science of the University of Pittsburgh, and the positions which I now hold—I am Chairman of the Engineering Division of the National Research Council created by the National Academy of Science under its Congressional order. I am consulting metallurgist of the United States Bureau of Standards. I am Research Associate in Metallurgy for the Carnegie Institution of Washington. I am Consulting Metallurgist of the Taylor Wharton Iron and Steel Company of High Bridge, New Jersey and Philadelphia. I am a Director of the Laboratory at Bedford Hills, New York, equipped and operated under

the auspices of the United States Bureau of Mines, the United States Bureau of Standards and the Columbia University, for the purpose of carrying out the investigations into the Metallurgy of iron and steel.

Q4. During the war you have been connected with the Government?

A. During the war I was Civilian Attache of the Ordnance Department for the purpose of finding the most suitable steel for helmets and body armor for our troops.

Q5. How are steels generally classified?

A. Into carbon steels or normal steels on the one hand, and alloy steels or special steels on the other hand.

Q6. What are the carbon steels?

A. Those are steels which owe their properties primarily, to the carbon which they contain over and above the iron. They are composed essentially of iron with usually a small quantity of carbon, rarely rising much above 1%, and in a very large proportion of cases not reaching one-half of one per cent., but having a very profound influence on the properties of the metal.

Q7. And what generally are the alloys or special steels?

A. The alloy or special steels are those which owe their properties to the presence of some element other than carbon. For instance, nickel, chromium, manganese, vanadium, silicon, etc.

Q8. How long have alloy steels as classified by you been recognized?

A. At least since 1890.

Q9. They were made even prior to that time, were they not?

A. They were made prior to, that time. They

were shown at Vienna Exposition of 1858, and tungsten steel was manufactured on a commercial scale at least as early as 1859. The celebrated Mushet steel, which has been in very wide use, was patented in about 1860.

MR. NEAVE: Defendant offers in evidence bound volume marked "Defendant's patents and publications," and the same is marked "Defendant's Exhibit D."

By MR. NEAVE:

Q10. In the alloy steels, known as chromium steels, nickel steels and nickel chromium steels, state the usual range respectively of chromium, nickel, carbon and manganese, and give some characteristic compositions of each of these steels known prior to November 1, 1906, and the dates at which they were known. You may give this in a tabular form if it is most convenient to you, and such comments as you desire to make.

A. I have prepared a table giving that information, which reads as follows:

EXAMPLES OF NICKEL-STEELS
PRIOR TO 1906

Exhibit Book	Date	Reference	Composition Nickel	Carbon	Manganese
381	1899	Abraham	2.-2.25	.30-.5	.38-.42
3	1902	Jamison	1.50-5.	.2-.5	.6-.75
89	1904	Harbord	2.75	.2	
90	1904	"	2.69	.08	.36

EXAMPLES OF CHROME STEELS PRIOR TO 1906.

Exhibit Book	Date	Reference	Composition Chrome	Carbon	Manganese
107	1891	Vosmaer	1.89	.77	.27
377	1895	Howe*	.25-4.	.31-1.32	.02-1.89
381	1899	Abraham	1.52	.46	.43

*31 different analyses given within these ranges.

ORDINARY NICKEL-CHROME AND CHROME-NICKEL STEELS

Known in the United States Prior to November 1, 1906

Use	Exhibit Book	Date	Reference	Composition Nickel	Chrome	Carbon	Manganese
Structural	17	Apr. 4, '05	Hadfield 786,561	3.5	1.71	.44	.32
Armor plate	19	Oct. 17, '05	Hadfield 802,188	3.30	1.8	.3-.4	.25
Krupp armor plate	345	Mar. 31, '99	Iron and Coal Trades Review	3.5	1.3	over .20	under .4
Krupp armor plate	346	'99	Senate Document #141	at least 3.5	at least 1.3	at least .20	not over .4
Armor plate	91	'04	Harbord & Hall	2.	1.	.4	not given
Krupp armor plate	352	'04	Pratt	3.50	1.5	2.5	not given
Armor plate	375	Sept. 7, '06	Edwards	3.50	1.50	.30	.7
Projectiles		1904-1906	Bethlehem Steel Co.	2.-3.	2.-3.	.6-1.00	.16-.35
Armor plate		1897-1906	Bethlehem Steel Co.	3.-4.	1.5-2.00	.28-.40	.30-.65

By Mr. Neave:

Q11. One column in each of these tables you have produced is headed the "Exhibit Book." The numbers under this heading refer to the pages in the Defendant's book of patents and publications, do they not?

A. Yes, sir.

Q12. And all of these instances that you have cited here in this table are shown in the Exhibit Book, except the instances of the projectiles and armor plates made by the Bethlehem Company, and those figures you take from the evidence in this case?

A. Yes, sir.

Q13. What are ordinary vanadium steels? Give some characteristic compositions known prior to November 1, 1906?

A. Strictly speaking, vanadium steels are carbon steels, the properties of which are modified by the presence of a small quantity of vanadium, but in the past it has often happened that chromium vanadium steels, that is, steels which contain a material quantity of chromium, and also a certain amount of vanadium, have been referred to often by careless writers as vanadium steels. For instance, in Stoughton's very excellent book, "Metallurgy of Iron and Steel," in his table 30, he gives the composition and properties of a large number of chrome vanadium steels and calls them vanadium steels. That was in accordance with the custom at that time when vanadium was being advertised, and there was very strong propaganda for convincing the public of the importance of vanadium and the accent was thrown on the vanadium and the influence of the other elements was belittled.

Q14. What have these ordinary vanadium steels been used for?

A. They have been used to a considerable extent for castings, and particularly for locomotive frames and I understand they have been successful.

Q15. You have a table giving some of the characteristic compositions, and so forth of these vanadium carbon steels?

A. Yes, sir. It reads as follows:

VANADIUM CARBON STEELS

Exhibit Book	Date	Reference	(Vanadium) Va.	(Carbon) C.	(Manganese) Mn.
171	Nov. 14, '01	Colby	1.—.5		
102	'04	Harbord & Hall	.14—1.11	.05—1.06	.43—.48
179	Feb. 8, '04	Guillet	.60—1.04	.11—.14	
174	Aug. 8, '04	"	.29—1.04	.11—.14	
217	'05	"	.25—1.15	.11—.88	.33—.55
218	'05	"	.60	.72	
	'05	"	.28—.32	.21—.65	.34—.46

By Mr. Neave:

Q16. What are vanadium nickel steels? If they were known prior to November of 1906, give some characteristic compositions of each of them?

A. Vanadium nickel steels in the same way are steels which owe their properties primarily to the nickel and vanadium they contain. I have a similar table of that which gives the composition of a number of vanadium nickel steels prior to 1906. It reads as follows:

VANADIUM NICKEL STEELS.

Exhibit Book	Date	Disclosed By	(Vanadium) Va.	(Carbon) C.	(Manganese) Mn.	(Nickel) Ni.
13	Oct. 4, '04	Manby	.05-.50	.50-1.50	.50-1.50	15.-25.
101	'04	Harbord	.28	.24	.48	3.38
225	'05	Guillet	.35	.26	.450	2.32
225	'05	"	.60	.15	.44	2.04
225	'05	"	.75	.15	.41	2.00
225	'05	"	1.	.23	.45	1.92
225	'05	"	1.45	.85	.65	2.64
167	July 1, '04	Wiener	.25	.25	.40	1.00
237	'05	"	.25	.25	.40	3.34
193	Sept. 25, '03	Marsolan	.50	.40		5.

By Mr. Neave:

Q17. In these last two tables you have produced, the abbreviations are used to designate the ingredients. I understand the abbreviation "VA" means vanadium; "C" means carbon; "MN" means manganese; and "NI" means nickel?

A. Yes, that is correct, sir. For "VA" one should read "V" as the proper abbreviation.

Q18. What are chrome vanadium steels? If they existed prior to November 1, 1906, give some characteristic compositions of those?

A. In the same way chrome vanadium steels are those which owe their properties to the presence of chromium and vanadium. I have a table which gives the compositions of three of these steels made in 1904. It reads as follows:

CHROME VANADIUM STEELS.

Exhibit Book	Date		(Vanadium) Va.	(Carbon) C.	(Manganese) Mn.	(Chromium) Cr.
132	Dec. '04	Sankey & Kent-Smith	.16— .18	.20— .44	.24— .83	.30— 1.26
167	July 1, '04	Wiener	.25	.25	.40	1.
169	Sept. 2, '04	"	.15	.30	.40	.50

By Mr. Neave:

Q19. In this table, the last column, which is headed "CR" means "Chrome"?

A. Yes, sir. The previous columns correspond to the columns in the tables just introduced.

Q20. What elements other than those you have referred to are usually present in chrome steels, nickel steels and chrome nickel steels, and in what range of percentages?

A. Manganese, silicon, phosphorus and sulphur. I have prepared a list of those elements. I do not find it in my hand at this moment. I can give it to you later, if that will be all right. The phosphorus and sulphur are rarely present in alloyed steels to the extent of more than .04 of one per cent. They are present as impurities derived from the ore from which the material is derived, and they are phosphorus and sulphur, which the manufacturer has been unable to remove in the process of manufacture. The manganese and silicon in most cases are residual quantities of these elements which are introduced for a specific purpose. In the process of manufacturing steel it becomes impregnated with oxygen, which is extremely injurious, and manganese or silicon or both are introduced when the metal is in a molten state for the pur-

pose of removing this oxygen in the form of oxide of manganese or oxide of silicon, but in order that this removal should be complete, a certain excess of manganese or silicon or both must be added to insure a complete removal, and this excess it is which is usually present in alloy steels.

In nickel steels, manganese may also be present intentionally for the purpose of replacing the nickel, because in the absence of chromium the effects of manganese and nickel are very closely similar. In the presence of chromium the manganese must be down, preferably .40 of one per cent. or less for a steel of say one and a half to two per cent. of chromium, because in the presence of chromium manganese is distinctly harmful. It is not in nickel steels free from chromium.

Q21. Certain of the prior patents or publications to which you have referred in the tables which you have presented make no mention of elements like carbon and manganese in referring to alloy steels. Does that mean that those elements were not present in such steels?

A. No, sir. It should not be so interpreted. They are habitually present. In fact, I might say you can say carbon is always an inevitable result and manganese almost necessary.

Q22. Will you please explain the purposes of the elements, vanadium, carbon, manganese, nickel and chromium, as used in the steels prior to November 1, 1906? That is, in those steels which you have referred to in your tabulations.

A. All of these elements have a generally similar effect looked at in a broad way; that is, they increase the cohesion of the metal, and in that way make

it strong, a higher elastic limit, a higher limit of stress within which the metal retains perfect elasticity, and, therefore, will return to its initial dimensions exactly after the stress is removed, and greater hardness. With those improvements goes a material loss of ductility and power of resisting shock, so that the quantity of these elements, singly and collectively, which must be added must be restricted so as not to cause an undue degree of brittleness and undue inability to resist shock.

Between chromium and nickel you must make a rather sharp distinction. Also between vanadium and nickel. Of the two chromium for given additions to strength and elasticity and hardness, gives greater brittleness than nickel. So that the ratio of nickel to chromium must be regulated to prevent the brittleness being undue and excessive for the service in view.

Also, nickel has the power of giving the steel a fibrous structure. In armor plate most particularly and in projectiles to a lesser degree this fibre is very important. To the armor plate it has been regarded as an essential, and this can be had only by the addition of nickel, so far as I know.

Chromium, on the other hand, enables us to get very great hardness, and it is a great help in the manufacture of chrome nickel steels, by widening the range of temperature which may be used for the heat treatment process, and the ranges of temperature which may be used in the fibering process to bring out or develop the fibre, of which nickel bearing steels are susceptible.

Vanadium has the same general effect of hardening, strengthening and embrittling the metal. In carbon steels and in chrome steels, particularly in chrome steels, vanadium has been found very beneficial. In

nickel steels corresponding benefit has not been found, and in chrome nickel steels it does not appear to have a material benefit, if not, indeed, to have a real harmful effect.

Q23. Both of the patents here in suit relate to alloy steels, do they not?

A. Yes, sir.

Q24. The first patent here in suit states that it relates to a self-hardening steel, and the second patent is not so designated. Is the steel of the second patent at least as much of a self-hardening steel as is the steel of the first patent?

A. Each of the patents has a specific composition in which the proportion of each element is specifically stated at an exact number. Each patent also has a broad or loose claim in which there is a wide and sometimes extraordinarily wide range of properties permitted, the upper limit being as much as thirty times the lower limit. The difference between the two narrow claims of the two patents consists only in the presence of .05 of one per cent. of tungsten, in the narrow claim of the first patent. Tungsten is not mentioned in the narrow claim of the second patent. Regarding that narrow claim of the first patent, which calls for .05 of one per cent. of tungsten, I do not think that that can have a material effect. I think its effect is negligible.

In regard to the broad claims of the two patents, the second patent has more carbon for the upper limit of carbon, more manganese for the upper limit of manganese, more chromium for the upper limit of chromium and more vanadium for the upper limit of vanadium than the first patent. So that if you take these upper limits, the steel of the second patent is more

self-hardening than the first patent, but in any way you look at it, it is as self-hardening, I should say, as the first. I do not think there could be any doubt about it, that that was the intention.

Q25. What is ordinarily meant by "Self-hardening steel"?

A. "Self-hardening steel" is one which when cooled in the air in pieces of moderate size from about a red heat or what is known as the transformation or critical range, is hard enough to be used as a cutting tool for cutting metals, iron included. That is to say, the common preparation of tool steels for cutting iron and other bodies. In the use of carbon steel, which was the common steel until relatively lately, this hardness was given by raising the metal to above a red heat and cooling it rapidly, as, for instance, in water or oil, and this rapid cooling conferred great hardness. Now, when people began to experiment with these alloy steels they found primarily with tungsten steel that it did not require cooling in water or rapid cooling, but a cooling in air was sufficiently rapid to give the hardness which was desired or necessary to use in cutting tools. So self-hardening steel, as I understand it, is one which in the size or shape of a cutting tool when cooled in the air, from red heat or above the critical range of temperature, is sufficiently hard to be used as a cutting tool then.

Q26. Is the self-hardening a desirable quality in projectile steel, armor plate and things of that sort?

A. The self-hardening property, as such, is objectionable for the reason that the self-hardening steel is too hard to be cut by other tools. It is itself an iron cutting metal, and before it can undergo the machining it is necessary, for bringing the shell or other

projectile to the prescribed dimensions, that the steel must be annealed in some special way in order to make it soft enough so that it can be cut by any metal tool.

Q27. In the years prior to 1906 what were the usual limits of vanadium in various alloy steels?

A. It was recognized very early that the quantity of vanadium must be kept low, and it was brought down to about .70 of one per cent., and then to a half per cent., and then perhaps to a quarter of a per cent., and then to about .15 of one per cent. Of course, vanadium is an expensive metal, and that is one consideration, but the beneficial properties were found to be given by small quantities of vanadium.

Q28. You want to refer to the exhibit book in this connection, do you not?

A. Yes, sir. The French writer, Guillet, in 1906, on page 353 of Guillet, Alliage Mettallique, said that the vanadium should not exceed .70 of one per cent. That is given also on page 180 of this book you have in your hand, defendant's volume of patents and publications.

On page 237 of this same book which you have in your hand (Defendant's Exhibit Book), the writer pointed out how the quantity of vanadium used had fallen, as I just said, from one per cent. to one-half per cent. to .20 of one per cent. and to .15 of one per cent.

Q29. To what extent in the years prior to 1906 had nickel chrome vanadium, or chrome nickel vanadium, been used or proposed for use, and will you give characteristic examples?

A. I have a table here which gives nine or ten cases. It reads as follows:

VANADIUM NICKEL CHROMIUM STEELS.

Use	Exhibit Book	Date	Reference	(Vanadium) Va.	(Carbon) C.	(Manganese) Mn.	(Nickel) Ni.	(Chrome) Cr.	(Tungsten) W.
Armor plate	73	July 30, '06	Marrel	.4—	.18	Not Specified	3.—	.40—	
			Freres Fr. Patent 366,532	.80*	.30	"	4.	.80	
French Armor plate	35	Sept. 1, '06	Schneider	.2— .5	.3— .5	"	3.— 5.	.5 — 1.5	
Armor plate	77	'04	Harbord & Hall	Usual	Usual	Usual	Usual	Usual	
"	238	'05	Wiener	"	"	"	"	"	
Automobile construction	337	June 28, '06	T. J. Fay	"	"	"	"	.50— 2.50	
French automobiles	331	Oct. 11, '06	Stafford	"	"	"	"	Usual	
Electric steel	21	Dec. 12, '05	Heroult Patent 807,826	As desired	As desired	As desired	As desired	As desired	
Fatigue resisting steel	341	Jan. 10, '06	Taylor	Up to .50	Usual	Usual	Usual	Usual	
Armor plate	37	Aug. 1, '06	Whales	.2— .5	.15— .25	.15— .35	5.— 12.	.15— .25	.50x .70

*Replacing chrome wholly or in part.

x Tungsten may be omitted.

By Mr. Neave:

Q30. During the years covered by the references as stated in your table, vanadium was under vigorous exploitation?

A. Very vigorous exploitation. Propaganda carried out with great advertisement. In fact, I think that many people were rather shocked at the "Patent Medicine" way in which this addition was being advertised.

Q31. It was a cure for all ills, was it?

A. A panacea for all ills and under all conditions.

Q32. Now referring to this last tabulation which you have presented of nickel chrome vanadium steels, will you comment briefly on the various references referred to in the table, all of which are contained in defendant's Exhibit Book of patents and publications?

A. On page 343 of the book Mr. C. H. Taylor on January 10, 1906, points out that small quantities, up to one-half of one per cent., increase the tenacity and particularly the fatigue resistance, and says that vanadium has been added to both chrome—nickel, and silicon—manganese steel with good results.

Mr. T. J. Fay in "The Automobile", New York, June 28, 1906, (Ex. book p. 338), says:

> "Vanadium, then, is a very important element because it does give to steel further ability to resist fatigue, but it is not necessary to eliminate either nickel or chromium to use vanadium."

This sentence occurs in a sub-section of his paper entitled, "The use of nickel chrome steel", and is the closing paragraph in that sub-section.

On page 238 Mr. Wiener, in the discussion of a paper by Dr. Guillet, to whom I have just referred, says:

"Dr. Guillet was evidently of opinion that nickel vanadium steel, or nickel chromium vanadium steel would be a grand material for armor plates, and appeared to think that such steel would come into use for this purpose."

On page 35 there is the United States patent to Mr. Schneider for an alloy for armor plates, a chrome nickel steel of the standard armor plate composition at that time, in which he proposes to add vanadium from .2 to .5 of one per cent. of vanadium to a standard chrome nickel armor plate steel.

MR. WARFIELD: Your Honor, I note the patent to which the witness has just been referring is not set up in the answer, and accordingly I reserve the usual objection. It is available, as I understand it, for the purpose of showing the state of the art but not as an anticipation.

MR. NEAVE: Your Honor, this patent he is speaking of is the Schneider patent. It is not set up in the answer as a prior art patent, but Schneider is set up as a prior inventor, and this is the American patent, and we are about to put in evidence the French patent, showing this date goes back of Churchward.

THE WITNESS: On page 37, United States patent to S. S. Wales, for alloy for armor plate, calling for—

MR. WARFIELD: Your Honor, the same observation applies to this patent, and I may save time, possibly, by making a general objection to the introduction of any of these patents not set up in the answer for any other purpose than showing the general state of the art.

THE COURT: If you wish an exception to be available, you had better make it specifically.

MR. WARFIELD: To each patent?

THE COURT: Yes.

MR. WARFIELD: Very good. I thought I could save time.

THE COURT: It would save time, but general objections are not of very much help to you.

MR. WARFIELD: Then, the offer of this patent is objected to, for any other purpose than that of merely showing the general state of the art.

THE WITNESS: The alloy described in the patent contains a large quantity of nickel and a small quantity of chromium. It is in that sense a chrome nickel steel. It is not the usual composition of chrome nickel steel. It contains also tungsten. The patentee says on line 57:

"I may substitute vanadium or molybdenum in place of tungsten in whole or in part."

On page 75 the French patent to Marrell Freres gives the composition of armor plate, nickel and chromium, the chromium being capable of being replaced in whole or in part by vanadium, and three other metals mentioned.

On page 77 Harbord & Hall in their Standard Text Book published in 1904, dealing with the composition of armor plates, say that each maker uses a special steel with varying percentages of such metals as nickel, chromium, manganese, vanadium and tungsten.

By THE COURT:

Q33. What is the date of that publication?

A. That is 1904. On page 332 an article from

the American Machinist, October 11, 1906, by B. E. D. Stafford. On page 332, he says:

> "I understand that in practice there is a car which is pronounced unbreakable in its material parts."

He says of the material used to give this unbreakable condition:

> "These steels are known as vanadium, nickel vanadium, and nickel chrome vanadium steels, and certain of the castings in use contain small proportions of vanadium."

By Mr. Neave:

Q34. Is there any doubt in your mind that nickel chrome vanadium steels were certainly known prior to November, 1906?

A. No, sir.

Q35. Do the patents in suit disclose to you as a metallurgist anything new or instructive as to alloy steels?

A. No, sir.

Q36. In your opinion would or did the addition of vanadium in the percentages given in the patents in suit to the chrome nickel steels known in the years prior to 1906 lead to any unexpected beneficial results?

A. No, sir. On the contrary, they failed to lead to the expected beneficial results.

Q37. To what extent has nickel chrome vanadium steel been used and to what extent is it now being used?

A. It was used some years ago to a considerable extent, but its use has become very much restricted. There is very little of it used now, so far as I know.

I think this is borne out by what occurred in the American Society for Testing Materials. They gave in their Year Book specifications for steels for many

purposes, including automobiles. They published specifications which they recommended, which their committees recommended, for use for automobile steels. In the year 1914 they gave such specifications for eight such steels, including nickel chrome vanadium steel and also nickel vanadium steel.

By Mr. Warfield:

Q38. What year was that first one?

A. The first one was the year book for 1914, published by the Society in 1914.

The following year, in the same place, we find the same steels specified with the exception of the chrome nickel vanadium steel, which is not mentioned, and the nickel vanadium steel, which is not mentioned.

A standard book by Bullens, "Steel and Its Heat Treatment," published in 1916, in Chapter I, on Vanadium Steels, which consists of nine pages, you will not find any reference to chrome nickel vanadium, though chrome nickel is repeatedly referred to; and five pages are occupied with the composition and physical properties of chrome vanadium steel, but I do not find any analyses or other references to chrome nickel vanadium steel. On page 306 he compares chrome nickel with chrome vanadium. I find many analyses of chrome nickel steel and tables and diagrams showing their physical properties, including a batch on page 327 of 17 analyses. Nowhere in this chapter or elsewhere that I have been able to find in the book is chrome nickel vanadium steel referred to. The index gives eight entries on chrome steel and thirteen entries on chrome-nickel steel, but it does not mention chrome nickel vanadium steel.

A book by E. F. Lake, on "The Composition and Heat Treatment of Steel," published by McGraw-Hill

Book Company in 1910. He discusses nickel steel over three pages and chrome steel over two pages, referring incidentally to chrome nickel and chrome vanadium steels, on page 100, in two places, but there is no reference there or elsewhere that I have found to chrome nickel vanadium. The article on vanadium in this book, page 104, refers to vanadium chrome manganese carbon steel, vanadium nickel manganese steel, vanadium tungsten chrome steel, but does not refer to nickel chrome vanadium steel, nor have I found anywhere in this book any reference to nickel chrome vanadium.

Another book by Professor Bradley Stoughton, 1908, "The Metallurgy of Iron and Steel." He devotes 26 pages to alloy steels, but it has no reference which I have found to nickel chrome vanadium steel, though he gives the Krupp armor plate correctly as containing about 3 1-4 per cent. nickel, 1 1-2 per cent. chromium, and a quarter of one per cent. of carbon. His index has 13 references to nickel steel, 9 to chrome steel, 3 to vanadium steel, but none to chrome nickel vanadium or nickel chrome vanadium.

A book by Harbord & Hall, "The Metallurgy of Steel," 1916, has seven pages on nickel steel, with many analyses, but none of them contain vanadium. About half a page is given to chrome nickel steel, but no reference is made to chrome nickel vanadium. About 25 pages are given up to vanadium steel, including a large number of analyses, none of which represents nickel chrome vanadium steel, nor do I find any reference to nickel chrome vanadium steel either in the article on chrome steel, or in that on nickel steel, or in that on vanadium steel. Chrome vanadium and nickel vanadium steels are mentioned, but nowhere nickel chrome vanadium, so far as I have found.

By Mr. Neave:

Q39. Does your own experience bear out and confirm the inferences which you draw from these various writers as to the use or non-use of nickel chrome vanadium steel.

A. Yes, sir.

Q40. Do you know of its being manufactured now?

A. I do not know of its being manufactured, but I should not like to say that it is not.

Q41. But your experience in this is pretty broad, is it not—the range of your knowledge?

A. I do a good deal of reading.

Q42. You have also been in touch almost continuously with the practical men, have you not, and manufacturers?

A. Yes, sir.

Q43. In that connection, you told me incidents relating to the steel helmets for the United States forces. Will you tell us about that?

A. As I mentioned, I was attached to the Ordnance Department for the purpose of finding a suitable steel for helmets and body armor. About the first thing was to make inquiries from a great many well-informed people, including Mr. George Norris, the general sales agent—I believe that is his title—of the American Vanadium Company, what steels were most promising for trial. We tried a great many, but there was no nickel chrome vanadium steel in those we tried.

Q44. Was nickel chrome vanadium steel suggested by anybody?

A. I do not think so. There was a lot of steel which had been made up, which was supposed to contain a small quantity of vanadium. This we tested and found that it contained an insignificant quantity of vanadium only. It was a nickel chrome steel.

Q45. What do you mean by an insignificant quantity?

A. Less than five hundredths of one per cent. I should consider that really immaterial.

Q46. No nickel chrome vanadium steel was adopted or used in the helmets with which our forces were supplied?

A. No, sir. But that perhaps may mislead. We did not finish our tests soon enough to enable the Government to make use of them before the Armistice.

Q47. To make use of the results of your experiments?

A. Of the results. The steel which was in use during the war, manganese steel, continued in use to the end of the war. We were not quick enough to overcome the great friction which was being required to introduce a new steel in place of that which was giving good satisfaction.

Q48. In what year did you take up this work on the helmets which you have been speaking of?

A. In September, 1917.

Mr. Neave: Referring to Defendant's Exhibit D, which is the volume containing the defendant's patents and publications, it is stipulated that printed Patent Office copies of the United States patents and photographic reproductions of the British Patents contained in said volume may be received in evidence with the same force and effect as certified copies or originals duly proved.

It is also agreed that the translations of the French Patent and of the foreign publications, extracts of which are contained in Defendant's Exhibit D, may, subject to correction if error be found to appear, be regarded as correct translations, and

that the original foreign text need not be introduced.

Further, it is agreed that the various publications contained in the defendant's volume of patents and publications, marked "Exhibit D", were printed and published on the dates specified in said volume, and that the reproductions contained in the volume may be accepted in place of the original publications duly proved, all subject to correction if error be found.

The defendant offers in evidence certified copy of the file wrapper and contents of the Schneider U. S. Patent No. 925,659, to be marked Defendant's Exhibit E.

Defendant also offers in evidence certified copy of the file wrapper and contents of the Schneider U. S. Patent No. 934,697, to be marked Defendant's Exhibit F.

Defendant also offers in evidence a copy in French of the Schneider French Patent No. 379,188, together with a certificate showing the application for that patent was filed in the French Patent Office on September 1, 1906, to be marked Defendant's Exhibit G.

Defendant also offers in evidence a translation of such French patent, and the exhibit, sworn to by the translator, to be marked Defendant's Exhibit G[1], and it is agreed that the translation may be taken to be correct unless error be found and pointed out.

Defendant also offers in evidence certified copy of file wrapper and contents of the Wales U. S. Patent No. 1,111,709, to be marked Defendant's Exhibit H.

MR. WARFIELD: I am reserving any objection that I may have to these exhibits which have just been introduced until I can examine them intelligently.

THE COURT: You may reserve all your rights of objection on the record.

MR. NEAVE: You may cross-examine, Mr. Warfield.

MR. WARFIELD: If the court please, may we have an adjournment at this time for about fifteen minutes? I think I can save time on the cross-examination. There is quite a bit of new matter here that we can sift out.

THE COURT: Very well.

(A recess was taken for fifteen minutes.)

MR. WARFIELD: Objection is taken to the introduction of Defendant's Exhibit E, being a certified copy of file wrapper and contents, United States Letters Patent to Schneider, No. 925,659, on the ground that this patent is not cited in the answer, and that the patent and the certified copy of the file wrapper and contents are incompetent, immaterial and irrelevant.

Objection is taken to the introduction of Defendant's Exhibit F, being a certified copy of the file wrapper and contents of United States Letters Patent to Schneider No. 934,697, on the ground that the patent is not cited in the answer, and that the patent and the file wrapper and contents are incompetent, immaterial and irrelevant.

Objection is taken to the introduction of De-

fendant's Exhibits G and G¹, being respectively an original and a translation of the French Patent to Schneider No. 397,188, on the ground that this patent is not cited in the answer, and that it is incompetent, immaterial and irrelevant. No objection is made to the copy of the patent as a copy, nor to the translation as a translation, subject to correction of all errors.

Objection is taken to the introduction of Defendant's Exhibit H, being a certified copy of the file wrapper and contents of the United States Letters Patent to Wales No. 1,111,709, on the ground that this patent is not cited in the answer, and that the patent and file wrapper and contents are incompetent and immaterial and irrelevant.

Mr. Neave: Your Honor, the Schneider and the Wales patents are not set up in the answer as anticipations, and they are too late, but Schneider and Wales are both pleaded as individuals who previously made this invention, if it is any invention, and had prior knowledge of it.

Mr. Warfield: I may say, if the court please, as to these exhibits, that we have no objection to their remaining in the record for such use and for such credence as the court may think they are entitled to under the objections and under any other objections that may be made, or that are inherent in them, so far as this case is concerned.

Mr. Neave: At the request of counsel for the plaintiff, counsel for defendant produces a memorandum which was attached to the copy of the report of Mr. Morris to Mr. Johnston, a por-

tion of which is copied on the record, and this memorandum is offered in evidence:

The memorandum is as follows:

July 9th, 1904.

MEMORANDUM.

Things to be looked up abroad.

Look up the use of Vanadium in Crucible Steel. Mr. Douglas Vickers should be able to give information on this subject & Krupp also.

Visit Holrodys,
Milnrow,
Richdale.

Mr. Leibert is Managing Director of this concern.

Look up the cost of grinding stones for Tasker Emery Grinders.

A. Johnston.

Get drawing of latest type gas fired melting furnaces used in crucible plant at Krupps."

Endorsed: "Memo.

Look up
Crucible Steel
Vickers and Krupps."

By Mr. Warfield: If the court please, it would be an intellectual pleasure to cross-examine the learned Doctor in this matter. If it were to be done thoroughly it would have to cover a very considerable time. I think in the interests of expedition and in view of the fact that there is nothing in the subject-matter testified to which your Honor cannot properly gauge and scope from the original documents and from the record otherwise made in this case, that we shall, in the interests of brevity, not cross-examine. I wish to couple this, however, with the statement, which I think

is a proper one, that both for the record and so far as your Honor is concerned—I am quite satisfied as to that point so far as your Honor is concerned, but also as to the record—there should be no prejudice as against plaintiff's case because he saves the time of the court and saves possibly a large amount of space in the record by not cross-examining. In other words, I think that it will be quite satisfactory for plaintiff not to cross-examine, and I think that should and may be the decision without prejudice.

HARRY T. MORRIS, heretofore sworn, recalled and examined and testified as follows:

By MR. NEAVE:

Q1. There has just been placed upon the record a memorandum dated July 9th, 1904, which is designated as a memorandum of things to be looked up abroad. One of the items is the use of vanadium in crucible steel. It is stated that Mr. Vickers should be able to give you knowledge on that. Then, there is a memorandum to visit Holrodys, in Richdale, of which Mr. Leibert is Managing Director. What was Holrodys? Did it have anything to do with vanadium?

A. No. I think it is "R-o-y-d-s", isn't it?

Q2. It is "r-o-d-y-s."

A. It is spelled wrong. It should be "r-o-y-d-s". They were a firm manufacturing machinery for cutting steel.

Q3. Another item here on the memorandum is to look up the cost of grinding stones for Tasker Emery

Grinders. Another item is to get a drawing of latest type of gas fired melting furnaces used in Crucible plant at Krupps. Were there any instructions as to your trip abroad other than those contained in this memorandum?

A. There were.

Q4. What did they relate to, generally?

A. I cannot recall all of them. As I stated yesterday. The investigation of electric furnaces in France and gas engines in Germany were the most important part. There were six or eight such memoranda, as I remember it. In addition to that, after I got abroad I received a number of cablegrams instructing me to go here or there.

Q5. Did those additional memoranda or cablegrams refer to vanadium—do you remember?

A. No. This is the only memorandum referring to vanadium.

Q6. Why did this memorandum happen to be in this file that you produced, and not the others?

A. I simply attached that to the letter for the information of counsel. I did not know what use they wanted to make of it.

Q7. Because it did relate to vanadium?

A. Because it related to this letter which I was submitting. It related to the subject-matter of the letter which I wrote from Essen in 1904.

Q8. To Mr. Johnston?

A. To Mr. Johnston.

(No cross-examination.)

Defendant Rests.

EVIDENCE IN REBUTTAL ON BEHALF OF THE PLAINTIFF.

MR. WARFIELD: Plaintiff offers in evidence a certified copy of the file wrapper and contents of the patent in suit, No. 845,756, as a certified copy of the file wrapper and contents of patent No. 845,756.

Plaintiff also offers in evidence a certified copy of the file wrapper and contents of the patent in suit, No. 868,327, as a certified copy of the file wrapper and contents of patent No. 868,327.

PERCY T. GRIFFITH, having been duly sworn, was examined and testified as follows:

By MR. WARFIELD:

Q1. Your name is Percy T. Griffith?

A. Yes.

Q2. Your age is 43?

A. Yes.

Q3. Your residence is Stamford, Connecticut?

A. Yes.

Q4. Your occupation, in part, is in charge of the commercial affairs of the plaintiff company?

A. Yes.

Q5. Were you familiar with the course of litigation of the suit in which the present plaintiff company was the plaintiff and the Carnegie Steel Company was the defendant on the two patents in suit herein?

A. From and after about the date of October, 1912, yes.

Q6. As that case progressed did you familiarize yourself with the record thereof?

A. I did, and read practically all the testimony, or all of it.

Q7. Can you state about when that suit was commenced?

A. About 1910. In about the month of August, 1910.

Q8. Was testimony taken in that case?

A. Testimony was taken over a period of years in that case, both here and abroad.

Q9. Can you give the names of some of the witnesses who were examined?

MR. NEAVE: Your Honor, it seems to me it is immaterial what witnesses testified in the suit against the Carnegie Company. The case never proceeded to hearing. There was never any adjudication on the matter, as I understand it, and it was settled by the granting of a license. I do not see why we should go into the record in the Carnegie case.

THE COURT: I do not see its relevancy, Mr. Warfield. Suppose they had made a categorical admission of your patent rights and their infringement, and had settled with you: What is that anything more than a declaration or statement by them of what they conceived to be your rights?

MR. WARFIELD: Nothing, your Honor, except that insofar as this case is concerned the defendant has introduced the contract between the Churchward Company and the Carnegie Company by virtue of which that litigation was settled, and I want to show what led up to that contract. As explanatory of that contract under those conditions it seems to me that it is competent.

THE COURT: You mean to lay ground to reform it for fraud, accident or mistake?

MR. WARFIELD: It may possibly have that effect.

MR. USINA: If it is for that purpose, your Honor, I object to it. There is a motion which has not been pressed before the court to bring that matter into the plaintiff's complaint. Until that motion is decided I do not think we ought to have any testimony in the matter. I should not oppose it except that Mr. Dinkey, who is the only man whom we could rely on, is not here.

THE COURT: I do not see why it is necessarily a part of the bill of complaint, Mr. Usina. It is a reply to your answer. Your answer sets up a release.

MR. USINA: Yes.

THE COURT: They reply that you have no release—that that release is not what on its face it purports to be.

MR. USINA: If your Honor please, it seems to me this is either one of two things: Either an effort to reform the contract, as to which I think testimony is inadmissible—

THE COURT: That is what it is, or nothing.

MR. USINA: Or it is a complaint against the Carnegie Company for damages for deceit, which is an entirely separate matter, a matter on a separate action. But, at any rate, the question of the admission of that has not been passed on by the court, and until it is passed on, and we are given an opportunity to answer the complaint thus

amended, I do not think any testimony should be introduced concerning it.

THE COURT: Do I have the outline of the fact situation in mind? You, considering yourself interested because of your liability to answer over to the original defendant of record, asked to intervene.

MR. USINA: Yes.

THE COURT: And you set up a release.

MR. USINA: Yes.

THE COURT: If that is a good release to you, it operates for the benefit of your alienees?

MR. USINA: Yes.

THE COURT: That is in evidence, is it?

MR. WARFIELD: Yes, your Honor.

THE COURT: Why can they not set up that which does not carry what it imports to carry, for the reason, for illustration, that there was a typographical error made in transcribing it, and it says the opposite to what the release really said, or any other answer to it?

MR. USINA: For correcting ambiguities in it, perhaps oral testimony would be admissible, but I think some foundation for it must be shown first.

THE COURT:—That is the reason I am inquiring.

MR. USINA: For reforming the contract I do not think it is admissible.

THE COURT: That is the reason I am inquiring whether the purpose is now to lay or attempt to lay the foundation for a reformation of the release.

MR. WARFIELD: It seems to me that it is permissible in any event, your Honor, under the circumstances of this case, to explain the facts which led up to that contract. Not necessarily by way of reformation, but by way of generally making it intelligible.

THE COURT: Why so? All your previous negotiations would be merged in what you did. No matter what the inducements were on either side, if you finally come to the conclusion, "we will shorten up this whole controversy by executing a general release," why is anyone interested in what preceded? I do not see that it has any value here, unless it is laying the ground to reform the release. If it is, I do not see how I can shut you out from your attempt to lay the ground for a reformation.

MR. WARFIELD: I think the evidence would have another bearing also, your Honor, in that there has been an attempt to show that the Carnegie Company has abandoned the use of the steel covered by these patents and covered by this contract, which is offered in evidence on behalf of the defendant, and an attempt is made to draw an inference from that state of facts prejudicial to this plaintiff, and from that standpoint it seems to me it is perfectly proper for us to show the course of the history of the Carnegie Company with reference to this steel, in so far as we can.

THE COURT: If that had any relevancy to this inquiry, I would concede that; but I do not see that it has. Supposing the Carnegie Company trespassed upon your rights, or did not trespass upon your rights. How does that affect the ques-

tion whether the Bethlehem Steel Company trespassed upon your rights? I do not see that it has any bearing whatever, except in its relation to the effect of this release as operating in favor of the original defendant.

MR. WARFIELD: I think that is true, your Honor.

THE COURT: However, the trial of these cases is nothing more than the taking of depositions anyhow, and you may state your objection upon the record so as to fully protect yourself, and we will take the testimony subject to that objection, with a statement by the Court, in compliance with the equity rules, that, as we now regard it, this line of testimony has no other relevancy, pertinency or bearing than the laying of ground for the reformation of the release in writing which has been offered in evidence.

MR. WARFIELD: We shall try to show your Honor that it has also another bearing.

THE COURT: You may state your objection in such way as you feel will fully protect you.

MR. USINA: Counsel for Carnegie Company objects to the admission of the evidence of this witness, if it be intended to vary the contract between Carnegie Company and plaintiff, on the ground that it is incompetent, as well as immaterial and irrelevant; also that it is not within the issues presented by the pleadings.

THE COURT: Have you refreshed your recollection of the equity rule on that subject? Are they required to make a replication to your answer?

MR. USINA: No, your Honor, they are not required to. They have a right to, I think, where any new ground is set up, but they have not availed themselves of that right by way of a reply. They have made a motion to amend their complaint, in which case we are entitled, first, to question its admissibility, and then to answer to it if it is admitted.

THE COURT: It does not seem to me that amendment is the remedy, because their bill of complaint, amended or unamended, speaks as of the date as of its original filing, and as of the date of its original filing nothing is known of this release. As multifariousness is no longer an objection to a bill, I suppose they could incorporate in it a bill to reform this release.

MR. USINA: I have not considered, your Honor, the possibility of their filing a reply. I have only thought of meeting the situation which they have actually presented, by way of a proposed amendment, and it seems to me the situation there is perfectly clear. The equity rules provide that the Court may, in its discretion, permit amendments of the pleadings, and, if an amendment is made of the complaint, that a certain period of time, I forget what it is, is allowed to defendant to amend his answer to meet the issue.

MR. WARFIELD: My present question, Mr. Usina, is simply as to the witnesses who testified.

MR. USINA: It may be, your Honor, that the testimony to be presented is not objectionable, but I assumed from Mr. Warfield's first remarks that perhaps it was going to be. If it is not, we can let it go until I find that it is.

THE COURT: You put your position fully on the record, so that you will be protected in all your rights.

MR. STRYKER: Our position, if your Honor please, on this question of the admissibility of the evidence to secure a reformation of the agreement, is that, in the present condition of the pleadings, there is no intimation that that is in issue; that a reformation of the agreement would be affirmative relief against the defendant, different from that prayed by the bill entirely, and not incidental to that praying. As the pleadings now stand, a release has been pleaded, and that not just a mere release but an agreement containing a great many terms, one of which was a release. Now if a recission of that release is sought, then it is incumbent upon the plaintiff to put us in *status quo* and to tender the consideration. If a reformation is sought, it certainly must be incumbent upon the plaintiff to put the pleadings in such shape, either by a special reply or an amendment, as to give the parties notice of that issue, which, as it now stands, is entirely outside of anything suggested by the pleadings. That is, if no replication is necessary, and if it be considered as though they denied our reply, then their denial would be a denial that there was a release, and we do not see how that situation can be construed into a prayer for a reformation of an existing release which is now in evidence. We think that is a distinct issue which must be raised in some way by the pleadings, before evidence may be introduced.

THE COURT: But, you see, you have the two phases, I assume, in which this can be regarded.

Under the equity rules we are called upon to try this case as if at law. If we were trying this case at law, under the Pennsylvania practice, the reformation has reference, not to the release, in which a party might ask to have that paper reformed, but is reform wholly for evidential purposes, just the same as if this action had been at law for damages and the defendant had introduced this release. I do not see that the plaintiff would have been called upon to have amended his bill. He would simply answer that piece of evidence. He might answer it by saying that the signatures were forgeries, or answer it by saying that the paper should be reformed because there was a mistake, in that, in the typewriting of it, there had been an error crept in, giving a different meaning from what the paper really had, or any other thing that he had to introduce which would destroy, not the paper, but its evidential effect in this particular case.

Mr. Stryker: I am not familiar, your Honor, with the Pennsylvania practice on that point so far as it differs from the New Jersey practice.

The Court: It does differ vitally and essentially in that respect, and I know that New Jersey counsel have a little difficulty in understanding how we can administer equitable relief under common law forms, and it seems to them a mixing of two things that will not happily combine. But I do not think any Pennsylvania lawyer sees any difficulty in the way of doing it. The trial judge develops it purely as a matter of law, and sits *ad interim* as a chancellor. The jury may sit as a chancellor and reform a paper. So far as I know,

the practice is peculiar to Pennsylvania, but it is very mobile and it is a very practical thing. Now so far as this case is concerned, it seems to me that it has no bearing whatever except in its evidential features, and, if so, I do not see any occasion to drag it into the pleadings. If you have stated your objections, you may proceed and we will take anything you have to say subject to the objection and the further objection of the defendants, with leave to them to move to strike out at the conclusion of the testimony, and after you have offered all the evidence that you have to offer on that phase of the case.

Mr. Warfield: We are going to be very brief, your Honor.

The Court: I do not say that to hurry you, but so that the defendants may be fully protected. You may protect yourself by a motion to strike out.

Mr. Neave: On behalf of the Bethlehem Steel Company, to come back to this question to which I originally objected, it is a question as to what witnesses testified in the suit against the Carnegie Company. It seems to me that that is immaterial from every point of view. It apparently can have no conceivable relation to the basis for the contract. There may have been a thousand witnesses and there may have been only one who testified, and still it would be entirely immaterial from any of the points of view that have been urged by Mr. Warfield, and I object to the question on that ground. I think probably we will get along better if we take up each specific question as it comes. This is a specific one.

THE COURT: Mr. Neave, I have disposed of that, because the rule is to take the testimony subject to the objection and subject to any comments that the trial judge may make at the time.

MR. NEAVE: I thought that that ruling was on the general proposition rather than on this specific question.

THE COURT: No, it had reference to your specific objection.

MR. NEAVE: Very well, sir.

THE COURT: In order that there may be no doubt as to the effect and extent of the ruling made, the testimony objected to is taken subject to the objection, with the expression from the trial judge that at the present time its relevancy does not appear and the objection should be sustained, and with leave to the defendants to move to strike out.

(Question read.)

A. S. S. Wales, C. W. F. Rys, John S. Unger, Albert E. Vancleave, Lee H. Bowman, Albert Ladd Colby, William D. O'Gorman, Ed. B. Shimer, John A. Matthews, Thomas Prosser, Henry Souther, Frank P. Gilligan and George P. Moore in the United States; Ehrenfried Corleis, chief chemist of the Krupp Works, and Fritz Ritershousen, metallurgical engineer at the same place, both taken in Germany; Leon Guillet, taken at Paris; J. O. Arnold, F. W. Harboard, J. Kent Smith, John E. Stead, Paul Girod and E. Riall Sankey, all taken in England.

By MR. WARFIELD:

Q10. Has a part of your familiarity with this art been gained by such study as you may have given to the

depositions of the witnesses whom you have named in that litigation?

A. Yes.

Q11. Do you know whether the S. S. Wales given on the list was at the time an employee of the Carnegie Steel Company?

A. I understand that he so swore.

Q12. Was he examined briefly or at length?

A. Very much at length.

Q13. That litigation was terminated upon the payment by the Carnegie Steel Company to the Churchward International Steel Company of a sum of money?

A. Yes.

Q14. How much?

A. $275,000.

Q15. When was the final agreement reached in accordance with which that money was to be paid?

Mr. Usina: I object. That matter is all shown on the agreement. It is a matter of writing in evidence. The date of the agreement is on its face.

The Court: I think that is covered by the ruling already made, Mr. Usina. You have leave to move to strike out, and that will fully protect you.

A. On or about May 29, 1914, at Philadelphia.

By Mr. Warfield:

Q16. That was an oral agreement, afterwards reduced to writing?

A. It was an oral agreement, afterwards reduced to writing.

Q17. At the time of that oral agreement, was any statement made as to rights of the Churchward International Steel Company against the Bethlehem Steel Company?

A. Yes.

Mr. Neave: That is all covered by the same objection, I suppose?

The Court: In order to have no doubt about it, the whole of this line of testimony is taken subject to the objection already made, as if each question were specifically objected to, and subject to leave to move to strike out.

By Mr. Warfield:

Q18. Was there an understanding between the parties as to this matter; if so, what was it?

Mr. Usina: I object to that, your Honor; to the form of the question.

The Court: That will not help us any, Mr. Warfield. If anything was said, I will permit you, under the ruling, to show what was said, but that question would not mean anything.

Mr. Warfield: That, of course, is not the proper form. I was trying to shorten up the matter.

Mr. Brown: I would call your Honor's attention to the fact that we do not know who was present at the interview. All we know is that this gentleman, who is a witness, says there was an oral agreement, which was afterwards reduced to writing. With whom? Under what circumstances? It seems to me we are getting away beyond anything that we have ever permitted in testimony.

The Court: Of course, you must face the rule of clear, precise and indubitable, and for that reason a good deal of latitude ought to be allowed counsel, because the string he is trying to break is pretty strong.

MR. WARFIELD: I quite appreciate that burden, your Honor, and I am trying not to go further than I have to, in order to avoid anything disagreeable.

THE COURT: I do not have to call your attention to the fact, Mr. Warfield, that what understanding was reached is too shadowy and indefinite to help us any, and we might as well keep it off the record.

(Question withdrawn.)

THE COURT: I think Mr. Brown's suggestion is a very pertinent one, that, if there was an agreement made and afterwards put into writing, we ought to have the parties to the agreement and when it was made and where it was made, and get it as clearly as we can get it.

MR. WARFIELD: Quite so, if the Court please, and counsel's objection forces me to take it up from that standpoint.

By MR. WARFIELD:

Q19. When was this final oral agreement reached? You have already stated that, possibly.

A. At Philadelphia, on or about May 29, 1914, at a conference between Mr. Dinkey, president of the Carnegie Steel Company—

Q20. Do you know his initials?

A. I do not recall his initials.

THE COURT: That identifies him. A. C., I think.

THE WITNESS: A. C., that is it; A. C. Dinkey, accompanied by the late C. C. Linthicum, his counsel, and the Churchward Company was represented

by its counsel, Mr. F. P. Warfield, by myself, and also by a stockholder, Mr. E. H. Gold, of Chicago, Ill.

Q21. State, in so far as you can remember, what was said by you and what was said by Mr. Dinkey on the question of the reservation of the Churchward International Steel Company's rights as against the Bethlehem Steel Company?

A. During the interview, which lasted from about 9 o'clock in the morning until about 4 in the afternoon, Mr. Dinkey made this statement, in which I am not attempting to quote his every exact word, but quite accurately, I believe: "If we make this, or a settlement with you, we should want you to include all rights for past infringement by others, so that we might proceed against them and help recoup ourselves from them," to which I made this reply, that it would be quite impossible for the Churchward Company to consider such a condition, and that, owing to the low terms on which a settlement would be made with the Carnegie Company, compared to what the Churchward Company and its stockholders had always hoped to receive from the infringement by the Carnegie Company, it had only been possible to arrange for a settlement by the clear understanding on the part of the Churchward Company that, after making this low settlement with the Carnegie Company, it would proceed to the full extent of its rights against the Bethlehem, Midvale and other companies which had infringed, or might have infringed, this patent, stating further to Mr. Dinkey that such a reservation of all our rights for past infringement against the Bethlehem Steel, Midvale and other companies was not only a condition precedent to making any settlement with him that day, but even to my presence at that meeting. Later, in discussing

who should be included in the settlement and release, Mr. Dinkey and Mr. Linthicum stated that in America any subsidiaries of the United States Steel Corporation, and only those, would be expected to be included, so that, in case any of those subsidiaries had infringed this patent, the United States Steel Corporation would not be making a settlement without full release of itself; but that in foreign countries, and notably in England, persons not subsidiaries of the United States Steel Corporation, and not, so far as they were quite sure, actual licensees of the United States Steel Corporation, under any or all of its patent rights or licenses, but who were correspondents, friends or concerns with whom they had reciprocal relations, should and must in those foreign countries, and particularly in England, be included in such settlement and release, and I believe the contract between the two parties afterwards executed makes that distinction, between American and foreign countries, and I believe that in the execution of that contract both and all of the parties concerned clearly understood that there were being released in America only the subsidiaries of the United States Steel Corporation, and the United States Government, to whom it was alleged the steel had been sold.

Q22. That was your understanding at the time, was it?

A. Unquestionably.

Q23. As based upon the conversations to which you have testified?

A. Yes, sir.

Q24. State whether or not any of the Churchward steel under the patents in suit herein is now being manufactured and used?

Mr. Neave: May I ask whether that means

that you have finished with reference to the Carnegie situation?

MR. WARFIELD: For the time being. I may realize that I have omitted something important and go back to that.

MR. NEAVE: I only want to protect myself on the motion to strike out, if you had gotten through.

MR. WARFIELD: Yes, you can assume that I have.

THE COURT: If that is a real issue, and I assume from the position of counsel that it is, why not keep that separate and apart from any other testimony which the witness may give? Introduce all that you have. What I mean to say is, you are going now into the question of your patent rights, are you?

MR. WARFIELD: We are going into the question of whether or not this is a commercially valuable steel.

THE COURT: That goes to the question of your patent rights.

MR. WARFIELD: Yes.

THE COURT: Why not just withdraw the witness, as far as that subject is concerned, with leave to recall him upon that afterwards, and keep this question of release as a thing separate and apart and keep it clear cut?

MR. WARFIELD: Only this, your Honor, that any statement he may make as to the present conditions surrounding the use of this steel necessarily, to a certain extent, is linked up with the experience that he had with the steel and with people in the art during this former litigation.

THE COURT: No, I meant, as a practical trial issue, the question of whether you have had patents issued to you, the question of their validity, the quesion of infringement—all those belong in one class. The question of whether you have released this defendant is an entirely different question. Now why not just keep them separated?

MR. WARFIELD: Very well, your Honor.

THE COURT: We will give you full privilege, of course, to recall this witness upon the other branch of the case.

MR. WARFIELD: Cross-examine.

THE COURT: Just state that you will recall the witness upon the other phases of the case.

MR. WARFIELD: I was adopting your Honor's suggestion. I assume that the reporter has your Honor's statement.

THE COURT: Very well. If it is on the record, that is all right, so as to preserve your rights. Now cross-examine upon the subject of the release. First let me inquire, Mr. Warfield, this. If this is not a fair question, consider it as withdrawn.

MR. WARFIELD: Your Honor could not ask anything but a fair question.

THE COURT: Assuming that there was no question raised but what the written release expressed the intention of the parties, and fairly expressed the understanding which was reached at this conference which preceded the execution of the written paper, is there any question as to the construction of the paper? I mean, does it operate as a release?

MR. WARFIELD: I think there is, your Honor, on a technical question, which is an important one in view of the language of the statute, as to what "use of the invention" means.

THE COURT: All right, I just want to know your position; in other words, whether, independently of any question of whether or not the release is expressive of the agreement of the parties or is not expressive of it, but taking it as it stands, you hold it is not in the way of a recovery here; is that it?

MR. WARFIELD: We hold that it does not include the acts complained of, by the Bethlehem Company. Yes, your Honor, not in the way of a recovery here.

MR. STRYKER: May I inquire whether the permission to move to strike out the testimony limits the time within which the motion may be made?

THE COURT: No, you are not limited; any time during the trial.

MR. STRYKER: It may be made at any time and for other reasons not stated?

THE COURT: At any time during the trial of the case, so that you can get of record your position.

MR. STRYKER: And we may add to our reasons already stated, if we see fit to add to them?

THE COURT: On your motion to strike out?

MR. STRYKER: Yes.

THE COURT: Anything you may think of in the meantime, put it in.

MR. WARFIELD: I shall most certainly interpose no formal objections, your Honor.

THE COURT: No, but I want counsel to understand that they are not losing any of their rights by our taking this course. They may move to strike out and base that motion on any ground which occurs to them then, whether previously thought of or not. Now cross-examine upon the subject of release.

Cross-examination.

By MR. BROWN:

Q25. You were represented by counsel at this conference to which you have referred?

A. Yes, sir, as stated.

Q26. Mr. Warfield was present?

A. Yes.

Q27. And this negotiation lasted from an early hour in the morning until pretty late in the evening?

A. Yes; late in the afternoon.

Q28. And I suppose that the difficulty that had to be overcome was the amount which was to be paid?

A. Yes.

Q29. If a settlement was reached?

A. Yes.

Q30. You asked more than $275,000?

A. We did.

Q31. And it was finally agreed that, for whatever was included within the terms of that agreement, $275,000 would be paid?

A. Yes.

Q32. Had you any knowledge at that time of other companies that were making this material and who you claimed were infringing your patent?

A. Yes; the Bethlehem and Midvale Companies.

Q33. The Bethlehem and the Midvale Company?

A. Yes, sir.

Q34. And you called that, I suppose, to the attention of Mr. Dinkey, did you?

A. I did.

Q35. You, of course, asked Mr. Dinkey whether Bethlehem and Midvale had obtained any of the material from Carnegie?

A. Such an idea never occurred to me, nor to Mr. Dinkey.

Q36. Do you mean by that that Mr. Dinkey had no knowledge that Bethlehem and Midvale were acquiring the steel from Carnegie?

A. Yes, sir.

Q37. He did not know it at that time?

A. That is my understanding.

Q38. Did he say so?

A. I should have to think very carefully whether he said that. He did not say anything of the kind at that particular interview.

Q39. At what interview did he make such a statement?

A. I have not said that he made such a statement. I merely stated that I should have to think whether what he said could have been so construed, and I answered that at that interview nothing was said that could be so construed, that I recall.

Q40. Now then, suppose you direct your mind to any other interview or interviews with Mr. Dinkey when this matter was discussed, and see whether or not you are prepared to say that Mr. Dinkey, either directly or indirectly, stated to you, or in your presence, that the Carnegie Steel Company had not sold to Bethlehem or to Midvale any of the material about which we are now making inquiry?

A. That in no way answers to the question on which I gave the answer that it was my understanding, or words to that effect. I at no time said that Mr. Dinkey said to me that he had or that he had not sold any steel to the Bethlehem or Midvale Companies. I have stated that at the time of the settlement such an idea never presented itself to me nor to Mr. Dinkey, the last being, of course, my understanding and belief.

Q41. Are you through?

A. Yes, sir.

Q42. Now I will repeat my question. Do you mean to say that Mr. Dinkey at any time stated to you, or in your presence, that the Carnegie Steel Company had not sold this material to Bethlehem or to Midvale?

A. No, sir, absolutely not.

Q43. You mean to say that he did not say that?

A. I mean to say that he did not say so.

Q44. You did not know, you say, that it had been sold by Carnegie to Bethlehem and Midvale?

A. No, I certainly did not know so.

Q45. You knew that you were entering into a contract which exempted from liability the vendees of the Carnegie Steel Company, did you not?

A. The word vendee was not brought up at the meeting.

Q46. Did you sign this contract?

A. No, sir.

Q47. Was it submitted to Mr. Warfield, your counsel, before it was signed?

A. I can only presume so. I would not want to say of my absolute knowledge.

Q48. If your attention was called to the fact that it appears from the contract that it was marked "approved by F. P. Warfield, counsel," would that assist you in your belief?

A. It would.

Q49. So that a formal contract was entered into by the Churchward Company and by the Carnegie Steel Company, in which the vendees of the Carnegie Steel Company were exempt from liability?

A. It seems to me that is a matter of legal interpretation, on which I could not pass.

Q50. Did you at that time, or at any time, inquire of Mr. Dinkey who his vendees were?

A. At which time? When you say at that time or at any time, what do you mean by that time?

Q51. By that time I assumed you would understand me to mean the conference that lasted from early in the morning to late in the evening.

A. No, sir.

Q52. If I should refer to that hereafter as "at that time," just bear in mind that that is what I mean, that conference. Now I ask you, and we will confine it to that conference, did you ask Mr. Dinkey at that conference, or did anybody in your hearing, who the vendees of the Carnegie Company were?

A. No; the word vendee was not used, as far as I can recall.

Q53. So that you did not think it of sufficient importance, when you were entering into a contract of this character, to ascertain from Mr. Dinkey who his vendees were, or who the vendees of the Carnegie Company were?

A. I believe at that interview that it was stated that the steel had been sold to the United States Government and that it had been used on warships of the United States Government. I do not know that the question of the vendee was taken up otherwise.

Q54. So that you were willing that a contract should be entered into without knowing who the persons were to whom Carnegie sold?

A. I am not prepared to answer yes to the conclusion that you assume from that interview. I think I would be well justified, in a business transaction, in assuming that war materials made in America, which had in a general business conference been discussed and referred to as materials sold to the United States Government, and which in the taking of testimony had been identified by the testimony as having been sold to the United States Government—I think any business man would be likely not to think of any other conclusion than that they had been sold to the United States Government, as so stated.

Q55. By whatever process of reasoning you reached that conclusion, the fact is that you made no inquiry to ascertain who the vendees were of the Carnegie Steel Company?

A. I should prefer not to put my answer to that question, because it seems to me it would be quite impossible to answer no, and the answer yes implies to me something quite different from what I should be willing to say. I think the discussion between the parties, in which it was stated, understood and known by them that the steel was sold to the United States Government, would preclude my answering yes to that question.

Q56. Then we may assume that there was no inquiry made as to who the vendees were; is that what I understand you to mean?

A. No direct, specific inquiry made. I will state that.

Q57. You did, however, understand that in the settlement with the Carnegie Company it was contemplated that any liability of the Carnegie Company, directly or indirectly, to the Churchward Company, was settled and ended, did you not?

A. That was too broad a question to cover any understanding which I can recall at that interview.

Q58. What was the agreement? What did you understand $275,000 were paid for?

A. To cover a full release to the Carnegie Company and subsidiaries of the United States Steel Corporation for the past infringement; a full release to the Carnegie, United States Steel Corporation and all other companies or concerns in foreign countries whom they had in mind, and the transfer to the Carnegie Steel Company of the rights subsequent to June, 1914, for war materials under the Churchward patents.

Q59. So that you reserved in your mind, if you did not express it in your agreement, the intention that if the Carnegie Steel Company had sold any of this material otherwise than to the Government, you meant to hold them liable for it? Do I understand that to be the purport of your answer?

A. I had no thought in my mind of their having sold it to anyone else than the United States Government.

Q60. So that you expected, when you made this settlement, that as far as you and the Carnegie were concerned, it did not make any difference how much they had manufactured or how much they had sold or to whom they had sold; as between you and Carnegie the matter was ended for all time?

A. I still seem to think that is a little broader conclusion than answers to my state of mind at the end of that interview. I may be mistaken, but it so impresses me.

Q61. What was the impression? What was the reservation that you had in your mind that you thought you could subsequently take advantage of and hold

Carnegie liable for something in addition to the $275,000?

A. I must answer that I had no such reservation in my mind, and knew of nothing at that time on which I could hold the Carnegie Company liable.

Q62. Did you know how much the Carnegie Company had made of this material?

A. I understood Mr. Dinkey to say—I am now dealing with one phase of the matter on which I wish to make it very plain that I will not speak with the certainty (though the matter is not very important, I wish to say that) that I might on some other matter, and that is, I believe he stated that they had made 17,000 tons of this material and furnished it to the United States Government.

Q63. Your recollection is that Mr. Dinkey had stated to you that they had made a certain quantity and that they had furnished all of that to the United States Government?

A. You put in the word "all." As there was no idea in my mind at that time that there was any question that the Carnegie Company had sold the steel to the United States Government, I should not be prepared quite to say that Mr. Dinkey used the word "all." I will say that my understanding was certainly that all of it had been furnished to the United States Government.

Q64. If Mr. Dinkey did not say that all had been furnished to the United States Government, why did you not inquire of him where the rest of it had been furnished?

A. I think, Mr. Brown, you are assuming that Mr. Dinkey made a specific statement excluding the word all, whereas his statement regarding the 17,000 tons that they had manufactured was, as I recall it, one

statement, and the other statements, that the goods had been sold to the Government, were things stated at other times, and known or understood by both of the parties, and not recognized as any possible issue. I do not think at that time—in fact, I know at that time that there was no question about the steel having been furnished to the Government, hence no doubt arose as to the construction of any sentence or words. The point was not considered by either party at that time.

Q65. You give Mr. Dinkey credit for being an astute, able business man, do you not?

A. Yes, sir, and of thorough integrity.

Q66. Do you mean this Court to understand that you believe that Mr. Dinkey would have paid you $275,000, and that he would have left open the question as to the liability of the Bethlehem Company in the first instance, and the Carnegie secondarily, as to any material that had been sold by Carnegie to Bethlehem?

A. I do not think that follows from any answer of mine, but I think the contrary follows, namely, it is my understanding that Mr. Dinkey did not at that time know of this steel having been furnished to the Bethlehem by the Carnegie.

Q67. If Mr. Dinkey were to say in your hearing that he did know it, that it was sold by him personally to Bethlehem and that he had knowledge of that sale when this contract was made, would you still answer in the way that you have done?

A. I should certainly not answer that Mr. Dinkey did not know of the sale if Mr. Dinkey said that he did. I should be inclined very much to accept his statement.

Q68. Assuming that Mr. Dinkey would so testify, and that it was a fact that he knew that this sale had been made to Bethlehem, do you mean that this Court

shall understand that you have such an estimate of Mr. Dinkey that you believe he would have paid you $275,000 without settling for all time any claim that you might have, directly or indirectly, against the Carnegie Company?

A. I should have no conclusion on that point until I had heard Mr. Dinkey's statement that he knew of this sale to the Bethlehem at the time he held the conversation with me which I have reported in this testimony, and heard his explanation personally.

Q69. As we may not have the opportunity of asking you again, then I assume, from what you say, that if Mr. Dinkey so testifies, then you do not think that he would have paid you $275,000 unless he believed that it was in settlement of any liability, directly or indirectly, that might have been incurred by the Carnegie Company?

A. I cannot answer that question other than I said before. I have not formed and cannot form any conclusion as to whether Mr. Dinkey would or would not have made such a payment without learning the further facts from himself.

THE COURT: Do you wish to conclude the cross-examination before recess, Mr. Brown?

MR. BROWN: Just a moment, your Honor.

THE COURT: While you are considering that, I would like to inquire of counsel for Bethlehem and counsel for the plaintiff in this case; does not this controversy resolve itself down to a question of whether you have released the Bethlehem or whether you have not? In other words, are they not within the principle that, being your licensees, they cannot question the validity of your rights?

MR. WARFIELD: The Carnegie Company?

THE COURT: Yes.

MR. WARFIELD: Yes, your Honor.

THE COURT: How can anyone get the benefit of their possession without taking the burden of their obligations and responsibilities?

MR. WARFIELD: That we think is the situation, if the Court please.

MR. NEAVE: The Bethlehem Company, your Honor, is not acting under any license whatever. As I told you the other day, it seems to me it is exactly the same as if Bethlehem had purchased this material from Churchward. If I or you or anybody purchased this material from Churchward, that purchase would not involve any recognition of the validity of the patents.

THE COURT: That is clear enough, Mr. Neave, from that view of it. That is not quite the thought that is presented. On this phase of it, you are standing in the shoes of the Carnegie Company.

MR. NEAVE: Who, when it made the sale to us, was not a licensee and never did become a licensee with reference to that material. The Carnegie Company never got a license with reference to what they sold to the Bethlehem Company. They got a release.

MR. BROWN: From liability.

THE COURT: Then you are differentiating between what would follow that agreement and what preceded it.

MR. NEAVE: The act of the Carnegie Company in making that material and selling it to the

Bethlehem Company was acknowledged by the Carnegie Company to be an act of infringement, not a licensed act, and the Carnegie Company at the time of the settlement got a release of the past.

Mr. Warfield: And admitted the validity of the patent in making that settlement.

The Court: I want to get the views of counsel on it. It looks to me more and more as if you stand or fall on the release question.

Mr. Neave: So far as that material is concerned, that 600 tons, it is a question of release, I think, not of license.

(At 1 P. M. a recess was taken until 2 P. M.)

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2 o'clock P. M.

Present: Parties as before noted.

Percy T. Griffith, heretofore sworn, called.

Mr. Brown: I am through with the witness.

Mr. Neave: I have no further cross-examination.

Mr. Warfield: I will recall Mr. Griffith under the agreement for direct examination.

Percy T. Griffith, heretofore sworn, recalled.

By Mr. Warfield:

Q70. Can you state whether any of this Churchward steel under the patents in suit is now being made, sold and used?

A. It is.

Q71. By whom and under what conditions? State one instance.

A. It is being manufactured in quantities by the United Alloy Steel Corporation of Canton, Ohio.

Q72. By consent of the Plaintiff Company?

A. By consent of the Plaintiff Company and under a license from it.

Q73. And upon the payment of a consideration for that license?

A. Yes, sir.

Q74. Is that consideration a continuing one?

A. A continuing royalty.

Q75. Is it a royalty for a substantial amount?

A. It is.

Q76. Do you wish to state the amount of that royalty?

A. I do not.

Q77. For what reason?

A. In the first place, it is the private affairs of the Churchward International Steel Corporation. Second, it is the private affairs of the United Alloy Steel Corporation, and I do not wish to make it public for commercial or trade reasons.

Q78. What kind of a plant has the United Alloy Steel Corporation? I wish to bring out the fact as to whether it is or is not one of the so-called prominent manufacturers of steel in this country.

A. It has a very large plant which, according to information received there, is valued by them in excess of twenty million dollars.

Q79. Can you state any of the users of this steel as manufactured by the United Alloy Steel Corporation under license from the Plaintiff?

A. I can for automobile gears with especial reference to the differential gears, known as the differential drive and the differential pinion.

Q80. Can you give the name of any company that is manufacturing and making up this steel for such purposes?

THE COURT: Let me inquire. You are now going into the other branch of your case.

MR. WARFIELD: Yes.

THE COURT: Have you introduced all that you propose to introduce on the question of this release?

MR. WARFIELD: Yes, your Honor, as the matter stands now, at any rate. Mr. Gold is not here. I do not want to go on the stand myself.

THE COURT: What about the equitable rule of the measure of proof? You have only one witness. How can we reform that release by the testimony of one witness, no matter how clear or otherwise satisfactory it may be?

MR. WARFIELD: Possibly not unless it is not contradicted.

THE COURT: I do not think the question of contradiction applies to it except, of course, the formal contradiction of the answer. What I mean is, if you are shutout by the technical rule—

MR. WARFIELD: We have gone as far as we could on that point, your Honor, because it is not possible to have Mr. Gold, who is a very busy man, here at this time. I am the only other one who knows the facts beside Mr. Dinkey. I do not want to go on the stand. I am not going to go on the stand.

THE COURT: What is your view? Are you going to ask us to reform this paper on the testimony of one witness?

MR. WARFIELD: No, your Honor. I do not believe it is going to be necessary to ask the Court to reform the paper.

THE COURT: Then, if this release releases the defendant, is not that the end of this inquiry? What is the use of going into anything else?

MR. WARFIELD: This phase of the case I am going into now involves quite a different matter, of course.

THE COURT: What I mean is, no matter how otherwise good your cause of action is as against this defendant, if you have released it, that is the end of it.

MR. WARFIELD: But that only applies to a comparatively small part of the steel made by the Bethlehem Steel Company, your Honor.

THE COURT: All right.

MR. WARFIELD: Out of 4600 tons only five hundred tons would be covered by the release in any event.

THE COURT: I thought it was the other way about.

MR. WARFIELD: No, sir.

THE COURT: All right.

(Last question read, as follows: "Q. Can you give the name of any company that is manufacturing and making up this steel for such purposes?")

THE WITNESS: The well known Timken Company of Detroit, Michigan, which uses this steel for gears of the class I have described, namely, differential gears for automobiles.

By Mr. Warfield:

Q81. From what standpoint is the Timken Company well known? Can you state what their general standing and reputation in the automobile trade is?

A. Its standing is very high for the producers of high-grade goods. It is very well known with respect to bearings and automobile gears.

Q82. That is, it is a maker not of automobiles but of automobile parts?

A. It is a maker of automobile parts. It does not, to my knowledge, make a complete automobile itself.

Q83. And as such what is the character of the trade, supplied by the Timken Company?

A. It is of the highest grade known to me.

Q84. Is this steel as it is being used in automobile gears, as you have testified, constituting a new product, or is it supplanting or replacing other material formerly used for the same purpose?

A. It is supplanting other steels formerly used for the same purpose.

Q85. What class of steels is it thus supplanting, if you know?

A. It is supplanting several classes of steels, including nickel chrome steels, high nickel steels, low nickel steels, chrome vanadium steels, and even supplanting the so-called open hearth carbon steels.

Q86. Do you know anything as to the relative price of this steel, the Churchward steel, as thus used, and of the other steels which it is supplanting, as you have testified?

A. The market price of this steel is higher than that of any of the steels I have mentioned and higher than any steel that I know of as having been used in such automobile gears.

Q87. Have you any opinion as to the performance of this steel as thus used in automobile gears, I mean as to its quality as demonstrated by its use?

A. I have considerable information of that kind.

Q88. Is the steel satisfactory for such use?

A. The steel is not only satisfactory for such use, but I should have no hesitation in saying, as I have heretofore, in other connections, that this steel is not only the best but today the only steel to use for such gears, as I have described, and, to add to that, probably the same statement can be made with respect to various other uses for the steel.

Q89. Has the plaintiff company any other licenses for this steel now in existence, or pending?

A. I do not recall any other license now in existence except the Carnegie license for war materials only, but there is, I think—

Q90. And the United Alloy Steel Corporation, as to which you have testified?

A. Yes, of course. Your word "Other" I thought applied to that, and the United Alloy Steel Corporation, but there is, I should call, pending an application, or what I consider a specific application for a license, to use these Churchward patents, and to manufacture materials under them for commercial purposes made on behalf of the United States Steel Corporation by its accredited representatives.

Q91. When was this application made?

A. Within a week.

Q92. Did you state whether or not the manufacture of Churchward steel by the United Alloy Steel Corporation is a substantial manufacture, or not?

A. It is a substantial manufacture, and a continuing one.

Q93. And the use in automobile gears, particularly, as you have already testified to it—is that a continuing use?

A. A continuing use and a successful one.

Q94. An increasing or not increasing use?

A. Not only an increasing one, but with every indication of being an overwhelmingly increasing use in the near or immediate future. In this connection I may say that the United Alloy Steel Corporation has manufactured, sold and delivered in excess of one thousand tons of Churchward steel under its license, that I have reason to believe that that amount is very moderately stated by me, and is very much more, and will be found much more when the next returns come in from said Corporation, and that they now have a very substantial amount of unfilled orders for this steel under these patents which they are filling and proceeding to fill, the exact amount of which, in justice to them, it, of course, would not be proper for me to state, but it is considerable.

Q95. These instances of use to which you have referred are instances of what you have termed commercial uses of this steel?

A. They are, unquestionably.

Q96. The use of this steel is for commercial purposes?

A. In every sense of the word.

Q97. And as such, distinguished from the agreement with the Carnegie Steel Company, which referred to the use of the steel for war materials?

A. Unquestionably and absolutely distinguished.

Q98. Can you give me any other instances of the present use of this Churchward steel for commercial purposes beyond what you have already given?

A. Since the manufacture of this steel by the

United Alloy Steel Corporation, and its use by such a well-known house as Timken, word of it has circulated through the automobile gear interests, including those using such gears and those making or cutting the same, many of whom undoubtedly have received first-hand information that this is licensed Churchward steel and possibly others have not, and a corporation making a very well-known automobile, extensively used in the United States, is now making or having made for it gears for use in that automobile, and is so using them, of Churchward steel, provided, so far as we are able to find, not in part or whole by the United Alloy Steel Corporation, but by an unlicensed manufacturer.

Q99. You stated that that was a use by a company manufacturing automobiles?

A. Yes, sir.

Q100. And one of the larger manufacturers of automobiles?

A. One of the largest.

Q101. Have you known of any instances of an order calling for nickel chrome vanadium steel, mentioned in these patents which you have called Churchward steel, being filled by something else than Churchward steel?

A. I have known of an order having been given for Churchward steel specifying the same as nickel chrome vanadium steel of a given specification, and that in supplying the goods the Steel Company delivered steel much as the Bethlehem Company did in this case to the Government containing nickel chrome only, and not a Churchward or nickel chrome vanadium steel, but the company which received those goods, being a private corporation, tested or analyzed the goods or both, and threw them back upon the

manufacturers. The company in question which has been named to me is not either of the defendants in this case, nor any corporation affiliated with them, nor any mentioned in this litigation.

Q102. For what purpose was that steel desired?

A. For automobile gears, for automobile differential gears.

Q103. Do you know of any other automobile company using this steel in its gears?

A. I know of another large and equally well-known automobile manufacturer which has recently, in place of nickel chrome steel, which it was using for such a gear, substituted or commenced to substitute Churchward steel, namely, nickel chrome vanadium steel.

I want to say that, in reference to the use for automobile differentials, that this specifically refers to the pinion and, to a smaller extent, the large drive gear.

Q104. Do you know whether this Churchward steel has appeared in the specifications of the Society of Automobile Engineers?

A. I know that at least over a period of some years it has not, and I further know that some years ago it was common knowledge in the trade, the steel trade, that the Society of Automobile Engineers had circulated information among its members that nickel chrome vanadium steel, being covered by the Churchward patents, and not at that time being made by any licensed manufacturer, and being in litigation with the United States Steel Corporation—

Q105. You mean the Carnegie Steel Company, specifically?

A. The Carnegie Steel Corporation, I mean—could not and should not be used by its members. I

am not aware to what extent it has become known to the Society of Automobile Engineers, officially that the United Alloy Steel Corporation has been making this steel under a license.

In this connection I may refer to a very interesting report in the trade that an automobile company specified—

By Mr. Neave:

Q106. Did you say a "Report in the trade"?

A. Yes, sir.

Mr. Neave: I object to that, your Honor.

The Court: How is that evidential?

Mr. Warfield: It is not evidential if it is a report in the trade unless the witness knows it of his own information.

The Witness: Can I allege it on information and belief?

Mr. Neave: I object to that, your Honor.

By Mr. Warfield:

Q107. Do not state anything unless you know the fact.

A. It would be a question in my mind as to what actual legal evidence could be produced. There are a great many things, of course, which come to a business man which he is not at liberty to make use of, as you doubtless know. For this reason we may withdraw that.

Q108. We will pass that.

A. I should have to consider, perhaps, with counsel whether it would be possible for me to reveal sources of information which are confidential.

Q109. You stated that the position of the Society

of Automobile Engineers was that this steel could not and should not be used. Do you know whether or not this is in accordance with the general policy of that Association, that it is advisable, so far as possible, to keep clear of matters which are complicated by unsettled patent litigations?

A. No, sir, I know nothing of its policy.

Q110. Do you know whether this instruction was in any way a reflection upon the character and quality of the steel?

A. I never heard of that as any explanation or even a partial explanation. I may say that up to the time of this trial I cannot recall ever having heard of even the insinuation that nickel chrome vanadium Churchward steel was inferior or even that it was not superior to the other steels under consideration, and that reply refers to my experience with this steel from October, 1912, to the present date indicated.

Q111. These instances of use of this Churchward steel which you have defined as unlicensed, you expect to deal with in due course as the situation demands?

A. We do.

Q112. You have heard the statements that have been made during the progress of this trial carrying or seeking to carry the inference that Churchward steel was not of value commercially?

A. I have heard it.

Q113. Do those statements agree with your knowledge of the character and performance of the steel and your knowledge of the business affairs of the plaintiff company?

A. They disagree wholly with that knowledge.

Q114. As based upon your experience as in part stated by you at this time on the record?

A. Yes, sir. They disagree also with everything else I have ever heard regarding this steel.

Cross-examination.

By Mr. Neave:

Q115. When was the plaintiff company organized?

A. The organization of the plaintiff company was prior to my connection with or interested in this steel, and I do not know that date.

Q116. When did you become connected with or interested in the plaintiff company?

A. In that steel, and to that extent in the plaintiff company, in October, 1912.

Q117. How did you become interested in the steel at that time?

A. I will amend that statement on recollection by saying that at some time, which I cannot recall, prior to that date Mr. Churchward, the inventor, and a large stockholder in the Churchward International Steel Corporation came to me and tendered me a small block of shares in return for an old long abandoned and forgotten obligation. That date is unknown to me at this time. In October, 1912, Mr. Churchward, having conferred with me regarding his pending litigation against the Carnegie Steel Corporation, solicited my counsel and advice, I commenced from that time to read up the testimony and take an interest in the steel and in the affairs of the company, which I had not done at the previous time of receiving the small block of stock.

Q118. In October, 1912, what was your occupation?

A. I was retired from active business, having

some six months previously sold out my interest in the Insurance Agency of E. E. Clapp & Company, No. 90 Williams Street.

Q119. What other business had you been engaged in except the insurance business prior to 1912?

A. I had been engaged in the insurance business from January 1, 1902, until about April, 1912. Prior to January 1, 1902, I was engaged in the profession of registered Patent Attorney before the United States Patent Office, but not an attorney admitted to the bar of any State or Court, and am still registered at the United States Patent Office as such.

Q120. Did you have a technical training prior to that time?

A. The only technical training I ever had was entering as a boy of about 12 or 13 the law office of Banning & Banning, afterwards Banning & Monroe, who specialized in patent law, and in my business and other leisure time from that time on I studied technically as much as was possible under the circumstances.

Q121. In October, 1912, Mr. Churchward came to you and asked you your advice or co-operation in his pending matters. What did you do from that time on?

A. Immediately very little beyond studying the testimony and conferring with counsel and waiting, more or less, for the progress of the case, which was necessarily very slow under the practice of deposition-taking at that time. Shall I proceed after that?

Q122. Yes.

A. After that I attended with counsel certain of the takings of depositions, met the opposing counsel, the late Mr. Linthicum, (whose name I always hesitate to speak here without pausing for a few seconds in respect to his very kindly and genial spirit and other

characteristics), and conferred with counsel relative to the developments of the case in the proposed taking of testimony in foreign countries, and afterwards in considering the expert testimony. That was about all that I can recall at this moment having done in connection with this steel other than innumerable conferences with Mr. Churchward until the time that either counsel or both proposed a meeting to discover whether we could get together for a settlement of the litigation of Churchward vs. Carnegie, and in about the month of March, 1914, in company with Mr. F. P. Warfield, counsel, and with Mr. E. H. Gold, previously referred to, a stockholder of the Churchward Company, I had a conference with Mr. Linthicum at Atlantic City, New Jersey. From that time until the date of the conference with Mr. Dinkey, on or about May 29, 1914, I believe the case was practically suspended, and little or nothing done with regard to it.

Q123. When did you become an officer of the plaintiff company?

A. I am not an officer of the plaintiff company and never have been.

Q124. What is your connection with the plaintiff company now?

A. My connection at the present time is that as stated at the outset, in answer to the question of Mr. Warfield, that I am in active charge of its affairs, with especial reference to the commercial development of the steel. I may say that my scope of duties has no very definite limits. Mr. Churchward and other stockholders of the company are friends of mine, some of them relatives, and all persons interested, or all I can recall at this moment, having from time to time since October, 1912, relied upon me to counsel

with them on the affairs of the corporation and to aid them or counsel or both in connection with the assertion of the rights of the plaintiff company in respect to its infringement litigation.

Q125. Do you consider yourself a metallurgist?

A. No, sir, though I may add in qualification of that statement that in seven years I have seen so much in respect to the steel, examined the statements of so many experts in their sworn testimony, and talked to so many people of all kinds and grades and of all occupations pertinent to this, that in some respects, and particularly wherever I am willing to give you a definite answer, I might almost say that that would be the same answer that a metallurgist would give or perhaps a better posted one.

Q126. You are a stockholder, are you, of the plaintiff company?

A. Yes, sir.

Q127. What connection have you with the United Alloys Steel Corporation?

A. I have no stock in the United Alloys Steel Corporation, and do not know of anything that I could consider a connection other than my relation as handling the affairs of the Churchward Company constitutes a relation with them.

Q128. What relation exists between the Churchward Company or any of its officers and the United Alloys Steel Corporation except the license?

A. There is no relation that I know of or have ever heard of between any officers of the Churchward Steel Company and the United Alloys Steel Corporation.

Q129. And what is the relation of the Churchward Company, the plaintiff, to the United Alloys Steel Corporation?

A. Purely that of patentee, or the owner of the patents on the part of the Churchward Company and of licensee on the part of the United Alloys Steel Corporation.

Q130. Is that license in writing?

A. Yes, sir.

Q131. When was it issued or granted?

A. In about May or June, 1918.

Q132. Will you let me have a copy of the license?

A. I have not got it myself. Counsel may have it.

Q133. May I see it?

Mr. Warfield: I have not a copy of the license. I do not know whether, in view of the witness' previous statements made, that he should exhibit a copy of that license, since he declined to state, giving his reasons for such declination, the amount of the royalty payments as defined therein.

Mr. Neave: It appears that the license is in writing, and I should suppose that that would be the best evidence of what this gentleman has been testifying to, and he apparently has access to it, and I move to strike out his testimony with reference to the license unless the written contract is produced.

The Court: Which part of his testimony? His examination in chief or the cross-examination?

Mr. Neave: His examination in chief. He has testified as to the United Alloys Steel Corporation manufacturing Churchward steel under a license. I do not know what patents there are there.

MR. WARFIELD: He stated the patents in suit.

THE COURT: I do not know what value it is to us except the fact, and that has no relation to the written papers, of whether it is or whether it is not making this kind of steel. I suppose it has some bearing upon the question of utility, but that turns on the fact of whether they are commercially dealing in it, and not upon the existence of any written paper.

MR. NEAVE: Subject to my objection I will ask these questions, to bring that out.

By MR. NEAVE:

Q134. Under what patent is that license granted?

A. Under the patents in suit here.

Q135. Any other patents?

A. No other patents in the contract or license, no, sir.

Q136. That sounds as though you had some hesitation in your mind.

A. I will answer the question directly, "No, sir." I will answer it "No."

Q137. For what term is that license?

A. The license depends for its continuance on the manufacture of a certain amount or minimum of this steel over given periods, and therefore a term cannot be defined, but I may say that the ultimate term as expressed has not yet been arranged between the parties for the entire life of the patent, and beyond that I feel that it would be trespassing on the business rights of the United Alloys Steel Corporation to place their affairs before other steel corporations.

Q138. Does the license specify the composition of the alloy steel that is being made under the license?

A. Except by specifying the numbers and dates of the patent, no, sir.

Q139. Is there an obligation to use that alloy steel?

A. I do not understand that question. There is no statement in the license as to what steel shall be manufactured except that they are given the right to manufacture under these two patents, which themselves specify the steel.

Q140. In order to attain the license they must pay you a royalty upon at least a certain output each year?

A. Yes, sir.

Q141. Whether or not they make that output?

A. I could not say from memory whether it would be a question of whether they make and sell it or pay the royalty on it or whether they must have orders for that amount, and either deliver those orders or pay for them. You said I had access to the paper. I am not an officer of the Churchward Company, and have no access to it, except by the influence of my association with them.

Q142. What knowledge have you as to the existence of the license?

A. I have seen it. I thought you meant by "access" that I was in custody of it.

Q143. Do you know the composition of the alloyed steels that the United Alloy Steel Corporation is making?

A. Approximately, but as those compositions, as I understand, vary in all steels, namely, no two specimens ever come out exactly alike—

Q144. What is your source of knowledge as to the composition of those steels?

A. Conferences with our licensees, and confer-

ences with those who have made analyses and tests of such steels.

Q145. Did you ever make any analyses or tests of those steels?

A. I would not know how to make an analysis myself personally.

Q146. Did you ever have any analysis made for you?

A. No, I never had any made. I saw those that were made, prior to my inspection.

Q147. More than one analysis?

A. I shall want to take just a second to answer that. In stating that I have seen an analysis, that might mean that I have seen some formal paper. By "analysis" I mean a list written down of the various elements of the steel and the proportions, and I have seen more than one analysis of those steels as being made and referred to in my testimony.

Q148. When did you last see such analysis?

A. I believe I last saw the analysis within about —well, within a few weeks, at the time of my visit to Canton, Ohio, but as that visit extended from early in the morning until late in the afternoon, and covered many matters, and I had long discussions with the parties over all the commercial aspects of Churchward Steel, I should not desire to state that I saw a written analysis of the steel at that particular time, though we did discuss the elements and the proportions of them quite considerably. If I did not see such an analysis at that point I saw it in a gear works in Syracuse, New York, which made such an analysis and made gears from the metal.

Q149. When was it that you saw these analyses? That is all I asked you.

A. Oh, I beg your pardon. That last referred to event was on or about August 14th, 1919.

Q150. What were the proportions? What were the ingredients and the proportions of those ingredients that were used in that steel?

A. I should consider that would be the same private affairs of both the United Alloys Steel Company and the Churchward International Steel Company, in which connection I may say that there are only about four years left of this patent in which commercially the plaintiff is entitled to benefit, and I recognize that it is commercially a task for me to do. I do not desire to be handicapped any more than is necessary by giving out information which may possibly, in the peculiar nature of things in the steel trade, interfere with the commercial success of Churchward Steel, which is very very much my task at present.

MR. NEAVE: Your Honor, I move to strike out all of the deposition of this witness relating to the United Alloys Steel Corporation. He has testified with reference to them only for the purpose of showing that they have a license and—

THE COURT: I do not see how I can strike it out, Mr. Neave. But, Mr. Warfield, of what value is it to us? I gathered it went to the question of the utility of this steel product, and therefore it had some value, but if what they are making is not what was patented it has no such value as that, and if what they were making was what was patented why should anybody object to stating what it was?

MR. WARFIELD: The witness has already

stated that it was within the patented steel. I think he only objected to stating the exact proportions, and I do not know whether there is any real objection to that from his standpoint. The only point is that the steel art is rather sensitive on these things. The United Alloys Steel Company is a customer of importance to the Churchward Company, and he wants to keep just as far as possible from anything they would object to.

THE COURT: How is counsel going to determine whether he is correct or mistaken in his statement that it is within the limits if he does not state what the analyses showed?

MR. WARFIELD: I think the witness would state an analysis or a typical analysis, or one analysis at least.

THE WITNESS: I can answer that question, I think, to satisfy the requirements by stating that these steels contained small proportions of carbon, manganese, nickel, chromium and vanadium, with minute and customary proportions of impurities, namely, phosphorus, sulphur, and so forth.

By MR. WARFIELD:

Q151. Can you not give an analysis?

A. Yes. And further that while the analyses that I have seen differ in the mathematical percentages of the elements, that on the whole, and speaking only from memory, they amount to about carbon, I think, .20; manganese, .38; nickel, varying amounts, ranging from .60 to 1.47; chromium, from about .40 to as high as .87; vanadium, variable, from .09 to .14, or possibly even .17, on which last I am not certain.

By Mr. Neave:

Q152. Has the plaintiff company manufactured any steel commercially, so far as you know?

A. Directly, no, sir.

Q153. Why that reservation? What do you mean by indirectly?

A. Suppose I say, then, other than in the manner previously stated, through licenses to the persons mentioned in my testimony, no.

Q154. What knowledge have you of sales by the United Alloys Steel Corporation?

A. Direct knowledge in their reports to us, both a formal report and in their statements made to me personally on visit.

Q155. The reports do not state to whom they sell, do they?

A. The written report I do not think stated to whom they sold, but their oral report did.

Q156. What do you know about what the purchasers of their material used it for? I am talking about your knowledge.

A. Yes. I do know that they do not use it for bearings, and that they do use it for the only other thing which, according to my information on that, they manufacture, namely, these gears, and the reason I know they do not use it for bearings is that I am informed they manufacture the steel that they use for their bearings, for some reason unknown to me.

Q157. Does the United Alloys Steel Corporation report to you the price at which it sells this material?

A. No, sir; they do not, by which I wish to say that I mean the price at which they have sold, but they report to us their market price on regular quotation

for this steel, with the reservation on their part that they really can make no price for steel without knowing the purpose of the particular steel, and that sort of thing.

Q158. Have you ever ordered or has the plaintiff ever ordered any steel from the United Alloys Steel Corporation?

A. No, sir; we have not.

Q159. Have you ever transmitted to them any orders?

A. No.

Q160. Have you ever or has the plaintiff ever had any steel made by that company?

A. No. I never had any steel made by them, nor transmitted them any order. I obtained a small trial order for them from a gear company in Syracuse, amounting to about 3000 pounds.

Q161. Have you copies of these written reports that were furnished by the United Alloys Steel Corporation to the plaintiff?

A. No, sir.

Q162. But you have seen them?

A. I think in my testimony I referred to a written report. I should rather say "written report" than to use the word "reports." I think "reports" is correct. I have seen it.

Q163. To whom has the United Steel Alloys Corporation sold this material other than to the Timken Company?

A. I believe they have not sold it to anyone other than the Timken Company, and the 3,000 pound order referred to in my recent testimony.

By Mr. Usina:

Q164. You have referred to the application which you had for a license from the U. S. Steel Corporation recently?

A. Yes, sir.

Q165. I suppose you had in mind the conversation that I had with you in New York a few days ago?

A. I had in mind the written application.

Q166. That written application is that letter that I wrote to Mr. Warfield, do you mean?

A. Yes.

Q167. Can you produce that?

A. I don't know.

Mr. Warfield: I think I have it.

The Witness: I may add to my answer that I also considered my interview with you part of that application.

Mr. Warfield: I have the letter. I should, of course, not have produced it unless you had asked for it.

(Letter handed to Mr. Usina by Mr. Warfield.)

Mr. Usina: Your Honor, in order to have the nature of what Mr. Griffith calls an application more exactly stated on the record I should like to have copied into the record the letter that was written by me to Mr. Warfield on the subject. I do not construe it as an application for a license, but rather as an inquiry as to the possibility of a license in case we should want to make the deal.

While the point is not of major importance, yet I should like to have it stated correctly.

Mr. Warfield: We, of course, have no objection, and we would not have produced the letter excepting for Mr. Usina's information.

The Witness: Might I ask the stenographer to read my answer to your question?

Mr. Usina: You said it was an application.

The Witness: What I should regard as an application.

By Mr. Usina:

Q168. Was this the letter that you consider to constitute the principal part of what you regard as an application?

A. Yes. The initial part, I should call it. I am not prepared to say I should call it the principal part.

Q169. When you and I talked about it, is it not more correct to say that it was an inquiry on my part whether we could, if we wished it, get a license, rather than an application for a license? Don't you think that is a more correct characterization?

A. I am not prepared to say that it is more correct. I rather got the impression that the subject was not one to be considered an application, but that it was rather an important negotiation or the commencement of important negotiations for a license for the commercial end of this steel.

Mr. Usina: I should like to read into the record the letter which the witness has identified in this connection, as follows:

"UNITED STATES STEEL CORPORATION
71 Broadway, Empire Building
NEW YORK

D. ANTHONY USINA,
General Patent Atttorney.

September 4th, 1919.

MESSRS. DUELL, WARFIELD & DUELL,
No. 21 West 44th Street,
New York City.

GENTLEMEN:

The Steel Corporation people have asked me about the possibility of making nickel-chrome vanadium steel which I assume, without looking into the matter, comes under the Churchward patents that were involved in the suit and settlement with the Carnegie Company. You will remember that this settlement gave us the patent rights insofar as they relate to war material. My present inquiry is directed to other kinds of material. It is said that some of the other steel concerns are making such material.

I have advised the Steel Corporation that in view of our previous settlement with you and in view of the fact that the questions of scope and validity of the patents are still undetermined it might be possible to secure a license for other than war materials at a reasonable figure. I don't think the trial in the Midvale and Bethlehem suits is going to turn on the strength of the patents. It may be a long time before we have the opinion of the court on the questions of scope and validity.

Will you kindly let me know whether you have licensed any other concerns and whether you will license us and on what terms.

Yours very truly,
D. A. USINA."

By MR. NEAVE:

Q170. In your direct testimony did you mention the American Society for Testing Materials? There was some association that you spoke of.

A. I believe the question made to me specified the name of the Society of Automobile Engineers, commonly known as S. A. E., the only title under which I think they are commonly known.

Q171. Are you a member of that Society?

A. No, sir.

Q172. You have no real knowledge of your own as to what actuated them in their dealings that you referred to?

A. Other than what I mentioned in my reply as being what I consider common knowledge in the trade, no.

Mr. Neave: Your Honor, I renew my objection to all of this witness' testimony with reference to the United Alloys Steel Corporation, and the license granted to it, in view of the showing in cross-examination that he will not produce the original license, and that we have no means of ascertaining what the alloys are, and I move that the testimony be stricken out.

The Court: So far as the question of the production of the license is concerned, you have not raised that question. So far as the other question is concerned, it seems to me that it goes rather to the weight of the testimony than to found a motion to strike it out. I do not see how I can strike it out.

Mr. Neave: It certainly goes to the weight of the testimony. I asked this witness to produce the license, which he has refused to produce.

The Court: Neither the possession nor the control of it has been traced to him.

Mr. Neave: He has seen it, and he says that it is his business with the Churchward Company to get business for it and to run, as I understand it, the commercial business of that company.

The Court: I know, but Mr. Warfield is there at your elbow, and if you desire it produced it seems to me the proper course is to call upon the plaintiff to produce it. I do not understand that the witness has it in his possession or in any sense under his control. He is not an officer of the corporation.

Mr. Neave: Very well, sir. I thought that I did, but as the witness refuses to produce it I call on Mr. Warfield to produce it.

Mr. Warfield: I haven't it here now. I should have to take up with the officers of the corporation the question of whether it should be produced and could be produced. It seems to me that the position taken by the witness, to the effect that it could add nothing more than a knowledge of the amount of royalty paid, which involves a more or less proper business secret of the United Alloys Company, relieves its non-production of any objection.

The Court: I understand a part of your answer to the call is that you are unable to produce it because you haven't it here and this is the first knowledge to produce it that you have received?

Mr. Warfield: Yes; and I do not know whether I could get it, in any event. I will endeavor to do so if possible.

By Mr. Warfield:

Q193. Do you know it to be a fact that the United Alloys Steel Corporation has paid moneys to the Churchward International Steel Company, the plaintiff herein, for a license under the patents in suit, or by way of royalty under a license under the patents in suit?

A. I do.

Q174. Do you know whether other payments are due from the United Alloys Steel Corporation or are accruing from the United Alloys Steel Corporation, under the same conditions?

A. I know they are accruing.

Q175. And those payments—

A. And those payments will become due, according to my best recollection, on December 31st, 1919, or as soon thereafter as the accounts can be made up.

Q176. You stated that the payments already made covered, did you, something over a thousand tons of steel?

A. Yes, sir. Over a thousand tons of this steel.

Plaintiff Rests.

Mr. Usina: I want to meet this question of testimony taken intended to vary the meaning of the license given by Carnegie to Bethlehem. If the testimony on that point is going to stand I want to have the opportunity to bring Mr. Dinkey in. If the testimony on that point is to be struck out, it will not be necessary.

The Court: I think counsel on the other side, Mr. Warfield, are entitled to a definite statement of your position. Their judgment might be very confident on

the situation as it is, but if they can fortify that with testimony, naturally they would want to take testimony.

Mr. Usina: Yes. We wish to take no chances on it.

Mr. Warfield: Is it necessary that we should at this time consider this case from all standpoints and state our position as based on that? I should want some little time for consideration. I have no objection whatsoever to Mr. Usina putting Mr. Dinkey on the stand, or doing anything that he wants. I want the entire facts brought out just entirely to Mr. Usina's satisfaction.

Mr. Usina: I do not want to do that if it is not necessary.

The Court: If you are not going to press that point, what is the sense of calling upon counsel to produce a busy man to come here to testify to something that amounts to nothing after he comes? We will leave it this way, Mr. Usina. After they have submitted their briefs, they will know by that time what their position is, and I will give you the opportunity then of calling Mr. Dinkey if you so desire. Is he the only witness whom you would call?

Mr. Usina: As far as the evidence has gone now, he is the only one that we would wish to call, yes.

The Court: I will give you leave to determine then whether you care to call him or whether you do not.

Mr. Warfield: That is very satisfactory to us.

The Court: I have no hesitation in saying, not forecasting any conclusion to which I may come, but I think counsel are entitled to know the impression upon

the mind of the trial Judge, so that they can prepare their arguments with that thought in mind—I have no hesitation in saying that I do not think there is anything in this case as yet, to which my attention has been directed, to vary that instrument. It may be that there is something in this record that has escaped me.

MR. WARFIELD: We have at least shown our good faith in the matter and shown that we were not trying to get something that we did not think we were entitled to.

THE COURT: When they file their brief, a copy of which you will have, then you can determine whether you will call Mr. Dinkey or not, and if you decide to call him I will give you an opportunity to call him.

MR. USINA: Very well, your Honor.

Adjourned.

STIPULATION RE INCORPORATION OF PLAINTIFF.

IT IS AGREED that the Churchward International Steel Company, the plaintiff in this case, was organized under the laws of the State of Delaware in January 1909, with an authorized capital stock of $500,000. all of which was issued, and that by certificate of amendment the capital stock was, in November, 1915, reduced to $250,000.

IT IS AGREED that the foregoing may be received in evidence in place of certified copies of the Certificate of Incorporation and the Amended Certificate of Incorporation, which have been offered in evidence, and that such copies may be withdrawn.