

NORTHERN ELECTRIC COMPANY, }
 LTD., AND WESTERN ELECTRIC } APPELLANTS; * Mar. 17,
 COMPANY, INC. (PLAINTIFFS) } 18, 19.
 * Nov. 9.

AND

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 GEORGE PERKINS (DEFENDANTS) } RESPONDENTS.

ON APPEAL FROM THE EXCHEQUER COURT OF CANADA

Patent—Re-issue patent—Conditions necessary for grant of—Patent Act, R.S.C. 1906, c. 69, s. 24—Interpretation—Conditions that original patent be deemed “defective” by reason of “insufficient description or specification” arising from “inadvertence, accident or mistake,” within the statute—Action for infringement of re-issue patent—Validity of amendments in re-issue patent—Proper limits of expert testimony.

The issue of a new patent (a re-issue patent) in accordance with an amended description and specification, under s. 24 of the *Patent Act*, R.S.C. 1906, c. 69, is not justified if the invention described in the amended description or specification and protected by the new patent is not the same invention as that to which the original patent related. The relief authorized by said s. 24 in respect of “insufficient description or specification” is limited to correcting insufficiency (arising “from inadvertence, accident or mistake”) in describing or specifying in the original patent the invention in respect of which the applicant therefor intended to ask protection. The statute did not contemplate a case in which an inventor has failed to claim protection in respect of something he has invented but failed to describe or specify adequately because he did not know or believe that what he had done constituted invention in the sense of the patent law and, consequently, had no intention of describing or specifying or claiming it in his original patent. The original patent cannot be “deemed defective” within s. 24 in a case where it obviously completely fulfilled the applicant’s intention—where the invention in respect of which he intended to obtain protection is quite certainly and sufficiently described and specified.

On appeal from the judgment of Maclean J., President of the Exchequer Court of Canada ([1936] Ex. C.R. 75), dismissing the plaintiffs’ action for alleged infringement of a re-issue patent (for an alleged new and useful improvement in radio communications):

Held: The appeal should be dismissed. The grant of the re-issue patent was unauthorized, as the conditions necessary for its grant under s. 24 (as above interpreted) were absent. The proper conclusion from the documents was that there was no defect in the statutory sense in the original patent (there was no suggestion that it could be deemed “inoperative”)—no reasonable ground for apprehending that it was defective in failing sufficiently to describe the inventions in respect of which the applicant for it was intending to claim invention; no “inadvertence, accident or mistake” of the applicant in respect of the description or specification of the invention that the applicant

* PRESENT:—Duff C.J. and Rinfret, Crocket, Davis and Kerwin JJ.

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had in mind. The pertinent documents conclusively negated any intention on the part of the applicant for the original patent to describe or to specify any of the inventions, so-called, embraced within the amendments in the re-issue patent in so far as they were material to the present appeal. Also, in view of the evidence as to the state of the art at the time of the application for the original patent, and at the time when the applicant therefor was alleged to have conceived and perfected the inventions embraced within the amendments in respect of which relief was now claimed, it was highly improbable that he believed he was entitled to obtain protection in respect thereof; and the balance of probability supported the conclusion that he was not so entitled.

A large part of the expert evidence given in the case (on both sides) was the subject of adverse comment by this Court, which held that much of it was not legal evidence and could not properly be taken into consideration. With reference to specified examples thereof, it was held, that any inference to be drawn from the applicant's specification in the original patent, as to whether or not the devices and arrangements in question in these proceedings were inventions of said applicant (to establish the affirmative of which was a substantive part of plaintiffs' case), was matter of fact for the court and not a matter upon which it was competent to any expert witness to pronounce; also (with reference to a witness being shown said original patent and being asked broadly to explain what said applicant was trying to do), that the issue touching the identity of the invention to which said original patent related, was a substantive issue in the action, and upon that issue no expert witness should have been permitted to express an opinion. Comments upon the proper limits of expert testimony in *British Celanese Ltd. v. Courtaulds Ltd.*, 52 R.P.C. 171, at 196-8, quoted.

APPEAL by the plaintiffs from the judgment of Maclean J., President of the Exchequer Court of Canada (1), dismissing their action, which was brought for a declaration that as between the parties certain letters patent alleged to be owned by the plaintiffs were valid and had been infringed by the defendants, and for an injunction and damages.

One patent in question was a re-issue of a patent for an alleged new and useful improvement in radio communications. As to this patent in question, Maclean J. dismissed the action on the ground of lack of invention and on the ground that there was no statutory authority for the granting of the re-issue patent, as it embraced more than the invention described and claimed or intended to be described and claimed in the original patent (and the claim in the action being for infringement of features claimed as invention which appear in the re-issue only); and the

appeal to this Court was (by the judgment now reported) dismissed on grounds similar to the latter ground mentioned.

The other patent in question was a re-issue of a patent for an alleged new and useful improvement in electrical receiving or repeating apparatus. As to this patent in question, Maclean J. dismissed the action on the ground that there was no infringement by the defendants; and the appeal to this Court was (by the judgment now reported) dismissed on the same ground.

O. M. Biggar K.C. and *R. S. Smart K.C.* for the appellants.

H. N. Chauvin K.C. and *F. B. Chauvin* for the respondents.

The judgment of the court was delivered by

DUFF C.J.—It will be convenient at the outset to quote the section of the statute of 1906 (R.S.C. 1906, c. 69, s. 24) from which the authority to grant the re-issue patent must be derived if such authority exists:

24. Whenever any patent is deemed defective or inoperative by reason of insufficient description or specification, or by reason of the patentee claiming more than he had a right to claim as new, but at the same time it appears that the error arose from inadvertence, accident or mistake, without any fraudulent or deceptive intention, the Commissioner may, upon the surrender of such patent and the payment of the further fee hereinafter provided, cause a new patent, in accordance with an amended description and specification made by such patentee, to be issued to him for the same invention, for any part or for the whole of the then unexpired residue of the term for which the original patent was, or might have been granted.

2. In the event of the death of the original patentee or of his having assigned the patent, a like right shall vest in his assignee or his legal representative.

3. Such new patent, and the amended description and specification, shall have the same effect in law, on the trial of any action thereafter commenced for any cause subsequently accruing, as if the same had been originally filed in such corrected form before the issue of the original patent.

4. The Commissioner may entertain separate applications, and cause patents to be issued for distinct and separate parts of the invention patented, upon payment of the fee for a re-issue for each of such re-issue patents.

First of all, the invention described in the amended description or specification and protected by the new patent must be the same invention as that to which the original patent related.

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Second, it is plain that the authority to issue a new patent in accordance with the amended description or specification is an authority by the exercise of which it is intended that the original patentee, or those claiming under him, shall have relief in respect of certain strictly specified things. These things, for our present purpose, are insufficient description or insufficient specification,—obviously, insufficient description or insufficient specification of the invention to which the original patent related.

Thirdly, such insufficiency of description or specification in respect of which relief is authorized under this section must have arisen from inadvertence, accident or mistake.

These conditions necessarily imply that the inadvertence, accident or mistake must be inadvertence, accident or mistake affecting the sufficiency of the description or specification in the original patent, and it is only in respect of such inadvertence, accident or mistake that the statute contemplates relief.

The statute does not contemplate a case in which an inventor has failed to claim protection in respect of something he has invented but failed to describe or specify adequately because he did not know or believe that what he had done constituted invention in the sense of the patent law and, consequently, had no intention of describing or specifying or claiming it in his original patent. The tenor of the section decisively negatives any intention to make provision for relief in such a case.

In this connection it is to be observed that, while the section provides for relief where the patentee claims too much, there is no provision for relief where the patentee fails to claim something to which he may be entitled. In this last mentioned case, he can only obtain relief if he can bring himself within the condition relating to insufficiency of description or specification arising from inadvertence, accident or mistake affecting the sufficiency of the description or specification.

It is to be noted that the section is retroactive in an important respect. The amendment speaks from the date of the original patent as regards causes of action arising after the date of the new patent. Even on the strictest construction, a serious injustice may arise from the operation of this provision where people have made arrange-

ments and expended money on the faith of the specification in the patent between the date of the original patent and of the re-issue patent,—a period which in this case extended to five years. It is our duty, I think, in the circumstances, not to extend the language of the section beyond cases clearly within its intendment.

It will be unnecessary to discuss at length the introductory words, “Whenever any patent is deemed defective or inoperative by reason * * *,” but one observation naturally arises out of the circumstances of the present appeal. There is no suggestion that the original patent was inoperative or could be deemed inoperative. It is essential, therefore, to enable the appellants to invoke the section, that the original patent should have been deemed defective by reason of insufficiency of description or specification arising from inadvertence, accident or mistake.

It is immaterial to my present purpose whether the word “deemed” contemplates the view of the Commissioner or the view of the Court before whom the question of the validity of the re-issue patent comes for decision, or the view of the parties concerned. At the lowest, the statute must contemplate some kind of reasonable ground for apprehension on the part of the original patentee that the patent is defective in the sense of the section. It would, in my opinion, be an abuse of this language to apply it to a case in which it is obvious that a patent completely fulfils the intention of the applicant, where there is plainly neither insufficiency of description nor specification, for the purpose which the applicant had in view; where, in other words, the invention in respect of which the patentee intended to obtain protection is quite certainly and sufficiently described and specified. In such a case, the patent is not in any proper sense of the phrase defective.

There is another view of the statute advanced by the appellants which I shall discuss later; but, in the view just expressed, the appellants necessarily fail; first, because the pertinent documents, the original application for the United States patent, the specification and claims in the original Canadian patent, conclusively negative any intention on the part of the applicant Arnold to describe or to specify any of the inventions, so-called, embraced within the amendments in so far as they are material to the present

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appeal; second, because, having regard to the evidence properly before us as to the state of the art at the time of the application for the Canadian patent, and at the time when Arnold is alleged to have conceived and perfected the inventions in respect of which relief is claimed by the appellants, it is highly improbable that Arnold believed he was entitled to obtain the protection of the law in respect of these so-called inventions; and that the balance of probability supports the conclusion that Arnold was not entitled to the protection of the patent law for these improvements, in respect of which protection is claimed.

In giving my reasons for these conclusions, I shall first consider the documents themselves; which constitute most weighty evidence. The two documents, the importance of which I shall emphasize, do not differ from one another in any material respect; they are Arnold's application for his United States patent, and the specification and claims in the original Canadian patent. Both these documents are signed by Arnold. There is, of course, a presumption, which is a presumption of law, that Arnold, in signing these documents, knew the nature of their contents. This presumption of law is fortified by a very powerful presumption of fact. There is quite sufficient evidence in the record to show, what nobody disputes, that Arnold was an accomplished physicist, a most competent radio engineer and master of the radio art and an experienced inventor. The documents before us, which include a number of specifications signed by him, make it quite clear that he was skilled in the art of scientific exposition, and that, also, nobody disputes.

At the material times, Arnold was associated with Richards, to whom reference will be made later, as assistant of Dr. Colpitts in the laboratory of the Western Electric Company, and with his staff was engaged in investigating radio communication and the practical and theoretical problems connected with it. It would hardly be disputed that few people were better fitted than he to appreciate the value of a given improvement or to form a just judgment upon the merit of it. He was an inventor accustomed to framing specifications and we may assume that he was little likely to be misled upon the point whether a given improvement gave evidence only of the application by a skilled engineer

of principles and methods well known among skilled radio engineers, or of something exceptional involving invention.

We must proceed upon the view, in the absence of some evidence to the contrary, that Arnold knew the contents of the documents I am now about to discuss and that he knew the effect of them in accordance with their proper construction.

On the 31st of August, 1915, Arnold signed his application for the original U.S. patent. The meaning of the application in its relevant aspects is not doubtful. The first two paragraphs are as follows:

Be it known that I, Harold DeForest Arnold, a citizen of the United States, residing at East Orange, in the County of Essex and State of New Jersey, have invented certain new and useful improvements in radio communication, of which the following is a full, clear, concise and exact description.

This invention relates to receiving systems for radio communication, particularly to devices for limiting the electrical power which may be transmitted to a receiving instrument in such a system, and more particularly to devices in which such limiting action is obtained by employing electric currents in an evacuated vessel.

The next paragraph states the object of the invention: which is to provide means by which a definite upper limit is set upon the amount of power that may be communicated to a receiving circuit or apparatus. Then, in the next paragraph, the desirability of such a limitation is explained, and the explanation given is that "foreign disturbances" which are often "of large magnitude compared with that of the normally received signals" may thereby be reduced to a value not exceeding that of such signals. Then it is stated that this object is attained by an arrangement of audions described, which will be conveniently referred to hereafter as the push-pull arrangement, and by causing the thermionic currents in audions so arranged to flow

by impressing upon their limiting electrodes, in multiple, an electromotive force operating through a high impedance, said high impedance being essential to the operation of the device for the purpose specified, * * *

such purpose being to put a definite upper limit upon the amount of power communicated to the receiving apparatus.

Then there is an explanation of the accompanying drawing which is said to represent a "receiving system" embodying the invention.

It will be observed that, up to this point, the invention is specifically stated to consist in a method for limiting the

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"electrical power" which may be transmitted to a receiving instrument in a system for radio communication. A drawing is attached to the application for the purpose of communicating a fuller understanding of the nature of the invention and for that purpose alone; and represents a receiving system for radio communication in which the invention, the power limiting device, operates in the final stage of amplification and restricts the amount of power transmitted therefrom to the ultimate receiving apparatus. The inventor declares:

The nature of this invention will be more fully understood by reference to the drawing, which represents a receiving system for radio communication embodying this invention, * * *

The specification then proceeds to trace the construction of the network by reference to the numbered parts of the drawing with explanations in some instances of the functions of those parts; and, the explanation having arrived at "amplifier 38," proceeds:

The output circuit of amplifier 38 is supplied by battery 34 and contains choke coil 42, condenser 40 and coil 41, whose functions are the same as those of the corresponding elements in the previous amplifier. It also contains condenser 43 and coil 44.

Then we are told:

The apparatus to the right of 44 comprises the power-limiting device and the receiving circuit.

Referring now to the first and second paragraphs, it is self evident that it is in the apparatus to the right of 44 that are to be found the devices limiting the amount of power which may be communicated to the final receiving circuit or apparatus; and in the conception and design of which resides the invention. It is in respect of these devices that the inventor declares he has produced an invention, and only in respect of these devices. A description of the apparatus to the right of 44 follows.

In explaining the operation of the system it is summarily stated that power received by the antenna is transferred to the circuit 5, 6, is augmented by the amplifier 7, is then communicated to the circuit 19, 20, is then transformed into low frequency form by rectification in element 21, is then augmented by amplifiers 31 and 38; and after this summary reference to the anterior parts of the drawing, the inventor states that the power is finally

passed to the receiving instrument through the power limiting device whose operation will now be explained.

Then follow three paragraphs in which the operation of the power limiting device comprised in the apparatus to the right of 44 is explained. Here again it is self evident that it is the power limiting device whose operation he is explaining.

Once again, the claims are explicitly limited to this power limiting device, with the exception of claim 1, which appears to be a combination claim for a combination of the power limiting device with the enumerated antecedent elements of a receiving system: an antenna, a tuned receiving circuit, and so on.

As I have already said, the inventor has left no room for doubt as to the meaning and effect of his application. He has invented, he says in his introductory paragraph, certain new and useful improvements in radio communication; and in what follows, he declares in emphatic words, he has given a full, clear and exact description of the new and useful improvements he has invented and for which in his claims he claims protection. This invention he sets forth as constituting an improvement both new and useful in a receiving circuit for radio communication. There is no other invention described. There is no suggestion that he has invented any other new and useful improvement or any other improvement, or that he has made any other invention of any description.

It would be an abuse of language to aver, for any purpose relevant to any controversy on this appeal, that this application describes or relates to any other invention.

The drawing, as I have said, was produced solely with the object of enabling the reader to comprehend the invention; that is to say, the invention with which the application is concerned. The drawing cannot be legitimately construed in any other way.

The parts of the drawing to the left of 44 are obviously, as matter of construction, there for the purpose of enabling the reader to realize the kind of network in which the invented devices operate and thereby the better to comprehend their purpose and mode of operation. To read the drawing in the other way is to read it as contradicting, not as illustrating, the text.

The application, therefore, with the appended drawing, construed in the only way in which it can properly be con-

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strued, negatives (as within the contemplation of the application) any claim by the inventor to having invented any improvement for which he is entitled to the protection of the law, in respect of any part of the apparatus disclosed by the drawing which is not involved in the invention explicitly claimed and set forth.

It is, therefore, of no relevancy in determining the invention to which this application relates that, by Arnold's instructions, sets of a "receiving system" of which the drawing, so far as it goes, would be a correct delineation, were or had been constructed; the existence of such physical objects is of no relevancy because the application has plainly no relation to any such particular physical things or contemplated physical things. There is not a syllable in the application, there is nothing in its detail, there is nothing in its general scope, there is nothing in the drawing, which can afford a foundation for the proposition that the application relates to some actually existing physical "receiving system." Indeed, it obviously could not be so. An actually existing physical system in operation, or capable of being put into operation, would be of fixed dimensions, of determined physical quantities. The windings of the transformers primary and secondary, for example, would be capable of exact mathematical description. So as to audions,—when actually existing in operation, or ready for operation, they must have certain physical constants, in an amplifier, an amplification factor, and so on. So also as to the condensers. There is no conceivable means by which any engineer could, from this drawing, construct any such actually existing physical system. Obviously, such a particular physical system as a whole, in all its various parts, was an invention not contemplated by this application. These physically existing sets, therefore, can be of no value in assisting us in determining what is the invention to which the application relates; they add nothing to the drawing.

They could not properly be resorted to for the purpose of explaining or for the purpose of limiting the scope of the invention expressly claimed. You could not properly, for example, restrict Arnold's claim in respect of his power limiting device to a claim for a power limiting device employing audions of the precise dimensions and physical

constants of the audions found in these receiving sets. Nor can you find anything in the documents as they stand which justifies the introduction of the elements of these physical receiving sets as elements to be considered in the determination of the meaning of the document. The drawing is there and may be used as illustrating the text, throwing light upon the meaning of it, but only for that purpose. I shall come later to the contention already mentioned that, for the purpose of applying the statute, these receiving sets serve as a link establishing the identity of the invention to which the original patent relates and the invention to which the amendments refer. For the present, I am concerned with applying the statute according to the interpretation above mentioned which limits admissible amendments to such as may be necessary to correct any insufficiency of description or specification arising from the error of the patentee in failing adequately to describe or specify an invention in respect of which he intended to apply for protection and arising from inadvertence, accident or mistake. These observations apply equally to the specification in the surrendered Canadian patent.

Now, I have no hesitation in drawing the inference that Arnold fully understood the scope and effect of the application of May 22nd, 1916, and of the specification in the original Canadian patent. He understood, that is to say, that he was excluding from the invention specified and claimed by him those devices and arrangements which are described and specified and claimed in the amendments in so far as we are presently concerned with such amendments. It is also very clear on the material before us that in the proceedings before the Commissioner leading up to the grant of the reissue patent no evidence was adduced to show that the specifications, the description or the claims of the original patent were insufficient to give effect to the intention of Arnold. Still less was there any evidence adduced to show that Arnold had failed to describe or to specify sufficiently the invention in respect of which he was claiming protection by reason of inadvertence, accident or mistake. Nor, indeed, is there any allegation to that effect. Again, no evidence was adduced at the trial directly bearing upon either of these points.

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I have examined the proceedings before the Commissioner and I cannot find there any statement made by Arnold personally that there was any such insufficiency of description or specification or any such inadvertence, accident or mistake. Indeed, there is not, I think, among these documents any statement by Arnold personally that he was the inventor of the alleged improvements to which the amendments relate. There is no reference in any of these documents to the receiving systems physically constructed upon which the appellants so much rely; still less any suggestion anywhere that the invention in respect of which the reissue patent is prayed for is to be found embodied in these existing physical things.

There is a letter signed in Arnold's name by R. R. Adams, attorney, which contains an argument, an ingenious argument, that the amendments contain nothing but permissible explanations of the drawings and the summary expressions in the text of the specification of the surrendered patent. The first paragraph is in these words:

It should be noted that in the re-issue application no change has been made in the drawing except to add three reference characters to the second vacuum tube, counting from the left, and that there is nothing, either in the specification or claims that is not illustrated in the drawing. The changes in the specification have been for the purpose of more clearly describing the parts of the device and are in the nature of insertions, amplifying somewhat the brief references in the original specification. Then, the statement concludes:

It is felt that all of the claims are properly included in the re-issue application and come well within the scope of the original patent as defined by the statement of inventions repeated in lines 20 to 25 of page 2 of the original specification and the fourteen original claims. However, on review it has been thought several claims can be cancelled without substantial loss of protection to applicant's invention and that some changes should be made in the other claims.

The ground upon which the application for the reissue patent is based is that everything in the amendments is to be found by implication in the specification of the original patent when read with the drawings. I have pointed out that, on the true construction of the specification, this is a wholly inadmissible proposition. What is material for my present purpose is that this letter contains no allegation that, in point of fact, it was Arnold's intention to claim or to describe or to specify the alleged invention with which the proposed amendments are concerned; or that, by reason of inadvertence, accident or mistake, he was led into some

insufficiency of description or specification. Still less is there any reference to any material adduced as evidence in support of an allegation of inadvertence, accident or mistake. I shall have a word later to say with regard to these proceedings.

It seems perfectly plain that the reissue patent ought not to have been granted and that, unless we are at liberty to empty the provisions of the enactment under which the conditions for the grant of a reissue patent are laid down, of all substance, we are inevitably forced to the conclusion that the grant of the reissue was an unauthorized and unwarranted act. For the present, however, I am concerned only with this: the proper conclusion from the documents, including the proceedings on the application for the reissue patent, is that there was no defect in the original patent in the statutory sense, no reasonable ground for apprehending that the patent was defective in failing sufficiently to describe the inventions in respect of which Arnold was intending to claim invention; no mistake on Arnold's part in respect of the description or the specification of the invention to which his application related. Accident is not suggested nor is inadvertence in the pertinent sense; that is to say, no inadvertence in respect of any insufficiency of description or specification of the invention that the applicant had in mind. The statutable conditions governing the exercise of the authority to grant the reissue patent are all absent. This, in itself, is, of course, sufficient to dispose of the appeal.

But it is necessary to examine the validity of the reissue patent from a point of view which stands upon a view of the statute different from that which I have expressed and which I am satisfied is the true view. The appellants say that a number of "receiving systems," to employ Arnold's own expression, all of them answering the description to be found in the specification in the surrendered Canadian patents (including the drawing), had actually been constructed and set up and put in operation before the date of Arnold's application for the original Canadian patent. Invoking the interpretation clause of the *Patent Act*, each one of these receiving systems, it is said, embodied the devices and arrangements claimed in the amendments in the reissue patent and in question in this litigation. These

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physically existing things were, it is argued, inventions within the definition in the interpretation clause of the *Patent Act*. The original patent, it is argued, was a patent in relation *inter alia* to these things and so was the reissue patent. Identity of invention, it is said, is established and we are asked to say that, consequently, the authority under the statute was exercisable.

This argument is not convincing.

First of all, the case of the appellants at the trial was that the inventive idea in respect of which Arnold was entitled to claim protection was not the condensers, the resistances, the coils, as physical things, but the use for which Arnold employed them. That is hardly consistent with the view that these physical things in themselves constituted the invention in respect of which the surrendered Canadian patent was granted.

On the argument before us, counsel for the appellants said, "What the patent was directed to was a physical object." The case at the trial was not that the patent was directed to a physical object, but to certain physical objects employed in a certain way and for a certain purpose, and that it was in this employment that the merit of the inventive idea lay.

The argument involves, of course, the proposition that it is sufficient, in order to obtain relief under the statute, to show that the drawing in the original patent exhibits a device in respect of which the patentee might have claimed protection if he had asked for it and sufficiently disclosed the nature of the invention. This, of course, is to discard the parts of the statute that I have been emphasizing, which make it very plain that the design of the statute is to afford relief only in respect of an invention clearly conceived as such, for which the original patentee intended to claim protection, but in respect of which, through the causes defined by the statute, there is insufficient description or specification. Identity of invention is only one of the conditions of the statute.

Then, as I have already pointed out, there is nothing in the original patent or in the specification of the original patent or the specification of the re-issue patent, or in the material before the Commissioner on the petition for the granting of the re-issue patent, dealing with these physical

instruments. I have already given my reasons, and I will not repeat them, for the conclusion that it would not be sufficient to show that the devices in these physical instruments constituted improvements in respect of which Arnold might have obtained protection if he had asked for it but had no intention of asking for it, either because he was deliberately abandoning them to the public, or because he was satisfied they were not inventions in respect of which he could properly claim protection, or because he overlooked the merit of them from the point of view of invention. That is not sufficient because the inadvertence, accident or mistake in respect of the sufficiency of description or specification must constitute a defect in the patent in the sense that it fails adequately to give effect to the intention of the applicant; I repeat, these physical sets add nothing to the drawing.

As I have already indicated, the weight of evidence appears to me to support the conclusion that the devices and arrangements in question in this litigation were not regarded by Arnold as inventions in respect of which he was entitled to a patent, and that this conclusion is that which best accords with the balance of probability arising from all the circumstances.

I shall deal specifically with the alleged patentable features of the alleged inventions which are described in the pertinent parts of the amended specification and claims in the re-issue patent. Before doing so, it is convenient to sketch some facts in the development of the instrument known as the audion. The audion, as invented by DeForest about the year 1906 or 1907, was a valve having three electrodes. The record contains the specifications in several patents granted to him in respect of improvements in the audion and circuits in which the audion was a part. A fact which it is useful to keep in mind in considering the evidence before us, and the arguments presented to us, is that the audion, as conceived and devised by DeForest, operated by a current of electricity passed through a gaseous medium. I do not wish to be misunderstood. In modern vacuum tubes a very high degree of evacuation has been achieved and the pure electron stream which passes from the cathode to the anode is not in any way dependent upon the conductivity of the small amount of residual atmospheric air

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or gas that may remain within the tube. But the audion, as conceived by DeForest, was an instrument in which the conductivity of a gaseous content was made use of purposely, and the term "audion," which was applied by DeForest to his instrument, continued, at all events, down to the end of the period with which we are concerned in this appeal, to be applied to that type of instrument; although for the last twenty years or so it may have been used to describe a vacuum tube having the general features of the audion as invented by DeForest but evacuated as completely as the pumps and other means at the command of engineers and manufacturers make possible.

There is some oral evidence with regard to these matters which is not very satisfactory and I have been obliged to resort to the documents in the record to obtain information upon them. Specifications of United States patents applied for by DeForest on the 14th February, 1906, 27th August, 1906, and 25th October, 1906, and 29th January, 1907, are in evidence. The first paragraph of the claim in the first of these is thus expressed:

An oscillation-detector comprising two electrodes separated by a heated gaseous medium, one of said electrodes consisting of mercury.

In the second, the description of the invention contains this sentence:

D represents an evacuated vessel of glass or other suitable material having two separated electrodes F and F' between which intervenes the gaseous medium which, when sufficiently heated or otherwise made highly conducting, forms the sensitive element of my oscillation detector.

In the third, there is described a three-electrode device, in other words, an audion, in which the first claim is expressed as follows:

In a device for amplifying electrical currents, an evacuated vessel inclosing a sensitive conducting gaseous medium maintained in a condition of molecular activity, * * *

In the last of them, the objects of the invention are thus stated:

* * * to increase the sensitiveness of oscillation detectors comprising in their construction a gaseous medium by means of the structural features and circuit arrangements which are hereinafter more fully described.

This specification describes a particular type of audion which is referred to later in a specification of a patent issued to Arnold upon an application of the 28th May, 1914.

The invention, the specification states, is for "new and useful improvements in gaseous repeaters in circuits of low impedance." The specification proceeds to state that, of

these improvements, the "following is a full, clear, concise and exact description":

Still more particularly, [the invention] relates to the use of thermionic repeaters for securing amplification of current in circuits of low impedance. By a thermionic current is meant current discharge from a hot cathode. Examples of *thermionic repeaters* are the DeForest *audion* disclosed in Patent No. 879,532, dated February 18, 1914, and others, the Von Lieben & Riesz repeater disclosed in Patent No. 1,038,910, dated September 17, 1912, etc. By vacuum discharge is meant current discharge between electrodes in space from which nearly all atmosphere is exhausted. The expression vacuum discharge repeaters is intended to include repeaters of the thermionic types and also those in which current flows between electrodes in space maintained in a conductive state by the arc or otherwise. The mercury arc repeater of an earlier application of this applicant, Serial No. 709,445, filed July 13, 1912, is an example of the class of vacuum discharge repeaters but it is not of the thermionic type.

February 18, 1914, ought to be February 18, 1908, as appears from the serial number 841,568.

It will be observed that the specification describes improvements in "gaseous repeaters." The DeForest audion and the Von Lieben repeater, both of which make use of the conductivity of the gaseous content, are given as typical examples of thermionic repeaters of the type to which the specification relates. Entire exhaustion of the atmosphere is not contemplated.

Now this specification shows in the plainest way that such gaseous repeaters were, in the mind of Arnold, properly designated by the term "audion." Indeed, in his description of his invention he invariably selects the "audion" as the gaseous repeater which exemplifies it, although he does not exclude other types—the repeaters are "preferably audions." In explaining the drawings the repeaters are always described as "audions." Claims 1, 2, 3, 4, 6 and 7 use the term "thermionic repeaters," of which, as already mentioned, the typical examples given are the DeForest audion and the Von Lieben repeater; while in claim 5, the term "vacuum discharge repeaters" is employed which, as already mentioned, contemplates a repeater from which the atmosphere is not entirely exhausted. This, let it be noted, is Arnold's conception of the term "audion," as appears from a patent dated the 2nd March, 1915, granted on an application dated the 22nd March, 1914.

In the application for Arnold's U.S. patent in respect of the invention which is now in question, dated the 31st August, 1915, the repeaters which are employed in the power limiting device, that is to say, in the apparatus

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immediately to the right of number 44 in the diagram of the network attached to the application, are described in the claims as "thermionic repeaters" and "thermionic elements." In the body of the specifications these structures are said to be "of the audion type"; and in the claims in the surrendered Canadian patent they are (in claims 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 and 14) described as "audions"; while in claim 1 they are referred to as "thermionic elements" and in claim 3 as "thermionic repeaters." There is not a suggestion in either the specification or the claim that the term "audion" in these documents does not designate repeaters of the type described as audions in Arnold's patent of the 2nd March, 1915, and his application of the 28th May, 1914. Indeed, the specification contains a reference which is definitely at variance with any such suggestion.

In describing the power limiting device and the means for securing uni-lateral conductivity, he distinguishes his own device from that invented by E. H. Colpitts and described in U.S. patent 1,128,292, by the circumstance that in Arnold's own device the electromotive force employed for driving the plate current operates through a high impedance and by that circumstance alone.

Now, turning to Colpitts' patent which was applied for on the 3rd of January, 1914, and granted on the 16th of February, 1915. We have a careful description of Colpitts' push-pull arrangement; the arrangement which Arnold adopts subject to the alteration mentioned. "This invention," Colpitts says,

relates to electric wave repeating apparatus and particularly to the use of vacuum discharge repeaters as exemplified by the so-called "audion" for repeating and amplifying in an output circuit waves of electric energy received in an input circuit.

He adds:

The principal parts of an audion element or structure are a heated filament or other source of ionization, an anode usually called a "plate," and an intermediate electrode usually called a "grid." These are preferably inclosed in an evacuated glass vessel. Characteristic features of the audion are that current can flow in one direction only in the ionized stream, and that the strength of current in the stream flowing from its source to the plate is modified by electrostatic rather than by electromagnetic force as in some other types of "gaseous" repeaters.

Colpitts would appear to have been an experienced and competent engineer, and it will be observed that he mentions as a characteristic feature of the audion that the

current can flow in one direction only in "the ionized stream" and that the function which he ascribes to the heated filament is that it is "a source of ionization."

Turning now to the claims,—in the first claim the repeating apparatus is said to comprise a

* * * divided input and divided output circuits, means for producing two ionized streams, said streams being oppositely included in said output circuit, and two electrodes for controlling said ionized streams respectively and oppositely connected in said input circuit.

In claim 7, the combination of the two repeating elements is said to comprise "a common source of ionization." This document appears to have been signed by Colpitts on the last day of December, 1913. The patent, issued on the 16th of February, 1915, as I have already observed, must have been present to Arnold's mind when he signed his application for the United States patent on the 31st August, 1915.

There is another patent of Colpitts for which application was made on the 18th May, 1914, the patent being granted on the 27th April, 1915, five days before the grant of Arnold's patent for improvements in audions which, as already pointed out, he gives as the preferable type of "gaseous repeaters" for his purposes. Colpitts' repeaters are described by him as audions. The space within the audion between the plate and filament is described as "the ionized space." The claims comprise "means for producing a state of ionization in the evacuated vessel."

In a patent applied for on the 24th of June, 1913, and granted to DeForest in 1921, the repeaters are described as audions, and the electrodes within the evacuated vessel as being surrounded by a gaseous conducting space.

The specification in a patent granted to Richards on the 14th of July, 1914, on an application of the 8th of February, 1913, relates to devices intended for use in connection with relays of the "gaseous type, such, for instance, as disclosed in letters patent [of] January 15th, 1907, and February 18th, 1908, granted to Lee DeForest." "This device," it is stated,

is well known in the art and termed an "audion" and because of the grid shaped element is sometimes known as the "grid-audion."

The objects of the invention, it is stated,

are obtained in this invention by the provision of an alternative or shunt path for the energy normally passing through this gaseous conductor.

"It is obvious," it is said,

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that the improvement disclosed herein may be applied to any of the various types of audions and similar gaseous relays without the exercise of invention.

It seems to follow from these documents, which would appear to be the most reliable evidence of contemporary usage, that, at the time of Arnold's application for his Canadian patent in 1916, the term "audion" was known among engineers and specialists in radio engineering as a term originally applied by DeForest to a repeater employing a conducting gaseous content and normally designating a repeater of that character; although there may be room for conjecture that shortly afterwards it came to be loosely used also as applying to any three-electrode repeater.

Light is thrown upon the use of the term by another set of contemporary documents. Reference will first be made to a patent granted to Langmuir on the 23rd of July, 1918, upon an application of the 29th of December, 1913. "The electron discharge tube" is described in these words:

In carrying my invention into practice I make use of an energy storing device arranged in co-operative relation with electron discharge tubes. By the term "electron discharge tube" I mean to imply the use of a highly exhausted envelop containing at least two electrodes one of which is provided with means for causing it to emit electrons. A device of this nature when connected to a source of current operates selectively in such a manner as to allow current to flow between the electrodes in only one direction; that is, there will be a flow of negative electricity from the electron emitting electrode to the other electrode or electrodes, but no flow in the opposite direction. In order that this result may be obtained when a potential of more than 20 or 30 volts is applied it is necessary to have the highest possible exhaustion of the envelop. Otherwise there will be a heavy ionization of the gas present and this will render the device useless for my purpose. By improved methods of exhausting the envelop, however, such a high vacuum may be secured that for any voltage which is applied there is no appreciable gas ionization but the flow of current is the result of a pure electron discharge and is entirely independent of any gas conductivity.

That is the way in which a scientist and an engineer familiar with radio engineering and its terms of art describes, at the relevant period, an instrument which operates without appreciable gas ionization and whose current is the result of a pure electron discharge independently of any gas conductivity. "The electron discharge tube" had evidently been described in applications filed on the 16th October, 1913, and it is explained with similar explicitness in the specification under a patent granted 24th April, 1917, and applied for July 15th, 1914.

This device is also described in the specification of a patent granted to Alexanderson on the 22nd of February, 1916, for which application was made on the 29th of October, 1913. The invention was for a selective tuning system. The system as described includes Langmuir's "electron discharge tube" but it is said that the invention is not confined to a relaying device operating with a pure electron discharge. In other words, the invention was not confined to a device operating independently of gas conductivity.

It results from all this that, according to the usage of the time, the claims in Arnold's Canadian patent embrace audions in the proper sense of the term, audions as described by DeForest, by Colpitts, by Richards and by Arnold himself, as is shown in his specification for improvements in "gaseous repeaters." His invention is stated in his application for his U.S. patent and in his surrendered Canadian patent to be a "power limiting device" and relates to appliances to be found to the right of the figure 44 in his sketch. The power limiting device included audions arranged in push-pull relation after the manner, subject to the qualification mentioned, explained in Colpitts' patent, and there is nowhere the slightest suggestion, or the slightest ground for a suggestion, that "the thermionic repeaters" which form a part of the network are repeaters of the character described by Langmuir and Alexanderson as "electron discharge devices" operating with a pure electron stream through a medium exhausted in the manner described by Langmuir.

It will be convenient now to quote from the appellants' factum a very concise description of the features of Arnold's 1915 receiving system to which it is alleged that the claims sued upon in the re-issue patent relate:

(1) the arrangement whereby a single audion is used for one stage of amplification and two audions in what is known as push-pull relation are used in the next stage (claims 33, 34, 36 and 37),

(2) the interposition of a resistance or impedance in shunt to the coil of a transformer between two stages of amplification (claims 53 to 55) with provision for the adjustability of this resistance (claims 61 to 70 inclusive) and its use in combination with a negative bias on the grid (claims 56 to 60), and

(3) the provision of condensers and choke coils in order to allow the audions in the successive stages of amplification to be energized from a single common battery (claims 77, 78, 85 and 86).

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As to the first of these alleged patentable features of Arnold's "receiving system," three things are admitted,—(1) that Colpitts, in the patent already referred to, had patented a push-pull arrangement which Arnold, with the modification mentioned in his specification, was virtually adopting. It is plain enough from the explanations of Colpitts that this arrangement was intended as one stage in a system of amplification. (2) It is admitted that a system by which a series of audions were so arranged that each one successively amplified the output of the last was well known. And (3) the system was well understood under which one push-pull arrangement immediately succeeded another push-pull arrangement.

These things being given, I find it difficult to perceive the invention involved in Arnold's arrangement; I do not doubt that Arnold regarded it as an arrangement well within the range of competent engineering skill.

It was argued that Arnold for the first time perceived that distortion is reduced when the electric energy fed into the incoming circuit of an audion is "well within the capacity," according to the phrase used, of the audion. Now, there is not a word in the specification of the surrendered Canadian patent, nor is there a suggestion in the drawings, to indicate such a limitation of the power fed from audion 38 into the push-pull arrangement. Nor, indeed, is this condition of the effectiveness of the arrangement set forth in the re-issue patent. If such was the condition of the practical working of this combination and invention was involved in the appreciation of it, then it should have been clearly and plainly stated and, in the absence of such a statement, the disclosure is, in my judgment, insufficient. However, the conclusive answer to this contention is that it was well known that with the audion of that period the amplifying circuit worked satisfactorily only on limited amounts of incoming energy. That is stated by Richards in the specification in his patent, to which reference has already been made, for which he applied on the 8th of February, 1913, and which was granted on the 14th of July, 1914. Richards explains that the relays of the type to which his invention relates, and to which this observation applies, which he describes as relays of the gaseous type, are relays such as those disclosed

in the patents to DeForest already referred to which are dated January 15, 1907, and February 18, 1908. Such devices, he says, are known in the art and are termed "audions."

I shall have to refer to Richards' actual invention on the point next discussed and, in that connection, to a note of Richards dated the 21st of November, 1912.

Richards and Arnold had been associated and Arnold signs Richards' note as a witness. It is quite plain that Richards in his specification is referring to a condition well understood and that his invention aims at providing a remedy. It was very freely suggested in the course of the trial and on the argument that Richards was dealing with a type of instrument that went out of vogue before Arnold's invention was complete. Richards, it was argued, was directing his attention to totally different conditions. I shall point out why this view is inadmissible.

As regards the second feature, the employment of a resistance for the purpose of improving the operation of, or the fidelity of reproduction by the audion is the substance of the patent of Richards to which I have just referred; and it is now necessary to examine the evidence adduced bearing upon the employment of this device by Arnold. Arnold and Richards, let me repeat, were associated as the assistants of Colpitts. Arnold witnessed the note that I am just about to quote. The circumstances all point to the conclusion that Arnold was familiar with Richards' idea of employing the resistance and that he did not in any way regard it as an invention of his own.

On the 21st of November, 1912, Richards made a note in the following words, which note was signed by Richards, his signature being witnessed by Arnold:

Try shunting grid and plate of audion to prevent excessive talking current from knocking down the efficiency of the repeater circuit. Advise work with a 5-K coil and .88 megohm connected in series. Mr. Mills constructed a new circuit and used this shunt with success.

The note seems to show that the condition restricting the usefulness of audions was well recognized, viz., that signals in which the current is excessive impair the efficiency of the repeater circuit; and the proposal is that the grid and plate of the audion shall be shunted for the purpose of correcting this. He appears to suggest an inductive and a non-inductive resistance in series for that purpose. Then he

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adds that, in a circuit newly constructed, this shunt has been employed with success.

The conception of Arnold's invention, it seems to be suggested, was complete in March, 1914, and was embodied in circuits which were constructed in the summer of 1914. Now, there are two notes of Arnold, one on the 10th of March, 1914, and one on the 4th of March, 1914, as follows:

Arrived to put in standard B audions, with higher B current, negative cells in C circuit, high fixed resistance across high side of input transformer, adjusting gain by tapping off across part of this for the grid. Checked high resistance coils—all about 50,000w each.

* * *

Note the advantages of using a high negative C voltage in audion in improving the uniformity of magnification over ranges of output, and also in improving exactness of reproduction.

The first thing to be observed about these notes is that they all refer to "audions" and, as already pointed out, the contemporary documents show plainly that the term "audion" at that time was used as designating a gaseous conductor. As to the notes of the year 1912, there can be no manner of doubt that Richards and Arnold were dealing with the same type of repeater,—the audion of DeForest described by Arnold, Richards and Colpitts as a "gaseous repeater." Kendall, it is true, says the standard B audion was the standard "high space current audion." There is no explanation of that term. Its natural meaning is an audion having space current of high value. That is, I presume, a high plate filament current. There is nothing in that to suggest an instrument of the character of the "electron discharge repeater" described by Langmuir and exhausted as explained by Langmuir with precision. There is no reason for thinking that Arnold in 1912 when he used the term "audion" had in his mind a repeater different in character from the gaseous repeater well known, as Richards says, in the art as the "audion," invented by DeForest and referred to by Arnold himself in the specification in his patent of the 2nd of March, 1915, as the audion of the usual type. There is, to be sure, a statement by the appellants' witness Johnson in rebuttal that when gas did appear in the DeForest tubes it was an abnormal condition. It is, of course, perfectly plain from what has already been said that at the relevant times the presence of gas in a DeForest tube was the normal condition.

But the consideration which is entirely conclusive upon this point is the fact that in his Canadian specification, Arnold, as has been pointed out, uses the term "audion" to describe the type of repeaters which his invention contemplates. In October, 1913, Langmuir had applied for patents in respect of his "electron discharge tube" and in February, 1916, a year and a half before Arnold's Canadian patent was granted, Alexanderson had received a patent in which he described the "electron discharge" tube as a device having a vacuum so high that gas ionization by collision is substantially absent. It was stated categorically by the witness Johnson that Arnold was the first to use in 1913 a tube which he spoke of as the high vacuum tube. He was obliged to admit that he was speaking from hearsay, and then finally said such tubes were known in 1913. If Arnold, in his note of 1912 and his notes of 1914, had in mind a repeater of this description and not the type of repeater which he and Richards and Colpitts had been in the habit of describing as an audion, it seems extraordinary that something was not said about it, and still more extraordinary that something was not said about it in the specification for the Canadian patent which issued in October, 1917.

It is impossible to maintain the contention that Arnold's resistance is something different from Richards' resistance on the ground that Arnold was dealing with one type of repeater and Richards with another.

Then it is sought to get rid of the Richards patent by labelling his patent a "blue glow preventer." It is abundantly plain from the documentary evidence before us that the blue glow was merely evidence of a condition of instability which, unless prevented, paralyzed the operation of the repeater. No doubt the high evacuation of the tube achieved by Langmuir greatly aided this prevention, and, perhaps, completely accomplished it, but, I repeat, we are not concerned with Langmuir's "electron discharge" device, we are concerned with the "audion."

Much the same considerations apply to the negative bias on the grid. As far back as April, 1912, Lowenstein had applied for a patent of a means for coping with the distortion arising from the unequal magnification of weak and strong signals and high and low frequencies in which he

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employed the negative grid bias. It is perfectly true that his patent contemplated the presence of some gaseous content in the repeater as DeForest's previous patent did, and Arnold's and Colpitts' subsequent patents did. But the problem is stated and the solution is given.

In May, 1914, Colpitts applied for a patent which was granted in April, 1915, a patent which has already been referred to. There appears in the drawings the combination of the negative bias on the grid and the resistance in shunt to the input electrode. And again, in an application made by Van der Bijl on the 21st of August, 1915, there is an association of resistances in shunt, grid bias and potentiometer shown in the drawings. Although this association is plainly disclosed, there is, by Colpitts, not even a reference to any of these devices in his specification, and none that I can discover in Van der Bijl.

These facts are important as showing that such an association was something well understood and this may properly be regarded as throwing light upon the fact that in Arnold's application for his U.S. patent, which is dated the 31st of August, 1915,—one year later than Colpitts' application and some months later than Colpitts' patent, and a week later than Van der Bijl's application—he passes over this association in the same way without comment.

Having regard to all these circumstances, it seems improbable that the employment by Arnold in 1914 of the negative bias and variable high resistance in combination was regarded by him as involving any advance not well within the scope of the skill of a trained specialist in these matters having a knowledge of what was generally known among such specialists; that is, on all the facts, the most natural explanation of the fact that he did not claim protection for this arrangement as an invention.

As to the third feature in respect of which protection is claimed, I would simply say that I see no satisfactory evidence of invention.

The form of Arnold's specification in the surrendered patent is, therefore, in my opinion, capable of the very simple explanation I have mentioned: that in respect of these matters in controversy in this appeal, he did not regard them as new or as inventions of his.

The appellants complain that the learned trial judge did not act upon the evidence of their experts. I regret to say that a large part of the evidence given by experts on both sides consists of material which ought not to be present in the record, for the plain reason that it is not legal evidence and cannot properly be taken into consideration by this Court, which, it hardly seems necessary to state, is a court of law. Some of the evidence given by the experts bearing upon the state of the art, what for brevity I have called the radio art, at a time when they were practitioners in that art, and are, therefore, competent to speak about it, is not only admissible but of weight and value. Some of it, although, perhaps, technically admissible, given by the witnesses in relation to the state of the art at a time when they had not much more than entered upon their studies as engineering students, is of no value. Some of it ought never to have been given. It is contradicted by the documents in the case and is obviously wrong. On the other hand, as I have said, there is a great mass of it which could not be properly taken into account by this Court, but the presence of which in the record substantially increases the labour of the Court, which is obliged to separate the legal from the irrelevant evidence. I mention two examples only—

The witness Johnson, who left the University of North Dakota in 1913-14 and entered Yale in the following year, professed to give evidence as to the problems with which Arnold was confronted from 1912-14 when he was perfecting his alleged invention, and, after descanting at great length about what Arnold had in his mind and was trying to do, was compelled to admit on cross-examination that he had never met Arnold before 1916, and that everything he said was an inference drawn by him from the specifications in the original patent and in the re-issue patent. In point of fact, it is quite obvious from perusal of his evidence that he is mainly speaking from the re-issue patent.

Now, it was a part of the case advanced by the appellants, a substantive part of their case, to establish that the devices and arrangements in question in these proceedings were inventions of Arnold, and any inference with regard to that to be drawn from Arnold's specification signed by him in 1915, if any such inference could be drawn, was matter of fact for the Court and not a matter upon which

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it was competent to any expert witness to pronounce. The opinions of such persons on such matters are entirely without legal relevancy and cannot be considered in this Court.

Again, the respondent's witness Kelley had put in his hands Arnold's original patent and was asked broadly to explain what Arnold was trying to do. The issue touching the identity of the invention to which Arnold's original patent related was a substantive issue in the action and upon that issue no expert witness should have been permitted to express an opinion.

The proper limits of expert testimony are well understood; the subject has, however, recently been the subject of comment by Lord Tomlin, and I think it is desirable to reproduce in full what Lord Tomlin said upon it (*British Celanese, Ltd. v. Courtaulds, Ltd.* (1)):

The area of the territory in which in cases of this kind an expert witness may legitimately move is not doubtful. He is entitled to give evidence as to the state of the art at any given time. He is entitled to explain the meaning of any technical terms used in the art. He is entitled to say whether in his opinion that which is described in the specification on a given hypothesis as to its meaning is capable of being carried into effect by a skilled worker. He is entitled to say what at a given time to him as skilled in the art a given piece of apparatus or a given sentence on any given hypothesis as to its meaning would have taught or suggested to him. He is entitled to say whether in his opinion a particular operation in connection with the art could be carried out and generally to give any explanation required as to facts of a scientific kind.

He is not entitled to say nor is counsel entitled to ask him what the specification means, nor does the question become any more admissible if it takes the form of asking him what it means to him as an engineer or as a chemist. Nor is he entitled to say whether any given step or alteration is obvious, that being a question for the court.

In the present case much time was occupied and substantial parts of the shorthand notes have been filled with questions and answers which in my opinion were not admissible.

To illustrate what I mean I will venture to call your Lordships' attention to a few examples taken at haphazard.

Evidence, Vol. 1, p. 16. Q. 150. Now there are in the alleged anticipations cases for the spinning of nitro silk where downward spinning is proposed?—Yes.

Q. 151. I ask you quite generally—I am going to take them later—do you find in any of those any assistance in reaching the process the subject of this first patent?—No.

P. 19, Q. 184. Do you find in this (i.e., *Clark's Specification*) although there is downward spinning, any suggestion of outside winding?—No.

P. 20, Q. 187. * * * Is that language consistent with what you inferred from the statement about the chamber being steam tight?—Yes. * * *

P. 23, Q. 224. Now turn to *Boullier*, No. 15015 of 1908. First of all you might tell my Lord what you understand *Boullier* to describe?—*Boullier* has got some idea of heating the filaments by radiation. * * *

P. 210, Q. 1807. * * * I suggest that means by the capacity of the apparatus to squirt?—Yes.

Q. 1809. So that we have here downward spinning and outside winding?—Yes, but which end of the filament do you imagine he takes hold of?

Q. 1810. Not the one in the jet, at all events?—I do not think it means “continuous” at all. What I read here is that he squirts until he has a tangle of his filament on the bottom of his apparatus.

P. 211, Q. 1815. It does not say anything about waiting on the bottom?—I think it does.

Evidence, Vol. II, p. 867, Q. 9537. Then it continues: “but is usually only very short so that the filaments can be spun at a high speed and need only travel a relatively short distance in the casing.” Does that passage there convey to your mind the necessity or desirability of a long casing?—No. Rather the reverse.

Q. 9538. Then just going on from line 50: “By way of example we have found that in most cases the volatile liquids are sufficiently evaporated and the filaments sufficiently solidified by a travel of one to two seconds exposed to a warm air current of about 30 deg. to 50 deg. C. in the casing.” Just bearing in mind that with the Provisional there are no drawings, does that passage enable you to gather anything as regards the speed of spinning?—No.

Q. 9542. I just want to ask one question on that paragraph. You see at line 115 it is dealing with guides, and I just want you to explain to his Lordship what you understand by this paragraph: “The said guide or guides may be located in the aperture or apertures through which the filaments leave the casing, or when the associated filaments pass round or over more than one guide in the casing, the last of each series of these may be placed in the issue apertures.” What does that convey to your mind?—The possibility of carrying the filaments in a zig-zag path to and fro inside the casing, in order to get the requisite length of travel, without needlessly extending the length of the casing. Of course, it also includes a case in which the filaments pass direct to an outlet, and over a single guide.

P. 887, Q. 9681. Then at line 21: “Under the conditions above described, the matter is expelled in the form of a continuous thread whose length is only limited by the capacity of the apparatus.” What does that convey to your mind?—It conveyed to my mind the limit as to the amount of material he can expel by his piston from his containing vessel. He has spoken of expelling the thread by means of a piston at page 2, line 15, and I assume he was speaking of a sort of charge which he could put in such a cylinder and expel by the piston.

Q. 9682. He goes on: “The thread or filament coagulated as above described after traversing the coagulating medium is drawn out by its extremity and wound on a roller or reel whence it is rewound on bobbins or into balls or skeins or by any suitable means, which it is unnecessary to describe.” Does that convey anything to your mind as regards the position of the winding or the time when it takes place after the coagulation?—Yes; it does suggest that after traversing the coagulating medium the thread is drawn out by its extremity. That suggests to my mind that it is drawn out of the apparatus and conveyed direct to a roller or reel on which it is wound.

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P. 893, Q. 9762. Do you find in *Boullier's* Specification any direction as to whether there would be a casing or an enclosed space or not?—Yes. He suggests that at any rate the back and sides should be closed in and that there should be a front put on where you want to limit the loss of heat by radiation.

P. 986, Q. 9797. Just look at the last lines in *Suvern*. "By this arrangement, the recovery of the solvent is also facilitated, since the same evaporates in comparatively only narrow chambers"?—Yes, that I think is quite obvious.

Q. 9798. So that you have narrow chambers—

Sir Arthur Colefax: Please do not lead here because it is absolutely in conflict with what this discloses.

Sir Stafford Cripps: I did not appreciate that there was any conflict upon this at all.

Q. 9799. Do you therefore find that *Suvern* tells you as an engineer that narrow chambers were used?—Yes.

P. 902, Q. 9868. What does that convey to your mind?—The film is formed by evaporation, or elimination of solvent and coagulation or coming together of the particles of viscose to make a relatively solid film, much as milk will coagulate on a heated liquid. The surface then will consist of a more coagulated body, substantially solid, but still containing a good deal of liquid.

P. 904, Q. 9875. I am coming back afterwards to ask you a question on page 250, but I want to deal with the viscose point first, if I may. I have read you the middle of page 250, except the last two lines, where he says: "However, provision has then to be made for hardening them"—that is the filaments—"as rapidly as possible, so that they may be reeled up. While viscose coagulates by itself in the air, too much time would in the case in question be required for the purpose." When it speaks of coagulating by itself in the air, bearing in mind the paragraph we have been looking at on page 132, where he tells you how that happens, what do you imagine he means there?—He means that if you tried to form a filament by allowing the viscose to coagulate in air at an ordinary temperature, the process would be altogether too slow to enable you to carry out that process and make a filament.

Q. 9878. I will just read to the end of the paragraph: "and the viscose threads after having been stretched to a certain length must be further treated according to this principle"; what do you understand "this principle" to mean?—Continued heating, probably after the threads have been formed and wound up, sufficient to convert the solidified viscose into viscid.

P. 905, Q. 9886. Now: "For the purpose of converting the fluid viscose thread into the solid viscid thread a current of hot air ascends in the shaft through which the thread sinks down"?—Yes.

Q. 9887. Would that be what is called counter current?—Yes, but he would not get it converted in such a shaft during its formation into a true viscid. I think the word is used loosely there.

The disadvantages of these methods are two-fold.

In the first place time is wasted and money spent on what is not legitimate. In the second place there accumulates a mass of material which so far from assisting the Judge renders his task the more difficult, because he has to sift the grain from an unnecessary amount of chaff.

It is advisable, I think, to repeat, for the purpose of emphasizing it, what I have said about the proceedings lead-

ing to the grant of the reissue patent. There can be little doubt that, as already observed, in granting the reissue patent, the conditions laid down by the statute were entirely disregarded. One is struck with amazement when one observes the utter absence of any attempt on the part of the applicants to offer evidence to establish the existence of the statutory conditions. As I have said, the fact upon which the appellants mainly rely in this appeal, viz., the existence in operation of certain "receiving systems" answering the description provided by the drawing in the original patent, is not mentioned in the application. There was produced literally no evidence of inadvertence or accident or mistake. It is too plain that the grant was quite destitute of legal authority.

As to Kendall's patent, I am satisfied there was no infringement.

The appeal should be dismissed with costs.

Appeal dismissed with costs.

Solicitors for the appellants: *Smart & Biggar.*

Solicitors for the respondents: *Chauvin, Walker, Stewart & Martineau.*

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