

affirmed by the Court, and his reasoning was approved of.

It seems to me that this is a direct decision that a procuratory or precept subsists as long as they are required for completing the right to which they relate. They do not fall by the divestiture of the granter. They may be used whenever the grantee thinks proper to do so. But if the right to which they relate has ceased to exist they fall with it. For they cannot be used to take up a right which is extinct.

For these reasons, I am of opinion that the title to the feu which was completed in 1834 was well made up. I think that I should reach the same conclusion as regards the lands conveyed by the disposition of 1811 in respect that the owner of these lands was the person who used the precept, and therefore consented to its being so used. Further, I should be inclined to hold that the title to the whole feu was well completed by virtue of the infettment on the precept of *clare* which the pursuer granted in own favour. But I do not think it necessary to enter into these questions, as I am satisfied that the feu disposition to Mr Gilmour was well feudalised in 1834.

On the question relating to the validity of the entail, it does not appear to me to be necessary to say anything. I think that the judgment of the Lord Ordinary is right, and I am satisfied with the reasons which he gives for it.

The LORD JUSTICE-CLERK and LORD LEE concurred.

LORD YOUNG was absent.

The Court adhered.

Counsel for the Pursuer and Reclaimer—Low—C. K. Mackenzie. Agents—Murray & Falconer, W.S.

Counsel for the Defenders and Respondents—Mackay—W. Campbell. Agents—Gill & Pringle, W.S.

Wednesday, July 16.

### FIRST DIVISION.

[Lord Trayner, Ordinary.]

KING, BROWN, & COMPANY v. ANGLO-AMERICAN BRUSH ELECTRIC LIGHT CORPORATION (LIMITED).

*Patent—Publication in Prior Specification—Public Use—Disconformity between Provisional and Final Specification.*

Where a specification described a process in a manner clear and intelligible to men of education and technical knowledge of the subject, that was held to be sufficient publication to invalidate a subsequent patent for the same process.

Where an electric machine was constructed and set up in the works of

general engineers, and was there used on one or two occasions to give light for operations which were being carried on in the works, that was held to be sufficient public use to invalidate a subsequent patent for a machine of the same type.

In his provisional specification a patentee described part of his invention to consist "in constructing commutators cylindrical with an insulating hub or body to which are attached metallic sub-segments placed in electrical connection with the general mechanism in which the commutator is employed, and metallic wearing segments detachably attached to said sub-segments." In his final specification he claimed "(2) a commutator cylinder consisting of an insulating hub or body to which are attached sub-segments placed in proper electrical connection with the general mechanism in which the commutator is employed, and wearing segments detachably attached to said sub-segments;" and "(4) the commutator having metallic insulating segments T.

*Opinion (per Lord Trayner)* that there was such disconformity between the provisional and final specification as to invalidate the patent.

Messrs King, Brown, & Company were makers of electric machinery at Rosebank Electric Works, Edinburgh. Their right to make machines known as "compound wound" dynamos having been extrajudicially challenged by the Anglo-American Brush Electric Light Corporation (Limited), carrying on business in York Place, Edinburgh, they brought the present action against the Brush Corporation for reduction of letters-patent, No. 2003, dated 18th October 1878, granted to Herbert John Hadden, of which patent the defenders were the proprietors and assignees.

The patent in question was for "improvements in apparatus for the generation and application of electricity for lighting, plating, and other purposes," the alleged invention of which "compound winding" was an essential feature being a 'communication from abroad by Charles Brush of Cleveland, Ohio, United States of America.'

The pursuers attacked the validity of the patent on these grounds—(1) that Mr Brush was not the first and true inventor of "compound winding," but that the said invention had been discovered and made known by Mr Samuel Varley prior to the date of the defenders' patent; (2) that the alleged invention had been publicly used prior to the date of the defenders' patent; and (3) that the final specification was not in conformity with the provisional, but embraced alleged inventions not included or indicated in the provisional.

With regard to the objection first above mentioned, it is necessary shortly to describe in what "compound winding" consists:—

When a loop of wire is moved in a direction transverse to the length of the wire through a magnetic field, the result is that a current of electricity is set up in the

direction of the length of the wire, the direction of the current varying as the wire is passed through the north or south polar field. Further, when a wire which carries a current of electricity crosses a soft iron bar it makes the bar a magnet, and conversely if a bar of iron crossed by a wire is magnetic it creates a current in the wire. These principles underlie the construction of dynamo-electric machines. In such machines when the armature is made to rotate in the magnetic field by the application of steam power or otherwise, currents of electricity are set up in the coils of the armature, varying in direction as the coils pass through the north and south polar fields. The ends of the coils are attached to a device called a commutator by which the alternating currents of electricity are converted into one continuous current. This current passes on from one pole of the commutator into a conducting wire to do the work of the machine, and is thereafter returned to the other pole of the commutator and sucked into the machine.

To create a magnetic field originally permanent magnets were used. Electro-magnets were next used which were charged from an external source such as a voltaic battery.

It was subsequently discovered that it was possible to supply the electricity for exciting the magnets from that produced by the machine itself. The first method of doing this was by what was called series winding. In this method there was only one wire, which starting from one pole of the commutator, was first wrapped round the electro-magnets, then led into the working circuit, and then returned to the opposite pole from which it had started. The whole of the electricity produced by the machine went first to excite the magnets, and then to perform the external work.

The next improvement consisted in dividing the current as it flowed from the commutator into two partial currents by bifurcating the conducting wire. One branch of the wire was wound round the magnets, and brought back to the opposite pole of the commutator; the second branch was employed for the external work, and was re-united to the first branch near where it met the commutator at the opposite pole. This was known as shunt winding.

The invention of compound winding or series shunt winding was a combination of these two methods. The wire was bifurcated as it left the commutator. Both the branches were wound round the electro-magnets. One branch was then carried directly to the opposite pole of the commutator without doing any work other than the excitation of the magnets. The other branch on leaving the electro-magnets was continued to form the external or working circuit, and was re-united to the first wire near where it met the commutator at the opposite pole. This arrangement admittedly had considerable advantages over the previous systems in securing uniformity and steadiness of the current.

The pursuers founded on a specification filed by Mr Samuel Varley in June 1877 as

containing a description of "compound winding." Mr Varley's patent was for "Improvements in apparatus for improving the electric light, parts of which invention are applicable to other purposes." It was dated in December 1876 (No. 4905), and sealed in March 1877. Mr Varley did not claim compound winding as part of his invention, but when he came to describe the mode of winding in his final specification he described it in these words:—"Part of the electricity developed by the machine is diverted to maintain the magnetism of the soft iron magnets, and the remaining portion is used to produce the electric light. There are several well-known ways of doing this; but the method I prefer is to wrap the soft iron magnets with two insulated wires, one having a larger resistance than the other. The circuit of larger resistance is always closed, and the circuit of less resistance is used for the electric light. When the electric light is being produced the greater portion of electricity passes through the circuit of less resistance, which I term the 'electric light circuit' maintaining the magnetism of the magnets, and producing the light. When the electric light circuit is opened from any cause, the electricity developed passes through the circuit of greater resistance only, and maintains the magnetism of the magnets." The description of "compound winding" contained in the final specification filed in the defenders' patent was as follows:—"I attain my object (the maintenance of a permanent magnetic field) by diverting from external work a portion of the current of the machine, and using it either alone or in connection with the rest of the current for working the field magnets. I prefer the latter plan of the two just above mentioned, especially for electroplating machines. If now the external circuit be broken entirely the magnetic field will, in the former plan just mentioned, remain unimpaired, and in the latter plan will remain sufficiently strong to effect the desired end. In applying my invention to dynamo-electric machines, I wind the cores of the field magnets with a suitable quantity of a comparatively fine wire, having a high resistance in comparison with that of the external circuit and the rest of the wire in the machine. The ends of this wire are so connected with other parts of the machine that when the latter is running a current of electricity constantly circulates in said wire whether the external circuit be closed or not. The high resistance of this wire prevents the passage through it of more than a small proportion of the whole current capable of being evolved by the machine; therefore the available external current is not materially lessened. When this device, which I have called a 'teaser,' is used in connection with field magnets also wound with coarse wire (as shown in figure 1 of the drawings) for the purpose of still further increasing the magnetic field by employing the main current for this purpose in the usual manner, then the 'teaser' may be so arranged that the current which passes through it will also circulate in the coarse wire, thus

increasing the efficiency of the device.”

A number of scientific witnesses were examined to show that the passage above quoted from Varley's specification did not contain a description of compound winding, and that it would not have conveyed an idea of that invention to a workman of ordinary skill so as to enable him to put it into practical effect. The result of the evidence, however, in the opinion of the Court, was that this was a description of compound winding intelligible enough to an educated electrician. (2) Only one machine was ever made from Varley's specification, and it was on the use of this machine that the pursuers founded as constituting anticipation by prior use. The machine in question was made under the directions of Varley by a workman in the employment of Messrs Siebe & Gorman, general engineers, who were interested in the patent along with Mr Varley, between the dates at which the provisional and final specification were filed. Both wires were wound round the magnets. When produced in this case it was not connected; but Mr Varley gave evidence to the effect that it had been connected as a series-shunt or compound-wound machine. The machine was fitted with an arc lamp, and was used in the works of Messrs Siebe & Gorman on two occasions for the purpose of throwing light into a tank where some diving experiments were being carried on. It was also used for the purpose of photographing an ice machine in the works, and was exhibited to some friends of the partners. (3) The alleged disconformity between the provisional and final specification in the defender's patent was this: In his provisional specification the patentee described his invention, as regarded the commutator, in these terms:—“The invention consists . . .

Also in constructing commutators cylindrical with an insulating hub or body to which are attached metallic sub-segments placed in electrical connection with the general mechanism in which the commutator is employed, and metallic wearing segments detachably attached to said sub-segments.”

In the final specification (as amended and disclaimed) the patentee claimed (2) a commutator cylinder consisting of an insulating hub or body to which are attached sub-segments placed in proper electrical connection with the general mechanism in which the commutator is employed, and wearing segments detachably attached to said sub-segments; (4) the commutator having metallic insulating segments T.

It was explained that it was necessary, or at least advantageous, to cut the armature bobbins (on which the coils of wire were wound) out of circuit when they were near the neutral or current reversing points of the magnetic field. To do this the continuity of the current conducting segments of the commutator had to be broken, either by a mere space or by the insertion of some non-conducting material at the given point. The cutting the bobbins out of circuit was known and practised before the date of the defenders' patent, but it was not before

that time done by means of an insulated metal segment. The advantage attaching to the defenders' method was, that the insulating segment being metal, like the conducting segments, a certain uniformity of wear was ensured over the entire surface of the commutator, which could not be preserved where a softer material like wood was used or where merely a space was left.

On 26th June 1889 the Lord Ordinary (TRAYNER) having considered the cause with the proof adduced, and heard parties, repelled the defences; reduced, decerned, and declared as concluded for.

“*Opinion.*—The question to be determined in this case is whether Mr Brush is the inventor of (1) the peculiar form of commutator, and (2) the series-shunt machine, for which the letters-patent now under reduction were granted. In regard to both, the pursuers maintain that Mr Brush is not the true inventor, and that both had been publicly known and used prior to the date of the letters-patent. To some extent the determination of the question at issue depends upon the construction of Mr Brush's patent obtained in 1878, and the patent obtained by Mr Varley in 1876; to some extent also on matters of fact which are disputed. A long proof has been led before me, from which it was not possible at the time to exclude evidence which ultimately resolved itself into expressions of opinion as to the meaning and construction of the two patents. In forming my judgment upon the questions submitted to me I have carefully considered the proof in so far as it was necessary thereby to instruct myself on scientific theory and detail, and in that respect I have obtained great assistance from the evidence adduced on both sides. I would like to add that I have been greatly assisted also by a remarkably able argument from both sides of the bar. But in construing the letters-patent I have put aside the different views of the witnesses on both sides, as construction is a matter for the Court and not for the witnesses.

“In disposing of the case I shall deal separately with the questions connected with the commutator and the series-shunt machine.

“First, as regards the commutator, Mr Brush describes his invention in the provisional specification in these terms:—‘In constructing commutators cylindrical with an insulating hub or body to which are attached metallic sub-segments placed in electrical connection with the general mechanism in which the commutator employed and metallic wearing segments detachably attached to said sub-segments. This is said to have been anticipated by Varley's commutator and the Manchester commutator, both of which have been produced. With regard to both of the last mentioned commutators, I think it may be said that they are cylindrical with metallic sub-segments, having metallic wearing segments detachably attached. They also had an ‘insulating body,’ or I should rather say ‘insulating substance,’ for the word body is

ambiguous. Yet, with all these points of similarity, I do not regard them as anticipations of the defender's commutator. The insulating hub or body of the defender's commutator is the 'body' or basis on which his commutator is constructed—to which the various parts of his commutator are attached. This cannot be said of the Varley or Manchester commutators in which the insulating substance does not form the body or basis of the commutator at all, and insulates not the whole commutator, but only one section of it. The purpose and effect of the Varley and Manchester commutators electrically considered were in my view the same as Brush's commutator, but it is not in that view that Brush claims that his commutator is a new invention. He claims it merely as a mechanical device or arrangement, having certain advantages over existing arrangements used to serve the same purpose. But as a mechanical arrangement I think it was new and useful, and not open to challenge. But the pursuers maintain that the letters-patent under reduction are rendered invalid by reason of the patentee claiming in his final specification (as amended and disclaimed) something with reference to this commutator, as an invention, which is not foreshadowed in the provisional specification. The claim here referred to is the fourth, which is in these terms:—'The commutator having metallic insulating segments T, substantially as shown in division three.' It appears to be necessary, or at least desirable and advantageous, to cut the armature bobbins out of circuit when they are crossing the neutral or current-reversing points of the magnetic field. To do this, the continuity of the current-conducting segments of the commutator has to be broken, either by a mere space or by the insertion of some non-conducting material at the given point. The cutting of the bobbins out of circuit was known and practised before the date of the defenders' patent; but it was not before then done by means of an insulated metal segment. The advantage which attaches to the defenders' method is this, that the insulated segment being metal, like the conducting segments, there is insured a certain uniformity of wear over the entire surface of the commutator, which could not be preserved where a softer material, like wood, was used, or where merely a space was left. I am not aware that prior to the defenders' patent any insulating body, metal or otherwise, was ever used in the construction of the commutator for the purpose of cutting the bobbins out of circuit. The insulating segment T of the defender's patent was therefore a novelty, and its utility I do not understand to be disputed. But was it foreshadowed by the provisional specification? I think not.

"In the first place, the defenders' second claim seems to me to be co-extensive with the provisional specification (in so far as it relates to the commutator), so that there was nothing left to claim under another head. If all that was foreshadowed in the provisional specification is included in the second claim, then the fourth claim (unless

regarded as mere repetition, which nobody suggests) is for something not there foreshadowed. *Secondly*, the provisional specification relates only to the construction of a cylindrical commutator, whereas one of the chief purposes of, and one of the main advantages to be derived from the insulating segment T is the preservation or maintenance of the cylindricality of the commutator, an object probably as important and as patentable as—but quite distinct from—the shape or mode of construction. *Thirdly*, the insulating segment T is not merely or necessarily a part of the cylindrical commutator, having sub-segments with wearing segments detachably attached. It has and is intended to have a peculiar function which is not referred to in the provisional specification at all. *Fourthly*, it is said that the segment T is a part of the wearing segment, and therefore falls within the description of the provisional specification; but I think this is not so. The wearing segment is an essential part of the defender's commutator; the segment T is not. It may be dispensed with altogether.

"I come, therefore, on this part of the case, to the conclusion that the patent sought to be reduced is invalid, in respect the invention claimed in the final specification is larger and different from that claimed in the provisional specification.

"It is right, notwithstanding what I have said, that I should also express my opinion upon the remaining question in the case, viz., Was Mr Brush the inventor of the series-shunt machine, or had that invention been anticipated by Varley. For the pursuers it is maintained that Varley disclosed and published the invention of a series-shunt machine in his specification and patent of 1876, and constructed a machine in conformity with that specification, which was a series-shunt machine, and was publicly used as such in 1877. The defender's patent, as I have said, is dated in 1878.

"In considering whether the description given by Varley in his specification amounts to a publication of the invention claimed by the defenders, it is necessary to bear in mind the two different kinds of winding used in dynamos known at the time when Varley's specification was lodged. The first of these was the series. In the series machine one wire was coiled round the magnets, and the current sent along this wire served both for the excitation of the magnets and the performance of the external work. There was thus one wire and one circuit. In the second, the shunt machine, there was again only one wire coiled round the magnets, but the electricity developed by the machine instead of being entirely conducted in one circuit (as in the series machine) was bifurcated immediately as it left the machine, and one part went wholly to the excitation of the magnets, while the other went wholly to the performance of the external work. The current was thus divided in two, each part of which formed a branch or circuit quite independent of the other. The defects or weak points in each of these machines has

been clearly explained by Mr Murray, and need not here be repeated. These defects found their remedy in the third kind of machine now known as series-shunt, which, speaking generally, is a compound of the other two; it is in effect a series machine with a shunt added to it. In this machine the magnets are wound round with two insulated wires, one having a higher resistance (the shunt coil) than the other (the series coil). The electricity produced by the machine is diverted or bifurcated immediately after it leaves the armature; part of it is taken by the shunt to magnetise the magnets; the remainder of it being conducted by the other wire (the series) so as to (1) excite the magnets, and (2) perform the external work. The shunt circuit is always closed, the other may be either closed or open. Thus, whether the series circuit is closed and is exciting the magnets and doing external work, or is open and conveying no energy, the shunt circuit is engaged in keeping the magnets sufficiently magnetised. For if the series circuit is open, the only path from the armature being by the shunt, more of the energy produced in the armature will pass through the shunt circuit, and the effect of the shunt in exciting the magnets will be increased, thus compensating for the absence of any excitation from the series circuit. The magnetisation of the magnets is in this manner maintained, so that the machine is kept ready to do full work on the series circuit being again closed.

“I turn now to Varley’s description, which for convenience I here quote. He says, describing his machine—‘Part of the electricity developed by the machine is diverted to maintain the magnetism of the soft iron magnets, and the remaining portion is used to produce the electric light. There are several well-known ways of doing this; but the method I prefer is to wrap the soft iron magnets with two insulated wires, one having a larger resistance than the other. The circuit of larger resistance is always closed, and the circuit of less resistance is used for the electric light. When the electric light is being produced the greater portion of electricity passes through the circuit of less resistance, which I term the “electric light circuit” maintaining the magnetism of the magnets, and producing the light. When the electric light circuit is opened from any cause, the electricity developed passes through the circuit of greater resistance only, and maintains the magnetism of the magnets.’

“In this description I find it disclosed (1) that the electricity developed by the machine is diverted or divided, one part going to maintain the magnetism of the magnets and the remainder going to produce the electric light; (2) that the method by which this may be accomplished (and the method which Varley prefers), is by wrapping the magnets with two insulated wires, one having a larger resistance than the other; (3) that the circuit of larger resistance is always closed, and the current passing through it maintains the magnetism of the magnets; and

(4) that the current passing through the circuit of lesser resistance is used for ‘maintaining the magnetism of the magnets, and producing the light.’ These four things appear to me to comprise every distinctive feature of a series-shunt machine. The series arrangement and the shunt arrangement are combined with the compensating or self-regulating result to which I have already alluded.

“The defender’s scientific witnesses all express in their examination-in-chief the opinion that Varley did not disclose or publish the series-shunt arrangement in the description which I have already quoted. They find Varley’s description to be inconsistent with series-shunt, and suggestive of something quite different. The value of these opinions, however, is seriously diminished when consideration is given to the method by which they are reached. I think I do the defender’s witnesses no injustice when I say that their method is to take Varley’s description paragraph by paragraph, each by itself and detached from the context, and then proceed to show how each separate paragraph is, when so read, inconsistent with or suggestive of something other than series-shunt. As an example of this method of dealing with Varley’s description I may refer to the evidence of Professor Sylvanus Thomson, the first witness examined by the defenders. Such a method is neither reasonable nor fair. To do justice to Varley’s description it must be read in its entirety; and when this is done even Mr Thomson has to admit, as he does on cross-examination, that the description is ‘consistent with a series-shunt arrangement,’ which is just a somewhat guarded way of saying that it is descriptive of a series-shunt arrangement. In like manner (but with a greater degree of fairness), Sir William Thomson deals with the description. He finds that there are some things inconsistent with series-shunt; that he ‘has been puzzled’ in trying to understand the description, which contains some words of a misleading rather than instructive tendency, and he concludes that an ordinary skilled workman would not in 1876 by Varley’s description ‘have had disclosed to him the system of series-shunt winding.’ That opinion certainly undergoes modification in the course of his examination, for he concludes his evidence in chief on this part of the case by saying that he thinks ‘it quite probable that in 1876, he (the ordinary skilled workman) might have been led to series-shunt by these descriptions.’ His cross-examination, however, brings him still nearer to the view which I have taken. He says—‘The whole passage is consistent with series-shunt winding except the partial inconsistency of the first lines, which is not an absolute inconsistency.’ On the whole I think Sir William Thomson may fairly be claimed by the pursuers as a witness in support of their views.

A great deal of evidence is adduced to show that Varley’s description would not have enabled an ordinary skilled workman to construct a series-shunt machine, although some of the defender’s witnesses

say that from Varley's description it would have been difficult only, not impossible; but assuming the fact to be that from Varley's description alone the ordinary skilled workman could not have constructed a series-shunt machine, that is by no means conclusive of the question in the defenders' favour. A specification may so insufficiently describe the process or the machine patented as to render the patent invalid—(*Betts v. Neilson*, L.R. 3 Ch. Ap. 432). It may nevertheless contain sufficient description to disclose or publish the invention, so as to prevent its being validly patented by another subsequently. But I think it has been demonstrated that Varley's description was sufficient to enable a workman to make his machine. The model, No. 37, which every one admits to be a model of a series-shunt wound machine, was made by a lad nineteen years of age, apprentice to an instrument maker 'from the information derived from Varley's patent with its drawings, and from nothing else.' It is entirely 'my own idea of Varley's patent.' The same thing was done by others. On the other hand, while there are witnesses brought to say that the description is misleading and inconsistent, no skilled workman has been brought to prove that having tried to make the machine from Varley's description he had been unable to do so—(*Vide per Tindal, C.-J., in Cornish v. Keene*, Webster's Pat. Cas. i. 502-3; and *per Lord Chancellor Cairns in British Dynamite Company v. Keels*, Goodeve's Pat. Cas. 193).

"It is further urged by the defenders that Varley had not when he invented his machine any knowledge of the value of series-shunt, and particularly of the quality of 'constant potential,' which by a series-shunt machine alone, of the three I have mentioned, can be approximately obtained; that series-shunt was not in his mind, but some method of series winding, with a separate coil for separate excitation; that, on the other hand, Brush knew the value of and was seeking to find a self-regulating machine. These matters have not, in my mind, any very direct bearing on the question at issue, but they require to be noticed. In the first place, Varley deposes that in making his specification he 'understood the electrical significance of series-shunt winding,' and I believe him. It is only due to Mr Varley that I should say that whatever may be the soundness or otherwise of his electrical theories, there is no doubt in my mind of his honesty; when he speaks to facts I think he may be entirely relied on. In the second place, whatever value Varley placed on the compound winding of his machine, it was not in his view to make a machine which should proceed on the principle of separate excitation within the machine itself. He made a drawing (No. 40 of process) in November 1876 (before the date of his provisional specification), which shows that he intended his machine to be a series-shunt, and not a series with separate excitation. With regard to that drawing Professor Sylvanus Thompson says—'So far as that drawing goes, it indicates a series-shunt arrange-

ment.' In the third place, without expressing any opinion as to what may have been the state of knowledge of either Varley or Brush before 1876 or 1878 as to the value or obtainability of 'constant potential,' it is certain that neither of them in their respective specifications say anything to indicate their appreciation of the value of that quality, or disclosed any view whatever as to the mode in which it was to be obtained. Even in 1878 constant potential was not felt to be a desideratum in electric machines, and in regard to this matter Varley and Brush for all that appears stand on an equal footing.

"Lastly, on this branch of the case, I have to notice that the defenders rely very much upon the fact that Varley in his specification did not claim the invention of compound winding. But Varley explains why he did not do so, and I have no doubt his explanation is true. Perhaps he was too timid; perhaps he had given a construction, and attributed a value to his brother's communication which it would not bear and did not merit. And yet it appears that another skilled electrician at first reading took the same view of that communication which Varley did. But the fact that Varley did not claim a certain invention is no proof that he did not publish it.

"I come now to the question, whether the defenders' machine was anticipated by user.

"A machine was constructed under Varley's specification in 1876 or 1877, which is produced. I think it is proved to be a series-shunt machine. It has the two coils of wire round the magnets, one of greater resistance than the other, and was capable undoubtedly of being worked as a series-shunt, having an appropriate commutator for that purpose. But some of the defenders' witnesses say it was a merely experimental machine, and could be connected in a variety of ways. It was certainly not worked as a series machine with separate excitation, for the commutator used was quite inappropriate to and negatived the idea of such use. How was it connected? Varley says—'The machine No. 29 was connected exactly in the way that is represented by that diagram' (No. 40). Sir William Thomson says that that diagram represents series-shunt. He is asked—'If you were told as a fact that this machine had been connected in accordance with the device shown in that sketch, would that convey to your mind a certainty that this machine had been worked as a series-shunt machine?' and he answers—'Yes.' There are other signs spoken to which in the opinion of some of the witnesses indicate that the machine was worked as a series-shunt, but there are contrary opinions also. I rely upon the evidence of Varley that his machine, which was undoubtedly capable of being connected and worked as a series-shunt, was so connected and worked. He knew best how his machine was connected, and, as I have said, on any matter of fact I have no doubt of Varley's accuracy and truthfulness. Then if it was so worked, it

was worked publicly. It was used publicly to illustrate certain operations in a diving tank, and for the purpose of photographing an ice-machine. These were not experiments on the machine itself. They were the application of the machine to business purposes made in the presence of the public without secrecy or concealment. Very little use of a machine in such circumstances will constitute prior user. 'If it is proved distinctly,' said Lord Lyndhurst, 'that a machine of the same kind was in existence, and was in public use, i.e., if use or if trials had been made of it in the eye and in the presence of the public, it is not necessary that it should come down to the time when the patent was granted. If it was discontinued, still that is sufficient evidence of the prior use so as to invalidate the letters-patent—(*Househill Company v. Neilson*, 2 Webster's Patent Cases, 709; *Creswell, J.*, in *Steed v. Williams*, 2 Webster's Patent Cases, 136.) Such use of Varley's machine is I think distinctly proved.

"I am therefore of opinion that the defenders' machine was anticipated by Varley's, both by publication and user, and that the defenders' patent is therefore invalid."

The defenders reclaimed, and argued—*On the question of prior publication*—The mere suggestion of an idea which required a new invention to give it practical effect did not constitute anticipation of a mechanical invention; the invention must be sufficiently disclosed. A good test of sufficiency of disclosure was to see whether the publication had had the practical effect of making the invention known. Varley's specification never made compound winding known. Assuming that he made the discovery, he failed to make it practically useful, or to describe it so as anyone could understand it. Further, Varley never made the discovery of compound winding. His patent did not deal with it nor describe it, nor did he claim the invention. It was not enough to find in a long description a few lines which, it might be maintained, were consistent with a subsequent invention; there must be a description consistent with nothing else. The passage in Varley's specification founded on by the pursuers might be consistent with compound winding, but was certainly not descriptive or definitive of it, and would not have conveyed the idea of compound winding to a workman of ordinary skill in 1876. The pursuers had accordingly failed to show that the defenders' invention had been anticipated by prior publication in Varley's specification—*Betts v. Menzies*, 1861, 10 H. of L. Cas. 117, 7 L.T. (N.S.) 110, 4 Best & Smith, Q.B. 996; *Neilson v. Betts*, L.R., Chan. App. 429; *Otto v. Linford*, March 11, 1882, 46 L.T.R. 35; *Hill v. Evans*, 1862, 31 L.J. Chan. 457; *Curtis on Patents* (4th ed.) 508. (2) *On the question of anticipation by use*—There was no use of Varley's machine except by way of experiment, the result being that the machine was thrown aside as a failure. That was not enough to constitute anticipation by

use—*Murray v. Clayton*, 1872, 7 Chan. App. 570; *Jones v. Pearce*, 1831, 1 Webster's Pat. Cas. 122; *Steed v. Williams, &c.*, 1843, 2 Webster's Pat. Cas. 126; *Galloway, &c. v. Bleadon*, 1839, 1 Webster's Pat. Cas. 520; *Eddison v. Holland*, 6 R.P.C. (3) *On the question of disconformity between the provisional and final specification*—A provisional specification was not the place for minute description. If the mechanism or invention were described as a whole in the provisional specification, the patentee might claim the total combination and as many subordinate combinations and subordinate integers in the final specification as he could get. The first claim was for the whole combination, the second and third for subordinate combinations, and the rest for mechanical pieces. Claim four was for a legitimate part of the invention set out in the provisional specification, and although this part might be dispensed with, it was none the less a useful part of the invention. On this branch of the case also the pursuers failed—*Harrisons v. Anderston Foundry Company*, June 20, 1876, 3 R. (H. of L.) 55; *Neuhall v. Elliott & Glass*, 1858, 27 L.J., C.P. 337; *Penn v. Bibby*, 1866, L.R., 2 Chan. App. 127; *Stoner v. Todd*, 1876, 4 Chan. Div. 58; *United Telephone Company v. Harrison*, 1882, 21 Chan. Div. 74; *Woodward v. Sansum*, 1887, 56 L.T.R. 347.

The pursuers argued—(1) *On question of prior publication*—Varley's specification contained words descriptive of and only consistent with compound winding. He did not claim it because he thought his brother had discovered it, and he was afraid of endangering the rest of his invention. A workman of less than ordinary intelligence, if he followed the directions therein contained, must produce a series-shunt machine. In fact, such a machine had been constructed from Varley's specification by apprentices previously unacquainted with the theory of compound winding, and without assistance—*Cornish v. Keene*, 1 Webster's Patent Cases, 502; *Philpott v. Hanbury*, April 24, 1885, 2 R.P.C. 43. (2) *On the question of anticipation by previous use*—The machine constructed from Varley's specification was a series-shunt dynamo, and it had been used several times to throw light on a tank for diving operations in Siebe & Gorman's works. It had also been shown to visitors there. That was sufficient to constitute public user so as to invalidate a subsequent patent—*Carpenter v. Smith*, 1841, 1 Webster's Patent Cases, 530; *Humpherson v. Syer*, July 26, 1887, 4 R.P.C. 407. Wilde's and Varley's commutators both anticipated the defenders', being practically identical with them. (3) *On question of disconformity between the provisional and final specification*—If a provisional specification only dealt with a mechanical combination, the patentee could not go further in his final specification by claiming a mechanical part of the combination as a separate integer. Under claim 4 an electrical advantage was claimed, but the provisional specification contained no allusion to the insulating segment T by

which the advantage was gained—*Baily v. Robertson*, February 23, 1877, 4 R. 545, June 21, 1878, 5 R. (H.L.) 179, L.R., 3 App. Cas. 1055. If what was claimed under head 4 was merely the mechanical device of substituting metal for wood segments it was not patentable.

At advising—

LORD M'LAREN — The defenders, the British Electric Light Corporation, claim under their patent the exclusive privilege of making dynamo-electric machines in which the electro-magnets are of the type known as "compound-wound" magnets; also known as the "series-shunt" type.

The pursuers King, Brown, & Company are makers of "compound-wound" dynamos; and their right to make such machines having been extrajudicially challenged, they have brought this action to have the defenders' patent reduced and declared void on various grounds; the chief objection being that the invention of compound-winding was previously discovered and made known by Mr Varley, and consequently that Mr Brush or his assignees are not in the position of being the "first and true inventors" of this valuable electric appliance. There can be no doubt that the holders of Brush's patent claim compound-winding as an essential feature of their machine, and accordingly if this claim be ill-founded the patent must fall. The argument was directed mainly to the question of the anticipation of the Brush system of compound-winding by Mr Varley, and I shall consider this subject in the first place, touching afterwards on the objections to Brush's specifications which are of a technical character.

In order to make my observations intelligible I must begin by stating in what compound-winding consists—

When the armature of an electro-magnet is attached to an axis, so as to be capable of rotating in the magnetic-field, the armature tends to place itself in a symmetrical position with reference to the poles of the magnet, and if force is applied to turn the armature on its axis, the movement of rotation is resisted by the forces in the magnetic-field. The energy expended by the steam power or whatever power is employed to turn the armature against the resistance of the magnetic-field is then converted into current-electricity, and the current being carried through the revolving axis by insulated wires is given off by an appliance termed a commutator, passes thence into a conducting wire, and is then ready to be used for electric lighting or any other purpose of utility to which it is capable of being applied.

In the rudimentary form of the dynamo machine I understand that the excitation of the electro-magnets was maintained from a separate, or as it is termed an external source, generally a battery of some kind.

The first improvement consisted in winding one of the conducting wires round the electro-magnets, the continuation of this wire being led into the external or working

circuit. In this way the current flowing from the dynamo was made to maintain the magnetism of the electro-magnets, as a part of the work which it had to perform. This is known as series-winding, because there is one continuous current which is only partly used in maintaining the magnetism.

The next improvement consisted in dividing the current as it flowed from the commutators into two partial currents. In this system the wire is bifurcated; one branch is wound round the electro-magnets and is returned to the opposite pole of the commutator. The second branch wire is employed for lighting or external work of some kind, and is re-united to the first branch wire near where it meets the commutator at the opposite pole. This is the form known as the shunt-winding system or shunt machine.

The invention of compound-winding, with which we are here concerned, consists in—I will not say a combination of the two methods—but in the addition of the shunt and the series methods. The wire is divided or bifurcated as it leaves the commutator. Both the branches are wound round the electro-magnets. One of these is directly returned to the opposite pole of the commutator without doing any work other than the excitation of the magnets. The second wire on leaving the electro-magnets is continued to form the external or working circuit and is ultimately re-united to the first wire. This arrangement seems to be an exception to the rule against trying to do two things at the same time; because it is admitted that the compound-wound machine is a much better working machine than the shunt. It appears that the sections of the wires can be so proportioned that a nearly uniform current flows in the working-field notwithstanding variations in the quality of work to be done. It is not necessary for the purposes of the case to explain why this should be; and if it were necessary, I am not sure that I am able to explain it. It is a question of the mathematical theory of current-electricity. But it is agreed that the compound-wound machine, when the wires have the proper relative conducting capacity gives better results as regards uniformity and steadiness of the current than are attained by either the series or the shunt, and this explains the importance of the right to use this invention to the parties concerned. I may here observe that it is not clear to me that either Varley or Brush were at first fully aware of the scientific and practical importance of the principle of compound-winding. Varley was the inventor or one of the inventors of the "series-machine," and both Varley and Brush were doubtless aware of the advantages and disadvantages of the "series" and the "shunt." The idea of introducing the two methods into the same machine is one that would very naturally occur to any one familiar with the subject and practically conversant with dynamo-machines. Assuming that this is intelligently done, with the object of getting a better working machine through



the union of the series and the shunt than is attainable by either of these modes of winding singly, then the invention is a proper subject of a patent, and it is not necessary to its validity that the patentee should have foreseen all these advantages which have only been realised through the subsequent introduction or extension of electric lighting with the incandescent lamp.

I may also observe that in Brush's specification, as well as in the specification of Varley, which is founded on as an anticipation, the mode of winding is only treated as one among many of other parts of a dynamo-machine; and it is quite possible that a reader, even if conversant with the subject, might peruse either of these documents without having his attention specially called to the novelty of the system of compound-winding. But neither will this consideration affect the question. An inventor may describe his invention clearly without proclaiming it as a very important discovery, and the question is whether compound-winding is clearly described in Varley's specification. The specification in question is No. 4905 of 1876, and its title is—"Improvements in apparatus for producing the electric light, parts of which invention are applicable to other purposes." The alleged anticipation is contained in the two paragraphs p. 4 lines 11 to 21.—"Part of the electricity developed by the machine is diverted to maintain the magnetism of the soft iron magnets, and the remaining portion is used to produce the electric light." I interrupt the reading to remark that in the words I have read the writer only announces what he is going to do, and does not profess to be explaining his method. This obvious and I should have thought superfluous criticism disposes of many pages of evidence in which witnesses are brought to say that these words would not give them a clear idea of the method of compound-winding. The specification proceeds—"There are several well-known ways of doing this" (that is of diverting a part of the electric energy developed by the machine), but the method I prefer is to wrap the soft iron magnets with two insulated wires, one having a larger resistance than the other.—The circuit of larger resistance is always closed, and the circuit of less resistance is used for the electric light."

If the description had stopped here, I should not have doubted that it contained a clear description of the construction of a compound-wound machine; I mean a description of so much of the apparatus as is included in the name compound-winding. The direction is to wrap the magnets with two insulated wires. It is of course implied that these wires are to carry currents coming from the machine; but this is not left to implication, because it is clearly explained that these insulated wires are the media for the transmission of separate currents, the one of larger resistance being always closed (in other words, acting as a shunt), while the other is used for the electric light (having previously contributed to the magnetisation

of the magnets by being wrapped round them). But if the description had stopped here it would have been open to the observation that while it described the construction it did not indicate except in a very general way the use of the compound-winding of the magnets. Now, I could hardly consider that to be an adequate description of an invention which should leave the reader in ignorance of its utility and its mode of action. But the information which I desiderate is supplied by the second paragraph—"When the electric light is being produced, the greater portion of electricity passes through the circuit of less resistance, which I term the 'electric light circuit,' maintaining the magnetism of the magnets and producing the light. When the electric light current is open from any cause, the electricity developed passes through the circuit of greater resistance only and maintains the magnetism of the magnets." There is here plainly described one of the advantages of the compound-wound dynamo, probably the only one known to the writer, viz., that when work is being done in the external circuit, the magnets have the benefit of the unobstructed flow of the electric current through the wire of larger section and less resistance, while when the external current is open and no work being done, the magnets receive through the wire of greater resistance the current which is sufficient for their excitation. I am here merely paraphrasing Mr Varley's description without meaning to add anything to it, and I think that anyone conversant with the subject and reading this paragraph (whether he agreed with Mr Varley or differed with him as to the possible benefits to be attained) would not be left in doubt as to what Mr Varley considered to be the *rationale* and the mode of action of the management of wires described in the preceding sentences.

I have difficulty in understanding how it is that a considerable number of able and distinguished men should have been persuaded to give their evidence as to the alleged insufficiency of Mr Varley's description as an anticipation. To a considerable extent the evidence of the witnesses for the Brush Company is made up of somewhat minute verbal criticism on the expressions used by Varley. But in so far as these gentlemen indicate an opinion as to the insufficiency of the description in its entirety, I think their conclusions are in part explained by their having misapprehended the question, because I observe that the question is frequently asked and answered whether Varley's specification is such as would enable an ordinary workman to make a compound-wound machine. Now, the question of anticipation does not depend, in our opinion, upon that test. We are not here trying the sufficiency of Varley's specification as a specification. Varley is not here claiming any exclusive privilege, (his patent has long since expired) and we have no occasion to consider whether he fulfilled the duty which is the counterpart of the exclusive privilege given to a patentee of particularly describing and ascertaining

the nature of his invention and the manner in which it is to be performed.

I am very far from saying that Varley's specification is insufficient as a specification of a patented invention. I rather think it would be held to meet the requirements of the Statute of King James. But the question we are now considering is quite different; it is, whether Mr Brush is or is not the first and true inventor of compound-winding, and the negative of that proposition may be proved by showing that the invention was previously described, not necessarily in language sufficient as directions to a mechanic, but in language clear and intelligible to educated men conversant with the subject and capable of giving the necessary directions to the hypothetical workman. An invention may be clearly described in mathematical or chemical symbols, the latter being perhaps the preferable illustration. Such a description, although it may have to be translated for the instruction of the operative chemist (just as if it were written in a foreign language), would be an anticipation of the same invention described in popular language such as is required (as far as practicable) by our patent law.

Now, I venture to think that if Varley's description had been put into the hands of any of the defender's witnesses (without reference to any question under the patent laws) that he would have understood it and would have been able to instruct a workman to make an experimental machine. I think I can collect from their evidence that the witnesses on both sides understood the specification perfectly, although some of them were certainly apprehensive that other persons less gifted would not find it so easy to be understood.

It is a remarkable circumstance in this case that neither in the course of the trial nor in the argument addressed to us has any reference been made to Brush's description of compound winding. It seems to have been assumed that it at least was a pattern of clearness, and certainly no objection was taken to it on the ground of insufficiency. Brush's description is contained in the passage:—"I attain my object by diverting from external work a portion of the current of the machine, and using it either alone or in connection with the rest of the current for working the field magnets. I prefer the latter plan of the two just above mentioned especially for electroplating machines. If now the external circuit be broken entirely the magnetic field will, in the former plan just mentioned, remain unimpaired; and in the latter plan will remain sufficiently strong to effect the desired end. In applying my invention to dynamo electric machines, I wind the cores of the field magnets with a suitable quantity of a comparatively fine wire having a high resistance in comparison with that of the external circuit and the rest of the wire in the machine. The ends of this wire are so connected with other parts of the machine that when the latter is running a current of electricity constantly circulates in said wire whether

the external circuit be closed or not. The high resistance of this wire prevents the passage through it of more than a small proportion of the whole current capable of being evolved by the machine; therefore the available external current is not materially lessened. When this device, which I have called a 'teaser,' is used in connection with field magnets, also wound with coarse wire (as shown in figure 1 of the drawings) for the purpose of still further increasing the magnetic field by employing the main current for this purpose in the usual manner, then the 'teaser' may be so arranged that the current which passes through it will also circulate in the coarse wire, thus increasing the efficiency of the device." Now if Varley's description be insufficient, I do not see how the validity of Brush's patent can be maintained, because the two descriptions are practically identical. Conversely, if the invention of compound winding be well described in Brush's specification, the identical description in Varley's specification must be an anticipation. I do not mean, of course, that the language of the two descriptions is absolutely identical. In describing the shunt arrangement Brush calls it a "teaser" (I do not know whether electricians attach any significance to this vocable), and there are some other variations of expression. But I can find nothing of substance in Brush that is not in Varley; and I cannot help adding that if there be any difference, Varley's description is more easily understood of the two.

This completes what I have to say on the subject of anticipation by prior publication. There is also a plea of anticipation by prior use. On this point the facts are these—In the interval between the filing of the provisional and complete specification Mr Varley had a machine made to his direction by the firm of Siebe & Gorman. When the machine was first tried, it did not work well, because its frame was not sufficiently strong to prevent the revolving armature being attracted into contact with the electro-magnets. I need not say that the motion of the armature must not be resisted by friction, but only by the immaterial though no less real resistance offered by the forces developed in the magnetic field. This was corrected by strengthening the frame, and the machine was successfully used in the production of an arc-light by the lamp produced along with the machine. Siebe & Gorman are makers of diving apparatus, and the lamp was used on their premises to exhibit the apparatus under water in a tank which they had for the purpose.

The case on public use is narrow; but we consider that what I have described is public use as interpreted by decisions. The machine in question was produced, and it is a compound-wound machine; nobody has said anything to the contrary, though some of the defenders' witnesses say that if the wires were uncoupled or were coupled up in a different way it would no longer be so. But the effect of uncoupling the shunt wires would be to render this part of the winding simply useless for any purpose, as

would indeed be the case with a machine of any kind if a material part of the machine is put out of its place or turned the wrong way.

The Lord Ordinary has in his judgment extracted some of the more noticeable expressions of opinion by the scientific witnesses on the question of prior publication and prior use, and has pointed out the insufficiency of the reasons given for holding Varley's specification to be incorrect or incomplete. I concur in the Lord Ordinary's view as to the weight to be attached to this part of the evidence, and in his Lordship's opinion generally on the facts of the case, except in so far as he may be held to imply that the test of the sufficiency of an anticipation is the same as the test that would be applied to the construction of a specification founded on as such.

There is another objection to the defenders' patent, and it is founded on an alleged inconsistency between the provisional and complete specifications. The provisional specification announces as one of the improvements for which the patent is granted, an improved construction of the commutator. The function of the commutator is to connect the alternating currents (as they pass from the revolving axis to the external circuit) into one continuous current; this is accomplished by fitting the axis with insulated segments to which the poles of the armature are connected by insulated wires, and the segments are so arranged that at the moment when the current in the machine is reversed, the external wire becomes disconnected from the corresponding segment and is at the same time brought into connection with the segment which is attached to the opposite pole of the machine.

The improvement indicated in the provisional specification is a purely mechanical improvement for the purpose of obtaining a mechanical advantage. But in the course of perfecting his invention Mr Brush found that an electrical advantage might also be secured by means of a slight variation of the mechanical arrangement indicated in the provisional specification. The variation consists in separating the segments, so that for a small portion of each semi-revolution the current shall be interrupted; that is to say, the current is cut out during the brief interval when the armature (or the particular member of the compound armature) is in a neutral position and when the resultant of the forces acting on it is therefore very small.

In the complete specification the variation whereby this electrical advantage may be gained is claimed as one of the patented improvements, and the question arises whether this difference between the provisional and complete specifications does not exceed the latitude allowed to an inventor who is only perfecting what he has provisionally announced.

The Lord Ordinary has held that the claim referred to is not covered by the provisional specification, on the ground that although the construction of the commutator as perfected is not materially varied,

yet as the variation represents a distinct principle and is directed to an object distinct from that which is indicated in the provisional specification, the two things cannot be regarded as identical inventions. There is much force in the Lord Ordinary's view on this question, but we consider it unnecessary to come to a decision upon it; because we are all of opinion that if there had been no more serious objection to the Brush Patent than this, it would be only fair to the patentee that he should be allowed an opportunity of disclaiming the variation on one of the patented improvements. But this is not the condition of the case as it arises for decision, because we are agreed that the patent is invalidated in its essential and fundamental privilege by reason of the prior publication and prior use by Varley of the invention of a compound winding for which this exclusive privilege is given.

For that reason I am of opinion that the interlocutor of the Lord Ordinary should be adhered to and decree of reduction of the patent pronounced.

The LORD PRESIDENT and LORD ADAM concurred.

LORD SHAND was absent.

The Court adhered.

Counsel for the Pursuers and Respondents—Graham Murray—C. S. Dickson—Daniell. Agents—Davidson & Syme, W.S.

Counsel for the Defenders and Reclaimers—D.-F. Balfour, Q. C.—Jameson. Agents—Mackenzie, Innes, & Logan, W.S.

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Thursday, July 17.

FIRST DIVISION.

[Lord Kyllachy, Ordinary.

PIRIE v. THE CALEDONIAN RAILWAY COMPANY.

*Process—Jury—Verdict—Mistake by Foreman of Jury in Counting Votes—Challenge of Verdict by Jurymen—Affidavit—New Trial.*

In an action of damages the jury returned a verdict for the defenders by seven to five. Shortly thereafter the pursuer presented a note to the Court stating that the foreman of the jury had made a mistake in counting the votes, that in reality the jury were equally divided, and craving a new trial. Affidavits by certain of the jurymen were produced in support of these allegations. *Held* that after the verdict of a jury is returned, recorded, and published, it cannot competently be challenged even by a member of the jury.

*Reparation—Damages—Railway—Passenger Killed while Leaning from Railway Carriage—Contributory Negligence.*